



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

**NPG-180BH**

**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(TMA >180°C) 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	7.0 x10 <sup>9</sup>	10 <sup>6</sup> ↑	2.5.17
Surface resistivity	MΩ	C-96/35/90	7.0 x10 <sup>7</sup>	10 <sup>4</sup> ↑	2.5.17
Permittivity 1 GHz	-	C-24/23/50	4.3-4.6	5.4 ↓	2.5.5.9
Loss Tangent 1 GHz	-	C-24/23/50	0.007-0.010	0.035 ↓	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	0.12-0.20	0.8 ↓	2.6.2.1
Flammability	-	C-24/23/50+E-24/125	V-0	V-0	UL94
Peel strength 1 oz (≥0.5mm)	lb/in	288°Cx10" solder floating	6-9	6 ↑	2.4.8
Thermal stress	SEC	288°C solder dipping	600 ↑	10 ↑	2.4.13.1
Decomposition temperature (5% weight loss)	°C	TGA	>390	-	2.4.24.6
Glass transition temperature	°C	TMA	>180	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	11-13		
Z-axis before Tg	ppm/°C	TMA	33-43	N/A	2.4.24
Z-axis after Tg	ppm/°C	TMA	135-155		
50~260°C	%	TMA	1.6		

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	0.35	14	7628 2 plies
0.08 1p	3	1086 1 ply	0.38	15	7628 2 plies
0.10	4	1080 2 plies	0.45 sp	18	1506 3 plies
0.10 1p	4	2116 1 ply	0.50	20.5	7628 3 plies
0.13	5	1080 2 plies	0.53	21	7628 3 plies
0.13 sp	5	2116 1 ply	0.71	28	7628 4 plies
0.15	6	1506 1 ply	0.74	29	7628 4 plies
0.15 2p	6	1086 2 plies	0.77	30	7628 4 plies
0.18 sp	7	7627 1 ply	0.8	31.5	7628 4 plies
0.20 1p	8	7628 1 ply	0.9	36	7628 5 plies
0.25 2p	10	2155 2 plies	1.0	39	7628 5 plies
0.30	12	2116 3 plies	1.1	43	7628 6 plies
0.30 sp	12	1506 2 plies	1.2	47	7628 6 plies

**■ PRODUCT SIZE & THICKNESS**

THICKNESS	COPPER CLADDING	SIZE		THICKNESS TOLERANCE
		inch	mm	
0.002(0.05)	3/8 (12)	48.8 x 36.6	1240 x 0930	IPC-4101E SPEC CLASS C/M
to	to	48.8 x 40.5	1240 x 1030	
0.047(1.2)	6.0 (210)	48.8 x 42.5	1240 x 1080	

**■ 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-180BHB

**■ FEATURES**

- Rheology of resin controlled to benefit the lamination of the boards.
- Modified phosphorous epoxy provides excellent heat and chemical resistance.
- Tg: TMA above 175°C.

