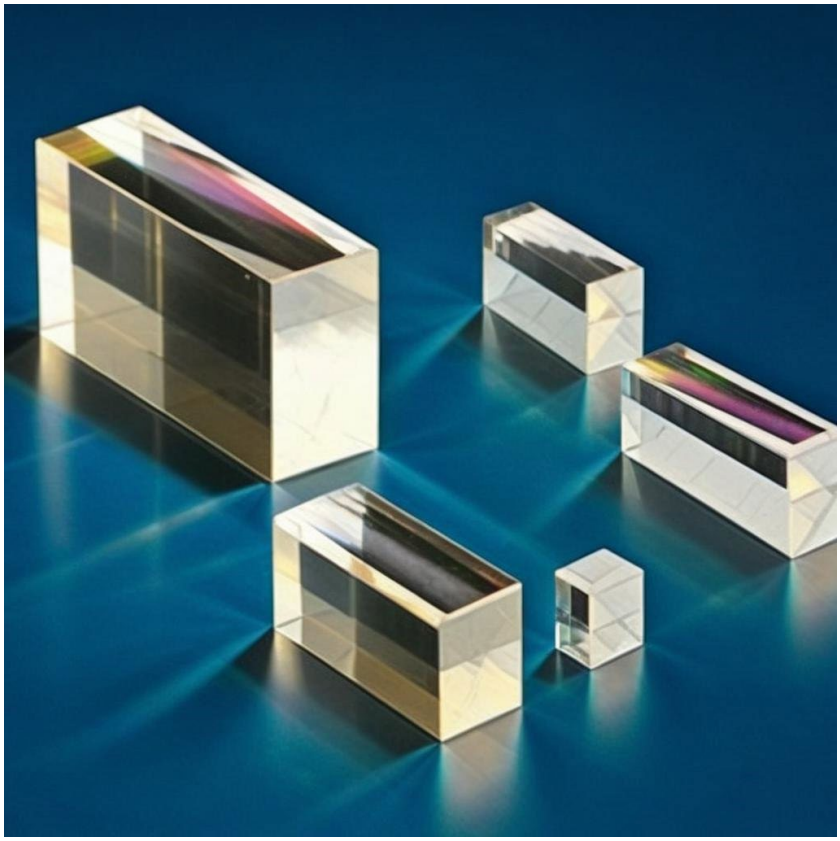
Photonics On Crystals

POC-OC-122443-Diffusion Bonded Crystal Datasheet

1 Main Features

- Significantly reduces thermal lensing effects for high-power laser applications.
- Enhanced thermal stability and performance due to bonded crystal structure.
- Combines undoped and laser crystals to optimize energy transfer and heat dissipation.
- Supports multiple crystal combinations like YVO4 + Nd:YVO4, Cr:YAG + Nd:YAG, etc.
- Available in diverse assembly configurations to meet custom requirements.



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2. Material General Description

Diffusion Bonded Crystals are advanced composite materials made by fusing laser and undoped crystals using optical contact techniques under high-temperature bonding. This design minimizes thermal lensing effects caused by high-power laser operations and enhances the thermal conductivity and energy transfer efficiency of the laser medium. By integrating undoped crystals, the bonded crystal reduces heat accumulation and ensures consistent beam quality. Common combinations include YVO4 + Nd:YVO4 and Cr:YAG + Nd:YAG. These crystals are widely applied in lasers requiring high thermal stability and reliable performance under continuous operation.

The technology allows for a seamless fusion of different crystal types, preserving the optical and mechanical integrity of the final product. This bonding technique is critical in high-energy lasers used for precision applications like LIDAR systems, material processing, and medical devices.

3. General Applications and Examples

Diffusion Bonded Crystals are essential in several advanced laser applications:

- **High-Power Solid-State Lasers:** Used in industrial and scientific laser systems requiring high thermal management for continuous and pulsed operations.
- **LIDAR Systems:** Employed in navigation and range-finding applications due to their superior optical performance and thermal stability.
- **Medical Devices:** Utilized in high-precision laser systems for surgical and therapeutic applications.
- **Laser Material Processing:** Ideal for cutting, welding, and engraving tasks due to enhanced energy transfer efficiency.
- **Scientific Research:** Supports high-power experiments, including nonlinear optics and spectroscopy, by providing stable and reliable laser mediums.

Examples:

1. **YVO4 + Nd:YVO4 + YVO4 Assembly:** Enhances energy transfer efficiency and reduces thermal effects, making it suitable for diode-pumped solid-state lasers.
2. **Cr:YAG + Nd:YAG Combination:** Offers passive Q-switching capabilities with excellent thermal properties, making it ideal for compact and portable laser systems.
3. **Custom Configurations:** Tailored for specific applications like high-precision lasers used in three-dimensional imaging and material diagnostics.

4. Chemical, Physical, and Structural Properties

Parameter	Value/Specification
Material Type	Laser crystal + Undoped crystal
Crystal Structure	Varies by type (e.g., YVO4, YAG)
Thermal Conductivity	Enhanced by undoped crystal
Thermal Expansion Coefficient	Low, dependent on crystal types
Bonding Technology	Optical contact and high-temperature bonding
Damage Threshold	High, suitable for high-power lasers

5. Optical, Laser, or Nonlinear Optical Properties

Crystal Assembly	Application	Optical Property

YVO4 + Nd:YVO4 + YVO4	Diode-pumped solid-state lasers	High energy transfer, low thermal effects
Cr:YAG + Nd:YAG	Passive Q-switching applications	High thermal stability, excellent durability
YVO4 + YAG + Nd:YAG	Advanced solid-state laser systems	Efficient beam quality

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6. Spectrum Transmission Curves

Spectrum transmission curves may vary based on the specific crystal combinations. For detailed technical data, please contact POC.

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7. Coating Specifications

- **Standard AR-Coating:** Reflectivity < 0.2% at specified laser wavelengths.
- **Customized Coating Options:** Available upon request for specific wavelength ranges.
- **High-Reflection Coatings (HR):** Optimized for specific laser applications.

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8. Standard Fabrication Specifications

Parameter	**Specification**
Crystal Size	Customizable (based on assembly)
Surface Quality (Scratch/Dig)	10/5 or better
Flatness	λ/8 @633 nm
Wavefront Distortion	λ/4 @633 nm
Parallelism	< 20 arc sec
Perpendicularity	< 15 arc min
Chamfer	0.2 mm × 45°

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9. POC Strength and Capabilities

Photonics On Crystals (POC) specializes in the design and fabrication of Diffusion Bonded Crystals to meet diverse application needs. Our expertise includes:

- Advanced bonding techniques ensuring high thermal and optical performance.
- Customizable crystal configurations and coatings tailored to specific requirements.
- High-precision manufacturing for superior beam quality and thermal management.

- Comprehensive support and consultation for industrial and scientific applications.

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10. Standard Products

Assembly Type	**Crystal Combination**	**Dimensions**	**Application**
Type (a)	YVO4 + Nd:YVO4 + YVO4	Customizable	Solid-state laser systems
Type (b)	Cr:YAG + Nd:YAG	Customizable	Passive Q-switching
Type (c)	YVO4 + YAG + Nd:YAG	Customizable	High-power lasers
Customization	**Available upon request**	**Customizable**	**Contact POC for details**