

Single Crystals Wafer & Substrate

Wafer & Substrate A – C	Wafer & Substrate C – G	Wafer & Substrate G – L	Wafer & Substrate L – P	Wafer & Substrate P – T	Wafer & Substrate U – Z
Aluminum	CaF ₂	GaSb	LiNbO ₃	PMNT	W (Polycrystal)
Al ₂ O ₃ (sapphire)	CeO ₂ (Epi-film)	GaAs	LiTaO ₃	SrTiO ₃	YAlO ₃ (YAP)
AlN template	CdWO ₄	GaN	Lu ₂ SiO ₅ : Ce	Nb:SrTiO ₃	YAG
Ag	CdS	GGG	LiF	SrLaAlO ₄	YVO ₄
Au	CdSe	InP	MgAl ₂ O ₄ (spinel)	SrLaGaO ₄	YSZ (Y:ZrO ₂)
Au/Cr coated SiO ₂ /Si	CdTe	InAs	MgO	SiO ₂ (quartz)	ZnO
BaF ₂	CdZnTe	InSb	Mg	SiC (4H, 6H, 3C)	ZnS
BaTiO ₃	CsI (TI)	KTN	MgF ₂	SBN	Zn
Bi ₂ Te ₃	DyScO ₃	KTaO ₃ (KTO)	Mica Disks	Si	ZnSe
BiGe ₃ O ₁₂ (BGO12)	Diamond on Si	LaAlO ₃	Mo (Polycrystal)	Si-Ge	ZnTe
Bi ₁₂ GeO ₂₀ (BGO20)	Fe (SS-Poly)	LSAT	NaCl	Te-Dy-Fe (GMM)	TbScO ₃ / DyScO ₃ /GdScO ₃
CaCO ₃ (Calcite)	GaP	LaF ₃	Nickel (single xtl)	TeO ₂	Zero Diffraction Plate for XRD
Cu	Graphite	LiAlO ₂	NdGaO ₃	Ti (polycrystal)	Zr
	Ge	LiGaO ₂	NdCaAlO ₄	TiO ₂	
		Li	PbWO ₄	Ta	

Single Crystals Wafer & Substrate A – C

1. Ag (Silver) Single crystal & Substrate

No.	Item	Description
1.	Ag(Silver) Single Crystal Substrate: <100>, 10x10x0.35-0.4 mm, 1 side polished	Ag(Silver) Single Crystal Substrate Purity: 99.999% Size: 10x10x0.3-0.45 mm Surface finish: One side optical polished Surface finish (RMS or Ra): One side polished < 30Å Orientation <100>
2.	Ag(Silver) Single Crystal Substrate: <110>, 10x10x0.5 mm, 1 side polished	Ag(Silver) Single Crystal Substrate Purity: 99.999% Size: 10x10x0.5 mm Surface finish: One side optical polished Surface finish (RMS or Ra): One side polished < 30Å Orientation <110>
3.	Ag(Silver) Single Crystal Substrate: <111>, 10x10x0.35-0.4 mm, 1 side polished	Ag(Silver) Single Crystal Substrate Purity: 99.999% Size: 10x10x0.35-0.4mm Surface finish: One side optical polished Surface finish (RMS or Ra): One side polished < 30Å Orientation <111>
4.	Hafnium(Hf) substrate (Polycrystalline) , 10x10x0.5 mm, 1 side polished	Hafnium(Hf) substrate (Polycrystalline) Purity: 99.5% Size: 10x10x0.5 mm Surface finish: One side optical polished Surface finish (RMS or Ra): N/A
5.	Vanadium(V) substrate (Polycrystalline) , 10x10x0.5 mm, 1 side polished	Vanadium(V) substrate (Polycrystalline) Purity: 99.5% Size: 10x10x0.5 mm Surface finish: One side optical polished Surface finish (RMS or Ra): N/A

2. Al - Aluminium Single Crystal

No.	Item	Description
1.	Aluminum Single Crystal Substrate: <100>, 2" Dia. x1.0 mm, 1 side polished	<u>Single crystal aluminum metallic substrate:</u> Purity: > 99.99% Size: 2" Dia x1.0 mm Surface finish: One side optical polished < 100A Application: substrates for metal, alloy film and biological materials Orientation <100> +/-2 deg.
2.	Aluminum Single Crystal Substrate: <100>, 8 mm Dia. x3.0 mm, 1 side polished	<u>Single crystal aluminum metallic substrate:</u> Purity: > 99.99% Size: 8mm Dia x3.0 mm Surface finish: One side optical polished < 100A Application: substrates for metal, alloy film and biological materials Orientation <100> +/-2 deg.
3.	Aluminum Single Crystal Substrate: <100>, 10x10x0.5 mm, 1 side polished	<u>Single crystal aluminum metallic substrate:</u> Purity: > 99.99% Size: 10x10x0.5 mm Surface finish: One side optical polished < 100A Application: substrates for metal, alloy film and biological materials Orientation <100> +/-2 deg.
4.	Aluminum Single Crystal Substrate: <100>, 10x10x1.0 mm, 1 side polished	<u>Single crystal aluminum metallic substrate:</u> Purity: > 99.99% Size: 10x10x1.0 mm Surface finish: One side optical polished < 100A Application: substrates for metal, alloy film and biological materials Orientation <100> +/-2 deg.
5.	Aluminum Single Crystal Substrate: <100>, 20x20x1.0 mm, 1 side polished	<u>Single crystal aluminum metallic substrate:</u> Purity: > 99.99% Size: 20x20x1.0 mm Surface finish: One side optical polished < 100A Application: substrates for metal, alloy film and biological materials Orientation <100> +/-2deg.
6.	Aluminum Single Crystal Substrate : <111>, 10x10x1.0 mm, 1 side polished	<u>Single crystal aluminum metallic substrate:</u> Purity: > 99.99% Size: 10x10x1.0 mm Surface finish: One side optical polished < 100A Application: substrates for metal, alloy film and biological materials Orientation: <111> +/-2deg.

7.	Aluminum Single Crystal Substrate: <110>, 10x10x1.0 mm, 1 side polished	<u>Single crystal aluminum metallic substrate:</u> Purity: > 99.99% Size: 10x10x1.0 mm Surface finish: One side optical polished < 100A Application: substrates for metal, alloy film and biological materials Orientation <110> +/-2deg.
8.	Aluminum Single Crystal Substrate: <111>, 20x20x1.0 mm, 1 side polished	<u>Single crystal aluminum metallic substrate:</u> Purity: > 99.99% Size: 20x20x1.0 mm; Surface finish: One side optical polished < 100A Application: substrates for metal, alloy film and biological materials Orientation <111> +/-2 deg.
9.	Aluminum Single Crystal Substrate: <110>, 20x20x1.0mm, 1 side polished	<u>Single crystal aluminum metallic substrate:</u> Purity: > 99.99% Size: 20x20x1.0mm Surface finish: One side optical polished < 100A Application: substrates for metal, alloy film and biological materials Orientation <110> +/-2 deg.
10.	Aluminum Foil for Battery Cathode Substrate (300mm Length x 295mm width x 45um thickness) - EQ-bcaf-15u	This aluminum foil (15 um) is used as substrate for coating cathode materials in Li-Ion rechargeable battery research. <u>Specifications:</u> Material: Aluminum , Purity > 99.9% Sell in roll only Length: 300m Width: 295mm Thickness: 15 um Density: 2.70 g·cm ⁻³ Net weight: 5.5 kg Tube weight: 1 kg Shipped in vacuum bag
11.	Aluminum Mesh Foil for Battery Cathode Substrate (240mm width x 45um thickness) - EQ-bcanf-45u	This aluminum net foil (45 um) is used as substrate for coating cathode materials in Li-Ion rechargeable battery research. <u>Specifications:</u> Material: Aluminum, Purity > 99.9% Sell in roll only Width: 240mm Thickness: 45 um Density: 2.70 g·cm ⁻³ Net weight: Tube weight: 1 kg Shipped in vacuum bag

3. Al₂O₃ (Sapphire)

I. C-Plane (0001)

A. square Al₂O₃ substrate 5x5mm,10x10mm&0.25"x0.25"

No.	Item	Description
1.	Al ₂ O ₃ - Sapphire Wafer, C-plane <0001>,10x10x0.1mm, 1SP	<p><u>Sapphire substrate is the popular substrates for III-V nitrides:</u></p> <p>superconductor and magnetic epi film due to less mis-matched lattice and stable chemical and physical properties. Wafer size: 10 x 10 x 0.1 mm thick Orientation : <0001> +/-0.5o Polished surface: substrate surface is EPI polished via a special CMP procedure with RA < 5 A one side polished Package: Each wafer is packed in 1000 class clean room with 100 grade plastic bag with wafer container.</p>
2.	Al ₂ O ₃ - Sapphire Wafer, C-plane <0001>,10x10x0.1mm, 2SP	<p><u>Sapphire substrate is the popular substrates for III-V nitrides:</u></p> <p>superconductor and magnetic epi film due to less mis-matched lattice and stable chemical and physical properties. Wafer size: 10 x 10 x 0.1 mm thick Orientation : <0001> +/-0.5o Polished surface: substrate surface is EPI polished via a special CMP procedure with RA < 5 A two sides polished Package: Each wafer is packed in 1000 class clean room with 100 grade plastic bag with wafer container.</p>
3.	Al ₂ O ₃ - Sapphire Wafer, C-plane <0001>, 10mmx5mmx0.5mm, 1 sp	<p><u>Sapphire substrate is the popular substrates for III-V nitrides:</u></p> <p>superconductor and magnetic epi film due to less mis-matched lattice and stable chemical and physical properties. Wafer size: 10 mm x 5 mm x 0.5 mm thick Orientation tolerance: +/-0.5 Deg. C plane orientation Polished surface: substrate surface is EPI polished via a special CMP procedure with Ra < 5 A 1 side polished Package: Each wafer is packed in 1000 class clean room with 100 grade plastic bag with wafer container. Precaution: R plane sapphire wafer is easy to cleave compared with C plane's. Please handle it with a care</p>
4.	Al ₂ O ₃ - Sapphire Wafer, C-plane <0001>, 10mmx5mmx0.5mm, 2 sp	<p><u>Sapphire substrate is the popular substrates for III-V nitrides:</u></p> <p>superconductor and magnetic epi film due to less mis-matched lattice and stable chemical and physical properties. Wafer size: 10 mm x 5 mm x 0.5 mm thick</p>

		<p>Orientation tolerance: +/-0.5 Deg. C plane orientation</p> <p>Polished surface: substrate surface is EPI polished via a special CMP procedure with Ra < 5 A</p> <p>2 side polished</p> <p>Package: Each wafer is packed in 1000 class clean room with 100 grade plastic bag with wafer container.</p> <p>Precaution: R plane sapphire wafer is easy to cleave compared with C plane's. Please handle it with a care</p>
5.	Al2O3 Sapphire Wafer, C-plane <0001>, 5mmx5mmx0.5mm, 2sp	<p><u>Sapphire substrate is the popular substrates for III-V nitrides:</u></p> <p>superconductor and magnetic epi film due to less mis-matched lattice and stable chemical and physical properties.</p> <p>Wafer size: 5 mm x 5 mm x 0.5 mm thick</p> <p>Orientation tolerance: +/-0.5 Deg. C plane orientation</p> <p>Polished surface: substrate surface is EPI polished via a special CMP procedure with Ra < 5 A</p> <p>2 sides polished</p> <p>Package: Each wafer is packed in 1000 class clean room with 100 grade plastic bag with wafer container.</p> <p>Precaution: R plane sapphire wafer is easy to cleave compared with C plane's. Please handle it with a care</p>
6.	Al2O3 Sapphire Wafer, C-plane <0001>, 5x5x0.5mm, 1sp	<p><u>Sapphire substrate is the popular substrates for III-V nitrides:</u></p> <p>superconductor and magnetic epi film due to less mis-matched lattice and stable chemical and physical properties.</p> <p>Wafer size: 5 mm x 5 mm x 0.5 mm thick</p> <p>Orientation tolerance: +/-0.5 Deg. C plane orientation</p> <p>Polished surface: substrate surface is EPI polished via a special CMP procedure with Ra < 5 A</p> <p>1 side polished</p> <p>Package: Each wafer is packed in 1000 class clean room with 100 grade plastic bag with wafer container.</p> <p>Precaution: R plane sapphire wafer is easy to cleave compared with C plane's. Please handle it with a care</p>
7.	Al2O3- Sapphire Wafer 10x10x0.43mm <0001> 1 SP	<p><u>Sapphire substrate is the popular substrates for III-V nitrides:</u></p> <p>superconductor and magnetic epi film due to less mis-matched lattice and stable chemical and physical properties.</p> <p>Wafer size: 10 x 10 x 0.43 mm thick</p> <p>Orientation : <0001> +/-0.5o</p> <p>Polished surface: substrate surface is EPI polished via a special CMP procedure with RA < 5 A</p> <p>1 side polished</p> <p>Package: Each wafer is packed in 1000 class clean room with 100 grade plastic bag with wafer container.</p>
8.	Al2O3- Sapphire Wafer 10x10x0.4mm <0001> 1 SP	<p><u>Sapphire substrate is the popular substrates for III-V nitrides:</u></p> <p>superconductor and magnetic epi film due to less mis-matched lattice and</p>

		<p>stable chemical and physical properties. Wafer size: 10 x 10 x 0.4 mm thick Orientation : <0001> +/-0.5o Polished surface: substrate surface is EPI polished via a special CMP procedure with RA < 5 A 1 side polished Package: Each wafer is packed in 1000 class clean room with 100 grade plastic bag with wafer container.</p>
9.	Al2O3- Sapphire Wafer 10x10x0.5mm (0001) 1 SP	<p><u>Sapphire substrate is the popular substrates for III-V nitrides:</u></p> <p>superconductor and magnetic epi film due to less mis-matched lattice and stable chemical and physical properties. Wafer size: 10 x 10 x 0.5 mm thick Orientation : (0001) +/-0.5o Polished surface: Substrate surface is EPI polished via a special CMP procedure with RA < 5 A 1 side polished Package: Each wafer is packed in 1000 class clean room with 100 grade plastic bag with wafer container.</p>
10.	Al2O3- Sapphire Wafer, C-plane (0001), 10x10x1mm, 1 SP	<p><u>Sapphire substrate is the popular substrates for III-V nitrides:</u></p> <p>superconductor and magnetic epi film due to less mis-matched lattice and stable chemical and physical properties. Wafer size: 10 x 10 x 1 mm thick Orientation : <0001> +/-0.5o Polished surface: substrate surface is EPI polished via a special CMP procedure with RA < 5 A 1 sides polished Package: Each wafer is packed in 1000 class clean room with 100 grade plastic bag with wafer container.</p>
11.	Al2O3- Sapphire Wafer, C-plane <0001>, 10x10x0.5mm, 2 SP	<p><u>Sapphire substrate is the popular substrates for III-V nitrides:</u></p> <p>superconductor and magnetic epi film due to less mis-matched lattice and stable chemical and physical properties. Wafer size: 10 x 10 x 0.5 mm thick Orientation : <0001> +/-0.5o Polished surface: substrate surface is EPI polished via a special CMP procedure with RA < 5 A 2 sides polished Package: Each wafer is packed in 1000 class clean room with 100 grade plastic bag with wafer container.</p>
12.	Al2O3- Sapphire Wafer, C-plane <0001>, 10x10x1mm, 2 SP	<p><u>Sapphire substrate is the popular substrates for III-V nitrides:</u></p> <p>superconductor and magnetic epi film due to less mis-matched lattice and stable chemical and physical properties. Wafer size: 10 x 10 x 1 mm thick Orientation: <0001> +/-0.5o Polished surface: substrate surface is EPI polished via a special CMP</p>

		<p>procedure with RA < 5 A</p> <p>2 sides polished</p> <p>Package: Each wafer is packed in 1000 class clean room with 100 grade plastic bag with wafer container.</p>
13.	Al2O3- Sapphire Wafer, C-plane (0001), 0.25"x0.25"x0.5mm, 1SP	<p><u>Sapphire substrate is the popular substrates for III-V nitrides:</u></p> <p>superconductor and magnetic epi film due to less mis-matched lattice and stable chemical and physical properties.</p> <p>Wafer size: 0.25" x 0.25" x 0.5 mm thick</p> <p>Orientation tolerance: +/-0.5 Deg. Please choose C, R, M, A plane orientation from " product option "</p> <p>Polished surface: substrate surface is EPI polished via a special CMP procedure with RA < 8 A</p> <p>Please choose 1 or 2 sides polished from " product option "</p> <p>Package: Each wafer is packed in 1000 class clean room with 100 grade plastic bag with wafer container.</p> <p>Precaution: R plane sapphire wafer is easy to cleave compared with C plane's. Please handle it with a care</p>

B. square Al2O3 substrate 0.5"x0.5"&1"x1"

No.	Item	Description
1.	Al2O3- Sapphire Wafer, C-plane (0001), 0.5"x0.5"x0.5mm, 1SP	<p><u>Sapphire substrate is the popular substrates for III-V nitrides:</u></p> <p>superconductor and magnetic epi film due to less mis-matched lattice and stable chemical and physical properties.</p> <p>Wafer size: 0.5" x 0.5" x 0.5 mm thick</p> <p>Orientation tolerance: +/-0.5 Deg. Please choose C, R, M, A plane orientation from " product option "</p> <p>Polished surface: substrate surface is EPI polished via a special CMP procedure with RA < 8 A</p> <p>Please choose 1 or 2 sides polished from " product option "</p> <p>Package: Each wafer is packed in 1000 class clean room with 100 grade plastic bag with wafer container.</p> <p>Precaution: R plane sapphire wafer is easy to cleave compared with C plane's. Please handle it with a care</p>
2.	Al2O3- Sapphire Wafer, C-plane (0001), 0.5"x0.5"x0.5mm, 2Sp	<p><u>Sapphire substrate is the popular substrates for III-V nitrides:</u></p> <p>superconductor and magnetic epi film due to less mis-matched lattice and stable chemical and physical properties.</p> <p>Wafer size: 0.5" x 0.5" x 0.5 mm thick</p> <p>Orientation tolerance: +/-0.5 Deg. C plane orientation</p> <p>Polished surface: substrate surface is EPI polished via a special CMP procedure with RA < 8 A</p> <p>2 sides polished</p> <p>Package: Each wafer is packed in 1000 class clean room with 100 grade plastic bag with wafer container.</p>

3.	Al ₂ O ₃ - Sapphire Wafer, C-plane (0001), 0.5"x0.5"x1.0mm, 1Sp	<p><u>Sapphire substrate is the popular substrates for III-V nitrides:</u></p> <p>superconductor and magnetic epi film due to less mis-matched lattice and stable chemical and physical properties. Wafer size: 0.5" x 0.5" x 1.0 mm thick Orientation tolerance: +/-0.5 Deg. C plane orientation Polished surface: substrate surface is EPI polished via a special CMP procedure with RA < 8 Å one side polished Package: Each wafer is packed in 1000 class clean room with 100 grade plastic bag with wafer container.</p>
4.	Al ₂ O ₃ - Sapphire Wafer, C-plane (0001), 0.5"x0.5"x1.0mm, 2Sp	<p><u>Sapphire substrate is the popular substrates for III-V nitrides:</u></p> <p>superconductor and magnetic epi film due to less mis-matched lattice and stable chemical and physical properties. Wafer size: 0.5" x 0.5" x 1.0 mm thick Orientation tolerance: +/-0.5 Deg. C plane orientation Polished surface: substrate surface is EPI polished via a special CMP procedure with RA < 8 Å 2 sides polished Package: Each wafer is packed in 1000 class clean room with 100 grade plastic bag with wafer container.</p>
5.	Al ₂ O ₃ - Sapphire Wafer, C-plane (0001), 1" X1"x0.5 mm 1SP	<p>Sapphire (single crystal of Al₂O₃) is being used extensively as a substrate for III-V nitrides and for many other epitaxial films. Wafer size: 1" X1"X0.5 mm thickness (0001) C plane orientation +/-0.5 Deg Polished surface: One side epi polished by special CMP technology. Package: Each wafer is packed in 1000 class clean room with 100 grade plastic bag with wafer container.</p>
6.	Al ₂ O ₃ - Sapphire Wafer, C-plane (0001), 1" X1"x0.5 mm 2SP	<p>Sapphire (single crystal of Al₂O₃) is being used extensively as a substrate for III-V nitrides and for many other epitaxial films. Wafer size: 1" X1"X0.5 mm thickness (0001) C plane orientation +/-0.5 Deg Polished surface: One side epi polished by special CMP technology. Package: Each wafer is packed in 1000 class clean room with 100 grade plastic bag with wafer container.</p>

C. Round Al₂O₃ (0001) Wafer

No.	Item	Description
1.	Al ₂ O ₃ - Sapphire Wafer <0001> 2"dia x 0.3mm 1SP	<p>Sapphire (single crystal of Al₂O₃) is being used extensively as a substrate for III-V nitrides and for many other epitaxial films.</p> <p>Wafer size: 2" dia x 0.3 mm thickness (0001) C plane orientation(+/-0.5 Deg) with Standard Flat</p> <p>Polished surface: Wafer surface is EPI polished via a special CMP procedure. Price listed here is for one side polished.</p> <p>Package: Each wafer is packed in 1000 class clean room with 100 grade plastic bag with wafer container.</p> <p><u>Typical Properties:</u> Crystal Structure: Hexagonal. a=4.758 Angstroms c=12.99 Angstroms, Melting Point: 2040 degree C Density: 3.97 gram/cm² Growth Technique: CZ crystal purity: >99.99% Hardness: 9 (mohs) Thermal Expansion: 7.5x10⁻⁶ (/ oC) Thermal Conductivity: 46.06 @ 0 °C 25.12 @ 100 °C, 12.56 @ 400 °C (W/(m.K)) Dielectric Constant: ~ 9.4 @300K at A axis ~ 11.58@ 300K at C axis Loss Tangent at 10 GHz: < 2x10⁻⁵ at A axis , <5 x10⁻⁵ at C axis</p>
2.	Al ₂ O ₃ - Sapphire Wafer <0001> 2"dia x 0.43mm 1SP	<p>Sapphire (single crystal of Al₂O₃) is being used extensively as a substrate for III-V nitrides and for many other epitaxial films.</p> <p>Wafer size: 2" dia x 0.43 mm thickness (0001) C plane orientation(+/-0.5 Deg) with Standard Flat</p> <p>Polished surface: Wafer surface is EPI polished via a special CMP procedure. Price listed here is for one side polished.</p> <p>Package: Each wafer is packed in 1000 class clean room with 100 grade plastic bag with wafer container.</p> <p><u>Typical Properties:</u> Crystal Structure: Hexagonal. a=4.758 Angstroms c=12.99 Angstroms, Melting Point: 2040 degree C Density: 3.97 gram/cm² Growth Technique: CZ crystal purity: >99.99% Hardness: 9 (mohs) Thermal Expansion: 7.5x10⁻⁶ (/ °C) Thermal Conductivity: 46.06 @ 0 °C 25.12 @ 100 °C, 12.56 @ 400 °C (W/(m.K)) Dielectric Constant: ~ 9.4 @300K at A axis ~ 11.58@ 300K at C axis Loss Tangent at 10 GHz: < 2x10⁻⁵ at A axis , <5 x10⁻⁵ at C axis</p>
3.	Al ₂ O ₃ - Sapphire Wafer, C-plane (0001), 2"dia x 0.5mm 2SP	<p>Sapphire (single crystal of Al₂O₃) is being used extensively as a substrate for III-V nitrides and for many other epitaxial films.</p> <p>Wafer size: 2" in dia x 0.5 +/- 0.05 mm thickness (0001) C plane orientation(+/-0.5 Deg) with Standard Flat</p> <p>Polished surface: Wafer surface is EPI polished via a special CMP</p>

		<p>procedure. Two sides polished. Package: Each wafer is packed in 1000 class clean room with 100 grade plastic bag with wafer container.</p> <p><u>Typical Properties:</u> Crystal Structure: Hexagonal. a=4.758 Angstroms c=12.99 Angstroms, Melting Point: 2040 degree C Density: 3.97 gram/cm² Growth Technique: CZ crystal purity: >99.99% Hardness: 9 (mohs) Thermal Expansion: 7.5x10⁻⁶ / °C Thermal Conductivity: 46.06 @ 0 °C 25.12 @ 100 °C, 12.56 @ 400 °C (W/(m.K)) Dielectric Constant: ~ 9.4 @300K at A axis ~ 11.58@ 300K at C axis Loss Tangent at 10 GHz: < 2x10⁻⁵ at A axis , <5 x10⁻⁵ at C axis</p>
4.	Al ₂ O ₃ - Sapphire Wafer, C-plane (0001), 3"Dia x0.5 mm, 1SP	<p>Sapphire (single crystal of Al₂O₃) is being used extensively as a substrate for III-V nitrides and for many other epitaxial films. Orientation: C-axis[0001](+0.3o) with Standard Flat Diameter: 3" +/- 0.3mm Thickness: 500um +/- 25 um Major Flat: A-axis[11-20]+/-0.2o Surface Finish: Front sides: Epi- polished Ra<0.5nm(by AFM) TTV: < 10um Polished surface: Two side epi polished by special CMP technology. Package: Each wafer is packed in 1000 class clean room .</p> <p><u>Typical Properties:</u> Crystal Structure: Hexagonal. a=4.758 Angstroms; c=12.99 Angstroms, Melting Point: 2040 degree C Density: 3.97 gram/cm² Growth Technique: CZ crystal purity: >99.99% Hardness: 9 (mohs) Thermal Expansion: 7.5x10⁻⁶ (/ °C) Thermal Conductivity: 46.06 @ 0 °C 25.12 @ 100 °C, 12.56 @ 400 °C (W/(m.K)) Dielectric Constant: ~ 9.4 @300K at A axis ~ 11.58@ 300K at C axis Loss Tangent at 10 GHz: < 2x10⁻⁵ at A axis , <5 x10⁻⁵ at C axis</p>
5.	Al ₂ O ₃ - Sapphire Wafer, C-plane (0001), 10mm Dia x0.5 mm 2SP	<p>Sapphire (single crystal of Al₂O₃) is being used extensively as a substrate for III-V nitrides and for many other epitaxial films. Wafer size: 10mm dia x 0.5 mm thickness (0001) C plane orientation (+0.5o) with Standard Flat Polished surface: two sides epi polished by special CMP technology. Surface roughness: Ra < 5 A (by AFM) Package: Each wafer is packed in 1000 class clean room with 100 grade plastic bag with wafer container.</p>
6.	Al ₂ O ₃ - Sapphire Wafer, C-plane (0001), 10mm Dia x0.5 mm 2SP	<p>Sapphire (single crystal of Al₂O₃) is being used extensively as a substrate for III-V nitrides and for many other epitaxial films. Wafer size: 10mm dia x 0.5 mm thickness</p>

		<p>(0001) C plane orientation ($\pm 0.5^\circ$) with Standard Flat Polished surface: two sides epi polished by special CMP technology. Surface roughness: $R_a < 5 \text{ \AA}$ (by AFM) Package: Each wafer is packed in 1000 class clean room with 100 grade plastic bag with wafer container.</p> <p><u>Typical Properties:</u> Crystal Structure: Hexagonal. $a=4.758 \text{ \AA}$ $c=12.99 \text{ \AA}$, Melting Point: 2040 degree C Density: 3.97 gram/cm² Growth Technique: CZ crystal purity: >99.99% Hardness: 9 (mohs) Thermal Expansion: 7.5×10^{-6} (/ oC) Thermal Conductivity: 46.06 @ 0 °C 25.12 @ 100 °C, 12.56 @ 400 °C (W/(m.K)) Dielectric Constant: ~ 9.4 @300K at A axis ~ 11.58@ 300K at C axis Loss Tangent at 10 GHz: $< 2 \times 10^{-5}$ at A axis , $< 5 \times 10^{-5}$ at C axis</p>
7.	Al ₂ O ₃ - Sapphire Wafer, C-plane (0001), 1" Dia x0.5 mm 1SP	<p>Sapphire (single crystal of Al₂O₃) is being used extensively as a substrate for III-V nitrides and for many other epitaxial films. Wafer size: 1" dia x 0.5 mm thickness (0001) C plane orientation $\pm 0.5^\circ$ Deg Polished surface: One side epi polished by special CMP technology. Surface roughness: $R_a < 5 \text{ \AA}$ (by AFM) Package: Each wafer is packed in 1000 class clean room with 100 grade plastic bag with wafer container.</p> <p><u>Typical Properties:</u> Crystal Structure: Hexagonal. $a=4.758 \text{ \AA}$ $c=12.99 \text{ \AA}$, Melting Point: 2040 degree C Density: 3.97 gram/cm² Growth Technique: CZ crystal purity: >99.99% Hardness: 9 (mohs) Thermal Expansion: 7.5×10^{-6} (/ oC) Thermal Conductivity: 46.06 @ 0 °C 25.12 @ 100 °C, 12.56 @ 400 °C (W/(m.K)) Dielectric Constant: ~ 9.4 @300K at A axis ~ 11.58@ 300K at C axis Loss Tangent at 10 GHz: $< 2 \times 10^{-5}$ at A axis , $< 5 \times 10^{-5}$ at C axis</p>
8.	Al ₂ O ₃ - Sapphire Wafer, C-plane (0001), 3" Dia.x0.5mm , 2SP	<p>Sapphire (single crystal of Al₂O₃) is being used extensively as a substrate for III-V nitrides and for many other epitaxial films. Orientation: C-axis[0001]($\pm 0.3^\circ$ Deg) with Standard Flat Diameter: 3" $\pm 0.3 \text{ mm}$ Thickness: 500um $\pm 25 \text{ \mu m}$ Major Flat: A-axis[11-20]$\pm 0.2^\circ$ Surface Finish: Front sides: Epi- polished $R_a < 0.5 \text{ nm}$(by AFM) Back side: Epi- polished , $< 0.5 \text{ nm}$(by AFM) TTV: $< 10 \text{ \mu m}$</p> <p>Polished surface: Two side epi polished by special CMP technology. Package: Each wafer is packed in 1000 class clean room .</p>

		<p><u>Typical Properties:</u> Crystal Structure: Hexagonal. a=4.758 Angstroms c=12.99 Angstroms, Melting Point: 2040 degree C Density: 3.97 gram/cm² Growth Technique: CZ crystal purity: >99.99% Hardness: 9 (mohs) Thermal Expansion: 7.5x10⁻⁶ (/ °C) Thermal Conductivity: 46.06 @ 0 °C 25.12 @ 100 °C, 12.56 @ 400 °C (W/(m.K)) Dielectric Constant: ~ 9.4 @300K at A axis ~ 11.58@ 300K at C axis Loss Tangent at 10 GHz: < 2x10⁻⁵ at A axis , <5 x10⁻⁵ at C axis</p>
9.	Al ₂ O ₃ single crystal substrate , <0001> 100mm Dia. x 0.5mm 1sp	<p>99.996% High Purity, Monocrystalline Al₂O₃</p> <p>Sapphire (single crystal of Al₂O₃) is being used extensively as a substrate for III-V nitrides and for many other epitaxial films. Orientation: C-axis[0001] (+-0.5o) with Standard Flat Orientation: C-axis[0001] +-0.5o Diameter: 100mm +/- 0.2mm Thickness: 500um +/- 25 um Major Flat: A-axis[11-20]+/-0.5o Major Flat Length: 32.5mm +/- 1.5mm Surface Finish: Front sides: Epi- polished Ra<0.2nm(by AFM) TTV: <= 25um Polished surface: One side epi polished by special CMP technology. Package: Each wafer is packed in 1000 class clean room .</p> <p><u>Typical Properties:</u> Crystal Structure: Hexagonal. a=4.758 Angstroms c=12.99 Angstroms, Melting Point: 2040 degree C Density: 3.97 gram/cm² Growth Technique: CZ crystal purity: 99.996% Hardness: 9 (mohs) Thermal Expansion: 7.5x10⁻⁶ (/ °C) Thermal Conductivity: 46.06 @ 0 °C 25.12 @ 100 °C, 12.56 @ 400 °C (W/(m.K)) Dielectric Constant: ~ 9.4 @300K at A axis ~ 11.58@ 300K at C axis Loss Tangent at 10 GHz: < 2x10⁻⁵ at A axis , <5 x10⁻⁵ at C axis</p>
10.	Al ₂ O ₃ single crystal substrate , <0001> 100mm Dia. x 0.5mm 2sp	<p>99.996% High Purity, Monocrystalline Al₂O₃</p> <p>Sapphire (single crystal of Al₂O₃) is being used extensively as a substrate for III-V nitrides and for many other epitaxial films. Orientation: C-axis[0001] (+-0.3o) with Standard Flat Orientation: C-axis[0001] +-0.3o Diameter: 100mm +/- 0.3mm Thickness: 500um +/- 25 um Major Flat: A-axis[11-20]+/-0.2o Major Flat Length: 32.5mm +/- 1.5mm Surface Finish: Front sides: Epi- polished Ra<0.5nm(by AFM) Back side: Epi- polished , <0.5nm(by AFM)</p>

		<p>TTV: < 10um Polished surface: Two side epi polished by special CMP technology. Package: Each wafer is packed in 1000 class clean room .</p> <p><u>Typical Properties:</u> Crystal Structure: Hexagonal. a=4.758 Angstroms c=12.99 Angstroms, Melting Point: 2040 degree C Density: 3.97 gram/cm² Growth Technique: CZ crystal purity: 99.996% Hardness: 9 (mohs) Thermal Expansion: 7.5×10^{-6} (/ °C) Thermal Conductivity: 46.06 @ 0 °C 25.12 @ 100 °C, 12.56 @ 400 °C (W/(m.K)) Dielectric Constant: ~ 9.4 @300K at A axis ~ 11.58@ 300K at C axis Loss Tangent at 10 GHz: < 2×10^{-5} at A axis , < 5×10^{-5} at C axis</p>
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II. M-Plane (1-100)

No.	Item	Description
1.	Al ₂ O ₃ - Sapphire Wafer 5x5x0.5 mm , M plane, 1 SP	<p>Sapphire substrate is the popular substrates for III-V nitrides, superconductor and magnetic epi film due to less mis-matched lattice and stable chemical and physical properties. Wafer size: 5 mm x 5 mm x 0.5 mm thick Orientation tolerance: +/-0.5 Deg. M plane orientation Polished surface: substrate surface is EPI polished via a special CMP procedure with Ra < 5 A 1 side polished Package: Each wafer is packed in 1000 class clean room with 100 grade plastic bag with wafer container.</p>
2.	Al ₂ O ₃ - Sapphire Wafer 5x5x0.5 mm , M plane, 2 SP	<p>Sapphire substrate is the popular substrates for III-V nitrides, superconductor and magnetic epi film due to less mis-matched lattice and stable chemical and physical properties. Wafer size: 5 mm x 5 mm x 0.5 mm thick Orientation tolerance: +/-0.5 Deg. M plane orientation Polished surface: substrate surface is EPI polished via a special CMP procedure with Ra < 5 A 2 sides polished from " product option " Package: Each wafer is packed in 1000 class clean room with 100 grade plastic bag with wafer container.</p>
3.	Al ₂ O ₃ - Sapphire Wafer, M plane, 10x10x0.5 mm 1SP	<p><u>Specifications:</u> Orientation: M <10-10> +/-0.5 o Wafer size: 10 mm x 10 mm x 0.5 mm thick Polished surface: One sideEPI polished via a special CMP procedure. Ra <5A Package: Each wafer is packed in 1000 class clean room with 100 grade plastic bag with wafer containernitrides, superconductor and magnetic epi film due to less mis-matched lattice and stable chemical and physical properties</p>

4.	Al ₂ O ₃ - Sapphire Wafer, M plane, 10x10x0.5 mm 2 SP	<p><u>Specifications:</u> Orientation: M <10-10> +/-0.5 o Wafer size: 10 mm x 10 mm x 0.5 mm thick Polished surface: Two sides EPI polished via a special CMP procedure. Ra <5A Package: Each wafer is packed in 1000 class clean room with 100 grade plastic bag with wafer container nitrides, superconductor and magnetic epi film due to less mis-matched lattice and stable chemical and physical properties</p>
5.	Al ₂ O ₃ - Sapphire Wafer, M plane, 10x10x1.0mm 1SP	<p><u>Specifications:</u> Orientation: M <10-10> +/-0.5 o Wafer size: 10 mm x 10 mm x 1.0 mm thick Polished surface: One side EPI polished via a special CMP procedure. Ra <5A Package: Each wafer is packed in 1000 class clean room with 100 grade plastic bag with wafer container nitrides, superconductor and magnetic epi film due to less mis-matched lattice and stable chemical and physical properties</p>
6.	Al ₂ O ₃ - Sapphire Wafer, M plane, 10x10x1.0mm 2sp	<p><u>Specifications:</u> Orientation: M <10-10> +/-0.5 o Wafer size: 10 mm x 10 mm x 1.0 mm thick Polished surface: two sides EPI polished via a special CMP procedure. Ra <5A Package: Each wafer is packed in 1000 class clean room with 100 grade plastic bag with wafer container nitrides, superconductor and magnetic epi film due to less mis-matched lattice and stable chemical and physical properties</p>
7.	Al ₂ O ₃ - Sapphire Wafer, 0.5"x0.5"x0.5mm M plane 1 SP	<p><u>Features:</u> Sapphire substrate is the popular substrates for III-V nitrides, superconductor and magnetic epi film due to less mis-matched lattice and stable chemical and physical properties. Wafer size: 0.5" x 0.5" x 0.5 mm thick Orientation tolerance: +/-0.5 Deg. M plane orientation Polished surface: substrate surface is EPI polished via a special CMP procedure with RA < 8 A 1 side polished Package: Each wafer is packed in 1000 class clean room with 100 grade plastic bag with wafer container.</p>
8.	Al ₂ O ₃ - Sapphire Wafer, 0.5"x0.5"x0.5mm M plane 2 SP	<p><u>Features:</u> Sapphire substrate is the popular substrates for III-V nitrides, superconductor and magnetic epi film due to less mis-matched lattice and stable chemical and physical properties. Wafer size: 0.5" x 0.5" x 0.5 mm thick Orientation tolerance: +/-0.5 Deg. M plane orientation Polished surface: substrate surface is EPI polished via a special CMP procedure with RA < 8 A</p>

		<p>2 sides polished</p> <p>Package: Each wafer is packed in 1000 class clean room with 100 grade plastic bag with wafer container.</p>
9.	Al ₂ O ₃ -Sapphire Wafer, M-plane- 1"Dia x 0.5 mm 1SP	<p><u>Features:</u></p> <p>M plane -- <1-100> orientation sapphire wafer is being used as a superconductor substrate due to less mis-matched lattice and stable chemical and physical properties.</p> <p>Wafer size: 2" dia x 0.4 - 0.5 mm thickness</p> <p>(1-100) M plane orientation +/-0.5 Deg</p> <p>Polished surface: Wafer surface is EPI polished via a special CMP procedure.</p> <p>One side polished</p> <p>Package: Each wafer is packed in 1000 class clean room with 100 grade plastic bag with wafer container.</p>
10.	Al ₂ O ₃ -Sapphire Wafer, M-plane- 1"Dia x 0.5 mm 2SP	<p><u>Specifications:</u></p> <p>Orientation: M <10-10> +/-0.5 o</p> <p>Wafer size: 2" dia x 0.4 - 0.5 mm thickness</p> <p>Polished surface: Two sidesEPI polished via a special CMP procedure. Ra <5A</p> <p>Package: Each wafer is packed in 1000 class clean room with 100 grade plastic bag with wafer container.</p>
11.	Al ₂ O ₃ - Sapphire Wafer, M Plane 2"Dia x0.43 mm wafer, 1SP	<p><u>Specifications:</u></p> <p>Orientation: M <10-10> +/-0.5 o</p> <p>Wafer size: 2" dia x 0.43 mm thickness</p> <p>Polished surface: One sideEPI polished via a special CMP procedure. Ra <5A</p> <p>Package: Each wafer is packed in 1000 class clean room with 100 grade plastic bag with wafer container.</p>
12.	Al ₂ O ₃ - Sapphire Wafer, M Plane 2"Dia x0.5 mm wafer, 2SP	<p><u>Features:</u></p> <p>M <10-10> orn. sapphire wafer is being used extensively as a substrate for III-V nitrides and magnetic epitaxial films due to its better lattice mismatch</p> <p>Wafer size: 2" dia x 0.4 - 0.5 mm thickness</p> <p>Orientaion: M plane <10-10>orn +/-0.5 Deg;</p> <p>Polished surface: Wafer surface is EPI polished via a special CMP procedure. Price listed here is for one side polished.</p> <p>Package: Each wafer is packed in 1000 class clean room with 100 grade plastic bag with wafer container.</p>
13.	Al ₂ O ₃ - Sapphire M Plane 3"Dia x 0.5 mm wafer, 2SP	<p><u>Specifications:</u></p> <p>Orientation: M Plane, <10-10> +/-0.5`o</p> <p>Wafer size: 3" dia x 0.5 mm thickness</p> <p>Two sides Epi polished</p> <p>Polished surface: Wafer surface is EPI polished via a special CMP procedure.</p> <p>Package: Each wafer is packed in 1000 class clean room with 100 grade plastic bag with wafer container.</p>

14.	Al ₂ O ₃ - Sapphire Wafer, M Plane (10-10) 3"Dia x 0.5 mm wafer, 1SP	<p><u>Specifications:</u> Orientation: M Plane, <10-10> +/-0.5° Wafer size: 3" dia x 0.5 mm thickness One side Epi polished Polished surface: Wafer surface is EPI polished via a special CMP procedure. Ra <5A Package: Each wafer is packed in 1000 class clean room with 100 grade plastic bag with wafer container.</p>
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4. AlN Template

A. AlN Template on Sapphire

No.	Item	Description
1.	AlN Epitaxial Template on Sapphire (Epi-Film on Sapphire, undoped) 10mmx10mmx1000nm	<p>AlN Epitaxial Template on sapphire is made by a hydride vapor phase epitaxy (HVPE)-based method. Epi AlN template is a cost effective way to replace AlN single crystal substrate.</p> <p><u>Specifications:</u> Sizes: 10mmx10mm Substrate Sapphire Orientation: c axis (0001) +/- 1.0 deg. Type and Doping: Undoped, Semi-insulating Macro Defect Density: <5 cm⁻² Front Surface Finish (Al Face): As-grown, Epi-ready Back Surface Finish Sapphire: as-received finish Useable Surface Area: >90% Edge Exclusion Area: 1mm Package: Single Wafer Container AlN layer thickness: 1000 nm</p>
2.	AlN Epitaxial Template on Sapphire (Epi-Film on Sapphire, undoped) 2"x1000nm t- two sides polished	<p>AlN Epitaxial Template on sapphire is made by a hydride vapor phase epitaxy (HVPE)-based method. Epi AlN template is a cost effective way to replace AlN single crystal substrate.</p> <p><u>Specifications:</u> Sizes: 2" round Substrate Sapphire Orientation: c axis (0001) +/- 0.5 deg. Type and Doping: Undoped, Macro Defect Density: <5 cm⁻² Front Surface Finish (Al Face): As-grown, Epi-ready Back Surface Finish Sapphire: as-received finish Useable Surface Area: >90% Edge Exclusion Area: 1mm Package: Single Wafer Container AlN layer thickness: 1000 nm Polish: Both sides polished</p>
3.	AlN Epitaxial Template on Sapphire (Epi-Film on Sapphire, undoped)	<p>AlN Epitaxial Template on sapphire is made by a hydride vapor phase epitaxy (HVPE)-based method. Epi AlN template is a cost effective way to</p>

	2"x1000nm t,one side polished	<p>replace AlN single crystal substrate.</p> <p><u>Specifications:</u> Sizes: 2" round AlN thin film orientation: (0001) Substrate Sapphire Orientation: c axis (0001) +/- 1.0 deg. Type and Doping: Undoped, Macro Defect Density: <5 cm⁻² Front Surface Finish (Al Face): As-grown, Epi-ready Back Surface Finish Sapphire: as-received finish Useable Surface Area: >90% Edge Exclusion Area: 1mm Package: Single Wafer Container AlN layer thickness: 1000 nm Polish: One side polished</p>
4.	AlN Epitaxial Template on Sapphire (Epi-Thim on Sapphire, undoped) 2"x 5000 nm	<p>AlIN Epitxial Template on sapphire is made by a hydride vapor phase epitaxy (HVPE)-based method. Epi AlN template is a cost effective way to replace AlN single crystal substrate.</p> <p><u>Specifications:</u> Sizes: 2" Round Dimensions: 50mm +/- 2mm Substrate Sapphire Orientation: c-axis (0001) +/- 1.0deg. Type and Doping: Undoped, Semi-insulating Macro Defect Density: <5 cm⁻² Front Surface Finish (Al Face): As-grown, Epi-ready Back Surface Finish Sapphire: as-received finish Useable Surface Area: >90% Edge Exclusion Area: 1mm Package: Single Wafer Container AlN layer thickness: 5000 nm, (iÀ 10%)</p>
5.	AlN Epitaxial Template on Sapphire (Epi-film on Sapphire, undoped) 4"x 5000 nm	<p>AlIN Epitxial Template on sapphire is made by a hydride vapor phase epitaxy (HVPE)-based method. Epi AlN template is a cost effective way to replace AlN single crystal substrate.</p> <p><u>Specifications:</u> Sizes: 4" Round Dimensions: 100 mm +/-2mm Substrate Sapphire Orientation: c-axis (00.1) +/- 0.3deg. Type and Doping: Undoped, Semi-insulating Macro Defect Density: <5 cm⁻² Front Surface Finish (Al Face): As-grown, Epi-ready Back Surface Finish Sapphire: as-received finish Useable Surface Area: >90% Edge Exclusion Area: 1mm Package: Single Wafer Container AlN layer thickness: 5000 nm, (iÀ 10%)</p>
6.	AlN Epitaxial Template on Sapphire (Epi-film on Sapphire, undoped) 4"x 1000 nm	<p>AlIN Epitxial Template on sapphire is made by a hydride vapor phase epitaxy (HVPE)-based method. Epi AlN template is a cost effective way to replace AlN single crystal substrate.</p>

		<p><u>Specifications:</u> Sizes: 4" Round Dimensions: 100 mm +/- 2mm Substrate Sapphire Orientation: c-axis (00.1) +/- 0.3deg. Type and Doping: Undoped, Semi-insulating Macro Defect Density: <5 cm-2 Front Surface Finish (Al Face): As-grown, Epi-ready Back Surface Finish Sapphire: as-received finish Useable Surface Area: >90% Edge Exclusion Area: 1mm Package: Single Wafer Container AlN layer thickness: 1000 nm , (iÀ 10%)</p>
7.	AlN Epitaxial Template on Silicon (Epi-film on <111> Si, undoped N type) 10mmx10mm x 200 nm	<p>AlN Epitaxial Template on Silicon is made by a hydride vapor phase epitaxy (HVPE)-based method. Epi AlN template on Silicon is a cost effective way to replace AlN single crystal substrate.</p> <p><u>Specifications:</u> Nominal AlN thickness: 200nm ±10%, one side coated Front Surface: <1nm RMS, as-grown Back surface: silicon as received AlN orientation: (00.2) Macro Defect Density: <1/cm² Wafer base: Silicon [111] 10x10 x0.5 mm, one side polished</p>
8.	AlN Epitaxial Template on 2" Silicon (Epi-film on <111> Si, undoped N type) 2"x 200 nm	<p>AlN Epitaxial Template on Silicon is made by a hydride vapor phase epitaxy (HVPE)-based method. Epi AlN template on Silicon is a cost effective way to replace AlN single crystal substrate.</p> <p><u>Specifications:</u> Nominal AlN thickness: 200nm ±10%, one side coated Front Surface: <1nm RMS, as-grown Back surface: silicon as received AlN orientation: (00.2) Macro Defect Density: <1/cm² Wafer base: Silicon [111] N type, 2" dia x0.5 mm, res: 1~10 ohm-cm, one side polished</p>
9.	AlN Epitaxial Template on 4" Silicon (Epi-film on <111> Si, undoped N type) 4"x 200 nm	<p>AlN Epitaxial Template on Silicon is made by a hydride vapor phase epitaxy (HVPE)-based method. Epi AlN template on Silicon is a cost effective way to replace AlN single crystal substrate.</p> <p><u>Specifications:</u> Nominal AlN thickness: 200nm ±10%, one side coated Front Surface: <1nm RMS, as-grown Back surface: silicon as received AlN orientation: (00.2) Macro Defect Density: <1/cm² Wafer base: Silicon [111] N type, 4" dia x0.5 mm, res: 1~10 ohm-cm, one side polished</p>

B. AlN Template on Silicon

No.	Item	Description
1.	AlN Epitaxial Template on Silicon (Epi-film on <111> Si, undoped N type) 10mmx10mm x 200 nm	<p>AlIN Epitxial Template on Silicon is made by a hydride vapor phase epitaxy (HVPE)-based method. Epi AlN template on Silicon is a cost effective way to replace AlN single crystal substrate.</p> <p><u>Specifications:</u> Nominal AlN thickness: 200nm \pm10%, one side coated Front Surface: <1nm RMS, as-grown Back surface: silicon as received AlN orientation: (00.2) Macro Defect Density: <1/cm² Wafer base: Silicon [111] 10x10 x0.5 mm, one side polished</p>
2.	AlN Epitaxial Template on 2" Silicon (Epi-film on <111> Si, undoped N type) 2"x 200 nm	<p>AlIN Epitxial Template on Silicon is made by a hydride vapor phase epitaxy (HVPE)-based method. Epi AlN template on Silicon is a cost effective way to replace AlN single crystal substrate.</p> <p><u>Specifications:</u> Nominal AlN thickness: 200nm \pm10%, one side coated Front Surface: <1nm RMS, as-grown Back surface: silicon as received AlN orientation: (00.2) Macro Defect Density: <1/cm² Wafer base: Silicon [111] N type, 2" dia x0.5 mm, res: 1~10 ohm-cm, one side polished</p>
3.	AlN Epitaxial Template on 4" Silicon (Epi-film on <111> Si, undoped N type) 4"x 200 nm	<p>AlIN Epitxial Template on Silicon is made by a hydride vapor phase epitaxy (HVPE)-based method. Epi AlN template on Silicon is a cost effective way to replace AlN single crystal substrate.</p> <p><u>Specifications:</u> Nominal AlN thickness: 200nm \pm10%, one side coated Front Surface: <1nm RMS, as-grown Back surface: silicon as received AlN orientation: (00.2) Macro Defect Density: <1/cm² Wafer base: Silicon [111] N type, 4" dia x0.5 mm, res: 1~10 ohm-cm, one side polished</p>

5. Au (Gold) Single Crystal & Substrate

No.	Item	Description
1.	Au(Gold) Single Crystal Substrate: <100>, 10x10x0.5 mm, 1 side polished	<u>Au(Gold) Single Crystal Substrate:</u> Purity: 99.999% Size: 10x10x0.5 mm Surface finish: One side optical polished Surface finish (RMS or Ra): One side polished < 30A Orientation <100>
2.	Au(Gold) Single Crystal Substrate: <110>, 10x10x0.5 mm, 1 side polished	<u>Au(Gold) Single Crystal Substrate:</u> Purity: 99.999% Size: 10x10x0.5 mm Surface finish: One side optical polished Surface finish (RMS or Ra): One side polished < 30A Orientation <110>
3.	Au(Gold) Single Crystal Substrate: <111>, 10x10x0.5 mm, 1 side polished	<u>Au(Gold) Single Crystal Substrate:</u> Purity: 99.999% Size: 10x10x0.5 mm Surface finish: One side optical polished Surface finish (RMS or Ra): One side polished < 30A Orientation <111>

6. Au/Cr coated SiO₂/Si substrate

No.	Item	Description
1.	Au (highly oriented polycrystalline) /Cr coated SiO ₂ /Si substrate , 6"x0.675 mm,1sp P-type B-doped, Au(111)=150 nm, Cr=20nm	<u>Specifications:</u> Film: Au/Cr coated SiO ₂ /Si substrate ,6"x0.675 mm,1sp P-type B-doped, Au(111)=150 nm Cr=20nm SiO ₂ =200 nm Si(100) P type B doped ~675 um Prime Grade Resistivity: <0.005 ohm.cm Substrate Size: 6" diameter +/- 0.5 mm x 0.675 mm Polish: one side polished Surface roughness: < 5A
2.	Au(highly oriented polycrystalline)/Cr coated SiO ₂ /Si substrate ,4"x0.525 mm,1sp P-type B-doped, Au(111)=150 nm, Cr=20nm	<u>Specifications:</u> Film: Au/Cr coated SiO ₂ /Si substrate ,4"x0.525 mm,1sp P-type B-doped, Au(111)=150 nm Cr=20nm SiO ₂ =300 nm Si(100) P type B doped ~525 um Prime Grade Resistivity: <0.005 ohm.cm Substrate Size: 4" diameter +/- 0.5 mm x 0.5 mm Polish: one side polished Surface roughness: < 5A

3.	Au(Gold) Coated Microscope Slides, Gold layer thickness: 50nm (+/- 5nm), Glass slide: 75 x 25mm	<p>High quality glass, standard microscope slides coated with 50nm of gold with a 5nm chromium adhesion layer between the glass slide surface and the gold coating. Can be used for a wide range of nanotechnology, biotechnology and AFM applications and is also suitable of an opaque microscopy support. Both Cr and Au are evaporated on the glass slide using a vacuum evaporation system. The gold surface is not atomically flat, but has bumps in the nm range. The gold slides are individually packed in a slide mailer. The gold slides are autoclavable.</p> <p><u>Specifications:</u> Glass slide: 75 x 25mm , 1mm thickness, soda lime glass Chromium adhesion layer thickness: 5nm Gold layer thickness: 50nm (+/- 5nm)</p>
4.	Au(Gold) coated on Si(111) substrate(P-type B-doped,) , 4"x0.5 mm, 1sp Au= 50nm (± 5nm)	<p>4" gold coated silicon wafers, useful for a variety of applications such as SEM or AFM supports, nanotechnology and biotechnology. Both Cr and Au are evaporated on the silicon wafers using a vacuum evaporation system with chromium between the glass and the gold to serve as an adhesion layer. The gold surface is not atomically flat, but has bumps in the nm range. The wafers are packed and shipped in a wafer carrier. Au coating should be stable to about 175° C; above that temperature delamination could occur.</p> <p><u>Specifications:</u> Film: Au coated on Si substrate , 4"x0.5 mm, 1sp P-type B-doped, Au=50nm (± 5nm) Si(100) P type B doped ~500 um Prime Grade Resistivity: N/A Substrate Size: 4" diameter +/- 0.5 mm x 0.5 mm Polish: one side polished Surface roughness: < 5A</p>

7. BaF2

No.	Item	Description
1.	BaF2, (100), 10x10x 0.5 mm, 2 sides polished	<p>Crystal: BaF2 Crystal Orientation: <100> Size: 10x10x0.5 mm Polished: 2 sides polished Surface finish (RMS or Ra): < 20A Package: 1000 class clean plastic bag</p>
2.	BaF2, (100), 10x10x 1.0 mm, 2 sides polished	<p>Crystal: BaF2 Crystal Orientation: <100> +/-1.5 ° Size: 10x10x1.0 mm Polished: 2 sides polished Surface finish (RMS or Ra): < 20A Package: 1000 class clean plastic bag</p>

3.	BaF2, (111), 1" Dia x 1.0 mm 1 Side polished	Crystal: BaF2 Crystal Orientation: <111> +/-1.5 ° Size: 25.4 diameter x 1.0 mm Polished: one side polished Surface finish (RMS or Ra): < 20A Package: 1000 class clean plastic bag
4.	BaF2, (111), 10x10x 1.0 mm 1 Side polished	Crystal: BaF2 Crystal Orientation: <111> +/-1.5 ° Size: 10x10x0.5 mm Polished: one side polished optional Surface finish (RMS or Ra): < 20A Package: 1000 class clean plastic bag
5.	BaF2, <100>, 10x10x1.0 mm, 1 side polished	Crystal: BaF2 Crystal Orientation: <100> +/-1.5 ° Size: 10x10x1.0 mm Polished: one side polished Surface finish (RMS or Ra): < 20A Package: 1000 class clean plastic bag
6.	BaF2, <111>, 10x10x 1.0 mm 2 Side polished	Crystal: BaF2 Crystal Orientation: <111> +/-1.5 ° Size: 10x10x1.0 mm Polished: two side polished Surface finish (RMS or Ra): < 20A Package: 1000 class clean plastic bag

8. BaTiO3

A. BaTiO3 Random orientation

No.	Item	Description
1.	BaTiO3 random Orientation 5x5 x5 mm, 2SP, Substrate grade	<u>Crystal Grade: Single Crystal with substrate grade:</u> Size: 5 x5 x 5 mm +/- 0.05 mm Polished: 2 sides epi polished by CMP Roughness: Ra < 0.5 nm Orientation: random Orientation Packing: 1000 class clean room in vacuum bag Shipping: in a thermal box with battery pack to keep substrate > 13°C

B. BaTiO₃ Substrate (100)

No.	Item	Description
1.	BaTiO ₃ (100) 5x5 x0.5 mm, 2SP, Substrate grade	Crystal Grade: Single Crystal with substrate grade Size: 5 x5 x0.5 mm +/- 0.05 mm Polished: 2 sides epi polished by CMP Roughness: Ra < 0.5 nm Orientation: <100> +/- 0.5 ° Packing: 1000 class clean room in vacuum bag Shipping: in a thermal box with battery pack to keep substrate > 13°C
2.	BaTiO ₃ (100) 5x5 x1.0 mm, 1SP Substrate grade	Crystal Grade: Single Crystal with substrate grade Size: 5 x5 x1.0 mm +/- 0.05 mm Polished: One side epi polished by CMP Roughness: Ra< 0.5 nm Orientation: <100> +/- 0.5 ° Packing: 1000 class clean room in vacuum bag Shipping: in a thermal box with battery pack to keep substrate > 13°C
3.	BaTiO ₃ (100) 5x5 x1.0 mm, 2SP, Substrate grade	Crystal Grade: Single Crystal with substrate grade Size: 5 x5 x1.0 mm +/- 0.05 mm Polished: 2 sides epi polished by CMP Roughness: Ra< 0.5 nm Orientation: <100> +/- 0.5 ° Packing: 1000 class clean room in vacuum bag Shipping: in a thermal box with battery pack to keep substrate > 13°C
4.	BaTiO ₃ (100) 10 x10 x 0.5 mm, 1SP, Substrate grade	Crystal Grade: Single Crystal with substrate grade Size: 10 x 10 x0.5 mm +/- 0.05 mm Polished: 1 sides epi polished by CMP Roughness: Ra< 0.5 nm Orientation: <100> +/- 0.5 ° Packing: 1000 class clean room in vacuum bag Shipping: in a thermal box with battery pack to keep substrate > 13°C
5.	BaTiO ₃ (100) 10 x10 x 0.5 mm, 2SP, Substrate grade	Crystal Grade: Single Crystal with substrate grade Size: 10 x 10 x0.5 mm +/- 0.05 mm Polished: 2 sides epi polished by CMP Roughness: Ra< 0.5 nm Orientation: <100> +/- 0.5 ° Packing: 1000 class clean room in vacuum bag Shipping: in a thermal box with battery pack to keep substrate > 13°C
6.	BaTiO ₃ (100) 10 x10 x 1.0 mm, 1SP, Substrate grade	Crystal Grade: Single Crystal with substrate grade Size: 10 x 10 x1.0 mm +/- 0.05 mm Polished: 2 sides epi polished by CMP Roughness: Ra< 0.5 nm Orientation: <100> +/- 0.5 ° Packing: 1000 class clean room in vacuum bag

		Shipping: in a thermal box with battery pack to keep substrate > 13°C
7.	BaTiO ₃ (100) 10 x10 x 1.0 mm, 2SP, Substrate grade	Crystal Grade: Single Crystal with substrate grade Size: 10 x 10 x1.0 mm +/- 0.05 mm Polished: 2 sides epi polished by CMP Roughness: Ra< 0.5 nm Orientation: <100> +/- 0.5 ° Packing: 1000 class clean room in vacuum bag Shipping: in a thermal box with battery pack to keep substrate > 13°C

C. BaTiO₃ Substrates (110)

No.	Item	Description
1.	BaTiO ₃ (110) 5x5x1.0 mm, 1SP, Substrate grade	Crystal Grade: Single Crystal with substrate grade Size: 5 x5 x 1.0 mm +/- 0.05 mm Polished: One sides epi polished by CMP Roughness: Ra< 0.5 nm Orientation: <110> +/- 0.5 ° Packing: 1000 class clean room in vacuum bag Shipping: in a thermal box with battery pack to keep substrate > 13°C
2.	BaTiO ₃ (110) 5x5x1.0 mm, 2SP, Substrate grade	Crystal Grade: Single Crystal with substrate grade Size: 5 x5 x 1.0 mm +/- 0.05 mm Polished: Two sides epi polished by CMP Roughness: Ra< 0.5 nm Orientation: <110> +/- 0.5 ° Packing: 1000 class clean room in vacuum bag Shipping: in a thermal box with battery pack to keep substrate > 13°C
3.	BaTiO ₃ (110) 10 x 10 x1.0 mm, 2SP, Substrate grade	Crystal Grade: Single Crystal with substrate grade Size: 10 x 10 x1.0 mm +/- 0.05 mm Polished: Two sides epi polished by CMP Roughness: Ra< 0.5 nm Orientation: <110> +/- 0.5 ° Packing: 1000 class clean room in vacuum bag Shipping: in a thermal box with battery pack to keep substrate > 13°C

D. BaTiO₃ Substrates (111)

No.	Item	Description
1.	BaTiO ₃ (111) 5x5 x1.0 mm, 2SP, Substrate grade	Crystal Grade: Single Crystal with substrate grade Size: 5 x5 x 1.0 mm +/- 0.05 mm Polished: 2 sides epi polished by CMP Roughness: Ra< 0.5 nm Orientation: <111> +/- 0.5 ° Packing: 1000 class clean room in vacuum bag Shipping: in a thermal box with battery pack to keep substrate > 10°C

2.	BaTiO ₃ (111) 5x5 x1.0 mm, 1SP , Substrate grade	Crystal Grade: Single Crystal with substrate grade Size: 5 x5 x 1.0 mm +/- 0.05 mm Polished: One side epi polished by CMP Roughness: Ra< 0.5 nm Orientation: <111> +/- 0.5 ° Packing: 1000 class clean room in vacuum bag Shipping: in a thermal box with battery pack to keep substrate > 10°C
3.	BaTiO ₃ (111) 10x10x1.0 mm, 1SP , Substrate grade	Crystal Grade: Single Crystal with substrate grade Size: 10 x10 x 1.0 mm +/- 0.05 mm Polished: One side epi polished by CMP Roughness: Ra< 0.5 nm Orientation: <111> Orientation tolerance: +/- 0.5 ° Packing: 1000 class clean room in vacuum bag Shipping: in a thermal box with battery pack to keep substrate > 10°C
4.	BaTiO ₃ (111) 10x10x1.0 mm, 2SP , Substrate grade	Crystal Grade: Single Crystal with substrate grade Size: 10 x10 x 1.0 mm +/- 0.05 mm Polished: Two sides epi polished by CMP Roughness: Ra< 0.5 nm Orientation: <111> Orientation tolerance: +/- 0.5 ° Packing: 1000 class clean room in vacuum bag Shipping: in a thermal box with battery pack to keep substrate > 10°C

E. BaTiO₃ Substrates (001)

No.	Item	Description
1.	BaTiO ₃ (001) 5x5x1.0 mm, 1SP, Substrate grade	Crystal Grade: Single Crystal with substrate grade Size: 5 x5 x 1.0 mm +/- 0.05 mm Polished: One side epi polished by CMP Roughness: Ra< 0.5 nm Orientation: <001> +/- 0.5 ° Packing: 1000 class clean room in vacuum bag Shipping: in a thermal box with battery pack to keep substrate > 13°C
2.	BaTiO ₃ (001) 5x5x1.0 mm, 2SP, Substrate grade	Crystal Grade: Single Crystal with substrate grade Size: 5 x5 x 1.0 mm +/- 0.05 mm Polished: 2 sides epi polished by CMP Roughness: Ra< 0.5 nm Orientation: <001> +/- 0.5 ° Packing: 1000 class clean room in vacuum bag Shipping: in a thermal box with battery pack to keep substrate > 13°C
3.	BaTiO ₃ (001) 10x10x0.5 mm, 1SP, Substrate grade	Crystal Grade: Single Crystal with substrate grade Size: 10 x10 x 0.5 mm +/- 0.05 mm Polished: One side epi polished by CMP

		Roughness: Ra < 0.5 nm Orientation: <001> +/- 0.5 ° Packing: 1000 class clean room in vacuum bag Shipping: in a thermal box with battery pack to keep substrate > 13°C
4.	BaTiO ₃ (001) 10x10x0.5 mm, 2SP, Substrate grade	Crystal Grade: Single Crystal with substrate grade Size: 10 x10 x 0.5 mm +/- 0.05 mm Polished: 2 sides epi polished by CMP Roughness: Ra < 0.5 nm Orientation: <001> +/- 0.5 ° Packing: 1000 class clean room in vacuum bag Shipping: in a thermal box with battery pack to keep substrate > 13°C

9. Bi₁₂GeO₂₀ (BGO20)

No.	Item	Description
1.	Bi ₁₂ GeO ₂₀ - BGO20 (001) 5x5x1 mm 1 side polished	<u>Features:</u> Crystal Bi ₁₂ GeO ₂₀ (BGO20) -- New generation acousto-optic crystal Wafer size: 10 x 5 x 0.5 mm thick Wafer size: 5 x 5 x 0.5 mm thick Orientation: (001) +/-0.5° Polished surface: substrate surface is EPI polished via a special CMP procedure with RA < 5 A 1 side polished Package: Each wafer is packed in 1000 class clean room with 100 grade plastic bag with wafer container.
2.	Bi ₁₂ GeO ₂₀ - BGO20 (001) 10x5x1.0 mm 1 side polished	<u>Features:</u> Crystal Bi ₁₂ GeO ₂₀ (BGO20) -- New generation acousto-optic crystal Wafer size: 10 x 5 x1.0 mm thick Orientation: (001) +/-0.5° Polished surface: substrate surface is EPI polished via a special CMP procedure with RA < 5 A 1 sides polished Package: Each wafer is packed in 1000 class clean room with 100 grade plastic bag with wafer container.
3.	Bi ₁₂ GeO ₂₀ - BGO20 (001) 10x10x1mm 1 side polished	<u>Features:</u> BGO is a good scintillation material and has found a wide range of applications in high energy physics, nuclear physics, space physics, nuclear medicine, geological prospecting and other industries. Wafer size: 10 x 10 x 1 mm thick Orientation: (001) +/-0.5° Polished surface: substrate surface is EPI polished via a special CMP procedure with RA < 5 A 1 sides polished Package: Each wafer is packed in 1000 class clean room with 100 grade plastic bag with wafer container.

4.	Bi ₁₂ GeO ₂₀ (BGO20) (001) 2" Dia x1mm 1 side polished	<p><u>Features:</u> Crystal Bi₁₂GeO₂₀ (BGO20) -- New generation acousto-optic crystal Wafer size: 2" Diameter x 1 mm thick Orientation: (001) +/-0.5° Polished surface: One side EPI polished via a special CMP procedure Surface roughness: Ra < 5 Å Package: Each wafer is packed in 1000 class clean room with 100 grade plastic bag with wafer container.</p>
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10. Bi₂Te₃

No.	Item	Description
1.	Bi ₂ Te ₃ Highly Oriented Crystal Substrate (001) 5x5x0.1 mm as Cleaved	<p>Bismuth telluride crystal substrate is highly oriented crystal (not single crystal), which is a narrow gap layered semiconductor with a hexagonal structure. The valence and conduction band structure can be described as a many-ellipsoidal model with 6 constant-energy ellipsoids that are centered on the reflection planes. General thermoelectric materials, thermoelectric factor is currently the largest pure-phase block; mechanical dissociation can get high-quality topological insulator material.</p> <p><u>Specifications:</u> Structure: Hexagonal, group 166, R-3M Lattice constant: a=4.38Å c=30.5Å Substrate orientation: highly oriented layer structure along <0001> Surface: as Cleaved Purity: 99.999%, atomic ratio, Resistivity: 2 m-ohm Mobility: 3000 cm² / V.s General Size: 5 mm x 5 mm x 0.1mm, Packing: packed in plastic bag with vacuum</p>
2.	Bi ₂ Te ₃ Highly Oriented Crystal Substrate (001) 10x10x0.1 mm as Cleaved	<p>Bismuth telluride crystal substrate is highly oriented crystal (not single crystal), which is a narrow gap layered semiconductor with a hexagonal structure. The valence and conduction band structure can be described as a many-ellipsoidal model with 6 constant-energy ellipsoids that are centered on the reflection planes. General thermoelectric materials, thermoelectric factor is currently the largest pure-phase block; mechanical dissociation can get high-quality topological insulator material.</p> <p><u>Specifications:</u> Structure: Hexagonal, group 166, R-3M Lattice constant: a=4.38Å c=30.5Å Substrate orientation: highly oriented layer structure along <0001> Surface: as Cleaved Purity: 99.999%, atomic ratio, Resistivity: 2 m-ohm Mobility: 3000 cm² / V.s General Size: 10 mm x 10 mm x 0.1mm, Packing: packed in plastic bag with vacuum</p>

11. Bi₃Ge₄O₁₂ (BGO12)

No.	Item	Description
1.	Bi ₄ Ge ₃ O ₁₂ - BGO12 (001) 10x10x0.5 mm 1 side polished	<p><u>Features:</u> Bi₄Ge₃O₁₂ (BGO12) is a good scintillation material and has found a wide range of applications in high energy physics, nuclear physics, space physics, nuclear medicine, geological prospecting and other industries. Wafer size: 10 x 10 x 0.5 mm thick Orientation: (001) +/-0.5° Polished surface: substrate surface is EPI polished via a special CMP procedure with RA < 5 Å 1 sides polished Package: Each wafer is packed in 1000 class clean room with 100 grade plastic bag with wafer container.</p>
2.	Bi ₄ Ge ₃ O ₁₂ - BGO12 (001) 10x10x0.5 mm 2 sides polished	<p><u>Features:</u> Bi₄Ge₃O₁₂ (BGO12) is a good scintillation material and has found a wide range of applications in high energy physics, nuclear physics, space physics, nuclear medicine, geological prospecting and other industries. Wafer size: 10 x 10 x 0.5 mm thick Orientation: (001) +/-0.5° Polished surface: substrate surface is EPI polished via a special CMP procedure with RA < 5 Å 2 sides polished Package: Each wafer is packed in 1000 class clean room with 100 grade plastic bag with wafer container.</p>

12. CaCO₃ (Calcite)

No.	Item	Description
1.	single crystal CaCO ₃ , (100) orientation, 10x10x0.5mm, one side EPI polished.	<p>CaCO₃ (Calcite) single crystal Orientation: (100) Size: 10mmx10mmx0.5mm Polish: one side EPI polished.</p> <p><u>Typical Properties:</u> Crystal structure: Rhomb. a= 4.989 Angstroms c= 17.062 Angstroms Melting point: 1339 degree C Density: 2.71 g/cm³ Transparency Range: 350nm - 2300nm Hardness: 3 (Mohs) Ra: <5Å</p>
2.	single crystal CaCO ₃ , (100) orientation, 10x10x1.0mm, one side EPI polished.	<p>CaCO₃ (Calcite) single crystal Orientation: (100) Size: 10mmx10mmx1.0mm Polish: one side EPI polished.</p>

		<p><u>Typical Properties:</u> Crystal structure: Rhomb. a= 4.989 Angstroms c= 17.062 Angstroms Melting point: 1339 degree C Density: 2.71 g/cm³ Transparency Range: 350nm - 2300nm Hardness: 3 (Mohs) Ra: <5A</p>
3.	single crystal CaCO ₃ , (100) orientation, 10x10x0.5mm, both sides EPI polished.	<p>CaCO₃ (Calcite) single crystal Orientation: (100) Size: 10mmx10mmx0.5mm Polish: both side EPI polished.</p> <p><u>Typical Properties:</u> Crystal structure: Rhomb. a= 4.989 Angstroms c= 17.062 Angstroms Melting point: 1339 degree C Density: 2.71 g/cm³ Transparency Range: 350nm - 2300nm Hardness: 3 (Mohs) Ra: <5A</p>
4.	single crystal CaCO ₃ , (100) orientation, 0.5"x0.5"x0.5mm, one side EPI polished.	<p>CaCO₃ (Calcite) single crystal Orientation: (100) Size: 12.7mmx12.7mmx0.5mm Polish: one side EPI polished.</p> <p><u>Typical Properties:</u> Crystal structure: Rhomb. a= 4.989 Angstroms c= 17.062 Angstroms Melting point: 1339 degree C Density: 2.71 g/cm³ Transparency Range: 350nm - 2300nm Hardness: 3 (Mohs) Ra: <5A</p>

13. CaF₂

No.	Item	Description
1.	CaF ₂ , (100), 10x10x 0.5 mm 1 Side polished	Crystal: CaF ₂ Crystal Orientation: <100> +/-1.5 o Size: 10x10x 0.5 mm Purity: > 99.99 % Polished: one side polished Surface finish (RMS or Ra): Ra< 25A Package: 1000 class clean plastic bag
2.	CaF ₂ , (100), 10x10x 1.0mm , 1 Side polished	Crystal: CaF ₂ Crystal Orientation: <100> +/-1.5 o Size: 10x10x1.0 mm Purity: > 99.99% Polished: One side polished

		Surface finish (RMS or Ra): Ra< 25A Package: 1000 class clean plastic bag
3.	CaF ₂ , (100), 10x10x 1.0mm , 2 Side polished	Crystal: CaF ₂ Crystal Orientation: <100> +/-1.5 o Size: 10x10x1.0 mm Purity: > 99.99% Polished: Two sides polished Surface finish (RMS or Ra): < 25A Package: 1000 class clean plastic bag
4.	CaF ₂ , (111), 10x10x 0.5mm , 2 Side polished	Crystal: CaF ₂ Crystal Orientation: <111> +/-1.5 o Size: 10x10x0.5 mm Purity: > 99.99% Polished: Two sides polished Surface finish (RMS or Ra): < 25A Package: 1000 class clean plastic bag
5.	CaF ₂ , (111), 10x10x 1.0mm , 1 Side polished	Crystal: CaF ₂ Crystal Orientation: <111> +/-1.5 o Size: 10x10x1.0 mm Purity: > 99.99% Polished: one side polished optional Surface finish (RMS or Ra): < 25A Package: 1000 class clean plastic bag
6.	CaF ₂ , (111), 10x10x 1.0mm , 2 Side polished	Crystal: CaF ₂ Crystal Orientation: <111> +/-1.5 o Size: 10x10x1.0 mm Purity: > 99.99% Polished: two sides polished optional Surface finish (RMS or Ra): < 25A Package: 1000 class clean plastic bag
7.	CaF ₂ , (110), 1"x1.0 mm , 2 Side polished-	Crystal: CaF ₂ Crystal Orientation: <110> +/-1.5 o Size: 1"x1.0 mm Purity: > 99.99% Polished: Two sides polished Surface finish (RMS or Ra): < 25A Package: 1000 class clean plastic bag
8.	CaF ₂ , (111), 1"x1.0 mm , 2 Side polished	Crystal: CaF ₂ Crystal Orientation: <111> +/-1.5 o Size: 1"x1.0 mm Purity: > 99.99% Polished: Two sides polished Surface finish (RMS or Ra): < 25A Package: 1000 class clean plastic bag

14. CdS

No.	Item	Description
1.	CdS (0001) 5 mm X 5 mm x 0.5 mm , 1 Sides polished	Size: 5 mm X 5 mm x 0.5 mm thickness Orientation: (0001) Polishing: one side polished. Surface roughness: Ra<10A Packing: in film supported box
2.	CdS (0001) 5 mm X 5 mm x 0.5 mm , 2 Sides polished	Size: 5 mm X 5 mm x 0.5 mm thickness Orientation: (0001) Polishing: two sides polished. Surface roughness: Ra<10A Packing: in film supported box
3.	CdS (10-10) 10x10x1.0 mm, 2 side polished	Size: 10mm x 10mm x 1.0 mm Orientation: (10-10) Polishing: two side polished. Surface roughness: Ra <10A Packing: in film supported box
4.	CdS (0001) 10x10x0.3 mm, Low resistivities: < 1 ohm-cm, 2 sides polished (2SP)	Size: 10mm x 10mm x 0.3 mm Orientation: (0001) N type, Cd doped Polishing: Two sides optically polished. (60/40) Surface roughness: Ra<10A Resistivities: <1 ohm-cm Packing: in film supported box
5.	CdS (0001) 10x10x0.5 mm, 1 side polished (1SP) R:10 ³ -10 ⁵ ohm.cm	Size: 10mm x 10mm x 0.5 mm Orientation: (0001) Polishing: one side side polished. Resistivity: 10 ³ - 10 ⁵ ohm.cm Surface roughness: Ra<10A Packing: in film supported box
6.	CdS (0001) 10x10x0.5 mm, 2 side polished (2SP)	Size: 10mm x 10mm x 0.5 mm Orientation: (0001) Polishing: Two sides polished. Surface roughness: Ra<10A Packing: in film supported box
7.	CdS (0001) N type, , 10x10x1.0 mm, High resistivities: >1E6ohm-cm, 2 sides polished	Size: 10mm x 10mm x 1.0 mm Orientation: (0001) N type, Cd doped Polishing: two sides optically polished. (60/40) Surface roughness: Ra <10A

		Resistivities: >1E6 ohm-cm Packing: in film supported box
8.	CdS (0001) N type, , 10x10x1.0 mm, low resistivities: < 1 ohm-cm, 2 sides polished	Size: 10mm x 10mm x 1.0 mm Orientation: (0001) N type, Cd doped Polishing: two sides optically polished. (60/40) Surface roughness: Ra<10A Resistivities: < 1 ohm-cm Packing: in film supported box
9.	CdS (0001) N type, , 25.4 mm in dia x1.0 mm, High resistivities: >1E6ohm- cm, 2 sides polished (60/40)	Size: 25.4 mm in Dia. x 1.0 mm thick Orientation: (0001) N type, Polishing: two sides optically polished. (60/40) Resistivities: >1E6 ohm-cm
10.	CdS (0001) N type, , 38.1 mm in dia x1.0 mm, Low resistivities: <1 ohm-cm, 2 sides polished (60/40)	Size: 38.1 mm Dia. x 1.0 mm thick Orientation: (0001) N type, Polishing: two sides optically polished. (60/40) Resistivities: <1 ohm-cm

15. CdSe

No.	Item	Description
1.	CdSe single crystal substrate, (0001) 10x10x1.0mm, 2sp Low Resistivity	CdSe single crystal Orientation (0001) Sizes: 10 x 10 +/- 0.1 mm Thickness: 1.0 +/- 0.1 mm Resistivities: < 1 ohm-cm Surface Quality: two sides optical polished 60/40
2.	CdSe single crystal substrate, Cd-doped (0001) 10x10x1.0mm, 2sp Low Resistivity	CdSe single crystal Orientation (0001) doped with Cd Sizes: 10 x 10 +/- 0.1 mm Thickness: 1.0 +/- 0.1 mm Resistivities: < 1 ohm-cm Surface Quality: two sides optical polished 60/40
3.	CdSe single crystal substrate, un-doped (0001) 10x10x1.0mm, 2sp High Resistivity	CdSe single crystal Orientation (0001) un-doped Sizes: 10 x 10 +/- 0.1 mm Thickness: 1.0 +/- 0.1 mm Resistivities: >E6 ohm-cm Surface Quality: two sides optical polished 60/40

16. CdTe / CZT / MCT

A. CdTe Substrates

No.	Item	Description
1.	CdTe 10x10x0.5 mm, Undoped, P-type, Random Orientation, 1 side polished	Size: 10mm x 10mm x 0.5 mm Orientation: Random (Single crystal off axis, can not detect any orientation by X-Ray) Polishing: one side polished. Surface roughness: <15A Packing: in film supported box
2.	CdTe (111), undoped, P-type 5x5x0.5 mm, 1 side polished	Size: 5mm x 5mm x 0.5 mm Orientation: (111) Resistivity: >10 ⁻⁶ ohm-cm Polishing: Optional at one side polished. Surface roughness: <15A Packing: in film supported box
3.	CdTe , Undoped, P-type Hi-Resistivity (110) 10x10x1.0 mm, 1 Side optical polished 60/40	Size: 10mm x 10mm x 1.0 mm Orientation: (110) Resistivity: > 10 ⁻⁶ ohm-cm Polishing: One side optical polished 60/40 . Packing: In film supported box
4.	CdTe (111), Undoped, P-type 5x5x0.35 mm, 2 side polished	Size: 5mm x 5mm x 0.35 mm Orientation: (111) Resistivity: >10 ⁻⁶ ohm-cm Polishing: Optional at both sides polished. Surface roughness: <15A Packing: in film supported box
5.	CdTe, Undoped, P-type, (110) 10x10x1.0 mm, 2 Side optical polished 60/40	Size: 10mm x 10mm x 1.0 mm Orientation: (110) Resistivity: > 10 ⁶ ohm-cm Polishing: Two sides side optical polished 60/40 . Surface roughness: <15A Packing: in film supported box
6.	CdTe (111), Undoped, P-type 10x10x0.35 mm, 2 Side polished	Size: 10mm x 10mm x 0.35 mm Orientation: (111) Undoped P type specific resistivity: > 10 ⁶ ohm-cm Carrier concentration: <10 ¹² /cm ³ Polishing: Both sides polished. Surface roughness: <15A Packing: in film supported box

7.	CdTe (111), Undoped, P-type 10x10x0.5 mm, 1 Side polished	Size: 10mm x 10mm x 0.5 mm Orientation: (111) Undoped P type specific resistivity: 1×10^6 ohm-cm Carrier concentration: $<10^{12}/\text{cm}^3$ Polishing: Single side polished. Surface roughness: $<15\text{\AA}$ Packing: in film supported box
8.	CdTe (111), Undoped, P-type 15x15x0.5 mm, 1 Side polished-1	Size: 15mm x 15mm x 0.5 mm Orientation: (111) Undoped P type specific resistivity: 1×10^6 ohm-cm Carrier concentration: $<10^{12}/\text{cm}^3$ Polishing: Single side polished. Surface roughness: $<15\text{\AA}$ Packing: in film supported box
9.	CdTe (111)B, Undoped, P-type 10x10x1.0 mm, 1 Side polished with B face to be polished	Size: 10mm x 10mm x 1.0 mm Orientation: (111)B Undoped P type specific resistivity: $>1 \times 10^6$ ohm-cm Carrier concentration: $<10^{12}/\text{cm}^3$ Polishing: Single side polished with B face to be polished Surface roughness: $<15\text{\AA}$ Packing: in film supported box
10.	CdTe (111)B, Undoped, P-type 10x10x1.0 mm, 2 Side polished	Size: 10mm x 10mm x 1.0 mm Orientation: (111)B Undoped P type specific resistivity: $>10^6$ ohm-cm Carrier concentration: $<10^{12}/\text{cm}^3$ Polishing: Both sides polished with chamfer to show B face. Surface roughness: $<15\text{\AA}$ Packing: in film supported box

B. CZT Substrates

No.	Item	Description
1.	CdTe doped with Zn, P type, Hi-R (CZT) (111) 10x10x 0.5mm, Two Sides polished	Crystal: Zn doped CdTe, also called CZT ($\text{Cd}_{1-x}\text{Zn}_x\text{Te}$, $x=0.04$) Orientation: $<111> \pm 0.5^\circ$ Size: 10x10x 0.5 mm Polished: two sides polished Resistivity: (P type) Carrier concentration: Surface roughness: $<15\text{\AA}$ Package: 1000 class clean plastic bag

2.	CdTe doped with Zn, P type (CZT) (110) 10x10x 1.0mm 2 Side polished	Crystal: Zn doped CdTe, also called CZT ($\text{Cd}_{1-x}\text{Zn}_x\text{Te}$, $x=0.04$) Orientation: $\langle 110 \rangle \pm 0.5^\circ$ Size: 10x10x 1.0mm Polished: two sides polished Resistivity: $> 4 \times 10^4 \text{ ohm-cm}$ (P type) Carrier concentration: $\sim 10^{15}/\text{cm}^3$ Surface roughness: $< 15\text{A}$ Package: 1000 class clean plastic bag
3.	CdTe doped with Zn, P type, (CZT) (111) 10x10x 0.5mm, 1sp	Crystal: Zn doped CdTe, also called CZT ($\text{Cd}_{1-x}\text{Zn}_x\text{Te}$, $x=0.04$) Orientation: $\langle 111 \rangle \pm 0.5^\circ$ Size: 10x10x 0.5 mm Polished: one side polished Resistivity: $(0.5-4.0) \times 10^4 \text{ oh-cm}$ (P type) Carrier concentration: $\sim 10^{15}/\text{cm}^3$ Surface roughness: $< 15\text{A}$ Package: 1000 class clean plastic bag
4.	CdTe doped with Zn, P type, (CZT) (111) 10x10x 1.0mm, 2sp	Crystal: Zn doped CdTe, also called CZT ($\text{Cd}_{1-x}\text{Zn}_x\text{Te}$, $x=0.04$) Orientation: $\langle 111 \rangle \pm 0.5^\circ$ Size: 10x10x 1.0 mm Polished: Two sides polished Resistivity: $(0.5-4.0) \times 10^4 \text{ oh-cm}$ (P type) Carrier concentration: $\sim 10^{15}/\text{cm}^3$ Surface roughness: $< 15\text{A}$ Package: 1000 class clean plastic bag
5.	CdZnTe (111)B, with Zn concentration around 14%, P type, 10x10x1.0mm 2sp R: $>1\text{E}6 \text{ ohm.cm}$	Crystal: Zn doped CdTe, also called CZT ($\text{Cd}_{1-x}\text{Zn}_x\text{Te}$, $x=0.04$) Orientation: (111)B, with Zn concentration around 14% Size: 10x10x 1.0 mm Polished: Two sides polished Resistivity: $> 1\text{E}6 \text{ ohm.cm}$ Package: 1000 class clean plastic bag

C. MCdTe

No.	Item	Description
1.	Hg(1-x)Cd(x)Te, $x=0.17$ (111), Undoped, N-type 10x10x0.5 mm, 2 Sides polished	$x=0.17$ Size: 10mm x 10mm x 0.5 mm Orientation: (111) Undoped N type specific resistivity: $> 10^7 \text{ ohm-cm}$ Carrier concentration, @ 77K: $3\text{E}14/\text{cm}^3$ Electron Mobility, @77K: $1.5\text{E}5 \text{ cm}^2/(\text{V.s})$ Cut-On Wavelength, @77K: from 3 micron to 40 micron Cut-On Wavelength, @300K: from 3 micron to 40 micron Polishing: Both sides polished. Scratch/Dig: 60/40

		Packing: in film supported box
2.	Hg(1-x)Cd(x)Te, x=0.17 (111), Undoped, N-type, 15 mm in dia x 0.5 mm, 2 Sides polished	x=0.17 Size: 15 mm in dia x 0.5 mm Orientation: (111) Undoped N type specific resistivity: $> 10^7$ ohm-cm Carrier concentration, @ 77K: $3E14/cm^3$ Electron Mobility, @77K: $1.5E5 cm^2/(V.s)$ Cut-On Wavelength, @77K: from 3 micron to 40 micron Cut-On Wavelength, @300K: from 3 micron to 40 micron Polishing: Both sides polished. Scratch/Dig: 60/40 Packing: in film supported box
3.	Hg(1-x)Cd(x)Te, x=0.43 (111), Undoped, N-type, 15 mm in dia x 0.5 mm, 2 Sides polished-1	x=0.43 Size: 15 mm in dia x 0.5 mm Orientation: (111) Undoped N type specific resistivity: $> 10^7$ ohm-cm Carrier concentration, @ 77K: $3E14/cm^3$ Electron Mobility, @77K: $1.5E5 cm^2/(V.s)$ Cut-On Wavelength, @77K: from 3 micron to 40 micron Cut-On Wavelength, @300K: from 3 micron to 40 micron Polishing: Both sides polished. Scratch/Dig: 60/40 Packing: in film supported box

17. CdWO₄

No.	Item	Description
1.	CdWO ₄ Random orientation 5 Dia. x0.4mm, 1 side polished	Single crystal CdWO ₄ Size: mm Dia. x 4 mm Thickness Orientation: Random Polished surface: one side polished Surface roughness: Ra<10A Packing: in 1000 class clean plastic bag
2.	CdWO ₄ (001) 10x10x0.5mm, 1 side polished	Single crystal CdWO ₄ Size: 10mm x 10mm x 0.5 mm Orientation: (001) Polished surface: one side polished Surface roughness: Ra <10A Packing: in 1000 class clean plastic bag
3.	CdWO ₄ (001) 10x10x0.5mm, 2 side polished	Single crystal CdWO ₄ Size: 10mm x 10mm x 0.5 mm Orientation: (001) +/-0.5 ° Polished surface: two sides polished

		Surface roughness: Ra<10A Packing: in 1000 class clean plastic bag
4.	CdWO ₄ (001) 10x5x0.5mm, 2 side polished	Single crystal CdWO ₄ Size: 10mm x 5mm x 0.5 mm Orientation: (001) +/-0.5 ° Polished surface: two sides polished Surface roughness: Ra<10A Packing: in 1000 class clean plastic bag
5.	CdWO ₄ (010) 5x5x0.1mm, 2 sides polished	Single crystal CdWO ₄ Size: 5mm x 5mm x 0.1 mm Orientation: (010) +/-0.5 ° Polished surface: two sides polished Surface roughness: Ra<10A Packing: in 1000 class clean plastic bag
6.	CdWO ₄ (100) 10x5x0.5mm, 2 side polished	Single crystal CdWO ₄ Size: 10mm x 5mm x 0.5 mm Orientation: (100) +/-0.5 ° Polished surface: two sides polished Surface roughness: Ra <10A Packing: in 1000 class clean plastic bag

18. Ce: Lu₂SiO₅

No.	Item	Description
1.	Ce:Lu ₂ SiO ₅ substrate (001) 1" Dia. x 1.0 mm 2sp	Crystal: Ce: Lu ₂ SiO ₅ Ce dopant 0.26 mol % Size: 1" Diameter x 1.0 mm thickness Orientation: (001) +/-0.5 ° Polish: Two sides optical polished. Pack: Packed in 1000 class plastic bag
2.	Ce:Lu ₂ SiO ₅ substrate (001) 10x10x0.5 mm, 1sp	Crystal: Ce: Lu ₂ SiO ₅ Ce dopant 0.26 mol % Size: 10x10x0.5 mm Orientation: (001) +/-0.5 ° Polish: One side optical polished. Pack: Packed in 1000 class plastic bag
3.	Ce:Lu ₂ SiO ₅ substrate (001) 10x10x0.5 mm, 2sp	Crystal: Ce: Lu ₂ SiO ₅ Ce dopant 0.26 mol % Size: 10x10x0.5 mm Orientation: (001) +/-0.5 ° Polish: One side optical polished. Pack: Packed in 1000 class plastic bag

19. CeO₂ Epi Film on YSZ

No.	Item	Description
1.	CeO ₂ Epi Film (40 nm one side) on YSZ <100> 10x10x0.5 mm.	Epitaxial thin Film Composition: <100> CeO ₂ Epitaxial Film Thickness: 40 nm +/- 10 nm Epitaxial FWHM: < 5 ° Substrate: <100>, YSZ, 10x10x0.5 mm, one side polished Package: Sealed in Vacuum in a plastic box and bag.
2.	CeO ₂ Epi Film (40 nm one side) on YSZ, <111>10x10x0.5 mm, 1sp	Epitaxial thin Film Composition: <111> CeO ₂ Epitaxial Film Thickness: 40 nm +/- 10 nm Epitaxial FWHM: < 5 ° +/- 1 ° Substrate: <111>, YSZ, 10x10x0.5 mm, one side polished Package: Sealed in Vacuum in a plastic box and bag.

20. CsI(Tl)

No.	Item	Description
1.	CsI Single crystal block 10x10x 5.0 mm, fine ground	Size: 10x10x 5.0mm +/-0.05mm Orientation: Random Polish: Fine ground . Pack: Packed in vacuum bag.
2.	CsI (Tl) Single crystal substrate 10x10x 0.5 mm, 2sp	Dopant: with Tl concentration 1000-3000 ppm Size: 10x10x 0.5mm +/-0.05mm Orientation: Radom Polish: Two sides optical polished. Pack: Packed in vacuum bag.
3.	CsI (Tl) Single crystal substrate 10x10x 1.0 mm, 1sp	Dopant: with Tl concentration 1000-3000 ppm Size: 10x10x 1.0mm +/-0.05mm Orientation: Radom Polish: One side optical polished. Pack: Packed in vacuum bag.

21. Cu - Copper single crystal substrates

No.	Item	Description
1.	Bi-Crystal Substrate of Cu: (100), 14° boundary, 10x10x1.5 mm, 1side polished	Bi-Single crystal copper substrate Boundary angle: 14° Purity: > 99.9999% Size: 10x10x1.5 mm Orientation: <100> +/- 2 ° Surface finish (RMS or Ra): One side polished < 30A Packing: in 1000 class clean-room with vacuumed bag

2.	Cu Single Crystal Substrate: (100), 10x10x0.5 mm, 1side polished	Single crystal copper metallic substrate Purity: > 99.9999% Size: 10x10x0.5 mm Orientation: <100> +/- 2° Edge orientation available with high cost upon request ! Surface finish (RMS or Ra): One side polished < 30A Packing: in 1000 class cleanroom with vacuumed bag Application: substrates for metal, alloy film and biological materials
3.	Cu Single Crystal Substrate: (110), 10x10x0.5 mm, 1 side polished	45Single crystal copper metallic substrate Purity: > 99.9999% Size: 10x10x0.5 mm Orientation: <110> +/- 2° Edge orientation available with high cost upon request ! Surface finish (RMS or Ra) : One side polished < 30A Packing: in 1000 class cleanroom with vacuumed bag Application: substrates for metal, alloy film and biological materials
4.	Cu Single Crystal Substrate: (111), 10x10x0.5 mm, 1 side polished	Single crystal copper metallic substrate Purity: > 99.9999% Size: 10x10x0.5 mm Orientation: <111> +/- 2° Edge orientation available with high cost upon request ! Surface finish (RMS or Ra): One side polished < 30A Packing: in 1000 class cleanroom with vacuumed bag Application: substrates for metal, alloy film and biological materials
5.	Cu Single Crystal Substrate: (100), 10x10x1.0 mm, 1side polished	Single crystal copper metallic substrate Purity: > 99.9999% Size: 10x10x1.0 mm Orientation: <100> +/- 2° Edge orientation available with high cost upon request ! Surface finish (RMS or Ra): One side polished < 30A Packing: in 1000 class cleanroom with vacuumed bag Application: substrates for metal, alloy film and biological materials
6.	Cu Single Crystal Substrate: (110), 10x10x1.0 mm, 1 side polished,	Single crystal copper metallic substrate Purity: > 99.9999% Size: 10x10x1.0 mm Orientation: <110> +/- 2° Edge orientation available with high cost upon request ! Surface finish (RMS or Ra): One side polished < 30A Packing: in 1000 class cleanroom with vacuumed bag Application: substrates for metal, alloy film and biological materials
7.	Cu Single Crystal Substrate: (111), 10x10x1.0 mm, 1 side polished	Single crystal copper metallic substrate Purity: > 99.9999% Size: 10x10x1.0 mm Orientation: <111> +/- 2° Edge orientation available with high cost upon request !

