



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

NP-180R

FEATURES

- High Tg 175°C (DSC)
- Excellent dimensional stability through-hole reliability
- Excellent electrical, chemical and heat resistance properties
- IPC-4101C specification is applicable
- U.L. designation:ANSI grade FR-5
- U.L. file number E98983
- Outstanding heat resistance
- High luminance of multi-functional epoxy contrast with copper for A.O.I.

PERFORMANCE LIST

Characteristics	Unit	Conditioning	Typical Values	SPEC	Test Method	
Volume resistivity	MΩ-cm	C-96/35/90	5 x10 ⁹ ~ 5x10 ¹⁰	10 ⁶ ↑	2.5.17	
Surface resistivity	MΩ	C-96/35/90	5 x10 ⁸ ~ 5x10 ⁹	10 ⁴ ↑	2.5.17	
Permittivity 1MHZ	-	C-24/23/50	4.6-4.8	5.4 ↓	2.5.5.9	
Permittivity 1GHZ	-	C-24/23/50	4.3-4.5	-	2.5.5.9	
Loss Tangent 1MHZ	-	C-24/23/50	0.015-0.020	0.035 ↓	2.5.5.9	
Loss Tangent 1GHZ	-	C-24/23/50	0.014-0.018	-	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	0.35 ↓	2.6.2.1	
Flammability	-	C-48/23/50	94V0	94V0	UL94	
Peel strength 1 oz	lb/in	288°Cx10" solder floating	8-10	6 ↑	2.4.8	
Thermal stress	SEC	288°C solder dipping	600 ↑	10 ↑	2.4.13.1	
Pressure cooker (2 atm 120°C)	1/2 hr	SEC	288°C dipping	600 ↑	N/A	-
	1 hr	SEC	288°C dipping	600 ↑	N/A	-
	2 hr	SEC	288°C dipping	600	N/A	-
Flexural strength	LW	N/mm ²	A	480-550	415 ↑	2.4.4
	CW	N/mm ²	A	415-480	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						
Z-axis before Tg	ppm/°C	TMA	50-70	N/A	2.4.24	
Z-axis after Tg	ppm/°C	TMA	200-300			
Glass transition temp	°C	DSC	175 ± 5	N/A	2.4.25	
Decomposition Temperature (Td 5% W/L)	°C	TGA	360	N/A	2.4.24.6	

NOTE:

The average value in the table refers to samples of .062" 1/1.

Test method per IPC-TM-650

Data shown are nominal values for reference only.



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

NP-180TL

■ FEATURES

- High Tg 175°C (DSC)
- Excellent dimensional stability through-hole reliability
- Excellent electrical, chemical and heat resistance properties
- IPC-4101C specification is applicable
- U.L. designation:ANSI grade FR-5
- U.L. file number E98983
- Outstanding heat resistance
- High luminance of multi-functional epoxy contrast with copper for A.O.I.

■ PERFORMANCE LIST

Characteristics	Unit	Conditioning	Typical Values	SPEC	Test Method
Volume resistivity	MΩ-cm	C-96/35/90	5.0 x10 ⁹	10 ⁶ ↑	2.5.17
Surface resistivity	MΩ	C-96/35/90	5.0 x10 ⁸	10 ⁴ ↑	2.5.17
Permittivity 1 MHZ	-	C-24/23/50	4.3-4.5	5.4 ↓	2.5.5.9
Permittivity 1 GHZ	-	C-24/23/50	4.1-4.3	-	2.5.5.9
Loss Tangent 1 MHZ	-	C-24/23/50	0.015-0.020	0.035 ↓	2.5.5.9
Loss Tangent 1 GHZ	-	C-24/23/50	0.014-0.018	-	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	0.35 ↓	2.6.2.1
Flammability	-	C-48/23/50	94V0	94V0	UL94
Peel strength 1 oz	lb/in	288°C x10" solder floating	8-10	6 ↑	2.4.8
Thermal stress	SEC	288°C solder dipping	600 ↑	10 ↑	2.4.13.1
Glass transition temp	°C	DSC	175 ± 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 Z-axis before Tg	ppm/°C	TMA	50-70	N/A	2.4.24
Z-axis after Tg	ppm/°C	TMA	200-300		
Decomposition Temperature (Td 5% W/L)	°C	TGA	360	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	
0.10	4	1080 2 plies	0.38	15	7628 2 plies
0.11	4	2116 1 ply	0.45	17	7628x2+1080x1
0.13	5	1080 2 plies	0.50	20	7628 3 plies
0.13sp	5	2116 1 ply	0.53	21	7628 3 plies
0.15	6	1506 1 ply	0.60	24	7628 3 plies
0.16	6	2112 2 plies	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
0.30sp	12	1506 2 plies	1.1	43	7628 6 plies
0.35	14	7628 2 plies	1.2	47	7628 6 plies

