CPS Technologies

AlSiC with High Thermal Conductivity Pyrolytic Graphite

AlSiC Pyrolytic Graphite Composite

- ***CTE – 50% of Cu at 8.5 ppm/°C***
- ***TC – 200% of Cu at 1000 W/mK[1]***
- ***Density – 33% of Cu at 3.0 g/cm^3***

AlSiC

- Low thermal expansion compatible with electronics and dielectric substrates
- Lightweight, high strength and stiffness composite
- Functional net shape cast design
- Provides a hermetic, strong envelope material for low strength, environmentally sensitive pyrolytic graphite

Pyrolytic Graphite

- Lightweight material that provides high heat spreading, 1300 W/mK in X,Y plane; 30 W/mK in Z direction

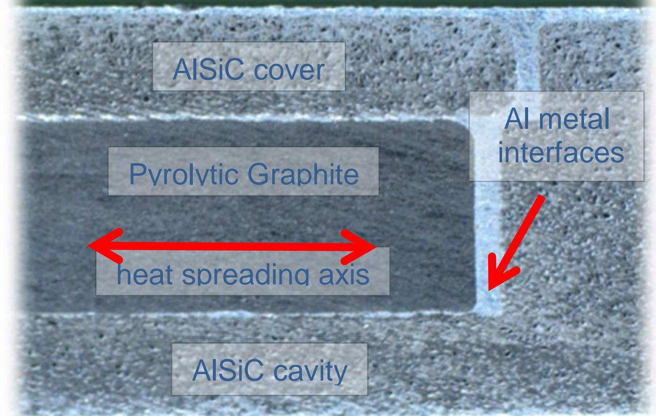
AlSiC/Pyrolytic Composite

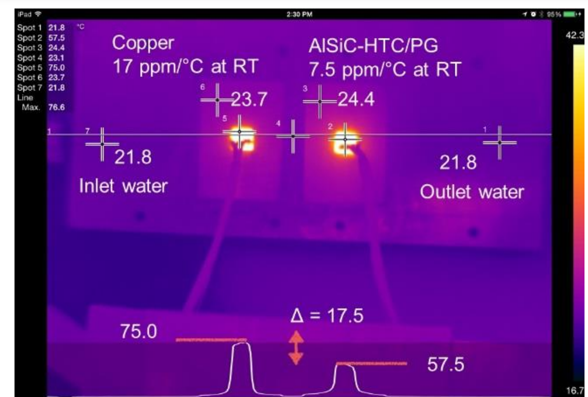
- Has an effective thermal conductivity of 1000 W/mK[1]

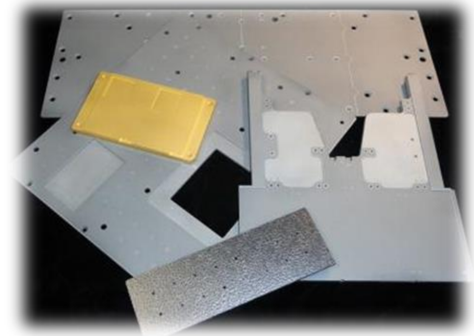
Applications

- Radar systems
- Airborne & Space electronics
- Edge-cooled / Conduction-cooled electronics
- Lightweight passive cooling mobile applications

[1] heat dissipation will be a function of design and thermal path







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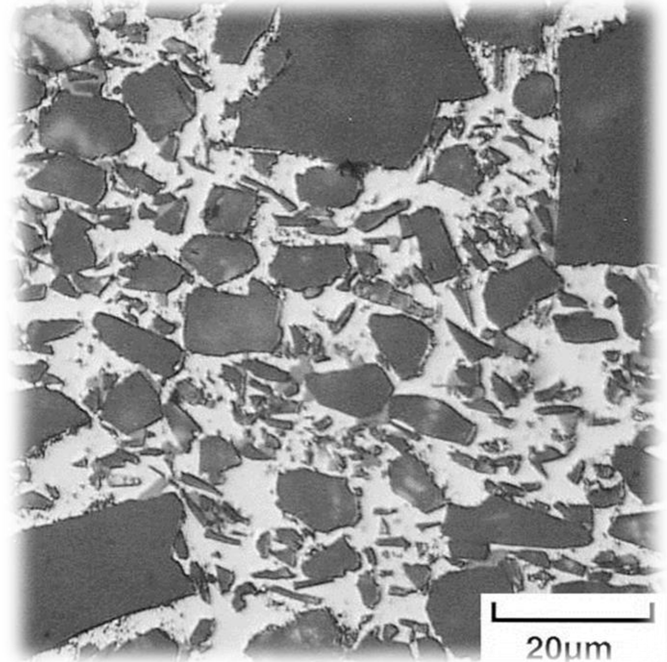
AlSiC 9 w/HTC PG Material Properties

CPS AlSiC combines aluminum metal and silicon carbide particulates to obtain material properties ideally suited for high power and high reliability IGBT modules for motor controllers, power conversion and hybrid and electric vehicle applications.

The AlSiC material CTE value is compatible with DBC aluminum nitride such that it will withstand many thousands of thermal cycles without delamination (a common failure in copper baseplate equivalents) for long service life and high reliability.

Assembly and performance will be optimized by reducing substrate thickness and decreasing solder layer thickness. With these optimizations, AlSiC will provide equivalent or improved thermal performance over copper based assemblies.



	AlSiC-9 with HTC-PG
Aluminum Alloy 356	37 vol%
Silicon Carbide (electronic grade)	63 vol%
Density (g/cm^3)	< 3.
Thermal Conductivity (W/mK) @25°C	Up to 1000 W/mK Potential heat dissipation will be a function of design and thermal path
Specific Heat (J/gK) @ 25°C	0.741
Thermal Expansion (CTE) ppm/°C	
30 – 100°C	8.00 σ = 0.26
30 – 150°C	8.37 σ = 0.26
30 – 200°C	8.75 σ = 0.27
AlSiC Young's Modulus (GPa)	188
AlSiC Shear Modulus (GPa)	76
AlSiC Strength (MPa) a-bar 4pt-bend	488
AlSiC Percent Elongation at Rupture	0.295
AlSiC Fracture Toughness	11.3
AlSiC Electrical Resistance (μOhm-cm)	20.7
AlSiC Hermeticity (atm-cm^3/s He)	< 10^{-9}

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