

# VT-447

UL Approval: E214381    Version: Rev. 9

## DATASHEETS - HALOGEN FREE & HIGH TG

VT-447 CCL/Laminate VT-447 PP/Prepreg

### General Information

- Halogen Free & High Tg (175°C) FR-4
- Laser Fluorescing
- CAF Resistance
- Low CTE
- Excellent Thermal Reliability

### Application

For Single Side\Double Side\ Multilayer PWB & Lead Free Assembly Applications.

### Availability

VT-447 Laminates are available in thickness from .002” to .200” and with the copper foil from 1/4oz to 12oz; Ventec can supply either reverse treated (RT) or double side treated copper foil. For cores ≤ .005”, it is recommended to use the reverse treated copper due to the low profile. The peel strength for RT foil is ≈1-2lbs/in (0.35Kg/m) less than Standard foil.

VT-447PP pre-pregs are available in many E-Glass styles, such as 7628, 7629, 1506, 1500, 2113, 2313, 3313, 2116, 1080, 1086, 1078, 106 & 1067.

### Storage Condition & Retest Time

|                   |                   | Prepreg           |                  | Laminate             |
|-------------------|-------------------|-------------------|------------------|----------------------|
| Storage Condition | Temperature       | Below 23°C (73°F) | Below 5°C (41°F) | Room                 |
|                   | Relative Humidity | Below 55% RH      | /                | /                    |
| Shelf Time*       |                   | 3 Months          | 6 Months         | 12 Months (airproof) |

\*The pre-preg exceeding shelf time should be retested.

# VT-447

## PROPERTIES SHEETS

### IPC-4101C Specification Sheet(s)/130(most compliant),127,128

| Properties  | Test Method         | Units            | Specification           | Typical Value     |
|---|---------------------|------------------|-------------------------|-------------------|
| <b>Thermal Properties</b>                           |                     |                  |                         |                   |
| Glass Transition Temp. (Tg)                         |                     |                  |                         |                   |
| DSC   | IPC-TM-650 2.4.25   | °C               | -                       | -                 |
| TMA   | IPC-TM-650 2.4.24   | °C               | 170 minimum             | 175               |
| Decomposition Temp. (Td) By TGA (at 5% weight loss) | ASTM D3850          | °C               | 340 minimum             | 370               |
| Time to Delamination---T260                         | IPC-TM-650 2.4.24.1 | Minute           | 30 minimum              | >60               |
| Time to Delamination---T288                         | IPC-TM-650 2.4.24.1 | Minute           | 15 minimum              | >20               |
| Z-axis CTE  |                     |                  |                         |                   |
| Before Tg   | IPC-TM-650 2.4.24   | ppm/°C           | 60 maximum              | 40                |
| After Tg  | IPC-TM-650 2.4.24   | ppm/°C           | 300 maximum             | 190               |
| Total Expansion (50~260°C)                          | IPC-TM-650 2.4.24   | %                | 3.0 maximum             | 2.6               |
| Thermal Stress @ 288°C                              | IPC-TM-650 2.4.13.1 | Second           | Pass 10s                | >600              |
| <b>Electrical Properties</b>                        |                     |                  |                         |                   |
| Dielectric Constant @ 1GHz                          | IPC-TM-650 5.5.5.9  | -                | 5.4 maximum             | 4.4               |
| Dissipation Factor @ 1GHz                           | IPC-TM-650 5.5.5.9  | -                | 0.035 minimum           | 0.014             |
| Volume Resistivity                                  |                     |                  |                         |                   |
| After Moisture Resistance                           | IPC-TM-650 2.5.17.1 | MΩ-cm            | 10 <sup>4</sup> minimum | 5*10 <sup>8</sup> |
| E-24/125  | IPC-TM-650 2.5.17.1 | MΩ-cm            | 10 <sup>3</sup> minimum | 5*10 <sup>6</sup> |
| Surface Resistivity                                 |                     |                  |                         |                   |
| After Moisture Resistance                           | IPC-TM-650 2.5.17.1 | MΩ               | 10 <sup>4</sup> minimum | 5*10 <sup>7</sup> |
| E24/125   | IPC-TM-650 2.5.17.1 | MΩ               | 10 <sup>3</sup> minimum | 5*10 <sup>6</sup> |
| Electrical Strength                                 | IPC-TM-650 2.5.6.2  | Volt/mil (KV/mm) | 762 (30) minimum        | 1200~1400 (54)    |
| Dielectric Breakdown                                | IPC-TM-650 2.5.6    | KV               | 40 minimum              | 60                |
| Comparative Tracking Index (CTI)                    | ASTM D3638          | Rating (Volt)    | -                       | Grade 4 (100~175) |
| Arc Resistance                                      | IPC-TM-650 2.5.1    | Second           | 60 minimum              | 65                |
| <b>Mechanical Properties</b>                        |                     |                  |                         |                   |
| Peel Strength (1oz)                                 |                     |                  |                         |                   |
| As received   | IPC-TM-650 2.4.8    | lb/in (N/mm)     | -                       | 7.3 (1.28)        |
| After thermal stress                                | IPC-TM-650 2.4.8    | lb/in (N/mm)     | 6 (1.05) minimum        | 7.2 (1.26)        |
| Flexural Strength                                   |                     |                  |                         |                   |
| Warp  | IPC-TM-650 2.4.4    | Kpsi (MPa)       | 60 (415) minimum        | 72 (500)          |
| Fill  | IPC-TM-650 2.4.4    | Kpsi (MPa)       | 50 (345) minimum        | 58 (400)          |
| <b>Physical Properties</b>                          |                     |                  |                         |                   |
| Moisture Absorption                                 | IPC-TM-650 2.6.2.1  | %                | 0.80 maximum            | 0.18              |
| Flammability  | UL-94               | Rating           | V0 minimum              | V0                |

- All test data provided are typical values and not intended to be specification values.

## VT-447

## PROCESS GUIDELINE

## Press Condition

1. Heating rate (Rise of Rate) of material [Material Temperature]:  
Programmable Press: 1.5-3.0°C/min (3-5°F/min). Manual Press :3-6°C /min (5-10°F/min)
2. Curing Temperature & Time: >60min at more than 185°C (356°F) [Material Temperature]
3. Full Pressure: ≥320psi
4. Vacuuming should be continued until over 140°C (284°F) [Material Temperature]

## Typical Drilling Parameters (φ0.3-1.0 mm)

|                   |          |            |
|-------------------|----------|------------|
| 1. Spindle Speed: | 120-180  | KRPM       |
| 2. Feed Rate:     | 120-220  | inch / min |
| 3. Retract Rate:  | 596-1000 | inch / min |
| 4. Chip Load:     | 0.6~2.0  | mil / Rev. |

## Desmearing Process

Desmear rate of **VT-447** is less than that of the conventional FR-4;  
 Minor adjustments to the desmear process may be necessary for the higher Tg materials;  
 Check with your chemical supplier for recommendations.