

New CEM-3

(Double-sided copper-clad)

R-1786

(Single-sided copper-clad)

R-1781

Epoxy resin copper-clad laminate using glass fabric and nonwoven glass fabric as base materials

■Features

- Excellent tracking resistance (CTI value for CEM-3 materials:600) can realize integration with power supply circuits.
- Excellent in thickness accuracy.
Variations in board thickness are ± 0.05 mm. This thickness accuracy is approx. 3 times higher compared with the existing composite copper-clad laminate.
- Excellent in high frequency characteristics.
Small dissipation factor and thickness variations can realize designed performance.

- Provides dimensional stability equivalent to that of glass epoxy (FR-4).
- Reduces CO₂ emission amount in our manufacturing process to one-quarter by means of our unique manufacturing process. (Compared with our conventional FR-4)

■Applications

- Liquid crystal television, PDP, PC peripheral equipment, air conditioner, plumbing equipment, power supply board, tuner, amusement machine, etc.

■Specifications (Assured values)

Standard size (Warp × Fill)	Nominal thickness		Thickness tolerance				Warpage, Twist	
			R-1786		R-1781		Single-sided	Double-sided
			Copper foil 0.018mm	Copper foil 0.035mm	Copper foil 0.018mm	Copper foil 0.035mm		
1,020 ⁺³ ₋₀ × 1,025 ⁺⁵ ₋₀ mm 1,220 ⁺³ ₋₀ × 1,025 ⁺⁵ ₋₀ mm	0.8mm	Including copper foil thickness.	0.81 ± 0.05mm	0.85 ± 0.05mm	0.80 ± 0.05mm	0.82 ± 0.05mm	≤ 10.0%	≤ 2.5%
	1.0mm		1.00 ± 0.05mm	1.04 ± 0.05mm	0.99 ± 0.05mm	1.01 ± 0.05mm	≤ 9.0%	≤ 2.5%
	1.2mm		1.15 ± 0.05mm	1.19 ± 0.05mm	1.14 ± 0.05mm	1.16 ± 0.05mm	≤ 7.0%	≤ 2.5%
	1.6mm		1.52 ± 0.05mm	1.56 ± 0.05mm	1.51 ± 0.05mm	1.53 ± 0.05mm	≤ 6.0%	≤ 2.0%

Note : When thickness is measured at 10 positions according to Section 5.3.3 in JIS C6481, thicknesses of at least 9 positions are within the tolerance range specified above. Thickness out of the tolerance range is within 125% of the above tolerance.

Note : For detail dimensions, please confer with us separately.

■General Properties

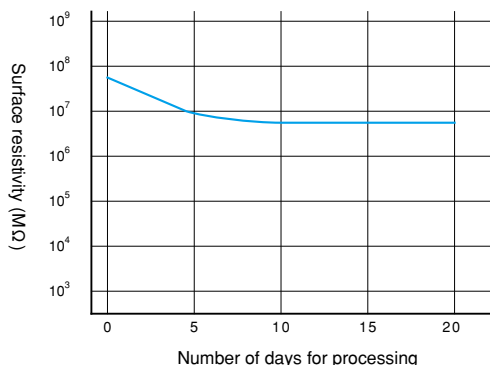
			R-1786	
Test item	Unit	Treatment conditions	Actual value	Guaranteed value
Volume resistivity	MΩ · m	C-96/20/65	1 × 10 ⁹	≥ 1 × 10 ⁶
		C-96/20/65+C-96/40/90	5 × 10 ⁷	≥ 1 × 10 ⁵
Surface resistance	MΩ	C-96/20/65	3 × 10 ⁸	≥ 1 × 10 ⁶
		C-96/20/65+C-96/40/90	1 × 10 ⁸	≥ 1 × 10 ⁵
Insulation resistance	MΩ	C-96/20/65	5 × 10 ⁸	≥ 1 × 10 ⁶
		C-96/20/65+D-2/100	1 × 10 ⁷	≥ 1 × 10 ⁴
Dielectric constant (1MHz)	—	C-96/20/65	4.5	≤ 5.5
		C-96/20/65+D-24/23	4.5	≤ 5.8
Dissipation factor (1MHz)	—	C-96/20/65	0.015	≤ 0.030
		C-96/20/65+D-24/23	0.015	≤ 0.035
Solder heat resistance (260℃)	second	A	≥ 120	≥ 60
Peel strength	Copper foil : 0.018mm (18 μm)	A	1.47	≥ 1.08
		S ₄	1.47	≥ 1.08
	Copper foil : 0.035mm (35 μm)	A	1.82	≥ 1.40
		S ₄	1.82	≥ 1.40
Heat resistance	—	A	240℃60minutes No blister	200℃60minutes No blister
Flexural strength (crosswise direction)	N/mm ²	A	280	≥ 225
Water absorption	%	E-24/50+D-24/23	0.08	≤ 0.25
Flammability (UL method)	—	A and E-168/70	94V-0	94V-0
Alkali resistance	—	Immersion (3 minutes)	no abnormality	no abnormality
Punching workability	—	A	Suitable temperature:25℃	—

