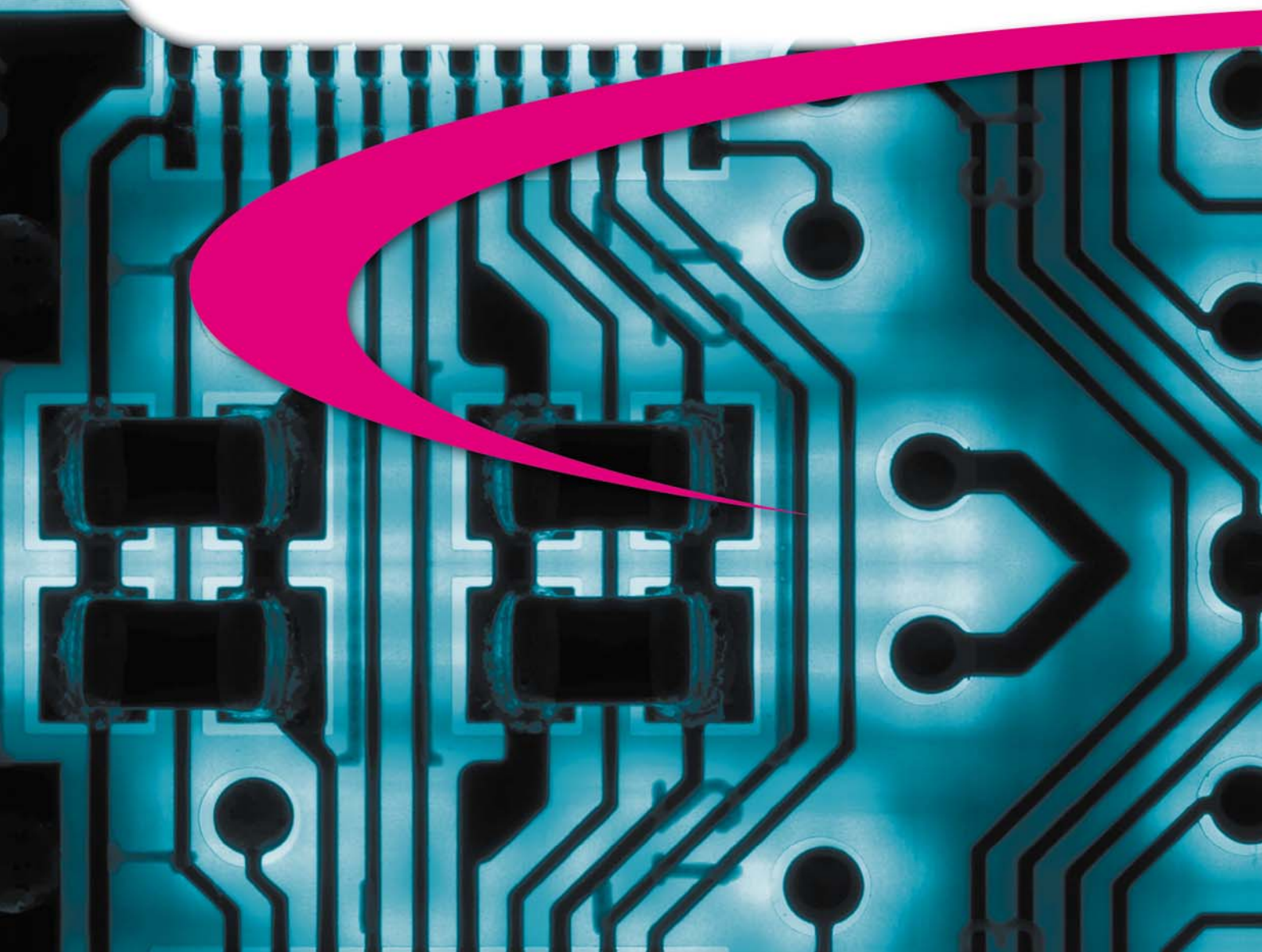
TECHNOLAM®
the laminate company

Data Sheet

NPG

- Halogen Free Laminates and Prepregs, modern Phosphorous-Epoxy-resin-system ensures high thermal and chemical resistance, Tg 150 °C (DSC)
- Exceptional consistent laminate quality due to exclusive use of Nan Ya's raw materials
- Low CTE z provides excellent reliability in thermo cycle test
- Superior properties in CAF precarious conditions and high thermal resistance
- IPC-4101C specification sheets 92, 93, 94, 122, 125, 127, 128 are applicable



