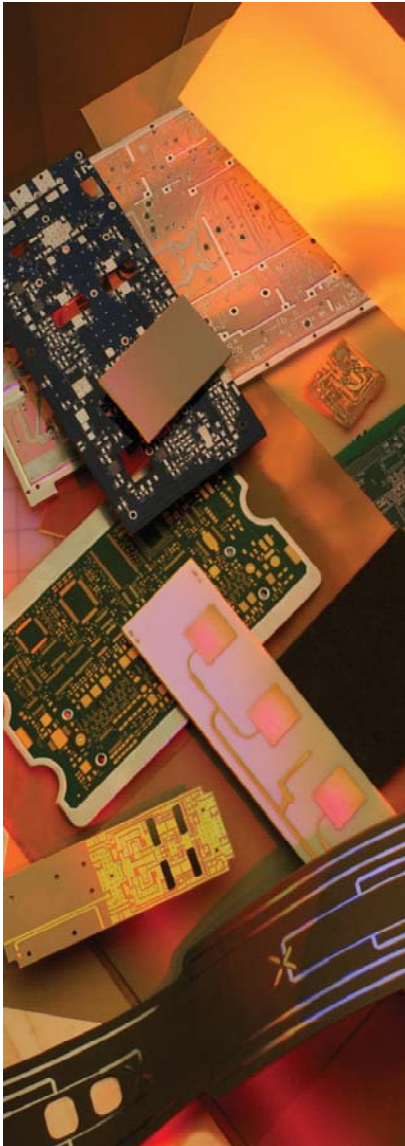


55ST

EPOXY NONWOVEN ARAMID LAMINATE AND PREPREG



55ST is an epoxy laminate and prepreg system, reinforced with non-woven aramid fiber, with significantly improved peel strength due to a tight interpenetrating polymer network within the aramid base matrix.

Features:

- Low in-plane (x,y) expansion of 8-10 ppm/°C allows attachment of SMT devices with minimal risk of solder joint failure due to CTE mismatch
- Significantly higher peel strength than most epoxy/aramid products due to interpenetrating polymer network that creates high internal cohesive strength between epoxy resin and aramid fibers
- Nonwoven aramid fiber organic reinforcement provides enhanced dimensional stability for improved multilayer yields
- Polymeric reinforcement results in PCBs typically 25% lighter in weight than conventional glass-reinforced laminates
- Laser and plasma ablatable for high speed formation of microvias and other features as small as 25µm
- Electrical and mechanical properties meeting the requirements of IPC-4101/55
- RoHS/WEEE compliant
- Recently converted to “E-Series” Thermount® for improved CTE control

Typical Applications:

- Military and commercial avionics, missiles and missile defense, satellites, and other high-reliability SMT applications requiring low in-plane (x,y) CTE values
- SMT applications requiring higher peel strengths, such as handheld devices or other applications where high g-forces may be present
- Other applications requiring low in-plane (x,y) CTE values, including chip carriers and multichip modules, where the chip carrier serves as an interposer for attachment to the underlying PCB

Typical Properties:

