

# Halogen Free, High Tg, Low Transmission Loss, Low CTE Multilayer Material

## MCL-HS 100 GH-100 (Prepreg)

### Low Dielectric Constant Glass Thermosetting Resin Multilayer Material

#### ■ Features

- MCL-HS 100(D) with Low Dk glass has low Dk/Df values.
- Suitable for package and high frequency application.
- MCL-HS 100 has low CTE values and reduces warpage.
- Well-suited for build-up construction.

#### ■ Applications

- Semiconductor packages.  
(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-HS100	-	3μm 5μm 12μm 18μm 35μm (STD,LP,RT,HVLP)	M0.06	0.06±0.02mm
			0.1	0.10±0.02mm
			M0.11	0.10±0.02mm
			M0.15	0.15±0.02mm
			M0.22	0.21±0.03mm
			0.2	0.20±0.02mm
			0.41	0.40±0.04mm
			0.81	0.80±0.08mm
	(D)	3μm 5μm 12μm 18μm 35μm (LP,RT,HVLP)	M0.06	0.06±0.02mm
			0.1	0.10±0.02mm
			M0.11	0.10±0.02mm
			M0.15	0.15±0.02mm
			M0.22	0.21±0.03mm
			0.2	0.20±0.02mm
			0.41	0.40±0.04mm
			0.81	0.80±0.08mm

Note1) STD:12μm, 18μm, 35μm; LP:3μm, 5μm, 12μm; RT:18μm, 35μm; HVLP:12μm, 18μm, 35μm. Please contact us for details.

Note2) 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	Unit	Actual Value		Test Method (IPC-TM-650)	
			MCL-HS100	MCL-HS100 Type(D)		
Tg	TMA	°C	210~230		2.4.24	
	DMA		240~260		-	
CTE *1	X Y	ppm/°C	(30~120°C)		2.4.24	
			6~8			
	Z		<Tg			
			20~30			
		>Tg		130~180		
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	430~450		2.3.40	
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	23~28		2.4.4	
Dielectric Constant	1GHz*2	C-96/20/65	-	3.9~4.1	3.4~3.6	2.5.5.5
	10GHz*2			3.9~4.1	3.4~3.6	
Dissipation Factor	1GHz*2	C-96/20/65	-	0.0030~0.0040	0.0020~0.0030	
	10GHz*2			0.0050~0.0060	0.0030~0.0040	
Volume Resistivity	C-96/20/65+C-96/40/90	Ω·cm	1×10 <sup>14</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	

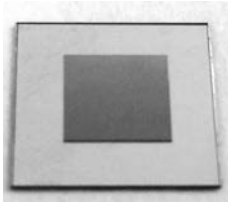
\*1) Heating Rate:10°C/min. \*2) Measured by Triplate-Line Resonator.  
0.4mm thickness core is used depending on test item.

## ●Prepreg

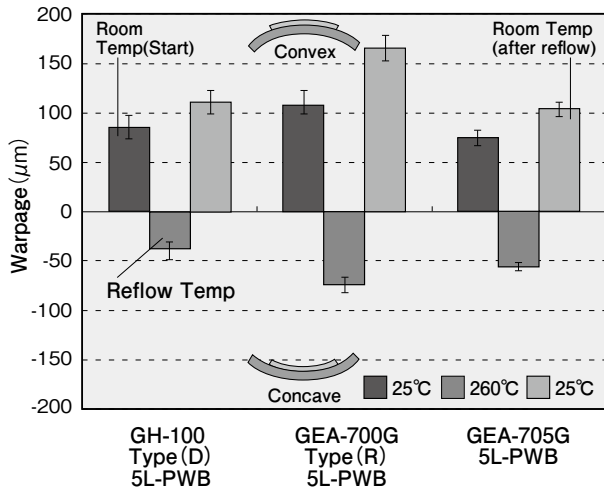
Part Number	Type		Glass Cloth			Properties		
			Style	Yarn Count (warp×fill)	Resin Content (%)	Volatile Content (%)	Dielectric Thickness after Lamination*1 (mm)	
GH-100	-	0.025	(1017N75)	1017	95×95	75±2	≤2.0	0.031
		0.03	(1027N71)	1027	75×75	71±2		0.042
		0.05	(1037N71)	1037	69×72	71±2		0.050
		0.06	(1078N61)	1078	53×53	61±2		0.071
		0.1	(2116N55)	2116	60×58	46±2		0.130
	(D)	0.03	(D1027N73)	1027	75×75	73±2		0.042
		0.05	(D1037N73)	1037	69×72	73±2		0.050
		0.06	(D1078N63)	1078	53×53	63±2		0.072
		0.08	(D2013N60)	2013	69×76	60±2		0.110
		0.1	(D2116N57)	2116	60×58	57±2		0.130
Test Method (IPC-TM-650)						2.3.16	2.3.19	-

\*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.

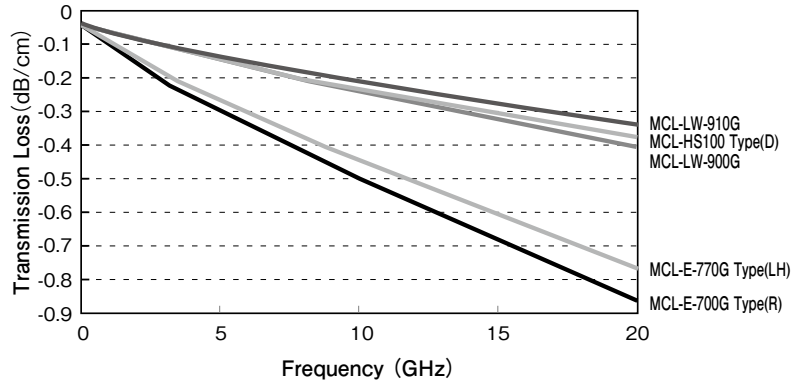
## ●Warpage of coreless-5layer



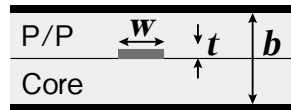
**TEG Chip**  
 \*Package size : 14mm×14mm  
 \*Chip size : 7.3mm×7.3mm  
 \*Chip thickness : 150μm  
 \*Underfill thickness : 60μm(CEL-C-3730-4)  
 <Sample>  
 \*L1,5:12μm Cu100%,L2,3,4:No copper,SR:-  
 \*Prepreg construction  
 GH-100 Type(D):(1078,R.C.:63%)×4ply  
 GEA-700G Type(R):(1078,R.C.:66%)×4ply  
 GEA-705G:(1078,R.C.:65%)×4ply



## ●Transmission Loss



<Measurement conditions>  
 •Evaluation PWB: Strip-line  
 •Temperature & Humidity: 25°C/60%RH  
 •Characteristic impedance: Approx. 50Ω  
 •Proofreading method: TRL(Thru-Reflect-Line)



•Trace width(w): 0.12~0.14mm  
 •Dielectric thickness(b): 0.25mm  
 •Trace thickness(t): 18μm