

# Halogen Free, Low Dielectric Constant, High Heat Resistance Multilayer Material MCL-HE-679G Type(S) GHA-679G Type(S) (Prepreg)

## Low Dielectric Constant Thermosetting Resin Multilayer Material (FR-4)

### ■ Features

- Enables lower transmission loss than MCL-HE-679G with lower dissipation factor.
- High Tg and superior heat resistance for soldering. (Suitable for lead free process)
- CTE in Z-direction is 30% lower than that of our standard FR-4.
- Halogen free material. It achieved the UL 94V-0 level of flammability without using any compound which includes halogen, antimony or red phosphorous.

### ■ Applications

- Network applications.
- High-frequency parts. (filters, VCOs, etc.)

### ■ Standard Specifications

Part Number	Type	Copper Foil Thickness	Code Name	Actual Thickness and Tolerance
MCL-HE-679G	(S)	12μm 18μm 35μm 70μm	0.06	0.06±0.02mm
			0.08	0.08±0.02mm
			0.1	0.10±0.02mm
			0.15	0.15±0.03mm
			0.2	0.20±0.03mm
			0.4	0.40±0.04mm
			0.6	0.60±0.06mm
			0.8	0.80±0.08mm
			1.0	1.00±0.08mm
			1.2	1.20±0.10mm

Note 1) 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.  
Note 2) The thickness means that of dielectric layer.

### ■ Characteristics

#### ● Thin Laminate

(t0.8mm)

Item	Condition *4	Unit	Actual Value	Test Method	
			MCL-HE-679G Type(S)	(IPC-TM-650)	
Tg	TMA	°C	180~190	2.4.24	
	DMA		260~280	—	
CTE *1	X	ppm/°C	12~15	2.4.24	
			Y		14~17
	Z				(<Tg)
			(>Tg)		190~230
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	370~390	2.3.40	
Copper Peel Strength (RT)	A	kN/m	0.5~0.7	2.4.8	
			35μm		0.6~0.8
Flexural Modulus (Lengthwise)	A	GPa	23~26	2.4.4	
Dielectric Constant	C-96/20/65	—	3.70~3.90	JPCA TM-001	
			3.90~4.10	2.5.5.9	
Dissipation Factor	C-96/20/65	—	0.0060~0.0080	JPCA TM-001	
			0.0050~0.0070	2.5.5.9	
Volume Resistivity	C-96/35/90	Ω·cm	1×10 <sup>14</sup> ~1×10 <sup>16</sup>	2.5.17	
Surface Resistance			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>14</sup>	—	
Water Absorption	E-24/50+D-24/23	%	0.1~0.3	2.6.2.1	
Flammability	A	—	V-0	UL94	

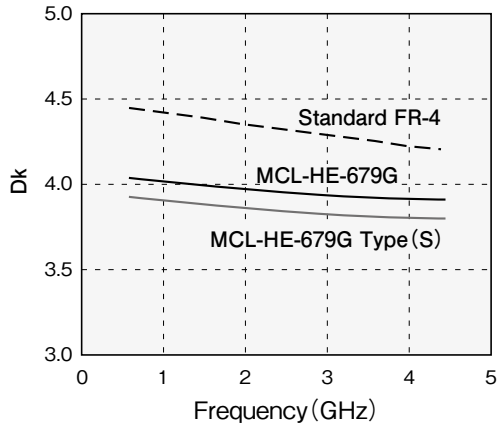
\*1) Heating Rate: 10°C/min. \*2) Measured by Triplate-line Resonator. \*3) Measured by Material Analyzer. \*4) Refer to last page "Condition Note"

●Prepreg

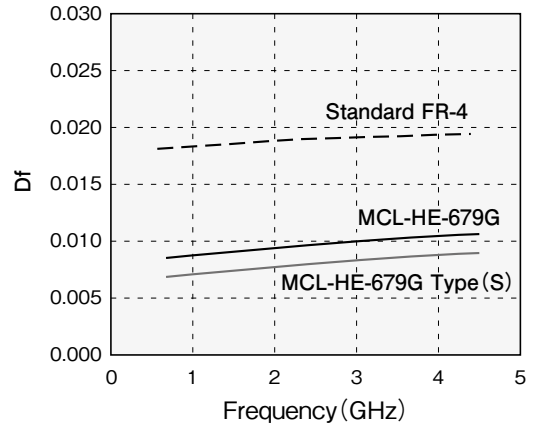
Part Number	Type		Glass Cloth		Properties			
			Style	Yarn Count (Warp×Fill)	Resin Content (%)	Volatile Content (%)	Gelation Time (sec.)	Dielectric Thickness after Lamination*1 (mm)
GHA-679G	0.04	(S1037N72)	1037	69×72	72±2	≤3.0	150±40	0.053
	0.06	(S1080N64)	1080	60×48	64±2			0.080
	0.06	(S1080N69)	1080	60×48	69±2			0.095
	0.06	(S1078N64)	1078	53×53	64±2			0.078
	0.08	(S3313N56)	3313	60×62	56±2			0.105
	0.08	(S3313N62)	3313	60×62	62±2			0.126
	0.1	(S2116N54)	2116	60×58	54±2			0.128
	0.1	(S2116N60)	2116	60×58	60±2			0.152
	0.15	(S1501N49)	1501	46×45	49±2		0.178	
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.

●Correlation between Dielectric Constant and Frequency



●Correlation between Dissipation Factor and Frequency



●Transmission Loss

