

Technical Data Sheet

Glass Ceramic Powders for Passive Components Low Temperature Glass-Ceramic Composites

Application

Ferro's low temperature ceramic formulations have a wide range of K values for use in a variety of components for a wide range of frequencies including Ceramic Inductors, Fuses, Common Mode Filters, SAW devices, Antennas, EMI, ESD, and other chip and multilayer components. Powder forms are available for both wet-stack and tape application processes.

Ferro's L-Series Ceramics are Pb/Cd free and formulated and processed to be RoHS compliant.

Typical Process Parameters

Storage and Shelf-life: These products should be stored in tightly sealed containers at 10 - 25°C, in a dry place away from direct sunlight. Shelf life of a factory seal container is minimum 2 years from date of shipment when properly stored.

Slurry Process:

- Dispersion: Ball mill 1.2" ZrO₂ Media
- First Stage Milling: 2Hrs
45% Formulation Powder
30% Ethanol
- Second Stage Milling: 3+Hrs
25% BX-054-4 Binder solution

Metallization:

- CN33-390 85% Ag Inner electrode and via
- TM63-147 Plateable Ag termination

Lamination: 3000 psi at 70°C with a 10 minute dwell time; no pressure followed by a lamination time of 10 minutes.

Firing: Forced air/exhausted belt or box furnace.

- 2°C/min from 25°C to 450°C
- 2 Hr. soak @ 450°C
- 6-8°C/min from 450°C to 850/900°C
- Minimum 10 minutes at peak temperature

TYPICAL PERFORMANCE PROPERTIES

	L4	L4.6	L5	L6	L7	L8	L12
TYPICAL POWDER PROPERTIES	Si-B-Al	Si-Al-B	Si-B-Al	Ba-B-Al-Si	Si-Ba-B-Al-Ca	Si-Ba-B-Al-Ca	Si-Ba-Sr-B-Al-Ca
THERMAL EXPANSION @ 260°C	69	59	49.5	53	52	50	68
GLASS (T _g)	500	500	500	500	785	785	785
TYPICAL TAPE PROPERTIES							
TYPICAL FIRED DENSITY	> 2.2	> 2.2	> 2.5	> 2.5	> 2.8	> 3.1	> 3.6
TYPICAL X, Y SHRINKAGE	14.5%	12.5%	13.5%	12.0%	14.0%	14.0%	14.0%
ELECTRICAL PROPERTIES							
DIELECTRIC CONSTANT @ 1 MHz	4.0	4.8	5.4	6.2	7.2	7.4	12.6
DISSIPATION FACTOR @ 1 MHz	< 0.2%	< 0.2%	< 0.2%	< 0.2%	< 0.15	< 0.15%	< 0.2
DIELECTRIC CONSTANT @ 10 GHz	4.1	4.4	5.4	5.8	6.7	7.2	12.0
DISSIPATION FACTOR @ 10 GHz	< 0.3%	< 0.4%	< 0.4%	< 0.4%	< 0.3%	< 0.25%	< 0.3%
INSULATION RESISTANCE	> 10 ¹²	> 10 ¹²	> 10 ¹²	> 10 ¹²	> 10 ¹²	> 10 ¹²	> 10 ¹²
BREAKDOWN VOLTAGE	> 1000	> 1000	> 1000	> 1000	> 1000	> 1000	> 1000
TYPICAL POWDER PROPERTIES							
PSD Horiba D50	3.00	3.20	2.65	2.50	2.70	3.60	3.30
SURFACE AREA	6.3	6.0	5.2	4.5	4.6	3.0	2.5



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