

Material properties ceramic base material - LTCC

Update: Jan 16, 2017



Postfired processing			Alumina Oxide			Alumina nitride	
Property	ITEMS	Unit	Al2O3 96%	Al2O3 99%	Al2O3 99.5%	AlN	
Physical	Color	-	White	85% translucent	White	Grey	
	Material - Aluminium%	%	96%	>99%	99.50%		
	Water absorption	%	0	0		0	
	Reflectivity	%	94*	Translucent		30**	
Electrical	Dielectric Constant (1MHz)	-	11.2	9.8	9.9	10	
	Dielectric Loss	*10^-3	3	3	2	3	
	Dielectric strenght	MV/m or KV/mm	>14	>15	>15	>19	
	Insulation/Volume resistance	Ω·cm	>10^14	>10^14	>10^14	>10^14	
	Density after Sintering (Bulk density)	g/cm3	3.72	3.89	3.9	3.3	
	Flexural Strength (3 point)	Mpa	400	379	379	300	
Mechanical	Surface Roughness	μm	0.3~0.6	0.3~0.6	0.3~0.6	0.3~0.6	
	Warpage	%	≤0.3	≤0.3	≤0.3	≤0.3	
	Thermal	Coefficient of Thermal Expansion (CTE)	ppm/°C	5.95	8.4	7.1	3.16
		Coefficient of Thermal Expansion (CTE) RT~500 °C	ppm/°C	6.82		8.1	4.02
	Thermal Conductivity (25°C) W/m·K		22	27	29	170	

* Reflectivity test reference thickness of 1mm

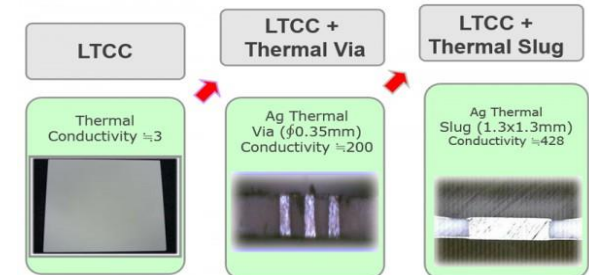
** Reflectivity test reference thickness of 0.5mm

Disclaimer: The data shown is typical of commercially available material and is only offered for comparative purposes. The information shall not to be interpreted as absolute material properties nor does it constitute a representation or warranty for which we assume legal liability. User shall determine suitability of the material for the intended use and assumes all risk and liability whatsoever in connection therewith.

Pre-fired processing

Property	ITEMS		MW03	MB03
Physical	Color	-	White	Black
	Material - Alumia content	%	≈50	≈50
Electrical	Dielectric Constant (10MHz)	-	≈7.5	≈8.3
	Dielectric Loss Tangent (10MHz)	-	≤2~3*10^-3	≤2~3*10^-3
	Dielectric Breakdown Voltage	KV	≥10 KV	≥10 KV
	Insulation resistance	Ω·cm	≥10^13	≥10^13
Mechanical	Density after Sintering	g/cm3	>2.93	>2.96
	Flexural Strength	Mpa	≥240	≥200
	Surface Roughness	μm	0.3~0.6	0.3~0.6
	Warpage	%	≤0.3	≤0.3
Thermal	Coefficient of Thermal Expansion (CTE)	ppm/°C	≈5~6	≈5~6
	Thermal Conductivity	W/MK	≈3	≈3

Thermal optimization



Manufacturing Capabilities

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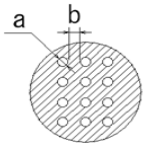
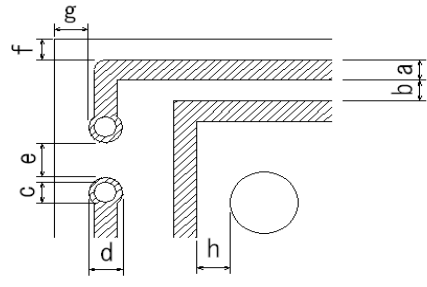