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

■ PRODUCT SIZE & THICKNESS

THICKNESS INCH(mm)	COPPER CLADDING OZ (µm)	SIZE		THICKNESS TOLERANCE
		INCH	mm	
0.004 (0.1)	0.5 (17)	48.8 x 36.6	1240 x 0930	IPC-4101C 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	

■ 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

■ This material can not be used in horizontal brown oxide process.

■ CERTIFICATION UL

• UL File No. : E98983 • ANSI TYPE:FR-5

Minimum Material Thickness Inch (mm)	Clad cond. Thickness min. max. mils mils (mic) (mic)	Max. Area Diameter Inch (mm)	Sold Lts Temp Time °C sec	UL 94 Flame class	Max. Operating Temp
0.004 (0.101)	0.68 4.08 (17) (102)	2.0 (50.8)	300 30	94V-0	140



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

NP-180B

■ FEATURES

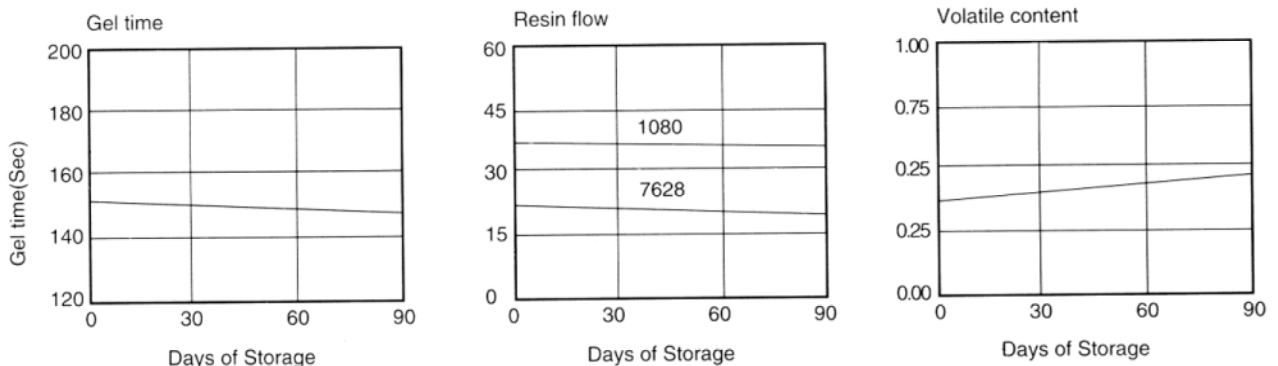
- Rheology of resin controlled to benefit the lamination of the boards.
- Multi-functional epoxy provides outstanding heat resistance, better dimensional stability, and through-hole reliability.
- Higher Tg: 170~180°C
- This material can not be used in horizontal brown oxide process

■ PERFORMANCE LIST

Specification: IPC-4101C is applicable

Glass style	RC%	RF%	GT sec (171°C)	VC%	After Pressed Thickness (per ply)	
					mm	Mil
7628HR	50 ± 3	28 ± 5	150 ± 20	0.75 ↓	0.193 ± 0.01	7.6 ± 0.4
7628MR	47 ± 3	26 ± 5			0.183 ± 0.01	7.2 ± 0.4
7628	43 ± 3	20 ± 5			0.173 ± 0.01	6.8 ± 0.4
1506MR	52 ± 3	30 ± 5			0.157 ± 0.01	6.2 ± 0.4
1506	48 ± 3	25 ± 5			0.145 ± 0.01	5.7 ± 0.4
2116HR	58 ± 3	38 ± 5			0.120 ± 0.01	4.7 ± 0.4
2116MR	54 ± 3	32 ± 5			0.109 ± 0.01	4.3 ± 0.4
2116	50 ± 3	26 ± 5			0.097 ± 0.01	3.8 ± 0.4
2313	55 ± 3	33 ± 5			0.081 ± 0.01	3.2 ± 0.4
2113	56 ± 3	32 ± 5			0.081 ± 0.01	3.2 ± 0.4
2112	60 ± 3	38 ± 5			0.069 ± 0.008	2.7 ± 0.3
1080HR	68 ± 3	48 ± 5			0.066 ± 0.008	2.6 ± 0.3
1080MR	65 ± 3	44 ± 5			0.061 ± 0.008	2.4 ± 0.3
1080	62 ± 3	39 ± 5			0.058 ± 0.008	2.3 ± 0.3
106	68 ± 3	43 ± 5			0.046 ± 0.008	1.8 ± 0.3

