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

Issued: 2008/03/01
New: 2020/09/01

Glass cloth base epoxy resin
Flame retardant copper clad laminate

NPGN-150LKHD

■ FEATURES

- Halogen, antimony, and red phosphorous free
- Flammability meets UL 94V-0
- Excellent thermal resistance and reliability
- UL file number E98983
- Excellent CAF resistance (Anti-migration)
- Lower C.T.E will provide excellent through-hole reliability
- IPC-4101E L127/128

■ PERFORMANCE LIST

Characteristics	Unit	Condition	Typical Values	SPEC	Test Method
Volume resistivity	MΩ-cm	C-96/35/90	5.5 x10^9	10^6 ↑	2.5.17
Surface resistivity	MΩ	C-96/35/90	5.5 x10^7	10^4 ↑	2.5.17
Permittivity 1 GHz	-	C-24/23/50	3.5-4.2	-	2.5.5.9
Loss Tangent 1 GHz	-	C-24/23/50	0.010-0.011	-	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	0.10-0.15	0.8 ↓	2.6.2.1
Flammability	-	C-48/23/50	V-0	V-0	UL94
Peel strength 1 oz (≥0.5mm)	lb/in	288℃x10" solder floating	7.5~8.0	6 ↑	2.4.8
Thermal stress	SEC	288℃ solder dipping	300 ↑	10 ↑	2.4.13.1
Glass transition temp	℃	DSC	150 ↑	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 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

NOTE: Data shown are nominal values for reference only.
The average value in the table refers to samples of .020" 1/1
Dk/Df value measured by HP-4991A (Resin content 43%~72%)
Test method per IPC-TM-650

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■ CONSTRUCTION & 1GHz-10GHz Dk/Df

mil	mm	Construction	Dk				Df			
			1GHz	3GHz	5GHz	10GHz	1GHz	3GHz	5GHz	10GHz
2	0.05 sp	1067*1	3.60	3.57	3.55	3.52	0.011	0.011	0.013	0.014
2.3	0.05 SR	1067*1	3.62	3.59	3.56	3.53	0.011	0.011	0.012	0.014
2.5	0.06 1P	1078*1	3.86	3.83	3.80	3.77	0.010	0.010	0.011	0.012
3	0.08 1P	1086*1	3.75	3.70	3.68	3.65	0.011	0.011	0.012	0.013
3.5	0.09	2112*1	3.83	3.80	3.80	3.78	0.010	0.010	0.011	0.012
4	0.10	1080*2	4.00	3.96	4.00	3.98	0.010	0.010	0.011	0.012
5	0.13	1080*2	3.90	3.87	3.83	3.82	0.010	0.010	0.011	0.012
6	0.15	1506*1	3.81	3.77	3.76	3.71	0.010	0.010	0.011	0.012
7	0.18	7627*1	4.29	4.21	4.20	4.29	0.009	0.009	0.010	0.011
8	0.21	7628*1	4.25	4.23	4.21	4.20	0.009	0.009	0.010	0.011
9	0.23	2116*2	3.90	3.85	3.84	3.81	0.010	0.010	0.011	0.012
10	0.25	2116*2	3.84	3.84	3.80	3.80	0.011	0.011	0.012	0.013
12	0.30	1506*2	4.24	4.15	4.14	4.12	0.010	0.010	0.011	0.012
14	0.35	7628*2	4.25	4.14	4.14	4.12	0.010	0.010	0.011	0.012
15	0.38	7628*2	4.24	4.15	4.14	4.12	0.010	0.010	0.011	0.012
16	0.40	7628*2	4.18	4.15	4.13	4.20	0.010	0.010	0.011	0.012
18	0.45	1080*1+7628*2	4.16	4.15	4.13	4.09	0.010	0.010	0.012	0.013
18	0.45 SP	1506*3	4.24	4.15	4.14	4.12	0.010	0.010	0.011	0.012
20	0.50	7628*3	4.35	4.36	4.25	4.24	0.010	0.010	0.011	0.012
21	0.53	7628*3	4.35	4.36	4.25	4.24	0.010	0.010	0.011	0.012
22	0.55	7628*3	4.34	4.34	4.24	4.22	0.010	0.010	0.011	0.012
24	0.60	7628*3	4.28	4.25	4.23	4.19	0.010	0.010	0.011	0.012
28	0.71	7628*4	4.35	4.34	4.24	4.20	0.010	0.010	0.011	0.012
29	0.74	7628*4	4.20	4.15	4.14	4.10	0.010	0.010	0.011	0.012

Above data shown are nominal values for reference only.

