

# FR4-TLM170(t)

## High Thermal resistance Epoxy Laminate and Prepreg

TLM-170(t) products are manufactured with a unique high performance epoxy resin reinforced with electrical grade (E-glass) glass fabric. TLM-170(t) offers enhanced thermal resistance due to a high Tg value, Tg 170 °C and achieve flammability class of UL94V-0.

These materials are compatible with the AOI process and exhibit the UV block characteristic.

TLM-170(t) also exhibit superior chemical resistance, thermal stability and CAF resistance. CCL and PCB can pass through Lead free solder process.

## Performance and Processing Advantages

- High performance epoxy blend which yields a higher heat resistance
- Superior dielectric thickness control
- Wide processing window for maximum lamination performance
- Enhanced thermal and chemical resistance
- Compatible with automatic optical inspection process
- UV-block feature
- Lead free solder process compatible
- CAF-Resistance
- Low CTE-Z provide excellent reliability in thermal cycle test
- Meet IPC-4101E /126 specification

## Availability

**Thickness:** 0.0025" [0.0635 mm] to 0.125" [3.2 mm]

**Size:** 40"x48", 42"x42", 42"x48", 48"x48", 54"x48"

Option: special size available.

**Copper Foil Cladding:** Grade 3 (HTE), 0.5 to 3.0 oz.

Option: Low profile & very low profile copper foil.

**Prepreg:** Available in roll form

**Glass Styles:** 0106, 1080, 2313, 2116, 1500 and 7628

## Industry Approvals

UL-Recognized – FR-4, File Number E174552



## TLM-170(t) TYPICAL LAMINATE PROPERTIES

Property	UNITS	Specification	Typical Value	CONDITION	Test Method (IPC-TM-650 or As noted)	
Glass Transition Temperature (Tg) by DSC, spec minimum	°C	170 min.	174	E-2/105	2.4.25	
Decomposition Temperature (Td)	°C	340 min.	360	TGA	ASTM D3850	
TD-260	Minutes	35 min.	> 60	TMA	2.4.24.1	
TD-288	Minutes	15 min.	> 40	TMA	2.4.24.1	
CTE X-Axis Y-Axis	Ambient to Tg	-	13	TMA	2.4.24	
	Pre-Tg	-	15			
CTE Z-Axis	Pre-Tg	60 max.	~40	TMA	2.4.24	
	Post-Tg	300 max.	~200			
50 - 260 °C	3.0% max.	130 (2.7%)				
Thermal Stress	Unetched	Pass visual	>300	288°C solder float x 10 sec.	2.4.13.1	
	Etched	Pass visual	>300			
Thermal Conductivity	W/mK	-	0.35	-	ASTM D5930	
Peel Strength (spec minimum)	1.0 oz. (35 micron)	Lb/inch (N/mm)	6.0(1.05)	7-9 (1.22-1.58)	After thermal stress	2.4.8
Dielectric Constant (DK)	1 MHz	-	5.4 max.	4.90		2.5.5.3
	500 MHz	-	-	4.80	C-24/23/50	2.5.5.9
	1 GHz	-	-	4.70		2.5.5.9
	1 MHz	-	0.035 max.	0.017		2.5.5.3
Loss Tangent (Df)	500 MHz	-	-	0.015	C-24/23/50	2.5.5.9
	1 GHz	-	-	0.015		2.5.5.9
Volume Resistivity	Mohm-cm	10 <sup>6</sup>	1 x 10 <sup>10</sup>	C-96/35/90	2.5.17.1	
Surface Resistivity	Mohm	10 <sup>4</sup>	1 x 10 <sup>8</sup>	C-96/35/90	2.5.17.1	
Dielectric Breakdown, spec minimum	kV	40 min.	80	D-48/50	2.5.6	
Arc resistance	Seconds	60 min.	120	D-48/50	2.5.1	
Comparative Tracking Index (CTI)	Volts	-	175-250 (CL=3)	IEC 60112	UL-746A ASTM D3638	
Moisture Absorption	%	0.35 max.	0.10	E1/105+ D-24/23	2.6.2.1	
Flexural Strength	CW	psi	50,000 min.	As received	2.4.4	
	LW	psi	60,000 min.			
Flammability	rating	V-0 min.	V-0	C-24/23/50+E- 24/125	UL94	
Bow & Twist	%	0.75 max.	0.30	As received/Etched	2.4.22.1	

Material Thickness Tested 1.5mm thickness Copper 1/1 Oz.

Information contained in this data sheet represents typical or average values and does not constitute any warranty or guarantee.