		<p>Surface finish (RMS or Ra): One side polished < 30A</p> <p>Packing: in 1000 class cleanroom with vacuumed bag</p> <p>Application: substrates for metal, alloy film and biological materials</p>
8.	<p>Cu Metallic Substrate (polycrystalline)</p> <p>10x10x0.5mm, 1 side polished</p>	<p>Cu Metallic Substrate (polycrystalline)</p> <p>Purity: 99.99%</p> <p>Size: 10x10x0.5 mm</p> <p>Orientation: N/A</p> <p>Surface finish (RMS or Ra): One side polished < 30A</p> <p>Packing: in 1000 class cleanroom with vacuumed bag</p> <p>Application: substrates for metal, alloy film and biological materials</p>
9.	<p>Cu Single Crystal Substrate: (110), 20x20x1.0 mm, 1 side polished</p>	<p>Single crystal copper metallic substrate</p> <p>Purity: > 99.9999%</p> <p>Size: 20x20x1.0 mm</p> <p>Orientation: <110> +/- 2°</p> <p>Edge orientation available with high cost upon request !</p> <p>Surface finish (RMS or Ra): One side polished < 30A</p> <p>Packing: in 1000 class cleanroom with vacuumed bag</p> <p>Application: substrates for metal, alloy film and biological materials</p>
10.	<p>Cu Single Crystal Substrate: (111), 20x20x1.0 mm, 1 side polished</p>	<p>Single crystal copper metallic substrate</p> <p>Purity: > 99.9999%</p> <p>Size: 20x20x1.0 mm</p> <p>Orientation: <111> +/- 2°</p> <p>Edge orientation available with high cost upon request !</p> <p>Surface finish (RMS or Ra): One side polished < 30A</p> <p>Packing: in 1000 class cleanroom with vacuumed bag</p> <p>Application: substrates for metal, alloy film and biological materials</p>
11.	<p>Cu Single Crystal Substrate: (100), 10mm Dia. x1.0 mm, 1 side polished,</p>	<p>Single crystal copper metallic substrate</p> <p>Purity: > 99.9999%</p> <p>Size: 10mm Dia x 1.0 mm thickness</p> <p>Ori.: <100> +/- 2°</p> <p>Edge orientation available with high cost upon request !</p> <p>Surface finish (RMS or Ra): One side polished < 30A</p> <p>Packing: in 1000 class cleanroom with vacuumed bag</p> <p>Application: substrates for metal, alloy film and biological material</p>
12.	<p>Cu Single Crystal Substrate: (100), 2" Dia. x1.0 mm, 1 side polished,</p>	<p>Single crystal copper metallic substrate</p> <p>Purity: > 99.9999%</p> <p>Size: 2" Dia x 1.0 mm thickness</p> <p>Ori.: <100> +/- 2°</p> <p>Edge orientation available with high cost upon request !</p> <p>Surface finish (RMS or Ra): One side polished < 30A</p> <p>Packing: in 1000 class cleanroom with vacuumed bag</p> <p>Application: substrates for metal, alloy film and biological material</p>
13.	<p>Cu Single Crystal Substrate: (110), 10mmDia. x1.0 mm, 1</p>	<p>Single crystal copper metallic substrate</p> <p>Purity: > 99.9999%</p>

	side polished,	<p>Size: 10mm Dia x 1.0 mm thickness Ori.: <110> +/-2 ° Edge orientation available with high cost upon request ! Surface finish (RMS or Ra): One side polished < 30A Packing: in 1000 class cleanroom with vacuumed bag Application: substrates for metal, alloy film and biological material</p>
14.	Cu Single Crystal Substrate: (110), 2" Dia. x1.0 mm, 1 side polished,	<p>Single crystal copper metallic substrate Purity: > 99.9999% Size: 2" Dia x 1.0 mm thickness Ori.: <110> +/-2 ° Edge orientation available with high cost upon request ! Surface finish (RMS or Ra): One side polished < 30A Packing: in 1000 class cleanroom with vacuumed bag Application: substrates for metal, alloy film and biological material</p>
15.	Cu Single Crystal Substrate: (111), 2" Dia. x1.0 mm, 1 side polished	<p>Single crystal copper metallic substrate Purity: > 99.9999% Size: 2" Dia x 1.0 mm thickness Ori.: <111> +/-2 ° Edge orientation available with high cost upon request ! Surface finish (RMS or Ra): One side polished < 30A Packing: in 1000 class cleanroom with vacuumed bag Application: substrates for metal, alloy film and biological material</p>
16.	Copper Foil for Battery Anode Substrate (190m length x 298mm width x 9um thickness) - EQ-bccf-9u	<p>This copper foil (9 um) is used as a substrate for coating anode materials in Li-Ion battery research.</p> <p><u>Specifications:</u> Material: Copper, Purity> 99.99% Sold in roll only Length: 190m Width: 298mm Thickness: 9 um Density: 8.94 g·cm⁻³ Net weight: 5.5 kg Tube weight: 1 kg Shipped in vacuum bag</p>
17.	Copper Foil for Graphene Growth (150m length x 150mm width x 25um thickness) - EQ-bccf-25u	<p>This copper foil with 25 um thickness is best candidate as substrate for growing Graphene with MTI's Dual Tube Furnace.</p> <p><u>Specifications:</u> Material: Tough Pitch Copper, Purity> 99.99% Tensile Strength: 28 kgf/mm Elongation: MIN3-8 Hardness Test: 80HV Grain Size: 0.02mm Electric Conductivity: 97% @20C Resistivity: ≤0.017165 Ω·mm/m Sold in roll only Length: 150m Width: 150mm</p>

		Thickness: 25 um Density: 8.94 g·cm ⁻³ Net weight: 5 kg Shipped in vacuum bag
18.	Copper Net Foil for Battery Anode Substrate (240mm width x 55um thickness x 20 Meter L) - EQ-bccnf-55u	10This copper net foil (55 um) is used as a substrate for coating anode materials in Li-Ion battery research. <u>Specifications:</u> Material: Copper, Purity> 99.99% Sold in roll only Length: 20 meter Width: 240mm Thickness: 55 um Density: 8.94 g·cm ⁻³ Net weight: 1 kg per roll Shipped in vacuum bag

22. Diamond on Silicon Wafer

No.	Item	Description
1.	Diamond on Oxide (DOI) Wafer, 4" , 2 um Thick, 10 nm Ra	Wafer Size: 4" diameter x 0.5mm Si wafer Orientation: (100) + / - 0.5° Insulating Layer: SiO ₂ Diamond film thickness: 2 microns,, Oxide Layer: 1 micron Resistivity: 10E3 ~ 10E4 ohm-cm Surface Roughness: as grown , RA < 10 nm Package: One 1000 class clean room with 100 class plastic bag
2.	Diamond on Silicon Wafer, 4" , 2 um Thick, 10 nm Ra	Wafer Size: 4" diameter x 0.5mm Si wafer Orientation: (100) + / - 0.5° Diamond film thickness: 2 micron Resistivity: 10E3 ~ 10E4 ohm-cm Surface Roughness: as grown , RA < 10 nm Package: One 1000 class clean room with 100 class plastic bag
3.	Electric Conductive Diamond on Insulator Wafer, 4" , 2 um Thick, 10 nm Ra	Wafer Size: 4" diameter x 0.5mm Si wafer Orientation: (100) + / - 0.5° Insulating Layer: SiO ₂ Diamond film thickness: 2 micron, Oxide Layer: 1 micron Resistivity: <0.1 ohm-cm Surface Roughness: as grown, RA < 10 nm Package: One 1000 class clean room with 100 class plastic bag
4.	Diamond on Oxide Wafer, 10x10mm, 2um Thick, 10nm Ra	Wafer Size: 10x10mm Si wafer Orientation: (100) + / - 0.5° Insulating Layer: SiO ₂ Diamond film thickness: 2 microns, Oxide Layer: 1 micron Resistivity: 10E3 ~ 10E4 ohm-cm

		Surface Roughness: as grown, RA < 10 nm Package: One 1000 class clean room with 100 class plastic bag
5.	Diamond on Silicon Wafer, 10x10mm, 2 um Thick, 10 nm Ra	Wafer Size: 10x10 Silicon wafer Orientation: (100) + / - 0.5° Diamond film thickness: 2 micron Resistivity: 10E3 ~ 10E4 ohm-cm Surface roughness: one sides CMP polished with surface roughness < 10 A Package: One 1000 class clean room with 100 class plastic bag
6.	Electric Conductive Diamond on Insulator Wafer, 10x10 , 2 um Thick, 10 nm Ra	Wafer Size: 10x10mm Si wafer Orientation: (100) + / - 0.5° Insulating Layer: SiO2 Diamond film thickness: 2 micron, Oxide Layer: 1 micron Resistivity: <0.1 ohm-cm Surface Roughness: as grown, RA < 10 nm Package: One 1000 class clean room with 100 class plastic bag
7.	Diamond on Silicon Wafer, 4" , 1 um Thick, 1nm Ra	Wafer Size: 4" diameter x 0.5mm Silicon wafer Orientation: (100) + / - 0.5° Diamond film thickness: 1 micron Resistivity: 103 ~ 104 Ohm-cm Surface roughness: one sides CMP polished with surface roughness < 10 A Package: One 1000 class clean room with 100 class plastic bag
8.	Diamond on Silicon Wafer, 10x10mm, 0.1 micron Thick, Ra<1 nm	Wafer Size: 10x10mm Si wafer Orientation: (100) Prime grade,P-type , B-doped Diamond film: 100 nm Aqua25 Diamond film thickness: 01 micron, Diamond Resistivity: 1000-10000 ohm-cm Surface Roughness: as grown , RA < 1 nm Package: One 1000 class clean room with 100 class plastic bag

23. DyScO3/GdScO3//TbScO3

No.	Item	Description
1.	DyScO3 (110) 10x10x0.5mm 1sp	<p><u>Specifications:</u> Size: 10mm x 10mm x 0.5mm Orientation: (110) + / - 0.5° Polish: one side EPI polished with surface roughness Ra< 5 A Package: One 1000 class clean room with 100 class plastic bag</p> <p><u>Features:</u> Good lattice match with perovskite structure superconductors Prefect for ferroelectric epitaxial thim film</p>
2.	GdScO3 (110) 10x10x0.5mm 1sp	<p><u>Specifications:</u> Size: 10mm x 10mm x 0.5mm</p>

		<p>Orientation: (110) + / - 0.5 ° Polish: one side EPI polished with surface roughness Ra< 5 A Package: One 1000 class clean room with 100 class plastic bag</p> <p><u>Features:</u> Good lattice match with perovskite structure superconductors Prefect for ferroelectric epitaxial thim film</p>
3.	GdScO3 (110) 10x10x0.5mm 2sp	<p><u>Specifications:</u> Size: 10mm x 10mm x 0.5mm Orientation: (110) + / - 0.5 ° Polish: two sides EPI polished with surface roughness Ra< 5 A Package: One 1000 class clean room with 100 class plastic bag</p> <p><u>Features:</u> Good lattice match with perovskite structure superconductors Prefect for ferroelectric epitaxial thim film</p>
4.	GdScO3 (110) 5x5x0.5mm 2sp	<p><u>Specifications:</u> Material: GdScO3 Size: 5mm x 5mm x 0.5mm Orientation: (110) + / - 0.5 ° Polish: Two sides EPI polished with surface roughness Ra< 5 A Package: One 1000 class clean room with 100 class plastic bag</p> <p><u>Features:</u> Good lattice match with perovskite structure superconductors Prefect for ferroelectric epitaxial thim film</p>
5.	DyScO3 (110) 5x5x0.5mm 1sp	<p><u>Specifications:</u> Size: 5mm x 5mm x 0.5mm Orientation: (110) + / - 0.5 ° Polish: one side EPI polished with surface roughness Ra< 5 A Package: One 1000 class clean room with 100 class plastic bag</p> <p><u>Features:</u> Good lattice match with perovskite structure superconductors Prefect for ferroelectric epitaxial thim film</p>
6.	DyScO3 (110) 5x5x0.5mm 2sp	<p><u>Specifications:</u> Size: 5mm x 5mm x 0.5mm Orientation: (110) + / - 0.5 ° Polish: two sides EPI polished with surface roughness Ra< 5 A Package: One 1000 class clean room with 100 class plastic bag</p> <p><u>Features:</u> Good lattice match with perovskite structure superconductors Prefect for ferroelectric epitaxial thim film</p>
7.	TbScO3 (110) 10x10x0.5mm 1sp	<p><u>Specifications:</u> Chemical Formula: TbScO3</p>

		<p>Size: 10mm x 10mm x 0.5mm Orientation: (110) + / - 0.5 ° Orthorhombic Tolerance : <0.5 o Edge Parallel: (001) Notches Polish: one side EPI polished with surface roughness Ra< 5 A (measured by AFM) Package: One 1000 class clean room with 100 class plastic bag</p> <p><u>Features:</u> Good lattice match with perovskite structure superconductors Prefect for ferroelectric epitaxial thim film</p>
8.	TbScO3 (110) 5x5x0.5mm 1sp-	<p><u>Specifications:</u> TbScO3 Size: 5mm x 5mm x 0.5mm Orientation: (110) + / - 0.5 ° Orthorhombic Tolerance : <0.5 o Edge Parallel: (001) Notches Polish: one side EPI polished with surface roughness Ra< 5 A Package: One 1000 class clean room with 100 class plastic bag</p> <p><u>Features:</u> Good lattice match with perovskite structure superconductors Prefect for ferroelectric epitaxial thim film</p>

24. Fe - Stainless Steel Substrate (Polycrystalline)

No.	Item	Description
1.	Polycrystal Fe foil : 1" x 1" x 0.5mm, as cold rolling	<p>Polycrystal Fe foil Purity: 99.99% Substrate dimension: 1" x 1" x 0.5mm Surface roughness: as cold rolling</p>
2.	Stainless Steel Foil: SS316 0.1mm Thick x 300mm W x 4000 mm L, SSF-316-300-01	<p>Polycrystalline SS316 stainless steel foil Foil dimension: 0.1 mm Thickness x 300mm Width x 4000 mm Length Surface fitness: as cold rolling Weight: ~1000 g</p>
3.	Stainless Steel Substrate (SS301-polycrystalline): 1" Dia x 0.3 mm, as cold rolling	<p>Polycrystal SS301 stainless steel substrate Average Grain Size: 10~50 Microns (No annealling) Substrate dimension: 25.4 diameter x 0.3 mm thickness, (1" Dia. x0.3 mm) Surface roughness: as cold rolling</p>
4.	Stainless Steel Substrate (SS301-polycrystalline): 1" x 1" x 0.3 mm, as cold rolling	<p>Polycrystal SS301 stainless steel substrate Average Grain Size: 10~50 Microns (No annealling) Substrate dimension: 25.4x25.4 x 0.3 mm, (1"x1"x0.3 mm) Surface roughness: as cold rolling</p>
5.	Stainless Steel Substrate (SS316-polycrystalline):	<p>Polycrystal SS301 stainless steel substrate Average Grain Size: 10~50 Microns (No annealling)</p>

1" x 1" x 0.5 mm, as cold rolling	Substrate dimension: 25.4x25.4 x 0.5 mm, (1"x1"x0.5 mm) Surface roughness: as cold rolling
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25. GaAs

A. GaAs(100)

i. GaAs (100) undoped

No.	Item	Description
1.	GaAs (100) orientation, SI (semi-insulating), undoped 10x10x 0.5mm, 1sp,	GaAs single crystal wafer Growing Method: LEC Orientation: (100) Size: 10x10x0.5mm Polishing: One side polished Doping: undoped Conductor type: SI, Semi-Insulating Resistivity: $\sim 1 \times 10^7$ Ohm.cm Mobility: $\sim 4500 \text{ cm}^2/\text{V.S}$ EPD: $\sim 5 \times 10^4/\text{cm}^2$
2.	GaAs(LEC) Wafer (100) undoped Semi-Insulated 2"D x0.5 mm, 1SP	GaAs single crystal wafer Growing Method: LEC Orientation: (100) Size: 2" dia x 0.5mm Polishing: one side polished; Roughness: < 5 Angstrom Doping: undoped Conductor type: Semi-Insulating Resistivity: $(4.5-4.86) \times 10^7$ Ohm.cm Mobility: $6360-6810 \text{ cm}^2/\text{V.S}$ Carrier Concentration: $(1.89-2.18) \times 10^{17} \text{ a/cm}^3$ EPD: $\sim 8600-9700/\text{cm}^2$
3.	GaAs(LEC) Wafer (100) undoped Semi-Insulated 2"D x0.5 mm, 2SP	GaAs single crystal wafer Growing Method: LEC Orientation: (100) Size: 2" dia x 0.5mm Polishing: Two sides polished; Roughness: < 5 Angstrom Doping: undoped Conductor type: Semi-Insulating Resistivity: $(3.45-5.49) \times 10^7$ Ohm.cm Mobility: $2140-3850 \text{ cm}^2/\text{V.S}$ EPD: $\sim 7000-19000/\text{cm}^2$
4.	GaAs , Growing Method: VGF ,(100) undoped Semi-Insulated 10x10 x0.6 mm, 1SP	GaAs single crystal wafer Growing Method: VGF Orientation: (100) Flat: (01-1) .(011) Size: 10x10 x 0.6mm

		<p>Polishing: one side polished; Ra(Average Roughness): < 0.4 nm Doping: undoped Conductor type: Semi-Insulating Resistivity: (0.6-1.1)E8 Ohm.cm Mobility:5870-6120 cm²/v.s. EPD: <5000/cm²</p>
5.	<p>GaAs Wafer , Growing Method: VGF ,(100) undoped Semi-Insulated 100mm D x0.6 mm, 1SP</p>	<p>GaAs single crystal wafer Growing Method: VGF Orientation: (100) Flat: (01-1) .(011) Size: 100 mm dia x 0.6mm Polishing: one side polished; Ra(Average Roughness): < 0.4 nm Doping: undoped Conductor type: Semi-Insulating Resistivity: (0.6-1.1)E8 Ohm.cm Mobility:5870-6120 cm²/v.s. EPD: <5000/cm²</p>
6.	<p>GaAs Wafer , Growing Method: VGF ,(100) undoped Semi-Insulated 100mm Dia. x0.6 mm, 2SP</p>	<p>GaAs single crystal wafer Growing Method: VGF Orientation: (100) Flat: (01-1) .(011) Size: 100mm dia x 0.6mm Polishing: two sides polished; Ra(Average Roughness): < 0.4 nm Doping: undoped Conductor type: Semi-Insulating Resistivity: (3.3-4.4)E8 Ohm.cm Mobility: 4710-5190 cm²/v.s EPD: <5000/cm²</p>
7.	<p>GaAs Wafer , Growing Method: VGF ,(100) undoped Semi-Insulated 2"D x0.5 mm, 1SP</p>	<p>GaAs single crystal wafer Growing Method: VGF Orientation: (100) Size: 2" dia x 0.5mm Polishing: single side polished Doping:un- doped Conductor type: Semi-insulating Ra(Average Roughness) : < 0.4 nm Mobility: 5210-6540 cm²/V.S Resistivity:(1.0-2.2) x 10⁸ ohm.cm EPD: <5000cm²</p>
8.	<p>GaAs Wafer , Growing Method: VGF ,(100) undoped Semi-Insulated 2"D x0.5 mm, 2SP</p>	<p>GaAs single crystal wafer Growing Method: VGF Orientation: (100) Size: 2" dia x 0.5mm Polishing: Double sides polished Doping:un- doped Conductor type: Semi-insulating</p>

		Ra(Average Roughness): < 0.4 nm Mobility: 5510-6180 cm ² /V.S Resistivity:(1.0-2.9) x 10 ⁸ ohm.cm EPD: <5000cm ²
9.	VGF-GaAs (100) orientation, undoped, Semi-insulating, 1sp, 3" dia x 0.45mm,Mechanical Grade	VGF -GaAs single crystal wafer Mechanical grade, Not Epi-ready, may have micro twin or lineage on <20% wafer surface, Undoped, Semi-Insulating; Major Flat: EJ (0-1-1) or US (01-1) with length: 22 +/- 2 mm; Minor Flat: EJ (0-11) or US (011) with length: 11 +/- 2 mm; Orientation: (100) +/- 0.5 deg.; Diameter: 76.2 +/- 0.4 mm; Thickness: 450 +/- 25 um; One side polished
10.	VGF-GaAs (100) orientation, undoped, Semi-insulating, 2sp, 3" dia x 0.5mm	GaAs single crystal wafer Growing Method: VGF Orientation: (100) Size: 3" dia x 0.5mm Polishing: both sides polished; Ra(Average Roughness): < 0.4 nm Doping: undoped Conductor type: Semi-Insulating Resistivity: (0.6-2.0)x10 ⁸ Ohm.cm Mobility: 5350-6380cm ² /V.S EPD: <5000cm ²
11.	VGF-GaAs (100) orientation, undoped, Semi-insulating, 1sp, 3" dia x 0.45mm,Mechanical Grade	VGF -GaAs single crystal wafer Mechanical grade, Not Epi-ready, may have micro twin or lineage on <20% wafer surface, Undoped, Semi-Insulating; Major Flat: EJ (0-1-1) or US (01-1) with length: 22 +/- 2 mm; Minor Flat: EJ (0-11) or US (011) with length: 11 +/- 2 mm; Orientation: (100) +/- 0.5 deg.; Diameter: 76.2 +/- 0.4 mm; Thickness: 450 +/- 25 um; One side polished

ii. GaAs (100) Te-doped

No.	Item	Description
1.	GaAs (100) orientation, 2 deg OFF Toward [101] +/- 0.5 deg, Te doped, N- type, 2" dia x 0.5mm, 1sp, Prime Grade	GaAs single crystal wafer, PRIME Grade Growing Method: LEC Orientation: (100) 2 degree OFF Toward [101] +/- 0.5 deg Size: 2" dia x 0.5mm Polishing: One side polished Doping: Te doped Conductor type: N-type Carrier Concentration: (1~2) x 10 ¹⁷ /cm ³ Mobility: 3000~1800 cm ² /V.S Resistivity: 0.0105 ~ 0.0074 ohm-cm

		EPD: $(3\sim 10) \times 10^3 / \text{cm}^2$ Note: EPI polishing: RMS < 5 Angstrom
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iii. GaAs(100) Si- doped

No.	Item	Description
1.	GaAs - Growing Method: VGF (100) Si doped, N-type, 2" dia x 0.5mm, 1sp,cc:(7.1-7.4) x 10 ¹⁷ /cm ³	GaAs single crystal wafer Growing Method: VGF Orientation: (100) Size: 2" dia x 0.5mm Polishing: One side polished Doping: Si doped Conductor type: N-type Carrier Concentration: $(7.1-7.4) \times 10^{17} / \text{cm}^3$ Mobility: 2350-2710 cm ² /V.S Resistivity: $(3.3-3.6) \times 10^{-3} \text{ ohm.cm}$ EPD: <5000cm ² Ra(Average Roughness): < 0.4 nm
2.	GaAs - Growing Method: VGF (100) Si doped, N-type, 2" dia x 0.5mm, 1sp,cc:(7.2-9.5) x 10 ¹⁷ /cm ³	GaAs single crystal wafer Growing Method: VGF Orientation: (100) Size: 2" dia x 0.5mm Polishing: One side polished Doping: Si doped Conductor type: N-type Carrier Concentration: $(7.2-9.5) \times 10^{17} / \text{cm}^3$ Mobility: 2400-2460 cm ² /V.S Resistivity: $(2.7-3.5) \times 10^{-3} \text{ ohm.cm}$ EPD: <5000cm ² Ra(Average Roughness): < 0.4 nm
3.	GaAs - Growing Method: VGF (100) Si doped, N-type, 2" dia x 0.35mm, 1sp,cc: (1.0-1.8) x 10 ¹⁸ /cm ³	GaAs single crystal wafer Growing Method: VGF Orientation: (100) Size: 2" dia x 0.35mm Polishing: One side polished Doping: Si doped Conductor type: N-type Carrier Concentration: $(1.0-1.8) \times 10^{18} / \text{cm}^3$ Mobility: 1960-2590 cm ² /V.S Resistivity: $(1.8-2.4) \times 10^{-3} \text{ ohm.cm}$ EPD: <500cm ² Ra(Average Roughness): < 0.4 nm
4.	GaAs - Growing Method: VGF (100) Si doped, N-type, 2" dia x 0.5mm, 1sp,cc:(4.2-6.7) x 10 ¹⁶ /cm ³	GaAs single crystal wafer Growing Method: VGF Orientation: (100) Size: 2" dia x 0.5mm Polishing: One side polished Doping: Si doped

		<p>Conductor type: N-type Carrier Concentration: $(4.2-6.7) \times 10^{16} / \text{cm}^3$ Mobility: $3720-5230 \text{ cm}^2/\text{V.S}$ Resistivity: $(2.0-4.0) \text{ E-3 ohm.cm}$ EPD: $<5000 \text{ cm}^2$ Ra(Average Roughness): $< 0.4 \text{ nm}$</p>
5.	<p>GaAs, Growing Method: VGF(100) Si doped, N-type, 2" dia x 0.5mm, 2sp,Carrier Concentration: $(1.0-1.1) \times 10^{18} / \text{cm}^3$</p>	<p>GaAs single crystal wafer Growing Method: VGF Orientation: (100) Size: 2" dia x 0.5mm Polishing: two sides polished Doping: Si doped Conductor type: S-C-N Carrier Concentration: $(1.0-1.1) \times 10^{18} / \text{cm}^3$ Mobility: $2270-2370 \text{ cm}^2/\text{V.S}$ Resistivity: $(2.5-2.6) \text{ E-3 ohm.cm}$ EPD: $<5000 \text{ cm}^2$ Ra(Average Roughness): $< 0.4 \text{ nm}$</p>
6.	<p>GaAs, Growing Method: VGF(100) Si doped, N-type, 2" dia x 0.5mm, 2sp,Carrier Concentration: $(4.3-6.2) \times 10^{16} / \text{cm}^3$</p>	<p>GaAs single crystal wafer Growing Method: VGF Orientation: (100) Size: 2" dia x 0.5mm Polishing: two sides polished Doping: Si doped Conductor type: S-C-N Carrier Concentration: $(4.3-6.2) \times 10^{16} / \text{cm}^3$ Mobility: $3450-3880 \text{ cm}^2/\text{V.S}$ Resistivity: $(2.8-3.9) \text{ E-2 ohm.cm}$ EPD: $<5000 \text{ cm}^2$ Ra(Average Roughness): $< 0.4 \text{ nm}$</p>
7.	<p>GaAs, Growing Method: VGF(100) Si doped, N-type, 3" dia x 0.5mm, 2sp,Carrier Concentration: $(1.1-1.6) \times 10^{18} / \text{cm}^3$</p>	<p>GaAs single crystal wafer Growing Method: VGF Orientation: (100) Size: 3" dia x 0.5mm Polishing: two sides polished Doping: Si doped Conductor type: S-C-N Carrier Concentration: $(1.1-1.6) \times 10^{18} / \text{cm}^3$ Mobility: $1950-2240 \text{ cm}^2/\text{V.S}$ Resistivity: $(2.0-2.5) \text{ E-3 ohm.cm}$ EPD: $<1000 \text{ cm}^2$ Ra(Average Roughness): $< 0.4 \text{ nm}$</p>
8.	<p>GaAs, Growing Method: VGF(100) Si doped, N-type, 4" dia x 0.5mm, 2sp,Carrier Concentration: $(2.2-3.1) \times 10^{18} / \text{cm}^3$</p>	<p>GaAs single crystal wafer Growing Method: VGF Orientation: (100) Size: 4" dia x 0.5mm Polishing: two sides polished Doping: Si doped</p>

		Conductor type: S-C-N Carrier Concentration: $(2.2-3.1) \times 10^{18}/\text{cm}^3$ Mobility: $1670-1820 \text{ cm}^2/\text{V.S}$ Resistivity: $(1.2-1.6) \text{ E-3 ohm.cm}$ EPD: $<5000 \text{ cm}^2$ Ra(Average Roughness): $< 0.4 \text{ nm}$
9.	GaAs (100) orientation, Si doped, N-type, 2" dia x 0.35mm, 2sp, resistivities: $(1-8) \text{ E-3 ohm-cm}$	GaAs single crystal wafer Growing Method: VGF Orientation: (100) Size: 2" dia x 0.35mm Polishing: both sides polished Doping: Si doped Conductor type: N-Type Resistivities: $(1 \sim 8) \times 10^{-3} \text{ ohm-cm}$ Carrier Concentration: $\sim 2.0 \text{ E}18 / \text{cm}^3$ (296 deg K) Mobility: $> 1,500 \text{ cm}^2/\text{V.S}$ EPD: $< 8 \times 10^3 / \text{cm}^2$ Note: Not EPI ready wafers

iv. GaAs(100) Cr-doped

No.	Item	Description
1.	GaAs , Growing Method: VGF(100) Cr- doped, Si- type, 2" dia x 0.35mm, 2sp	GaAs single crystal wafer Growing Method: VGF Orientation: (100) Size: 2" dia x 0.35mm Polishing: Two sides polished Doping: Cr- doped Conductor type: S-I Ra(Average Roughness): $< 0.4 \text{ nm}$ Mobility: $5560-5950 \text{ cm}^2/\text{V.S}$ Resistivity: $(0.8-1.3) \text{ E8 ohm.cm}$ EPD: $<5000 \text{ cm}^2$

v. GaAs(100) Zn-doped

No.	Item	Description
1.	GaAs (100) orientation, Zn-doped 10x5x 0.35mm, 1sp,	GaAs single crystal wafer Growing Method: LEC Orientation: (100) Size: $10 \times 5 \times 0.35 \text{ mm}$ Polishing: One side polished Doping: Zn doped Conductor type: P-type Carrier Concentration: $\sim 5 \times 10^{18} / \text{cm}^3$ Mobility: $\geq 50 \text{ cm}^2/\text{V.S}$ EPD: $\leq 5 \times 10^4 / \text{cm}^2$ Note: Not EPI ready wafers

2.	GaAs (100) orientation, P type, Zn-doped, 2" dia x 0.4mm, $6.15 \times 10^{17} \text{cm}^{-3}$, 2sp	<p>GaAs single crystal wafer Growing Method: LEC Orientation: (100) Size: 2" dia x 0.4mm Polishing: both sides polished; Roughness: < 5 Angstrom Doping: Zn-doped Conductor type: P-type Resistivity: $(6 \sim 7) \times 10^{-2} \text{ Ohm.cm}$ carrier concentration, $6.15 \times 10^{17} \text{ cm}^{-3}$ Mobility: $\sim 150 \text{ cm}^2/\text{V.S}$ EPD: $< 2 \times 10^4 / \text{cm}^{-2}$</p>
3.	GaAs Wafer - Growing Method: VGF (100) Zn doped P-type, , 2"x0.5 mm, 1sp	<p>GaAs single crystal wafer Growing Method: VGF Orientation: (100) Size: 2" dia x 0.5mm Polishing: one side polished Doping: Zn doped Conductor type: S-C-P Carrier Concentration: $(1.1-1.2) \times 10^{18} / \text{cm}^3$ Mobility: $156-159 \text{ cm}^2/\text{V.S}$ EPD: $< 5000 / \text{cm}^2$ Resistivity: $(3.2-3.4) \times 10^{-2} \text{ ohm.cm}$ Ra(Average Roughness) : < 0.4 nm</p>
4.	GaAs Wafer - Growing Method: VGF (100) Zn doped P-type, , 2"x0.5 mm, 1sp	<p>GaAs single crystal wafer Growing Method: VGF Orientation: (100) Size: 2" dia x 0.5mm Polishing: one side polished Doping: Zn doped Conductor type: S-C-P Carrier Concentration: $(5.6-7.8) \times 10^{17} / \text{cm}^3$ Mobility: $182-199 \text{ cm}^2/\text{V.S}$ EPD: $< 5000 / \text{cm}^2$ Resistivity: $(5.3-5.6) \times 10^{-2} \text{ ohm.cm}$ Ra(Average Roughness) : < 0.4 nm</p>
5.	GaAs Wafer - Growing Method: VGF (100) Zn doped Ptype, , 2"x0.35 mm, 1sp	<p>GaAs single crystal wafer Growing Method: VGF Orientation: (100) Size: 2" dia x 0.35mm Polishing: one side polished Doping: Zn doped Conductor type: S-C-P Carrier Concentration: $(2.0-3.2) \times 10^{18} / \text{cm}^3$ Mobility: $117-137 \text{ cm}^2/\text{V.S}$ EPD: $< 5000 / \text{cm}^2$ Resistivity: $(1.7-2.3) \times 10^{-2} \text{ ohm.cm}$ Ra(Average Roughness) : < 0.4 nm</p>

6.	GaAs Wafer - Growing Method: VGF (100) Zn doped Ptype, , 2"x0.35 mm, 1sp	GaAs single crystal wafer Growing Method: VGF Orientation: (100) Size: 2" dia x 0.35mm Polishing: one side polished Doping: Zn doped Conductor type: S-C-P Carrier Concentration: $(2.0-3.2) \times 10^{18} / \text{cm}^3$ Mobility: $117-137 \text{ cm}^2/\text{V.S}$ EPD: $<5000/\text{cm}^2$ Resistivity: $(1.7-2.3) \times 10^{-2} \text{ ohm.cm}$ Ra(Average Roughness) : $< 0.4 \text{ nm}$
7.	GaAs Wafer - Growing Method: VGF (100) Zn doped Ptype, , 3"x0.625 mm, 1sp	GaAs single crystal wafer Growing Method: VGF Orientation: (100) Size: 3" dia x 0.625mm Polishing: one side polished Doping: Zn doped Conductor type: S-C-P Carrier Concentration: $(1.3-2.2) \times 10^{19} / \text{cm}^3$ Mobility: $64-75 \text{ cm}^2/\text{V.S}$ EPD: $<5000/\text{cm}^2$ resistivity: $(4.5-6.7) \times 10^{-3} \text{ ohm.cm}$ Ra(Average Roughness) : $< 0.4 \text{ nm}$
8.	GaAs Wafer - Growing Method: VGF (100) Zn doped Ptype, , 100mm x0.625 mm, 2sp, Carrier Concentration: $(1.3-1.6) \times 10^{19} / \text{cm}^3$	GaAs single crystal wafer Growing Method: VGF Orientation: (100) Size: 100mm dia x 0.625mm Polishing: Two sides polished Doping: Zn doped Conductor type: S-C-P Carrier Concentration: $(1.3-1.6) \times 10^{19} / \text{cm}^3$ Mobility: $70-75 \text{ cm}^2/\text{V.s}$ EPD: $\leq 5000/\text{cm}^2$ resistivity: $(5.5-6.5) \times 10^{-3} \text{ ohm.cm}$ Ra(Average Roughness) : $< 0.4 \text{ nm}$

B. GaAs (110)

No.	Item	Description
1.	GaAs VGF Grown(110) orientation, Un-doped, Semi-Insulating, 100mm dia x 0.5mm, 1sp	GaAs single crystal wafer Growing Method: VGF Orientation: (110) Size: 100mm dia x 0.5mm Polishing: One side polished Doping: Un-doped Conductor type: S-I Carrier Concentration: N/A

		<p>Mobility: 3990-5030cm²/V.S</p> <p>Resistivity: (2.5-5.1)x10⁻⁸ohm.cm</p> <p>Ra(Average Roughness): < 0.4 nm</p>
2.	GaAs VGF Grown(110) orientation, un-doped, Semi-Insulating, 3" dia x 0.5mm, 1sp	<p>GaAs single crystal wafer</p> <p>Growing Method: VGF</p> <p>Orientation: (110)</p> <p>Size: 3" dia x 0.5mm</p> <p>Polishing: One side polished</p> <p>Doping: Un-doped, Semi-Insulating</p> <p>Conductor type: S-I</p> <p>Carrier Concentration: N/A</p> <p>Mobility: 4570-5110cm²/V.S</p> <p>Resistivity: (2.6-3.8)x10⁻⁸ohm.cm</p>
3.	GaAs VGF Grown(110) orientation, Zn-doped, P-type, 3" dia x 0.5mm, 1sp	<p>GaAs single crystal wafer</p> <p>Growing Method: VGF</p> <p>Orientation: (110)</p> <p>Size: 3" dia x 0.5mm</p> <p>Polishing: One side polished</p> <p>Doping: Zn-doped</p> <p>Conductor type: P-type</p> <p>Carrier Concentration: (5.5-6.3)E19/cm³</p> <p>Mobility: 184-193cm²/V.S</p> <p>EPD: <5000/cm²</p> <p>Resistivity: (5.4-5.9)x10⁻²ohm.cm</p> <p>Ra(Average Roughness): < 0.4 nm</p>
4.	GaAs VGF Grown(110) orientation, Zn-doped, P-type, 3" dia x 0.5mm, 2sp,	<p>GaAs single crystal wafer</p> <p>Growing Method: VGF</p> <p>Orientation: (110)</p> <p>Size: 3" dia x 0.5mm</p> <p>Polishing: Two sides polished</p> <p>Doping: Zn-doped</p> <p>Conductor type: P-type</p> <p>Carrier Concentration: (1.3-1.4)E19/cm³</p> <p>Mobility: 71-74 cm²/V.S</p> <p>Ra(Average Roughness): < 0.4 nm</p> <p>Resistivity: (6.1-6.6)x10⁻³ohm.cm</p>
5.	GaAs, VGF Grown (110) ori. N type, Si-doped, 10x10x0.3mm, 2sp	<p>GaAs single crystal wafer</p> <p>Growing Method: VGF</p> <p>Orientation: (110)</p> <p>Size: 10x10x0.3mm</p> <p>Polishing: two side polished</p> <p>Doping: Si-doped</p> <p>Conductor type: S-C-N</p> <p>Carrier Concentration: (1.4-4.1)x10E17/cm³</p> <p>Mobility: 3100-3180 cm²/V.S</p> <p>Ra(Average Roughness): < 0.4 nm</p>

6.	GaAs, VGF Grown (110) ori. N type, Si-doped, 2" dia x 0.35mm, 1sp,	GaAs single crystal wafer Growing Method: VGF Orientation: (110) Size: 2" dia x 0.35mm Polishing: One side polished Doping: Si-doped Conductor type: S-C-N Carrier Concentration: $(1.4-4.1) \times 10^{17}/\text{cm}^3$ Mobility: 3100-3180 $\text{cm}^2/\text{V.S}$ Ra(Average Roughness): < 0.4 nm
7.	GaAs, VGF Grown (110) ori. N type, Si-doped, 2" dia x 0.4mm, 1sp	GaAs single crystal wafer Growing Method: VGF Orientation: (110) Size: 2" dia x 0.4 mm Polishing: One side polished Doping: Si-doped Conductor type: S-C-N Carrier Concentration: $(2.4-2.7) \times 10^{18}/\text{cm}^3$ Mobility: 1800-1820 $\text{cm}^2/\text{V.S}$ Resistivity: $(1.3-1.5) \times 10^{-2} \text{ ohm.cm}$ Ra(Average Roughness): < 0.4 nm
8.	GaAs, VGF Grown (110) ori. N type, un-doped, 10x10x0.2mm, 2sp	GaAs single crystal wafer Growing Method: VGF Orientation: (110) Size: 10x10x0.2mm Polishing: Two sides polished Doping: un-doped Conductor type: S-I Mobility: 3990-5030 $\text{cm}^2/\text{V.S}$ Resistivity: $(2.5-5.1) \times 10^8 \text{ ohm.cm}$ Ra(Average Roughness): < 0.4 nm
9.	GaAs, VGF Grown (110) ori. N type, un-doped, 10x10x0.5mm, 1sp	GaAs single crystal wafer Growing Method: VGF Orientation: (110) Size: 10x10x0.5mm Polishing: One side polished Doping: un-doped Conductor type: S-I Mobility: 3990-5030 $\text{cm}^2/\text{V.S}$ Resistivity: $(2.5-5.1) \times 10^8 \text{ ohm.cm}$ Ra(Average Roughness): < 0.4 nm
10.	GaAs, VGF Grown (110) ori. N type, un-doped, 5x5x0.2mm, 2sp	GaAs single crystal wafer Growing Method: VGF Orientation: (110) Size: 5x5x0.2mm Polishing: Two sides polished Doping: un-doped Conductor type: S-I

		Mobility: 3990-5030 cm ² /V.S Resistivity: (2.5-5.1)x10 ⁸ ohm.cm Ra(Average Roughness): < 0.4 nm
11.	GaAs, VGF Grown (110) ori. un-doped, Semi-Insulating, 20x20x0.5mm, 1sp	GaAs single crystal wafer Growing Method: VGF Orientation: (110) Size: 20x20x0.5mm Polishing: One side polished Doping: un-doped Conductor type: S-I Mobility: 3990-5030 cm ² /V.S Resistivity: (2.5-5.1)x10 ⁸ ohm.cm Ra(Average Roughness): < 0.4 nm
12.	GaAs, VGF Grown (110) ori. Zn-doped, P-type, 2" dia x 0.5mm, 1sp,	GaAs single crystal wafer Growing Method: VGF Orientation: (110) Size: 2" dia x 0.5mm Polishing: One side polished Doping: Zn-doped Conductor type: P-type Carrier Concentration: (1.2-1.3)x10 ¹⁹ /cm ³ Mobility: 72-75 cm ² /V.S Ra(Average Roughness): < 0.4 nm
13.	GaAs, VGF Grown (110) orientation, SI, undoped, 2" dia x 0.5mm, 2sp,	GaAs single crystal wafer Growing Method: VGF Orientation: (110) Size: 2" dia x 0.5mm Polishing: two sides polished Doping: undoped, Conductor type: SI (semi-insulating) Carrier Concentration: N/A Mobility: 3780-3920 cm ² /V.S EPD: N/A Resistivity: (4.3-4.8)E8 ohm.cm Ra(Average Roughness): < 0.4 nm
14.	GaAs, VGF Grown (110) orientation, SI, undoped, 2" dia x 0.5mm, 1sp,	GaAs single crystal wafer Growing Method: VGF Orientation: (110) Size: 2" dia x 0.5mm Polishing: one side polished Doping: undoped, Conductor type: SI (semi-insulating) Carrier Concentration: (0.2-5.5)E8/cm ³ Mobility: 3830-5270 cm ² /V.S EPD: <5000/cm ² Resistivity: (2.2-2.3)E8 ohm.cm Ra(Average Roughness): < 0.4 nm

15.	GaAs, VGF Grown (110) orientation, SI, undoped, 2" dia x 0.5mm, 2sp,	GaAs single crystal wafer Growing Method: VGF Orientation: (110) Size: 2" dia x 0.5mm Polishing: two sides polished Doping: undoped, Conductor type: SI (semi-insulating) Carrier Concentration: N/A Mobility: 5060-6230 cm ² /V.S Resistivity: (0.9-2.7)E8 ohm.cm Ra(Average Roughness): < 0.4 nm
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C. GaAs(111)

No.	Item	Description
1.	GaAs (111) orientation, Semi-Insulating, undoped, 2" dia x 0.5mm, 1sp,	GaAs single crystal wafer Growing Method: LEC Orientation: (111) Size: 2" dia x 0.5mm Polishing: one side polished Doping: undoped Conductor type: xx-type, Semi-Insulating Resistivity:(6.5- 6.59)x10E7 ohm.cm Carrier Concentration: (1.65-4.0)x10E7cm ⁻³ Mobility:(5200- 5730) cm ² /V.S EPD: (6.2-6.5)x10 ⁴ /cm ⁻²
2.	GaAs ,Growing Method: VGF (111)A , SI, undoped, 4" dia x 0.55mm, 2sp	GaAs single crystal wafer Growing Method: VGF Orientation: (111)A Primary Flat: US(0-11); Secondary Flat: US(2-1-1) Size: 4" dia x 0.55 mm Polishing: Two sides polished Doping: undoped Conductor type: Semi-Insulating Resistivity:(2.3-2.4)E8 ohm.cm Carrier Concentration: N/A Mobility:5360-5480 cm ² /V.S EPD: N/A Ra(Average Roughness): < 0.4 nm
3.	GaAs ,Growing Method: VGF (111)B , SI, undoped, 2" dia x 0.5mm, 2sp	GaAs single crystal wafer Growing Method: VGF Orientation: (111)B Primary Flat: EJ(0-11)+/- 0.5 deg; Secondary Flat: EJ(-211) Size: 2" dia x 0.5mm Polishing: Two sides polished Doping: undoped Conductor type: Semi-Insulating Resistivity:(1.3-2.7)E8 ohm.cm

		Carrier Concentration: N/A Mobility: 4630-5970 cm ² /V.S EPD: N/A Ra(Average Roughness): < 0.4 nm
4.	GaAs ,Growing Method: VGF (111)B , Si, undoped, 4" dia x 0.625mm, 2sp	GaAs single crystal wafer Growing Method: VGF Orientation: (111)B Primary Flat: EJ(0-11)+/- 0.5 deg; Secondary Flat: EJ(-211) Size: 4" dia x 0.625mm Polishing: Two sides polished Doping: undoped Conductor type: Semi-Insulating Resistivity: (2.0-2.1)E8 ohm.cm Carrier Concentration: N/A Mobility: 5030-5240 cm ² /V.S EPD: N/A Ra(Average Roughness): < 0.4 nm
5.	GaAs ,Growing Method: VGF (111)B , Si-doped, 2" dia x 0.35mm, 2sp	GaAs single crystal wafer Growing Method: VGF Orientation: (111)B Primary Flat: EJ(0-11)+/- 0.5 deg; Secondary Flat: EJ(-211) Size: 2" dia x 0.35mm Polishing: Two sides polished Doping: Si-doped Conductor type: S-C-N Resistivity: (1.5-4.1)E-3 ohm.cm Carrier Concentration: (0.6-2.4)x10 ¹⁸ /c.c Mobility: 1750-2450 cm ² /V.S EPD: N/A Ra(Average Roughness) : < 0.4 nm
6.	GaAs ,Growing Method: VGF (111)B , Si-doped, 3" dia x 0.625 mm, 2sp	GaAs single crystal wafer Growing Method: VGF Orientation: (111)B Primary Flat: EJ(0-11)+/- 0.5 deg; Secondary Flat: EJ(-211) Size: 3" dia x 0.6mm Polishing: Two sides polished Doping: Si-doped Conductor type: S-C-N Resistivity: (1.5-1.7)E-3 ohm.cm Carrier Concentration: (1.9-2.4)E18 /c.c Mobility: 1760-1980 cm ² /V.S EPD: N/A Ra(Average Roughness) : < 0.4 nm
7.	GaAs (111) orientation, P-type, Zn-doped, 2" dia x 0.4mm, 1sp,	GaAs single crystal wafer Growing Method: LEC Orientation: (111) Size: 2" dia x 0.4mm Polishing: one side polished Doping: Zn-doped,

		<p>Conductor type: P-type Resistivity: 1.58E-1 ohm.cm Carrier Concentration: 2.16x10¹⁷cm⁻³ Mobility: 190 cm²/V.S EPD: 3.3x10⁴/cm⁻²Note: Ra(Average Roughness) : < 0.4 nm</p>
8.	GaAs (111) orientation, Semi-Insulating, undoped, 2" dia x 0.4mm, 1sp,	<p>GaAs single crystal wafer Growing Method: LEC Orientation: (111) Size: 2" dia x 0.4mm Polishing: one side polished Doping: undoped, SI (semi-insulating) Conductor type: Resistivity: 3.6x10⁷ ohm.cm Carrier Concentration: 4.0x10⁷cm⁻³ Mobility: 5200 cm²/V.S EPD: 6.5x10⁴/cm⁻² Ra(Average Roughness): < 0.4 nm Note: Not EPI ready wafers</p>
9.	GaAs (111) orientation, Zn-doped, P-type, 2" dia x 0.4mm, 2sp,	<p>GaAs single crystal wafer Growing Method: LEC Orientation: (111) Size: 2" dia x 0.4mm Polishing: two sides polished Doping: Zn-doped Conductor type: P-type Resistivity: 1.29E-1 ohm.cm Carrier Concentration: 2.31x10¹⁷cm⁻³ Mobility: 210 cm²/V.S EPD: 5.7x10⁴/cm⁻²Note: Ra(Average Roughness): < 0.4 nm Not EPI ready wafers</p>
10.	GaAs, Growing Method: VGF, (111), Zn-doped, P-type, 2" dia x 0.5mm, 2sp	<p>GaAs single crystal wafer Growing Method: VGF Orientation: (111) Size: 2" dia x 0.5mm Polishing: two sides polished Doping: Zn-doped, Conductor type: S-C-P Resistivity: (8.8-9.8)E-3 ohm.cm Carrier Concentration: (7.2-8.5)E18cm⁻³ Mobility: 84-90 cm²/V.S Ra(Average Roughness): < 0.4 nm</p>

D. GaAs -CLEARANCE!-No Detailed Data!

i. GaAs (100) with 2 degree off

No.	Item	Description
1.	GaAs Wafer , N-type (100) with 2 degree off 2"D x0.5 mm, 1SP	GaAs Wafer , N-type (100) with 2 degree off 2"D x0.5 mm, 1SP Size: 2" dia x 0.5mm Polishing: one side polished; Size: N-type

ii. GaAs N-type

No.	Item	Description
1.	GaAs Wafer , N-type 2"D x0.5 mm, 1SP	GaAs single crystal wafer Size: 2" dia x 0.5mm Polishing: one side polished; Type:-N

iii. GaAs P-type

No.	Item	Description
1.	GaAs Wafer , P-type 2"D x0.5 mm, 1SP	GaAs single crystal wafer Size: 2" dia x 0.5mm Polishing: one side polished; Type:-P

iv. GaAs(311)

No.	Item	Description
1.	GaAs Wafer ,(311) 2"D x0.5 mm, 1SP	GaAs single crystal wafer Size: 2" dia x 0.5mm Polishing: one side polished; Orientation: (311)

26. GaN Crystal & Epi Template

No.	Item	Description
1.	Si-doped GaN (0001) Epitaxial Template on Sapphire N-type, 2"x 4.5 micron,1sp	Si- doped GaN Epitaxial Template on sapphire GaN (0001) thin film layer thickness 4.5 microns Sizes 2" Round Dimensions 50.8mm +/- 0.25mm

		Conduction Type: N-type, Resistivity: 2.5E-3 Ohm-cm Carrier Conc: 1E19 /cc FWHM of RC for the symmetric (002) reflection : ~ 250 arcsec; FWHM of RC for the asymmetric (102) reflection : ~350 arcsec The condition of front surface: is as grown with Ga face Substrates: sapphire (0001) miscut: 0.2 deg +/- 0.1 deg toward M plane thickness of sapphire: 430 um +/- 15 um one side polished with the condition of back surface is " as received"
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A. GaN Single Crystal

No.	Item	Description
1.	GaN -Single Crystal Substrate (0001), 10x10x0.475 mm, Semi-Insulating, 1SP	<p>GaN single crystal substrates is made by a hydride vapor phase epitaxy (HVPE)-based method. During the HVPE process, HCl reacts with molten Ga to form GaCl, which in turn reacts with NH₃ to form GaN. The large growth rate enables the growth of self-supporting wafer thicknesses in a convenient time period.</p> <p><u>Specifications:</u> Orientation: c-axis (0001) +/- 1.0 ° Nominal Thickness: 475+/- 25 microns Dimension: 10 mm x 10 mm +/- 0.5 mm Bow: <5 microns TTV: <10 microns Conduction Type: Semi-Insulating Resistivity: 106 ohm-cm Dislocation Density: <5x10⁶cm⁻² Macro Defect Density: <5 cm⁻² Transmission: => 70% Front Surface Finish: (Ga Face) , RMS <0.5 nm Edge Exclusion Area: 1mm Package Single Wafer Container or membrane box</p>
2.	GaN -Single Crystal Substrate (0001), 10x10.5x0.255 mm , 1SP	<p>GaN single crystal substrates is made by a hydride vapor phase epitaxy (HVPE)-based method. During the HVPE process, HCl reacts with molten Ga to form GaCl, which in turn reacts with NH₃ to form GaN. The large growth rate enables the growth of self-supporting wafer thicknesses in a convenient time period.</p> <p><u>Specifications:</u> Orientation: c-axis (0001) +/- 1.0 ° Nominal Thickness: 255+/- 30 microns Dimension: 10 mm x 10.5 mm +/- 0.5 mm Resistivity: < 0.5 Ohm-cm Dislocation Density: <6x10⁷ cm⁻² Macro Defect Density: <=2 cm⁻² Transmission: => 70% Front Surface Finish: (Ga Face), RMS <2.0 nm Edge Exclusion Area 1mm</p>

		Package Single Wafer Container or membrane box
3.	GaN -Single Crystal Substrate (0001), 10x10x0.475 mm , N-type, 1SP	<p>GaN single crystal substrates is made by a hydride vapor phase epitaxy (HVPE)-based method. During the HVPE process, HCl reacts with molten Ga to form GaCl, which in turn reacts with NH₃ to form GaN. The large growth rate enables the growth of self-supporting wafer thicknesses in a convenient time period.</p> <p><u>Specifications:</u> Orientation: c-axis (0001) +/- 1.0 ° Nominal Thickness: 475+/- 25 microns Dimension: 10 mm x 10 mm +/- 0.5 mm Bow: <5 microns TTV: <10 microns Conduction Type: N type Resistivity: < 0.5 Ohm-cm Dislocation Density: <5x10⁶cm⁻² Macro Defect Density: <5 cm⁻² Transmission: => 70% Front Surface Finish (Ga Face), RMS <0.5 nm Edge Exclusion Area 1mm Package Single Wafer Container or membrane box</p>
4.	GaN -Single Crystal Substrate (0001), 18x18 x 200 um , N- type, 1SP R: <0.05 ohm.cm	<p>GaN single crystal substrates is made by a hydride vapor phase epitaxy (HVPE)-based method. During the HVPE process, HCl reacts with molten Ga to form GaCl, which in turn reacts with NH₃ to form GaN. The large growth rate enables the growth of self-supporting wafer thicknesses in a convenient time period.</p> <p><u>Specifications:</u> Orientation: c-axis (0001) +/- 1.0 ° Nominal Thickness: 200+/- 10 um Dimension: 18 mm x 18 mm +/- 0.5 mm Bow: <5 microns Conduction Type: N type Resistivity: < 0.05 Ohm-cm Dislocation Density: <1x10⁶cm⁻² Macro Defect Density: <5 cm⁻² Transmission: => 70% Front Surface Finish: (Ga Face) , RMS <0.5 nm Edge Exclusion Area 1mm Package Single Wafer Container or membrane box</p>

B. GaN Template on Sapphire

i. Undoped GaN Template on Sapphire

No.	Item	Description
1.	GaN Epitaxial Template on Sapphire, C plane (Epi-Thin on Sapphire, N type) 10 x 10 mm x 5 micron	<p>GaN Epitaxial Template on sapphire is made by a hydride vapor phase epitaxy (HVPE)-based method. During the HVPE process, HCl reacts with molten Ga to form GaCl, which in turn reacts with NH₃ to form GaN. Epi GaN template is a cost effective way to replace GaN single crystal substrate</p> <p><u>Specifications:</u> Sizes 10mmx10mm Substrate Sapphire, Orientation C (0001) +/- 1.0 ° Conduction Type: n-type, Resistivity < 0.5 Ohm-cm Front Surface Finish (Ga Face) As-grown Back Surface Finish Sapphire as-received finish Useable Surface Area >90% Edge Exclusion Area 1mm Package Single Wafer Container GaN layer thickness 5 microns , (=/- 10%)</p>
2.	GaN Epitaxial Template on Sapphire, C plane (Epi-Film on Sapphire, N type) 10x10 x0.5 mm x 30 micron Thickness	<p>GaN Epitaxial Template on sapphire is made by a hydride vapor phase epitaxy (HVPE)-based method. During the HVPE process, HCl reacts with molten Ga to form GaCl, which in turn reacts with NH₃ to form GaN. Epi GaN template is a cost effective way to replace GaN single crystal substrate</p> <p><u>Specifications:</u> Sizes 10mmx10mm x0.5mm Substrate Sapphire, Orientation C (0001) +/- 1.0 ° Conduction Type: n-type, Resistivity < 0.5 Ohm-cm Front Surface Finish (Ga Face) As-grown Back Surface Finish Sapphire as-received finish Useable Surface Area >90% Edge Exclusion Area 1mm Package Single Wafer Container GaN layer thickness 30 microns , (+/- 10%)</p>
3.	GaN Epitaxial Template on Sapphire, C plane (Epi-Film on Sapphire, N type) 5x5 mmx 30 micron Thickness	<p>GaN Epitaxial Template on sapphire is made by a hydride vapor phase epitaxy (HVPE)-based method. During the HVPE process, HCl reacts with molten Ga to form GaCl, which in turn reacts with NH₃ to form GaN. Epi GaN template is a cost effective way to replace GaN single crystal substrate</p> <p><u>Specifications:</u> Sizes 5mmx5mm Substrate Sapphire, Orientation C (0001) +/- 1.0 ° Conduction Type: n-type, Resistivity < 0.5 Ohm-cm</p>

		<p>Front Surface Finish (Ga Face) As-grown Back Surface Finish Sapphire as-received finish Useable Surface Area >90% Edge Exclusion Area 1mm Package Single Wafer Container GaN layer thickness 30 microns , (+/- 10%)</p>
4.	<p>GaN Epitaxial Template on Sapphire, M plane (Epi-Film on Sapphire, N type) 10 x 10 mm x 5 micron</p>	<p>GaN Epitaxial Template on sapphire is made by a hydride vapor phase epitaxy (HVPE)-based method. During the HVPE process, HCl reacts with molten Ga to form GaCl, which in turn reacts with NH₃ to form GaN. Epi GaN template is a cost effective way to replace GaN single crystal substrate</p> <p><u>Specifications:</u> Sizes 10mmx10mm Substrate Sapphire, Orientation M (00.1) +/- 1.0 o Conduction Type: n-type, Resistivity < 0.5 Ohm-cm Front Surface Finish (Ga Face) As-grown Back Surface Finish Sapphire as-received finish Useable Surface Area >90% Edge Exclusion Area 1mm Package Single Wafer Container GaN layer thickness 5 microns , (+/- 10%)</p>
5.	<p>GaN Epitaxial Template on Sapphire, R- plane (Epi-Thim on Sapphire, N type) 10 x 10 mm x 5 micron</p>	<p>GaN Epitaxial Template on sapphire is made by a hydride vapor phase epitaxy (HVPE)-based method. During the HVPE process, HCl reacts with molten Ga to form GaCl, which in turn reacts with NH₃ to form GaN. Epi GaN template is a cost effective way to replace GaN single crystal substrate</p> <p><u>Specifications:</u> Sizes 10mmx10mm Substrate Sapphire, Orientation R (00.1) +/- 1.0 o Conduction Type: n-type, Resistivity < 0.5 Ohm-cm Front Surface Finish (Ga Face) As-grown Back Surface Finish Sapphire as-received finish Useable Surface Area >90% Edge Exclusion Area 1mm Package Single Wafer Container GaN layer thickness 5 microns , (+/- 10%)</p>
6.	<p>GaN Epitaxial Template on Sapphire (C plane), N type, undoped, 2" x 30 micron</p>	<p>GaN Epitaxial Template on sapphire is made by a hydride vapor phase epitaxy (HVPE)-based method. During the HVPE process, HCl reacts with molten Ga to form GaCl, which in turn reacts with NH₃ to form GaN. Epi GaN template is a cost effective way to replace GaN single crystal substrate</p> <p><u>Specifications:</u> Sizes 2" Round Dimensions 50.8mm +/- 0.25mm x 0.5 mm th Substrate Sapphire, Orientation c-axis (0001) +/- 1.0 o</p>

		<p>Conduction Type: n-type, Resistivity < 0.5 Ohm-cm Front Surface Finish (Ga Face) As-grown Back Surface Finish Sapphire as-received finish Useable Surface Area >90% Edge Exclusion Area 1mm Package Single Wafer Container GaN layer thickness 30 microns , (+/- 10%)</p>
7.	GaN Epitaxial Template on Sapphire (R plane), N type, undoped, 2"x 5 micron	<p>GaN Epitaxial Template on sapphire is made by a hydride vapor phase epitaxy (HVPE)-based method. During the HVPE process, HCl reacts with molten Ga to form GaCl, which in turn reacts with NH₃ to form GaN. Epi GaN template is a cost effective way to replace GaN single crystal substrate</p> <p><u>Specifications:</u> Sizes 2" Round Dimensions 50.8mm +/- 0.25mm Substrate Sapphire, Orientation R plane +/- 1.0 o Conduction Type: n-type, Resistivity < 0.5 Ohm-cm Front Surface Finish (Ga Face) As-grown Back Surface Finish Sapphire as-received finish Useable Surface Area >90% Edge Exclusion Area 1mm Package Single Wafer Container GaN layer thickness 5 microns , (=/- 10%)</p>
8.	GaN Epitaxial Template on Sapphire (Epi-Film on Sapphire, M plane), N type, undoped, 2"x 5 micron	<p>GaN Epitaxial Template on sapphire is made by a hydride vapor phase epitaxy (HVPE)-based method. During the HVPE process, HCl reacts with molten Ga to form GaCl, which in turn reacts with NH₃ to form GaN. Epi GaN template is a cost effective way to replace GaN single crystal substrate.</p> <p><u>Specifications:</u> Sizes 2" Round Dimensions 50.8mm +/- 0.25mm Substrate Sapphire, Orientation M plane +/- 1.0 o Conduction Type: n-type, undoped Resistivity < 0.5 Ohm-cm Front Surface Finish (Ga Face) As-grown Back Surface Finish Sapphire as-received finish Useable Surface Area >90% Edge Exclusion Area 1mm Package Single Wafer Container GaN layer thickness 5 microns , (=/- 10%)</p>
9.	GaN Epitaxial Template on Sapphire (C plane), N type, undoped, 2"x 5 micron, 2sp	<p>GaN Epitaxial Template on sapphire is made by a hydride vapor phase epitaxy (HVPE)-based method. During the HVPE process, HCl reacts with molten Ga to form GaCl, which in turn reacts with NH₃ to form GaN. Epi GaN template is a cost effective way to replace GaN single crystal substrate.</p>

		<p><u>Specifications:</u> Sizes 2" Round Dimensions 50.8mm +/- 0.25mm Substrate Sapphire, Orientation c-axis (0001) +/- 1.0 o Conduction Type: n-type, Resistivity < 0.5 Ohm-cm Front Surface Finish (Ga Face) As-grown Back Surface Finish Sapphire as-received finish Useable Surface Area >90% Edge Exclusion Area 1mm Package Single Wafer Container GaN layer thickness 5 microns , (=/- 10%) Double sides polished</p>
10.	GaN Epitaxial Template on Sapphire (C plane), N type, undoped, 2"x 5 micron, 1sp	<p>GaN Epitaxial Template on sapphire is made by a hydride vapor phase epitaxy (HVPE)-based method. During the HVPE process, HCl reacts with molten Ga to form GaCl, which in turn reacts with NH₃ to form GaN. Epi GaN template is a cost effective way to replace GaN single crystal substrate.</p> <p><u>Specifications:</u> Sizes 2" Round Dimensions 50.8mm +/- 0.25mm Substrate Sapphire, Orientation c-axis (0001) +/- 1.0 o Conduction Type: n-type, Resistivity < 0.5 Ohm-cm Front Surface Finish (Ga Face) As-grown Back Surface Finish Sapphire as-received finish Useable Surface Area >90% Edge Exclusion Area 1mm Package Single Wafer Container GaN layer thickness 5 microns , (+/- 10%)</p>
11.	Semi-Insulating GaN Epitaxial Template on Sapphire (C plane), N type, undoped, 3"x 5 micron, 1sp	<p>GaN Epitaxial Template on sapphire is made by a hydride vapor phase epitaxy (HVPE)-based method. During the HVPE process, HCl reacts with molten Ga to form GaCl, which in turn reacts with NH₃ to form GaN. Epi GaN template is a cost effective way to replace GaN single crystal substrate.</p> <p><u>Specifications:</u> Semi-Insulating GaN Epitaxial Template on Sapphire (C plane) Sizes: 3" Round Substrate Sapphire, Orientation c-axis (0001) +/- 1.0 o Conduction Type: n-type, undoped Typical Macro Defect Density: < 5cm⁻² Resistivity: >10⁶ Ohm-cm Front Surface Finish (Ga Face) As-grown Back Surface Finish Sapphire as-received finish Useable Surface Area >90% Edge Exclusion Area 1mm Package Single Wafer Container GaN layer thickness 5 microns , (+/- 1 micron)</p>

12.	GaN Epitaxial Template on Sapphire (Semi-insulated) 2"x 5 Micron-- Research Grade	<p>GaN Epitaxial Template on sapphire is made by a hydride vapor phase epitaxy (HVPE)-based method. During the HVPE process, HCl reacts with molten Ga to form GaCl, which in turn reacts with NH₃ to form GaN. Epi GaN template is a cost effective way to replace GaN single crystal substrate.</p> <p><u>Specifications:</u> Research Grade Sizes 2" Round Dimensions 50mm +/- 2mm Substrate Sapphire, Orientation c-axis (00.1) +/- 1.0° Conduction Type: n-type, Resistivity > 1E6 Ohm-cm Front Surface Finish (Ga Face) As-grown Back Surface Finish Sapphire as-received finish Useable Surface Area >90% Edge Exclusion Area 1mm Package Single Wafer Container GaN layer thickness 5 microns , (+/- 10%)</p>
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ii. Doped GaN Template on Sapphire

No.	Item	Description
1.	Mg-doped GaN (0001) Epitaxial Template on Sapphire P type, 2"x 3 micron, 1sp	<p>Mg- doped GaN (0001) Epitaxial Template on sapphire is made by MOCVD -based method.</p> <p><u>Specifications:</u> Mg- doped GaN Epitaxial Template on sapphire Sizes 2" Round GaN (0001) thin film layer thickness 3 microns Dimensions 50.8mm +/- 0.25mm Conduction Type: P-type, Resistivity 3.0~5.0 Ohm-cm Carrier Concentration: (1E17-3E18)/cc Hole Mobility: 20 cm²/V FWDM of Rocking Curve for (00.2) reflection for 2 um and 3 um is around 350 arcsec FWDM of Rocking Curve for (10.2) reflection for 2 um and 3 um is around 450 arcsec The condition of front surface of the template is "as grown" with Ga face Substrate: Sapphire (0001) Orientation (0001) miscut: 0.2 deg +/- 0.1 deg toward M plane one side polished with the condition of back surface " as-received finish"</p>
2.	Mg-doped GaN Epitaxial Template on Sapphire Ptype, 2"x 2 micron, 1sp	<p>Mg- doped GaN Epitaxial Template on sapphire is made by MOCVD -based method.</p> <p><u>Specifications:</u> Mg- doped GaN Epitaxial Template on sapphire Sizes 2" Round GaN (0001) thin film layer thickness 2 microns Dimensions 50.8mm +/- 0.25mm Resistivity 2.0~4.0 Ohm-cm Carrier Concentration: (0.1-3)E18/cc</p>

		<p>Hole Mobility: 20 cm²/V</p> <p>FWDM of Rocking Curve for (00.2) reflection for 2 μm and 3 μm is around 350 arcsec</p> <p>FWDM of Rocking Curve for (10.2) reflection for 2 μm and 3 μm is around 450 arcsec</p> <p>The condition of front surface of the templates is "as grown" with Ga face</p> <p>Substrate: Sapphire (0001)</p> <p>Orientation: (0001) miscut 0.2 deg +/- 0.1 deg toward M plane</p> <p>one side polished with the condition of back surface is "as received finish".</p>
3.	Si-doped GaN (0001) Epitaxial Template on Sapphire N-type, 2"x 4.5 micron, 1sp	<p>Si- doped GaN Epitaxial Template on sapphire is made by MOCVD -based method.</p> <p><u>Specifications:</u></p> <p>Si- doped GaN Epitaxial Template on sapphire</p> <p>GaN (0001) thin film layer thickness 4.5 microns</p> <p>Sizes 2" Round</p> <p>Dimensions 50.8mm +/- 0.25mm</p> <p>Conduction Type: N-type,</p> <p>Resistivity: 2.5E-3 Ohm-cm</p> <p>Carrier Conc: 1E19 /cc</p> <p>FWHM of RC for the symmetric (002) reflection : ~ 250 arcsec;</p> <p>FWHM of RC for the asymmetric (102) reflection : ~350 arcsec</p> <p>The condition of front surface: is as grown with Ga face</p> <p>Substrates: sapphire</p> <p>(0001) miscut: 0.2 deg +/- 0.1 deg toward M plane</p> <p>thickness of sapphire: 430 μm +/- 15 μm</p> <p>one side polished with the condition of back surface is " as received"</p>

C. GaN Template on Silicon

No.	Item	Description
1.	GaN Epitaxial Template on 2" Silicon Wafer, GaN film, N type, undoped on Si (111) substrates, 2"x 500 nm, 1sp	<p>GaN Epitaxial Template on silicon is made by a hydride vapor phase epitaxy (HVPE)-based method. During the HVPE process, HCl reacts with molten Ga to form GaCl, which in turn reacts with NH₃ to form GaN. Epi GaN template on silicon is a cost effective way to replace GaN single crystal substrate.</p> <p><u>Specifications:</u></p> <p>Nominal GaN thickness: 0.5 μm ± 0.1 μm</p> <p>Front Surface finish (Ga-face): <1nm RMS, As-grown, Epi-ready</p> <p>Back surface finish: as received</p> <p>GaN orientation: C-plane (00.1)</p> <p>Polarity: Ga-face</p> <p>Conduction Type: Undoped (N-)</p> <p>Macro Defect Density: <5/cm²</p> <p>Wafer base: Silicon [111], N type, P doped, res: 0-10 ohm-cm, 2" diameter x 0.5mm, one side polished</p>
2.	GaN Epitaxial Template on 2" Silicon Wafer, GaN film, N type, undoped on Si (111) substrates, 2"x 500 nm, 2sp	<p>GaN Epitaxial Template on silicon is made by a hydride vapor phase epitaxy (HVPE)-based method. During the HVPE process, HCl reacts with molten Ga to form GaCl, which in turn reacts with NH₃ to form GaN. Epi GaN template on silicon is a cost effective way to replace GaN single crystal</p>

		<p>substrate.</p> <p><u>Specifications:</u> Nominal GaN thickness: $0.5\mu\text{m} \pm 0.1\mu\text{m}$ Front Surface finish (Ga-face): <1nm RMS, As-grown, Epi-ready Back surface finish: Silicon as received GaN orientation: C-plane (00.1) Polarity: Ga-face Conduction Type: Undoped (N-) Macro Defect Density: <1/cm² Wafer base: Silicon [111], N type, P doped, 0-10 ohm-cm, 2" diameter x 0.5mm, both sides polished</p>
3.	<p>GaN Epitaxial Template on 4" Silicon Wafer, GaN film, 0.5 μm th, N type, undoped, on Si (111) substrates, 4"x 500 nm, 1sp R: 70-85 ohm.cm</p>	<p>GaN Epitaxial Template on silicon is made by a hydride vapor phase epitaxy (HVPE)-based method. During the HVPE process, HCl reacts with molten Ga to form GaCl, which in turn reacts with NH₃ to form GaN. Epi GaN template on silicon is a cost effective way to replace GaN single crystal substrate.</p> <p><u>Specifications:</u> Nominal GaN thickness: $0.5\mu\text{m} \pm 0.1\mu\text{m}$ Front Surface finish (Ga-face): <1nm RMS, As-grown, Epi-ready Back surface finish: Silicon as received GaN orientation: C-plane (00.1) Polarity: Ga-face Conduction Type: Undoped (N-) Resistivity: 70-85 ohm-cm Macro Defect Density: <5/cm² Wafer base: Silicon [111], N type, P doped, Res: 0-10 ohm-cm, 4" diameter x 0.5mm, one side polished</p>
4.	<p>GaN Epitaxial Template on 4" Silicon Wafer, GaN film, 0.5 μm th, N type, undoped, on Si (111) substrates, 4"x 500 nm, 1sp R:<0.5 ohm.cm</p>	<p>GaN Epitaxial Template on silicon is made by a hydride vapor phase epitaxy (HVPE)-based method. During the HVPE process, HCl reacts with molten Ga to form GaCl, which in turn reacts with NH₃ to form GaN. Epi GaN template on silicon is a cost effective way to replace GaN single crystal substrate.</p> <p><u>Specifications:</u> Nominal GaN thickness: $0.5\mu\text{m} \pm 0.1\mu\text{m}$ Front Surface finish (Ga-face): <1nm RMS, As-grown, Epi-ready Back surface finish: as received GaN orientation: C-plane (00.1) Polarity: Ga-face Conduction Type: Undoped (N-) Resistivity: < 0.5 ohm-cm Macro Defect Density: <5/cm² Wafer base: Silicon [111], N-type P-doped R:1-10 ohm.cm; 4" diameter x 0.5mm, one side polished</p>
5.	<p>GaN Epitaxial Template on Silicon Wafer, N type, undoped, 10x10 mm x 500 nm,</p>	<p>GaN Epitaxial Template on silicon is made by a hydride vapor phase epitaxy (HVPE)-based method. During the HVPE process, HCl reacts with molten Ga to form GaCl, which in turn reacts with NH₃ to form GaN. Epi GaN template on silicon is a cost effective way to replace GaN single crystal</p>

		<p>substrate.</p> <p><u>Specifications:</u> Nominal GaN thickness: $0.5\mu\text{m} \pm 0.1\mu\text{m}$ Front Surface finish (Ga-face): <1nm RMS, As-grown, Epi-ready Back surface finish: Silicon (111) N-type P-doped R:0-10 ohm.cm GaN orientation: C-plane (00.1) Polarity: Ga-face Conduction Type: Undoped (N-) and resistivities: < 0.05 Ohm-cm Macro Defect Density: <1/cm² Wafer base: Silicon [111], 10x10x0.5mm, one side polished</p>
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27. GaP

A. GaP Substrate (100)

i. GaP (100) undoped

No.	Item	Description
1.	GaP Wafer, undoped (100) 10x10x0.5 mm, 1sp	GaP single crystal wafer, Size: 10mm x 10 mm x 0.5 mm, Doping: undoped, semi-insulating Conducting type: N-type, Carrier Concentration: $1.4 \times 10^6/\text{cm}^3$ Resistivity: 3.5×10^{10} Orientation: (100) Polished: one side Surface finish (RMS or Ra) : < 8A
2.	GaP Wafer, undoped (100) 10x10x0.5 mm, 2sp	GaP single crystal wafer, Size: 10mm x 10 mm x 0.5 mm, Doping: undoped, Conducting type: N-type, Orientation: (100) Polished: two sides Surface finish (RMS or Ra) : < 8A
3.	GaP wafer undoped (100) 2" diaX 0.5mm 1sp	GaP single crystal wafer, Size: 2" diameter(+/- 0.15mm) x 0.5mm(+/- 0.05mm), Doping: undoped, Conducting type: N-type, Orientation: (100)+_30' Edge Orientation: (110) $\pm 1^\circ$ Polished: one side polished. Surface finish (RMS or Ra) : < 8A
4.	GaP Wafer undoped (100) 2"x0.5 2sp	GaP single crystal wafer, Size: 2" diameter(+/- 0.15mm) x 0.5mm(+/- 0.05mm), Doping: undoped, Conducting type: N-type,

		Orientation: (100)+_30' Edge Orientation: (110)±1° Polished: Both sides polished. Surface finish (RMS or Ra) : < 8A
5.	GaP Wafer undoped (100) 3"x0.3 2sp	GaP single crystal wafer, Size: 3" diameter x 0.3mm, Doping: undoped, Conducting type: N-type, Orientation: (100) Resistivity: 69 ohm.cm Carrier Concentration: 6.2E14 cmE-3 EPD: 2.3xE5 cmE-2 Polished: two sides Surface finish (RMS or Ra) : < 8A

ii. GaP (100) S-doped

No.	Item	Description
1.	GaP wafer, N type, S doped, (100), 2 deg toward [101] +/- 0.5 deg, 48 mm in dia x 0.25 mm, 1sp	GaP single crystal wafer, Size: 48 mm in diameter x 0.25mm, Doping: S doped Conducting type: N-type, Orientation: (100) 2 degree OFF toward [101] +/- 0.5 deg Polished: one side Surface finish (RMS or Ra) : < 8A Carrier Concentration: (0.25 ~ 2.0) E18 / cm^3 Resistivities: 0.185 ohm-cm
2.	GaP wafer, S doped, (100), 2" dia x 0.35 mm, 2sp	GaP single crystal wafer, Size: 2" diameter x 0.35mm, Doping: S doped Conducting type: N-type, Orientation: (100) Polished: two sides Surface finish (RMS or Ra) : < 8A
3.	GaP wafer, S doped, (100), 2" dia x 0.5 mm, 1sp	GaP single crystal wafer, Size: 2" diameter(+/_0.15mm) x 0.5mm(+/_ 0.05mm), Doping: S-doped, Conducting type: N-type, Orientation: (100)+_30' Edge Orientation: (110)±1° Polished: One side polished. Surface finish (RMS or Ra) : < 8A
4.	GaP wafer, S doped, (100), 2" dia x 0.50 mm, 2sp	GaP single crystal wafer, Size: 2" diameter(+/_0.15mm) x 0.5mm(+/_ 0.05mm),

		Doping: S-doped, Conducting type: N-type, Orientation: (100)+_30' Edge Orientation: (110)±1° Polished:Both sides polished. Surface finish (RMS or Ra) : < 8A
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iii. GaP (100) Zn-doped

No.	Item	Description
1.	GaP wafer, Zn doped, P type, (100), 10x10 x 0.35 mm, 2sp,R:7.9x10 ⁻² ohm-cm	GaP single crystal wafer, Size: 10x10 x 0.35 mm, Doping: Zn doped Conducting type: P-type, Orientation: (100) resistivity:7.9x10 ⁻² ohm-cm carrier concentration: 1.38 E 18 a/cm ³ mobility: 60 cm ² /Vs EPD: <1E5 Polished: two sides Surface finish (RMS or Ra): < 8A
2.	GaP wafer, Zn doped, P type, (100), 2" dia x 0.35 mm, 2sp R:1.15E-1 ohm.cm	GaP single crystal wafer, Size: 2" diameter x 0.35 mm, Doping: Zn doped Conducting type: P-type, Orientation: (100) resistivity:1.15x10 ⁻¹ ohm-cm carrier concentration: 8.2 E 17 cm ³ mobility: 65 cm ² /Vs EPD: <4.3E4 Polished: two sides Surface finish (RMS or Ra) : < 8A
3.	GaP wafer, Zn doped, P type, (100), 2" dia x 0.35 mm, 2sp,R:7.9x10 ⁻² ohm-cm	GaP single crystal wafer, Size: 2" diameter x 0.35 mm, Doping: Zn doped Conducting type: P-type, Orientation: (100) resistivity:7.9x10 ⁻² ohm-cm carrier concentration: 1.38 E 18 a/cm ³ mobility: 60 cm ² /Vs EPD: <1E5 Polished: two sides Surface finish (RMS or Ra): < 8A
4.	GaP wafer, Zn doped, P type, (100), 2" dia x 0.4 mm, 1sp (carrier conc.:7E17/cc)	GaP single crystal wafer, Size: 2" diameter x 0.4 mm, Doping: Zn doped Conducting type: P-type,

		Orientation: (100) resistivity: 1.17×10^{-1} ohm-cm carrier concentration: $(6.95) \times 10^{17} / \text{cm}^3$ mobility: $77 \text{ cm}^2/\text{Vs}$ EPD: $< 4.5 \times 10^4$ Polished: one side polished Surface finish (RMS or Ra): $< 8 \text{ \AA}$
5.	GaP wafer, Zn doped, P type, (100), $5 \times 5 \times 0.35$ mm, 2sp, R: 7.9×10^{-2} ohm-cm	GaP single crystal wafer, Size: $5 \times 5 \times 0.35$ mm, Doping: Zn doped Conducting type: P-type, Orientation: (100) resistivity: 7.9×10^{-2} ohm-cm carrier concentration: $1.38 \times 10^{18} \text{ a/cm}^3$ mobility: $60 \text{ cm}^2/\text{Vs}$ EPD: $< 10^5$ Polished: two sides Surface finish (RMS or Ra): $< 8 \text{ \AA}$

B. GaP Substrates (110)

No.	Item	Description
1.	GaP Wafer, undoped (110) $10 \times 10 \times 0.5$ mm, 1sp	GaP single crystal wafer Size: $10 \text{ mm} \times 10 \text{ mm} \times 0.5 \text{ mm}$ Doping: undoped Conducting type: N-type, Orientation: (110) Polished: One side Polished. Surface finish (RMS or Ra): $< 8 \text{ \AA}$
2.	GaP Wafer, undoped (110) $10 \times 10 \times 0.5$ mm, 2sp	GaP single crystal wafer Size: $10 \text{ mm} \times 10 \text{ mm} \times 0.5 \text{ mm}$ Doping: undoped Conducting type: N-type Orientation: (110) Polished: Two sides Polished Surface finish (RMS or Ra): $< 8 \text{ \AA}$
3.	GaP Wafer, undoped (110) $5 \times 5 \times 0.3$ mm, 1sp	GaP single crystal wafer Size: $5 \times 5 \times 0.3 \text{ mm}$ Doping: undoped Conducting type: N-type Orientation: (110) Polished: One side Polished Surface finish (RMS or Ra): $< 8 \text{ \AA}$
4.	GaP Wafer, undoped (110) $5 \times 5 \times 0.3$ mm, 2sp	GaP single crystal wafer Size: $5 \times 5 \times 0.3 \text{ mm}$

		Doping: undoped, Conducting type: N-type Orientation: (110) Polished: Two sides Polished Surface finish (RMS or Ra): < 8A
5.	GaP Wafer undoped (110) 2"x0.4mm, 2sp	GaP single crystal wafer Size: 2" diameter x 0.4mm Doping: undoped Conducting type: N-type Orientation: (110) Polished: two sides Surface finish (RMS or Ra): < 8A
6.	GaP Wafer, undoped (110) 10x10x 1.0 mm, 2sp	GaP single crystal wafer Size: 10mm x 10 mm x 1.0 mm Doping: undoped Conducting type: N-type Orientation: (110) Polished: Double sides Polished Surface finish (RMS or Ra): < 8A

C. GaP Substrates (111)

No.	Item	Description
1.	GaP Wafer, Undoped (111) 10x10x0.35 mm, 2sp	GaP single crystal wafer Size: 10mm x 10 mm x 0.35 mm Doping: undoped Conducting type: N-type Orientation: (111) Polished: Two sides Surface finish (RMS or Ra): < 8A
2.	GaP Wafer, Undoped (111) 10x10x0.5 mm, 2sp	GaP single crystal wafer Size: 10mm x 10 mm x 0.5 mm Doping: undoped Conducting type: N-type Orientation: (111) Polished: Two sides Surface finish (RMS or Ra): < 8A
3.	GaP Wafer, S doped (111) 2"x0.5 mm, 2sp	GaP single crystal wafer Size: 2" diameter(+/- 0.15mm) x 0.5mm(+/- 0.05mm) Doping: S-doped Conducting type: N-type Orientation: (111)+_30' Edge Orientation: (110)±1° Polished: Both sides polished Surface finish (RMS or Ra) : < 8A

4.	GaP wafer, S doped, (111) orientation, 2" dia x 0.5mm, 1sp	GaP single crystal wafer Size: 2" diameter(+/-0.15mm) x 0.5mm(+/- 0.05mm) Doping: S-doped Conducting type: N-type Orientation: (111)+_30' Edge Orientation: (110)±1° Polished:One side polished Surface finish (RMS or Ra) : < 8A
5.	GaP Wafer, undoped (111) 2"x0.45 mm, 1sp,Semi-Insulating	GaP single crystal wafer,Semi-Insulating Size: 2" diameter x 0.45mm Doping: undoped, Semi-insulating Conducting type: Orientation: (111) Polished: one side polished Surface finish (RMS or Ra) : < 8A
6.	GaP Wafer, undoped (111) 2"x0.5 mm, 1sp	GaP single crystal wafer Size: 2" diameter(+/-0.15mm) x 0.5mm(+/- 0.05mm) Doping: undoped Conducting type: N-type Orientation: (111)+_30' Edge Orientation: (110)±1° Polished:One side polished Surface finish (RMS or Ra) : < 8A
7.	GaP Wafer, Zn-doped (111) 2"x0.45 mm, 1sp	GaP single crystal wafer Size: 2" diameter x 0.45mm Doping: Zn-doped Conducting type: P-type Orientation: (111) Polished: one side polished Surface finish (RMS or Ra): < 8A Resistivity:7.5E-2 ohm.cm Mobility: 63cmE2/Vs Carrier Concentration:1.28xE18cmE-3 EPD:8xE4 cmE-2
8.	GaP Wafer, Zn-doped (111)B 2"x0.45 mm, 1sp	GaP single crystal wafer Size: 2" diameter x 0.45mm Doping: Zn-doped Conducting type: P-type Orientation: (111)B Polished: one side polished Surface finish (RMS or Ra): < 8A Resistivity:4.2E-1 ohm.cm Mobility: 70cmE2/Vs Carrier Concentration:2.1E17cmE-3 EPD: 2.6E4 cmE-2

9.	GaP Wafer undoped (111) 2"x0.5 mm 2sp	<p>GaP single crystal wafer Size: 2" diameter(+/_0.15mm) x 0.5mm(+/_ 0.05mm) Doping: undoped Conducting type: N-type Orientation: (111)+_30' Edge Orientation: (110)±1° Polished:Both sides polished Surface finish (RMS or Ra): < 8A</p>
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28. GaSb

A. GaSb undoped

No.	Item	Description
1.	GaSb Wafer (100), undoped, 2"x0.42 mm 1sp	<p><u>Specifications:</u> Size: 2" diameter x 0.42mm, Orientation: (100) Dopping: undoped, Conducting type: P-type. Polish: one side polished by CMP Roughness: < 0.5nm Packing: 1000 class clean room in a single wafer container</p> <p><u>Typical Properties:</u> Crystal Structure: cubic a = 6.095 Å Density: 5.619 g/cm³ Melting point: 710 °C Grown by a special LEC technique , EPD :<10000/cm². Thermal Expansion: 6.1 x 10⁻⁶ /oK Thermal conductivity: 270 mW / cm.k at 300K</p>
2.	GaSb Wafer (100), undoped, 2"x0.45 mm ,1sp	<p><u>Specifications:</u> Size: 2" diameter x 0.45mm Orientation: (100) Dopping: undoped Conducting type: P-type. Polish: one side polished by CMP Packing: 1000 class clean room in a single wafer container</p> <p><u>Typical Properties:</u> Crystal Structure: cubic a = 6.095 Å Density: 5.619 g/cm³ Melting point: 710 °C Grown by a special LEC technique, EPD :<10⁴/cm² Carrier concentration: (1-2)x10¹⁷ cm⁻³ Mobility: 600-700 cm²/Vs Thermal Expansion: 6.1 x 10⁻⁶ /oK Thermal conductivity: 270 mW / cm.k at 300K</p>

3.	GaSb Wafer (100), undoped, 2"x0.5 mm two sides polished	<p><u>Specifications:</u> Size: 2" diameter x 0.5mm Orientation: (100) Dopping: undoped Conducting type: P-type. Polish: two sides polished by CMP Roughness: < 0.5nm Packing: 1000 class clean room in a single wafer container</p> <p><u>Typical Properties:</u> Crystal Structure: cubic $a = 6.095 \pm 0.3$ Density: 5.619 g/cm³ Melting point: 710 °C Grown by a special LEC technique, EPD : <10000/cm² Thermal Expansion: 6.1×10^{-6} /oK Thermal conductivity: 270 mW / cm.k at 300K</p>
4.	GaSb Wafer (100), undoped, 3"x0.625 mm One side polished	<p><u>Specifications:</u> Size: 3" diameter x 0.625mm Orientation: (100) Dopping: undoped Conducting type: P-type. Polish: one side polished by CMP Roughness: < 0.5nm Carrier Concentration: $1.5 \times 10^{17} \text{ cm}^{-3}$ Mobility: 640 cm²/V.S Packing: 1000 class clean room in a single wafer container</p> <p><u>Typical Properties:</u> Crystal Structure: cubic $a = 6.095 \text{ \AA}$ Density: 5.619 g/cm³ Melting point: 710 °C Grown by a special LEC technique, EPD : <10000/cm² Thermal Expansion: 6.1×10^{-6} /oK Thermal conductivity: 270 mW / cm.k at 300K</p>
5.	GaSb Wafer (111)-B, undoped, P-type 2"x0.45 mm ,1sp	<p><u>Specifications:</u> Size: 2" diameter x 0.45mm, Orientation: (111)-B Flats: SEMI PF <110>. SF<100> Dopping: undoped, Conducting type: P-type. Polish: one side polished by CMP Resistivity: $7.5 \times 10^{-2} \text{ ohm.cm}$ Mobility: 690 cm²/Vs Carrier concentration: $1.2 \times 10^{17} \text{ ohm.cm}$ EPD : $4.5 \times 10^3 \text{ cm}^{-2}$ Packing: 1000 class clean room in a single wafer container</p> <p><u>Typical Properties:</u> Crystal Structure: cubic $a = 6.095 \text{ \AA}$ Density: 5.619 g/cm³ Melting point: 710 oC Grown by a special LEC technique, EPD : <10⁴/cm².</p>

		Carrier concentration: $(1-2) \times 10^{17} \text{ cm}^{-3}$ Mobility: $600-700 \text{ cm}^2/\text{Vs}$ Thermal Expansion: $6.1 \times 10^{-6} / \text{oK}$ Thermal conductivity: $270 \text{ mW} / \text{cm.k}$ at 300K
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B. GaSb Si-doped

No.	Item	Description
1.	GaSb (100), P-type, Si doped, 2" x 0.450 mm wafer, 1sp	<p>High quality GaSb single crystal wafers for semiconductor industries. Size: 2" diameter x 0.45mm, Orientation: (100) Dopping: Si doped, Conducting type: P-type. Resistivities: $0.002 \sim 0.005 \text{ ohm-cm}$ @ 20 deg C Carrier Concentration: $(2 \sim 5) \times 10^{18} \text{ cm}^{-3}$ Polish: one side polished. Grown by a special LEC technique , EPD : $<2000/\text{cm}^2$. We also provide high resistivity N and P type GaSb wafers.</p> <p><u>Typical Properties:</u> Crystal Structure: cubic $a = 6.095$ Density: 5.619 g/cm^3 Melting point: 710 oC Thermal Expansion: $6.1 \times 10^{-6} / \text{oK}$ Thermal conductivity: $270 \text{ mW} / \text{cm.k}$ at 300K</p>

C. GaSb Te-doped

No.	Item	Description
1.	GaSb (100), N Type, Te doped, 2"D x 0.45mm wafer 1sp	<p>High quality GaSb single crystal wafers for semiconductor industries. Size: 2" diameter x 0.45mm, Orientation: (100) Dopping: Te doped, Conducting type: N-type. Polish: one side polished. Grown by a special LEC technique, EPD : $<10000/\text{cm}^2$ We also provide high resistivity N and P type GaSb wafers.</p>
2.	GaSb (100), Te doped, 3" D x 0.625mm wafer 1sp	<p>High quality GaSb single crystal wafers for semiconductor industries. Size: 3" (76.2+/-0.4 mm) diameter x 0.625+/-0.025mm, Orientation: (100) +/- 0.5 o Dopping: Te doped, Conducting type: N-type. Polish: one side polished. Grown by a special LEC technique , EPD : $<10000/\text{cm}^2$ We also provide high resistivity N and P type GaSb wafers.</p> <p><u>Typical Properties:</u> Crystal Structure: cubic $a = 6.095 \text{ \AA}$</p>

		Density: 5.619 g/cm ³ Melting point: 710 °C Thermal Expansion: 6.1 x 10 ⁻⁶ /oK Thermal conductivity: 270 mW / cm.k at 300K
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D. GaSb Zn-doped

No.	Item	Description
1.	GaSb (100), Zn doped P type, 3"D x x 0.625mm wafer 1sp	<p>High quality GaSb single crystal wafers for semiconductor industries. Size: 3" (76.2+/-0.4 mm) diameter x 0.625+/-0.025 mm, Orientation: (100) +/- 0.5 ° Dopping: Zn doped, Conducting type: P-type. Polish: one side polished. Grown by a special LEC technique , EPD :<10000/cm² We also provide high resistivity N and P type GaSb wafers.</p> <p><u>Typical Properties:</u> Crystal Structure: cubic a = 6.095 Å Density: 5.619 g/cm³ Melting point: 710 °C Thermal Expansion: 6.1 x 10⁻⁶ /oK Thermal conductivity: 270 mW / cm.k at 300K</p>
2.	GaSb, (100), Zn- doped,, P-type, 2" dia x 0.45mm, 1sp	<p>High quality GaSb single crystal wafers for semiconductor industries. Size: 2" diameter x 0.45mm, Orientation: (100) Dopping: Zn- doped, Conducting type: P-type. Carrier concentration:(1-3)x10¹⁷ cm⁻³ EPD: < 10⁴ cm⁻² Mobility:200-500 cm²/V.S Polish: one side polished. Grown by a special LEC technique We also provide high resistivity N and P type GaSb wafers.</p> <p><u>Typical Properties:</u> Crystal Structure: cubic a = 6.095 Å Density: 5.619 g/cm³ Melting point: 710 °C Thermal Expansion: 6.1 x 10⁻⁶ /oK Thermal conductivity: 270 mW / cm.k at 300K</p>
3.	GaSb, (100), Zn- doped,, P-type, 2" dia x 0.5mm, 1sp	<p>High quality GaSb single crystal wafers for semiconductor industries. Size: 2" diameter x 0.5mm, Orientation: (100) Dopping: Zn- doped, Conducting type: P-type. Polish: one side polished. Grown by a special LEC technique , EPD :<5000/cm² We also provide high resistivity N and P type GaSb wafers.</p>

