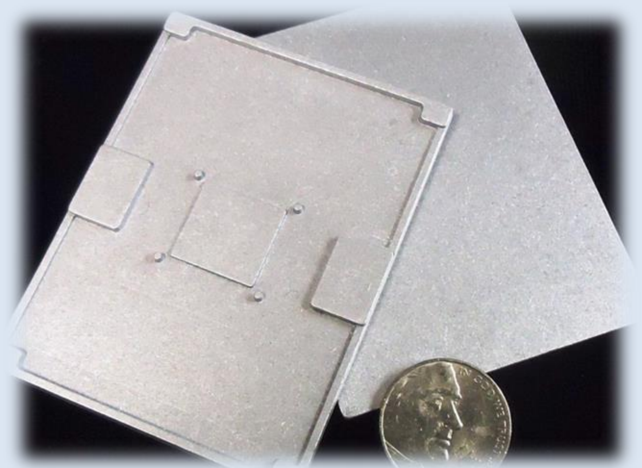
CPS TECHNOLOGIES

AlSiC Microprocessor Applications



Thermal Management

- Controlled thermal expansion compatible with die or substrates
- High thermal conductivity with controlled CTE improves thermal dissipation

Net Shape Casting Technology

- Tight dimensional control of cavity depth
- Complex shapes without machining
- Cost effective, high volume manufacturing

Lightweight Material

- Large formats (>50 mm square) possible with little weight penalty
- Reduces weight per solder ball in BGAs

High Strength, High Stiffness

- Reduces assembly warping
- Thinner bond line with reproducible thickness

.

CPS Technologies Corporation
111 South Worcester Street, Norton, MA 02766
508 222-0614

www.alsic.com

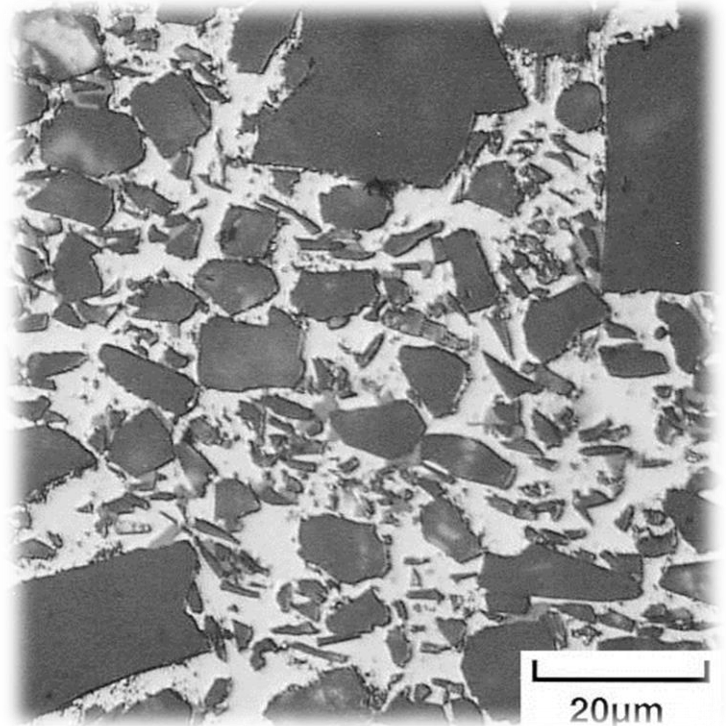
CPS TECHNOLOGIES

AlSiC Material Properties

CPS AlSiC combines aluminum metal and silicon carbide particulates to obtain material properties ideally suited for Flip Chip and Microprocessor Lids that require good thermal conductivity and a compatible thermal expansion for thermal management.

Thermal management also requires shape and stiffness to maintain a thin TIM1 bond line during product life. A stiff lid will control warping and bowing during assembly to improve solder attachment; it also reduces warping during cycling to maintain a thin TIM1 bond line for the best thermal dissipation and device performance.

