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

MCL-E-705G GEA-705G〈Prepreg〉

High Tg Glass Epoxy Multilayer Materials

■Features

- ●MCL-E-705G has low CTE values in X,Y directions and reduces warpage of package substrate significantly.
- ●MCL-E-705G Type(L) has ultra low CTE value(≤5ppm/℃).
- ●MCL-E-705G Type(LH) has ultra low CTE value(3ppm/℃).
- ●Well-suited for build-up construction.

■Applications

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

■Standard Specifications

Part Number	Type	Copper Foil Thickness	Code Name	Actual Thickness and Tolerance
MCL-E-705G	(—) (L)	2μm 3μm 5μm 12μm(LP,PF)	U0.03	0.03±0.013mm
			U0.04	0.04±0.013mm
			T0.06	0.06±0.013mm
		2μm 3μm 5μm 12μm 18μm (STD,LP,PF)	M0.06	0.06±0.02mm
			0.1	0.11±0.02mm
			M0.11	0.10±0.02mm
			M0.15	0.15±0.02mm
			M0.22	0.21±0.03mm
		2μm 3μm 5μm 12μm 18μm 35μm 70μm (STD,LP,PF)	0.2	0.21±0.03mm
			0.31	0.31±0.03mm
			0.41	0.41±0.04mm
			0.51	0.52±0.05mm
			0.61	0.62±0.06mm
			0.71	0.72±0.07mm
			0.81	0.82±0.08mm
	(LH)	2μm 3μm 5μm 12μm (STD,LP,PF)	M0.06	0.06±0.02mm
			0.1	0.11±0.02mm
			D0.15	0.15±0.02mm
			0.2	0.21±0.03mm
			0.26	0.26±0.03mm

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

(t0.1mm)

Item		Condition *3	Unit	Actual Value			Test Method (IPC-TM-650)
				MCL-E-705G	MCL-E-705G Type(L)	MCL-E-705G Type(LH)	
Tg		TMA	℃	250～270			2.4.24
		DMA		295～305			—
CTE *1	X	(30～120℃)	ppm/℃	5～7	3～4	2.5～3.5	2.4.24
	Y			5～7	3～4	2.5～3.5	
	Z	(<Tg)		10～15			
		(>Tg)		70～90			
Solder Heat Resistance(260℃)		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	℃	430～450			2.3.40
Heat Resistance for HDI Process(Semi-Additive)		260℃Reflow	cycles	>20			—
Copper Peel Strength	12μm	A	kN/m	0.8～1.0			2.4.8
	18μm			0.9～1.1			
Surface Roughness(Ra)		A	μm	2～3			2.2.17
Flexural Modulus(Lengthwise)		A	GPa	32～34	34～36	37～39	2.4.4
Dielectric Constant	1MHz	C-96/20/65	—	4.5～4.7	4.3～4.5	4.3～4.5	2.5.5.9
	1GHz*2			4.2～4.4	4.0～4.2	4.0～4.2	JPCA TM-001
Dissipation Factor	1MHz	C-96/20/65	—	0.0060～0.0080	0.0060～0.0080	0.0060～0.0080	2.5.5.9
	1GHz*2			0.0070～0.0090	0.0070～0.0090	0.0070～0.0090	JPCA TM-001
Volume Resistivity		C-96/20/65+C-96/40/90	Ω·cm	1×10^{15}～1×10^{16}			2.5.17
Surface Resistance		C-96/20/65+C-96/40/90	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			2.6.2.1

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

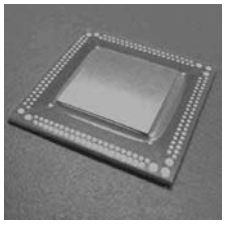
●Prepreg

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-705G	—	0.025	(1017N73)	1017	95×95	73±2	≦2.0	160±30	0.025
		0.03	(1027N73)	1027	75×75	73±2		180±30	0.040
		0.04	(1037N73)	1037	69×72	73±2			0.048
		0.06	(1078N65)	1078	53×53	65±2		200±30	0.071
		0.1	(2116N58)	2116	60×58	58±2			0.126
	(L)	0.025	(L1017N73)	1017	95×95	73±2		160±30	0.025
		0.03	(L1027N73)	1027	75×75	73±2		180±30	0.040
		0.04	(L1037N73)	1037	69×72	73±2			0.048
		0.06	(L1078N65)	1078	53×53	65±2		200±30	0.071
		0.1	(L2116N58)	2116	60×58	58±2			0.126

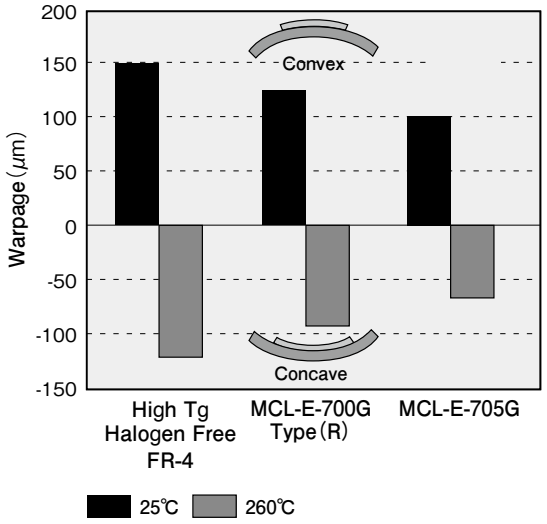
Test Method (IPC-TM-650)	2.3.16	2.3.19	2.3.18	—

*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.

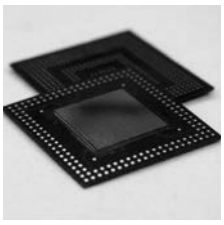
●Warpage of FC-BGA



TEG Chip
*Chip size:20mm×20mm
*Chip thickness:0.725mm
*Bump diameter:80μm
*Bump pitch:200μm
TEG Substrate
*Sub size:35mm×35mm
*Core thickness:0.4mm
*Build up thickness:30μm×2stack
*SR thickness:20μm



●Warpage of PKG



TEG Substrate spec
*Size:14mm×14mm
*Total thickness:250μm
*SR thickness:20μm
(SR-7200G:Hitachi Chemical)
*Prepreg thickness:40μm
*Core thickness:110μm