## TLM-170(t) PREPREG TYPICAL PROPERTY VALUES

Fabric Style <sup>1</sup>	Resin Content <sup>2</sup> (%)	Resin Flow <sup>2</sup> (%)	Volatile Content <sup>3</sup> (%)	Gel Time <sup>2</sup> (sec)	Scale flow Thickness <sup>2</sup>		After Pressed Thickness <sup>2</sup>	
					mil	mm	mil	mm
0106MRC	75 ± 3.0	46 ± 6.0	0.50 Max.	70 ± 20	-	-	2.6 ± 0.4	0.066 ± 0.01
1080LRC	63 ± 3.0	39 ± 6.0			2.2 ± 0.4	0.056 ± 0.01	2.7 ± 0.4	0.069 ± 0.01
1080MRC	66 ± 3.0	42 ± 5.0			2.4 ± 0.4	0.061 ± 0.01	2.9 ± 0.4	0.074 ± 0.01
1080HRC	68 ± 3.0	46 ± 5.0			2.5 ± 0.4	0.064 ± 0.01	3.1 ± 0.4	0.079 ± 0.01
2313MRC	57 ± 3.0	35 ± 5.0			3.4 ± 0.4	0.086 ± 0.01	4.0 ± 0.4	0.102 ± 0.01
2116MRC	55 ± 3.0	34 ± 5.0			3.9 ± 0.4	0.099 ± 0.01	5.0 ± 0.4	0.127 ± 0.01
2116HRC	60 ± 3.0	40 ± 5.0			4.0 ± 0.4	0.102 ± 0.01	5.3 ± 0.4	0.135 ± 0.01
7628LRC	42 ± 3.0	20 ± 4.0			6.6 ± 0.4	0.165 ± 0.01	7.0 ± 0.4	0.178 ± 0.01
7628MRC	44 ± 3.0	22 ± 4.0			6.7 ± 0.4	0.165 ± 0.01	7.3 ± 0.4	0.185 ± 0.01
7628HRC	47 ± 3.0	27 ± 4.0			6.8 ± 0.4	0.168 ± 0.01	7.9 ± 0.4	0.201 ± 0.01

Note: 1 Other fabric styles are available upon request.

2 Property values are adjustable for special processing needs

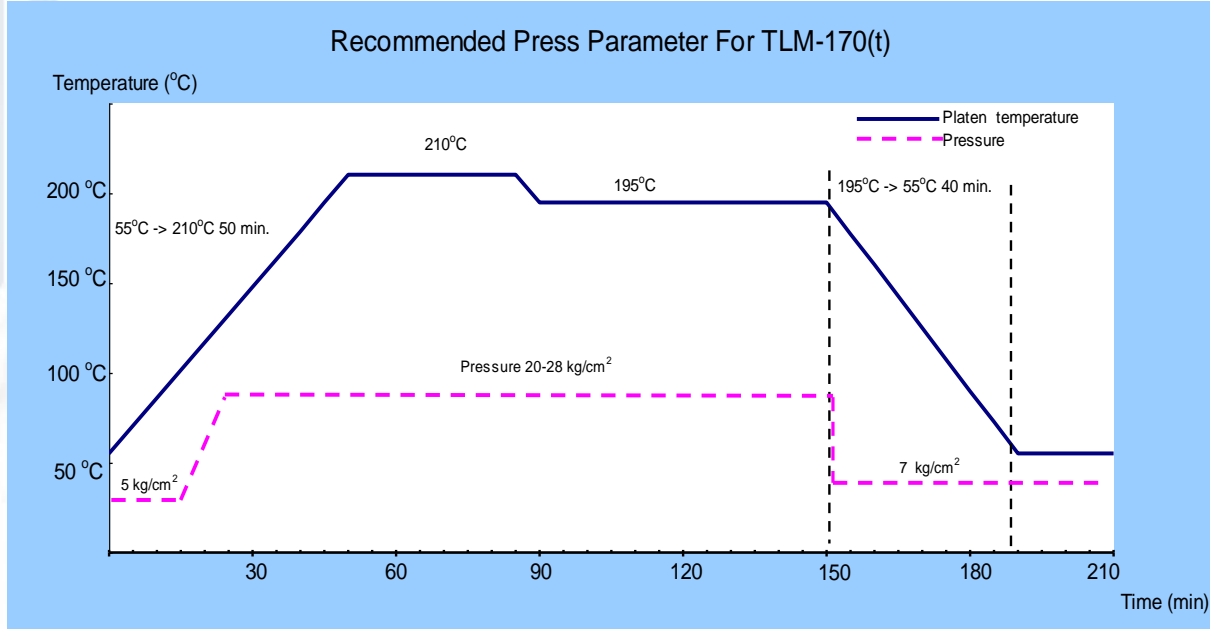
3 Volatile content for all prepregs is less than 0.5%

### **Storage condition:**

- Prepreg properties will maintained for 3 months when keep it under 23°C and under 50%RH
- Beware of moisture, always keep it wrapped in damp proof material.

## Recommendation

### Press Cycle:



Cushion: Craft paper 162 g/m<sup>2</sup> top and bottom 9-12 sheets each  
 Number of sheets: 6-8 layers

Product heating rate (@ 65-120°C)	2.0 – 3.0 °C/min
Cure time @ 190°C	70 - 90 min
Full Pressure	20 – 28 kg/cm <sup>2</sup>
Cool down rate	< 2 °C/min

Note : This press cycle is just recommendation only.  
 PCB Manufacturer may adjust it based on genuine process .

### PCB packaging:

PCB packaging shall be a proper packaging to prevent moisture uptake by PCB with vacuum seal condition include adequate desiccant material to prevent PCB from moisture which diffuse in the packaging material. Using the right packaging materials and maintain in a good condition, PCB's can be stored for up to one year without absorbing excess moisture.