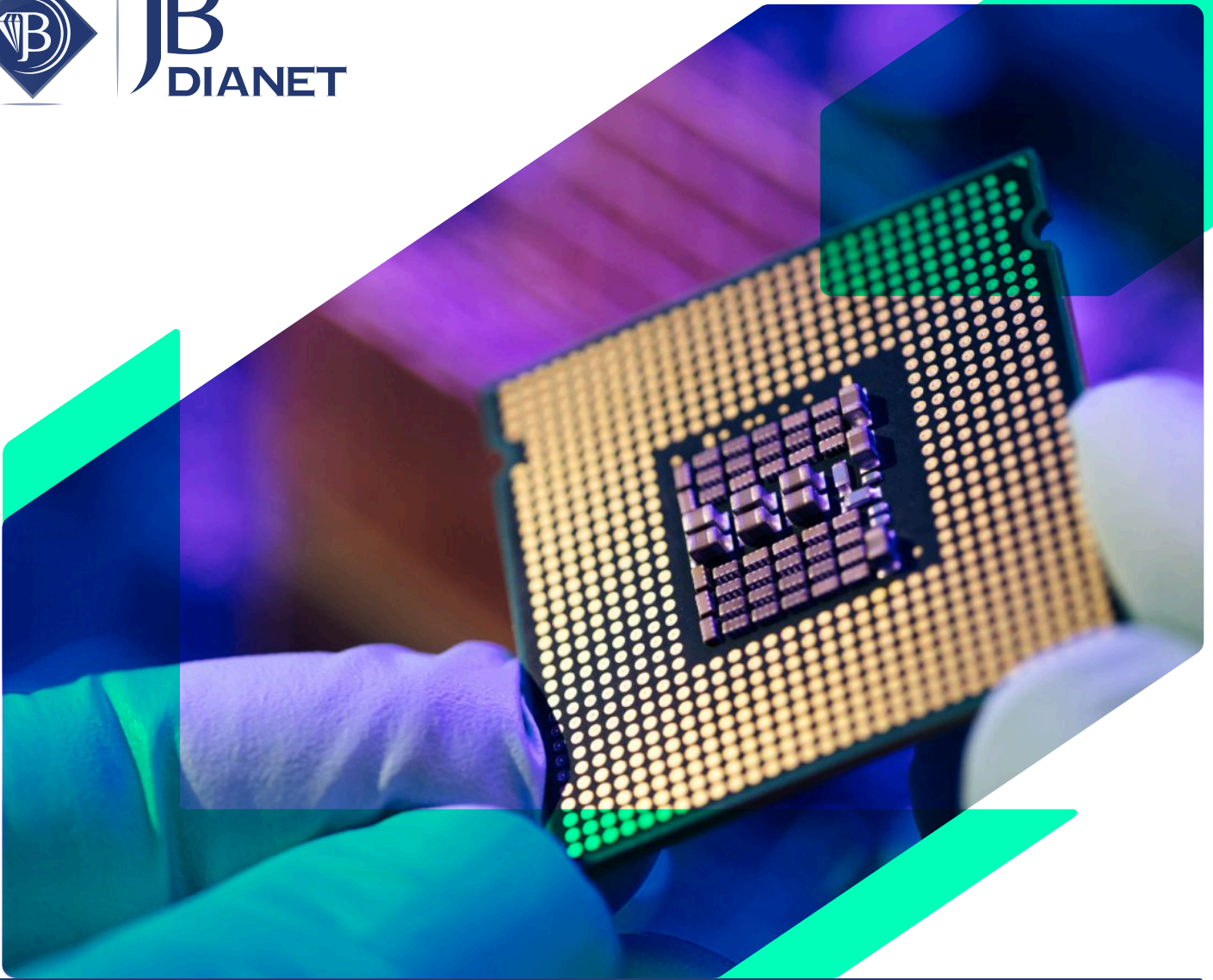




JB
DIANET



CVD Diamond for **Semiconductors & Quantum Computing**

JB Dianet has developed semiconductor-grade CVD diamonds, offering superior thermal conductivity and electrical insulation. These diamonds are ideal for high-power electronics and advanced quantum computing applications.

