# Optical Power Surge Protector

## Bidirectional

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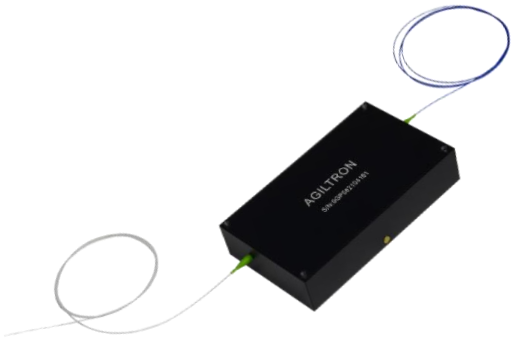


The optical power surge protector is a two-fiber port module that has a passive low insertion loss during normal operation but actively suppresses an optical power surge quickly (about 100ns) when the passing light intensity exceeds a preset level. The unit maintains the output at the preset point when the input power is higher. This is achieved by using a detector to tap a small portion of light and feed into a closed-loop circuit to control an NS variable fiber optical attenuator connected between light input and output. The maximum allowed output power is manually settable by a resistor pot through a side screw. High maximum output power up to 10W is available through special order. The optical power surge protector provides an ultimate solution for sensor protection. The non-mechanical device has passed the most stringent mil-spec and space flight qualifications and is designed for over 25 years of continuous operation. The module comes with a wall-plug 12V power supply.

The device is optimized for fast surge protection while also regulating to provide a stable output. It has more oscillations in the regulation function. For high-performance output stability, please order our Regulator, which also has a surge protection function but with a much slower speed.

## Applications

- Sensor Protection
- Surge Prevention
- Instrumentation

## Features

- No Moving Parts
- High Reliability
- High Speed

## Specifications

| Parameter | | Min | Typical | Max | Unit |
|---|---|---|---|---|---|
| Central Wavelength | | 760 | | 2000 | nm |
| Insertion Loss [1] | 1260 -1650nm | | 1.0 | 1.4 | dB |
| | 960 - 1100nm | | 1.2 | 1.6 | dB |
| | 760 – 960nm | | 1.5 | 1.8 | dB |
| Dynamic Range | | 18 | 25 | 30 | dB |
| Return Loss | | 45 | 50 | | dB |
| Response Time | | 0.1 | | 50 | µs |
| Maximum Output Power Setting [2] | | 0.2 | | 20 | W |
| Electrical Power Consumption | | | | 2 | W |
| Operating Temperature [3] | | -5 | | 45 | °C |
| Storage Temperature | | -40 | | 85 | °C |

**Notes**:

[1]. Excluding connectors. Including the power tapping for feedback control.

[2]. High power version up to 20W is available.

[3]. The VOA can be operated in a wider temperature range from as -10 to 70°C, but some performances such as the maximum attenuation will be degraded.

RoHS COMPLIANT

Warning: **The device mounted on the PCB is an OEM module designed for system integration only, not for general uses. Do not touch the PCB by hand. The electrical static can kill the chips even without a power plug-in, and unpleasant electrical shock may also be felt. For laboratory use, please buy a protected Turnkey system.**

