Photonics On Crystals

POC-OC-122501-BGO Crystal Datasheet

1 Main Features

- High scintillation efficiency under γ-radiation.
- High density and short radiation length.
- Excellent optical, mechanical, and scintillation properties.
- Suitable for high-energy physics and nuclear imaging applications.
- Custom sizes and OEM services available upon request.

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2. Material General Description

Bismuth Germanate ($Bi_4Ge_3O_{12}$), commonly known as BGO, is a high-performance scintillation crystal widely utilized in applications requiring high scintillation efficiency and excellent mechanical stability. Its high density (7.13 g/cm³) and short radiation length make it an ideal material for detecting γ-rays in nuclear medicine imaging, high-energy physics, geological exploration, and oil well logging. BGO exhibits superior transparency and scintillation performance, enabling precise radiation detection in complex environments. Customization in dimensions and coating specifications is available through POC's advanced processing capabilities.

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3. General Applications and Examples

Applications Include:

- **High-Energy Physics:** BGO crystals are integral components in detectors for particle accelerators, where they detect γ-rays with high precision and efficiency.
- **Nuclear Medicine Imaging:** In PET and SPECT systems, BGO crystals convert γ-radiation into visible light, enabling accurate imaging for medical diagnostics.
- **Geological Prospecting:** Utilized in γ-ray spectrometers for mineral exploration and resource analysis.
- **Oil Well Logging:** Supports energy spectrum analysis for oil and gas exploration.
- **Industrial and Security Applications:** Applied in radiation monitoring and safety inspection systems.

Case Study Example:
A PET imaging system employing BGO crystals achieved enhanced image resolution and higher γ-ray detection efficiency, outperforming traditional scintillators in clinical diagnostic settings.

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4. Chemical, Physical, and Structural Properties

Property	Value
Chemical Formula	$Bi_4Ge_3O_{12}$
Density	7.13 g/cm³
Melting Point	1050°C
Radiation Length	11 mm
Refractive Index	2.15
Emission Peak	480 nm
Decay Constant	300 ns
Light Output	11% ~ 14%
Energy Resolution (511 KeV)	20%
Crystal Structure	Cubic System

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5. Optical, Laser, or Nonlinear Optical Properties

Parameter	Specification
Transmission Range	0.45 - 7 µm
Refractive Index @ 0.63 µm	2.55
Electro-Optic Coefficient r_{41}	3.5 pm/V

Dielectric Constant	40
Dark Resistance	10^4 Ohm cm

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6. Spectrum Transmission Curves

The spectral response curve of BGO shows optimal transmission in the visible light range with an emission peak at 480 nm. Custom measurements can be provided upon request.

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7. Coating Specification

Coatings are available on request for specific wavelength ranges, ensuring high optical efficiency and minimal reflection. Examples include anti-reflective (AR) coatings for 450-700 nm.

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8. Standard Fabrication Specifications

Parameter	**Specification**
Clear Aperture	≥ 85%
Face Dimensions Tolerance	± 0.1 / ± 0.25 mm
Thickness Tolerance	± 0.2 mm
Parallelism Error	≤ 30 arcsec
Protective Chamfers	≤ 0.3 mm at 45°
Surface Quality	40-20 S-D
Wavefront Distortion	≤ λ/4 @ 632.8 nm
Coatings	Uncoated or per request
Mount	Unmounted

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9. POC Strength and Capabilities

Photonics On Crystals (POC) specializes in processing high-performance BGO crystals tailored to diverse industry applications. With state-of-the-art equipment and stringent quality control measures, POC ensures:

- Exceptional precision in crystal fabrication and customization.
- Advanced coating technologies for enhanced optical performance.
- Comprehensive support for prototyping and volume production.

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10. Standard Products

Photonics On Crystals

Face Dimensions	Length	Orientation	SKU	Price (USD)
20 x 20 mm	1.1 mm	[100]	6875	490
25 x 25 mm	1.1 mm	[110]	6874	570
30 x 30 mm	1.4 mm	[110]	6877	690

Note: Custom dimensions and specifications are available upon request.