

Materials Properties Chart

Specifications are offered as assistance to Engineers and Purchasing professionals in the design and procurement of thin and thick film circuit substrates.

Centerline Technologies makes no certification as to the suitability of materials for any application. (Basis for specifications available upon request.)

Properties	Units	Polished High Density 996 Alum. Oxide	As-fired High Density 996 Alum. Oxide Hi-rel Grade	Beryllium Oxide	Aluminum Nitride	Fused Silica Quartz	Sapphire (Crystalline)	Polished Titanates	Ferrites and Garnets
Chemical Composition		Al ₂ O ₃	Al ₂ O ₃	BeO	AlN	SiO ₂	Al ₂ O ₃	—	—
Purity	%	99.6	99.6	99.5	98	100	100	—	—
Color		White	White	White	Tan	Transparent	Transparent	Cream	Gray
Nominal Density	g/cm ³	3.87	3.87	2.85	3.28	2.2	3.97	—	—
Surface Finish (Polished)	μ-inches	<1.0	n/a	2.0-4.0	<2.0	60/40 Optical	<1.0μ-inch CLA	<3.0	<16.0
Surface Finish (As fired)	μ-inches	n/a	2-3	n/a	n/a	n/a	n/a	n/a	n/a
Camber	inch/inch	.0003/.0005	.002	.0003/.0005	.0003/.0005	.0003/.0005	.0003/.0005	—	—
Thickness	inches	0.004-.040*	0.005-0.025*	0.005-0.100*	0.004-0.100*	0.004-0.080*	0.004-0.050*	0.005-0.025*	0.010-0.025*
Thickness Tolerance	inches	±0.0005	±0.001*	±0.0005	±0.0005	±0.0005	±0.0005	±0.0005	±0.0005
Process Sizes	inches								
(L/W)	1.0/4.5	1.0/6.0	1.0/2.25	1.0/4.5	1.0/2.25	1.0/2.25	1.0/2.25	1.0/2.25	
Coefficient of Thermal Expansion (CTE)	10-6	7.0-8.3 (25-1000°C)	7.0-8.3 (25-1000°C)	9.0 (25-1000°C)	4.6 (25-300°C)	0.55 (20-320°C)	A plane @ 25°C-5.3	—	—
Thermal Conductivity	Watts/m ² K	26.9	26.9	270	170	n/a	n/a	—	—
Dielectric Constant	@1 MHz	9.9±0.1	9.9±0.1	6.5	8.6	3.826	11.5/9.3†	36-180	14.5-17.6
Dielectric Constant	@4 MHz	9.9	9.9	—	—	—	—	—	—
Dielectric Constant	@10 MHz	9.7	9.7	—	—	—	—	—	—
Dissipation Factor (Loss Tangent)	@1 MHz	0.0001	0.0001	0.0004	0.001	0.000015	.00086/.0003†	—	—
Dissipation Factor (Loss Tangent)	@10 MHz	0.0002	0.0002	—	—	—	—	—	—
Q	@1 GHz	5000	5000	—	5000	—	—	—	—
Hardness	Rockwell	87	87	45	n/a	7 Mohs	1800/2200A Knoop	—	—
Flexural Strength	K(10-3) lbs/sq.in.	90	90	35 (3 pt. bend)	59 (4 pt. bend)	25	60	—	—
Compressive Strength	M(10-3) lbs/sq.in.	54	54	n/a	n/a	161	350	—	—
Grain Size	um (microns)	<1.0	<1.0	9-16	5-7	Amorphous	Single Crystal	—	—

• Additional thicknesses and tolerances available upon request

† Value varies with orientation (“A” plane / “C” plane)