

# LightBend™ Straight Series Fiber Optic Switch

(1x1, 1x2, 2x2, 2x2 Bypass, Dual 1x1, Dual 1x2, Dual 2x2, Dual 2x2 Bypass, Quad 1x1.

Multimode: Full 2x2, Dual Full 2x2), Bidirectional

(Protected by U.S. patent 6823102 and pending patents)



DATASHEET

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## Features

- Low Optical Distortions
- 8 Ports Integration
- High Isolation
- High Reliability
- Fail-Safe Latching
- Epoxy-Free Optical Path
- Low Cost

## Applications

- Protection
- Instrumentation

The LB Straight Series Fiber Optic Switch connects optical channels by redirecting an incoming optical signal into a selected output fiber. This is achieved using a patent pending opto-mechanical configuration and activated via an electrical control signal. Latching operation preserves the selected optical path after the driver signal has been removed. The switch has integrated electrical position sensors. The new material-based advanced design significantly reduces moving part position sensitivity, offering unprecedented high stability as well as an unmatched low cost. Electronic driver is available for this series of switches. The switch is bidirectional. The LB Mini Straight Series Switches can be directly mounted on printed circuit board with configurations of 1x1, Dual 1x1, Quad 1x1, 1x2, Dual 1x2, 2x2, Dual 2x2, Dual 2x2 Bypass both Single mode and Multimode, also we provide configurations Full 2x2 and Dual Full 2x2 Multimode. If you want to looking for Single mode Full 2x2 and Dual Full 2x2 Switches, please pay attention to our MEMS series Switch.

We offer tight-bend-fiber version, which reduces the bending radius. This feature enables smaller overall foot print.

## Specifications

Parameter		Min	Typical	Max	Unit
Operating Wavelength	Single mode	1310 or/and 1550			nm
		1260 ~ 1650			nm
	Multimode	850 or/and 1310			nm
Insertion Loss <sup>[1], [2]</sup>			0.5	1.0 (1.2 <sup>[3]</sup> )	dB
Polarization Depended Loss (Single Mode)				0.1	dB
Wavelength Dependent Loss			0.15	0.25 (0.3 <sup>[3]</sup> )	dB
Cross Talk <sup>[1]</sup>	Single mode	50			dB
	Multimode	35			dB
Return Loss <sup>[1]</sup>	Single mode	50			dB
	Multimode	35			dB
Switching Time			3	10	ms
Repeatability				± 0.02	dB
Durability		10 <sup>7</sup>			cycles
Operating Optical Power			300	500 <sup>[4]</sup>	mW
Switching Type		Latching / Non-Latching			
Operating Temperature		-5 ~ 70			°C
Storage Temperature		-40 ~ 85			°C
Fiber Type	Single mode	SMF-28, or equivalent			
	Multimode	MM 50/125, MM 62.5/125, or equivalent			

### Notes:

- [1]. Excluding Connectors.
- [2]. Multimode IL Measure @ Light source CPR<14 dB.
- [3]. Dual band, Broad band.
- [4]. Continuous operation, for pulse operation call.

**Warning:** This device must use the reference circuit to driver otherwise it is unstable.

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Rev 12/29/23

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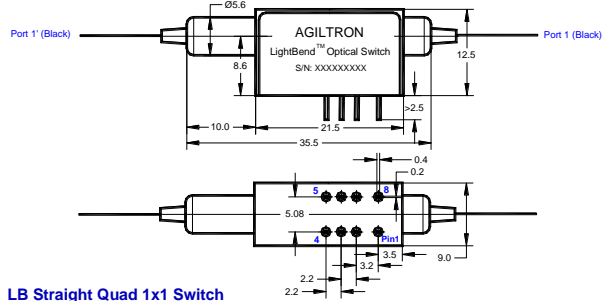
(Protected by U.S. patent 6823102 and pending patents)



