Long Win's Thermal Solution

TIM Thermal Performance Measurement

LongWin
Fundamental, Forward & First
Since 1985

LW-9389 TIM Thermal Conductivity and Resistance

Features

- Based on ASTM D 5470-06 Standard
- Applicable specimens:
  Grease, pad, MCPCB, ceramics, dielectric layers, etc.
- Measurement range:
  Thermal impedance >0.01 °Ccm²/W; Accuracy ±5%
  Thermal conductivity <20 W/m°C

Principle

1. Heat Flux

$$Q_h = K_m A \frac{T_{h3} - T_{h1}}{Xh_{13}} \qquad Q = \frac{Q_c + Q_h}{2}$$

$$Q_c = K_m A \frac{T_{c1} - T_{c3}}{Xc_{13}}$$

Km: Thermal conductivity of meter bar

2. Interface Temperature: Ths & Tcs

$$Ths = T_{h1} - \frac{Xh_{s1}}{Xh_{13}}(T_{h3} - T_{h1})$$

$$Tcs = T_{c1} + \frac{Xc_{s1}}{Xc_{13}}(T_{c1} - T_{c3})$$

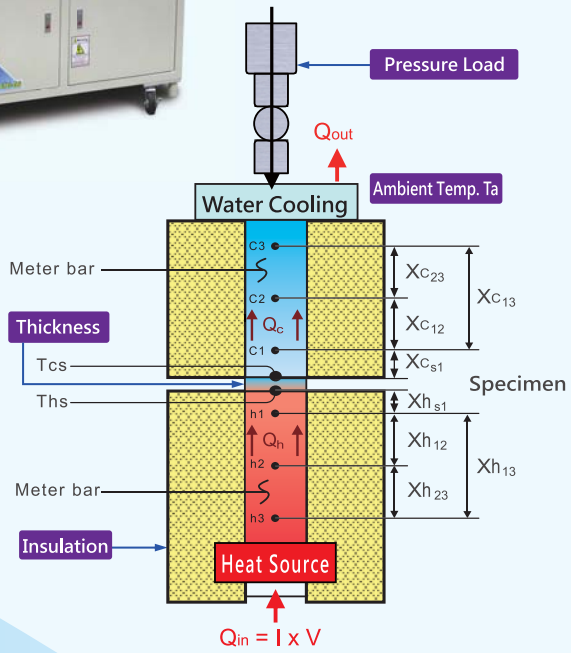
3. Thermal Resistance (°C/W)

$$R = \frac{Ths - Thc}{Q}$$

4. Thermal Conductivity (W/m°C)

$$K = \frac{1}{A} \times \frac{t}{R}$$

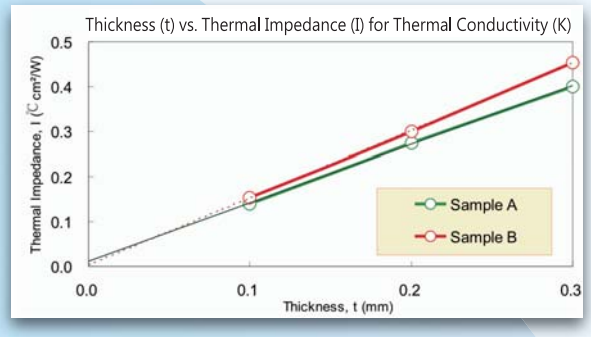
t: Thickness of specimen (mm)



Example

Thermal conductivity of grease at Th=80°C

Specimen	Th	Tc	P	Q	R	I	t	K
	°C	°C	psi	W	°C/W	°Ccm²/W	mm	W/m°C
A	79.79	68.19	40.01	70.97	1.054	0.163	0.1	1.40
	79.30	63.33	40.01	58.37	1.765	0.274	0.2	
	80.15	60.19	40.01	51.82	2.486	0.385	0.3	
B	79.93	69.23	40.01	70.00	0.986	0.153	0.1	1.03
	79.97	62.81	40.01	57.23	1.935	0.300	0.2	
	79.99	58.29	40.01	47.94	2.920	0.453	0.3	



