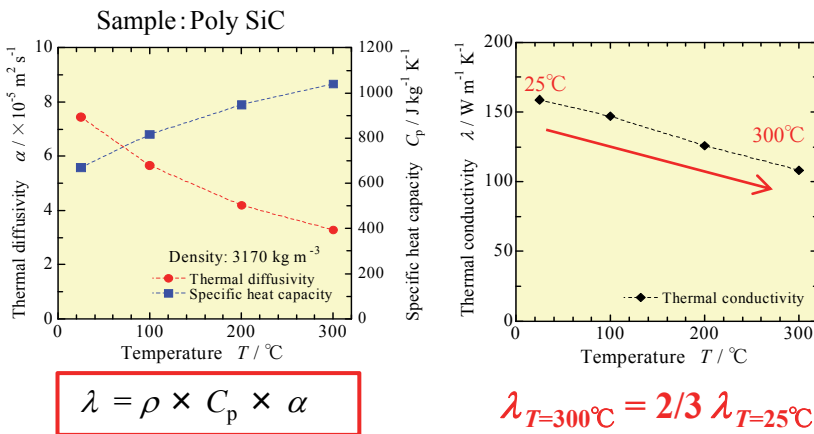


Evaluation of the thermal properties for the semiconductor device

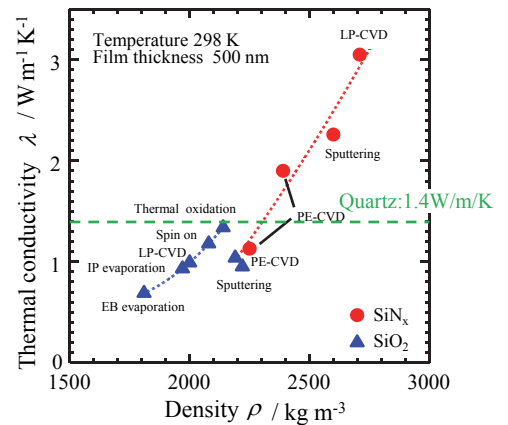
In "Thermal design" of semiconductor devices, it is important to know accurate thermophysical properties. An optimal measurement method must be used in consideration of the characteristics of the material.

Temperature dependence of thermal properties



ρ : Density α : Thermal diffusivity
 C_p : Specific heat capacity λ : Thermal conductivity

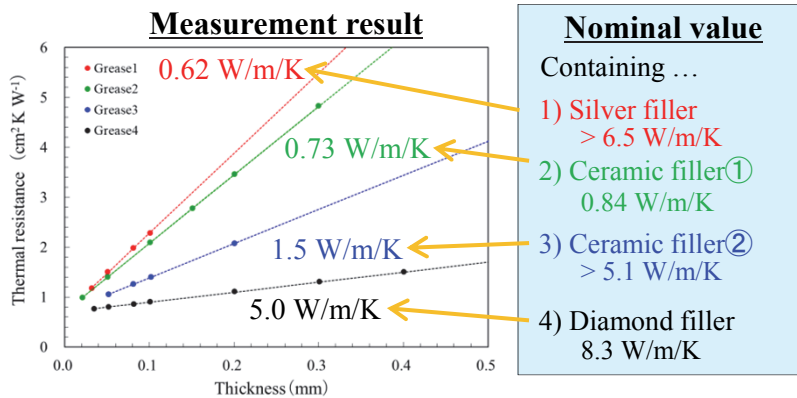
Thermal conductivity of thin films



The thermal conductivity of thin film tends to be lower than the bulk value. It is due to the influence of film quality such as crystallinity.

Comparison between Nominal and measurement value

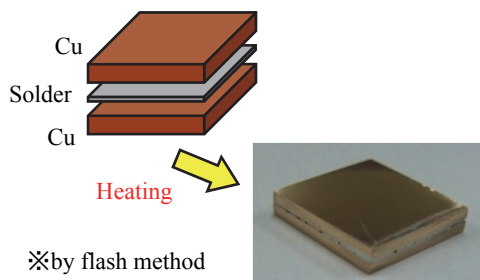
Thermal conductivity measurement of thermal greases by steady heat flow method



The thermal conductivity may change depending on the conditions and situations of measurement. It should be measured similar to the situation in which it is used.

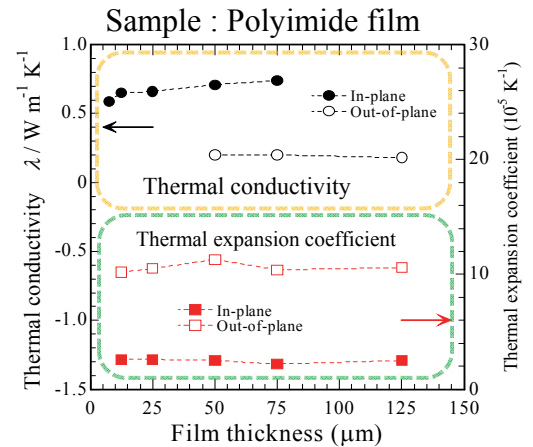
Thermal conductivity of bonding layer

The thermal conductivity decreases due to the defects of the bonding layer and the influence of the interface.



Composition of solder	Thermal conductivity ($\text{W m}^{-1} \text{K}^{-1}$)		Composition (Reference)
	Measurement value	Reference value	
Sn60%, Pb40%	26	51	Sn63%, Pb37%
Sn96.5%, Ag3.5%	25	33	Sn96.5%, Ag3.5%
Sn99%, Ag0.3%, Cu0.7%	30	64	Sn95.2%, Ag3.8%, Cu1.0%

Anisotropy



【Thermal conductivity】

In-plane > Out-of-plane

【Thermal expansion coefficient】

Out-of-plane > In-plane