

# High Elastic Modulus, Low CTE Multilayer Material

# MCL-E-679F Type(R) GEA-679F Type(R) (Prepreg)

## High Tg Glass Epoxy Multilayer Material(FR-4)

### ■ Features

- CTE is 20% lower in X,Y directions and 50% lower in Z direction than that of our standard FR-4.
- Elastic modulus is 30% higher than that of our standard FR-4. Even thin laminate has less warpage and deflection.
- Superior heat resistance at PCT.
- Surface roughness is 1/4 that of our standard FR-4, making fine pattern possible.

### ■ Applications

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

### ■ Standard Specifications

Part Number	Type	Copper Foil Thickness	Code Name	Actual Thickness and Tolerance
MCL-E-679F	(R)	2,3,5,12,18,35 $\mu$ m (STD,LP,PF)	M0.06	0.07 $\pm$ 0.02mm
		2 $\mu$ m	0.1	0.11 $\pm$ 0.02mm
		5 $\mu$ m	0.15	0.16 $\pm$ 0.03mm
		12 $\mu$ m	0.2	0.21 $\pm$ 0.04mm
		18 $\mu$ m	0.31	0.32 $\pm$ 0.04mm
		35 $\mu$ m	0.41	0.42 $\pm$ 0.05mm
		70 $\mu$ m	0.61	0.63 $\pm$ 0.06mm
		(STD,LP,PF)	0.81	0.84 $\pm$ 0.09mm

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

Note2) STD:12 $\mu$ m,18 $\mu$ m,35 $\mu$ m; LP:2 $\mu$ m,3 $\mu$ m,5 $\mu$ m,12 $\mu$ m,18 $\mu$ m; PF:2 $\mu$ m,3 $\mu$ m,5 $\mu$ m,12 $\mu$ m. Please contact us for details.

Note3) 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.

Note4) The thickness means that of dielectric layer.

### ■ Characteristics

#### ● Thin Laminate

(t0.4mm)

Item	Condition *3	Unit	Actual Value	Test Method	
			MCL-E-679F Type(R)	(IPC-TM-650)	
Tg	TMA	°C	160~170	2.4.24	
	DMA		190~200	—	
CTE *1	X	ppm/°C	12~14	2.4.24	
			Y		12~14
	Z		(<Tg)		20~30
			(>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)			>30		
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	18 $\mu$ m	A	kN/m	1.1~1.2	2.4.8
	35 $\mu$ m			1.2~1.3	
Surface Roughness (Ra)	A		$\mu$ m	2~3	2.2.17
Flexural Modulus (Lengthwise)	A		GPa	27~33	2.4.4
Dielectric Constant	1MHz	C-96/20/65	—	4.8~5.0	2.5.5.9
	1GHz*2			4.5~4.7	JPCA TM-001
Dissipation Factor	1MHz	C-96/20/65	—	0.0080~0.0100	2.5.5.9
	1GHz*2			0.0130~0.0150	JPCA TM-001
Volume Resistivity	C-96/35/90		$\Omega \cdot$ cm	1 $\times$ 10 <sup>15</sup> ~1 $\times$ 10 <sup>16</sup>	2.5.17
Surface Resistance			$\Omega$	1 $\times$ 10 <sup>13</sup> ~1 $\times$ 10 <sup>15</sup>	
Insulation Resistance	C-96/20/65		$\Omega$	1 $\times$ 10 <sup>14</sup> ~1 $\times$ 10 <sup>16</sup>	—
	C-96/20/65+D-2/100			1 $\times$ 10 <sup>13</sup> ~1 $\times$ 10 <sup>15</sup>	—
Water Absorption	E-24/50+D-24/23		%	0.3~0.5	2.6.2.1
Flammability	A		—	V-0	UL94

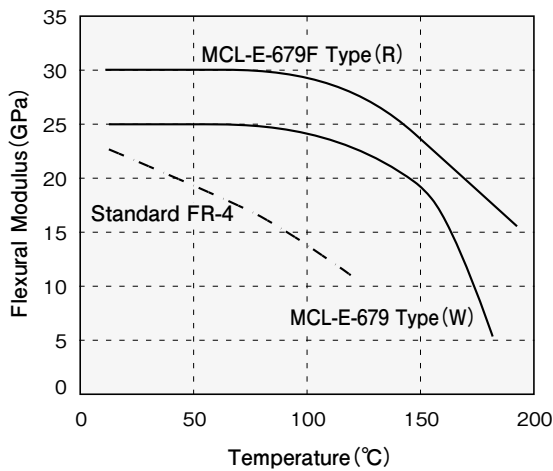
\*1) Heating Rate:10°C/min. \*2) Measured by Triplate-Line Resonator. \*3) Refer to last page "Condition Note"  
0.8mm thickness core is used depending on test item.

●Prepreg

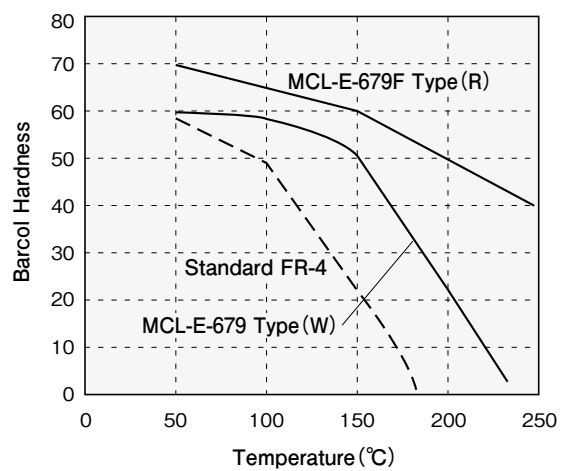
Part Number	Type		Glass Cloth		Properties				
			Style	Yarn Count (warp×fill)	Resin Content (%)	Volatile Content (%)	Gelation Time (sec.)	Dielectric Thickness after Lamination *1 (mm)	
GEA-679F	(R)	0.04	(FRZPE)	1037	69×72	73±2	≤1.0	115±25	0.049
		0.06	(FRUOE)	1080	60×48	68±2		110±25	0.081
			(FRROE)	1078	53×53	68±2		0.081	
		0.1	(FRSKE)	2116	60×58	58±2	≤0.75	110±25	0.130
		0.15	(FREGE)	1504	60×50	51±2		0.154	
Test Method(IPC-TM-650)					2.3.16	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.

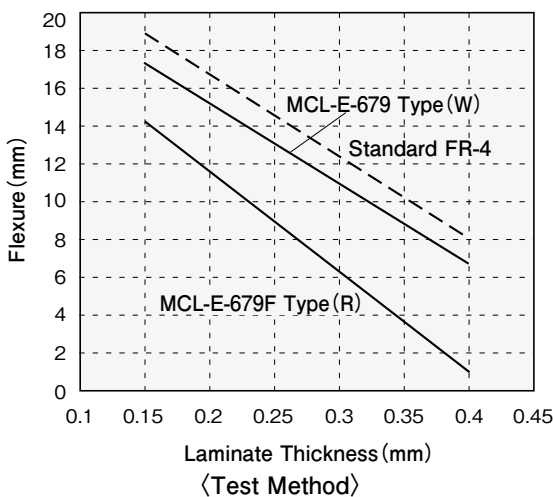
●Flexural Modulus



●Barcol Hardness



●Stiffness Properties



●Water Absorption under 85°C 85%RH (t0.4mm)

