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

Issued: 2021/07/12
New: 2022/12/21

Glass cloth base modified epoxy resin
Flame retardant copper clad laminate

NPG-199

■ FEATURES

- Ultra low loss at high frequency application
- High Tg>180℃(TMA) and low CTE
- Halogen and antimony free
- Excellent dimensional stability and through-hole reliability
- 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	4.11	-	2.5.5.13
Permittivity 1GHz (RC70%)	-	C-24/23/50	3.71	-	2.5.5.13
Permittivity 3GHz (RC50%)	-	C-24/23/50	4.10	-	2.5.5.13
Permittivity 3GHz (RC70%)	-	C-24/23/50	3.70	-	2.5.5.13
Permittivity 10GHz (RC50%)	-	C-24/23/50	4.06	-	2.5.5.13
Permittivity 10GHz (RC70%)	-	C-24/23/50	3.66	-	2.5.5.13
Loss tangent 1GHz (RC50%)	-	C-24/23/50	0.0030	-	2.5.5.13
Loss tangent 1GHz (RC70%)	-	C-24/23/50	0.0026	-	2.5.5.13
Loss tangent 3GHz (RC50%)	-	C-24/23/50	0.0034	-	2.5.5.13
Loss tangent 3GHz (RC70%)	-	C-24/23/50	0.0028	-	2.5.5.13
Loss tangent 10GHz (RC50%)	-	C-24/23/50	0.0043	-	2.5.5.13
Loss tangent 10GHz (RC70%)	-	C-24/23/50	0.0035	-	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 <0.53mm	0.08	-	2.6.2.1
Flammability	-	C-48/23/50	V-0	V-0	UL94
Peel strength 1 oz (HVLP)	lb/in	288℃x10" solder floating	3.5-4.0	-	2.4.8
Heat resistance	SEC	288℃ solder dipping	300↑	10↑	2.4.13.1
Glass transition temp	℃	TMA	180↑	-	2.4.24
		DMA	210	-	2.4.24.4
Coefficient of thermal expansion Z-axis before Tg Z-axis after Tg	 ppm/℃ ppm/℃	 TMA TMA	 30-40 180-200	-	2.4.24
Decomposition temperature (Td 5% W/L)	℃	TGA, 10℃/min	440	-	2.4.24.6

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

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■ CONSTRUCTION

THICKNESS mm	mil	CONSTRUCTION		THICKNESS mm	mil	CONSTRUCTION	
0.05	2.0	1035	1 ply	0.13	5.0	1035	2 plies
0.06	2.5	1035	1 ply	0.15	6.0	1078	2 plies
0.08 1p	3.0	1035	1 ply	0.18	7.0	1078	2 plies
0.08	3.0	1078	1 ply	0.20	8.0	1078	2 plies
0.09	3.5	1078	1 ply	0.25	10.0	1078	3 plies
0.09 1p	3.5	1035	1 ply	0.30	12.0	3313	3 plies
0.09 2p	3.5	1037	2 plies	0.38	15.0	3313	4 plies
0.10	4.0	1078	1 ply	0.40	16.0	3313	4 plies
0.10 2p	4.0	1035	2 plies	0.50	20.0	3313	5 plies
0.12	4.5	1035	2 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 0.020 (0.50)	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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Glass cloth base modified epoxy resin
Flame retardant prepreg

NPG-199B

■ 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	60	0.143 ± 0.010	5.62 ± 0.4
	57	0.131 ± 0.010	5.15 ± 0.4
3313	64	0.125 ± 0.010	4.92 ± 0.4
	60	0.110 ± 0.010	4.34 ± 0.4
1078	73	0.101 ± 0.008	3.97 ± 0.3
	70	0.090 ± 0.008	3.53 ± 0.3
	67	0.080 ± 0.008	3.16 ± 0.3
1035	78	0.078 ± 0.008	3.08 ± 0.3
	76	0.071 ± 0.008	2.80 ± 0.3
	72	0.060 ± 0.008	2.35 ± 0.3
1037	78	0.066 ± 0.008	2.60 ± 0.3
	76	0.060 ± 0.008	2.37 ± 0.3
1027	78	0.055 ± 0.008	2.17 ± 0.3
	76	0.050 ± 0.008	1.97 ± 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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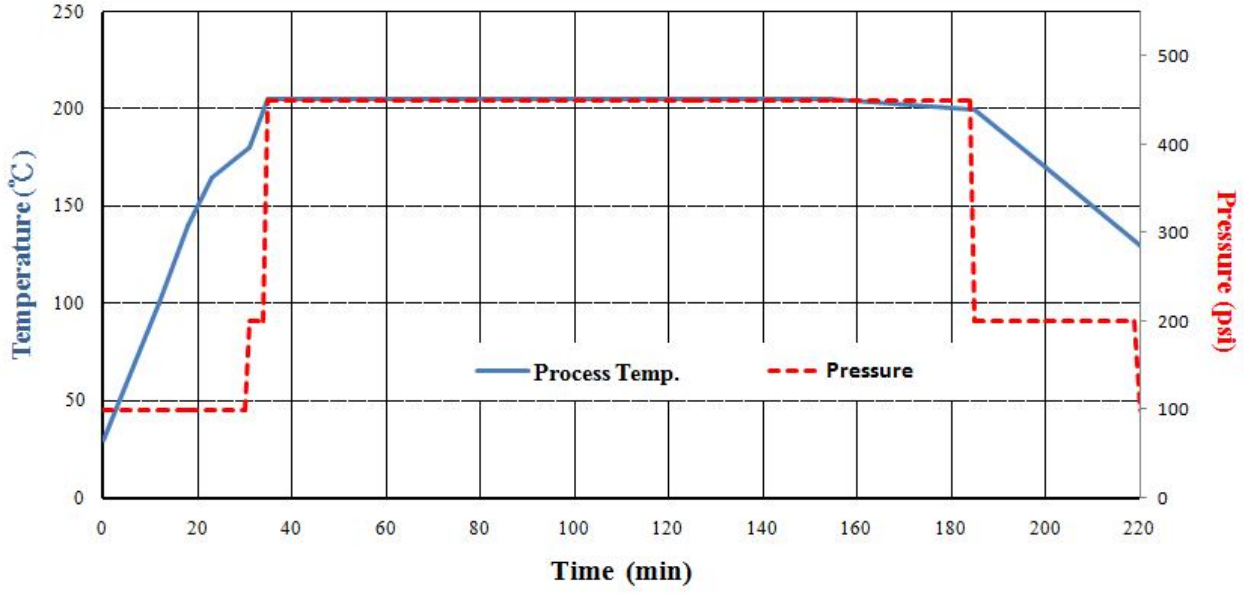
Recommended press cycles:



Suggestions:

1. Heating rate (110℃~150℃)
   3.0℃/min is acceptable.
   2.5℃/min is preferred.
2. Product temperature should be kept at higher 205℃ for more than 90 min to fully cure resin.
3. Pressure should be up to 380~450psi, high pressure is better for resin flowing and filling in the gaps.
4. Pressure should be kept below 200psi during cooling period.
5. Vacuum should be kept for at least 30 min from start.
6. Cushion for pressure evenness is needed.

■ 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)	Max. mil (μm)	Max. Area Diameter inch (mm)	Solder Lts Temp °C	Time sec	UL 94 Flame Class	Max. Operating Temp
0.002 (0.05)	0.36 (9)	4.08 (102)	2.0 (50.8)	300	30	94V-0	130