



Faraday Optical Isolator

FI-PS-, FI-PI- & FI-BP-

Faraday optical isolators of FI- series are built with the superior materials of large Verdet constant, high thermal conductivity, low absorption coefficient Terbium Gallium Garnet (TGG) and low temperature coefficient rare-earth-doped magnets for various applications to protect laser systems from reflection disturbances. Both free-space isolators and fiber-pigtailed versions are available.

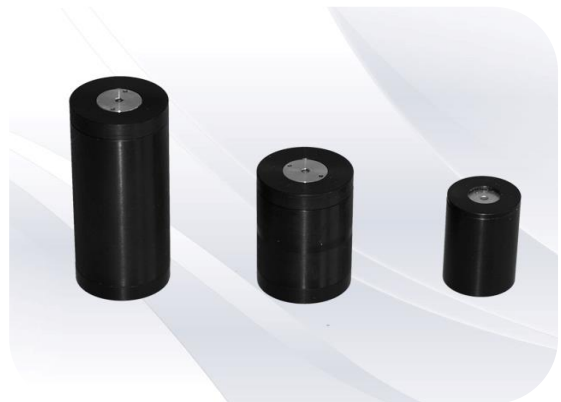
Orientated mainly to OEM applications, free space isolators includes polarization-sensitive and polarization-insensitive versions over 1025-1085nm. A unique optics design enables the substantial compensation of the thermal self-action due to laser absorption in high power operations, resulting in improved isolation rate as well as output light beam quality. Furthermore, the light beams in reverse direction are blocked inside and dumped to heat sinks. This eliminates possible cladding modes induced in input lead fiber protecting a source from instabilities, power spikes and permanent optical damage. Such the free space isolators or Faraday over other bands are also available over 500-1080nm on request.

Fiber-pigtailed broadband optical isolators are also available over 840nm and 1060nm bands. Broadband operation with flat-top isolation profile is achieved by integrating a 45° crystal with a 45° Faraday rotator. The wavelength dependences of polarization rotation induced by the two elements compensate each other in backward transmission, resulting in flat-top isolation profile over a wide spectral range. These isolators are well-suited for the applications with wideband light sources such as OCT systems and tunable fiber lasers.

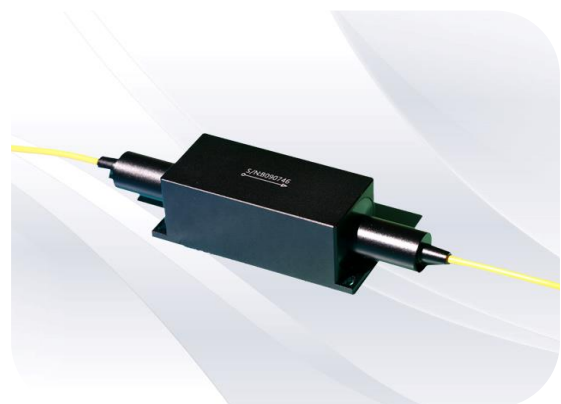
WL Photonics also provides various other TGG-based optical isolators and Faraday rotators over 500-1080nm for custom applications.

Key Features

- High power handling
- Broadband operation
- High isolation
- Compact design
- Both free-space and fiber-pigtailed version available.
- Affordable cost
- Custom solution for OEM applications



Free Space Faraday Isolator and Rotator



Fiber-Pigtailed Broadband Isolator



Main Specifications of Free Space Optical Isolator (FI-PS- or PI-version)