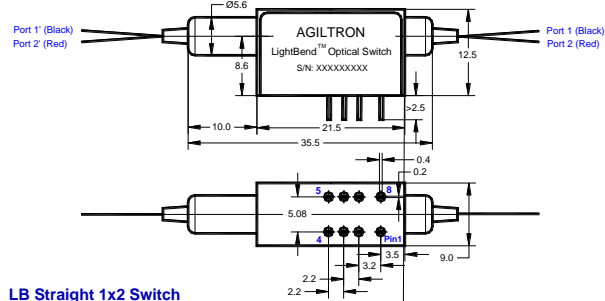
## DATASHEET

### Mechanical Dimensions (mm)

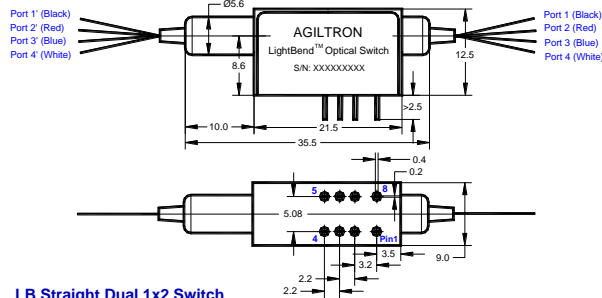
**LB Straight 1x1 Switch**



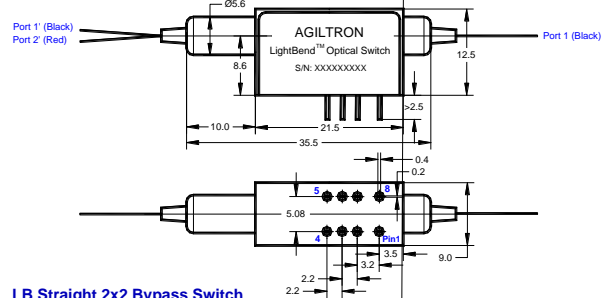
**LB Straight Dual 1x1 Switch**



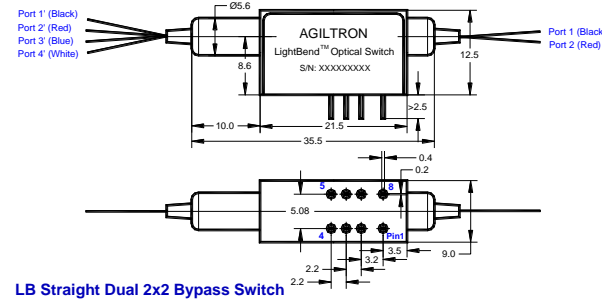
**LB Straight Quad 1x1 Switch**



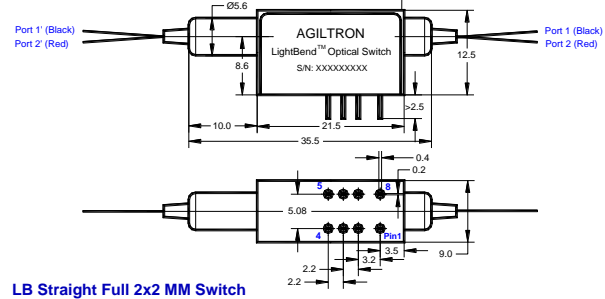
**LB Straight 1x2 Switch**



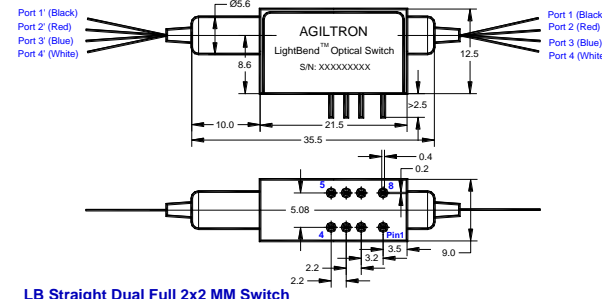
**LB Straight Dual 1x2 Switch**



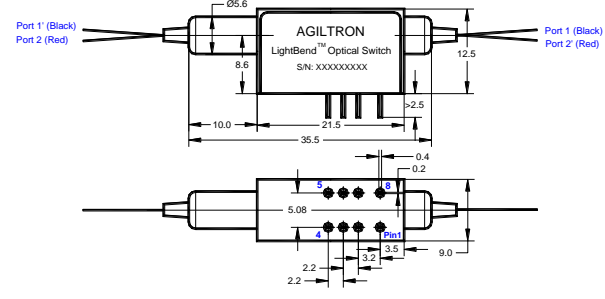
**LB Straight 2x2 Bypass Switch**



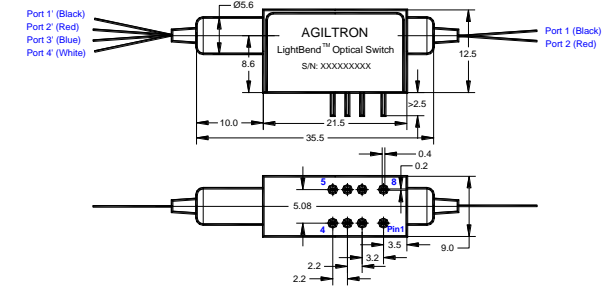
**LB Straight Dual 2x2 Bypass Switch**



**LB Straight Full 2x2 MM Switch**



**LB Straight Dual Full 2x2 MM Switch**



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

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### Electrical Connector Configurations

