

VT-481

UL Approval: E214381 V

Version: B5 /97 /98 /99 /101

# Laminate/Prepreg

### **General Information**

- > Mid-Tg FR4.0
- > Phenolic Cure System & Lead Free Compatible
- > Excellent Thermal Reliability
- > Low Z-CTE
- > CAF Resistance
- > UV Blocking

## **Application**

Computer, Communication Equipment, Instrumentation, Electronic Game Machine, Automotive, etc

## **Availability**

- > Core Thickness: 0.002" (0.05mm) to 0.200" (5mm), available in sheet or panel form
- > Copper Foil: 1/4oz to 12oz
- > Prepregs are available in roll or panel form
- > E-Glass styles: 7628, 1506, 1500, 2113, 2313, 3313, 2116, 1080, 1086, 1078, 106 &1067, etc

**Note:** For cores 0.005", it is recommended to use the reverse treated copper due to the low profile. The peel strength for RT foil is  $\approx 1-2$ lbs/ in (0.35Kg/m) less than standard foil.

Properties		Prepreg	Laminate	
Storage Condition	Temperature	Below 23°C (73°F)	Below 5°C (41°F)	Room
	Relative humidity	Below 55% RH	/	1
Shelf Life		3 months	6 months	24 months (airproof)

The prepreg exceeding shelf life should be retested.

#### CORPORATE HEADQUARTERS

#### Ventec Electronics Co. Ltd.

308 TaiShan Rd, New District Suzhou, Jiangsu, P.R. China 215129 T: +86 512-68091810

Email: sales@ventec.com.cn

#### EMEA REGIONAL HEADQUARTERS

#### Ventec Europe

Unit 1 Trojan Business Centre, Tachbrook Park Estate, Leamington-Spa, CV34 6RH, UK

T: +44 1926-889822

Email: sales@ventec-europe.com

#### AMERICAS REGIONAL HEADQUARTERS

#### Ventec USA

720 Lee St., Elk Grove Village, Illinois, IL 60007, United States of America

T: +1 630-4221627

Email: saleseast@ventec-usa.com www.venteclaminates.com

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# Properties Sheet IPC-4101E /97 /98 /99 /101