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Rev 10/30/26

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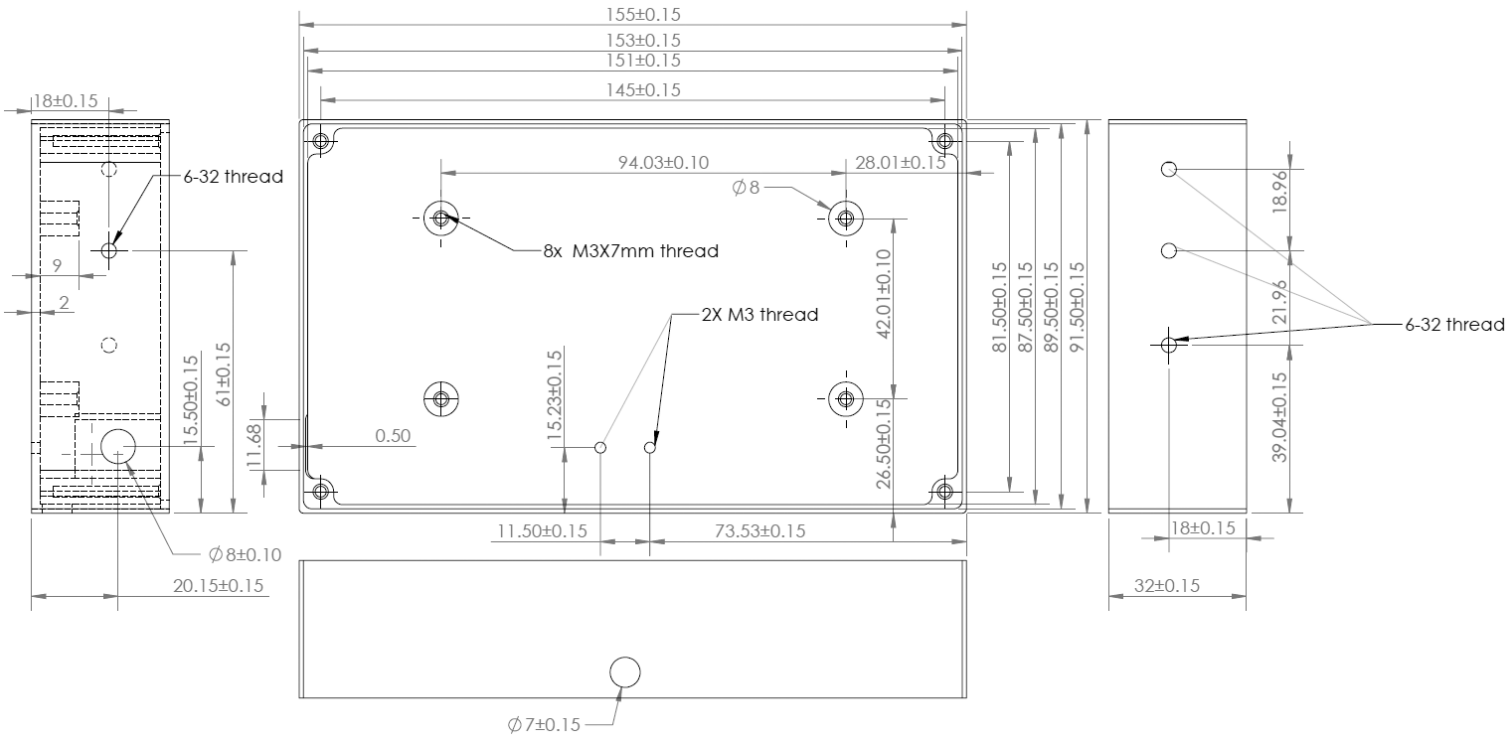
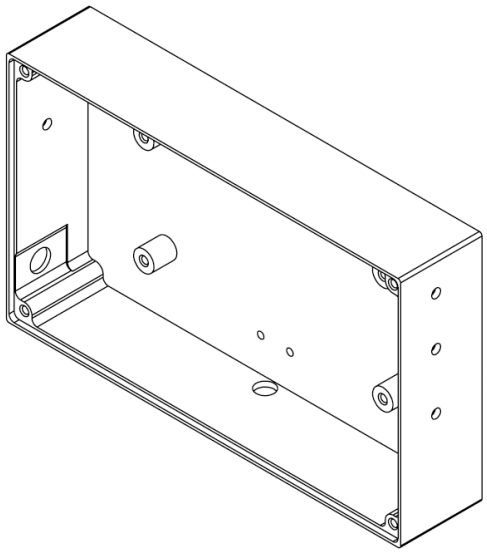
### Dimensions of Module (mm)



**Notes**:

1. Material to ba AL6061
2. Surface treatment:
   sandblasting and oxide black

*Product dimensions may change without notice. This is sometimes required for non-standard specifications.

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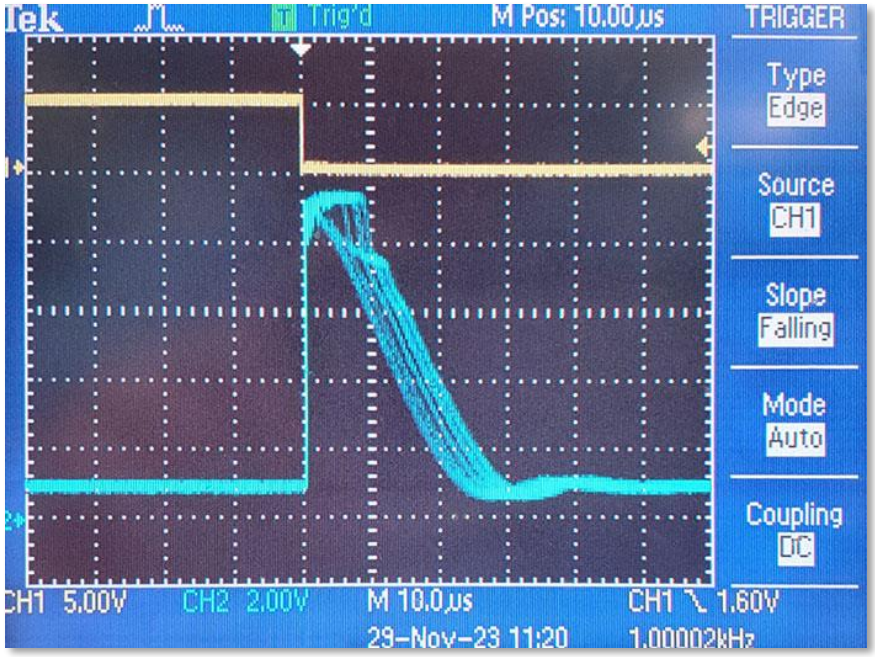
## Operation Instruction