		<p><u>Typical Properties:</u> Crystal Structure: cubic $a = 6.095 \text{ \AA}$ Density: 5.619 g/cm^3 Melting point: 710°C Thermal Expansion: $6.1 \times 10^{-6} / \text{oK}$ Thermal conductivity: 270 mW / cm.k at 300K</p>
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29. GdScO3/DyScO3/TbScO3

No.	Item	Description
1.	DyScO3 (110) 10x10x0.5mm 1sp	<p><u>Specifications:</u> Size: 10mm x 10mm x 0.5mm Orientation: (110) + / - 0.5° Polish: one side EPI polished with surface roughness $Ra < 5 \text{ \AA}$ Package: One 1000 class clean room with 100 class plastic bag Features</p> <p>Good lattice match with perovskite structure superconductors Prefect for ferroelectric epitaxial thim film</p>
2.	GdScO3 (110) 10x10x0.5mm 1sp	<p><u>Specifications:</u> Size: 10mm x 10mm x 0.5mm Orientation: (110) + / - 0.5° Polish: one side EPI polished with surface roughness $Ra < 5 \text{ \AA}$ Package: One 1000 class clean room with 100 class plastic bag Features</p> <p>Good lattice match with perovskite structure superconductors Prefect for ferroelectric epitaxial thim film</p>
3.	GdScO3 (110) 10x10x0.5mm 2sp	<p><u>Specifications:</u> Size: 10mm x 10mm x 0.5mm Orientation: (110) + / - 0.5° Polish: two sides EPI polished with surface roughness $Ra < 5 \text{ \AA}$ Package: One 1000 class clean room with 100 class plastic bag Features</p> <p>Good lattice match with perovskite structure superconductors Prefect for ferroelectric epitaxial thim film</p>
4.	GdScO3 (110) 5x5x0.5mm 2sp	<p><u>Specifications:</u> Material: GdScO3 Size: 5mm x 5mm x 0.5mm Orientation: (110) + / - 0.5° Polish: Two sides EPI polished with surface roughness $Ra < 5 \text{ \AA}$ Package: One 1000 class clean room with 100 class plastic bag Features</p> <p>Good lattice match with perovskite structure superconductors</p>

		Prefect for ferroelectric epitaxial thim film
5.	DyScO3 (110) 5x5x0.5mm 1sp	<p><u>Specifications:</u> Size: 5mm x 5mm x 0.5mm Orientation: (110) + / - 0.5 ° Polish: one side EPI polished with surface roughness Ra< 5 A Package: One 1000 class clean room with 100 class plastic bag Features</p> <p>Good lattice match with perovskite structure superconductors Prefect for ferroelectric epitaxial thim film</p>
6.	DyScO3 (110) 5x5x0.5mm 2sp	<p><u>Specifications:</u> Size: 5mm x 5mm x 0.5mm Orientation: (110) + / - 0.5 ° Polish: two sides EPI polished with surface roughness Ra< 5 A Package: One 1000 class clean room with 100 class plastic bag Features</p> <p>Good lattice match with perovskite structure superconductors Prefect for ferroelectric epitaxial thim film</p>
7.	TbScO3 (110) 10x10x0.5mm 1sp	<p><u>Specifications:</u> Chemical Formula: TbScO3 Size: 10mm x 10mm x 0.5mm Orientation: (110) + / - 0.5 ° Orthorhombic Tolerance : <0.5 o Edge Parallel: (001) Notches Polish: one side EPI polished with surface roughness Ra< 5 A (measured by AFM) Package: One 1000 class clean room with 100 class plastic bag Features</p> <p>Good lattice match with perovskite structure superconductors Prefect for ferroelectric epitaxial thim film</p>
8.	TbScO3 (110) 5x5x0.5mm 1sp-	<p><u>Specifications:</u> TbScO3 Size: 5mm x 5mm x 0.5mm Orientation: (110) + / - 0.5 ° Orthorhombic Tolerance : <0.5 o Edge Parallel: (001) Notches Polish: one side EPI polished with surface roughness Ra< 5 A Package: One 1000 class clean room with 100 class plastic bag Features</p> <p>Good lattice match with perovskite structure superconductors Prefect for ferroelectric epitaxial thim film</p>

30. Ge (Prime grade)

A. 5x5mm & 10x10mm & 1"x0.5"

No.	Item	Description
1.	Ge Substrate (100) 5x 5x0.5 mm, 1 SP, Undoped	<u>Specifications:</u> Growing Method: CZ Wafer Size: 5x5x0.5 mm Surface Polishing: one side epi polished Orientation: (100) Surface roughness: < 8 Å (by AFM) Doping: Undoped Conductor type: N-type Resistivity: 49.2-61.4 Ohms/cm EPD: Package: under 1000 class clean room in wafer container
2.	Ge Substrate (100) 5x 5x0.5 mm, 2SP, Undoped	<u>Specifications:</u> Growing Method: CZ Wafer Size: 5x5x0.5 mm Surface Polishing: Two sides epi polished Orientation: (100) Surface roughness: < 8 Å (by AFM) Doping: Undoped Conductor type: N-type Resistivity: 49.2-61.4 Ohms/cm EPD: Package: under 1000 class clean room in wafer container
3.	Ge Substrate (100) 10x10x 0.5 mm, 1 SP, Undoped .	<u>Specifications:</u> Growing Method: CZ Wafer Size: 10x10x0.5 mm Surface Polishing: one side epi polished Orientation: (100) Surface roughness: < 8 Å (by AFM) Doping: Undoped Conductor type: N-type Resistivity: > 30 Ohms/cm EPD: Package: under 1000 class clean room in wafer container
4.	Ge Substrate (100) 10x10x 0.5 mm, 2 SP, Undoped	<u>Specifications:</u> Growing Method: CZ Wafer Size: 10x10x0.5 mm Surface Polishing: two sides epi polished Orientation: (100) Surface roughness: < 8 Å (by AFM) Doping: Undoped Conductor type: N-type Resistivity: > 30 Ohms/cm EPD:

		Package: under 1000 class clean room in wafer container
5.	Ge Substrate: (100) 10x10 x 0.5 mm , 1SP, N type Sb doped	<u>Specifications:</u> Growing Method: CZ Wafer Size: 10 x 10 x0.5 mm Surface Polishing: one side epi polished Orientation: (100) or (111) +/- 0.5° (Choose in product option) Surface roughness: < 8 Å (by AFM) Doping: Sb doped Conductor type: N-type Resistivity: 0.2-0.23 Ohms/cm EPD: Package: under 1000 class clean room in wafer container
6.	Ge Substrate: (100) 10x10 x 0.5 mm , 1SP, P type Ga doped	<u>Specifications:</u> Growing Method: CZ Wafer Size: 10 x 10 x0.5 mm Surface Polishing: one side epi polished Orientation: (100) or (111) +/- 0.5° (Choose in product option) Surface roughness: < 8 Å (by AFM) Doping: Ga doped Conductor type: P-type Resistivity: 0.083-19.3 Ohms/cm EPD: Package: under 1000 class clean room in wafer container
7.	Ge Substrate (110) 10x10x 0.5 mm, 1 SP, Undoped .	<u>Specifications:</u> Growing Method: CZ Wafer Size: 10x10x0.5 mm Surface Polishing: one side epi polished Orientation: (110) Surface roughness: < 8 Å (by AFM) Doping: Undoped Conductor type: N-type Resistivity: 61.7-62.2 Ohms/cm EPD: N/A Package: under 1000 class clean room in wafer container
8.	Ge Substrate (111) 1"x0.5"x2.54mm mm, 1 SP, Undoped	<u>Specifications:</u> Growing Method: CZ Wafer Size: 25.4x12.7x2.54 mm Surface Polishing: one side epi polished Orientation: (111) Surface roughness: < 8 Å (by AFM) Doping: Undoped Conductor type: N-type Resistivity: 60.4-65.3 Ohms/cm EPD: N/A Package: under 1000 class clean room in wafer container

9.	Ge Substrate (111) 10x10x 0.5 mm, 1 SP, Undoped .	<u>Specifications:</u> Growing Method: CZ Wafer Size: 10x10x0.5 mm Surface Polishing: one side epi polished Orientation: (111) Surface roughness: < 8 Å (by AFM) Doping: Undoped Conductor type: N-type Resistivity: 61.7-62.2 Ohms/cm EPD: N/A Package: under 1000 class clean room in wafer container
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B. 1" Diameter Wafer

No.	Item	Description
1.	Ge Wafer (100) Undoped, 1" dia x 0.5 mm , 2SP	<u>Specifications:</u> Growing Method: CZ Orientation: (100) +/- 0.5 Deg. Wafer Size: 1" dia x 500 microns Surface Polishing: two side epi polished Surface roughness: Ra < 8 Å (by AFM) Doping: Undoped Conductor type: N-type Resistivity: 52.9-61.2 Ohms/cm EPD: Package: under 1000 class clean room <u>Typical Properties:</u> Structure: Cubic, a = 5.6754 Å Density: 5.323 g/cm ³ at room temperature Melting Point: 937.4 oC Thermal Conductivity: 640
2.	Ge Wafer Undoped, 1" dia x 0.5 mm , 1SP(100)	<u>Specifications:</u> Growing Method: CZ Orientation: (100) +/- 0.5 Deg. Wafer Size: 1" dia x 500 microns Surface Polishing: one side epi polished Surface roughness: Ra < 8 Å (by AFM) Doping: Undoped Conductor type: N-type Resistivity: 10 - 45 Ohms/cm EPD: Package: under 1000 class clean room <u>Typical Properties:</u> Structure: Cubic, a = 5.6754 Å Density: 5.323 g/cm ³ at room temperature Melting Point: 937.4 oC Thermal Conductivity: 640

C. 2" Diameter Wafer

i. 2" wafers (100)

a. Undoped Ge (100)

No.	Item	Description
1.	Ge Wafer (100) Undoped, 2" dia x 0.3mm, resistivities: >35 ohm-cm, 2SP	<p><u>Specifications:</u> Growing Method: CZ Orientation: (100) +/- 0.5 Deg. Wafer Size: 2" dia x 300 microns Surface Polishing: Two sides epi polished Surface roughness: RMS or Ra < 5 Å (by AFM) Doping: Undoped Conductor type: N-type Resistivity: >35 Ohms/cm EPD: Package: under 1000 class clean room</p> <p><u>Typical Properties:</u> Structure: Cubic, a = 5.6754 Å Density: 5.323 g/cm³ at room temperature Melting Point: 937.4 oC Thermal Conductivity: 640</p>
2.	Ge Wafer (100) Undoped, 2" dia x 0.5 mm, 1SP, resistivities: >45 ohm-cm	<p><u>Specifications:</u> Growing Method: CZ Orientation: (100) +/- 0.5 Deg. Wafer Size: 2" dia x 500 microns Surface Polishing: one side epi polished Surface roughness: RMS or Ra < 5 Å (by AFM) Doping: Undoped Conductor type: N-type Resistivity: >45 Ohms/cm EPD: Package: under 1000 class clean room</p> <p><u>Typical Properties:</u> Structure: Cubic, a = 5.6754 Å Density: 5.323 g/cm³ at room temperature Melting Point: 937.4 oC Thermal Conductivity: 640</p>
3.	Ge Wafer (100) Undoped, 2" dia x 0.5 mm, resistivities: >45 ohm-cm, 2SP	<p><u>Specifications:</u> Growing Method: CZ Orientation: (100) +/- 0.5 Deg. Wafer Size: 2" dia x 500 microns Surface Polishing: Two sides epi polished Surface roughness: RMS or Ra < 5 Å (by AFM) Doping: Undoped</p>

		<p>Conductor type: N-type Resistivity: >45 Ohms/cm EPD: Package: under 1000 class clean room</p> <p><u>Typical Properties:</u> Structure: Cubic, a = 5.6754 Å Density: 5.323 g/cm³ at room temperature Melting Point: 937.4 °C Thermal Conductivity: 640</p>
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b. N Type Ge (100)

No.	Item	Description
1.	Ge Wafer (100) 2" dia x 0.5 mm, 1SP, N type (Sb doped), resistivity:0.008-0.009 ohm-cm	<p><u>Specifications:</u> Growing Method: CZ Orientation: (100) +/-0.5 Deg. Wafer Size: 2" dia x 500 microns Surface Polishing: one side epi polished Surface roughness: RMS or Ra< 5 Å (by AFM) Doping: Sb Doped Conductor type: N-type Resistivity: 0.008-0.009 ohm-cm EPD: Package: under 1000 class clean room</p> <p><u>Typical Properties:</u> Structure: Cubic, a = 5.6754 Å Density: 5.323 g/cm³ at room temperature Melting Point: 937.4 °C Thermal Conductivity: 640</p>
2.	Ge Wafer (100) 2" dia x 0.5 mm, 1SP, N type (Sb doped), resistivity:0.39-0.45 ohm-cm	<p><u>Specifications:</u> Growing Method: CZ Orientation: (100) +/-0.5 Deg. Wafer Size: 2" dia x 500 microns Surface Polishing: one side epi polished Surface roughness: RMS or Ra< 5 Å (by AFM) Doping: Sb Doped Conductor type: N-type Resistivity: 0.39-0.45 ohm-cm EPD: Package: under 1000 class clean room</p> <p><u>Typical Properties:</u> Structure: Cubic, a = 5.6754 Å Density: 5.323 g/cm³ at room temperature Melting Point: 937.4 °C Thermal Conductivity: 640</p>

3.	Ge Wafer (100) 2" dia x 0.5 mm, 2SP, N type (Sb doped), Resistivities: 3.97-4.46 ohm-cm	<p><u>Specifications:</u> Growing Method: CZ Orientation: (100) +/-0.5 Deg. Wafer Size: 2" dia x 500 microns Surface Polishing: Two sides epi polished Surface roughness: RMS or Ra< 5 A (by AFM) Doping: Sb Doped Conductor type: N-type Resistivity: 3.97-4.46 Ohms/cm EPD: Package: under 1000 class clean room</p> <p><u>Typical Properties:</u> Structure: Cubic, a = 5.6754 A Density: 5.323 g/cm³ at room temperature Melting Point: 937.4 °C Thermal Conductivity: 640</p>
4.	Ge Wafer (100) 2" dia x 0.5 mm, 2SP, N type (Sb doped), resistivities: 10-20 ohm-cm	<p><u>Specifications:</u> Growing Method: CZ Orientation: (100) +/-0.5 Deg. Wafer Size: 2" dia x 500 microns Surface Polishing: Two sides epi polished Surface roughness: RMS or Ra< 5 A (by AFM) Doping: Sb Doped Conductor type: N-type Resistivity: 10-20 Ohms/cm EPD: Package: under 1000 class clean room</p> <p><u>Typical Properties:</u> Structure: Cubic, a = 5.6754 A Density: 5.323 g/cm³ at room temperature Melting Point: 937.4 °C Thermal Conductivity: 640</p>
5.	Ge Wafer (100) 2" dia x 0.5 mm, 2SP, N type (Sb doped), resistivities: 0.0075-0.01 ohm-cm	<p><u>Specifications:</u> Growing Method: CZ Orientation: (100) +/-0.5 Deg. Wafer Size: 2" dia x 500 microns Surface Polishing: Two sides epi polished Surface roughness: RMS or Ra< 5 A (by AFM) Doping: Sb Doped Conductor type: N-type Resistivity: 0.0075-0.01 Ohms/cm EPD: Package: under 1000 class clean room</p> <p><u>Typical Properties:</u> Structure: Cubic, a = 5.6754 A Density: 5.323 g/cm³ at room temperature Melting Point: 937.4 °C Thermal Conductivity: 640</p>

6.	Ge Wafer (100) 2" dia x 0.5 mm, 2SP, N type (Sb doped), resistivities: 0.26-0.31 ohm-cm	<p><u>Specifications:</u> Growing Method: CZ Orientation: (100) +/-0.5 Deg. Wafer Size: 2" dia x 500 microns Surface Polishing: Two sides epi polished Surface roughness: RMS or Ra< 5 Å (by AFM) Doping: Sb Doped Conductor type: N-type Resistivity: 0.26-0.31 Ohms/cm EPD: Package: under 1000 class clean room</p> <p><u>Typical Properties:</u> Structure: Cubic, a = 5.6754 Å Density: 5.323 g/cm³ at room temperature Melting Point: 937.4 °C Thermal Conductivity: 640</p>
7.	Ge Wafer (100) 2" dia x 0.5 mm, 1SP, N type (Sb doped), resistivities: 10-20 ohm-cm	<p><u>Specifications:</u> Growing Method: CZ Orientation: (100) +/-0.5 Deg. Wafer Size: 2" dia x 500 microns Surface Polishing: one side epi polished Surface roughness: RMS or Ra< 5 Å (by AFM) Doping: Sb Doped Conductor type: N-type Resistivity: 10-20 ohm-cm EPD: Package: under 1000 class clean room</p> <p><u>Typical Properties:</u> Structure: Cubic, a = 5.6754 Å Density: 5.323 g/cm³ at room temperature Melting Point: 937.4 °C Thermal Conductivity: 640</p>
8.	Ge Wafer (100) 2" dia x 0.5 mm, 1SP, N type (Sb doped), resistivities: 1-10 ohm-cm	<p><u>Specifications:</u> Growing Method: CZ Orientation: (100) +/-0.5 Deg. Wafer Size: 2" dia x 500 microns Surface Polishing: one side epi polished Surface roughness: RMS or Ra< 5 Å (by AFM) Doping: Sb Doped Conductor type: N-type Resistivity: 1 - 10 ohm-cm EPD: Package: under 1000 class clean room</p> <p><u>Typical Properties:</u> Structure: Cubic, a = 5.6754 Å Density: 5.323 g/cm³ at room temperature Melting Point: 937.4 °C Thermal Conductivity: 640</p>

9.	Ge Wafer (100) 2" dia x 0.5 mm, 1SP, N type (Sb doped), resistivities:0.001-0.01 ohm-cm	<p><u>Specifications:</u> Growing Method: CZ Orientation: (100) +/-0.5 Deg. Wafer Size: 2" dia x 500 microns Surface Polishing: one side epi polished Surface roughness: < 8 Å (by AFM) Doping: Sb Doped Conductor type: N-type Resistivity: 0.001-0.01 ohm-cm EPD: Package: under 1000 class clean room</p> <p><u>Typical Properties:</u> Structure: Cubic, a = 5.6754 Å Density: 5.323 g/cm³ at room temperature Melting Point: 937.4 °C Thermal Conductivity: 640</p>
10.	Ge Wafer (100) 2" dia x 0.5 mm, 1SP, N type (Sb doped), resistivities:0.01-0.1 ohm-cm	<p><u>Specifications:</u> Growing Method: CZ Orientation: (100) +/-0.5 Deg. Wafer Size: 2" dia x 500 microns Surface Polishing: one side epi polished Surface roughness: < 8 Å (by AFM) Doping: S0b Doped Conductor type: N-type Resistivity: 0.01-0.1 ohm-cm EPD: Package: under 1000 class clean room</p> <p><u>Typical Properties:</u> Structure: Cubic, a = 5.6754 Å Density: 5.323 g/cm³ at room temperature Melting Point: 937.4 °C Thermal Conductivity: 640</p>
11.	Ge Wafer (100) 2" dia x 0.5 mm, 1SP, N type (Sb doped), resistivities:0.011-0.014 ohm-cm	<p><u>Specifications:</u> Growing Method: CZ Orientation: (100) +/-0.5 Deg. Wafer Size: 2" dia x 500 microns Surface Polishing: one side epi polished Surface roughness: < 8 Å (by AFM) Doping: Sb Doped Conductor type: N-type Resistivity: 0.011-0.014 ohm-cm EPD: Package: under 1000 class clean room</p> <p><u>Typical Properties:</u> Structure: Cubic, a = 5.6754 Å Density: 5.323 g/cm³ at room temperature Melting Point: 937.4 °C Thermal Conductivity: 640</p>

12.	Ge Wafer (100) 2" dia x 1.0 mm, 1SP, N type (Sb doped), resistivities: --- 0.02 ohm-cm	<p><u>Specifications:</u> Growing Method: CZ Orientation: (100) +/-0.5 Deg. Wafer Size: 2" dia x 1000 microns Surface Polishing: one side epi polished Surface roughness: < 8 Å (by AFM) Doping: Sb Doped Conductor type: N-type Resistivity: 0.02 Ohms/cm EPD: Package: under 1000 class clean room</p> <p><u>Typical Properties:</u> Structure: Cubic, a = 5.6754 Å Density: 5.323 g/cm³ at room temperature Melting Point: 937.4 °C Thermal Conductivity: 640</p>
13.	Ge Wafer (100) 2" dia x 1.0 mm, 1SP, N type (Sb doped), resistivities: 0.26-0.31 ohm-cm	<p><u>Specifications:</u> Growing Method: CZ Orientation: (100) +/-0.5 Deg. Wafer Size: 2" dia x 1000 microns Surface Polishing: one side epi polished Surface roughness: < 8 Å (by AFM) Doping: Sb Doped Conductor type: N-type Resistivity: 0.26-0.31 Ohms/cm EPD: Package: under 1000 class clean room</p> <p><u>Typical Properties:</u> Structure: Cubic, a = 5.6754 Å Density: 5.323 g/cm³ at room temperature Melting Point: 937.4 °C Thermal Conductivity: 640</p>

c. P Type Ge (100)

No.	Item	Description
1.	Ge Wafer (100) 2" dia x 0.4 mm, 2SP, P type (Ga doped), resistivities: 0.1ohm-cm	<p><u>Specifications:</u> Growing Method: CZ Orientation: (100) +/-0.5 Deg. Wafer Size: 2" dia x 400 microns Surface Polishing: Two sides epi polished Surface roughness: < 8 Å (by AFM) Doping: Ga Doped Conductor type: P-type Resistivity: 0.1 Ohms/cm EPD: Package: under 1000 class clean room</p>

		<p><u>Typical Properties:</u> Structure: Cubic, a = 5.6754 Å Density: 5.323 g/cm³ at room temperature Melting Point: 937.4 °C Thermal Conductivity: 640</p>
2.	Ge Wafer (100) 2" dia x 0.175 mm, 1SP, P type (Ga doped), resistivity: 0.005-0.04 ohm.cm	<p><u>Specifications:</u> Growing Method: CZ Orientation: (100) +/- 0.5 Deg. Primary Flat: <100> +/- 2 Degree Wafer Size: 2" dia x 0.175mm Surface Polishing: One side epi polished Surface roughness: < 5 Å (by AFM) Doping: Ga Doped Conductor type: P-type Resistivity: 0.005-0.04 Ohms/cm EPD: Package: under 1000 class clean room</p> <p><u>Typical Properties:</u> Structure: Cubic, a = 5.6754 Å Density: 5.765 g/cm³ Melting Point: 937.4 °C Thermal Conductivity: 640</p>
3.	Ge Wafer (100) 2" dia x 0.175 mm, 2SP, P type (Ga doped), resistivity: 0.005-0.04 ohm.cm	<p><u>Specifications:</u> Growing Method: CZ Orientation: (100) +/- 0.5 Deg. Primary Flat:<100> +/- 2 Degree Wafer Size: 2" dia x 0.175mm Surface Polishing: Two sides epi polished Surface roughness: < 5 Å (by AFM) Doping: Ga Doped Conductor type: P-type Resistivity: 0.005-0.04 Ohms/cm EPD: Package: under 1000 class clean room</p> <p><u>Typical Properties:</u> Structure: Cubic, a = 5.6754 Å Density: 5.765 g/cm³ Melting Point: 937.4 °C Thermal Conductivity: 640</p>
4.	Ge Wafer (100) 2" dia x 0.5 mm, 1SP, P type (Ga doped), resistivity: 0.003 -0.0078 ohm-cm	<p><u>Specifications:</u> Growing Method: CZ Orientation: (100) +/- 0.5 Deg. Wafer Size: 2" dia x 500 microns Surface Polishing: One side epi polished Surface roughness: < 8 Å (by AFM) Doping: Ga Doped</p>

		<p>Conductor type: P-type Resistivity: 0.003~0.0078 Ohms/cm EPD: Package: under 1000 class clean room</p> <p><u>Typical Properties:</u> Structure: Cubic, a = 5.6754 Å Density: 5.323 g/cm³ at room temperature Melting Point: 937.4 °C Thermal Conductivity: 640</p>
5.	Ge Wafer (100) 2" dia x 0.5 mm, 1SP, P type (Ga doped), resistivity: 0.01-0.1 ohm-cm	<p><u>Specifications:</u> Growing Method: CZ Orientation: (100) +/-0.5 Deg. Wafer Size: 2" dia x 500 microns Surface Polishing: One side epi polished Surface roughness: < 8 Å (by AFM) Doping: Ga Doped Conductor type: P-type Resistivity: 0.01-0.1 Ohm.cm EPD: Package: under 1000 class clean room</p> <p><u>Typical Properties:</u> Structure: Cubic, a = 5.6754 Å Density: 5.323 g/cm³ at room temperature Melting Point: 937.4 °C Thermal Conductivity: 640</p>
6.	Ge Wafer (100) 2" dia x 0.5 mm, 1SP, P type (Ga doped), resistivity: 0.013-0.017 ohm-cm	<p><u>Specifications:</u> Growing Method: CZ Orientation: (100) +/-0.5 Deg. Wafer Size: 2" dia x 500 microns Surface Polishing: One side epi polished Surface roughness: < 5 Å (by AFM) Doping: Ga Doped Conductor type: P-type Resistivity: 0.013-0.017 ohm-cm EPD: Package: under 1000 class clean room</p> <p><u>Typical Properties:</u> Structure: Cubic, a = 5.6754 Å Density: 5.765 g/cm³ Melting Point: 937.4 °C Thermal Conductivity: 640</p>
7.	Ge Wafer (100) 2" dia x 0.5 mm, 1SP, P type (Ga doped), resistivity: 0.23-0.25 ohm-cm	<p><u>Specifications:</u> Growing Method: CZ Orientation: (100) +/-0.5 Deg. Wafer Size: 2" dia x 500 microns Surface Polishing: One side epi polished Surface roughness: < 8 Å (by AFM)</p>

		<p>Doping: Ga Doped Conductor type: P-type Resistivity: 0.23-0.25 Ohm.cm EPD: Package: under 1000 class clean room</p> <p><u>Typical Properties:</u></p> <p>Structure: Cubic, $a = 5.6754 \text{ \AA}$ Density: 5.323 g/cm³ at room temperature Melting Point: 937.4 °C Thermal Conductivity: 640</p>
8.	Ge Wafer (100) 2" dia x 0.5 mm, 1SP, P type (Ga doped), resistivity: 1-10 ohm-cm	<p><u>Specifications:</u></p> <p>Growing Method: CZ Orientation: (100) +/-0.5 Deg. Wafer Size: 2" dia x 500 microns Surface Polishing: One side epi polished Surface roughness: < 8 Å (by AFM) Doping: Ga Doped Conductor type: P-type Resistivity: 1-10 Ohm.cm EPD: Package: under 1000 class clean room</p> <p><u>Typical Properties:</u></p> <p>Structure: Cubic, $a = 5.6754 \text{ \AA}$ Density: 5.323 g/cm³ at room temperature Melting Point: 937.4 °C Thermal Conductivity: 640</p>
9.	Ge Wafer (100) 2" dia x 0.5 mm, 2SP, P type (Ga doped), resistivities: 0.003-0.004ohm-cm	<p><u>Specifications:</u></p> <p>Growing Method: CZ Orientation: (100) +/-0.5 Deg. Wafer Size: 2" dia x 500 microns Surface Polishing: Two sides epi polished Surface roughness: < 8 Å (by AFM) Doping: Ga Doped Conductor type: P-type Resistivity: 0.003-0.004Ohms/cm EPD: Package: under 1000 class clean room</p> <p><u>Typical Properties:</u></p> <p>Structure: Cubic, $a = 5.6754 \text{ \AA}$ Density: 5.323 g/cm³ at room temperature Melting Point: 937.4 °C Thermal Conductivity: 640</p>
10.	Ge Wafer (100) 2" dia x 0.5 mm, 2SP, P type (Ga doped), resistivity: 0.01-0.1 ohm-cm	<p><u>Specifications:</u></p> <p>Growing Method: CZ Orientation: (100) +/-0.5 Deg. Wafer Size: 2" dia x 500 microns</p>

		<p>Surface Polishing: Two sides epi polished Surface roughness: < 5 Å (by AFM) Doping: Ga Doped Conductor type: P-type Resistivity: 0.01-0.1 Ohms/cm EPD: Package: under 1000 class clean room</p> <p><u>Typical Properties:</u> Structure: Cubic, a = 5.6754 Å Density: 5.765 g/cm³ Melting Point: 937.4 °C Thermal Conductivity: 640</p>
11.	Ge Wafer (100) 2" dia x 0.5 mm, 2SP, P type (Ga doped), resistivity: 0.052-0.057 ohm-cm	<p><u>Specifications:</u> Growing Method: CZ Orientation: (100) +/- 0.5 Deg. Wafer Size: 2" dia x 500 microns Surface Polishing: Two sides epi polished Surface roughness: < 5 Å (by AFM) Doping: Ga Doped Conductor type: P-type Resistivity: 0.052-0.057 Ohms/cm EPD: Package: under 1000 class clean room</p> <p><u>Typical Properties:</u> Structure: Cubic, a = 5.6754 Å Density: 5.765 g/cm³ Melting Point: 937.4 °C Thermal Conductivity: 640</p>
12.	Ge Wafer (100) 2" dia x 0.5 mm, 2SP, P type (Ga doped), resistivity: 10.0 - 15 ohm-cm	<p><u>Specifications:</u> Growing Method: CZ Orientation: (100) +/- 0.5 Deg. Wafer Size: 2" dia x 500 microns Surface Polishing: Two sides epi polished Surface roughness: < 5 Å (by AFM) Doping: Ga Doped Conductor type: P-type Resistivity: 10.~ 15 Ohms/cm EPD: Package: under 1000 class clean room</p> <p><u>Typical Properties:</u> Structure: Cubic, a = 5.6754 Å Density: 5.765 g/cm³ Melting Point: 937.4 °C Thermal Conductivity: 640</p>
13.	VGF-Ge Wafer(100) . 50 mmdia x 0.175 mm, 1SP, P type (Ga doped) R:0.008-0.021 Ohm.cm	<p><u>Specifications:</u> Growing Method: VGF Orientation: (100) +/- 0.5 Deg.</p>

		<p>Wafer Size: 50(+/-0.3) mm dia x 175(+/-15) microns Surface Polishing: One side polished Surface roughness: < 8 Å (by AFM) Doping: Ga Doped Conductor type: P-type Resistivity: 0.008-0.02 Ohm.cm Carrier Concentration: N/A Mobility: N/A EPD: <=500 /cm² Ra(Average Roughness): < 0.4 nm Package: under 1000 class clean room</p> <p><u>Typical Properties:</u> Structure: Cubic, a = 5.6754 Å Density: 5.323 g/cm³ at room temperature Melting Point: 937.4 °C Thermal Conductivity: 640</p>
14.	VGF-Ge Wafer(100) . 50 mm dia x 0.175 mm, 2SP, P type (Ga doped) R:0.008-0.021 Ohm.cm	<p><u>Specifications:</u> Growing Method: VGF Orientation: (100) +/-0.5 Deg. Wafer Size: 50(+/-0.3) mm dia x 175(+/-15) microns Surface Polishing: Both sides polished Surface roughness: < 8 Å (by AFM) Doping: Ga Doped Conductor type: P-type Resistivity: 0.008-0.021 Ohm.cm Carrier Concentration: N/A Mobility: N/A EPD: <=500 /cm² Ra(Average Roughness): < 0.4 nm Package: under 1000 class clean room</p> <p><u>Typical Properties:</u> Structure: Cubic, a = 5.6754 Å Density: 5.323 g/cm³ at room temperature Melting Point: 937.4 °C Thermal Conductivity: 640</p>

ii. 2" wafers(111)

a. Ge <111> undoped

No.	Item	Description
1.	Ge Wafer . Undoped, 2" dia x 0.5 mm, 1SP (111)	<p><u>Specifications:</u> Growing Method: CZ Orientation: (111) +/-0.5 Deg. Wafer Size: 2" dia x 500 microns Surface Polishing: one side epi polished Surface roughness: < 8 Å (by AFM) Doping: Undoped Conductor type: N-type Resistivity: >40 Ohms/cm</p>

		<p>EPD: Package: under 1000 class clean room</p> <p><u>Typical Properties:</u> Structure: Cubic, a = 5.6754 Å Density: 5.323 g/cm³ at room temperature Melting Point: 937.4 °C Thermal Conductivity: 640</p>
2.	Ge Wafer . Undoped, 2" dia x 0.5 mm, 2SP (111)	<p><u>Specifications:</u> Growing Method: CZ Orientation: (111) +/- 0.5 Deg. Wafer Size: 2" dia x 0.5 mm Surface Polishing: two sides epi polished Surface roughness: < 8 Å (by AFM) Doping: Undoped Conductor type: N-type Resistivity: >40 Ohms/cm EPD: Package: under 1000 class clean room</p> <p><u>Typical Properties:</u> Structure: Cubic, a = 5.6754 Å Density: 5.323 g/cm³ at room temperature Melting Point: 937.4 °C Thermal Conductivity: 640</p>

b. Ge<111> Doped N-type

No.	Item	Description
1.	Ge Wafer (111) 2" dia x 0.5 mm, 1SP, N type (Sb doped), resistivities: 0.01-0.1ohm-cm	<p><u>Specifications:</u> Growing Method: CZ Orientation: (111) +/- 0.5 Deg. Wafer Size: 2" dia x 500 microns Surface Polishing: one side epi polished Surface roughness: < 8 Å (by AFM) Doping: Sb Doped Conductor type: N-type Resistivity: 0.01-0.1 Ohms/cm EPD: Package: under 1000 class clean room</p> <p><u>Typical Properties:</u> Structure: Cubic, a = 5.6754 Å Density: 5.323 g/cm³ at room temperature Melting Point: 937.4 °C Thermal Conductivity: 640</p>
2.	Ge Wafer (111) 2" dia x 0.5 mm, 1SP, N type (Sb doped), resistivities:	<p><u>Specifications:</u> Growing Method: CZ</p>

	0.05-0.5ohm-cm	<p>Orientation: (111) +/-0.5 Deg. Wafer Size: 2" dia x 500 microns Surface Polishing: one side epi polished Surface roughness: < 8 Å (by AFM) Doping: Sb Doped Conductor type: N-type Resistivity: 0.05-0.5 Ohms/cm EPD: Package: under 1000 class clean room</p> <p><u>Typical Properties:</u> Structure: Cubic, a = 5.6754 Å Density: 5.323 g/cm³ at room temperature Melting Point: 937.4 °C Thermal Conductivity: 640</p>
3.	Ge Wafer (111) 2" dia x 0.5 mm, 1SP, N type (Sb doped), resistivities: 6.9-8.9ohm-cm	<p><u>Specifications:</u> Growing Method: CZ Orientation: (111) +/-0.5 Deg. Wafer Size: 2" dia x 500 microns Surface Polishing: one side epi polished Surface roughness: < 8 Å (by AFM) Doping: Sb Doped Conductor type: N-type Resistivity: 6.9-8.9 Ohms/cm EPD: Package: under 1000 class clean room</p> <p><u>Typical Properties:</u> Structure: Cubic, a = 5.6754 Å Density: 5.323 g/cm³ at room temperature Melting Point: 937.4 °C Thermal Conductivity: 640</p>
4.	Ge Wafer (111) 2" dia x 0.5 mm, 1SP, N type (Sb doped), resistivities: 0.0063-0.009ohm-cm	<p><u>Specifications:</u> Growing Method: CZ Orientation: (111) +/-0.5 Deg. Wafer Size: 2" dia x 500 microns Surface Polishing: one side epi polished Surface roughness: < 8 Å (by AFM) Doping: Sb Doped Conductor type: N-type Resistivity: 0.0063-0.009 Ohms/cm EPD: Package: under 1000 class clean room</p> <p><u>Typical Properties:</u> Structure: Cubic, a = 5.6754 Å Density: 5.323 g/cm³ at room temperature Melting Point: 937.4 °C Thermal Conductivity: 640</p>

5.	Ge Wafer (111) 2" dia x 0.5 mm, 1SP, N type (Sb doped), resistivities: 0.079-0.091ohm-cm	<p><u>Specifications:</u> Growing Method: CZ Orientation: (111) +/- 0.5 Deg. Wafer Size: 2" dia x 500 microns Surface Polishing: one side epi polished Surface roughness: < 8 Å (by AFM) Doping: Sb Doped Conductor type: N-type Resistivity: 0.079-0.091 Ohms/cm EPD: Package: under 1000 class clean room</p> <p><u>Typical Properties:</u> Structure: Cubic, a = 5.6754 Å Density: 5.323 g/cm³ at room temperature Melting Point: 937.4 °C Thermal Conductivity: 640</p>
6.	Ge Wafer (111) 2" dia x 0.5 mm, 2SP, N type (Sb doped), resistivities: 0.007-0.009 ohm-cm	<p><u>Specifications:</u> Growing Method: CZ Orientation: (111) +/- 0.5 Deg. Wafer Size: 2" dia x 500 microns Surface Polishing: Two sides epi polished Surface roughness: < 8 Å (by AFM) Doping: Sb Doped Conductor type: N-type Resistivity: 0.007-0.009 Ohms/cm EPD: Package: under 1000 class clean room</p> <p><u>Typical Properties:</u> Structure: Cubic, a = 5.6754 Å Density: 5.323 g/cm³ at room temperature Melting Point: 937.4 °C Thermal Conductivity: 640</p>
7.	Ge Wafer (111) 2" dia x 0.5 mm, 2SP, N type (Sb doped), resistivities: 0.05-0.5 ohm-cm	<p><u>Specifications:</u> Growing Method: CZ Orientation: (111) +/- 0.5 Deg. Wafer Size: 2" dia x 500 microns Surface Polishing: two side epi polished Surface roughness: < 8 Å (by AFM) Doping: Sb Doped Conductor type: N-type Resistivity: 0.05~0.5 Ohms/cm EPD: Package: under 1000 class clean room</p> <p><u>Typical Properties:</u> Structure: Cubic, a = 5.6754 Å Density: 5.323 g/cm³ at room temperature Melting Point: 937.4 °C Thermal Conductivity: 640</p>

8.	Ge Wafer (111) 2" dia x 0.5 mm, 2SP, N type (Sb doped), resistivities: 10.5-15.2 ohm-cm	<p><u>Specifications:</u> Growing Method: CZ Orientation: (111) +/-0.5 Deg. Wafer Size: 2" dia x 500 microns Surface Polishing: two side epi polished Surface roughness: < 8 A (by AFM) Doping: Sb Doped Conductor type: N-type Resistivity: 10.5-15.2 Ohms/cm EPD: Package: under 1000 class clean room</p> <p><u>Typical Properties:</u> Structure: Cubic, a = 5.6754 A Density: 5.323 g/cm³ at room temperature Melting Point: 937.4 oC Thermal Conductivity: 640</p>
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c. Ge<111> Doped P-type

No.	Item	Description
1.	Ge Wafer (111) 2" dia x 0.4 mm, 2SP, P type (Ga doped) Resistivities: 0.035-0.039ohm-cm	<p><u>Specifications:</u> Growing Method: CZ Orientation: (111) +/-0.5 Deg. Wafer Size: 2" dia x 400 microns Surface Polishing: Two sides epi polished Surface roughness: < 8 A (by AFM) Doping: Ga Doped Conductor type: P-type Resistivity: 0.035-0.039Ohms/cm EPD: Package: under 1000 class clean room</p> <p><u>Typical Properties:</u> Structure: Cubic, a = 5.6754 A Density: 5.323 g/cm³ at room temperature Melting Point: 937.4 °C Thermal Conductivity: 640</p>
2.	Ge Wafer (111) 2" dia x 0.5 mm, 1SP, P type (Ga doped), Resistivities: 0.022-0.026 ohm-cm	<p><u>Specifications:</u> Growing Method: CZ Orientation: (111) +/-0.5 Deg. Wafer Size: 2" dia x 500 microns Surface Polishing: one side epi polished Surface roughness: < 8 A (by AFM) Doping: Ga Doped Conductor type: P-type Resistivity: < 0.022-0.026 Ohms/cm EPD: Package: under 1000 class clean room</p> <p><u>Typical Properties:</u></p>

		<p>Structure: Cubic, $a = 5.6754 \text{ \AA}$ Density: 5.323 g/cm^3 at room temperature Melting Point: 937.4°C Thermal Conductivity: 640</p>
3.	Ge Wafer (111) 2" dia x 0.5 mm, 1SP, P type (Ga doped), resistivities: 0.24-0.33 ohm-cm	<p><u>Specifications:</u> Growing Method: CZ Orientation: (111) $\pm 0.5^\circ$ Deg. Wafer Size: 2" dia x 500 microns Surface Polishing: one side epi polished Surface roughness: $< 8 \text{ \AA}$ (by AFM) Doping: Ga Doped Conductor type: P-type Resistivity: 0.24-0.33 Ohms/cm EPD: Package: under 1000 class clean room</p> <p><u>Typical Properties:</u> Structure: Cubic, $a = 5.6754 \text{ \AA}$ Density: 5.323 g/cm^3 at room temperature Melting Point: 937.4°C Thermal Conductivity: 640</p>
4.	Ge Wafer (111) 2" dia x 0.5 mm, 1SP, P type (Ga doped), resistivities: 1-10 ohm-cm	<p><u>Specifications:</u> Growing Method: CZ Orientation: (111) $\pm 0.5^\circ$ Deg. Wafer Size: 2" dia x 0.5mm Surface Polishing: one side epi polished Surface roughness: $< 8 \text{ \AA}$ (by AFM) Doping: Ga Doped Conductor type: P-type Resistivity: 1-10 Ohms/cm EPD: Package: under 1000 class clean room</p> <p><u>Typical Properties:</u> Structure: Cubic, $a = 5.6754 \text{ \AA}$ Density: 5.323 g/cm^3 at room temperature Melting Point: 937.4°C Thermal Conductivity: 640</p>
5.	Ge Wafer (111) 2" dia x 0.5 mm, 2SP, P type (Ga doped) resistivities: 0.007-0.008ohm-cm	<p><u>Specifications:</u> Growing Method: CZ Orientation: (111) $\pm 0.5^\circ$ Deg. Wafer Size: 2" dia x 500 microns Surface Polishing: Two sides epi polished Surface roughness: $< 8 \text{ \AA}$ (by AFM) Doping: Ga Doped Conductor type: P-type Resistivity: 0.007-0.008Ohms/cm EPD: Package: under 1000 class clean room</p>

		<u>Typical Properties:</u> Structure: Cubic, $a = 5.6754 \text{ \AA}$ Density: 5.323 g/cm^3 at room temperature Melting Point: 937.4°C Thermal Conductivity: 640
6.	Ge Wafer (111) 2" dia x 0.5 mm, 2SP, P type (Ga doped) resistivities: 0.05-0.1ohm-cm	<u>Specifications:</u> Growing Method: CZ Orientation: (111) $\pm 0.5^\circ$ Wafer Size: 2" dia x 500 microns Surface Polishing: Two sides epi polished Surface roughness: $< 8 \text{ \AA}$ (by AFM) Doping: Ga Doped Conductor type: P-type Resistivity: 0.05-0.1ohms/cm EPD: Package: under 1000 class clean room <u>Typical Properties:</u> Structure: Cubic, $a = 5.6754 \text{ \AA}$ Density: 5.323 g/cm^3 at room temperature Melting Point: 937.4°C Thermal Conductivity: 640

iii. 2" wafers(110)

No.	Item	Description
1.	Ge Wafer (110)N type, Sb doped, 2" dia x 0.5 mm, 1SP Resistivity: 0.113-0.12 ohm.cm	<u>Specifications:</u> Growing Method: CZ Orientation: (110) $\pm 0.5^\circ$ Wafer Size: 2" dia x 500 microns Surface Polishing: one side epi polished Surface roughness: $< 8 \text{ \AA}$ (by AFM) Doping: Sb doped Conductor type: N-type Resistivity: 0.113-0.12 ohm.cm EPD: Package: under 1000 class clean room <u>Typical Properties:</u> Structure: Cubic, $a = 5.6754 \text{ \AA}$ Density: 5.323 g/cm^3 at room temperature Melting Point: 937.4°C Thermal Conductivity: 640
2.	Ge Wafer (110) Ga-doped, 2" dia x 0.5 mm, 1SP Resistivity : 0.81-1.01 ohm-cm	<u>Specifications:</u> Growing Method: CZ Orientation: (110) $\pm 0.5^\circ$ Wafer Size: 2" dia x 500 microns Surface Polishing: one side epi polished

		<p>Surface roughness: < 8 Å (by AFM) Doping: Ga-doped Conductor type: P-type Resistivity: 0.81-1.01 Ohms/cm EPD: Package: under 1000 class clean room</p> <p><u>Typical Properties:</u> Structure: Cubic, a = 5.6754 Å Density: 5.323 g/cm³ at room temperature Melting Point: 937.4 °C Thermal Conductivity: 640</p>
3.	Ge Wafer (110) Ga-doped, 2" dia x 0.5 mm, 1SP Resistivity : 1-10 ohm-cm	<p><u>Specifications:</u> Growing Method: CZ Orientation: (110) +/- 0.5 Deg. Wafer Size: 2" dia x 500 microns Surface Polishing: one side epi polished Surface roughness: < 8 Å (by AFM) Doping: Ga-doped Conductor type: P-type Resistivity: 1-10 Ohms/cm EPD: Package: under 1000 class clean room</p> <p><u>Typical Properties:</u> Structure: Cubic, a = 5.6754 Å Density: 5.323 g/cm³ at room temperature Melting Point: 937.4 °C Thermal Conductivity: 640</p>
4.	Ge Wafer (110) N type, Sb doped, 2" dia x 0.5 mm, 2SPR: 5.3-6.7ohm.cm	<p><u>Specifications:</u> Growing Method: CZ Orientation: <110> +/- 0.5 Deg/ <110> Wafer Size: 2" dia x 500 microns Surface Polishing: Two sides epi polished Surface roughness: < 8 Å (by AFM) Doping: Sb doped Conductor type: N-type Resistivity: 5.3-6.7Ohms/cm EPD: Package: under 1000 class clean room</p> <p><u>Typical Properties:</u> Structure: Cubic, a = 5.6754 Å Density: 5.323 g/cm³ at room temperature Melting Point: 937.4 °C Thermal Conductivity: 640</p>
5.	Ge Wafer (110) Undoped, 2" dia x 0.5 mm, 1SP	<p><u>Specifications:</u> Growing Method: CZ Orientation: (110) +/- 0.5 Deg. Wafer Size: 2" dia x 500 microns</p>

		<p>Surface Polishing: one side epi polished Surface roughness: < 8 Å (by AFM) Doping: Undoped Conductor type: N-type Resistivity: >45 Ohms/cm EPD: Package: under 1000 class clean room</p> <p><u>Typical Properties:</u> Structure: Cubic, a = 5.6754 Å Density: 5.323 g/cm³ at room temperature Melting Point: 937.4 °C Thermal Conductivity: 640</p>
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iv. 2" Wafers <211>

No.	Item	Description
1.	Ge Wafer (211) Undoped, 2" dia x 0.45 mm, 1SP, resistivities: >45 ohm-cm	<p><u>Specifications:</u> Growing Method: CZ Orientation: (211) +/- 0.5 Deg. Wafer Size: 2" dia x 450 microns Surface Polishing: one side epi polished Surface roughness: < 8 Å (by AFM) Doping: Undoped Conductor type: N-type Resistivity: > 45 Ohms/cm EPD: Package: under 1000 class clean room</p> <p><u>Typical Properties:</u> Structure: Cubic, a = 5.6754 Å Density: 5.323 g/cm³ at room temperature Melting Point: 937.4 °C Thermal Conductivity: 640</p>
2.	Ge Wafer (211) Undoped, 2" dia x 0.45 mm, 2SP, Resistivities: > 45 ohm-cm	<p><u>Specifications:</u> Growing Method: CZ Orientation: (211) +/- 0.5 Deg. Wafer Size: 2" dia x 450 microns Surface Polishing: two sides epi polished Surface roughness: < 8 Å (by AFM) Doping: Undoped Conductor type: N-type Resistivity: > 45 Ohms/cm EPD: Package: under 1000 class clean room</p> <p><u>Typical Properties:</u> Structure: Cubic, a = 5.6754 Å Density: 5.323 g/cm³ at room temperature Melting Point: 937.4 °C Thermal Conductivity: 640</p>

D. 3" Diameter Wafer

No.	Item	Description
1.	Ge Wafer Undoped (100) 3" dia x 0.5 mm 1 side polished resistivity: 56.2- 62.5 ohm-cm	<u>Specifications:</u> Growing Method: CZ Orientation: (100) +/- 0.5 Deg. Flat: (110) Wafer Size: 3" dia x 0.5 mm Surface Polishing: one side epi polished Surface roughness: < 8 Å (by AFM) Doping: Undoped Conductor type: N-type Resistivity: 56.2-62.5 Ohms/cm EPD: Package: under 1000 class clean room in wafer container
2.	Ge Wafer, N-type Sb- doped (100) 3" dia x 0.5 mm 1 side polished resistivity: 0.05-0.1 ohm- cm	<u>Specifications:</u> Growing Method: CZ Orientation: (100) +/- 0.5 Deg. Flat: (110) Wafer Size: 3" dia x 0.5 mm Surface Polishing: one side epi polished Surface roughness: < 8 Å (by AFM) Doping: Sb-doped Conductor type: N-type Resistivity: 0.05-0.1 Ohms/cm EPD: Package: under 1000 class clean room in wafer container

E. 4" Diameter Wafer

i. Ge N-type ,undoped

No.	Item	Description
1.	Ge Wafer (111) 4" dia x 0.5 mm, 1SP, N type (un- doped)	<u>Specifications:</u> Growing Method: CZ Orientation: (111) +/- 0.5 Deg. Wafer Size: 4" dia x 500 microns Surface Polishing: One side epi polished Surface roughness: < 8 Å (by AFM) Doping: Un- Doped Conductor type: N-type Resistivity: 42.3-64.2 Ohms/cm EPD: Package: under 1000 class clean room <u>Typical Properties:</u> Structure: Cubic, a = 5.6754 Å

		Density: 5.323 g/cm ³ at room temperature Melting Point: 937.4 °C Thermal Conductivity: 640
2.	Ge Wafer (100) . Undoped, 4" dia x 0.5 mm, 2SP	<u>Specifications:</u> Growing Method: CZ Orientation: (100) +/- 0.5 Deg. Wafer Size: 4" dia x 500 microns Surface Polishing: Two sides epi polished Surface roughness: < 8 Å (by AFM) Doping: Undoped Conductor type: N-type Resistivity: 58.3-60.9 Ohms/cm EPD: Package: under 1000 class clean room <u>Typical Properties:</u> Structure: Cubic, a = 5.6754 Å Density: 5.323 g/cm ³ at room temperature Melting Point: 937.4 °C Thermal Conductivity: 640
3.	Ge Wafer(100) . Undoped, 4" dia x 0.5 mm, 1SP	<u>Specifications:</u> Growing Method: CZ Orientation: (100) +/- 0.5 Deg. Wafer Size: 4" dia x 500 microns Surface Polishing: one side epi polished Surface roughness: < 8 Å (by AFM) Doping: Undoped Conductor type: N-type Resistivity: 58.3-60.9 Ohms/cm EPD: Package: under 1000 class clean room <u>Typical Properties:</u> Structure: Cubic, a = 5.6754 Å Density: 5.323 g/cm ³ at room temperature Melting Point: 937.4 °C Thermal Conductivity: 640
4.	Ge Wafer (111) 4" dia x 0.5 mm, 2SP, N type	<u>Specifications:</u> Growing Method: CZ Orientation: (111) +/- 0.5 Deg. Wafer Size: 4" dia x 500 microns Surface Polishing: Two sides epi polished Surface roughness: < 8 Å (by AFM) Doping: Un- Doped Conductor type: N-type Resistivity: 42.3-64.2 Ohms/cm EPD: Package: under 1000 class clean room <u>Typical Properties:</u> Structure: Cubic, a = 5.6754 Å

		Density: 5.323 g/cm ³ at room temperature Melting Point: 937.4 °C Thermal Conductivity: 640
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ii. Ge P-type Ga-doped

No.	Item	Description
1.	Ge Wafer(100) . 4" dia x 0.5 mm, 2SP, P type (Ga doped) R:4.37-5.1 ohm.cm	<p><u>Specifications:</u> Growing Method: CZ Orientation: (100) +/-0.5 Deg. Wafer Size: 4" dia x 500 microns Surface Polishing: Two sides epi polished Surface roughness: < 8 Å (by AFM) Doping: Ga Doped Conductor type: P-type High Resistivity: R:4.37-5.1 ohm.cm Carrier Concentration: $1.0 \times 10^{15} / \text{cm}^3$ Package: under 1000 class clean room</p> <p><u>Typical Properties:</u> Structure: Cubic, $a = 5.6754 \text{ \AA}$ Density: 5.323 g/cm³ at room temperature Melting Point: 937.4 °C Thermal Conductivity: 640</p>
2.	Ge Wafer(100) . 4" dia x 0.5 mm, 2SP, P type (Ga doped) R:0.019-0.024 Ohm.cm	<p><u>Specifications:</u> Growing Method: CZ Orientation: (100) +/-0.5 Deg. Wafer Size: 4" dia x 500 microns Surface Polishing: Two sides epi polished Surface roughness: < 8 Å (by AFM) Doping: Ga Doped Conductor type: P-type Resistivity: 0.019-0.024 Ohm.cm EPD: Package: under 1000 class clean room</p> <p><u>Typical Properties:</u> Structure: Cubic, $a = 5.6754 \text{ \AA}$ Density: 5.323 g/cm³ at room temperature Melting Point: 937.4 °C Thermal Conductivity: 640</p>
3.	Ge Wafer(100) . 4" dia x 0.5 mm, 1SP, P type (Ga doped) R:0.019-0.024 Ohm.cm	<p><u>Specifications:</u> Growing Method: CZ Orientation: (100) +/-0.5 Deg. Wafer Size: 4" dia x 500 microns Surface Polishing: One side epi polished Surface roughness: < 8 Å (by AFM) Doping: Ga Doped Conductor type: P-type</p>

		Resistivity: 0.019~0.024 Ohms/cm EPD: Package: under 1000 class clean room <u>Typical Properties:</u> Structure: Cubic, a = 5.6754Å Density: 5.323 g/cm ³ at room temperature Melting Point: 937.4 °C Thermal Conductivity: 640
4.	VGF-Ge Wafer(100) . 100mm dia x 0.4 mm, 2SP, P type (Ga doped) R:0.005-0.04 Ohm.cm	<u>Specifications:</u> Growing Method: VGF Orientation: (100) +/-0.4 Deg. Wafer Size: 100mm dia x 400 microns Surface Polishing: Two sides polished Surface roughness: < 8 Å (by AFM) Doping: Ga Doped Conductor type: P-type Resistivity: 0.005-0.04 ohm.cm Ra(Average Roughness): < 0.4 nm Package: under 1000 class clean room <u>Typical Properties:</u> Structure: Cubic, a = 5.6754Å Density: 5.323 g/cm ³ at room temperature Melting Point: 937.4 °C Thermal Conductivity: 640
5.	VGF-Ge Wafer(100) . 100mm dia x 0.5 mm, 2SP, P type (Ga doped) R:0.13-0.21 Ohm.cm	<u>Specifications:</u> Growing Method: VGF Orientation: (100) +/-0.4 Deg. Wafer Size: 100mm dia x 500 microns Surface Polishing: Two sides polished Surface roughness: < 8 Å (by AFM) Doping: Ga Doped Conductor type: P-type Resistivity: 0.13-0.21Ohm.cm Carrier Concentration: (1.5-2.9) x10 ¹⁶ /c.c Mobility: 1690-1930 cm ² /Vs EPD: <500 /cm Ra(Average Roughness): < 0.4 nm Package: under 1000 class clean room <u>Typical Properties:</u> Structure: Cubic, a = 5.6754Å Density: 5.323 g/cm ³ at room temperature Melting Point: 937.4 °C Thermal Conductivity: 640
6.	VGF-Ge Wafer(100) . 100 mm dia x 0.175 mm, 1SP, P type (Ga doped) R:0.19-0.24 Ohm.cm	<u>Specifications:</u> Growing Method: VGF Orientation: (100) +/-0.5 Deg. Wafer Size: 100(+/-0.4) mm dia x 175(+/-25) microns

		<p>Surface Polishing: One side polished Surface roughness: < 8 Å (by AFM) Doping: Ga Doped Conductor type: P-type Resistivity: 0.19-0.24 Ohm.cm Carrier Concentration: N/A Mobility: N/A EPD: <=500 /cm² Ra(Average Roughness): < 0.4 nm Package: under 1000 class clean room</p> <p><u>Typical Properties:</u> Structure: Cubic, a = 5.6754Å Density: 5.323 g/cm³ at room temperature Melting Point: 937.4 °C Thermal Conductivity: 640</p>
7.	VGF-Ge Wafer(100) . 100 mmdia x 0.175 mm, 2SP, P type (Ga doped) R:0.28-0.32Ohm.cm	<p><u>Specifications:</u> Growing Method: VGF Orientation: (100) +/-0.5 Deg. Wafer Size: 100(+/-0.4) mm dia x 175(+/-25) microns Surface Polishing: Both sides polished Surface roughness: < 8 Å (by AFM) Doping: Ga Doped Conductor type: P-type Resistivity: 0.28-0.32Ohm.cm Carrier Concentration: N/A Mobility: N/A EPD: <=500 /cm² Ra(Average Roughness): < 0.4 nm Package: under 1000 class clean room</p> <p><u>Typical Properties:</u> Structure: Cubic, a = 5.6754Å Density: 5.323 g/cm³ at room temperature Melting Point: 937.4 °C Thermal Conductivity: 640</p>
8.	VGF-Ge Wafer(100) . 100 mmdia x 0.5 mm, 1SP, P type (Ga doped) R:0.13-0.21 Ohm.cm	<p><u>Specifications:</u> Growing Method: VGF Orientation: (100) +/-0.4 Deg. Wafer Size: 100 mm dia x 500 microns Surface Polishing: One side polished Surface roughness: < 8 Å (by AFM) Doping: Ga Doped Conductor type: P-type Resistivity: 0.13-0.21Ohm.cm Carrier Concentration: (1.5-2.9) x10¹⁶ /c.c Mobility: 1690-1930 cm²/Vs EPD: <500 /cm² Ra(Average Roughness): < 0.4 nm Package: under 1000 class clean room</p>

		<u>Typical Properties:</u> Structure: Cubic, $a = 5.6754\text{\AA}$ Density: 5.323 g/cm^3 at room temperature Melting Point: $937.4\text{ }^{\circ}\text{C}$ Thermal Conductivity: 640
9.	VGF-Ge Wafer(100)with 6 degree miscut toward<111> ,100 mmdia x 0.5 mm, 1SP, P type (Ga doped) R:0.3-0.33 Ohm.cm	<u>Specifications:</u> Growing Method: VGF Orientation: VGF-Ge Wafer(100)with 6 degree miscut toward<111> Wafer Size: 100 mm dia x 500 microns Surface Polishing: One side polished Surface roughness: $< 8\text{ \AA}$ (by AFM) Doping: Ga Doped Conductor type: P-type Resistivity: $0.3\text{-}0.33\text{ Ohm.cm}$ Carrier Concentration: $(0.9\text{-}1.0) \times 10^{16}\text{ /c.c}$ Mobility: $1900\text{-}2060\text{ cm}^2/\text{Vs}$ EPD: $<500\text{ /cm}^2$ Ra(Average Roughness): $< 0.4\text{ nm}$ Package: under 1000 class clean room <u>Typical Properties:</u> Structure: Cubic, $a = 5.6754\text{\AA}$ Density: 5.323 g/cm^3 at room temperature Melting Point: $937.4\text{ }^{\circ}\text{C}$ Thermal Conductivity: 640

iii. Ge,N-type ,Sb & As -doped

No.	Item	Description
1.	Ge Wafer (100) 4" dia x 0.5 mm, 1SP, N type (Sb doped)	<u>Specifications:</u> Growing Method: CZ Orientation: (100) +/-0.5 Deg. Wafer Size: 4" dia x 500 microns Surface Polishing: One side epi polished Surface roughness: $< 8\text{ \AA}$ (by AFM) Doping: Sb Doped Conductor type: N-type Resistivity: $0.029\text{-}0.054\text{ Ohms/cm}$ EPD: Package: under 1000 class clean room <u>Typical Properties:</u> Structure: Cubic, $a = 5.6754\text{\AA}$ Density: 5.323 g/cm^3 at room temperature Melting Point: $937.4\text{ }^{\circ}\text{C}$ Thermal Conductivity: 640
2.	Ge Wafer (100) 4" dia x 0.5 mm, 2SP, N type (Sb doped) with Res: 0.029-0.054 ohm-cm	<u>Specifications:</u> Growing Method: CZ Orientation: (100) +/-0.5 Deg.

		<p>Wafer Size: 4" dia x 500 microns Surface Polishing: Two sides epi polished Surface roughness: < 8 Å (by AFM) Doping: Sb Doped Conductor type: N-type Resistivity: 0.029-0.054 Ohms/cm EPD: Package: under 1000 class clean room</p> <p><u>Typical Properties:</u> Structure: Cubic, a = 5.6754 Å Density: 5.323 g/cm³ at room temperature Melting Point: 937.4 °C Thermal Conductivity: 640</p>
3.	GF-Ge Wafer (100) 4" dia x 0.5 mm, 2SP, N type (As- doped) with Res: 0.05-0.25 ohm.cm	<p><u>Specifications:</u> Growing Method: VGF Orientation: (100) +/-0.5 Deg. Wafer Size: 4" dia x 500 microns Surface Polishing: Two sides epi polished Surface roughness: < 8 Å (by AFM) Doping: As- Doped Conductor type: N-type Resistivity: 0.05-0.25 ohm.cm Ra(Average Roughness): < 0.4 nm Package: under 1000 class clean room</p> <p><u>Typical Properties:</u> Structure: Cubic, a = 5.6754 Å Density: 5.323 g/cm³ at room temperature Melting Point: 937.4 °C Thermal Conductivity: 640</p>
4.	Ge Wafer (111) 4" dia x 0.5 mm, 1SP, N type (Sb-doped)	<p><u>Specifications:</u> Growing Method: CZ Orientation: (111) +/-0.5 Deg. Wafer Size: 4" dia x 500 microns Surface Polishing: Onr side epi polished Surface roughness: < 8 Å (by AFM) Doping: Sb- Doped Conductor type: N-type Resistivity: 0.014-0.022 Ohms-cm EPD: Package: under 1000 class clean room</p> <p><u>Typical Properties:</u> Structure: Cubic, a = 5.6754 Å Density: 5.323 g/cm³ at room temperature Melting Point: 937.4 °C Thermal Conductivity: 640</p>
5.	Ge Wafer (111) 4" dia x 0.5 mm, 2SP, N type (Sb-doped)	<p><u>Specifications:</u> Growing Method: CZ</p>

		<p>Orientation: (111) +/-0.5 Deg. Wafer Size: 4" dia x 500 microns Surface Polishing: Two sides epi polished Surface roughness: < 8 Å (by AFM) Doping: Sb- Doped Conductor type: N-type Resistivity: 0.014-0.022 Ohms/cm EPD: Package: under 1000 class clean room</p> <p><u>Typical Properties:</u> Structure: Cubic, a = 5.6754Å Density: 5.323 g/cm³ at room temperature Melting Point: 937.4 °C Thermal Conductivity: 640</p>
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31. GGG (Gd₃Ga₅O₁₂)

No.	Item	Description
1.	GGG, (111), 3" dia x0.5mm, 1sp	<p><u>Specifications:</u> Size: 3" dia x 0.5mm Orientation: (111) Polish: one side EPI polished</p> <p><u>Physical Properties of Sapphire:</u> Crystal Structure: Cubic: a =12.376 Å , (Z = 8) Molecular weight: 1012.365 Melt Point: 1800 °C Density: 7.09 g/cm³ Hardness: ~ 8 (mohns) Refractive index: 1.95 Crystal Purity: > 99.99% Crystal growth method: Czochralski Crystal growth direction: <111></p>
2.	GGG, (111), 3" dia x0.5mm, 2sp	<p><u>Specifications:</u> Size: 3" dia x 0.5mm Orientation: (111) Polish: both sides EPI polished</p> <p><u>Physical Properties of Sapphire:</u> Crystal Structure: Cubic: a =12.376 Å , (Z = 8) Molecular weight: 1012.365 Melt Point: 1800 °C Density: 7.09 g/cm³ Hardness: ~ 8 (mohns) Refractive index: 1.95 Crystal Purity: > 99.99% Crystal growth method: Czochralski Crystal growth direction: <111></p>

3.	GGG, (100), 5x5x0.5mm, 1sp	<p><u>Specifications:</u> Size: 5mm x 5mm x 0.5mm Orientation: (100) Polish: one side EPI polished</p> <p><u>Physical Properties of Sapphire:</u> Crystal Structure: Cubic: $a = 12.376 \text{ \AA}$, ($Z = 8$) Molecular weight: 1012.365 Melt Point: 1800 °C Density: 7.09 g/cm³ Hardness: ~ 8 (mohns) Refractive index: 1.95 Crystal Purity: > 99.99% Crystal growth method: Czochralski Crystal growth direction: <111></p>
4.	GGG, (100), 5x5x0.5mm, 2sp	<p><u>Specifications:</u> Size: 5mm x 5mm x 0.5mm Orientation: (100) Polish: two sides EPI polished</p> <p><u>Physical Properties of Sapphire:</u> Crystal Structure: Cubic: $a = 12.376 \text{ \AA}$, ($Z = 8$) Molecular weight: 1012.365 Melt Point: 1800 °C Density: 7.09 g/cm³ Hardness: ~ 8 (mohns) Refractive index: 1.95 Crystal Purity: > 99.99% Crystal growth method: Czochralski Crystal growth direction: <111></p>
5.	GGG, (110), 5x5x0.5mm, 1sp	<p><u>Specifications:</u> Size: 5mm x 5mm x 0.5mm Orientation: (110) Polish: one side EPI polished</p> <p><u>Physical Properties of Sapphire:</u> Crystal Structure: Cubic: $a = 12.376 \text{ \AA}$, ($Z = 8$) Molecular weight: 1012.365 Melt Point: 1800 °C Density: 7.09 g/cm³ Hardness: ~ 8 (mohns) Refractive index: 1.95 Crystal Purity: > 99.99% Crystal growth method: Czochralski Crystal growth direction: <111></p>
6.	GGG, (111), 20x20x0.5mm, 2sp	<p><u>Specifications:</u> Size: 20mm x 20mm x 0.5mm Orientation: (111) Polishing: Two sides EPI polished</p>

		<p>Surface roughness < 8A</p> <p><u>Physical Properties of Sapphire:</u> Crystal Structure: Cubic: $a = 12.376 \text{ \AA}$, (Z = 8) Molecular weight: 1012.365 Melt Point: 1800 °C Density: 7.09 g/cm³ Hardness: ~ 8 (mohns) Refractive index: 1.95 Crystal Purity: > 99.99% Crystal growth method: Czochralski Crystal growth direction: <111></p>
7.	GGG, (111), 5x5x0.5mm, 1sp	<p><u>Specifications:</u> Size: 5mm x 5mm x 0.5mm Orientation: (111) Polish: one side EPI polished</p> <p><u>Physical Properties of Sapphire:</u> Crystal Structure Cubic: $a = 12.376 \text{ \AA}$, (Z = 8) Molecular weight: 1012.365 Melt Point: 1800 °C Density: 7.09 g/cm³ Hardness: ~ 8 (mohns) Refractive index: 1.95 Crystal Purity: > 99.99% Crystal growth method: Czochralski Crystal growth direction: <111></p>
8.	GGG (111), 10x10x0.5mm, 2sp	<p><u>Specifications:</u> Size: 10mm x 10mm x 0.5mm Orientation: (111) Polish: both sides EPI polished</p> <p><u>Physical Properties of Sapphire:</u> Crystal Structure: Cubic: $a = 12.376 \text{ \AA}$, (Z = 8) Molecular weight: 1012.365 Melt Point: 1800 °C Density: 7.09 g/cm³ Hardness: ~ 8 (mohns) Refractive index: 1.95 Crystal Purity: > 99.99% Crystal growth method: Czochralski Crystal growth direction: <111></p>
9.	GGG, (111), 10x10x0.5mm, 1sp	<p><u>Specifications:</u> Size: 10mm x 10mm x 0.5mm Orientation: (111) Polish: one side EPI polished</p> <p><u>Physical Properties of Sapphire:</u> Crystal Structure: Cubic: $a = 12.376 \text{ \AA}$, (Z = 8) Molecular weight: 1012.365</p>

		Melt Point: 1800 °C Density: 7.09 g/cm ³ Hardness: ~ 8 (mohns) Refractive index: 1.95 Crystal Purity: > 99.99% Crystal growth method: Czochralski Crystal growth direction: <111>
10.	GGG, (111), 10x5x0.5mm, 2sp	<u>Specifications:</u> Size: 10mm x 5mm x 0.5mm Orientation: (111) Polish: both sides EPI polished
11.	GGG, (111), 5x5x0.5mm, 2sp	<u>Specifications:</u> Size: 5mm x 5mm x 0.5mm Orientation: (111) Polish: both sides EPI polished
12.	GGG, (100), 10x10x0.5 mm, 2sp	<u>Specifications:</u> Size: 10mm x 10mm x 0.5mm Orientation: (100) Polish: both sides EPI polished <u>Physical Properties of Sapphire:</u> Crystal Structure: Cubic: $a = 12.376 \text{ \AA}$, (Z = 8) Molecular weight: 1012.365 Melt Point: 1800 °C Density: 7.09 g/cm ³ Hardness: ~ 8 (mohns) Refractive index: 1.95 Crystal Purity: > 99.99% Crystal growth method: Czochralski Crystal growth direction: <111>
13.	GGG, (100), 10x10x0.5mm, 1sp	<u>Specifications:</u> Size: 10mm x 10mm x 0.5mm Orientation: (100) Polish: one side EPI polished <u>Physical Properties of Sapphire:</u> Crystal Structure: Cubic: $a = 12.376 \text{ \AA}$, (Z = 8) Molecular weight: 1012.365 Melt Point: 1800 °C Density: 7.09 g/cm ³ Hardness: ~ 8 (mohns) Refractive index: 1.95 Crystal Purity: > 99.99% Crystal growth method: Czochralski Crystal growth direction: <111>
14.	GGG, (110), 10x10x0.5 mm, 1sp	<u>Specifications:</u> Size: 10mm x 10mm x 0.5mm

		<p>Orientation: (110) Polish: One side EPI polished</p> <p><u>Physical Properties of Sapphire:</u> Crystal Structure Cubic: $a = 12.376 \text{ \AA}$, ($Z = 8$) Molecular weight: 1012.365 Melt Point: 1800 °C Density: 7.09 g/cm³ Hardness: ~ 8 (Mohs) Refractive index: 1.95 Crystal Purity: > 99.99% Crystal growth method: Czochralski Crystal growth direction: <111></p>
15.	GGG, (110), 10x10x0.5 mm, 2sp	<p><u>Specifications:</u> Size: 10mm x 10mm x 0.5mm Orientation: (110) Polish: both sides EPI polished</p> <p><u>Physical Properties of Sapphire:</u> Crystal Structure Cubic: $a = 12.376 \text{ \AA}$, ($Z = 8$) Molecular weight: 1012.365 Melt Point: 1800 °C Density: 7.09 g/cm³ Hardness: ~ 8 (Mohs) Refractive index: 1.95 Crystal Purity: > 99.99% Crystal growth method: Czochralski Crystal growth direction: <111></p>

32. Graphite & Graphene Substrate

A. Graphene film on Ni/SiO₂/Si

No.	Item	Description
1.	Graphene film on Ni/SiO ₂ /Si 100mm dia,	<p>Graphene™ films are grown directly on a Ni/SiO₂/Si deposited on an oxidized silicon wafer using a CVD process.</p> <p><u>Specifications:</u> Research Grade, about 90 % useful area Wafer Size: 100 mm diameter Growth Method: Chemical Vapor Deposition (CVD) Technique Film thickness: 1-10 monolayer thick Graphene film is multilayer with thickness varying in the range 1-10 layers; Graphene layers are aligned relative to each (graphite-like A-B stacking) other as indicated by the Raman spectrum</p> <p>The graphene is grown on Ni film by CVD process. Nickel film is deposited on the substrate covered by thermally grown oxide layer</p>

		<p>Thickness of the Ni layer is 300 nm; The thickness of the silicon oxide layer is 500 nm; The thickness of the wafer is 500 μm The crystallographic orientation of silicon is 100; films are continuous with low defect density. Atomically thin carbon film (1-10 layer) Outstanding electronic properties Chemical inertness and stability Unprecedented mechanical strength</p>
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B. Graphene Oxide Thin Film on Glass

No.	Item	Description
1.	Graphene Oxide Thin Film on Glass, D=50.8 mm, thickness=1 mm	<p>Graphene oxide films can be prepared on different substrates as well, such as PET, quartz, wafers, or substrates provided by a customer. The transparency and thickness of the GO films can be adjusted according to customer requirements.</p> <p><u>Application: Graphene oxide films:</u></p> <p>Flexible nonvolatile memory Production of Reduced Graphene Oxide (RGO) films, which can be applied in thin film transistors Transparent conductors Gas sensors Supercapacitors Electronic and optoelectronic devices</p> <p><u>Specifications:</u> Diameter of Graphene Oxide Film: 35 mm Thickness: 175 nm Deposited on a round slide: D=50.8 mm, thickness=1 mm</p>

C. Multilayer Graphene on Nickel foil: 2"x2"

No.	Item	Description
1.	Multilayer Graphene on Nickel foil: 2"x2"	<p>Multilayer Graphene on Nickel foil: 2"x2" sheet Nickel foil thickness: 25 micron We offer multilayer graphene films that are about 300 monolayers (105 nm) thick on average.</p> <p>These graphene films are grown on nickel foil and continuous across nickel surface steps and grain boundaries.</p>

D. Pyrolytic Graphite Substrate

No.	Item	Description
1.	Pyrolytic Graphite Substrate, C axis Textured, 10x10x0.5 mm, One Side Polished	<p>Size: 10 mm x 10 mm x 0.50 mm thickness Orientation: C axis textured Surface fitness: one side polished</p>

		Surface roughness: < 65A
2.	Pyrolytic Graphite Substrate, C axis Textured, 10x3X0.5 mm, One Side Polished	Size: 10 mm x 3 mm x 0.50 mm thickness Orientation: C axis textured Surface fitness: one side polished Surface roughness: < 65A
3.	Pyrolytic Graphite Substrate, C axis Textured, 10x5X0.5 mm, One Side Polished	Size: 10 mm x 5 mm x 0.50 mm thickness Orientation: C axis textured Surface fitness: one side polished Surface roughness: < 65A
4.	Pyrolytic Graphite Substrate, C axis textured, 2"W x 2"L X 0.5 mm T, 1SP	Size: 2.0" x 2.0" x 0.5 mm thickness Orientation: C axis textured Surface fitness: one side polished Surface roughness: < 65A
5.	Pyrolytic Graphite Substrate, C axis textured, 3"W x 3"L X 0.5 mm T, 1SP	Size: 3.0" x 3.0" x 0.5 mm thickness Orientation: C axis textured Surface fitness: one side polished Surface roughness: < 65A
6.	Pyrolytic Graphite Substrate, C axis Textures, 1"W x 1"L X 0.4-0.5mm Thick. 1sp	Size: 1.0" x 1.0" x 0.4-0.5mm thickness Orientation: C axis textured Surface fitness: 1sp Surface roughness: < 65A
7.	Pyrolytic Graphite Substrate, C axis Textures, 1"W x 1"L X 1.0mm T 1sp	Size: 1.0" x 1.0" x 1.0mm thickness Orientation: C axis textured Surface fitness: 1sp Surface roughness: < 65A

33. InAs

A. InAs <100>

i. InAs <100> doped

No.	Item	Description
1.	InAs (100), P Type, Zn doped 2" dia x 0.45 mm, one side polished	2" InAs wafer (P type) 2" InAs wafer P Type, Zn doped Size: 2" dia x 450 micron +/-20 microns Orientation: <100> +/-0.5° Polishing: one-side polishd Resistivities: 9.4x10 ⁻³ ohm-cm Packing: in 1000 class clean room with wafer container

		<p><u>Properties:</u> Growth method: LEC Orientation: (100) +/- 0.5 ° Orientation Flat: SEMI Doping: Zn doped Conductivity type: P type Carrier Concentration: 5.3E18/ cm³ Mobility: 126 cm²/V.S Resistivity: 0.0084 Ohm-Cm EPD: 1.2E4 / cm²</p>
2.	InAs (100), S-doped 2" dia x 0.45 mm, one side polished	<p>2" InAs wafer (Ntype) 2" InAs wafer (S-doped, Ntype) Size: 2" dia x 450 micron +/-25 microns Orientation: <100> +/-0.5° Polishing: One-side polishd Packing: in 1000 class clean room with wafer container</p> <p><u>Properties:</u> Growth method: LEC Orientation: (100) +/- 0.5 ° Orientation Flat: SEMI Doping: S-doped Conductivity type: N type Carrier Concentration: 7.6x10¹⁷/ cm³ EPD: <5000 cm² Resistivity: 5.8x10⁻⁴ ohm.cm Mobility: 13960 cm²/vs</p>
3.	InAs (100), S-doped 10x10x0.5mm, 1sp	<p><u>Properties:</u> Growth method: LEC Orientation: (100) Orientation Flat: N/A Doping: S-doped Conductivity type: N type Carrier Concentration: 1x10E18 cmE-3 Mobility: 9000 cm²/V.S Standard thickness: 0.5mm Standard size: 10mm x 10mm Polish: one-side</p>
4.	InAs, (100), Sn doped, N-type, 10mm x10mm x 0.5mm 1sp	<p><u>Properties:</u> Growth method: LEC Orientation: (100) ± 0.5 Deg Orientation Flat: N/A Doping: Sn doped Conductivity type: N type Carrier Concentration: (3-10)E17cm³ Mobility: >11000 cm²/V.S EPD: <15000 / cm² Standard thickness: 500 ± 20 mm Size: 10x10 mm Polish: one-side</p>

5.	InAs, (100), Zn doped, P-type, 10mm x10mm x 0.5mm 1sp	<p><u>Properties:</u> Growth method: LEC Orientation: (100) +/- 0.5 Deg Orientation Flat: <110> Doping: Zn doped Conductivity type: P type Carrier Concentration: ~3-10E17 / cm³ Mobility: 165cm²/V.S EPD: <15000 cm² Standard thickness: 500+/-20 mm Size: 10x10 mm Polish: one-side</p>
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ii. InAs <100> undoped

No.	Item	Description
1.	InAs (100), Undoped 2" dia x 0.4mm, two side polished,	<p>2" InAs wafer (Ntype) 2" InAs wafer (Undoped, N type) Size: 2" dia x 400 micron +/-25 microns Orientation: <100> +/-0.5° Polishing: two sides polishd Resistivities: 1.25E-2 ohm-cm Packing: in 1000 class clean room with wafer container</p> <p><u>Properties:</u> Growth method: LEC Orientation: (100) +/- 0.5 ° Orientation Flat Doping: undoped Conductivity type: N type Carrier Concentration: 2.1E16/ cm³ Mobility: 240 / cm²/Vs Resistivity: 6.27E-3 ohm-cm EPD: <3500 / cm²</p>
2.	InAs (100), Undoped 2" dia x 0.4mm, one side polished, Resistivities: (1- 1.13) ^E-2 ohm-cm	<p>2" InAs wafer (Ntype) 2" InAs wafer (Undoped, N type) Size: 2" dia x 400 micron +/-25 microns Orientation: <100> +/-0.5° Polishing: one-side polishd Resistivities: (1- 1.13) ^E-2 ohm-cm Packing: in 1000 class clean room with wafer container</p> <p><u>Properties:</u> Growth method: LEC Orientation: (100) +/- 0.5 ° Orientation Flat Doping: undoped Conductivity type: N type Carrier Concentration: (2.6-2.7) x10^16/ cm³ Mobility: 21050 -22000 cm²/Vs Resistivity: (1- 1.13) ^E-2 ohm-cm EPD: <=6000 / cm²</p>

3.	InAs (100), undoped 10x10x0.4mm, 1sp	<u>Properties:</u> Growth method: LEC Orientation: (100) +/- 0.5° Orientation Flat: N/A Doping: Undoped Conductivity type: N type Carrier Concentration: <3E16 / cm ³ Mobility: >20000 cm ² /V.S EPD: <5E4 / cm ² Standard thickness: 500+/- 20 mm Standard size: 10mm x 10mm Polish: one-side
4.	InAs (100), undoped 10x10x0.5mm, 1sp	<u>Properties:</u> Growth method: LEC Orientation: (100) +/- 0.5° Orientation Flat: N/A Doping: Undoped Conductivity type: N type Carrier Concentration: <3E16 / cm ³ Mobility: >20000 cm ² /V.S EPD: <5E4 / cm ² Standard thickness: 500+/- 20 mm Standard size: 10mm x 10mm Polish: one-side
5.	InAs (100), undoped 30mm dia wafer 1sp	<u>Properties:</u> Growth method: LEC Orientation: (100) ± 0.5 Deg Orientation Flat: <110> Doping: Undoped Conductivity type: N type Carrier Concentration: <3E16 / cm ³ Mobility: >20000 cm ² /V.S EPD: <5E4 / cm ² Standard thickness: 500 ± 20 mm Standard diameter: 30 mm Polish: one-side
6.	InAs (100), undoped 5x5x0.5mm, 1sp	<u>Properties:</u> Growth method: LEC Orientation: (100) Orientation Flat: N/A Doping: Undoped Conductivity type: N type Carrier Concentration: <3E16 / cm ³ Mobility: >20000 cm ² /V.S EPD: <5E4 / cm ² Standard thickness: 0.5mm Standard size: 5mm x 5mmx0.5mm

		Polish: one-side
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B. InAs <111>

No.	Item	Description
1.	InAs (111)A, P Type, Zn doped 2" dia x 0.45 mm, one side polished	<p>2" InAs wafer (P type) 2" InAs wafer P Type, Zn doped Size: 2" dia x 450 micron +/-20 microns Orientation: <111>A Polishing: one-side polishd Resistivities: 5.1×10^{-2} ohm-cm Packing: in 1000 class clean room with wafer container</p> <p><u>Properties:</u> Growth method: LEC Orientation: (111) A Orientation Flat: SEMI Doping: Zn doped Conductivity type: P type Carrier Concentration: $6.4 \times 10^{17} / \text{cm}^3$ Mobility: $192 \text{ cm}^2/\text{V.S}$ Resistivity: 5.1×10^{-2} Ohm-Cm EPD: $1.9 \times 10^4 / \text{cm}^2$</p>
2.	InAs (111), N type, undoped, 2" in dia x 0.5mm, 1sp	<p><u>Properties:</u> Growth method: LEC Orientation: (111) ± 0.5 Deg Orientation Flat: <0-11> .<01-1> Doping: Undoped Conductivity type: N type Carrier Concentration: $<3 \times 10^{16} / \text{cm}^3$ Mobility: $>2 \times 10^4 \text{ cm}^2/\text{V.S}$ EPD: $<10000 / \text{cm}^2$ Standard thickness: 500 ± 25 mm Standard diameter: $2" \pm 0.4$mm Polish: one-side</p>
3.	InAs (111)A, N type, undoped, 2" in dia x 0.45mm, 1sp	<p><u>Properties:</u> Growth method: LEC Orientation: (111)A ± 0.5 Deg Orientation Flat: SEMI Doping: Undoped Conductivity type: N type Carrier Concentration: $<2 \times 10^{16} / \text{cm}^3$ Mobility: $>23400 \text{ cm}^2/\text{V.S}$ EPD: $<10000 / \text{cm}^2$ Resistivity: 1.3×10^{-2} ohm.cm Standard thickness: 450 ± 25 mm Standard diameter: $2" \pm 0.4$mm Polish: one-side</p>

4.	InAs (111), undoped, N-type, 10mm x10mm x 0.5mm 1sp	<p><u>Properties:</u> Growth method: LEC Orientation: (111) ± 0.5 Deg Orientation Flat: N/A Doping: Undoped Conductivity type: N type Carrier Concentration: $<3E16 / \text{cm}^3$ Mobility: $>20000 \text{ cm}^2/\text{V.S}$ EPD: $<5E4 / \text{cm}^2$ Standard thickness: 500 ± 20 mm Standard size: 10mm x 10mm Polish: one-side</p>
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C. InAs <411>

No.	Item	Description
1.	InAs (411), S doped ellipse shape wafer (area >30mm dia) 1sp	<p><u>Properties:</u> Growth method: LEC Orientation: (411) ± 0.5 Deg Orientation Flat: N/A Doping: S doped Conductivity type: N type Carrier Concentration: $<7E17 \sim 1E18 / \text{cm}^3$ Mobility: $>10000 \text{ cm}^2/\text{V.S}$ EPD: $<2E4 / \text{cm}^2$ Standard thickness: 500 ± 20 mm Size: ellipse shape, (area > 30mm diameter) Polish: one-side</p>

D. InAs <511>

No.	Item	Description
1.	InAs (511), S doped ellipse shape wafer (area >30mm dia) 1sp	<p><u>Properties:</u> Growth method: LEC Orientation: (511) ± 0.5 Deg Orientation Flat: N/A Doping: S doped Conductivity type: N type Carrier Concentration: $<7E17 \sim 1E18 / \text{cm}^3$ Mobility: $>10000 \text{ cm}^2/\text{V.S}$ EPD: $<2E4 / \text{cm}^2$ Standard thickness: 500 ± 20 mm Size: ellipse shape, (area > 30mm diameter) Polish: one-side</p>

34. InP

No.	Item	Description																																	
1.	InP (100) Zn doped, 2" x0.35 mm, wafer, 2sp	InP single crystal wafer Orientation: (100) Size: 2" diameter x 0.35mm Doping: Zn doped Conducting type: P-type Carrier Concentration: (1.9-2.4)x10 ¹⁸ /c.c Resistivity: (4.0-6.1)x10 ⁻² ohm.cm EPD: <5000 /cm ² Polish: two sides polished																																	
		<div>Typical Properties</div> <table><tr><th>Dopant</th><th>Type</th><th>Carrier Concentration (cm⁻³)</th><th>Mobility (cm²/V.Sec)</th><th>Resistivity (ohm-cm)</th><th>EPD (cm⁻²)</th></tr><tr><td>Undoped</td><td>N</td><td>0.8 ~ 2.0 x10¹⁵</td><td>3600 ~ 4000</td><td>0.03 ~ 0.2</td><td>5~6 x10⁴</td></tr><tr><td rowspan="2">Sn</td><td rowspan="2">N</td><td>0.5 ~1.0 x10¹⁸</td><td>200 ~ 2400</td><td>0.001 ~ 0.002</td><td rowspan="2">3~5 x10⁴</td></tr><tr><td>0.5 ~1.0 x10¹⁸</td><td>1500 ~ 2000</td><td>0.0025~0.007</td></tr><tr><td rowspan="2">Zn</td><td rowspan="2">P</td><td>0.8 ~ 2.0 x10¹⁸</td><td>2500 ~ 3500</td><td rowspan="2">0.0025 ~ 0.006</td><td rowspan="2">1~ 3 x10⁴</td></tr><tr><td>2.5 ~ 4.0 x10¹⁸</td><td>1300 ~ 1600</td></tr><tr><td>Fe</td><td>Semi-Insulating</td><td>0.1 ~ 1.0</td><td>2000</td><td>10⁷ ~ 10⁸</td><td>4~ 5 x10⁴</td></tr></table>	Dopant	Type	Carrier Concentration (cm ⁻³)	Mobility (cm ² /V.Sec)	Resistivity (ohm-cm)	EPD (cm ⁻²)	Undoped	N	0.8 ~ 2.0 x10 ¹⁵	3600 ~ 4000	0.03 ~ 0.2	5~6 x10 ⁴	Sn	N	0.5 ~1.0 x10 ¹⁸	200 ~ 2400	0.001 ~ 0.002	3~5 x10 ⁴	0.5 ~1.0 x10 ¹⁸	1500 ~ 2000	0.0025~0.007	Zn	P	0.8 ~ 2.0 x10 ¹⁸	2500 ~ 3500	0.0025 ~ 0.006	1~ 3 x10 ⁴	2.5 ~ 4.0 x10 ¹⁸	1300 ~ 1600	Fe	Semi-Insulating	0.1 ~ 1.0	2000
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Fe	Semi-Insulating	0.1 ~ 1.0	2000	10 ⁷ ~ 10 ⁸	4~ 5 x10 ⁴																														
2.	InP (111) S doped, 2"x0.5mm wafer, 1sp	InP(LEC) single crystal waferOrientation: (111) Size: 2" diameter x 0.5mm Doping: S- doped Conducting type: N Carrier Concentration: 4.83x10 ¹⁸ ohm.cm EPD: 7x10 ⁴ /cmE2 Resistivity: 1.02x10 ⁻³ ohm.cm Polish: one side polished																																	
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3.	InP ,Growing Method: VGF(100) Sn doped,2 " x 0.35mm, wafer, 1sp	<p>InP single crystal wafer Orientation: (100) Size: 2" diameter x 0.35 mm Growing Method: VGF Doping: Sn doped Conducting type: S-C-N Polish: one side polished Resistivity: (2.9-3.8)E-3 ohm.cm Mobility: 2180-2350 cmE2/V.S EPD: <5000 /cmE2 Carrier Concentration: (6.9-9.9)E17 /cmE-3 Ra(Average Roughness): < 0.4 nm</p> <p>Typical Properties</p> <table><tr><th>Dopant</th><th>Type</th><th>Carrier Concentration (cm⁻³)</th><th>Mobility (cm²/V.Sec)</th><th>Resistivity (ohm-cm)</th><th>EPD (cm⁻²)</th></tr><tr><td>Undoped</td><td>N</td><td>$0.8 \sim 2.0 \times 10^{15}$</td><td>3600 ~ 4000</td><td>0.03 ~ 0.2</td><td>$5 \sim 6 \times 10^4$</td></tr><tr><td>Sn</td><td>N</td><td>$0.5 \sim 1.0 \times 10^{18}$ $0.5 \sim 1.0 \times 10^{18}$</td><td>200 ~ 2400 1500 ~ 2000</td><td>0.001 ~ 0.002 0.0025~0.007</td><td>$3 \sim 5 \times 10^4$</td></tr><tr><td>Zn</td><td>P</td><td>$0.8 \sim 2.0 \times 10^{18}$ $2.5 \sim 4.0 \times 10^{18}$</td><td>2500 ~ 3500 1300 ~ 1600</td><td>0.0025 ~ 0.006</td><td>$1 \sim 3 \times 10^4$</td></tr><tr><td>Fe</td><td>Semi-Insulating</td><td>0.1 ~ 1.0</td><td>2000</td><td>$10^7 \sim 10^8$</td><td>$4 \sim 5 \times 10^4$</td></tr></table>	Dopant	Type	Carrier Concentration (cm ⁻³)	Mobility (cm ² /V.Sec)	Resistivity (ohm-cm)	EPD (cm ⁻²)	Undoped	N	$0.8 \sim 2.0 \times 10^{15}$	3600 ~ 4000	0.03 ~ 0.2	$5 \sim 6 \times 10^4$	Sn	N	$0.5 \sim 1.0 \times 10^{18}$ $0.5 \sim 1.0 \times 10^{18}$	200 ~ 2400 1500 ~ 2000	0.001 ~ 0.002 0.0025~0.007	$3 \sim 5 \times 10^4$	Zn	P	$0.8 \sim 2.0 \times 10^{18}$ $2.5 \sim 4.0 \times 10^{18}$	2500 ~ 3500 1300 ~ 1600	0.0025 ~ 0.006	$1 \sim 3 \times 10^4$	Fe	Semi-Insulating	0.1 ~ 1.0	2000	$10^7 \sim 10^8$	$4 \sim 5 \times 10^4$
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4.	InP ,Growing Method: VGF(100) Zn doped,3 " x 0.625mm, wafer, 1sp	<p>InP single crystal wafer Orientation: (100) Size: 3" diameter x 0.625 mm Growing Method: VGF Doping: Zn doped Conducting type: S-C Polish: one side polished Resistivity: (3.1-3.7)E-2 ohm.cm Mobility: 62-65 cmE2/V.S EPD: <5000 /cmE2Carrier Concentration: (2.6-3.2)E+18 /cmE-3 Ra(Average Roughness): < 0.4 nm</p> <p>Typical Properties</p> <table><tr><th>Dopant</th><th>Type</th><th>Carrier Concentration (cm⁻³)</th><th>Mobility (cm²/V.Sec)</th><th>Resistivity (ohm-cm)</th><th>EPD (cm⁻²)</th></tr><tr><td>Undoped</td><td>N</td><td>$0.8 \sim 2.0 \times 10^{15}$</td><td>3600 ~ 4000</td><td>0.03 ~ 0.2</td><td>$5 \sim 6 \times 10^4$</td></tr></table>	Dopant	Type	Carrier Concentration (cm ⁻³)	Mobility (cm ² /V.Sec)	Resistivity (ohm-cm)	EPD (cm ⁻²)	Undoped	N	$0.8 \sim 2.0 \times 10^{15}$	3600 ~ 4000	0.03 ~ 0.2	$5 \sim 6 \times 10^4$																		
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5.	InP-(LEC Grown) (100) S doped, 2"x0.5mm wafer, 1sp	<p>InP(LEC) single crystal waferOrientation: (100) Size: 2" diameter x 0.5mm Doping: S- doped Conducting type: N Carrier Concentration: >1x10¹⁸ ohm.cm EPD: <10⁵ /cmE2 Polish: one side polished</p> <p>Typical Properties</p> <table><tr><td>Dopant</td><td>Type</td><td>Carrier Concentration (cm⁻³)</td><td>Mobility (cm²/V.Sec)</td><td>Resistivity (ohm-cm)</td><td>EPD (cm⁻²)</td></tr><tr><td>Undoped</td><td>N</td><td>0.8 ~ 2.0 x10¹⁵</td><td>3600 ~ 4000</td><td>0.03 ~ 0.2</td><td>5~6 x10⁴</td></tr><tr><td>Sn</td><td>N</td><td>0.5 ~ 1.0 x10¹⁸ 0.5 ~ 1.0 x10¹⁸</td><td>200 ~ 2400 1500 ~ 2000</td><td>0.001 ~ 0.002 0.0025~0.007</td><td>3~5 x10⁴</td></tr><tr><td>Zn</td><td>P</td><td>0.8 ~ 2.0 x10¹⁸ 2.5 ~ 4.0 x10¹⁸</td><td>2500 ~ 3500 1300 ~ 1600</td><td>0.0025 ~ 0.006</td><td>1~ 3 x10⁴</td></tr><tr><td>Fe</td><td>Semi- Insulating</td><td>0.1 ~ 1.0</td><td>2000</td><td>10⁷ ~ 10⁸</td><td>4~ 5 x10⁴</td></tr></table>	Dopant	Type	Carrier Concentration (cm ⁻³)	Mobility (cm ² /V.Sec)	Resistivity (ohm-cm)	EPD (cm ⁻²)	Undoped	N	0.8 ~ 2.0 x10 ¹⁵	3600 ~ 4000	0.03 ~ 0.2	5~6 x10 ⁴	Sn	N	0.5 ~ 1.0 x10 ¹⁸ 0.5 ~ 1.0 x10 ¹⁸	200 ~ 2400 1500 ~ 2000	0.001 ~ 0.002 0.0025~0.007	3~5 x10 ⁴	Zn	P	0.8 ~ 2.0 x10 ¹⁸ 2.5 ~ 4.0 x10 ¹⁸	2500 ~ 3500 1300 ~ 1600	0.0025 ~ 0.006	1~ 3 x10 ⁴	Fe	Semi- Insulating	0.1 ~ 1.0	2000	10 ⁷ ~ 10 ⁸	4~ 5 x10 ⁴
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6.	InP-(VGF- Grown) (100) S doped, 2"x0.5mm wafer, 1sp	<p>InP single crystal wafer Growing Method: VGF Orientation: (100) Size: 2" diameter x 0.5 mm Doping: S- doped Conducting type: S-C-N Polish: one side polished Resistivity: (1.8-2.0)x10⁻³ ohm.cm Mobility: 1320-1870 cmE2/V.S EPD: <2000 /cmE2 Carrier Concerntration: (1.7-6.0) x10¹⁸ /cm^3 Ra(Average Roughness): < 0.4 nm</p> <p>Typical Properties</p> <table><tr><td>Dopant</td><td>Type</td><td>Carrier Concentration (cm⁻³)</td><td>Mobility (cm²/V.Sec)</td><td>Resistivity (ohm-cm)</td><td>EPD (cm⁻²)</td></tr></table>	Dopant	Type	Carrier Concentration (cm ⁻³)	Mobility (cm ² /V.Sec)	Resistivity (ohm-cm)	EPD (cm ⁻²)																								
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7.	InP-VGF Grown (111)A Fe doped, 2"x0.35 mm wafer, 1sp, Semi-insulating	<p>InP single crystal wafer Orientation: (111)A Size: 2" diameter x 0.35mm Doping: Fe doped Conducting type: Semi-Insulating Resistivity: (1.8-2.3)E7 ohm.cm Mobility:2050-2300 cm^2/v.s Polish: one side polished Ra(Average Roughness): < 0.4 nm</p> <p>Typical Properties</p> <table><tr><th>Dopant</th><th>Type</th><th>Carrier Concentration (cm⁻³)</th><th>Mobility (cm²/V.Sec)</th><th>Resistivity (ohm-cm)</th><th>EPD (cm⁻²)</th></tr><tr><td>Undoped</td><td>N</td><td>0.8 ~ 2.0 x10¹⁵</td><td>3600 ~ 4000</td><td>0.03 ~ 0.2</td><td>5~6 x10⁴</td></tr><tr><td>Sn</td><td>N</td><td>0.5 ~1.0 x10¹⁸ 0.5 ~1.0 x10¹⁸</td><td>200 ~ 2400 1500 ~ 2000</td><td>0.001 ~ 0.002 0.0025~0.007</td><td>3~5 x10⁴</td></tr><tr><td>Zn</td><td>P</td><td>0.8 ~ 2.0 x10¹⁸ 2.5 ~ 4.0 x10¹⁸</td><td>2500 ~ 3500 1300 ~ 1600</td><td>0.0025 ~ 0.006</td><td>1~ 3 x10⁴</td></tr><tr><td>Fe</td><td>Semi-Insulating</td><td>0.1 ~ 1.0</td><td>2000</td><td>10⁷ ~ 10⁸</td><td>4~ 5 x10⁴</td></tr></table>	Dopant	Type	Carrier Concentration (cm ⁻³)	Mobility (cm ² /V.Sec)	Resistivity (ohm-cm)	EPD (cm ⁻²)	Undoped	N	0.8 ~ 2.0 x10 ¹⁵	3600 ~ 4000	0.03 ~ 0.2	5~6 x10 ⁴	Sn	N	0.5 ~1.0 x10 ¹⁸ 0.5 ~1.0 x10 ¹⁸	200 ~ 2400 1500 ~ 2000	0.001 ~ 0.002 0.0025~0.007	3~5 x10 ⁴	Zn	P	0.8 ~ 2.0 x10 ¹⁸ 2.5 ~ 4.0 x10 ¹⁸	2500 ~ 3500 1300 ~ 1600	0.0025 ~ 0.006	1~ 3 x10 ⁴	Fe	Semi-Insulating	0.1 ~ 1.0	2000	10 ⁷ ~ 10 ⁸	4~ 5 x10 ⁴
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8.	VGF InP (100) Zn doped, 2" x 0.35mm, wafer, 1sp	<p>InP single crystal wafer Growing Method: VGF Orientation: (100) Size: 2" diameter x 0.35 mm Doping: Zn doped Conducting type: S-C Polish: one side polished Resistivity: (6.6-7.0)E-2 ohm.cm Mobility: 82-84 cmE2/V.SEPD:<5000 /cmE2 Carrier Concerntration: (1.1-1.2) E+18 /cm^3 Ra(Average Roughness): < 0.4 nm</p>																														