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Revision Date: April 2011

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

SPECIFICATION SHEET #:	IPC-4101 / 92, 93, 94, 122, 125, 127, 128
FLAME RETARDANT MECHANISM:	Phosphorus, UL94 V-0
FILLERS (≥ 5 %):	Contains inorganic fillers
ID REFERENCE:	UL/ANSI: FR-4 / 92, 93, 94, 122, 125, 127, 128

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		≥ 150 / ≥ 140	≥ 150	≥ 150 / ≥ 140	≥ 150	°C	2.4.25	3.10.1.6
Decomposition Temperature (Td) TGA	5% wt. loss	348	-	348	≥ 325	°C	2.4.24.6	3.10.1.8
	onset wt. loss	340	-	340	-			
CTE, z-axis	prior Tg	30 - 50	-	30 - 50	≤ 60	ppm/°C	2.4.24	3.10.1.11
	above Tg	200 - 230	-	200 - 230	≤ 300			
CTE, x/y-axis	prior Tg	9 - 13	-	9 - 13	-	ppm/°C	2.4.24	3.10.1.11
	above Tg	9 - 13	-	9 - 13	-			
Thermal Expansion (50 °C - 260 °C) z-axis	TE	3,0	-	3,0	≤ 3,5	%	2.4.24	3.10.1.11
Thermal Conductivity	λ	0,58	-	0,58	-	W/mK	Laser Flash	-
Thermal Resistance: Time to Delamination	T260	> 60	-	> 60	≥ 30	minutes	2.4.24.1	3.10.1.12
	T288	> 20	-	> 20	≥ 5			
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		pass	pass visual	pass	pass visual	rating	2.4.13.1	3.10.1.2
B. etched		pass	pass visual	pass	pass visual			
CAF Resistance		pass	AABUS	pass	AABUS	pass / fail	2.6.25	3.12.1.4
Peel Strength, minimum								3.9.1.1
A.	Low profile copper foil and very low profile copper foil - all copper foil >17µm [0,669 mil]	0,78 [4,50]	0,70 [4,00]	0,88 [5,00]	0,70 [4,00]	N/mm [lb/in]	2.4.8	
B.	Standard profile copper foil							
	1. after thermal stress (35 µm)	0,88 [5,00]	0,80 [4,57]	1,23 [7,00]	1,05 [6,00]	N/mm [lb/in]	2.4.8.2	3.9.1.1.1
	2. at 125 °C [257 °F]	0,78 [4,50]	0,70 [4,00]	0,88 [5,00]	0,70 [4,00]	N/mm [lb/in]	2.4.8.3	3.9.1.1.2
	3. after process solutions	0,70 [4,00]	0,55 [3,14]	0,88 [5,00]	0,80 [4,57]	N/mm [lb/in]	2.4.8	3.9.1.1.3
C.	all other foil - composite	-	AABUS	-	AABUS			
Volume Resistivity, minimum								
A. C-96/35/90		$5{,}0*10^{9}$	10^{6}	$5{,}0*10^{8}$	-	MΩcm	2.5.17.1	3.11.1.3
B. after moisture resistance		-	-	-	10^{4}			
C. at elevated temperature E-24/125		$7{,}5*10^{9}$	10^{3}	$6{,}0*10^{8}$	10^{3}			
Surface Resistivity, minimum								
A. C-96/35/90		$5{,}0*10^{7}$	10^{4}	$5{,}0*10^{6}$	-	MΩ	2.5.17.1	3.11.1.4
B. after moisture resistance		-	-	-	10^{4}			
C. at elevated temperature E-24/125		$9{,}0*10^{7}$	10^{3}	$2{,}1*10^{7}$	10^{3}			
Dielectric Breakdown, minimum		60	-	60	40	kV	2.5.6	3.11.1.6
Electric Strength, minimum (laminate & 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	A. @ 1MHz	4,43	5,40	4,70	5,40	-	2.5.5.2	3.11.1.1
(laminate & prepreg as laminated)	B. @ 100MHz	4,25	-	4,53	-	-	2.5.5.3	3.11.2.11
	C. @ 1 GHz	4,10	-	4,30	-	-	2.5.5.9	
	D. @ 2 GHz	4,07	-	4,26	-	-	2.5.5.5	
	E. @ 5 GHz	-	-	-	-	-		
Loss Tangent, spec. maximum	A. @ 1MHz	0,016	0,035	0,014	0,035	-	2.5.5.2	3.11.1.2
(laminate & prepreg as laminated)	B. @ 100MHz	0,015	-	0,013	-	-	2.5.5.3	3.11.2.2
	C. @ 1 GHz	0,011	-	0,011	-	-	2.5.5.9	
	D. @ 2 GHz	0,010	-	0,010	-	-	2.5.5.5	
	E. @ 5 GHz	-	-	-	-	-		
Flexural Strength, minimum								
A. Length direction		-	-	450	415 [60190]	N/mm^2 [lb/in^2]	2.4.4	3.9.1.3
B. Cross direction		-	-	390	345 [50040]			
Flexural Strength at elevated temperature, length direction, minimum		-	-	-	-	N/mm^2 [lb/in^2]	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 (laminate & 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^3	-	-