- The maximum output power level $P_{Set}$ is preset per customer's request as a default. The $P_{Set}$ can be adjusted manually through the screw hole.
- Plug in the accompanied power supply.
- When the input power exceeds the maximum power setting, the device starts regulating output to be constant.
- No response when the input power lower than the preset level.

## Typical Response




1. Power Surge: 10 dB
2. Regulation Stability: < 0.02 dB
3. Response Time: 30 µs

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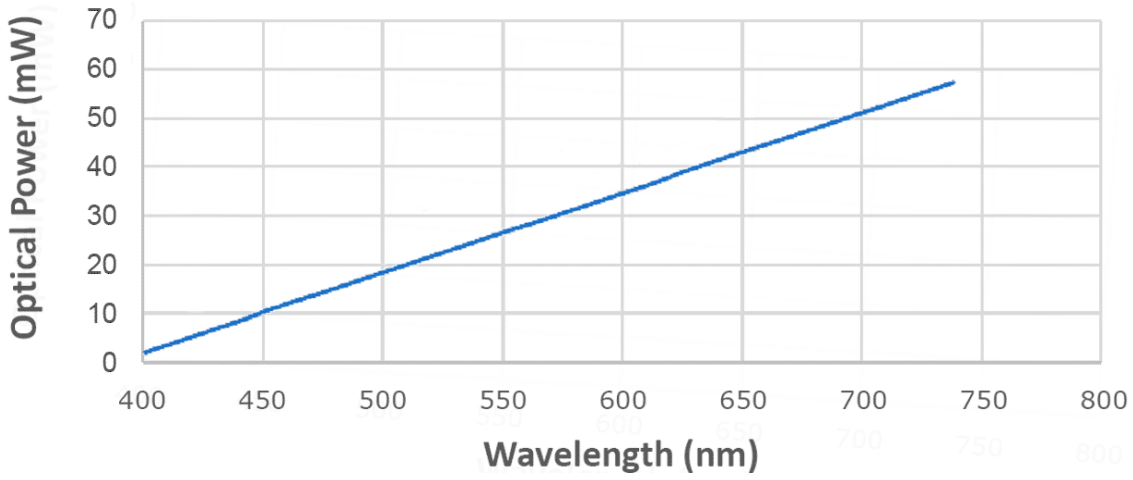
### Optical Power Handling vs Wavelength for Standard SM Fibers

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## Ordering Information (Part Number)

| | ☐ | ☐ | ☐☐☐ | ☐ | ☐ | ☐ | ☐ |
|---|---|---|---|---|---|---|---|
| **Prefix** | **Configuration** | **Wavelength** | **Max Output Power** | **Fiber Type** | **Fiber Cover** | **Fiber Length** | **Connector [1][2]** |
| **OPSP-** | SM = 1<br>PM = 2<br>MM = 3<br>3 Port SM = S<br>3 Port PM = P<br>3 Port MM = M<br>Special = 0 | 1060 = 1<br>2000 = 2<br>1310 = 3<br>1480 = 4<br>1550 = 5<br>1625 =6<br>780 = 7<br>850 = 8<br>650 = E<br>550 = F<br>400 = G<br>Special = 0 | 10mW = 010<br>20mW = 020<br>30mW = 030<br>40mW = 040<br>50mW = 050<br>60mW = 060<br>70mW = 070<br>80mW = 080<br>90mW = 090<br>100mW = 100<br>500mW = 500<br>900mW = 900<br>5W = A05<br>10W = A10<br>20W = A20<br>0.1mW = 00M<br>Special = 000 | SMF-28 = 1<br>HI1060 = 2<br>HI780 = 3<br>PM1550 = 5<br>PM850 = 8<br>PM980 = 9<br>50/125 = 6<br>Special = 0 | 0.9mm tube = 3<br>Special = 0 | 0.25m = 1<br>0.5m = 2<br>1.0 m = 3<br>Special = 0 | None = 1<br>FC/PC = 2<br>FC/APC = 3<br>SC/PC = 4<br>SC/APC = 5<br>ST/PC = 6<br>LC/PC = 7<br>LC/APC = A<br>LC/UPC = U<br>Special = 0 |

[1]: High power connector may be available per request, please contact sales.
Regular fiber connector has PER ~22dB. Connector with PER >27 dB is available using special process

[2]. The default connector configuration uses fiber with 0.9 mm buffer protection. The connector cannot be installed directly onto bare fiber because the bare fiber is prone to damage during shipping. However, the connector can be assembled on bare fiber if a 3 cm protective loose tube is added for reinforcement. The customer may remove this protective tube after testing. The optical power handling of a standard connector is less than 0.5 W for SMF-28 fiber and decreases further for smaller-core fibers.

