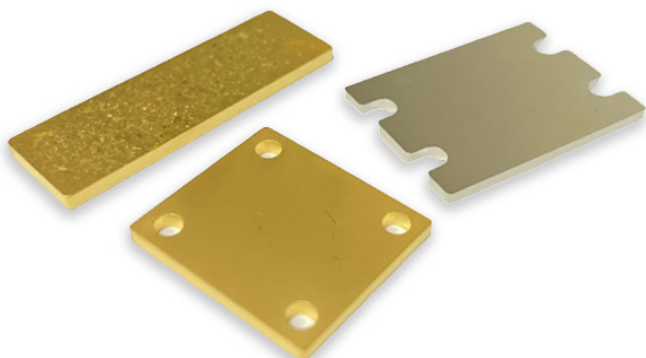


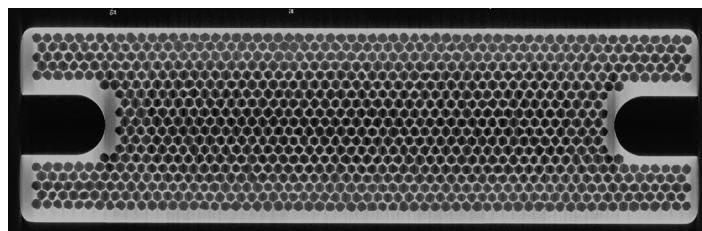
Cu-Diamond

A high-performance copper-diamond composite for demanding thermal management applications

Element Six (E6) is the world's leading provider of diamond-enabled technical solutions. We supply a range of diamond materials for demanding thermal management applications, including a market-leading copper-diamond composite. Formed by a unique manufacturing process, this material has a thermal conductivity and coefficient of thermal expansion between copper and diamond and is an ideal choice of heat spreader for a range of high-power density semiconductor device applications, including: high end AI chips for high performance computing, RF power amplifiers for defense and wireless communications, power modules for reliable power conversion, and high power semiconductor lasers.



Cu-Diamond samples



X-ray image showing distribution of diamond grit particles within a Cu-Diamond heat spreader

Properties

Volume fraction of diamond	45±5%	35±5%
Thermal conductivity (TC) at 300 K ($\text{W m}^{-1} \text{K}^{-1}$)	1000	800
Coefficient of Thermal Expansion (CTE)		
300 K (ppm K^{-1})	7.2	8.5
500 K (ppm K^{-1})	8.4	9.7
700 K (ppm K^{-1})	9.3	10.5
Minimum thickness (mm)	2.0	0.35

Advantages

- Reduces thermal management bottlenecks
- Improves thermal performance of the device package
- Increases device reliability
- Enhances output power
- Maintains performance and structural integrity after thermal cycle testing
- TC and CTE can be tuned by varying the copper-diamond composition

Availability

Cu-Diamond can be supplied in sizes ranging from a few mm to several cm, and can be coated with thin metal layers, such as Au and Ni, allowing for compatibility with standard die attach bonding. Complex shapes and features, such as holes, steps and curves, can be produced according to customer requirements. Further details are available upon request.



Element Six is a global leader in the development and production of synthetic diamond and tungsten carbide solutions. For over 70 years, our innovation expertise has enabled a wide range of industries, from aerospace and mining, to semiconductors and sensing. Part of the De Beers Group, our primary manufacturing sites are located in the US, UK, Ireland, Germany and South Africa. Our sites in Ireland and Germany are ISO 50001 certified.

Through the Anglo American and De Beers Groups, Element Six is a member of the UN Global Compact (UNGC). The UNGC drives business awareness and action towards the UN Sustainable Development Goals (SDGs), focussing on 10 principles around human rights, labour, environment and anti-corruption. Element Six works within the De Beers Group Building Forever commitment and Science Based Target Initiative (STBi), which is also based on the UNGC principles.

We incorporate and take responsibility for these principles through the Element Six Code of Conduct, Our Values, Responsibilities and Policies.

At Element Six, we have active communities working towards sustainability from a variety of angles, such as environmental impact, inclusion, diversity and community outreach, both internally and externally.

Contact us

Europe

Customer Services

T +44 1344 638 200

E technologies@e6.com

Americas*

T +1 408 986 2400

E ustechnologies@e6.com

*Registered with the Department of State for handling ITAR sensitive and controlled defense projects.

© Element Six. 2024

ELEMENTSIX and the e6 logo are trade marks of the Element Six Group.

e6.com | e6cvd.com

