

Halogen Free, High Elastic Modulus and Low CTE Multilayer Material

MCL-E-679FG MCL-E-679FGB (Black Type) GEA-679FG (Prepreg)

High Tg Glass Epoxy Multilayer Material (FR-4)

Features

- Halogen free material for environmental concerns.
- CTE (Z-direction) is 50% lower than that of our standard FR-4.
- Elastic modulus is 20% higher than that of our standard FR-4. Even thin laminate has less warpage and deflection.
- Superior heat resistance for soldering (suitable for the lead free process).
- Surface roughness is 1/4 of our standard FR-4, and making fine pattern possible.

Applications

- Semiconductor packages. (FC-BGA, BGA, CSP)
- Core material for HDI.

Standard Specifications

Part Number	Type	Copperfoil Thickness	Code Name	Actual Thickness and Tolerance
MCL-E-679FG MCL-E-679FGB	(S)	2μm 3μm 5μm 12μm (LP,PF)	U0.03	0.030±0.013mm
			U0.04	0.040±0.013mm
			U0.05	0.050±0.013mm
			T0.04	0.040±0.013mm
			T0.05	0.050±0.013mm
			T0.06	0.060±0.013mm
	(R) (S)	2,3,5,12,18μm (STD,LP,PF)	T0.07	0.070±0.013mm
			M0.06	0.07±0.02mm
			0.1	0.11±0.02mm
			0.15	0.16±0.03mm
			0.2	0.21±0.04mm
			0.3	0.32±0.05mm
			0.41	0.40±0.05mm
			0.61	0.60±0.06mm
0.81	0.80±0.08mm			

Note1) STD:Standard copper foil, LP:Low profile copper foil, PF:Hitachi profile-free copper foil.

Note2) STD:12μm, 18μm, 35μm, 70μm; LP:2μm, 3μm, 5μm, 12μm, 18μm; PF:2μm, 3μm, 5μm, 12μm. Please contact us for details. Note3) "U" for 1-ply; "T" for 2-ply.

Note4) In case laminate thickness lies in between two thickness figures shown above, the tolerance of such laminate would be equal to the tolerance of the thicker one.

Note5) The thickness means that of dielectric layer.

Characteristics

Thin Laminate

(t0.4mm)

Item	Condition	Unit	Actual Value		Test Method (IPC-TM-650)
			MCL-E-679FG Type (R)	MCL-E-679FG Type (S)	
Tg	TMA	°C	165~175	175~185	2.4.24
	DMA		200~220	210~230	—
CTE *1	(30~120°C)	ppm/°C	13~15	12~14	2.4.24
			13~15	12~14	
			23~33 (<Tg)	20~30	
			140~170 (>Tg)	130~160	
Solder Heat Resistance (260°C)	A	sec.	>300		—
T-260 (Without Copper)	TMA	min.	>60		2.4.24.1
T-288 (Without Copper)			>60		
Decomposition Temperature (5% Weight Loss)	TGA	°C	340~360		2.3.40
Heat Resistance for HDI Process (Semi-Additive)	260°C Reflow	cycles	>10		—
Copper Peel Strength	A	kN/m	0.9~1.1	1.1~1.2	2.4.8
			1.1~1.2	1.2~1.3	
Surface Roughness (Ra)	A	μm	2~3		2.2.17
Flexural Modulus (Lengthwise)	A	GPa	23~28	24~29	2.4.4
Dielectric Constant	C-96/20/65	—	5.2~5.4	5.0~5.2	2.5.5.1
			4.6~4.8		2.5.5.5
Dissipation Factor	C-96/20/65	—	0.0080~0.0100		2.5.5.1
			0.0160~0.0180		2.5.5.5
Volume Resistivity	C-96/35/90	Ω·cm	1×10 ¹⁵ ~1×10 ¹⁶		2.5.17
Surface Resistance		Ω	1×10 ¹³ ~1×10 ¹⁵		
Insulation Resistance	C-96/20/65	Ω	1×10 ¹⁴ ~1×10 ¹⁶		—
	C-96/20/65+D-2/100		1×10 ¹³ ~1×10 ¹⁵		—
Water Absorption	E-24/50+D-24/23	%	0.4~0.6	0.3~0.5	2.6.2.1
Flammability (UL-94)	A	—	V-0		2.3.10

*1) Heating Rate:10°C/min. *2) Measured by Triplate-Line Resonator. 0.8mm thickness core is used depending on test item.

