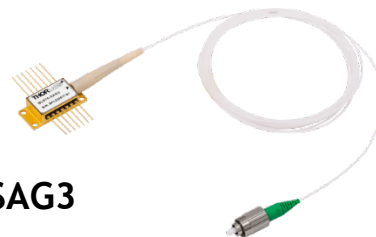


## 976 nm, 300 mW Butterfly Laser, SM Fiber with FBG



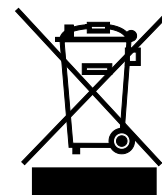
BL976-SAG3

### Description

Thorlabs' BL976-SAG3 is a 976 nm, 300 mW FBG-stabilized laser with a SM fiber output and FC/APC connector in a 14-pin, hermetically sealed butterfly package. It is well suited for low-noise core pumping of Erbium-doped fiber including CW lasers, mode-locked oscillators and EDFA's, as well as other applications that benefit from an FBG-stabilized or higher power single mode laser. The FBG, which is temperature-insensitive by virtue of its design, stabilizes the Fabry-Perot gain chip emission and also reduces the gain chip's sensitivity to external reflection. BL976-SAG3 is Telcordia™ GR-468 CORE qualified.

### Specifications

| Absolute Max Ratings <sup>a</sup>                          |              |
|--|--------------|
| LD Reverse Voltage (Max) <sup>b</sup>                      | 2.0 V        |
| Absolute Max Current <sup>b</sup>                          | 600 mA       |
| Absolute Max Power <sup>b</sup>                            | 350 mW       |
| PD Reverse Voltage (Max) <sup>b</sup>                      | 15 V         |
| Operating Case Temperature (T <sub>Submount</sub> = 25 °C) | -5 to 75 °C  |
| Storage Temperature  | -40 to 85 °C |
| Max Tightening Torque                                      | 150 mN•m     |



- Absolute Maximum Rating specifications should never be exceeded. Operating beyond these conditions can seriously damage the laser.
- T<sub>CHIP</sub> = 25 °C, T<sub>CASE</sub> = -5 °C to 75 °C

| BL976-SAG3 Operation Specs                                |                          |                |            |               |
|---|--------------------------|----------------|------------|---------------|
|   | Symbol                   | Min            | Typical    | Max           |
| Peak Wavelength <sup>a</sup>                              | $\lambda_p$              | 975 nm         | 976 nm     | 977 nm        |
| Spectral Bandwidth, @ -3 dB                               | $\Delta\lambda$          | -              | -          | 1 nm          |
| Output CW Operating Power                                 | P <sub>OP</sub>          | 300 mW         | -          | -             |
| Kink-Free Power   | P <sub>Kink-Free</sub>   | -              | 330 mW     | -             |
| Threshold Current   | I <sub>TH</sub>          | -              | 35 mA      | 60 mA         |
| Forward Current (@ P <sub>OP</sub> )                      | I <sub>OP</sub>          | -              | 470 mA     | 520 mA        |
| Slope Efficiency  | $\Delta P/\Delta I$      | 0.5 W/A        | 0.75 W/A   | -             |
| Forward Voltage   | V <sub>F</sub>           | -              | 1.8 V      | 2.0 V         |
| Power Stability <sup>b</sup>                              | P <sub>stab</sub>        | -              | < 1%       | 2%            |
| Temp. Coefficient of FBG (@ P <sub>OP</sub> )             | $\Delta\lambda/\Delta T$ | -              | 0.01 nm/°C | 0.02 nm/°C    |
| Monitor PD Responsivity <sup>c</sup> (@ I <sub>OP</sub> ) | I <sub>MON/P</sub>       | 0.5 $\mu$ A/mW | -          | 10 $\mu$ A/mW |

- Vacuum Wavelength, @T<sub>CASE</sub> = T<sub>FBG</sub> = 25 °C
- Peak-to-peak operating power, 10 Hz to 50 kHz, over 60 seconds
- The monitor diode indicates the power out of the rear facet and is intended to be used as an approximate indicator of power out of the chip.

