

# Data Sheet

## NPG-170

- Halogen Free Laminates and Prepregs, modern Phosphorous-Epoxy-resin-system ensures high thermal and chemical resistance, Tg 170 °C (DSC)
- Exceptional consistent laminate quality due to exclusive use of Nan Ya's raw materials
- Adapted constructions and layouts pass more than 2000 cycles - 40 °C / + 140 °C with CTE  $\alpha_1$  40 ppm/K
- Superior properties in CAF precarious conditions and high thermal resistance
- IPC-4101C specification sheets 94, 122, 125, 127, 128, 130 are applicable

Revision Date: September 2011

**NAN YA SPECIFICATION SHEET FOR NPG-170 - High Tg halogen free, multifunctional Epoxy Laminates and Prepregs**

<b>SPECIFICATION SHEET #:</b>	IPC-4101 / 94, 122, 125, 127, 128, 130
<b>FLAME RETARDANT MECHANISM:</b>	Phosphorus, UL94 V-0
<b>FILLERS (≥ 5 %):</b>	Contains inorganic fillers
<b>ID REFERENCE:</b>	UL/ANSI: FR-4 / 94, 122, 125, 127, 128, 130

LAMINATE DATA SHEET								
Laminate Properties	Specification < 0,50 mm [0,0197 in] 50% RC		Specification ≥ 0,50 mm [0,0197 in] 40% RC		Units metric [English]	Test Method (IPC-TM-650)	Ref. Para.	
	Typical Value	Specification	Typical Value	Specification				
Glass Transition Temperature (Tg) by DSC / TMA	≥ 170 / ≥ 160	≥ 170	≥ 170 / ≥ 160	≥ 170	°C	2.4.25	3.10.1.6	
Decomposition Temperature (Td) TGA 5% wt. loss onset wt. loss	350 343	- -	350 343	≥ 340 -	°C	2.4.24.6	3.10.1.8	
CTE, z-axis prior Tg above Tg	30 - 50 200 - 230	- -	30 - 50 200 - 230	≤ 60 ≤ 300	ppm/°C	2.4.24	3.10.1.11	
CTE, x/y-axis prior Tg above Tg	9 - 13 9 - 13	- -	9 - 13 9 - 13	- -	ppm/°C	2.4.24	3.10.1.11	
Thermal Expansion (50 °C - 260 °C) z-axis	TE	2,7	2,7	≤ 3,0	%	2.4.24	3.10.1.11	
Thermal Conductivity	λ	0,58	0,58	-	W/mK	Laser Flash	-	
Thermal Resistance: Time to Delamination	T260 T288	> 60 > 20	- -	> 60 ≥ 30 ≥ 5	minutes	2.4.24.1	3.10.1.12	
Pressure Cooker Test - 2 hours (10 s solder dip @ 288 °C)	pass	pass visual	pass	pass visual	pass visual	-	-	
Thermal Stress 10 s at 288 °C [550,4 °F], minimum A. unetched B. etched	pass pass	pass visual pass visual	pass pass	pass visual pass visual	rating	2.4.13.1	3.10.1.2	
CAF Resistance	pass	AABUS	pass	AABUS	pass / fail	2.6.25	3.12.1.4	
Peel Strength, minimum A. Low profile copper foil and very low profile copper foil - all copper foil >17µm [0,669 mil] B. Standard profile copper foil 1. after thermal stress (35 µm) 2. at 125 °C [257 °F] 3. after process solutions C. all other foil - composite	0,78 [4,50] 0,88 [5,00] 0,78 [4,50] 0,70 [4,00]	0,70 [4,00] 0,80 [4,57] 0,70 [4,00] 0,55 [3,14]	0,88 [5,00] 1,23 [7,00] 0,88 [5,00] 0,88 [5,00]	0,70 [4,00] 1,05 [6,00] 0,70 [4,00] 0,80 [4,57]	N/mm [lb/in] N/mm [lb/in] N/mm [lb/in] N/mm [lb/in]	2.4.8 2.4.8.2 2.4.8.3 2.4.8	3.9.1.1 3.9.1.1.1 3.9.1.1.2 3.9.1.1.3	
Volume Resistivity, minimum A. C-96/35/90 B. after moisture resistance C. at elevated temperature E-24/125	5,0*10 <sup>9</sup> - 7,5*10 <sup>9</sup>	10 <sup>6</sup> - 10 <sup>3</sup>	5,0*10 <sup>8</sup> - 6,0*10 <sup>8</sup>	- 10 <sup>4</sup> 10 <sup>3</sup>	MΩcm	2.5.17.1	3.11.1.3	
Surface Resistivity, minimum A. C-96/35/90 B. after moisture resistance C. at elevated temperature E-24/125	5,0*10 <sup>7</sup> - 9,0*10 <sup>7</sup>	10 <sup>4</sup> - 10 <sup>3</sup>	5,0*10 <sup>6</sup> - 2,1*10 <sup>7</sup>	- 10 <sup>4</sup> 10 <sup>3</sup>	MΩ	2.5.17.1	3.11.1.4	
Dielectric Breakdown, minimum	60	-	60	40	kV	2.5.6	3.11.1.6	
Electric Strength, minimum (laminated & prepreg as laminated)	40 [1000]	30 [750]	- -	- -	kV/mm [V/mil]	2.5.6.2	3.11.1.7 3.11.2.3	
Arc Resistance, minimum	120	60	120	60	s	2.5.1	3.11.1.5	
Comparative Tracking Index (CTI)	2 / 250 - 399	-	2 / 250 - 399	-	PLC / V	ASTM D3638	-	
Permittivity, spec. maximum (laminated & prepreg as laminated)	A. @ 1MHz B. @ 100MHz C. @ 1 GHz D. @ 2 GHz E. @ 5 GHz	4,40 4,20 4,08 4,05 -	5,40 - - - -	4,68 4,50 4,28 4,24 -	5,40 - - - -	- - - - -	2.5.5.2 2.5.5.3 2.5.5.9 2.5.5.5	3.11.1.1 3.11.2.11
Loss Tangent, spec. maximum (laminated & prepreg as laminated)	A. @ 1MHz B. @ 100MHz C. @ 1 GHz D. @ 2 GHz E. @ 5 GHz	0,016 0,014 0,012 0,011 -	0,035 - - - -	0,014 0,013 0,012 0,010 -	0,035 - - - -	- - - - -	2.5.5.2 2.5.5.3 2.5.5.9 2.5.5.5	3.11.1.2 3.11.2.2
Flexural Strength, minimum A. Length direction B. Cross direction	- -	- -	450 390	415 [60190] 345 [50040]	N/mm <sup>2</sup> [lb/in <sup>2</sup> ]	2.4.4	3.9.1.3	
Flexural Strength at elevated temperature, length direction, minimum	-	-	-	-	N/mm <sup>2</sup> [lb/in <sup>2</sup> ]	2.4.4.1	3.9.1.4	
Dimensional stability x/y-axis E-0,5/170(R)/E-4/105(TL)	0,01 - 0,03	< 0,05	0,01 - 0,03	< 0,05	%	2.4.39	3.9.1.2	
Moisture Absorption, maximum	0,30	-	0,10	0,80	%	2.6.2.1	3.12.1.1	
Flammability (laminated & prepreg as laminated)	V-0	V-0 minimum	V-0	V-0 minimum	rating	UL94	3.10.1.1	
Density (50 % resin content)	2,10	-	2,10	-	g/cm <sup>3</sup>	-	-	