■ PRODUCT SIZE & THICKNESS

THICKNESS inch (mm)	COPPER CLADDING oz (μm)	SIZE inch	SIZE mm	THICKNESS TOLERANCE
0.002 (0.05) to 0.039 (1.0)	H (17) 1.0 (35) 2.0 (70) 3.0 (102)	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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Issued: 2008/03/01
New: 2021/10/28

Glass cloth base epoxy resin
Flame retardant prepreg

NPGN-150LKHDB

■ FEATURES

- Rheology of resin controlled to benefit the lamination of the boards.
- Modified phosphorous epoxy provides excellent heat and chemical resistance.
- Other properties are similar to standard FR-4.

■ PERFORMANCE LIST

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

Glass style	RC%	GT sec (171℃)	VC%	Dk				Df			
				1GHz	3GHz	5GHz	10GHz	1GHz	3GHz	5GHz	10GHz
1027	70 ± 3	130 ± 20	1.5 ↓	3.55	3.52	3.50	3.50	0.012	0.012	0.013	0.014
1027MR	74 ± 3			3.50	3.47	3.45	3.45	0.012	0.012	0.013	0.015
1027HR	76 ± 3			3.48	3.45	3.43	3.43	0.012	0.012	0.013	0.015
106 1037	70 ± 3			3.55	3.52	3.50	3.50	0.012	0.012	0.013	0.014
106TR 1037TR	72 ± 3			3.53	3.50	3.48	3.48	0.012	0.012	0.013	0.015
106MR 1037MR	74 ± 3			3.50	3.47	3.45	3.45	0.012	0.012	0.013	0.015
106HR 1037HR	76 ± 3			3.48	3.45	3.43	3.43	0.012	0.012	0.013	0.015
1067	70 ± 3			3.55	3.52	3.50	3.50	0.012	0.012	0.013	0.014
1067MR	74 ± 3			3.50	3.47	3.45	3.45	0.012	0.012	0.014	0.015
1067HR	76 ± 3			3.48	3.45	3.43	3.43	0.012	0.012	0.013	0.015
1078	64 ± 3			3.69	3.66	3.64	3.64	0.012	0.012	0.013	0.014
1078MR	67 ± 3			3.65	3.63	3.58	3.58	0.012	0.012	0.013	0.014
1078HR	70 ± 3			3.59	3.56	3.54	3.54	0.012	0.012	0.013	0.014
1080	64 ± 3			3.69	3.66	3.64	3.64	0.012	0.012	0.013	0.014
1080MR	67 ± 3			3.65	3.62	3.58	3.58	0.012	0.012	0.013	0.014
1080HR	70 ± 3			3.59	3.56	3.54	3.54	0.012	0.012	0.013	0.014
2112	62 ± 3			3.77	3.74	3.72	3.72	0.012	0.012	0.013	0.014
2113	58 ± 3			3.93	3.92	3.90	3.90	0.011	0.012	0.013	0.014
2116	52 ± 3			3.97	3.95	3.92	3.92	0.011	0.012	0.013	0.014
2116MR	56 ± 3			3.89	3.86	3.80	3.80	0.011	0.012	0.013	0.014
2116HR	60 ± 3			3.81	3.78	3.76	3.76	0.011	0.012	0.013	0.014
1506	50 ± 3			3.90	3.87	3.85	3.85	0.011	0.011	0.012	0.013
1506MR	54 ± 3			3.86	3.83	3.81	3.81	0.011	0.012	0.013	0.014
7628	45 ± 3			4.18	4.10	4.08	4.08	0.011	0.011	0.012	0.012
7628MR	49 ± 3			4.08	4.06	4.04	4.04	0.011	0.011	0.012	0.013
7628HR	52 ± 3			3.98	3.95	3.93	3.93	0.011	0.011	0.012	0.013

■ After Pressed Theoretical Thickness of prepreg (per ply)

Data shown are nominal values for reference only.
Copper thickness of inner layer Hoz/1oz