Item	Desc	Diagram	Standard (Al2O3)	Standard (Al2O3 99%)	Standard (Al2O3 99%.5)	Standard (AlN)
Material	Substrate color		White Al2O3/Black Al2O3	Transparent	White	AlN
	Conductor		Ag, Cu, AgPt, AdPg, Au, Pt	Ag	Ag, Cu, AgPt, AdPg, Au, Pt	Ag, Cu, AgPt, AdPg, Au, Pt
	Resistor		0.1 ohm -500 Mohm		0.1 ohm -500 Mohm	0.1 ohm -500 Mohm
	OG / finish		Transparent / Black	Transparent	Transparent / Black	Transparent / Black
Structure	Substrate Size (a)(b)		Thickness <0.5mm, ≤110mm Thickness ≥0.5mm, ≤200mm	≤100mm	Thickness <0.5mm, ≤110mm Thickness ≥0.5mm, ≤200mm	Thickness <0.5mm, ≤110mm Thickness ≥0.5mm, ≤200mm
	Substrate thickness (e)		0.1/0.25/0.38/0.5/0.635/0.8/1.0mm	0.4/0.5/1.0mm	0.4/0.5/1.0mm	0.25/0.36/0.5mm
	Dimensional Tolerance		±50um	±50um	±50um	±50um
	Thickness Tolerance		±5%	±5%	±5%	±5%
	Warpage		≤±0.3%	≤±0.3%	≤±0.3%	≤±0.3%
	Max. Layers		<10	2	2	2
Cavity Size (a)(b) Cavity Wall To Part Edge Spacing (c)(d) Floor Thickness(e) Min. thickness (f) Cavity Depth (g)			a ≥0.5mm b ≥0.50mm	N/A	N/A	a ≥0.5mm b ≥0.50mm
			c ≥0.50mm d ≥0.50mm	N/A	N/A	c ≥0.50mm d ≥0.50mm
			0.1/0.25/0.36/0.5/0.635/0.8/1.0mm	0.4mm	0.4mm	0.25/0.36/0.5mm
			0.1mm	N/A	N/A	Al2O3 0.1mm
			0.1~1.5mm	N/A	N/A	Al2O3 0.1~1.5mm

Manufacturing Capabilities

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Item	Desc	Diagram	Standard (Al2O3)	Standard (AlN)	Standard (AlN)	Standard (AlN)
Via	Thermal Via Diameter (a)		a. $\phi 0.1\text{mm} \sim 0.3\text{mm}$	a. $\phi 0.15\text{mm} \sim 0.3\text{mm}$	a. $\phi 0.15\text{mm} \sim 0.3\text{mm}$	a. $\phi 0.1\text{mm} \sim 0.3\text{mm}$
	Thermal Via Spacing (b)		b. 0.3mm	b. 0.3mm	b. 0.3mm	b. 0.3mm
Traces	Min. Line Width (a)		0.1mm	0.1mm	0.1mm	0.1mm
	Min. Line Spacing (b)		0.1mm	0.1mm	0.1mm	0.1mm
	Min. Via Diameter (c)		$\phi 0.15\text{mm}$	$\phi 0.15\text{mm}$	$\phi 0.15\text{mm}$	$\phi 0.15\text{mm}$
	Min. Coverage Diameter (d)		$\phi 0.15\text{mm}$	$\phi 0.15\text{mm}$	$\phi 0.15\text{mm}$	$\phi 0.15\text{mm}$
	Min. Coverage Spacing (e)		0.15mm	0.15mm	0.15mm	0.15mm
	Line to Part Edge Spacing (f)		$\geq 0.10\text{mm}$	$\geq 0.10\text{mm}$	$\geq 0.10\text{mm}$	$\geq 0.10\text{mm}$
	Coverage to Part Edge Spacing (g)		$\geq 0.10\text{mm}$	$\geq 0.10\text{mm}$	$\geq 0.10\text{mm}$	$\geq 0.10\text{mm}$
	Line to Via Spacing (h)		$\geq 0.10\text{mm}$	$\geq 0.10\text{mm}$	$\geq 0.10\text{mm}$	$\geq 0.10\text{mm}$
	Typical conductive thickness		14 +/- 2um 20um-300um when thickfilm Cu	14 +/- 2um	14 +/- 2um 20um-300um when thickfilm Cu	14 +/- 2um 20um-300um when thickfilm Cu
Through hole metallisation	Yes	Yes	Yes	Yes		