RED is Special Order

**Note:**

- **PM1550** fiber works well for **1310nm**

## Application Notes

**Fiber Core Alignment**
Note that the minimum attenuation for these devices depends on excellent core-to-core alignment when the connectors are mated. This is crucial for shorter wavelengths with smaller fiber core diameters that can increase the loss of many decibels above the specification if they are not perfectly aligned. Different vendors' connectors may not mate well with each other, especially for angled APC.

**Fiber Cleanliness**
Fibers with smaller core diameters (<5 μm) must be kept extremely clean, contamination at fiber-fiber interfaces, combined with the high optical power density, can lead to significant optical damage. This type of damage usually requires re-polishing or replacement of the connector.

**Maximum Optical Input Power**
Due to their small fiber core diameters for short wavelength and high photon energies, the damage thresholds for device is substantially reduced than the common 1550nm fiber. To avoid damage to the exposed fiber end faces and internal components, the optical input power should never exceed 20 mW for wavelengths shorter 650nm. We produce a special version to increase the how handling by expanding the core side at the fiber ends.



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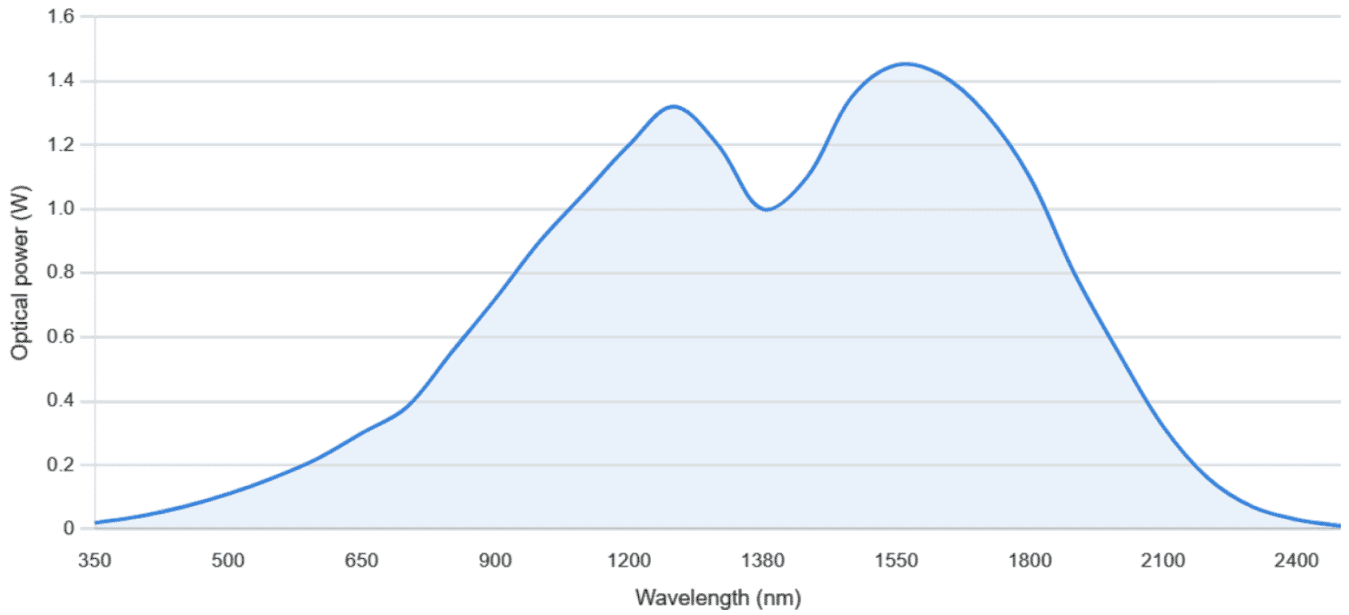
### Regular Single Mode / Polarization Maintaining Fiber Optical Power Handing vs Wavelength




Single mode fiber optical power is limited by nonlinear effects in addition to absorption that increase loss and generate heat. The curve shows the approximate safe CW power envelope for standard single-mode fiber. Actual limits depend on fiber design, core size, length, and laser characteristics. Specialty fibers can significantly increase the power limit.



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