



MCS Data Sheet

MCS Thermally-Conductive Base Material for Printed Circuit Boards

A **Metal Clad Substrate (MCS)** is a thermally-conductive base material that is laminated between aluminum and copper foil. The copper foil is etched into the desired circuit pattern on a PCB and the metal base draws heat away from this circuit through the thin prepreg, which achieves greater thermal conductivity than standard FR-4 for heat dissipation. These materials are an inexpensive alternative for active cooling methods and for thick film technology and offer very high mechanical and thermal stability.

Isola offers a Lambda family of prepreg for thermal management, which includes **DE104, IS410, PCL370HR** and **IS450**.

IS450's high Tg epoxy system increases the dielectric conductivity to 1 W/(m·K). In high power applications, the designer must accommodate the heat dissipated by active devices, conductor resistance losses, and dielectric loss in order to reduce the distance between the components, which can be difficult to achieve with standard base materials.

This system is well suited for high density LEDs, power converters and heat sink circuits in industrial and automobile applications.

Multilayer production can be achieved through conventional processing. A cost-efficient mixed assembly with other multilayer qualities is possible. Isola's MCS laminates offer a glass transition temperature greater than 150°C.

www.isola-group.com/products/MCS

ORDERING INFORMATION:

Contact your local sales representative or visit www.isola-group.com for further information.

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Features

- High Thermal Performance
 - ▶ Up to 18 W/(m·K) @ laminates
 - ▶ 1.0 W/(m·K) @ prepregs
- T260: >60 minutes
- T288: >20 minutes
- Low coefficient of expansion in Z-axis direction
 - ▶ 50 ppm/K @ RT -120°C
- Core Material Standard Availability
 - ▶ Thickness: 0.0025" - 0.006" (0.060 mm - 0.150 mm)
 - ▶ Available in full size sheet or panel form
- Prepreg Standard Availability
 - ▶ Roll or panel form
- Copper Foil Type Availability
 - ▶ Standard HTE Grade 3
- Copper Weights
 - ▶ ½ oz, 1 oz and 2 oz (18 µm, 35 µm, & 70 µm) available
 - ▶ Heavier copper available upon request
 - ▶ Thinner copper foil available upon request
- Glass Fabric Availability
 - ▶ Standard E-glass

MCS Technology

The laminates are based on a single-sided, copper-clad and insulated metal core. Aluminium is used as carrier. Depending on the application, DE104, IS410, PCL370HR, IS450 or RCC-450 can be used as the insulation layer. The following factors should be considered:

- Thermal conductivity
- Electrical insulation
- Peel strength
- Coefficient of expansion

| |
|-------------------|
| Copper |
| Dielectric |
| Aluminium |

Copper

The standard copper cladding is 35 µm (1 oz./Sq. Ft.) up to 210 µm (6 oz./Sq. Ft.). The copper clad can be processed as normal and is completely reflow suitable.

Dielectric

A thermally-conductive insulation layer is located beneath the copper. By a special filler with a low thermal resistance and a high electrical insulation, a thermal conductivity of 1.3 W/(m·K) (without glass reinforcement) can be reached. Thicknesses from 0.0025" (60 µm) to 0.006" (150 µm) are available.

Aluminium

A metal core from aluminium in the alloy 5754-H22 is used as carrier. This layer, combined with the dielectric, provides the basis for ideal heat dissipation. As a standard, 0.059" (1.5 mm) layers are used. Other thicknesses are available on request.

Raw Materials

| | |
|-----------------------------------|------------------------|
| Carrier: | E-glass fabrics |
| Primary resin system: | Epoxy |
| Secondary resin system: | Multifunctional epoxy |
| Flame retardant mechanism: | Brominated epoxy resin |
| Filler: | Inorganic filler |
| Aluminium: | Alloy: 5754-H22 |

Supply Forms Prepreg

IS450 Prepreg

| Glass Fabrics Number & Type | Prepreg | |
|--------------------------------|-------------------|----------------------------|
| | Resin Content (%) | Theoretical Thickness (mm) |
| 1 x 106 | 79 | 0.070 |
| 1 x 1080 | 73 | 0.100 |
| 1 x 2116 | 53 | 0.120 |

| Property | Typical Values Of Isola's Lambda Materials | | | | | | Units | Test Method | |
|---|--|---------------------|---------------------|---------------------|---------------------|---------------|------------------|--------------------------|------------|
| | DE104 | IS410 | 370HR | IS450 | RCC-450 | Specification | | | |
| | | | | | | | Metric (English) | IPC-TM-650 (or as noted) | |
| Glass Transition Temperature (Tg) by TMA | >130 | >165 | >165 | >150 | >150 | – | °C | 2.4.24 | |
| T288 by TMA | >5 | >40 | >12 | >15 | >15 | – | Minutes | ASTM D3850 | |
| CTE, Z-axis <Tg Dielectric (TMA) | 70 | 70 | 50 | 50 | 50 | AABUS | ppm/°C | 2.4.24 | |
| Thermal Conductivity | Dielectric | 0.23 | 0.35 | 0.50 | 1.00 | 1.30 | – | W/(m·K) | ASTM D5470 |
| | MCS | 3.7 | 5.5 | 7.8 | 12.6 | 18.9 | – | | |
| Volume Resistivity | 4.0x10 ⁷ | 6.6x10 ⁷ | 2.6x10 ⁷ | 3.0x10 ⁷ | 2.3x10 ⁷ | – | MΩ·cm | 2.5.17.1 | |
| Surface Resistivity | 4.1x10 ⁶ | 4.2x10 ⁶ | 2.9x10 ⁶ | 1.3x10 ⁷ | 1.5x10 ⁷ | – | MΩ | 2.5.17.1 | |
| Dielectric Constant @1 MHz | 4.5 | 4.6 | 5.0 | 5.0 | 4.9 | – | – | 2.5.5.3 | |
| Dissipation Factor @1 MHz | 0.010 | 0.011 | 0.014 | 0.018 | 0.015 | – | – | 2.5.5.3 | |
| Electric Strength (Laminates of 0.003" (0.1 mm)) | 32 | 36 | 40 | 30 | 40 | 30 750 | kV/mm (V/mil) | 2.5.6.2 | |
| Peel Strength to Copper (as received) | 1.9 | 1.4 | 1.0 | 0.8 | 0.9 | – | N/mm (lb/inch) | – | |
| Flammability (Laminate & prepreg as laminated) | V-0 | V-0 | V-0 | V-0 | V-0 | – | Rating | UL-94 | |

The data, while believed to be accurate and based on analytical methods considered to be reliable, is for information purposes only. Any sales of these products will be governed by the terms and conditions of the agreement under which they are sold.