CVD Diamonds: A Solution for Semiconductor Industries

Chemical Vapor Deposition (CVD) diamonds are rapidly emerging as a game-changing material in the semiconductor industry. Known for their exceptional physical and thermal properties, CVD diamonds are playing a crucial role in advancing high-performance electronics, power devices, and quantum computing. JB Dianet has developed semiconductor-grade CVD diamonds that offer significant advantages over traditional materials like silicon, silicon carbide (SiC), and gallium nitride (GaN).

Here’s a comparison table that highlights the differences between Diamond, Silicon (Si), Silicon Carbide (SiC), and Gallium Nitride (GaN) in semiconductor applications:

Property	Diamond (CVD)	Silicon (Si)	Silicon Carbide (SiC)	Gallium Nitride (GaN)
Thermal Conductivity	2000–2200 W/m·K	150 W/m·K	490 W/m·K	130 W/m·K
Bandgap	5.5 eV	1.1 eV	3.26 eV	3.4 eV
Breakdown Electric Field	10 MV/cm	0.3 MV/cm	3 MV/cm	3.3 MV/cm
Carrier Mobility (Electrons)	4500 cm ² /V·s	1400 cm ² /V·s	900 cm ² /V·s	1500 cm ² /V·s
Carrier Mobility (Holes)	3800 cm ² /V·s	450 cm ² /V·s	N/A	N/A
Thermal Expansion Coefficient	1–2 × 10 ⁶ /K	2.6 × 10 ⁶ /K	4.7 × 10 ⁶ /K	5.59 × 10 ⁶ /K
Maturity of Technology	Emerging	Mature	Growing	Growing
High-Temperature Capability	Excellent	Moderate	High	High



Our Products

Product Description

Our semiconductor-grade CVD diamonds are specifically designed to meet the stringent demands of the semiconductor industry, providing exceptional thermal conductivity, electrical insulation, and mechanical durability. These diamonds are manufactured using advanced Chemical Vapor Deposition (CVD) technology and are optimized for use in high-power electronic devices, quantum computing, and thermal management applications.