**BL976-SAG3 Fiber Characteristics**

|   | Min                           | Typical           | Max               |
|---|-------------------------------|-------------------|-------------------|
| Fiber Type                                | HI1060 or Equivalent SM Fiber |                   |                   |
| Protection Tubing Diameter                | 900 $\mu\text{m}$             |                   |                   |
| Mode Field Diameter <sup>a</sup> @ 980 nm | 5.9 $\pm$ 0.3 $\mu\text{m}$   |                   |                   |
| Numerical Aperture                        | 0.14                          |                   |                   |
| Fiber Coating Diameter                    | 230 $\mu\text{m}$             | 250 $\mu\text{m}$ | 270 $\mu\text{m}$ |
| FBG Coat Diameter                         | -                             | -                 | 400 $\mu\text{m}$ |
| Fiber Termination                         | FC/APC, 2.0 mm Narrow Key     |                   |                   |
| FP Gain Chip to FBG Distance <sup>b</sup> | 1.9 m                         | 2.0 m             | 2.1 m             |
| Fiber Distance after FBG                  | 0.4 m                         | 1.0 m             | -                 |
| Bend Radius                               | 25 mm                         | -                 | -                 |

a. Mode Field Diameter (MFD) is specified as a nominal value

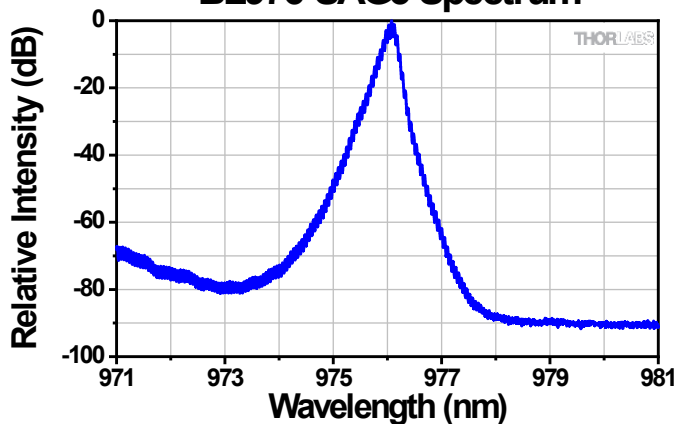
b. To the center of the FBG, approximate location marked on outside of tubing

**BL976-SAG3 TEC Characteristics**

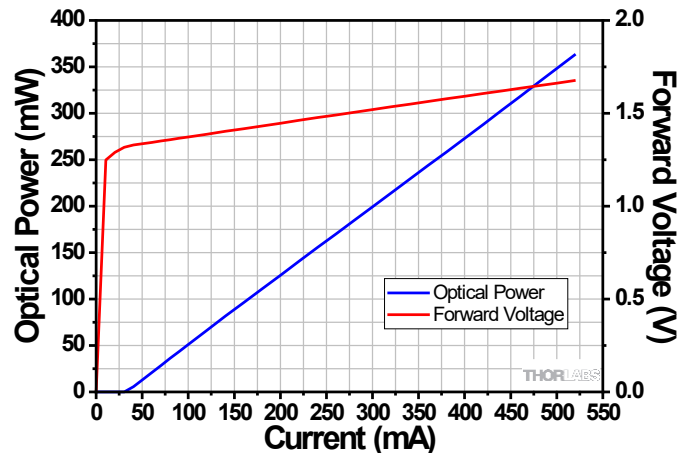
|                                 | Symbol           | Min            | Typical       | Max             |
|---------------------------------|------------------|----------------|---------------|-----------------|
| TEC Current                     | $I_{\text{TEC}}$ | -              | -             | 1.4 A           |
| TEC Voltage                     | $V_{\text{TEC}}$ | -              | -             | 2.1 V           |
| Thermistor Resistance (@ 25 °C) | $R_{\text{TH}}$  | 9.5 k $\Omega$ | 10 k $\Omega$ | 10.5 k $\Omega$ |

