



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

# NPG-170DR

**■ FEATURES**

- Halogen, antimony, and red phosphorous free
- Flammability meets UL 94 V-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	Conditioning	Typical Values	SPEC	Test Method	
Volume resistivity	MΩ-cm	C-96/35/90	$5 \times 10^8 \sim 5 \times 10^9$	$10^6 \uparrow$	2.5.17	
Surface resistivity	MΩ	C-96/35/90	$5 \times 10^6 \sim 5 \times 10^7$	$10^4 \uparrow$	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 $\uparrow$	60 $\uparrow$	2.5.1	
Dielectric breakdown	KV	D-48/50	60 $\uparrow$	40 $\uparrow$	2.5.6	
Moisture absorption	%	D-24/23	0.05-0.10	0.35 $\downarrow$	2.6.2.1	
Flammability	-	C-48/23/50	94V0	94V0	UL94	
Peel strength 1 oz	lb/in	288°Cx10" solder floating	7-8	6 $\uparrow$	2.4.8	
Thermal stress	SEC	288°C solder dipping	300 $\uparrow$	10 $\uparrow$	2.4.13.1	
Pressure cooker (2 atm 120°C)	1/2 hr	SEC	288°C dipping	300 $\uparrow$	N/A	-
	1 hr	SEC	288°C dipping	300 $\uparrow$	N/A	-
	2 hr	SEC	288°C dipping	300	N/A	-
Flexural strength	LW	N/mm <sup>2</sup>	A	475-550	415 $\uparrow$	2.4.4
	CW	N/mm <sup>2</sup>	A	360-440	345 $\uparrow$	2.4.4
Dimensional stability X-Y axis	%	E-0.5/170	0.005-0.030	0.050 $\downarrow$	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	N/A	2.4.24	
Z-axis after Tg	ppm/°C	TMA	200-230	N/A	2.4.24	
Glass transition temp	°C	DSC	170 $\pm$ 5	N/A	2.4.25	
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 .062" 1/1.

Test method per IPC-TM-650



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

# NPG-170DTL

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- Halogen, antimony, and red phosphorous free
- Flammability meets UL 94 V-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	Conditioning	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	0.35 ↓	2.6.2.1
Flammability	-	C-48/23/50	94V0	94V0	UL94
Peel strength 1 oz	lb/in	288°Cx10" 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

**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 1PLY	0.38	15	7628 2 plies
0.10	4	1080 2 plies	0.45	17	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
0.13sp	5	2116 1 ply	0.60	24	7628 3 plies
0.15	6	1506 1 ply	0.77	30	7628 4 plies
0.16	6	2112 2 plies	0.8	31.5	7628 4 plies
0.21	8	7628 1 ply	0.9	36	7628 5 plies
0.26	10	2116 2 plies	1.0	39	7628 5 plies
0.30	12	2116 3 plies	1.1	43	7628 6 plies
0.30sp	12	1506 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		SIZE		THICKNESS TOLERANCE
	OZ	(µm)	INCH	mm	
0.004 (0.1)	H (17)	2.0 (70)	48.8 x 36.6	1240 x 0930	IPC-4101C SPEC CLASS C/M
to			48.8 x 40.5	1240 x 1030	
0.039 (1.0)			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-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

