

## Features

- Unmatched Low Cost
- Very Broad Spectral Range
- High Isolation
- High Reliability
- Epoxy-Free Optical Path

## Applications

- Sensor
- Spectroscopy
- High Power Laser
- Instrumentation

The FFUL series of Ultra-Low Loss Fiber-Fiber 1×N Broadband Optical Switch uses a patent-pending v-groove alignment mechanism activated by a precision motor and immersed in a specially formulated, non-fluorescent index-matching liquid. This design eliminates optical coatings and air gaps, enabling a continuous light path with minimal loss and reflection across a broad spectral range from 200 to 2500 nm. MWIR and LWIR versions are available for use with specialty fibers. The switch supports single-mode and multimode fibers with core sizes from 50 to 1000 μm and is fully bidirectional, accommodating up to 300 ports. It retains its last position upon power loss and offers reliable long-term operation, validated through years of continuous use. Control is available via RS232 or USB with graphical software, and a LabVIEW interface is also supported. The switch is available as a fully packaged module. For PM fibers, both polarization states are transmitted identically to how they propagate in the fiber.

## Specifications

| Parameter                                | Min                       | Typical | Max  | Unit  |
|--|---------------------------|---------|------|-------|
| Operation Wavelength                     | 200                       |         | 5000 | nm    |
| Insertion Loss <sup>[1]</sup>            | 0.3                       | 0.4     | 0.8  | dB    |
| Wavelength Dependent Loss <sup>[2]</sup> |                           | 0.05    | 0.3  | dB    |
| Polarization Dependent Loss              |                           | 0.03    | 0.10 | dB    |
| Return Loss <sup>[5]</sup>               | 35                        |         |      | dB    |
| Cross Talk On/Off Ratio                  | 60                        |         | 70   | dB    |
| VOA Resolution                           | 0.3                       | 0.5     | 1    | dB    |
| Operating Voltage                        |                           | 5       | 5.5  | VDC   |
| Power Consumption                        |                           |         | 2    | W     |
| Switching Type                           | Latching                  |         |      |       |
| Switching Time <sup>[3]</sup>            |                           | 0.8     |      | s     |
| Durability                               | 10 <sup>7</sup>           |         |      | cycle |
| Operating Temperature                    | 0                         |         | 70   | °C    |
| Optical Power Handling <sup>[4]</sup>    |                           | 1       | 2    | W     |
| Storage Temperature                      | -40                       |         | 85   | °C    |
| Fiber Type                               | Ø50 ~ Ø400 μm core fiber  |         |      |       |
| Package Dimension                        | See Mechanical Dimensions |         |      |       |

### Notes:

[1]. Measured without connectors for 1xN. For multimode fiber, use a laser source with CPR<15

[2]. Within 200 nm bandwidth

[3]. Defined for speed between the adjacent channels

[4]. High power version available

\* The switch covers an ultra-broad spectral band that is only limited by the fiber intrinsic transmission properties.

**Note:** The specifications provided are for general applications with a cost-effective approach. If you need to narrow or expand the tolerance, coverage, limit, or qualifications, please [click this link](#):

