

# Data Sheet

## FR-4-11PY

- High CTI Laminates, Tg 140 °C (DSC)
- Exceptional consistent laminate quality due to exclusive use of Nan Ya's raw materials
- Common PTH process parameters result in very good through hole reliability and copper foil peel strength
- UV blocked due to used resin system
- UL listing FR-4.0, IPC-4101D / 97

# FR-4-11PY

Revision Date: September 2014

## NAN YA SPECIFICATION SHEET FOR FR-4-11PY - High CTI medium Tg Epoxy Laminates

SPECIFICATION SHEET #:	IPC-4101 / 97
CURING AGENT:	Dicy
FLAME RETARDANT MECHANISM:	RoHS compliant Bromine, UL94 V-0
FILLERS:	Inorganic fillers
ID REFERENCE:	UL/ANSI: FR-4.0 / 97

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		140 ± 5 / 130	≥ 110	140 ± 5 / 130	≥ 110	°C	2.4.25	3.10.1.6
Decomposition Temperature (Td) TGA 5% wt. loss		310	-	310	-	°C	ASTM D3850	3.10.1.10
CTE, z-axis	prior Tg	50 - 70	-	50 - 70	-	ppm/°C	2.4.24	3.10.1.11
	above Tg	200-300	-	250-350	-			
CTE, x/y-axis	prior Tg	15 - 18	-	15 - 18	-	ppm/°C	2.4.24	3.10.1.11
	above Tg	15 - 18	-	15 - 18	-			
Thermal Expansion (50 °C - 260 °C) z-axis		TE	-	4,2	-	%	2.4.24	3.10.1.11
Thermal Conductivity		λ	-	0,49	-	W/mK	Laser Flash	-
Thermal Resistance: Time to Delamination		T260	-	20-30	-	minutes	2.4.24.1	3.10.1.12
		T288	-	2 - 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]	-	0,70 [4,00]	-	0,70 [4,00]	N/mm [lb/in]	2.4.8	
B.	Standard profile copper foil							
	1. after thermal stress (35 µm)	1,75 [10,00]	0,80 [4,57]	1,75 [10,00]	1,05 [6,00]	N/mm [lb/in]	2.4.8.2	3.9.1.1.1
	2. at 125 °C [257 °F]	-	0,70 [4,00]	-	0,70 [4,00]	N/mm [lb/in]	2.4.8.3	3.9.1.1.2
	3. after process solutions	-	0,55 [3,14]	-	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 x 10 <sup>9</sup>	10 <sup>6</sup>	10 <sup>9</sup>	-	MΩcm	2.5.17.1	3.11.1.3
B.	after moisture resistance	-	-	-	10 <sup>6</sup>			
C.	at elevated temperature E-24/125	-	10 <sup>3</sup>	-	10 <sup>3</sup>			
Surface Resistivity, minimum								
A.	C-96/35/90	5,0 x 10 <sup>7</sup>	10 <sup>4</sup>	10 <sup>7</sup>	-	MΩ	2.5.17.1	3.11.1.4
B.	after moisture resistance	-	-	-	10 <sup>4</sup>			
C.	at elevated temperature E-24/125	-	10 <sup>3</sup>	-	10 <sup>3</sup>			
Dielectric Breakdown, minimum D-48/50		> 60	-	> 60	> 40	kV	2.5.6	3.11.1.6
Electric Strength, minimum		40	30	-	-	kV/mm	2.5.6.2	3.11.1.7
(laminate & prepreg as laminated)		[1000]	[750]	-	-	[V/mil]		3.11.2.3
Arc Resistance, minimum D-48/50+D-0,5/23		> 120	> 60	> 120	> 60	s	2.5.1	3.11.1.5
Comparative Tracking Index (CTI) C-96/20/65		0 / ≥ 600	AABUS	0 / ≥ 600	AABUS	PLC / V	ASTM D3638	-
Permittivity, spec. maximum								
(laminate & prepreg as laminated)								
A.	@ 1MHz	4,1	< 5,4	4,6	< 5,4	-	2.5.5.2	3.11.1.1
B.	@ 100MHz	-	-	-	-	-	2.5.5.3	3.11.2.11
C.	@ 1 GHz	3,9	-	4,1	-	-	2.5.5.9	
D.	@ 2 GHz	-	-	-	-	-	2.5.5.5	
E.	@ 5 GHz	-	-	-	-	-	-	
Loss Tangent, spec. maximum								
(laminate & prepreg as laminated)								
A.	@ 1MHz	0,016	< 0,035	0,013	< 0,035	-	2.5.5.2	3.11.1.2
B.	@ 100MHz	-	-	-	-	-	2.5.5.3	3.11.2.2
C.	@ 1 GHz	0,016	-	0,013	-	-	2.5.5.9	
D.	@ 2 GHz	-	-	-	-	-	2.5.5.5	
E.	@ 5 GHz	-	-	-	-	-	-	
Flexural Strength, minimum								
A. Length direction		-	-	480-550	415 [60190]	N/mm <sup>2</sup> [lb/in <sup>2</sup> ]	2.4.4	3.9.1.3
B. Cross direction		-	-	415-480	345 [50040]			
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		0,005 - 0,03	< 0,05	0,005 - 0,03	< 0,05	%	2.4.39	3.9.1.2
Moisture Absorption, maximum D-24/23		0,02 - 0,30	-	0,05 - 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)		1,92	-	1,92	-	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	0,75	%	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

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

all Nan Ya laminates are in conformance with RoHS regulations

# FR-4-11PY

## Prepreg FR-4-11PYB

Glass Fabric	Resin Content [%]	Resin Flow [%]	Gel Time @ 170 °C [s]	Thickn. after lamination per ply [ $\mu\text{m}$ ] <sup>1)</sup>
1080	62 ± 3	23 ± 5	90 ± 20	69 ± 8
2116	50 ± 3	20 ± 5		111 ± 10
7628	43 ± 3	13 ± 5		190 ± 10

<sup>1)</sup> acc. recommended press cycle, 75 % remaining copper, 1 oz  
Revision date: September 2014

## Recommended Press Cycle