Note : Test piece thickness is 1.6 mm.

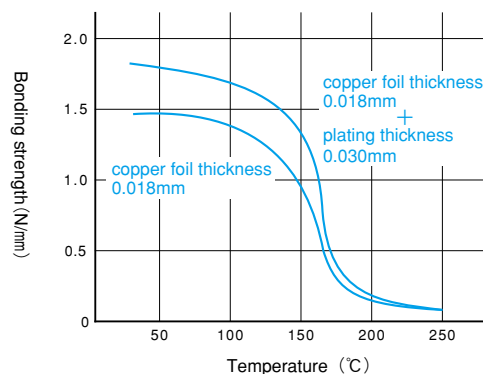
Note : The above tests are in accordance with JIS C6481. However, flame resistance is tested in accordance with UL94, and punching workability is in accordance with our company's testing method.

Characteristic graph (reference value)

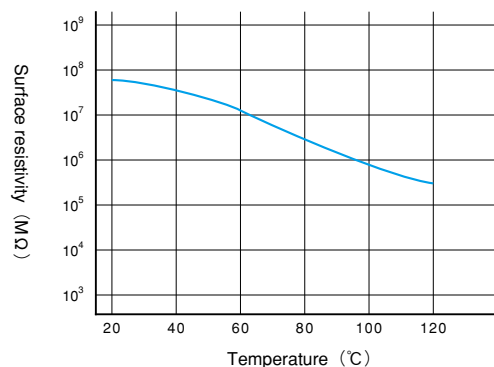
Time-dependent change of surface resistance (40°C、90%RH processing)
 (Comb pattern circuit width : 0.64mm、Circuit interval : 1.3mm)



Peel strength of copper foil



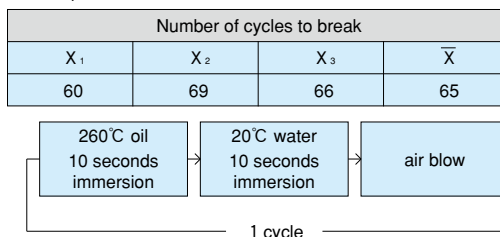
Temperature characteristic of surface resistance (Comb pattern circuit width : 0.64mm、Circuit interval : 1.3mm)



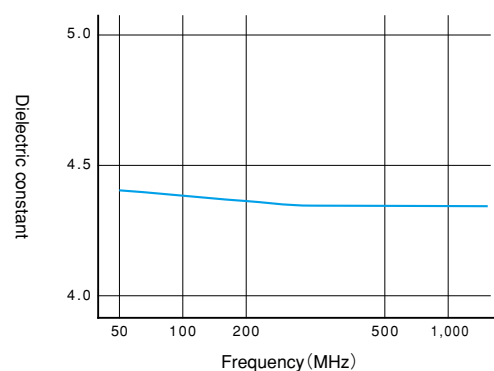
Through hole reliability

● Test condition
 Create test pieces by applying copper through hole processing on test patterns, give the following thermal shocks, and measure the number of cycles until disconnection occurs.