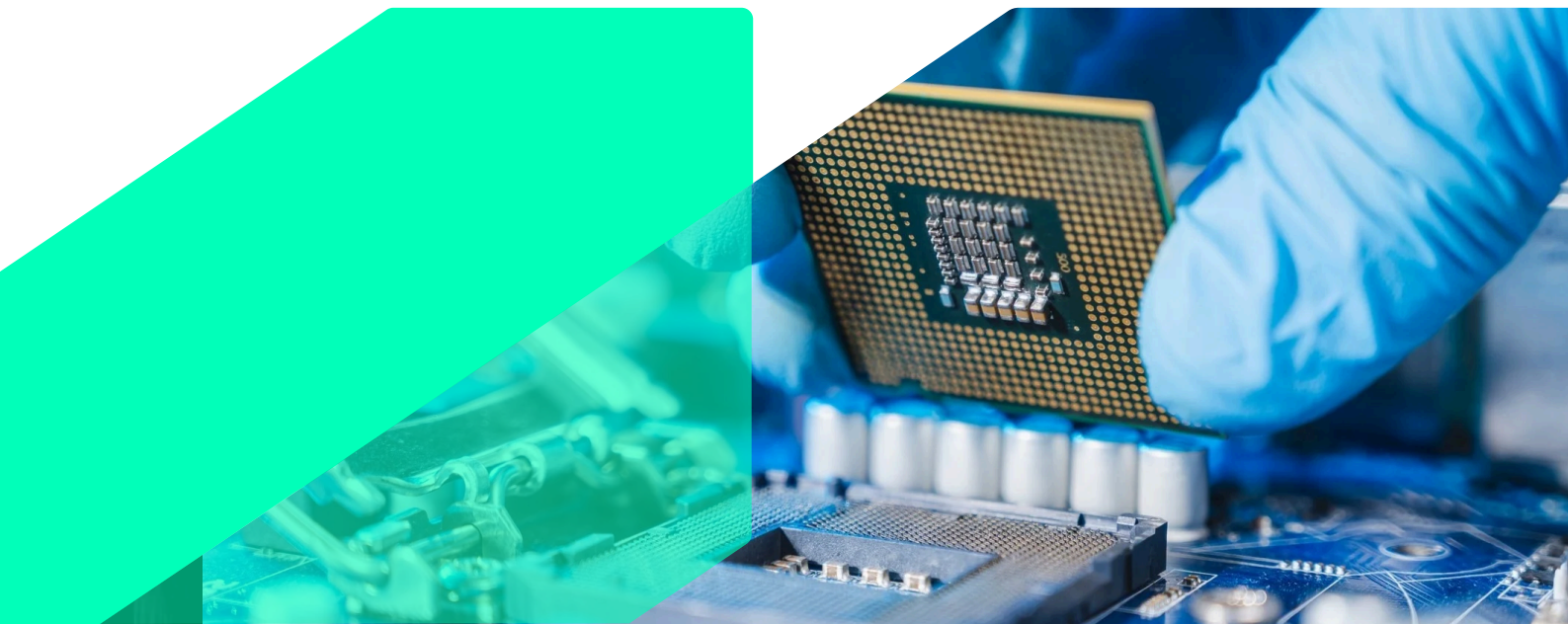


⦿ Specifications and Tolerances

- Edges : Laser Cut
- Face / Surface Orientation : 100
- Laser Kerf : 3°
- Lateral Tolerance : +0.2/-0 mm
- Side 1 Roughness Ra : polished, Ra <2 - 30 nm
- Side 2 Roughness Ra : polished, Ra <2 - 30 nm
- Thickness Tolerance : +/- 0.05 mm
- Thickness Dimension : 0.3-0.5mm

⦿ Material Properties

- Nitrogen Concentration : < 5 ppb (Optional) N2 Controlled based on Requirements
- Boron Concentration : 3×10^{17} to 3×10^{23} (Optional) Atoms/Cm³ Br Controlled based on Requirements



Benefits of CVD Diamonds in Semiconductors:

- **Enhanced Heat Dissipation** : Superior thermal conductivity ensures efficient heat removal in high - power devices.
- **High-Voltage Tolerance** : Wide bandgap and high breakdown voltage make CVD diamonds ideal for high-voltage power electronics.
- **Durability** : Mechanical hardness and chemical inertness ensure long-term reliability in harsh environments.
- **High-Speed Switching** : CVD diamonds support faster switching speeds in RF and high-frequency applications.
- **Room-Temperature Quantum Operation** : CVD diamonds enable the development of practical, room-temperature quantum computing devices.

