

IPC-4101 /134 UL - File Number E41625

TerraGreen® 400GE laminate materials are our most advanced ultra-high speed, halogen free ultra-low loss design solution.

### PRODUCT FEATURES

#### Industry Recognition

- UL File Number: E41625
- RoHS Compliant

#### Performance Attributes

- CAF resistant
- Low moisture absorption
- Halogen free
- 6x 260°C reflow capable
- 6x 288°C solder float capable

#### Processing Advantages

- FR-4 process compatible
- Excellent Fill and Flow
- Multiple lamination cycles
- HDI technology compatible

### PRODUCT AVAILABILITY

#### Standard Material Offering: Laminate

- 2 to 10 mil (0.05 to 0.25 mm)

#### Copper Foil Type

- HVLP3 (VLP1) ≤1.1 micron Rz JIS
- Advanced RTF ≤2.5 micron Rz JIS

#### Copper Weight

- ½, 1 and 2 oz (18, 35 and 70 µm) available
- Thinner copper foil available

#### Standard Material Offering: Prepreg

- Tooling of prepreg panels
- Moisture barrier packaging

#### Glass Fabric Availability

- E-glass
- Square weave glass
- Mechanically spread glass

TerraGreen® 400GE is our Halogen Free material solution for next generation 5G infrastructure, data center systems, high end computing, wired & wireless communications and AI applications with data rates >100 Gb/s. Our novel resin system, RTF3 (<2.5 µm Rz JIS) copper foil and e-glass is our lowest cost member of the TerraGreen 400G® family of products.

The TerraGreen® 400GE resin system has proven superior CAF performance on tight pitch testing. CAF performance is enhanced by the resin systems excellent interlaminar and bond line adhesion strength.

TerraGreen® 400GE is lead free compatible and sequential lamination capable and can be processed utilizing standard PCB equipment and processing steps. TerraGreen® 400GE meets UL94 V-0.

### 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	200	°C	2.4.25C	
Glass Transition Temperature (Tg) by DMA	215	°C	2.4.24.4	
Glass Transition Temperature (Tg) by TMA	180	°C	2.4.24C	
Decomposition Temperature (Td) by TGA @ 5% weight loss	>380C	°C	2.4.24.6	
Time to Delaminate by TMA (Copper removed)	A. T288 B. T300	60+	Minutes	2.4.24.1
Z-Axis CTE	A. Pre-Tg B. Post-Tg C. 50 to 260°C, (Total Expansion)	37 170 1.8	ppm/°C ppm/°C %	2.4.24C
X/Y-Axis CTE	12/13	ppm/°C	2.4.24C	
Thermal Conductivity	0.54	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. @ 10 GHz B. @ 20 GHz	3.29 3.25	—	2.5.5.5
Df, Loss Tangent	A. @ 10 GHz B. @ 20 GHz	0.0026	—	2.5.5.5
Volume Resistivity	C-96/35/90	2.0x10 <sup>8</sup>	MΩ-cm	2.5.17.1
Surface Resistivity	C-96/35/90	2.0x10 <sup>7</sup>	MΩ	2.5.17.1
Dielectric Breakdown	70	kV	2.5.6B	
Arc Resistance	180	Seconds	2.5.1B	
Electric Strength (Laminate & laminated prepreg)	67 (1700)	kV/mm (V/mil)	2.5.6.2A	
Comparative Tracking Index (CTI)	2 (250-499)	Class (Volts)	UL 746A ASTM D3638	
Peel Strength	A. Low profile and very low profile copper foil B. Low profile and very low profile copper foil ... After thermal stress	0.7 (4.1)	N/mm (lb/inch)	2.4.8C 2.4.8.2A
Flexural Strength	A. Length direction B. Cross direction	393 (57) 338 (49)	MPa (kpsi)	2.4.4B
Tensile Strength	A. Length direction B. Cross direction	220 (32) 193 (28)	MPa (kpsi)	ASTM D3039
Young's Modulus	A. Length direction B. Cross direction	14.5 (2100) 13.0 (1900)	GPa(kpsi)	ASTM D790-15e2
Flexural Modulus	A. Lengthwise B. Crosswise	12.1 (1750) 11.7(1700)	GPa (kpsi)	ASTM D790-15e2
Moisture Absorption	<0.1	%	2.6.2.1A	
Flammability (Laminate & laminated prepreg)	V-0	Rating	UL 94	
Relative Thermal Index (RTI)	140	°C	UL 746	

## NOTES

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

Revisions:

A: Initial release - 1/23

B: Corrected units for Youngs Modulus from MPa to GPa - 1/24

C: Corrected laminate thickness offering from maximum 18 mils to 10 mils, updated copper foil offering - 3/24

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.