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9.	VGF InP (100) Fe doped, 2"x0.35 mm wafer, 1sp	<p>VGF InP single crystal wafer Orientation: (100) Size: 2" diameter x 0.35mm Doping: Fe doped Conducting type: Semi-Insulating Resistivity: (0.6-1.4) E7 ohm.cm Mobility: 2200-2380 cmE2/V.s EPD: <5000 /cmE2 Polish: one side polished</p> <table><tr><th colspan="6">Typical Properties</th></tr><tr><th>Dopant</th><th>Type</th><th>Carrier Concentration (cm⁻³)</th><th>Mobility (cm²/V.Sec)</th><th>Resistivity (ohm-cm)</th><th>EPD (cm⁻²)</th></tr><tr><td>Undoped</td><td>N</td><td>0.8 ~ 2.0 x10¹⁵</td><td>3600 ~ 4000</td><td>0.03 ~ 0.2</td><td>5~6 x10⁴</td></tr><tr><td>Sn</td><td>N</td><td>0.5 ~1.0 x10¹⁸ 0.5 ~1.0 x10¹⁸</td><td>200 ~ 2400 1500 ~ 2000</td><td>0.001 ~ 0.002 0.0025~0.007</td><td>3~5 x10⁴</td></tr><tr><td>Zn</td><td>P</td><td>0.8 ~ 2.0 x10¹⁸ 2.5 ~ 4.0 x10¹⁸</td><td>2500 ~ 3500 1300 ~ 1600</td><td>0.0025 ~ 0.006</td><td>1~ 3 x10⁴</td></tr><tr><td>Fe</td><td>Semi-Insulating</td><td>0.1 ~ 1.0</td><td>2000</td><td>10⁷ ~ 10⁸</td><td>4~ 5 x10⁴</td></tr></table>	Typical Properties						Dopant	Type	Carrier Concentration (cm ⁻³)	Mobility (cm ² /V.Sec)	Resistivity (ohm-cm)	EPD (cm ⁻²)	Undoped	N	0.8 ~ 2.0 x10 ¹⁵	3600 ~ 4000	0.03 ~ 0.2	5~6 x10 ⁴	Sn	N	0.5 ~1.0 x10 ¹⁸ 0.5 ~1.0 x10 ¹⁸	200 ~ 2400 1500 ~ 2000	0.001 ~ 0.002 0.0025~0.007	3~5 x10 ⁴	Zn	P	0.8 ~ 2.0 x10 ¹⁸ 2.5 ~ 4.0 x10 ¹⁸	2500 ~ 3500 1300 ~ 1600	0.0025 ~ 0.006	1~ 3 x10 ⁴	Fe	Semi-Insulating	0.1 ~ 1.0	2000	10 ⁷ ~ 10 ⁸	4~ 5 x10 ⁴
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10.	InP (100) undoped, 2" x 0.35 mm wafer, 1sp	<p>InP single crystal wafer Orientation: (100) Size: 2" diameter x 0.35 mm Doping: Un- doped Conducting type: S-C Polish: one side polished Resistivity: (3.2-3.4)^-1 ohm.cm Mobility: 4270-4400cm^2/V.S EPD: <5000 /cm^2 Carrier Concerntration:(4.2-4.6) ^15 /cmE-3</p>																																				

		Typical Properties					
		Dopant	Type	Carrier Concentration (cm ⁻³)	Mobility (cm ² /V.Sec)	Resistivity (ohm-cm)	EPD (cm ⁻²)
		Undoped	N	7.5-9.5 x10 ¹⁵	4300-4400	1.6E-1-4.5E-1	<5000
		Sn	N	0.5 ~1.0 x10 ¹⁸ 0.5 ~1.0 x10 ¹⁸	200 ~ 2400 1500 ~ 2000	0.001 ~ 0.002 0.0025~0.007	3~5 x10 ⁴
		Zn	P	0.8 ~ 2.0 x10 ¹⁸ 2.5 ~ 4.0 x10 ¹⁸	2500 ~ 3500 1300 ~ 1600	0.0025 ~ 0.006	1~ 3 x10 ⁴
		Fe	Semi-Insulating	N/A	1550-1640	(2.1-2.7) x10 ⁷	<5000
11.	InP ,Growing Method: VGF(100) Zn doped,100 mm x 1.0mm, wafer, 1sp	InP single crystal wafer Orientation: (100) Size: 100mm diameter x 1.0 mm Growing Method: VGF Doping: Zn doped Conducting type: S-C Polish: one side polished Resistivity: N/A Mobility: N/A EPD: <=5000 /cmE2 Carrier Concentration: (1-8)x10 ¹⁸ /cm ⁻³ Ra(Average Roughness): < 0.4 nm					
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		Dopant	Type	Carrier Concentration (cm ⁻³)	Mobility (cm ² /V.Sec)	Resistivity (ohm-cm)	EPD (cm ⁻²)
		Undoped	N	0.8 ~ 2.0 x10 ¹⁵	3600 ~ 4000	0.03 ~ 0.2	5~6 x10 ⁴
		Sn	N	0.5 ~1.0 x10 ¹⁸ 0.5 ~1.0 x10 ¹⁸	200 ~ 2400 1500 ~ 2000	0.001 ~ 0.002 0.0025~0.007	3~5 x10 ⁴
		Zn	P	0.8 ~ 2.0 x10 ¹⁸ 2.5 ~ 4.0 x10 ¹⁸	2500 ~ 3500 1300 ~ 1600	0.0025 ~ 0.006	1~ 3 x10 ⁴
		Fe	Semi-Insulating	0.1 ~ 1.0	2000	10 ⁷ ~ 10 ⁸	4~ 5 x10 ⁴

35. InSb

A. InSb Ge-doped

No.	Item	Description
1.	InSb (100) 10x10x 0.45 mm, P type, Ge doped, 1 side polished	<p>10x10x0.45 mm InSb wafer (P type, Ge doped) Size: 10x10x0.45 mm Orientation: <100> +/-0.2° with two reference flats Polishing: one-side side polishd (back side etched) Packing: Sealed under nitrogen with single wafer container in 1000 class clean room</p> <p><u>Properties:</u> Growth method: LEC Orientation: (100) +/- 0.2° Orientation Flat Doping: Ge ndoped Conductivity type: P type Carrier Concentration: (0.05- 0.50)E17@77K</p>
2.	InSb (100) 2" dia x 0.4 mm, P type, Ge doped , 1 sided polished, Carrier Conc: 1.45 x 10 ¹⁵ /cc	<p>2" InSb wafer (P type, Ge doped) Size: 2" dia x 0.4mm thick Orientation: <100> +/-0.2 ° Polishing: one side polishd Packing: Sealed in nitrogen in single wafer container at 1000 class clean room</p> <p><u>Properties:</u> Growth method: LEC Orientation: (100) +/- 0.5 ° Orientation Flat: N/A Doping: Ge Conductivity type: P Type Carrier Concentration: 1.45x10¹⁵/cc Mobility: 7860 cm²/Vs EPD: <200 / cm 2 Resistivity: 5.46x10E-1 ohm.cm</p>
3.	InSb (100) 2" dia x 0.45 mm, P type, Ge doped , 1 sided polished , carrier conc: (0.05- 0.50)x10 ¹⁷ /cc	<p>2" InSb wafer (P type, Ge doped) Size: 2" dia x 0.45mm thick Orientation: <100> +/-0.2 ° Polishing: one side polishd Packing: Sealed in nitrogen in single wafer container at 1000 class clean room</p> <p><u>Properties:</u> Growth method: LEC Orientation: (100) +/- 0.5 ° Orientation Flat: N/A Doping: Ge Conductivity type: P Type Carrier Concentration: (0.05-0.50)x10¹⁷/cc</p>

		Mobility: $> (4.0-8.4) \times 10^3 \text{ cm}^2/\text{Vs}$ EPD: $<200 / \text{cm}^2$
4.	InSb (100) 2" dia x 0.45 mm, P type, Ge doped , 1 sided polished , CC: $2.04 \times 10^{17}/\text{cc}$ -1	2" InSb wafer (P type, Ge doped) Size: 2" dia x 0.45mm thick Orientation: $\langle 100 \rangle \pm 0.2^\circ$ Polishing: one side polishd Packing: Sealed in nitrogen in single wafer container at 1000 class clean room <u>Properties:</u> Growth method: LEC Orientation: (100) $\pm 0.5^\circ$ Orientation Flat: N/A Doping: Ge Conductivity type: P Type Carrier Concentration: $2.04 \times 10^{17}/\text{cc}$ Mobility: $1350 \text{ cm}^2/\text{Vs}$ EPD: $\leq 200 / \text{cm}^2$ Resistivity: $3.5 \times 10^{-2} \text{ ohm.cm}$
5.	InSb (100) 2" dia x 0.45 mm, P type, Ge doped , 2 sided polished , CC: $1.35 \times 10^{15}/\text{cc}$	2" InSb wafer (P type, Ge doped) Size: 2" dia x 0.45mm thick Orientation: $\langle 100 \rangle \pm 0.2^\circ$ Polishing: two sides polishd Packing: Sealed in nitrogen in single wafer container at 1000 class clean room <u>Properties:</u> Growth method: LEC Orientation: (100) $\pm 0.5^\circ$ Orientation Flat: N/A Doping: Ge Conductivity type: P Type Carrier Concentration: $1.35 \times 10^{15}/\text{cc}$ Mobility: $6300 \text{ cm}^2/\text{Vs}$ EPD: $\leq 200 / \text{cm}^2$ Resistivity: $7.34 \times 10^{-1} \text{ ohm.cm}$

B. InSb Te-doped

No.	Item	Description
1.	InSb (100) 10x10x 0.45 mm, N type, Te doped, 1 side polished	10x10x0.45 mm InSb wafer (N type, Te doped) Size: 10x10x0.45 mm Orientation: $\langle 100 \rangle \pm 0.2^\circ$ with two reference flats Polishing: one-side side polishd (back side etched) Packing: Sealed under nitrogen with single wafer container in 1000 class clean room <u>Properties:</u> Growth method: LEC Orientation: (100) $\pm 0.2^\circ$

		<p>Orientation Flat: Two <010> and <001> Doping: Te doped Conductivity type: N type Carrier Concentration: (0.19- 0.5)E18 @77K Mobility: >(3.58-5.6)E4 cm²/Vs EPD: <1200 - 1500 / cm²</p>
2.	InSb (100) 2" dia x 0.45 mm, Te doped, N type, 1 side polished	<p>2" InSb wafer (N type, Te Doped) Size: 2" dia x 0.45mm thick Orientation: <100> +/-0.2 ° Polishing: one side polishd Packing: Sealed in nitrogen in single wafer container at 1000 class clean room</p> <p><u>Properties:</u> Growth method: LEC Orientation: (100) +/- 0.2 ° Orientation Flat: Two reference flats at <100> Doping: Te Conductivity type: N type Carrier Concentration: (0.1-0.3)E18/cc Mobility</p>
3.	InSb (111)- A 2" dia x 0.45 mm, Te-doped, N type, 1 side(In) polished	<p>2" InSb wafer (N type, Te-doped) Size: 2" dia x 0.45mm thick Orientation: <111> +/-0.5o with two reference flats Polishing: one-side (In) polishd (back side etched) Packing: Sealed under nitrogen with single wafer container in 1000 class clean room</p> <p><u>Properties:</u> Growth method: LEC Orientation: (111) +/- 0.5° Orientation Flat: <110> .<112> Doping: Te-doped Conductivity type: N type Resistivity: (1.1-3.3) x10E-4 ohm.cm Carrier Concentration: 5E17-2E18 cmE-2 Mobility: 24000-34000 cm²/Vs EPD: 1x10E3 / cm -2</p>
4.	InSb (111)- B 2" dia x 0.45 mm, Te-doped, N type, 1 side(Sb) polished	<p>2" InSb wafer (N type, Te-doped) Size: 2" dia x 0.45mm thick Orientation: <111> +/-0.5o with two reference flats Polishing: one-side side(Sb) polishd (back side etched) Packing: Sealed under nitrogen with single wafer container in 1000 class clean room</p> <p><u>Properties:</u> Growth method: LEC Orientation: (111) +/- 0.5° Orientation Flat <110> .<112> Doping: Te-doped</p>

		Conductivity type: N type Resistivity: $(1.1-3.3) \times 10^{-4}$ ohm.cm Carrier Concentration: $5 \times 10^{17}-2 \times 10^{18}$ cmE-2 Mobility: $24000-34000$ cm ² /Vs EPD: 1×10^3 / cm -2
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C. InSb undoped

No.	Item	Description
1.	InSb (100) 10x10x 0.45 mm, Undoped, N type, 1 side polished	<p>InSb substrate 10x10x0.45 mm (N type, undoped) Size: 10x10x0.45 mm Orientation: $\langle 100 \rangle \pm 0.2^\circ$ Polishing: one-side side polished (back side etched) Packing: Sealed under nitrogen with single wafer container in 1000 class clean room</p> <p><u>Properties:</u> Growth method: LEC Orientation (100) $\pm 0.2^\circ$ Orientation Flat Doping: Undoped Conductivity type: N type Carrier Concentration: $(0.1-0.85)E15$ @77K Mobility: $(5.0-3.5)E5$ cm²/Vs EPD: <200 / cm²</p>
2.	InSb (100) 2" dia x 0.45 mm, Undoped, N type, 1 side polished	<p>2" InSb wafer (N type, undoped) Size: 2" dia x 0.45mm thick Orientation: $\langle 100 \rangle \pm 0.2^\circ$ with two reference flats Polishing: one-side side polishd (back side etched) Packing: Sealed under nitrogen with single wafer container in 1000 class clean room</p> <p><u>Properties:</u> Growth method: LEC Orientation: (100) $\pm 0.2^\circ$ Orientation Flat: (100) Doping: Undoped Conductivity type: N type Carrier Concentration: $(0.1-0.3)E15$ @77K Mobility: N/A EPD: N/A</p>
3.	InSb (111)-A 2" dia x 0.45 mm, Undoped, N type, In- side polished	<p>2" InSb wafer (N type, undoped) Size: 2" dia x 0.45mm thick Orientation: $\langle 111 \rangle \pm 0.5^\circ$ with two reference flats Polishing: In-side side polishd (back side etched) Packing: Sealed under nitrogen with single wafer container in 1000 class clean room</p>

		<u>Properties:</u> Growth method: LEC Orientation: (111) +/- 0.5° Orientation Flat Doping: Undoped Conductivity type: N type Carrier Concentration: (0.1-0.3)E15 @77K
4.	InSb (111)-B 2" dia x 0.45 mm, Undoped, N type, Sb- side polished	2" InSb wafer (N type, undoped) Size: 2" dia x 0.45mm thick Orientation: <111> +/-0.5° with two reference flats Polishing: Sb-side side polisd (back side etched) Packing: Sealed under nitrogen with single wafer container in 1000 class clean room <u>Properties:</u> Growth method: LEC Orientation: (111) +/- 0.5° Orientation Flat Doping: Undoped Conductivity type: N type Carrier Concentration: (0.1-0.3)E15 @77K

36. KTaO3

No.	Item	Description
1.	KTaO3 (100) 5x5x0.5 mm, 2sp	<u>Properties:</u> Orientation: (100) +/-0.5° Edge // <001> & <010> Size: 5mm x 5mm x 0.5mm Polish: two sides polish Surface roughness: < 5A Packed in 1000 cls clean room and plastic bag
2.	KTaO3, (100), 5 x5 x0.5mm, 1sp	<u>Properties:</u> Orientation: (100) +/-0.5° Edge // <001> & <010> Size: 5mm x 5mm x 0.5mm Polish: one side polish Surface roughness: < 5A
3.	KTaO3, (110), 5 x5 x0.5mm, 1sp	<u>Properties:</u> Orientation: (110) +/-0.5° Size: 5mm x 5mm x 0.5mm Polish: one side polish Surface roughness: < 5A
4.	KTaO3, (111), 5 x5 x0.5mm, 1sp	<u>Properties:</u> Orientation: (111) +/-0.5° Size: 5mm x 5mm x 0.5mm Polish: one side polish

		Surface roughness: < 5A
5.	KTaO ₃ (100) 10x10 x 0.5 mm, 1sp - New Crystal for ferroelectric film	<u>Properties:</u> Orientation: (100) +/-0.5° Edge // <001> & <010> Size: 10mm x 10mm x 0.5mm Polish: one side polished Surface roughness: < 5A Packed in 1000 class clean room and 100 class plastic bag
6.	KTaO ₃ (100) 10x10x0.5 mm, 2sp	<u>Properties:</u> Orientation: (100) +/-0.5° Edge // <001> & <010> Size: 10mm x 10mm x 0.5mm Polish: two sides polish Surface roughness < 5A
7.	KTaO ₃ (110) 10x10x0.5 mm 1sp	<u>Specifications:</u> Single crystal KTaO ₃ Orientation: (110) Size: 10mm x 10mm x 0.5mm Polish: one side polish Surface Roughness: < 10A
8.	KTaO ₃ (110) 10x10x0.5 mm 2sp	<u>Specifications:</u> Single crystal KTaO ₃ Orientation: (110) Size: 10mm x 10mm x 0.5mm Polish: both sides polish
9.	KTaO ₃ (111) 10x10x0.5 mm 1sp	<u>Specifications:</u> Single crystal KTaO ₃ Orientation: (111) Size: 10mm x 10mm x 0.5mm Polish: One side polish
10.	KTaO ₃ (111) 10x10x0.5 mm 2sp	<u>Specifications:</u> Single crystal KTaO ₃ Orientation: (111) Size: 10mm x 10mm x 0.5mm Polish: both sides polish

37. KTN (KTaNbO₃)

No.	Item	Description
1.	KTN (100) 5x5x0.5mm, 2sp,	<u>Properties:</u> Orientation: (100) +/-0.5 ° Size: 5x 5 mm x 0.5mm Polish: two sides optical grade polished

		Surface roughness: < 5A Packed: each in membrane box
2.	KTN (100) 4.5x4.5x0.5 2sp,	<u>Properties:</u> Orientation: (100) +/-0.5 ° Size: 4.5 mm x 4.5 mm x 0.5mm Polish: two sides optical grade polished Surface roughness: < 5A Packed: each in membrane box
3.	KTN (100) 10x10x0.5 2sp,	Single crystal KTN (KTa _{1-x} Nb _x O ₃) is transparent isotropic crystal with very large electro-optic coefficients of about >600 pm/V, which is 20 times larger than that of conventional LiNbO ₃ . <u>Properties:</u> Orientation: (100) +/-0.5 ° Size: 10mm x 10mm x 0.5mm Polish: two sides optical grade polished Surface roughness: < 5A Packed: each in membrane box

38. LaAlO₃

A. Squar LaAlO₃ Substrates

No.	Item	Description
1.	LaAlO ₃ (100) orn. 5 x 5 x 0.3 mm substrate , 2 side polished	<u>Specifications:</u> Wafer Size: 5 x 5 x 0.3 mm thickness +/-0.05 mm, Wafer Orientation: (100) +/-0.5 Deg Polishing: Two sides CMP polished with free sub-surface damaged. Surface finish (RMS or Ra): < 10A Packed: Under 1000 class clean room. (EPI ready) and in 100 grade plastic bag in a wafer container.
2.	LaAlO ₃ (100) orn. 5 x 5 x 0.5 mm substrate , 2 side Epi polished	<u>Specifications:</u> Wafer Size: 5 x 5 x 0.5 mm thickness +/-0.05 mm, Wafer Orientation: (100) +/-0.5 Deg Polishing: Two sides CMP polished with free sub-surface damaged. Surface finish (RMS or Ra): < 10A Packed: Under 1000 class clean room. (EPI ready) and in 100 grade plastic bag in a wafer container.
3.	LaAlO ₃ , (100) orn. 10 x 5 x 0.5 mm substrate , 1 side Epi polished	<u>Specifications:</u> Wafer Size: 10 x 5 x 0.5 mm thickness +/-0.05 mm, Wafer Orientation: (100) +/-0.5 Deg Polishing: One side CMP polished with free sub-surface damaged. Surface finish (RMS or Ra): < 10A Packed: Under 1000 class clean room. (EPI ready) and in 100 grade plastic bog in a wafer container.

4.	LaAlO ₃ , (100) orn. 5 x 5 x 0.5 mm substrate , 1 side Epi polished	<p><u>Specifications:</u> Wafer Size: 5 x 5 x 0.5 mm thickness +/-0.05 mm, Wafer Orientation: (100) +/-0.5 Deg Polishing: One side CMP polished with free sub-surface damaged. Surface finish (RMS or Ra): < 10A Packed: Under 1000 class clean room. (EPI ready) and in 100 grade plastic bog in a wafer container.</p>
5.	LaAlO ₃ , (100) orn. 0.25" x 0.25" x 0.5 mm substrate , 1 side Epi polished	<p><u>Specifications:</u> Wafer Size: 0.25" x 0.25" x 0.5 mm thickness +/-0.05 mm, Wafer Orientation: (100) +/-0.5 Deg Polishing: One side CMP polished with free sub-surface damaged. Surface finish (RMS or Ra): < 10A Packed: Under 1000 class clean room. (EPI ready) and in 100 grade plastic bag in a wafer container.</p>
6.	LaAlO ₃ , (100) ori. 10x10x1.0 mm substrate , 2 side EPI polished	<p>LaAlO₃ single crystal provides a good lattice match to many materials with perovskite structure. It is an excellent substrate for epitaxial growth of high T_c superconductors, magnetic and ferro-electric thin films. The dielectric properties of LaAlO₃ crystal are well suitable for low loss microwave and dielectric resonance applications.</p> <p><u>Specifications:</u> Wafer Size: 10 x 10 mm x 1.0 mm thickness +/-0.05 mm, Wafer Orientation: (100) +/-0.5 Deg Polishing: Two sides CMP polished with free sub-surface damaged. Surface finish (RMS or Ra): < 10A Packed: Under 1000 class clean room. (EPI ready) and in 100 grade plastic bag in a wafer container.</p>
7.	LaAlO ₃ , (100) ori. 10x10x1.0 mm substrate, 1 side EPI polished	<p>LaAlO₃ single crystal provides a good lattice match to many materials with perovskite structure. It is an excellent substrate for epitaxial growth of high T_c superconductors, magnetic and ferro-electric thin films. The dielectric properties of LaAlO₃ crystal are well suitable for low loss microwave and dielectric resonance applications.</p> <p><u>Specifications:</u> Wafer Size: 10 x 10 mm x 1.0 mm thickness +/-0.05 mm, Wafer Orientation: (100) +/-0.5 Deg Polishing: one side CMP polished with free sub-surface damaged. Surface finish (RMS or Ra): < 10A Packed: Under 1000 class clean room. (EPI ready) and in 100 grade plastic bag in a wafer container.</p>
8.	LaAlO ₃ , (100) ori 10x10x 0.45mm substrate , 1 side EPI polished	<p>LaAlO₃ single crystal provides a good lattice match to many materials with perovskite structure. It is an excellent substrate for epitaxial growth of high T_c superconductors, magnetic and ferro-electric thin films. The dielectric properties of LaAlO₃ crystal are well suitable for low loss microwave and dielectric resonance applications.</p>

		<p><u>Specifications:</u> Wafer Size: 10mm x 10 mm x 0.45 mm thickness +/-0.05 mm, Wafer Orientation: (100) +/-0.5 Deg Polishing: One side CMP polished with free sub-surface damaged. Surface finish (RMS or Ra): < 10A Packed: Under 1000 class clean room. (EPI ready) and in 100 grade plastic bag in a wafer container.</p>
9.	LaAlO ₃ , (100) ori 10x10x 0.5mm substrate, 1 side EPI polished	<p>LaAlO₃ single crystal provides a good lattice match to many materials with perovskite structure. It is an excellent substrate for epitaxial growth of high T_c superconductors, magnetic and ferro-electric thin films. The dielectric properties of LaAlO₃ crystal are well suitable for low loss microwave and dielectric resonance applications.</p> <p><u>Specifications:</u> Wafer Size: 10 x 10 mm x 0.5 mm thickness +/-0.05 mm, Wafer Orientation: (100) +/-0.5 Deg Polishing: One side CMP polished with free sub-surface damaged. Surface finish (RMS or Ra): < 10A Packed: Under 1000 class clean room. (EPI ready) and in 100 grade plastic bag in a wafer container.</p>
10.	LaAlO ₃ , (100) ori. 10x10x 0.5mm substrate, 2 side EPI polished	<p>LaAlO₃ single crystal provides a good lattice match to many materials with perovskite structure. It is an excellent substrate for epitaxial growth of high T_c superconductors, magnetic and ferro-electric thin films. The dielectric properties of LaAlO₃ crystal are well suitable for low loss microwave and dielectric resonance applications.</p> <p><u>Specifications:</u> Wafer Size: 10 x 10 mm x 0.5 mm thickness +/-0.05 mm, Wafer Orientation: (100) +/-0.5 Deg Polishing: Two sides CMP polished with free sub-surface damaged. Surface finish (RMS or Ra): < 10A Packed: Under 1000 class clean room. (EPI ready) and in 100 grade plastic bag in a wafer container.</p>
11.	single crystal LaAlO ₃ wafer, (100), 0.5"x 0.5" x 0.5mm, EPI ready for 1 side polished	<p>LaAlO₃ single crystal provides a good lattice match to many materials with perovskite structure. It is an excellent substrate for epitaxial growth of high T_c superconductors, magnetic and ferro-electric thin films. The dielectric properties of LaAlO₃ crystal are well suitable for low loss microwave and dielectric resonance applications.</p> <p><u>Specifications:</u> Wafer Size: 0.5" x 0.5" x 0.5 mm thickness +/-0.05 mm, Wafer Orientation: (100) +/-0.5 Deg Polishing: CMP polished with free sub-surface damaged. Please choose one side or tow side polished from " option " Surface finish (RMS or Ra): < 10A Packed: Under 1000 class clean room. (EPI ready) and in 100 grade plastic bag in a wafer container.</p>
12.	single crystal LaAlO ₃ wafer, (100), 0.5"x 0.5" x 0.5mm, EPI ready for 2	<p>LaAlO₃ single crystal provides a good lattice match to many materials with perovskite structure. It is an excellent substrate for epitaxial growth of</p>

	side polished	<p>high Tc superconductors, magnetic and ferro-electric thin films. The dielectric properties of LaAlO₃ crystal are well suitable for low loss microwave and dielectric resonance applications.</p> <p><u>Specifications:</u> Wafer Size: 0.5" x 0.5" x 0.5 mm thickness +/-0.05 mm, Wafer Orientation: (100) +/-0.5 Deg Polishing: CMP polished with free sub-surface damaged. Please choose one side or tow side polished from "option" Surface finish (RMS or Ra): < 10A Packed</p>
13.	LaAlO ₃ , (100) orn. 1"x 1" x 0.5mm substrate , 2 side epi polished	<p>LaAlO₃ single crystal provides a good lattice match to many materials with perovskite structure. It is an excellent substrate for epitaxial growth of high Tc superconductors, magnetic and ferro-electric thin films. The dielectric properties of LaAlO₃ crystal are well suitable for low loss microwave and dielectric resonance applications.</p> <p><u>Specifications:</u> Wafer Size: 1" x 1" x 0.5 mm thickness +/-0.05 mm, Wafer Orientation: (100) +/-0.5 Deg Polishing: Two sides CMP polished with free sub-surface damaged. Please choose one side or two side polished from " option " Surface finish (RMS or Ra): < 10A Packed: Under 1000 class clean room. (EPI ready) and in 100 grade plastic bag in a wafer container.</p>
14.	LaAlO ₃ , (100) orn. 20x20 x 0.5mm substrate , 2 side epi polished	<p>LaAlO₃ single crystal provides a good lattice match to many materials with perovskite structure. It is an excellent substrate for epitaxial growth of high Tc superconductors, magnetic and ferro-electric thin films. The dielectric properties of LaAlO₃ crystal are well suitable for low loss microwave and dielectric resonance applications.</p> <p><u>Specifications:</u> Wafer Size: 20x20 x 0.5 mm thickness +/-0.05 mm, Wafer Orientation: (100) +/-0.5 Deg Polishing: Two sides CMP polished with free sub-surface damaged. Please choose one side or two side polished from " option " Surface finish (RMS or Ra): < 10A Packed: Under 1000 class clean room. (EPI ready) and in 100 grade plastic bag in a wafer container.</p>
15.	LaAlO ₃ ,(100) orn. 1"x 1" x 0.5mm substrate, 1 side epi polished	<p>LaAlO₃ single crystal provides a good lattice match to many materials with perovskite structure. It is an excellent substrate for epitaxial growth of high Tc superconductors, magnetic and ferro-electric thin films. The dielectric properties of LaAlO₃ crystal are well suitable for low loss microwave and dielectric resonance applications.</p> <p><u>Specifications:</u> Wafer Size: 1" x 1" x 0.5 mm thickness +/-0.05 mm, Wafer Orientation: (100) +/-0.5 Deg Polishing: One side CMP polished with free sub-surface damaged. Surface finish (RMS or Ra): < 10A</p>

		Packed Under 1000 class clean room. (EPI ready) and in 100 grade plastic bag in a wafer container.
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B. Round LaAlO₃ Wafer

No.	Item	Description
1.	LaAlO ₃ , (100) Orn. 0.5" x 0.5mm wafer 2SP	<p>LaAlO₃ single crystal provides a good lattice match to many materials with perovskite structure. It is an excellent substrate for epitaxial growth of high T_c superconductors, magnetic and ferro-electric thin films. The dielectric properties of LaAlO₃ crystal are well suitable for low loss microwave and dielectric resonance applications.</p> <p><u>Specifications:</u> Wafer Size: 0.5" dia +/- 0.5 mm x 0.5 thickness +/-0.05 mm, Wafer Orientation: (100) +/-0.5 Deg Edge Orientation: <100> +/-1 Deg with 4 mm Length Polishing: CMP polished with free sub-surface damaged. Surface finish (RMS or Ra): < 10A Packed: Under 1000 class clean room, and in 100 grade plastic bag in a wafer container.</p>
2.	LaAlO ₃ , (100) Orn. 1" x 0.5mm wafer 1 SP	<p>LaAlO₃ single crystal provides a good lattice match to many materials with perovskite structure. It is an excellent substrate for epitaxial growth of high T_c superconductors, magnetic and ferro-electric thin films. The dielectric properties of LaAlO₃ crystal are well suitable for low loss microwave and dielectric resonance applications.</p> <p><u>Specifications:</u> Wafer Size: 1" dia +/- 0.5 mm x 0.5 thickness +/-0.05 mm, Wafer Orientation: (100) +/-0.5 Deg Edge Orientation: <001> +/-1 Deg with 16 mm Length Polishing: CMP polished with free sub-surface damaged. Surface finish (RMS or Ra): < 10A Packed: Under 1000 class clean room, and in 100 grade plastic bag in a wafer container.</p>
3.	LaAlO ₃ , (100) Orn. 1" x 0.5mm wafer 2 SP	<p>LaAlO₃ single crystal provides a good lattice match to many materials with perovskite structure. It is an excellent substrate for epitaxial growth of high T_c superconductors, magnetic and ferro-electric thin films. The dielectric properties of LaAlO₃ crystal are well suitable for low loss microwave and dielectric resonance applications.</p> <p><u>Specifications:</u> Wafer Size: 1" dia +/- 0.5 mm x 0.5 thickness +/-0.05 mm, Wafer Orientation: (100) +/-0.5 Deg Edge Orientation: <001> +/-1 Deg with 16 mm Length Polishing: CMP polished with free sub-surface damaged. Surface finish (RMS or Ra): < 10A Packed: Under 1000 class clean room, and in 100 grade plastic bag in a wafer container.</p>

4.	LaAlO ₃ , (100) Orn. EPI polishing 2" x 0.5mm wafer 1 SP	<p>LaAlO₃ single crystal provides a good lattice match to many materials with perovskite structure. It is an excellent substrate for epitaxial growth of high T_c superconductors, magnetic and ferro-electric thin films. The dielectric properties of LaAlO₃ crystal are well suitable for low loss microwave and dielectric resonance applications.</p> <p><u>Specifications:</u> Wafer Size: 2" dia +/- 0.5 mm x 0.5 thickness +/-0.05 mm, Wafer Orientation: (100) +/-0.5 Deg Edge Orientation: <001> +/-1 Deg with 16 mm Length Polishing: CMP polished with free sub-surface damaged. Surface finish (RMS or Ra): < 8A Packed: Under 1000 class clean room, and in 100 grade plastic bag in a wafer container.</p>
5.	LaAlO ₃ , (100) Orn. EPI polishing 2" x 0.5mm wafer 2 SP	<p>LaAlO₃ single crystal provides a good lattice match to many materials with perovskite structure. It is an excellent substrate for epitaxial growth of high T_c superconductors, magnetic and ferro-electric thin films. The dielectric properties of LaAlO₃ crystal are well suitable for low loss microwave and dielectric resonance applications.</p> <p><u>Specifications:</u> Wafer Size: 2" dia +/- 0.5 mm x 0.5 thickness +/-0.05 mm, Wafer Orientation: (100) +/-0.5 Deg Edge Orientation: <001> +/-1 Deg with 16 mm Length Polishing: CMP polished with free sub-surface damaged. Surface finish (RMS or Ra) :: < 10A Packed: Under 1000 class clean room, and in 100 grade plastic bag in a wafer container.</p>
6.	LaAlO ₃ , (100) Orn. EPI polishing 2" x 1.0 mm wafer 2SP	<p>LaAlO₃ single crystal provides a good lattice match to many materials with perovskite structure. It is an excellent substrate for epitaxial growth of high T_c superconductors, magnetic and ferro-electric thin films. The dielectric properties of LaAlO₃ crystal are well suitable for low loss microwave and dielectric resonance applications.</p> <p><u>Specifications:</u> Wafer Size: 2" dia +/- 0.5 mm x 1.0 thickness +/-0.05 mm, Wafer Orientation: (100) +/-0.5 Deg Edge Orientation: <001> +/-1 Deg with 16 mm Length Polishing: Two sides CMP polished with free sub-surface damaged. Surface finish (RMS or Ra): < 10A Packed: Under 1000 class clean room, and in 100 grade plastic bag in a wafer container</p>
7.	LaAlO ₃ , (100) Orn. EPI polishing 3" x 0.5mm wafer 2 SP	<p>LaAlO₃ single crystal provides a good lattice match to many materials with perovskite structure. It is an excellent substrate for epitaxial growth of high T_c superconductors, magnetic and ferro-electric thin films. The dielectric properties of LaAlO₃ crystal are well suitable for low loss microwave and dielectric resonance applications.</p>

		<p><u>Specifications:</u> Wafer Size: 3" dia +/- 0.5 mm x 0.5 thickness +/-0.05 mm, Wafer Orientation: (100) +/-0.5 Deg Edge Orientation: <001> +/-1 Deg with 16 mm Length Polishing: CMP polished with free sub-surface damaged. Surface finish (RMS or Ra): < 10A Packed: Under 1000 class clean room, and in 100 grade plastic bag in a wafer container.</p>
8.	LaAlO ₃ , (100) orn. EPI polishing 3" x 0.5mm wafer 1 SP	<p>LaAlO₃ single crystal provides a good lattice match to many materials with perovskite structure. It is an excellent substrate for epitaxial growth of high T_c superconductors, magnetic and ferro-electric thin films. The dielectric properties of LaAlO₃ crystal are well suitable for low loss microwave and dielectric resonance applications.</p> <p><u>Specifications:</u> Wafer Size: 3" dia +/- 0.5 mm x 0.5 thickness +/-0.05 mm, Wafer Orientation: (100) +/-0.5 Deg Edge Orientation: <001> +/-1 Deg with 20 mm Length Polishing: CMP polished with free sub-surface damaged. Surface finish (RMS or Ra): < 10A Packed: Under 1000 class clean room. (EPI ready) and in 100 grade plastic bag in a wafer container.</p>

C. Special Orientation LaAlO₃ Substrate

No.	Item	Description
1.	LaAlO ₃ , (110) 10x10x0.5 mm substrate, 2 side Epi polished	<p><u>Specifications:</u> Wafer Size: 10 x 10 x 0.5 mm thickness +/-0.05 mm, Wafer Orientation: (110) +/-0.5 Deg Polishing: Two sides CMP polished with free sub-surface damaged. Surface finish (RMS or Ra): < 10A Packed: Under 1000 class clean room, and in 100 grade plastic bag in a wafer container.</p>
2.	LaAlO ₃ , (110) 10x10x0.5 mm substrate, 1 side Epi polished	<p><u>Specifications:</u> Wafer Size: 10 x 10 x 0.5 mm thickness +/-0.05 mm, Wafer Orientation: (110) +/-0.5 Deg Polishing: One side CMP polished with free sub-surface damaged. Surface finish (RMS or Ra): < 10A Packed: Under 1000 class clean room, and in 100 grade plastic bag in a wafer container.</p>
3.	LaAlO ₃ , (110) 5x5x0.5 mm substrate, one side Epi polished	<p><u>Specifications:</u> Wafer Size: 5x5 x 0.5 mm thickness +/-0.05 mm, Wafer Orientation: (110) +/-0.5 Deg Polishing: One side CMP polished with free sub-surface damaged. Surface finish (RMS or Ra): < 10A Packed: Under 1000 class clean room, and in 100 grade plastic bag in a wafer container.</p>

4.	LaAlO ₃ , (110) 5x5x0.5 mm substrate, two sides Epi polished	<p><u>Specifications:</u> Wafer Size: 5x5 x 0.5 mm thickness +/-0.05 mm, Wafer Orientation: (110) +/-0.5 Deg Polishing: two sides EPI polished with free sub-surface damaged. Surface finish (RMS or Ra): < 10A Packed: Under 1000 class clean room, and in 100 grade plastic bag in a wafer container.</p>
5.	LaAlO ₃ , (111) 10x10x0.5 mm substrate, 2 sides Epi polished	<p><u>Specifications:</u> Wafer Size: 10 x 10 x 0.5 mm thickness +/-0.05 mm, Wafer Orientation: (111) +/-0.5 Deg Polishing: Two sides CMP polished with free sub-surface damaged. Surface finish (RMS or Ra): < 10A Packed: Under 1000 class clean room, and in 100 grade plastic bag in a wafer container.</p>
6.	LaAlO ₃ , (111) 5x5x0.5 mm substrate, one side Epi polished	<p><u>Specifications:</u> Wafer Size: 5x5 x 0.5 mm thickness +/-0.05 mm, Wafer Orientation: (111) +/-0.5 Deg Polishing: One side CMP polished with free sub-surface damaged. Surface finish (RMS or Ra): < 10A Packed: Under 1000 class clean room, and in 100 grade plastic bag in a wafer container.</p>
7.	LaAlO ₃ , (110) Orn. EPI polishing 2" x 0.5mm wafer 1 SP	<p>LaAlO₃ single crystal provides a good lattice match to many materials with perovskite structure. It is an excellent substrate for epitaxial growth of high T_c superconductors, magnetic and ferro-electric thin films. The dielectric properties of LaAlO₃ crystal are well suitable for low loss microwave and dielectric resonance applications.</p> <p><u>Specifications:</u> Wafer Size: 2" dia +/- 0.5 mm x 0.5 thickness +/-0.05 mm, Wafer Orientation: (110) +/-0.5 Deg Edge Orientation: <001> +/-1 Deg with 16 mm Length Polishing: CMP polished with free sub-surface damaged. Surface finish (RMS or Ra): < 10A Packed: Under 1000 class clean room, and in 100 grade plastic bag in a wafer container.</p>
8.	LaAlO ₃ , (110) orn. EPI polishing 3" x 0.5mm wafer 1 SP	<p>LaAlO₃ single crystal provides a good lattice match to many materials with perovskite structure. It is an excellent substrate for epitaxial growth of high T_c superconductors, magnetic and ferro-electric thin films. The dielectric properties of LaAlO₃ crystal are well suitable for low loss microwave and dielectric resonance applications.</p> <p><u>Specifications:</u> Wafer Size: 3" dia +/- 0.5 mm x 0.5 thickness +/-0.05 mm, Wafer Orientation: (110) +/-0.5 Deg Edge Orientation: <001> +/-1 Deg with 20 mm Length Polishing: CMP polished with free sub-surface damaged. Surface finish (RMS or Ra): < 10A Packed: Under 1000 class clean room. (EPI ready) and in 100 grade plastic</p>

		bag in a wafer container.
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39. LaF3

No.	Item	Description
1.	LaF3 (100)ori. 10x10x0.5mm 1sp	<u>Specifications:</u> Size: 10x10x 0.5mm +/-0.05mm Orientation: (100) +/-1.5 ° Polish: One side EPI polished by CMP technology with less sub-surface lattice damage. Surface roughness: < 5 A Pack: Packed in 100 grade plastic bag under 1000 class clean room.
2.	LaF3 (100)ori. 10x10x0.5mm 2sp	<u>Specifications:</u> Size: 10x10x 0.5mm +/-0.05mm Orientation: (100) +/-1.5 ° Polish: Two sides EPI polished by CMP technology with less sub-surface lattice damage. Surface roughness: < 5 A Pack: Packed in 100 grade plastic bag under 1000 class clean room.
3.	LaF3 (110)ori. 10x10x0.5mm 2sp	<u>Specifications:</u> Size: 10x10x 0.5mm +/-0.05mm Orientation: (110) +/-1.5 Deg Polish: Two sides EPI polished by CMP technology with less sub-surface lattice damage. Surface roughness: < 5 A Pack: Packed in 100 grade plastic bag under 1000 class clean room.
4.	LaF3 6.35 mm Dia. x 1.575mm ,fine ground	<u>Specifications:</u> Size: 6.35 mm Dia. x 1.575mm Orientation: (100) +/-1.5 Deg Polish: fine ground, by CMP technology with less sub-surface lattice damage. Surface roughness: < 5 A Pack: Packed in 100 grade plastic bag under 1000 class clean room.
5.	LaF3 (100)ori. 10 mm Dia. x 15 mm 2ep	<u>Specifications:</u> Size: 10 mm Dia. x 15mm +/-0.05mm Orientation: (100) +/-1.5 Deg Polish: two ends polished by CMP technology with less sub-surface lattice damage. Surface roughness: < 5 A Pack: Packed in 100 grade plastic bag under 1000 class clean room.
6.	LaF3 (110)ori. 6 mm Dia. x 0.5mm 1sp	<u>Specifications:</u> Size: 6 mm Dia. x 0.5mm +/-0.05mm Orientation: (100) +/-1.5 ° Polish: One sides EPI polished by CMP technology with less sub-surface lattice damage.

		Surface roughness: < 5 A Pack: Packed in 100 grade plastic bag under 1000 class clean room.
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40. LiAlO₂

No.	Item	Description
1.	LiAlO ₂ (100) 2" dia. x 0.5mm, 1sp	<u>Specifications:</u> Single crystal LiAlO ₂ Lattice constant: Tetragonal a=b=5.17Å c=6.26Å Size: 2" Diameter x 0.5mm Orientation: (100) Al Terminated face in polished surface Polish: one side polished. Surface roughness < 5A
2.	LiAlO ₂ (001) 10x10x0.5mm, 1sp	<u>Specifications:</u> Single crystal LiAlO ₂ Lattice constant: Tetragonal a=b=5.17Å c=6.26Å Size: 10mm x 10mm x 0.5mm Orientation: (001) Polish: one side polished. Surface roughness < 5A
3.	LiAlO ₂ (100) 10x10x0.5mm, 1sp	<u>Specifications:</u> Single crystal LiAlO ₂ Lattice constant: Tetragonal a=b=5.17Å c=6.26Å Size: 10mm x 10mm x 0.5mm Orientation: (100) Polish: one side polished. Surface roughness < 5A
4.	LiAlO ₂ (100) 10x10x0.5mm, 2sp	<u>Specifications:</u> Single crystal LiAlO ₂ Lattice constant: Tetragonal a=b=5.17Å c=6.26Å Size: 10mm x 10mm x 0.5mm Orientation: (100) Polish: one side polished. Surface roughness < 5A

41. LiF

No.	Item	Description
1.	LiF, (100), 10x10x 1.0 mm 1 side polished	<u>Specifications:</u> Crystal: LiF Orientation: <100> +/-1.5 ° Size: 10x10x1.0mm Polished: one side polished

		Package: 1000 class clean plastic bag
2.	LiF, (100), 10x10x 1.0 mm 2 sides polished	<u>Specifications:</u> Crystal: LiF Orientation: $\langle 100 \rangle \pm 1.5^\circ$ Size: 10x10x1.0 mm Polished: two sides polished Package: 1000 class clean plastic bag
3.	LiF, (111), 10x10x 1.0 mm 1 side polished	<u>Specifications:</u> Crystal: LiF Orientation: $\langle 111 \rangle \pm 1.5^\circ$ Size: 10x10x1.0mm Polished: one side polished Package: 1000 class clean plastic bag
4.	LiF, (110), 10x10x 1.0 mm 1 side polished	<u>Specifications:</u> Crystal: LiF Orientation: $\langle 110 \rangle \pm 1.5^\circ$ Size: 10x10x1.0mm Polished: one side polished Package: 1000 class clean plastic bag

42. LiGaO₂

No.	Item	Description
1.	LiGaO ₂ (001) 10x10x0.5mm, 1sp	<u>Specifications:</u> Single crystal LiGaO ₂ Lattice constant: $a=5.406\text{\AA}$ $b=5.012\text{\AA}$ $c=6.379\text{\AA}$ Size: 10mm x 10mm x 0.5mm Orientation: (001) Polish: Single side(Ga-face) polished. Surface roughness < 5A
2.	LiGaO ₂ (010) 10x10x0.5mm, 2sp	<u>Specifications:</u> Single crystal LiGaO ₂ Lattice constant: $a=5.406\text{\AA}$ $b=5.012\text{\AA}$ $c=6.379\text{\AA}$ Size: 10mm x 10mm x 0.5mm Orientation: (010) Polish: Two sides polished. Surface roughness < 5A
3.	LiGaO ₂ (010) 5x5x0.5mm, 2sp	<u>Specifications:</u> Single crystal LiGaO ₂ Lattice constant: $a=5.406\text{\AA}$ $b=5.012\text{\AA}$ $c=6.379\text{\AA}$ Size: 5mm x 5mm x 0.5mm Orientation: (010) Polish: two sides polished.

		Surface roughness < 5A
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43. LiNbO₃

A. SAW Grade LiNbO₃ Wafers

i. LiNbO₃ saw grade X-cut

No.	Item	Description
1.	LiNbO ₃ saw grade, X-cut, 10x10x0.5 mm, 1sp	Saw grade single crystal LiNbO ₃ Purity: > 99.9% Orientation: X-cut Size: 10mm x 10mm x 0.5mm Polish: one side polished
2.	LiNbO ₃ saw grade, X-cut, 2" wafer, 1sp	Saw grade single crystal LiNbO ₃ Purity: > 99.9% Orientation: X-cut Size: 2" diameter x 0.5mm Polish: one side polished
3.	LiNbO ₃ saw grade wafer, X-cut, 3" x0.5 mm, 1sp	Saw grade single crystal LiNbO ₃ Purity: 99.99% Orientation: X-cut Size: 3" diameter x 0.5mm Polish: one side polished

ii. LiNbO₃ saw grade Y-cut

No.	Item	Description
1.	LiNbO ₃ SAW grade, 36 degree off Y-X cut with flat orientation: X cut or <11-20>, 20x20x0.5mm, 1sp	Saw grade single crystal LiNbO ₃ Purity: > 99.9% Orientation: 36 deg Y-X cut with flat orientation: X cut or <11-20> Size: 10mm x 10mm x 0.5mm Polish: one side polished
2.	LiNbO ₃ SAW grade, Y-cut, 10x10x0.5mm, 1sp	Saw grade single crystal LiNbO ₃ Purity: > 99.9% Orientation: Y-cut Size: 10mm x 10mm x 0.5mm Polish: one side polished
3.	LiNbO ₃ SAW grade, Y-cut, 36 degree off 10x10x0.5mm, 1sp	Saw grade single crystal LiNbO ₃ Purity: > 99.9% Orientation: Y-cut with 36 degree off

		Size: 10mm x 10mm x 0.5mm Polish: one side polished
4.	LiNbO3 saw grade wafer, Y-cut, 2"x0.5 mm, 1sp	Saw grade single crystal LiNbO3 Purity: > 99.9% Orientation: Y-cut Size: 2" diameter x 0.5mm Polish: one side polished
5.	LiNbO3 saw grade wafer, Y-cut, 3" x0.5 mm, 1sp	Saw grade single crystal LiNbO3 Purity: > 99.9% Orientation: Y-cut Size: 3" diameter x 0.5mm Polish: one side polished
6.	LiNbO3 saw grade wafer, Y-cut, 4" x0.5 mm, 1sp	Saw grade single crystal LiNbO3 Purity: > 99.9% Orientation: Y-cut Size: 4" diameter x 0.5mm Polish: one side polished
7.	LiNbO3 saw grade wafer, 128 deg. Y/X cut, 3" x1.0 mm, 2sp	Saw grade single crystal LiNbO3 Purity: > 99.9% Orientation: 128 degree Y-X cut Size: 3" diameter x 1.0 mm Polish: two sides polished
8.	LiNbO3 saw grade wafer, 128 deg. Y-X cut, 3" x0.5 mm, 2sp	Saw grade single crystal LiNbO3 Purity: > 99.9% Orientation: 128 degree Y-X cut Size: 3" diameter x 0.5mm Polish: two sides polished
9.	LiNbO3 saw grade wafer, 128 deg. Y-X cut, 4" dia x0.5 mm, 1sp	Saw grade single crystal LiNbO3 Purity: > 99.9% Orientation: 128 degree rotated from the +y through the +Z axis about the X axis Size: 4" diameter x 0.5mm Flats: Primary Flat is normal to the +X axis Secondary flat is 90 degree clockwise from the primary flat when viewing the polished face <+Z/-Y> Polish: one side polished
10.	LiNbO3 saw grade wafer, 128 deg. Y-X cut, 4" dia x0.5 mm, 2sp	Saw grade single crystal LiNbO3 Purity: > 99.9% Orientation: 128 degree rotated from the +y through the +Z axis about the X axis Size: 4" diameter x 0.5mm Flats: Primary Flat is normal to the +X axis

		Secondary flat is 90 degree clockwise from the primary flat when viewing the polished face <+Z/-Y> Polish: Two sides polished
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iii. LiNbO₃ saw grade Z-cut

No.	Item	Description
1.	LiNbO ₃ SAW grade, Z-cut, 10x10x0.5mm, 1sp	Saw grade single crystal LiNbO ₃ Purity: > 99.9% Orientation: Z-cut Size: 10mm x 10mm x 0.5mm Polish: one side polished
2.	LiNbO ₃ saw grade, Z-cut, 2"x0.5mm wafer, 1sp	Saw grade single crystal LiNbO ₃ Purity: > 99.9% Orientation: Z-cut Size: 2" diameter x 0.5mm Polish: one side polished
3.	LiNbO ₃ saw grade wafer, Z-cut, 3" x0.5 mm , 1sp	Saw grade single crystal LiNbO ₃ Purity: > 99.9% Orientation: Z-cut Size: 3" diameter x 0.5mm Polish: one side polished

B. Optical Grade LiNbO₃ Wafers

No.	Item	Description
1.	LiNbO ₃ Op. grade Xcut 4x8x0.275mm 2sp coating	Optical grade single crystal LiNbO ₃ Orientation: X-cut +/-0.5° Size: 4mm x 8mm x 0.275mm Polish: two sides polished Surface roughness: < 8 Å (by AFM)
2.	LiNbO ₃ Op. grade Xcut 4x8x0.55mm 2sp coating	Optical grade single crystal LiNbO ₃ Orientation: X-cut +/-0.5° Size: 4mm x 8mm x 0.55mm Polish: two sides polished Surface roughness: < 8 Å (by AFM)
3.	LiNbO ₃ Op. grade Xcut 4x8x0.825mm 2sp coating	Optical grade single crystal LiNbO ₃ Orientation: X-cut +/-0.5° Size: 4mm x 8mm x 0.825mm Polish: two sides polished Surface roughness: < 8 Å (by AFM)

4.	LiNbO3 Op. grade Xcut 4x8x2.75mm 2sp coating	Optical grade single crystal LiNbO3 Orientation: X-cut $\pm 0.5^\circ$ Size: 4mm x 8mm x 2.75mm Polish: two sides polished Surface roughness: < 8 Å (by AFM)
5.	LiNbO3 optical grade, Z-cut, 5x5x0.5, 2sp	Optical grade single crystal LiNbO3 Orientation: Z-cut $\pm 0.5^\circ$ Size: 5mm x 5mm x 0.5mm Polish: two sides polished Surface roughness: < 8 Å (by AFM)
6.	LiNbO3 optical grade, X-cut, 10x10x0.5mm, 2sp	Optical grade single crystal LiNbO3 Orientation: X-cut $\pm 0.5^\circ$ Size: 10mm x 10mm x 0.5mm Polish: two sides polished Surface roughness: < 8 Å (by AFM)
7.	LiNbO3 optical grade, X-cut, 10x10x1.0mm, 2sp	Optical grade single crystal LiNbO3 Orientation: X-cut $\pm 0.5^\circ$ Size: 10mm x 10mm x 1.0mm Polish: two sides polished Surface roughness: < 8 Å (by AFM)
8.	LiNbO3 optical grade, Y-cut, 10x10x0.5mm, 2sp	Optical grade single crystal LiNbO3 Orientation: Y-cut $\pm 0.5^\circ$ Size: 10mm x 10mm x 0.5mm Polish: two sides polished Surface roughness: < 8 Å (by AFM)
9.	LiNbO3 optical grade, Z-cut, 10x10x0.1, 2sp	Optical grade single crystal LiNbO3 Orientation: Z-cut $\pm 0.5^\circ$ Size: 10mm x 10mm x 0.1mm Polish: two sides polished Surface roughness: < 8 Å (by AFM)
10.	LiNbO3 optical grade, Z-cut, 10x10x0.5mm, 2sp	Optical grade single crystal LiNbO3 Orientation: Z-cut $\pm 0.5^\circ$ Size: 10mm x 10mm x 0.5mm Polish: two sides polished Surface roughness: < 8 Å (by AFM)
11.	LiNbO3 wafer, optical grade, X-cut, 3" x0.5mm, 2sp	Optical grade single crystal LiNbO3 Orientation: X-cut $\pm 0.5^\circ$ Size: 3" diameter x 0.5mm Polish: two sides polished Surface roughness: < 8 Å (by AFM)

12.	LiNbO3 wafer, optical grade, X-cut, 2" x0.5mm , 2sp	Optical grade single crystal LiNbO3 Orientation: X-cut +/-0.5 ° Size: 2" diameter x 0.5mm Polish: two sides polished Surface roughness: < 8 Å (by AFM)
13.	LiNbO3 wafer, optical grade, Y-cut, 2"x0.5mm, 2sp	Optical grade single crystal LiNbO3 Orientation: Y-cut Size: 2" diameter x 0.5mm Polish: two sides polished Surface roughness: < 8 Å (by AFM)
14.	LiNbO3 wafer, optical grade, Y-cut, 3" x0.5mm, 2sp	Optical grade single crystal LiNbO3 Orientation: Y-cut +/-0.5 ° Size: 3" diameter x 0.5mm Polish: two sides polished Surface roughness: < 8 Å (by AFM)
15.	LiNbO3 Wafer , optical grade, Z-cut, 3"x0.5mm, 2sp	Optical grade single crystal LiNbO3 Orientation: Z-cut +/-0.5 ° Size: 3" diameter x 0.5mm Polish: two sides polished Surface roughness: < 8 Å (by AFM)
16.	LiNbO3 optical grade, Z-cut, 2" x 0.5mm wafer, 2sp	Optical grade single crystal LiNbO3 Orientation: Z-cut +/-0.5 ° Size: 2" diameter x 0.5mm Polish: two sides polished Surface roughness: < 8 Å (by AFM)

C. Mg: LiNbO3 Wafers

No.	Item	Description
1.	Mg doped LiNbO3 optical grade, Z-cut, 10x10x0.5 mm , 2sp	Mg Doped LiNbO3 Optical grade single crystal MgO Doped : 5.0 % mol Orientation: Z-cut Size: 10x10 x 0.5mm Surface finish: two sides polished Surface roughness: < 5Å by AFM

D. SLN (stoichiometric LiNbO3) Wafres

No.	Item	Description
1.	Stoichiometric LiNbO3 (SLN) Wafer, Z-cut, 10x5 x 0.5 mm , 1sp	Stoichiometric LiNbO3 Optical grade single crystal Li2O3 content: > 49.8% mol

		Orientation: Z-cut Size: 10x5 x 0.5mm Surface finish: one side polished Surface roughness: < 5A by AFM
2.	Stoichiometric LiNbO ₃ (SLN) Wafer, Z-cut, 2" D x 0.5 mm t, 1sp	Stoichiometric LiNbO ₃ Optical grade single crystal Li ₂ O ₃ content: > 49.8% mol Orientation: Z-cut Size: 2" diameter x 0.5mm Surface finish: One side polished Surface roughness: < 5A by AFM
3.	Stoichiometric LiNbO ₃ (SLN) Wafer, Z-cut, 10x10 x 0.5 mm, 1sp	Stoichiometric LiNbO ₃ Optical grade single crystal Li ₂ O ₃ content: > 49.8% mol Orientation: Z-cut Size: 10x10 x 0.5mm Surface finish: one side polished Surface roughness: < 5A by AFM
4.	Stoichiometric LiNbO ₃ (SLN) Wafer, Z-cut, 10x10 x 0.5 mm t, 2sp	Stoichiometric LiNbO ₃ Optical grade single crystal Li ₂ O ₃ content: > 49.8% mol Orientation: Z-cut Size: 10x10 x 0.5mm Surface finish: two sides polished Surface roughness: < 5A by AFM
5.	Stoichiometric LiNbO ₃ (SLN) Wafer, Z-cut, 7x7 x 0.5 mm, 1sp	Stoichiometric LiNbO ₃ Optical grade single crystal Li ₂ O ₃ content: > 49.8% mol Orientation: Z-cut Size: 7x7 x 0.5mm Surface finish: one side polished Surface roughness: < 5A by AFM
6.	Stoichiometric LiNbO ₃ (SLN) Wafer, Z-cut, 7x7x 0.5 mm t, 2sp	Stoichiometric LiNbO ₃ Optical grade single crystal Li ₂ O ₃ content: > 49.8% mol Orientation: Z-cut Size: 7x7 x 0.5mm Surface finish: two sides polished Surface roughness: < 5A by AFM

E. PPMgOLN Components

No.	Item	Description
1.	Periodically-Poled Mg doped LiNbO ₃ Element: 5L x 2W x 0.5H mm, Conversion for 976 - >488nm	Mg Doped LiNbO ₃ Optical grade single crystal MgO Doped: 5% mol Orientation: Z-cut Size: 5L x 2W x 0.5H mm

		<p>Surface finish: two sides polished on 2x0.5mm side S1 and S2</p> <p>Surface roughness: < 1/10 wavelength @633nm, 20/10 Scratch/Dig over clear aperture</p> <p>Nonlinear conversion: deff > 12 pm/V for 976 to 488 nm SHG @ 35 +/- 5 deg. C</p> <p>No AR coating at this moment</p>
2.	Periodically-Poled Mg doped LiNbO3 Element: 5Lx2Wx0.5H mm, Conversion for 1064 -> 532nm	<p>Mg Doped LiNbO3 Optical grade single crystal</p> <p>MgO Doped: 5% mol</p> <p>Orientation: Z-cut</p> <p>Size: 5L x 2W x 0.5H mm</p> <p>Surface finish: two sides polished on 2x0.5mm side S1 and S2</p> <p>Surface roughness: < 1/10 wavelength @633nm, 20/10 Scratch/Dig over clear aperture</p> <p>Nonlinear conversion: deff>14 pm/V for 1064 to 532 nm SHG @35 +/- 5 deg C</p> <p>No AR coating at this moment</p>

44. LSAT

A. LSAT <100>

No.	Item	Description
1.	LSAT (100) 5x5 x0.5 mm Square Substrate --- 1 side epi polished	<p>LSAT (LaAlO_3)_{0.3} ($\text{Sr}_2\text{AlTaO}_6$)_{0.7} is a newly developing crystal with perovskite structure and twin-free. LSAT has excellent lattice match with high T_c superconductors and many oxide materials. LSAT has lower melting point and can be grown by CZ technology at lower cost, therefore, it is expected to replace LaAlO_3 and SrTiO_3 as a common single crystal substrate for epitaxial oxide thin films for gain magnetic ferro-electronic and superconductive devices</p> <p><u>Substrate Specifications:</u></p> <p>Size: 5 x 5 x 0.5 mm +/-0.05 mm</p> <p>Orientation: <100> +/-0.5 Deg</p> <p>Surface Roughness: CMP polished with min. sub-surface damage , and Ra < 5 A</p> <p>Package: Packing in 1000 class clean room with 100 grade clean plastic bag</p>
2.	LSAT (100) 5x5 x0.5 mm Square Substrate --- 2 side epi polished	<p>LSAT (LaAlO_3)_{0.3} ($\text{Sr}_2\text{AlTaO}_6$)_{0.7} is a newly developing crystal with perovskite structure and twin-free. LSAT has excellent lattice match with high T_c superconductors and many oxide materials. LSAT has lower melting point and can be grown by CZ technology at lower cost, therefore, it is expected to replace LaAlO_3 and SrTiO_3 as a common single crystal substrate for epitaxial oxide thin films for gain magnetic ferro-electronic and superconductive devices</p> <p><u>Substrate Specifications:</u></p> <p>Size: 5 x 5 x 0.5 mm +/-0.05 mm</p> <p>Orientation: <100> +/-0.5 Deg</p> <p>Surface Roughness: CMP polished with min. sub-surface damage , and Ra <</p>

		<p>5 A</p> <p>Package: Packing in 1000 class clean room with 100 grade clean plastic bag</p>
3.	<p>LSAT (100) 10x10 x0.5 mm Square Substrate --- 1 side epi polished</p>	<p>LSAT (LaAlO_3)_{0.3} ($\text{Sr}_2\text{AlTaO}_6$)_{0.7} is a newly developing crystal with perovskite structure and twin-free. LSAT has excellent lattice match with high T_c superconductors and many oxide materials. LSAT has lower melting point and can be grown by CZ technology at lower cost, therefore, it is expected to replace LaAlO_3 and SrTiO_3 as a common single crystal substrate for epitaxial oxide thin films for gain magnetic ferro-electronic and superconductive devices</p> <p><u>Substrate Specifications:</u> Size: 10 x 10 x 0.5 mm +/-0.05 mm Orientation: <100> +/-0.5 Deg Surface Roughness: CMP polished with min. sub-surface damage, and Ra < 5 A Package: Packing in 1000 class clean room with 100 grade clean plastic bag</p>
4.	<p>LSAT (100) 10x10 x0.5 mm Square Substrate --- 2 side epi polished</p>	<p>LSAT (LaAlO_3)_{0.3} ($\text{Sr}_2\text{AlTaO}_6$)_{0.7} is a newly developing crystal with perovskite structure and twin-free. LSAT has excellent lattice match with high T_c superconductors and many oxide materials. LSAT has lower melting point and can be grown by CZ technology at lower cost, therefore, it is expected to replace LaAlO_3 and SrTiO_3 as a common single crystal substrate for epitaxial oxide thin films for gain magnetic ferro-electronic and superconductive devices</p> <p><u>Substrate Specifications:</u> Size: 10 x 10 x 0.5 mm +/-0.05 mm Orientation: <100> +/-0.5 Deg Surface Roughness: CMP polished with min. sub-surface damage, and Ra < 5 A Package: Packing in 1000 class clean room with 100 grade clean plastic bag</p>
5.	<p>LSAT (100) 10x5 x0.5 mm Square Substrate --- 2 side epi polished</p>	<p>LSAT (LaAlO_3)_{0.3} ($\text{Sr}_2\text{AlTaO}_6$)_{0.7} is a newly developing crystal with perovskite structure and twin-free. LSAT has excellent lattice match with high T_c superconductors and many oxide materials. LSAT has lower melting point and can be grown by CZ technology at lower cost, therefore, it is expected to replace LaAlO_3 and SrTiO_3 as a common single crystal substrate for epitaxial oxide thin films for gain magnetic ferro-electronic and superconductive devices</p> <p><u>Substrate Specifications:</u> Size: 10 x 5 x 0.5 mm +/-0.05 mm Orientation: <100> +/-0.5 Deg Surface Roughness: CMP polished with min. sub-surface damage, and Ra < 5 A Package: Packing in 1000 class clean room with 100 grade clean plastic bag</p>

6.	LSAT (100) 15x15 x0.5 mm Square Substrate --- 2 side epi polished	<p>LSAT (LaAlO₃)_{0.3} (Sr₂AlTaO₆)_{0.7} is a newly developing crystal with perovskite structure and twin-free. LSAT has excellent lattice match with high T_c superconductors and many oxide materials. LSAT has lower melting point and can be grown by CZ technology at lower cost, therefore, it is expected to replace LaAlO₃ and SrTiO₃ as a common single crystal substrate for epitaxial oxide thin films for gain magnetic ferro-electronic and superconductive devices</p> <p><u>Substrate Specifications:</u> Size: 15 x 15 x 0.5 mm +/-0.05 mm Orientation: <100> +/-0.5 Deg Surface Roughness: CMP polished with min. sub-surface damage, and Ra < 5 Å Package: Packing in 1000 class clean room with 100 grade clean plastic bag</p>
7.	LSAT (100) 1" x0.5 mm wafer --- 2 side epi polished	<p>LSAT (LaAlO₃)_{0.3} (Sr₂AlTaO₆)_{0.7} is a newly developing crystal with perovskite structure and twin-free. LSAT has excellent lattice match with high T_c superconductors and many oxide materials. LSAT has lower melting point and can be grown by CZ technology at lower cost, therefore, it is expected to replace LaAlO₃ and SrTiO₃ as a common single crystal substrate for epitaxial oxide thin films for gain magnetic ferro-electronic and superconductive devices</p> <p><u>Substrate Specifications:</u> Size: 1" Dia. +/-0.5 mm x 0.5 mm +/-0.05 mm Orientation: <100> +/-0.5 Deg Surface Roughness: CMP polished with min. sub-surface damage, and Ra < 5 Å Package: Packing in 1000 class clean room with 100 grade clean plastic bag</p>
8.	LSAT (100) 2" x0.5 mm wafer --- 1 side epi polished	<p>LSAT (LaAlO₃)_{0.3} (Sr₂AlTaO₆)_{0.7} is a newly developing crystal with perovskite structure and twin-free. LSAT has excellent lattice match with high T_c superconductors and many oxide materials. LSAT has lower melting point and can be grown by CZ technology at lower cost, therefore, it is expected to replace LaAlO₃ and SrTiO₃ as a common single crystal substrate for epitaxial oxide thin films for gain magnetic ferro-electronic and superconductive devices</p> <p><u>Substrate Specifications:</u> Size: 2" Dia. +/-0.5 mm x 0.5 mm +/-0.05 mm Orientation: <100> +/-0.5 Deg Surface Roughness: CMP polished with min. sub-surface damage, and Ra < 5 Å Package: Packing in 1000 class clean room with 100 grade clean plastic bag</p>
9.	LSAT (100) 2" x0.5 mm wafer --- 2 side epi polished	<p>LSAT (LaAlO₃)_{0.3} (Sr₂AlTaO₆)_{0.7} is a newly developing crystal with perovskite structure and twin-free. LSAT has excellent lattice match with high T_c superconductors and many oxide materials. LSAT has lower melting point and can be grown by CZ technology at lower cost, therefore,</p>

		<p>it is expected to replace LaAlO₃ and SrTiO₃ as a common single crystal substrate for epitaxial oxide thin films for gain magnetic ferro-electronic and superconductive devices</p> <p><u>Substrate Specifications:</u> Size: 2" Dia. +/-0.5 mm x 0.5 mm +/-0.05 mm Orientation: <100> +/-0.5 Deg Surface Roughness: CMP polished with min. sub-surface damage, and Ra < 5 A Package: Packing in 1000 class clean room with 100 grade clean plastic bag</p>
10.	LSAT single crystal substrate (001) with 2 degree miscut along (100) 2sp 10x10x0.5mm	<p>LSAT (LaAlO₃)_{0.3} (Sr₂AlTaO₆)_{0.7} is a newly developing crystal with perovskite structure and twin-free. LSAT has excellent lattice match with high T_c superconductors and many oxide materials. LSAT has lower melting point and can be grown by CZ technology at lower cost, therefore, it is expected to replace LaAlO₃ and SrTiO₃ as a common single crystal substrate for epitaxial oxide thin films for gain magnetic ferro-electronic and superconductive devices</p> <p><u>Substrate Specifications:</u> Size: 10 x 10 x 0.5 mm +/-0.05 mm Orientation: (001) with 2 degree miscut along (100) Surface Roughness: CMP polished with min. sub-surface damage, and Ra < 5 A Package: Packing in 1000 class clean room with 100 grade clean plastic bag</p>

B. LSAT <210>

No.	Item	Description
1.	LSAT (210) 10x10 x0.5 mm Square Substrate --- 1 side epi polished	<p>LSAT (LaAlO₃)_{0.3} (Sr₂AlTaO₆)_{0.7} is a newly developing crystal with perovskite structure and twin-free. LSAT has excellent lattice match with high T_c superconductors and many oxide materials. LSAT has lower melting point and can be grown by CZ technology at lower cost, therefore, it is expected to replace LaAlO₃ and SrTiO₃ as a common single crystal substrate for epitaxial oxide thin films for gain magnetic ferro-electronic and superconductive devices</p> <p><u>Substrate Specifications:</u> Size: 10 x 10 x 0.5 mm +/-0.05 mm Orientation: <210> +/-0.5 Deg Surface Roughness: CMP polished with min. sub-surface damage, and Ra < 5 A Package: Packing in 1000 class clean room with 100 grade clean plastic bag</p>

C. LSAT<110>

No.	Item	Description
1.	LSAT (110) 10x10 x0.5 mm Square Substrate --- 1 side epi polished	<p>LSAT (LaAlO_3)_{0.3} ($\text{Sr}_2\text{AlTaO}_6$)_{0.7} is a newly developing crystal with perovskite structure and twin-free. LSAT has excellent lattice match with high T_c superconductors and many oxide materials. LSAT has lower melting point and can be grown by CZ technology at lower cost, therefore, it is expected to replace LaAlO_3 and SrTiO_3 as a common single crystal substrate for epitaxial oxide thin films for gain magnetic ferro-electronic and superconductive devices</p> <p><u>Substrate Specifications:</u> Size: 10 x 10 x 0.5 mm +/-0.05 mm Orientation: <110> +/-0.5 Deg Surface Roughness: CMP polished with min. sub-surface damage , and Ra < 5 A Package: Packing in 1000 class clean room with 100 grade clean plastic bag</p>
2.	LSAT (110) 10x10 x0.5 mm Square Substrate --- 2 sides epi polished	<p>LSAT (LaAlO_3)_{0.3} ($\text{Sr}_2\text{AlTaO}_6$)_{0.7} is a newly developing crystal with perovskite structure and twin-free. LSAT has excellent lattice match with high T_c superconductors and many oxide materials. LSAT has lower melting point and can be grown by CZ technology at lower cost, therefore, it is expected to replace LaAlO_3 and SrTiO_3 as a common single crystal substrate for epitaxial oxide thin films for gain magnetic ferro-electronic and superconductive devices</p> <p><u>Substrate Specifications:</u> Size: 10 x 10 x 0.5 mm +/-0.05 mm Orientation: <110> +/-0.5 Deg Surface Roughness: CMP polished with min. sub-surface damage , and Ra < 5 A Package: Packing in 1000 class clean room with 100 grade clean plastic bag</p>
3.	LSAT (110) 2" x0.5 mm wafer --- 1 side epi polished	<p>LSAT (LaAlO_3)_{0.3} ($\text{Sr}_2\text{AlTaO}_6$)_{0.7} is a newly developing crystal with perovskite structure and twin-free. LSAT has excellent lattice match with high T_c superconductors and many oxide materials. LSAT has lower melting point and can be grown by CZ technology at lower cost, therefore, it is expected to replace LaAlO_3 and SrTiO_3 as a common single crystal substrate for epitaxial oxide thin films for gain magnetic ferro-electronic and superconductive devices</p> <p><u>Substrate Specifications:</u> Size: 2" Dia. +/-0.5 mm x 0.5 mm +/-0.05 mm Orientation: <110> +/-0.5 Deg Surface Roughness: CMP polished with min. sub-surface damage , and Ra < 5 A Package: Packing in 1000 class clean room with 100 grade clean plastic bag</p>
4.	LSAT (110) 2" x0.5 mm wafer --- 2 side epi polished	<p>LSAT (LaAlO_3)_{0.3} ($\text{Sr}_2\text{AlTaO}_6$)_{0.7} is a newly developing crystal with perovskite structure and twin-free. LSAT has excellent lattice match with high T_c superconductors and many oxide materials. LSAT has lower</p>

		<p>melting point and can be grown by CZ technology at lower cost, therefore, it is expected to replace LaAlO₃ and SrTiO₃ as a common single crystal substrate for epitaxial oxide thin films for gain magnetic ferro-electronic and superconductive devices</p> <p>Substrate Specifications: Size: 2" Dia. +/-0.5 mm x 0.5 mm +/-0.05 mm Orientation: <110> +/-0.5 Deg Surface Roughness: CMP polished with min. sub-surface damage , and Ra < 5 A Package: Packing in 1000 class clean room with 100 grade clean plastic bag</p>
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D. LSAT<111>

No.	Item	Description
1.	LSAT (111) 5x5x0.5 mm Square Substrate --- 1 side epi polished	<p>LSAT (LaAlO₃)_{0.3} (Sr₂AlTaO₆)_{0.7} is a newly developing crystal with perovskite structure and twin-free. LSAT has excellent lattice match with high T_c superconductors and many oxide materials. LSAT has lower melting point and can be grown by CZ technology at lower cost, therefore, it is expected to replace LaAlO₃ and SrTiO₃ as a common single crystal substrate for epitaxial oxide thin films for gain magnetic ferro-electronic and superconductive devices</p> <p><u>Substrate Specifications:</u> Size: 5x5 x 0.5 mm +/-0.05 mm Orientation: <111> +/-0.5 Deg Polishing: One side polished Surface Roughness: CMP polished with min. sub-surface damage, and Ra < 5 A Package: Packing in 1000 class clean room with 100 grade clean plastic bag</p>
2.	LSAT (111) 2" x0.5 mm wafer --- 1 side epi polished	<p>LSAT (LaAlO₃)_{0.3} (Sr₂AlTaO₆)_{0.7} is a newly developing crystal with perovskite structure and twin-free. LSAT has excellent lattice match with high T_c superconductors and many oxide materials. LSAT has lower melting point and can be grown by CZ technology at lower cost, therefore, it is expected to replace LaAlO₃ and SrTiO₃ as a common single crystal substrate for epitaxial oxide thin films for gain magnetic ferro-electronic and superconductive devices</p> <p><u>Substrate Specifications:</u> Size: 2" Dia. +/-0.5 mm x 0.5 mm +/-0.05 mm Orientation: <111> +/-0.5 Deg Surface Roughness: CMP polished with min. sub-surface damage , and Ra < 5 A Package: Packing in 1000 class clean room with 100 grade clean plastic bag</p>
3.	LSAT (111) 10x10 x0.5 mm Square Substrate --- 1 side epi polished	<p>LSAT (LaAlO₃)_{0.3} (Sr₂AlTaO₆)_{0.7} is a newly developing crystal with perovskite structure and twin-free. LSAT has excellent lattice match with high T_c superconductors and many oxide materials. LSAT has lower melting point and can be grown by CZ technology at lower cost, therefore, it is expected to replace LaAlO₃ and SrTiO₃ as a common single crystal substrate for epitaxial oxide thin films for gain magnetic ferro-electronic and superconductive devices</p>

		<p><u>Substrate Specifications:</u> Size: 10 x 10 x 0.5 mm +/-0.05 mm Orientation: <111> +/-0.5 Deg Polishing: One side polished Surface Roughness: CMP polished with min. sub-surface damage, and Ra < 5 A Package: Packing in 1000 class clean room with 100 grade clean plastic bag</p>
4.	LSAT (111) 10x10 x0.5 mm Square Substrate --- 2 side epi polished	<p>LSAT (LaAlO₃)_{0.3} (Sr₂AlTaO₆)_{0.7} is a newly developing crystal with perovskite structure and twin-free. LSAT has excellent lattice match with high T_c superconductors and many oxide materials. LSAT has lower melting point and can be grown by CZ technology at lower cost, therefore, it is expected to replace LaAlO₃ and SrTiO₃ as a common single crystal substrate for epitaxial oxide thin films for gain magnetic ferro-electronic and superconductive devices</p> <p><u>Substrate Specifications:</u> Size: 10 x 10 x 0.5 mm +/-0.05 mm Orientation: <111> +/-0.5 Deg Polishing: Two sides polished Surface Roughness: CMP polished with min. sub-surface damage, and Ra < 5 A Package: Packing in 1000 class clean room with 100 grade clean plastic bag</p>

45. MgAl₂O₄ (spinel)

A. Spinel Wafers(100)

No.	Item	Description
1.	MgAl ₂ O ₄ (100) 2" dia x 0.5mm 1 side polished	<p>MgAl₂O₄ single crystal substrate Size: 2" Diameter x 0.5mm +/-0.05mm Orientation: (100) +/-0.5° Polished: One side side Surface roughness: < 5 A Packing: 1000 class clean room with 100 class plastic bag</p> <p>MgAl₂O₄ (spinel) single crystals are widely used for bulk acoustic wave and microwave devices and fast IC epitaxial substrates. It is also found that MgAl₂O₄ is a good substrate for III-V nitrides device. MgAl₂O₄ crystal is very difficult to grow, due to the difficulty in maintaining a single phase structure. Following several year of effort, MTI is proud of being able to supply the best quality MgAl₂O₄ crystal in the world.</p>
2.	MgAl ₂ O ₄ (100) 2" dia x 0.5mm 2 sides polished	<p>MgAl₂O₄ single crystal substrate Size: 2" Diameter x 0.5mm +/-0.05mm Orientation: (100) +/-0.5° Polished: two sides side Surface roughness: < 5 A Packing: 1000 class clean room with 100 class plastic bag</p> <p>MgAl₂O₄ (spinel) single crystals are widely used for bulk acoustic wave</p>

		and microwave devices and fast IC epitaxial substrates. It is also found that MgAl ₂ O ₄ is a good substrate for III-V nitrides device. MgAl ₂ O ₄ crystal is very difficult to grow, due to the difficulty in maintaining a single phase structure. Following several year of effort, MTI is proud of being able to supply the best quality MgAl ₂ O ₄ crystal in the world.
3.	MgAl ₂ O ₄ (100) 30 mm dia x 0.5mm 1 side polished	<p>MgAl₂O₄ single crystal substrate Size: 30 mm Diameter x 0.5mm +/-0.05mm Orientation: (100) +/-0.5° Polished: One side Surface roughness: < 5 A Packing: 1000 class clean room with 100 class plastic bag</p> <p>MgAl₂O₄ (spinel) single crystals are widely used for bulk acoustic wave and microwave devices and fast IC epitaxial substrates. It is also found that MgAl₂O₄ is a good substrate for III-V nitrides device. MgAl₂O₄ crystal is very difficult to grow, due to the difficulty in maintaining a single phase structure. Following several year of effort, MTI is proud of being able to supply the best quality MgAl₂O₄ crystal in the world.</p>
4.	MgAl ₂ O ₄ (100) 32 mm dia x 0.5mm 1 side polished	<p>MgAl₂O₄ single crystal substrate Size: 32 mm Diameter x 0.5mm +/-0.05mm Orientation: (100) +/-0.5° Polished: One side Surface roughness: < 5 A Packing: 1000 class clean room with 100 class plastic bag</p> <p>MgAl₂O₄ (spinel) single crystals are widely used for bulk acoustic wave and microwave devices and fast IC epitaxial substrates. It is also found that MgAl₂O₄ is a good substrate for III-V nitrides device. MgAl₂O₄ crystal is very difficult to grow, due to the difficulty in maintaining a single phase structure. Following several year of effort, MTI is proud of being able to supply the best quality MgAl₂O₄ crystal in the world.</p>
5.	MgAl ₂ O ₄ (100) 34 mm dia x 0.5mm 1 side polished	<p>MgAl₂O₄ single crystal substrate Size: 34 mm Diameter x 0.5mm +/-0.05mm Orientation: (100) +/-0.5° Polished: One side Surface roughness: < 5 A Packing: 1000 class clean room with 100 class plastic bag</p> <p>MgAl₂O₄ (spinel) single crystals are widely used for bulk acoustic wave and microwave devices and fast IC epitaxial substrates. It is also found that MgAl₂O₄ is a good substrate for III-V nitrides device. MgAl₂O₄ crystal is very difficult to grow, due to the difficulty in maintaining a single phase structure. Following several year of effort, MTI is proud of being able to supply the best quality MgAl₂O₄ crystal in the world.</p>
6.	MgAl ₂ O ₄ (100) 35 mm dia x 0.5mm 2 sides polished	<p>MgAl₂O₄ single crystal substrate Size: 35 mm Diameter x 0.5mm +/-0.05mm Orientation: (100) +/-0.5° Polished: Two sides Surface roughness: < 5 A Packing: 1000 class clean room with 100 class plastic bag</p>

		<p>MgAl₂O₄ (spinel) single crystals are widely used for bulk acoustic wave and microwave devices and fast IC epitaxial substrates. It is also found that MgAl₂O₄ is a good substrate for III-V nitrides device. MgAl₂O₄ crystal is very difficult to grow, due to the difficulty in maintaining a single phase structure. Following several year of effort, MTI is proud of being able to supply the best quality MgAl₂O₄ crystal in the world.</p>
7.	MgAl ₂ O ₄ (100) 1" dia x 0.5mm 1 side polished	<p>MgAl₂O₄ single crystal substrate Size: 1" Diameter x 0.5mm +/-0.05mm Orientation: (100) +/-0.5° Polished: One side Surface roughness: < 5 Å Packing: 1000 class clean room with 100 class plastic bag</p> <p>MgAl₂O₄ (spinel) single crystals are widely used for bulk acoustic wave and microwave devices and fast IC epitaxial substrates. It is also found that MgAl₂O₄ is a good substrate for III-V nitrides device. MgAl₂O₄ crystal is very difficult to grow, due to the difficulty in maintaining a single phase structure. Following several year of effort, MTI is proud of being able to supply the best quality MgAl₂O₄ crystal in the world.</p>
8.	MgAl ₂ O ₄ (100) 0.5"x0.5"x0.5mm 1 side polished	<p>MgAl₂O₄ single crystal substrate Size: 0.5"x0.5"x 0.5mm +/-0.05mm Orientation: (100) +/-0.5° Polishes: One side Surface roughness: < 5 Å Packing: 1000 class clean room with 100 class plastic bag</p> <p>MgAl₂O₄ (spinel) single crystals are widely used for bulk acoustic wave and microwave devices and fast IC epitaxial substrates. It is also found that MgAl₂O₄ is a good substrate for III-V nitrides device. MgAl₂O₄ crystal is very difficult to grow, due to the difficulty in maintaining a single phase structure. Following several year of effort, MTI is proud of being able to supply the best quality MgAl₂O₄ crystal in the world.</p>
9.	MgAl ₂ O ₄ (100) 10x10x0.5mm, 1 side polished	<p>MgAl₂O₄ single crystal substrate Size: 10mm x 10mm x 0.5mm +/-0.05mm Orientation: (100) +/-0.5° Polished: One side Surface roughness: < 5 Å Packing: 1000 class clean room with 100 class plastic bag</p> <p>MgAl₂O₄ (spinel) single crystals are widely used for bulk acoustic wave and microwave devices and fast IC epitaxial substrates. It is also found that MgAl₂O₄ is a good substrate for III-V nitrides device. MgAl₂O₄ crystal is very difficult to grow, due to the difficulty in maintaining a single phase structure. Following several year of effort, MTI is proud of being able to supply the best quality MgAl₂O₄ crystal in the world.</p>
10.	MgAl ₂ O ₄ (100) 5x5x0.5mm 1 side	MgAl ₂ O ₄ single crystal substrate

	polished	<p>Size: 5mm x 5mm x 0.5mm +/-0.05mm Orientation: (100) +/-0.5° Polishes: One side Surface roughness: < 5 A Packing: 1000 class clean room with 100 class plastic bag</p> <p>MgAl₂O₄ (spinel) single crystals are widely used for bulk acoustic wave and microwave devices and fast IC epitaxial substrates. It is also found that MgAl₂O₄ is a good substrate for III-V nitrides device. MgAl₂O₄ crystal is very difficult to grow, due to the difficulty in maintaining a single phase structure. Following several year of effort, MTI is proud of being able to supply the best quality MgAl₂O₄ crystal in the world.</p>
11.	MgAl ₂ O ₄ (100) 5x5x0.5mm 1 side polished	<p>MgAl₂O₄ single crystal substrate Size: 5mm x 5mm x 0.5mm +/-0.05mm Orientation: (100) +/-0.5° Polishes: One side Surface roughness: < 5 A Packing: 1000 class clean room with 100 class plastic bag</p> <p>MgAl₂O₄ (spinel) single crystals are widely used for bulk acoustic wave and microwave devices and fast IC epitaxial substrates. It is also found that MgAl₂O₄ is a good substrate for III-V nitrides device. MgAl₂O₄ crystal is very difficult to grow, due to the difficulty in maintaining a single phase structure. Following several year of effort, MTI is proud of being able to supply the best quality MgAl₂O₄ crystal in the world.</p>
12.	MgAl ₂ O ₄ (100) 5x5x0.5mm 2 sides polished	<p>MgAl₂O₄ single crystal substrate Size: 5mm x 5mm x 0.5mm +/-0.05mm Orientation: (100) +/-0.5° Polishes: Two sides Surface roughness: < 5 A Packing: 1000 class clean room with 100 class plastic bag</p> <p>MgAl₂O₄ (spinel) single crystals are widely used for bulk acoustic wave and microwave devices and fast IC epitaxial substrates. It is also found that MgAl₂O₄ is a good substrate for III-V nitrides device. MgAl₂O₄ crystal is very difficult to grow, due to the difficulty in maintaining a single phase structure. Following several year of effort, MTI is proud of being able to supply the best quality MgAl₂O₄ crystal in the world.</p>
13.	MgAl ₂ O ₄ (100) 10x10x1.0mm, 1 side polished	<p>MgAl₂O₄ single crystal substrate Size: 10mm x 10mm x 1.0mm +/-0.05mm Orientation: (100) +/-0.5° Polished: One side Surface roughness: < 5 A Packing: 1000 class clean room with 100 class plastic bag</p> <p>MgAl₂O₄ (spinel) single crystals are widely used for bulk acoustic wave and microwave devices and fast IC epitaxial substrates. It is also found that MgAl₂O₄ is a good substrate for III-V nitrides device. MgAl₂O₄ crystal is very difficult to grow, due to the difficulty in maintaining a single phase structure. Following several year of effort, MTI is proud of being able to supply the best quality MgAl₂O₄ crystal in the world.</p>

		supply the best quality MgAl ₂ O ₄ crystal in the world.
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B. Spinel Wafers(110)

No.	Item	Description
1.	MgAl ₂ O ₄ (110) 32 mm Dia x0.5mm, 1 side polished	<p>MgAl₂O₄ single crystal substrate Size: 32 mm Dia x0.5mm +/-0.05mm Orientation: (110) +/-0.5° Polished: one side Surface roughness: < 5 A Packing: 1000 class clean room with 100 class plastic bag</p> <p>MgAl₂O₄ (spinel) single crystals are widely used for bulk acoustic wave and microwave devices and fast IC epitaxial substrates. It is also found that MgAl₂O₄ is a good substrate for III-V nitrides device. MgAl₂O₄ crystal is very difficult to grow, due to the difficulty in maintaining a single phase structure. Following several year of effort, MTI is proud of being able to supply the best quality MgAl₂O₄ crystal in the world.</p>
2.	MgAl ₂ O ₄ (110) 32 mm Dia x0.5mm, 2 sides polished	<p>MgAl₂O₄ single crystal substrate Size: 32 mm Dia x0.5mm +/-0.05mm Orientation: (110) +/-0.5° Polished: Two sides Surface roughness: < 5 A Packing: 1000 class clean room with 100 class plastic bag</p> <p>MgAl₂O₄ (spinel) single crystals are widely used for bulk acoustic wave and microwave devices and fast IC epitaxial substrates. It is also found that MgAl₂O₄ is a good substrate for III-V nitrides device. MgAl₂O₄ crystal is very difficult to grow, due to the difficulty in maintaining a single phase structure. Following several year of effort, MTI is proud of being able to supply the best quality MgAl₂O₄ crystal in the world.</p>
3.	MgAl ₂ O ₄ (110) 2" Dia x0.5mm, 1 side polished	<p>MgAl₂O₄ single crystal substrate Size: 2" Dia x0.5mm +/-0.05mm Orientation: (110) +/-0.5° Polished: One side Surface roughness: < 5 A Packing: 1000 class clean room with 100 class plastic bag</p> <p>MgAl₂O₄ (spinel) single crystals are widely used for bulk acoustic wave and microwave devices and fast IC epitaxial substrates. It is also found that MgAl₂O₄ is a good substrate for III-V nitrides device. MgAl₂O₄ crystal is very difficult to grow, due to the difficulty in maintaining a single phase structure. Following several year of effort, MTI is proud of being able to supply the best quality MgAl₂O₄ crystal in the world.</p>
4.	MgAl ₂ O ₄ (110) 2" Dia x0.5mm, 2 sides polished	<p>MgAl₂O₄ single crystal substrate Size: 2" Dia x0.5mm +/-0.05mm Orientation: (110) +/-0.5°</p>

