

## Polyimide Laminate and Prepreg



**33N** is a flame retardant (UL94 V-0) polyimide laminate and prepreg system where the excellent high performance properties of polyimide need to be combined with flame retardance. High T<sub>g</sub> (250°C) results in low overall z-axis expansion, and minimizes risk of latent PTH defects in-service.



### Features:

- T<sub>g</sub> greater than 250°C
- UL recognized as UL94 V-0
- Low Z-axis expansion of 1.2% between 50-260°C (vs. 2.5-4.0% for typical high-performance epoxies)
- Low Z-axis expansion minimizes the risk of PTH latent defects caused during solder reflow and device attachment
- Decomposition temperature of 390°C (vs. 300-360°C for typical high-performance epoxies) offering outstanding long term high-temperature performance
- Electrical and mechanical properties meeting the requirements of IPC-4101/40 and /41
- Toughened chemistry resists resin fracturing
- Ideal for lead-free processing
- RoHS/WEEE compliant

### Typical Applications:

- PCBs that are subjected to high temperatures during processing, such as lead-free soldering, HASL, IR Reflow
- Applications with significant lifetimes at high temperatures, such as aircraft engine instrumentation, down hole drilling, under-hood automotive controls, burn-in boards, or industrial sensors.

## Typical Properties:

Property	Units	Value	Test Method
<b>1. Electrical Properties</b>			
Dielectric Constant			
@ 1 MHz	Multilayer ~ 50% RC	4.25	IPC TM-650 2.5.5.3
@ 1 GHz	Multilayer ~ 50% RC	4.1	IPC TM-650 2.5.5.9
Dissipation Factor			
@ 1 MHz	-	0.01	IPC TM-650 2.5.5.3
@ 1 GHz	-	N/A	IPC TM-650 2.5.5.9
Volume Resistivity			
C96/35/90	MΩ-cm	7.2 x 10 <sup>7</sup>	IPC TM-650 2.5.17.1
E24/125	MΩ-cm	4.5 x 10 <sup>8</sup>	IPC TM-650 2.5.17.1
Surface Resistivity			
C96/35/90	MΩ	4.1 x 10 <sup>8</sup>	IPC TM-650 2.5.17.1
E24/125	MΩ	1.6 x 10 <sup>9</sup>	IPC TM-650 2.5.17.1
Electrical Strength	Volts/mil (kV/mm)	1290 (50.8)	IPC TM-650 2.5.6.2
Dielectric Breakdown	kV	>40	IPC TM-650 2.5.6
Arc Resistance	sec	170	IPC TM-650 2.5.1
<b>2. Thermal Properties</b>			
Glass Transition Temperature (Tg)			
TMA	°C	>250	IPC TM-650 2.4.24
DSC	°C	N/A	IPC TM-650 2.4.25
Decomposition Temperature (Td)			
Initial	°C	353	IPC TM-650 2.4.24.6
5%	°C	389	IPC TM-650 2.4.24.6
T260	min	>60	IPC TM-650 2.4.24.1
T288	min	23	IPC TM-650 2.4.24.1
T300	min	8	IPC TM-650 2.4.24.1
CTE (X,Y)	ppm/°C	16	IPC TM-650 2.4.41
CTE (Z)			IPC TM-650 2.4.24
< Tg	ppm/°C	53	IPC TM-650 2.4.24
> Tg	ppm/°C	164	IPC TM-650 2.4.24
z-axis Expansion (50-260°C)	%	1.2	IPC TM-650 2.4.24
<b>3. Mechanical Properties</b>			
Peel Strength to Copper (1 oz/35 micron)			
After Thermal Stress	lb/in (N/mm)	7.2 (1.2)	IPC TM-650 2.4.8
At Elevated Temperatures	lb/in (N/mm)	7.2 (1.2)	IPC TM-650 2.4.8.2
After Process Solutions	lb/in (N/mm)	7.5 (1.3)	IPC TM-650 2.4.8
Young's Modulus	Mpsi (GPa)	3.2	IPC TM-650 2.4.18.3
Flexural Strength	kpsi (MPa)		IPC TM-650 2.4.4
Tensile Strength	kpsi (MPa)		IPC TM-650 2.4.18.3
Poisson's Ratio	-	0.15	ASTM D-3039
<b>4. Physical Properties</b>			
Water Absorption (0.062")	%	0.21	IPC TM-650 2.6.2.1
Specific Gravity	g/cm <sup>3</sup>	1.6	ASTM D792 Method A
Thermal Conductivity	W/mk	0.2	ASTM E1461
Flammability	class	V-0	UL-94

Results listed above are typical properties, provided without warranty, expressed or implied, and without liability. Properties may vary, depending on design and application. Arlon reserves the right to change or update these values.

## Availability:

Arlon Part Number	Glass Style	Resin %	Scaled Flow Hf (mils)	Scaled Flow ΔH (mils)
33N0672	106	72	1.9 ± 0.3	0.55 ± 0.20
33N8063	1080	63	2.6 ± 0.3	0.55 ± 0.20
33N2355	2313	55	3.6 ± 0.3	0.55 ± 0.20
33N2650	2116	50	4.3 ± 0.3	0.55 ± 0.20
33N2840	7628	40	6.8 ± 0.3	0.55 ± 0.20

## Recommended Process Conditions:

Process inner-layers through develop, etch, and strip using standard industry practices. Use brown oxide on inner layers. Adjust dwell time in the oxide bath to ensure uniform coating. Bake inner layers in a rack for 60 minutes at 107°C - 121°C (225°F - 250°F) immediately prior to lay-up. Vacuum desiccate the prepreg for 8 - 12 hours prior to lamination.

### Lamination Cycle:

- 1) Pre-vacuum for 30 - 45 minutes
- 2) Control the heat rise to 4°C - 6°C (8°F - 12°F) per minute between 65°C and 121°C (150°F and 250°F).

Panel Size		Pressure	
in	cm	psi	kg/cm <sup>2</sup>
12 x 18	40 x 46	275	19
16 x 18	30 x 46	350	24
18 x 24	46 x 61	400	28

- 3) Set cure temperature at 213°C (415°F). Start cycle timer when product temperature reaches 210°C (410°F)

- 4) Cure time at temperature = 90 minutes

NOTE: For sequential lamination use 60 minutes for the first lamination and 90 minutes for the final

Cool down under pressure at ≤ 6°C/min (12°F/min)

Drill at 350 SFM. Undercut bits are recommended for vias 0.018" and smaller

De-smear using alkaline permanganate or plasma with settings appropriate for polyimide; plasma is preferred for positive etchback

Conventional plating processes are compatible with 33N

Standard profiling parameters may be used; chip breaker style router bits are not recommended

Bake for 1 - 2 hours at 121°C (250°F) prior to solder to reflow of HASL

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