## Typical Performance Plots

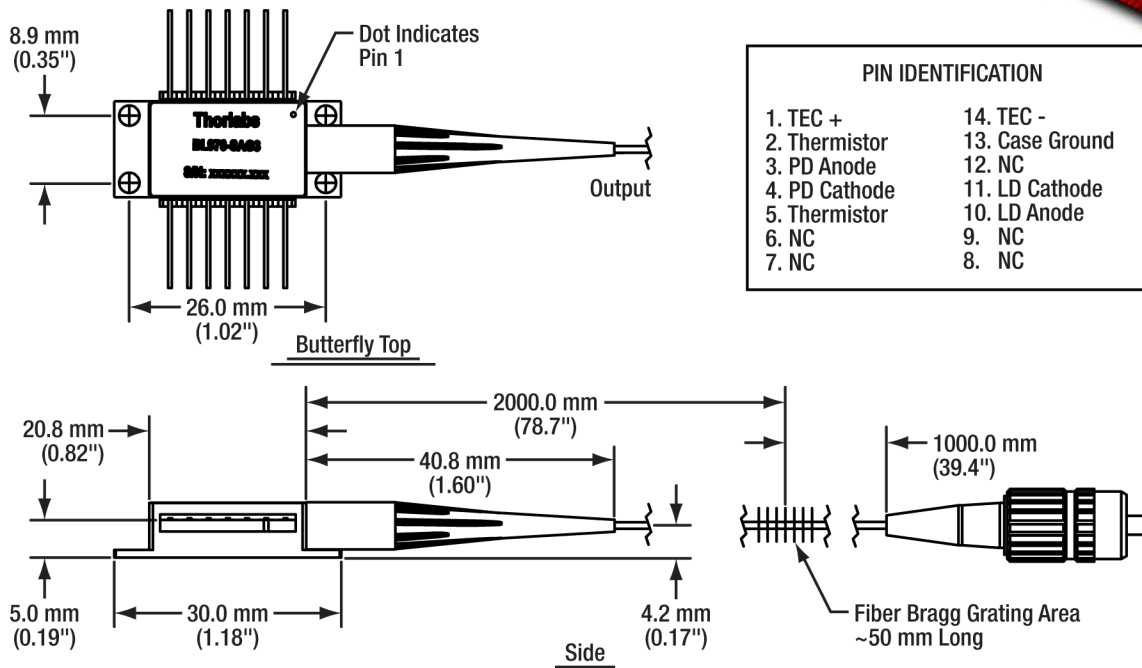
**BL976-SAG3 Spectrum**



**BL976-SAG3 LIV**



## Drawing



## Operation Notes and Warnings

- 1) Always inspect and clean the fiber end face of the pigtail and mating fiber prior to mating. Damaged or scratched fibers will have to be re-polished or re-connectorized. The mating sleeve should also remain clean. It is recommended that mating be done only in a clean environment. Failure to properly clean this fiber can cause the fiber end face to become burned or otherwise damaged. Inspecting with the device powered on can cause injury and/or permanent blindness.
- 2) Always ensure this device is properly temperature regulated. Thorlabs' recommended mounts are CLD1015 or LM14S2. Thermal paste or tape between the bottom surface of the butterfly package and the mount can improve thermal conductivity. Mounting screws should be used with appropriate torque.
- 3) Stress-induced birefringence in the fiber between the laser and the FBG will cause the polarization of the FBG-reflected light to change. For best performance, avoid manipulating the fiber over this region during use.
- 4) The monitor PD is intended to be used as an indicator of relative power and may change value if the coiled fiber is repositioned. For monitoring absolute power, a 1% fiber tap splitter (coupler) with separate PD should be used.
- 5) This product is not designed to be modulated. It is suggested to use an external switch such as a Pockels cell if a modulated output is desired.
- 6) If shortening the fiber length, be sure to leave the FBG which is marked on the outside of the fiber and tubing.
- 7) To protect the laser diode from damage due to static electricity (ESD), please follow proper ESD handling precautions.
- 8) This device emits coherent light from the connector end of the fiber and is classified as Class 3B when combined with other components. To ensure safe operation, use only with a suitable power source that complies with the requirements for laser systems, as specified in IEC-60825-1 "Safety of Laser Products."
- 9) Handle the module only by its package. Do not hold by the fiber pigtail.