55ST

| Property | Units | Value | Test Method |
|--|-------------------|-----------------------|---------------------|
| 1. Electrical Properties | | | |
| Dielectric Constant <i>(may vary with Resin %)</i> | | | |
| @ 1 MHz | - | 3.8 | IPC TM-650 2.5.5.3 |
| @ 1 GHz | - | | IPC TM-650 2.5.5.9 |
| Dissipation Factor | | | |
| @ 1 MHz | - | 0.022 | IPC TM-650 2.5.5.3 |
| @ 1 GHz | - | | IPC TM-650 2.5.5.9 |
| Volume Resistivity | | | |
| C96/35/90 | MΩ-cm | 4.5 x 10 ⁷ | IPC TM-650 2.5.17.1 |
| E24/125 | MΩ-cm | 6.6 x 10 ⁷ | IPC TM-650 2.5.17.1 |
| Surface Resistivity | | | |
| C96/35/90 | MΩ | 2.9 x 10 ⁸ | IPC TM-650 2.5.17.1 |
| E24/125 | MΩ | 2.4 x 10 ⁸ | IPC TM-650 2.5.17.1 |
| Electrical Strength | Volts/mil (kV/mm) | 1540 (60.6) | IPC TM-650 2.5.6.2 |
| Dielectric Breakdown | kV | | IPC TM-650 2.5.6 |
| Arc Resistance | sec | 154 | IPC TM-650 2.5.1 |
| 2. Thermal Properties | | | |
| Glass Transition Temperature (Tg) | | | |
| TMA | °C | | IPC TM-650 2.4.24 |
| DSC | °C | 170 | IPC TM-650 2.4.25 |
| Decomposition Temperature (Td) | | | |
| Initial | °C | 296 | IPC TM-650 2.4.24.6 |
| 5% | °C | 309 | IPC TM-650 2.4.24.6 |
| T260 | min | 6 | IPC TM-650 2.4.24.1 |
| T288 | min | 0 | IPC TM-650 2.4.24.1 |
| T300 | min | 0 | IPC TM-650 2.4.24.1 |
| CTE (x,y) | ppm/°C | 8 - 10 | IPC TM-650 2.4.41 |
| CTE (z) | | | |
| < Tg | ppm/°C | 122 | IPC TM-650 2.4.24 |
| > Tg | ppm/°C | 279 | IPC TM-650 2.4.24 |
| z-axis Expansion (50-260°C) | % | 4.2 | IPC TM-650 2.4.24 |
| 3. Mechanical Properties | | | |
| Peel Strength to Copper (1 oz/35 micron) | | | |
| After Thermal Stress | lb/in (N/mm) | 8.0 (1.3) | IPC TM-650 2.4.8 |
| At Elevated Temperatures | lb/in (N/mm) | 8.0 (1.3) | IPC TM-650 2.4.8.2 |
| After Process Solutions | lb/in (N/mm) | 8.0 (1.3) | IPC TM-650 2.4.8 |
| Young's Modulus | Mpsi (GPa) | 2.0 (14) | IPC TM-650 2.4.18.3 |
| Flexural Strength | kpsi (MPa) | 38 (262) | IPC TM-650 2.4.4 |
| Tensile Strength | kpsi (MPa) | 36 (248) | IPC TM-650 2.4.18.3 |
| Compressive Modulus | kpsi (MPa) | | ASTM D-695 |
| Poisson's Ratio (x, y) | - | | ASTM D-3039 |
| 4. Physical Properties | | | |
| Water Absorption | % | 0.3 | IPC TM-650 2.6.2.1 |
| Specific Gravity | g/cm ³ | 1.35 | 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 % | Mil/Ply | Flow % |
|-------------------|-------------|---------|---------|--------|
| 55ST153 | E210 | 53 | 1.9 | 15 |
| 55ST253 | E220 | 53 | 3 | 15 |
| 55ST353 | E230 | 53 | 4 | 15 |
| 55ST165 | E210 | 65 | 2.3 | 25 |
| 55ST263 | E220 | 63 | 3.6 | 25 |

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 4.5°C - 6.5°C (8°F - 12°F) per minute between 82°C and 138°C (180°F and 280°F)

| Panel Size | | Pressure | |
|------------|---------|----------|----------|
| in | cm | psi | kg/sq cm |
| 12 x 12 | 40 x 40 | 250 | 17 |
| 12 x 18 | 40 x 46 | 275 | 19 |
| 16 x 18 | 30 x 46 | 350 | 25 |
| 18 x 24 | 46 x 61 | 400 | 27 |

- 3) Product temperature at start of cure = 182°C (360°F).
- 4) Cure time at temperature = 90 minutes
- 5) Cool down under pressure at $\leq 6^{\circ}\text{C}/\text{min}$ ($10^{\circ}\text{F}/\text{min}$)

Drill at 350-400 SFM. Undercut bits are recommended for vias 0.023" (0.9cm) and smaller

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

Conventional plating processes are compatible with 55ST

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 reflow or HASL

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