



# DE104

## Low Tg 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 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-4101D WAM1.

### Product Attributes

Legacy Materials

### Typical Market Applications

Automotive & Transportation

#### 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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# Data Sheet

Tg 135°C

Td 315°C

Dk 4.37

Df 0.022

IPC-4101 - / 21

UL - File Number E41625

Last Updated April 5, 2018  
Revision No: B

## Product Features

- Industry Recognition
  - UL File Number: E41625
  - Qualified to UL's MCIL Program
  - RoHS Compliant
- Performance Attributes
- Processing Advantages
  - UV blocking and AOI fluorescence

## Product Availability

- Standard Material Offering: Laminate
  - 2 to 93 mil (0.05 to 2.4 mm)
  - Available in full size sheet or panel form
- Copper Foil Type
  - HTE Grade 3
  - RTF (Reverse Treat Foil)
- Copper Weight
  - ½ to 2 oz (18 to 70 µm) available
  - Heavier copper available
  - Thinner copper foil available
- Standard Material Offering: Prepreg
  - Roll or panel form
  - Tooling of prepreg panels
- Glass Fabric Availability
  - E-glass
  - Square weave glass
  - Mechanically spread glass

# DE104 Typical Values

Last Updated Apr 5, 2018

Property	Typical Value	Units	Test Method
		Metric (English)	IPC-TM-650 (or as noted)
Glass Transition Temperature (Tg) by DSC	135	°C	2.4.25C
Decomposition Temperature (Td) by TGA @ 5% weight loss	315	°C	2.4.24.6
Time to Delaminate by TMA (Copper removed)	A. T260 B. T288	°C Minutes	2.4.24.1
Z-Axis CTE	A. Pre-Tg B. Post-Tg C. 50 to 260°C, (Total Expansion)	ppm/°C ppm/°C %	2.4.24C
X/Y-Axis CTE	Pre-Tg	ppm/°C	2.4.24C
Thermal Conductivity	0.36	W/mK	ASTM E1952
Thermal Stress 10 sec @ 288°C (550.4°F)	A. Unetched B. Etched	Pass	Pass Visual 2.4.13.1
Dk, Permittivity	A. @ 100 MHz B. @ 500 MHz C. @ 1 GHz D. @ 2 GHz E. @ 5 GHz	—	2.5.5.3 2.5.5.3 2.5.5.9 2.5.5.5 2.5.5.5
Df, Loss Tangent	A. @ 100 MHz B. @ 500 MHz C. @ 1 GHz D. @ 2 GHz E. @ 5 GHz	—	2.5.5.3 2.5.5.3 2.5.5.9 2.5.5.5 2.5.5.5
Volume Resistivity	A. C-96/35/90 B. After moisture resistance C. At elevated temperature	— $1.3 \times 10^6$ $3.4 \times 10^7$	MQ-cm 2.5.17.1
Surface Resistivity	A. C-96/35/90 B. After moisture resistance C. At elevated temperature	— $1.0 \times 10^6$ $7.2 \times 10^6$	MQ 2.5.17.1
Dielectric Breakdown	>50	kV	2.5.6B
Arc Resistance	105	Seconds	2.5.1B
Electric Strength (Laminate & laminated prepreg)	54 (1350)	kV/mm (V/mil)	2.5.6.2A
Comparative Tracking Index (CTI)	2	Class (Volts)	UL 746A ASTM D3638
Peel Strength	A. Low profile copper foil and very low profile copper foil all copper foil >17 µm [0.669 mil] B. Standard profile copper 1. After thermal stress 2. At 125°C (257°F) 3. After process solutions	1.23 (7.0) 1.58 (9.0) 1.23 (7.0) 1.58 (9.0)	2.4.8C N/mm (lb/inch) 2.4.8.2A 2.4.8.3 2.4.8.3
Flexural Strength	A. Length direction B. Cross direction	84.0 65.2	ksi 2.4.4B
Tensile Strength	A. Length direction B. Cross direction	57.0 42.4	ksi ASTM D3039
Moisture Absorption	0.3	%	2.6.2.1A
Flammability (Laminate & laminated prepreg)	V-0	Rating	UL 94
Max Operating Temperature	130	°C	UL 796

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.

[www.isola-group.com/products/all-printed-circuit-materials/de104/](http://www.isola-group.com/products/all-printed-circuit-materials/de104/)

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## NOTE

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Revision A: Corrected 5GHz Df label

Revision B: Corrected units for Flexural and Tensile Strength