

# Sapphire Sheets EFG™ and CLASS®

Sapphire continues to be the engineers' material of choice for applications that call for reduced contamination, lower particle generation and increased productivity. Today sapphire is increasingly being specified over quartz, silicon carbide, silicon, zinc sulphide and other materials that fall short of providing the best solution.

One of the hardest materials in existence, sapphire can stand up to the rigors of almost any environment. With a melting point of over 2000°C, sapphire is ideal for high-temperature applications. Sapphire is chemically inert. It works perfectly in harsh chemical environments, including fluorine plasma. In addition, sapphire can transmit ultraviolet, visible and infrared light, as well as microwaves— a range broader than most materials.

Unlike other sapphire growth technologies that require extensive post-growth machining, Saint-Gobain Crystals' sapphire sheets are grown to "near-net" size, minimizing finishing costs.



## EFG™ Sheet Products

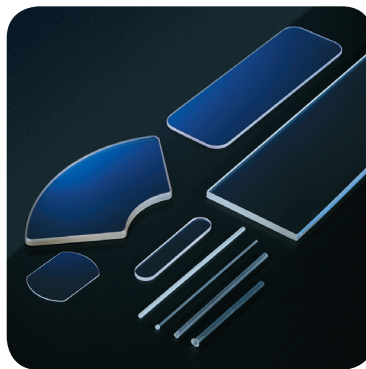
A full range for any application:

- Disks, rings and windows: variety of sizes and finished thicknesses upon request
- Bonded assemblies: patented bonding process allows stacking of sheets and vacuum channel machining
- Complex shapes: machined to any form or bonded into unique shapes
- Curved sheet: custom grown to meet the need for various sizes and shapes

## CLASS® Sheet Products

World's largest area sapphire sheets:

- CLASS<sup>225</sup>—9" wide by 26" long
- CLASS<sup>300</sup>—12" wide by 20" long
- CLASS Sapphire sheet products possible up to 15" wide



## Applications

### Semiconductor Processing

Sapphire's superior mechanical, thermal and chemical properties are well-suited to harsh environments, such as those experienced in the semiconductor industry.

Applications include:

- Viewports and sight windows
- End effectors
- Gas diffusion plates
- Focus rings

### Sensor Windows

Sapphire provides superior strength, scratch resistance and broadband transmission to protect and enable many sensor applications, including:

- Forward-looking infrared (FLIR) windows
- Laser designator/range-finder windows
- Infrared windows for spectroscopic analysis
- Optical sensors for industrial processes
- Mail sorting optical scanner windows
- Heat/smoke detection windows

*Saint-Gobain Crystals' high-performance, durable and affordable sapphire sheets offer significant performance advantages over other materials.*

## Standard As-Grown Sheet Products

	Square inches	Square mm		inches	mm
<b>Any surface area between</b>	1 - 231	645 - 149,290	<b>With a max width of</b>	8.9	226
<b>OR</b>					
<b>Any surface area between</b>	1 - 286	645 - 184,257	<b>With a max width of</b>	11.9	302
<b>Thickness</b>	0.180 - .305	4.572 - 7.747			

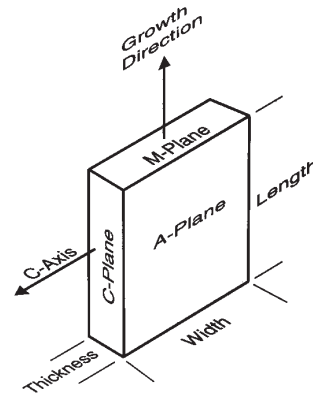
Fabrication Tolerances	Standard Tolerances (inches)	Standard Tolerances (mm)
Length / Width / Diameter	0.020	0.508
Thickness	0.005	0.127
Flatness	0.005	0.127
Parallelism	0.010	0.254
Ground Finish	< 63 micro inch	< 1.6 micro meter
Polished Finish (Scratch/Dig)	80/50	80/50

## CLASS® Physical/Optical/Mechanical Properties

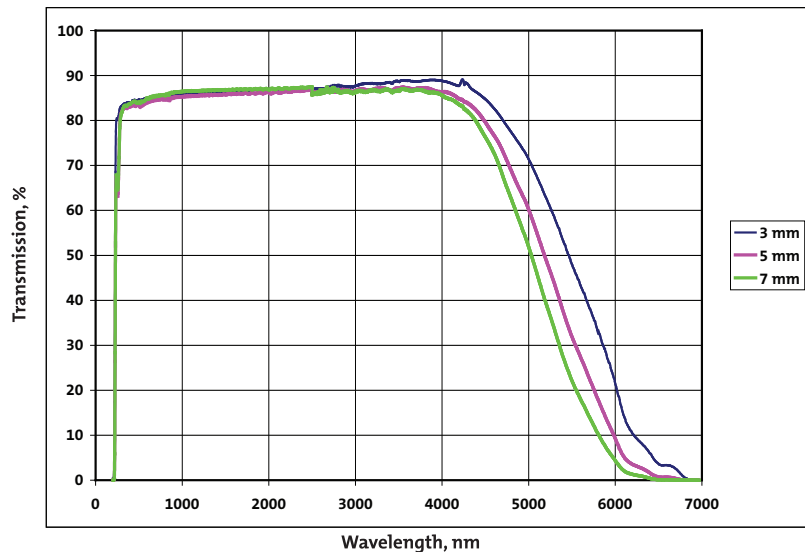
Biaxial Strength*	600 MPa
Design Strength*	200 MPa
Total Integrated Scatter	<1% @ ≥700 nm
BTDF	<0.06 @ ≥700 nm
Thermal Expansion Coefficient (25-1000° C)	
Parallel to C-axis	$8.8 \times 10^{-6}$
Perpendicular to C-axis	$7.9 \times 10^{-6}$
Hardness*	
Parallel to C-axis	1900 Knoop
Perpendicular to C-axis	2200 Knoop

\*between 20° and 25° Centigrade

## "A-Plane" Crystal Orientation



## Uv-vis-NIR transmission: EFG sapphire



**SAINT-GOBAIN**

Saint-Gobain Crystals

www.crystals.saint-gobain.com

Manufacturer reserves the right to alter specifications.

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