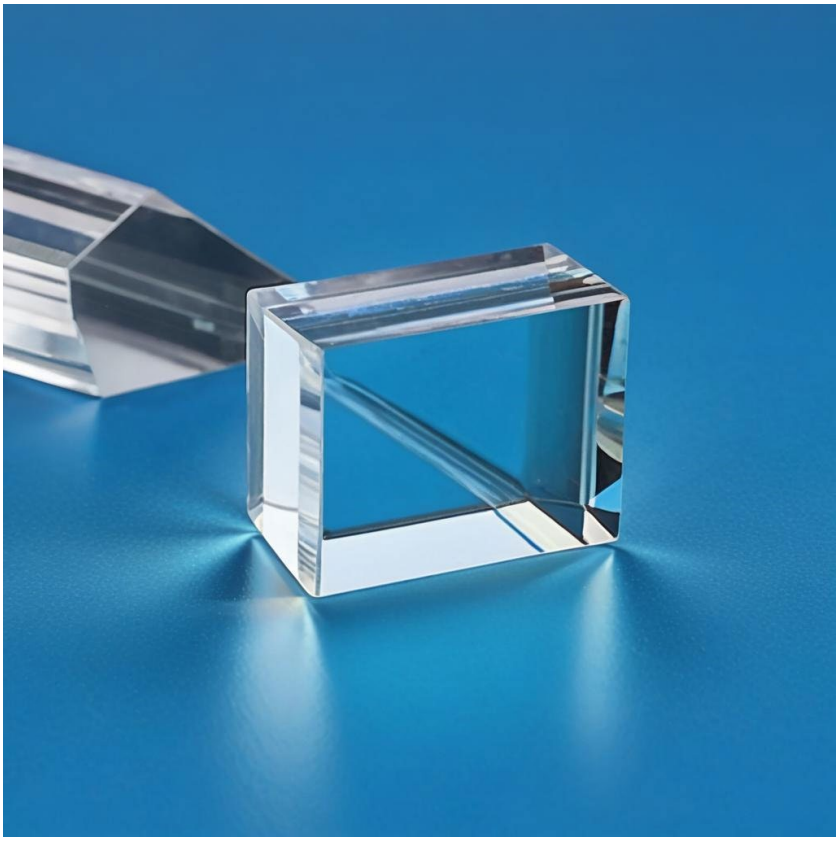
POC-OC-122403- Datasheet for BBO Crystals by Photonics On Crystals (POC)

1. Main Features

- Exceptional transparency from 190 nm to 3500 nm, enabling a broad range of UV to IR applications.
- High SHG efficiency, approximately six times higher than KDP crystals.
- High damage threshold of >10 GW/cm², suitable for high-power laser applications.
- Compatibility with phase matching for SHG, THG, and up to fifth harmonic generation.
- Customizable dimensions and coatings tailored to specific industrial and scientific needs.



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2. Material General Description

Beta-Barium Borate (BBO), with the chemical formula β-BaB_2O_4, is a nonlinear optical (NLO) crystal renowned for its superior optical properties and broad transmission range (190–3500 nm). With a high nonlinear coefficient and exceptional thermal and mechanical stability, BBO is a preferred choice for frequency conversion applications, including SHG, THG, and optical parametric oscillators (OPOs).

BBO exhibits a high damage threshold (>10 GW/cm² at 1064 nm), low absorption loss, and excellent phase-matching capabilities. Its uniaxial structure, characterized by high homogeneity and minimal walk-off angles, supports both type I and type II phase matching, enabling precise frequency tuning for ultraviolet (UV) to infrared (IR) outputs. This crystal's durability, coupled with its compatibility with advanced coatings, makes it an indispensable material in high-power laser systems, spectroscopy, and electro-optic applications.

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3. General Applications and Examples

BBO crystals are versatile and widely utilized in a variety of high-performance applications:

1. **Harmonic Generation**:
   - High-efficiency SHG and THG for Nd:YAG lasers, producing UV wavelengths at 213 nm and beyond.
   - Fifth harmonic generation with >200 mW output at 213 nm.
2. **Ultrashort Pulse Lasers**:
   - Frequency-doubling and tripling ultrashort pulses, enabling efficient wavelength conversion in femtosecond laser systems.
   - Pulse widths as short as 10 fs with superior phase-velocity matching.
3. **Optical Parametric Oscillators (OPOs)**:
   - Tunable coherent radiation across 400–3100 nm with exceptional conversion efficiency (18%-30%).
   - Type I and Type II phase-matching capabilities for precise wavelength adjustments.
4. **Dye Lasers**:
   - High UV output efficiency (205–310 nm) for spectroscopy and advanced dye laser applications.
5. **Electro-Optic Devices**:
   - Ideal for Q-switching and modulation in high-power systems, with energy outputs exceeding 100 W and repetition rates up to 1000 kHz.