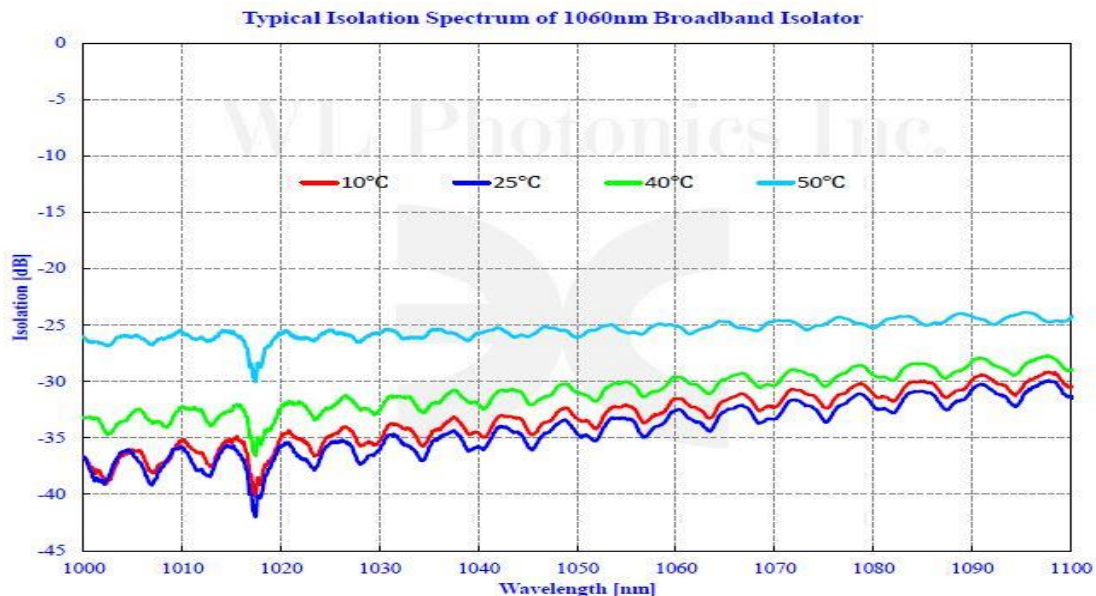
| Parameter | Polarization-Sensitive Version (FI-PS-) | Polarization-Insensitive Version (FI-PI-) |
|--|--|---|
| Center Wavelength (λ_c) | Any wavelength specified within 1025-1085nm | |
| Operating Bandwidth | $\lambda_c \pm 5\text{nm}$ | |
| Pulsed Damage Threshold | $< 10\text{J}/\text{cm}^2$ at 10ns | |
| Average Power ¹ | 30W | |
| Max. Input Beam Size @ $1/e^2$ Interception | 1.6mm in diameter | 0.75mm in diameter |
| Transmission @ λ_c | $> 92\%$ | |
| Polarization Dependent Loss (PDL) | N/A | $< 0.20\text{dB}$ |
| Isolation @ λ_c and 23°C | $> 30\text{dB}$ | |
| Isolation over $\lambda_c \pm 5\text{nm}$ and $10 \sim 50^\circ\text{C}$ | $> 22\text{dB}$ | |
| Input & Output Light Polarizations ² | In the same plane | In orthogonal planes |
| Input & Output Light Beams | Coaxially centered | |
| Operating Temperature | 0 to 50°C | |
| Storage Temperature | -10 to 60°C | |
| Storage Humidity | 0-90% (Non-condensing) | |
| Dimension | $\Phi 30\text{mm} \times 45\text{mm}$ (L) | $\Phi 30\text{mm} \times 80\text{mm}$ (L) |
| RoHS | Compliant | |
| Notes | ¹ It is referenced for forward transmission as standard. Please specify if both forward and backward transmissions are requested. ² In orthogonal planes for FI-PS -series and in the same plane for FI-PI-series are available on request. | |



Main Specifications of Fiber-Pigtailed Broadband Optical Isolator (FI-BP-Version)

