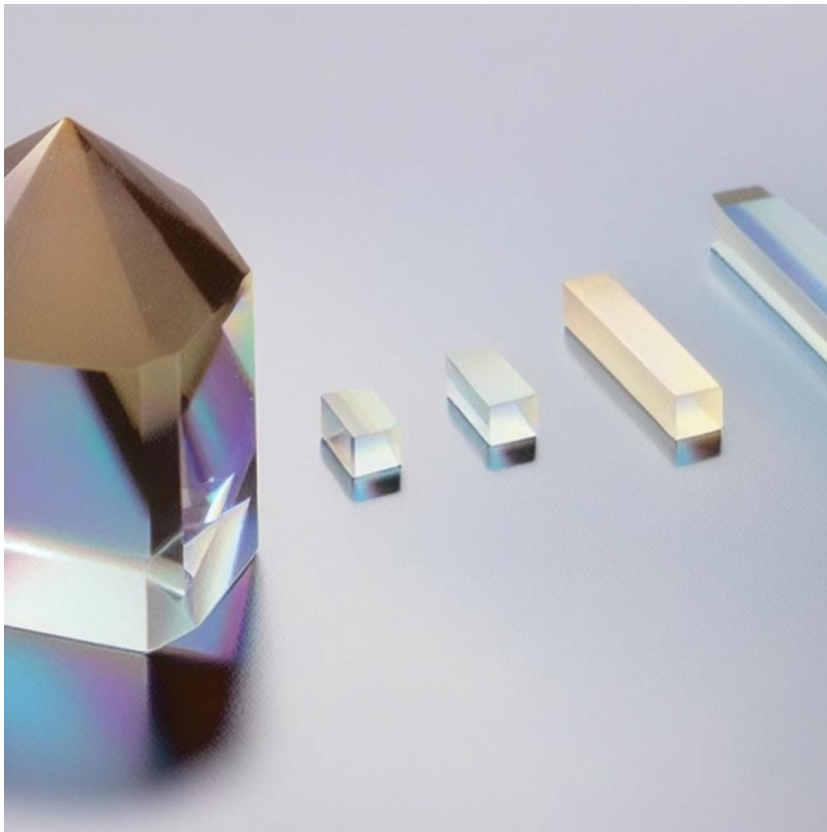


## POC-OC-122504-CVD Diamond Crystal Datasheet

### 1 Main Features

- High optical transparency from ultraviolet to infrared regions.
- Exceptional thermal conductivity for heat dissipation in high-power applications.
- High mechanical hardness and durability for demanding environments.
- Refractive index of 2.38 with low dispersion characteristics.
- Capability for custom fabrication and enhanced transparency coatings.



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### 2. Material General Description

Chemical Vapor Deposition (CVD) Diamond Crystal is an advanced material with exceptional physical, thermal, and optical properties. Produced under controlled conditions, CVD diamond leverages  $sp^2$  and  $sp^3$  hybridized bonds, resulting in unmatched mechanical strength and chemical stability. CVD diamonds can be synthesized as single crystals or polycrystalline layers, enabling diverse applications in optics, electronics, and laser systems.

Optical-grade polycrystalline CVD diamonds have low absorption rates in UV, visible, and IR wavelengths, making them excellent candidates for high-power laser optics. The material demonstrates superior thermal conductivity and hardness, extending its usability to extreme temperature ranges above 2000°C. POC offers high-quality single and polycrystalline diamonds tailored to meet specific optical and mechanical needs.

<https://www.poc.com.sg> Photonics on Crystals, A brand of *Shapeoptics Holdings*

Add: Prestige Centre, #09-10, 71 BUKIT BATOK CRESCENT, Singapore 658071 Tel: +65-90799669

### 3. General Applications and Examples

- **High-Power Laser Systems:** Suitable for windows, lenses, and optical components in high-power IR and UV laser systems.
- **Thermal Management Solutions:** Acts as a heat spreader in high-power electronic circuits and laser diodes due to its exceptional thermal conductivity.
- **Protective Coatings:** Provides mechanical durability for optics in harsh environments, including military-grade systems.
- **Spectroscopy and Infrared Applications:** Transparent in the IR range, allowing its use in spectroscopic windows for research and industrial instruments.
- **Diamond-based Quantum Technology:** Employed in applications requiring precise quantum properties, such as nitrogen-vacancy (NV) center-based sensors and quantum computing hardware.

### 4. Chemical, Physical, and Structural Properties

Property	Specification
Chemical Composition	Carbon (C)
Crystal Structure	Cubic
Density	3.5 g/cm <sup>3</sup>
Thermal Conductivity	2000 W/m·K
Refractive Index	2.38
Hardness (Mohs)	10
Operating Temperature Range	-100°C to 2000°C
Fracture Toughness	3.5 MPa·m <sup>1/2</sup>
Optical Transparency Range	225 nm to 25 μm
Enhanced Coating Transparency	>99%

### 5. Optical, Laser, and Nonlinear Optical Properties

Parameter	Specification
Laser Damage Threshold	>10 GW/cm <sup>2</sup>
Absorption Coefficient (10.6 μm)	<0.1 cm <sup>-1</sup>
Transparency	UV to far IR (225 nm to 25 μm)

Birefringence	None (Isotropic Material)
Refractive Index Stability	Excellent (2.38 across spectrum)

## 6. Spectrum Transmission Curves

CVD Diamond shows high transmission rates exceeding 90% across ultraviolet (225 nm), visible, and infrared wavelengths up to 25  $\mu\text{m}$ . Custom coatings can enhance transmission to >99%.

## 7. Coating Specification

- Anti-reflective (AR) coatings available for UV, visible, and IR ranges.
- Enhanced coating improves transparency to >99%.
- Coating durability tested under extreme environmental conditions.

## 8. Standard Fabrication Specifications

Specification	Details
Dimensions	Custom sizes up to 140 mm diameter
Thickness Tolerance	$\pm 0.1$ mm
Surface Quality	10-5 S-D (Scratch-Dig)
Parallelism	<1 arcminute
Chamfer	<0.2 mm at 45°
Flatness	< $\lambda/10$ @ 633 nm
Coating Options	AR, DLC, and custom coatings

## 9. POC Strength and Capabilities

- Expertise in sourcing high-quality CVD Diamond materials.
- Advanced fabrication facilities for custom optical components.
- Precision polishing and coating capabilities to meet demanding specifications.
- Dedicated R&D support for specialized applications, including quantum technologies and high-power lasers.
- Comprehensive quality assurance for consistent performance in diverse environments.

## 10. Standard Products

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Product	Dimensions	Coating	Price (USD)
Optical-Grade Diamond	50 × 50 × 2 mm	AR Coated (IR)	2,000
Thermal-Grade Diamond	100 × 100 × 5 mm	None	3,500
Quantum-Grade Diamond	25 × 25 × 1 mm	NV Center Enhanced	5,000
Custom Dimensions	As requested	AR/DLC/None	