

# Guidelines/recommendations

## “Measuring the thermal conductivity and thermal resistance of prepregs und bonding sheets” (the user is responsible for implementation)

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### Objective:

- Measuring thermal conductivity in [W/mK] and thermal resistance  $R_{th}$  in [K/W]

### Methods:

- Test method ASTM D5470 or ASTM D5470 equivalent (guarded hot plate method; TIM tester)

### Parameter recommendations:

- Sample construction:
  - Prepregs sandwiched between 35µm Cu foil
  - Prepreg with glass fiber type 106
  - Total prepreg thickness 200 – 400µm (\*), i.e. sandwich several sheets together
- Temperature difference  $T > 10$  K and heat flow Q: 1-20 W (\*)
- Measurement temperature: 50 – 60°C

(\*) The sample thickness should be adjusted according to the thermal conductivity of the material to satisfy the conditions for  $T$  and  $Q$

## Equations

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Thermal resistance  $R_{th}$ :

$$R_{th} = \frac{\Delta T}{Q} \quad \left( \frac{K}{W} \right)$$

Thermal conductivity :

$$\lambda = \frac{d}{A \cdot R_{th}} = \frac{d}{A} \cdot \frac{Q}{\Delta T} \quad \left( \frac{W}{m \cdot K} \right)$$

Use the following equation to calculate the thermal conductivity of prepregs/bonding sheets from the total thermal conductivity of the multi-layer composite:

$$\lambda_s = \frac{d_s}{\sum_i^n \frac{d_i}{\lambda_i}}$$

$\lambda$  : Thermal conductivities  
 $d$ : Layer thicknesses  
 $i$ : Index of each layer (n layers)

$\lambda_s$  : Thermal conductivity of the multi-layer composite  
 $d_s$  : Total thickness of the multi-layer composite