Thermat Properties           Tg         DSC         IPC-TM-650 2.4.25         °C         150 minimum         155           Td         ASTM D3850         °C             T260         IPC-TM-650 2.4.24.1         Minute         30 minimum         >60           T280         IPC-TM-650 2.4.24.1         Minute         30 minimum         >50           T288         IPC-TM-650 2.4.24.1         Minute         5 minimum         >50           Thermal Stress @ 288°C         IPC-TM-650 2.4.24         pm/°C         60 maximum         45           After Tg         IPC-TM-650 2.4.24         ppm/°C         300 maximum         220           After Tg         IPC-TM-650 2.4.24         ppm/°C         3 maximum         2.6           X-Y CTE         IPC-TM-650 2.4.24         ppm/°C         -         111-13           MOT         U.9.4         °C         -         130           Electrical Properties           DK @ 161-R R 509°         IPC-TM-650 2.5.5.9         -         5.4 maximum         4.3           Second         After Moisture         Resistance         IPC-TM-650 2.5.17.1         MΩ-cm         1.0E+4 minimum         5.0E+6	Properties		Test Method	Units	Specification	Typical Value			
TMA IPC-TM-650 2.4.24 °C	Thermal Properties								
Td	Tg	DSC	IPC-TM-650 2.4.25	°C	150 minimum	155			
T260		TMA	IPC-TM-650 2.4.24	°C	-	-			
T288	Td		ASTM D3850	°C	325 minimum	345			
Thermal Stress @ 288° C	T260		IPC-TM-650 2.4.24.1	Minute	30 minimum	>60			
Z-axis CTE	T288		IPC-TM-650 2.4.24.1	Minute	5 minimum	25			
After Tg         IPC-TM-650 2.4.24         ppm/°C         300 maximum         220           X-Y CTE         IPC-TM-650 2.4.24         %         3.5 maximum         2.6           X-Y CTE         IPC-TM-650 2.4.24         ppm/°C         –         11-13           MOT         UI 94         °C         –         130           Electrical Properties           DK @ 16Hz RC 50%         IPC-TM-650 2.5.5.9         –         5.4 maximum         4.3           DF @ 16Hz RC 50%         IPC-TM-650 2.5.17.1         MΩ-cm         1.0E+4 minimum         5.0E+8           Volume Resistivity         After Moisture Resistance         IPC-TM-650 2.5.17.1         MΩ-cm         1.0E+4 minimum         5.0E+6           Surface Resistivity         After Moisture Resistance         IPC-TM-650 2.5.17.1         MΩ         1.0E+3 minimum         5.0E+6           Surface Resistivity         After Moisture Resistance         IPC-TM-650 2.5.6.2         Volt/mil (KV/mm)         762 (30) minimum         1200-1400 (54)           Electrical Strength         IPC-TM-650 2.5.6.2         Volt/mil (KV/mm)         762 (30) minimum         1200-1400 (54)           Dielectric Breakdown         IPC-TM-650 2.5.6.2         Volt/mil (KV/mm)         762 (30) minimum         1200-1400 (	Thermal Stress @ 288°C		IPC-TM-650 2.4.13.1	Second	Pass 10s	>600			
Total Expansion   19C-TM-650 2.4.24   %   3.5 maximum   2.6	Z-axis CTE	Before Tg	IPC-TM-650 2.4.24	ppm/°C	60 maximum	45			
SAME		After Tg	IPC-TM-650 2.4.24	ppm/°C	300 maximum	220			
MOT			IPC-TM-650 2.4.24	%	3.5 maximum	2.6			
Electrical Properties           DK @ 16Hz RC 50%         IPC-TM-650 2.5.5.9         -         5.4 maximum         4.3           DF @ 16Hz RC 50%         IPC-TM-650 2.5.5.9         -         0.035 maximum         0.015           Volume Resistivity         After Moisture Resistance         IPC-TM-650 2.5.17.1         MΩ-cm         1.0E+4 minimum         5.0E+8           Surface Resistivity         After Moisture Resistance         IPC-TM-650 2.5.17.1         MΩ         1.0E+3 minimum         5.0E+6           Surface Resistivity         After Moisture Resistance         IPC-TM-650 2.5.17.1         MΩ         1.0E+4 minimum         5.0E+6           Electrical Strength         IPC-TM-650 2.5.6.2         Volt/mil (KV/mm)         762 (30) minimum         1200-1400 (54)           Dielectric Breakdown         IPC-TM-650 2.5.6.2         Volt/mil (KV/mm)         762 (30) minimum         1200-1400 (54)           Arc Resistance         ASTM D495         Second         60 minimum	X-Y CTE		IPC-TM-650 2.4.24	ppm/°C	-	11~13			
