



isola

B-FR408

FR408

Epoxy base material
for high-frequency
applications

Epoxy Base Material for High-Frequency Applications

FR408

FR408, a high-performance FR-4 epoxy laminate and prepreg system, was specially developed for innovative, complex circuits. Its low dielectric constant and low loss factor make this material an ideal solution for circuit boards that are required to exhibit faster signal speeds or improved signal integrity.

The benefits of FR408 also include an elevated T_g (180 °C) and excellent temperature resistance.

FR408 can be pressed and processed similarly to DURAVER® E-Cu quality 104. (standard FR-4) Consequently, this product can be used with existing production systems without any additional expense.

Outstanding Benefits

- Nominal T_g of 180 °C (DSC)
- Low thermal z-axis expansion
- Good dielectric properties
- Can be processed like standard FR-4
- Low moisture absorption

Typical Applications

Analog

- Computers
- Workstations
- Telecommunications

Digital

- Mobile telephone
- Electronic storage media
- Navigations systems (GPS)
- Digital TV

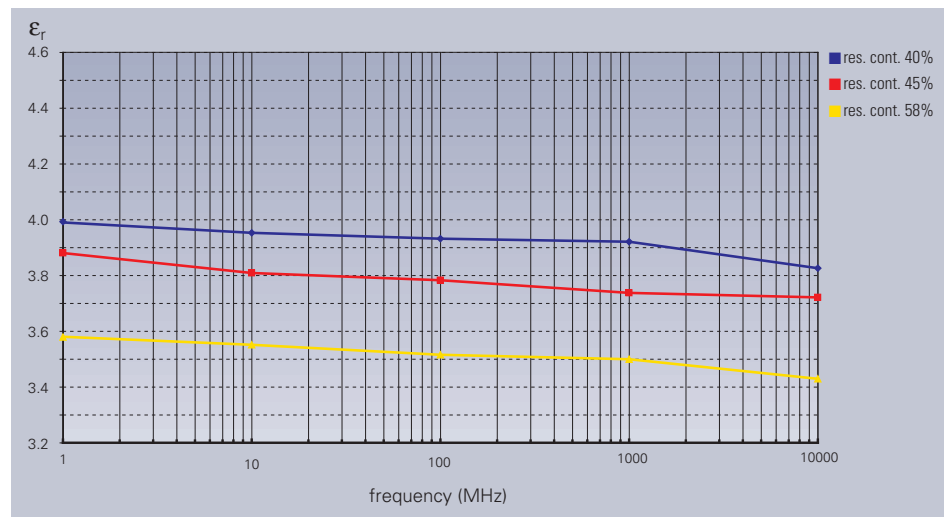
Raw Materials

The same E-glass fabric types are used as in our standard DURAVER® E-Cu quality 104 (FR-4).

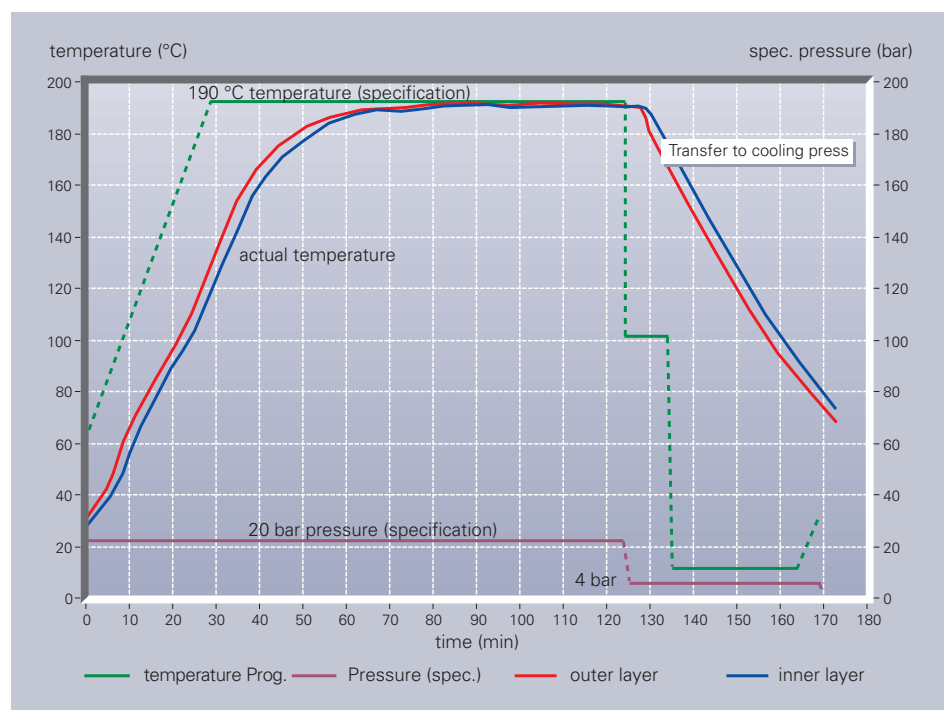
Standard copper claddings with thicknesses of 18 μm , 35 μm and 70 μm are available. We use only HTE copper foil treated for **enhanced temperature resistance**.

