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

Issued: 2020/02/14
New: 2022/12/27

Glass cloth base modified epoxy resin
Flame retardant copper clad laminate

NPG-188H

■ FEATURES

- Low dissipation factor at high frequency range
- High Tg> 200℃(TMA) and Low Z-CTE、Hi-Td
- Halogen and antimony free
- Excellent dimensional stability and through-hole reliability
- Flammability: UL 94V-0
- Application: high speed server, storage, router and network

■ PERFORMANCE LIST

Characteristics	Unit	Condition	Typical Values	SPEC	Test Method
Volume resistivity	MΩ-cm	C-96/35/90	$5x10^9$	10^6↑	2.5.17
Surface resistivity	MΩ	C-96/35/90	$5x10^7$	10^4↑	2.5.17
Permittivity 1GHz (RC50%)	-	C-24/23/50	4.39	-	2.5.5.13
Permittivity 1GHz (RC70%)	-	C-24/23/50	3.75	-	2.5.5.13
Permittivity 3GHz (RC50%)	-	C-24/23/50	4.34	-	2.5.5.13
Permittivity 3GHz (RC70%)	-	C-24/23/50	3.74	-	2.5.5.13
Permittivity 10GHz (RC50%)	-	C-24/23/50	4.21	-	2.5.5.13
Permittivity 10GHz (RC70%)	-	C-24/23/50	3.70	-	2.5.5.13
Loss tangent 1GHz (RC50%)	-	C-24/23/50	0.0041	-	2.5.5.13
Loss tangent 1GHz (RC70%)	-	C-24/23/50	0.0033	-	2.5.5.13
Loss tangent 3GHz (RC50%)	-	C-24/23/50	0.0044	-	2.5.5.13
Loss tangent 3GHz (RC70%)	-	C-24/23/50	0.0035	-	2.5.5.13
Loss tangent 10GHz (RC50%)	-	C-24/23/50	0.0054	-	2.5.5.13
Loss tangent 10GHz (RC70%)	-	C-24/23/50	0.0042	-	2.5.5.13
Arc resistance	SEC	D-48/50+D-0.5/23	120 ↑	60 ↑	2.5.1
Dielectric breakdown	KV	D-48/50	45 ↑	40 ↑	2.5.6
Moisture absorption	%	D-24/23	0.15	-	2.6.2.1
Flammability	-	C-48/23/50	V-0	V-0	UL94
Peel strength 1oz (low profile)	lb/in	288℃x10" solder floating	3.5 ↑	2.5 ↑	2.4.8
Heat resistance	SEC	288℃ solder dipping	300 ↑	10 ↑	2.4.13.1
Glass transition temperature	℃	TMA	200 ↑	N/A	2.4.24
Coefficient of thermal expansion X/Y-axis Z-axis before Tg Z-axis after Tg 50-260℃	 ppm/℃ ppm/℃ ppm/℃ %	 TMA TMA TMA TMA	 9-10 25-30 130-150 1.4%	N/A	2.4.24
Decomposition temperature (Td 5% W/L)	℃	TGA, 10℃/min	420	325 ↑	2.4.24.6

Data shown are nominal values for reference only.

NOTE:
The average value in the table refers to samples of .031" 1/1.
Test method per IPC-TM-650

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■ CONSTRUCTION

THICKNESS mm	mil	CONSTRUCTION		THICKNESS mm	mil	CONSTRUCTION	
0.05	2.0	1067	1 ply	0.15	6.0	1078	2 plies
0.06 1p	2.5	1067	1 ply	0.18	7.0	1086	2 plies
0.06	2.5	1078	1 ply	0.20	8.0	3313	2 plies
0.08	3.0	1086	1 ply	0.25	10.0	2116	2 plies
0.08 sp	3.0	1078	1 ply	0.25 3p	10.0	3313	3 plies
0.09 1p	3.5	1086	1 ply	0.30 3p	12.0	3313	3 plies
0.09 2p	3.5	1037	2 plies	0.35	14.0	3313	4 plies
0.10	4.0	3313	1 ply	0.38	15.0	3313	4 plies
0.10 sp	4.0	1086	1 ply	0.40 4p	16.0	2116	4 plies
0.10 2p	4.0	1067	2 plies	0.45 4p	18.0	2116	4 plies
0.13	5.0	1078	2 plies	0.50 5p	20.0	3313	5 plies
0.13 1p	5.0	2116	1 ply	0.53 5p	21.0	2116	5 plies

1. ▭: Preferred structure for HLC application

2. Requirement for not listed glass fabrics types, please contact our technical customer service team for discussion in advance.

■ PRODUCT SIZE & THICKNESS

THICKNESS inch (mm)	COPPER CLADDING oz (μm)	SIZE inch	SIZE mm	THICKNESS TOLERANCE
0.002(0.05) to 0.021 (0.53)	3/8 (12) 0.5 (17) 1.0 (35) 2.0 (70)	48.8 x 36.6 48.8 x 40.5 48.8 x 42.5	1240 x 0930 1240 x 1030 1240 x 1080	IPC-4101E SPEC CLASS C/M

■ **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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New: 2022/03/07

Glass cloth base modified epoxy resin
Flame retardant prepreg

NPG-188HB

■ FEATURES

- Rheology of resin controlled to benefit the lamination of the multilayers.
- Halogen and antimony free
- High performance resin provides excellent heat and chemical resistance.