Storage Stability



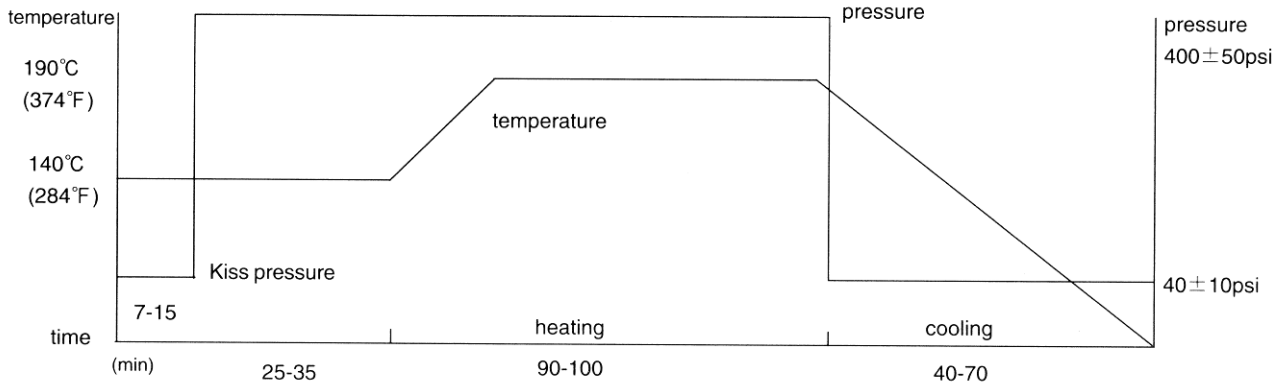
Storage Condition : 20°C, 50% RH for 3 months
 : Max 5°C for 6 months

Data shown are nominal values for reference only.

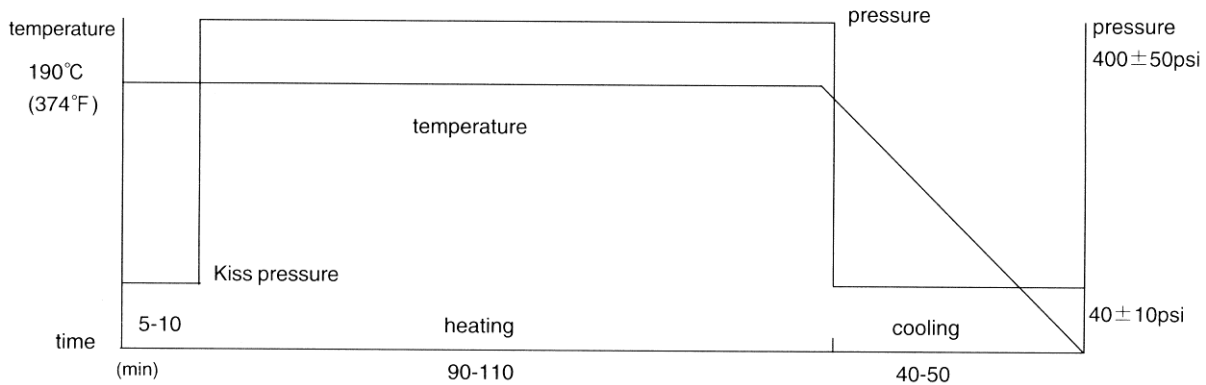


Recommended press cycles:

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 and 140°C
 1-3°C/min is acceptable.
 1.5-2.5°C/min would be better.
2. Temperature of material over 170°C must be held for at least 60min. to allow epoxy 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 when the temperature of material is over 100°C, in order to avoid introducing twist.

CERTIFICATION UL

- UL File No. : E98983
- ANSI TYPE: FR-5

Minimum Material Thickness Inch (mm)	Clad cond. Thickness min. max. mils mic (mic)	Max. Area Diameter Inch (mm)	Sold Lts Temp Time °C sec	UL 94 Flame class	Max. Operating Temp
0.004 (0.101)	0.68 4.08 (17) (102)	2.0 (50.8)	300 30	94V-0	140