



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

**NPG-150N**

**■ FEATURES**

- Halogen, antimony, and red phosphorous free
- Flammability meets UL 94 V-0
- Excellent long term reliability
- UV blocking type
- IPC-4101E L127/128
- Reactive type flame retardants
- Mid Tg and lower C.T.E will provide excellent through-hole reliability
- Superior CAF-Resistance (Anti-migration)

**■ 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 MHz	-	C-24/23/50	4.2-4.4	5.4 ↓	2.5.5.9
Permittivity 1 GHz	-	C-24/23/50	3.8-4.0	-	2.5.5.9
Loss Tangent 1 MHz	-	C-24/23/50	0.013-0.015	0.035 ↓	2.5.5.9
Loss Tangent 1 GHz	-	C-24/23/50	0.011-0.013	-	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	94V0	94V0	UL94
Peel strength 1 oz (≥0.5mm)	lb/in	288°Cx10" solder floating	8-10	6 ↑	2.4.8
Thermal stress	SEC	288°C solder dipping	300 ↑	10 ↑	2.4.13.1
Glass transition temp	°C	DSC	150 ± 5	N/A	2.4.25
Glass transition temp	°C	TMA	> 140	N/A	2.4.24
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	30-50		
Z-axis after Tg	ppm/°C	TMA	200-230		
Decomposition temperature (Td 5% W/L)	°C	TGA	350	N/A	2.4.24.6

**NOTE:**

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

Data shown are nominal values for reference only.



**■ CONSTRUCTION**

THICKNESS		CONSTRUCTION		THICKNESS		CONSTRUCTION	
mm	mil			mm	mil		
0.05	2	106	1 ply	0.35	14	7628	2 plies
0.08	3	2112	1 ply	0.38	15	7628	2 plies
0.10	4	1080	2 plies	0.45	18	7628x2+1080x1	
0.11	4	2116	1 ply	0.50	20	7628	3 plies
0.13	5	1080	2 plies	0.53	21	7628	3 plies
0.13 sp	5	2116	1 ply	0.60	24	7628	3 plies
0.15	6	1506	1 ply	0.77	30	7628	4 plies
0.21	8	7628	1 ply	0.8	31.5	7628	4 plies
0.26	10	2116	2 plies	0.9	36	7628	5 plies
0.30	12	2116	3 plies	1.0	39	7628	5 plies
0.30 sp	12	1506	2 plies	1.2	47	7628	6 plies

• 1.2, 1.1, 1.0, 0.9, 0.8, 0.77 mm THICKNESS INCLUDE CLADDING, ALL OTHERS EXCLUDE CLADDING

**■ 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	
	2.0 (70)	48.8 x 42.5	1240 x 1080	
0.047 (1.2)	3.0 (105)			

**■ 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-150NB

**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.
- Higher Tg: 150±5°C
- Other properties are similar to standard FR-4