Dielectric constant depending on frequency

parameter: resin content



Recommended Press Parameters



Supply forms and storage

The laminates are produced in standard sheet size:

1225 x 1070 mm (warp)

Prepregs are available with a standard roll width of approx. 1255 mm.

Other sheet sizes and roll widths available on request.

Laminate and prepreg panels are cut to specifications.

For pin-lam technology, required holes are also punched in the prepreg panels as specified. A wide range of punching tools are available for this.

The prepregs can be stored for three months at < 20 °C and rel. humidity of < 50 %, and considerably longer if kept in a refrigerated storeroom. When removing chilled product from storage, take appropriate steps to prevent condensation.

Typical drilling parameters for 4-ply ML 1.6 mm thick

Diameter mm	Feed rate mm/s	Speed rpm/1000	Exit mm/s
0.30	42	110	163
0.60	92	80	200
0.90	70	53	200
1.20	53	40	200
1.50	43	32	200
1.80	37	27	200
2.20	25	22	200
2.40	20	20	200

FR408 Standard Prepregs

Prepreg type		Calculated thickness		Resin content
		mm	inch	%
106	HS03	0.065	0.0026	75 ± 3
1080	HS02	0.075	0.0030	61 ± 3
3080	HS01	0.077	0.0030	59 ± 3
3113	HS01	0.102	0.0040	53 ± 3
1651	HS01	0.152	0.0060	47 ± 3
7628	HS02	0.200	0.0079	45 ± 3

FR408 Standard Laminate Constructions

Nominal thickness		Thickness tolerance IPC 4101A cl. B	Construction	Mean resin content
mm	inch	mm		%
0.050	0.002	± 0.018	1 x 106	65.0
0.075	0.003	± 0.018	1 x 1080	61.0
0.100	0.004	± 0.018	1 x 1634	42.0
0.125	0.005	± 0.025	1 x 1647	47.0
0.150	0.006	± 0.025	1 x 1651	46.0
0.200	0.008	± 0.038	1 x 7628	45.0
0.250	0.010	± 0.038	2 x 1647	47.0
0.300	0.012	± 0.050	2 x 1651	46.0
0.360	0.014	± 0.050	2 x 7628	41.0
0.540	0.021	± 0.064	3 x 7628	41.0
0.710	0.028	± 0.064	4 x 7628	41.0
0.900	0.035	± 0.100	5 x 7628	41.0
1.000	0.039	± 0.100	5 x 7628	45.0

Nominal thickness		Thickness tolerance IPC 4101A cl. L	Construction	Mean resin content
mm	inch	mm		%
1.550	0.060	± 0.130	8 x 7628	45.0

Technical Values

FR408

Specification Sheet #:	IPC-4101A/24
Reinforcement:	Woven E-glass
Resin system:	Primary: Epoxy • Secondary: Multifunctional Epoxy
Flame Retardant Mechanism:	Bromine • Minimum UL 94 Requirement: V-1
Fillers:	n/a
ID Reference:	UL/ANSI: FR-4 • ANSI: FR-4/24
Glass Transition (T _g):	150 °C - 200 °C

Explanations:

C = preconditioning in humidity chamber
E = preconditioning at temperature

The figures following the letter symbols indicate with the first digit the duration of the preconditioning in hours, with the second digit the preconditioning temperature in °C and with the third digit the relative humidity.

