NAN YA PLASTICS CORPORATION
ELECTRONIC MATERIALS DIVISION.
COPPER CLAD LAMINATE DEPARTMENT
NO. 201. TUNG HWA N. ROAD, TAIPEI, TAIWAN.

Issued: 2009/02/19
New: 2010/09/01

Glass cloth base epoxy resin
flame retardant copper clad laminate

NPGN-170R

■ 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℃ (DSC) and low C.T.E will provide excellent dimentsional stability and through-hole reliability
- ANSI type : FR-4

■ PERFORMANCE LIST

Characteristics		Unit	Conditioning	Typical Values	SPEC	Test Method
Volume resistivity		MΩ-cm	C-96/35/90	5 x10^8 ~ 5x10^9	10^6↑	2.5.17
Surface resistivity		MΩ	C-96/35/90	5 x10^6 ~ 5x10^7	10^4↑	2.5.17
Permittivity 1MHZ		-	C-24/23/50	4.6-4.9	5.4↓	2.5.5.9
Permittivity 1GHZ		-	C-24/23/50	4.4-4.6	-	2.5.5.9
Loss Tangent 1MHZ		-	D-24/23/50	0.015-0.018	0.035↓	2.5.5.9
Loss Tangent 1GHZ		-	D-24/23/50	0.010-0.015	-	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℃x10" solder floating	7-9	6↑	2.4.8
Thermal stress		SEC	288℃ solder dipping	300↑	10↑	2.4.13.1
Pressure cooker (2 atm 120℃)	1/2 hr	SEC	288℃ dipping	300↑	N/A	-
	1 hr	SEC	288℃ dipping	300↑	N/A	-
	2 hr	SEC	288℃ dipping	300	N/A	-
Flexural strength	LW	N/mm^2	A	475-550	415↑	2.4.4
	CW	N/mm^2	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/℃ ppm/℃ ppm/℃	 TMA TMA TMA	 9-13 30-50 200-230	N/A	2.4.24
Glass transition temp		℃	DSC	170 ± 5	N/A	2.4.25

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

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Glass cloth base epoxy resin
flame retardant copper clad laminate

NPGN-170TL

■ 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℃ (DSC) and low C.T.E will provide excellent dimensional stability and through-hole reliability
- ANSI type : FR-4

■ 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 x10^7	10^4 ↑	2.5.17
Permittivity 1 MHZ	-	C-24/23/50	4.6-4.8	5.4 ↓	2.5.5.9
Permittivity 1 GHZ	-	C-24/23/50	4.4-4.6	-	2.5.5.9
Loss Tangent 1 MHZ	-	C-24/23/50	0.014-0.016	0.035 ↓	2.5.5.9
Loss Tangent 1 GHZ	-	C-24/23/50	0.010-0.012	-	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℃x10" solder floating	7-9	6 ↑	2.4.8
Thermal stress	SEC	288℃ solder dipping	300 ↑	10 ↑	2.4.13.1
Glass transition temp	℃	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/℃	TMA	9-13	N/A	2.4.24
Z-axis before Tg	ppm/℃	TMA	30-50		
Z-axis after Tg	ppm/℃	TMA	200-230		

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:

HICKNESS mm	mil	CONSTRUCTION		THICKNESS mm	mil	CONSTRUCTION	
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 ples
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 OZ (μm)		SIZE INCH	mm	THICKNESS TOLERANCE
0.004 (0.1) to 0.039 (1.0)	H (17)	2.0 (70)	48.8 x 36.6	1240 x 0930	IPC-4101C SPEC CLASS C/M
	1.0 (35)	3.0 (105)	48.8 x 40.5	1240 x 1030	
			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.

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Glass cloth base epoxy resin
flame retardant prepreg

NPGN-170B

■ FEATURES

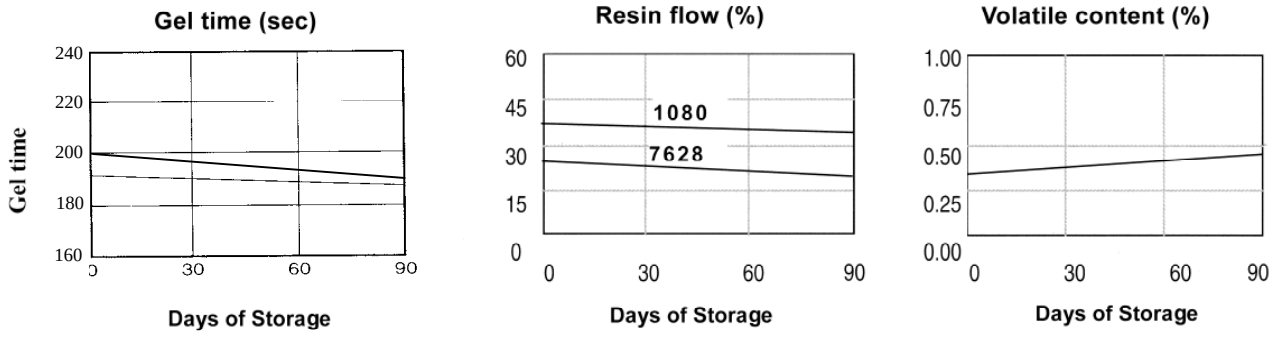
- Halogen, antimony, and red phosphorous free
- Rheology of resin controlled to benefit the lamination of the boards.
- Modified phosphorous epoxy provides excellent heat and chemical resistance.
- Tg: 170±5℃