■ PERFORMANCE LIST

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

Glass style	RC%	After Pressed Thickness (per ply)	
		mm	mil
2116	62	0.151 ± 0.01	5.93 ± 0.4
	58	0.134 ± 0.01	5.26 ± 0.4
	54	0.120 ± 0.01	4.71 ± 0.4
2113	60	0.105 ± 0.01	4.14 ± 0.4
3313	59	0.106 ± 0.01	4.18 ± 0.4
1080	72	0.098 ± 0.008	3.86 ± 0.3
	69	0.087 ± 0.008	3.43 ± 0.3
	66	0.078 ± 0.008	3.09 ± 0.3
1078	72	0.098 ± 0.008	3.86 ± 0.3
	69	0.087 ± 0.008	3.43 ± 0.3
	66	0.078 ± 0.008	3.09 ± 0.3
1067	78	0.080 ± 0.008	3.15 ± 0.3
	76	0.073 ± 0.008	2.86 ± 0.3
	72	0.061 ± 0.008	2.41 ± 0.3
106	78	0.064 ± 0.008	2.52 ± 0.3
	76	0.058 ± 0.008	2.29 ± 0.3
1037	78	0.064 ± 0.008	2.52 ± 0.3
	76	0.058 ± 0.008	2.29 ± 0.3

Requirement for not listed glass fabrics types, please contact our technical customer service team for discussion in advance.

■ Storage stability

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

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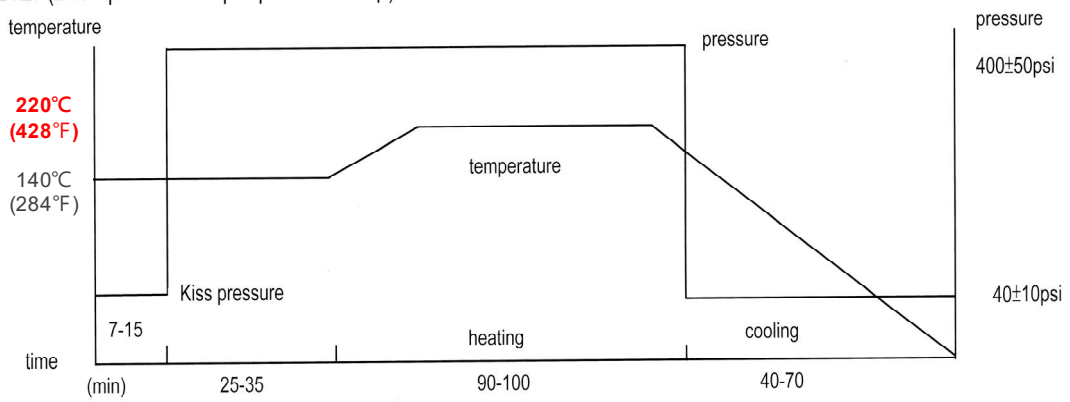
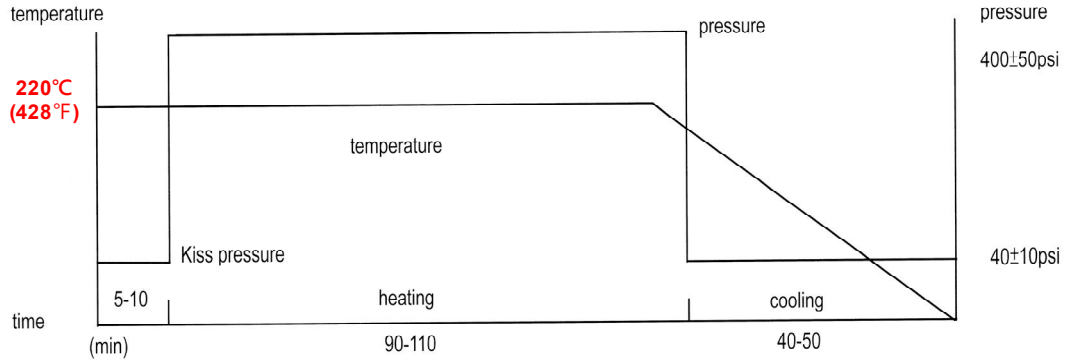
Recommended press cycles:

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



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



Suggestions:

1. Heating rate of material between 80℃(176℉) 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 **200℃(392°F)** must be held for at least **90min** 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
- ANSI Type: FR-4.1
- UL 746 Recognition

Minimum Material Thickness inch (mm)	Clad cond. Thickness Min. mil (μm)	Clad cond. Thickness Max. mil (μm)	Max. Area Diameter inch (mm)	Solder Lts Temp °C	Solder Lts Time sec	UL 94 Flame Class	Max. Operating Temp
0.002 (0.05)	0.60 (15)	4.08 (102)	2.0 (50.8)	288	30	94V-0	130