

NEW HEAT SINK MATERIAL

KCW-10

1. Introduction

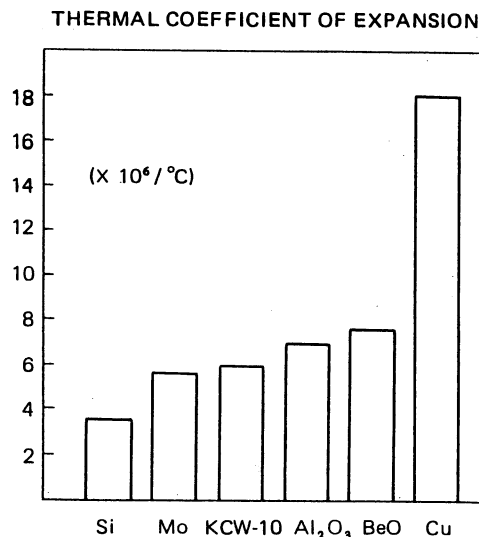
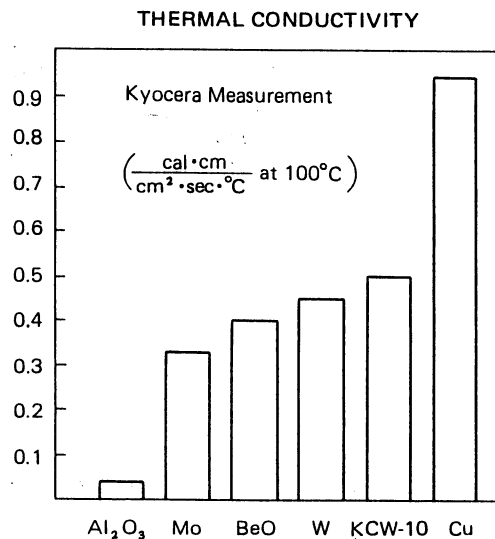
Kyocera is utilizing a new heat sink material to enhance thermal dissipation of semiconductor packages. It is a compound alloy of 10% copper and 90% tungsten. The heat sink is brazed to the alumina body with a silver-copper eutectic. Kyocera's designation for this material is KCW-10.

Combining the superior heat sink characteristics of KCW-10 with Kyocera packages provides the design engineers with a reliable package capable of high power dissipation.

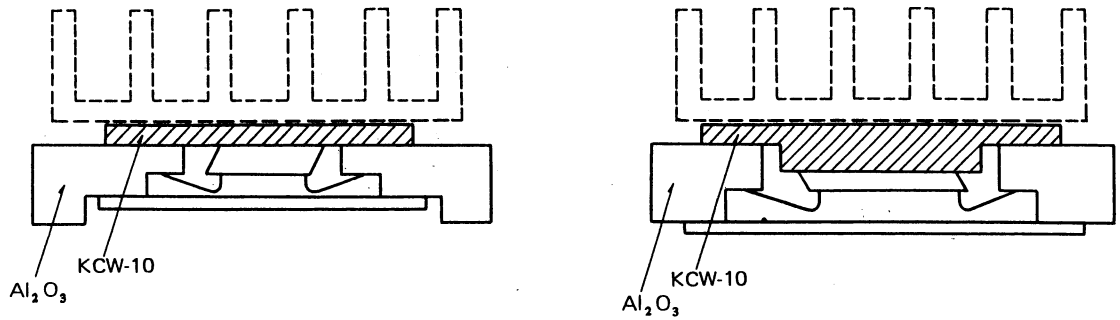
The features of KCW-10 are:

- Thermal coefficient of expansion (TCE) closely matches our alumina materials A473 white and A440 black.
- High thermal conductivity (20% better than Beryllia).
- Machinable to many shapes such as threaded stud, finned and stepped heat sinks.
- Electrically conductive.

2. Comparison of Material Options



3. Examples of Package Designs



4. Material Characteristics

Item		Material Code		
		KCW-10	A473	A440
Composition	%	Cu 10 W 90	Al ₂ O ₃ 92	Al ₂ O ₃ 90
Bulk Density	—	17.3	3.6	3.6
Specific Heat	cal/g·°C	0.05	0.19	0.20
Thermal Conductivity (100°C)	$\frac{\text{cal} \cdot \text{cm}}{\text{cm}^2 \cdot \text{sec} \cdot ^\circ\text{C}}$	0.50	0.04	0.04
T.C.E. (40–400°C)	X 10 ⁻⁶ /°C	6.0	6.9	7.0
Vickers Hardness (Load 500g = 17.64 oz)	Kg/mm ²	300	1,350	1,300
	X 10 ³ PSI	427	1,920	1,849
Flexural Strength	Kg/mm ²	108	32	28
	X 10 ³ PSI	154	46	40
Tensile Strength	Kg/mm ²	50.2	—	—
	X 10 ³ PSI	71	—	—
Young's Modulus of Elasticity	X 10 ³ Kg/mm ²	34	27	26
	X 10 ⁶ PSI	48	38	37
Electrical Resistivity (20°C)	μΩ·cm	6.58	—	—
Ref: IACS Resistivity	%	26	—	—