Type	RC	Press Thk Per Ply						
		Hoz Cu (um)				1oz Cu (um)		
		100%	70%	50%	30%	70%	50%	30%
1027	70%	38	32	29	25	27	20	-
1027MR	74%	45	39	36	33	34	27	20
1027HR	76%	49	44	40	37	38	31	24
106/1037	70%	48	42	39	35	37	30	-
106TR/1037TR	72%	52	47	43	40	41	34	27
106MR/1037MR	74%	56	51	48	44	46	39	32
106HR/1037HR	76%	62	56	53	50	51	44	37
1067	70%	60	55	51	48	49	42	35
1067MR	74%	70	65	62	58	60	53	46
1067HR	76%	77	72	68	65	66	59	52
1078	64%	77	72	69	65	67	60	53
1078MR	67%	86	81	77	74	75	68	61
1078HR	70%	96	91	87	84	85	78	71
1080	64%	77	72	69	65	67	60	53
1080MR	67%	86	81	77	74	75	68	61
1080HR	70%	96	91	87	84	85	78	71
2112	62%	107	102	99	95	97	90	83
2113	58%	104	99	96	93	94	87	80
2116	52%	119	114	111	107	109	102	95
2116MR	56%	133	128	124	121	122	115	108
2116HR	60%	141	136	132	129	130	123	116
1506	50%	175	170	166	163	164	157	150
1506MR	54%	194	189	186	182	184	177	170
7628	45%	198	193	190	187	188	181	174
7628MR	49%	219	214	210	207	208	201	194
7628HR	52%	236	231	228	224	226	219	212

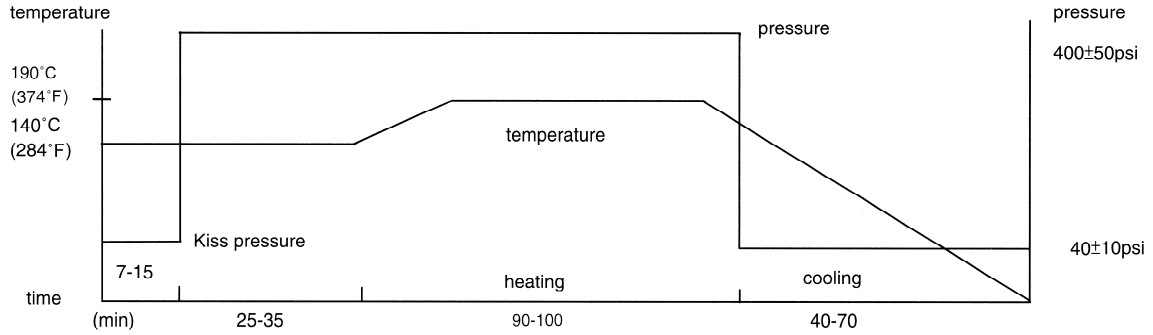
1. Due to the pressed thickness could be effected by press related condition, the table showed for reference only.
2. The glass cloth minimum thickness customer must be concerned

Storage Condition: 20℃, 50%RH for 3 months

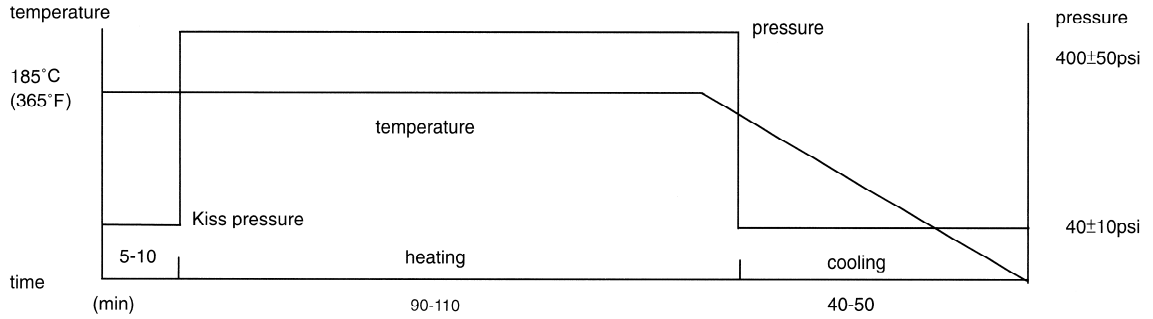
: Max. 5℃ for 6 months

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 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 60 min 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. mils (μm)	Clad cond. Thickness Max. mils (μm)	Max. Area Diameter inch (mm)	Max. Operating Temp	Solder Lts Temp ℃	Solder Lts Time sec	UL 94 Flame Class
0.0016 (0.04)	0.59 (15)	4.02 (102)	2.0 (50.8)	130	288	30	94V-0