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

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Prepreg NPG-B

Glass Fabric	Resin Content	Resin Flow	Gel Time @ 170 °C	Thickn. after lamination per ply [µm] [1)]	@ 1 MHz[2)]		@ 1 GHz[2)]	
	[%]	[%]	[s]	[µm]	Dk	Df	Dk	Df
106	68 ± 3	33 ± 5	160 ± 20	38 ± 8	3,94	0,015	3,78	0,014
106MR	72 ± 3	38 ± 5		45 ± 8	3,81	0,015	3,66	0,014
106HR	74 ± 3	45 ± 5		49 ± 8	3,74	0,016	3,59	0,013
1080	62 ± 3	35 ± 5		66 ± 8	4,14	0,015	3,96	0,013
1080MR	65 ± 3	40 ± 5		74 ± 8	4,04	0,016	3,87	0,013
1080HR	68 ± 3	44 ± 5		83 ± 8	3,94	0,015	3,78	0,013
2112	60 ± 3	35 ± 5		95 ± 8	4,21	0,018	4,03	0,016
2113	56 ± 3	35 ± 5		92 ± 10	4,34	0,018	4,15	0,016
2116	50 ± 3	25 ± 5		107 ± 10	4,54	0,016	4,34	0,015
2116MR	54 ± 3	30 ± 5		120 ± 10	4,41	0,016	4,21	0,014
2116HR	58 ± 3	38 ± 5		135 ± 10	4,27	0,015	4,09	0,013
1506	48 ± 3	23 ± 5		161 ± 10	4,61	0,015	4,40	0,013
1506MR	52 ± 3	30 ± 5		179 ± 10	4,47	0,016	4,27	0,013
7628	43 ± 3	17 ± 5		184 ± 10	4,77	0,016	4,55	0,013
7628MR	47 ± 3	22 ± 5		194 ± 10	4,64	0,015	4,43	0,014
7628HR	50 ± 3	27 ± 5		220 ± 10	4,54	0,016	4,34	0,014

[1)] acc. recommended press cycle, 75 % remaining copper, 1 oz
[2)] data shown are actual values and are not guaranteed
Revision date: April 2011

Recommended Press Cycle