



## GA-LD

### High Tg200 Dicy-free Curing Low Dk/Df Laminate and Prepreg

GA-LD is an advanced high Tg (200°C/DSC) . Low Dk/Df multifunctional epoxy laminate . Excellent heat resistance, CAF resistance and Low CTE performance, suitable for through-hole reliability, Lead Free process, and is more suitable for high multilayer PCB process, high density PCB. Superior electrical performance, suitable for high frequency high- speed telecommunications.

Laminate:GA-LD

Prepreg: GA-LDB

## Key Features

### I Tg: 200°C(DSC)

This material with high performance multi-function resin , crosslink density is high. Material Tg values can reach above 200 °C(DSC).

### I Dk: 3.75 & Df: 0.0070

Within the scope of the 1 MHz - 20 GHz, material has superior electrical properties, is conducive to the high frequency high-speed transmission, and high density wiring design. The lower signal loss can ensure signal integrity.

### I Z-CTE(50-260):2.4%

Its remarkable very low expansion coefficient, is more suitable for making high multilayer PCB, ensure the reliability of high temperature welding and assembly process.

### I Td: 355°C

Excellent resistance to aging temperature, keep the material performance in high thermal shock or high temperature environment impact.

## Applications

- Ø multilayer PCB
- Ø Servers
- Ø Storage Networks
- Ø Routing/Switching
- Ø RF/Wireless Communication
- Ø Line cards

## Industrial Approvals

- Ø IPC-4101E/98/99/101/126
- Ø UL File Number : e186152
- Ø UL Type Designation : FR-4.0
- Ø Flammability Rating : 94V-0
- Ø Maximum Operating Temperature : 130°C

## Normal Size & Thickness

| Thickness<br>Inch (mm) | Size  |           | Thickness Tolerance |
|------------------------|-------|-----------|---------------------|
|                        | Inch  | mm        |                     |
| 0.002 (0.05)           | 49×37 | 1244×0940 | IPC-4101 Class C/M  |
| To                     | 49×41 | 1244×1042 |                     |
| 0.125 (3.2)            | 49×43 | 1244×1093 |                     |

| Characteristic<br><b>GA-LD</b>       |           | Unit              | Test Method              | Typical data      | spec              |
|--------------------------------------|-----------|-------------------|--------------------------|-------------------|-------------------|
|                                      |           |                   | IPC-TM-650 (or as noted) |                   |                   |
| Volume Resistivity                   |           | MΩ-cm             | 2.5.17.1                 | 7X10 <sup>9</sup> | ≥ 10 <sup>6</sup> |
| Surface Resistivity                  |           | MΩ                | 2.5.17.1                 | 2X10 <sup>8</sup> | ≥ 10 <sup>4</sup> |
| Permittivity (RC50%)                 | At 1GHz   | -                 | 2.5.5.9/2.5.5.13         | 3.75/3.80         | ≤ 5.20            |
|                                      | At 5GHz   |                   | 2.5.5.13                 | 3.75              | /                 |
|                                      | At 10GHz  |                   | 2.5.5.13                 | 3.70              | /                 |
|                                      | At 15GHz  |                   | 2.5.5.13                 | 3.70              | /                 |
| Loss Tangent (RC50%)                 | At 1GHz   | -                 | 2.5.5.9/2.5.5.13         | 0.0070/0.0080     | ≤ 0.035           |
|                                      | At 5GHz   |                   | 2.5.5.13                 | 0.0080            | /                 |
|                                      | At 10GHz  |                   | 2.5.5.13                 | 0.0090            | /                 |
|                                      | At 15GHz  |                   | 2.5.5.13                 | 0.0090            | /                 |
| Arc Resistance                       |           | Sec               | 2.5.1                    | 120               | ≥ 60              |
| Dielectric Breakdown                 |           | KV                | 2.5.6                    | 40                | ≥ 40              |
| Dielectric Strength(thickness<0.5mm) |           | KV/mm             | 2.5.6.2                  | 40                | ≥ 30              |
| CTI                                  |           | PLC(V)            | ASTM D3638               | 3(175-249)        | /                 |
| Thermal Stress Test                  |           | -                 | 2.4.13.1                 | Pass              | Pass              |
| Td (5% Weight loss)                  |           | °C                | 2.4.24.6                 | 355               | ≥ 340             |
| Glass Transition Temperature         | DMA       | °C                | 2.4.24.2                 | 215               | /                 |
|                                      | DSC       | °C                | 2.4.25                   | 200               | ≥ 170             |
|                                      | TMA       | °C                | 2.4.24                   | 175               | /                 |
| Thermal Conductivity                 |           | W/mK              | ASTM D5470               | 0.40              | /                 |
| Most Operation Temperature(MOT)      |           | °C                | UL Cert                  | 130               | 130               |
| T288                                 |           | Min               | 2.4.24.1                 | ≥ 30              | ≥ 15              |
| T300                                 |           | Min               | 2.4.24.1                 | 18                | ≥ 2               |
| X/Y-Axis CTE                         | Before Tg | PPM/°C            | 2.4.24                   | 13/15             | /                 |
| Z-Axis CTE                           | Before Tg | PPM/°C            | 2.4.24                   | 45                | ≤ 60              |
|                                      | After Tg  | PPM/°C            |                          | 220               | ≤ 300             |
| Z-Axis CTE (50~260°C)                |           | %                 | 2.4.24                   | 2.4               | ≤ 3.0             |
| Peel Strength (RTF 1OZ)              |           | Lb/in(N/mm)       | 2.4.8                    | 5.5(0.96)         | ≥ 4(0.7)          |
| Flexural Strength                    | LW        | N/mm <sup>2</sup> | 2.4.4                    | 450               | ≥ 415             |
|                                      | CW        | N/mm <sup>2</sup> |                          | 400               | ≥ 345             |
| E-modulus                            | LW/CW     | Gpa               | ---                      | 23/22             | /                 |
| Flexural Modulus                     | LW/CW     | Gpa               | ---                      | 26/24             | /                 |
| Moisture Absorption                  |           | %                 | 2.6.2.1                  | 0.10              | ≤ 0.5             |
| Flammability                         |           | -                 | UL94                     | V-0               | V-0               |

Note: 1. Test sample is 62mil 1/1(without special remark).

2. The data above is only for reference, and the actual data will have deviation, according to varieties of test equipment and method.