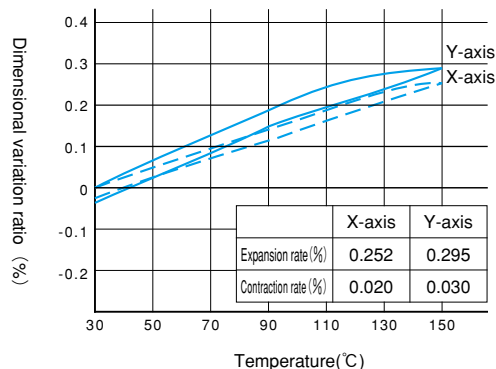
● Example



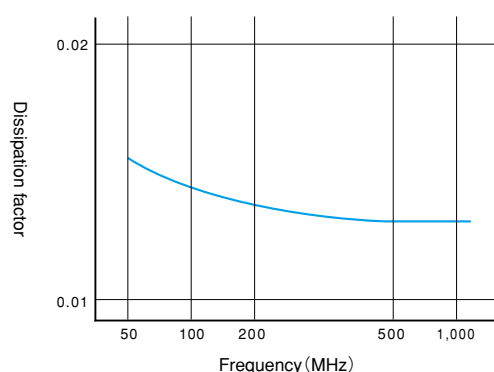
Frequency characteristic of dielectric constant (IPC TM-650 2.5.5.9)



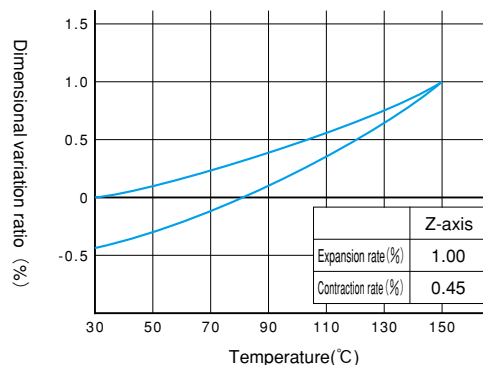
Thermal expansion and contraction rates (Dilatometer method) (150°C scale)



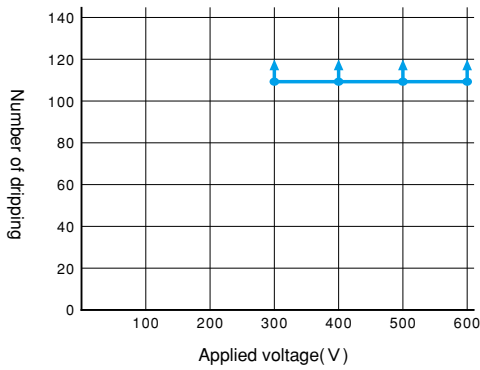
Frequency characteristic of dissipation factor (IPC TM-650 2.5.5.9)



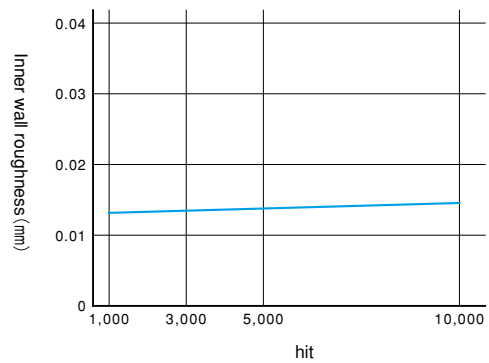
Thermal expansion and contraction rates (TMA method) (150°C scale)