| Parameter | Isolator for 840nm Band (FI-BP-840-) | Isolator for 1060nm Band (FI-BP-1060-) |
|---|---|--|
| Center Wavelength (λ_c) | 840nm | 1060nm |
| Operating Bandwidth | ± 40 nm | ± 50 nm |
| Typical Isolation | 30-32dB | |
| Minimum Isolation @ 23 °C | 25dB | 27dB |
| Max. Polarization-Dependent Loss @ λ_c and 23°C | 0.15dB (SM fiber pigtail only) | |
| Extinction Ratio | 20 dB (PM fiber pigtail inly) | |
| Typical Insertion Loss @ λ_c and 23°C | 1.0dB | |
| Max. Insertion Loss @ 23°C | 1.7dB over 840 \pm 40nm | 1.6dB over 1060 \pm 50nm |
| Minimum Return Loss | 50/50dB | |
| Max. Input Optical Power ¹ | 0.5W (CW) | 1.0W (CW) |
| Max. Tensile Load of Pigtail | 5N | |
| Pigtail Fiber Type ² | HI780 | HI1060 |
| | Panda PM780 Aligned in PM slow axes (fast-axis blocking) | Panda PM980 Aligned In PM slow axes (fast-axis blocking) |
| Operating Temperature | 0 to 50 °C | |
| Storage Temperature | -10 to 60 °C | |
| Storage Humidity | 0-90% (Non-condensing) | |
| Dimension | See below drawings | |
| RoHS | Compliant | |
| Notes | ¹ Higher power handlings are available on request. ² Other type fibers are available on request. | |

Typical Isolation Spectrum of FI-BP-1060-





Dimensions of Free-Space Pol.-Sensitive Isolator (FI-PS-Version)

Input & out polarizations in the same plane

WL Photonics Inc. reserves the right to change dimensions without notice.

| | | | |
|-------------------------------|-----------|--------------|---|
| UNLESS OTHERWISE SPECIFIED: | NAME | DATE | WL Photonics Inc. |
| DIMENSIONS ARE IN MILLIMETERS | DESIGN | 1/2015 | |
| LINEAR: ±0.1 | CHECKED | Frank | Feb. 1, 2015 |
| ANGULAR: ±0.15 | ENG APPR. | | |
| Ø: ±0.05 | MFG APPR. | | |
| FINISH: Roughness 3.2 | Q.A. | | |
| THE FIGURE(S) | COMMENTS: | | |
| MATERIAL: | | | |
| FINISH: | | | |
| TITLE | | | Dimensions of Free Space Isolator (FI-PS-Version) |
| SIZE | DWG. NO. | REV | |
| A | WL-D-101 | 1 | |
| SCALE: 2:1 | WEIGHT: | SHEET 1 OF 1 | |

Dimensions of Free-Space Pol.-Insensitive Isolator (FI-PI-Version)

