

METEORWAVE® 4000M

High Frequency / Ultra Low Loss Laminate For Automotive Radar Applications

Benefits

- Stable dielectric performance over a wide frequency range
- Excellent Electrical Properties utilizing SI® Technology
- Very high reliability and fracture toughness
- High Conductive Anodic Filament (CAF) resistance

Applications

- Short-Range (24GHz) Automotive Radar
- Long-Range (77 GHz) Automotive Radar



Meteorwave® 4000M high frequency / ultra-low loss electronic materials offer advanced electrical performance and high reliability for automotive radar applications. Meteorwave® 4000M is ideal for automotive radar programs up to 77GHz.

Excellent Electrical Properties utilizing SI® Technology

- Stable Dk/Df versus frequency and temperature
- Very low loss
- High aging resistance

Very High Reliability

- T₃₀₀ > 120 minutes
- High fracture toughness
- Very high Conductive Anodic Filament (CAF) resistance
- Lead-free assembly compatibility
- Tight thickness and resin content controls

Highly CAF Resistant

- All constructions utilize super spread weaves and fiberglass finishes optimized for CAF performance.

High-Tg FR-4 Processing

- Processes similar to other high-Tg materials
- 90 minutes cure at 216°C and 400-500 psi

Meets UL 94V-0 and IPC-4101/102 Specifications

UL file number: E36295

Properties	Conditions	Typical Value	Unit	Test Method
Electrical Properties				
Dielectric Constant	@ 10 GHz	3.2		IPC-TM-650.2.5.5.5
	@ 77 GHz	3.18 (RTF-2) 3.20 (HVLP2)		Ring Resonator method
Dissipation Factor	@ 10 GHz	0.0020		Split-Post Dielectric Resonator
TcDk (-50 – 140°C)	@ 10 GHz	15	ppm/ °C	IPC-TM-650.2.5.5.5
Volume Resistivity	C - 96 / 35 / 90	4.70 x 10 ⁶	MΩ - cm	IPC-TM-650.2.5.17.1
	E - 24 / 125	5.20 x 10 ⁷		
Surface Resistivity	C - 96 / 35 / 90	1.30 x 10 ⁶	MΩ	IPC-TM-650.2.5.17.1
	E - 24 / 125	7.40 x 10 ⁷		
Electric Strength		4.6x10 ⁴ (1800)	V/mm (V/mil)	IPC-TM-650.2.5.6.2
Thermal Properties				
*Glass Transition Temperature (Tg)	TMA(°C)	170	°C	IPC-TM-650.2.4.24c
	DMA(°C) (Tan d Peak)	200	°C	IPC-TM-650.2.4.24.3
Degradation Temperature (TGA)	Degradation Temp (TGA) (5% wt. loss)	390	°C	IPC-TM-650.2.3.40
T-300	Time to delamination @ 300°C	>120	minutes	IPC-TM-650.2.4.24.1
Thermal Conductivity		0.46	W/mK	ASTM E1461
Specific Heat		0.84	J/gK	ASTM E1461
Mechanical Properties				
Peel Strength	1/2 oz Cu (18μ)	0.5 (3) (RTF-2) 0.6 (3) (H-VLP2)	N/mm (lbf/inch)	IPC-TM-650.2.4.8
	After Solder Float	0.5 (3) (RTF-2) 0.6 (3) (H-VLP2)	N/mm (lbf/inch)	IPC-TM-650.2.4.8
X / Y CTE	-40°C to + 125°C	24 / 25	ppm/°C	IPC-TM-650.2.4.41 (modified): 5 mil 1x1078 construction
Z Axis CTE Alpha 1 / Alpha 2	50°C to Tg / Tg to 260°C	55	ppm/°C	IPC-TM-650.2.4.24
Z Axis Expansion	50°C to 260°C	2.6	%	IPC-TM-650.2.4.24
Young's Modulus (X / Y)		18.6/17.9 (3.9/3.5)	GN/m ² (psi x 10 ⁶)	ASTM D3039
Flexural Strength (X / Y)	@ 125°C	356/328 (51.7 / 47.6)	GN/m ² (psix10 ⁶)	
	@ 150°C	346/305 (50.2/44.3)	GN/m ² (psi x 10 ⁶)	
Chemical / Physical Properties				
Moisture Absorption		0.12	wt. %	IPC-TM-650.2.6.2.1

* DMA is the preferred method for measuring Tg - other methods may be less accurate.

- All test data provided are typical values and not intended to be specification values. For review of critical specification tolerances, please contact a company representative directly
- Meteorwave® 4000M is available in most common panel sizes.
- Please contact AGC for availability of any other constructions, copper weights and types, and glass styles.