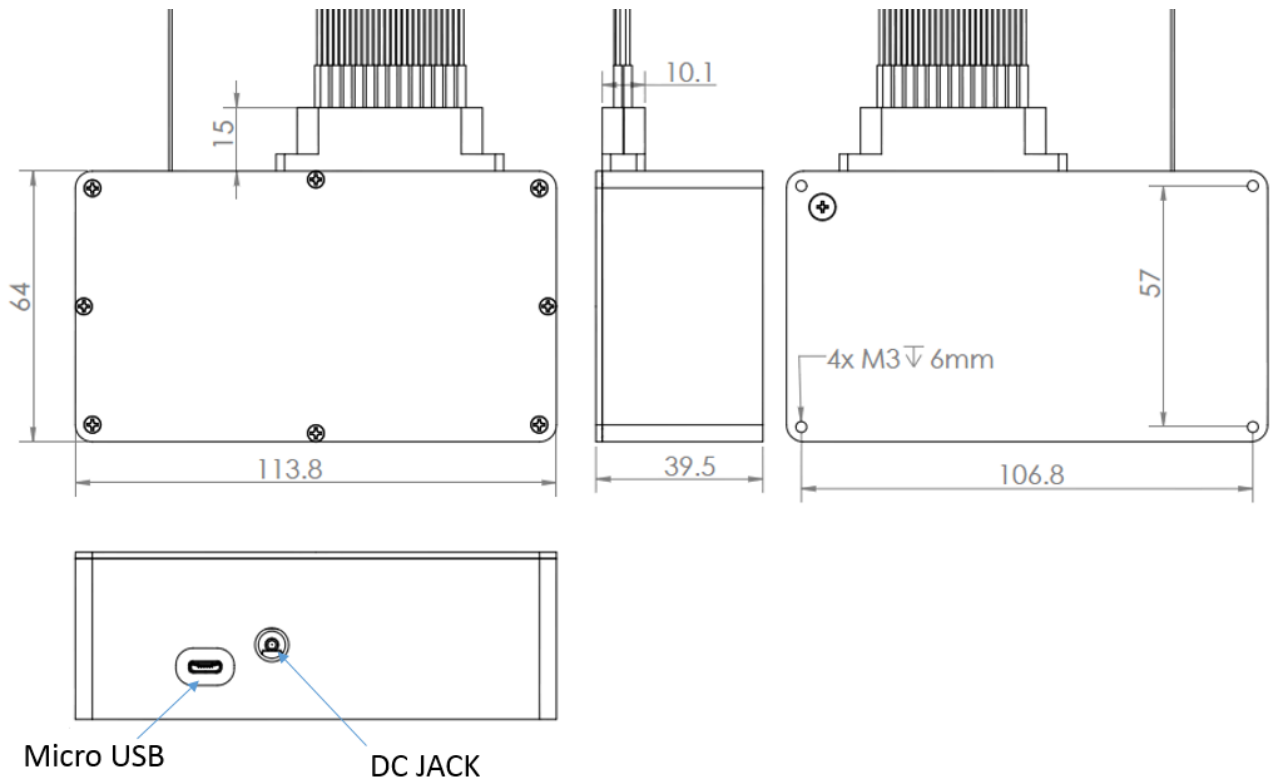
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Rev 03/27/25

(broadband 200-3000nm, bidirectional)

## DATASHEET

### Mechanical Dimensions (Unit: mm)



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

### Computer Interface

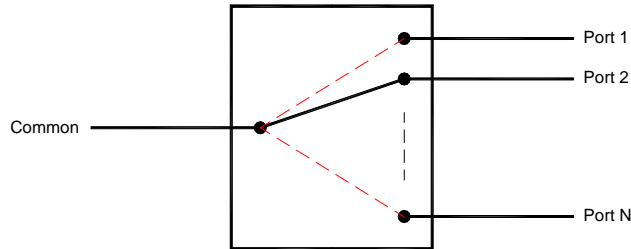
Computer controlling kit with Micro USB interfaces and Windows™ GUI.

(broadband 200-3000nm, bidirectional)

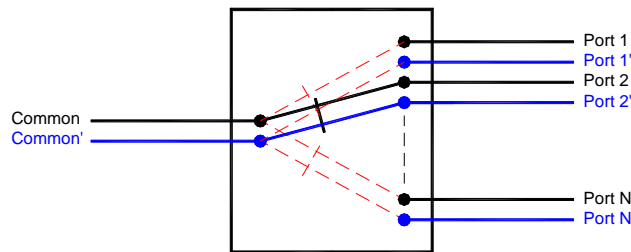
DATASHEET

## Function Diagram

### SelfAlign 1xN Series Switch



### SelfAlign Dual 1xN Series Switch



## Ordering Information

| Prefix       | Type   | Channel                               | Wavelength   | Configuration                         | Package                     | Fiber Type   | Fiber Cover  | Fiber Length                                     | Connector   |
|--------------|--|---------------------------------------|--|---------------------------------------|-----------------------------|--|--|--|---|
| <b>FFUL-</b> | 1x8 Switch = 008<br>1x9 Switch = 009<br>1x10 Switch = 010<br>...<br>1x128 Switch = 128 | Single = S<br>Dual = D<br>Special = 0 | Any <sup>[1]</sup> = A<br>1060 = 1<br>1310 = 3<br>1550 = 5<br>650 = 6<br>780 = 7<br>850 = 8<br>1310/1550 = 9<br>350 = B<br>450 = C<br>520 = D<br>Special = 0 | Single = S<br>Dual = D<br>Special = 0 | Standard = 1<br>Special = 0 | 50/125 = 5<br>62.5/125 = 6<br>105/125 = E<br>200/NA.22 = F<br>300/NA.22 = G<br>400/NA.22 = H<br>600/NA.22 = J<br>800/NA.22 = K<br>1000/NA.22 = L<br>SM28 <sup>[2]</sup> = S<br>SM1900 <sup>[3]</sup> = M<br>UV180nm = U<br>Special = 0 | Bare fiber = 1<br>2 mm Jacket = 2<br>0.9mm tube = 3<br>Special = 0 | 0.25m = 1<br>0.5m = 2<br>1.0m = 3<br>Special = 0 | None = 1<br>FC/PC = 2<br>SC/PC = 4<br>ST/PC = 6<br>SMA=S<br>Special = 0 |