●Prepreg

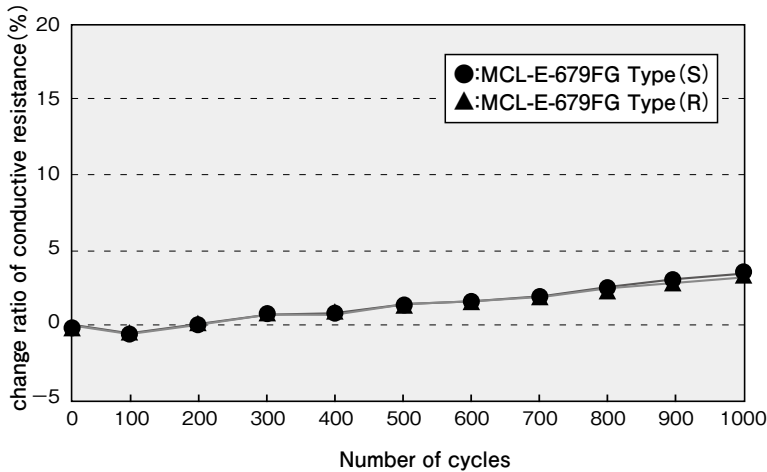
Part Number	Type		Glass Cloth		Properties				
			Style	Yarn Content (warp×fill)	Resin Content (%)	Volation Content (%)	Gelation Time (sec.)	Dielectric Thickness (mm) *1 () After pattern filling	
GEA-679FG	(R)	0.03 (GBPE)	1027	75×75	73±2	≤1.5	175±30	0.040	
		0.04 (GRZPE)	1037	69×72	73±2		165±30	0.048	
		0.06 (GRROE)	1078	53×53	68±2	≤1.0	155±30	0.079	
		0.1 (GRSKE)	2116	60×58	58±2			0.127	
	(S)	0.03 (GSAPE)	1017	95×95	78±2	≤1.5	175±30	0.031	
		0.03 (GSBPE)	1027	75×75	73±2			0.040	
		0.03 (GSBSE)	1027	75×75	78±2			0.050	
		0.04 (GSZPE)	1037	69×72	73±2	≤1.0		0.048	
		0.06 (GSROE)	1078	53×53	68±2			0.079	
		0.1 (GSSKE)	2116	60×58	58±2			165±30	0.127

Test Method(IPC-TM-650)	2.3.16.1	2.3.19	2.3.18	—
-------------------------	----------	--------	--------	---

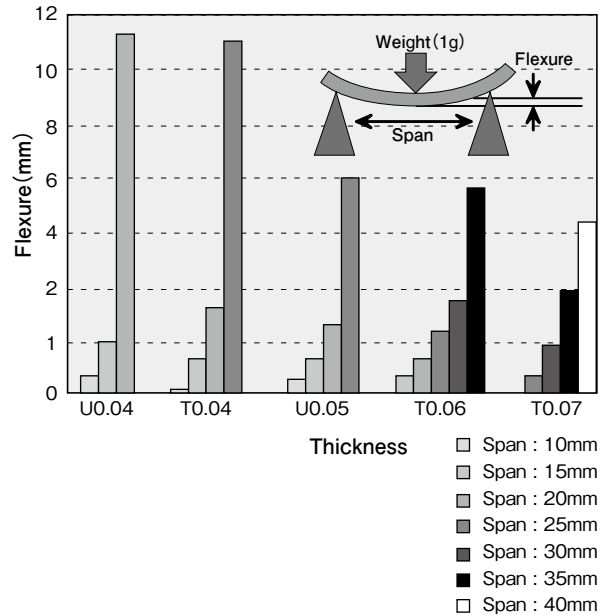
*1) The dielectric thickness after lamination is defined as the thickness of one sheet of prepreg when the resin flow is 0%.
This value changes depending on the press condition or inner layer pattern.

●Through-hole reliability

Test condition: -55°C, 30min. ⇄ 150°C, 30min.
Pattern: Wall to wall distance 0.3mm, Laminate thickness: t0.8mm
Pre-condition: 260°C reflow × 2times ⇒ Solder dipping (260°C 10sec.)



●Stiffness Properties



●Prepreg thickness after pattern filling

(Inner layer copper 15μm)