**PERFORMANCE LIST**

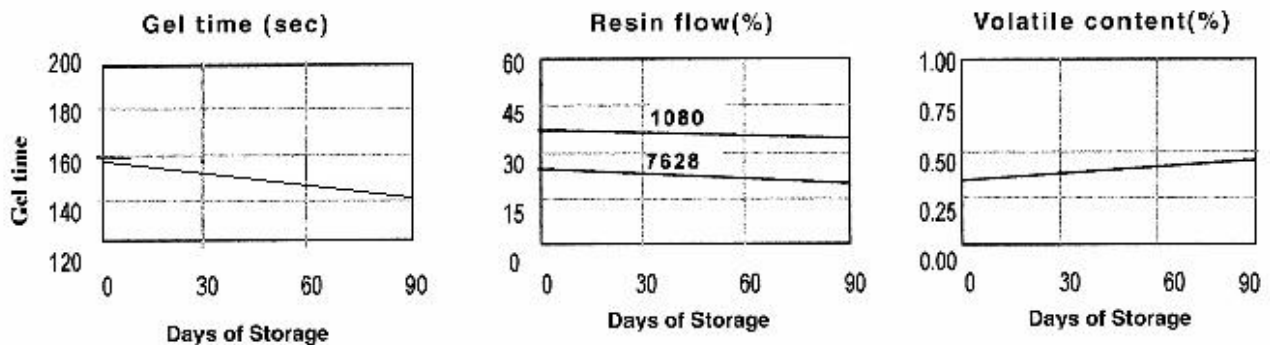
Specification: IPC-4101E is applicable

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Glass style	RC%	GT sec (171°C)	VC%	After Pressed Thickness (per ply)	
				mm	mil
7628HR	50 ± 3	160 ± 20	1.5 ↓	0.193 ± 0.01	7.6 ± 0.4
7628MR	47 ± 3			0.183 ± 0.01	7.2 ± 0.4
7628	43 ± 3			0.173 ± 0.01	6.8 ± 0.4
1506MR	52 ± 3			0.157 ± 0.01	6.2 ± 0.4
1506	48 ± 3			0.145 ± 0.01	5.7 ± 0.4
2116HR	58 ± 3			0.120 ± 0.01	4.7 ± 0.4
2116MR	54 ± 3			0.109 ± 0.01	4.3 ± 0.4
2116	50 ± 3			0.097 ± 0.01	3.8 ± 0.4
2113	56 ± 3			0.081 ± 0.01	3.2 ± 0.4
2112	60 ± 3			0.069 ± 0.008	2.7 ± 0.3
1080HR	68 ± 3			0.064 ± 0.008	2.5 ± 0.3
1080MR	65 ± 3			0.061 ± 0.008	2.4 ± 0.3
1080	62 ± 3			0.058 ± 0.008	2.3 ± 0.3
106	68 ± 3			0.046 ± 0.008	1.8 ± 0.3
*1086	62 ± 3			0.066 ± 0.008	2.6 ± 0.3
*1067	68 ± 3			0.049 ± 0.008	1.9 ± 0.3
*1078	62 ± 3			0.058 ± 0.008	2.3 ± 0.3

\*Laser drillable prepreg

**Storage Stability**



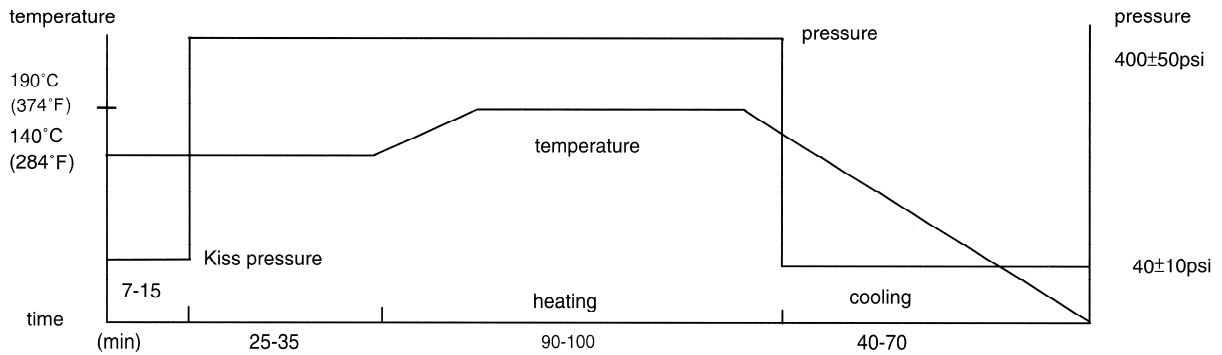
Storage Condition : 20°C 50% RH for 3 months  
 : Max 5°C for 6 months

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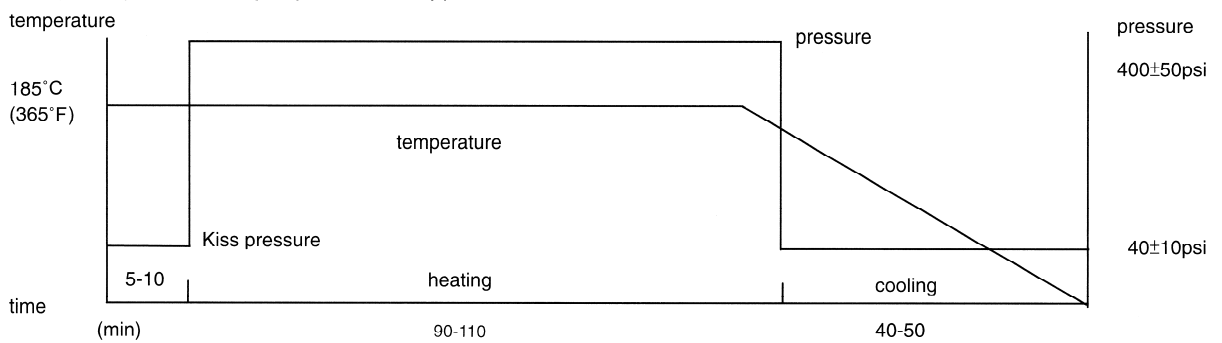


**Recommended press cycles:**

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



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



**Suggestions:**

1. Heating rate of material between 70°C (158°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 170°C (338°F) must be held for at least 60 min 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
- UL 746 Recognition

Minimum Material Thickness inch (mm)	Clad cond. Thickness		Max. Area Diameter inch (mm)	Max. Operating Temp	Solder Lts		UL 94 Flame Class
	Min. mils (µm)	Max. mils (µm)			Temp °C	Time sec	
0.0016 (0.04)	0.59 (15)	4.02 (102)	2.0 (50.8)	130	288	30	94V-0