elementsix™

DE BEERS GROUP

Diafilm™ TM

CVD diamond the ultimate semiconductor thermal management solution

Our customized CVD diamond enables system size reduction, improved reliability and the opportunity to design higher power systems within an existing module footprint

Diamond singulated heat spreaders
The optimal thermal solution

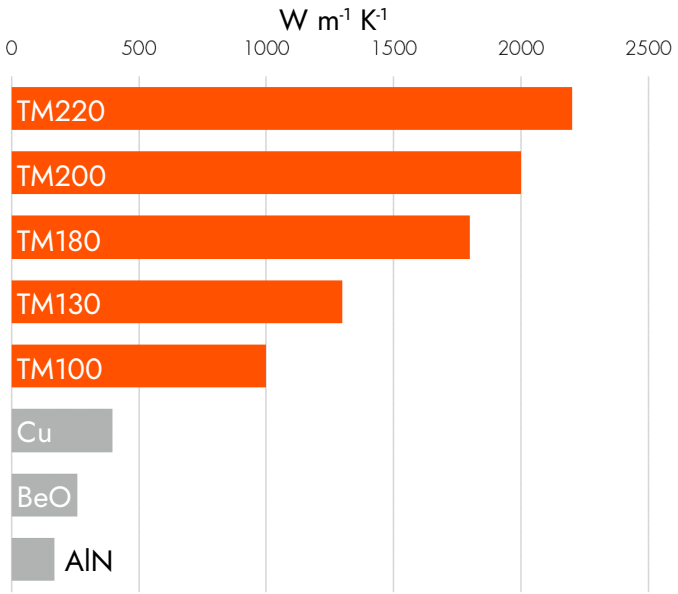
Diafilm™ TM is a proven thermal management material ideal for high-power RF, optoelectronic and high-voltage power semiconductor devices. It reduces thermal gradients near a device, making heat sinks more efficient and allows high power devices to be used without increasing the system size or reducing the operating ambient temperature.

Diafilm™ TM singulated heat spreaders can:

- Lower device temperatures
- Improve reliability
- Expand performance capability

Diafilm™ TM outperforms other commercially available heat spreader materials, with the highest known thermal conductivity of any solid material at room temperature.

Thermal conductivity



Advantages of Diafilm™ TM microwave CVD diamond heat spreaders

- Highest thermal conductivity of any material
- Electrically insulating
- Five levels of thermal conductivity available
- Range of sizes, thicknesses, and metalizations available
- Broad range of die bonding solutions
- Available in diameters up to 130 mm

Property	Diafilm TM100	Diafilm TM130	Diafilm TM180	Diafilm TM200	Diafilm TM220
Thermal conductivity					
@ 300K ($W\ m^{-1}\ K^{-1}$)	>1000	>1300	>1800	>2000	>2200*
@ 425K ($W\ m^{-1}\ K^{-1}$)	>900	>1200	>1500	>1500	>1620
Thermal expansion coefficient					
@ 300K ($ppm\ K^{-1}$)	1.10 ± 0.1	1.10 ± 0.1	1.10 ± 0.1	1.10 ± 0.1	1.10 ± 0.1
@ 1000K ($ppm\ K^{-1}$)	4.4 ± 0.1	4.4 ± 0.1	4.4 ± 0.1	4.4 ± 0.1	4.4 ± 0.1
Thermal diffusivity					
@ 300K ($cm^2\ s^{-1}$)	>5.5	>7.2	>10.0	>11.1	>12.2
Specific heat capacity					
@ 300K ($J\ kg^{-1}\ K^{-1}$)	520	520	520	520	520
Hardness					
Gpa	81 ± 18	81 ± 18	81 ± 18	81 ± 18	81 ± 18
Fracture toughness					
($MPa\ m^{0.5}$)	5.3 - 7.0	5.3 - 7.0	5.3 - 7.0	5.3 - 7.0	5.3 - 7.0
Young's modulus					
(GPa)	1050	1050	1050	1050	1050
Poisson's ratio	0.1	0.1	0.1	0.1	0.1
Density					
($10^3\ kg\ m^{-3}$)	3.52	3.52	3.52	3.52	3.52

* Measured at 293 K

Going beyond today's technical boundaries

Diafilm™ TM's superior thermal conductivity presents unprecedented reductions in junction temperature, while maintaining the same power level. This offers engineers the opportunity to create more economical and reliable systems.

Modelling and analysing proposed solutions

Our engineers and technologists use the latest computer modelling systems to model and analyse every aspect of the thermal and mechanical properties of a proposed application.

We recommend and provide the optimal size, shape and thickness, and work with customers to most effectively integrate diamond into their applications.

Contact us to find out more

Americas
T +1 408 986 2410
E ustechnologies@e6.com

Europe
T +44 1344 638 200
E technologies@e6.com

e6.com