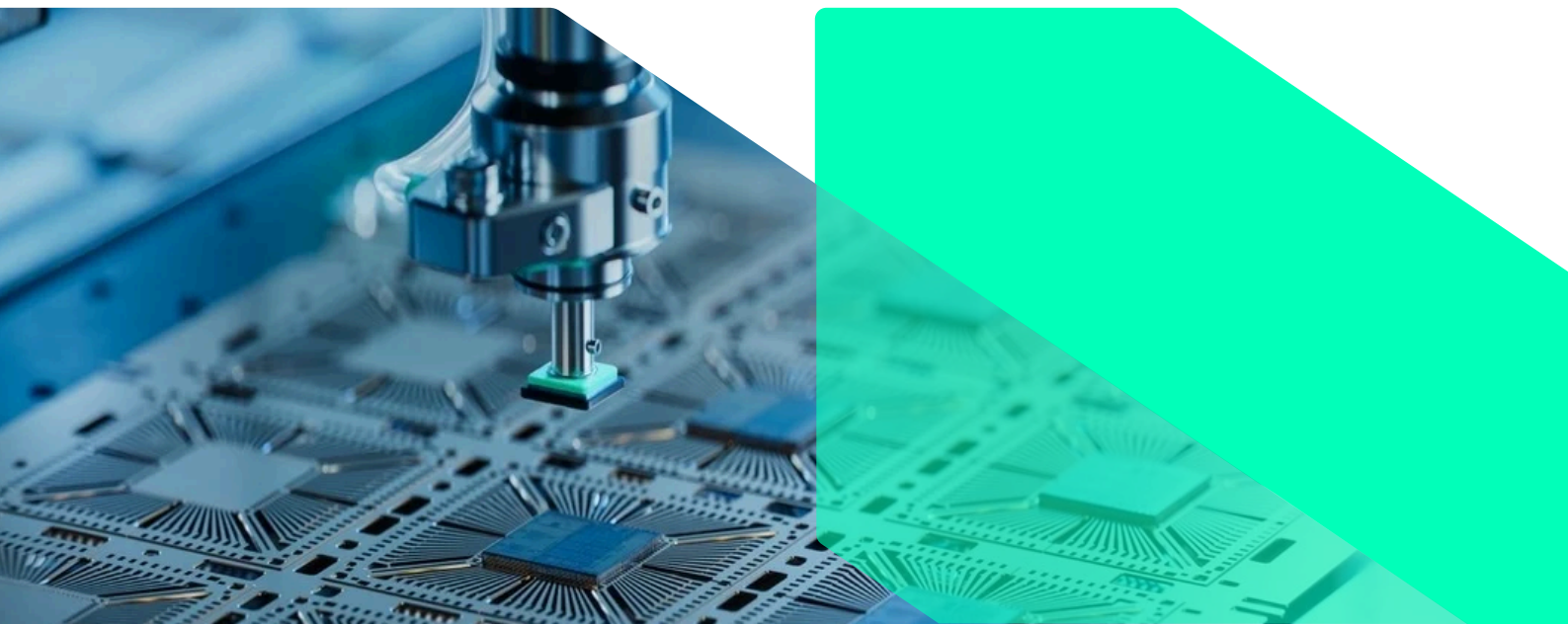
Our Expertise

Advanced CVD Diamond Production:

Leveraging cutting-edge CVD technology, we produce both polycrystalline and single-crystal diamonds that are engineered for semiconductor applications. These diamonds offer exceptional thermal conductivity and mechanical strength, making them ideal for high-performance semiconductor devices.

Specialized Team:

At JB Dianet, our team of experts, including scientists, engineers, and material specialists, ensures that every diamond produced meets the stringent requirements of the semiconductor industry, enabling solutions for advanced power electronics, high-frequency devices, and quantum computing.



Applications of CVD Diamonds in Semiconductor Devices

Power Electronics

Superior thermal conductivity enables efficient heat dissipation in IGBTs, Schottky diodes, and power transistors, enhancing their performance and longevity.

High-Frequency Devices

CVD diamonds support faster switching speeds and higher frequencies in RF amplifiers and microwave devices due to their wide bandgap and high electron mobility.

Quantum Computing

Nitrogen-vacancy (NV) centres in CVD diamonds serve as qubits for quantum processors and sensors, operating at room temperature with long coherence times.

