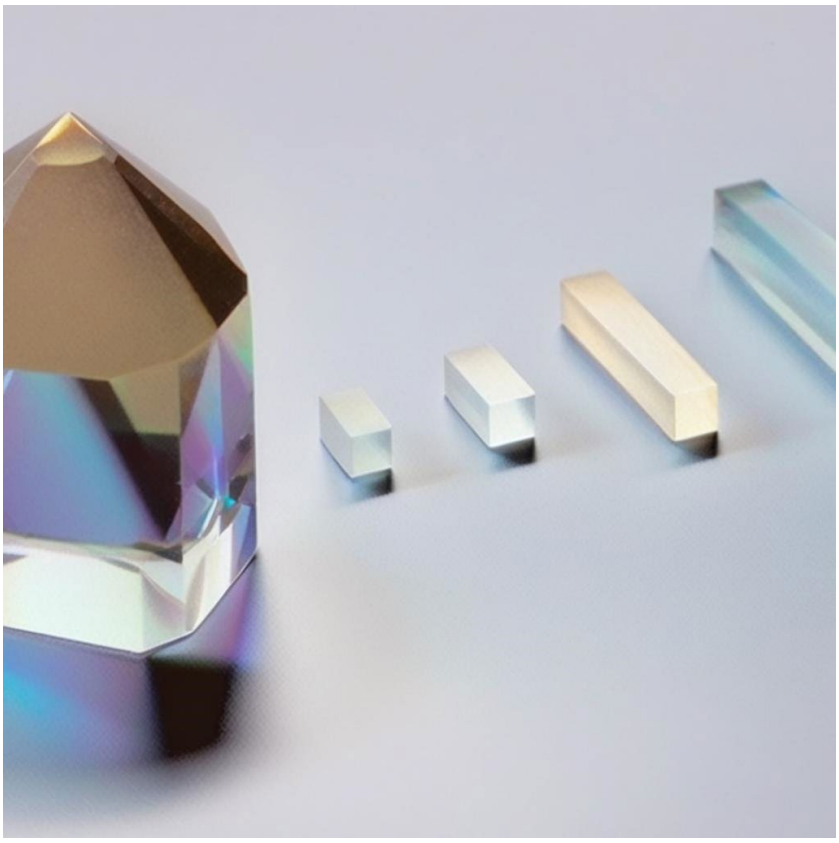
Photonics On Crystals

POC-OC-122418-BaGa4Se7 Crystal Datasheet

1. Main Features

- Wide transmission range from 0.47 µm to 18 µm.
- High nonlinear optical coefficient (dmax = 24.3 pm/V).
- Excellent transparency with low absorption coefficients.
- High damage threshold, suitable for high-power applications.
- Ideal for mid-infrared applications, including spectroscopy and OPA/OPO systems.



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2. Material General Description

BaGa4Se7 Crystal, abbreviated as BGSe Crystal, is an advanced nonlinear infrared optical crystal characterized by its broad transmission range (0.47–18 µm) and high transparency. It exhibits a nonlinear coefficient approximately 2–3 times higher than AgGaS2 Crystals and a damage threshold roughly 3.7 times higher than traditional AgGaS2 materials. The crystal's peak nonlinear coefficient, dmax, reaches up to 24.3 pm/V, making it highly efficient for frequency conversion and nonlinear optical applications.

BGSe Crystals are increasingly applied in areas such as biomedical spectroscopy, atmospheric sensing, and high-power mid-infrared optical parametric amplification (OPA) and oscillation (OPO)

systems. With advanced optical clarity and damage resistance, BaGa4Se7 serves as one of the most promising materials for cutting-edge infrared applications requiring precise wavelength tuning and high-energy optical efficiency.

