

m-ply

Ultra Low Loss Bonding Ply

Prepreg Part Number Meteorwave 4000P

M-Ply™ prepreg is designed for RF/digital constructions, including bonding PTFE to PTFE and PTFE to digital printed circuit boards. M-Ply can be used wherever bonding between RF structures or hybrids of RF and digital structures require high bond strength, excellent and consistent signal integrity, good fill and flow prepreg characteristics, and excellent thermal and environmental reliability. Like all of the Meteorwave family of products, M-Ply will facilitate high temperature lead-free assembly, provides CAF resistance and has a low Z-axis expansion.

Key Features

Excellent Electrical Properties

- Very low loss in a thermosetting prepreg
- Stable electrical properties over extreme ranges of environmental conditions

Bond Ply Characteristics

- Excellent bonding to PTFE substrates
- Very low z-axis expansion
- T300 greater than 120 minutes
- Highly reliable sequential lamination performance
- Tight thickness and resin content controls
- Very Low Outgassing (meets NASA requirements)
- Stable electrical properties versus frequency when tested over various environmental conditions

Processing Benefits

- Prepreg Stability
 - o Long Shelf Life. Does not require refrigeration
- Lamination uses Meteorwave Press Profile
 - o Flow characteristics allow for filling of features and good adhesion
 - o Typically no preparation of PTFE surface necessary for good inter-laminar bonds when used with N9000 PTFE laminate
 - o High thermal stability allows for multiple lamination cycles
- Drilling
 - o Resin formulation and use of spread glass results in excellent hole wall quality
 - o Compatible with PTFE drill parameters
 - o Meteorwave can use same hole preparation process as PTFE layers

Prepreg Availability

- Available in a variety of fiberglass styles and resin content
- UL 94V-0 rating
- Meets IPC-4101/91 and /102 specifications
- All of AGC Nelco's PCB materials are RoHS compliant

Applications

- Hybrid RF/Digital Constructions
- 5G Antennae
- Mulyilayer RF Designs
- Multifunction Antennae
- Multilayer PTFE
- RF/Microwave Applications

Glass	Resin Content	10 GHz Dk	10 GHz Df	Thickness (inches)	Thickness (um)
106	80	3.26	0.0020	0.0027	67.4
1067	77	3.28	0.0020	0.0028	71.0
1035	77	3.28	0.0020	0.0027	69.3
1078	75	3.29	0.0021	0.0040	100.5
1080	75	3.29	0.0021	0.0040	100.5



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	M-Ply	U.S. Units	M-Ply	Metric Units	Test Method
Mechanical Properties					
Peel Strength - 1 oz. (35 micron) Cu					
After Solder Float	5.5	lb / inch	1.00	N / mm	IPC-TM-650.2.4.8
At Elevated Temperature	4.4	lb / inch	0.77	N / mm	IPC-TM-650.2.4.8.2
After Exposure to Process Solutions	5.0	lb / inch	0.88	N / mm	IPC-TM-650.2.4.8.2
X / Y CTE [-40°C to +125°C]	10-14	ppm / °C	10-14	ppm / °C	IPC-TM-650.2.4.41
Z Axis CTE Alpha 1 [50°C to Tg] 55% RC	55	ppm / °C	55	ppm / °C	IPC-TM-650.2.4.24
Z Axis CTE Alpha 2 [Tg to 260°C] 55% RC	260	ppm / °C	260	ppm / °C	IPC-TM-650.2.4.24
Z Axis Expansion [50°C to 260°C] 43% RC	2.1	%	2.1	%	IPC-TM-650.2.4.24
Z Axis Expansion [50°C to 260°C] 55% RC	2.6	%	2.6	%	IPC-TM-650.2.4.24
Young's Modulus (X / Y)	3.9 / 3.5	psi x 10 ⁶	18.6 / 17.9	GN / m ²	ASTM D3039
Poisson's Ratios (X / Y)	0.170 / 0.163		0.170 / 0.163		ASTM D3039
Thermal Conductivity	0.45	W / mK	0.45	W / mK	ASTM E1461
Specific Heat	0.84	J / gK	0.84	J / gK	ASTM E1461
Flexural Strength					
@125°C (W/F)	51.7 / 47.6	psi x 10 ⁶	356 / 328	GN / m ²	IPC-TM-650.2.4.4.1
@150°F (W/F)	50.2 / 44.3	psi x 10 ⁶	346 / 305	GN / m ²	IPC-TM-650.2.4.4.1
Electrical Properties					
Dielectric Constant (Typical)					
@ 2 GHz (Stripline)	3.2		3.2		IPC-TM-650.2.5.5.5
@ 10 GHz (Stripline)	3.3		3.3		IPC-TM-650.2.5.5.5
Dissipation Factor (Typical)					
@ 2 GHz (Split Post Cavity)	0.0018		0.0018		
@ 10 GHz (Split Post Cavity)	0.0021		0.0021		
Volume Resistivity					
C - 96 / 35 / 90	4.70x10 ⁶	MΩ- cm	4.70x10 ⁶	MΩ- cm	IPC-TM-650.2.5.17.1
E - 24 / 125	5.20x10 ⁸	MΩ- cm	5.20x10 ⁸	MΩ- cm	IPC-TM-650.2.5.17.1
Surface Resistivity					
C - 96 / 35 / 90	1.30x10 ⁶	MΩ	1.30x10 ⁶	MΩ	IPC-TM-650.2.5.17.1
E - 24 / 125	7.40x10 ⁷	MΩ	7.40x10 ⁷	MΩ	IPC-TM-650.2.5.17.1
Electric Strength	1800	V / mil	4.6x10 ⁴	V / mm	IPC-TM-650.2.5.6.2
Dielectric Breakdown	>50	kV	>50	kV	IPC-TM-650.2.5.6
Arc Resistance	210	seconds	210	seconds	IPC-TM-650.2.5.1
Thermal Properties					
*Glass Transition Temperature (Tg)					
TMA (°C)	170	°C	170	°C	IPC-TM-650.2.4.24c
DMA (°C) (Tan d Peak)	200	°C	200	°C	IPC-TM-650.2.4.24.3
Degradation Temp (TGA) (5% wt. loss)	390	°C	390	°C	IPC-TM-650.2.3.40
Pressure Cooker-60 min then solder dip	pass		pass		IPC-TM-650.2.6.16
@288°C until failure (max 10 min.)					(modified)
T300	>120	>120 minutes	>120	minutes	IPC-TM-650.2.4.24.1
Chemical / Physical Properties					
Moisture Absorption	0.12	wt. %	0.12	wt. %	IPC-TM-650.2.6.2.1
Methylene Chloride Resistance	0.27	% wt. chg.	0.27	% wt. chg.	IPC-TM-650.2.3.4.3
Density [50% resin content]	1.95	g / cm ³	1.95	g / cm ³	Internal Method

*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.