



DE156

Halogen-free Laminates and Prepregs

DE156 is a base material of type FR-4. The resin matrix is based on a modified epoxy resin; conventional E-glass-fabric is used for reinforcement.

The requirements of flammability class V-0 as per UL 94 are met without addition of antimony compounds. Since this grade does not contain halogens, it displays greater thermal stability than a standard FR-4, as time to delamination (T260) measurements prove.

Product Attributes

Legacy Materials , High Thermal Reliability , Halogen Free

Typical Market Applications

Consumer Electronics

ORDERING INFORMATION:

Contact your local sales representative or visit www.isola-group.com for further information.

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Data Sheet

Tg 155°C

Td 390°C

Dk 4.00

Df 0.02

IPC-4101 - /128

UL - File Number E41625

Last Updated July 21, 2017
Revision No:

Product Features

- Industry Recognition
 - UL File Number: E41625
 - RoHS Compliant
- Performance Attributes
 - Halogen free
- Processing Advantages
 - UV blocking and AOI fluorescence

Product Availability

- Standard Material Offering: Laminate
 - 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

DE156 Typical Values

Last Updated Jul 21, 2017

Property		Typical Value	Units	Test Method
			Metric (English)	IPC-TM-650 (or as noted)
Glass Transition Temperature (Tg) by DSC		155	°C	2.4.25C
Decomposition Temperature (Td) by TGA @ 5% weight loss		390	°C	2.4.24.6
Time to Delaminate by TMA (Copper removed)	A. T260 B. T288	60 >10	Minutes	2.4.24.1
Z-Axis CTE	A. Pre-Tg B. Post-Tg C. 50 to 260°C, (Total Expansion)	45 220 2.8	ppm/°C ppm/°C %	2.4.24C
X/Y-Axis CTE	Pre-Tg	133	ppm/°C	2.4.24C
Thermal Conductivity		0.4	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	4.05	—	2.5.5.3
	B. @ 1 GHz	4.01		2.5.5.9
	C. @ 2 GHz	4.00		2.5.5.5
	D. @ 5 GHz	3.97		2.5.5.5
	E. @ 10 GHz	—		2.5.5.5
Df, Loss Tangent	A. @ 100 MHz	0.0130	—	2.5.5.3
	B. @ 1 GHz	0.0161		2.5.5.9
	C. @ 2 GHz	0.0167		2.5.5.5
	D. @ 5 GHz	0.0172		2.5.5.5
	E. @ 10 GHz	0.0172		2.5.5.5
Volume Resistivity	A. C-96/35/90 B. After moisture resistance C. At elevated temperature	5.0 x 10 ⁶ 3.0 x 10 ⁷ 2.8 x 10 ⁶	MΩ-cm	2.5.17.1
Surface Resistivity	A. C-96/35/90 B. After moisture resistance C. At elevated temperature	2.0 x 10 ³ 4.0 x 10 ⁶ 1.0 x 10 ⁷	MΩ	2.5.17.1
Dielectric Breakdown		60	kV	2.5.6B
Arc Resistance		115	Seconds	2.5.1B
Electric Strength (Laminate & laminated prepreg)		36 (1500)	kV/mm (V/mil)	2.5.6.2A
Comparative Tracking Index (CTI)		—	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]	7.0	N/mm (lb/inch)	2.4.8C
	B. Standard profile copper	8.0		2.4.8.2A
	1. After thermal stress	6.0		2.4.8.3
	2. At 125°C (257°F)	7.0		2.4.8.3
Flexural Strength	A. Length direction	89,500	ksi	2.4.4B
	B. Cross direction	62,700		
Tensile Strength	A. Length direction	55,242	ksi	ASTM D3039
	B. Cross direction	39,335		
Poisson's Ratio	A. Length direction	0.175	—	ASTM D3039
	B. Cross direction	0.143		
Moisture Absorption		0.1	%	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.

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