# GA-HF-17

**Halogen-free High Tg170 Dicy Curing Laminate and Prepreg**

*GA-HF-17 is an advanced Halogen-free high Tg170(DSC)、multifunctional epoxy Laminate. Excellent heat resistance, CAF resistance and Low CTE, suitable for through-hole reliability, Lead Free process、multilayer PCB and high density PCB. Environmental-friendly material, absence of highly toxic dioxins, Antimony-free and no toxic evolution during waste burning.*

*Laminate:GA-HF-17*
*Prepreg: GA-HFB-17*

## Key Features

- ***Tg: 173℃(DSC)***
  *This material with high performance multi-function resin, crosslink density is high. Material Tg values can reach above 170 ℃(DSC).*
- ***Z-CTE(50-260):2.5%***
  *Its remarkable very low expansion coefficient, is more suitable for making high multilayer PCB, ensure the reliability of high temperature welding.*
- ***Td: 370℃***
  *Excellent resistance to aging temperature, keep the material performance in high thermal shock or high temperature environment impact.*
- ***T288: 60min ↑***
  *Suitable for Lead-free process. Subjected to thermal shock for many times, still can maintain good material performance. And excellent dimensional stability and low expansion coefficient, apply to HDI process.*

## Applications

- *Multilayer PCB*
- *Cellular phone*
- *Servers*
- *Mobile Communication*
- *Memory Module*

## Industrial Approvals

- *IPC-4101D/127/128/130*
- *UL File Number：e186152*
- *UL Type Designation：FR-4.1*
- *Flammability Rating：94V-0*
- *Maximum Operating Temperature： 130℃*

## Normal Size & Thickness

| Thickness Inch (mm) | Size Inch mm | Thickness Tolerance |
|---|---|---|
| 0.0012 (0.03)<br>To<br>0.125 (3.2) | 49×37 1244×0940<br>49×41 1244×1042<br>49×43 1244×1093 | IPC-4101 Class C/M |

| Characteristic<br>GA-HF-17 | | Unit | Test Method<br>IPC-TM-650 （or as noted） | Typical Values | SPEC. |
|---|---|---|---|---|---|
| Volume Resistivity | | MΩ-cm | 2.5.17.1 | $2X10^9$ | $\geqq 10^6$ |
| Surface Resistivity | | MΩ | 2.5.17.1 | $1X10^6$ | $\geqq 10^4$ |
| Permittivity (RC 50%) | At 1MHz | - | 2.5.5.9 | 4.85 | ≦5.40 |
| | At 1GHz | | 2.5.5.9/2.5.5.13 | 4.63/4.80 | / |
| Loss Tangent (RC 50%) | At 1MHz | - | 2.5.5.9 | 0.0121 | ≦0.035 |
| | At 1GHz | | 2.5.5.9/2.5.5.13 | 0.0157/0.0160 | / |
| 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) | | ℃ | 2.4.24.6 | 370 | ≧340 |
| Glass Transition Temperature | DMA | ℃ | 2.4.24.2 | 190 | / |
| | DSC | ℃ | 2.4.25 | 173 | ≧170 |
| | TMA | ℃ | 2.4.24 | 160 | / |
| Thermal Conductivity | | W/mK | ASTM D5470 | 0.40 | / |
| Most Operation Temperature(MOT) | | ℃ | UL Cert | 130 | 130 |
| T288 | | Min | 2.4.24.1 | ≧60 | ≧15 |
| T300 | | Min | 2.4.24.1 | ≧2 | ≧2 |
| X/Y-Axis CTE | Before Tg | PPM/℃ | 2.4.24 | 14/15 | / |
| Z-Axis CTE | Before Tg | PPM/℃ | 2.4.24 | 35 | ≦60 |
| | After Tg | PPM/℃ | | 200 | ≦300 |
| Z-Axis CTE (50~260℃) | | % | 2.4.24 | 2.5 | ≦3.0 |
| Peel Strength (HTE 1OZ) | | Lb/in(N/mm) | 2.4.8 | 8(1.40) | ≧6(1.05) |
| Flexural Strength | LW | $N/mm^2$ | 2.4.4 | 600 | ≧415 |
| | CW | $N/mm^2$ | | 460 | ≧345 |
| E-modulus | LW/CW | Gpa | --- | 25/24 | / |
| Flexural Modulus | LW/CW | Gpa | --- | 25/24 | / |
| Moisture Absorption | | % | 2.6.2.1 | 0.10 | ≦0.8 |
| Flammability | | - | UL94 | V-0 | V-0 |

Note: 1.Test sample is 40 mil 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.