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3. General Applications and Examples

BaGa4Se7 Crystals excel in several specialized fields due to their exceptional nonlinear optical and transmission properties:

1. **Biomedical Spectroscopy**:
   BGSe Crystals enable highly accurate spectroscopic measurements in mid-infrared wavelengths, ideal for applications such as bio-molecular fingerprinting and non-invasive diagnostics.
2. **Atmospheric Sensing and Remote Monitoring**:
   With a wide transparency range and low absorption coefficients, BGSe Crystals are crucial for atmospheric gas monitoring, including CO and trace element detection, via laser-based technologies.
3. **OPO and OPA Systems**:
   These crystals are essential in optical parametric oscillators and amplifiers for mid-infrared wavelength generation, enabling fine-tuning between 3–5 µm and 8–14 µm.
4. **Defense and Aerospace**:
   Advanced IR laser systems utilizing BGSe Crystals support high-energy military applications, including lidar and infrared countermeasure systems.
5. **Advanced Research in Photonics**:
   BGSe Crystals are pivotal in developing next-generation high-energy infrared optical devices, making them indispensable in academic and industrial R&D settings.

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4. Chemical and Structural Properties

Property	Value
Chemical Formula	BaGa4Se7
Crystal Structure	Orthorhombic
Lattice Parameters	a = 11.224 Å, b = 12.457 Å, c = 7.145 Å
Density	4.77 g/cm³
Mohs Hardness	3.5
Melting Point	998°C
Thermal Conductivity	1.6 W/m·K (at 300 K)
Transparency Range	0.47–18 µm

Absorption Coefficient	< 0.05 cm^{-1} (at 1064 nm)
Damage Threshold	> 1.2 J/cm^2 (at 1064 nm)

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5. Optical and Nonlinear Optical Properties

Property	**Value**
Transparency Range	0.47–18 µm
Refractive Indices (at 1064 nm)	no = 2.671, ne = 2.847
Nonlinear Coefficient (pm/V)	dmax = 24.3
Absorption Coefficient	< 0.05 cm^{-1} (at 1064 nm)
Laser Damage Threshold	> 1.2 J/cm^2 (at 1064 nm)
Nonlinear Optical Efficiency	2–3 times that of AgGaS2

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6. Spectrum Transmission Curves

(Spectrum transmission curves can be provided upon request, illustrating high efficiency across the 0.47–18 µm range.)

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7. Coating Specification

- **AR Coatings**: Anti-reflective coatings available for 3–5 µm and 8–12 µm ranges.
- **Dual-Band Coatings**: Customized coatings designed for specific laser applications.
- **Customization**: Coatings for extended infrared applications are available upon request.

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8. Standard Fabrication Specifications

Specification	**Value**
Orientation Accuracy	± 0.5°
Clear Aperture	> 90%
Surface Quality (Scratch/Dig)	40-20
Flatness	λ/8 at 633 nm
Parallelism	< 30 arc sec
Perpendicularity	< 10 arc min
Surface Flatness Tolerance	± 0.1 mm

Length Tolerance	± 0.1 mm (1–10 mm)
	± 0.5 mm (> 10 mm)

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9. POC Strength and Capabilities

Photonics On Crystals (POC) specializes in designing and delivering BaGa4Se7 Crystals tailored for high-performance optical applications. With advanced manufacturing capabilities and strict quality control, POC ensures:

- Customization to exact user specifications for orientation, size, and coating.
- Rigorous testing for durability and optical clarity.
- Support for both prototype development and large-scale production.

POC's expertise in advanced infrared crystal manufacturing guarantees unparalleled reliability and precision for all photonics applications.

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10. Standard Products

Face Dimensions (mm)	**Length (mm)**	**Orientation (Theta/Phi)**	**Coating**	**Application**	**Price (USD)**
5 x 5	10	0°/0°	AR @ 3–5 µm	Mid-IR spectroscopy	Request
10 x 10	15	0°/0°	AR @ 8–12 µm	OPO/OPA systems	Request
Custom	Custom	Custom	Custom	Custom	Request