

# Halogen Free, Low Dielectric Constant, High Heat Resistance Multilayer Material

## MCL-HE-679G Type(S) GHA-679G Type(S) (Prepreg)

### ■ 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.
- Achieved UL 94V-0 flammability standard 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	Laminate Thickness
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

Note1) The thickness means that of dielectric layer.

### ■ Characteristics

#### ● Thin Laminate

(t0.8mm)

Item	Condition *4	Unit	Actual Value	Reference	
			MCL-HE-679G Type(S)	(IPC-TM-650)	
Tg	TMA method	A	180~190	2.4.24	
	DMA method	A	260~280	—	
CTE *1	X(30~120°C)	A	12~15	—	
	Y(30~120°C)	A	14~17		
	Z	<Tg	A	30~40	2.4.24
		>Tg	A	190~230	
Solder Heat Resistance (260°C)		A	sec.	>300	—
T-260 (Without Copper)		A	min.	>60	2.4.24.1
T-288 (Without Copper)				>60	
Decomposition Temperature (TGA method 5% Weight Loss)		A	°C	370~390	2.3.40
Copper Peel Strength (RT)	18μm	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	1GHz*2	A	—	3.70~3.90	JPCA TM-001
	1GHz*3			3.90~4.10	2.5.5.9
Dissipation Factor	1GHz*2	A	—	0.0060~0.0080	JPCA TM-001
	1GHz*3			0.0050~0.0070	2.5.5.9
Volume Resistivity		C-96/40/90	Ω·cm	1×10 <sup>14</sup> ~1×10 <sup>16</sup>	
Surface Resistance				1×10 <sup>13</sup> ~1×10 <sup>15</sup>	
Insulation Resistance		A	Ω	1×10 <sup>14</sup> ~1×10 <sup>16</sup>	
		D-2/100		1×10 <sup>12</sup> ~1×10 <sup>14</sup>	

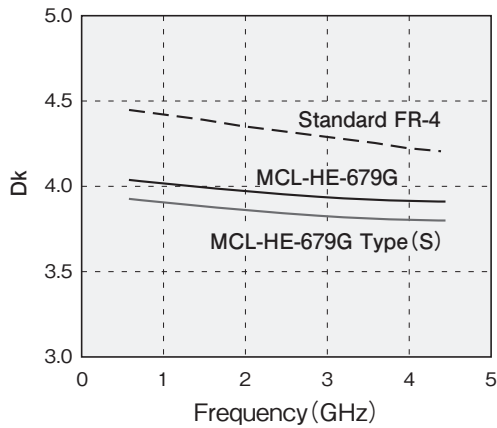
\*1) Heating Rate: 10°C/min. \*2) Measured by Triplate-line Resonator. \*3) Measured by Material Analyzer. \*4) Refer to last page "Condition Note"  
\*Above data are experimental results and not guaranteed.

●Prepreg

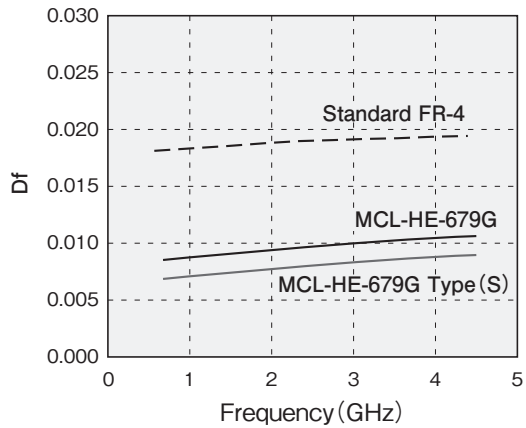
Part Number	Type		Glass Cloth	Properties	
			Style	Resin Content (%)	Dielectric Thickness after Lamination*1 (mm)
GHA-679G	0.04	(S1037N72)	1037	72±2	0.053
	0.06	(S1080N64)	1080	64±2	0.080
	0.06	(S1080N69)	1080	69±2	0.095
	0.06	(S1078N64)	1078	64±2	0.078
	0.08	(S3313N56)	3313	56±2	0.105
	0.08	(S3313N62)	3313	62±2	0.126
	0.1	(S2116N54)	2116	54±2	0.128
	0.1	(S2116N60)	2116	60±2	0.152
Reference (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.

●Correlation between Dielectric Constant and Frequency



●Correlation between Dissipation Factor and Frequency



●Transmission Loss