		<p>Polished: Two sides Surface roughness: < 5 A Packing: 1000 class clean room with 100 class plastic bag</p> <p>MgAl₂O₄ (spinel) single crystals are widely used for bulk acoustic wave and microwave devices and fast IC epitaxial substrates. It is also found that MgAl₂O₄ is a good substrate for III-V nitrides device. MgAl₂O₄ crystal is very difficult to grow, due to the difficulty in maintaining a single phase structure. Following several year of effort, MTI is proud of being able to supply the best quality MgAl₂O₄ crystal in the world.</p>
5.	MgAl ₂ O ₄ (110) 10x10x0.5mm, 1 side polished	<p>MgAl₂O₄ single crystal substrate Size: 10mm x 10mm x 0.5mm +/-0.05mm Orientation: (110) +/-0.5° Polished: One side Surface roughness: < 5 A Packing: 1000 class clean room with 100 class plastic bag</p> <p>MgAl₂O₄ (spinel) single crystals are widely used for bulk acoustic wave and microwave devices and fast IC epitaxial substrates. It is also found that MgAl₂O₄ is a good substrate for III-V nitrides device. MgAl₂O₄ crystal is very difficult to grow, due to the difficulty in maintaining a single phase structure. Following several year of effort, MTI is proud of being able to supply the best quality MgAl₂O₄ crystal in the world.</p>
6.	MgAl ₂ O ₄ (110) 10x10x0.5mm, 2 sides polished	<p>MgAl₂O₄ single crystal substrate Size: 10mm x 10mm x 0.5mm +/-0.05mm Orientation: (110) +/-0.5° Polished: Two sides Surface roughness: < 5 A Packing: 1000 class clean room with 100 class plastic bag</p> <p>MgAl₂O₄ (spinel) single crystals are widely used for bulk acoustic wave and microwave devices and fast IC epitaxial substrates. It is also found that MgAl₂O₄ is a good substrate for III-V nitrides device. MgAl₂O₄ crystal is very difficult to grow, due to the difficulty in maintaining a single phase structure. Following several year of effort, MTI is proud of being able to supply the best quality MgAl₂O₄ crystal in the world.</p>
7.	MgAl ₂ O ₄ (110) 1/4"x1/4"x0.5 mm 1 side polished	<p>MgAl₂O₄ single crystal substrate Size: 1/4"x1/4"x0.5 mm +/-0.05mm Orientation: (110) +/-0.5° Polished: One side Surface roughness: < 5 A Packing: 1000 class clean room with 100 class plastic bag</p> <p>MgAl₂O₄ (spinel) single crystals are widely used for bulk acoustic wave and microwave devices and fast IC epitaxial substrates. It is also found that MgAl₂O₄ is a good substrate for III-V nitrides device. MgAl₂O₄ crystal is very difficult to grow, due to the difficulty in maintaining a single phase structure. Following several year of effort, MTI is proud of being able to supply the best quality MgAl₂O₄ crystal in the world.</p>

8.	MgAl ₂ O ₄ (110) 5x5x0.5 mm 1 side polished	<p>MgAl₂O₄ single crystal substrate Size: 5x5x0.5 mm +/-0.05mm Orientation: (110) +/-0.5° Polished: One side Surface roughness: < 5 A Packing: 1000 class clean room with 100 class plastic bag</p> <p>MgAl₂O₄ (spinel) single crystals are widely used for bulk acoustic wave and microwave devices and fast IC epitaxial substrates. It is also found that MgAl₂O₄ is a good substrate for III-V nitrides device. MgAl₂O₄ crystal is very difficult to grow, due to the difficulty in maintaining a single phase structure. Following several year of effort, MTI is proud of being able to supply the best quality MgAl₂O₄ crystal in the world.</p>
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C. Spinel Wafers(111)

No.	Item	Description
1.	MgAl ₂ O ₄ (111) 2" dia x 0.5mm 1 side polished	<p>MgAl₂O₄ single crystal substrate Size: 2" Diameter x 0.5mm +/-0.05mm Orientation: (111) +/-0.5° Polished: One side polished Surface roughness: < 5 A Packing: 1000 class clean room with 100 class plastic bag</p> <p>MgAl₂O₄ (spinel) single crystals are widely used for bulk acoustic wave and microwave devices and fast IC epitaxial substrates. It is also found that MgAl₂O₄ is a good substrate for III-V nitrides device. MgAl₂O₄ crystal is very difficult to grow, due to the difficulty in maintaining a single phase structure. Following several year of effort, MTI is proud of being able to supply the best quality MgAl₂O₄ crystal in the world.</p>
2.	MgAl ₂ O ₄ (111) 2" dia x 0.5mm 2 sides polished	<p>MgAl₂O₄ single crystal substrate Size: 2" dia x 0.5mm +/-0.05mm Orientation: (111) +/-0.5° Polished: Two sides Surface roughness: < 5 A Packing: 1000 class clean room with 100 class plastic bag</p> <p>MgAl₂O₄ (spinel) single crystals are widely used for bulk acoustic wave and microwave devices and fast IC epitaxial substrates. It is also found that MgAl₂O₄ is a good substrate for III-V nitrides device. MgAl₂O₄ crystal is very difficult to grow, due to the difficulty in maintaining a single phase structure. Following several year of effort, MTI is proud of being able to supply the best quality MgAl₂O₄ crystal in the world.</p>
3.	MgAl ₂ O ₄ (111) 1" in dia x 0.5mm 1 side polished	<p>MgAl₂O₄ single crystal substrate Size: 35 mm dia x 0.5mm +/-0.05mm Orientation: (111) +/-0.5° Polished: One side polished Surface roughness: < 5 A</p>

		<p>Packing: 1000 class clean room with 100 class plastic bag</p> <p>MgAl₂O₄ (spinel) single crystals are widely used for bulk acoustic wave and microwave devices and fast IC epitaxial substrates. It is also found that MgAl₂O₄ is a good substrate for III-V nitrides device. MgAl₂O₄ crystal is very difficult to grow, due to the difficulty in maintaining a single phase structure. Following several year of effort, MTI is proud of being able to supply the best quality MgAl₂O₄ crystal in the world.</p>
4.	MgAl ₂ O ₄ (111) 35 mm dia x 0.5mm 1 side polished	<p>MgAl₂O₄ single crystal substrate Size: 35 mm dia x 0.5mm +/-0.05mm Orientation: (111) +/-0.5° Polished: One side polished Surface roughness: < 5 Å Packing: 1000 class clean room with 100 class plastic bag</p> <p>MgAl₂O₄ (spinel) single crystals are widely used for bulk acoustic wave and microwave devices and fast IC epitaxial substrates. It is also found that MgAl₂O₄ is a good substrate for III-V nitrides device. MgAl₂O₄ crystal is very difficult to grow, due to the difficulty in maintaining a single phase structure. Following several year of effort, MTI is proud of being able to supply the best quality MgAl₂O₄ crystal in the world.</p>
5.	MgAl ₂ O ₄ (111) 10x10x0.5mm, 1 side polished	<p>MgAl₂O₄ single crystal substrate Size: 10mm x 10mm x 0.5mm +/-0.05mm Orientation: (111) +/-0.5° Polished: One side Surface roughness: < 5 Å Packing: 1000 class clean room with 100 class plastic bag</p> <p>MgAl₂O₄ (spinel) single crystals are widely used for bulk acoustic wave and microwave devices and fast IC epitaxial substrates. It is also found that MgAl₂O₄ is a good substrate for III-V nitrides device. MgAl₂O₄ crystal is very difficult to grow, due to the difficulty in maintaining a single phase structure. Following several year of effort, MTI is proud of being able to supply the best quality MgAl₂O₄ crystal in the world.</p>
6.	MgAl ₂ O ₄ (111) 10x10x0.5mm, 2 sides polished	<p>MgAl₂O₄ single crystal substrate Size: 10mm x 10mm x 0.5mm +/-0.05mm Orientation: (100) +/-0.5° Polished: two sides Surface roughness: < 5 Å Packing: 1000 class clean room with 100 class plastic bag</p> <p>MgAl₂O₄ (spinel) single crystals are widely used for bulk acoustic wave and microwave devices and fast IC epitaxial substrates. It is also found that MgAl₂O₄ is a good substrate for III-V nitrides device. MgAl₂O₄ crystal is very difficult to grow, due to the difficulty in maintaining a single phase structure. Following several year of effort, MTI is proud of being able to supply the best quality MgAl₂O₄ crystal in the world.</p>
7.	MgAl ₂ O ₄ (111) 5x5x0.5 mm 1 side polished	MgAl ₂ O ₄ single crystal substrate

		<p>Size: 5mm x 5mm x 0.5mm +/-0.05mm Orientation: (111) +/-0.5° Polished: One side Surface roughness: < 5 A Packing: 1000 class clean room with 100 class plastic bag</p> <p>MgAl₂O₄ (spinel) single crystals are widely used for bulk acoustic wave and microwave devices and fast IC epitaxial substrates. It is also found that MgAl₂O₄ is a good substrate for III-V nitrides device. MgAl₂O₄ crystal is very difficult to grow, due to the difficulty in maintaining a single phase structure. Following several year of effort, MTI is proud of being able to supply the best quality MgAl₂O₄ crystal in the world.</p>
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46. MgF₂

No.	Item	Description
1.	MgF ₂ , (001), 10x10x 0.5 mm 1 side polished	<p>Crystal: MgF₂ Crystal Orientation: <001> +/-1.5 ° Size: 10x10x 0.5 mm Purity: > 99.99% Polished: One side polished Surface roughness: < 10A Package: 1000 class clean plastic bag</p>
2.	MgF ₂ , (001), 10x10x 1.0 mm 2 sides polished	<p>Crystal: MgF₂ Orientation: <001> +/-1.5 ° Size: 10x10x 1.0 mm Purity: > 99.99 % Polished: two sides polished Surface roughness: < 10A Package: 1000 class clean plastic bag</p>
3.	MgF ₂ , (100), 10x10x 0.5mm 1 side polished	<p>Crystal: MgF₂ Crystal Orientation: <100> +/-1.5 ° Size: 10x10x 0.5 mm Purity: > 99.99 % Polished: One side polished Surface roughness: < 10A Package: 1000 class clean plastic bag</p>
4.	MgF ₂ , (100), 10x10x 0.5mm Two side polished	<p>Crystal: MgF₂ Crystal Orientation: <100> +/-1.5 ° Size: 10x10x 0.5 mm Purity: > 99.99 % Polished: Two sides polished Surface roughness: < 10A Package: 1000 class clean plastic bag</p>
5.	MgF ₂ , (100), 10x10x 1.0 mm 1 side polished	<p>Crystal: MgF₂ Crystal Orientation: <100> +/-1.5 °</p>

		Size: 10x10x 1.0 mm Purity: > 99.99 % Polished: One side polished Surface roughness: < 10A Package: 1000 class clean plastic bag
6.	MgF2, (100), 10x10x 1.0 mm 2 sides polished	Crystal: MgF2 Crystal Orientation: <100> +/-1.5 ° Size: 10x10x 1.0 mm Purity: > 99.99 % Polished: two sides polished Surface roughness: < 10A Package: 1000 class clean plastic bag
7.	MgF2, (110), 10x10x 1.0 mm 1 side polished	Crystal: MgF2 Crystal Orientation: <110> +/-1.5 ° Size: 10x10x 1.0 mm Purity: > 99.99 % Polished: one side polished Surface roughness: < 10A Package: 1000 class clean plastic bag
8.	MgF2, (110), 10x10x 1.0 mm 2 sides polished	Crystal: MgF2 Crystal Orientation: <110> +/-1.5 ° Size: 10x10x 1.0 mm Purity: > 99.99 % Polished: two sides polished Surface roughness: < 10A Package: 1000 class clean plastic bag
9.	MgF2, (110), 20x20x 1.0 mm 1 side polished	Crystal: MgF2 Crystal Orientation: <110> +/-1.5 ° Size: 20x20x 1.0 mm Purity: > 99.99 % Polished: one side polished Surface roughness: < 10A Package: 1000 class clean plastic bag
10.	MgF2, (111), 10x10x 0.5 mm 1 side polished	Crystal: MgF2 Orientation: <111> +/-1.5 ° Size: 10x10x 0.5 mm Purity: > 99.99 % Polished: One side polished Surface roughness: < 10A Package: 1000 class clean plastic bag
11.	MgF2, (111), 10x10x 1.0 mm 2 sides polished	Crystal: MgF2 Orientation: <111> +/-1.5 ° Size: 10x10x 1.0 mm Purity: > 99.99 %

		Polished: two sides polished Surface roughness: < 10A Package: 1000 class clean plastic bag
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47. MgO

A. MgO Substrates(100)

No.	Item	Description
1.	MgO (100) Substrate 10x10 x0.5mm , 1SP	MgO Substrate Size: 10mm x 10mm x 0.5mm +/- 0.05 mm (choose 1.0 mm thick at extra cost) Orientation: (100) +/-0.5 Deg Polish: One or two side EPI polished by CMP technology with minimum sub-surface damage. RA: < 10A(By AFM 5x5 μm^2) Packing: The substrate is packed with 100 grade clean plastic bag under 1000 class clean room. Precautions: MgO is sensitive to moisture, and must be stored in vacuum box.
2.	MgO (100) Substrate 10x10 x0.8 mm, fine ground	MgO Substrate Size: 10mm x 10mm x 0.8mm +/- 0.05 mm (choose 1.0 mm thick at extra cost) Orientation: (100) +/-0.5 Deg Polish: fine ground Surface roughness: < 1 micron Packing: The substrate is packed with 100 grade clean plastic bag under 1000 class clean room. Precautions: MgO is sensitive to moisture, and must be stored in vacuum box.
3.	MgO (100) Substrate 5 x 5 x0.5 mm, 1SP	MgO substrate Size: 5 mm x 5 mm x 0.5mm +/-0.05 mm Orientation: (100) +/-0.5 o Polish: One side EPI polished by CMP technology with minimum sub-surface damage. RA: < 10A(By AFM 5x5 μm^2) Packing: The substrate is packed with 100 grade clean plastic bag under 1000 class clean room. Precautions: MgO is sensitive to moisture, and must be stored in vacuum box.
4.	MgO (100) Substrate 5x5x0.5mm, 2SP	MgO substrate Size: 5mm x 5mm x 0.5mm +/-0.05 mm Orientation: (100) +/-0.5 o Polish: Two sides EPI polished by CMP technology with minimum sub-surface damage. RA: < 10A(By AFM 5x5 μm^2) Packing: The substrate is packed with 100 grade clean plastic bag under

		1000 class clean room. Precautions: MgO is sensitive to moisture, and must be stored in vacuum box.
5.	MgO (100) Substrate 0.25"x0.25"x0.5mm, 1SP	MgO substrate Size: 0.25" x 0.25" x 0.5mm +/-0.05 mm Orientation: (100) +/-0.5 o Polish: One side EPI polished by CMP technology with minimum sub-surface damage. RA: < 10A(By AFM 5x5 μm^2) Packing: The substrate is packed with 100 grade clean plastic bag under 1000 class clean room. Precautions: MgO is sensitive to moisture, and must be stored in vacuum box.
6.	MgO (100) Substrate 10 x 5 x0.45mm, 1SP	MgO substrate Size: 10 mm x 5 mm x 0.45mm +/-0.05 mm Orientation: (100) +/-0.5 o Polish: One side EPI polished by CMP technology with minimum sub-surface damage. RA: < 10A(By AFM 5x5 μm^2) Packing: The substrate is packed with 100 grade clean plastic bag under 1000 class clean room. Precautions: MgO is sensitive to moisture, and must be stored in vacuum box.
7.	MgO (100) Substrate 10 x 5 x0.5mm, 1SP	MgO substrate Size: 10 mm x 5 mm x 0.5mm +/-0.05 mm Orientation: (100) +/-0.5 o Polish: One side EPI polished by CMP technology with minimum sub-surface damage. RA: < 10A(By AFM 5x5 μm^2) Packing: The substrate is packed with 100 grade clean plastic bag under 1000 class clean room. Precautions: MgO is sensitive to moisture, and must be stored in vacuum box.
8.	MgO (100) Substrate 10x10x0.5mm , 2SP	MgO Substrate Size: 10mm x 10mm x 0.5mm +/- 0.05 mm (choose 1.0 mm thick at extra cost) Orientation: (100) +/-0.5 Deg Polish: two sides EPI polished by CMP technology with minimum sub-surface damage. RA: < 10A(By AFM 5x5 μm^2) Packing: The substrate is packed with 100 grade clean plastic bag under 1000 class clean room. Precautions: MgO is sensitive to moisture, and must be stored in vacuum box. Please choose one side or two side polished , 0.5 or 1.0 mm thickness from " product option.

9.	MgO (100) Substrate 0.5"x0.5"x0.5 mm , 2SP	MgO Substrate Size: 0.5"mm x 0.5"mm x 0.5mm +/- 0.05 mm (choose 1.0 mm thick at extra cost) Orientation: (100) +/-0.5 Deg Polish: One side EPI polished by CMP technology with minimum sub-surface damage. RA: < 10A(By AFM 5x5 μm^2) Packing: The substrate is packed with 100 grade clean plastic bag under 1000 class clean room. Precautions: MgO is sensitive to moisture, and must be stored in vacuum box.
10.	MgO (100) Substrate 0.5"x0.5"x0.5mm , 1SP	MgO Substrate Size: 0.5"mm x 0.5"mm x 0.5mm +/- 0.05 mm (choose 1.0 mm thick at extra cost) Orientation: (100) +/-0.5 Deg Polish: One side EPI polished by CMP technology with minimum sub-surface damage. RA: < 10A(By AFM 5x5 μm^2) Packing: The substrate is packed with 100 grade clean plastic bag under 1000 class clean room. Precautions: MgO is sensitive to moisture, and must be stored in vacuum box.
11.	MgO (100) Substrate 0.5"x0.5"x1.0 mm , 1SP	MgO Substrate Size: 0.5"mm x 0.5"mm x 1.0mm +/- 0.05 mm (choose 1.0 mm thick at extra cost) Orientation: (100) +/-0.5 Deg Polish: One side EPI polished by CMP technology with minimum sub-surface damage. Surface roughness: < 10A Packing: The substrate is packed with 100 grade clean plastic bag under 1000 class clean room. Precautions: MgO is sensitive to moisture, and must be stored in vacuum box.
12.	MgO (100) Substrate 10x10 x1.0 mm , 2SP	MgO Substrate Size: 10mm x 10mm x 1.0 mm +/- 0.05 mm (choose 1.0 mm thick at extra cost) Orientation: (100) +/-0.5 Deg Polish: One or two side EPI polished by CMP technology with minimum sub-surface damage. Surface roughness: < 10A Packing: The substrate is packed with 100 grade clean plastic bag under 1000 class clean room. Precautions: MgO is sensitive to moisture, and must be stored in vacuum box. Please choose one side or two side polished , 0.5 or 1.0 mm thickness from " product option.
13.	MgO (100) Substrate 10x10 x1.0mm , 1SP	MgO Substrate Size: 10mm x 10mm x 1.0 mm +/- 0.05 mm (choose 1.0 mm thick at extra cost)

		<p>Orientation: (100) +/-0.5 Deg</p> <p>Polish: One or two side EPI polished by CMP technology with minimum sub-surface damage.</p> <p>Surface roughness: < 10A</p> <p>Packing: The substrate is packed with 100 grade clean plastic bag under 1000 class clean room.</p> <p>Precautions: MgO is sensitive to moisture, and must be stored in vacuum box.</p> <p>Please choose one side or two side polished , 0.5 or 1.0 mm thickness from " product option.</p>
14.	MgO (100) Substrate 20x20x0.5 mm , 1SP	<p>MgO Substrate</p> <p>Size: 20mm x 20mm x 0.5mm +/- 0.05 mm (choose 1.0 mm thick at extra cost)</p> <p>Orientation: (100) +/-0.5 Deg</p> <p>Polish: One side EPI polished by CMP technology with minimum sub-surface damage.</p> <p>Surface roughness: <10A</p> <p>Packing: The substrate is packed with 100 grade clean plastic bag under 1000 class clean room.</p> <p>Precautions: MgO is sensitive to moisture, and must be stored in vacuum box.</p>
15.	MgO (100) Substrate 20x20x0.5 mm , 2SP	<p>MgO Substrate</p> <p>Size: 20mm x 20mm x 0.5mm +/- 0.05 mm (choose 1.0 mm thick at extra cost)</p> <p>Orientation: (100) +/-0.5 Deg</p> <p>Polish: Two sides EPI polished by CMP technology with minimum sub-surface damage.</p> <p>Surface roughness: < 10A</p> <p>Packing: The substrate is packed with 100 grade clean plastic bag under 1000 class clean room.</p> <p>Precautions: MgO is sensitive to moisture, and must be stored in vacuum box.</p>
16.	MgO (100) Substrate 1.0"x1.0"x0.5 mm , 1SP	<p>MgO Substrate</p> <p>Size: 1.0"mm x 1.0"mm x 0.5mm +/- 0.05 mm (choose 1.0 mm thick at extra cost)</p> <p>Orientation: (100) +/-0.5 Deg</p> <p>Polish: One side EPI polished by CMP technology with minimum sub-surface damage.</p> <p>Surface roughness: < 10A</p> <p>Packing: The substrate is packed with 100 grade clean plastic bag under 1000 class clean room.</p> <p>Precautions: MgO is sensitive to moisture, and must be stored in vacuum box.</p>
17.	MgO (100) Substrate 1.0"x1.0"x0.5 mm , 2SP	<p>MgO Substrate</p> <p>Size: 1.0"mm x 1.0"mm x 0.5mm +/- 0.05 mm (choose 1.0 mm thick at extra cost)</p> <p>Orientation: (100) +/-0.5 Deg</p> <p>Polish: 2 sides EPI polished by CMP technology with minimum sub-surface</p>

		<p>damage.</p> <p>Surface roughness: < 10A</p> <p>Packing: The substrate is packed with 100 grade clean plastic bag under 1000 class clean room.</p> <p>Precautions: MgO is sensitive to moisture, and must be stored in vacuum box.</p>
18.	MgO (100) Epi polishing wafer 1" Dia x0.5mm ,1SP	<p>MgO single crystal substrate</p> <p>Size: 1" diameter x 0.5mm +/- 0.05 mm</p> <p>Orientation: (100) +/-0.5 Deg</p> <p>Polish: One side EPI polished by CMP technology with minimum sub-surface damage.</p> <p>Surface Roughness: Ra < 10A</p> <p>Packing: The substrate is packed with 100 grade clean plastic bag under 1000 class clean room.</p> <p>Precautions: MgO is sensitive to moisture, and must be stored in vacuum box.</p>
19.	MgO (100) Epi polishing wafer 1" Dia x0.5mm, 2SP	<p>MgO single crystal substrate</p> <p>Size: 1" diameter x 0.5mm +/- 0.05 mm</p> <p>Orientation: (100) +/-0.5 Deg</p> <p>Polish: Two sides EPI polished by CMP technology with minimum sub-surface damage.</p> <p>Surface Roughness: Ra <10A</p> <p>Packing: The substrate is packed with 100 grade clean plastic bag under 1000 class clean room.</p> <p>Precautions: MgO is sensitive to moisture, and must be stored in vacuum box.</p>
20.	MgO (100) Epi polishing wafer 2" Dia x0.5mm, 2SP	<p>MgO single crystal substrate</p> <p>Size: 2" diameter x 0.5mm +/- 0.05 mm</p> <p>Orientation: (100) +/-0.5 Deg</p> <p>Polish: Two sides EPI polished by CMP technology with minimum sub-surface damage.</p> <p>Surface Roughness: Ra < 10A</p> <p>Packing: The substrate is packed with 100 grade clean plastic bag under 1000 class clean room.</p> <p>Precautions: MgO is sensitive to moisture, and must be stored in vacuum box.</p>
21.	MgO (100) Epi polishing wafer 2" Dia x0.5mm, 1SP	<p>MgO single crystal substrate</p> <p>Size: 2" diameter x 0.5mm +/- 0.05 mm</p> <p>Orientation: (100) +/-0.5 Deg</p> <p>Polish: One side EPI polished by CMP technology with minimum sub-surface damage.</p> <p>Surface Roughness: Ra < 10A</p> <p>Packing: The substrate is packed with 100 grade clean plastic bag under 1000 class clean room.</p> <p>Precautions: MgO is sensitive to moisture, and must be stored in vacuum box.</p>

22.	MgO (100) Substrate 2.0"x2.0"x0.5mm , 1SP	<p>MgO Substrate</p> <p>Size: 2.0"mm x 2.0"mm x 0.5mm +/- 0.05 mm (choose 1.0 mm thick at extra cost)</p> <p>Orientation: (100) +/-0.5 Deg</p> <p>Polish: One side EPI polished by CMP technology with minimum sub-surface damage.</p> <p>Surface roughness: < 10A</p> <p>Packing: The substrate is packed with 100 grade clean plastic bag under 1000 class clean room.</p> <p>Precautions: MgO is sensitive to moisture, and must be stored in vacuum box.</p>
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B. MgO Substrates(110)

No.	Item	Description
1.	MgO (110) Substrate 5x5x0.5 mm , 1SP	<p>MgO single crystal substrate</p> <p>Size: 5x5x 0.5mm +/- 0.05 mm</p> <p>Orientation: (110) +/-0.5 Deg</p> <p>Polish: One or two side EPI polished by CMP technology with minimum sub-surface damage.</p> <p>Surface Roughness: < 10A</p> <p>Packing: The substrate is packed with 100 grade clean plastic bag under 1000 class clean room.</p> <p>Precautions: MgO is sensitive to moisture, and must be stored in vacuum box.</p>
2.	MgO (110) Substrate 5x5x0.5 mm , 2SP	<p>MgO single crystal substrate</p> <p>Size: 5x5x 0.5mm +/- 0.05 mm</p> <p>Orientation: (110) +/-0.5 Deg</p> <p>Polish: two sides EPI polished by CMP technology with minimum sub-surface damage.</p> <p>Surface Roughness: < 10A</p> <p>Packing: The substrate is packed with 100 grade clean plastic bag under 1000 class clean room.</p> <p>Precautions: MgO is sensitive to moisture, and must be stored in vacuum box.</p>
3.	MgO (110) Substrate 10x10 x0.5 mm , 1SP	<p>MgO single crystal substrate</p> <p>Size: 10x10 x 0.5mm +/- 0.05 mm</p> <p>Orientation: (110) +/-0.5 Deg</p> <p>Polish: One side EPI polished by CMP technology with minimum sub-surface damage.</p> <p>Surface Roughness: < 10A</p> <p>Packing: The substrate is packed with 100 grade clean plastic bag under 1000 class clean room.</p> <p>Precautions: MgO is sensitive to moisture, and must be stored in vacuum box.</p>
4.	MgO (110) Substrate 10x10 x0.5 mm , 2SP	MgO single crystal substrate

		<p>Size: 10x10 x 0.5mm +/- 0.05 mm</p> <p>Orientation: (110) +/-0.5 Deg</p> <p>Polish: Two sides EPI polished by CMP technology with minimum sub-surface damage.</p> <p>Surface Roughness: < 10A</p> <p>Packing: The substrate is packed with 100 grade clean plastic bag under 1000 class clean room.</p> <p>Precautions: MgO is sensitive to moisture, and must be stored in vacuum box.</p>
5.	MgO (110) Substrate 10x10 x1.0 mm , 1SP	<p>MgO single crystal substrate</p> <p>Size: 10x10 x 1.0mm +/- 0.05 mm</p> <p>Orientation: (110) +/-0.5 Deg</p> <p>Polish: One side EPI polished by CMP technology with minimum sub-surface damage.</p> <p>Surface Roughness: < 10A</p> <p>Packing: The substrate is packed with 100 grade clean plastic bag under 1000 class clean room.</p> <p>Precautions: MgO is sensitive to moisture, and must be stored in vacuum box.</p>
6.	MgO (110) Substrate 0.5"x0.5"x0.5 mm , 1SP	<p>MgO single crystal substrate</p> <p>Size: 0.5"x0.5" x 0.5mm +/- 0.05 mm</p> <p>Orientation: (110) +/-0.5 Deg</p> <p>Polish: One side EPI polished by CMP technology with minimum sub-surface damage.</p> <p>Surface Roughness: <10A</p> <p>Packing: The substrate is packed with 100 grade clean plastic bag under 1000 class clean room.</p> <p>Precautions: MgO is sensitive to moisture, and must be stored in vacuum box.</p>
7.	MgO (110) Substrate 1"x1"x0.5 mm , 1SP	<p>MgO single crystal substrate</p> <p>Size: 1"x1" x 0.5mm +/- 0.05 mm</p> <p>Orientation: (110) +/-0.5 Deg</p> <p>Polish: One side EPI polished by CMP technology with minimum sub-surface damage.</p> <p>Surface Roughness: < 10A</p> <p>Packing: The substrate is packed with 100 grade clean plastic bag under 1000 class clean room.</p> <p>Precautions: MgO is sensitive to moisture, and must be stored in vacuum box.</p>

C. MgO Substrates(111)

No.	Item	Description
1.	MgO (111) Substrate 5x5x0.5 mm , 1SP	<p>MgO single crystal substrate</p> <p>Size: 5x5x 0.5mm +/-0.05 mm</p> <p>Orientation: (111) +/-0.5 Deg</p> <p>Polish: One side EPI polished by CMP technology with minimum sub-</p>

		<p>surface damage.</p> <p>Surface Roughness: < 15A</p> <p>Packing: The substrate is packed with 100 grade clean plastic bag under 1000 class clean room.</p>
2.	MgO (111) Substrate 5x5x0.5 mm , 2SP	<p>MgO single crystal substrate</p> <p>Size: 5x5x 0.5mm +/- 0.05 mm</p> <p>Orientation: (111) +/-0.5 Deg</p> <p>Polish: Two sides EPI polished by CMP technology with minimum sub-surface damage.</p> <p>Surface Roughness: < 15A</p> <p>Packing: The substrate is packed with 100 grade clean plastic bag under 1000 class clean room.</p> <p>Precautions: MgO is sensitive to moisture, and must be stored in vacuum box.</p>
3.	MgO (111) Square substrate 0.25"x0.25"x0.5mm , 1SP	<p>MgO single crystal substrate</p> <p>Size: 5x5x 0.5mm +/- 0.05 mm</p> <p>Orientation: (111) +/-0.5 Deg</p> <p>Polish: One side EPI polished by CMP technology with minimum sub-surface damage.</p> <p>Surface roughness: < 15A</p> <p>Packing: The substrate is packed with 100 grade clean plastic bag under 1000 class clean room.</p> <p>Precautions: MgO is sensitive to moisture, and must be stored in vacuum box.</p>
4.	MgO (111) Substrate 10x10 x0.5 mm, 1SP	<p>MgO single crystal substrate</p> <p>Size: 10x10 x 0.5mm +/- 0.05 mm</p> <p>Orientation: (111) +/-0.5 Deg</p> <p>Polish: One side EPI polished by CMP technology with minimum sub-surface damage.</p> <p>Surface roughness: < 15A</p> <p>Packing: The substrate is packed with 100 grade clean plastic bag under 1000 class clean room.</p> <p>Precautions: MgO is sensitive to moisture, and must be stored in vacuum box.</p>
5.	MgO (111) Substrate 10x10 x0.5 mm, 2SP	<p>MgO single crystal substrate</p> <p>Size: 10x10 x 0.5mm +/- 0.05 mm</p> <p>Orientation: (111) +/-0.5 Deg</p> <p>Polish: two sides EPI polished by CMP technology with minimum sub-surface damage.</p> <p>Surface roughness: < 15A</p> <p>Packing: The substrate is packed with 100 grade clean plastic bag under 1000 class clean room.</p> <p>Precautions: MgO is sensitive to moisture, and must be stored in vacuum box.</p>
6.	MgO (111) Substrate 10x10 x1.0 mm, 1SP	<p>MgO single crystal substrate</p> <p>Size: 10x10 x 1.0mm +/- 0.05 mm</p>

		<p>Orientation: (111) +/-0.5 Deg</p> <p>Polish: One side EPI polished by CMP technology with minimum sub-surface damage.</p> <p>Surface roughness: < 15A</p> <p>Packing: The substrate is packed with 100 grade clean plastic bag under 1000 class clean room.</p> <p>Precautions: MgO is sensitive to moisture, and must be stored in vacuum box.</p>
7.	MgO (111) Square substrate 0.5" x0.5" x0.5 mm , 1SP	<p>MgO single crystal substrate</p> <p>Size: 0.5" x 0.5" x 0.5mm +/- 0.05 mm</p> <p>Orientation: (100) +/-0.5 Deg</p> <p>Polish: One side EPI polished by CMP technology with minimum sub-surface damage.</p> <p>Surface roughness: < 15A</p> <p>Packing: The substrate is packed with 100 grade clean plastic bag under 1000 class clean room.</p> <p>Precautions: MgO is sensitive to moisture, and must be stored in vacuum box.</p>
8.	MgO (111) Square substrate 1" x 1"x 0.5 mm , 1SP	<p>MgO single crystal substrate</p> <p>Size: 1" x 1" x 0.5mm +/- 0.05 mm</p> <p>Orientation: (111) +/-0.5 Deg</p> <p>Polish: One side EPI polished by CMP technology with minimum sub-surface damage.</p> <p>Surface roughness: < 15A</p> <p>Packing: The substrate is packed with 100 grade clean plastic bag under 1000 class clean room.</p> <p>Precautions: MgO is sensitive to moisture, and must be stored in vacuum box.</p>

48. Mica Disks(Highest Grade)

No.	Item	Description
1.	Highest Grade Mica Disks, 10mm diameter pkg/10	<p>Recommended for AFM</p> <p>Highest quality grade V1 mica, 0.21mm (.0085") thick. Interleaved, in packages of 10.</p> <p>Diameter : 10mm (0.39")</p>
2.	Highest Grade Mica Disks, 20mm diameter pkg/10	<p>Recommended for AFM</p> <p>Highest quality grade V1 mica, 0.21mm (.0085") thick. Interleaved, in packages of 10.</p> <p>Diameter : 20mm (0.39")</p>
3.	Highest Grade Mica Sheets, 15mm x 15mm (0.59 x 0.59") ,0.15 to 0.177mm (.006-.007") thick , pkg/10	<p>Highest Grade Mica Sheets,</p> <p>Highest quality Grade V1</p> <p>Size: 15mm x 15mm (0.59 x 0.59")</p> <p>Thickness: 0.15 to 0.177mm (.006-.007")</p> <p>Sheets interleaved</p>

4.	Highest Grade Mica Sheets, 15mm x 15mm (0.59 x 0.59") ,0.15 to 0.177mm (.006-.007") thick , pkg/10 -1	Highest Grade Mica Sheets, Highest quality Grade V1 Size: 15mm x 15mm (0.59 x 0.59") Thickness: 0.15 to 0.177mm (.006-.007") Sheets interleaved
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49. Mo - Molybdenum Substrates (polycrystalline)

No.	Item	Description
1.	Mo Polycrystalline Substrate: 1"x1" x 0.5 mm, two sides polished	Polycrystalline Mo substrate Purity: 99.9% Average Grain Size: 10~50 Microns (No annealing) Substrate dimension: 1"x1" x 0.5 mm Polishing: two sides as cool rolling Surface roughness: < 30A
2.	Mo Polycrystalline Substrate: 10 x 10 x 0.5mm, two sides polished	Polycrystalline Mo substrate Purity: 99.9% Average Grain Size: 10~50 Microns (No annealing) Substrate dimension: 10 x 10 x 0.5 mm Polishing: two sides as cool rolling Surface roughness: < 30A
3.	Mo - Molybdenum Polycrystalline Metallic Foil: 100mm x 100mm x 0.025mm(thickness),	Mo - Molybdenum Polycrystalline Metallic Foil: Average Grain Size: 10~50 Microns (No annealing) Substrate dimension: 100mm x 100mm x 0.025mm(thickness), Surface roughness: < 30A
4.	Mo - Molybdenum Polycrystalline Metallic Foil: 100mm x 100mm x 0.05mm(thickness),	Mo - Molybdenum Polycrystalline Metallic Foil: Average Grain Size: 10~50 Microns (No annealing) Substrate dimension: 100mm x 100mm x 0.05mm(thickness), Surface roughness: < 30A
5.	Mo - Molybdenum Polycrystalline Metallic Foil: 200mm x 100mm x 0.1mm(thickness),	Mo - Molybdenum Polycrystalline Metallic Foil: Average Grain Size: 10~50 Microns (No annealing) Substrate dimension: 200mm x 100mm x 0.1mm(thickness), Surface roughness: < 30A

50. NaCl

No.	Item	Description
1.	NaCl (100), 10x10x 2.0 mm 1 Side polished	Crystal: NaCl Crystal Orientation: <100> +/-2 ° Size: 10x10x 2.0 mm Polished: one side polished

		Purity: 99.9% Surface roughness: < 30Å Package: 1000 class clean plastic bag sealed Note: NaCl crystal is sensitive to moisture and water, must be stored in desiccator box
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51. NdCaAlO₄

No.	Item	Description
1.	NdCaAlO ₄ (001) 10x10x0.5 mm, 1 side polished	Single crystal NdCaAlO ₄ Substrate Size: 10mm x 10mm x 0.5 mm Orientation: (001) Polishing: one side polished. Surface roughness: < 5Å Packing: in 1000 class clean room with plastic bag
2.	NdCaAlO ₄ (001) 10x10x0.5 mm, 2 sides polished	Single crystal NdCaAlO ₄ Substrate Size: 10mm x 10mm x 0.5 mm Orientation: (001) Polishing: two sides polished. Surface roughness: < 5Å Packing: in 1000 class clean room with plastic bag
3.	NdCaAlO ₄ (100) 10x10x0.5 mm, 1 side polished	Single crystal NdCaAlO ₄ Substrate Size: 10mm x 10mm x 0.5 mm Orientation: (001) Polishing: one side polished. Surface roughness: < 5Å Packing: in 1000 class clean room with plastic bag

52. NdGaO₃

A. NdGaO₃ Substrate (011)

No.	Item	Description
1.	NdGaO ₃ (011) 10x10x0.4 mm, 1 SP	Single crystal NdGaO ₃ Substrate Size: 10mm x 10mm x 0.4 mm Orientation: (011) Polishing: one side polished. Surface roughness: < 5Å Packing: in 1000 class clean room with plastic bag <u>Typical Properties of NdGaO₃:</u> Structure: Orthorhombic Lattice Constant: a=5.43Å, b=5.50Å, c=7.71Å Melting Point: 1600 °C

		Density: 7.57 g/cm ³ Thermo-expansion: 7.89 x10 ⁻⁶ /k Dielectric constant: 25 Loss tangent: 3x10 ⁻³ Hardness: 5.9 (Mohs)
2.	NdGaO ₃ (011) 10x10x0.5 mm, 1 SP	Single crystal NdGaO ₃ Substrate Size: 10mm x 10mm x 0.5 mm Orientation: (011) Polishing: one side polished. Surface roughness: < 5A Packing: in 1000 class clean room with plastic bag <u>Typical Properties of NdGaO₃:</u> Structure: Orthohombic Lattice Constant: a=5.43Å, b=5.50Å, c=7.71Å Melting Point: 1600 °C Density: 7.57 g/cm ³ Thermo-expansion: 7.89 x10 ⁻⁶ /k Dielectric constant: 25 Loss tangent: 3x10 ⁻³ Hardness: 5.9 (Mohs)
3.	NdGaO ₃ (011) 10x5x0.5 mm, 1 SP-1	Single crystal NdGaO ₃ Substrate Size: 10mm x 5mm x 0.5 mm Orientation: (011) Polishing: one side polished. Surface roughness: < 5A Packing: in 1000 class clean room with plastic bag <u>Typical Properties of NdGaO₃:</u> Structure: Orthohombic Lattice Constant: a=5.43Å, b=5.50Å, c=7.71Å Melting Point: 1600 °C Density: 7.57 g/cm ³ Thermo-expansion: 7.89 x10 ⁻⁶ /k Dielectric constant: 25 Loss tangent: 3x10 ⁻³ Hardness: 5.9 (Mohs)
4.	NdGaO ₃ (011) 2" dia x0.5 mm, 1 SP	Single crystal NdGaO ₃ Substrate Size: 2" dia x 0.5 mm Orientation: (011) Polishing: one side polished. Surface roughness: < 5A Packing: in 1000 class clean room with plastic bag <u>Typical Properties of NdGaO₃:</u> Structure: Orthohombic Lattice Constant: a=5.43, b=5.50, c=7.71 Melting Point: 1600 °C Density: 7.57 g/cm ³

		Thermo-expansion: $7.89 \times 10^{-6}/\text{k}$ Dielectric constant: 25 Loss tangent: 3×10^{-3} Hardness: 5.9 (Mohs)
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B. NdGaO3 substrates(001)

No.	Item	Description
1.	NdGaO3 (001) 5x5x0.45 mm, 2 SP	<p>Single crystal NdGaO3 Substrate Size: 5mm x 5mm x 0.45 mm Orientation: (001) Polishing: two side side polished. Surface roughness: < 5A Packing: in 1000 class clean room with plastic bag</p> <p><u>Typical Properties of NdGaO3:</u> Structure: Orthohombic Lattice Constant: a=5.43, b=5.50, c=7.71 Melting Point: 1600 oC Density: 7.57 g/cm3 Thermo-expansion: $7.89 \times 10^{-6}/\text{k}$ Dielectric constant: 25 Loss tangent: 3×10^{-3} Hardness: 5.9 (Mohs)</p>
2.	NdGaO3 (001) 5x5x0.5 mm, 1 SP	<p>Single crystal NdGaO3 Substrate Size: 5mm x 5mm x 0.5 mm Orientation: (001) Polishing: one side polished. Surface roughness: < 5A Packing: in 1000 class clean room with plastic bag</p> <p><u>Typical Properties of NdGaO3:</u> Structure: Orthohombic Lattice Constant: a=5.43, b=5.50, c=7.71 Melting Point: 1600 °C Density: 7.57 g/cm3 Thermo-expansion: $7.89 \times 10^{-6}/\text{k}$ Dielectric constant: 25 Loss tangent: 3×10^{-3} Hardness: 5.9 (Mohs)</p>
3.	NdGaO3 (001) 10x10x0.5 mm, 1 SP	<p>Single crystal NdGaO3 Substrate Size: 10mm x 10mm x 0.5 mm Orientation: (001) Polishing: one side side polished. Surface roughness: < 5A Packing: in 1000 class clean room with plastic bag</p> <p><u>Typical Properties of NdGaO3:</u> Structure: Orthohombic</p>

		Lattice Constant(Å): a=5.43, b=5.50, c=7.71 Melting Point: 1600 °C Density: 7.57 g/cm ³ Thermo-expansion: 7.89 x10 ⁻⁶ /k Dielectric constant: 25 Loss tangent: 3x10 ⁻³ Hardness: 5.9 (Mohs)
4.	NdGaO ₃ (001) 10x10x0.5 mm, 2 SP	Single crystal NdGaO ₃ Substrate Size: 10mm x 10mm x 0.5 mm Orientation: (001) Polishing: two side side polished. Surface roughness: < 5A Packing: in 1000 class clean room with plastic bag <u>Typical Properties of NdGaO₃:</u> Structure: Orthohombic Lattice Constant: a=5.43, b=5.50, c=7.71 Melting Point: 1600 °C Density: 7.57 g/cm ³ Thermo-expansion: 7.89 x10 ⁻⁶ /k Dielectric constant: 25 Loss tangent: 3x10 ⁻³ Hardness: 5.9 (Mohs)

C. NdGaO₃ Substrates(100)

No.	Item	Description
1.	NdGaO ₃ (100) 5x5x0.5mm, 1 SP	Single crystal NdGaO ₃ Substrate Size: 5x5 x 0.5 mm Orientation: (100) Polishing: one side polished. Surface roughness: < 5A Packing: in 1000 class clean room with plastic bag <u>Typical Properties of NdGaO₃:</u> Structure: Orthohombic Lattice Constant: a=5.43, b=5.50, c=7.71 Melting Point: 1600 °C Density: 7.57 g/cm ³ Thermo-expansion: 7.89 x10 ⁻⁶ /k Dielectric constant: 25 Loss tangent: 3x10 ⁻³ Hardness: 5.9 (Mohs)
2.	NdGaO ₃ (100) 5x5x0.5mm, 2SP	Single crystal NdGaO ₃ Substrate Size: 5x5 x 0.5 mm Orientation: (100) Polishing: two sides polished. Surface roughness: < 5A Packing: in 1000 class clean room with plastic bag

		<p><u>Typical Properties of NdGaO₃:</u> Structure: Orthohombic Lattice Constant: a=5.43: b=5.50, c=7.71 Melting Point: 1600 °C Density: 7.57 g/cm³ Thermo-expansion: 7.89 x10⁻⁶/k Dielectric constant: 25 Loss tangent: 3x10⁻³ Hardness: 5.9 (Mohs)</p>
3.	NdGaO ₃ (100) 1/4 " x 1/4 " x 0.5mm, 2 SP	<p>Single crystal NdGaO₃ Substrate Size: 1/4 " x 1/4 " x 0.5mm Orientation: (100) Polishing: two side polished. Surface roughness: < 5A Packing: in 1000 class clean room with plastic bag</p> <p><u>Typical Properties of NdGaO₃:</u> Structure: Orthohombic Lattice Constant: a=5.43, b=5.50, c=7.71 Melting Point: 1600 °C Density: 7.57 g/cm³ Thermo-expansion: 7.89 x10⁻⁶/k Dielectric constant: 25 Loss tangent: 3x10⁻³ Hardness: 5.9 (Mohs)</p>
4.	NdGaO ₃ (100) 10x10x0.5 mm, 1 SP	<p>Single crystal NdGaO₃ Substrate Size: 10mm x 10mm x 0.5 mm Orientation: (100) Polishing: one side side polished. Surface roughness: < 5A Packing: in 1000 class clean room with plastic bag</p> <p><u>Typical Properties of NdGaO₃:</u> Structure: Orthohombic Lattice Constant(Å): a=5.43, b=5.50, c=7.71 Melting Point: 1600 °C Density: 7.57 g/cm³ Thermo-expansion: 7.89 x10⁻⁶/k Dielectric constant: 25 Loss tangent: 3x10⁻³ Hardness 5.9 (Mohs)</p>
5.	NdGaO ₃ (100) 10x10x0.5 mm, 2 SP	<p>Single crystal NdGaO₃ Substrate Size: 10mm x 10mm x 0.5 mm Orientation: (100) Polishing: two side side polished. Surface roughness: < 5A Packing: in 1000 class clean room with plastic bag</p> <p><u>Typical Properties of NdGaO₃:</u> Structure: Orthohombic Lattice Constant: a=5.43, b=5.50, c=7.71 Melting Point: 1600 °C Density: 7.57 g/cm³</p>

		Thermo-expansion: $7.89 \times 10^{-6}/\text{k}$ Dielectric constant: 25 Loss tangent: 3×10^{-3} Hardness: 5.9 (Mohs)
6.	NdGaO ₃ (100) 15x15x0.5 mm, 2 SP	Single crystal NdGaO ₃ Substrate Size: 15x15x0.5mm Orientation: (100) Polishing: two side side polished. Surface roughness: < 5A Packing: in 1000 class clean room with plastic bag <u>Typical Properties of NdGaO₃:</u> Structure: Orthohombic Lattice Constant: a=5.43, b=5.50, c=7.71 Melting Point: 1600 °C Density: 7.57 g/cm ³ Thermo-expansion: $7.89 \times 10^{-6}/\text{k}$ Dielectric constant: 25 Loss tangent: 3×10^{-3} Hardness: 5.9 (Mohs)
7.	NdGaO ₃ (100) 2" dia x0.5 mm, 1 SP	Single crystal NdGaO ₃ Substrate Size: 2" dia x 0.5 mm Orientation: (100) Polishing: one side polished. Surface roughness: < 5A Packing: in 1000 class clean room with plastic bag <u>Typical Properties of NdGaO₃:</u> Structure: Orthohombic Lattice Constant: a=5.43Å, b=5.50Å, c=7.71Å Melting Point: 1600 °C Density: 7.57 g/cm ³ Thermo-expansion: $7.89 \times 10^{-6}/\text{k}$ Dielectric constant: 25 Loss tangent: 3×10^{-3} Hardness: 5.9 (Mohs)

D. NdGaO₃ Substrates(110)

No.	Item	Description
1.	NdGaO ₃ (110) 5x5x0.5mm, 1 SP	Single crystal NdGaO ₃ Substrate Size: 5x5 x 0.5 mm Orientation: (110) Polishing: one side polished. Surface roughness: < 5A Packing: in 1000 class clean room with plastic bag <u>Typical Properties of NdGaO₃:</u> Structure: Orthohombic

		<p>Lattice Constant: $a=5.43$, $b=5.50$, $c=7.71$ Melting Point: $1600\text{ }^{\circ}\text{C}$ Density: 7.57 g/cm^3 Thermo-expansion: $7.89 \times 10^{-6}/\text{k}$ Dielectric constant: 25 Loss tangent: 3×10^{-3} Hardness: 5.9 (Mohs)</p>
2.	NdGaO ₃ (110) 5x5x0.5mm, 2 SP	<p>Single crystal NdGaO₃ Substrate Size: 5x5 x 0.5 mm Orientation: (110) Polishing: two sides polished. Surface roughness: < 5A Packing: in 1000 class clean room with plastic bag</p> <p><u>Typical Properties of NdGaO₃:</u> Structure: Orthohombic Lattice Constant: $a=5.43$, $b=5.50$, $c=7.71$ Melting Point: $1600\text{ }^{\circ}\text{C}$ Density: 7.57 g/cm^3 Thermo-expansion: $7.89 \times 10^{-6}/\text{k}$ Dielectric constant: 25 Loss tangent: 3×10^{-3} Hardness: 5.9 (Mohs)</p>
3.	NdGaO ₃ (110) 1/4 " x 1/4 " x 0.5mm, 1 SP	<p>Single crystal NdGaO₃ Substrate Size: 5x5 x 0.5 mm Orientation: (110) Polishing: one side polished. Surface roughness: < 5A Packing: in 1000 class clean room with plastic bag</p> <p><u>Typical Properties of NdGaO₃:</u> Structure: Orthohombic Lattice Constant: $a=5.43$, $b=5.50$, $c=7.71$ Melting Point: $1600\text{ }^{\circ}\text{C}$ Density: 7.57 g/cm^3 Thermo-expansion: $7.89 \times 10^{-6}/\text{k}$ Dielectric constant: 25 Loss tangent: 3×10^{-3} Hardness: 5.9 (Mohs)</p>
4.	NdGaO ₃ (110) 10x10x0.5 mm, 1 SP	<p>Single crystal NdGaO₃ Substrate Size: 10mm x 10mm x 0.5 mm Orientation: (110) Polishing: one side polished. Surface roughness: < 5A Packing: in 1000 class clean room with plastic bag</p> <p><u>Typical Properties of NdGaO₃:</u> Structure: Orthohombic Lattice Constant: $a=5.43$, $b=5.50$, $c=7.71$ Melting Point: $1600\text{ }^{\circ}\text{C}$</p>

		Density: 7.57 g/cm ³ Thermo-expansion: 7.89 x10 ⁻⁶ /k Dielectric constant: 25 Loss tangent: 3x10 ⁻³ Hardness: 5.9 (Mohs)
5.	NdGaO ₃ (110) 10x10x0.5 mm, 2 SP	Single crystal NdGaO ₃ Substrate Size: 10mm x 10mm x 0.5 mm Orientation: (110) Polishing: two side polished. Surface roughness: < 5A Packing: in 1000 class clean room with plastic bag <u>Typical Properties of NdGaO₃:</u> Structure: Orthohombic Lattice Constant: a=5.43: b=5.50: c=7.71 Melting Point: 1600 °C Density: 7.57 g/cm ³ Thermo-expansion: 7.89 x10 ⁻⁶ /k Dielectric constant: 25 Loss tangent: 3x10 ⁻³ Hardness: 5.9 (Mohs)
6.	NdGaO ₃ (110) 10x10x1.0 mm, 1 SP	Single crystal NdGaO ₃ Substrate Size: 10mm x 10mm x 1.0 mm Orientation: (110) Polishing: one side polished. Surface roughness: < 5A Packing: in 1000 class clean room with plastic bag <u>Typical Properties of NdGaO₃:</u> Structure: Orthohombic Lattice Constant: a=5.43, b=5.50, c=7.71 Melting Point: 1600 °C Density: 7.57 g/cm ³ Thermo-expansion: 7.89 x10 ⁻⁶ /k Dielectric constant: 25 Loss tangent: 3x10 ⁻³ Hardness : 5.9 (Mohs)
7.	NdGaO ₃ (110) 15x15x0.5 mm, 2 SP	Single crystal NdGaO ₃ Substrate Size: 15mm x 15mm x 0.5 mm Orientation: (110) Polishing: two side polished. Surface roughness: < 5A Packing: in 1000 class clean room with plastic bag <u>Typical Properties of NdGaO₃:</u> Structure: Orthohombic Lattice Constant: a=5.43, b=5.50, c=7.71 Melting Point: 1600 °C Density: 7.57 g/cm ³ Thermo-expansion: 7.89 x10 ⁻⁶ /k

		Dielectric constant: 25 Loss tangent: 3×10^{-3} Hardness: 5.9 (Mohs)
8.	NdGaO ₃ (110) 2" dia x0.5 mm, 2 SP	<p>Single crystal NdGaO₃ Substrate Size: 2" dia x 0.5 mm Orientation: (110) Polishing: two side polished. Surface roughness: < 5A Packing: in 1000 class clean room with plastic bag</p> <p><u>Typical Properties of NdGaO₃:</u> Structure: Orthohombic Lattice Constant: a=5.43, b=5.50, c=7.71 Melting Point: 1600 °C Density: 7.57 g/cm³ Thermo-expansion: $7.89 \times 10^{-6}/\text{k}$ Dielectric constant: 25 Loss tangent: 3×10^{-3} Hardness: 5.9 (Mohs)</p>

53. Ni - Nickel Substrate (Single crystal and Polycrystalline)

A. Ni Polycrystalline substrate

No.	Item	Description
1.	Ni Metallic Substrate (polycrystalline): 1" x 1" x 0.5 mm, 1 side polished	<p>Polycrystal Ni metallic substrate made from 2 mm thickness cold rolling Nickel plate Purity: > 99.9% Average Grain Size: 10~50 Microns (No annealling) Substrate dimension: 25.4x25.4 x 0.5 mm, (1"x1"x0.5mm) Surface finish: (RMS or Ra): < 30A,one side polished</p>
2.	Ni Metallic Substrate (polycrystalline): 10x10 x 0.5 mm, 1 side polished	<p>Polycrystal Ni metallic substrate made from 2 mm thickness cold rolling Nickel plate Purity: > 99.9% Average Grain Size: 10~50 Microns (No annealling) Substrate dimension: 10x10 x 0.5 mm, Surface finish: (RMS or Ra): < 30A,one side polished</p>
3.	Ni Metallic Substrate (polycrystalline): 10x10 x 1.0 mm, 1 side polished-1	<p>Polycrystal Ni metallic substrate made from 2 mm thickness cold rolling Nickel plate Purity: > 99.9% Average Grain Size: 10~50 Microns (No annealling) Substrate dimension: 10x10 x 1.0 mm, Surface finish: (RMS or Ra): < 30A,one side polished</p>

4.	Ni Metallic Substrate (polycrystalline): 2" x 2" x 1.0 mm, 1 side polished	<p>Polycrystal Ni metallic substrate made from 2 mm thickness cold rolling Nickel plate</p> <p>Purity: > 99.9%</p> <p>Average Grain Size: 10 ~ 50 microns (without Annealing)</p> <p>Substrate dimension: 50 x 50 x 1.0 mm, (2"x2"x 1.0 mm)</p> <p>Surface finish: (RMS or Ra): < 30A, one side polished</p>
5.	304 Stainless Steel Meshed Disc as Electrode Substrate for CR20XX Coin Cell -EQ-SSMD-304	<p>This SS 304 meshed round disc can be easily single side coated by battery electrode material paste and directly put into CR20xx coin cell for testing purpose, it is very easy and convenient.</p> <p>Please note that customer should be aware of the 304 stainless steel chemical property and see if it is applicable to their own battery material.</p> <p><u>Specifications:</u></p> <p>Material: Stainless Steel, Purity> 99.9%</p> <p>Sold in box only</p> <p>Diameter: 15mm</p> <p>Thickness: 0.15mm</p> <p>Quantity: 100pcs</p> <p>Net weight: 128mg/pcs</p> <p>Application: Directly coat electrode material on it to collect current</p>
6.	Nickel Foam for Battery Cathode Substrate (1000mm length x 300mm width x 1.6mm thickness) - EQ-bcnf-16m	<p>Nickel Foam for Battery Cathode Substrate (1m length x 300mm width x 1.6mm thickness) EQ-bcnf-16m</p> <p><u>Specifications:</u></p> <p>Material: Nickel Foam, Purity> 99.99%</p> <p>Sold in roll only</p> <p>Length: 1m</p> <p>Width: 300mm</p> <p>Thickness: 1.6 mm</p> <p>Net weight: 104g</p> <p>Surface Density: 346g/m²</p> <p>Porosity: ≥95% (80-110 Pores per Inch)</p> <p>Extensibility: Lengthwise≥5%; Widthwise≥12%</p> <p>Tensile Strength : Lengthwise≥1.25N/mm²; Widthwise≥1.00N/mm²</p>
7.	Nickel Foam for Battery or Supercapacitor Cathode Substrate (300mm length x 80mm width x 0.08mm thickness) - EQ-bcnf-80um	<p>Nickel Foam for Battery Cathode Substrate (300mm length x 80mm width x 0.08mm thickness) - EQ-bcnf-80um</p> <p><u>Specifications:</u></p> <p>Material: Nickel Foam, Purity> 99.99%</p> <p>Sold in roll only</p> <p>Length: 300 mm</p> <p>Width: 80 mm</p> <p>Thickness: 0.08mm (80um)</p> <p>Net weight: 8.32g</p> <p>Surface Density before rolling: 346g/m²</p> <p>Porosity: ≥95% (80-110 Pores per Inch)</p> <p>Extensibility: Lengthwise≥5%; Widthwise≥12%</p> <p>Tensile Strength : Lengthwise≥1.25N/mm²; Widthwise≥1.00N/mm²</p>

8.	Nickel Foil: (0.03mm thick x 150mm width x 5000 mm length) - NFoil-25u	<p>0.025mm thickness Nickel Foil for graphene and other film deposition</p> <p><u>Specifications:</u> Material: Nickel, Purity> 99.9% Sold in roll only Length: 5000 mm Width: 150 mm Thickness: 0.03mm (25um) Net weight: 200g Shipping weight: 13lb Typical Physics Properties Purity: ≥99.9% Form: foil Resistivity: 6.97 $\mu\Omega$-cm, 20°C Thickness: 0.125 mm Bp: 2732 °C(lit.) Mp: 1453 °C(lit.) Density: 8.9 g/mL at 25 °C(lit.)</p>
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B. Ni Single crystal

No.	Item	Description
1.	Ni Single Crystal Substrate, <100>, 10x10 x 0.5 mm, 1 side polished	Ni Single crystal substrate Purity: > 99.99% Orientation: <100> $\pm 2^\circ$ Substrate dimension: 10x10 x 0.5 mm Surface finish (RMS or Ra): < 30A Paching: under 100 class clean room with vacuumed bag
2.	Ni Single Crystal Substrate, <100>, 10x10 x 1.0 mm, 1 side polished	Ni Single crystal substrate Purity: > 99.99% Orientation: <100> $\pm 2^\circ$ Substrate dimension: 10x10 x 1.0 mm Surface finish (RMS or Ra): < 30A Paching: under 100 class clean room with vacuumed bag
3.	Ni Single Crystal Substrate, <110>, 10x10 x 0.5 mm, 1 side polished	Single crystal Ni metallic substrate Purity: > 99.99% Orientation: <110> $\pm 2^\circ$ Substrate dimension: 10x10 x 0.5 mm Surface finish: (RMS or Ra): < 30A, one side polished Paching: under 100 class clean room with vacuumed bag
4.	Ni Single Crystal Substrate, <110>, 10x10 x 1.0 mm, 1 side polished	Single crystal Ni metallic substrate Purity: > 99.99% Orientation: <110> $\pm 2^\circ$ Substrate dimension: 10x10 x 1.0 mm Surface finish: (RMS or Ra): < 30A, one side polished Paching: under 100 class clean room with vacuumed bag

5.	Ni Single Crystal Substrate, <110>, 20x20 x 1.0 mm, 1 side polished	Single crystal Ni metallic substrate Single crystal is grown by special Bridgman method Purity: > 99.99% Orientation: <110> $\pm 2^\circ$ Substrate dimension: 20x20 x 1.0 mm Surface finish: (RMS or Ra): < 30A, one side polished Packing: under 100 class clean room with vacuumed bag
6.	Ni Single Crystal Substrate, <110>, 30 Dia. x 1.0 mm, 1 side polished	Single crystal Ni metallic substrate Purity: > 99.99% Orientation: <110> $\pm 2^\circ$ Substrate dimension: 30 mm diameter x 1.0 mm Surface finish: Surface finish: (RMS or Ra): < 30A, one side polished Packing: under 100 class clean room with vacuumed bag
7.	Ni Single Crystal Substrate, <111>, 10x10 x 0.5 mm, 1 side polished	Single crystal Ni metallic substrate Purity: > 99.99% Orientation: <111> $\pm 2^\circ$ Substrate dimension: 10x10 x 0.5 mm Surface finish: (RMS or Ra): < 30A, one side polished Packing: under 100 class clean room with vacuumed bag
8.	Ni Single Crystal Substrate, <111>, 10x10 x 1.0 mm, 1 side polished	Ni Single crystal substrate Purity: > 99.99% Orientation: <111> $\pm 2^\circ$ Substrate dimension: 10x10 x 1.0 mm Surface finish: One side polished Roughness (RMS, Ra) < 30A Packing: under 100 class clean room with vacuumed bag

54. PbWO4

No.	Item	Description
1.	PbWO4 (001) single crystal substrate 10x10x0.5mm, 2sp	<p>substrate: PbWO4 Wafer size: 10 x 10 x 0.5 Orientation: (001) Polished surface: two sides polished Package: Each wafer is packed in 1000 class clean room with plastic bag . PbWO4 single crystal, 10 x 10 x 0.4mm, both faces polished.</p> <p>Lead tungstate (PbWO4) is a new scintillating crystal discovered in 1990s. It is one of the most dense oxide crystal (8.3g/cm³), and is distinguished by its short radiation length (0.9 cm), small Moliere radius (2.19cm) and strong irradiation hardness. Its scintillation light output peaks between 450-550nm with a fast component decay time in the range from 2-20ns. After irradiation with g-ray, the degradation in the optical transmittance is not large up to 106 rad. PbWO4 is considered as a promising scintillation material for electromagnetic spectrometer in high energy, nuclear physics experiment as well as nuclear medicine.</p>

		<p>Main PropertiesCrystal structure: Tetragonal; Space group I 41 /a; Lattice constant (??) a = b = 5.416 , c = 12.049; Density (g/cm³) 8.28; Radiation length (cm) 0.92; Mole re radius (cm) 2.19; Decay constant (ns) 6/30; Peak emission (nm): 440/530; Light output (%) 0.5; Index of refraction: 2.16; Melting point (oC) 1123; Hygroscopicity: No Cleavage (101); Crystal boule size 30 mm in diameter x 100 mm in length</p>
2.	PbWO ₄ (100) single crystal substrate 10x10x0.4mm,2sp	<p>substrate: PbWO₄ Wafer size: 10 x 10 x 0.4 Orientation: (100) Polished surface: two sides polished Package: Each wafer is packed in 1000 class clean room with plastic bag . PbWO₄ single crystal, 10 x 10 x 0.4mm, both faces polished.</p> <p>Lead tungstate (PbWO₄) is a new scintillating crystal discovered in 1990s. It is one of the most dense oxide crystal (8.3g/cm³), and is distinguished by its short radiation length (0.9 cm), small Moliere radius (2.19cm) and strong irradiation hardness. Its scintillation light output peaks between 450-550nm with a fast component decay time in the range from 2-20ns. After irradiation with g-ray, the degradation in the optical transmittance is not large up to 106 rad. PbWO₄ is considered as a promising scintillation material for electromagnetic spectrometer in high energy, nuclear physics experiment as well as nuclear medicine.</p> <p>Main PropertiesCrystal structure: Tetragonal; Space group I 41 /a; Lattice constant (??) a = b = 5.416 , c = 12.049; Density (g/cm³) 8.28; Radiation length (cm) 0.92; Mole re radius (cm) 2.19; Decay constant (ns) 6/30; Peak emission (nm): 440/530; Light output (%) 0.5; Index of refraction: 2.16; Melting point (oC) 1123; Hygroscopicity: No Cleavage (101); Crystal boule size 30 mm in diameter x 100 mm in length</p>
3.	PbWO ₄ single crystal substrate 10x5x0.5mm,fine ground	<p>substrate:PbWO₄ Wafer size: 10 x 5 x 0.5 mm Orientation: (100) Polished surface: two sides fine ground Package: Each wafer is packed in 1000 class clean room with plastic bag . PbWO₄ single crystal, 10 x 5 x 0.5mm, both faces fine ground.</p> <p>Lead tungstate (PbWO₄) is a new scintillating crystal discovered in 1990s. It is one of the most dense oxide crystal (8.3g/cm³), and is distinguished by its short radiation length (0.9 cm), small Moliere radius (2.19cm) and strong irradiation hardness. Its scintillation light output peaks between 450-550nm with a fast component decay time in the range from 2-20ns. After irradiation with g-ray, the degradation in the optical transmittance is not large up to 106 rad. PbWO₄ is considered as a promising scintillation material for electromagnetic spectrometer in high energy, nuclear physics experiment as well as nuclear medicine.</p> <p>Main PropertiesCrystal structure: Tetragonal; Space group I 41 /a; Lattice constant (Å) a = b = 5.416 , c = 12.049; Density (g/cm³) 8.28; Radiation length (cm) 0.92; Mole re radius (cm) 2.19; Decay constant (ns) 6/30; Peak emission (nm): 440/530; Light output (%) 0.5; Index of refraction: 2.16; Melting point (°C) 1123; Hygroscopicity: No Cleavage (101); Crystal boule size 30 mm in diameter x 100 mm in length</p>

55. PMNT

No	Item	Description																						
1.	PMNT Substrate (001) 10x10x0.5mm, one sides polished	<p>Size: 10x10x 0.5mm +/-0.05mm Orientation: (001) +/-0.5 Deg Growing Method: Bridgman method Polish: One side EPI polished by CMP tecnology with less sub-surface lattice damage. Pack: Packed in 100 grade plastic bag under 1000 class clean room.</p> <table><tr><td>ChemicalComposition:</td><td>(PbMg 0.33 Nb 0.67)1-x: (PbTiO3)x; x=0.29-0.32</td></tr><tr><td>Crystalstructure / Lattice</td><td>R3m, Rhombohedral a0 ~ 4.024 Å, (pseudo-cubic, varies with composition)</td></tr><tr><td>Melting Point:</td><td>1280 oC</td></tr><tr><td>Density</td><td>8.1 g/cm3</td></tr><tr><td>Piezoelectric Coefficient</td><td>d33 m >2000 pC/N</td></tr><tr><td>Coupling Constant</td><td>k33 (longitudinal mode) >92% kt (thickness mode) 59-62% k33' (beam mode) 84-88%</td></tr><tr><td>Dielectric Constant</td><td>e (at 1kHz after poling) 4000</td></tr><tr><td>Dielectric loss</td><td>tan delta < 0.9</td></tr><tr><td>Curie temperature:</td><td>135-150 oC</td></tr><tr><td>Max size</td><td>25 mm x 25 mm x 1- 2 mm thickness along [001],</td></tr><tr><td>Electrode Coating</td><td>Gold or Silver paste coating available upon request</td></tr></table>	ChemicalComposition:	(PbMg 0.33 Nb 0.67)1-x: (PbTiO3)x; x=0.29-0.32	Crystalstructure / Lattice	R3m, Rhombohedral a0 ~ 4.024 Å, (pseudo-cubic, varies with composition)	Melting Point:	1280 oC	Density	8.1 g/cm3	Piezoelectric Coefficient	d33 m >2000 pC/N	Coupling Constant	k33 (longitudinal mode) >92% kt (thickness mode) 59-62% k33' (beam mode) 84-88%	Dielectric Constant	e (at 1kHz after poling) 4000	Dielectric loss	tan delta < 0.9	Curie temperature:	135-150 oC	Max size	25 mm x 25 mm x 1- 2 mm thickness along [001],	Electrode Coating	Gold or Silver paste coating available upon request
ChemicalComposition:	(PbMg 0.33 Nb 0.67)1-x: (PbTiO3)x; x=0.29-0.32																							
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Max size	25 mm x 25 mm x 1- 2 mm thickness along [001],																							
Electrode Coating	Gold or Silver paste coating available upon request																							
2.	PMNT Substrate (001) 25x10x0.5mm, one sides polished	<p>Size: 25x10x 1.0mm +/-0.05mm Orientation: (001) +/-0.5 Deg Growing Method: Bridgman method Polish: One side EPI polished by CMP tecnology with less sub-surface lattice damage. Pack: Packed in 100 grade plastic bag under 1000 class clean room.</p> <table><tr><td>ChemicalComposition:</td><td>(PbMg 0.33 Nb 0.67)1-x: (PbTiO3)x; x=0.29-0.32</td></tr><tr><td>Crystalstructure / Lattice</td><td>R3m, Rhombohedral a= 4.024 Å, (pseudo-cubic, varies with composition)</td></tr><tr><td>Melting Point:</td><td>1280 oC</td></tr><tr><td>Density</td><td>8.1 g/cm3</td></tr><tr><td>Piezoelectric Coefficient</td><td>d33 m >2000 pC/N</td></tr><tr><td>Coupling Constant</td><td>k33 (longitudinal mode) >92% kt (thickness mode) 59-62% k33' (beam mode) 84-88%</td></tr><tr><td>Dielectric Constant</td><td>ε (at 1kHz after poling) 4000</td></tr><tr><td>Dielectric loss</td><td>tan delta < 0.9</td></tr><tr><td>Curie temperature:</td><td>135-150 oC</td></tr><tr><td>Max size</td><td>25 mm x 25 mm x 1- 2 mm thickness along [001],</td></tr></table>	ChemicalComposition:	(PbMg 0.33 Nb 0.67)1-x: (PbTiO3)x; x=0.29-0.32	Crystalstructure / Lattice	R3m, Rhombohedral a= 4.024 Å, (pseudo-cubic, varies with composition)	Melting Point:	1280 oC	Density	8.1 g/cm3	Piezoelectric Coefficient	d33 m >2000 pC/N	Coupling Constant	k33 (longitudinal mode) >92% kt (thickness mode) 59-62% k33' (beam mode) 84-88%	Dielectric Constant	ε (at 1kHz after poling) 4000	Dielectric loss	tan delta < 0.9	Curie temperature:	135-150 oC	Max size	25 mm x 25 mm x 1- 2 mm thickness along [001],		
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		Electrode Coating	Gold or Silver paste coating available upon request
3.	PMNT Substrate (001) 5x5x0.5mm, One side polished	Size: 5x5x 0.5mm +/-0.05mm Orientation: (001) +/-0.5 Deg Growing Method: Bridgman method Polish: One side EPI polished by CMP tecnology with less sub-surface lattice damage. Pack: Packed in 100 grade plastic bag under 1000 class clean room.	
		ChemicalComposition:	(PbMg 0.33 Nb 0.67)1-x: (PbTiO3)x; x=0.29-0.32
		Crystal structure / Lattice	R3m, Rhombohedral a0 ~ 4.024 Å, (pseudo-cubic, varies with composition
		Melting Point:	1280 oC
		Density	8.1 g/cm3
		Piezoelectric Coefficient	d33 m >2000 pC/N
		Coupling Constant	k33 (longitudinal mode) >92% kt (thickness mode) 59-62% k33' (beam mode) 84-88%
		Dielectric Constant	e (at 1kHz after poling) 4000
		Dielectric loss	tan delta < 0.9
		Curie temperature:	135-150 oC
		Max size	25 mm x 25 mm x 1- 2 mm thickness along [001],
		Electrode Coating	Gold or Silver paste coating available upon request
4.	PMNT Substrate (011) 10x10x0.5mm, one sides polished	Size: 10x10x 0.5mm +/-0.05mm Orientation: (011) +/-0.5 Deg Growing Method: Bridgman Method Polish: One side EPI polished by CMP tecnology with less sub-surface lattice damage. Pack: Packed in 100 grade plastic bag under 1000 class clean room.	
		ChemicalComposition:	(PbMg 0.33 Nb 0.67)1-x: (PbTiO3)x; x=0.29-0.32
		Crystalstructure / Lattice	R3m, Rhombohedral a0 ~ 4.024 Å, (pseudo-cubic, varies with composition
		Melting Point:	1280 oC
		Density	8.1 g/cm3
		Piezoelectric Coefficient	d33 m >2000 pC/N
		Coupling Constant	k33 (longitudinal mode) >92% kt (thickness mode) 59-62% k33' (beam mode) 84-88%
		Dielectric Constant	e (at 1kHz after poling) 4000
		Dielectric loss	tan delta < 0.9
		Curie temperature:	135-150 oC
		Max size	25 mm x 25 mm x 1- 2 mm thickness along [001],
		Electrode Coating	Gold or Silver paste coating available upon request

56. SBN

No.	Item	Description	
1.	SBN (001) 10x10x0.5 mm 2sp	Strontium-Barium Niobate ($\text{Sr}_x\text{Ba}_{(1-x)}\text{Nb}_2\text{O}_6$) SBN is an excellent optical and photorefractive material due to its excellent photorefractive, electro-optic, nonlinear optic, and dielectric properties. SBN crystal has a very large electro-optic coefficient up to 1400 pm/V. and is potential crystal for new generation E-O devices Standard substrate SBN ($\text{Sr}_{0.4}\text{Ba}_{0.6}\text{Nb}_2\text{O}_6$) Orientation: (001) +/-0.5 ° Size: 10mm x 10mm x 0.5 mm Polish: two sides optical grade polished Surface roughness: < 5A Packed: each in membrane box	
		Chemical formula	($\text{Sr}_x\text{Ba}_{(1-x)}\text{Nb}_2\text{O}_6$) 0.75>x>0.60
		Crystal structure	Tetragonal (4mm) a = 3.946 Å c = 12.46 Å
		Melting point	1500 °C
		Density	5.4 g/cm ³
		Mohs hardness	5.5
		Thermal conductivity	0.006 W/cm*K
		EO constants	(r33:460~1400pm/V)
		High optical uniformity	(<1x10-4)
		Dielectric constant	E11=450 E32=900
		Coercive field	(Ef:~0.25 k V/mm
		Curie Temperature	70-80°C
		Transmission range	400-6000 nm
		Absorption coefficient	0.3cm ⁻¹ @ 0.44µm
		Piezoelectric Coefficient	D33 = 130 m/V
Refractive index	n _o =2.312 n _e =2.273		
2.	SBN (100) 10x10x0.5 mm 2sp	Strontium-Barium Niobate ($\text{Sr}_x\text{Ba}_{(1-x)}\text{Nb}_2\text{O}_6$) SBN is an excellent optical and photorefractive material due to its excellent photorefractive, electro-optic, nonlinear optic, and dielectric properties. SBN crystal has a very large electro-optic coefficient up to 1400 pm/V. and is potential crystal for new generation E-O devices Standard substrate SBN ($\text{Sr}_{0.4}\text{Ba}_{0.6}\text{Nb}_2\text{O}_6$) Orientation: (100) +/-0.5 o Size: 10mm x 10mm x 0.5 mm Polish: two sides optical grade polished Surface roughness: < 5A Packed: each in membrane box	

		<table><tr><td>Chemical formula</td><td>(Sr_xBa_(1-x)Nb₂O₆) 0.75>x>0.60</td></tr><tr><td>Crystal structure</td><td>Tetragonal (4mm) a = 3.946 Å c = 12.46 Å</td></tr><tr><td>Melting point</td><td>1500 °C</td></tr><tr><td>Density</td><td>5.4 g/cm³</td></tr><tr><td>Mohs hardness</td><td>5.5</td></tr><tr><td>Thermal conductivity</td><td>0.006 W/cm*K</td></tr><tr><td>EO constants</td><td>(r33:460~1400pm/V)</td></tr><tr><td>High optical uniformity</td><td>(<1×10-4)</td></tr><tr><td>Dielectric constant</td><td>E11=450 E32=900</td></tr><tr><td>Coercive field</td><td>(Ef:~0.25 k V/mm</td></tr><tr><td>Curie Temperature</td><td>70-80°C</td></tr><tr><td>Transmission range</td><td>400-6000 nm</td></tr><tr><td>Absorption coefficient</td><td>0.3cm⁻¹ @ 0.44μm</td></tr><tr><td>Piezoelectric Coefficient</td><td>D33 = 130 m/V</td></tr><tr><td>Refractive index</td><td>n_o=2.312 n_e=2.273</td></tr></table>	Chemical formula	(Sr _x Ba _(1-x) Nb ₂ O ₆) 0.75>x>0.60	Crystal structure	Tetragonal (4mm) a = 3.946 Å c = 12.46 Å	Melting point	1500 °C	Density	5.4 g/cm ³	Mohs hardness	5.5	Thermal conductivity	0.006 W/cm*K	EO constants	(r33:460~1400pm/V)	High optical uniformity	(<1×10-4)	Dielectric constant	E11=450 E32=900	Coercive field	(Ef:~0.25 k V/mm	Curie Temperature	70-80°C	Transmission range	400-6000 nm	Absorption coefficient	0.3cm ⁻¹ @ 0.44μm	Piezoelectric Coefficient	D33 = 130 m/V	Refractive index	n _o =2.312 n _e =2.273
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3.	SBN (100) 10x10x0.8 mm 2sp	<p>Strontium-Barium Niobate (Sr_xBa_(1-x)Nb₂O₆) SBN is an excellent optical and photorefractive material due to its excellent photorefractive, electro-optic, nonlinear optic, and dielectric properties. SBN crystal has a very large electro-optic coefficient up to 1400 pm/V. and is potential crystal for new generation E-O devices</p> <p>Standard substrate</p> <p>SBN (Sr_{0.4}Ba_{0.6}Nb₂O₆) Orientation: (100) +/-0.5 o Size: 10mm x 10mm x 0.8 mm Polish: two sides optical grade polished Surface roughness: < 5A Packed: each in membrane box</p> <table><tr><td>Chemical formula</td><td>(Sr_xBa_(1-x)Nb₂O₆) 0.75>x>0.60</td></tr><tr><td>Crystal structure</td><td>Tetragonal (4mm) a = 3.946 Å c = 12.46 Å</td></tr><tr><td>Melting point</td><td>1500 °C</td></tr><tr><td>Density</td><td>5.4 g/cm³</td></tr><tr><td>Mohs hardness</td><td>5.5</td></tr><tr><td>Thermal conductivity</td><td>0.006 W/cm*K</td></tr><tr><td>EO constants</td><td>(r33:460~1400pm/V)</td></tr><tr><td>High optical uniformity</td><td>(<1×10-4)</td></tr><tr><td>Dielectric constant</td><td>E11=450 E32=900</td></tr><tr><td>Coercive field</td><td>(Ef:~0.25 k V/mm</td></tr><tr><td>Curie Temperature</td><td>70-80°C</td></tr></table>	Chemical formula	(Sr _x Ba _(1-x) Nb ₂ O ₆) 0.75>x>0.60	Crystal structure	Tetragonal (4mm) a = 3.946 Å c = 12.46 Å	Melting point	1500 °C	Density	5.4 g/cm ³	Mohs hardness	5.5	Thermal conductivity	0.006 W/cm*K	EO constants	(r33:460~1400pm/V)	High optical uniformity	(<1×10-4)	Dielectric constant	E11=450 E32=900	Coercive field	(Ef:~0.25 k V/mm	Curie Temperature	70-80°C								
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		Transmission range	400-6000 nm
		Absorption coefficient	0.3cm^{-1} @ $0.44\mu\text{m}$
		Piezoelectric Coefficient	D33 = 130 m/V
		Refractive index	$n_o=2.312$ $n_e=2.273$
4.	SBN (001) 20x20 x 1.0 mm 2sp	<p>Strontium-Barium Niobate ($\text{Sr}_x\text{Ba}_{(1-x)}\text{Nb}_2\text{O}_6$) SBN is an excellent optical and photorefractive material due to its excellent photorefractive, electro-optic, nonlinear optic, and dielectric properties. SBN crystal has a very large electro-optic coefficient up to 1400 pm/V. and is potential crystal for new generation E-O devices Standard substrate</p> <p>SBN60 ($\text{Sr}_{0.4}\text{Ba}_{0.6}\text{Nb}_2\text{O}_6$) Orientation: (100) +/-0.5 o Size: 20 mm x 20 mm x 1.0 mm Polish: two sides optical grade polished Surface roughness: < 5A Packed: each in mebrane box</p>	

57. Si (Bare Prime, Thermal oxide ,Pt coated &Solar Cell Grade)

A. 5mmx5mm substrate

No.	Item	Description
1.	Si single crystal Substrate (100) orn, 5x5x0.5 mm, 1 sp, N-type undoped, resistivities > 1000 ohm-cm	<p>Single crystal Si, Conductive type: N-type undoped Resistivity: > 1000 ohm-cm Size: 5x5 x 0.5mm Orientation: (100) Polish: one sides polished Surface roughness: < 5A</p>
2.	Si single crystal Substrate (100) orn, 5x5x0.5 mm, 1 sp,P-type B-doped, resistivities 1-10 ohm-cm	<p>Single crystal Si, Conductive type: P-type B-doped Resistivity: 1-10 ohm-cm Size: 5x5 x 0.5mm Orientation: (100) Polish: one sides polished Surface roughness: < 5A</p>
3.	Si single crystal Substrate (111) orn, 5x5x0.5 mm, 1 sp,N-type undoped, resistivities > 1000 ohm-cm	<p>Single crystal Si, Conductive type: N-type , undoped Resistivity: > 1000 ohm-cm Size: 5x5 x 0.5mm Orientation: (111) Polish: one sides polished Surface roughness: < 5A</p>

4.	Si single crystal Substrate (111) orn, 5x5x0.5 mm, 1 sp, P-type B-doped, resistivities 1-10 ohm-cm	Single crystal Si, Conductive type: P-type B-doped Resistivity: 1-10 ohm-cm Size: 5x5 x 0.5mm Orientation: (111) Polish: one sides polished Surface roughness: < 5A
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B. 10x10 mm substrates

No.	Item	Description
1.	Si Substrate (100) ori. 10x10x0.5 mm, 1 sp, P type, B doped, R:0.1-1 ohm-cm	Single crystal Si, Conductive type: P type B doped Resistivity: 0.1-1.0 ohm-cm Size: 10x10 x 0.5mm Orientation: (100) Polish: one side polished Surface roughness: < 5A
2.	Si Substrate (100) ori. 10x10x0.5 mm, 1 sp, P type, B doped, R:1-10 ohm-cm	Single crystal Si, Conductive type: P type B doped Resistivity: 1-10 ohm-cm Size: 10x10 x 0.5mm Orientation: (100) Polish: one side polished Surface roughness: < 5A
3.	Si Substrate (100) orn, 10x10x0.5 mm, 2 sp, P type, B doped, R:8-32 ohm-cm	Single crystal Si, Conductive type: P type B doped Resistivity: 8-32 ohm-cm Size: 10x10 x 0.5mm Orientation: (100) Polish: Two sides polished Surface roughness: < 5A
4.	Si Substrate (100) orn, 10x10x0.6 mm, 1 sp, P type, B doped, 0.1-1.0 ohm-cm	Single crystal Si, Conductive type: P type B doped Resistivity: 0.1~1.0 ohm-cm Size: 10x10 x 0.6mm Orientation: (100) Polish: One side polished Surface roughness: < 5A
5.	Si single crystal Substrate (100) ori, 10x10x0.5 mm, 1 sp, undoped, resistivities > 1000 ohm-cm	Single crystal Si, Conductive type: undoped Resistivity: > 1000 ohm-cm Size: 10x10 x 0.5mm Orientation: (100) Polish: one sides polished

		Surface roughness: < 5A
6.	Si single crystal Substrate (100) orn, 10x10x0.5 mm, 1 sp, N type, P-doped, resistivities :1-10.3 ohm-cm	Single crystal Si, Conductive type: N type, P-doped Resistivity: 1-10.3 ohm-cm Size: 10x10 x 0.5mm Orientation: (100) Polish: one side polished Surface roughness: < 5A
7.	Si single crystal Substrate (100) orn, 10x10x0.5 mm, 2 sp, P-doped, resistivities :5.7-10.3 ohm-cm	Single crystal Si, Conductive type: P-doped Resistivity: 5.7-10.3 ohm-cm Size: 10x10 x 0.5mm Orientation: (100) Polish: two sides polished Surface roughness: < 5A
8.	Si single crystal Substrate (100) orn, 10x10x0.5 mm, 2 sp, undoped	Single crystal Si, Conductive type: undoped Resistivity: 100 ~ 2500 ohm-cm Size: 10x10 x 0.5mm Orientation: (100) Polish: Two sides polished Surface roughness: < 5A
9.	Si single crystal Substrate (110) orn, 10x10x0.5 mm, 1 sp, undoped	Single crystal Si, Conductive type: undoped Resistivity: 1900-2800 ohm-cm Size: 10x10 x 0.5mm Orientation: (110) Polish: One side polished Surface roughness: < 5A
10.	Si single crystal Substrate (111) orn, 10x10x0.5 mm, 1 sp, undoped	Single crystal Si, Conductive type: undoped Resistivity: > 1,000 ohm-cm Size: 10x10 x 0.5mm Orientation: (111) Polish: One side polished Surface roughness: < 5A
11.	Si single crystal Substrate (111) orn, 10x10x0.5 mm, 2 sp, N-type undoped	Single crystal Si, N-type Conductive type: undoped Resistivity: > 1,000 ohm-cm Size: 10x10 x 0.5mm Orientation: (111) Polish: two sides polished Surface roughness: < 5A

12.	Si single crystal Substrate (111) orn, 10x10x0.5 mm, 2 sp,P-type undoped,R:1250-1340 ohm.cm	Single crystal Si, P-type Conductive type: undoped Resistivity: 1250-1340 ohm.cm Size: 10x10 x 0.5mm Orientation: (111) Polish: two sides polished Surface roughness: < 5A
13.	Si single crystal Substrate (210) ori, 10x10x0.5 mm, 1 sp, undoped, P-type	Single crystal Si, Conductive type: undoped Resistivity: >1000 ohm-cm Size: 10x10 x 0.5mm Orientation: (210) Polish: One side polished Surface roughness: < 5A
14.	Si single crystal Substrate (211) orn, 10x10x0.5 mm, 1 sp, undoped, P-type	Single crystal Si, Conductive type: undoped Resistivity: >500 ohm-cm Size: 10x10 x 0.5mm Orientation: (211) Polish: One side polished Surface roughness: < 5A

C. 1" diameter wafers

No.	Item	Description
1.	Si Wafer (100), 1" dia x 0.25-0.3 mm, 2sp, undoped	Single crystal Si, Conductive type: undoped Resistivity: > 1000 ohm-cm Size: 1" diameter x 0.25-0.3 mm Orientation: (100) Polish: Two sides polished Surface roughness: < 5A
2.	Si Wafer (100), 1" dia x 0.5 mm, 1sp, undoped, resistivities > 1000 ohm-cm	Single crystal Si, Conductive type: undoped Resistivity: > 1000 ohm-cm Size: 1" diameter x 0.5mm Orientation: (100) Polish: One side sides polished Surface roughness: < 5A
3.	Si Wafer (100), 1" dia x 0.5mm, 1sp, N type, P doped	Single crystal Si, Conductive type: N type (P doped) Size: 1" diameter x 0.45mm Orientation: (100) Polish: One side sides polished Surface roughness: < 5A
4.	Si Wafer (100), 1" dia x 0.5mm, 1sp, P type, B-doped	Single crystal Si, Conductive type: P type (B doped) Resistivity: 0.048--0.055ohm-cm Size: 1" diameter x 0.45mm

		Orientation: (100) Polish: One side sides polished Surface roughness: < 5A
5.	Si Wafer (100), 1" dia x 0.5mm, 1sp, P type, B-doped, R:1-10 ohm.cm	Single crystal Si, Conductive type: P type (B doped) Resistivity: 1-10ohm-cm Size: 1" diameter x 0.5mm Orientation: (100) Polish: One side sides polished Surface roughness: < 5A
6.	Si Wafer (111), 1" dia x 0.5 mm, 1sp, undoped, resistivities > 1000 ohm-cm	Single crystal Si, Conductive type: undoped Resistivity: > 1000 ohm-cm Size: 1" diameter x 0.5mm Orientation: (111) Polish: One side sides polished Surface roughness: < 5A

D.2" Diameter Wafers

i. Si 2" N-type undoped

a. Si 2" N-type CZ undoped

No.	Item	Description
1.	Si Wafer (100), 2" dia x 0.5mm t, 2SP, CZ Undoped , R:235-250 ohm-cm	Single crystal Si, Conductive type: Undoped Resistivity: 235-250 ohm-cm Size: 2" diameter x 0.5mm Orientation: (100) Polish: Two sides polished Surface roughness: < 5A
2.	Si Wafer (111), 2" dia x 0.35mm, 2SP, CZ Undoped R:320-600ohm.cm	Single crystal Si, Conductive type: Undoped Resistivity: 320-600 ohm-cm Size: 2" diameter x 0.35mm Orientation: (100) Polish: Two sides polished Surface roughness: < 5A

b. Si 2" N-type FZ-undoped

No.	Item	Description
1.	Si Wafer (100), 2" dia x 0.5 mm t, 1SP, FZ Undoped, resistivities: > 1000 ohm-cm	Single crystal Si, Conductive type: Undoped Resistivity: > 1000 ohm-cm Size: 2" diameter x 0.5 mm

		Orientation: (100) Polish: one side polished Surface roughness: < 5A
2.	Si Wafer (100), 2" dia x 0.5 mm t, 1SP, FZ Undoped, resistivities: > 5000 ohm-cm	Single crystal Si, Conductive type: Undoped Resistivity: > 5000 ohm-cm Size: 2" diameter x 0.5 mm Orientation: (100) Polish: one side polished Surface roughness: < 5A
3.	Si Wafer (100), N type, undoped, 2" dia x 0.5mm t, 2SP, FZ Undoped, R>1000 ohm-cm	Single crystal Si, Conductive type: N type, Undoped Resistivity: >1000 ohm-cm Size: 2" diameter x 0.5mm Orientation: (100) Polish: Two sides polished Surface roughness: < 5A
4.	Si Wafer (111), 2" dia x 0.5mm, 1SP, FZ Undoped., R> 1000 ohm-cm	Single crystal Si, (FZ) Conductive type: Undoped Resistivity: > 1000 ohm-cm Size: 2" diameter x 0.5mm Orientation: (111) Polish: One side polished Surface roughness: < 5A
5.	Si Wafer (111), 2" dia x 0.5mm, 1SP, FZ Undoped., R> 10000 ohm-cm	Single crystal Si, (FZ) Conductive type: Undoped Resistivity: > 10000 ohm-cm Size: 2" diameter x 0.5mm Orientation: (111) Polish: One side polished Surface roughness: < 5A
6.	Si Wafer (111), 2" dia x 0.5mm, 1SP, FZ Undoped., R> 5000 ohm-cm	Single crystal Si, (FZ) Conductive type: Undoped Resistivity: > 5000 ohm-cm Size: 2" diameter x 0.5mm Orientation: (111) Polish: One side polished Surface roughness: < 5A
7.	Si Wafer (111), 2" dia x 0.5mm, 2SP, FZ Undoped., R> 1000 ohm-cm	Single crystal Si, (FZ) Conductive type: Undoped Resistivity: > 1000 ohm-cm Size: 2" diameter x 0.5mm Orientation: (111) Polish: Two sides polished Surface roughness: < 5A

8.	Si Wafer (110), 2" dia x 0.5 mm t, 1SP, FZ Undoped,	Single crystal Si, Conductive type: Undoped Resistivity: >1000 ohm.cm Size: 2" diameter x 0.5mm Orientation: (110) Polish: one side polished Surface roughness: < 5A
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ii. Si 2" N-type Doped

No.	Item	Description
1.	Si Wafer (100), N type, P doped, 2" dia x 0.5 mm t, 1SP, R:1-10ohm.cm	Single crystal Si, Conductive type: N type, P doped, Resistivity: 1-10 ohm-cm Size: 2" diameter x 0.5 mm Orientation: (100) Polish: one side polished Surface roughness: < 5A
2.	Si Wafer (100), N type, P doped, 2" dia x 0.5 mm t, 1SPR:0.1-1.0ohm.cm	Single crystal Si, Conductive type: N type, P doped, Resistivity: 0.1-1 ohm-cm Size: 2" diameter x 0.5 mm Orientation: (100) Polish: one side polished Surface roughness: < 5A
3.	Si Wafer (100), N type, P doped, 2" dia x 0.5 mm t, 2SP, R:0.5-5.0 ohm.cm	Single crystal Si, Conductive type: N type, P doped, Resistivity: 0.5-5.0 ohm-cm Size: 2" diameter x 0.5 mm Orientation: (100) Polish: Two sides polished Surface roughness: < 5A
4.	Si Wafer (100), N type, P doped, 2" dia x 0.5 mm t, 2SP, R:1-10ohm.cm	Single crystal Si, Conductive type: N type, P doped, Resistivity:1-10 ohm-cm Size: 2" diameter x 0.5 mm Orientation: (100) Polish: Two sides polished Surface roughness: < 5A
5.	Si Wafer (100), 2" dia x 0.3 mm t, 1SP, N type/ As- doped R<=0.005 ohm.cm	Single crystal Silicon Conductive type: N- type/ As-doped Resistivity: R: <=0.005 ohm-cm Size: 50.8 diameter +/- 0.5 mm x 0.3 +/- 0.025 mm Orientation: (100) +/- 1°

