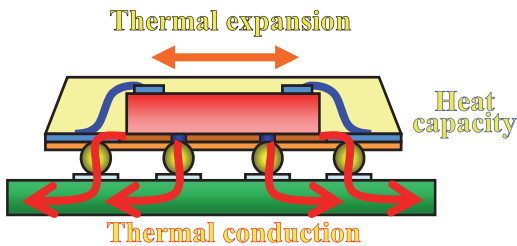


For realization of more accurate thermal design

In thermal design, in order to reduce the deviation between the temperature distribution of the device during operation and the results of the heat transfer calculations, the exact model and accurate properties are required. The best way for realizing the optimal thermal design are to apply a suitable technique for measuring the thermophysical property values of used material, furthermore, to be evaluate the heat release characteristics of an actual device.

Thermal properties of materials

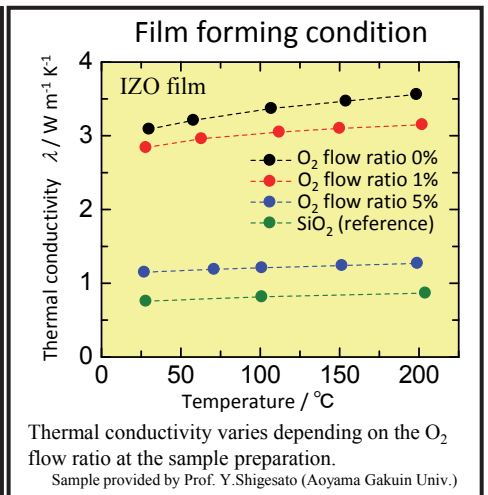
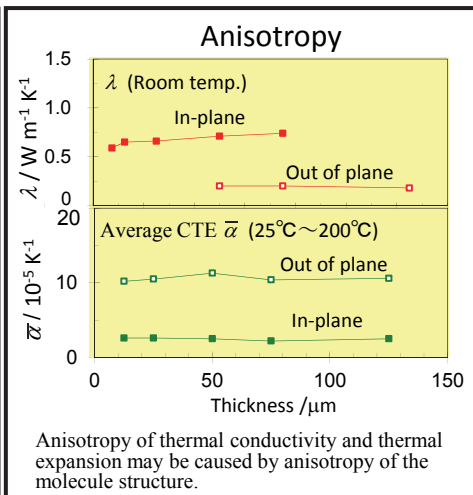
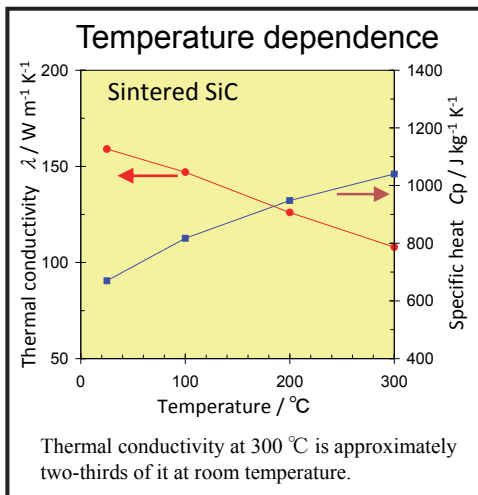


Thermal conductivity, heat capacity, and thermal expansion are important thermophysical properties for thermal design of device with heat generator (e.g. semiconductor package).

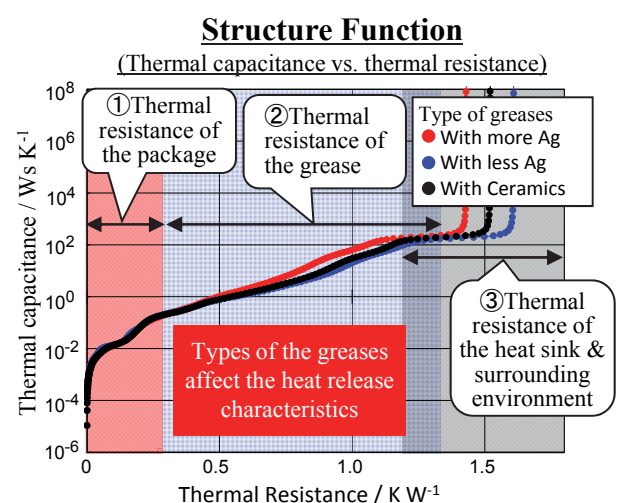
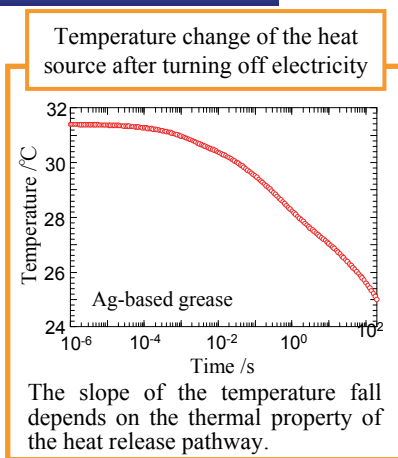
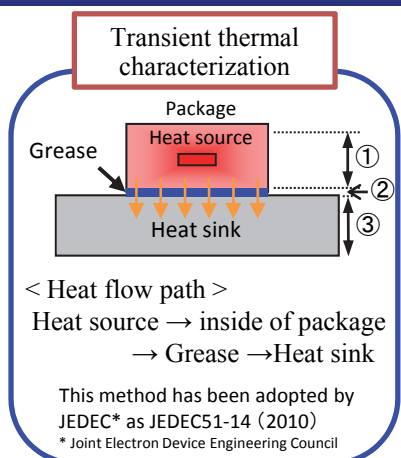
	Thick	Plate, Film	Thin film
Thermal conductivity	Bulk		
Thermal diffusivity			
Thermal expansion			
Heat capacity (specific heat)			

Steady heat flow method		3 ω method
Flash method	AC calorimetry	Thermo-reflectance method
Strain gauge	Laser interferometry	
Thermo mechanical analysis		Bending method
	DSC method	

It's very important to select a best measuring method !



Transient thermal characterization of a device



Transient thermal characterization method visualizes the thermal properties of heat transfer path for a device, and enables the determination of the bottle-neck part of the heat release pathway in it. Furthermore, the dependence of the heat release characteristics on the types of material (e.g. thermal grease) can also be identified.