

DATA SHEET



GT ADVANCED
TECHNOLOGIES



Large format Sapphire
High Quality HEM[®]-Grown Boules

www.gtat.com

Large format HEM[®] quality -grown sapphire



Our industry-leading HEM[®] sapphire production capabilities yield the largest, highest quality boules available. This means large format parts with unrestricted thickness.

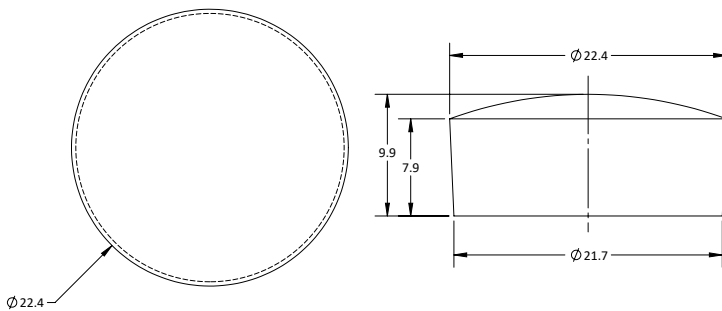
Emerging applications demand a combination of large and thick sapphire products with outstanding optical properties. This is a capability unique to GTAT, and we can supply this material in the form of boules or parts as needed. GTAT's industry-leading cost structure enables users to maximize economy of scale since multiple parts

can be fashioned from a single, high quality boule.

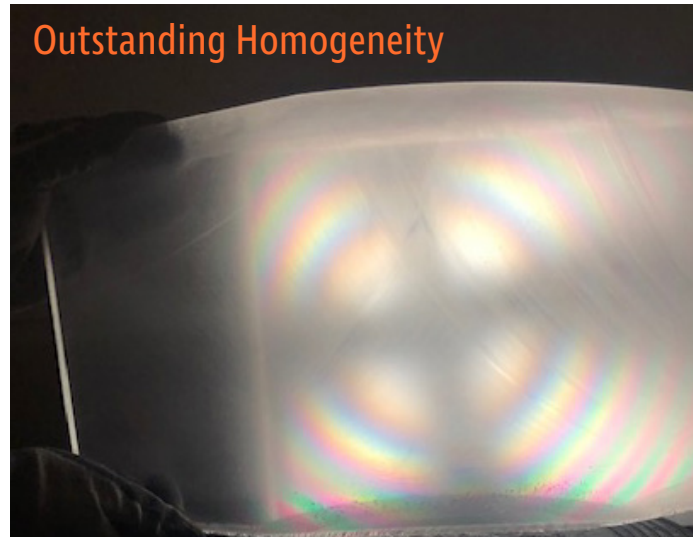
In addition to cost-leadership, GTAT's large format sapphire provides users with unmatched design flexibility in terms of part size and optical orientation. Our design team will work with you to optimize the sapphire for your application.

Another advantage of acquiring these pre-oriented parts from GTAT is that they can be further fabricated by customers themselves; no need to release any sensitive IP.

