

# Adhesivless Polyimide Copper Clad Laminate ESPANEX<sup>®</sup> M Series

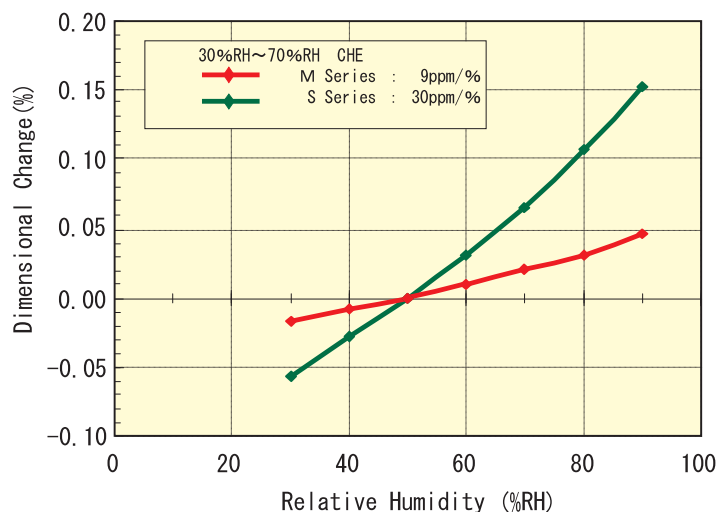
## Features of ESPANEX<sup>®</sup> M Series

- Excellent Fine Line Capability  
Smooth Metal to Polyimide Interface
- High Reliability under Hard Circumstance  
High Reliability under High Temperature and Humidity.
- Excellent dimensional stability in circuit manufacturing process
- Excellent folding endurance
- Low Moisture Absorption Polyimide
- Low CHE (Coefficient of Humidity Expansion)

Table. Properties\*

Property	Unit	Single Sided CCL		Double Sided CCL		Test Method
		S series	M Series	S series	M Series	
PI Tensile Strength	MPa	330	<b>390</b>	280	<b>310</b>	IPC-TM-650, 2. 4. 19
PI Elongation	%	75	<b>45</b>	55	<b>40</b>	
PI Tensile Modulus	MPa	4300	<b>7500</b>	4300	<b>7100</b>	
PI Propagation Tear Strength	kN/m	2. 3	<b>5. 7</b>	2. 3	<b>5. 7</b>	ASTM D 1922
Peel Strength	Side A	kN/m	1. 4	0. 9	<b>1. 3</b>	JIS C 5016 B
	Side B	kN/m	-	-	<b>1. 4</b>	
Dimension Stability After Etching (3σ)	MD	%	X±0. 04	<b>X±0. 02</b>	X±0. 04	IPC-TM-650, 2. 2. 4 (B)
	TD	%	X±0. 04	<b>X±0. 02</b>	X±0. 04	
Dimension Stability After heating (3σ)	MD	%	X±0. 04	<b>X±0. 02</b>	X±0. 04	IPC-TM-650, 2. 2. 4 (C) 250°C, 30min
	TD	%	X±0. 04	<b>X±0. 02</b>	X±0. 04	
Dielectric Constant (1MHz)	-	3. 5	<b>3. 0</b>	3. 5	<b>3. 0</b>	IPC-TM-650, 2. 5. 5. 3
Dissipation Factor (1MHz)	-	0. 007	<b>0. 006</b>	0. 007	<b>0. 006</b>	
Dielectric Constant (14. 5GHz)	-	3. 3	<b>3. 1</b>	3. 3	<b>3. 1</b>	Cavity Resonator Perturbation
Dissipation Factor (14. 5GHz)	-	0. 017	<b>0. 006</b>	0. 017	<b>0. 006</b>	
Moisture Absorption	%	1. 6	<b>0. 7</b>	1. 6	<b>0. 7</b>	23°C, 50%RH, 24h

Coefficient Humid Elongation (at 23°C)



Soldering Durability\*\*

Material	Exposure Period	After Dried 0 day	After 40°C/90%RH 4 Days	After 40°C/90%RH 8 Days
S Series (Double sided)		400°C	230°C	220°C
M Series (Double Sided)		400°C	310°C	300°C

\*\*Test Method: Solder Bath Dipping for 10 Seconds