3-M2.5x0.45 even on Ø26

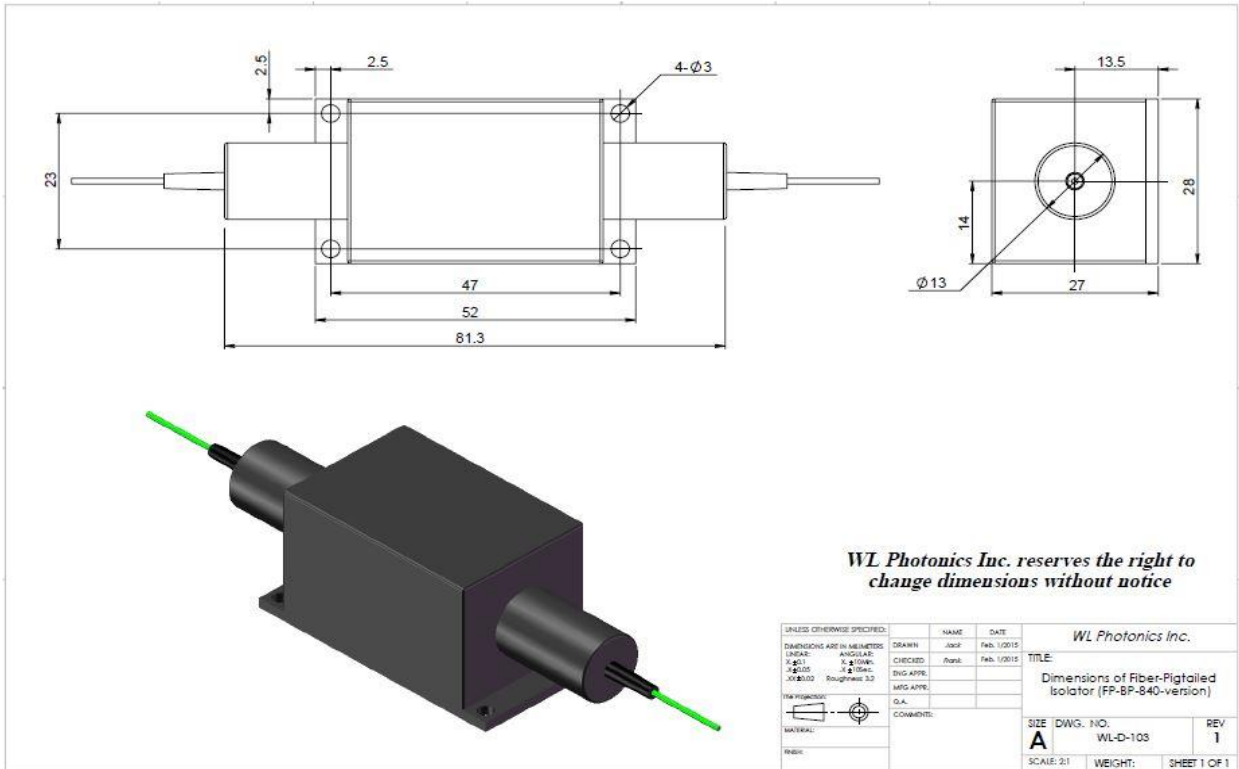
M22x0.75

WL Photonics Inc. reserves the right to change dimensions without notice.

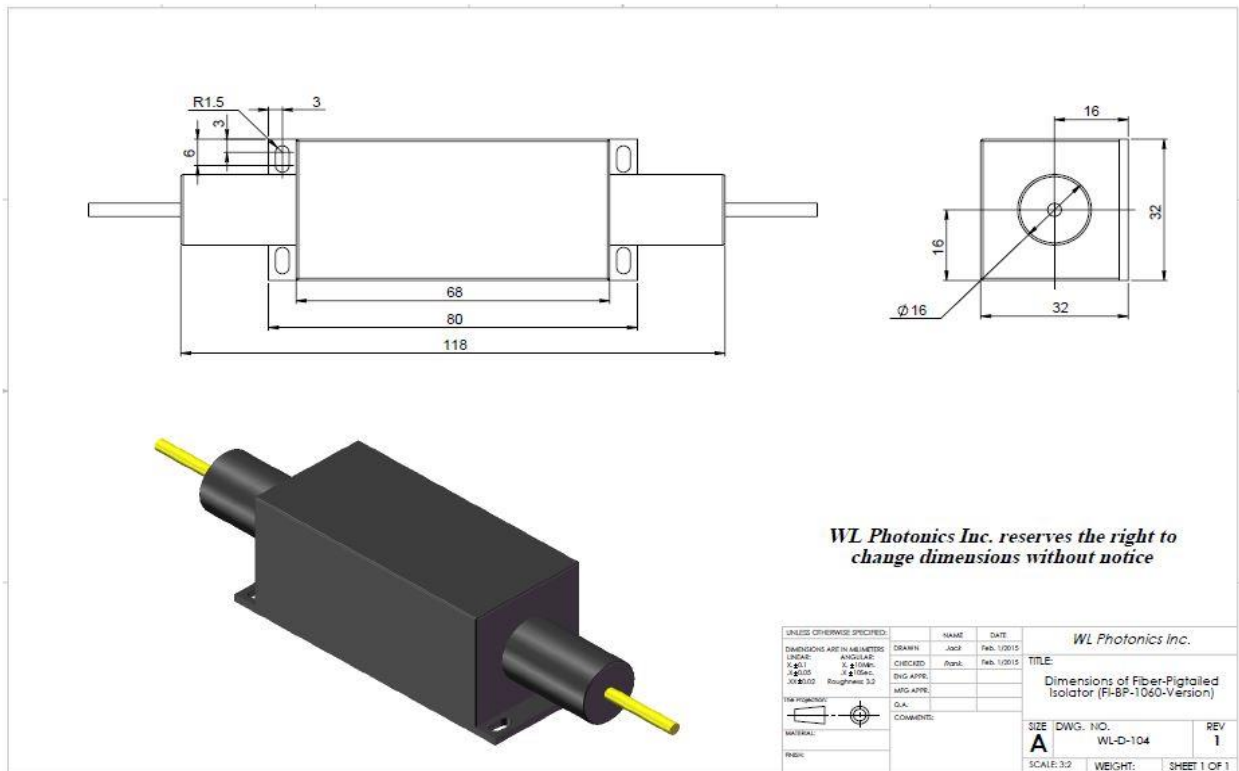
| | | | |
|-------------------------------|-----------|--------------|---|
| UNLESS OTHERWISE SPECIFIED: | NAME | DATE | WL Photonics Inc. |
| DIMENSIONS ARE IN MILLIMETERS | DESIGN | 1/2015 | |
| LINEAR: ±0.1 | CHECKED | Frank | Feb. 1, 2015 |
| ANGULAR: ±0.15 | ENG APPR. | | |
| Ø: ±0.05 | MFG APPR. | | |
| FINISH: Roughness 3.2 | Q.A. | | |
| THE FIGURE(S) | COMMENTS: | | |
| MATERIAL: | | | |
| FINISH: | | | |
| TITLE | | | Dimensions of Free Space Isolator (FI-PI-Version) |
| SIZE | DWG. NO. | REV | |
| A | WL-D-102 | 1 | |
| SCALE: 2:1 | WEIGHT: | SHEET 1 OF 1 | |