DK @ 1GHz RC 50%   IPC-TM-650 2.5.5.9   -	MOT		UL 94	°C	-	130			
DF @ 1GHz RC 50%	Electrical Properties								
Volume Resistivity         After Moisture Resistance         IPC-TM-650 2.5.17.1         MΩ-cm         1.0E+4 minimum         5.0E+8           Surface Resistivity         After Moisture Resistance         IPC-TM-650 2.5.17.1         MΩ -cm         1.0E+3 minimum         5.0E+6           Surface Resistivity         After Moisture Resistance         IPC-TM-650 2.5.17.1         MΩ -cm         1.0E+4 minimum         5.0E+6           Electrical Strength         IPC-TM-650 2.5.17.1         MΩ -cm         1.0E+3 minimum         5.0E+6           Electrical Strength         IPC-TM-650 2.5.6.2         Volt/mil (KV/mm)         762 (30) minimum         1200~1400 (54)           Dielectric Breakdown         IPC-TM-650 2.5.6.2         Volt/mil (KV/mm)         762 (30) minimum         1200~1400 (54)           Dielectric Breakdown         IPC-TM-650 2.5.6.2         Volt/mil (KV/mm)         762 (30) minimum         1200~1400 (54)           Comparative Tracking Index (CTI)         ASTM D3638         Rating (Volt)         -         Grade 3 (175~250)           Arc Resistance         ASTM D495         Second         60 minimum         147           Mechanical Properties           Peel Strength (10z)         As received         IPC-TM-650 2.4.8         Ib/in (N/mm)         6 (1.05) minimum         7.5~10 (1.3~1.75)	DK @ 1GHz RC 50%		IPC-TM-650 2.5.5.9	_	5.4 maximum	4.3			
Resistance   E-24/125   IPC-TM-650 2.5.17.1   MΩ-cm   1.0E+3 minimum   5.0E+6	DF @ 1GHz RC 50%		IPC-TM-650 2.5.5.9	-	0.035 maximum	0.015			
Surface Resistivity         After Moisture Resistance         IPC-TM-650 2.5.17.1         MΩ         1.0E+4 minimum         5.0E+7           Electrical Strength         IPC-TM-650 2.5.17.1         MΩ         1.0E+3 minimum         5.0E+6           Electrical Strength         IPC-TM-650 2.5.6.2         Volt/mil (KV/mm)         762 (30) minimum         1200~1400 (54)           Dielectric Breakdown         IPC-TM-650 2.5.6         KV         40 minimum         60           Comparative Tracking Index (CTI)         ASTM D3638         Rating (Volt)         -         Grade 3 (175~250)           Arc Resistance         ASTM D495         Second         60 minimum         147           Mechanical Properties           Peel Strength (1oz)         As received         IPC-TM-650 2.4.8         lb/in (N/mm)         -         7.5~10 (1.3~1.75)           After thermal strength         IPC-TM-650 2.4.4         Kpsi (MPa)         60 (415) minimum         80 (560)           Fill         IPC-TM-650 2.4.4         Kpsi (MPa)         50 (345) minimum         65 (450)           Physical Properties           Moisture Absorption         IPC-TM-650 2.6.2.1         %         0.80 maximum         0.12	Volume Resistivity		IPC-TM-650 2.5.17.1	MΩ-cm	1.0E+4 minimum	5.0E+8			
Resistance   F-24/125   IPC-TM-650 2.5.17.1   MΩ   1.0E+3 minimum   5.0E+6		E-24/125	IPC-TM-650 2.5.17.1	MΩ-cm	1.0E+3 minimum	5.0E+6			
Electrical Strength	Surface Resistivity		IPC-TM-650 2.5.17.1	ΜΩ	1.0E+4 minimum	5.0E+7			
Dielectric Breakdown		E-24/125	IPC-TM-650 2.5.17.1	МΩ	1.0E+3 minimum	5.0E+6			
Comparative Tracking Index (CTI)         ASTM D3638         Rating (Volt)         -         Grade 3 (175~250)           Arc Resistance         ASTM D495         Second         60 minimum         147           Mechanical Properties           Peel Strength (1oz)         As received         IPC-TM-650 2.4.8         lb/in (N/mm)         -         7.5~10 (1.3~1.75)           After thermal stress         IPC-TM-650 2.4.8         lb/in (N/mm)         6 (1.05) minimum         7.5~10 (1.3~1.75)           Flexural Strength         Warp         IPC-TM-650 2.4.4         Kpsi (MPa)         60 (415) minimum         80 (560)           Fill         IPC-TM-650 2.4.4         Kpsi (MPa)         50 (345) minimum         65 (450)           Physical Properties           Moisture Absorption         IPC-TM-650 2.6.2.1         %         0.80 maximum         0.12	Electrical Strength		IPC-TM-650 2.5.6.2	Volt/mil (KV/mm)	762 (30) minimum	1200~1400 (54)			