		Polish: one side polished Surface roughness: < 5A
6.	Si Wafer (110), 2" dia x 0.5 mm t, 1SP, N type/ P doped	Single crystal Silicon Conductive type: N- type/ P-doped Resistivity: 1-10 ohm-cm Size: 50.8 diameter +/- 0.5 mm x 0.5 +/- 0.025 mm Orientation: (110) +/- 1° Polish: one side polished Surface roughness: < 5A
7.	Si Wafer (110), 2" dia x 0.5 mm t, 2SP, N type/ P doped R:0.05-0.5 ohm.cm	Single crystal Silicon Conductive type: N- type/ P-doped Resistivity: 0.05-0.5 ohm.cm Size: 50.8 diameter +/- 0.5 mm x 0.5 +/- 0.025 mm Orientation: (110) +/- 1° Polish: two sides polished Surface roughness: < 5A
8.	Si Wafer (110), 2" dia x 0.5 mm t, 2SP, N type/ P doped,R:3.2-3.7 ohm-cm	Single crystal Silicon Conductive type: N- type/ P-doped Resistivity: 3.2-3.7 ohm-cm Size: 50.8 diameter +/- 0.5 mm x 0.5 +/- 0.025 mm Orientation: (110) +/- 1° Polish: two sides polished Surface roughness: < 5A
9.	Si Wafer (111), 2" dia x 0.35 mm t, 1SP, N type/ As- doped R<0.02 ohm.cm	Single crystal Silicon Conductive type: N- type/ As-doped Resistivity: R: <0.02 ohm-cm Size: 50.8 diameter +/- 0.5 mm x 0.35 +/- 0.025 mm Orientation: (111) +/- 1° Polish: one side polished Surface roughness: < 5A
10.	Si Wafer (111), 2" dia x 0.5 mm t, 1SP, N type/ P doped	Single crystal Silicon Conductive type: N- type/ P-doped Resistivity: 0.1 - 1 ohm-cm Size: 50.8 diameter +/- 0.5 mm x 0.5 +/- 0.025 mm Orientation: (111) +/- 1° Polish: one side polished Surface roughness: < 5A
11.	Si Wafer (111), 2" dia x 0.5 mm t, 2SP, N type/ P doped ,R:0.005-0.05 ohm.cm	Single crystal Silicon Conductive type: N- type/ P-doped Resistivity: 0.005-0.05 ohm.cm Size: 50.8 diameter +/- 0.5 mm x 0.5 +/- 0.025 mm Orientation: (111) +/- 1° Polish: one side polished Surface roughness: < 5A

iii. Si 2" P-type

No.	Item	Description
1.	Si Wafer (100), 2" dia x 0.27 mm t, 1SP, P type/ B doped	Single crystal Silicon Conductive type: P type/ Boron doped Resistivity: <0.01 ohm-cm Size: 50.8 diameter +/- 0.5 mm x 0.27 +/- 0.025 mm Orientation: (100) +/- 1° Polish: one side polished Surface roughness: < 5A
2.	Si Wafer (100), 2" dia x 0.28 mm t, 1SP, P type/ B doped	Single crystal Silicon Conductive type: P type/ Boron doped Resistivity: 3-5 ohm-cm Size: 50.8 diameter +/- 0.5 mm x 0.28 +/- 0.025 mm Orientation: (100) +/- 1° Polish: one side polished Surface roughness: < 5A
3.	Si wafer (100), 2" dia x 0.5mm, 2SP, P type,R:0.1-1 ohm.cm	Single crystal Si, Conductive type: P type (B doped) Resistivity: 0.1-1.0 ohm-CM Size: 2" diameter x 0.5mm Orientation: (100) Polish: Two side polished (2 SP) Surface roughness: < 5A
4.	Si wafer (100), 2" dia x 0.5mm, 2SP, P type,R:1-10 ohm.cm	Single crystal Si, Conductive type: P type (B doped) Resistivity: 1-10 ohm-CM Size: 2" diameter x 0.5mm Orientation: (100) Polish: Two side polished (2 SP) Surface roughness: < 5A
5.	Si Wafer (100), 2" dia x 0.5mm, 1SP, P type R:0.001-0.005 ohm.cm	Single crystal Si, Conductive type: P type (B doped) Resistivity: 0.001-0.005 ohm.cm Size: 2" diameter x 0.5mm Orientation: (100) Polish: one side polished Surface roughness: < 5A
6.	Si Wafer (100), 2" dia x 0.5mm, 1SP, P type R:0.01-0.05 ohm.cm	Single crystal Si, Conductive type: P type (B doped) Resistivity: 0.01-0.05 ohm.cm Size: 2" diameter x 0.5mm Orientation: (100) Polish: one side polished

		Surface roughness: < 5A
7.	Si Wafer (100), 2" dia x 0.5mm, 1SP, P type R:0.1-1.0 ohm.cm	Single crystal Si, Conductive type: P type (B doped) Resistivity: 0.1-1.0 ohm.cm Size: 2" diameter x 0.5mm Orientation: (100) Polish: one side polished Surface roughness: < 5A
8.	Si Wafer (100), 2" dia x 0.5mm, 1SP, P type R:1-10 ohm.cm	Single crystal Si, Conductive type: P type (B doped) Resistivity: 1-10 ohm-cm Size: 2" diameter x 0.5mm Orientation: (100) Polish: one side polished Surface roughness: < 5A
9.	Si Wafer (110), 2" dia x 0.5 mm t, 1SP, P type/ B doped	Single crystal Silicon Conductive type: P type/ Boron doped Resistivity: 1-10 ohm-cm Size: 50.8 diameter +/- 0.5 mm x 0.5 +/- 0.025 mm Orientation: (110) +/- 1° Polish: one side polished Surface roughness: < 5A
10.	Si Wafer (110), 2" dia x 0.5 mm t, 2SP, P type/ B doped, 8-12 ohm-cm	Single crystal Silicon Conductive type: P type/ Boron doped Resistivity: 8-12 ohm-cm Size: 50.8 diameter +/- 0.5 mm x 0.5 +/- 0.025 mm Orientation: (110) +/- 1° Polish: Two sides polished Surface roughness: < 5A
11.	Si Wafer (110), 2" dia x 0.5 mm t, 2SP, P type/ B doped, R:0.01-1.0ohm-cm	Single crystal Silicon Conductive type: P type/ Boron doped Resistivity: 0.01-1.0 ohm-cm Size: 50.8 diameter +/- 0.5 mm x 0.5 +/- 0.025 mm Orientation: (110) +/- 1° Polish: Two sides polished Surface roughness: < 5A
12.	Si Wafer (110), 2" dia x 0.5 mm t, 2SP, P type/ B doped, R:0.1-1.0ohm-cm	Single crystal Silicon Conductive type: P type/ Boron doped Resistivity: 0.1-1.0 ohm-cm Size: 50.8 diameter +/- 0.5 mm x 0.5 +/- 0.025 mm Orientation: (110) +/- 1° Polish: Two sides polished Surface roughness: < 5A

13.	Si Wafer (111), 2" dia x 0.28 mm t, 1SP, P type/ B doped	Single crystal Silicon Conductive type: P type/ Boron doped Resistivity: 0.1 - 10 ohm-cm Size: 50.8 diameter +/- 0.5 mm x 0.28 +/- 0.025 mm Orientation: (111) +/- 1° Polish: one side polished Surface roughness: < 5A
14.	Si Wafer (111), 2" dia x 0.5 mm t, 1SP, P type/ B doped	Single crystal Silicon Conductive type: P type/ Boron doped Resistivity: 1 - 10 ohm-cm Size: 50.8 diameter +/- 0.5 mm x 0.5 +/- 0.025 mm Orientation: (111) +/- 1° Polish: one side polished Surface roughness: < 5A
15.	Si Wafer (111), 2" dia x 0.5 mm t, 2SP, P type/ B doped, R: 0.005-0.05 ohm-cm	Single crystal Silicon Conductive type: P type/ Boron doped Resistivity: 0.005-0.05 ohm-cm Size: 50.8 diameter +/- 0.5 mm x 0.5 +/- 0.025 mm Orientation: (111) +/- 1° Polish: Two sides polished Surface roughness: < 5A
16.	Si Wafer (111), 2" dia x 0.5 mm t, 2SP, P type/ B doped, R: 1 - 10 ohm-cm	Single crystal Silicon Conductive type: P type/ Boron doped Resistivity: 1 - 10 ohm-cm Size: 50.8 diameter +/- 0.5 mm x 0.5 +/- 0.025 mm Orientation: (111) +/- 1° Polish: Two sides polished Surface roughness: < 5A
17.	Si Wafer (111), 2" dia x 0.1 mm t, 1SP, P type/ B doped,	Single crystal Silicon Conductive type: P type/ Boron doped Resistivity: N/A Size: 50.8 diameter +/- 0.5 mm x 0.1 +/- 0.025 mm Orientation: (111) +/- 1° Polish: One side polished Surface roughness: < 5A

E. 3" Diameter Wafers

i. Si 3" N-type Un-doped

No.	Item	Description
1.	Si wafer (100), 3 "dia x0.5 mm, 1sp, N type un-doped R:>1000 ohm.cm	Single crystal Si, Conductivity: N type (un-doped)

		Resistivity: >1000 ohm-CM Size: 3" diameter x 0.5 mm Orientation: (100) Polish: One side polished Surface roughness: < 5A
2.	Si wafer (100), 3 "dia x0.5 mm, 2sp, N type, Undoped	Single crystal Si, Conductivity: N type, Undoped Resistivity: >1,000 ohm-CM Size: 3" diameter x 0.5 mm Orientation: (100) Polish: Two sides polished Surface roughness: < 5A
3.	Thermal Oxide Wafer: 300 nm SiO2 Layer on Si (100), 3"dia x 0.50 mm t,undoped N type, 1SP R:>1000 ohm.cm	Thermal oxide Layer Research Grade , about 80 % useful area SiO2 layer on 3" Silicon wafer Oxide layer thickness: 300 nm (2000A) +/-10% Growth method - Dry oxidizing at 1000°C Refractive index - 1.455 Note: customized oxide layer available upon request from 50 nm - 1000 nm <u>Specifications:</u> Conductive type: N-type/ un-doped Resistivity: >1000 ohm.cm Size: 3" diameter +/- 0.5 mm x 0.5 mm Orientation: (100) +/- 1° Polish: one side polished Surface roughness: < 5A
4.	Si wafer (111), 3 " dia x 0.5 mm, 1sp, N type, undoped, resistivity: > 1000ohm-cm	Single crystal Si, Conductivity: N type (undoped) Resistivity: > 1000 ohm-CM Size: 3" diameter x 0.5 mm Orientation: <111> with secondary orientation flat <110> Polish: One side polished Surface roughness: < 5A
5.	Si wafer (111), 3 " dia x 0.5 mm, 2sp, N type, undoped, resistivity: > 1000ohm-cm	Single crystal Si Conductivity: N type (undoped) Resistivity: > 1000 ohm-CM Size: 3" diameter x 0.5 mm Orientation: <111> with secondary orientation flat <110> Polish: Two sides polished Surface roughness: < 5A

ii. Si 3" P-type

No.	Item	Description
1.	Si wafer (100) 3 " dia x 0.5 mm, 1sp P type, B doped, R:<0.1 ohm.cm	Single crystal Si, Conductivity: P type (B doped) Resistivity: <0.1 ohm-CM Size: 3" diameter x 0.5 mm Orientation: <100> with secondary orientation flat <110> Polish: One side polished Surface roughness: < 5A
2.	Si wafer (100) 3 " dia x 0.5 mm, 1sp P type/B doped, resistivities: 1-10 ohm-cm	Single crystal Si, Conductivity: P type (B doped) Resistivity: 1~10 ohm-CM Size: 3" diameter x 0.5 mm Orientation: <100> with secondary orientation flat <110> Polish: One side polished Surface roughness: < 5A
3.	Si wafer (100) 3 " dia x 0.5 mm, 2sp P type/B doped, resistivities: 0.005-0.028 ohm-cm	Single crystal Si, Conductivity: P type (B doped) Resistivity: 0.005-0.028 ohm-CM Size: 3" diameter x 0.5 mm Orientation: <100> with orientation flat <110>.<110> Polish: Two sides polished Surface roughness: < 5A
4.	Si wafer (100), 3 "dia x 0.38 mm, 1sp, P type, B doped, resistivities: 1-10 ohm-cm	Single crystal Si, Conductivity: P type (B doped) Resistivity: 1~10 ohm-cm Size: 3" diameter Thickness: 0.381 +/- 0.025 mm Orientation: (100) Polish: One side polished Surface roughness: < 5A
5.	Si wafer (110) 3 " dia x 0.5 mm 1sp P type, B doped, resistivity: 1-10 ohm-cm	Single crystal Si, Conductivity: P type (B doped) Resistivity: 1~10 ohm-CM Size: 3" diameter x 0.5 mm Orientation: <110> with secondary orientation flat <111> Polish: One side polished Surface roughness: < 5A
6.	Si wafer (111) 3 " dia x 0.5 mm 1sp P type, B doped, resistivity: 1-10 ohm-cm	Single crystal Si, Conductivity: P type (B doped) Resistivity: 1~10 ohm-CM Size: 3" diameter x 0.5 mm Orientation: <111> with secondary orientation flat <110> Polish: One side polished

		Surface roughness: < 5A
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iii. Si 3" N-type Doped

No.	Item	Description
1.	Si wafer (100), 3 " dia x 0.35 mm, 1sp, N type, P doped, resistivity: <0.01 ohm-cm	Single crystal Si, Conductivity: N type (P doped) Resistivity: <0.01 ohm-CM Size: 3" diameter x 0.35 mm Orientation: <100> Polish: One side polished Surface roughness: < 5A
2.	Si wafer (100), 3 "dia x0.5 mm, 1sp, N type P-doped, R:1-10 ohm.cm	Single crystal Si, Conductivity: N type (P doped) Resistivity: 1-10 ohm-CM Size: 3" diameter x 0.5 mm Orientation: (100) Polish: One side polished Surface roughness: < 5A
3.	Si wafer (100), 3 "dia x0.5 mm, 2sp, N type P-doped, resistivities: 0.1-1 ohm-cm	Single crystal Si, Conductivity: N type (P doped) Resistivity: 0.1~1.0 ohm-CM Size: 3" diameter x 0.5 mm Orientation: (100) Polish: Two sides polished Surface roughness: < 5A
4.	Si wafer (110), 3 " dia x 0.5 mm, 1sp, N type, P doped, resistivity: 1-10 ohm-cm	Single crystal Si, Conductivity: N type (P doped) Resistivity: 1-10 ohm-CM Size: 3" diameter x 0.5 mm Orientation: <110> with secondary orientation flat <110> Polish: One side polished Surface roughness: < 5A
5.	Si wafer (111), 3 " dia x 0.35 mm, 1sp, N type, P doped, resistivity: <0.01 ohm-cm	Single crystal Si, Conductivity: N type (P doped) Resistivity: <0.01 ohm-CM Size: 3" diameter x 0.35 mm Orientation: <111> Polish: One side polished Surface roughness: < 5A
6.	Si wafer (111), 3 "dia x0.5 mm, 1sp, N type Sb-doped, resistivities: 0.0073-0.0097 ohm-cm	Single crystal Si, Conductivity: N type (Sb- doped) Resistivity: 0.0078--0.0097 ohm-CM

		Size: 3" diameter x 0.5 mm Orientation: (111) Polish: One side polished Surface roughness: < 5A
7.	Si Wafer (100) 2 Deg. Off Toward (110) , 3 " dia x 0.5 mm, 1 sp, N type	Single crystal Si, Conductivity: N type (P doped) Resistivity: various ohm-CM Size: 3" diameter x 0.5 mm Orientation: (100) 2 Deg. Off Toward (110) Polish: One side polished Surface roughness: < 5A
8.	Si Wafer (100) 3 Deg. Off Toward (110) , 3 " dia x 0.5 mm, 1 sp, N type	Single crystal Si, Conductivity: N type (P doped) Resistivity: various ohm-CM Size: 3" diameter x 0.5 mm Orientation: (100) 3 Deg. Off Toward (110) Polish: One side polished Surface roughness: < 5A
9.	Si Wafer (100) 4 Deg. Off Toward (110) , 3 " dia x 0.5 mm, 1 sp, N type	Single crystal Si, Conductivity: N type (P doped) Resistivity: various ohm-CM Size: 3" diameter x 0.5 mm Orientation: (100) 4 Deg. Off Toward (110) Polish: One side polished Surface roughness: < 5A

F. 4" Diameter Wafers

i. Si 4" undoped

No.	Item	Description
1.	Si Wafer (100), 4" dia x 0.5 mm, 1SP, Undoped with resistivities: >1,000 ohm-cm	Single crystal:Si Conductivity: Undoped Resistivity: >1000 ohm-CM Size: 4" diameter x 0.5 mm Orientation: (100) Polish: One side polished Surface roughness: < 5A
2.	Si Wafer (100), 4" dia x 0.5 mm, 1SP, Undoped with resistivities: >5000 ohm-cm	Single crystal:Si Conductivity: Undoped Resistivity: >5000 ohm-CM Size: 4" diameter x 0.5 mm Orientation:(100) Polish: One side polished Surface roughness: < 5A

3.	Si Wafer (100), 4" dia x 0.5 mm, 2SP, Undoped, resistivities: > 1000 ohm-cm	Single crystal Si, Conductivity: Undoped Resistivity: > 1000 ohm-CM Size: 4" diameter x 0.5 mm Orientation: (100) Polish: two sides polished Surface roughness: < 5A
4.	Si Wafer (111), 4 " dia x 0.4 mm, 1SP, N Type (undoped, FZ R>5000 ohm-cm	Single crystal Si, Conductivity: N type (undoped) Resistivity: >5000 ohm-CM Size: 4" diameter x 0.4 mm Orientation: (111) Polish: One side polished Surface roughness: < 5A
5.	Si Wafer (111), 4 " dia x 0.5 mm, 1SP, N Type (undoped, FZ R>1000 ohm-cm)	Single crystal Si, Conductivity: N type (undoped) Resistivity: >1000 ohm-CM Size: 4" diameter x 0.5 mm Orientation: (111) Polish: One side polished Surface roughness: < 5A
6.	Si Wafer (111), 4 " dia x 0.5 mm, 1SP, N Type (undoped, FZ R>10000 ohm-cm)	Single crystal Si, Conductivity: N type (undoped) Resistivity: >10000 ohm-CM Size: 4" diameter x 0.5 mm Orientation: (111) Polish: One side polished Surface roughness: < 5A
7.	Si Wafer (111), 4 " dia x 0.5 mm, 1SP, N Type (undoped, FZ R>5000 ohm-cm)	Single crystal Si, Conductivity: N type (undoped) Resistivity: >5000 ohm-CM Size: 4" diameter x 0.5 mm Orientation: (111) Polish: One side polished Surface roughness: < 5A

ii. Si 4" N-type Doped

No.	Item	Description
1.	Si Wafer (100), 4 " dia x 0.525 mm, 1SP, N Type, P doped, Resistivities: 0.1-1.0 ohm-cm	Single crystal Si, Conductivity: N type (P doped) Resistivity: 0.1-1.0 ohm-CM Size: 4" diameter x 0.5 mm Orientation: (100) +/- 0.5 Deg Polish: One side polished Surface roughness: < 10A
2.	Si Wafer (100), 4 " dia x 0.525 mm, 1SP, N Type, P	Single crystal Si,

	doped, Resistivities: 1-5 ohm-cm	Conductivity: N type (P doped) Resistivity: 1-5 ohm-CM Size: 4" diameter x 0.525 mm Orientation: (100) +/- 0.5 Deg Polish: One side polished Surface roughness: < 10A
3.	Si Wafer (111), 4 " dia x 0.5 mm, 1SP, N Type (P doped), resistivity: 1-10 ohm-cm	Single crystal Si, (CZ) Conductivity: N type (P doped) Resistivity: 1-10 ohm-cm Size: 4" diameter x 0.5 mm Orientation: (111) Polish: One side polished Surface roughness: < 5A
4.	Si Wafer (111)+/_ 0.5 degree 4 " dia x 0.525 mm, 1SP, N Type (P doped), resistivity: 1-5 ohm-cm	Single crystal Si, (CZ) Conductivity: N type (P doped) Resistivity: 1-5 ohm-cm Size: 4" diameter x 0.525 mm Orientation: (111)+/_ 0.5 degree Polish: One side polished Surface roughness: < 5A
5.	Si Wafer (111)with 4 deg. off, 4 " dia x 0.525 mm, 1SP, N Type (P doped), resistivity: 1-10 ohm-cm	Single crystal Si, (CZ) Conductivity: N type (P doped) Resistivity: 1-10 ohm-cm Size: 4" diameter x 0.525 mm Orientation: (111)with 4 deg. off, Polish: One side polished Surface roughness: < 5A
6.	Si Wafer (100), 4 " dia x 0.5 mm, 1SP, N Type ,Sb doped,	Single crystal Si, Conductivity: N type (Sb doped) Size: 4" diameter x 0.5 mm Orientation: (100) Polish: One side polished Surface roughness: < 5A
7.	Si Wafer (111), 4 " dia x 0.5 mm, 1SP, N Type (Sb doped), resistivity: 0.005-0.02 ohm-cm	Single crystal Si, Conductivity: N type (Sb doped) Resistivity: 0.005~0.02 ohm-cm Size: 4" diameter x 0.5 mm Orientation: (111) Polish: One side polished Surface roughness: < 5A
8.	Si Wafer (100), Prime Grade, 4 " dia x 0.525 mm, 1SP, N Type, As doped, resistivity: <0.005 ohm-cm	Single crystal Si, (CZ) (Prime Grade) Conductivity: N type (As doped) Resistivity: <0.005 ohm-cm Size: 4" in diameter x 0.525 mm

		Orientation: 4 degree off <100> +/- 0.5 deg Polish: One side polished Surface roughness: < 5A
9.	Si Wafer (111), Prime Grade, 4 " dia x 0.5 mm, 1SP, N Type, As doped, resistivity: 0.001-0.005 ohm-cm	Single crystal Si, (CZ) (Prime Grade) Conductivity: N type (As doped) Resistivity: 0.001~0.005 ohm-cm Size: 4" in diameter x 0.525 mm Orientation: 4 degree off (111) +/- 0.5 deg Polish: One side polished Surface roughness: < 5A

iii. Si 4" P-type Doped

No.	Item	Description
1.	Si Wafer (100), 4 " dia x 0.525 mm, 1SP, P Type, B doped, Resistivities: 0.1 - 1.0 ohm-cm	Single crystal Si, Prime Grade Conductivity: P type (B doped) Resistivity: 0.1~1.0 ohm-cm Size: 4" diameter x 0.525 (+/- 0.025) mm Orientation: (100) +/- 0.5 deg Polish: One side polished Surface roughness: < 5A
2.	Si Wafer (100), 4 " dia x 0.525 mm, 1SP, P Type, B doped, resistivities: <0.005 ohm-cm	Single crystal Si, Prime Grade Conductivity: P type (B doped) Resistivity: <0.005ohm-cm Size: 4" diameter x 0.525 (+/- 0.025) mm Orientation: (100) +/- 0.5 deg Polish: One side polished Surface roughness: < 5A
3.	Si Wafer (100), 4 " dia x 0.525 mm, 1SP, P Type, B doped, resistivities: 1-10 ohm-cm	Single crystal Si, Prime Grade Conductivity: P type (B doped) Resistivity: 1-10 ohm-cm Size: 4" diameter x 0.525 (+/- 0.025) mm Orientation: (100) +/- 0.5 deg Polish: One side polished Surface roughness: < 5A
4.	Si Wafer (100), 4 " dia x 0.525 mm, 1SP, P Type, B doped, resistivities:10-20 ohm-cm	Single crystal Si, Prime Grade Conductivity: P type (B doped) Resistivity: 10-20 ohm-cm Size: 4" diameter x 0.525 (+/- 0.025) mm Orientation: (100) +/- 0.5 deg Polish: One side polished Surface roughness: < 5A
5.	Si Wafer (100), 4 " dia x 0.625 mm, 1SP, P Type, B	Single crystal Si, Prime Grade

	doped, Resistivities: 1-10 ohm-cm	Conductivity: P type (B doped) Resistivity: 1-10 ohm-cm Size: 4" diameter x 0.625 (+/- 0.025) mm Orientation: (100) +/- 0.5 deg Polish: One side polished Surface roughness: < 5A
6.	Si Wafer (100), 4 " dia x 0.5 mm, 1SP, P Type, B doped, resistivities:0.3-0.6 ohm-cm	Single crystal Si, Conductivity: P type (B doped) Resistivity: 0.3-0.6 ohm-cm Size: 4" diameter x 0.5 mm Orientation: (100) Polish: One side polished Surface roughness: < 5A
7.	Si Wafer (100), 4 " dia x 0.5 mm, 2SP, P Type B doped, Resistivities: 0.2-0.3 ohm-cm	Single crystal Si, Conductivity: P type (B doped) Resistivity: 0.2~0.3 ohm-cm Size: 4" diameter x 0.5 mm Orientation: (100) Polish: two sides polished Surface roughness: < 5A
8.	Si Wafer (111) 4 +/- 0.5 degree off , 4 " dia x 0.5 mm, 1SP, P Type, B doped, resistivity: 0.004-0.006 ohm-cm	Single crystal Si, (CZ) Conductivity: P type (B - doped) Resistivity: 0004-0.006 ohm-cm Size: 4" in diameter x 0.5mm Orientation: (111) 4 +/- 0.5 degree off Polish: One side polished Surface roughness: < 5A
9.	Si Wafer (111) with 4 degree off , 4 " dia x 0.5 mm, 1SP, P Type, B doped, resistivity: <0.01 ohm-cm	Single crystal Si, (CZ) Conductivity: P type (B - doped) Resistivity: <0.01 ohm-cm Size: 4" in diameter x 0.5mm Orientation: (111) 4 +/- 0.5 degree off Polish: One side polished Surface roughness: < 5A
10.	Si Wafer (111)4 +/- 0.5 degree off , 4 " dia x 0.525 mm, 1SP, P Type, B doped, resistivity: <= 0.005 ohm-cm-	Single crystal Si, (CZ) (Prime Grade) Conductivity: P type (B - doped) Resistivity: <= 0.005 ohm-cm Size: 4" in diameter x 0.525 mm Orientation: (111) 4 +/- 0.5 degree off Polish: One side polished Surface roughness: < 5A
11.	Si Wafer (111)4 +/- 0.5 degree off , 4 " dia x 0.525 mm, 1SP, P Type, B doped, resistivity: 0.001 -	Single crystal Si, (CZ) (Prime Grade) Conductivity: P type (B - doped) Resistivity: 0.001- 0.005 ohm-cm

	0.005 ohm-cm	Size: 4" in diameter x 0.525 mm Orientation: (111) 4 +/- 0.5 degree off Polish: One side polished Surface roughness: < 5A
12.	Si Wafer (111) 4 +/- 0.5 degree off Prime Grade, 4 " dia x 0.5 mm, 1SP, P Type, B doped, resistivity: 2.3-3.3 ohm-cm	Single crystal Si, (CZ) (Prime Grade) Conductivity: P type (B doped) Resistivity: 2.3~3.3 ohm-cm Size: 4" in diameter x 0.5 mm Orientation: 4 degree off (111) +/- 0.5 deg Polish: One side polished Surface roughness: < 5A
13.	Si Wafer (111) 4 +/- 0.5 degree off , 4 " dia x 0.525 mm, 1SP, P Type, B doped, resistivities:1-10 ohm-cm	Single crystal Si, Conductivity: P type (B doped) Resistivity: 1-10 ohm-cm Size: 4" diameter x 0.525 mm Orientation: (111) 4 +/- 0.5 degree off Polish: One side polished Surface roughness: < 5A
14.	Si Wafer (111) miscut 0+/-0.5 degree, 4 " dia x 0.525 mm, 1SP, P Type, B doped, Resistivities:0.001-0.005ohm-cm	Single crystal Si, Conductivity: P type (B doped) Resistivity: 0.001-0.005ohm-cm Size: 4" diameter x 0.525 mm Orientation: (111) miscut 0+/-0.5 degree, Polish: One side polished Surface roughness: < 5A
15.	Si Wafer (111) miscut 0+/-0.5 degree, 4 " dia x 0.525 mm, 1SP, P Type, B doped, Resistivities:1-10 ohm-cm	Single crystal Si, Conductivity: P type (B doped) Resistivity: 1-10 ohm-cm Size: 4" diameter x 0.525 mm Orientation: (111) miscut 0+/-0.5 degree, Polish: One side polished Surface roughness: < 5A
16.	Si Wafer (100), 4 " dia x 0.525 mm, 1SP, P Type, B doped, Resistivities: 230-1100 ohm-cm	Single crystal Si Conductivity: P type (B doped) Resistivity: 230-1100 ohm-cm Size: 4" diameter x 0.525 (+/- 0.025) mm Orientation: (100) +/- 1.0 deg Polish: One side polished Surface roughness: < 5A

G.5" Diameter Wafers

No.	Item	Description
1.	Si Wafer (100), 5 " dia x 0.625mm, 1SP N-type ,P- doped	Single crystal Si, Conductivity: N- type (P- doped) Size: 5" diameter x 0.625 mm Orientation: (100) Resistivity: 1-10 ohm-cm Polish: One side polished Surface roughness: < 5A
2.	Si Wafer (111), 5 " dia x 0.625mm, 1SP P-type (B- doped)	Single crystal Si Conductivity: P- type (B- doped) Size: 5" diameter x 0.625 mm Orientation: (111) Resistivity: 3-5 ohm-cm Polish: One side polished Surface roughness: < 5A

H.6" Diameter Wafers

No.	Item	Description
1.	Si wafer (100), 6 " dia x 0.65 - 0.7 mm, 1SP N-type (P- doped)	Silicon Single crystal wafer (100) orientation 6" Diameter x 0.65 -0.7 mm N type, P- doped Resistivity:1.1-1.25 ohm-cm One side polished
2.	Si wafer (100), 6 " dia x 0.65 - 0.7 mm, 1SP P type (B doped)	Silicon Single crystal wafer (100) orientation 6" Diameter x 0.65 -0.7 mm P type, boron doped Resistivity:8-12 ohm-cm One side polished
3.	Si wafer (111), 6 " dia x 0.65 - 0.7 mm, 1SP P type (B doped)	Silicon Single crystal wafer (111) orientation 6" Diameter x 0.65 -0.7 mm P type, boron doped Resistivity:5-10 ohm-cm One side polished

I. Thermal Oxide Wafers, 2 - 4" Research Grade

i. Thermal Oxide Wafer 2" Dia.

No.	Item	Description
1.	Thermal Oxide Wafer: 300 nm SiO ₂ Layer on Si (100), 2" dia x 0.50 mm t, P type, 1 side polished, R: < 0.005 ohm.cm	<p>Thermal oxide Layer Research Grade, about 80 % useful area SiO₂ layer on 2" Silicon wafer Oxide layer thickness: 300 nm (2000Å) +/-10% Growth method - Dry oxidizing at 1000°C Refractive index - 1.455 Note: customized oxide layer available upon request from 50 nm - 1000 nm</p> <p><u>Specifications:</u> Conductive type: P type/ Boron doped Resistivity: <0.005 ohm-cm Size: 50.8 diameter +/- 0.5 mm x 0.50 +/- 0.025 mm Orientation: (100) +/- 1° Polish: one side polished Surface roughness: < 5Å</p>
2.	Thermal Oxide Wafer: 100 nm SiO ₂ Layer on Si (100), 2" dia x 0.50 mm t, N- type, 1 side polished	<p>Thermal oxide wafer Thermal oxide Layer Research Grade, about 80 % useful area SiO₂ layer on 2" Silicon wafer Oxide layer thickness: 100 nm (1000Å) +/-10% Growth method - Dry oxidizing at 1000°C Refractive index - 1.455 Note: customized oxide layer available upon request from 50 nm - 1000 nm</p> <p><u>Specifications:</u> Conductive type: N- type/ P- doped Resistivity: <0.01 ohm-cm Size: 50.8 +/- 0.5 mm in diameter x 0.5 +/- 0.05 mm th Orientation: (100) +/- 1° Polish: one side polished Surface roughness: < 5Å</p>
3.	Thermal Oxide Wafer: 50 nm SiO ₂ Layer on Si (100), 2" dia x 0.30 mm t, N type, undoped	<p>Thermal oxide Layer Research Grade, about 80 % useful area SiO₂ layer on 2" Silicon wafer Oxide layer thickness: 50 nm (500Å) +/-10% Growth method - Dry oxidizing at 1000°C Refractive index - 1.455 Note: customized oxide layer available upon request from 50 nm - 1000 nm</p> <p><u>Specifications:</u> Conductive type: N- type/ Un- doped Resistivity: >1000 ohm-cm</p>

		Size: 50.8 diameter +/- 0.5 mm x 0.3 +/- 0.025 mm Orientation: (100) +/- 1° Polish: one side polished Surface roughness: < 5A
4.	Thermal Oxide Wafer: 50 nm SiO ₂ Layer on Si (100), 2" dia x 0.40 mm t, N- type , 1 side polished	Thermal oxide Layer Research Grade , about 80 % useful area SiO ₂ layer on 2" Silicon wafer Oxide layer thickness: 50 nm (2000A) +/-10% Growth method - Dry oxidizing at 1000oC Refractive index - 1.455 Note: customized oxide layer available upon request from 50 nm - 1000 nm <u>Specifications:</u> Conductive type: N- type/ P- doped Resistivity: 1 - 10 ohm-cm Size: 50.8 diameter +/- 0.5 mm x 0.4 +/- 0.025 mm Orientation: (100) +/- 1° Polish: one side polished Surface roughness: < 5A
5.	Thermal Oxide Wafer: 50 nm SiO ₂ Layer on Si (100), 2" dia x 0.40 mm t, P type , 1 side polished	Thermal oxide Layer Research Grade , about 80 % useful area SiO ₂ layer on 2" Silicon wafer Oxide layer thickness: 50 nm (500A) +/-10% Growth method - Dry oxidizing at 1000oC Refractive index - 1.455 Note: customized oxide layer available upon request from 50 nm - 1000 nm <u>Specifications:</u> Conductive type: P type/ Boron doped Resistivity: 1 - 10 ohm-cm Size: 50.8 diameter +/- 0.5 mm x 0.4 +/- 0.025 mm Orientation: (100) +/- 1° Polish: one side polished Surface roughness: < 5A

ii. Thermal Oxide Wafer 3" Dia.

No.	Item	Description
1.	Thermal Oxide Wafer: 300 nm SiO ₂ Layer on Si (100), 3" dia x 0.50 mm t, undoped N type, 1SP R:>1000 ohm.cm	Thermal oxide Layer Research Grade , about 80 % useful area SiO ₂ layer on 3" Silicon wafer Oxide layer thickness: 300 nm (2000A) +/-10% Growth method - Dry oxidizing at 1000°C Refractive index - 1.455 Note: customized oxide layer available upon request from 50 nm - 1000 nm

		<p><u>Specifications:</u> Conductive type: N-type/ un-doped Resistivity: >1000 ohm.cm Size: 3" diameter +/- 0.5 mm x 0.5 mm Orientation: (100) +/- 1° Polish: one side polished Surface roughness: < 5A</p>
2.	<p>Thermal Oxide Wafer: 100 nm SiO₂ Layer on the FRONT SIDE (only) of Si (111), 3" dia x 0.50 mm t, P-type, 1SP</p>	<p>Thermal oxide Layer Research Grade, about 80 % useful area SiO₂ layer on the FRONT SIDE (only) of 3" Silicon wafer Oxide layer thickness: 100 nm (1000A) +/-10% Growth method - Dry oxidizing at 1000oC Refractive index - 1.455</p> <p>Note: customized oxide layer available upon request from 50 nm - 1000 nm</p> <p><u>Specifications:</u> Conductive type: P-type/ B-doped Resistivity: 0.1-1.0 ohm.cm Size: 3" +/- 0.5 mm in diameter x 0.5 mm +/- 0.05 mm th Orientation: (111) +/- 1° Polish: one side polished Surface roughness: < 5A</p>
3.	<p>Thermal Oxide Wafer: 300 nm SiO₂ Layer on Si (100), 3" dia x 0.50 mm t, N-type, P-doped 1SP R:1-10 ohm.cm</p>	<p>Thermal oxide Layer Research Grade, about 80 % useful area SiO₂ layer on 3" Silicon wafer Oxide layer thickness: 300 nm (1000A) +/-10% Growth method - Dry oxidizing at 1000oC Refractive index - 1.455</p> <p>Note: customized oxide layer available upon request from 50 nm - 1000 nm</p> <p><u>Specifications:</u> Conductive type: N-type/ P-doped Resistivity: 1-10 ohm.cm Size: 3" +/- 0.5 mm in diameter x 0.5 mm +/- 0.05 mm th Orientation: (100) +/- 1° Polish: one side polished Surface roughness: < 5A</p>
4.	<p>Thermal Oxide Wafer: 300 nm SiO₂ Layer on Si (100), 3" dia x 0.50 mm t, P-type, B-doped 1SP R:1-10 ohm.cm</p>	<p>Thermal oxide Layer Research Grade, about 80 % useful area SiO₂ layer on 3" Silicon wafer Oxide layer thickness: 300 nm (1000A) +/-10% Growth method - Dry oxidizing at 1000oC Refractive index - 1.455</p> <p>Note: customized oxide layer available upon request from 50 nm - 1000 nm</p>

		<u>Specifications:</u> Conductive type: P-type/ B-doped Resistivity: 1-10 ohm.cm Size: 3" +/- 0.5 mm in diameter x 0.5 mm +/- 0.05 mm th Orientation: (100) +/- 1° Polish: one side polished Surface roughness: < 5A
5.	Thermal Oxide Wafer: 300 nm SiO ₂ Layer on Si (111), 3" dia x 0.50 mm t, N-type, P-doped 1SP R:5-15 ohm.cm	Thermal oxide Layer Research Grade , about 80 % useful area SiO ₂ layer on 3" Silicon wafer Oxide layer thickness: 300 nm (1000A) +/-10% Growth method - Dry oxidizing at 1000oC Refractive index - 1.455 Note: customized oxide layer available upon request from 50 nm - 1000 nm <u>Specifications:</u> Conductive type: N-type/ P-doped Resistivity: 5-15 ohm.cm Size: 3" +/- 0.5 mm in diameter x 0.5 mm +/- 0.05 mm th Orientation: (111) +/- 1° Polish: one side polished Surface roughness: < 5A

iii. Thermal Oxide Wafer 4" Dia.

a. Thermal Oxide Wafer 4" Dia.--Undoped N-type

No.	Item	Description
1.	Thermal Oxide Wafer: 50 nm SiO ₂ Layer on Si (100), 4" dia x 0.5 mm t, N type , undoped, R:>1000ohm.cm	Thermal oxide Layer Research Grade , about 80 % useful area SiO ₂ layer on 2" Silicon wafer Oxide layer thickness: 50 nm (500A) +/-10% Growth method - Dry oxidizing at 1000oC Refractive index - 1.455 Note: customized oxide layer available upon request from 50 nm - 1000 nm <u>Specifications:</u> Conductive type: N- type/ Un- doped Resistivity: >1000 ohm-cm Size: 101mm diameter +/- 0.5 mm x 0.5 +/- 0.025 mm Orientation: (100) +/- 1° Polish: one side polished Surface roughness: < 5A

2.	Thermal Oxide Wafer: 300 nm SiO ₂ Layer on Si (100), 4"dia x 0.50 mm t, undoped N type, 1SP R:>5000 ohm.cm	<p>Thermal oxide Layer Research Grade , about 80 % useful area SiO₂ layer on 4 Silicon wafer Oxide layer thickness: 300 nm (2000Å) +/-10% Growth method - Dry oxidizing at 1000°C Refractive index - 1.455</p> <p>Note: customized oxide layer available upon request from 50 nm - 1000 nm</p> <p><u>Specifications:</u> Conductive type: N-type/ un-doped Resistivity: >5000 ohm.cm Size: 4"meter +/- 0.5 mm x 0.5 mm Orientation: (100) +/- 1° Polish: one side polished Surface roughness: < 5Å</p>
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b. Thermal Oxide Wafer 4" Dia.-Doped N-type

No.	Item	Description
1.	Thermal Oxide Wafer: 100 nm SiO ₂ Layer on Si (100), 4"dia x 0.50 mm t, Ntype , 1SP R: < 0.01 ohm.cm	<p>Thermal oxide Layer Research Grade, about 80 % useful area SiO₂ layer on 4 Silicon wafer Oxide layer thickness: 100 nm (2000Å) +/-10% Growth method - Dry oxidizing at 1000°C Refractive index - 1.455</p> <p>Note: customized oxide layer available upon request from 50 nm - 1000 nm</p> <p><u>Specifications:</u> Conductive type: N-type/ P-doped Resistivity: < 0.01 ohm.cm Size: 4"meter +/- 0.5 mm x 0.5 mm Orientation: (100) +/- 1° Polish: one side polished Surface roughness: < 5Å</p>
2.	Thermal Oxide Wafer: 100 nm SiO ₂ Layer on Si (100), 4"dia x 0.50 mm t, Ntype , 1SP R: 0.3-0.6 ohm.cm	<p>Thermal oxide Layer Research Grade, about 80 % useful area SiO₂ layer on 4 Silicon wafer Oxide layer thickness: 100 nm (2000Å) +/-10% Growth method - Dry oxidizing at 1000°C Refractive index - 1.455</p> <p>Note: customized oxide layer available upon request from 50 nm - 1000 nm</p> <p><u>Specifications:</u> Conductive type: N-type/ P-doped</p>

		Resistivity: 0.3-0.6 ohm.cm Size: 4"meter +/- 0.5 mm x 0.5 mm Orientation: (100) +/- 1° Polish: one side polished Surface roughness: < 5A
3.	Thermal Oxide Wafer: 100 nm SiO2 Layer on Si (100), 4"dia x 0.50 mm t, Ntype , 1SP R: 1-10 ohm.cm	Thermal oxide Layer Research Grade, about 80 % useful area SiO2 layer on 4 Silicon wafer Oxide layer thickness: 100 nm (2000A) +/-10% Growth method - Dry oxidizing at 1000°C Refractive index - 1.455 Note: customized oxide layer available upon request from 50 nm - 1000 nm <u>Specifications:</u> Conductive type: N-type/ P-doped Resistivity: 1-10 ohm.cm Size: 4"meter +/- 0.5 mm x 0.5 mm Orientation: (100) +/- 1° Polish: one side polished Surface roughness: < 5A
4.	Thermal Oxide Wafer: 100 nm SiO2 Layer on Si (100), 4"dia x 0.50 mm t, Ntype ,As-doped 1SP	Thermal oxide Layer Research Grade , about 80 % useful area SiO2 layer on 4 Silicon wafer Oxide layer thickness: 100 nm (2000A) +/-10% Growth method - Dry oxidizing at 1000°C Refractive index - 1.455 Note: customized oxide layer available upon request from 50 nm - 1000 nm <u>Specifications:</u> Conductive type: N-type/ As-doped Resistivity: < 0.005 ohm.cm Size: 4"meter +/- 0.5 mm x 0.5 mm Orientation: (100) +/- 1° Polish: one side polished Surface roughness: < 5A
5.	Thermal Oxide Wafer: 1000 nm SiO2 Layer on Si (100), 4"dia x 0.50 mm t, Ptype , 1SP,R:1-10 ohm.cm	Thermal oxide Layer Research Grade , about 80 % useful area SiO2 layer on 4 Silicon wafer Oxide layer thickness: 1000 nm (2000A) +/-10% Growth method - Dry oxidizing at 1000oC Refractive index - 1.455 Note: customized oxide layer available upon request from 50 nm - 1000 nm

		<p><u>Specifications:</u> Conductive type: P-type/ B-doped Resistivity: 1-10 ohm.cm Size: 4"meter +/- 0.5 mm x 0.5 mm Orientation: (100) +/- 1° Polish: one side polished Surface roughness: < 5A</p>
6.	<p>Thermal Oxide Wafer: 500 nm SiO₂ Layer on Si (100), 4"dia x 0.50 mm t, N-type , 1sp</p>	<p>Thermal oxide Layer Research Grade , about 80 % useful area SiO₂ layer on 4 Silicon wafer Oxide layer thickness: 500 nm (2000A) +/-10% Growth method - Dry oxidizing at 1000oC Refractive index - 1.455</p> <p>Note: customized oxide layer available upon request from 50 nm - 1000 nm</p> <p><u>Specifications:</u> Conductive type: N-type/ P-doped Resistivity: 0.01-0.1 ohm.cm Size: 4"meter +/- 0.5 mm x 0.5 mm Orientation: (100) +/- 1° Polish: one side polished Surface roughness: < 5A</p>
7.	<p>Thermal Oxide Wafer: 300 nm SiO₂ Layer on Si (100), 4"dia x 0.50 mm t, N type, 1SP R:1-10 ohm.cm</p>	<p>Thermal oxide Layer Research Grade , about 80 % useful area SiO₂ layer on 4 Silicon wafer Oxide layer thickness: 300 nm (2000A) +/-10% Growth method - Dry oxidizing at 1000oC Refractive index - 1.455</p> <p>Note: customized oxide layer available upon request from 50 nm - 1000 nm</p> <p><u>Specifications:</u> Conductive type: N-type/ P-doped Resistivity: 1-10 ohm.cm Size: 4"meter +/- 0.5 mm x 0.5 mm Orientation: (100) +/- 1° Polish: one side polished Surface roughness: < 5A</p>
8.	<p>Thermal Oxide Wafer: 1000 nm SiO₂ Layer on Si (100), 4"dia x 0.50 mm t, N-type , 1sp</p>	<p>Thermal oxide Layer Research Grade , about 80 % useful area SiO₂ layer on 4 Silicon wafer Oxide layer thickness: 1000 nm (2000A) +/-10% Growth method - Dry oxidizing at 1000oC Refractive index - 1.455</p> <p>Note: customized oxide layer available upon request from 50 nm - 1000 nm</p>

		<p><u>Specifications:</u> Conductive type: N-type/ P-doped Resistivity: 0.01-0.05-ohm.cm Size: 4"meter +/- 0.5 mm x 0.5 mm Orientation: (100) +/- 1° Polish: one side polished Surface roughness: < 5A</p>
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c. Thermal Oxide Wafer 4" Dia.--Doped-P-type

No.	Item	Description
1.	Thermal Oxide Wafer: 100 nm SiO ₂ Layer on Si (100), 4"dia x 0.50 mm t, P-type ,B-doped 1SP R:< 0.005 ohm.cm	<p>Thermal oxide Layer Research Grade , about 80 % useful area SiO₂ layer on 4 Silicon wafer Oxide layer thickness: 100 nm (2000A) +/-10% Growth method - Dry oxidizing at 1000°C Refractive index - 1.455</p> <p>Note: customized oxide layer available upon request from 50 nm - 1000 nm</p> <p><u>Specifications:</u> Conductive type: P-type/ B-doped Resistivity: < 0.005 ohm.cm Size: 4"meter +/- 0.5 mm x 0.5 mm Orientation: (100) +/- 1° Polish: one side polished Surface roughness: < 5A</p>
2.	Thermal Oxide Wafer: 100 nm SiO ₂ Layer on Si (100), 4"dia x 0.50 mm t, P-type ,B-doped 1SP R:1-10 ohm.cm	<p>Thermal oxide Layer Research Grade , about 80 % useful area SiO₂ layer on 4 Silicon wafer Oxide layer thickness: 100 nm (2000A) +/-10% Growth method - Dry oxidizing at 1000°C Refractive index - 1.455</p> <p>Note: customized oxide layer available upon request from 50 nm - 1000 nm</p> <p><u>Specifications:</u> Conductive type: P-type/ B-doped Resistivity: 1-10 ohm.cm Size: 4"meter +/- 0.5 mm x 0.5 mm Orientation: (100) +/- 1° Polish: one side polished Surface roughness: < 5A</p>
3.	Thermal Oxide Wafer: 300 nm SiO ₂ Layer on Si (100), 4"dia x 0.50 mm t, P type, 1SP R:0.001-0.005 ohm.cm	<p>Thermal oxide Layer Research Grade , about 80 % useful area SiO₂ layer on 4 Silicon wafer Oxide layer thickness: 300 nm (2000A) +/-10%</p>

		<p>Growth method - Dry oxidizing at 1000°C Refractive index - 1.455</p> <p>Note: customized oxide layer available upon request from 50 nm - 1000 nm</p> <p><u>Specifications:</u> Conductive type: P-type/ B-doped Resistivity: R:0.001-0.005 ohm.cm Size: 4"meter +/- 0.5 mm x 0.5 mm Orientation: (100) +/- 1° Polish: one side polished Surface roughness: < 5A</p>
4.	<p>Thermal Oxide Wafer: 300 nm SiO2 Layer on Si (100), 4"dia x 0.50 mm t, P type, 1SP R:0.01-0.05 ohm.cm</p>	<p>Thermal oxide Layer Research Grade , about 80 % useful area SiO2 layer on 4 Silicon wafer Oxide layer thickness: 300 nm (3000A) +/-10% Growth method - Dry oxidizing at 1000°C Refractive index - 1.455</p> <p>Note: customized oxide layer available upon request from 50 nm - 1000 nm</p> <p><u>Specifications:</u> Conductive type: P-type/ B-doped Resistivity: R:0.01-0.05ohm.cm Size: 4"meter +/- 0.5 mm x 0.5 mm Orientation: (100) +/- 1° Polish: one side polished Surface roughness: < 5A</p>
5.	<p>Thermal Oxide Wafer: 300 nm SiO2 Layer on Si (100), 4"dia x 0.525 mm t, N type, 2SP R:1-20 ohm.cm</p>	<p>Thermal oxide Layer SiO2 layer on 4 Silicon wafer Oxide layer thickness: 300 nm (2000A) +/-10% Growth method - Dry oxidizing at 1000oC Refractive index - 1.455</p> <p>Note: customized oxide layer available upon request from 50 nm - 1000 nm</p> <p><u>Specifications:</u> Conductive type: N-type/ P-doped Resistivity: 1-20 ohm.cm Size: 4"meter +/- 0.5 mm x 0.525 mm Orientation: (100) +/- 1° Polish: Two sides polished Surface roughness: < 5A</p>
6.	<p>Thermal Oxide Wafer: 90 nm SiO2 Layer on Si (100), 4"dia x 0.50 mm t, P type, 1SP</p>	<p>Thermal oxide Layer Research Grade , about 80 % useful area 90nm SiO2 layer on 4 " Silicon wafer Oxide layer thickness: 90 nm (2000A) +/-10% Growth method - Dry oxidizing at 1000oC Refractive index - 1.455</p>

		<p>Note: customized oxide layer available upon request from 50 nm - 1000 nm</p> <p><u>Specifications:</u> Conductive type: P-type/ B-doped Resistivity: 0.1-1.0ohm.cm Size: 4"meter +/- 0.5 mm x 0.5 mm Orientation: (100) +/- 1° Polish: one side polished Surface roughness: < 5A</p>
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J. Si+SiO₂+Pt Thin Film

No.	Item	Description
1.	SiO ₂ +Pt thin film on Si (B-doped)substrate, 10x10x0.5mm, 1sp (SiO ₂ =500nm, Pt=60nm)	<p><u>Specifications:</u> Conductive type: SiO₂+Ti+Pt thin film on Si(B-doped) substrate, 10x10x0.5mm,1sp(SiO₂=500nm,Pt=60nm) Resistivity: <0.005 ohm.cm Size: 10x10 x 0.5 mm Polish: one side polished Surface roughness: < 5A</p>
2.	SiO ₂ +Pt thin film on Si substrate ,4"x0.5mm,1sp P-type B-doped, (SiO ₂ =500nm, Pt=60nm)	<p><u>Specifications:</u> Film: SiO₂+Pt thin film on Si (P-type) substrate, 4"x0.5mm, 1sp SiO₂=500nm Pt=60nm Resistivity: <0.005 ohm.cm Substrate Size: 4" diameter +/- 0.5 mm x 0.5 mm thickness Polish: one side polished Surface roughness: < 5A</p>

K. Si+SiO₂ +Ti(or TiO₂)+Pt Thin film

i. Si+SiO₂ +Ti(or TiO₂)+Pt (111) Highly Oriented Polycrystal

No.	Item	Description
1.	SiO ₂ +Ti+Pt(111) thin film on Si substrate, 4"x0.525mm,1sp P-type B-doped, (SiO ₂ =300nm, Ti=10nm ,Pt(111)=150nm)	<p><u>Specifications:</u> Film: SiO₂+Ti+Pt(111) thin film on Si (P-type) substrate, 4"x0.525mm, 1sp SiO₂=300nm Ti=10nm Pt(111)=150nm Resistivity: N/A Substrate Size: 4" diameter +/- 0.5 mm x 0.5 mm Polish: one side polished Surface roughness: < 5A</p>

2.	SiO ₂ +TiO ₂ +Pt(111) thin film on Si substrate, 4"x0.525mm,1sp P-type B-doped, (SiO ₂ =300nm, TiO ₂ =20nm, Pt(111)=150nm)	<u>Specifications:</u> Film: SiO ₂ +TiO ₂ +Pt(111) thin film on Si (P-type) substrate, 4"x0.525mm,1sp SiO ₂ =300nm TiO ₂ =20nm Pt(111)=150nm Resistivity: N/A Substrate Size: 4" diameter +/- 0.5 mm x 0.525 mm Polish: one side polished Surface roughness: < 5A
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ii. Si+SiO₂ +Ti+Pt Polycrystalline

No.	Item	Description
1.	SiO ₂ +Ti+Pt thin film on Si (B-doped)substrate ,10x10x0.5mm,1sp	<u>Specifications:</u> Conductive type: SiO ₂ +Ti+Pt thin film on Si(B-doped) substrate, 10x10x0.5mm, 1sp(SiO ₂ =500nm, Ti=50nm, Pt=200nm) Resistivity: <0.005 ohm.cm Size: 10x10 x 0.5 mm Polish: one side polished Surface roughness: < 5A
2.	SiO ₂ +Ti+Pt thin film on Si substrate ,10x5x0.5mm,1sp,B-doped	<u>Specifications:</u> Conductive type: SiO ₂ +Ti+Pt thin film on Si(B-doped) substrate, 10x5x0.5mm, 1sp(SiO ₂ =500nm,Ti=50nm, Pt=200nm) Resistivity: <0.005 ohm.cm Size: 10x5 x 0.5 mm Polish: one side polished Surface roughness: < 5A
3.	SiO ₂ +Ti+Pt thin film on Si substrate ,4"x0.5mm,1sp P-type B-doped,(SiO ₂ =500nm,Ti=50nm ,Pt=200nm)	<u>Specifications:</u> Film: SiO ₂ +Ti+Pt thin film on Si (P-type) substrate, 4"x0.5mm, 1sp SiO ₂ =500nm Ti=50nm Pt=200nm Resistivity: <0.005 ohm.cm Substrate Size: 4" diameter +/- 0.5 mm x 0.5 mm Polish: one side polished Surface roughness: < 5A

L. SiO₂+Si₃N₄ on Si wafer

No.	Item	Description
1.	300 nm SiO ₂ Layer+ 50nm Si ₃ N ₄ (both sides) on Si (100), 2" dia x 0.250 mm t, P type , B-doped R:<0.01-0.1ohm.cm	Thermal oxide Layer Research Grade , about 80 % useful area SiO ₂ (300nm)+50nm Si ₃ N ₄ layer on 2" Silicon wafer(Both sides) Oxide layer thickness: 300 nm (2000A) +/-10%

		<p>Si₃N₄ thickness:50nm(Both sides) Growth method - Dry oxidizing at 1000°C Refractive index - 1.455</p> <p>Note: customized oxide layer available upon request from 50 nm - 1000 nm</p> <p><u>Specifications:</u> Conductive type: Si P type/ Boron doped Resistivity: 0.01-0.1 ohm-cm Size: 50.8 diameter +/- 0.5 mm x 0.250 +/- 0.025 mm Orientation: (100) +/- 0.5° Polish: Both sides polished Surface roughness: < 5A</p>
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M. Silicon Wafer for Solar Cell

No.	Item	Description
1.	Salor Grade Si Wafer 156 x156 x 0.2 mm , <100> (as lapped) 10pcs/Pack	<p>Solar Grade Mono-Crystalline Silicon Wafer Specification Wafer Area: 156mm x 156mm Thickness (T): 200 ±20µm Crystalline: Mono-crystalline Donor type/ Dopant: P/Boron Dislocation density (Etching Pit): ≤5000 pcs/cm² Orientation: <100>±1° Oxygen concentration: ≤1.0×10¹⁸ atoms/cm³ Carbon concentration: ≤5×10¹⁶ atoms/cm³ Resistivity: 0.5-6.0 ohm.cm or 0.5~3.0 ohm.cm & 3.0~6.0ohm.cm TTV: <30µm Saw marks: ≤15µm Surface quality: As cut, cleaned Edge chips: ≤2 per wafer, Depth≤1.0mm, Length≤1.0mm;No edge cracks</p>
2.	Salor Grade Si Wafer 125 x125 x 0.2 mm , <100> (as lapped) 10pcs/Pack	<p>Solar Grade Mono-Crystalline Silicon Wafer Specification Wafer Area: 125mm x 125mm Thickness (T): 200 ±20µm Crystalline: Mono-crystalline Donor type/ Dopant: P/Boron Dislocation density (Etching Pit): ≤5000 pcs/cm² Orientation: <100>±1° Oxygen concentration: ≤1.0×10¹⁸ atoms/cm³ Carbon concentration: ≤5×10¹⁶ atoms/cm³ Resistivity: 0.5-6.0 ohm.cm or 0.5~3.0 ohm.cm&3.0~6.0ohm.cm TTV: <30µm Saw marks: ≤15µm Surface quality: As cut, cleaned Edge chips: ≤2 per wafer, Depth≤1.0mm, Length≤1.0mm;No edge cracks</p>

58. SiC Wafer (4H & 6H) & SiC Film(3C)

A. SiC (4H)

No.	Item	Description
1.	SiC - 4H (0001), 3" dia. x0.35 mm th., two sides polished (EPI- polished)	<p><u>Specifications:</u> Orientation: <0001> +/-0.5 degree Dimension: 3" (+/-0.015") Dx0.35mm(+/-25um) Polished: two sides epi polished Surface Roghness: < 10 A by AFM</p> <p><u>Typical Properties of Single Crystal SiC:</u> Formula weight: 40.10 Unit Cell: Hexagonal Lattice constant: a =3.07 A, c = 10.53 A Stacking sequence: ABCA (4H) Growth Technique: MOCVD Orientation: (0001) Polishing: Silicon face polished Band Gap: 3.26eV (Indirect) Conductivity type: N Resistivity: 0.01~0.1 ohm-cm Micropipe Density: <=30 cm⁻² Dielectric Constant: e (11) = e (22) = 9.66 e (33) = 10.33 Thermal Conductivity @ 300K: 4W / cm. K Hardness: 9 Mohs Ra: <= 1nm</p>
2.	SiC - 4H (0001), 10x10x0.33 mm , one side polished	<p><u>Specifications:</u> Orientation: <0001> +/-0.5 Dimension: 10 x 10 x 0.33 +/-0.03 mm Polished: One sides epi polished on Si face Surface Roghness: < 10 A by AFM</p> <p><u>Typical Properties of Single Crystal SiC:</u> Formula weight: 40.10 Unit Cell: Hexagonal Lattice constant: a =3.07 A c = 10.05 A 4Stacking sequence: ABCA (6H) Growth Technique: MOCVD Orientation: on axis or 3.5° off (0001) Polishing : Silicon face polished Band Gap: 3.26 eV (Indirect) Conductivity type: N Resistivity: 0.01~0.5 ohm-cm Dielectric Constant: e (11) = e (22) = 9.66 e (33) = 10.33 Thermal Conductivity @ 300 K:5 W / cm. K Hardness: 9 Mohs</p>
3.	SiC - 4H (0001), 5x5x0.33 mm , one side polished	<p><u>Specifications:</u> Orientation: <0001> +/-0.5 Dimension: 5x5 x 0.33 +/-0.03 mm Polished: One sides epi polished on Si face</p>

		<p>Surface Roghness: < 10 Å by AFM</p> <p><u>Typical Properties of Single Crystal SiC:</u> Formula weight: 40.10 Unit Cell: Hexagonal Lattice constant: a =3.07 Å c = 10.05 Å Stacking sequence: ABCA (6H) Growth Technique: MOCVD Orientation: on axis or 3.5° off (0001) Polishing: Silicon face polished Band Gap: 3.26 eV (Indirect) Conductivity type: N Resistivity: 0.01~0.5 ohm-cm Dielectric Constant: $\epsilon(11) = \epsilon(22) = 9.66$ $\epsilon(33) = 10.33$ Thermal Conductivity @ 300K: 4 W / cm. K Hardness: 9 Mohs</p>
4.	SiC - 4H (0001), 1" dia. x0.26 mm th., one side polished	<p><u>Specifications:</u> Orientation: <0001> +/-0.5 Dimension: 1" x 0.26 +/-0.03 mm Polished: One side epi polished Surface Roghness: < 5 Å by AFM</p> <p><u>Typical Properties of Single Crystal SiC:</u> Formula weight: 40.10 Unit Cell: Hexagonal Lattice constant: a =3.07 Å c = 10.53 Å Stacking sequence: ABCA (4H) Growth Technique: MOCVD Orientation: on axis or 3.5° off (0001) Polishing: Silicon face polished Band Gap: 3.26eV (Indirect) Conductivity type: N Resistivity: 0.015~0.5 ohm-cm Dielectric Constant: $\epsilon(11) = \epsilon(22) = 9.66$ $\epsilon(33) = 10.33$ Thermal Conductivity @ 300K: 4W / cm. K Hardness: 9 Mohs</p>
5.	SiC - 4H (0001), 2" dia. x0.33 mm th., one side polished	<p><u>Specifications:</u> Orientation: <0001> ±30' Edge Orientation : <11-20>±1°<10-10>±1° Dimension: 2"±/0.15mm x 0.33 ±/0.05mm Polished: One side polished Surface Roghness: < 5 Å by AFM</p> <p><u>Typical Properties of Single Crystal SiC:</u> Formula weight: 40.10 Unit Cell: Hexagonal Lattice constant: a =3.07 Å, c = 10.53 Å Stacking sequence: ABCA (4H) Growth Technique: MOCVD Orientation: on axis or 3.5° off (0001) Polishing: Silicon face polished Band Gap: 3.26eV (Indirect)</p>

		Conductivity type: N Resistivity: 0.015~0.5 ohm-cm Dielectric Constant: $\epsilon(11) = \epsilon(22) = 9.66$ $\epsilon(33) = 10.33$ Thermal Conductivity @ 300K: 4W / cm. K Hardness: 9 Mohs
6.	SiC - 4H (0001), 2" dia. x0.43 mm th.,N-doped Two sides polished	<u>Specifications:</u> SiC - 4H, N-doped Orientation: $\langle 0001 \rangle \pm 30'$ Edge Orientation : $\langle 11-20 \rangle \pm 1^\circ \langle 10-10 \rangle \pm 1^\circ$ Dimension: 2" ± 0.15 mm x 0.43 ± 0.05 mm Polished: Two sides polished Micropipe defects: ≤ 30 cm-2
7.	SiC - 4H (0001), 3" dia. x0.40 mm th., two sides polished,"Si" face EPI ready	Specifications of Substrate Orientation: $\langle 0001 \rangle \pm 0.5$ Dimension: 3" x 0.4 ± 0.03 mm Polished: two sides epi polished Surface Roghness: < 5 A by AFM <u>Typical Properties of Single Crystal SiC:</u> Formula weight: 40.10 Unit Cell: Hexagonal Lattice constant: $a = 3.07$ A $c = 10.53$ A Stacking sequence: ABCA (4H) Growth Technique: MOCVD Orientation: on axis or 3.5° off (0001) Polishing: Silicon face polished Band Gap: 3.26eV (Indirect) Conductivity type: N Resistivity: 0.015~0.5 ohm-cm Dielectric Constant: $\epsilon(11) = \epsilon(22) = 9.66$ $\epsilon(33) = 10.33$ Thermal Conductivity @ 300K: 4W / cm. K Hardness: 9 Mohs

B. SiC (6H)

No.	Item	Description
1.	SiC - 6H (0001), 1" dia. x0.26 mm th., one side polished	<u>Specifications:</u> Orientation: $\langle 0001 \rangle \pm 0.5$ Dimension: 1"Dx0.25-0.26mm6 ± 0.03 mm Polished: One side epi polished Surface Roghness: < 10 A by AFM <u>Typical Properties:</u> Formula weight: 40.10 Unit Cell: Hexagonal Lattice constant: $a = 3.08$ A $c = 15.117$ A Stacking sequence: ABCACB (6H) Growth Technique: MOCVD Orientation: on axis or 3.5° off (0001)

		Polishing: Silicon face polished Band Gap: 3.03eV (Indirect) Conductivity type: N Resistivity: 0.020~0.200 ohm-cm Dielectric Constant: $\epsilon(11) = \epsilon(22) = 9.66$ $\epsilon(33) = 10.33$ Thermal Conductivity @ 300K: 5 W / cm. K Hardness: 9 Mohs
2.	SiC - 6H (0001), 2" dia. x 0.33 mm thick, one side polished	<u>Specifications:</u> Orientation: <0001> +/-0.5 Dimension: 2"Dx0.33mm +/-0.03 mm Polished: One side epi polished Surface Roughness: < 10 Å by AFM <u>Typical Properties:</u> Formula weight: 40.10 Unit Cell: Hexagonal Lattice constant: $a = 3.08$ Å $c = 15.117$ Å Stacking sequence: ABCACB (6H) Growth Technique: MOCVD Orientation: on axis or 3.5° off (0001) Polishing: Silicon face polished Band Gap: 3.03eV (Indirect) Conductivity type: N Resistivity: 0.020~0.200 ohm-cm Dielectric Constant: $\epsilon(11) = \epsilon(22) = 9.66$ $\epsilon(33) = 10.33$ Thermal Conductivity @ 300K: 5 W / cm. K Hardness: 9 Mohs
3.	SiC - 6H (0001), 2" dia. x 0.26 mm th., two sides polished	<u>Specifications:</u> Orientation: <0001> +/-0.5 Dimension: 2"Dx0.25-0.26mm +/-0.03 mm Polished: two sides epi polished Surface Roughness: < 10 Å by AFM <u>Typical Properties:</u> Formula weight: 40.10 Unit Cell: Hexagonal Lattice constant: $a = 3.08$ Å $c = 15.117$ Å Stacking sequence: ABCACB (6H) Growth Technique: MOCVD Orientation: on axis or 3.5° off (0001) Polishing: Two sides polished, Silicon face epi-ready polished and carbon face optically polished Band Gap: 3.03eV (Indirect) Conductivity type: N Resistivity: 0.020~0.200 ohm-cm Dielectric Constant: $\epsilon(11) = \epsilon(22) = 9.66$ $\epsilon(33) = 10.33$ Thermal Conductivity @ 300K: 5 W / cm. K Hardness: 9 Mohs
4.	SiC - 6H (0001)/<11-20>^45 degree , 2" dia. x 0.3 mm th., one side polished	<u>Specifications:</u> Orientation: (0001)/<11-20>^45 degree Dimension: 2"Dx0.3mm +/-0.03 mm

		<p>Polished: One side polished Surface Roughness: < 10 Å by AFM</p> <p><u>Typical Properties:</u> Formula weight: 40.10 Unit Cell: Hexagonal Lattice constant: $a = 3.08 \text{ Å}$ $c = 15.117 \text{ Å}$ Stacking sequence: ABCACB (6H) Growth Technique: MOCVD Orientation: on axis or 3.5° off (0001) Polishing: Silicon face polished Band Gap: 3.03 eV (Indirect) Conductivity type: N Resistivity: 0.020~0.200 ohm-cm Dielectric Constant: $\epsilon(11) = \epsilon(22) = 9.66$ $\epsilon(33) = 10.33$ Thermal Conductivity @ 300K: 5 W / cm. K Hardness: 9 Mohs</p>
5.	SiC - 6H (0001), 5x5x0.26 , two sides polished	<p><u>Specifications:</u> Orientation: <0001> +/-0.5 Dimension: 5x5x 0.26 +/-0.03 mm Polished: two sides polished Surface Roughness: < 10 Å by AFM</p> <p><u>Typical Properties:</u> Formula weight: 40.10 Unit Cell: Hexagonal Lattice constant: $a = 3.08 \text{ Å}$ $c = 15.117 \text{ Å}$ Stacking sequence: ABCACB (6H) Growth Technique: MOCVD Orientation: on axis or 3.5° off (0001) Polishing: Silicon face polished Band Gap: 3.03 eV (Indirect) Conductivity type: N Resistivity: 0.02~0.2 ohm-cm Dielectric Constant: $\epsilon(11) = \epsilon(22) = 9.66$ $\epsilon(33) = 10.33$ Thermal Conductivity @ 300K: 5 W / cm. K Hardness: 9 Mohs</p>
6.	SiC - 6H (0001), 5x5x0.33 mm , one side polished	<p><u>Specifications:</u> Orientation: <0001> +/-0.5 Dimension: 5x5x 0.33 +/-0.025 mm Polished: One side epi polished Surface Roughness: < 10 Å by AFM</p> <p><u>Typical Properties:</u> Formula weight: 40.10 Unit Cell: Hexagonal Lattice constant: $a = 3.08 \text{ Å}$, $c = 15.117 \text{ Å}$ Stacking sequence: ABCACB (6H) Growth Technique: MOCVD Orientation: on axis or 3.5° off (0001) Polishing: Silicon face polished Band Gap: 3.03 eV (Indirect)</p>

		Conductivity type: N Resistivity: 0.02~0.2 ohm-cm Dielectric Constant: $\epsilon(11) = \epsilon(22) = 9.66$ $\epsilon(33) = 10.33$ Thermal Conductivity @ 300K: 5 W / cm. K Hardness: 9 Mohs
7.	SiC - 6H (0001), 1/4"x1/4"x0.26 mm , two sides polished (2sp)	<u>Specifications:</u> Orientation: <0001> +/-0.5 Dimension: 1/4"x 1/4" x 0.26 +/-0.03 mm Polished: Two sides epi polished Surface Roughness: < 10 Å by AFM <u>Typical Properties:</u> Formula weight: 40.10 Unit Cell: Hexagonal Lattice constant: $a = 3.08 \text{ Å}$, $c = 15.117 \text{ Å}$ Stacking sequence: ABCACB (6H) Growth Technique: MOCVD Orientation: on axis or 3.5° off (0001) Polishing: Silicon face polished Band Gap: 3.03 eV (Indirect) Conductivity type: N Resistivity: 0.02~0.2 ohm-cm Dielectric Constant: $\epsilon(11) = \epsilon(22) = 9.66$ $\epsilon(33) = 10.33$ Thermal Conductivity @ 300K: 4 W / cm. K Hardness: 9 Mohs
8.	SiC - 6H (0001), with 3.5 degree off , 5x5x0.26 mm , one side polished	<u>Specifications:</u> Orientation: <0001> +/-0.5 with 3.5 degree off Dimension: 5x5 x 0.26 +/-0.03 mm Polished: One side epi polished and Si face terminated Surface Roughness: < 10 Å by AFM <u>Typical Properties:</u> Formula weight: 40.10 Unit Cell: Hexagonal Lattice constant: $a = 3.08 \text{ Å}$ $c = 15.117 \text{ Å}$ Stacking sequence: ABCACB (6H) Growth Technique: MOCVD Orientation: on axis or 3.5° off (0001) Polishing: Silicon face polished Band Gap: 3.03 eV (Indirect) Conductivity type: N Resistivity: 0.02~0.2 ohm-cm Dielectric Constant: $\epsilon(11) = \epsilon(22) = 9.66$ $\epsilon(33) = 10.33$ Thermal Conductivity @ 300K: 4W / cm. K Hardness: 9 Mohs
9.	SiC - 6H (0001), 10x10x0.26 mm , two sides polished	<u>Specifications:</u> Orientation: <0001> +/-0.5 Dimension: 10x10 x 0.26 +/-0.03 mm Polished: two sides epi polished Surface Roughness: < 10 Å by AFM

		<p><u>Typical Properties:</u> Formula weight: 40.10 Unit Cell: Hexagonal Lattice constant: $a = 3.08 \text{ \AA}$ $c = 15.117 \text{ \AA}$ Stacking sequence: ABCACB (6H) Growth Technique: MOCVD Orientation: on axis or 3.5° off (0001) Polishing: Silicon face polished Band Gap: 3.03 eV (Indirect) Conductivity type: N Resistivity: 0.02~0.2 ohm-cm Dielectric Constant: $\epsilon(11) = \epsilon(22) = 9.66$ $\epsilon(33) = 10.33$ Thermal Conductivity @ 300K: 4W / cm. K Hardness: 9 Mohs</p>
10.	SiC - 6H (0001), 10x10x0.3 mm , one side polished	<p><u>Specifications:</u> Orientation: <0001> +/-0.5 Dimension: 10x10 x 0.3 +/-0.03 mm Polished: One side epi polished and Si face terminated Surface Roughness: < 10 A by AFM</p> <p><u>Typical Properties:</u> Formula weight: 40.10 Unit Cell: Hexagonal Lattice constant: $a = 3.08 \text{ \AA}$ $c = 15.117 \text{ \AA}$ Stacking sequence: ABCACB (6H) Growth Technique: MOCVD Orientation: on axis or 3.5° off (0001) Polishing: Silicon face polished Band Gap: 3.03 eV (Indirect) Conductivity type: N Resistivity: 0.02~0.2 ohm-cm Dielectric Constant: $\epsilon(11) = \epsilon(22) = 9.66$ $\epsilon(33) = 10.33$ Thermal Conductivity @ 300K: 4W / cm. K Hardness: 9 Mohs</p>
11.	SiC - 6H (0001), with 3.5 degree off , 10x10x0.26 mm , , one side polished	<p><u>Specifications:</u> Orientation: <0001> +/-0.5 with 3.5 degree off Dimension: 10x10 x 0.26 +/-0.03 mm Polished: One side epi polished and Si face terminated Surface Roughness: < 10 A by AFM</p> <p><u>Typical Properties:</u> Formula weight: 40.10 Unit Cell: Hexagonal Lattice constant: $a = 3.08 \text{ \AA}$ $c = 15.117 \text{ \AA}$ Stacking sequence: ABCACB (6H) Growth Technique: MOCVD Orientation: on axis or 3.5° off (0001) Polishing: Silicon face polished Band Gap: 3.03 eV (Indirect) Conductivity type: N Resistivity: 0.02~0.2 ohm-cm Dielectric Constant: $\epsilon(11) = \epsilon(22) = 9.66$ $\epsilon(33) = 10.33$</p>

		Thermal Conductivity @ 300K: 4W / cm. K Hardness: 9 Mohs
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C. SiC Film (3C) on Si wafer

No.	Item	Description
1.	4" SiC-3C N doped Epi Film as CMP on both sides of Silicon Wafer after epitaxy growth, 3.3 micron Thick, -SiC-3CP-4-03	<p><u>Specifications:</u> Film: SiC Epi film with 3C structure grown by PECVD Thickness: 3300 nm +/- 10% (can be grown up to 20 micron th; the price would be increased with the requested film thickness) Orientation: 3C SiC (100) Surface: CMP (film chemical mechanical polished) Target doping level: 1.0E17 - 1.0E18 /cc (Available Doping range: 1E16 - 1E19 /cc) Type and dopant: N type, Nitrogen doping</p> <p><u>Silicon substrate:</u> Size: 100 mm dia x 0.525 mm thickness Orientation: (100) Type: N type / P doped (P type is available as well) Resistivity: 1- 10 ohm.cm (resistivities is dependent on the doping level) Polish: one side polished</p>
2.	4"SiC-3C Undoped Epi Film as CMP on both sides of Silicon Wafer after epitaxy growth, 1.5 micron Thick, - SiC-3CP-4-015-1	<p><u>Specifications:</u> Film: SiC Epi film with 3C structure grown by PECVD Thickness: 1500 nm +/- 10% (can be grown up to 20 micron th; the price would be increased with the requested film thickness) Orientation: 3C SiC (100) Surface: CMP (film chemical mechanical polished) on both sides with Ra < 5 Angstrom Target doping level: < 1.0E16 /cc Type and dopant: N type, Undoped</p> <p><u>Silicon substrate:</u> Size: 100 mm dia x 0.525 mm thickness Orientation: (100) Type: P type / B doped (N type is available as well) Resistivity: 1- 10 ohm.cm Polish: one side polished</p>
3.	SiC-3C Undoped Epi Film as CMP on both sides of Silicon Wafer after epitaxy growth, 1.5 micron Thick, 10x10x0.525mm	<p><u>Specifications:</u> Film: SiC Epi film with 3C structure grown by PECVD Thickness: 1500 nm +/- 10% (can be grown up to 20 micron th; the price would be increased with the requested film thickness) Orientation: 3C SiC (100) Surface: CMP (film chemical mechanical polished) on both sides with Ra < 5 Angstrom Target doping level: < 1.0E16 /cc Type and dopant: N type, Undoped</p> <p><u>Silicon substrate:</u> Size: 10mm x 10mm x 0.525 mm thickness</p>

		Orientation: (100) Type: P type / B doped (N type is available as well) Resistivity: 1- 10 ohm.cm Polish: one side polished
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59. Si-Ge alloy crystal

No.	Item	Description
1.	Si-Ge (2%) Wafer (100), 4 " dia x 0.5 mm, 1SP, P Type, resistivities:7-8ohm.cm	Single crystal Si-Ge (wt 2%) Conductivity: P type Resistivity: 7-8 ohm-cm Size: 4" diameter x 0.5 mm Orientation: (100) Polish: One side polished Surface roughness: < 5A
2.	Si-Ge (2%) Wafer (100), 4 " dia x 0.5 mm, 2SP, P- Type, resistivities:7-8 ohm-cm	Single crystal Si-Ge (2wt %) Conductivity: P type Resistivity: 7-8 ohm-cm Size: 4" diameter x 0.5 mm Orientation: (100) Polish: Two sides polished Surface roughness: < 5A

60. SiO₂ (Fused Silica)

A. Fused silica for Semi-conductor

No.	Item	Description
1.	Fused Silica Glass Substrate, 0.5"x0.5"x0.5 mm, 2sides polished	UV grade Fused Silica Size: 0.5" x 0.5" x 0.5 mm Polishing: Two sides polished Surface Roughness: < 5 A
2.	Fused Silica Glass Substrate, 10x10x0.5 mm, 1 side polished	UV grade Fused Silica Size: 10 x 10 x 0.5 mm Polishing: One side polished Surface Roughness: < 5 A
3.	Fused Silica Glass Substrate, 10x10x0.5 mm, 2 side polished	UV grade Fused Silica Size: 10 x 10 x 0.5 mm Polishing: Two sides polished Surface Roughness: < 5 A
4.	Fused Silica Glass Substrate, 10x10x1.0mm,	UV grade Fused Silica

	1 side polished	Size: 10 x 10 x 1.0mm Polishing: One side polished Surface Roughness: < 5 A
5.	Fused Silica Glass Substrate, 10x10x1.0mm, two sides polished	UV grade Fused Silica Size: 10 x 10 x 1.0mm Polishing: Two sides polished Surface Roughness: < 5 A
6.	Fused Silica Glass Substrate, 2"x0.5 mm, 2 sides polished	UV grade Fused Silica Size: 2"x0.5mm Polishing: Two sides polished Surface Roughness: < 5 A
7.	Fused Silica Glass Substrate, 4" x 0.5 mm, 1 sides polished	UV grade Fused Silica Size: 4"diameter x 0.5 mm Polishing: one side polished Surface Roughness: < 5 A
8.	Fused Silica Glass Substrate, 4" x 0.5 mm, 2 sides polished	UV grade Fused Silica Size: 4"diameter x 0.5 mm Polishing: Two sides polished Surface Roughness: < 5
9.	Fused Silica Glass , 2" x 0.5 mm, 1sp	UV grade Fused Silica Size: 2" diameter x 0.5 mm Polishing: One side polished For DIY glass window and substrate
10.	Fused Silica Glass Substrate, 100 x 100 x 1.0 mm, 2 sides polished	UV grade Fused Silica Size: 100 mm x 100 mm x 1.0 mm Polishing: Two sides polished Surface Roughness: < 5 A

B. Fused Silica for Solar Cell Application

No.	Item	Description
1.	Fused Silica Glass Substrate, 1"x1"x1.4 mm, 2 sides optical polished	Optical grade Fused Silica Size: 1"x1"x1.4 mm, Polishing: Two sides optical polished(S/D 60/40)
2.	Fused Silica Glass Substrate, 25mm x 1.0mm(+/-0.1) 2 sides optical polished with S/D: 60/40	Optical grade Fused Silica Size: 25mm dia. x 1.0mm(+/-0.1) thick Polishing: Two sides optical polished with S/D: 60/40

61. SiO₂ (single crystal quartz)

A. AT-cut single crystal quartz

No.	Item	Description
1.	Quartz single crystal, AT-cut, 10x10x0.5mm, 2SP	Single crystal SiO ₂ (quartz) Size: 10mm x 10mm x 0.5mm Orientation: AT-cut Polish: two sides polished. Surface roughness: < 5 Å (by AFM) Packing: in 1000 class clean room by wafer carrier
2.	Quartz single crystal, AT-cut, 4" dia x0.5mm, 2 sp	Single crystal SiO ₂ (quartz) Size: 4" diameter x 0.5mm thickness Orientation: AT-cut +/- 0.5° Polishing: two sides epi polished by CMP Surface roughness: < 5 Å (by AFM) Packing: in 1000 class clean room by wafer carrier

B. <101> single crystal quartz

No.	Item	Description
1.	Quartz single crystal, saw grade (101), 10x10x1.0mm, 2 sp	Single crystal SiO ₂ (quartz) ,saw grade Size: 10mm x 10mm x 1.0mm Orientation: (101) Polish: two sides polished.

C. X Cut single crystal quartz

No.	Item	Description
1.	Quartz single crystal, X-cut, 10x10x0.5mm, 1 SP	Single crystal SiO ₂ (quartz) Size: 10mm x 10mm x 0.5mm Orientation: X-cut Polish: one sides polished. Surface roughness: < 5 Å (by AFM) Packing: in 1000 class clean room by wafer carrier
2.	Quartz single crystal, X-cut, 10x10x0.1mm, 2 sp	Single crystal SiO ₂ (quartz) Size: 10mm x 10mm x 0.1mm Orientation: X-cut Polish: two sides polished. Surface roughness: < 5 Å (by AFM) Packing: in 1000 class clean room by wafer carrier
3.	Quartz single crystal, X-cut, 10x10x0.5mm, 2SP	Single crystal SiO ₂ (quartz)

		<p>Size: 10mm x 10mm x 0.5mm</p> <p>Orientation: X-cut</p> <p>Polish: two sides polished.</p> <p>Surface roughness: < 5 Å (by AFM)</p> <p>Packing: in 1000 class clean room by wafer carrier</p>
4.	Quartz single crystal, X-cut, 1x1x0.1mm, 2sp	<p>Single crystal SiO₂ (quartz)</p> <p>Size: 1x1x0.1mm</p> <p>Orientation: X-cut</p> <p>Polish: Two sides polished.</p> <p>Surface roughness: < 5 Å (by AFM)</p> <p>Packing: in 1000 class clean room by wafer carrier</p>
5.	Quartz single crystal, X-cut, 1x1x0.5mm, 2sp	<p>Single crystal SiO₂ (quartz)</p> <p>Size: 1x1x0.5mm</p> <p>Orientation: X-cut</p> <p>Polish: Two sides polished.</p> <p>Surface roughness: < 5 Å (by AFM)</p> <p>Packing: in 1000 class clean room by wafer carrier</p>
6.	Quartz single crystal, X-cut, 1"x1"x0.5mm, 2SP	<p>Single crystal SiO₂ (quartz)</p> <p>Size: 1"x1" x 0.5mm</p> <p>Orientation: X-cut</p> <p>Polish: two sides polished.</p> <p>Surface roughness: < 5 Å (by AFM)</p> <p>Packing: in 1000 class clean room by wafer carrier</p>
7.	Quartz single crystal, X-cut, 20x20x0.5mm, 2SP	<p>Single crystal SiO₂ (quartz)</p> <p>Size: 20mm x 20mm x 0.5mm</p> <p>Orientation: X-cut</p> <p>Polish: two sides polished.</p> <p>Surface roughness: < 5 Å (by AFM)</p> <p>Packing: in 1000 class clean room by wafer carrier</p>
8.	Quartz single crystal, X-cut, 10x10x1mm, 1SP	<p>Single crystal SiO₂ (quartz)</p> <p>Size: 10mm x 10mm x 1mm</p> <p>Orientation: X-cut</p> <p>Polish: One side polished.</p> <p>Surface roughness: < 5 Å (by AFM)</p> <p>Packing: in 1000 class clean room by wafer carrier</p>
9.	Quartz single crystal, X-cut, 10x10x1mm, 2SP	<p>Single crystal SiO₂ (quartz)</p> <p>Size: 10mm x 10mm x 1mm</p> <p>Orientation: X-cut</p> <p>Polish: two sides polished.</p> <p>Surface roughness: < 5 Å (by AFM)</p> <p>Packing: in 1000 class clean room by wafer carrier</p>
10.	Quartz X-cut, 2" dia x 0.3mm, 2 sp	Single crystal SiO ₂ (quartz)

		Size: 2" diameter x 0.3mm Orientation: X-cut Polish: two sides polished. Surface roughness: < 5 Å (by AFM) Packing: in 1000 class clean room by wafer carrier
11.	Quartz X-cut, 2" dia x 0.5mm, 1 sp	Single crystal SiO ₂ (quartz) Size: 2" diameter x 0.5mm Orientation: X-cut Polish: one sides polished. Surface roughness: < 5 Å (by AFM) Packing: in 1000 class clean room by wafer carrier
12.	Quartz X-cut, 2" dia x 0.5mm, 2 sp	Single crystal SiO ₂ (quartz) Size: 2" diameter x 0.5mm Orientation: X-cut Polish: two sides polished. Surface roughness: < 5 Å (by AFM) Packing: in 1000 class clean room by wafer carrier
13.	Quartz X-cut, 2" dia x 1.0 mm, 2 sp	Single crystal SiO ₂ (quartz) Size: 2" diameter x 1.0 mm Orientation: X-cut Polish: two sides polished. Surface roughness: < 5 Å (by AFM) Packing: in 1000 class clean room by wafer carrier
14.	Quartz X-cut, 3" dia x 0.5mm, 2sp	Single crystal SiO ₂ (quartz) Size: 3" diameter x 0.5mm Orientation: X-cut Polish: two sides polished. Surface roughness: < 5 Å (by AFM) Packing: in 1000 class clean room by wafer carrier
15.	Quartz X-cut, 3" dia x 1.0mm, 2sp	Single crystal SiO ₂ (quartz) Size: 3" diameter x 1.0mm Orientation: X-cut Polish: two sides polished. Surface roughness: < 5 Å (by AFM) Packing: in 1000 class clean room by wafer carrier
16.	Quartz Single crystal wafer: X-cut, 4" dia x 0.5mm, 2 sp	Single crystal SiO ₂ (quartz) Size: 4" diameter x 0.5mm thickness Orientation: X-cut +/- 0.5° Polishing: two sides epi polished by CMP Surface roughness: < 5 Å (by AFM) Packing: in 1000 class clean room by wafer carrier

D.Y Cut single crystal quartz

No.	Item	Description
1.	Quartz , Saw Grade , Y-cut, 5x5x1.0 mm, 1 sp	SiO ₂ (quartz), Saw Grade Size: 5mmx5mmx1.0mm Orientation: Y-cut Polish: one side polished. Surface roughness: < 5 Å (by AFM) Packing: in 1000 class clean room by wafer carrier
2.	Quartz single crystal, Y-cut, 0.5"x0.5"x0.5mm, 2 sp	Single crystal SiO ₂ (quartz) Size: 0.5" x 0.5" x 0.5mm Orientation: Y-cut Polish: two sides polished. Surface roughness: < 5 Å (by AFM) Packing: in 1000 class clean room by wafer carrier
3.	Quartz single crystal, Y-cut, 10x10x0.1mm, 2 sp	Single crystal SiO ₂ (quartz) Size: 10mm x 10mm x 0.1mm Orientation: Y-cut Polish: two sides polished. Surface roughness: < 5 Å (by AFM) Packing: in 1000 class clean room by wafer carrier
4.	Quartz single crystal, Y-cut, 10x10x0.5mm, 1 sp	Single crystal SiO ₂ (quartz) Size: 10mm x 10mm x 0.5mm Orientation: Y-cut Polish: one sides polished. Surface roughness: < 5 Å (by AFM) Packing: in 1000 class clean room by wafer carrier
5.	Quartz single crystal, Y-cut, 10x10x0.5mm, 2 sp	Single crystal SiO ₂ (quartz) Size: 10mm x 10mm x 0.5mm Orientation: Y-cut Polish: two sides polished. Surface roughness: < 5 Å (by AFM) Packing: in 1000 class clean room by wafer carrier
6.	Quartz single crystal, Y-cut, 10x10x1.0mm, 2 sp	Single crystal SiO ₂ (quartz) Size: 10mm x 10mm x 1.0mm Orientation: Y-cut Polish: two sides polished. Surface roughness: < 5 Å (by AFM) Packing: in 1000 class clean room by wafer carrier
7.	Quartz single crystal, Y-cut, saw grade 10x10x1.0mm, 1 sp	Single crystal SiO ₂ (quartz) saw grade Size: 10mm x 10mm x 1.0mm Orientation: Y-cut

		Polish: one sides polished. Surface roughness: < 5 A (by AFM) Packing: in 1000 class clean room by wafer carrier
8.	Quartz Y-cut, 2" dia x 0.3mm, 2 sp	Single crystal SiO ₂ (quartz) Size: 2" diameter x 0.3mm Orientation: Y-cut Polish: two sides polished. Surface roughness: < 5 A (by AFM) Packing: in 1000 class clean room by wafer carrier
9.	Quartz Y-cut, 2" dia x 0.5mm, 1 sp	Single crystal SiO ₂ (quartz) Size: 2" diameter x 0.5mm Orientation: Y-cut Polish: one sides polished. Surface roughness: < 5 A (by AFM) Packing: in 1000 class clean room by wafer carrier
10.	Quartz Y-cut, 2" dia x 0.5mm, 2 sp	Single crystal SiO ₂ (quartz) Size: 2" diameter x 0.5mm Orientation: Y-cut Polish: two sides polished. Surface roughness: < 5 A (by AFM) Packing: in 1000 class clean room by wafer carrier
11.	Quartz Y-cut, 3" dia x 0.5mm, 2 sp	Single crystal SiO ₂ (quartz) Size: 3" diameter x 0.5mm Orientation: Y-cut Polish: two sides polished. Surface roughness: < 5 A (by AFM) Packing: in 1000 class clean room by wafer carrier
12.	Quartz Single Crystal wafer, Y-cut with 33.3 degree off , 3" dia x 0.3-0.5mm, 1 sp	Single crystal SiO ₂ (quartz) Size: 3" diameter x 0.3-0.5mm thickness Orientation: Y-cut ,33.3 degree off Polishing: one side polished Surface roughness: < 5 A (by AFM) Packing: in 1000 class clean room by wafer carrier
13.	Quartz Single Crystal wafer, Y-cut with 33.3 degree off , 3" dia x 0.5mm, 1 sp	Single crystal SiO ₂ (quartz) Size: 3" diameter x 0.5mm thickness Orientation: Y-cut ,33.3 degree off Polishing: one side polished Surface roughness: < 5 A (by AFM) Packing: in 1000 class clean room by wafer carrier
14.	Quartz Single Crystal wafer, Y-cut, 4" dia x 0.5mm, 2 sp	Single crystal SiO ₂ (quartz) Size: 4" diameter x 0.5mm thickness Orientation: Y-cut +/- 0.5°

		Polishing: two sides epi polished by CMP Surface roughness: < 5 A (by AFM) Packing: in 1000 class clean room by wafer carrier
15.	Quartz Single Crystal wafer, Y-cut with 33.3 degree off , 4" dia x 0.5mm, 1 sp	Single crystal SiO ₂ (quartz) Size: 4" diameter x 0.5mm thickness Orientation: Y-cut ,33.3 degree off Polishing: one side polished Surface roughness: < 5 A (by AFM) Packing: in 1000 class clean room by wafer carrier

E. Z Cut single crystal quartz

No.	Item	Description
1.	Quartz Z-cut, 5x5x0.5mm 2sp	SiO ₂ (quartz) Size: 5x5x0.5mm Orientation: Z-cut Polish: two sides polished.
2.	Quartz Saw grade, Z-cut, 5x5x1.0mm	SiO ₂ (quartz) saw grade Size: 5x5x1.0mm Orientation: Z-cut Polish: One side polished.
3.	Quartz single crystal, Z-cut, 10x10x0.1mm, 2 sp	Single crystal SiO ₂ (quartz) Size: 10mm x 10mm x 0.1mm Orientation: Z-cut Polish: two sides polished. Surface roughness: < 5 A (by AFM) Packing: in 1000 class clean room by wafer carrier
4.	Quartz single crystal, Z-cut, 10x10x0.5mm, 1 sp	Single crystal SiO ₂ (quartz) Size: 10mm x 10mm x 0.5mm Orientation: Z-cut Polish: one sides polished.
5.	Quartz single crystal, Z-cut, 10x10x0.5mm, 2sp	Single crystal SiO ₂ (quartz) Size: 10mm x 10mm x 0.5mm Orientation: Z-cut Polish: two sides polished.
6.	Quartz single crystal, Z-cut, 10x10x1.0mm, 1 sp	Single crystal SiO ₂ (quartz) Size: 10mm x 10mm x 1.0mm Orientation: Z-cut Polish: One side polished.

