



**Glass cloth base epoxy resin  
Flame retardant copper clad laminate**

**NPG-170DR**

**FEATURES**

- Halogen, antimony, and red phosphorous free
- Flammability meets UL 94V-0
- Excellent long term reliability
- UV blocking type
- Superior CAF-Resistance (Anti-migration)
- Reactive type flame retardants
- High Tg 170°C (DSC) and low C.T.E will provide excellent dimensional stability and through-hole reliability
- ANSI type: FR-4.1

**PERFORMANCE LIST**

Characteristics	Unit	Condition	Typical Values	SPEC	Test Method	
Volume resistivity	MΩ-cm	C-96/35/90	5 x10 <sup>8</sup> ~ 5x10 <sup>9</sup>	10 <sup>6</sup> ↑	2.5.17	
Surface resistivity	MΩ	C-96/35/90	5 x10 <sup>6</sup> ~ 5x10 <sup>7</sup>	10 <sup>4</sup> ↑	2.5.17	
Permittivity 1GHz	-	C-24/23/50	4.0-4.1	-	2.5.5.9	
Loss Tangent 1GHz	-	D-24/23/50	0.005-0.006	-	2.5.5.9	
Arc resistance	SEC	D-48/50+D-0.5/23	120 ↑	60 ↑	2.5.1	
Dielectric breakdown	KV	D-48/50	60 ↑	40 ↑	2.5.6	
Moisture absorption	%	D-24/23	0.05-0.10	0.8 ↓	2.6.2.1	
Flammability	-	C-48/23/50	V-0	V-0	UL94	
Peel strength 1 oz (≥0.5mm)	lb/in	288°C x10" solder floating	7-8	6 ↑	2.4.8	
Thermal stress	SEC	288°C solder dipping	300 ↑	10 ↑	2.4.13.1	
Pressure cooker (2 atm 120°C)	1/2 hr	SEC	288°C dipping	300 ↑	N/A	-
	1 hr	SEC	288°C dipping	300 ↑	N/A	-
	2 hrs	SEC	288°C dipping	300	N/A	-
Flexural strength	LW	N/mm <sup>2</sup>	A	475-550	415 ↑	2.4.4
	CW	N/mm <sup>2</sup>	A	360-440	345 ↑	2.4.4
Dimensional stability X-Y axis	%	E-0.5/170	0.005-0.030	0.050 ↓	2.4.39	
Coefficient of thermal expansion X-Y axis Z-axis before Tg Z-axis after Tg	ppm/°C	TMA	9-13	N/A	2.4.24	
	ppm/°C	TMA	30-40			
	ppm/°C	TMA	200-230			
Glass transition temp	°C	DSC	170 ± 5	N/A	2.4.25	
Decomposition temperature (Td 5% W/L)	°C	TGA	380	N/A	2.4.24.6	

**NOTE:**

Data shown are nominal values for reference only.

The average value in the table refers to samples of .062" 1/1.  
Test method per IPC-TM-650



**Glass cloth base epoxy resin  
Flame retardant copper clad laminate**

**NPG-170DTL**

**FEATURES**

- Halogen, antimony, and red phosphorous free
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- Excellent long term reliability
- UV blocking type
- Superior CAF-Resistance (Anti-migration)
- Reactive type flame retardants
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**PERFORMANCE LIST**

Characteristics	Unit	Condition	Typical Values	SPEC	Test Method
Volume resistivity	MΩ-cm	C-96/35/90	5.0 x10 <sup>9</sup>	10 <sup>6</sup> ↑	2.5.17
Surface resistivity	MΩ	C-96/35/90	5.0 x10 <sup>7</sup>	10 <sup>4</sup> ↑	2.5.17
Permittivity 1 GHz	-	C-24/23/50	3.9-4.0	-	2.5.5.9
Loss Tangent 1 GHz	-	C-24/23/50	0.005-0.006	-	2.5.5.9
Arc resistance	SEC	D-48/50+D-0.5/23	120 ↑	60 ↑	2.5.1
Dielectric breakdown	KV	D-48/50	60 ↑	40 ↑	2.5.6
Moisture absorption	%	D-24/23	0.20-0.30	0.8 ↓	2.6.2.1
Flammability	-	C-48/23/50	V-0	V-0	UL94
Peel strength 1 oz (≥0.5mm)	lb/in	288°C x10" solder floating	7-8	6 ↑	2.4.8
Thermal stress	SEC	288°C solder dipping	300 ↑	10 ↑	2.4.13.1
Glass transition temp	°C	DSC	170 ± 5	N/A	2.4.25
Dimensional stability X-Y axis	%	E-4/105	0.01-0.03	0.05 ↓	2.4.39
Coefficient of thermal expansion X-Y axis	ppm/°C	TMA	9-13	N/A	2.4.24
Z-axis before Tg	ppm/°C	TMA	30-40		
Z-axis after Tg	ppm/°C	TMA	200-230		
Decomposition temperature (Td 5% W/L)	°C	TGA	380	N/A	2.4.24.6

Data shown are nominal values for reference only.