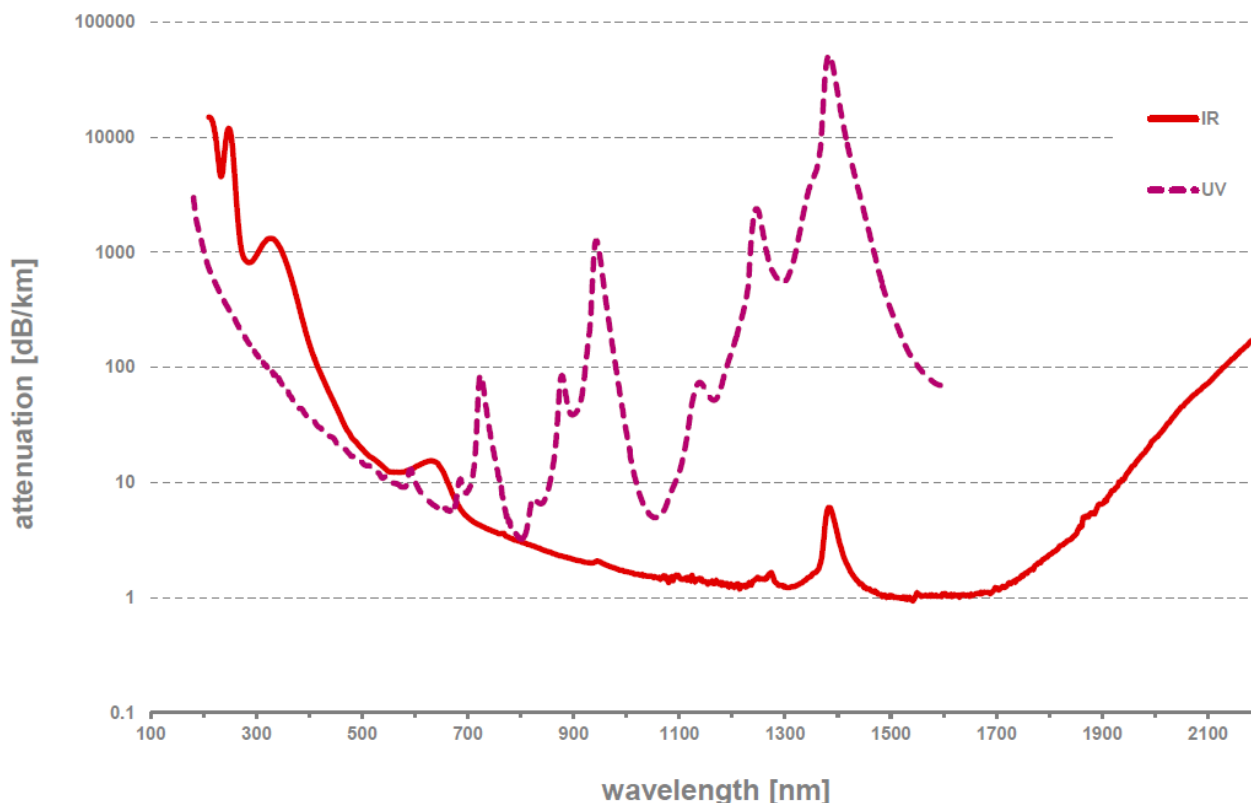
[1]. This is the cost-effective version of the switch, designed to ensure low loss across the full fiber transmission range. By default, the insertion loss is tested at a convenient single wavelength. Testing at other wavelengths can be performed upon selection of a specific test wavelength. For multi-wavelength characterization, select "0" and specify the desired wavelengths to receive test results at each of those points.

[2]. It uses 1mm collimators covering 1230-1630nm

[3]. It uses 1mm collimators covering 1700-2400nm

RED is Special Order

## Typical Fiber Transmissions



## 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 ( $< 5 \mu\text{m}$ ) 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 handling by expanding the core side at the fiber ends.