The load is a resistive coil which is activated by applying 5V (draw ~ 40mA). However, the current flow direction must be correct otherwise it will cancel the permanent magnet inside causing instability. We strongly recommend to use the reference circuit to avoid major issues. We offer pushbutton elevation driver for verifications or convenient income inspection.

#### Latching Type

**Application Note:** Applying a constant driving voltage increases stability. The switches can also be driven by a pulse mode using Agiltron recommended circuit for energy saving.

Status	Optical Path					Electric Drive		Status Sensor			
	1x1	Dual 1x1	Quad 1x1	1x2	Dual 1x2	Pin 1	Pin 8	Pin 2 - 3	Pin 3 - 4	Pin 5 - 6	Pin 6 - 7
Status I	Port 1 → 1'	Port 1 → 1' Port 2 → 2'	Port 1 → 1' Port 2 → 2' Port 3 → 3' Port 4 → 4'	Port 1 → 1'	Port 1 → 1' Port 2 → 2'	5V Pulse	0	Open	Close	Close	Open
Status II	Dark	Dark	Dark	Port 1 → 2'	Port 1 → 3' Port 2 → 4'	0	5V Pulse	Close	Open	Open	Close

Status	Optical Path				Electric Drive		Status Sensor			
	2x2 Bypass	Dual 2x2 Bypass	Full 2x2 MM	Dual Full 2x2 MM	Pin 1	Pin 8	Pin 2 - 3	Pin 3 - 4	Pin 5 - 6	Pin 6 - 7
Status I	Port 1 → 1' Port 2 → 2'	Port 1 → 1' Port 2 → 2' Port 3 → 3' Port 4 → 4'	Port 1 → 1' Port 2' → 2	Port 1 → 1' Port 2 → 2' Port 3' → 3 Port 4' → 4	5V Pulse	0	Open	Close	Close	Open
Status II	Port 1 → 2'	Port 1 → 3' Port 2 → 4'	Port 1 → 2' Port 2' → 1'	Port 1 → 4 Port 2 → 3 Port 3' → 2' Port 4' → 1'	0	5V Pulse	Close	Open	Open	Close

[1]. LB Straight Full 2x2, Dual Full 2x2 Switch are for Multimode only. If you want Single mode Full 2x2, Dual Full 2x2, Octc Full 2x2 Switch, please see Agiltron MEMS Series Switch.

[2]. Typical Pulse Width is 20 ms.

[3]. We can provide 3V or other Driving voltage switches, please call sales.

#### Non-Latching Type

Status	Optical Path					Electric Drive		Status Sensor			
	1x1 Normally Transparency	1x1 Normally Dark	Dual 1x1	Quad 1x1	1x2	Pin 1	Pin 8	Pin 2 - 3	Pin 3 - 4	Pin 5 - 6	Pin 6 - 7
Status I	Dark	Port 1 → 1'	Port 1 → 1' Port 2 → 2'	Port 1 → 1' Port 2 → 2' Port 3 → 3' Port 4 → 4'	Port 1 → 1'	5V Pulse	0	Open	Close	Close	Open
Status II	Port 1 → 1'	Dark	Dark	Dark	Port 1 → 2'	No Power		Close	Open	Open	Close

Status	Optical Path					Electric Drive		Status Sensor			
	Dual 1x2	2x2 Bypass	Dual 2x2 Bypass	Full 2x2 MM	Dual Full 2x2 MM	Pin 1	Pin 8	Pin 2 - 3	Pin 3 - 4	Pin 5 - 6	Pin 6 - 7
Status I	Port 1 → 1' Port 2 → 2'	Port 1 → 1' Port 2 → 2'	Port 1 → 1' Port 2 → 2' Port 3 → 3' Port 4 → 4'	Port 1 → 1' Port 2' → 2	Port 1 → 1' Port 2 → 2' Port 3' → 3 Port 4' → 4	5V Pulse	0	Open	Close	Close	Open
Status II	Port 1 → 3' Port 2 → 4'	Port 1 → 2'	Port 1 → 3' Port 2 → 4'	Port 1 → 2' Port 2' → 1'	Port 1 → 4 Port 2 → 3 Port 3' → 2' Port 4' → 1'	No Power		Close	Open	Open	Close

[1]. LB Straight Full 2x2, Dual Full 2x2 Switch are only for Multimode switches. If you want Single mode Full 2x2, Dual Full 2x2, Octc Full 2x2 Switch, please see Agiltron MEMS Series Switch.