PREPREG DATA SHEET					
Prepreg Requirements	Typical Value	Specification	Unit	Test Method	Ref. Para.
1. Shelf Life, minimum (Condition 1/ Condition 2)	meets requirements	180 / 90	Days	AABUS	3.17
2. Reinforcement	woven E-glass	as per IPC-4412 or AABUS	-	-	-
3. Volatile content maximum	0,75	1,50	%	2.3.19	3.9.2.8
4. Prepreg Parameters	-	-	AABUS	AABUS	1.1.7
5. Flammability (as laminated)	V-0	V-0 minimum	rating	UL94	3.10.2.1
6. Other	-	-	-	-	-

Data shown are nominal values for reference only, no review according MIL-S-13949

\*AABUS = As Agreed upon Between User and Supplier.

all Nan Ya laminates are in conformance with RoHS regulations

# NPG-170

## Prepreg NPG-170B

Glass Fabric	Resin Content [%]	Resin Flow [%]	Gel Time @ 170 °C [s]	Thickn. after lamination per ply [ $\mu\text{m}$ ] <sup>1)</sup>	@ 1 MHz <sup>2)</sup>		@ 1 GHz <sup>2)</sup>	
					Dk	Df	Dk	Df
106	68 ± 3	35 ± 5	200 ± 20	38 ± 8	3,94	0,019	3,85	0,017
106MR	72 ± 3	45 ± 5		45 ± 8	3,81	0,019	3,75	0,017
106HR	74 ± 3	40 ± 5		49 ± 8	3,74	0,020	3,64	0,018
1080	62 ± 3	34 ± 5		68 ± 8	4,14	0,019	4,05	0,017
1080MR	65 ± 3	40 ± 5		75 ± 8	4,04	0,018	3,94	0,016
1080HR	68 ± 3	44 ± 5		85 ± 8	3,94	0,020	3,86	0,018
2112	60 ± 3	37 ± 5		97 ± 8	4,21	0,018	4,13	0,016
2113	56 ± 3	32 ± 5		95 ± 10	4,34	0,017	4,26	0,015
2116	50 ± 3	25 ± 5		110 ± 10	4,54	0,017	4,45	0,015
2116MR	54 ± 3	25 ± 5		122 ± 10	4,41	0,016	4,31	0,014
2116HR	58 ± 3	35 ± 5		138 ± 10	4,27	0,017	4,17	0,015
1506	48 ± 3	23 ± 5		164 ± 10	4,61	0,017	4,51	0,015
1506MR	52 ± 3	28 ± 5		183 ± 10	4,47	0,017	4,34	0,015
7628	43 ± 3	17 ± 5		188 ± 10	4,77	0,017	4,65	0,015
7628MR	47 ± 3	25 ± 5		208 ± 10	4,64	0,015	4,51	0,013
7628HR	50 ± 3	28 ± 5		224 ± 10	4,54	0,016	4,45	0,014

<sup>1)</sup> acc. recommended press cycle, 75 % remaining copper, 1 oz

<sup>2)</sup> data shown are actual values and are not guaranteed

Revision date: September 2011

## Recommended Press Cycle