Specification

- Range: 4~50 kgf (8.8~110 lb)
- Meter bar area: □ 25.4 × 25.4 mm or dia. 25.4 mm
- Max. heating power: 180 W
- Max. temperature of heating module: 180°C
- Cooling capability of cooling module: >180 W
- Cooling temperature: Ambient +3~50°C
- Thickness of hard specimens: By micrometer
- Thickness of soft specimens: By 3 sets of LVDT
  - Accuracy: 5 µm
  - Resolution: 1 µm
  - Displacement: <5 mm
- Overall dimension: 1.37 (W) × 0.87 (D) × 1.88 (H) m
- Power source: AC220V, 10 Amp, single phase
- Air source: 5~7 kg/cm², consumption <1 liter/min

No. 064 / 201510

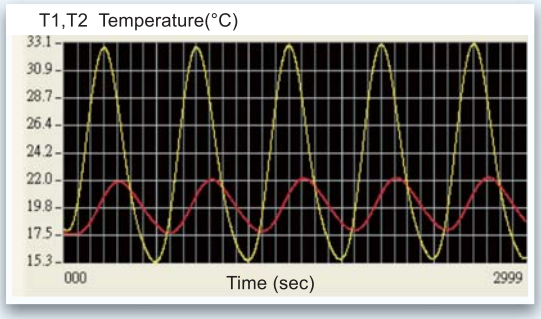
LW-9614 In-Plane Thermal Diffusivity Measurement

Features

- Based on Angstrom Method
- Applicable specimens:
  Highly thermal conductive films / sheets
  EX: Graphite, copper and aluminum, etc.
- Measurement range:
  Thermal diffusivity: 0.05~10 cm²/sec
  Thermal conductivity: >15 W/m°C

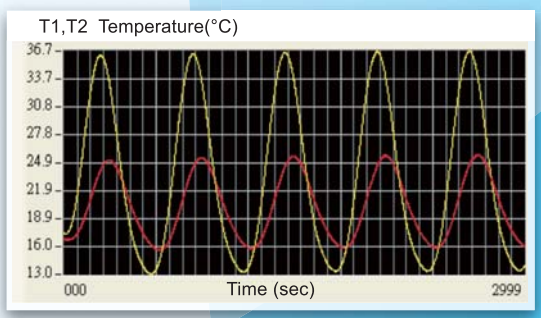
Example

Copper C1100



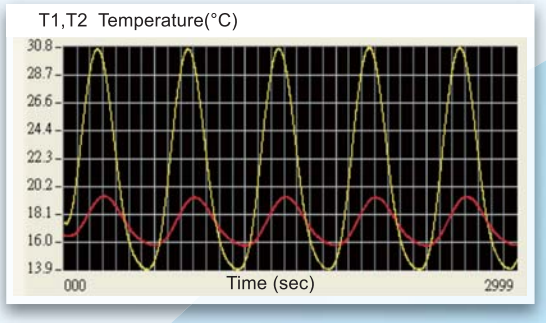
Thermal diffusivity (α)=1.14 cm²/sec
Density (ρ)=8.94 g/cm³
Specific heat (Cp)=0.092 cal/g°C
Thermal conductivity (K)= αρCp=392 W/m°C

High-Performance Graphite



Thermal diffusivity (α)=2.98 cm²/sec

Graphite sheet t=0.06 mm



Thermal diffusivity (α)=2.07 cm²/sec

Other Materials

Material	Thermal diffusivity (α) cm²/sec	
	Standard	LW-9614
C1100	1.17	1.14
C2680	0.34	0.36
C5191	0.17	0.18
A1100	0.97	0.99

Specification

- A heating & cooling unit: 20 x 20 mm (Ref.)
- Amplitude and sine waves are controlled by PC.
- Specimen dimension:
  - Length: >300 mm
  - Width: 20~30 mm
  - Thickness: 0.02~0.6 mm
- Tension strength of specimens: >100 gf/mm²
- Overall dimension: 0.9 (W) × 0.65 (D) × 1.65 (H) m
- Power source: AC220V, 5 Amp, single phase

LongWin Fundamental, Forward & First
Long Win Science and Technology Corporation

No.7, Shih 2nd Road, Youth Ind. Park, Yangmei, Taoyuan, 32657, Taiwan

TEL: 886-3-464-3221
E-mail: longwin@longwin.com
URL: http://www.longwin.com