



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.

www.isola-group.com/products/DE156

ORDERING INFORMATION:

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

Isola Group
3100 West Ray Road
Suite 301
Chandler, AZ 85226
Phone: 480-893-6527
Fax: 480-893-1409
info@isola-group.com

Isola Asia Pacific (Hong Kong) Ltd.
Unit 3512 - 3522, 35/F
No. 1 Hung To Road, Kwun Tong,
Kowloon, Hong Kong
Phone: 852-2418-1318
Fax: 852-2418-1533
info.hkg@isola-group.com

Isola GmbH
Isola Strasse 2
D-52348 Düren, Germany
Phone: 49-2421-8080
Fax: 49-2421-808164
info-dur@isola-group.com

Halogen Free

DE156 Data Sheet

**Tg 155, Td 390
Dk 4.00, Df 0.02
/128**

Features

- High Thermal Performance
 - ▶ Tg: 155°C (DSC)
 - ▶ Td: 390°C (TGA @ 5% wt loss)
 - ▶ Superior performance through multiple thermal excursions
 - ▶ Superior chemical and thermal resistance
 - ▶ Lower CTE from ambient to 288°C
- T260: 60 minutes
- T288: >10 minutes
- RoHS Compliant
- UV Blocking and AOI Compatible
 - ▶ UV blocking and enhanced fluorescence
 - ▶ Compatible with all AOI equipment, including laser-enhanced reflectance systems
- Core Material Standard Availability
 - ▶ Thickness: 0.002" (0.05 mm) to 0.060"/0.062" (1.5 mm)
 - ▶ Available in full size 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
- Industry Approvals
 - ▶ IPC-4101D WAM1 /128
 - ▶ UL - File Number E41625

DE156 Specifications

Property	Typical Values				
			Units	Test Method	
	Typical Value	Specification	Metric (English)	IPC-TM-650 (or as noted)	
Glass Transition Temperature (Tg) by DSC		155	150-200	°C	2.4.25
Decomposition Temperature (Td) by TGA @ 5% weight loss		390	–	°C	ASTM D3850
T260		60	–	Minutes	2.4.25
T288		>10	–	Minutes	2.4.25
CTE, Z-axis	A. Pre-Tg B. Post-Tg	45 220	AABUS –	ppm/°C	2.4.24
CTE, X-, Y-axes	A. Pre-Tg B. Post-Tg	13 14	AABUS –	ppm/°C	2.4.24
Z-axis Expansion (50-260°C)		2.8	–	%	2.4.24
Thermal Conductivity		0.4	–	W/mK	ASTM D5930
Thermal Stress 10 sec @ 288°C (550.4°F)	A. Unetched B. Etched	Pass	Pass Visual	Rating	2.4.13.1
Dk, Permittivity (Laminate & prepreg as laminated) Tested at 50% resin	A. @ 100 MHz (HP4285A)	4.05	5.4	–	2.5.5.3
	B. @ 1 GHz (HP4291A)	4.01	–		2.5.5.9
	C. @ 2 GHz (Bereskin Stripline)	4.00	–		2.5.5.5
	D. @ 5 GHz (Bereskin Stripline)	3.97	–		2.5.5.5
	E. @ 10 GHz (Bereskin Stripline)	–	–		2.5.5.5
Df, Loss Tangent (Laminate & prepreg as laminated) Tested at 50% resin	A. @ 100 MHz (HP4285A)	0.0130	0.035	–	2.5.5.3
	B. @ 1 GHz (HP4291A)	0.0161	–		2.5.5.9
	C. @ 2 GHz (Bereskin Stripline)	0.0167	–		2.5.5.5
	D. @ 5 GHz (Bereskin Stripline)	0.0172	–		2.5.5.5
	E. @ 10 GHz (Bereskin Stripline)	0.0172	–		2.5.5.5
Volume Resistivity	A. 96/35/90	5.0x10 ⁶	1.0x10 ⁶	MΩ-cm	2.5.17.1
	B. After moisture resistance	3.0x10 ⁷	–		
	C. At elevated temperature	2.8x10 ⁶	1.0x10 ³		
Surface Resistivity	A. 96/35/90	2.0x10 ³	1.0x10 ⁴	MΩ	2.5.17.1
	B. After moisture resistance	4.0x10 ⁶	–		
	C. At elevated temperature	1.0x10 ⁷	1.0x10 ³		
Dielectric Breakdown		60	40	kV	2.5.6
Arc Resistance		115	60	Seconds	2.5.1
Electric Strength (Laminate & prepreg as laminated)		36 (1500)	30 (750)	kV/mm (V/mil)	2.5.6.2
Comparative Tracking Index (CTI)		–	–	Volts	UL-746A ASTM D3638
Peel Strength	A. Low profile copper foil and very low profile – all copper weights >17 microns	7.0	4.0	lb/inch	2.4.8
	B. Standard profile copper	–	–		2.4.8.2
	1. After thermal stress	8.0	4.5		2.4.8.3
	2. At 125°C (257°F)	6.0	4.0		–
	3. After process solutions	7.0	3.0	–	–
Flexural Strength	A. Lengthwise direction	89,500	–	lb/inch ²	2.4.4
	B. Crosswise direction	62,700	–		
Tensile Strength	A. Lengthwise direction	55,242	–	lb/inch ²	–
	B. Crosswise direction	39,335	–		
Young's Modulus	A. Grain direction	3677	–	ksi	ww
	B. Fill direction	3179	–		
Poisson's Ratio	A. Grain direction	0.175	–	–	xx
	B. Fill direction	0.143	–		
Moisture Absorption		0.1	–	%	2.6.2.1
Flammability (Laminate & prepreg as laminated)		V-0	V-1	Rating	UL 94
Max Operating Temperature		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.

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