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4. Chemical and Structural Properties

Property	Value
Crystal Structure	Trigonal, Space group R3c
Lattice Parameter	a = b = 12.532 Å, c = 12.717 Å, Z = 6
Density	3.85 g/cm³
Melting Point	~1095°C
Mohs Hardness	4
Thermal Conductivity	1.2 W/m·K (⊥ axis), 1.6 W/m·K (∥ axis)
Thermal Expansion Coefficient	$a_1 = 4 \times 10^{-6}$/K, $a_2 = 36 \times 10^{-6}$/K

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5. Optical and Nonlinear Optical Properties

Property	Value
Transparency Range	190–3500 nm
SHG Phase Matching Range	409.6–3500 nm (Type I), 525–3500 nm (Type II)
Damage Threshold	>10 GW/cm² @ 1064 nm
Temperature Acceptance	~55°C
NLO Coefficients	d_{31} = 2.7 pm/V, d_{36} = 5.8 × d_{66} (KDP)
Refractive Indices	no = 1.655 (532 nm), ne = 1.542 (1064 nm)
Walk-Off Angle	2.7° (Type I), 3.2° (Type II)

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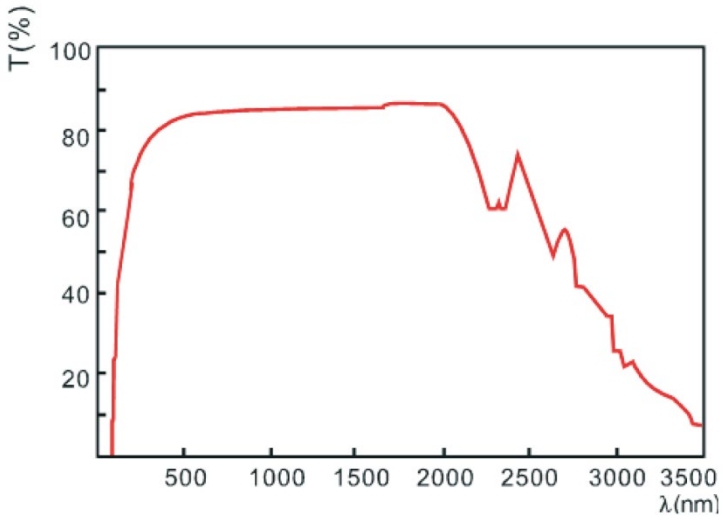
6. Spectrum Transmission Curves

Graphs depicting BBO's transparency curve and phase-matching characteristics are provided for precision laser applications.



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7. Coating Specifications

- **Low-Reflectance AR Coatings**: Customized for SHG, THG, and FOHG at 1064 nm.
- **Dual-Band and Triple-Band Coatings**: Available for high-power lasers.
- **Durability**: High threshold for damage with long-term reliability.

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8. Standard Fabrication Specifications

Attribute	Value
Dimensions	0.1–25 mm thickness
Surface Quality	10/5 (Scratch-Dig Precision Grade)
Parallelism	<20 arc seconds
Angle Tolerance	$\Delta\theta < 0.25°$, $\Delta\varphi < 0.25°$
Damage Threshold	>1 GW/cm² @ 1064 nm, 10 Hz

9. POC Strength and Capabilities

Photonics On Crystals (POC) provides unmatched expertise in manufacturing BBO crystals. With state-of-the-art facilities, we specialize in producing defect-free crystals tailored to customer requirements. Our comprehensive services include custom dimensions, advanced coatings, and precision engineering for a variety of applications. POC ensures strict quality control and rapid delivery times, supporting industries like aerospace, defense, and biomedical research.

10. Standard Products

Dimensions (mm)	Coatings	Applications	Price (USD)
6 × 6 × 0.1	AR@515 nm	SHG@1030 nm, Type I	$450
6 × 6 × 0.2	AR@800 nm	THG@800 nm, Type I	$500
6 × 6 × 0.5	BBAR@1064 nm	FOHG@1064 nm, Type II	$550
Custom	Upon request	Tailored to user specifications	Contact for Pricing