

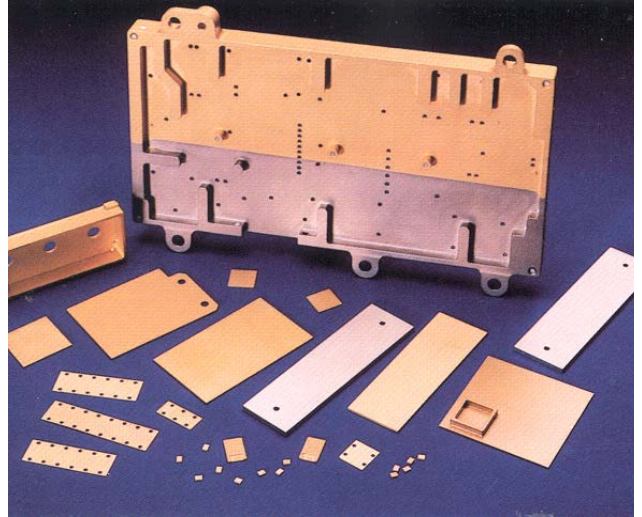
BERYLLIUM METAL MATRIX COMPOSITES FOR ELECTRONIC PACKAGING

Electronic packaging materials from Materion Ceramics are high performance beryllium metal matrix composites that have tailorable thermal, physical and mechanical properties. Our “E-Materials” are ideally suited for electronic packaging applications that require CTEs matched to ceramic chip carriers while providing high thermal conductivity and low weight.

APPLICATIONS

SMT

Surface Mount Technologies often require thermal cores that conduct heat away from the components as well as constrain the die. Materion Ceramics’ E-materials meet both conditions, driving the overall CTE of the assembly down to $<9.0\text{pp}/^\circ\text{C}$. At the same Time, these materials provide high thermal conductivity to reduce the junction temperatures.



RF/Microwave

Advanced RF/Microwave package bases require improved heat transfer due to higher packaging densities, CTE matches to the ceramic package and the low weight requirements of avionics applications. E-Materials have 35% higher thermal conductivity than AlSiC (65% SiC) are 75% lighter than Kovar with five time’s lower amplitude than AlSiC, and a CTE to match Gallium Arsenide and Ceramic package substrates like Al^2O^3 or AlN.



For soldering the package down to the base, E-Materials can be nickel, gold, silver, copper, tin or cadmium plated for this and other applications in the electronic packaging world. E-Materials can also be soldered by AuGe or AuSn to provide a hermetic package where required.

Machinability

E-Materials can be machined by conventional processes. For E20, carbide cutters are recommended. For E40 and E60 grades, EDM laser or diamond machining can be used. The materials can be vacuum-brazed to conventional ring frame materials.

AVAILABILITY

E-Materials are production materials and come in a variety of sizes. Typical thicknesses range from 0.018” (0.457mm) to 1.00” (25.4mm); widths from 0.250” (0.635mm) to 12” (305mm) and lengths up to 12” (305mm). Flatness: Typical flatness is <0.0007 inch (0.0178mm/25.4mm). Surface Finish: Typical is 63 Ra but $<32\text{Ra}$ can be achieved.

MAE-001

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PROPERTIES OF MATERIALS USED FOR MICROELECTRONIC PACKAGES

Material	Density g/cc (Lbs/cu in)	eModulus GPA(Msi)	Thermal Conductivity W/m/°K	CTE ppm/°C avg 25.50°C
Be/BeO Composites				
E20	2.06 (.07)	303 (44)	210	8.7
E40	2.30 (.084)	317 (46)	220	7.5
E60	2.52 (.091)	330 (48)	230	6.1
AlSiC~70%*	3.01 (.111)	220 (32)	~170*	6.7
AlSiC~45/55%	2.95 (.109)	195 (28)	160	8.5
Kovar	8.1 (.300)	140(20)	14	5.9
CuMoCu 13/74/13%	9.9 (.360)	269(39)	181	5.8
CuW-25/75%	14.8 (.583)	228 (34)	190	8.3
Aluminum 6061T6	2.75 (.100)	70 (10)	170	23.6

*Approximate

Note: Handling beryllium metal in solid form poses no special health risk. Like many industrial materials, beryllium-containing materials may pose a health risk if recommended safe handling practices are not followed. Inhalation of airborne beryllium may cause a serious lung disorder in susceptible individuals. The Occupational Safety and Health Administration (OSHA) has set mandatory limits on occupational respiratory exposures. Read and follow the guidance in the Material Safety Data Sheet (MSDS) before working with this material. For additional information on safe handling practices or technical data on Beryllium, contact Materion.