Thermal Management

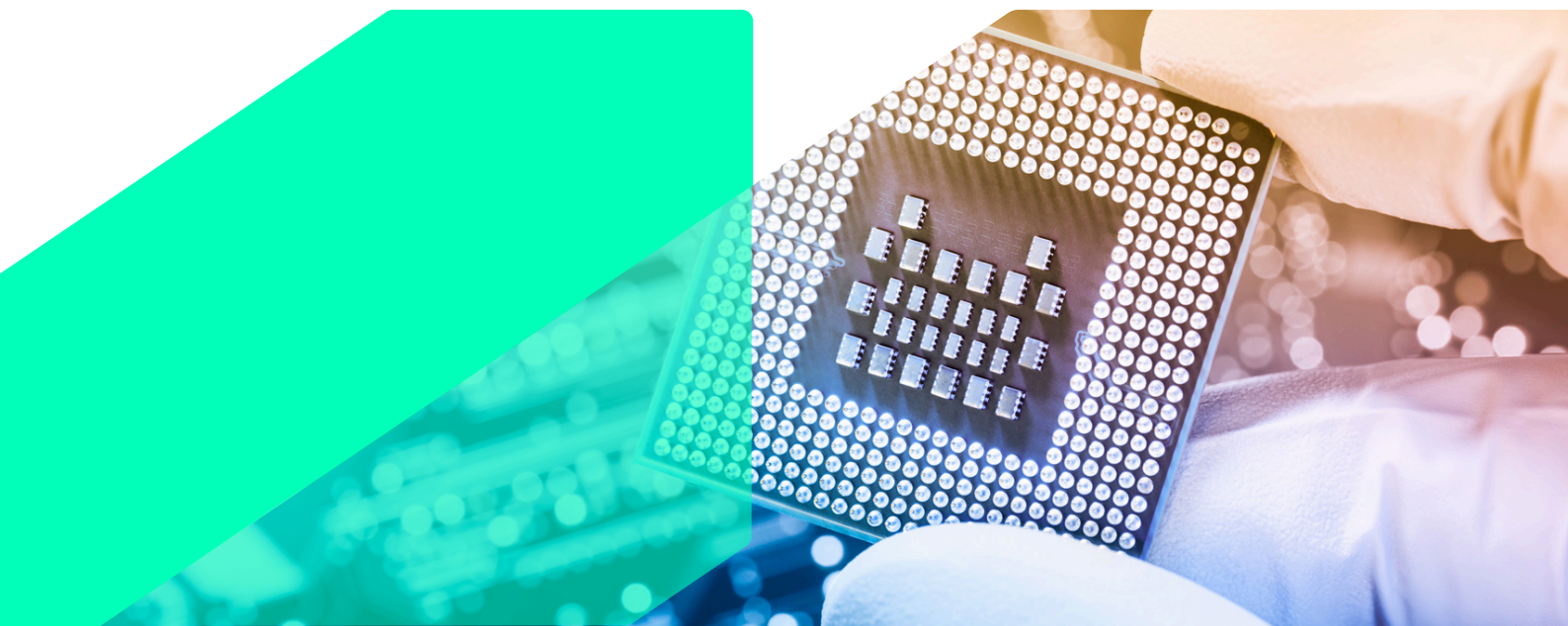
CVD diamonds are used as heat sinks and spreaders in high-power electronics and optoelectronic devices to manage heat efficiently.

Optoelectronics

In laser diodes and high-power LEDs, CVD diamonds improve thermal management, ensuring stable and long-lasting operation.

Wide Bandgap Semiconductor Devices

CVD diamonds enhance the thermal and electrical performance of wide bandgap materials like GaN and SiC, enabling higher efficiency, faster switching speeds, and improved reliability in high-power and high-frequency applications.



Why Collaborate with JB Dianet ?



Customization & Flexibility

We provide tailored CVD diamond solutions, adapting to specific technical requirements like shape, size, and thermal properties.



Quality & Reliability

Our products meet the highest industry standards, with stringent quality control ensuring consistent performance in demanding applications.



Collaborative Approach

We prioritize long-term partnerships, working with researchers, manufacturers, and industries to explore new uses for CVD diamonds.



Advanced Technology

We utilize the latest CVD technologies to deliver cutting-edge diamond materials with superior thermal and mechanical properties.



Scalability

Our facilities are equipped to handle both large-scale production and small-batch custom orders, ensuring we can meet the demands of any project size.



Expert Support

Our experienced team of scientists and engineers offers technical guidance and support throughout the development and integration process.

Contact us



info@jbdianet.com



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