Properties	Units	Specification	Isola-Value	Specification	Isola-Value
		Laminate thickness < 0.50 mm		Laminate thickness ≥ 0.50 mm	
1. Peel Strength , minimum					
A. Low profile copper foil and very low profile copper foil – all copper weights >17 µm	N/mm	0.70	n/a	0.70	n/a
B. Standard profile copper foil (35 µm)					
1. After thermal stress	N/mm	0.80	1.25	1.05	1.25
2. At 125 °C	N/mm	0.70	1.20	0.70	1.25
3. After process solutions	N/mm	0.55	1.15	0.80	1.60
C. All other foil composite	N/mm	n/a	n/a	n/a	n/a
2. Volume Resistivity , minimum					
A. C-96/35/90	MΩ · cm	1.0 · 10 ⁶	1.0 · 10 ⁶	n/a	n/a
B. After moisture resistance	MΩ · cm	n/a	n/a	1.0 · 10 ⁴	9.8 · 10 ³
C. At elevated temperature E 24/125	MΩ · cm	1.0 · 10 ³	1.0 · 10 ³	1.0 · 10 ³	3.1 · 10 ³
3. Surface Resistivity , minimum					
A. C-96/35/90	MΩ	1.0 · 10 ⁴	1.0 · 10 ⁶	n/a	n/a
B. After moisture resistance	MΩ	n/a	n/a	1.0 · 10 ⁴	7.7 · 10 ⁷
C. At elevated temperature E 24/125	MΩ	1.0 · 10 ³	1.0 · 10 ³	1.0 · 10 ³	3.2 · 10 ¹⁰
4. Moisture Absorption , maximum	%	n/a	n/a	0.80	≤ 0.80
5. Dielectric Breakdown , maximum	kV	n/a	n/a	40	46
6. Permittivity @ 1 MHz , maximum (Laminate or prepreg as laminated)		5.4	3.8	5.4	3.9
7. Loss Tangent @ 1MHz , maximum (Laminate or prepreg as laminated)		0.035	0.010	0.035	0.010
8. Flexural Strength , minimum					
A. Length direction	N/mm ²	n/a	n/a	415	680
B. Cross direction	N/mm ²	n/a	n/a	345	490
9. Flexural Strength @ Elevated Temperature , length direction, minimum	N/mm ²	n/a	n/a	n/a	n/a
10. Thermal Stress at 288 °C , minimum					
A. Unetched	s	≥ 10	≥ 10	≥ 10	≥ 10
B. Etched	s	≥ 10	≥ 10	≥ 10	≥ 10
11. Electric Strength , minimum (Laminate or prepreg as laminated)	kV/mm	30	55	n/a	n/a
12. Flammability					
A. Average burn time, maximum	s	5	3	5	4
B. Individual burn time, maximum	s	10	4	10	5
13. Glass Transition Temperature (T_g) DSC , nominal	°C	n/a	180	n/a	180
14. Coefficient of Thermal Expansion (CTE) TMA					
Fill direction (below T _g / above T _g)	ppm/K				16/15
Warp direction (below T _g / above T _g)	ppm/K				12/5
Vertical (below T _g / above T _g)	ppm/K				70/220

*not applicable

All of this Technical Information has been determined with due care and thoroughness. However, because the conditions of use and the process and application technologies employed can vary so greatly, the provided data and figures can only serve as nonbinding guidelines. They do not constitute a guarantee that the purchased item will possess certain attributes. For this reason, no liability whatsoever can be assumed for them. The buyer is obliged to check the suitability of all supplied products.

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