

Properties of sapphire and sapphire wafers**Typical Properties of Sapphire Wafers and Substrates**

Sapphire is a single crystal Al_2O_3 with a hexagonal (rhombohedral) crystal structure.

Sapphire wafers and sapphire substrates are available in C, R, A and M plane orientations.

Sapphire related services include, Sapphire wafer back-thinning, edge grinding, edge rounding, diameter reduction, hole drilling, chamfering, blending and polishing, v-grooves, surface pyramid structures, laser slag removal, slots and steps.

Technical Data Sheet

Name	Orientation
C-Plane (0 Degree)	0001
R-Plane	1-102
A-Plane (Perpendicular to C)	11-20
M-Plane (Perpendicular to C and A)	
Mechanical Properties	
Density at 20°C	3.98 g/cm ³
Hardness	Knoop: 1500 Mohs: 9
Tensile Strength	275 - 400 MPa 40,000 - 58,000 psi
Flexural Strength	480 - 895 MPa 70,000 - 130,000 psi
Compression Strength (ultimate)	2.0 GPa / 300,000 psi
Young's Modulus (elasticity)	345 GPa / 50 x 10 ⁶ psi
Bulk Modulus (compression)	250 GPa / 36 x 10 ⁶ psi
Shear Modulus (rigidity)	145 GPa / 21 x 10 ⁶ psi
Modulus of Rupture	350 - 690 MPa / 50,000 - 100,000 psi
Poisson's Ratio	.29
Melting Point	2040°C / 3700°F / 2310 K
Thermal Properties	
Thermal Conductivity:	
Perpendicular to C	at 23°C: 23.0 W/m°C at 77°C: 16.8 W/m°C
Parallel to C	at 24°C: 25.8 W/m°C at 70°C: 17.35 W/m°C

at 18°C: 756 J/kg°C
at -182°C: 104 J/kg°C

Volume Resistivity	at 25°C 10^{14} ohm/cm
Dielectric Strength	4.8×10^5
Dielectric Constant:	
Perpendicular to C	9.4
Parallel to C	11.5
Dissipation Factor	$10^{-4} \tan \delta$

Temp °C	Perpendicular to C	Parallel to C
70	6.95	5.90
100	7.08	6.05
200	7.66	6.60
300	8.30	7.32
400	9.00	8.07
500	9.63	8.88
600	10.45	9.77

- Optical transmission of sapphire
- Sapphire wafers and sapphire substrates
- Optical polishing of all materials
- Sapphire ultra-thin wafers, ultra-thin substrates and windows
- Lapping, contract lapping, precision flat lapping and polishing
- Sapphire index of refraction
- C-plane sapphire windows, plates, substrates and disks
- Polished optical colored glass filters and laser protection windows and shields

[Return to Home Page](#) Optical polishing, lapping, dicing
and optical components polishing



Valley Design East
Phoenix Park Business Center
2 Shaker Road, Bldg. E-001
Shirley, MA 01464
Phone: 978.425.3030
Fax: 978.425.3031

Valley Design West
Santa Cruz, CA 95060
Phone: 831.420.0595
Fax: 831.420.0592



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