

Technical data

Material

Standard

UL Approval

Original Bungard presensitized base material FR4

FR4 - 86 V0 with UV blocker

DIN IEC 249, MIL-S-13949 H, CSA, ISO 9002, ISO 14001

E 98983 / E 213990

Property	Pre-treatment	Specification	Unit	Typ. measured
Flexural strength lengthwise	A	> 415	N/mm ²	485 - 550
Flexural strenght crosswise	A	> 350	N/mm ²	400 - 450
Dimension stability X/Y	E-2/150	< 0.05	%	< 0.03
Moisture absorbtion	D-24/23	< 0.35	%	< 0.10
Copper peeling strength (35 µm Cu)	A after 10s at 288 °C	1.4	N/mm	> 1.80
Thermal expansion coeff. in Z before Tg	TMA	-	mm/mm/°C	5 x 10 ⁻⁵
in Z after Tg	TMA	-	mm/mm/°C	20 x 10 ⁻⁵
Dielectric breakdown	D 48/50	> 40	kV	> 60
Dielectric constant ϵ_r	1 MHz C-24/23/50	< 5.4	-	4.2 - 4.8
Dissipation factor tan δ	1 MHz C-24/23/50	< 0.035	-	0.01 - 0.016
Surface Resistivity	C-96/35/90	> 10 ⁴	MΩ	5 x 10 ⁶ - 5 x 10 ⁷
Volume Resistivity	C-96/35/90	> 10 ⁶	MΩ / cm	5 x 10 ⁸ - 5 x 10 ⁹
Arc resistance	D-48/50+D-0.5/23	> 60	sec	> 120
Flammability rating (UL 94)	A	94 V-0	-	94 V-0
Glas transition temp. TG	DSC	-	°C	140 ± 5
Boiling test 30 min	288 °C dipped	-	sec	230
Lotbadfestigkeit	288 °C dipped	> 10	sec	> 200
Thickness tolerance dielectric	MIL Class II			1.55 +/- 0.08 mm
Thickness tolerance copper				35 µm +/- 5 µm
Deformation	rel. to diagonal length	< 3	%	< 3

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**Original Bungard presensitized base material FR4 with UV blocker
IPC 4101A**

Property	Test method	Specification	Units	Typical Value
Glass Transition Temperature (Tg) by DSC, spec. Minimum	2.4.25	110-150	°C	150
Decomposition Temperature (Td)	ASTM D3850	-	°C	320
CTE, Z-Axis pre TG	2.4.24	AABUS	ppm/°C	15
CTE, Z-Axis post TG	2.4.24	-	ppm/°C	250
CTE, X-, Y-Axis pre TG	2.4.24	AABUS	ppm/°C	15
CTE, X-, Y-Axis post TG	2.4.24	-	ppm/°C	17
Thermal Conductivity	ASTM D5930	-	W/mK	0.36
Thermal Stress 10s @ 288°C spec minimum	unetched/ etched	2.4.13.1 2.4.13.1	Pass visual Pass visual	Rating Rating
Permittivity, spec maximum	A. @ 1 MHz B. @ 100 MHz C. @ 1 GHz	2.5.5.3 2.5.5.9 2.5.5.5	5.4 - -	- - -
Loss tangent, spec maximum	A. @ 1 MHz B. @ 100 MHz C. @ 1 GHz	2.5.5.3 2.5.5.9 2.5.5.5	0.035 - -	- - -
Volume Resistivity spec minimum	After moisture resistance At elevated temperature	2.5.17.1 2.5.17.1	10 ⁶ 10 ³	MOhm cm MOhm cm
Surface Resistivity spec minimum	After moisture resistance At elevated temperature	2.5.17.1 2.5.17.1	10 ⁴ 10 ³	MOhm MOhm
Dielectric Breakdown, spec minimum	2.5.6	40	kV	60
Arc Resistance, spec minimum	2.5.1	60	Seconds	105
Comparative Tracking Index	CTI / ASTM D3638	UL-746A	-	Volts
Peel strenght spec. minimum	After thermal stress At 125 °C After process solutions	2.4.8 2.4.8 2.4.8	105 105 105	N/mm N/mm N/mm
Flexural strength, minimum	lengthwise crosswise	2.4.4 2.4.4	415 345	G.Pa G. Pa
Moisture absorbtion spec maximum	2.6.2.1	0.80	%	0.20
UL Approval	E 47820 / E98983 / E213990			
Flammability, spec minimum	UL-94	V-1	Rating	V-0
Thickness tolerance dielectric	Class II		mm	1.55 +/- 0.08
Thickness tolerance copper			µm	35 +/- 5
Deformation rel. to diagonal length		< 3	%	< 3