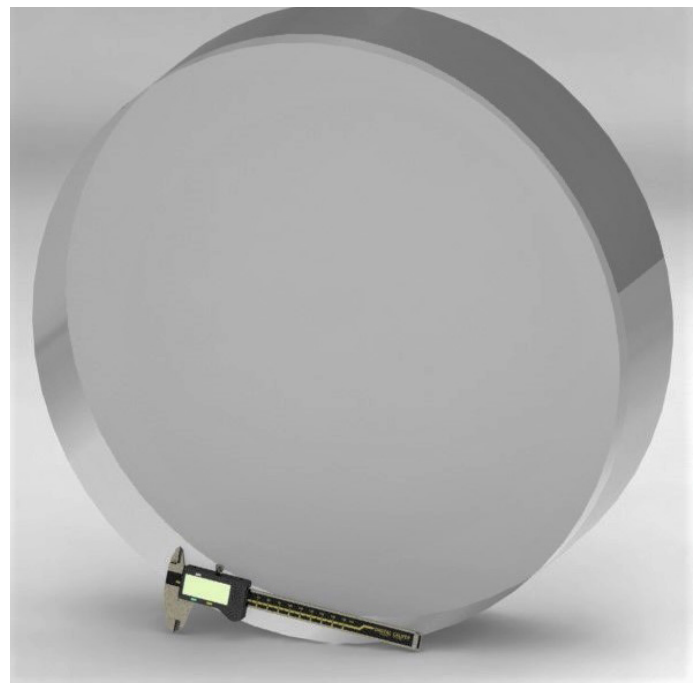
Large-Format Boules



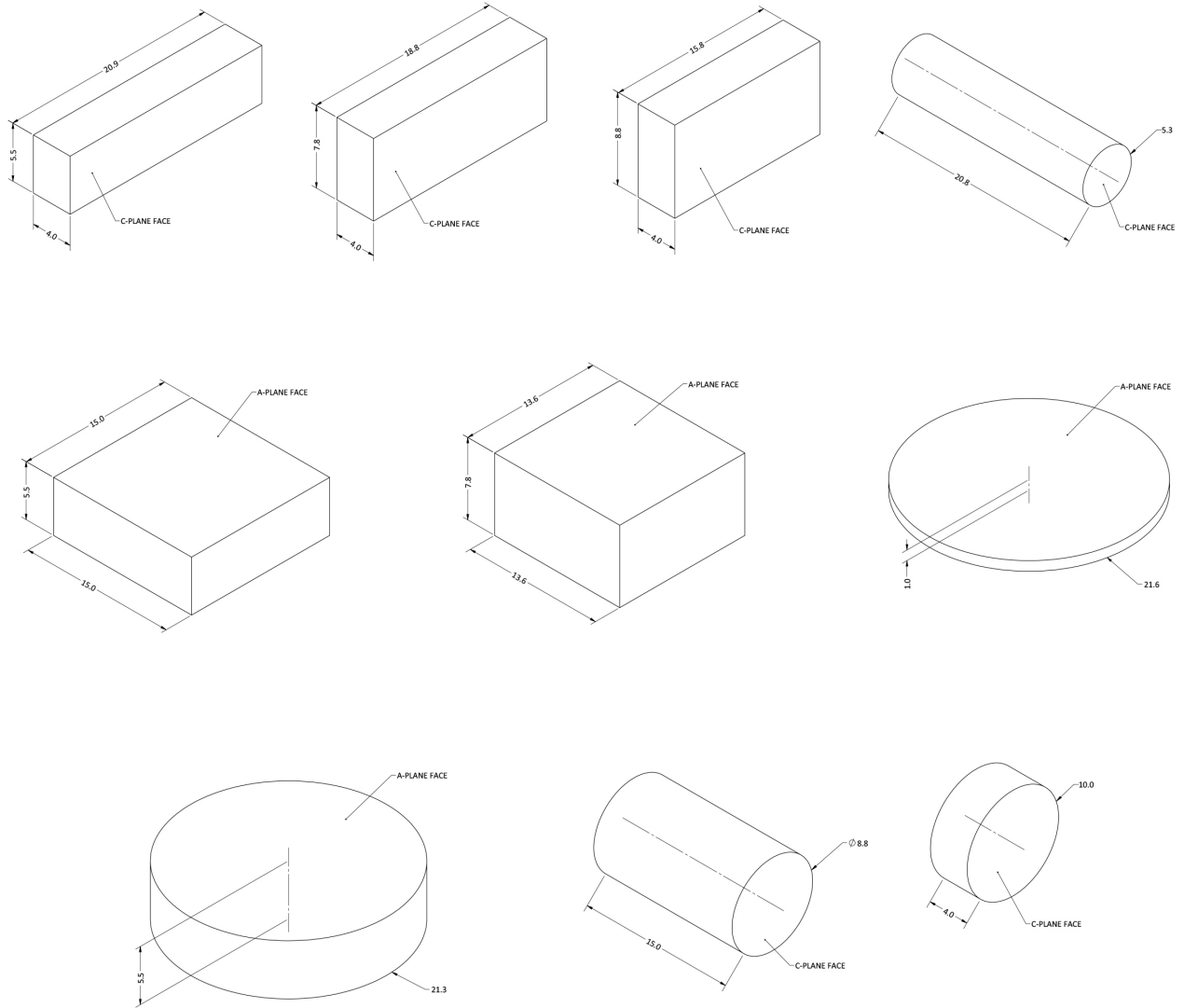
Outstanding Homogeneity



Large A-Plane Window



Example Parts from 260kg Boule



Dimensions in inches

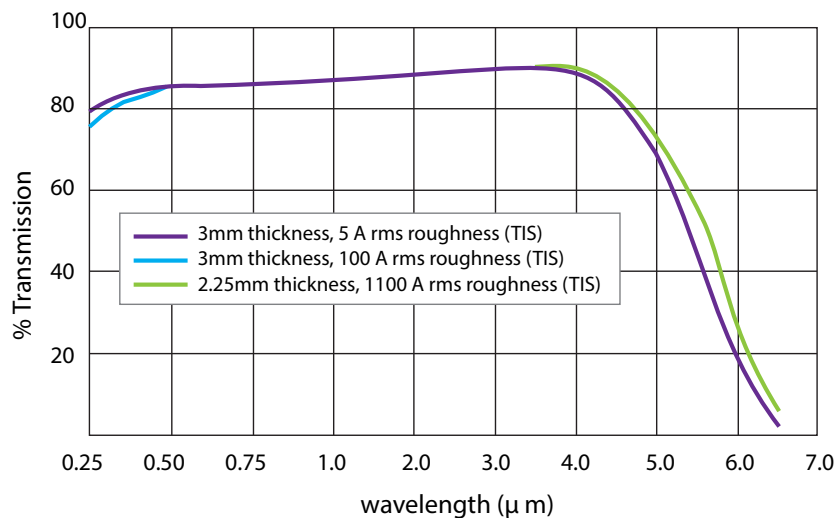
MECHANICAL AND PHYSICAL PROPERTIES

PHYSICAL	
Chemical formula	Al ₂ O ₃
Crystal structure	Hexagonal system (rhombohedral)
Unit cell dimension	a = 4.758 Å, c = 12.991 Å
Density	3.98 g cm ⁻³
Hardness	9 mohs, 1525-2000
Melting point	Knoop 2040 °C
Boiling point	2980 °C
MECHANICAL* (*psi = 6.9 kPa)	
Tensile strength	40,000-60,000 psi (design criterion)
Flexural strength	70,000-130,000 psi (design criterion)
Young's modulus	50x 10 ⁶ psi
Compressive modulus	55x 10 ⁶ psi
Flexural modulus	52x 10 ⁶ psi
Rigidity modulus	21.5x 10 ⁶ psi
Volumetric modulus of elasticity (bulk modulus)	35x 10 ⁶ psi
Poisson's ratio	0.29

THERMAL	
Thermal conductivity (60° to c-axis) at 25 °C	0.065 cal cm ⁻¹ s ⁻¹ °C ⁻¹
Thermal expansion coefficient (60° to c-axis) 25 - 800 °C	8.40 x 10 ⁻⁶ °C ⁻¹
Specific heat at 25 °C	0.185 CAL/GM
Heat capacity at 25 °C	18.6 cal °C ⁻¹ mol ⁻¹
ELECTRICAL	
Volume resistivity	10 ¹⁴ Ohm-cm
Dielectric strength	480,000 V cm ⁻¹
Dielectric constant	E perpendicular to c-axis: 9.4
	E parallel to c-axis: 11.5
Dissipation factor, tan delta	10 ⁻⁴

TRANSMISSION CURVE

STANDARD HEM SAPPHIRE TRANSMISSION



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