**NOTE:**

The average value in the table refers to samples of .020" 1/1.  
Test method per IPC-TM-650



**■ CONSTRUCTION**

THICKNESS		CONSTRUCTION	THICKNESS		CONSTRUCTION
mm	mil		mm	mil	
0.05 sp	2	1067 1 ply	0.20 2p	8	3313 2 plies
0.08 1p	3	1086 1 ply	0.26	10	2116 2 plies
0.10	4	1080 2 plies	0.30 3p	12	3313 3 plies
0.11	4	2116 1 ply	0.35 4p	14	3313 4 plies
0.13	5	1080 2 plies	0.38 4p	15	3313 4 plies
0.13 sp	5	2116 1 ply	0.45 4p	18	2116 4 plies
0.15 2p	6	1086 2 plies	0.50 5p	20	3313 5 plies
0.18 2p	7	3313 2 plies	0.53 5p	21	2116 5 plies

- Construction with glass fabrics type thicker than 2116 (excluded) is not recommended.
- Requirement for not listed glass fabrics types, please contact our technical customer service team for discussion in advance.

**■ PRODUCT SIZE & THICKNESS**

THICKNESS	COPPER CLADDING	SIZE		THICKNESS TOLERANCE
		inch	mm	
0.002 (0.05)	H (17)	48.8 x 36.6	1240 x 0930	IPC-4101E SPEC CLASS C/M
to	1.0 (35)	48.8 x 40.5	1240 x 1030	
0.039 (1.0)	2.0 (70)	48.8 x 42.5	1240 x 1080	
	3.0 (102)			

- Keeping the core and prepreg in the same grain direction is crucial to ensure the flatness of multilayer boards.
- Grain direction is shown on the certificate of conformance.



**Glass cloth base epoxy resin  
 Flame retardant prepreg**

**NPG-170DB**

■ **FEATURES**

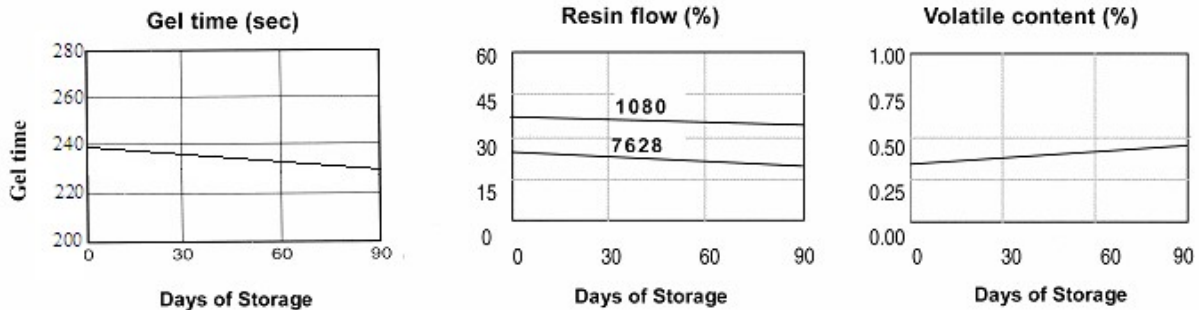
- Halogen, antimony, and red phosphorous free
- Rheology of resin controlled to benefit the lamination of the boards.
- Modified phosphorous epoxy provides excellent heat and chemical resistance.
- Tg: 170±5°C

■ **PERFORMANCE LIST**

Specification: IPC-4101E is applicable  
 Data shown are nominal values for reference only.

