

TABLE 1. Properties of traditional and selected advanced thermal management materials (xy – in-plane; z – through-plane).

TRADITIONAL MATERIALS	THERMAL CONDUCTIVITY (W/m-K)	CTE (ppm/K)	DENSITY (g/cm³)
Copper	400	17	8.9
Aluminum	218	23	2.7
Kovar	17	5.9	8.3
Copper/tungsten	157-190	5.7-8.3	15-17
Invar/silver	153	6.5	8.8
Continuous carbon fiber/aluminum	290 xy-218	-1-+162	2.3-2.6
Discontinuous carbon fiber/aluminum	185xy	6.02	2.5
Discontinuous carbon fiber/epoxy	20-290xy	4-72	1.6-1.8
Silicon/aluminum	126-160	6.5-17	2.5-2.6
SiC particle/aluminum (Al/SiC)	170-220	6.2-16.2	2.8-3.0
Beryllia particle/beryllium	240	6.1	2.6
Natural graphite/epoxy	370xy	-2.42	1.94
Discontinuous carbon fiber/copper	300xy	6.5-92.5	6.8
Continuous carbon fiber/SiC	370xy	2.52	2.2
ADVANCED MATERIALS			
Highly Oriented Pyrolytic Graphite	1300-1700	-1.02	2.3
Thermal Pyrolytic Graphite	1500xy-20z		
Natural graphite	500xy-150 z	–	–
Diamond particle/aluminum	550-600	7.0-7.5	3.1
Diamond particle/copper	600-1200	5.8	5.9
Diamond particle/SiC	600	1.8	3.3