

ELECTRONICS

*Diafilm™*



# 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 and/or operating temperature.*

# DIAMOND SINGULATED HEAT SPREADERS THE OPTIMAL THERMAL SOLUTIONS

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

Diafilm TM singulated heat spreaders can:

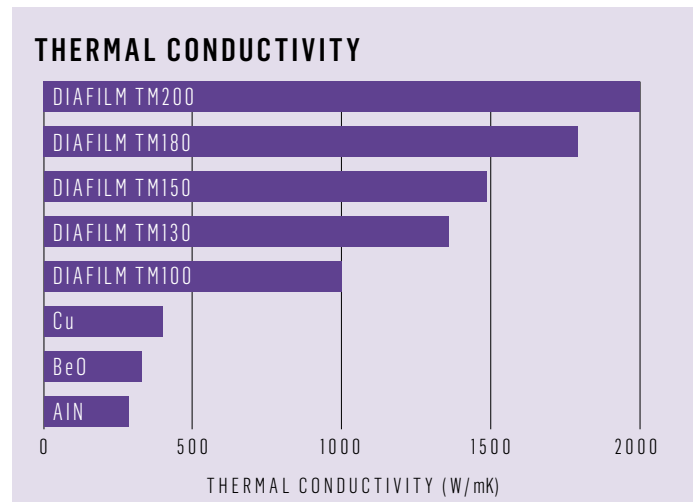
- Lower device temperatures
- Improve reliability
- Expand performance capability

PROPERTY	DIAFILM TM100	DIAFILM TM130	DIAFILM TM150	DIAFILM TM180	DIAFILM TM200
<b>THERMAL CONDUCTIVITY</b>					
@ 300 K (W/mK)	>1000	>1300	>1500	>1800	>2000
@ 425 K (W/mK)	>900	>1200	>1400	>1500	>1500
<b>THERMAL EXPANSION COEFFICIENT</b>					
@ 300 K (ppm/K)	1.0 ± 0.1	1.0 ± 0.1	1.0 ± 0.1	1.0 ± 0.1	1.0 ± 0.1
@ 1000 K (ppm/K)	4.4 ± 0.1	4.4 ± 0.1	4.4 ± 0.1	4.4 ± 0.1	4.4 ± 0.1
<b>THERMAL DIFFUSIVITY</b>					
@ 300 K (cm <sup>2</sup> /s)	>5.5	>7.2	>8.3	>10.0	>11.1
<b>SPECIFIC HEAT CAPACITY</b>					
@ 300 K (J/kgK)	520	520	520	520	520
<b>VICKERS HARDNESS</b>					
@ 300 K (kg/mm <sup>2</sup> )	8000± 1900	8000± 1900	8000± 1900	8000± 1900	8000± 1900
<b>FRACTURE TOUGHNESS</b>					
(MPam <sup>0.5</sup> )	5.3 - 7.0	5.3 - 7.0	5.3 - 7.0	5.3 - 7.0	5.3 - 7.0
<b>YOUNG'S MODULUS</b>					
(GPa)	1000 - 1100	1000 - 1100	1000 - 1100	1000 - 1100	1000 - 1100
Poisson's ratio	0.1	0.1	0.1	0.1	0.1
<b>DENSITY</b>					
(10 <sup>3</sup> kg/m <sup>3</sup> )	3.52	3.52	3.52	3.52	3.52

## FIND OUT MORE ABOUT DIAFILM TM

Contact your nearest Element Six technical representative: call +1 408 986 2400, email [ustechnologies@e6.com](mailto:ustechnologies@e6.com) or visit our website [www.e6.com/thermal](http://www.e6.com/thermal)

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



## 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 140 mm

## 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.

## MODELING AND ANALYZING PROPOSED SOLUTIONS

Our engineers and technologists use the latest computer modeling systems to model and analyze 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.