Glass style	RC%	GT sec (171°C)	VC%	After Pressed Thickness (per ply)	
				mm	mil
1506MR	54 ± 3	240 ± 20	0.75 ↓	0.197 ± 0.01	7.8 ± 0.4
1506	50 ± 3			0.178 ± 0.01	7.0 ± 0.4
2116HR	60 ± 3			0.150 ± 0.01	5.9 ± 0.4
2116MR	56 ± 3			0.134 ± 0.01	5.3 ± 0.4
2116	52 ± 3			0.120 ± 0.01	4.7 ± 0.4
2113	58 ± 3			0.105 ± 0.01	4.1 ± 0.4
2112	62 ± 3			0.106 ± 0.008	4.2 ± 0.3
1080HR	70 ± 3			0.096 ± 0.008	3.8 ± 0.3
1080MR	67 ± 3			0.086 ± 0.008	3.4 ± 0.3
1080	64 ± 3			0.078 ± 0.008	3.1 ± 0.3
106HR	76 ± 3			0.062 ± 0.008	2.4 ± 0.3
106MR	74 ± 3			0.057 ± 0.008	2.2 ± 0.3
106	70 ± 3			0.048 ± 0.008	1.9 ± 0.3

**Storage Stability**

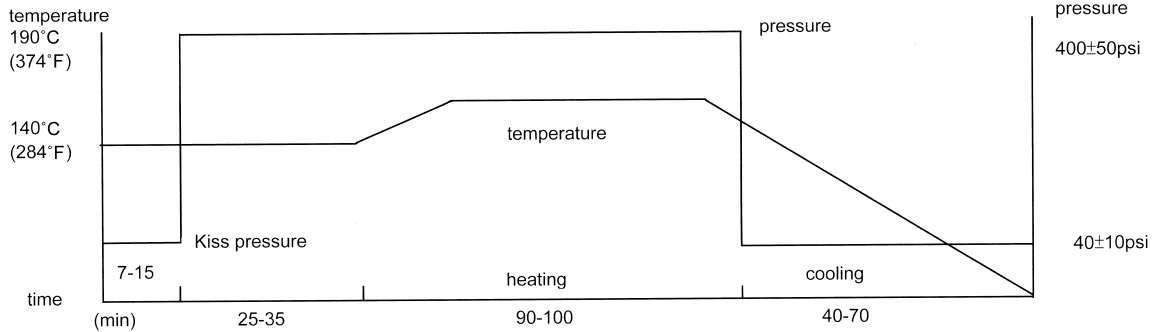


Storage Condition: 20°C 50% RH for 3 months  
 : Max. 5°C for 6 months

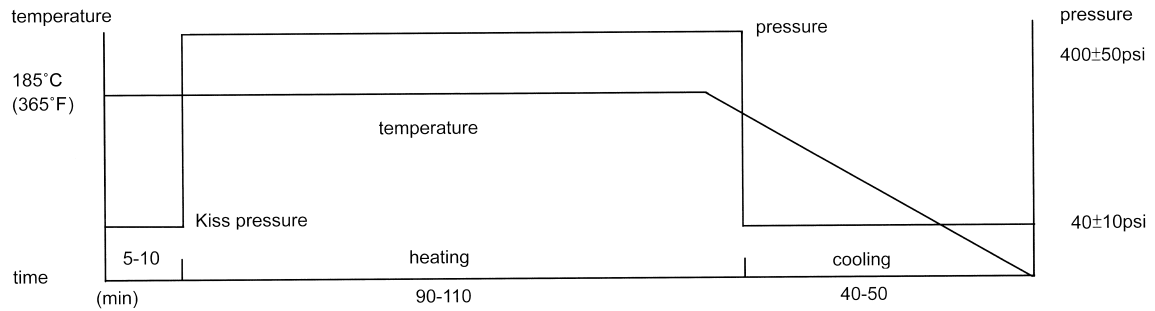


### Recommended press cycles:

A:2T2P(2 temperature step/2 pressure step)



B:1T2P(1 temperature step/2 pressure step)



### Suggestions:

1. Heating rate of material between 80°C(176°F) and 140°C(284°F)  
1-3°C/min (1.8~5.4°F/min) is acceptable.  
1.5-2.5°C/min (2.7~4.5°F/min) would be better.
2. Temperature of material over 180°C(356°F) must be held for at least 80min to allow resin to fully cure.
3. The pressure should be kept below 100psi during cooling to ambient temperature.
4. Cooling rate of material should be kept under 2.5°C/min (4.5°F/min) when the temperature of material is over 100°C(212°F), in order to avoid introducing twist.

### ■ CERTIFICATION UL

- UL File No.: E98983
- ANSI TYPE: FR-4.1