7.	Quartz single crystal, Z-cut, 10x10x1.0mm, 2 sp	Single crystal SiO ₂ (quartz) Size: 10mm x 10mm x 1.0mm Orientation: Z-cut Polish: two sides polished.
8.	Quartz single crystal, Z-cut, 20x20x0.5 mm, 2 sp	Single crystal SiO ₂ (quartz) Size: 20mm x 20mm x 0.5mm Orientation: Z-cut Polish: two sides polished.
9.	Quartz single crystal, Z-cut, 25x25x0.5 mm, 2 sp	Single crystal SiO ₂ (quartz) Size: 25mm x 25mm x 0.5mm Orientation: Z-cut Polish: two sides polished.
10.	Quartz Z-cut, 2" dia x 0.5mm, 1 sp	Single crystal SiO ₂ (quartz) Size: 2" diameter x 0.5mm Orientation: Z-cut Polish: one sides polished.
11.	Quartz Z-cut, 2" dia x 0.5mm, 2 sp	Single crystal SiO ₂ (quartz) Size: 2" diameter x 0.5mm Orientation: Z-cut Polish: two sides polished.
12.	Quartz Z-cut, 2.25" dia x 0.5mm, 2 sp	Single crystal SiO ₂ (quartz) Size: 2.25" diameter x 0.5mm Orientation: Z-cut Polish: two sides polished.
13.	Quartz Z-cut, 3" dia x 0.5mm, 1 sp	Single crystal SiO ₂ (quartz) Size: 3" diameter x 0.5mm Orientation: Z-cut Polish: one sides polished.
14.	Quartz Z-cut, 3" dia x 0.5mm, 2 sp	Single crystal SiO ₂ (quartz) Size: 3" diameter x 0.5mm Orientation: Z-cut Polish: two sides polished.
15.	Quartz Single Crystal Wafer, Z-cut, 4" dia x 0.5mm, 1 sp	Single crystal SiO ₂ (quartz) Size: 4" diameter x 0.5mm thickness Orientation: Z-cut +/- 0.5o Polishing: one side epi polished by CMP Surface roughness: < 5 Å (by AFM) Packing: in 1000 class clean room by wafer carrier

16.	Quartz single crystal, Z-cut, 32.5mm dia x 5.0mm, 2 sp	Single crystal SiO ₂ (quartz) Size: 32.5mm diameter x 5.0mm Orientation: Z-cut Polish: two sides polished.
17.	Quartz Z-cut, 10mm dia x 15 mm, 2 sp	Single crystal SiO ₂ (quartz) Size: 10mm diameter x 15mm Orientation: Z-cut Polish: two sides polished.
18.	Quartz single crystal, Z-cut, 4" dia x 0.5mm, 2 sp	Single crystal SiO ₂ (quartz) Size: 4" diameter x 0.5mm thickness Orientation: Z-cut +/- 0.5° Polishing: two sides epi polished by CMP Surface roughness: < 5 Å (by AFM) Packing: in 1000 class clean room by wafer carrier
19.	Quartz single crystal, Z-cut, 10x10x10 mm, 6 sp	Single crystal SiO ₂ (quartz) Size: 10mm x 10mm x 10 mm Orientation: Z-cut Polish: six sides polished.

F. ST-Cut Single Crystal Quartz

No.	Item	Description
1.	Quartz ST-cut, 10 x 10 x 0.35 mm, 1 sp	Single crystal SiO ₂ (quartz) Size: 10 x 10 x 0.35 mm Orientation: ST-cut Polish: one side polished.
2.	Quartz ST-cut, 10 x 10 x 0.5 mm, 1 sp	Single crystal SiO ₂ (quartz) Size: 10 x 10 x 0.5 mm Orientation: ST-cut Polish: one side polished.
3.	Quartz ST-cut, 10 x 10 x 0.5 mm, 2 sp	Single crystal SiO ₂ (quartz) Size: 10 x 10 x 0.5 mm Orientation: ST-cut Polish: two sides polished.
4.	Quartz ST-cut, 10 x 10 x 1.0 mm, 1 sp	Single crystal SiO ₂ (quartz) Size: 10 x 10 x 1.0 mm Orientation: ST-cut Polish: one side polished.

5.	Quartz ST-cut, 10 x 10 x 1.0 mm, 2 sp	Single crystal SiO ₂ (quartz) Size: 10 x 10 x 1.0 mm Orientation: ST-cut Polish: two sides polished.
6.	Quartz ST-cut, 2" dia x 0.5mm, 1 sp	Single crystal SiO ₂ (quartz) Size: 2" diameter x 0.5mm Orientation: ST-cut Polish: one side polished.
7.	Quartz ST-cut, 3" dia x 0.5mm, 1 sp	Single crystal SiO ₂ (quartz) Size: 3" diameter x 0.5mm Orientation: ST-cut Polish: one side polished.
8.	Quartz ST-cut, 4" dia x 0.5mm, 1 sp	Single crystal SiO ₂ (quartz) Size: 4" diameter x 0.5mm Orientation: ST-cut Polish: one side polished.

G. Zero Diffraction Plate for XRD

No.	Item	Description
1.	Zero Diffraction Plate for XRD sample: 24.6 Dia x 1.0 mm with Cavity 10 ID x 0.2 mm, Si Crystal, SiZero24D10C1-cavity	Cavity zero diffraction plate is made of single crystal Silicon cut at special orientation Si P-type B-doped Resistivity: 10-15 ohm.cm Perfect for sample holder of powder XRD, which has no background noise from 2 to 120° (2θ angle Cu Ka X-Ray) Size: 24.6 mm diameter x 1.0 mm Thickness, with a cavity in the center of the plate with 10mm dia. and 0.2mm depth Surface: one side optical polished Fit with XRD of Siemens, Scintag, Rigaku and many more
2.	Zero Diffraction Plate for XRD sample: 30x30 mm with Cavity 20 ID x 1.0 mm, SiO ₂ Crystal - SiZero3030-cavity	Cavity zero diffraction plate is made of single crystal quartz which is cut at special orientation Perfect for sample holder of powder XRD, which has no background noise from 2 to 120° (2θ angle Cu Ka X-Ray) Size: 30 x 30 x 2.5mm Thickness, with a round cavity in the center of the plate with 20 mm dia. and 1.0mm depth Surface: two sides optical polished Fit with XRD of Siemens, Scintag, Rigaku and many more
3.	Zero Diffraction Plate for XRD sample: 20 x 18 x 1.5 mm, 2sp, Si single crystal - SiZero201815S2	Zero diffraction plate is made of single crystal Silicon cut at special orientation Perfect for sample holder of powder XRD, which has no background noise from 2 to 120° (2θ angle Cu Ka X-Ray)

		<p>Size: 20 x 18 x 1.5</p> <p>Surface: two sides optic mmal polished</p> <p>Fit with XRD of Siemens, Scintag, Rugaku and many more</p> <p>Si P-type B-doped</p> <p>resistivity:10-32 ohm.cm</p>
4.	Zero Diffraction Plate for XRD sample: 24.6 mm Dia x 0.5 mm t, Si single crystal - SiZero24D05C1	<p>Zero diffraction plate is made of single crystal Silicon cut at special orientation</p> <p>Perfect for sample holder of powder XRD, which has no background noise from 2 to 120 o (2Q angle Cu Ka X-Ray)</p> <p>Size: 24.6 mm diameter x 0.5 mm Thickness</p> <p>Surface: one side optical polished</p> <p>Fit with XRD of Siemens, Scintag, Rugaku and many more</p> <p>Si P-type B-doped</p> <p>resistivity:10-15 ohm.cm</p>
5.	Zero Diffraction Plate for XRD sample: 24.6 mm Dia x 1.0 mm t, Si single crystal - SiZero24D10C1	<p>Zero diffraction plate is made of single crystal Silicon cut at special orientation</p> <p>Perfect for sample holder of powder XRD, which has no background noise from 2 to 120 o (2Q angle Cu Ka X-Ray)</p> <p>Size: 24.6 mm diameter x 1.0 mm Thickness</p> <p>Surface: one side optical polished</p> <p>Fit with XRD of Siemens, Scintag, Rugaku and many more</p> <p>Si P-type B-doped</p> <p>resistivity:10-15 ohm.cm</p>
6.	Zero Diffraction Plate for XRD Sample: 25 Dia x 2.5 mm, 2sp, SiO2 single crystal - SOZero25	<p>Zero refraction plate is made of single crystal quartz cut at special orientation</p> <p>Perfect for sample holder of powder XRD, which has no background noise from 2 to 120 o (2Q angle Cu Ka X-Ray)</p> <p>Size: 25 mm Dia x 2.5 mm thickness, two sides optical polished</p> <p>Fit with XRD of Siemens, Scintag, Rugaku and many more</p>
7.	Zero Diffraction Plate for XRD sample: 25x25x2.0 mm, 1sp, Si single crystal - SiZero252520S1	<p>Zero diffraction plate is made of single crystal Silicon cut at special orientation</p> <p>Perfect for sample holder of powder XRD, which has no background noise from 2 to 120 o (2Q angle Cu Ka X-Ray)</p> <p>Size: 25x25x2.0</p> <p>Surface: One side optic mmal polished</p> <p>Fit with XRD of Siemens, Scintag, Rugaku and many more</p> <p>Si P-type B-doped</p> <p>resistivity:25-35 ohm.cm</p>
8.	Zero Diffraction Plate for XRD sample: 30 x 30 x 2.5 mm , SiO2 single crystal - SoZero303025S1	<p>Zero diffraction plate is made of single crystal quartz cut at special orientation</p> <p>Perfect for sample holder of powder XRD, which has no background noise from 2 to 120 o (2Q angle Cu Ka X-Ray)</p> <p>Size: 30 x 30 x x 2.5 mm thickness</p> <p>Surface: Single side optical polished</p> <p>Fit with XRD of Siemens, Scintag, Rugaku and many more</p>

9.	Zero Diffraction Plate for XRD sample: 30 x 30 x 2.5 mm , SiO ₂ single crystal - SoZero303025S2	Zero diffraction plate is made of single crystal quartz cut at special orientation Perfect for sample holder of powder XRD, which has no background noise from 2 to 120 o (2Q angle Cu Ka X-Ray) Size: 30 x 30 x x 2.5 mm thickness Surface: two sides optical polished Fit with XRD of Siemens, Scintag, Rugaku and many more
10.	Zero Diffraction Plate for XRD sample: 46x25x2.5 mm ,2sp , SiO ₂ single crystal	Zero diffraction plate is made of single crystal quartz cut at special orientation Perfect for sample holder of powder XRD, which has no background noise from 2 to 120 o (2Q angle Cu Ka X-Ray) Size: 46x25x 2.5 mm thickness Surface: two sides optical polished Fit with XRD of Siemens, Scintag, Rugaku and many more
11.	Zero Diffraction Plate for XRD sample: 16.1 mm Dia x 1.5mm t, Si single crystal - SiZero16D15C1	Zero diffraction plate is made of single crystal Silicon cut at special orientation Perfect for sample holder of powder XRD, which has no background noise from 2 to 120 o (2Q angle Cu Ka X-Ray) Size: 16.1 mm diameter x 1.5 mm Thickness Surface: one side optical polished Fit with XRD of Siemens, Scintag, Rugaku and many more Si P-type B-doped resistivity:10-15 ohm.cm

62. SOI Wafer (Silicon On Insulator)

No.	Item	Description
1.	SOI Epitaxial Wafer: 4" , 20um (P/Boron) + 2 um SiO ₂ + 500um Si (undoped)	Device Layer
		Diameter: 100 +/- .1mm
		Type/Dopant: P/Boron
		Orientation: <1-0-0>+/- .5 degree
		Thickness: 20 +/- .5 um
		Resistivity: <0.01 ohm-cm
		Flatness: <2um
		Flats: Semi Std.
		Finish: Polished
		Buried Thermal Oxide:
		Thickness: 2um +/- 5%
		Handle Wafers:
		Type/Dopant undoped
		Orientation <1-0-0>+/- .5 degree

		Resistivity:	>2,000 ohm-cm / FZ
		Thickness:	500 +/- 10 um
		Finish:	Polished
2.	SOI Epitxial Wafer: 1"x1", 2 .5µm (P- doped) +1.0 SiO2 +625um Si (P-type /Boron doped)	Device Layer	
		Size:	1" x 1"
		Type/Dopant:	P-doped
		Orientation:	<1-0-0>+/- .5 degree
		Thickness:	2.5±0.5µm
		Resistivity:	1-4 ohm-cm
		Flatness:	
		Flats:	Semi
		Finish:	Polished
		Buried Thermal Oxide:	
		Thickness:	2um +/- 5%
		Handle Wafers:	
		Type/Dopant	undoped
		Orientation	<1-0-0>+/- .5 degree
		Resistivity:	>2,000 ohm-cm / FZ
3.	SOI Epitxial Wafer: 6", 2.5 µm (P- doped) + 1.0 SiO2 + 625um Si (P-type /Boron doped)	Device Layer	
		Diameter:	100 +/- .1mm
		Type/Dopant:	P-doped
		Orientation:	<1-0-0>+/- .5 degree
		Thickness:	2.5±0.5µm
		Resistivity:	1-4 ohm-cm
		Flatness:	
		Flats:	Semi
		Finish:	Polished
		Buried Thermal Oxide:	
		Thickness:	2um +/- 5%
		Handle Wafers:	
		Type/Dopant	undoped
		Orientation	<1-0-0>+/- .5 degree
		Resistivity:	>2,000 ohm-cm / FZ

		Thickness:	500 +/- 10 um
		Finish:	Polished

63. SOS(Silicon on Sapphire)

No.	Item	Description
1.	Silicon-on-Sapphire (11-02, R Plate), 100mm Dia x0.6um thick,1sp	<p><u>Silicon EPI Layer:</u> Silicon Orientation: (100) Type, Dopant: Intrinsic type, undoped Silicon Thickness: 0.6um +/- 0.06 um Resistivity: >100 ohm.cm Silicon epi film on C plate sapphire is available upon request</p> <p><u>Sapphire Wafer:</u> R plane -- (1-102) with single flat Wafer size: 100mm dia x 0.53 mm thickness Orientation Flat Length: 32.5mm +/-2.5mm , Flatness: 10um, Parallelism:20um Polished surface: Wafer surface is EPI polished via a special CMP procedure. One side polished Projected C-Axis: 45 degree +/- 2 degree Backside Surface: fine ground and etched; Roughness: Ground-64u" Ra</p>
2.	Silicon-on-Sapphire (11-02, R Plate), 10mmx10mm x0.6um thick,1sp	<p><u>Silicon EPI Layer:</u> Silicon Orientation: (100) Type, Dopant: Intrinsic type, undoped Silicon Thickness: 0.6um +/- 0.06 um Resistivity: >100 ohm.cm Silicon epi film on C plate sapphire is available upon request</p> <p><u>Sapphire Wafer:</u> R plane -- (1-102) with single flat Wafer size: 10mmx10mm x 0.6 mm thickness Polished surface: Wafer surface is EPI polished via a special CMP procedure. One side polished</p>

64. SrLaAlO4

No.	Item	Description
1.	Single crystal SrLaAlO ₄ , (100), 10x10x0.5mm 2sp	<p><u>Specifications:</u> Size: 10mm x 10mm x 0.5mm Orientation: (100) + / - 0.5 ° Polish: two sides EPI polished with surface roughness < 5 Å Package: One 1000 class clean room with 100 class plastic bag Features</p> <p>Good lattice match with perovskite structure superconductors Stable structure with much less defects than SrTiO₃</p>

		<p>Low dielectric constant suitable for microwave or high frequency application</p> <p><u>Typical Properties:</u> Purity 99.99% Color Light Brown Crystal Structure: Tetragonal Lattice Constant: $a = b = 3.756 \text{ \AA}$ $c = 12.636 \text{ \AA}$ Density: 5.92 g / cc Melting Point 1650 °C Thermal Expansion Coeff. 12 ppm / °C Dielectric Constant 16.81 at a axis 20.02 at c axis Loss Tangent (1 MHz, 300K) 6×10^{-4} at a axis 8×10^{-4} at c axis Maximum as grown. crystal size 30 mm dia x 35 mm length Standard Orientation (100), (001) Edge alignment Available on request</p>
2.	SrLaAlO ₄ (100) 10x10x0.5mm, 1sp	<p><u>Specifications:</u> Size: 10mm x 10mm x 0.5mm Orientation: (100) + / - 0.5 ° Polish: one side EPI polished with surface roughness < 5 Å Package: One 1000 class clean room with 100 class plastic bag Features</p> <p>Good lattice match with perovskite structure superconductors Stable structure with much less defects than SrTiO₃ Low dielectric constant suitable for microwave or high frequency application</p> <p><u>Typical Properties:</u> Purity 99.99% Color Light Brown Crystal Structure: Tetragonal Lattice Constant: $a = b = 3.756 \text{ \AA}$ $c = 12.636 \text{ \AA}$ Density: 5.92 g / cc Melting Point 1650 °C Thermal Expansion Coeff. 12 ppm / °C Dielectric Constant 16.81 at a axis 20.02 at c axis Loss Tangent (1 MHz, 300K) 6×10^{-4} at a axis 8×10^{-4} at c axis Maximum as grown. crystal size 30 mm dia x 35 mm length Standard Orientation (100), (001) Edge alignment Available on request</p>
3.	Single crystal SrLaGaO ₄ , (001), 10x10x0.5mm 2sp	<p><u>Specifications:</u> Size: 10mm x 10mm x 0.5mm Orientation: (001) + / - 0.5 ° Polish: Two sides EPI polished with surface roughness < 5 Å Package: One 1000 class clean room with 100 class plastic bag</p> <p><u>Features:</u> Good lattice match with perovskite structure superconductors Stable structure with much less defects than SrTiO₃ Low dielectric constant suitable for microwave or high frequency application</p>

4.	Single crystal SrLaGaO ₄ , (100), 10x10x0.5mm 2sp	<p><u>Specifications:</u> Size: 10mm x 10mm x 0.5mm Orientation: (100) + / - 0.5 ° Polish: Two sides EPI polished with surface roughness < 5 Å Package: One 1000 class clean room with 100 class plastic bag</p> <p><u>Features:</u> Good lattice match with perovskite structure superconductors Stable structure with much less defects than SrTiO₃ Low dielectric constant suitable for microwave or high frequency application</p>
5.	Single crystal SrLaGaO ₄ , (100), 10x5x0.5mm , one side polished	<p><u>Specifications:</u> Size: 10mm x 5mm x 0.5mm Orientation: (100) + / - 0.5 ° Polish: One side EPI polished with surface roughness < 5 Å Package: One 1000 class clean room with 100 class plastic bag</p> <p><u>Features:</u> Good lattice match with perovskite structure superconductors Stable structure with much less defects than SrTiO₃ Low dielectric constant suitable for microwave or high frequency application</p>
6.	Single crystal SrLaGaO ₄ , (100), 10x5x0.5mm , Two sides polished	<p><u>Specifications:</u> Size: 10mm x 5mm x 0.5mm Orientation: (100) + / - 0.5 ° Polish: One side EPI polished with surface roughness < 5 Å Package: One 1000 class clean room with 100 class plastic bag</p> <p><u>Features:</u> Good lattice match with perovskite structure superconductors Stable structure with much less defects than SrTiO₃ Low dielectric constant suitable for microwave or high frequency application</p>
7.	Single crystal SrLaGaO ₄ , (100), 5x5x0.5mm , one side polished	<p><u>Specifications:</u> Size: 10mm x 10mm x 0.5mm Orientation: (100) + / - 0.5 ° Polish: One side EPI polished with surface roughness < 5 Å Package: One 1000 class clean room with 100 class plastic bag</p> <p><u>Features:</u> Good lattice match with perovskite structure superconductors Stable structure with much less defects than SrTiO₃ Low dielectric constant suitable for microwave or high frequency application</p>

65. SrTiO₃

A. (100) SrTiO₃ Substrates

i. Square: 10x10mm

No.	Item	Description
1.	SrTiO ₃ (100) 10x10x0.5mm, 1sp, (Crystal made of Japan) - STOa101005S1-JP	<p>SrTiO₃ single crystal provides a good lattice match to most materials with Perovskite structure. It is an excellent substrate for epitaxial growth of HTS and many oxide thin films. SrTiO₃ single crystal has also been used widely for special optical windows and as high quality sputtering target. MTI has the full production line to manufacture first the high purity SrTiO₃ powder, then the single crystal boules and finally the epi-polished substrates in many sizes. This allows us to provide SrTiO₃ single crystal products with the highest quality and the lowest price to our customers all over the world.</p> <p><u>Specifications:</u> SrTiO₃: Materials from Japan Size: 10x10x 0.5mm +/-0.05mm Orientation: (100) +/-0.5 Deg Edge orientation Indication: <001> +/-2 Deg available as option with extra cost Polish: One side EPI polished by CMP technology with less sub-surface lattice damage. Pack: Packed in 100 grade plastic bag under 1000 class clean room.</p>
2.	SrTiO ₃ (100) 10x10x0.5 mm Epi polished wafer 1 SP,	<p>SrTiO₃ single crystal provides a good lattice match to most materials with Perovskite structure. It is an excellent substrate for epitaxial growth of HTS and many oxide thin films. SrTiO₃ single crystal has also been used widely for special optical windows and as high quality sputtering target. MTI has the full production line to manufacture first the high purity SrTiO₃ powder, then the single crystal boules and finally the epi-polished substrates in many sizes. This allows us to provide SrTiO₃ single crystal products with the highest quality and the lowest price to our customers all over the world.</p> <p><u>Specifications:</u> Size: 10x10x 0.5mm +/-0.05mm (1.0mm thickness available as option) Orientation: (100) +/-0.5 Deg Edge orientation Indication: <001> +/-2 Deg available as option. Polish: One side EPI polished by CMP technology with less sub-surface lattice damage. Pack: Packed in 100 grade plastic bag under 1000 class clean room.</p>
3.	SrTiO ₃ (100) 10x10x0.5 mm Epi polished wafer 2SP,	<p>SrTiO₃ single crystal provides a good lattice match to most materials with Perovskite structure. It is an excellent substrate for epitaxial growth of HTS and many oxide thin films. SrTiO₃ single crystal has also been used widely for special optical windows and as high quality sputtering target. MTI has the full production line to manufacture first the high purity SrTiO₃ powder, then the single crystal boules and finally the epi-polished substrates in</p>

		<p>many sizes. This allows us to provide SrTiO₃ single crystal products with the highest quality and the lowest price to our customers all over the world.</p> <p><u>Specifications:</u> Size: 10x10x 0.5mm +/-0.05mm (1.0mm thickness available as option) Orientation: (100) +/-0.5 Deg Edge orientation Indication: <001> +/-2 Deg available as option. Polish: EPI polished by CMP technology with less sub-surface lattice damage. Pack: Packed in 100 grade plastic bag under 1000 class clean room.</p>
4.	SrTiO ₃ (100) 10x10x1.0 mm Epi polished wafer 1 SP	<p>SrTiO₃ single crystal provides a good lattice match to most materials with Perovskite structure. It is an excellent substrate for epitaxial growth of HTS and many oxide thin films. SrTiO₃ single crystal has also been used widely for special optical windows and as high quality sputtering target. MTI has the full production line to manufacture first the high purity SrTiO₃ powder, then the single crystal boules and finally the epi-polished substrates in many sizes. This allows us to provide SrTiO₃ single crystal products with the highest quality and the lowest price to our customers all over the world.</p> <p><u>Specifications:</u> Size: 10x10x 1.0mm +/-0.05mm Orientation: (100) +/-0.5 Deg Edge orientation Indication: <001> +/-2 Deg available as option. Polish: EPI polished by CMP technology with less sub-surface lattice damage. Pack: Packed in 100 grade plastic bag under 1000 class clean room</p>
5.	SrTiO ₃ (100) 10x10x1.0 mm Epi polished wafer 2 SP	<p>SrTiO₃ single crystal provides a good lattice match to most materials with Perovskite structure. It is an excellent substrate for epitaxial growth of HTS and many oxide thin films. SrTiO₃ single crystal has also been used widely for special optical windows and as high quality sputtering target. MTI has the full production line to manufacture first the high purity SrTiO₃ powder, then the single crystal boules and finally the epi-polished substrates in many sizes. This allows us to provide SrTiO₃ single crystal products with the highest quality and the lowest price to our customers all over the world.</p> <p><u>Specifications:</u> Size: 10x10x 0.5mm +/-0.05mm (1.0mm thickness available as option) Orientation: (100) +/-0.5 Deg Edge orientation Indication: <001> +/-2 Deg available as option. Polish: EPI polished by CMP technology with less sub-surface lattice damage. Pack: Packed in 100 grade plastic bag under 1000 class clean room.</p>
6.	SrTiO ₃ (100) 10x10x0.1mm, 1SP	<p>SrTiO₃ single crystal provides a good lattice match to most materials with Perovskite structure. It is an excellent substrate for epitaxial growth of HTS and many oxide thin films. SrTiO₃ single crystal has also been used widely for special optical windows and as high quality sputtering target. MTI has the full production line to manufacture first the high purity SrTiO₃ powder,</p>

		<p>then the single crystal boules and finally the epi-polished substrates in many sizes. This allows us to provide SrTiO₃ single crystal products with the highest quality and the lowest price to our customers all over the world.</p> <p><u>Specifications:</u> Size: 10x10x 0.1mm +/-0.05mm Orientation: (100) +/-0.5 Deg Edge orientation Indication: <001> +/-2 Deg available as option with extra cost Polish: One side EPI polished by CMP technology with less sub-surface lattice damage. Pack: Packed in 100 grade plastic bag under 1000 class clean room.</p>
7.	SrTiO ₃ (100) 10x10x0.1mm, 2SP	<p>SrTiO₃ single crystal provides a good lattice match to most materials with Perovskite structure. It is an excellent substrate for epitaxial growth of HTS and many oxide thin films. SrTiO₃ single crystal has also been used widely for special optical windows and as high quality sputtering target. MTI has the full production line to manufacture first the high purity SrTiO₃ powder, then the single crystal boules and finally the epi-polished substrates in many sizes. This allows us to provide SrTiO₃ single crystal products with the highest quality and the lowest price to our customers all over the world.</p> <p><u>Specifications:</u> Size: 10x10x 0.1mm +/-0.05mm Orientation: (100) +/-0.5 Deg Edge orientation Indication: <001> +/-2 Deg available as option with extra cost Polish: Two sides EPI polished by CMP technology with less sub-surface lattice damage. Pack: Packed in 100 grade plastic bag under 1000 class clean room.</p>
8.	SrTiO ₃ Substrate with Step Surface & Ti terminated (100) 10x10x0.5mm, 1 SP	<p>Step STO substrate is a atomically smooth SrTiO₃ (100) with steps one unit cell in height was obtained by treating the crystal surface with a pH-controlled NH₄F-HF solution. The homoepitaxy of SrTiO₃ film on the crystal surface proceeds in a perfect layer-by-layer mode as verified by reflection high-energy electron diffraction and atomic force microscopy. Ion scattering spectroscopy revealed that the TiO₂ atomic plane terminated the as-treated clean surface and that the terminating atomic layer could be tuned to the SrO atomic plane by homoepitaxial growth. This technology provides a well-defined substrate surface for atomically regulated epitaxial growth of such perovskite oxide films .</p> <p><u>Specifications:</u> Size: 10x10x 0.5mm +/-0.05mm Orientation: 0.1° miscut from (100) (+/- 0.1° from Y and X direction) Polish: One sides EPI polished by CMP technology with less sub-surface lattice damage. Surface Termination: TiO₂ layer (via special etching)</p>

ii. Rectangular: 10x5 mm and 10x3mm

No.	Item	Description
1.	SrTiO ₃ (100) 5x3x0.5mm, 1sp, (Materials from Japan)	<p>SrTiO₃ single crystal provides a good lattice match to most materials with Perovskite structure. It is an excellent substrate for epitaxial growth of HTS and many oxide thin films. SrTiO₃ single crystal has also been used widely for special optical windows and as high quality sputtering target. MTI has the full production line to manufacture first the high purity SrTiO₃ powder, then the single crystal boules and finally the epi-polished substrates in many sizes. This allows us to provide SrTiO₃ single crystal products with the highest quality and the lowest price to our customers all over the world.</p> <p><u>Specifications:</u> SrTiO₃: (Materials from Japan) Size: 5 x 3 x 0.5mm +/-0.05mm Orientation: (100) +/-0.5 Deg Edge orietation Indication: <001> +/-2 Deg avaiable as option with extra cost Polish: One side EPI polished by CMP tecnology with less sub-surface lattice damage. Pack: Packed in 100 grade plastic bag under 1000 class clean room.</p>
2.	SrTiO ₃ (100) 10x5x0.5mm, 1sp	<p>SrTiO₃ single crystal provides a good lattice match to most materials with Perovskite structure. It is an excellent substrate for epitaxial growth of HTS and many oxide thin films. SrTiO₃ single crystal has also been used widely for special optical windows and as high quality sputtering target. MTI has the full production line to manufacture first the high purity SrTiO₃ powder, then the single crystal boules and finally the epi-polished substrates in many sizes. This allows us to provide SrTiO₃ single crystal products with the highest quality and the lowest price to our customers all over the world.</p> <p><u>Specifications:</u> Size: 10x5x 0.5mm +/-0.05mm test grade Orientation: (100) +/-0.5 Deg Edge orietation Indication: <001> +/-2 Deg avaiable as option with extra cost Polish: One side EPI polished by CMP tecnology with less sub-surface lattice damage. Pack: Packed in 100 grade plastic bag under 1000 class clean room.</p>
3.	SrTiO ₃ (100) 10x5x0.5mm, 2sp,	<p>49SrTiO₃ single crystal provides a good lattice match to most materials with Perovskite structure. It is an excellent substrate for epitaxial growth of HTS and many oxide thin films. SrTiO₃ single crystal has also been used widely for special optical windows and as high quality sputtering target. MTI has the full production line to manufacture first the high purity SrTiO₃ powder, then the single crystal boules and finally the epi-polished substrates in many sizes. This allows us to provide SrTiO₃ single crystal products with the highest quality and the lowest price to our customers all over the world.</p>

		<p><u>Specifications:</u> Size: 10x5x 0.5mm +/-0.05mm Orientation: (100) +/-0.5 Deg Edge orientation Indication: <001> +/-2 Deg available as option with extra cost Polish: Double sides EPI polished by CMP technology with less sub-surface lattice damage. Pack: Packed in 100 grade plastic bag under 1000 class clean room.</p>
4.	SrTiO ₃ (100) 10x5x1.0 mm Epi polished wafer 1 SP,	<p>SrTiO₃ single crystal provides a good lattice match to most materials with Perovskite structure. It is an excellent substrate for epitaxial growth of HTS and many oxide thin films. SrTiO₃ single crystal has also been used widely for special optical windows and as high quality sputtering target. MTI has the full production line to manufacture first the high purity SrTiO₃ powder, then the single crystal boules and finally the epi-polished substrates in many sizes. This allows us to provide SrTiO₃ single crystal products with the highest quality and the lowest price to our customers all over the world.</p> <p><u>Specifications:</u> Size: 10x10x 0.5mm +/-0.05mm (1.0mm thickness available as option) Orientation: (100) +/-0.5 Deg Edge orientation Indication: <001> +/-2 Deg available as option. Polish: EPI polished by CMP technology with less sub-surface lattice damage. Pack: Packed in 100 grade plastic bag under 1000 class clean room.</p>

iii. Small Square: 6.35x6.35mm, 5x5 mm and 3x3 mm

No.	Item	Description
1.	SrTiO ₃ (100) 6.35x6.35x0.5 mm , 1 SP,	<p>SrTiO₃ single crystal provides a good lattice match to most materials with Perovskite structure. It is an excellent substrate for epitaxial growth of HTS and many oxide thin films. SrTiO₃ single crystal has also been used widely for special optical windows and as high quality sputtering target. MTI has the full production line to manufacture first the high purity SrTiO₃ powder, then the single crystal boules and finally the epi-polished substrates in many sizes. This allows us to provide SrTiO₃ single crystal products with the highest quality and the lowest price to our customers all over the world.</p> <p><u>Specifications:</u> Size: 6.35x6.35 x 0.5mm +/-0.05mm Orientation: (100) +/-0.5 Deg Edge orientation Indication: <001> +/-2 Deg available as option with extra cost Polish: EPI polished by CMP technology with less sub-surface lattice damage. Pack: Packed in 100 grade plastic bag under 1000 class clean room.</p>
2.	SrTiO ₃ (100) 6.35x6.35x0.5 mm , 2SP	<p>SrTiO₃ single crystal provides a good lattice match to most materials with Perovskite structure. It is an excellent substrate for epitaxial growth of HTS</p>

		<p>and many oxide thin films. SrTiO₃ single crystal has also been used widely for special optical windows and as high quality sputtering target. MTI has the full production line to manufacture first the high purity SrTiO₃ powder, then the single crystal boules and finally the epi-polished substrates in many sizes. This allows us to provide SrTiO₃ single crystal products with the highest quality and the lowest price to our customers all over the world.</p> <p><u>Specifications:</u> Size: 6.35x6.35x 0.5mm +/-0.05mm Orientation: (100) +/-0.5 Deg Edge orietation Indication: <001> +/-2 Deg avaiable as option with extra cost Polish: EPI polished by CMP tecnology with less sub-surface lattice damage. Pack: Packed in 100 grade plastic bag under 1000 class clean room.</p>
3.	SrTiO ₃ (100) 5x5x0.2 mm, 1 SP,	<p>SrTiO₃ single crystal provides a good lattice match to most materials with Perovskite structure. It is an excellent substrate for epitaxial growth of HTS and many oxide thin films. SrTiO₃ single crystal has also been used widely for special optical windows and as high quality sputtering target. MTI has the full production line to manufacture first the high purity SrTiO₃ powder, then the single crystal boules and finally the epi-polished substrates in many sizes. This allows us to provide SrTiO₃ single crystal products with the highest quality and the lowest price to our customers all over the world.</p> <p><u>Specifications:</u> Size: 5x5x 0.2mm +/-0.05mm Orientation: (100) +/-0.5 Deg Edge orietation Indication: <001> +/-2 Deg avaiable as option with extra cost Polish: EPI polished by CMP tecnology with less sub-surface lattice damage. Pack: Packed in 100 grade plastic bag under 1000 class clean room.</p>
4.	SrTiO ₃ (100) 5x5x0.25 mm, 2 SP,	<p>SrTiO₃ single crystal provides a good lattice match to most materials with Perovskite structure. It is an excellent substrate for epitaxial growth of HTS and many oxide thin films. SrTiO₃ single crystal has also been used widely for special optical windows and as high quality sputtering target. MTI has the full production line to manufacture first the high purity SrTiO₃ powder, then the single crystal boules and finally the epi-polished substrates in many sizes. This allows us to provide SrTiO₃ single crystal products with the highest quality and the lowest price to our customers all over the world.</p> <p><u>Specifications:</u> Size: 5x5x 0.25mm +/-0.05mm Orientation: (100) +/-0.5 Deg Edge orietation Indication: <001> +/-2 Deg avaiable as option with extra cost Polish: two sides polished EPI polished by CMP tecnology with less sub-surface lattice damage. Pack: Packed in 100 grade plastic bag under 1000 class clean room.</p>

5.	SrTiO ₃ (100) 5x5x0.5 mm , 1 SP,	<p>SrTiO₃ single crystal provides a good lattice match to most materials with Perovskite structure. It is an excellent substrate for epitaxial growth of HTS and many oxide thin films. SrTiO₃ single crystal has also been used widely for special optical windows and as high quality sputtering target. MTI has the full production line to manufacture first the high purity SrTiO₃ powder, then the single crystal boules and finally the epi-polished substrates in many sizes. This allows us to provide SrTiO₃ single crystal products with the highest quality and the lowest price to our customers all over the world.</p> <p><u>Specifications:</u> Size: 5x5x 0.5mm +/-0.05mm Orientation: (100) +/-0.5 Deg Edge orietation Indication: <001> +/-2 Deg avaiable as option with extra cost Polish: EPI polished by CMP tecnology with less sub-surface lattice damage. Pack: Packed in 100 grade plastic bag under 1000 class clean room.</p>
6.	SrTiO ₃ (100) 5x5x0.5 mm, 2 SP,	<p>SrTiO₃ single crystal provides a good lattice match to most materials with Perovskite structure. It is an excellent substrate for epitaxial growth of HTS and many oxide thin films. SrTiO₃ single crystal has also been used widely for special optical windows and as high quality sputtering target. MTI has the full production line to manufacture first the high purity SrTiO₃ powder, then the single crystal boules and finally the epi-polished substrates in many sizes. This allows us to provide SrTiO₃ single crystal products with the highest quality and the lowest price to our customers all over the world.</p> <p><u>Specifications:</u> Size: 5x5x 0.5mm +/-0.05mm Orientation: (100) +/-0.5 Deg Edge orietation Indication: <001> +/-2 Deg avaiable as option with extra cost Polish: EPI polished by CMP tecnology with less sub-surface lattice damage. Pack: Packed in 100 grade plastic bag under 1000 class clean room.</p>
7.	SrTiO ₃ (100) 5x5x1.0 mm, 2 SP,	<p>SrTiO₃ single crystal provides a good lattice match to most materials with Perovskite structure. It is an excellent substrate for epitaxial growth of HTS and many oxide thin films. SrTiO₃ single crystal has also been used widely for special optical windows and as high quality sputtering target. MTI has the full production line to manufacture first the high purity SrTiO₃ powder, then the single crystal boules and finally the epi-polished substrates in many sizes. This allows us to provide SrTiO₃ single crystal products with the highest quality and the lowest price to our customers all over the world.</p> <p><u>Specifications:</u> Size: 5x5x 1.0mm +/-0.05mm Orientation: (100) +/-0.5 Deg Edge orietation Indication: <001> +/-2 Deg avaiable as option with extra cost</p>

		Polish: EPI polished by CMP technology with less sub-surface lattice damage. Pack: Packed in 100 grade plastic bag under 1000 class clean room.
8.	SrTiO ₃ (100) 3x3x0.5mm, 1sp, (Materials from Japan)	<p>SrTiO₃ single crystal provides a good lattice match to most materials with Perovskite structure. It is an excellent substrate for epitaxial growth of HTS and many oxide thin films. SrTiO₃ single crystal has also been used widely for special optical windows and as high quality sputtering target. MTI has the full production line to manufacture first the high purity SrTiO₃ powder, then the single crystal boules and finally the epi-polished substrates in many sizes. This allows us to provide SrTiO₃ single crystal products with the highest quality and the lowest price to our customers all over the world.</p> <p><u>Specifications:</u> Size: 3 x 3 x 0.5mm +/-0.05mm Orientation: (100) +/-0.5 Deg Edge orientation Indication: <001> +/-2 Deg available as option with extra cost Polish: One side EPI polished by CMP technology with less sub-surface lattice damage. Pack: Packed in 100 grade plastic bag under 1000 class clean room.</p>

iv. Inch Size: 0.25" square, 0.5" square and 1" Round

No.	Item	Description
1.	SrTiO ₃ (100) 0.25"x0.25"x0.5 mm Epi polished wafer 1 SP	<p>SrTiO₃ single crystal provides a good lattice match to most materials with Perovskite structure. It is an excellent substrate for epitaxial growth of HTS and many oxide thin films. SrTiO₃ single crystal has also been used widely for special optical windows and as high quality sputtering target. MTI has the full production line to manufacture first the high purity SrTiO₃ powder, then the single crystal boules and finally the epi-polished substrates in many sizes. This allows us to provide SrTiO₃ single crystal products with the highest quality and the lowest price to our customers all over the world.</p> <p><u>Specifications:</u> Size: 0.5"x0.5" x 0.5mm +/-0.05mm Orientation: (100) +/-0.5 Deg Edge orientation Indication: <001> +/-2 Deg available as option with extra cost Polish: EPI polished by CMP technology with less sub-surface lattice damage. Pack: Packed in 100 grade plastic bag under 1000 class clean room.</p>
2.	SrTiO ₃ (100) 0.25"x0.25"x0.5 mm Epi polished wafer 2 SP	<p>SrTiO₃ single crystal provides a good lattice match to most materials with Perovskite structure. It is an excellent substrate for epitaxial growth of HTS and many oxide thin films. SrTiO₃ single crystal has also been used widely for special optical windows and as high quality sputtering target. MTI has the full production line to manufacture first the high purity SrTiO₃ powder, then the single crystal boules and finally the epi-polished substrates in many sizes. This allows us to provide SrTiO₃ single crystal products with</p>

		<p>the highest quality and the lowest price to our customers all over the world.</p> <p><u>Specifications:</u> Size: 0.5"x0.5" x 0.5mm +/-0.05mm Orientation: (100) +/-0.5 Deg Edge orientation Indication: <001> +/-2 Deg available as option with extra cost Polish: EPI polished by CMP technology with less sub-surface lattice damage. Pack: Packed in 100 grade plastic bag under 1000 class clean room.</p>
3.	SrTiO3 (100) 0.5"x0.5"x0.5 mm Epi polished wafer 1 SP	<p>SrTiO3 single crystal provides a good lattice match to most materials with Perovskite structure. It is an excellent substrate for epitaxial growth of HTS and many oxide thin films. SrTiO3 single crystal has also been used widely for special optical windows and as high quality sputtering target. MTI has the full production line to manufacture first the high purity SrTiO3 powder, then the single crystal boules and finally the epi-polished substrates in many sizes. This allows us to provide SrTiO3 single crystal products with the highest quality and the lowest price to our customers all over the world.</p> <p><u>Specifications:</u> Size: 0.5"x0.5" x 0.5mm +/-0.05mm Orientation: (100) +/-0.5 Deg Edge orientation Indication: <001> +/-2 Deg available as option with extra cost Polish: EPI polished by CMP technology with less sub-surface lattice damage. Pack: Packed in 100 grade plastic bag under 1000 class clean room.</p>
4.	SrTiO3 (100) 0.5"x0.5"x0.5 mm Epi polished wafer 2 SP	<p>SrTiO3 single crystal provides a good lattice match to most materials with Perovskite structure. It is an excellent substrate for epitaxial growth of HTS and many oxide thin films. SrTiO3 single crystal has also been used widely for special optical windows and as high quality sputtering target. MTI has the full production line to manufacture first the high purity SrTiO3 powder, then the single crystal boules and finally the epi-polished substrates in many sizes. This allows us to provide SrTiO3 single crystal products with the highest quality and the lowest price to our customers all over the world.</p> <p><u>Specifications:</u> Size: 0.5"x0.5" x 0.5mm +/-0.05mm Orientation: (100) +/-0.5 Deg Edge orientation Indication: <001> +/-2 Deg available as option with extra cost Polish: EPI polished by CMP technology with less sub-surface lattice damage. Pack: Packed in 100 grade plastic bag under 1000 class clean room.</p>
5.	SrTiO3 (100) 0.5"x0.5"x1.0 mm Epi polished wafer 1 SP	<p>SrTiO3 single crystal provides a good lattice match to most materials with Perovskite structure. It is an excellent substrate for epitaxial growth of HTS and many oxide thin films. SrTiO3 single crystal has also been used widely</p>

		<p>for special optical windows and as high quality sputtering target. MTI has the full production line to manufacture first the high purity SrTiO₃ powder, then the single crystal boules and finally the epi-polished substrates in many sizes. This allows us to provide SrTiO₃ single crystal products with the highest quality and the lowest price to our customers all over the world.</p> <p><u>Specifications:</u> Size: 0.5"x0.5" x 1.0mm +/-0.05mm Orientation: (100) +/-0.5 Deg Edge orientation Indication: <001> +/-2 Deg available as option with extra cost Polish: EPI polished by CMP technology with less sub-surface lattice damage. Pack: Packed in 100 grade plastic bag under 1000 class clean room.</p>
6.	SrTiO ₃ (100) 1" dia. x0.5 mm Epi polished wafer 1 SP	<p>SrTiO₃ single crystal provides a good lattice match to most materials with Perovskite structure. It is an excellent substrate for epitaxial growth of HTS and many oxide thin films. SrTiO₃ single crystal has also been used widely for special optical windows and as high quality sputtering target. MTI has the full production line to manufacture first the high purity SrTiO₃ powder, then the single crystal boules and finally the epi-polished substrates in many sizes. This allows us to provide SrTiO₃ single crystal products with the highest quality and the lowest price to our customers all over the world.</p> <p><u>Specifications:</u> Size: 1" dia. x 0.5mm +/-0.05mm Orientation: (100) +/-0.5 Deg Polish: EPI polished by CMP technology with less sub-surface lattice damage. Pack: Packed in 100 grade plastic bag under 1000 class clean room.</p>
7.	SrTiO ₃ (100) 1" dia. x0.5 mm Epi polished wafer 2 SP	<p>SrTiO₃ single crystal provides a good lattice match to most materials with Perovskite structure. It is an excellent substrate for epitaxial growth of HTS and many oxide thin films. SrTiO₃ single crystal has also been used widely for special optical windows and as high quality sputtering target. MTI has the full production line to manufacture first the high purity SrTiO₃ powder, then the single crystal boules and finally the epi-polished substrates in many sizes. This allows us to provide SrTiO₃ single crystal products with the highest quality and the lowest price to our customers all over the world.</p> <p><u>Specifications:</u> Size: 1" dia. x 0.5mm +/-0.05mm Orientation: (100) +/-0.5 Deg Polish: EPI polished by CMP technology with less sub-surface lattice damage. Pack: Packed in 100 grade plastic bag under 1000 class clean room.</p>
8.	SrTiO ₃ (100) 20mm dia. x0.5 mm Epi polished wafer 2 SP	<p>SrTiO₃ single crystal provides a good lattice match to most materials with Perovskite structure. It is an excellent substrate for epitaxial growth of HTS and many oxide thin films. SrTiO₃ single crystal has also been used widely for special optical windows and as high quality sputtering target. MTI has</p>

		<p>the full production line to manufacture first the high purity SrTiO₃ powder, then the single crystal boules and finally the epi-polished substrates in many sizes. This allows us to provide SrTiO₃ single crystal products with the highest quality and the lowest price to our customers all over the world.</p> <p><u>Specifications:</u> Size: 20mm dia. x 0.5mm +/-0.05mm Orientation: (100) +/-0.5 Deg Polish: EPI polished by CMP technology with less sub-surface lattice damage. Pack: Packed in 100 grade plastic bag under 1000 class clean room.</p>
9.	SrTiO ₃ (100) 30mm dia. x0.5 mm 1SP	<p>SrTiO₃ single crystal provides a good lattice match to most materials with Perovskite structure. It is an excellent substrate for epitaxial growth of HTS and many oxide thin films. SrTiO₃ single crystal has also been used widely for special optical windows and as high quality sputtering target. MTI has the full production line to manufacture first the high purity SrTiO₃ powder, then the single crystal boules and finally the epi-polished substrates in many sizes. This allows us to provide SrTiO₃ single crystal products with the highest quality and the lowest price to our customers all over the world.</p> <p><u>Specifications:</u> Size: 30 mm dia. x 0.5mm +/-0.05mm Orientation: (100) +/-0.5 Deg Polish: EPI polished by CMP technology with less sub-surface lattice damage. Pack: Packed in 100 grade plastic bag under 1000 class clean room.</p>
10.	SrTiO ₃ (100) 30mm dia. x0.5 mm Epi polished wafer 2 SP	<p>SrTiO₃ single crystal provides a good lattice match to most materials with Perovskite structure. It is an excellent substrate for epitaxial growth of HTS and many oxide thin films. SrTiO₃ single crystal has also been used widely for special optical windows and as high quality sputtering target. MTI has the full production line to manufacture first the high purity SrTiO₃ powder, then the single crystal boules and finally the epi-polished substrates in many sizes. This allows us to provide SrTiO₃ single crystal products with the highest quality and the lowest price to our customers all over the world.</p> <p><u>Specifications:</u> Size: 30 mm dia. x 0.5mm +/-0.05mm Orientation: (100) +/-0.5 Deg Polish: EPI polished by CMP technology with less sub-surface lattice damage. Pack: Packed in 100 grade plastic bag under 1000 class clean room.</p>

v. SrTiO₃ Substrate with Ti terminated and Step Surface

No.	Item	Description
1.	SrTiO ₃ Substrate with Step Surface & Ti terminated (100) 10x10x0.5mm, 1 SP	<p>Step STO substrate is a atomically smooth SrTiO₃ (100) with steps one unit cell in height was obtained by treating the crystal surface with a pH-controlled NH₄F-HF solution. The homoepitaxy of SrTiO₃ film on the crystal surface proceeds in a perfect layer-by-layer mode as verified by reflection high-energy electron diffraction and atomic force microscopy. Ion scattering spectroscopy revealed that the TiO₂ atomic plane terminated the as-treated clean surface and that the terminating atomic layer could be tuned to the SrO atomic plane by homoepitaxial growth. This technology provides a well-defined substrate surface for atomically regulated epitaxial growth of such perovskite oxide films .</p> <p><u>Specifications:</u> Size: 10x10x 0.5mm +/-0.05mm Orientation: 0.1° miscut from (100) (+/- 0.1° from Y and X direction) Polish: One sides EPI polished by CMP technology with less sub-surface lattice damage. Surface Termination: TiO₂ layer (via special etching)</p>

B. (110) SrTiO₃ Substrates

No.	Item	Description
1.	SrTiO ₃ (110) 5x5x0.2 mm Epi polished wafer 1 SP	<p>SrTiO₃ single crystal provides a good lattice match to most materials with Perovskite structure. It is an excellent substrate for epitaxial growth of HTS and many oxide thin films. SrTiO₃ single crystal has also been used widely for special optical windows and as high quality sputtering target. MTI has the full production line to manufacture first the high purity SrTiO₃ powder, then the single crystal boules and finally the epi-polished substrates in many sizes. This allows us to provide SrTiO₃ single crystal products with the highest quality and the lowest price to our customers all over the world.</p> <p><u>Specifications:</u> Size: 5x5x 0.2mm +/-0.05mm Orientation: (110) +/-0.5 Deg Edge orietation Indication: <001> +/-2 Deg avaiable as option with extra cost Polish: EPI polished by CMP tecnology with less sub-surface lattice damage. Pack: Packed in 100 grade plastic bag under 1000 class clean room.</p>
2.	SrTiO ₃ (110) 5x5x0.5 mm Epi polished wafer 1 SP	<p>SrTiO₃ single crystal provides a good lattice match to most materials with Perovskite structure. It is an excellent substrate for epitaxial growth of HTS and many oxide thin films. SrTiO₃ single crystal has also been used widely for special optical windows and as high quality sputtering target. MTI has the full production line to manufacture first the high purity SrTiO₃ powder, then the single crystal boules and finally the epi-polished substrates in many sizes. This allows us to provide SrTiO₃ single crystal products with</p>

		<p>the highest quality and the lowest price to our customers all over the world.</p> <p><u>Specifications:</u> Size: 5x5x 0.5mm +/-0.05mm Orientation: (110) +/-0.5 Deg Edge orientation Indication: <001> +/-2 Deg available as option with extra cost Polish: EPI polished by CMP technology with less sub-surface lattice damage. Pack: Packed in 100 grade plastic bag under 1000 class clean room.</p>
3.	SrTiO ₃ (110) 5x5x0.5 mm Epi polished wafer 2 SP	<p>SrTiO₃ single crystal provides a good lattice match to most materials with Perovskite structure. It is an excellent substrate for epitaxial growth of HTS and many oxide thin films. SrTiO₃ single crystal has also been used widely for special optical windows and as high quality sputtering target. MTI has the full production line to manufacture first the high purity SrTiO₃ powder, then the single crystal boules and finally the epi-polished substrates in many sizes. This allows us to provide SrTiO₃ single crystal products with the highest quality and the lowest price to our customers all over the world.</p> <p><u>Specifications:</u> Size: 5x5x 0.5mm +/-0.05mm Orientation: (110) +/-0.5 Deg Edge orientation Indication: <001> +/-2 Deg available as option with extra cost Polish: EPI polished by CMP technology with less sub-surface lattice damage. Pack: Packed in 100 grade plastic bag under 1000 class clean room.</p>
4.	SrTiO ₃ (110) 1/4"x1/4"x0.5 mm Epi polished wafer 1 SP	<p>SrTiO₃ single crystal provides a good lattice match to most materials with Perovskite structure. It is an excellent substrate for epitaxial growth of HTS and many oxide thin films. SrTiO₃ single crystal has also been used widely for special optical windows and as high quality sputtering target. MTI has the full production line to manufacture first the high purity SrTiO₃ powder, then the single crystal boules and finally the epi-polished substrates in many sizes. This allows us to provide SrTiO₃ single crystal products with the highest quality and the lowest price to our customers all over the world.</p> <p><u>Specifications:</u> Size: 1/4"x1/4"x 0.5mm +/-0.05mm Orientation: (110) +/-0.5 Deg Edge orientation Indication: <001> +/-2 Deg available as option with extra cost Polish: EPI polished by CMP technology with less sub-surface lattice damage. Pack: Packed in 100 grade plastic bag under 1000 class clean room.</p>
5.	SrTiO ₃ (110) 1/4"x1/4"x0.5 mm Epi polished wafer 2 SP	<p>SrTiO₃ single crystal provides a good lattice match to most materials with Perovskite structure. It is an excellent substrate for epitaxial growth of HTS and many oxide thin films. SrTiO₃ single crystal has also been used widely</p>

		<p>for special optical windows and as high quality sputtering target. MTI has the full production line to manufacture first the high purity SrTiO₃ powder, then the single crystal boules and finally the epi-polished substrates in many sizes. This allows us to provide SrTiO₃ single crystal products with the highest quality and the lowest price to our customers all over the world.</p> <p><u>Specifications:</u> Size: 1/4"x1/4"x 0.5mm +/-0.05mm Orientation: (110) +/-0.5 Deg Edge orientation Indication: <001> +/-2 Deg available as option with extra cost Polish: EPI polished by CMP technology with less sub-surface lattice damage. Pack: Packed in 100 grade plastic bag under 1000 class clean room.</p>
6.	SrTiO ₃ (110) 10x10x0.5 mm Epi polished wafer 1 SP	<p>SrTiO₃ single crystal provides a good lattice match to most materials with Perovskite structure. It is an excellent substrate for epitaxial growth of HTS and many oxide thin films. SrTiO₃ single crystal has also been used widely for special optical windows and as high quality sputtering target. MTI has the full production line to manufacture first the high purity SrTiO₃ powder, then the single crystal boules and finally the epi-polished substrates in many sizes. This allows us to provide SrTiO₃ single crystal products with the highest quality and the lowest price to our customers all over the world.</p> <p><u>Specifications:</u> Size: 10x10x 0.5mm +/-0.05mm Orientation: (110) +/-0.5 Deg Edge orientation Indication: <001> +/-2 Deg available as option with extra cost Polish: EPI polished by CMP technology with less sub-surface lattice damage. Pack: Packed in 100 grade plastic bag under 1000 class clean room.</p>
7.	SrTiO ₃ (110) 10x10x0.5 mm Epi polished wafer 2 SP	<p>SrTiO₃ single crystal provides a good lattice match to most materials with Perovskite structure. It is an excellent substrate for epitaxial growth of HTS and many oxide thin films. SrTiO₃ single crystal has also been used widely for special optical windows and as high quality sputtering target. MTI has the full production line to manufacture first the high purity SrTiO₃ powder, then the single crystal boules and finally the epi-polished substrates in many sizes. This allows us to provide SrTiO₃ single crystal products with the highest quality and the lowest price to our customers all over the world.</p> <p><u>Specifications:</u> Size: 10x10x 0.5mm +/-0.05mm Orientation: (110) +/-0.5 Deg Edge orientation Indication: <001> +/-2 Deg available as option with extra cost Polish: EPI polished by CMP technology with less sub-surface lattice damage. Pack: Packed in 100 grade plastic bag under 1000 class clean room</p>
8.	SrTiO ₃ (110) 20x20x0.5	

	mm Epi polished wafer 1 SP	<p>SrTiO₃ single crystal provides a good lattice match to most materials with Perovskite structure. It is an excellent substrate for epitaxial growth of HTS and many oxide thin films. SrTiO₃ single crystal has also been used widely for special optical windows and as high quality sputtering target. MTI has the full production line to manufacture first the high purity SrTiO₃ powder, then the single crystal boules and finally the epi-polished substrates in many sizes. This allows us to provide SrTiO₃ single crystal products with the highest quality and the lowest price to our customers all over the world.</p> <p><u>Specifications:</u> Size: 20x20x 0.5mm +/-0.05mm Orientation: (110) +/-0.5 Deg Edge orientation Indication: <001> +/-2 Deg available as option with extra cost Polish: EPI polished by CMP technology with less sub-surface lattice damage. Pack: Packed in 100 grade plastic bag under 1000 class clean room.</p>
9.	SrTiO ₃ (110) 1"x0.5 mm Epi polished wafer 1 SP	<p>SrTiO₃ single crystal provides a good lattice match to most materials with Perovskite structure. It is an excellent substrate for epitaxial growth of HTS and many oxide thin films. SrTiO₃ single crystal has also been used widely for special optical windows and as high quality sputtering target. MTI has the full production line to manufacture first the high purity SrTiO₃ powder, then the single crystal boules and finally the epi-polished substrates in many sizes. This allows us to provide SrTiO₃ single crystal products with the highest quality and the lowest price to our customers all over the world.</p> <p><u>Specifications:</u> Size: 1"x 0.5mm +/-0.05mm Orientation: (110) +/-0.5 Deg Edge orientation Indication available as option with extra cost Polish: EPI polished by CMP technology with less sub-surface lattice damage. Pack: Packed in 100 grade plastic bag under 1000 class clean room.</p>

C. (111) SrTiO₃ Substrate

No.	Item	Description
1.	SrTiO ₃ (111) 5x5x0.5 mm Epi polished wafer 1 SP	<p>SrTiO₃ single crystal provides a good lattice match to most materials with Perovskite structure. It is an excellent substrate for epitaxial growth of HTS and many oxide thin films. SrTiO₃ single crystal has also been used widely for special optical windows and as high quality sputtering target. MTI has the full production line to manufacture first the high purity SrTiO₃ powder, then the single crystal boules and finally the epi-polished substrates in many sizes. This allows us to provide SrTiO₃ single crystal products with the highest quality and the lowest price to our customers all over the world.</p> <p><u>Specifications:</u> Size: 5x5x 0.5mm +/-0.05mm Orientation: (111) +/-0.5 Deg</p>

		<p>Edge orientation Indication: <001> +/-2 Deg available as option with extra cost</p> <p>Polish: EPI polished by CMP technology with less sub-surface lattice damage.</p> <p>Pack: Packed in 100 grade plastic bag under 1000 class clean room.</p>
2.	SrTiO ₃ (111) 5x5x0.5 mm Epi polished wafer 2 SP	<p>SrTiO₃ single crystal provides a good lattice match to most materials with Perovskite structure. It is an excellent substrate for epitaxial growth of HTS and many oxide thin films. SrTiO₃ single crystal has also been used widely for special optical windows and as high quality sputtering target. MTI has the full production line to manufacture first the high purity SrTiO₃ powder, then the single crystal boules and finally the epi-polished substrates in many sizes. This allows us to provide SrTiO₃ single crystal products with the highest quality and the lowest price to our customers all over the world.</p> <p><u>Specifications:</u> Size: 5x5x 0.5mm +/-0.05mm Orientation: (111) +/-0.5 Deg Edge orientation Indication: <001> +/-2 Deg available as option with extra cost Polish: EPI polished by CMP technology with less sub-surface lattice damage. Pack: Packed in 100 grade plastic bag under 1000 class clean room.</p>
3.	SrTiO ₃ (111) 1/4"x1/4"x0.5 mm Epi polished wafer 1 SP	<p>SrTiO₃ single crystal provides a good lattice match to most materials with Perovskite structure. It is an excellent substrate for epitaxial growth of HTS and many oxide thin films. SrTiO₃ single crystal has also been used widely for special optical windows and as high quality sputtering target. MTI has the full production line to manufacture first the high purity SrTiO₃ powder, then the single crystal boules and finally the epi-polished substrates in many sizes. This allows us to provide SrTiO₃ single crystal products with the highest quality and the lowest price to our customers all over the world.</p> <p><u>Specifications:</u> Size: 1/4" x 1/4" x 0.5mm +/-0.05mm Orientation: (111) +/-0.5 Deg Edge orientation Indication: <001> +/-2 Deg available as option with extra cost Polish: EPI polished by CMP technology with less sub-surface lattice damage. Pack: Packed in 100 grade plastic bag under 1000 class clean room.</p>
4.	SrTiO ₃ (111) 10x10x0.5 mm Epi polished wafer 1 SP	<p>SrTiO₃ single crystal provides a good lattice match to most materials with Perovskite structure. It is an excellent substrate for epitaxial growth of HTS and many oxide thin films. SrTiO₃ single crystal has also been used widely for special optical windows and as high quality sputtering target. MTI has the full production line to manufacture first the high purity SrTiO₃ powder, then the single crystal boules and finally the epi-polished substrates in many sizes. This allows us to provide SrTiO₃ single crystal products with the highest quality and the lowest price to our customers all over the world.</p>

		<p><u>Specifications:</u> Size: 10x10x 0.5mm +/-0.05mm Orientation: (111) +/-0.5 Deg Edge orientation Indication: <001> +/-2 Deg available as option with extra cost Polish: EPI polished by CMP technology with less sub-surface lattice damage. Pack: Packed in 100 grade plastic bag under 1000 class clean room.</p>
5.	SrTiO ₃ (111) 10x10x0.5 mm Epi polished wafer 2 SP	<p>SrTiO₃ single crystal provides a good lattice match to most materials with Perovskite structure. It is an excellent substrate for epitaxial growth of HTS and many oxide thin films. SrTiO₃ single crystal has also been used widely for special optical windows and as high quality sputtering target. MTI has the full production line to manufacture first the high purity SrTiO₃ powder, then the single crystal boules and finally the epi-polished substrates in many sizes. This allows us to provide SrTiO₃ single crystal products with the highest quality and the lowest price to our customers all over the world.</p> <p><u>Specifications:</u> Size: 10x10x 0.5mm +/-0.05mm Orientation: (111) +/-0.5 Deg Edge orientation Indication: <001> +/-2 Deg available as option with extra cost Polish: EPI polished by CMP technology with less sub-surface lattice damage. Pack: Packed in 100 grade plastic bag under 1000 class clean room.</p>
6.	SrTiO ₃ (111) 15x15x0.5 mm Epi polished wafer 1 SP	<p>SrTiO₃ single crystal provides a good lattice match to most materials with Perovskite structure. It is an excellent substrate for epitaxial growth of HTS and many oxide thin films. SrTiO₃ single crystal has also been used widely for special optical windows and as high quality sputtering target. MTI has the full production line to manufacture first the high purity SrTiO₃ powder, then the single crystal boules and finally the epi-polished substrates in many sizes. This allows us to provide SrTiO₃ single crystal products with the highest quality and the lowest price to our customers all over the world.</p> <p><u>Specifications:</u> Size: 15x15x 0.5mm +/-0.05mm Orientation: (111) +/-0.5 Deg Edge orientation Indication: <001> +/-2 Deg available as option with extra cost Polish: EPI polished by CMP technology with less sub-surface lattice damage. Pack: Packed in 100 grade plastic bag under 1000 class clean room.</p>
7.	SrTiO ₃ (111) 1"x0.5 mm Epi polished wafer 1 SP	<p>SrTiO₃ single crystal provides a good lattice match to most materials with Perovskite structure. It is an excellent substrate for epitaxial growth of HTS and many oxide thin films. SrTiO₃ single crystal has also been used widely for special optical windows and as high quality sputtering target. MTI has the full production line to manufacture first the high purity SrTiO₃ powder, then the single crystal boules and finally the epi-polished substrates in</p>

		<p>many sizes. This allows us to provide SrTiO₃ single crystal products with the highest quality and the lowest price to our customers all over the world.</p> <p><u>Specifications:</u> Size: 1"x 0.5mm +/-0.05mm Orientation: (111) +/-0.5 Deg Edge orientation Indication: <001> +/-2 Deg available as option with extra cost Polish: EPI polished by CMP technology with less sub-surface lattice damage. Pack: Packed in 100 grade plastic bag under 1000 class clean room.</p>
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D. Step SrTiO₃ Substrate (imported from Japan)

No.	Item	Description
1.	SrTiO ₃ Substrate with Step Surface & Ti terminated (100) 10x10x0.5mm, 1 SP	<p>Step STO substrate is a atomically smooth SrTiO₃ (100) with steps one unit cell in height was obtained by treating the crystal surface with a pH-controlled NH₄F-HF solution. The homoepitaxy of SrTiO₃ film on the crystal surface proceeds in a perfect layer-by-layer mode as verified by reflection high-energy electron diffraction and atomic force microscopy. Ion scattering spectroscopy revealed that the TiO₂ atomic plane terminated the as-treated clean surface and that the terminating atomic layer could be tuned to the SrO atomic plane by homoepitaxial growth. This technology provides a well-defined substrate surface for atomically regulated epitaxial growth of such perovskite oxide films.</p> <p><u>Specifications:</u> Size: 10x10x 0.5mm +/-0.05mm Orientation: 0.1° miscut from (100) (+/- 0.1° from Y and X direction) Polish: One sides EPI polished by CMP technology with less sub-surface lattice damage. Surface Termination: TiO₂ layer (via special etching)</p>

E. SrTiO₃ with Nb and Fe doped

i. SrTiO₃ Nb-doped wt 0.7%

No.	Item	Description
1.	Nb: SrTiO ₃ (100) 0.7% Nb, 1x1x0.5mm, 1sp-	<p>Single crystal SrTiO₃ with 0.7%~1% Nb doping Size: 1mm x 1mm x 0.5mm Orientation: (100) Polish: one side EPI polished.</p>
2.	Nb: SrTiO ₃ (100) 5x5x0.5mm, 1sp wt0.7%	<p>Single crystal SrTiO₃ with 0.7% Nb doping (optional) Size: 5mm x 5mm x 0.5mm Orientation: (100) +/-0.5 ° Polish: one side EPI polished.</p>

3.	Nb: SrTiO ₃ (100) 5x5x0.5mm, 2sp wt0.7%	Single crystal SrTiO ₃ with 0.7% Nb doping Size: 5mm x 5mm x 0.5mm Orientation: (100) Polish: two sides EPI polished. Resistivity: 0.0035~0.007 Ohm-cm Mobility: 8.5~9.0 cm ² /Vs
4.	Nb: SrTiO ₃ (111) 0.7% Nb, 5x5x0.5mm, 1sp	Single crystal SrTiO ₃ with 0.7% Nb doping Size: 5mm x 5mm x 0.5mm Orientation: (111) +/-0.5 ° Polish: one side EPI polished.
5.	Nb: SrTiO ₃ (100) 0.7% Nb, 10x5x0.5mm, 1sp	Single crystal SrTiO ₃ with 0.7% Nb doping Size: 10mm x 5mm x 0.5mm Orientation: (100) Polish: one side EPI polished.
6.	Nb: SrTiO ₃ (100), 0.7% wt Nb, 10x5x0.5mm, 2 sp	Single crystal SrTiO ₃ with 0.7% Nb doping Size: 10mm x 5mm x 0.5mm Orientation: (100) Polish: two sides EPI polished.
7.	Nb: SrTiO ₃ (100), 10x10x1.0mm, 1sp,	Single crystal SrTiO ₃ doped with 0.7% Nb Size: 10mm x 10mm x 1.0mm Orientation: (100) +/-0.5 ° Polish: one side polished. Surface roughness: < 5 A
8.	Nb: SrTiO ₃ (100), 10x10x1.0mm,2sp	Single crystal SrTiO ₃ doped with 0.7% Nb Size: 10mm x 10mm x 1.0mm Orientation: (100) +/-0.5 ° Polish: two sides polished. Surface roughness: < 5 A
9.	Nb: SrTiO ₃ (100), 0.7% wt Nb, 10x10x0.5mm, 1sp,	Single crystal SrTiO ₃ doped with 0.7% Nb Size: 10mm x 10mm x 0.5mm Orientation: (100) +/-0.5 ° Polish: one side polished. Surface roughness: < 5 A
10.	Nb: SrTiO ₃ (110), 0.7% wt Nb, 10x10x0.5mm, 1sp,	Single crystal SrTiO ₃ doped with 0.7% Nb Size: 10mm x 10mm x 0.5mm Orientation: (110) +/-0.5 ° Polish: one side polished. Surface roughness: < 5 A
11.	Nb: SrTiO ₃ (110), 0.7% wt Nb, 5x5x0.5mm, 1sp,	Single crystal SrTiO ₃ doped with 0.7% Nb

		Size: 5mm x 5mm x 0.5mm Orientation: (110) $\pm 0.5^\circ$ Polish: one side polished. Surface roughness: < 5 Å
12.	Nb: SrTiO ₃ (111), 0.7% wt Nb, 10x10x0.5mm, 1sp,	Single crystal SrTiO ₃ doped with 0.7% Nb Size: 10mm x 10mm x 0.5mm Orientation: (111) $\pm 0.5^\circ$ Polish: one side polished. Surface roughness: < 5 Å
13.	0.7% Nb: SrTiO ₃ Single crystal substrate, (001) with 2.5 degree miscut along<100>. 2sp 10x10x0.5mm	Single crystal SrTiO ₃ doped with 0.7 wt% Nb Size: 10mm x 10mm x 0.5mm Orientation: (100) with 2.5 degree miscut along<100> Polish: two sides EPI polished. Surface roughness < 5 Å
14.	Nb: SrTiO ₃ (100) 10x10x0.5mm, 2sp wt0.7%	Single crystal SrTiO ₃ doped with 0.7 wt% Nb Size: 10mm x 10mm x 0.5mm Orientation: (100) $\pm 0.5^\circ$ Polish: two sides EPI polished. Surface roughness < 5 Å

ii. SrTiO₃ Nb-doped wt 1.0%

No.	Item	Description
1.	Nb: SrTiO ₃ (100) 1.0% Nb, 10x10x0.5mm, 2sp	Single crystal SrTiO ₃ with 1% Nb doping Size: 10mm x 10 mm x 0.5mm Orientation: (100) Polish: two sides EPI polished.
2.	Nb: SrTiO ₃ (100) 1.0% Nb, 10x5x0.5mm, 1sp	Single crystal SrTiO ₃ with 0.7%~1% Nb doping Size: 10mm x 5mm x 0.5mm Orientation: (100) Polish: one side EPI polished.
3.	Nb: SrTiO ₃ (100) 1.0% Nb, 5x5x0.5mm, 1sp	Single crystal SrTiO ₃ with 1% Nb doping Size: 5 mm x 5mm x 0.5mm Orientation: (100) Polish: one side EPI polished.
4.	Nb: SrTiO ₃ (111) 1.0% Nb, 10x10x0.5mm, 1sp	Single crystal SrTiO ₃ with 1.0% Nb doping Size: 10mm x 10 mm x 0.5mm Orientation: (111) Polish: one side EPI polished.

iii. SrTiO₃ Nb-doped wt 0.1%

No.	Item	Description
1.	Nb: SrTiO ₃ (100) 0.1 % Nb, 10x10x0.5mm, 1sp	Single crystal SrTiO ₃ with 0.1 % Nb doping Size: 10mm x 10 mm x 0.5mm Orientation: (100) Polish: One side EPI polished.
2.	Nb: SrTiO ₃ (100) 0.1 % Nb, 10x10x0.5mm, 2sp	Single crystal SrTiO ₃ with 0.1 % Nb doping Size: 10mm x 10 mm x 0.5mm Orientation: (100) Polish: two sides EPI polished.
3.	Nb: SrTiO ₃ (100) 0.1 % Nb, 10x5x0.5mm, 1sp	Single crystal SrTiO ₃ with 0.7%~1% Nb doping Size: 10mm x 5mm x 0.5mm Orientation: (100) Polish: one side EPI polished.
4.	Nb: SrTiO ₃ (100) 0.1 % Nb, 10x5x0.5mm, 2sp	Single crystal SrTiO ₃ with 0.1% Nb doping Size: 10mm x 5mm x 0.5mm Orientation: (100) Polish: one side EPI polished.
5.	Nb: SrTiO ₃ (100) 0.1 % Nb, 5x5x0.5mm, 1sp	Single crystal SrTiO ₃ with 0.1 % Nb doping Size: 5 mm x 5mm x 0.5mm Orientation: (100) Polish: One side EPI polished.
6.	Nb: SrTiO ₃ (100) 0.1 % Nb, 5x5x0.5mm, 2sp	Single crystal SrTiO ₃ with 0.1 % Nb doping Size: 5 mm x 5mm x 0.5mm Orientation: (100) Polish: Two side EPI polished.

iv. SrTiO₃ Fe-doped

No.	Item	Description
1.	Fe: SrTiO ₃ (100) 10 x5x0.5mm, 1sp, (Fe doped 0.01 wt %)	Single crystal SrTiO ₃ doped with 0.01% Fe Size: 10 mm x 5 mm x 0.5mm Orientation: (100) +/-0.5 ° Polish: one side polished. Surface roughness: < 5 Å
2.	Fe: SrTiO ₃ (100) 10x10x0.5mm, 1sp, (Fe doped 0.01 wt %)	Single crystal SrTiO ₃ doped with 0.01% Fe Size: 10mm x 10mm x 0.5mm

		Orientation: (100) $\pm 0.5^\circ$ Polish: one side polished. Surface roughness: < 5 A
3.	Fe: SrTiO ₃ (100) 10x10x0.5mm, 1sp, (Fe doped 0.05 wt %)	Single crystal SrTiO ₃ doped with 0.05% Fe Size: 10mm x 10mm x 0.5mm Orientation: (100) $\pm 0.5^\circ$ Polish: one side polished. Surface roughness: < 5 A
4.	Fe: SrTiO ₃ (100) 10x3x0.5mm, 1sp, (Fe doped 0.05wt %)	Single crystal SrTiO ₃ doped with 0.05% Fe Size: 10 mm x 3 mm x 0.5mm Orientation: (100) $\pm 0.5^\circ$ Polish: one side polished. Surface roughness: < 5 A
5.	Fe: SrTiO ₃ (100) 5x5x0.5mm, 1sp, (Fe doped 0.005 wt %)	Single crystal SrTiO ₃ doped with 0.005% Fe Size: 5 mm x 5 mm x 0.5mm Orientation: (100) $\pm 0.5^\circ$ Polish: one side polished. Surface roughness: < 5 A
6.	Fe: SrTiO ₃ (111) 10x10x0.5mm, 1sp, (Fe doped 0.005 wt %)	Single crystal SrTiO ₃ doped with 0.005% Fe Size: 10 mm x 10 mm x 0.5mm Orientation: (111) $\pm 0.5^\circ$ Polish: one side polished. Surface roughness: < 5 A
7.	Fe: SrTiO ₃ (111) 5x5x0.5mm, 1sp, (Fe doped 0.005 wt %)	Single crystal SrTiO ₃ doped with 0.005% Fe Size: 5 mm x 5 mm x 0.5mm Orientation: (111) $\pm 0.5^\circ$ Polish: one side polished. Surface roughness: < 5 A

F. SrTiO₃: Bi-Crystal Substrates

No.	Item	Description
1.	Bi-Crystal SrTiO ₃ Substrate, , 10x10x0.5 mm, 1sp, 45 Deg (100)	<p>SrTiO₃ Bi-Crystal substrate is made of two pieces oriented SrTiO₃ crystal. One grain boundary is formed under high temperature and pressure. It is excellent to make High T_c superconduct SQUID</p> <p><u>Specifications:</u> Substrate Size: 10x10x 0.5mm ± 0.05mm Face Orientation: (100) $\pm 0.3^\circ$ Edge orientation Indication: <001> $\pm 0.5^\circ$ Crystal Boundary: 36° ($\pm 0.5^\circ$) Polish: One side EPI polished by CMP .</p>

		<p>Surface Roughness: < 5 A by AFM Pack: Packed in 100 grade plastic bag under 1000 class clean room.</p>
2.	Bi-Crystal SrTiO3 Substrate, (100) 4x4x0.5 mm, 1sp, 24 Deg	<p>SrTiO3 Bi-Crystal substrate is made of two pieces oriented SrTiO3 crystal. One grain boundary is formed under high temperature and pressure. It is excellent to make High Tc syperconduct SQUID</p> <p><u>Specifications:</u> Substrate Size: 10x10x 0.5mm +/-0.05mm Face Orientation: (100) +/- 0.3° Edge orietation Indication: <001> +/-0.5° Crystal Boundary: 24° (+/-0.5°) Polish: One side EPI polished by CMP . Surface Roughness: < 5 A by AFM Pack: Packed in 100 grade plastic bag under 1000 class clean room.</p>
3.	Bi-Crystal SrTiO3 Substrate (100) 10x5x0.5 mm, 1sp, 24 Deg	<p>SrTiO3 Bi-Crystal substrate is made of two pieces oriented SrTiO3 crystal. One grain boundary is formed under high temperature and pressure. It is excellent to make High Tc syperconduct SQUID</p> <p><u>Specifications:</u> Substrate Size: 10x10x 0.5mm +/-0.05mm Face Orientation: (100) +/- 0.3° Edge orietation Indication: <001> +/-0.5° Crystal Boundary: 24° (+/-0.5°) Polish: One side EPI polished by CMP . Surface Roughness: < 5 A by AFM Pack: Packed in 100 grade plastic bag under 1000 class clean room.</p>
4.	Bi-Crystal SrTiO3 Substrate, (100) 5x5x0.5 mm, 1sp, 30 Deg	<p><u>Specifications:</u> Substrate Size: 10x10x 0.5mm +/-0.05mm Face Orientation: (100) +/- 0.3° Edge orietation Indication: <001> +/-0.5° Crystal Boundary: 24° (+/-0.5°) Polish: One side EPI polished by CMP . Surface Roughness: < 5 A by AFM Pack: Packed in 100 grade plastic bag under 1000 class clean room.</p>
5.	Bi-Crystal SrTiO3 Substrate,(100) 5x5x0.5 mm, 1sp, 24 Deg	<p><u>Specifications:</u> Substrate Size: 10x10x 0.5mm +/-0.05mm Face Orientation: (100) +/- 0.3° Edge orietation Indication: <001> +/-0.5° Crystal Boundary: 24° (+/-0.5°) Polish: One side EPI polished by CMP . Surface Roughness: < 5 A by AFM Pack: Packed in 100 grade plastic bag under 1000 class clean room.</p>
6.	Bi-Crystal SrTiO3 Substrate (100) 5mm in dia. x0.5 mm, 1sp, 24 Deg	<p><u>Specifications:</u> Substrate Size: 10x10x 0.5mm +/-0.05mm Face Orientation: (100) +/- 0.3° Edge orietation Indication: <001> +/-0.5° Crystal Boundary: 24° (+/-0.5°) Polish: One side EPI polished by CMP .</p>

		Surface Roughness: < 5 A by AFM Pack: Packed in 100 grade plastic bag under 1000 class clean room.
7.	Bi-Crystal SrTiO ₃ Substrate (100) 10x10x0.5 mm, 1sp, 4 Deg	SrTiO ₃ Bi-Crystal substrate is made of two pieces oriented SrTiO ₃ crystal. One grain boundary is formed under high temperature and pressure. It is excellent to make High T _c superconduct SQUID <u>Specifications:</u> Substrate Size: 10x10x 0.5mm +/-0.05mm Face Orientation: (100) +/- 0.3° Edge orientation Indication: <001> +/-0.5° Crystal Boundary: 24° (+/-0.5°) Polish: One side EPI polished by CMP . Surface Roughness: < 5 A by AFM Pack: Packed in 100 grade plastic bag under 1000 class clean room.
8.	Bi-Crystal SrTiO ₃ Substrate (100) 10x10x1.0 mm, 1sp, 2 Deg	SrTiO ₃ Bi-Crystal substrate is made of two pieces oriented SrTiO ₃ crystal. One grain boundary is formed under high temperature and pressure. It is excellent to make High T _c superconduct SQUID <u>Specifications:</u> Substrate Size: 10x10x 0.5mm +/-0.05mm Face Orientation: (100) +/- 0.3° Edge orientation Indication: <001> +/-0.5° Crystal Boundary: 24° (+/-0.5°) Polish: One side EPI polished by CMP . Surface Roughness: < 5 A by AFM Pack: Packed in 100 grade plastic bag under 1000 class clean room.

66. SrTiO₃ with Nb and Fe doped

A. SrTiO₃ Nb-doped wt 0.7%

No.	Item	Description
1.	Nb: SrTiO ₃ (100) 0.7% Nb, 1x1x0.5mm, 1sp-	Single crystal SrTiO ₃ with 0.7%~1% Nb doping Size: 1mm x 1mm x 0.5mm Orientation: (100) Polish: one side EPI polished.
2.	Nb: SrTiO ₃ (100) 5x5x0.5mm, 1sp wt0.7%	Single crystal SrTiO ₃ with 0.7% Nb doping (optional) Size: 5mm x 5mm x 0.5mm Orientation: (100) +/-0.5 ° Polish: one side EPI polished.
3.	Nb: SrTiO ₃ (100) 5x5x0.5mm, 2sp wt0.7%	Single crystal SrTiO ₃ with 0.7% Nb doping Size: 5mm x 5mm x 0.5mm Orientation: (100)

		Polish: two sides EPI polished. Resistivity: 0.0035~0.007 Ohm-cm Mobility: 8.5~9.0 cm ² /Vs
4.	Nb: SrTiO ₃ (111) 0.7% Nb, 5x5x0.5mm, 1sp	Single crystal SrTiO ₃ with 0.7% Nb doping Size: 5mm x 5mm x 0.5mm Orientation: (111) +/-0.5 ° Polish: one side EPI polished.
5.	Nb: SrTiO ₃ (100) 0.7% Nb, 10x5x0.5mm, 1sp	Single crystal SrTiO ₃ with 0.7% Nb doping Size: 10mm x 5mm x 0.5mm Orientation: (100) Polish: one side EPI polished.
6.	Nb: SrTiO ₃ (100), 0.7% wt Nb, 10x5x0.5mm, 2 sp	Single crystal SrTiO ₃ with 0.7% Nb doping Size: 10mm x 5mm x 0.5mm Orientation: (100) Polish: two sides EPI polished.
7.	Nb: SrTiO ₃ (100), 10x10x1.0mm, 1sp,	Single crystal SrTiO ₃ doped with 0.7% Nb Size: 10mm x 10mm x 1.0mm Orientation: (100) +/-0.5 ° Polish: one side polished. Surface roughness: < 5 Å
8.	Nb: SrTiO ₃ (100), 10x10x1.0mm, 2sp	Single crystal SrTiO ₃ doped with 0.7% Nb Size: 10mm x 10mm x 1.0mm Orientation: (100) +/-0.5 ° Polish: two sides polished. Surface roughness: < 5 Å
9.	Nb: SrTiO ₃ (100), 0.7% wt Nb, 10x10x0.5mm, 1sp,	Single crystal SrTiO ₃ doped with 0.7% Nb Size: 10mm x 10mm x 0.5mm Orientation: (100) +/-0.5 ° Polish: one side polished. Surface roughness: < 5 Å
10.	Nb: SrTiO ₃ (110), 0.7% wt Nb, 10x10x0.5mm, 1sp,	Single crystal SrTiO ₃ doped with 0.7% Nb Size: 10mm x 10mm x 0.5mm Orientation: (110) +/-0.5 ° Polish: one side polished. Surface roughness: < 5 Å
11.	Nb: SrTiO ₃ (110), 0.7% wt Nb, 5x5x0.5mm, 1sp,	Single crystal SrTiO ₃ doped with 0.7% Nb Size: 5mm x 5mm x 0.5mm Orientation: (110) +/-0.5 ° Polish: one side polished. Surface roughness: < 5 Å

12.	Nb: SrTiO ₃ (111), 0.7% wt Nb, 10x10x0.5mm, 1sp,	Single crystal SrTiO ₃ doped with 0.7% Nb Size: 10mm x 10mm x 0.5mm Orientation: (111) $\pm 0.5^\circ$ Polish: one side polished. Surface roughness: < 5 Å
13.	0.7% Nb: SrTiO ₃ Single crystal substrate ,(001) with 2.5 degree miscut along<100>. 2sp 10x10x0.5mm	Single crystal SrTiO ₃ doped with 0.7 wt% Nb Size: 10mm x 10mm x 0.5mm Orientation: (100) with 2.5 degree miscut along<100> Polish: two sides EPI polished. Surface roughness < 5 Å
14.	Nb: SrTiO ₃ (100) 10x10x0.5mm, 2sp wt0.7%	Single crystal SrTiO ₃ doped with 0.7 wt% Nb Size: 10mm x 10mm x 0.5mm Orientation: (100) $\pm 0.5^\circ$ Polish: two sides EPI polished. Surface roughnessL < 5 Å

B. SrTiO₃ Nb-doped wt 1.0%

No.	Item	Description
1.	Nb: SrTiO ₃ (100) 1.0% Nb, 10x10x0.5mm, 2sp	Single crystal SrTiO ₃ with 1% Nb doping Size: 10mm x 10 mm x 0.5mm Orientation: (100) Polish: two sides EPI polished.
2.	Nb: SrTiO ₃ (100) 1.0% Nb, 10x5x0.5mm, 1sp	Single crystal SrTiO ₃ with 0.7%~1% Nb doping Size: 10mm x 5mm x 0.5mm Orientation: (100) Polish: one side EPI polished.
3.	Nb: SrTiO ₃ (100) 1.0% Nb, 5x5x0.5mm, 1sp	Single crystal SrTiO ₃ with 1% Nb doping Size: 5 mm x 5mm x 0.5mm Orientation: (100) Polish: one side EPI polished.
4.	Nb: SrTiO ₃ (111) 1.0% Nb, 10x10x0.5mm, 1sp	Single crystal SrTiO ₃ with 1.0% Nb doping Size: 10mm x 10 mm x 0.5mm Orientation: (111) Polish: one side EPI polished.

C. SrTiO₃ Nb-doped wt 0.1%

No.	Item	Description
1.	Nb: SrTiO ₃ (100) 0.1 % Nb, 10x10x0.5mm, 1sp	Single crystal SrTiO ₃ with 0.1 % Nb doping Size: 10mm x 10 mm x 0.5mm Orientation: (100) Polish: One side EPI polished.
2.	Nb: SrTiO ₃ (100) 0.1 % Nb, 10x10x0.5mm, 2sp	Single crystal SrTiO ₃ with 0.1 % Nb doping Size: 10mm x 10 mm x 0.5mm Orientation: (100) Polish: two sides EPI polished.
3.	Nb: SrTiO ₃ (100) 0.1 % Nb, 10x5x0.5mm, 1sp	Single crystal SrTiO ₃ with 0.7%~1% Nb doping Size: 10mm x 5mm x 0.5mm Orientation: (100) Polish: one side EPI polished.
4.	Nb: SrTiO ₃ (100) 0.1 % Nb, 10x5x0.5mm, 2sp	Single crystal SrTiO ₃ with 0.1% Nb doping Size: 10mm x 5mm x 0.5mm Orientation: (100) Polish: one side EPI polished.
5.	Nb: SrTiO ₃ (100) 0.1 % Nb, 5x5x0.5mm, 1sp	Single crystal SrTiO ₃ with 0.1 % Nb doping Size: 5 mm x 5mm x 0.5mm Orientation: (100) Polish: One side EPI polished.
6.	Nb: SrTiO ₃ (100) 0.1 % Nb, 5x5x0.5mm, 2sp	Single crystal SrTiO ₃ with 0.1 % Nb doping Size: 5 mm x 5mm x 0.5mm Orientation: (100) Polish: Two side EPI polished.

