



# Sapphire



A-STAR supply the sapphire crystal with high quality, low cost. Careful selection of raw materials and strictly quality control at every stage of growth, ensure the best specifications for different application.

Sapphire Due to the hardest of the oxide crystals, Sapphire has a combination of optical and physical properties that makes it the best choice for a variety of demanding applications. Sapphire maintains its strength even at high temperatures. It has good thermal properties, excellent electrical and dielectric properties and is resistant to chemical attack. These properties encourage the use of Sapphire in aggressive environments where reliability, optical transmission or strength is required.

A-STAR supply the sapphire crystal with high quality, low cost. Careful selection of raw materials and strictly quality control at every stage of growth, ensure the best specifications for different application. Large size Sapphire crystals up to 4" in boule is available in A-STAR.

## Basic Properties

Crystal Structure:	Hexagonal System
Lattice:	a=4.785Å, c=12.991Å
Density:	3.98g/cm <sup>3</sup>
Transmission Range	0.15-5.5μm
Melting Point:	2042°C
Specific Heat:	0.418W×s/g/k
Thermal Conductivity:	25.12W/m/k(@100°C)
Thermal Shock Resistance:	790W/m
Thermal Expansion Coefficient:	5.8 × 10 <sup>-6</sup> /K
dn/dt (@633nm)	13 × 10 <sup>-6</sup> /K
Mohs Hardness:	9
Refractive Index(n o ):	1.83(0.26mm), 1.76(0.63mm), 1.58(5.57mm)

## 2. Standard Specifications of Epi-ready Sapphire Substrate

Diameter	50.8+/-0.05, mm	76.2+/-0.05, mm
Thickness	330-430+/-50μ	380-480+/-50μ
Orientation	C (0001) +/-0.1 o	C (0001) +/-0.1 o
TTV and Bow	<20μ	<25μ
Front Surface	Epi polished	Epi polished
Back Side	Lapped or polished	Lapped or polished
Flatness	<5μ	<5μ
Roughness (Ra)	<0.5mm	<0.8mm
Flat Length	16.0+/-0.5mm	22.0+/-0.5mm
Primary Flat Location	A or M +/-0.5 o	A or M +/-0.5 o
Secondary Flat Location	90 o ccw to primary	90 o ccw to primary
Package	25 wafer cassette	25 wafer cassette

Our as-cut wafer is also available with the following specifications: Φ2", Φ3"x 0.65/0.7mm

Other high-precision sapphire windows, AR- or HR-coatings are available upon request. Sapphire boule grown by CZ and TGT method and cut Sapphire blocks is also available.

## 3. Standard Specifications of Sapphire Windows & Mirrors

Diameter:	+0.0, -0.1mm
Thickness:	±0.02mm
Flatness:	better than 1 per 10mm (@633nm)
Parallelism:	better than 3'
Perpendicularity:	better than 5'
Scratch-Dig:	20-30 per MIL-O-13830A
Wavefront Distortion:	Less than 1 /2 per inch (l@1064nm)

Any specifications are available upon your request.

**Main Applications include:** UV and IR Optics, Windows for Temperature and Pressure, Corrosion Resistance, Abrasion Resistance, Heat sinks and Thermocouples, Semiconductor Wafer Carriers, Electrical Insulators, Thin film Deposition, Transparent Electronic Substrate, Silicon on Sapphire Wafers, Superconductor Substrate.

**1. Electronic** Sapphire substrate with different orientation has different applications: a. (0001) Basal Plane Sapphire Substrate: – Epitaxial Gallium Nitride chip for blue LED – IR detector b. (-1 1 0 2) R-Plane Sapphire Substrate: – GaAs wafer carriers – Microwave IC – SOS (Silicon on Sapphire)- High Speed IC – Pressure Transducer c. (1 -1 2 0) A Plane Sapphire Substrate: The growth of high Te superconductors

**2. Aerospace Application** – Windows for sensors – Infrared Countermeasure lamps

**3. Analytical Application** – Used in very high-pressure applications in replacement of glass or quartz tubes in NMR – Sapphire replaces quartz to improve durability and reduce contamination in mass spectroscopy

**4. Medical Application** – Surgical tips – Endoscope lenses

**5. Optical Application** – Illumination windows – Sapphire light guides Optical components such as lenses, prisms and other laser and infrared optics

### Contact Info

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