



## DE104 Laminate and Prepreg

**DE104** offers excellent thermal resistance, due to its special resin system and a low coefficient of thermal expansion in the Z-axis.

The glass transition temperature (Tg) is 135°C (DSC). Time to delamination of the laminate at a temperature of 260°C is greater 12 minutes and the decomposition temperature (Td) is 315°C. The product is listed as FR-4 and can be processed using standard parameters. DE104 multilayer (ML) corresponds to NEMA-grade FR-4 and meets the requirements of IPC-4101C /21.

**This product is available to our customers in Europe.**

[www.isola-group.com/products/DE104](http://www.isola-group.com/products/DE104)

### ORDERING INFORMATION:

Contact your local sales representative or visit [www.isola-group.com](http://www.isola-group.com) for further information.

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Low Tg Material

# DE104 Data Sheet

**Dk 4.37, Df 0.022**  
**Tg 135, Td 315**  
**/21**

## Features

- High Thermal Performance
  - ▶ Tg: 135°C (DSC)
  - ▶ Td: 315°C (TGA @ 5% wt loss)
- T260: 12 minutes
- RoHS Compliant
- UV Blocking and AOI Fluorescence
  - ▶ High throughput and accuracy during PCB fabrication and assembly
- Standard Availability
  - ▶ Thickness: 0.002" (0.05 mm) to 0.093" (2.4 mm)
  - ▶ Available in sheet or panel form
- Prepreg Standard Availability
  - ▶ Roll or panel form
  - ▶ Tooling of prepreg panels available
- Copper Foil Type Availability
  - ▶ Standard HTE Grade 3
  - ▶ RTF (Reverse Treat Foil)
- Copper Weights
  - ▶ ½, 1 and 2 oz (18, 35 and 70 µm) available
  - ▶ Heavier copper available upon request
  - ▶ Thinner copper foil available upon request
- Glass Fabric Availability
  - ▶ Standard E-glass
  - ▶ Square weave glass fabric available
  - ▶ Spread glass fabric available
- Industry Approvals
  - ▶ IPC-4101D WAM1 /21
  - ▶ UL – File Number E41625
  - ▶ Qualified to UL's MCIL Program

# DE104 Specifications

Property	Typical Values				
			Units	Test Method	
	Typical Value	Specification	Metric (English)	IPC-TM-650 (or as noted)	
<b>Glass Transition Temperature (Tg) by DSC</b>		135	–	°C	2.4.25
<b>Decomposition Temperature (Td) by TGA @ 5% weight loss</b>		315	–	°C	ASTM D3850
<b>T260</b>		12	–	Minutes	2.4.24.1
<b>T288</b>		–	–	Minutes	2.4.25
<b>CTE, Z-axis</b>	A. Pre-Tg B. Post-Tg	70 250	– –	ppm/°C	2.4.24
<b>CTE, X-, Y-axes</b>	A. Pre-Tg B. Post-Tg	16/13 14/7	– –	ppm/°C	2.4.24
<b>Z-axis Expansion (50-260°C)</b>		4.2	–	%	2.4.24
<b>Thermal Conductivity</b>		0.36	–	W/mK	ASTM D5930
<b>Thermal Stress 10 sec @ 288°C (550.4°F)</b>	A. Unetched B. Etched	Pass	Pass Visual	Rating	2.4.13.1
<b>Dk, Permittivity (Laminate &amp; prepreg as laminated) Split Post Method, Tested at 50% resin</b>	A. @ 100 MHz	4.46	5.40	–	2.5.5.3
	B. @ 500 MHz	4.40			
	C. @ 1 GHz	4.37			
	D. @ 2 GHz	4.35			
	E. @ 5 GHz	4.32			
<b>Df, Loss Tangent (Laminate &amp; prepreg as laminated) Split Post Method, Tested at 50% resin</b>	A. @ 100 MHz	0.020	0.035	–	2.5.5.3
	B. @ 500 MHz	0.021			
	C. @ 1 GHz	0.022			
	D. @ 2 GHz	0.023			
	E. @ 5 GHz	0.024			
<b>Volume Resistivity</b>	A. 96/35/90	–	–	MΩ-cm	2.5.17.1
	B. After moisture resistance	1.3x10 <sup>6</sup>	1.0x10 <sup>4</sup>		
	C. At elevated temperature	3.4x10 <sup>7</sup>	1.0x10 <sup>3</sup>		
<b>Surface Resistivity</b>	A. 96/35/90	–	–	MΩ	2.5.17.1
	B. After moisture resistance	1.0x10 <sup>6</sup>	1.0x10 <sup>4</sup>		
	C. At elevated temperature	7.2x10 <sup>6</sup>	1.0x10 <sup>3</sup>		
<b>Dielectric Breakdown</b>		>50	40	kV	2.5.6
<b>Arc Resistance</b>		105	60	Seconds	2.5.1
<b>Electric Strength (Laminate &amp; prepreg as laminated)</b>		54 (1350)	29 (736)	kV/mm (V/mil)	2.5.6.2
<b>Comparative Tracking Index (CTI)</b>		2	–	Class (Volts)	–
<b>Peel Strength</b>	A. Low profile copper foil and very low profile – all copper weights >17 microns	1.23 (7.0)	0.70 (4.0)	N/mm (lb/inch)	2.4.8
	B. Standard profile copper	–	–		2.4.8.2
	1. After thermal stress	1.58 (9.0)	1.05 (6.0)		2.4.8.3
	2. At 125°C (257°F)	1.23 (7.0)	0.70 (4.0)		–
	3. After process solutions	1.58 (9.0)	0.80 (4.5)	–	
<b>Flexural Strength</b>	A. Lengthwise direction	84,000	–	lb/inch <sup>2</sup>	2.4.4
	B. Crosswise direction	65,200			
<b>Tensile Strength</b>	A. Lengthwise direction	57,000	–	lb/inch <sup>2</sup>	–
	B. Crosswise direction	42,400			
<b>Moisture Absorption</b>		0.3	0.8	%	2.6.2.1
<b>Flammability (Laminate &amp; prepreg as laminated)</b>		V-0	V-0	Rating	UL 94
<b>Max Operating Temperature</b>		130	UL Cert	°C	–

The data, while believed to be accurate and based on analytical methods considered to be reliable, is for information purposes only. Any sales of these products will be governed by the terms and conditions of the agreement under which they are sold.