D. SrTiO₃ Fe-doped

No.	Item	Description
1.	Fe: SrTiO ₃ (100) 10 x5x0.5mm, 1sp, (Fe doped 0.01 wt %)	Single crystal SrTiO ₃ doped with 0.01% Fe Size: 10 mm x 5 mm x 0.5mm Orientation: (100) +/-0.5 ° Polish: one side polished. Surface roughness: < 5 Å
2.	Fe: SrTiO ₃ (100) 10x10x0.5mm, 1sp, (Fe doped 0.01 wt %)	Single crystal SrTiO ₃ doped with 0.01% Fe Size: 10mm x 10mm x 0.5mm Orientation: (100) +/-0.5 °

		Polish: one side polished. Surface roughness: < 5 Å
3.	Fe: SrTiO ₃ (100) 10x10x0.5mm, 1sp, (Fe doped 0.05 wt %)	Single crystal SrTiO ₃ doped with 0.05% Fe Size: 10mm x 10mm x 0.5mm Orientation: (100) $\pm 0.5^\circ$ Polish: one side polished. Surface roughness: < 5 Å
4.	Fe: SrTiO ₃ (100) 10x3x0.5mm, 1sp, (Fe doped 0.05wt %)	Single crystal SrTiO ₃ doped with 0.05% Fe Size: 10 mm x 3 mm x 0.5mm Orientation: (100) $\pm 0.5^\circ$ Polish: one side polished. Surface roughness: < 5 Å
5.	Fe: SrTiO ₃ (100) 5x5x0.5mm, 1sp, (Fe doped 0.005 wt %)	Single crystal SrTiO ₃ doped with 0.005% Fe Size: 5 mm x 5 mm x 0.5mm Orientation: (100) $\pm 0.5^\circ$ Polish: one side polished. Surface roughness: < 5 Å
6.	Fe: SrTiO ₃ (111) 10x10x0.5mm, 1sp, (Fe doped 0.005 wt %)	Single crystal SrTiO ₃ doped with 0.005% Fe Size: 10 mm x 10 mm x 0.5mm Orientation: (111) $\pm 0.5^\circ$ Polish: one side polished. Surface roughness: < 5 Å
7.	Fe: SrTiO ₃ (111) 5x5x0.5mm, 1sp, (Fe doped 0.005 wt %)	Single crystal SrTiO ₃ doped with 0.005% Fe Size: 5 mm x 5 mm x 0.5mm Orientation: (111) $\pm 0.5^\circ$ Polish: one side polished. Surface roughness: < 5 Å

67. SrTiO₃: Bi-Crystal Substrates (100)

No.	Item	Description
1.	Bi-Crystal SrTiO ₃ Substrate, , 10x10x0.5 mm, 1sp, 45 Deg (100)	<p>SrTiO₃ Bi-Crystal substrate is made of two pieces oriented SrTiO₃ crystal. One grain boundary is formed under high temperature and pressure. It is excellent to make High T_c superconduct SQUID</p> <p><u>Specifications:</u> Substrate Size: 10x10x 0.5mm ± 0.05mm Face Orientation: (100) $\pm 0.3^\circ$ Edge orientation Indication: <001> $\pm 0.5^\circ$ Crystal Boundary: 36° ($\pm 0.5^\circ$) Polish: One side EPI polished by CMP . Surface Roughness: < 5 Å by AFM Pack: Packed in 100 grade plastic bag under 1000 class clean room.</p>

2.	Bi-Crystal SrTiO ₃ Substrate, (100) 4x4x0.5 mm, 1sp, 24 Deg	<p>SrTiO₃ Bi-Crystal substrate is made of two pieces oriented SrTiO₃ crystal. One grain boundary is formed under high temperature and pressure. It is excellent to make High T_c superconduct SQUID</p> <p><u>Specifications:</u> Substrate Size: 10x10x 0.5mm +/-0.05mm Face Orientation: (100) +/- 0.3° Edge orientation Indication: <001> +/-0.5° Crystal Boundary: 24° (+/-0.5°) Polish: One side EPI polished by CMP . Surface Roughness: < 5 A by AFM Pack: Packed in 100 grade plastic bag under 1000 class clean room.</p>
3.	Bi-Crystal SrTiO ₃ Substrate (100) 10x5x0.5 mm, 1sp, 24 Deg	<p>SrTiO₃ Bi-Crystal substrate is made of two pieces oriented SrTiO₃ crystal. One grain boundary is formed under high temperature and pressure. It is excellent to make High T_c superconduct SQUID</p> <p><u>Specifications:</u> Substrate Size: 10x10x 0.5mm +/-0.05mm Face Orientation: (100) +/- 0.3° Edge orientation Indication: <001> +/-0.5° Crystal Boundary: 24° (+/-0.5°) Polish: One side EPI polished by CMP . Surface Roughness: < 5 A by AFM Pack: Packed in 100 grade plastic bag under 1000 class clean room.</p>
4.	Bi-Crystal SrTiO ₃ Substrate, (100) 5x5x0.5 mm, 1sp, 30 Deg	<p>SrTiO₃ Bi-Crystal substrate is made of two pieces oriented SrTiO₃ crystal. One grain boundary is formed under high temperature and pressure. It is excellent to make High T_c superconduct SQUID</p> <p><u>Specifications:</u> Substrate Size: 10x10x 0.5mm +/-0.05mm Face Orientation: 100) +/- 0.3° Edge orientation Indication: <001> +/-0.5° Crystal Boundary: 24° (+/-0.5°) Polish: One side EPI polished by CMP . Surface Roughness: < 5 A by AFM Pack: Packed in 100 grade plastic bag under 1000 class clean room.</p>
5.	Bi-Crystal SrTiO ₃ Substrate,(100) 5x5x0.5 mm, 1sp, 24 Deg	<p>SrTiO₃ Bi-Crystal substrate is made of two pieces oriented SrTiO₃ crystal. One grain boundary is formed under high temperature and pressure. It is excellent to make High T_c superconduct SQUID</p> <p><u>Specifications:</u> Substrate Size: 10x10x 0.5mm +/-0.05mm Face Orientation: (100) +/- 0.3° Edge orientation Indication: <001> +/-0.5° Crystal Boundary: 24° (+/-0.5°) Polish: One side EPI polished by CMP . Surface Roughness: < 5 A by AFM Pack: Packed in 100 grade plastic bag under 1000 class clean room.</p>

6.	Bi-Crystal SrTiO ₃ Substrate (100) 5mm in dia. x0.5 mm, 1sp, 24 Deg	<p>SrTiO₃ Bi-Crystal substrate is made of two pieces oriented SrTiO₃ crystal. One grain boundary is formed under high temperature and pressure. It is excellent to make High T_c superconduct SQUID</p> <p><u>Specifications:</u> Substrate Size: 10x10x 0.5mm +/-0.05mm Face Orientation: (100) +/- 0.3° Edge orientation Indication: <001> +/-0.5° Crystal Boundary: 24° (+/-0.5°) Polish: One side EPI polished by CMP . Surface Roughness: < 5 Å by AFM Pack: Packed in 100 grade plastic bag under 1000 class clean room.</p>
7.	Bi-Crystal SrTiO ₃ Substrate (100) 10x10x0.5 mm, 1sp, 4 Deg	<p>SrTiO₃ Bi-Crystal substrate is made of two pieces oriented SrTiO₃ crystal. One grain boundary is formed under high temperature and pressure. It is excellent to make High T_c superconduct SQUID</p> <p><u>Specifications:</u> Substrate Size: 10x10x 0.5mm +/-0.05mm Face Orientation: (100) +/- 0.3° Edge orientation Indication: <001> +/-0.5° Crystal Boundary: 24° (+/-0.5°) Polish: One side EPI polished by CMP . Surface Roughness: < 5 Å by AFM Pack: Packed in 100 grade plastic bag under 1000 class clean room.</p>
8.	Bi-Crystal SrTiO ₃ Substrate (100) 10x10x1.0 mm, 1sp, 2 Deg	<p>SrTiO₃ Bi-Crystal substrate is made of two pieces oriented SrTiO₃ crystal. One grain boundary is formed under high temperature and pressure. It is excellent to make High T_c superconduct SQUID</p> <p><u>Specifications:</u> Substrate Size: 10x10x 0.5mm +/-0.05mm Face Orientation: (100) +/- 0.3° Edge orientation Indication: <001> +/-0.5° Crystal Boundary: 24° (+/-0.5°) Polish: One side EPI polished by CMP . Surface Roughness: < 5 Å by AFM Pack: Packed in 100 grade plastic bag under 1000 class clean room.</p>

68. TeO₂

No.	Item	Description
1.	TeO ₂ (110) 10x10x0.5mm, 1sp	<p>Single crystal TeO₂ Size: 10mm x 10mm x 0.5mm Orientation: (100), (110), (111) Polish: one side EPI polished. Surface Roughness: < 5 Å</p> <p><u>Typical Properties:</u> Crystal Structure: Tetragonal, a= 4.810 Å c=7.613 Å Melting point: 730 °C</p>

		<p>Density: 5.99 g / cc Hardness: 4.5 Mohs Photo-elastic Coeff. (632.8nm): P11=0.074, P13= 0340, P31= 0.091, P33=0.240 Refractive inde: $n_o = 2.18$ $n_e = 2.32$ A-O Figure of Merit: $M2\ 793 \times 10^{-18}$ S3/g Transparency range: 350 ~ 500 nm Transitivity: > 70% at 632.8 nm Gradient of refractive index: $< 5 \times 10^{-5}$ /cm Phase velocity: 616 m/s Crystalgrowth method: CZ and Bridgman</p>
2.	TeO ₂ (110) 10x10x0.5mm, 2sp	<p>Single crystal TeO₂ Size: 10mm x 10mm x 0.5mm Orientation: (110) Polish: two sides EPI polished. Surface Roughness: < 5A</p> <p><u>Typical Properties:</u> Crystal Structure: Tetragonal, $a = 4.810 \text{ \AA}$ $c = 7.613 \text{ \AA}$ Melting point: 730 °C Density: 5.99 g / cc Hardness: 4.5 Mohs Photo-elastic Coeff. (632.8nm): P11=0.074, P13= 0340, P31= 0.091, P33=0.240 Refractive inde: $n_o = 2.18$ $n_e = 2.32$ A-O Figure of Merit: $M2\ 793 \times 10^{-18}$ S3/g Transparency range: 350 ~ 500 nm Transitivity: > 70% at 632.8 nm Gradient of refractive index: $< 5 \times 10^{-5}$ /cm Phase velocity: 616 m/s Crystalgrowth method: CZ and Bridgman</p>
3.	TeO ₂ (110) 45x0.5mm, 2sp	<p>Single crystal TeO₂ Size: 45mm x 0.5mm Orientation: (110) Polish: two sides EPI polished. Surface Roughness: < 5A</p> <p><u>Typical Properties:</u> Crystal Structure: Tetragonal, $a = 4.810 \text{ \AA}$ $c = 7.613 \text{ \AA}$ Melting point: 730 °C Density: 5.99 g / cc Hardness: 4.5 Mohs Photo-elastic Coeff. (632.8nm): P11=0.074, P13= 0340, P31= 0.091, P33=0.240 Refractive inde: $n_o = 2.18$ $n_e = 2.32$ A-O Figure of Merit: $M2\ 793 \times 10^{-18}$ S3/g Transparency range: 350 ~ 500 nm Transitivity: > 70% at 632.8 nm Gradient of refractive index: $< 5 \times 10^{-5}$ /cm Phase velocity: 616 m/s Crystalgrowth method: CZ and Bridgman</p>

69. Ti - Titanium Substrate (Polycrystalline)

No.	Item	Description
1.	Titanium (Ti) Metallic Substrate: 1"x0.5 mm, 1side polished	Polycrystal Ti metallic substrate Purity: > 99.9% Density: 4.506 g/cm ³ Melting Point: 1668°C Size: 1" dia x 0.5 mm Surface finish (RMS or Ra): One side polished < 30A Application: substrates for metal, alloy film and biological materials
2.	Titanium (Ti) Metallic Substrate: 1"x1"x0.5 mm, 1side polished	Polycrystal Ti metallic substrate Purity: > 99.9% Density: 4.506 g/cm ³ Melting Point: 1668°C Size: 1"x1"x0.5 mm, Surface finish (RMS or Ra): One side polished < 30A Application: substrates for metal, alloy film and biological materials
3.	Titanium (Ti) Metallic Substrate: 10x10x0.5 mm, 1side polished	Polycrystal Ti metallic substrate Purity: > 99.9% Density: 4.506 g/cm ³ Melting Point: 1668°C Size: 10x10x0.4 mm Surface finish (RMS or Ra): One side polished < 30A Application: substrates for metal, alloy film and biological materials
4.	Titanium (Ti) Metallic Substrate: 10x5x0.5 mm, 1side polished	Polycrystal Ti metallic substrate Purity: > 99.9% Size: 10x5x0.5 mm Surface finish (RMS or Ra): One side polished < 30A Application: substrates for metal, alloy film and biological materials
5.	Titanium (Ti) Foil: 105mm Width x 0.1mm thick x 700 mm Length	Polycrystal Ti metallic Foil Purity: > 99.9% Size: 0.1mm thickness x 105 mm width x 700 mm Length Surface finish: as cold rolling < 50 A Packing: in vacuumed bag Application: substrates for new generation solar cell and fuel cell

70. TiO₂ substrates

A. TiO₂ substrate (111)

No.	Item	Description
1.	iO ₂ single crystal substrate (111) 10x10x0.5mm, 1sp	<p>Single crystal TiO₂ (Rutile) Size: 10mm x 10mm x 0.5mm Orientation: (111) Purity: >99.99% Polish: one side EPI polished.</p> <p>Rutile (TiO₂) single crystal is one of the most suitable materials for spectral prisms and polarizing devices such as optical isolators and beam displacers because it has a large birefringence with a high refractive index. Compared to YVO₄, TiO₂ crystal is more stable chemically and physically. Our high quality rutile single crystal boule and polished components have been widely used for optical isolators and special prisms.</p>
2.	TiO ₂ single crystal substrate (111) 10x10x0.5mm, 2sp	<p>Single crystal TiO₂ (Rutile) Size: 10mm x 10mm x 0.5mm Orientation: (111) Purity: >99.99% Polish: Two sides EPI polished.</p> <p>Rutile (TiO₂) single crystal is one of the most suitable materials for spectral prisms and polarizing devices such as optical isolators and beam displacers because it has a large birefringence with a high refractive index. Compared to YVO₄, TiO₂ crystal is more stable chemically and physically. Our high quality rutile single crystal boule and polished components have been widely used for optical isolators and special prisms.</p>

B. TiO₂ Substrates (011)

No.	Item	Description
1.	TiO ₂ (011) 10x10x0.5mm, 1sp	<p>Single crystal TiO₂ (Rutile) Size: 10mm x 10mm x 0.5mm Orientation: (011) +/- 0.5 degree Purity: >99.99% Polish: one side EPI polished.</p> <p>Rutile (TiO₂) single crystal is one of the most suitable materials for spectral prisms and polarizing devices such as optical isolators and beam displacers because it has a large birefringence with a high refractive index. Compared to YVO₄, TiO₂ crystal is more stable chemically and physically. Our high quality rutile single crystal boule and polished components have been widely used for optical isolators and special prisms.</p>

C. TiO₂ Substrates (001)

No.	Item	Description
1.	TiO ₂ (001) 10x10x1.0mm, 1sp	<p>Single crystal TiO₂ (Rutile) Size: 10mm x 10mm x 1.0mm Orientation: (001) Purity: >99.99% Polish: one side EPI polished.</p> <p>Rutile (TiO₂) single crystal is one of the most suitable materials for spectral prisms and polarizing devices such as optical isolators and beam displacers because it has a large birefringence with a high refractive index. Compared to YVO₄, TiO₂ crystal is more stable chemically and physically. Our high quality rutile single crystal boule and polished components have been widely used for optical isolators and special prisms.</p>
2.	TiO ₂ (001) 10x10x1.0mm, 2sp	<p>Single crystal TiO₂ (Rutile) Size: 10mm x 10mm x 1.0mm Orientation: (001) Purity: >99.99% Polish: two sides EPI polished.</p> <p>Rutile (TiO₂) single crystal is one of the most suitable materials for spectral prisms and polarizing devices such as optical isolators and beam displacers because it has a large birefringence with a high refractive index. Compared to YVO₄, TiO₂ crystal is more stable chemically and physically. Our high quality rutile single crystal boule and polished components have been widely used for optical isolators and special prisms.</p>
3.	TiO ₂ (001) 10x10x0.2mm, two side polished	<p>Single crystal TiO₂ (Rutile) Size: 10mm x 10mm x 0.2mm Orientation: (001) Purity: >99.99% Polish: Two sides EPI polished. Surface Roughness: < 5A</p> <p>Rutile (TiO₂) single crystal is one of the most suitable materials for spectral prisms and polarizing devices such as optical isolators and beam displacers because it has a large birefringence with a high refractive index. Compared to YVO₄, TiO₂ crystal is more stable chemically and physically. Our high quality rutile single crystal boule and polished components have been widely used for optical isolators and special prisms.</p>
4.	TiO ₂ (001) 5x5x0.5mm, 2sp	<p>Single crystal TiO₂ (Rutile) Size: 5mm x 5mm x 0.5mm Orientation: (001) Purity: >99.99% Polish: two sides EPI polished.</p> <p>Rutile (TiO₂) single crystal is one of the most suitable materials for spectral prisms and polarizing devices such as optical isolators and beam displacers because it has a large birefringence with a high refractive index.</p>

		Compared to YVO4, TiO2 crystal is more stable chemically and physically. Our high quality rutile single crystal boule and polished components have been widely used for optical isolators and special prisms.
5.	TiO2 Substrate (001) 5x5x0.5mm, 1sp	<p>Single crystal TiO2 (Rutile) Size: 5mm x 5mm x 0.5mm Orientation: (001) Purity: >99.99% Polish: one side EPI polished.</p> <p>Rutile (TiO2) single crystal is one of the most suitable materials for spectral prisms and polarizing devices such as optical isolators and beam displacers because it has a large birefringence with a high refractive index. Compared to YVO4, TiO2 crystal is more stable chemically and physically. Our high quality rutile single crystal boule and polished components have been widely used for optical isolators and special prisms.</p>
6.	TiO2 (001) 10x10x0.5mm, 1sp	<p>Single crystal TiO2 (Rutile) Size: 10mm x 10mm x 0.5mm Orientation: (001) Purity: >99.99% Polish: one side EPI polished. Surface Roughness: < 5A</p> <p>Rutile (TiO2) single crystal is one of the most suitable materials for spectral prisms and polarizing devices such as optical isolators and beam displacers because it has a large birefringence with a high refractive index. Compared to YVO4, TiO2 crystal is more stable chemically and physically. Our high quality rutile single crystal boule and polished components have been widely used for optical isolators and special prisms.</p>
7.	TiO2 (001) 10x10x0.5mm, 2sp	<p>Single crystal TiO2 (Rutile) Size: 10mm x 10mm x 0.5mm Orientation: (001) Purity: >99.99% Polish: two sides EPI polished.</p> <p>Rutile (TiO2) single crystal is one of the most suitable materials for spectral prisms and polarizing devices such as optical isolators and beam displacers because it has a large birefringence with a high refractive index. Compared to YVO4, TiO2 crystal is more stable chemically and physically. Our high quality rutile single crystal boule and polished components have been widely used for optical isolators and special prisms.</p>
8.	TiO2 (001) 10x5x0.5mm, 1sp	<p>Single crystal TiO2 (Rutile) Size: 10mm x 5mm x 0.5mm Orientation: (001) Purity: >99.99% Polish: one side EPI polished. Surface Roughness: < 5A</p> <p>Rutile (TiO2) single crystal is one of the most suitable materials for spectral prisms and polarizing devices such as optical isolators and beam</p>

		displacers because it has a large birefringence with a high refractive index. Compared to YVO4, TiO2 crystal is more stable chemically and physically. Our high quality rutile single crystal boule and polished components have been widely used for optical isolators and special prisms.
9.	TiO2 (001) 10x5x0.5mm, two side polished	<p>Single crystal TiO2 (Rutile) Size: 10mm x 5mm x 0.5mm Orientation: (001) Purity: >99.99% Polish: Two sides EPI polished. Surface Roughness: < 5A</p> <p>Rutile (TiO2) single crystal is one of the most suitable materials for spectral prisms and polarizing devices such as optical isolators and beam displacers because it has a large birefringence with a high refractive index. Compared to YVO4, TiO2 crystal is more stable chemically and physically. Our high quality rutile single crystal boule and polished components have been widely used for optical isolators and special prisms.</p>

D. TiO2 Substrates (100)

No.	Item	Description
1.	TiO2 (100) 5x5x0.5mm, 1sp	<p>Single crystal TiO2 (Rutile) Size: 5mm x 5mm x 0.5mm Orientation: (100) Purity: >99.99% Polish: one side EPI polished.</p> <p>Rutile (TiO2) single crystal is one of the most suitable materials for spectral prisms and polarizing devices such as optical isolators and beam displacers because it has a large birefringence with a high refractive index. Compared to YVO4, TiO2 crystal is more stable chemically and physically. Our high quality rutile single crystal boule and polished components have been widely used for optical isolators and special prisms.</p>
2.	TiO2 (100) 5x5x0.5mm, 2sp	<p>Single crystal TiO2 (Rutile) Size: 5mm x 5mm x 0.5mm Orientation: (100) Purity: >99.99% Polish: two sides EPI polished.</p> <p>Rutile (TiO2) single crystal is one of the most suitable materials for spectral prisms and polarizing devices such as optical isolators and beam displacers because it has a large birefringence with a high refractive index. Compared to YVO4, TiO2 crystal is more stable chemically and physically. Our high quality rutile single crystal boule and polished components have been widely used for optical isolators and special prisms.</p>
3.	TiO2 (100) 10x10x0.5mm, 1sp	<p>Single crystal TiO2 (Rutile) Size: 10mm x 10mm x 0.5mm</p>

		<p>Orientation: (100) Purity: >99.99% Polish: one side EPI polished.</p> <p>Rutile (TiO₂) single crystal is one of the most suitable materials for spectral prisms and polarizing devices such as optical isolators and beam displacers because it has a large birefringence with a high refractive index. Compared to YVO₄, TiO₂ crystal is more stable chemically and physically. Our high quality rutile single crystal boule and polished components have been widely used for optical isolators and special prisms.</p>
4.	TiO ₂ (100) 10x10x0.5mm, 2sp	<p>Single crystal TiO₂ (Rutile) Size: 10mm x 10mm x 0.5mm Orientation: (100) Purity: >99.99% Polish: two sides EPI polished.</p> <p>Rutile (TiO₂) single crystal is one of the most suitable materials for spectral prisms and polarizing devices such as optical isolators and beam displacers because it has a large birefringence with a high refractive index. Compared to YVO₄, TiO₂ crystal is more stable chemically and physically. Our high quality rutile single crystal boule and polished components have been widely used for optical isolators and special prisms.</p>
5.	TiO ₂ (100) 10x10x1.0mm, 1sp	<p>Single crystal TiO₂ (Rutile) Size: 10mm x 10mm x 1.0mm Orientation: (100) Polish: one side EPI polished.</p> <p>Rutile (TiO₂) single crystal is one of the most suitable materials for spectral prisms and polarizing devices such as optical isolators and beam displacers because it has a large birefringence with a high refractive index. Compared to YVO₄, TiO₂ crystal is more stable chemically and physically. Our high quality rutile single crystal boule and polished components have been widely used for optical isolators and special prisms.</p>
6.	TiO ₂ (100) 10x10x1.0mm, 2sp	<p>Single crystal TiO₂ (Rutile) Size: 10mm x 10mm x 1.0mm Orientation: (100) Polish: two sides EPI polished.</p> <p>Rutile (TiO₂) single crystal is one of the most suitable materials for spectral prisms and polarizing devices such as optical isolators and beam displacers because it has a large birefringence with a high refractive index. Compared to YVO₄, TiO₂ crystal is more stable chemically and physically. Our high quality rutile single crystal boule and polished components have been widely used for optical isolators and special prisms.</p>

E. TiO₂ substrates (101)

No.	Item	Description
1.	TiO ₂ (101) 10x10x0.5mm, 1 SP	<p>Single crystal TiO₂ (Rutile) Size: 10mm x 10mm x 0.5mm Orientation: (101) Polish: one sides EPI polished.</p> <p>Rutile (TiO₂) single crystal is one of the most suitable materials for spectral prisms and polarizing devices such as optical isolators and beam displacers because it has a large birefringence with a high refractive index. Compared to YVO₄, TiO₂ crystal is more stable chemically and physically. Our high quality rutile single crystal boule and polished components have been widely used for optical isolators and special prisms.</p>
2.	TiO ₂ (101) 10x10x0.5mm, 2 SP	<p>Single crystal TiO₂ (Rutile) Size: 10mm x 10mm x 0.5mm Orientation: (101) Polish: two sides EPI polished.</p> <p>Rutile (TiO₂) single crystal is one of the most suitable materials for spectral prisms and polarizing devices such as optical isolators and beam displacers because it has a large birefringence with a high refractive index. Compared to YVO₄, TiO₂ crystal is more stable chemically and physically. Our high quality rutile single crystal boule and polished components have been widely used for optical isolators and special prisms.</p>
3.	TiO ₂ (101) 10x10x1.0mm, 1 SP	<p>Single crystal TiO₂ (Rutile) Size: 10mm x 10mm x 1.0 mm Orientation: (101) +/- 0.5 degree Polish: one sides EPI polished.</p> <p>Rutile (TiO₂) single crystal is one of the most suitable materials for spectral prisms and polarizing devices such as optical isolators and beam displacers because it has a large birefringence with a high refractive index. Compared to YVO₄, TiO₂ crystal is more stable chemically and physically. Our high quality rutile single crystal boule and polished components have been widely used for optical isolators and special prisms.</p>
4.	TiO ₂ (101) 10x10x1.0mm, 2SP	<p>Single crystal TiO₂ (Rutile) Size: 10mm x 10mm x 1.0 mm Orientation: (101) +/- 0.5 degree Polish: two sides EPI polished.</p> <p>Rutile (TiO₂) single crystal is one of the most suitable materials for spectral prisms and polarizing devices such as optical isolators and beam displacers because it has a large birefringence with a high refractive index. Compared to YVO₄, TiO₂ crystal is more stable chemically and physically. Our high quality rutile single crystal boule and polished components have been widely used for optical isolators and special prisms.</p>

F. TiO₂ substrates (110)

No.	Item	Description
1.	TiO ₂ (110) 10x10x1.0mm, 1sp	<p>Single crystal TiO₂ (Rutile) Size: 10mm x 10mm x 1.0mm Orientation: (110) Purity: >99.99% Polish: one sides EPI polished.</p> <p>Rutile (TiO₂) single crystal is one of the most suitable materials for spectral prisms and polarizing devices such as optical isolators and beam displacers because it has a large birefringence with a high refractive index. Compared to YVO₄, TiO₂ crystal is more stable chemically and physically. Our high quality rutile single crystal boule and polished components have been widely used for optical isolators and special prisms.</p>
2.	TiO ₂ (110) 5x5x0.5mm, 1sp	<p>Single crystal TiO₂ (Rutile) Size: 5mm x 5mm x 0.5mma Orientation: (110) Purity: >99.99% Polish: one side EPI polished.</p> <p>Rutile (TiO₂) single crystal is one of the most suitable materials for spectral prisms and polarizing devices such as optical isolators and beam displacers because it has a large birefringence with a high refractive index. Compared to YVO₄, TiO₂ crystal is more stable chemically and physically. Our high quality rutile single crystal boule and polished components have been widely used for optical isolators and special prisms.</p>
3.	TiO ₂ (110) 5x5x0.5mm, 2sp	<p>Single crystal TiO₂ (Rutile) Size: 5mm x 5mm x 0.5mm Orientation: (110) Purity: >99.99% Polish: two sides EPI polished.</p> <p>Rutile (TiO₂) single crystal is one of the most suitable materials for spectral prisms and polarizing devices such as optical isolators and beam displacers because it has a large birefringence with a high refractive index. Compared to YVO₄, TiO₂ crystal is more stable chemically and physically. Our high quality rutile single crystal boule and polished components have been widely used for optical isolators and special prisms.</p>
4.	TiO ₂ (110) 10x10x0.5mm, 1sp	<p>Single crystal TiO₂ (Rutile) Size: 10mm x 10mm x 0.5mm Orientation: (110) Purity: >99.99% Polish: one side EPI polished.</p> <p>Rutile (TiO₂) single crystal is one of the most suitable materials for spectral prisms and polarizing devices such as optical isolators and beam</p>

		<p>displacers because it has a large birefringence with a high refractive index. Compared to YVO₄, TiO₂ crystal is more stable chemically and physically. Our high quality rutile single crystal boule and polished components have been widely used for optical isolators and special prisms.</p>
5.	TiO ₂ (110) 10x10x0.5mm, 2sp	<p>Single crystal TiO₂ (Rutile) Size: 10mm x 10mm x 0.5mm Orientation: (110) Purity: >99.99% Polish: two sides EPI polished.</p> <p>Rutile (TiO₂) single crystal is one of the most suitable materials for spectral prisms and polarizing devices such as optical isolators and beam displacers because it has a large birefringence with a high refractive index. Compared to YVO₄, TiO₂ crystal is more stable chemically and physically. Our high quality rutile single crystal boule and polished components have been widely used for optical isolators and special prisms.</p>
6.	TiO ₂ (110) 10x5x0.5mm, 1sp	<p>Single crystal TiO₂ (Rutile) Size: 10mm x 5mm x 0.5mm Orientation: (110) Purity:>99.99% Polish: one side EPI polished.</p> <p>Rutile (TiO₂) single crystal is one of the most suitable materials for spectral prisms and polarizing devices such as optical isolators and beam displacers because it has a large birefringence with a high refractive index. Compared to YVO₄, TiO₂ crystal is more stable chemically and physically. Our high quality rutile single crystal boule and polished components have been widely used for optical isolators and special prisms.</p>
7.	TiO ₂ (110) 10x5x0.5mm, 2sp	<p>Single crystal TiO₂ (Rutile) Size: 10mm x 5mm x 0.5mm Orientation: (110) Purity: >99.99% Polish: Two sides EPI polished.</p> <p>Rutile (TiO₂) single crystal is one of the most suitable materials for spectral prisms and polarizing devices such as optical isolators and beam displacer because it has a large birefringence with a high refractive index. Compared to YVO₄, TiO₂ crystal is more stable chemically and physically. Our high quality rutile single crystal boule and polished components have been widely used for optical isolators and special prisms.</p>
8.	TiO ₂ (110) 10x10x1.0mm, 2sp	<p>Single crystal TiO₂ (Rutile) Size: 10mm x 10mm x 1.0mm Orientation: (110) Purity: >99.99% Polish: two sides EPI polished.</p> <p>Rutile (TiO₂) single crystal is one of the most suitable materials for spectral prisms and polarizing devices such as optical isolators and beam displacers because it has a large birefringence with a high refractive index.</p>

		Compared to YVO ₄ , TiO ₂ crystal is more stable chemically and physically. Our high quality rutile single crystal boule and polished components have been widely used for optical isolators and special prisms.
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71. W - Tungsten Polycrystalline Metal Substrates

No.	Item	Description
1.	W Polycrystalline Substrate: 1"x1"x0.5 mm, two sides polished	Polycrystalline W (Tungston) substrate Average Grain Size: 10~50 Microns (No annealling) Substrate dimension: 1"x1"x0.5 mm Polishing: two sides as cool rolling Surface roughness(RMS or Ra) < 30A
2.	W Polycrystalline Substrate: 10 x 10 x 0.5 mm, two sides polished	Polycrystalline W (Tungston) substrate Average Grain Size: 10~50 Microns (No annealling) Substrate dimension: 10 x 10 x 0.5 mm Polishing: two sides Surface roughness(RMS or Ra) < 30A
3.	Ta - Tantalum Polycrystalline Metallic Foil: 0.05mm thick x 200mm Width x 400 mm Length	Polycrystal Ta metallic Foil Purity: 99.95% Size: 0.05mm thickness x 200 mm width x 400 mm Length Surface finish: as cold rolling < 50 A Packing: in vacuumed bag Application: Tantalum's main end uses are in capacitors, vacuum furnaces, chemical process equipment, nuclear reactors and aircraft parts.
4.	W - Tungsten Polycrystalline Metallic Foil: 125 mm Width x 0.1mm thick x 200 mm Length	Polycrystal W metallic Foil Purity: > 99.9% Size: 0.1mm thickness x 125 mm width x 200 mm Length Surface roughness(RMS or Ra): as cold rolling < 50 A Packing: in vacuumed bag Application: substrates for new generation solar cell and fuel cell

72. YAG(undoped ,Ce-doped,Nd-doped)

A. YAG (undoped)

No.	Item	Description
1.	YAG (100) 10x10x0.5mm, 1sp	Single crystal of YAG Size: 10mm x 10mm x 0.5mm Orientation: (100) Polish: one side polished Undoped YAG (Y ₃ Al ₅ O ₁₂) is a new substrate and window material for both UV and IR optics. It is particularly useful for high temperature and high-

		energy applications. YAG shows no trace absorption in 2-3micron region where glasses tend to be highly absorbent due to the strong H2O2 band. The YAG's mechanical and chemical stability is similar to sapphire, but YAG is no birefringence and has higher optical homogeneity.
2.	YAG (100) 10x10x0.5mm, 2sp	<p>Single crystal of YAG Size: 10mm x 10mm x 0.5mm Orientation: (100) Polish: two sides polished</p> <p>Undoped YAG (Y3Al5O12) is a new substrate and window material for both UV and IR optics. It is particularly useful for high temperature and high-energy applications. YAG shows no trace absorption in 2-3micron region where glasses tend to be highly absorbent due to the strong H2O2 band. The YAG's mechanical and chemical stability is similar to sapphire, but YAG is no birefringence and has higher optical homogeneity.</p>
3.	YAG (100) 10x10x1.0mm, 1sp	<p>Single crystal of YAG Size: 10mm x 10mm x 1.0mm Orientation: (100) Polish: one side polished</p> <p>Undoped YAG (Y3Al5O12) is a new substrate and window material for both UV and IR optics. It is particularly useful for high temperature and high-energy applications. YAG shows no trace absorption in 2-3micron region where glasses tend to be highly absorbent due to the strong H2O2 band. The YAG's mechanical and chemical stability is similar to sapphire, but YAG is no birefringence and has higher optical homogeneity.</p>
4.	YAG (111) 10x10x0.5mm, 1sp	<p>Single crystal of YAG Size: 10mm x 10mm x 0.5mm Orientation: (111) +/-0.5 ° Polish: one side polished Surface roughness: < 10 Å</p> <p>Undoped YAG (Y3Al5O12) is a new substrate and window material for both UV and IR optics. It is particularly useful for high temperature and high-energy applications. YAG shows no trace absorption in 2-3micron region where glasses tend to be highly absorbent due to the strong H2O2 band. The YAG's mechanical and chemical stability is similar to sapphire, but YAG is no birefringence and has higher optical homogeneity.</p>
5.	YAG (110) 10x10x0.5mm, 1sp	<p>Single crystal of YAG Size: 10mm x 10mm x 0.5mm Orientation: (110) +/-0.5 ° Polish: one side polished Surface roughness: < 10 Å</p> <p>Undoped YAG (Y3Al5O12) is a new substrate and window material for both UV and IR optics. It is particularly useful for high temperature and high-energy applications. YAG shows no trace absorption in 2-3micron region where glasses tend to be highly absorbent due to the strong H2O2 band.</p>

		The YAG's mechanical and chemical stability is similar to sapphire, but YAG is no birefringence and has higher optical homogeneity.
6.	YAG (110) 10x10x0.5mm, 2sp	<p>Single crystal of YAG Size: 10mm x 10mm x 0.5mm Orientation: (110) +/-0.5 ° Polish: Two sides polished Surface roughness: < 10 A</p> <p>Undoped YAG (Y3Al5O12) is a new substrate and window material for both UV and IR optics. It is particularly useful for high temperature and high-energy applications. YAG shows no trace absorption in 2-3micron region where glasses tend to be highly absorbent due to the strong H2O2 band. The YAG's mechanical and chemical stability is similar to sapphire, but YAG is no birefringence and has higher optical homogeneity.</p>
7.	YAG (100) 2" diax0.5mm, 1sp	<p>Single crystal of YAG Size: 2" dia. x 0.5mm Orientation: (100) +/-0.5 ° Polish: One side polished Surface roughness: < 10 A</p> <p>Undoped YAG (Y3Al5O12) is a new substrate and window material for both UV and IR optics. It is particularly useful for high temperature and high-energy applications. YAG shows no trace absorption in 2-3micron region where glasses tend to be highly absorbent due to the strong H2O2 band. The YAG's mechanical and chemical stability is similar to sapphire, but YAG is no birefringence and has higher optical homogeneity.</p>
8.	YAG (111) 2" diax0.5mm, 1sp	<p>Single crystal of YAG Size: 2" dia. x 0.5mm Orientation: (111) +/-0.5 ° Polish: One side polished Surface roughness: < 10 A</p> <p>Undoped YAG (Y3Al5O12) is a new substrate and window material for both UV and IR optics. It is particularly useful for high temperature and high-energy applications. YAG shows no trace absorption in 2-3micron region where glasses tend to be highly absorbent due to the strong H2O2 band. The YAG's mechanical and chemical stability is similar to sapphire, but YAG is no birefringence and has higher optical homogeneity.</p>

B. YAG: Ce doped

No.	Item	Description
1.	Ce:YAG substrate (111) 5 x 5 x 0.5 mm, 2sp	<p><u>Specifications:</u> Crystal: Ce: YAG (0.2% wt Ce doped) Size: 5 x 5 x 0.5mm +/-0.05mm Orientation: (111) +/-0.5 ° Polish: two sides optical polished.</p>

		Pack: Packed in 1000 class plastic bag
2.	Ce:YAG substrate (111) 10x10x 0.5 mm, 2sp	<u>Specifications:</u> Crystal: Ce: YAG (0.2% wt Ce doped) Size: 10 x 10 x 0.5mm +/-0.05mm Orientation: (111) +/-0.5° Polish: two sides optical polished. Pack: Packed in 1000 class plastic bag

C. YAG:Nd doped

No.	Item	Description
1.	Nd:YAG (wt.1.0%) substrate (111) 10x10x 0.5 mm, 2sp	<u>Specifications:</u> Crystal: Nd: YAG (1.0 % wt Nd doped) Size: 10 x 10 x 0.5mm +/-0.05mm Orientation: (111) +/-0.5° Polish: two sides optical polished. Pack: Packed in 1000 class plastic bag
2.	Nd:YAG substrate (100) 10x10x 1.0 mm, 2sp	<u>Specifications:</u> Crystal: Nd: YAG Size: 10 x 10 x 1.0mm +/-0.05mm Orientation: (100) +/-0.5° Polish: two sides optical polished. Pack: Packed in 1000 class plastic bag
3.	YAG Rod with 1.1atm% Nd , 4.0 D x 130 L (mm) with Coating - Premium grade	<u>Specifications:</u> Rod Geoetry Nd doped 1.04+/-0.12 atom % by formulation Diameter: 4 mm +/-0.03mm Length: 130 mm +/-0.5mm Angulation: <5' Surface form: <0.1 Lambda A/B face parallelism: < 10" Optioal Properties: WFD < 0.21 lambda Ext. Ration: (dB) >26 Barrel Finish: 0.8 - 1.6 microns Coating Ref. <0.15% Surface Finish: 10 - 5 Coating: AR @ 1064 nm at two ends Package: In plastic bag with foam insert case
4.	YAG Rod with 1.1atm% Nd , 5.0 D x 130 L (mm) with AR Coating - Premium grade	<u>Specifications:</u> Rod Geoetry Nd doped 1.04+/-0.12 atom % by formulation Diameter: 5 mm +/-0.03mm Length: 130 mm +/-0.5mm Angulation: <5' Surface form: <0.1 Lambda A/B face parallelism: < 10"

		<p>Optical Properties: WFD < 0.21 λ</p> <p>Ext. Ration: (dB) >26</p> <p>Barrel Finish: 0.8 - 1.6 microns</p> <p>Coating Ref. <0.15%</p> <p>Surface Finish: 10 - 5</p> <p>Coating: AR @ 1064 nm at two ends</p> <p>Package: In plastic bag with foam insert case</p>
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73. YAlO₃

A. YAlO₃ Nd-Doped

No.	Item	Description
1.	YAlO ₃ Nd-doped (100) 10x10x0.5mm, 1 side polished	<p>Single crystal: YAlO₃</p> <p>Substrate Size: Nd-doped 10mm x 10mm x 0.5mm</p> <p>Orientation: (100) $\pm 0.5^\circ$</p> <p>Polished: one side polished</p> <p>Surface Roughness: < 5A</p> <p>Packing: 1000 class clean room and bag</p>
2.	YAlO ₃ Nd-doped (100) 24x24x0.5mm, 2 side polished	<p>Single crystal: YAlO₃</p> <p>Substrate Size: Nd-doped, 24mm x 24mm x 0.5mm</p> <p>Orientation: (100) $\pm 0.5^\circ$</p> <p>Polished: two sides polished</p> <p>Surface Roughness: < 5A</p> <p>Packing: 1000 class clean room and bag</p>

B. YAlO₃ undoped

No.	Item	Description
1.	YAlO ₃ (100) 5x5x0.5mm, 1 side polished	<p>Single crystal: YAlO₃</p> <p>Substrate Size: 5mm x 5mm x 0.5mm</p> <p>Orientation: (100) $\pm 0.5^\circ$</p> <p>Polished: one side polished</p> <p>Surface Roughness: < 5A</p> <p>Packing: 1000 class clean room and bag</p>
2.	YAlO ₃ (110) 5x5x0.5mm, 1 side polished	<p>Single crystal: YAlO₃</p> <p>Substrate Size: 5mm x 5mm x 0.5mm</p> <p>Orientation: (110) $\pm 0.5^\circ$</p> <p>Polished: one side polished</p> <p>Surface Roughness: < 5A</p> <p>Packing: 1000 class clean room and bag</p>
3.	YAlO ₃ (001) 10x10x0.5mm, 1 side polished	<p>Single crystal: YAlO₃</p> <p>Substrate Size: 10mm x 10mm x 0.5mm</p>

		<p>Orientation: (001) $\pm 0.5^\circ$</p> <p>Polished: one side polished</p> <p>Surface Roughness: < 5A</p> <p>Packing: 1000 class clean room and bag</p>
4.	YAlO ₃ (001) 10x10x0.5mm, 2 side polished	<p>Single crystal: YAlO₃</p> <p>Substrate Size: 10mm x 10mm x 0.5mm</p> <p>Orientation: (001) $\pm 0.5^\circ$</p> <p>Polished: Two sides polished</p> <p>Surface Roughness: < 5A</p> <p>Packing: 1000 class clean room and bag</p>
5.	YAlO ₃ (100) 10x10x0.5mm, 1 side polished	<p>Single crystal: YAlO₃</p> <p>Substrate Size: 10mm x 10mm x 0.5mm</p> <p>Orientation: (100) $\pm 0.5^\circ$</p> <p>Polished: one side polished</p> <p>Surface Roughness: < 5A</p> <p>Packing: 1000 class clean room and bag</p>
6.	YAlO ₃ (100) 10x10x0.5mm, 2 sides polished	<p>Single crystal: YAlO₃</p> <p>Substrate Size: 10mm x 10mm x 0.5mm</p> <p>Orientation: (100) $\pm 0.5^\circ$</p> <p>Polished: two sides polished</p> <p>Surface Roughness: < 5A</p> <p>Packing: 1000 class clean room and bag</p>
7.	YAlO ₃ (100) 10x10x1.0mm, 1 side polished	<p>Single crystal: YAlO₃</p> <p>Substrate Size: 10mm x 10mm x 1.0mm</p> <p>Orientation: (100) $\pm 0.5^\circ$</p> <p>Polished: one side polished</p> <p>Surface Roughness: < 5A</p> <p>Packing: 1000 class clean room and bag</p>
8.	YAlO ₃ (110) 10x10x0.5mm, 1 side polished	<p>Single crystal: YAlO₃</p> <p>Substrate Size: 10mm x 10mm x 0.5mm</p> <p>Orientation: (110) $\pm 0.5^\circ$</p> <p>Polished: one side polished</p> <p>Surface Roughness: < 5A</p> <p>Packing: 1000 class clean room and bag</p>
9.	YAlO ₃ (110) 10x10x0.5mm, 2 sides polished	<p>Single crystal: YAlO₃</p> <p>Substrate Size: 10mm x 10mm x 0.5mm</p> <p>Orientation: (110) $\pm 0.5^\circ$</p> <p>Polished: two sides polished</p> <p>Surface Roughness: < 5A</p> <p>Packing: 1000 class clean room and bag</p>

74. YBCO Epi. Film on SrTiO3 or LaAlO3

No.	Item	Description
1.	One Side 100nm YBCO Film on Nb:SrTiO3 (wt.0.7%) 10x10x0.5 mm substrate	<p><u>Epitaxial YBCO HTS Thin Film on SrTiO3 substrate up to 30 mm</u></p> <p>MTI Corp joins with several research institutes around the world, to finally make high Tc superconducting epitaxial thin film commercially available at an affordable price. MTI supplies high quality double side epitaxial thin film up to 3" diameter on LaAlO3, LSAT, Al2O3 and SrTiO3 single crystal substrate by a unique technology.</p> <p>This will make YBCO thin film available at low cost. Researchers don't need to grow thin film any more, but concentrate their talent on HTSC film related devices, such as microwave filter for wireless and HTSC Squid.</p>
2.	One Side 100nm YBCO Film on SrTiO3(100) 10x10x0.5 mm substrate	<p><u>Epitaxial YBCO HTS Thin Film on SrTiO3 substrate up to 30 mm</u></p> <p>MTI Corp joins with several research institutes around the world, to finally make high Tc superconducting epitaxial thin film commercially available at an affordable price. MTI supplies high quality double side epitaxial thin film up to 3" diameter on LaAlO3, LSAT, Al2O3 and SrTiO3 single crystal substrate by a unique technology.</p> <p>This will make YBCO thin film available at low cost. Researchers don't need to grow thin film any more, but concentrate their talent on HTSC film related devices, such as microwave filter for wireless and HTSC Squid.</p>
3.	One Side 400nm YBCO Film on SrTiO3(100) 10x10x0.5 mm substrate	<p><u>Epitaxial YBCO HTS Thin Film on SrTiO3 substrate up to 30 mm in diameter</u></p> <p>MTI Corp joins with several research institutes around the world, to finally make high Tc superconducting epitaxial thin film commercially available at an affordable price. MTI supplies high quality double side epitaxial thin film up to 3" diameter on LaAlO3, LSAT, Al2O3 and SrTiO3 single crystal substrate by a unique technology.</p> <p>This will make YBCO thin film available at low cost. Researchers don't need to grow thin film any more, but concentrate their talent on HTSC film related devices, such as microwave filter for wireless and HTSC Squid.</p>
4.	YBCO Thin Film 100nm (one side) on LaAlO3, 10x10x0.5 mm	<p><u>Epitaxial YBCO HTS Thin Film Up to 3" (75 mm)</u></p> <p>MTI Corp joins with several research institutes around the world, to finally make high Tc superconducting epitaxial thin film commercially available at an affordable price. MTI supplies high quality double side epitaxial thin film up to 3" diameter on LaAlO3, LSAT, Al2O3 and SrTiO3 single crystal substrate by a unique technology.</p> <p>This will make YBCO thin film available at very low cost. Researchers don't need to grow thin film any more, but concentrate their talent on HTSC film related devices, such as microwave filter for wireless and HTSC Squid.</p>
5.	YBCO Thin Film 400nm (one side) on LaAlO3, 10x10x0.5 mm	<p><u>Epitaxial YBCO HTS Thin Film Up to 3" (75 mm)</u></p>

		<p>MTI Corp joins with several research institutes around the world, to finally make high Tc superconducting epitaxial thin film commercially available at an affordable price. MTI supplies high quality double side epitaxial thin film up to 3" diameter on LaAlO₃, LSAT, Al₂O₃ and SrTiO₃ single crystal substrate by a unique technology.</p> <p>This will make YBCO thin film available at very low cost. Researchers don't need to grow thin film any more, but concentrate their talent on HTSC film related devices, such as microwave filter for wireless and HTSC Squid.</p>
6.	YBCO Thin Film 500nm (Two sides) on LaAlO ₃ , 3" dia.x0.5 mm,2sp	<p><u>Epitaxial YBCO HTS Thin Film Up to 3" (75 mm)</u></p> <p>MTI Corp joins with several research institutes around the world, to finally make high Tc superconducting epitaxial thin film commercially available at an affordable price. MTI supplies high quality double side epitaxial thin film up to 3" diameter on LaAlO₃, LSAT, Al₂O₃ and SrTiO₃ single crystal substrate by a unique technology.</p> <p>This will make YBCO thin film available at very low cost. Researchers don't need to grow thin film any more, but concentrate their talent on HTSC film related devices, such as microwave filter for wireless and HTSC Squid.</p>
7.	YBCO Thin Film 500nm (Two sides) on LaAlO ₃ , 2" dia.x0.5 mm,2sp	<p>MTI Corp joins with several research institutes around the world, to finally make high Tc superconducting epitaxial thin film commercially available at an affordable price. MTI supplies high quality double side epitaxial thin film up to 3" diameter on LaAlO₃, LSAT, Al₂O₃ and SrTiO₃ single crystal substrate by a unique technology.</p> <p>This will make YBCO thin film available at very low cost. Researchers don't need to grow thin film any more, but concentrate their talent on HTSC film related devices, such as microwave filter for wireless and HTSC Squid.</p>
8.	YBCO Thin Film 500nm (two sides) on Al ₂ O ₃ (R-plane), 10x5x0.5 mm	<p><u>Epitaxial YBCO HTS Thin Film Up to 3" (75 mm)</u></p> <p>MTI Corp joins with several research institutes around the world, to finally make high Tc superconducting epitaxial thin film commercially available at an affordable price. MTI supplies high quality double side epitaxial thin film up to 3" diameter on LaAlO₃, LSAT, Al₂O₃ and SrTiO₃ single crystal substrate by a unique technology.</p> <p>This will make YBCO thin film available at very low cost. Researchers don't need to grow thin film any more, but concentrate their talent on HTSC film related devices, such as microwave filter for wireless and HTSC Squid.</p>
9.	YBCO Thin Film 500nm (two sides) on Al ₂ O ₃ (R-plane), 10x10x0.5 mm	<p><u>Epitaxial YBCO HTS Thin Film Up to 3" (75 mm)</u></p> <p>MTI Corp joins with several research institutes around the world, to finally make high Tc superconducting epitaxial thin film commercially available at an affordable price. MTI supplies high quality double side epitaxial thin film up to 3" diameter on LaAlO₃, LSAT, Al₂O₃ and SrTiO₃ single crystal substrate by a unique technology.</p>

		This will make YBCO thin film available at very low cost. Researchers don't need to grow thin film any more, but concentrate their talent on HTSC film related devices, such as microwave filter for wireless and HTSC Squid.
10.	YBCO Thin Film 500nm (Two sides) on MgO, 2" dia.x0.5 mm,2sp	MTI Corp joins with several research institutes around the world, to finally make high Tc superconducting epitaxial thin film commercially available at an affordable price. MTI supplies high quality double side epitaxial thin film up to 3" diameter on LaAlO ₃ , LSAT, Al ₂ O ₃ and SrTiO ₃ single crystal substrate by a unique technology. This will make YBCO thin film available at very low cost. Researchers don't need to grow thin film any more, but concentrate their talent on HTSC film related devices, such as microwave filter for wireless and HTSC Squid.

75. YSZ

A. YSZ Substrates (100)

i. Square YSZ (100) substrate

No.	Item	Description
1.	YSZ (100) 10x10 x0.3 mm Substrate , 1SP	<p>Single crystal YSZ Substrate Size: 10 x 10 x 0.3mm +/-0.05 mm Standard, and optional 1.0mm available Orientation: (100) +/-0.5 Deg Polish: polished by CMP technology . One side polished Surface roughness: < 5 Å by AFM Packing: The substrate is packed in 100 grade clean plastic bag under 1000 class clean room</p> <p><u>Typical Physical Properties:</u> Chemical Formula: Y₂O₃ stabilized ZrO₂, 8 %mole Y₂O₃ Crystal Structure: Cubic, Face Centered, CaF₂ type Unit Cell: a = 5.125 Å Density: 5.8 g / cc Purity: 99.99% Melting Point: 2500 °C Thermal Expansion Coeff. 10.3 ppm / °C Dielectric Constant: 27 Crystal Growth Technique: Flux Technique</p>
2.	YSZ (100) 10x10 x0.5 mm Substrate , 1SP	<p>Single crystal YSZ Substrate Size: 10 x 10 x 0.5mm +/-0.05 mm Standard, and optional 1.0mm available Orientation: (100) +/-0.5 Deg Polish: polished by CMP technology . One side polished Surface roughness: < 5 Å by AFM Packing: The substrate is packed in 100 grade clean plastic bag under 1000 class clean room</p> <p><u>Typical Physical Properties:</u> Chemical Formula: Y₂O₃ stabilized ZrO₂, 8 %mole Y₂O₃</p>

		<p>Crystal Structure: Cubic, Face Centered, CaF2 type Unit Cell : $a = 5.125 \text{ \AA}$ Density : 5.8 g / cc Purity: 99.99% Melting Point: 2500°C Thermal Expansion Coeff $10.3 \text{ ppm / }^\circ\text{C}$ Dielectric Constant: 27 Crystal Growth Technique: Flux Technique</p>
3.	YSZ (100) 10x10 x0.1 mm Extra Thin Substrate , 1SP	<p>Single crystal YSZ Substrate Size: $10 \times 10 \times 0.10 \text{ mm} \pm 0.005 \text{ mm}$ Standard, and optional 1.0mm available Orientation: (100) $\pm 0.5^\circ$ Deg Polish: polished by CMP technology. One side polished Surface roughness: $< 5 \text{ \AA}$ by AFM Packing: The substrate is packed in 100 grade clean plastic bag under 1000 class clean room</p> <p><u>Typical Physical Properties:</u> Chemical Formula: Y2O3 stabilized ZrO2, 8 %mole Y2O3 Crystal Structure: Cubic, Face Centered, CaF2 type Unit Cell : $a = 5.125 \text{ \AA}$ Density : 5.8 g / cc Purity: 99.99% Melting Point: 2500°C Thermal Expansion Coeff $10.3 \text{ ppm / }^\circ\text{C}$ Dielectric Constant: 27 Crystal Growth Technique: Flux Technique</p>
4.	YSZ (100) 10x10 x0.1 mm Extra Thin Substrate , 2SP	<p>Single crystal YSZ Substrate Size: $10 \times 10 \times 0.10 \text{ mm} \pm 0.005 \text{ mm}$ Standard, and optional 1.0mm available Orientation: (100) $\pm 0.5^\circ$ Deg Polish: polished by CMP technology . Two sides polished Surface roughness: $< 5 \text{ \AA}$ by AFM Packing: The substrate is packed in 100 grade clean plastic bag under 1000 class clean room</p> <p><u>Typical Physical Properties:</u> Chemical Formula: Y2O3 stabilized ZrO2, 8 %mole Y2O3 Crystal Structure: Cubic, Face Centered, CaF2 type Unit Cell : $a = 5.125 \text{ \AA}$ Density : 5.8 g / cc Purity: 99.99% Melting Point: 2500°C Thermal Expansion Coeff $10.3 \text{ ppm / }^\circ\text{C}$ Dielectric Constant: 27 Crystal Growth Technique: Flux Technique</p>
5.	YSZ (100) 10x5x 0.5mm , 1SP	<p>Single crystal YSZ Substrate Size: $10 \times 5 \times 0.5 \text{ mm} \pm 0.05 \text{ mm}$ Orientation: (100) $\pm 0.5^\circ$ Polish: polished by CMP technology . One side polished (1SP)</p>

		<p>Surface roughness: < 5 Å by AFM Packing: The substrate is packed in 100 grade clean plastic bag under 1000 class clean room</p> <p><u>Typical Physical Properties:</u> Chemical Formula: Y₂O₃ stabilized ZrO₂, 8 %mole Y₂O₃ Crystal Structure: Cubic, Face Centered, CaF₂ type Unit Cell: a = 5.125 Å Density: 5.8 g / cc Purity: 99.99% Melting Point: 2500 °C Thermal Expansion Coeff 10.3 ppm / °C Dielectric Constant: 27 Crystal Growth Technique: Flux Technique</p>
6.	YSZ (100) 10x5x 0.5mm , 2SP	<p>Single crystal YSZ Substrate Size: 10x5 x 0.5mm +/-0.05 mm Orientation: (100) +/-0.5° Polish: polished by CMP technology. Two sides polished (1SP) Surface roughness: < 5 Å by AFM Packing: The substrate is packed in 100 grade clean plastic bag under 1000 class clean room</p> <p><u>Typical Physical Properties:</u> Chemical Formula: Y₂O₃ stabilized ZrO₂, 8 %mole Y₂O₃ Crystal Structure: Cubic, Face Centered, CaF₂ type Unit Cell: a = 5.125 Å Density: 5.8 g / cc Purity: 99.99% Melting Point: 2500 °C Thermal Expansion Coeff 10.3 ppm / °C Dielectric Constant: 27 Crystal Growth Technique: Flux Technique</p>
7.	YSZ (100) 5x5x 0.5mm , 1SP	<p>Single crystal YSZ Substrate Size: 5x5 x 0.5mm +/-0.05 mm Orientation: (100) +/-0.5° Polish: polished by CMP technology . One side polished (1SP) Surface roughness: < 5 Å by AFM Packing: The substrate is packed in 100 grade clean plastic bag under 1000 class clean room</p> <p><u>Typical Physical Properties:</u> Chemical Formula: Y₂O₃ stabilized ZrO₂, 8 %mole Y₂O₃ Crystal Structure: Cubic, Face Centered, CaF₂ type Unit Cell: a = 5.125 Å Density: 5.8 g / cc Purity: 99.99% Melting Point: 2500 °C Thermal Expansion Coeff 10.3 ppm / °C Dielectric Constant: 27 Crystal Growth Technique: Flux Technique</p>

8.	YSZ (100) 5x5x 0.5mm , 2SP	<p>Single crystal YSZ Substrate Size: 5x5 x 0.5mm +/-0.05 mm Orientation: (100) +/-0.5° Polish: polished by CMP technology . Two sides polished (2SP) Surface roughness: < 5 Å by AFM Packing: The substrate is packed in 100 grade clean plastic bag under 1000 class clean room</p> <p><u>Typical Physical Properties:</u> Chemical Formula: Y2O3 stabilized ZrO2, 8 %mole Y2O3 Crystal Structure: Cubic, Face Centered, CaF2 type Unit Cell : a = 5.125 Å Density : 5.8 g / cc Purity: 99.99% Melting Point: 2500 °C Thermal Expansion Coeff 10.3 ppm / °C Dielectric Constant: 27 Crystal Growth Technique: Flux Technique</p>
9.	YSZ (100) 5x5x 1.0mm , 1SP	<p>Single crystal YSZ Substrate Size: 5x5 x 1.0 mm +/-0.05 mm Orientation: (100) +/-0.5° Polish: polished by CMP technology . One side polished (1SP) Surface roughness: < 5 Å by AFM Packing: The substrate is packed in 100 grade clean plastic bag under 1000 class clean room</p> <p><u>Typical Physical Properties:</u> Chemical Formula: Y2O3 stabilized ZrO2, 8 %mole Y2O3 Crystal Structure: Cubic, Face Centered, CaF2 type Unit Cell : a = 5.125 Å Density : 5.8 g / cc Purity: 99.99% Melting Point: 2500 °C Thermal Expansion Coeff 10.3 ppm / °C Dielectric Constant: 27 Crystal Growth Technique: Flux Technique</p>
10.	YSZ (100) 5x5x 2.0mm , 2SP	<p>Single crystal YSZ Substrate Size: 5x5 x 2.0mm +/-0.05 mm Orientation: (100) +/-0.5° Polish: polished by CMP technology . Two sides polished (2SP) Surface roughness: < 5 Å by AFM Packing: The substrate is packed in 100 grade clean plastic bag under 1000 class clean room</p> <p><u>Typical Physical Properties:</u> Chemical Formula: Y2O3 stabilized ZrO2, 8 %mole Y2O3 Crystal Structure: Cubic, Face Centered, CaF2 type Unit Cell: a = 5.125 Å Density: 5.8 g / cc Purity: 99.99% Melting Point: 2500 °C</p>

		<p>Thermal Expansion Coeff 10.3 ppm / °C Dielectric Constant: 27 Crystal Growth Technique: Flux Technique</p>
11.	YSZ (100) 10x10x0.5 mm Substrate , 2SP	<p>Single crystal YSZ Substrate Size: 10 x 10 x 0.5mm +/-0.05 mm Standard, and optional 1.0mm available Orientation: (100) +/-0.5 Deg Polish: polished by CMP technology . Two sides polished Surface roughness: < 5 Å by AFM Packing: The substrate is packed in 100 grade clean plastic bag under 1000 class clean room</p> <p><u>Typical Physical Properties:</u> Chemical Formula: Y2O3 stabilized ZrO2, 8 %mole Y2O3 Crystal Structure: Cubic, Face Centered, CaF2 type Unit Cell: a = 5.125 Å Density: 5.8 g / cc Purity: 99.99% Melting Point: 2500 °C Thermal Expansion Coeff 10.3 ppm / °C Dielectric Constant: 27 Crystal Growth Technique: Flux Technique</p>
12.	YSZ (100) 10x10x 1.0 mm Substrate , 1SP	<p>Single crystal YSZ Substrate Size: 10 x 10 x 1.0 mm +/-0.05 mm Standard, and optional 1.0mm available Orientation: (100) +/-0.5 Deg Polish: polished by CMP technology . One side polished Surface roughness: < 5 Å by AFM Packing: The substrate is packed in 100 grade clean plastic bag under 1000 class clean room</p> <p><u>Typical Physical Properties:</u> Chemical Formula: Y2O3 stabilized ZrO2, 8 %mole Y2O3 Crystal Structure: Cubic, Face Centered, CaF2 type Unit Cell: a = 5.125 Å Density: 5.8 g / cc Purity: 99.99% Melting Point: 2500 °C Thermal Expansion Coeff 10.3 ppm / °C Dielectric Constant: 27 Crystal Growth Technique: Flux Technique</p>
13.	YSZ (100) 10x10x 1.0 mm Substrate , 2SP	<p>Single crystal YSZ Substrate Size: 10 x 10 x 1.0 mm +/-0.05 mm Standard, and optional 1.0mm available Orientation: (100) +/-0.5 Deg Polish: polished by CMP technology . Two sides polished Surface roughness: < 5 Å by AFM Packing: The substrate is packed in 100 grade clean plastic bag under 1000 class clean room</p> <p><u>Typical Physical Properties:</u> Chemical Formula: Y2O3 stabilized ZrO2, 8 %mole Y2O3 Crystal Structure: Cubic, Face Centered, CaF2 type</p>

		Unit Cell: $a = 5.125 \text{ \AA}$ Density: 5.8 g / cc Purity: 99.99% Melting Point: 2500°C Thermal Expansion Coeff $10.3 \text{ ppm / }^\circ\text{C}$ Dielectric Constant: 27 Crystal Growth Technique: Flux Technique
14.	YSZ (100) 0.5"x0.5" x 0.5mm , 1SP	Single crystal YSZ Substrate Size: 0.5"x0.5". x 0.5mm +/-0.05 mm Orientation: (100) +/-0.5 Deg Polish: polished by CMP technology. One side polished Surface roughness: $< 5 \text{ \AA}$ by AFM Packing: The substrate is packed in 100 grade clean plastic bag under 1000 class clean room <u>Typical Physical Properties:</u> Chemical Formula: Y2O3 stabilized ZrO2, 8 %mole Y2O3 Crystal Structure: Cubic, Face Centered, CaF2 type Unit Cell: $a = 5.125 \text{ \AA}$ Density: 5.8 g / cc Purity: 99.99% Melting Point: 2500°C Thermal Expansion Coeff $10.3 \text{ ppm / }^\circ\text{C}$ Dielectric Constant: 27 Crystal Growth Technique: Flux Technique
15.	YSZ (100) 0.5"x0.5" x 0.5mm , 2SP	Single crystal YSZ Substrate Size: 0.5"x0.5". x 0.5mm +/-0.05 mm Orientation: (100) +/-0.5 Deg Polish: polished by CMP technology . Two sides polished Surface roughness: $< 5 \text{ \AA}$ by AFM Packing: The substrate is packed in 100 grade clean plastic bag under 1000 class clean room <u>Typical Physical Properties:</u> Chemical Formula: Y2O3 stabilized ZrO2, 8 %mole Y2O3 Crystal Structure: Cubic, Face Centered, CaF2 type Unit Cell: $a = 5.125 \text{ \AA}$ Density : 5.8 g / cc Purity: 99.99% Melting Point: 2500°C Thermal Expansion Coeff $10.3 \text{ ppm / }^\circ\text{C}$ Dielectric Constant: 27 Crystal Growth Technique: Flux Technique
16.	YSZ (100) 1" x 1" x 1.0mm , 2SP	Single crystal YSZ Substrate Size: 1"x1" x 1.0mm +/-0.05 mm Orientation: (100) +/-0.5 Deg Polish: polished by CMP technology. Two sides polished Surface roughness: $< 5 \text{ \AA}$ by AFM Packing: The substrate is packed in 100 grade clean plastic bag under 1000 class clean room

		<p><u>Typical Physical Properties:</u> Chemical Formula: Y2O3 stabilized ZrO2, 8 %mole Y2O3 Crystal Structure: Cubic, Face Centered, CaF2 type Unit Cell: a = 5.125Å Density : 5.8 g / cc Purity: 99.99% Melting Point: 2500 °C Thermal Expansion Coeff 10.3 ppm / °C Dielectric Constant: 27 Crystal Growth Technique: Flux Technique</p>
17.	YSZ (100) 1"x1" x 0.5mm , 1SP	<p>Single crystal YSZ Substrate Size: 1"x1" x 0.5mm +/-0.05 mm Orientation: (100) +/-0.5 Deg Polish: polished by CMP technology. One side polished Surface roughness: < 5 Å by AFM Packing: The substrate is packed in 100 grade clean plastic bag under 1000 class clean room</p> <p><u>Typical Physical Properties:</u> Chemical Formula: Y2O3 stabilized ZrO2, 8 %mole Y2O3 Crystal Structure: Cubic, Face Centered, CaF2 type Unit Cell: a = 5.125Å Density: 5.8 g / cc Purity: 99.99% Melting Point: 2500 °C Thermal Expansion Coeff 10.3 ppm / °C Dielectric Constant: 27 Crystal Growth Technique: Flux Technique</p>
18.	YSZ (100) 1"x1" x 0.5mm , 2SP	<p>Single crystal YSZ Substrate Size: 1"x1" x 0.5mm +/-0.05 mm Orientation: (100) +/-0.5 Deg Polish: polished by CMP technology. two sides polished Surface roughness: < 5 Å by AFM Packing: The substrate is packed in 100 grade clean plastic bag under 1000 class clean room</p> <p><u>Typical Physical Properties:</u> Chemical Formula: Y2O3 stabilized ZrO2, 8 %mole Y2O3 Crystal Structure: Cubic, Face Centered, CaF2 type Unit Cell: a = 5.125Å Density: 5.8 g / cc Purity: 99.99% Melting Point: 2500 °C Thermal Expansion Coeff 10.3 ppm / °C Dielectric Constant: 27 Crystal Growth Technique: Flux Technique</p>
19.	YSZ (100) 50 x50 x 0.5mm , 1SP	<p>Single crystal YSZ Substrate Size: 50 x50 x 0.5mm +/-0.05 mm Orientation: (100) +/-0.5 Deg Polish: polished by CMP technology . One side polished</p>

		<p>Surface roughness: < 5 Å by AFM Packing: The substrate is packed in 100 grade clean plastic bag under 1000 class clean room</p> <p><u>Typical Physical Properties:</u> Chemical Formula: Y2O3 stabilized ZrO2, 8 %mole Y2O3 Crystal Structure: Cubic, Face Centered, CaF2 type Unit Cell: a = 5.125 Å Density: 5.8 g / cc Purity: 99.99% Melting Point: 2500 °C Thermal Expansion Coeff 10.3 ppm / °C Dielectric Constant: 27 Crystal Growth Technique: Flux Technique</p>
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ii. Round YSZ (100) wafer

No.	Item	Description
1.	YSZ (100) 1" dia x 0.5mm, 1sp	<p>Single crystal YSZ Substrate Size: 1" dia. x 0.5mm +/-0.05 mm Orientation: (100) +/-0.5 Deg Polish: polished by CMP technology. One side polished Surface roughness: < 5 Å by AFM Packing: The substrate is packed in 100 grade clean plastic bag under 1000 class clean room</p> <p><u>Typical Physical Properties:</u> Chemical Formula: Y2O3 stabilized ZrO2, 8 %mole Y2O3 Crystal Structure: Cubic, Face Centered, CaF2 type Unit Cell: a = 5.125 Å Density: 5.8 g / cc Purity: 99.99% Melting Point: 2500 °C Thermal Expansion Coeff 10.3 ppm / °C Dielectric Constant: 27 Crystal Growth Technique: Flux Technique</p>
2.	YSZ (100) 1" dia x 0.5mm, 2sp	<p>Single crystal YSZ Substrate Size: 1" dia. x 0.5mm +/-0.05 mm Orientation: (100) +/-0.5 Deg Polish: polished by CMP technology. Two sides polished Surface roughness: < 5 Å by AFM Packing: The substrate is packed in 100 grade clean plastic bag under 1000 class clean room</p> <p><u>Typical Physical Properties:</u> Chemical Formula: Y2O3 stabilized ZrO2, 8 %mole Y2O3 Crystal Structure: Cubic, Face Centered, CaF2 type Unit Cell: a = 5.125 Å Density: 5.8 g / cc Purity: 99.99% Melting Point: 2500 oC</p>

		<p>Thermal Expansion Coeff 10.3 ppm / °C Dielectric Constant: 27 Crystal Growth Technique: Flux Technique</p>
3.	YSZ (100) 10 mm dia x 0.5mm, 2SP	<p>Single crystal YSZ Substrate Size: 10mm dia. x 0.5mm +/-0.05 mm Orientation: (100) +/-0.5 Deg Polish: polished by CMP technology. Two sides polished Surface roughness: < 5 Å by AFM Packing: The substrate is packed in 100 grade clean plastic bag under 1000 class clean room</p> <p><u>Typical Physical Properties:</u> Chemical Formula: Y2O3 stabilized ZrO2, 8 %mole Y2O3 Crystal Structure: Cubic, Face Centered, CaF2 type Unit Cell: a = 5.125 Å Density: 5.8 g / cc Purity: 99.99% Melting Point: 2500 °C Thermal Expansion Coeff 10.3 ppm / °C Dielectric Constant: 27 Crystal Growth Technique: Flux Technique</p>
4.	YSZ (100) 8 mm dia x 0.5mm, 2SP	<p>Single crystal YSZ Substrate Size: 8 mm dia. x 0.5mm +/-0.05 mm Orientation: (100) +/-0.5 Deg Polish: polished by CMP technology . Two sides polished Surface roughness: < 5 Å by AFM Packing: The substrate is packed in 100 grade clean plastic bag under 1000 class clean room</p> <p><u>Typical Physical Properties:</u> Chemical Formula: Y2O3 stabilized ZrO2, 8 %mole Y2O3 Crystal Structure: Cubic, Face Centered, CaF2 type Unit Cell: a = 5.125 Å Density: 5.8 g / cc Purity: 99.99% Melting Point: 2500 °C Thermal Expansion Coeff 10.3 ppm / °C Dielectric Constant: 27 Crystal Growth Technique: Flux Technique</p>
5.	YSZ (100) 2" dia x 0.5mm, 1SP	<p>Single crystal YSZ Substrate Size: 2" dia. x 0.5mm +/-0.05 mm Orientation: (100) +/-0.5 Deg Polish: polished by CMP technology . one side polished Surface roughness: < 5 Å by AFM Packing: The substrate is packed in 100 grade clean plastic bag under 1000 class clean room</p> <p><u>Typical Physical Properties:</u> Chemical Formula: Y2O3 stabilized ZrO2, 8 %mole Y2O3 Crystal Structure: Cubic, Face Centered, CaF2 type Unit Cell: a = 5.125Å</p>

		Density: 5.8 g / cc Purity: 99.99% Melting Point: 2500 °C Thermal Expansion Coeff 10.3 ppm / °C Dielectric Constant: 27 Crystal Growth Technique: Flux Technique
6.	YSZ (100) 2" dia x 0.5mm, 2SP	Single crystal YSZ Substrate Size: 2" dia. x 0.5mm +/-0.05 mm Orientation: (100) +/-0.5 Deg Polish: polished by CMP technology. Two sides polished Surface roughness: < 5 Å by AFM Packing: The substrate is packed in 100 grade clean plastic bag under 1000 class clean room <u>Typical Physical Properties:</u> Chemical Formula: Y2O3 stabilized ZrO2, 8 %mole Y2O3 Crystal Structure: Cubic, Face Centered, CaF2 type Unit Cell: a = 5.125 Å Density: 5.8 g / cc Purity: 99.99% Melting Point: 2500 °C Thermal Expansion Coeff 10.3 ppm / °C Dielectric Constant: 27 Crystal Growth Technique: Flux Technique
7.	YSZ (100) 0.5" dia x 0.5mm, 1SP	Single crystal YSZ Substrate Size: 0.5" dia. x 0.5mm +/-0.05 mm Orientation: (100) +/-0.5 Deg Polish: polished by CMP technology . one side polished Surface roughness: < 5 Å by AFM Packing: The substrate is packed in 100 grade clean plastic bag under 1000 class clean room <u>Typical Physical Properties:</u> Chemical Formula: Y2O3 stabilized ZrO2, 8 %mole Y2O3 Crystal Structure: Cubic, Face Centered, CaF2 type Unit Cell: a = 5.125 Å Density: 5.8 g / cc Purity: 99.99% Melting Point: 2500 °C Thermal Expansion Coeff 10.3 ppm / °C Dielectric Constant: 27 Crystal Growth Technique: Flux Technique

B. YSZ Substrate (110)

No.	Item	Description
1.	Single crystal YSZ (110), 0.5"x 0.5"x0.5mm , 1 side polished	Single crystal YSZ Substrate Size: 0.5"x0.5"x 0.5mm +/-0.05 mm Orientation: (110) +/-0.5 Deg

		<p>Polish: polished by CMP technology. one side polished Surface roughness: < 5 Å by AFM Packing: The substrate is packed in 100 grade clean plastic bag under 1000 class clean room</p> <p><u>Typical Physical Properties:</u> Chemical Formula: Y2O3 stabilized ZrO2, 8 %mole Y2O3 Crystal Structure: Cubic, Face Centered, CaF2 type Unit Cell: a = 5.125 Å Density : 5.8 g / cc Purity: 99.99% Melting Point: 2500 °C Thermal Expansion Coeff 10.3 ppm / °C Dielectric Constant: 27 Crystal Growth Technique: Flux Technique</p>
2.	Single crystal YSZ (110), 0.5"x 0.5"x0.5mm , 2 side polished	<p>Single crystal YSZ Substrate Size: 0.5"x0.5"x 0.5mm +/-0.05 mm Orientation: (110) +/-0.5 Deg Polish: polished by CMP technology. Two sides polished Surface roughness: < 5 Å by AFM Packing: The substrate is packed in 100 grade clean plastic bag under 1000 class clean room</p> <p><u>Typical Physical Properties:</u> Chemical Formula: Y2O3 stabilized ZrO2, 8 %mole Y2O3 Crystal Structure: Cubic, Face Centered, CaF2 type Unit Cell: a = 5.125 Å Density: 5.8 g / cc Purity: 99.99% Melting Point: 2500 °C Thermal Expansion Coeff 10.3 ppm / °C Dielectric Constant: 27 Crystal Growth Technique: Flux Technique</p>
3.	Single crystal YSZ (110), 10x10x 0.5mm , 1 side polished	<p>Single crystal YSZ Substrate Size: 10x10 x 0.5mm +/-0.05 mm Orientation: (110) +/-0.5 Deg Polish: polished by CMP technology . one side polished Surface roughness: < 5 Å by AFM Packing: The substrate is packed in 100 grade clean plastic bag under 1000 class clean room</p> <p><u>Typical Physical Properties:</u> Chemical Formula: Y2O3 stabilized ZrO2, 8 %mole Y2O3 Crystal Structure: Cubic, Face Centered, CaF2 type Unit Cell: a = 5.125 Å Density: 5.8 g / cc Purity: 99.99% Melting Point: 2500 °C Thermal Expansion Coeff 10.3 ppm / °C Dielectric Constant: 27 Crystal Growth Technique: Flux Technique</p>

4.	Single crystal YSZ (110), 10x10x 0.5mm , 2 side polished	<p>Single crystal YSZ Substrate Size: 10x10 x 0.5mm +/-0.05 mm Orientation: (110) +/-0.5 Deg Polish: polished by CMP technology. Two sides polished Surface roughness: < 5 Å by AFM Packing: The substrate is packed in 100 grade clean plastic bag under 1000 class clean room</p> <p><u>Typical Physical Properties:</u> Chemical Formula: Y2O3 stabilized ZrO2, 8 %mole Y2O3 Crystal Structure: Cubic, Face Centered, CaF2 type Unit Cell: a = 5.125 Å Density: 5.8 g / cc Purity: 99.99% Melting Point: 2500 °C Thermal Expansion Coeff 10.3 ppm / °C Dielectric Constant: 27 Crystal Growth Technique: Flux Technique</p>
5.	YSZ (110) 5x5x 0.5mm Square wafer with one side polished, 1sp	<p>Single crystal YSZ Substrate Size: 5x5 x 0.5mm +/-0.05 mm Orientation: (110) +/-0.5 Deg Polish: one side polished Surface roughness: < 5 Å by AFM Packing: The substrate is packed in 100 grade clean plastic bag under 1000 class clean room</p> <p><u>Typical Physical Properties:</u> Chemical Formula: Y2O3 stabilized ZrO2, 8 %mole Y2O3 Crystal Structure: Cubic, Face Centered, CaF2 type Unit Cell: a = 5.125 Å Density : 5.8 g / cc Purity: 99.99% Melting Point: 2500 °C Thermal Expansion Coeff 10.3 ppm / °C Dielectric Constant: 27 Crystal Growth Technique: Flux Technique</p>
6.	YSZ (110) 5x5x 0.5mm Square wafer with one side polished, 2sp	<p>Single crystal YSZ Substrate Size: 5x5 x 0.5mm +/-0.05 mm Orientation: (110) +/-0.5 Deg Polish: Two sides polished Surface roughness: < 5 Å by AFM Packing: The substrate is packed in 100 grade clean plastic bag under 1000 class clean room</p> <p><u>Typical Physical Properties:</u> Chemical Formula: Y2O3 stabilized ZrO2, 8 %mole Y2O3 Crystal Structure: Cubic, Face Centered, CaF2 type Unit Cell: a = 5.125 Å Density: 5.8 g / cc Purity: 99.99% Melting Point: 2500 °C</p>

		Thermal Expansion Coeff 10.3 ppm / °C Dielectric Constant: 27 Crystal Growth Technique: Flux Technique
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C. YSZ substrates (111)

No.	Item	Description
1.	YSZ (111) 5x5x 0.5mm Square wafer 1 side polished	<p>Single crystal YSZ Substrate Size: 5x5 x 0.5mm +/-0.05 mm Orientation: (111) +/-0.5 Deg Polish: polished by CMP technology. one side polished Surface roughness: < 5 Å by AFM Packing: The substrate is packed in 100 grade clean plastic bag under 1000 class clean room</p> <p><u>Typical Physical Properties:</u> Chemical Formula: Y2O3 stabilized ZrO2, 8 %mole Y2O3 Crystal Structure: Cubic, Face Centered, CaF2 type Unit Cell: a = 5.125 Å Density: 5.8 g / cc Purity: 99.99% Melting Point: 2500 °C Thermal Expansion Coeff 10.3 ppm / °C Dielectric Constant: 27 Crystal Growth Technique: Flux Technique</p>
2.	YSZ (111) 1" dia x 0.5mm, 1sp	<p>Single crystal YSZ Substrate Size: 1" dia. x 0.5mm +/-0.05 mm Orientation: (111) +/-0.5 Deg Polish: polished by CMP technology . One side polished Surface roughness: < 5 Å by AFM Packing: The substrate is packed in 100 grade clean plastic bag under 1000 class clean room</p> <p><u>Typical Physical Properties:</u> Chemical Formula: Y2O3 stabilized ZrO2, 8 %mole Y2O3 Crystal Structure: Cubic, Face Centered, CaF2 type Unit Cell: a = 5.125 Å Density: 5.8 g / cc Purity: 99.99% Melting Point: 2500 °C Thermal Expansion Coeff 10.3 ppm / °C Dielectric Constant: 27 Crystal Growth Technique: Flux Technique</p>
3.	YSZ (111) 8 mm dia x 0.5mm, 2SP	<p>Single crystal YSZ Substrate Size: 8 mm dia. x 0.5mm +/-0.05 mm Orientation: (111) +/-0.5 Deg Polish: polished by CMP technology . Two sides polished Surface roughness: < 5 Å by AFM Packing: The substrate is packed in 100 grade clean plastic bag under 1000 class clean room</p>

		<p>class clean room</p> <p><u>Typical Physical Properties:</u> Chemical Formula: Y2O3 stabilized ZrO2, 8 %mole Y2O3 Crystal Structure: Cubic, Face Centered, CaF2 type Unit Cell: $a = 5.125 \text{ \AA}$ Density: 5.8 g / cc Purity: 99.99% Melting Point: 2500 °C Thermal Expansion Coeff 10.3 ppm / °C Dielectric Constant: 27 Crystal Growth Technique: Flux Technique</p>
4.	YSZ (111) 0.5"x0.5"x 0.5mm , 1SP, Square wafer	<p>Single crystal YSZ Substrate Size: 0.5"x0.5" x 0.5mm +/-0.05 mm Orientation: (111) +/-0.5 Deg Polish: One side polished by CMP technology . Surface roughness: < 5 A by AFM Packing: The substrate is packed in 100 grade clean plastic bag under 1000 class clean room</p> <p><u>Typical Physical Properties:</u> Chemical Formula: Y2O3 stabilized ZrO2, 8 %mole Y2O3 Crystal Structure: Cubic, Face Centered, CaF2 type Unit Cell: $a = 5.125 \text{ \AA}$ Density: 5.8 g / cc Purity: 99.99% Melting Point: 2500 °C Thermal Expansion Coeff 10.3 ppm / °C Dielectric Constant: 27 Crystal Growth Technique: Flux Technique</p>
5.	YSZ (111) 1" x 1" x 0.5mm , 1SP, Square wafer	<p>Single crystal YSZ Substrate Size: 1" x 1" x 0.5mm +/-0.05 mm Orientation: (111) +/-0.5 Deg Polish: Two sides polished by CMP technology . Surface roughness: < 5 A by AFM Packing: The substrate is packed in 100 grade clean plastic bag under 1000 class clean room</p> <p><u>Typical Physical Properties:</u> Chemical Formula: Y2O3 stabilized ZrO2, 8 %mole Y2O3 Crystal Structure: Cubic, Face Centered, CaF2 type Unit Cell : $a = 5.125 \text{ \AA}$ Density : 5.8 g / cc Purity: 99.99% Melting Point: 2500 °C Thermal Expansion Coeff 10.3 ppm / °C Dielectric Constant: 27 Crystal Growth Technique: Flux Technique</p>
6.	YSZ (111) 10x10x 0.5mm , 1SP, Square wafer	<p>Single crystal YSZ Substrate Size: 10x10 x 0.5mm +/-0.05 mm</p>

		<p>Orientation: (111) +/-0.5 Deg Polish: One side polished by CMP technology . Surface roughness: < 5 Å by AFM Packing: The substrate is packed in 100 grade clean plastic bag under 1000 class clean room</p> <p><u>Typical Physical Properties:</u> Chemical Formula: Y2O3 stabilized ZrO2, 8 %mole Y2O3 Crystal Structure: Cubic, Face Centered, CaF2 type Unit Cell: a = 5.125 Å Density: 5.8 g / cc Purity: 99.99% Melting Point: 2500 °C Thermal Expansion Coeff 10.3 ppm / °C Dielectric Constant: 27 Crystal Growth Technique: Flux Technique</p>
7.	YSZ (111) 10x10x 1.0mm , 1SP, Square wafer	<p>Single crystal YSZ Substrate Size: 10x10 x 1.0mm +/-0.05 mm Orientation: (111) +/-0.5 Deg Polish: One side polished by CMP technology . Surface roughness: < 5 Å by AFM Packing: The substrate is packed in 100 grade clean plastic bag under 1000 class clean room</p> <p><u>Typical Physical Properties:</u> Chemical Formula: Y2O3 stabilized ZrO2, 8 %mole Y2O3 Crystal Structure: Cubic, Face Centered, CaF2 type Unit Cell: a = 5.125Å Density: 5.8 g / cc Purity: 99.99% Melting Point: 2500 °C Thermal Expansion Coeff 10.3 ppm / °C Dielectric Constant: 27 Crystal Growth Technique: Flux Technique</p>

76. YVO4

No.	Item	Description
1.	YVO4 (001) 10x10x0.2mm, 2sp	<p>Single crystal YVO4 Size: 10mm x 10mm x 0.2mm Orientation: (001) Polish: two sides polished.</p> <p>YVO4 is a new birefringent crystal for fiber optics. YVO4 is an ideal material for optical polarizing components, such as fiber optic isolators, beam displacers, circulators, etc because of its wide transparency range and large birefringence. Its medium hardness renders it particularly amenable to high quality polish and optical finish with ease.</p> <p>MTI Corporation has set up a joint venture with Anhui Optics Research Institute of Chinese Academy of Science, KMT Co. Ltd. located in Hefei, China, and has been producing high quality, low cost YVO4 single crystals</p>

		<p>and related components since 1997. Depending on customer's choice, we can supply crystal boules (up to 30 mm dia x 35 mm length), as-cut blocks or polished components with or without AR coating.</p> <p>MTI concentrates on crystal business only and has no intention to manufacture fiber optical devices in competition with any of its customers. Therefore MTI is your reliable long-term partner in fiber optics industries.</p>
2.	YVO4 (001) 10x10x0.5mm, 1sp	<p>Single crystal YVO4 Size: 10mm x 10mm x 0.5mm Orientation: (001) Polish: one side polished.</p> <p>YVO4 is a new birefringent crystal for fiber optics. YVO4 is an ideal material for optical polarizing components, such as fiber optic isolators, beam displacers, circulators, etc because of its wide transparency range and large birefringence. Its medium hardness renders it particularly amenable to high quality polish and optical finish with ease.</p> <p>MTI Corporation has set up a joint venture with Anhui Optics Research Institute of Chinese Academy of Science, KMT Co. Ltd. located in Hefei, China, and has been producing high quality, low cost YVO4 single crystals and related components since 1997. Depending on customer's choice, we can supply crystal boules (up to 30 mm dia x 35 mm length), as-cut blocks or polished components with or without AR coating.</p> <p>MTI concentrates on crystal business only and has no intention to manufacture fiber optic</p>
3.	YVO4 (100) 10x10x0.5mm, 1sp	<p>Single crystal YVO4 Size: 10mm x 10mm x 0.5mm Orientation: (100) Polish: one side polished.</p> <p>YVO4 is a new birefringent crystal for fiber optics. YVO4 is an ideal material for optical polarizing components, such as fiber optic isolators, beam displacers, circulators, etc because of its wide transparency range and large birefringence. Its medium hardness renders it particularly amenable to high quality polish and optical finish with ease.</p> <p>MTI Corporation has set up a joint venture with Anhui Optics Research Institute of Chinese Academy of Science, KMT Co. Ltd. located in Hefei, China, and has been producing high quality, low cost YVO4 single crystals and related components since 1997. Depending on customer's choice, we can supply crystal boules (up to 30 mm dia x 35 mm length), as-cut blocks or polished components with or without AR coating.</p> <p>MTI concentrates on crystal business only and has no intention to manufacture fiber optical devices in competition with any of its customers. Therefore MTI is your reliable long-term partner in fiber optics industries.</p>
4.	YVO4 (100) 10x10x0.5mm, 2sp	<p>Single crystal YVO4 Size: 10mm x 10mm x 0.5mm Orientation: (100) Polish: two sides EPI polished.</p> <p>YVO4 is a new birefringent crystal for fiber optics. YVO4 is an ideal material for optical polarizing components, such as fiber optic isolators, beam</p>

		<p>displacers, circulators, etc because of its wide transparency range and large birefringence. Its medium hardness renders it particularly amenable to high quality polish and optical finish with ease.</p> <p>MTI Corporation has set up a joint venture with Anhui Optics Research Institute of Chinese Academy of Science, KMT Co. Ltd. located in Hefei, China, and has been producing high quality, low cost YVO4 single crystals and related components since 1997. Depending on customer's choice, we can supply crystal boules (up to 30 mm dia x 35 mm length), as-cut blocks or polished components with or without AR coating.</p> <p>MTI concentrates on crystal business only and has no intention to manufacture fiber optical devices in competition with any of its customers. Therefore MTI is your reliable long-term partner in fiber optics industries.</p>
5.	YVO4 (110) 10x10x0.5mm, 1sp	<p>Single crystal YVO4 Size: 10mm x 10mm x 0.5mm Orientation: (100) Polish: one side polished.</p> <p>YVO4 is a new birefringent crystal for fiber optics. YVO4 is an ideal material for optical polarizing components, such as fiber optic isolators, beam displacers, circulators, etc because of its wide transparency range and large birefringence. Its medium hardness renders it particularly amenable to high quality polish and optical finish with ease.</p> <p>MTI Corporation has set up a joint venture with Anhui Optics Research Institute of Chinese Academy of Science, KMT Co. Ltd. located in Hefei, China, and has been producing high quality, low cost YVO4 single crystals and related components since 1997. Depending on customer's choice, we can supply crystal boules (up to 30 mm dia x 35 mm length), as-cut blocks or polished components with or without AR coating.</p> <p>MTI concentrates on crystal business only and has no intention to manufacture fiber optical devices in competition with any of its customers. Therefore MTI is your reliable long-term partner in fiber optics industries.</p>

77. ZnO (Undoped, Ga- Doped ,In-doped)

A. ZnO Substrates -- C plate

No.	Item	Description
1.	ZnO (0001) 5x5x0.5mm, 1 Side Polishd, O-face polished	<p>Single crystal ZnO Size: 5mm x 5mm x 0.5mm Orientation: (0001) +/-0.5° Polish: one side polished. (O Face polished) Surface roughness: < 5A Packing: one 1000 class clean room with 100 class plastic bag</p>
2.	ZnO (0001) 1/4"x1/4"x0.5mm,1sp	<p>Single crystal ZnO Size:1/4"x1/4"x0.5mm, Orientation: (0001) +/- 0.5°, C-plane Polish: one side polished Surface Roughness: < 5 A Packed in 1000 class clean room with 100 class plastic bag</p>

3.	ZnO (0001) 10x10x0.5mm, 1sp Zn-Face Polished	Single crystal ZnO N type, undoped Size: 10mm x 10mm x 0.5mm Orientation: (0001) +/-0.5° Polish: one side polished. Zn -Face Polished Surface roughness: < 5 A Packing: in 100 class plastic bag in 1000 class clean room
4.	ZnO (0001) 5x5x0.5mm, 1sp Zn face polished	Single crystal ZnO Size: 5mm x 5mm x 0.5mm Orientation: (0001) +/-0.5° Polish: one side polished. (Zn Face polished) Surface roughness: < 5A Packing: one 1000 class clean room with 100 class plastic bag
5.	ZnO (0001) 5x5x0.5mm, 2sp	Single crystal ZnO Size: 5mm x 5mm x 0.5mm Orientation: (0001) +/- 0.5°, C-plane Polish: two sides polished, One is terminaed on Zn Face and another is in O face Surface Roughness: < 5 A Packed in 1000 class clean room with 100 class plastic bag
6.	ZnO (0001) 10x10x0.2 mm, 1sp O-face polished	Single crystal ZnO Size: 10mm x 10mm x 0.2 mm Orientation: (0001) +/-0.5° Polish: one side polished. O-Face polished Surface roughness: < 5 A Packing: in 100 class plastic bag in 1000 class clean room
7.	ZnO (0001) 10x10x0.5mm, 1sp O-Face Polished	Single crystal ZnO N type, undoped, Size: 10mm x 10mm x 0.5mm Orientation: (0001) +/-0.5° Polish: one side polished. O-Face Polished Surface roughness: < 5 A Packing: in 100 class plastic bag in 1000 class clean room
8.	ZnO (0001) 10x10x0.5mm, 2sp	Single crystal ZnO Size: 10mm x 10mm x 0.5mm Orientation: (0001) +/-0.5° Polish: two sides EPI polished. Surface Roughness: < 5A FaceID: Zn face polished with charmfer
9.	ZnO (0001) 10x10x1.0 mm, 1sp O-face polished	Single crystal ZnO Size: 10mm x 10mm x 1.0 mm Orientation: (0001) +/-0.5° Polish: one side polished. O-Face polished

		Surface roughness: < 5 A Packing: in 100 class plastic bag in 1000 class clean room
10.	ZnO (0001) 10x10x1.0 mm, 1sp Zn-face polished	Single crystal ZnO Size: 10mm x 10mm x 1.0 mm Orientation: (0001) +/-0.5° Polish: one side polished. Zn-Face polished Surface roughness: < 5 A Packing: in 100 class plastic bag in 1000 class clean room
11.	ZnO (0001) 10x10x1.0 mm, 2sp	Single crystal ZnO Size: 10mm x 10mm x 1.0 mm Orientation: (0001) +/-0.5° Polish: two sides polished. Surface roughness: < 5 A Packing: in 100 class plastic bag in 1000 class clean room

B. ZnO Substrate --- A Plate

No.	Item	Description
1.	ZnO (11-20) A-plane 5x5x0.5mm, 2sp	Single crystal ZnO Size: 5mm x 5mm x 0.5mm Orientation: (11-20) +/- 0.5°, A-plane Polish: two sides polished. Surface Roughness: < 5 A Packed in 1000 class clean room with 100 class plastic bag
2.	ZnO (11-20) A-plane 10x10x0.5mm, 1sp	Single crystal ZnO Size: 5mm x 5mm x 0.5mm Orientation: (11-20) +/- 0.5°, A-plane Polish: One side polished. Surface Roughness: < 5 A Packed in 1000 class clean room with 100 class plastic bag
3.	ZnO (11-20) A-plane 10x10x0.5mm, 2sp	Single crystal ZnO Size: 10mm x 10mm x 0.5mm Orientation: (11-20), A-plane Polish: two sides polished.
4.	ZnO (11-20) A-plane 5x5x0.5mm, 1sp	Single crystal ZnO Size: 5mm x 5mm x 0.5mm Orientation: (11-20) +/- 0.5°, A-plane Polish: one side polished. Surface roughness: < 5A Packed in 1000 class clean room with 100 class plastic bag

C. ZnO Substrates -- M Plate

No.	Item	Description
1.	ZnO (1-100) M-plane 5x5x0.5mm, 1sp	Single crystal ZnO Size: 5mm x 5mm x 0.5mm Orientation: (1-100) $\pm 0.5^\circ$ Polish: one side polished. Surface roughness: < 5A Packing: one 1000 class clean room with 100 class plastic bag
2.	ZnO (1-100) M-plane 10x10x0.5mm, 1sp	Single crystal ZnO Size: 10mm x 10mm x 0.5mm Orientation: (1-100) $\pm 0.5^\circ$, M-plane Polish: one side polished. Surface Roughness: < 5 A Packed in 1000 class clean room with 100 class plastic bag
3.	ZnO (1-100) M-plane 10x10x0.5mm, 2sp	Single crystal ZnO Size: 10mm x 10mm x 0.5mm Orientation: (1-100) $\pm 0.5^\circ$, M-plane Polish: two sides polished. Surface Roughness: < 5 A Packed in 1000 class clean room with 100 class plastic bag
4.	ZnO (1-100) M-plane 5x5x0.5mm, 2sp	Single crystal ZnO Size: 5mm x 5mm x 0.5mm Orientation: (1-100) $\pm 0.5^\circ$, M-plane Polish: two sides polished. Surface Roughness: < 5 A Packed in 1000 class clean room with 100 class plastic bag

D. Ga Doped & In -doped ZnO substrates

No.	Item	Description
1.	Ga:ZnO (0001) N+ type, Ga doped, 10x10x0.5mm, 1sp Zn face polished	Single crystal ZnO N+ Type, Ga doped Size: 10mm x 10mm x 0.5mm Resistivity: 0.1-0.001 ohm-cm Orientation: (0001) $\pm 0.5^\circ$ Polish: one side polished. Zn face polished Packing: in 100 class plastic bag in 1000 class clean room
2.	Ga:ZnO (0001) N+ type, Ga doped, 10x 10x1.0mm, 1sp Oxygen Face Polished	Single crystal ZnO N+ Type, Ga doped Size: 10mm x 10mm x 1.0mm Resistivity: 0.1-0.001ohm-cm Orientation: (0001) $\pm 0.5^\circ$

		Polish: one side polished. Oxygen Face Polished Packing: in 100 class plastic bag in 1000 class clean room
3.	Ga:ZnO (0001) N+ type, Ga doped, 10x 10x1.0mm, 1sp Zn Face Polished	Single crystal ZnO N+ Type, Ga doped Size: 10mm x 10mm x 1.0mm Resistivity: 0.1-0.001ohm-cm Orientation: (0001) +/-0.5° Polish: one side polished. Zn Face Polished Packing: in 100 class plastic bag in 1000 class clean room
4.	Ga:ZnO (0001) N+ type, Ga doped, 10x10x0.5mm, 1sp Oxygen face polished	Single crystal ZnO N+ Type, Ga doped Size: 10mm x 10mm x 0.5mm Resistivity: 0.1-0.001 ohm-cm Orientation: (0001) +/-0.5° Polish: one side polished. Oxygen face polished Packing: in 100 class plastic bag in 1000 class clean room
5.	In:ZnO (0001) N+ type, In doped, 25.4 mm in dia x 0.3 mm, 2sp	Single crystal ZnO N+ Type, In doped Size: 25.4 mm in dia x 0.3 mm Doping level: > 4E18 cm ⁻³ Resistivity: less than 1 x10 ⁻³ ohm-cm Orientation: (0001) +/-0.5° Polish: double sides polished. Packing: in 100 class plastic bag in 1000 class clean room

78. ZnO epi film on Al2O3

No.	Item	Description
1.	ZnO Epi Film on Sapphire(0001), 2"x0.5mm, N2 -doped , ZnO: 0.5 um	<u>ZnO Epi Template Specifications:</u> Film: ZnO epi film on Sapphire <0001> N2-doped Film thickness: 500 Å (0.5 um) Total Thickness Variation: 5% Resistivity: 10--1000 ohm-cm Epi orientation: <0001> Film quality: < 50 arc seconds by double crystal x-ray diffraction 2"meter +/- 0.5 mm x 0.5 mm, <0001>orn. Polish: one side polished Surface roughness: < 5Å

79. ZnSe

No.	Item	Description
1.	ZnSe (100) 10x10x0.5mm, 1sp	Single crystal ZnSe Size: 10mm x 10mm x 0.5mm Orientation: (100) $\pm 0.5^\circ$ Polishing: one side polished. <10A Packing: In 1000 class clean room with 100 class clean bag
2.	ZnSe (100) 10x10x0.5mm, 2sp	Single crystal ZnSe Size: 10mm x 10mm x 0.5mm Orientation: (100) Polish: both two sides polished with roughness < 5A Packed: in 1000 class clean room with 100 class plastic plastic bag
3.	ZnSe (100) 10x10x1.0mm, 2sp	Single crystal ZnSe Size: 10mm x 10mm x 1.0mm Orientation: (100) $\pm 0.5^\circ$ Polishing: two sides polished. <10A Packing: In 1000 class clean room with 100 class clean bag
4.	ZnSe (100) 5x5x0.5mm, 1sp	Single crystal ZnSe Size: 5 mm x 5 mm x 0.5mm Orientation: (100) $\pm 0.5^\circ$ Polishing: one side polished. <10A Packing: In 1000 class clean room with 100 class clean bag
5.	ZnSe (110) 10x10x1.0mm, 2sp with s/d: 60/40 on both sides, High resistivity	Single crystal ZnSe Size: 10mm x 10mm x 1.0mm Orientation: (110) $\pm 0.5^\circ$ Polishing: two sides polished. with s/d: 60/40 High resistivity. $R > E6$ ohm.cm

80. ZnTe

No.	Item	Description
1.	ZnTe (110) 10x10x 0.5mm, 2sp	Single crystal ZnTe Size: 10mm x 10mm x 0.5 mm Orientation: (110) $\pm 0.5^\circ$ Resistivities: $> 1E6$ ohm-cm Polishing: two sides polished. 60/40
2.	ZnTe Random orientation , n type, 10x10x0.5 mm, 2sp	Single crystal ZnTe Size: 10mm x 10mm x 0.5 mm N type Specific Resistivity: $> 10^6$ ohm-cm

		Orientation: Random orientation Polishing: two sides polished. Scratch/Dig: 60/40
3.	ZnTe (100) , N type, 10x10x0.5 mm, 2sp	Single crystal ZnTe Size: 10mm x 10mm x 0.5 mm N- type Specific Resistivity: > 10 ⁶ ohm-cm Orientation: (100) +/-0.5° Polishing: two sides polished. Scratch/Dig: 60/40
4.	ZnTe (100) , P type, 10x10x0.5 mm, 2sp	Single crystal ZnTe Size: 10mm x 10mm x 0.5 mm P- type Specific Resistivity: > 10 ⁶ ohm-cm Orientation: (100) +/-0.5° Polishing: two sides polished. Scratch/Dig: 60/40
5.	ZnTe (110) 10x10x1.0mm, 2sp	Single crystal ZnTe Size: 10mm x 10mm x 1.0 mm Resistivities: > 1E06 ohm-cm Orientation: (110) +/-0.5° Polishing: two sides polished. 60/40

81. ZnS

No.	Item	Description
1.	ZnS (110) 10x10x1.0mm, 2sp(Two sides 60/40 polished)	Single crystal ZnS Size: 10mm x 10mm x 1.0 mm Orientation: (110) +/-0.5° Resistivities: >1E6 ohm-cm Polishing: Two sides 60/40 polished
2.	ZnS (110) 5x5x0.5mm, 2sp(Two sides 60/40 polished)	Single crystal ZnS Size: 5 mm x 5 mm x 0.5 mm Orientation: (110) +/-0.5° Resistivities: >1E6 ohm-cm Polishing: Two sides 60/40 polished
3.	ZnS (111) 10x10x0.5mm, 1sp(One side polished)	Single crystal : ZnS Size: 10mm x 10mm x 0.5 mm Orientation: (111) +/-0.5° Resistivit: High Polishing: One side polished

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