

# METEORWAVE M1

## High Frequency / Ultra Low Loss Laminate & Prepreg For Automotive Radar and mmWave 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
- Available in a variety of constructions

### Applications

- Automotive radar (77GHz)
- mmWave antenna
- Aerospace & Defense
- Satellite communication



Meteorwave® M1 high frequency / ultra-low loss electronic materials offer advanced electrical performance and high reliability for automotive radar applications. Meteorwave® M1 is ideal for automotive radar programs up to 77GHz.

#### Excellent Electrical Properties Utilizing SI® Technology

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

#### Very High Reliability

- Low thermal expansion
- T<sub>300</sub> > 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

Properties	Conditions	Typical Value	Unit	Test Method
<b>Electrical Properties</b>				
Dielectric Constant	@ 10 GHz	3.1		IPC-TM-650.2.5.5.5
	@ 77 GHz (RTF2 copper)	3.10		Ring Resonator method
Dissipation Factor	@ 10 GHz	0.0018		Split-Post Dielectric Resonator
TcDk (-50 – 140°C)	Dk vs Temp. @ 10 GHz	12	ppm/°C	IPC-TM-650.2.5.5.5
Volume Resistivity	C - 96 / 35 / 90	2.8x10 <sup>8</sup>	MΩ	IPC-TM-650.2.5.17.1
	E - 24 / 125	1.9x10 <sup>8</sup>	MΩ	IPC-TM-650.2.5.17.1
Surface Resistivity	C - 96 / 35 / 90	4.0x10 <sup>7</sup>	MΩ	IPC-TM-650.2.5.17.1
	E - 24 / 125	7.7x10 <sup>7</sup>	MΩ	IPC-TM-650.2.5.17.1
Electric Strength		69	kV / mm	IPC-TM-650.2.5.6.2
Dielectric Breakdown		>50	kV	IPC-TM-650.2.5.6
Arc Resistance		> 180	seconds	IPC-TM-650.2.5.1
<b>Thermal Properties</b>				
Glass Transition Temperature (Tg)	DMA(°C) (Tan d Peak)	230	°C	IPC-TM-650.2.4.24.3
Degradation Temperature (TGA)	5% wt. loss	391	°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	RT	0.54	W/mK	ASTM E1461
Specific Heat	20°C	0.95	J/gK	ASTM E1461
<b>Mechanical Properties</b>				
Peel Strength	1/2 oz Cu (18μm) (RTF2 copper)	0.6	N/mm	IPC-TM-650.2.4.8
	After Solder Float	0.6	N/mm	IPC-TM-650.2.4.8
X / Y CTE	-40°C to + 125°C	18 / 18	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	47 / 178	ppm/°C	IPC-TM-650.2.4.24
Z Axis Expansion	50°C to 260°C	2.4	%	IPC-TM-650.2.4.24
Flexural Modulus	125 °C (W/F)	12/11	GPa	IPC-TM-650.2.4.4.1
<b>Chemical / Physical Properties</b>				
Moisture Absorption		0.088	wt. %	IPC-TM-650.2.6.2.1
Flammability		V-0	Rating	UL94

- 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® M1 can be manufactured in laminate thickness from 1.2 mil (0.031 mm) and up.
- Meteorwave® M1 is available in most common panel sizes.
- Please contact AGC for availability of any other constructions, copper weights and glass styles including ultra-low profile copper and RTFOIL®

