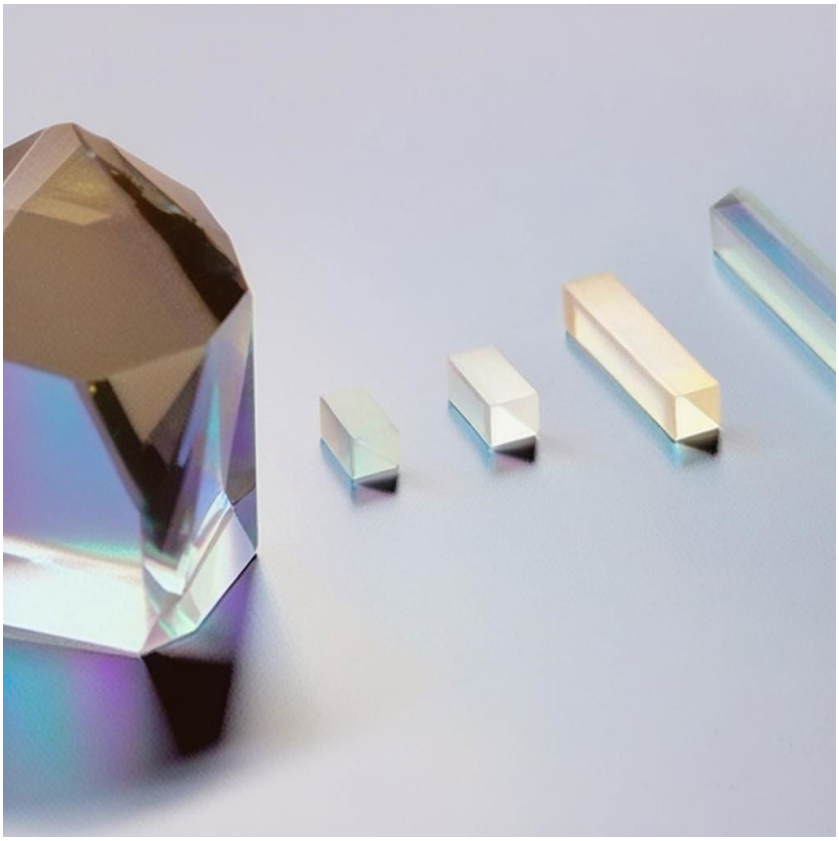
Photonics On Crystals

POC-OC-122506-Optical Grade Single Crystal Diamond Crystal Datasheet

1 Main Features

- Exceptional ultraviolet-to-infrared transmission with negligible absorption.
- Low scattering loss (less than 0.02% at 1064 nm) and outstanding optical clarity.
- Low absorption coefficient with high purity (nitrogen content below 5 ppb).
- Excellent thermal and mechanical stability, suitable for high-power laser applications.
- Customizable sizes and shapes available upon request.



2. Material General Description

Single Crystal Diamond Crystal is synthesized using advanced chemical vapor deposition (CVD) techniques. These crystals are characterized by high optical transparency across a broad spectral range, from ultraviolet (UV) to far-infrared (IR). Due to their unique atomic arrangement and low defect density, they offer minimal scattering and absorption, making them ideal for precision optical applications. Single-crystal diamonds are produced with low nitrogen and other impurities, achieving superior optical clarity and thermal conductivity compared to conventional materials. Their low birefringence and high mechanical strength allow for usage in demanding environments, such as high-power laser systems or spectroscopy.

3. General Application and Examples

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Single Crystal Diamond Crystals are extensively used in high-performance optical systems due to their unmatched optical properties:

1. **High-Power Laser Systems**: Ideal as output couplers and laser windows due to their low absorption and high damage threshold.
2. **Infrared Optics**: Highly suited for IR spectrometers, beam splitters, and lenses, offering minimal absorption at wavelengths up to 2.5 µm.
3. **UV Applications**: Perfect for ultraviolet photonics due to high UV transmission and resistance to radiation damage.
4. **X-ray and Gamma-ray Detectors**: Low absorption and high structural integrity make them suitable for extreme energy photon applications.
5. **High-Energy Optics**: Excellent for precision machining, such as laser cutting and drilling systems.

4. Chemical, Physical, and Structural Properties

Property	**Value**
Crystal Structure	Cubic
Density	3.52 g/cm³
Refractive Index (at 1 µm)	2.38
Thermal Conductivity	>2,000 W/m·K
Melting Point	>4,000 °C
Absorption Coefficient	<0.02 cm^{-1} (at 1064 nm)
Transparency Range	220 nm to 2.5 µm
Hardness	10 (Mohs Scale)
Nitrogen Impurity Content	<5 ppb

5. Optical and Nonlinear Optical Properties

Optical Property	**Value**
Transmission Range	225 nm to 2.5 µm
Absorption Coefficient	<0.02 cm^{-1}
Scattering Loss	<0.02%
Laser Damage Threshold	>10 J/cm² (10 ns pulse at 1064 nm)
Birefringence	Negligible
Reflection Loss	Minimal with AR coating

6. Spectrum Transmission Curves

The transmission curve showcases high transparency over a broad spectral range from 220 nm to 2.5 µm. Transmission efficiency exceeds 95% when an anti-reflective coating is applied, making it optimal for IR and UV applications.

7. Coating Specification

- Available coatings: AR (anti-reflective) coatings for wavelengths ranging from 220 nm to 2.5 µm.
- Coating Durability: Withstands high-power laser systems with no damage.

8. Standard Fabrication Specifications

Parameter	Specification
Maximum Size	Up to 100 mm diameter
Surface Flatness	<λ/10 @ 632.8 nm
Surface Roughness	<5 nm RMS
Thickness Tolerance	±0.02 mm
Parallelism	<3 arcsec
Clear Aperture	>90%

9. POC Strength and Capabilities

Photonics On Crystals (POC) specializes in high-quality optical-grade diamond manufacturing. With cutting-edge CVD technology, we provide custom-tailored solutions for demanding applications in photonics and laser systems. Our expertise ensures consistent production of ultra-pure, low-defect diamond crystals with stringent quality control.

10. Standard Products

Size (mm)	Thickness (mm)	Coating	SKU	Price (USD)
10 x 10	1	AR (220-2,500 nm)	1001	500
20 x 20	2	AR (220-2,500 nm)	1002	800
50 x 50	5	AR (220-2,500 nm)	1003	2,000
Custom Size	Custom	AR (optional)	Upon Request	Quote