■ PERFORMANCE LIST

Specification : IPC-4101C is applicable

Glass style	RC%	RF%	GT sec (171℃)	VC%	After Pressed Thickness (per ply)	
					mm	Mil
7628HR	50 ± 3	28 ± 5	200 ± 20	0.75 ↓	0.193 ± 0.01	7.6 ± 0.4
7628MR	47 ± 3	25 ± 5			0.183 ± 0.01	7.2 ± 0.4
7628	43 ± 3	17 ± 5			0.173 ± 0.01	6.8 ± 0.4
1506MR	52 ± 3	28 ± 5			0.157 ± 0.01	6.2 ± 0.4
1506	48 ± 3	23 ± 5			0.145 ± 0.01	5.7 ± 0.4
2116HR	58 ± 3	35 ± 5			0.120 ± 0.01	4.7 ± 0.4
2116MR	54 ± 3	25 ± 5			0.109 ± 0.01	4.3 ± 0.4
2116	50 ± 3	25 ± 5			0.097 ± 0.01	3.8 ± 0.4
2113	56 ± 3	32 ± 5			0.081 ± 0.01	3.2 ± 0.4
2112	60 ± 3	37 ± 5			0.069 ± 0.008	2.7 ± 0.3
1080HR	68 ± 3	44 ± 5			0.064 ± 0.008	2.5 ± 0.3
1080MR	65 ± 3	40 ± 5			0.061 ± 0.008	2.4 ± 0.3
1080	62 ± 3	34 ± 5			0.058 ± 0.008	2.3 ± 0.3
106	68 ± 3	35 ± 5			0.040 ± 0.008	1.6 ± 0.3

Storage Stability

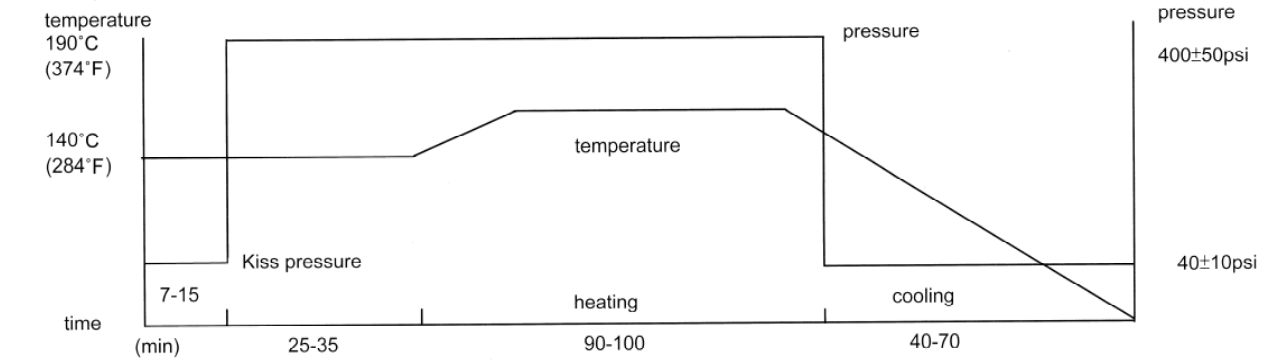


Storage Condition : 20℃ 50% RH for 3 months
: Max 5℃ for 6 months

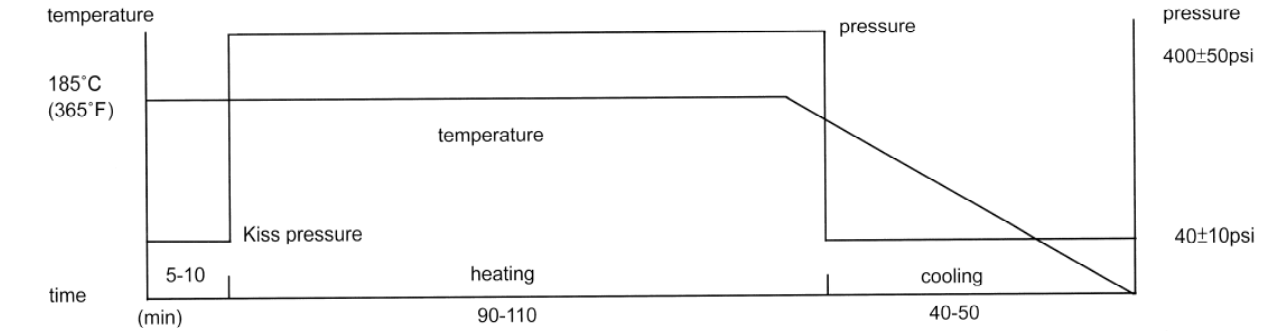
Data shown are nominal values for reference only.

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℃(158℉) and 140℃(284℉)
   1-3℃/min (1.8~5.4℉/min) is acceptable.
   1.5-2.5℃/min (2.7~4.5℉/min) would be better.
2. Temperature of material over 170℃(338℉) must be held for at least 60min 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℃/min (4.5℉/min) when the temperature of material is over 100℃(212℉), in order to avoid introducing twist.

■ CERTIFICATION UL

UL File No.:E98983

UL 746 Recognition

Minimum Material Thickness inch (mm)	Clad cond. Thickness Min. Mils (mic)	Max. Mils (mic)	Max. Area Diameter Inch (mm)	Sold Lts Temp ℃	Time sec	UL 94 Flame class	Max. Operating Temp
0.002 (0.051)	0.67 (17)	4.08 (102)	2.0 (50.8)	288	30	94V-0	130