**■ PERFORMANCE LIST**

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

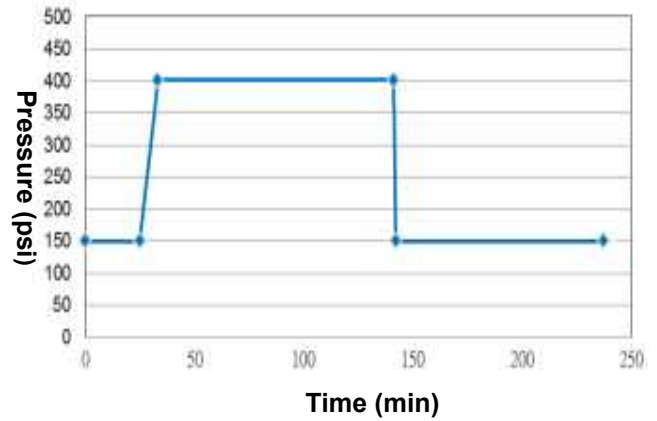
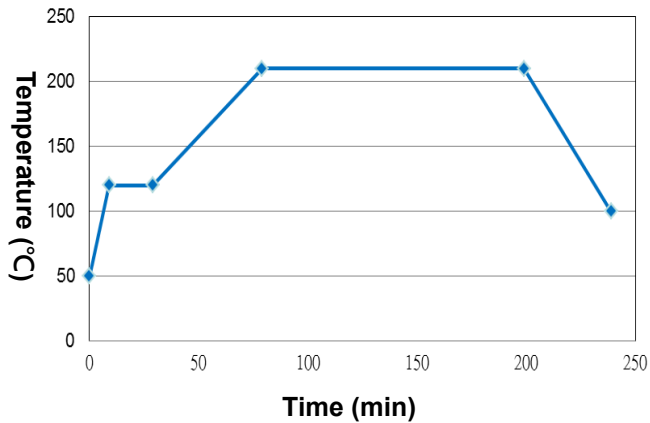
Glass style	RC%	After Pressed Thickness (100%Cu, per ply)	
		mm	mil
7628HR	53 ± 3	0.232 ± 0.01	9.1 ± 0.4
7628MR	50 ± 3	0.215 ± 0.01	8.5 ± 0.4
7628	46 ± 3	0.195 ± 0.01	7.7 ± 0.4
1506	51 ± 3	0.172 ± 0.01	6.8 ± 0.4
2116HR	61 ± 3	0.146 ± 0.01	5.8 ± 0.4
2116MR	57 ± 3	0.130 ± 0.01	5.1 ± 0.4
2116	53 ± 3	0.117 ± 0.01	4.6 ± 0.4
2113	59 ± 3	0.102 ± 0.008	4.0 ± 0.3
2112	63 ± 3	0.105 ± 0.008	4.1 ± 0.3
1080SR	73 ± 3	0.103 ± 0.008	4.1 ± 0.3
1080HR	71 ± 3	0.094 ± 0.008	3.7 ± 0.3
1080MR	68 ± 3	0.084 ± 0.008	3.3 ± 0.3
1080	65 ± 3	0.076 ± 0.008	3.0 ± 0.3
1067HR	77 ± 3	0.076 ± 0.008	3.0 ± 0.3
1067MR	75 ± 3	0.069 ± 0.008	2.7 ± 0.3
1067	71 ± 3	0.058 ± 0.008	2.3 ± 0.3
106HR/1037HR	77 ± 3	0.060 ± 0.008	2.4 ± 0.3
106MR/1037MR	75 ± 3	0.055 ± 0.008	2.2 ± 0.3
106/1037	71 ± 3	0.047 ± 0.008	1.8 ± 0.3
1027HR	77 ± 3	0.048 ± 0.008	1.9 ± 0.3
1027MR	75 ± 3	0.044 ± 0.008	1.7 ± 0.3
1027	71 ± 3	0.037 ± 0.008	1.5 ± 0.3

**■ Storage Stability**

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



**Recommended press cycles:**



**Suggestions:**

1. Heating rate of material between 90°C(194°F)and 130°C(266°F)  
 1~3°C/min (1.8~5.4°F/min) is acceptable.  
 1.5~2.0°C/min (2.7~3.6°F/min)would be better.
2. Temperature of material over 205°C(401°F)must be held for at least 90min to allow resin to fully cure.
3. The pressure should be kept below 150psi 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: UL FR-4.1
- UL 746 Recognition

Minimum Material Thickness inch (mm)	Clad cond. Thickness		Max. Area Diameter inch (mm)	Solder Lts		UL 94 Flame Class	Max. Operating Temp
	Min. mils (µm)	Max. mils (µm)		Temp °C	Time sec		
0.0016 (0.04)	0.36 (9)	8.4 (210)	2.0 (50.8)	300	30	94V-0	130