AlSiC is a lightweight lid material that reduces weight per solder ball and will make a package insensitive to orientation dependence. Large format lids can be considered with AlSiC which enable integrated SIP designs.



	AlSiC-9	AlSiC-12
Aluminum Alloy 356	37 vol%	63 vol%
Silicon Carbide (electronic grade)	63 vol%	37 vol%
Density (g/cm^3)	3.01	2.89
Thermal Conductivity (W/mK) @25°C	190 typical (180 W/mK min)	180 typical (170 W/mK min)
Specific Heat (J/gK) @ 25°C	0.741	0.808
Thermal Expansion (CTE) ppm/°C		
30 – 100°C	8.00 σ = 0.26	10.9 σ = 0.25
30 – 150°C	8.37 σ = 0.26	11.2 σ = 0.25
30 – 200°C	8.75 σ = 0.27	11.7 σ = 0.25
Young's Modulus (GPa)	188	167
Shear Modulus (GPa)	76	69
Strength (MPa) a-bar 4pt-bend	488	471
Percent Elongation at Rupture	0.295	N/A
Fracture Toughness	11.3	N/A
Electrical Resistance (µOhm-cm)	20.7	20.7
Hermeticity ($atm\text{-}cm^3/s$ He)	$< 10^{-9}$	$< 10^{-9}$

CPS Technologies Corporation
111 South Worcester Street, Norton, MA 02766
508 222-0614

www.alsic.com

CPS TECHNOLOGIES

AlSiC with High Thermal Dissipation 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

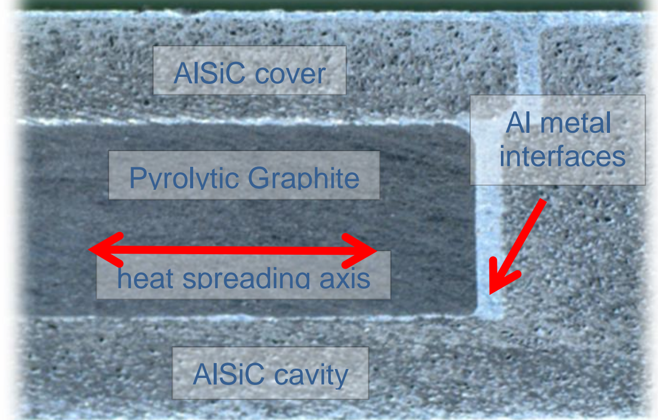
AlSiC/Pyrolytic Composite

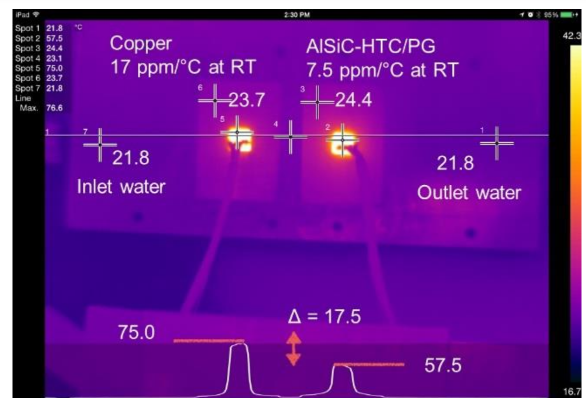
- Has an effective thermal conductivity of 1000 W/mK[1]

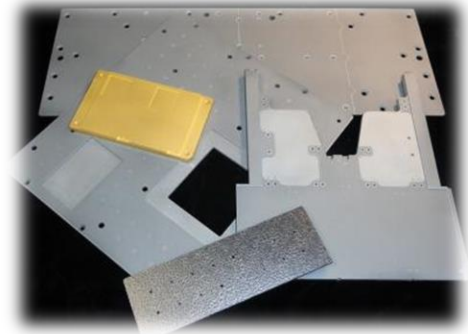
Applications

- 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







CPS Technologies Corporation
111 South Worcester Street, Norton, MA 02766
508 222-0614
www.alsic.com