

# Halogen Free, High Tg, High Elastic Modulus, Ultra Low CTE Multilayer Material

## MCL-E-770G Type(R) GEA-770G (Prepreg)

### High Tg Glass Epoxy Multilayer Materials

#### ■ Features

- MCL-E-770G has ultra low CTE values in X,Y directions and reduces warpage of package substrate significantly.
- MCL-E-770G Type(LH) has ultra low CTE value(less than 2.0ppm/°C).
- GEA-770G is suited for EPS(Embedded Passive Substrate) construction package.

#### ■ Applications

- Semiconductor packages.  
(FC-CSP,PoP,SiP)
- Core material for thinner module.

#### ■ Standard Specifications

Part Number	Type	Copper Foil Thickness	Code Name	Actual Thickness and Tolerance	
MCL-E-770G	(R)	2μm	U0.03	0.030±0.013mm	
		3μm	U0.04	0.040±0.013mm	
		5μm			
		12μm (LD,PF)	T0.05	0.050±0.013mm	
		(RLH)	2μm	M0.06	0.060±0.020mm
			3μm	0.1	0.105±0.020mm
	5μm		HD0.15	0.155±0.020mm	
	12μm (STD,LP)		0.2	0.210±0.040mm	
	2μm		LHM0.06	0.060±0.020mm	
	3μm		LH0.1	0.105±0.020mm	
	5μm		LHD0.15	0.155±0.020mm	
	12μm		LH0.2	0.210±0.030mm	
	18μm (STD,LP)	LHY0.25	0.255±0.030mm		

Note1) STD:Standard copper foil, LP:Low profile copper foil.

Note2) STD:12μm,18μm; LP:2μm, 3μm, 5μm, 12μm, 18μm. 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.

#### ■ Characteristics

##### ● Thin Laminate

(t0.2mm)

Item	Condition *3	Unit	Actual Value		Test Method (IPC-TM-650)	
			MCL-E-770G Type(R)	MCL-E-770G Type(RLH)		
Tg	TMA	°C	260~280		2.4.24	
	DMA		300~330		—	
CTE *1	X	ppm/°C	4.0~6.0	1.5~2.0	2.4.24	
			Y	4.0~6.0		1.5~2.0
	Z		(<Tg)	8~13		
			(>Tg)	70~90		
Solder Heat Resistance(260°C)	A	sec.	>300		—	
T260(Without copper)	TMA	min.	>60		2.4.24.1	
T288(Without copper)			>60			
Decomposition Temperature(5% Weight Loss)	TGA	°C	430~450		2.3.40	
Heat Resistance for HDI Process(Semi-Additive)	260°CReflow	cycles	>20		—	
Copper Peel Strength	12μm	A	kN/m	0.7~0.9	2.4.8	
	18μm			0.8~1.0		
Surface Roughness(Ra)	A	μm	2~3		2.2.17	
Flexural Modulus(Lengthwise)	A	GPa	30~32	34~36	2.4.4	
Dielectric Constant	1MHz	C-96/20/65	—	4.4~4.6	4.2~4.4	2.5.5.9
	1GHz*2			4.1~4.3	3.9~4.1	JPCA TM-001
Dissipation Factor	1MHz	C-96/20/65	—	0.003~0.005	0.003~0.005	2.5.5.9
	1GHz*2			0.004~0.006	0.004~0.006	JPCA TM-001
Volume Resistivity	C-96/20/65+C-96/40/90	Ω·cm	1×10 <sup>15</sup> ~1×10 <sup>16</sup>		2.5.17	
Surface Resistance	C-96/20/65+C-96/40/90	Ω	1×10 <sup>13</sup> ~1×10 <sup>15</sup>			
Insulation Resistance	C-96/20/65	Ω	1×10 <sup>14</sup> ~1×10 <sup>16</sup>		—	
	C-96/20/65+D-2/100		1×10 <sup>13</sup> ~1×10 <sup>15</sup>		—	
Water Absorption	E-24/50+D-24/23	%	0.2~0.4		2.6.2.1	
Flammability	A	—	V-0		UL94	

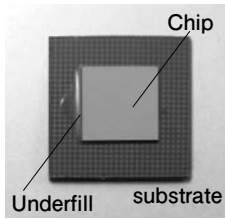
\*1) Heating Rate:10°C/min. \*2) Measured by Triplate-Line Resonator. \*3) Refer to last page "Condition Note"  
t0.4mm thickness core is used depending on test item.

## ●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-770G	-	0.025	(1017N72)	1017	95×95	72±2	≤2.0	270±30	0.025
		0.025	(1017N76)	1017	95×95	76±2			0.030
		0.03	(1027N72)	1027	75×75	72±2			0.040
		0.03	(1027N76)	1027	75×75	76±2			0.048
		0.04	(1037N72)	1037	69×72	72±2			0.048
	(L)	0.025	(L1017N72)	1017	95×95	72±2		270±30	0.025
		0.025	(L1017N76)	1017	95×95	76±2			0.030
		0.03	(L1027N72)	1027	75×75	72±2			0.040
		0.03	(L1027N76)	1027	75×75	76±2			0.048
		0.035	(L1024N68)	1024	90×90	68±2			0.041
		0.035	(L1024N73)	1024	90×90	73±2			0.050
		0.04	(L1037N72)	1037	69×72	72±2			0.048
		0.045	(L1030N71)	1030	90×90	71±2			0.058
		Test Method (IPC-TM-650)							2.3.16

※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.

## ●Warpage of FC-CSP



TEG Chip  
 \*Package size : 14mm×14mm  
 \*Chip size : 7.3mm×7.3mm  
 \*Chip thickness : 150μm  
 \*Underfill thickness : 60μm (CEL-C-3730-4)  
 \*Solder Resist thickness : 20μm (FZ-2700GA)  
 <Sample> Core Thickness 200μm+1024(S-HD) PPG  
 MCL-E-705G Type(LH)+GEA-705G Type(L)  
 MCL-E-770G Type(LH)+GEA-705G Type(L)  
 MCL-E-770G Type(LH)+GEA-770G Type(L)