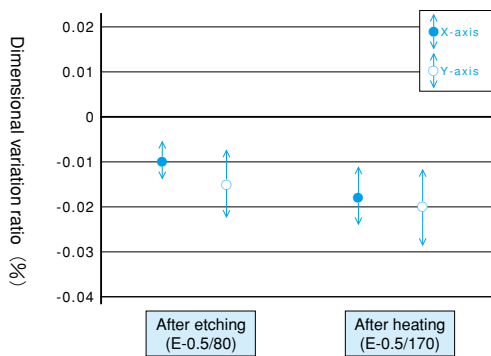
■ Tracking resistance (IEC method)(0.1% NH₄Cl)
(Electrode (platinum) interval)



■ Inner wall roughness (60,000rpm 0.05mm/rev 3 ply)



■ Dimensional variation ratio (plate thickness 1.6mm copper foil thickness 0.018mm)
Size : 305mm(X-axis)×280mm(Y-axis)/Span : 270mm(X-axis), 260mm(Y-axis)

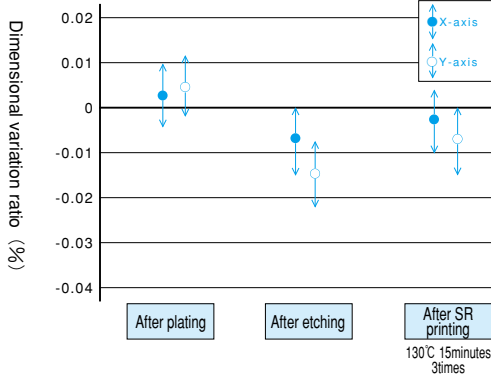


■ Punching characteristic (Punching temperature 25°C)

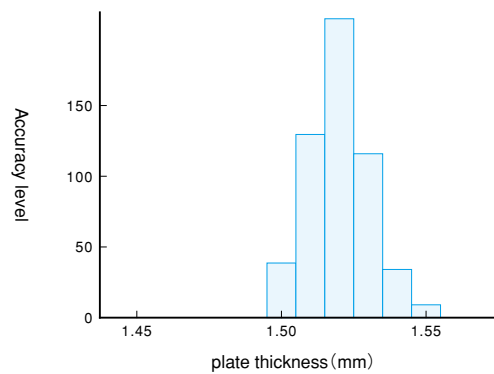
Maximum dynamic shearing stress N/mm ²	Maximum dynamic pull-out stress N/mm ²
161.7	46.1

※Punching temperature is equal to the board's surface temperature.

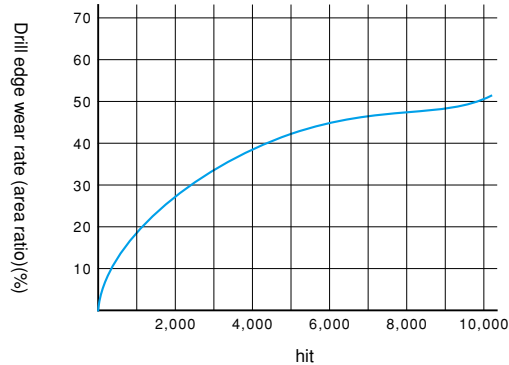
■ Dimensional variation ratio (Processing steps plate thickness 1.6mm copper foil thickness 0.018mm)
Size : 305mm(X-axis)×280mm(Y-axis)/Span : 270mm(X-axis), 260mm(Y-axis)



■ thickness accuracy (board thickness 1.6mm copper foil thickness 0.018mm)
(\bar{x} =1.52mm R=0.053mm \sqrt{v} =0.014mm)



■ Drill wear resistance Drill ϕ 0.6mm U C35 Number of rotations 60,000rpm
Feed rate 0.035mm/rev Entry boards : Aluminum(0.15mm)
Backup board : Bakelite plate thickness : 1.6mm Copper foil 0.018mm 3 ply



■ Hole diameter contraction after punching (Punching temperature : 25°C R-1581)