Dimensions of Fiber-Pigtailed Isolator @ 840nm Band (FI-BP-840-Version)



Dimensions of Fiber-Pigtailed Isolator @ 1060nm Band (FI-BP-1060-Version)





Ordering Information

Part Number of Free-Space Isolator: FI-PA-B

Part Number of Free-Pigtailed Isolator: FI-BP-B-C-D/E-F

- A. **S** is for free space polarization-sensitive version and **I** is for free space polarization-insensitive version.
- B. Center wavelength in nanometer. 1035 is for 1035nm center wavelength, 1060 is for 1060nm center wavelength.
- C. Fiber type: **SM** is for single mode fiber and **PM** is for Panda polarization maintaining fiber (only existing for pigtail version).
- D. Pigtail cable diameter in millimeter: **0.25** is for 250 μ m OD buffer fiber, **0.9** is for 900 μ m OD loose tube and **3.0** is for 3.0mm OD cable (only existing for pigtail version).
- E. Pigtail length in meter: **0.5** is for 0.5m long and **1.0** is for 1M long (only existing for pigtail version).
- F. Connector type of pigtail termination, such as **FC/APC**, **FC/UPC** **SC/APC** or **LU/UPC** and **00** is for no connector (only existing for pigtail version).

Example 1: FI-PS-1035

Description: Free space high power polarization-sensitive optical isolator for 1035nm.

Example 2: FI-PI-1055

Description: Free space high power polarization-insensitive optical isolator for 1055nm.

Example 3: FI- FI-BP-840-SM-0.9/1.0-FC/UPC

Description: Fiber optic broadband polarization-insensitive isolator over 840nm \pm 40nm with 1.0meter long, 900 μ m OD loose cabled HI1060 fiber pigtails terminated with FC/UPC connectors on both pigtail ends. 0.5W (CW) optical input power.

Example 4: FI- FI-BP-1060-SM-3.0/1.5-FC/APC

Description: Fiber optic broadband polarization-insensitive isolator over 1060nm \pm 50nm with 1.5meter long, 3.0mm OD loose cabled HI1060 fiber pigtails terminated with FC/APC connectors on both pigtail ends. 1.0W (CW) optical input power.

Example 5: FI- FI-BP-1060-PM-3.0/1.0-00

Description: Fiber optic broadband polarization-sensitive isolator over 1060nm \pm 50nm with 1.0meter long, 3.0mm OD loose cabled Panda PM980 fiber pigtails aligned in PM slow axes (fast-axis blocking) and no connectors on pigtail ends. 1.0W (CW) optical input power.