Arc Resistance         ASTM D495         Second         60 minimum         147           Mechanical Properties           Peel Strength (1oz)         As received         IPC-TM-650 2.4.8         lb/in (N/mm)         -         7.5~10 (1.3~1.75)           After thermal stress         IPC-TM-650 2.4.8         lb/in (N/mm)         6 (1.05) minimum         7.5~10 (1.3~1.75)           Flexural Strength         Warp         IPC-TM-650 2.4.4         Kpsi (MPa)         60 (415) minimum         80 (560)           Fill         IPC-TM-650 2.4.4         Kpsi (MPa)         50 (345) minimum         65 (450)           Physical Properties           Moisture Absorption         IPC-TM-650 2.6.2.1         %         0.80 maximum         0.12	Dielectric Breakdown		IPC-TM-650 2.5.6	KV	40 minimum	60			
Mechanical Properties           Peel Strength (1oz)         As received         IPC-TM-650 2.4.8         lb/in (N/mm)         -         7.5~10 (1.3~1.75)           After thermal stress         IPC-TM-650 2.4.8         lb/in (N/mm)         6 (1.05) minimum         7.5~10 (1.3~1.75)           Flexural Strength         Warp         IPC-TM-650 2.4.4         Kpsi (MPa)         60 (415) minimum         80 (560)           Fill         IPC-TM-650 2.4.4         Kpsi (MPa)         50 (345) minimum         65 (450)           Physical Properties           Moisture Absorption         IPC-TM-650 2.6.2.1         %         0.80 maximum         0.12	Comparative Tracking Index (CTI)		ASTM D3638	Rating (Volt)	-	Grade 3 (175~250)			
Peel Strength (1oz)         As received         IPC-TM-650 2.4.8         lb/in (N/mm)         -         7.5~10 (1.3~1.75)           After thermal stress         IPC-TM-650 2.4.8         lb/in (N/mm)         6 (1.05) minimum         7.5~10 (1.3~1.75)           Flexural Strength         Warp         IPC-TM-650 2.4.4         Kpsi (MPa)         60 (415) minimum         80 (560)           Fill         IPC-TM-650 2.4.4         Kpsi (MPa)         50 (345) minimum         65 (450)           Physical Properties           Moisture Absorption         IPC-TM-650 2.6.2.1         %         0.80 maximum         0.12	Arc Resistance		ASTM D495	Second	60 minimum	147			
After thermal stress   IPC-TM-650 2.4.8   Ib/in (N/mm)   6 (1.05) minimum   7.5~10 (1.3~1.75)	Mechanical Properties								
Stress	Peel Strength (1oz)	As received	IPC-TM-650 2.4.8	lb/in (N/mm)	-	7.5~10 (1.3~1.75)			
Fill         IPC-TM-650 2.4.4         Kpsi (MPa)         50 (345) minimum         65 (450)           Physical Properties           Moisture Absorption         IPC-TM-650 2.6.2.1         %         0.80 maximum         0.12			IPC-TM-650 2.4.8	lb/in (N/mm)	6 (1.05) minimum	7.5~10 (1.3~1.75)			
Physical Properties       Moisture Absorption     IPC-TM-650 2.6.2.1     %     0.80 maximum     0.12	Flexural Strength	Warp	IPC-TM-650 2.4.4	Kpsi (MPa)	60 (415) minimum	80 (560)			
Moisture Absorption IPC-TM-650 2.6.2.1 % 0.80 maximum 0.12		Fill	IPC-TM-650 2.4.4	Kpsi (MPa)	50 (345) minimum	65 (450)			
	Physical Propertie	s							
Flammability UL-94 Rating V-0 minimum V-0	Moisture Absorption		IPC-TM-650 2.6.2.1	%	0.80 maximum	0.12			
	Flammability		UL-94	Rating	V-0 minimum	V-0			

All test data provided are typical values and not intended to be specification values.

#### CORPORATE HEADQUARTERS

#### Ventec Electronics Co. Ltd.

308 TaiShan Rd, New District Suzhou, Jiangsu, P.R. China 215129 T: +86 512-68091810

Email: sales@ventec.com.cn

#### EMEA REGIONAL HEADQUARTERS

Unit 1 Trojan Business Centre, Tachbrook Park Estate, Leamington-Spa, CV34 6RH, UK

T: +44 1926-889822

Email: sales@ventec-europe.com

### AMERICAS REGIONAL HEADQUARTERS

#### Ventec USA

720 Lee St., Elk Grove Village, Illinois, IL 60007, United States of America

T: +1 630-4221627

Email: saleseast@ventec-usa.com www.venteclaminates.com Page 2 of 2

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