

IPC-4101 /21 UL - File Number E41625

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

### PRODUCT FEATURES

#### Industry Recognition

- UL File Number: E41625
- RoHS Compliant

#### Performance Attributes

- CAF resistant
- Lead-free assembly compatible

#### Processing Advantages

- FR-4 process compatible
- 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

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-4101.

### PRODUCT ATTRIBUTES



### TYPICAL MARKET APPLICATIONS



### ORDERING INFORMATION:

Contact your local sales representative or contact [info@isola-group.com](mailto:info@isola-group.com) for further information.

#### Isola Group

6565 West Frye Road Chandler, AZ 85226  
Phone: 480-893-6527  
Fax: 480-893-1409

#### Isola Asia Pacific

(Hong Kong) Ltd. 12/F, Kin Sang Commercial Centre, 49 King Yip Street, Kwun Tong, Kowloon,  
Hong Kong  
Phone: 852-2418-1318  
Fax: 852-2418-1533

#### Isola GmbH

Isola Strasse 2 D-52348 Düren, Germany  
Phone: 49-2421-8080  
Fax: 49-2421-808164

# Typical Values Table

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	12 –	°C Minutes	2.4.24.1
Z-Axis CTE	A. Pre-Tg B. Post-Tg C. 50 to 260°C, (Total Expansion)	70 250 4.2	ppm/°C ppm/°C %	2.4.24C
X/Y-Axis CTE	Pre-Tg	16/13	ppm/°C	2.4.24C
Thermal Conductivity		0.36	W/m-K	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	4.46 4.40 4.37 4.35 4.32	–	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	0.020 0.021 0.022 0.023 0.024	–	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	– $1.3 \times 10^6$ $3.4 \times 10^7$	MΩ-cm	2.5.17.1
Surface Resistivity	A. C-96/35/90 B. After moisture resistance C. At elevated temperature	– $1.0 \times 10^6$ $7.2 \times 10^6$	MΩ	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)	N/mm (lb/inch)	2.4.8C 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
Relative Thermal Index (RTI)		130	°C	UL 796

## NOTES

Visit our site <http://www.isola-group.com> for more details.

Revisions:

A: Initial release - 4/17

B: Correct 5GHz Df label - 8-17

C: Corrected units for Flexural and Tensile Strength - 8/18

D: Change MOT to RTI 5/19

Isola, the Isola logo, Astra, Chronon, GETEK, I-Fill, IsoDesign, IsoStack, I-Speed, I-Tera, Polyclad, Stratus, TerraGreen, and The Base for Innovation are registered trademarks or trademarks of ISOLA USA Corp. in the United States and in other countries.

Copyright © 2021 Isola Group. All rights reserved.