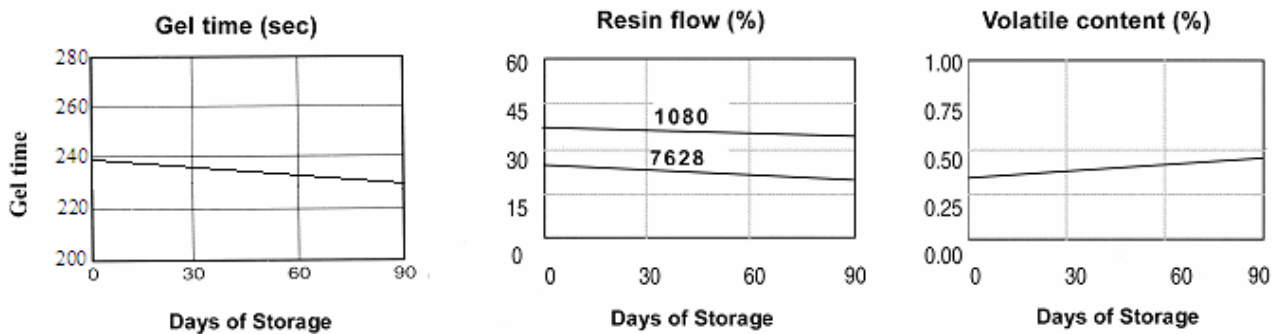
**■ PERFORMANCE LIST**

Specification : IPC-4101C is applicable

Glass style	RC%	RF%	GT sec (171°C)	VC%	After Pressed Thickness (per ply)	
					mm	Mil
7628HR	52 ± 3	28 ± 5	240 ± 20	0.75 ↓	0.237 ± 0.01	9.3 ± 0.4
7628MR	49 ± 3	22 ± 5			0.220 ± 0.01	8.7 ± 0.4
7628	45 ± 3	17 ± 5			0.199 ± 0.01	7.9 ± 0.4
1506	50 ± 3	25 ± 5			0.178 ± 0.01	7.0 ± 0.4
2116HR	60 ± 3	34 ± 5			0.150 ± 0.01	5.9 ± 0.4
2116MR	56 ± 3	28 ± 5			0.134 ± 0.01	5.3 ± 0.4
2116	52 ± 3	20 ± 5			0.120 ± 0.01	4.7 ± 0.4
2113	58 ± 3	25 ± 5			0.105 ± 0.01	4.1 ± 0.4
1080HR	70 ± 3	37 ± 5			0.096 ± 0.008	3.8 ± 0.3
1080MR	67 ± 3	33 ± 5			0.086 ± 0.008	3.4 ± 0.3
1080	64 ± 3	28 ± 5			0.078 ± 0.008	3.1 ± 0.3
106HR	76 ± 3	35 ± 5			0.062 ± 0.008	2.4 ± 0.3
106MR	74 ± 3	30 ± 5			0.057 ± 0.008	2.2 ± 0.3
106	70 ± 3	20 ± 5			0.048 ± 0.008	1.9 ± 0.3

Data shown are nominal values for reference only.

**Storage Stability**

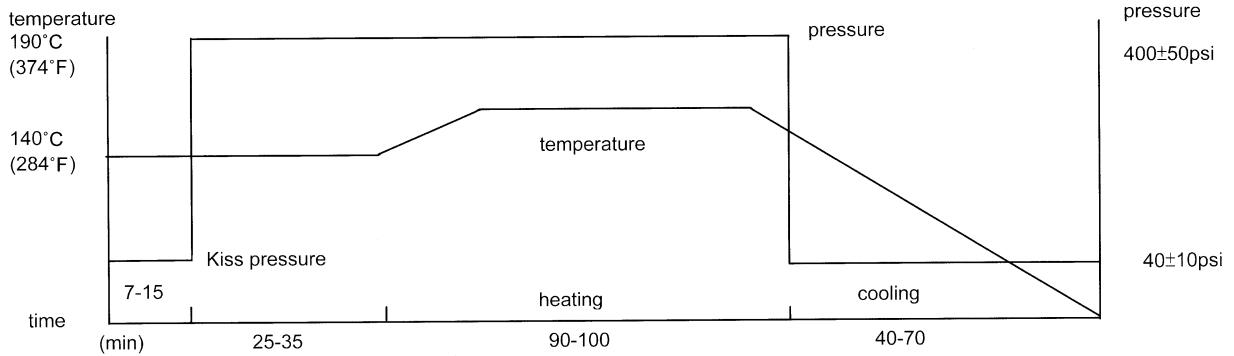


Storage Condition : 20°C 50% RH for 3 months  
 : Max 5°C for 6 months

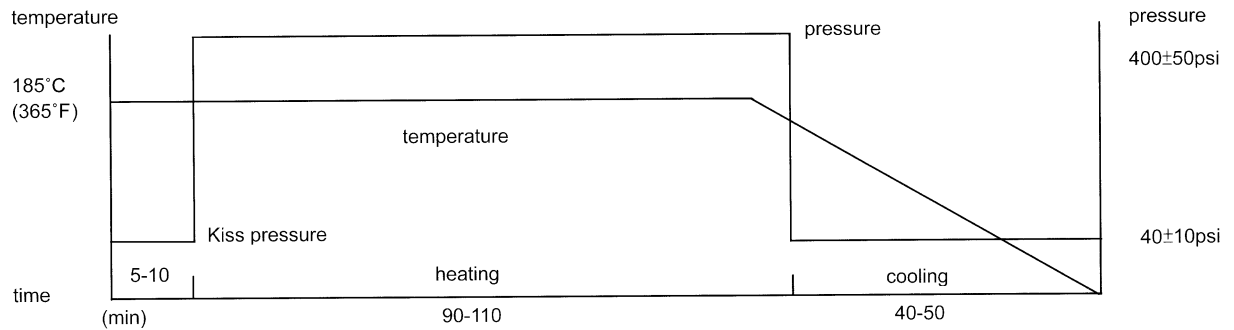


**Recommended press cycles:**

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