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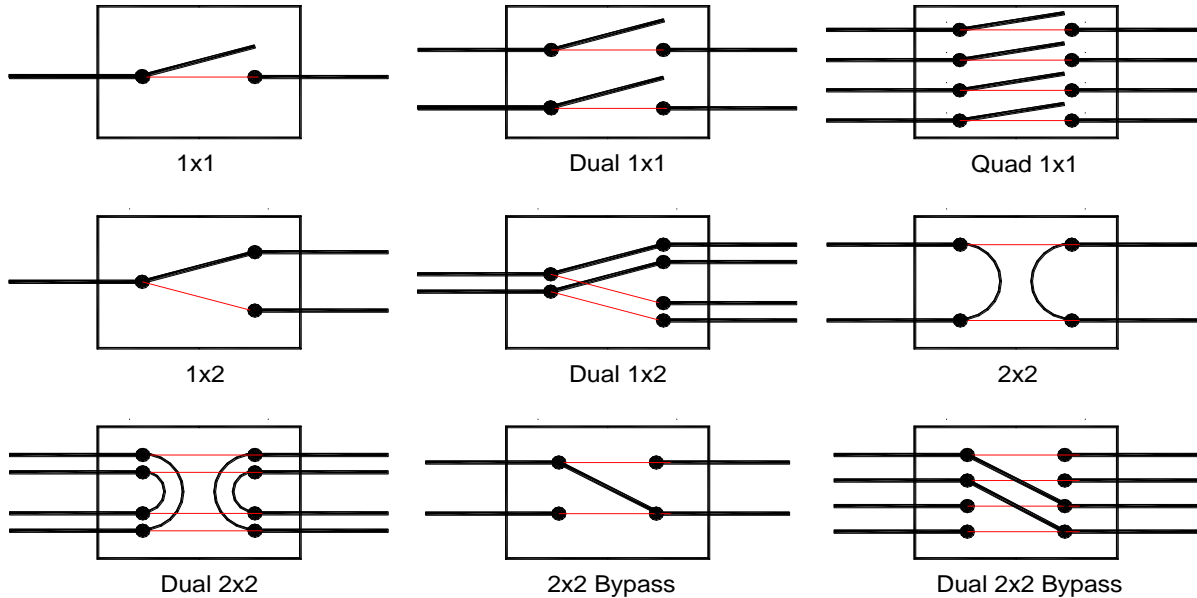
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### Functional Diagram



### Ordering Information

Prefix	Type	Wavelength	Switch	Package	Fiber Type	Fiber Cover	Fiber Length	Connector
LSSW- <sup>[1]</sup>	1x1 Latching = 11	1060 = 1	Latching = 1	Standard = 1	SMF-28 = 1	Bare fiber = 1	0.25m = 1	None = 1
LSBS- <sup>[2]</sup>	1x1 N/T <sup>[5]</sup> = 1T	C+L = 2	Non-latching = 2	Special = 0	MM 50/125 = 5	900um tube = 3	0.5m = 2	FC/PC = 2
LSDS- <sup>[3]</sup>	1x1 N/D <sup>[6]</sup> = 1D	1310 = 3	Special = 0		MM 62.5/125 = 6	Special = 0	1.0m = 3	FC/APC = 3
LSDB- <sup>[4]</sup>	1x2 = 12	1550 = 5			Special = 0		Special = 0	SC/PC = 4
	2x2 = 22	780 = 7						SC/APC = 5
	Special = 00	850 = 8						ST/PC = 6
		1310 & 1550 = 9						LC/PC = 7
		850 & 1310 = A						Duplex LC/PC = 8
		1260~1650 = B						LC/UPC = U
		Special = 0						Special = 0

[1]. LSSW: LB Straight 1x1, 1x2, Full 2x2 (MM only) Switch.

[2]. LSBS: LB Straight 2x2 Bypass Switch.

[3]. LSDS: LB Straight Dual 1x1, 1x2, Full 2x2 (MM only) Switch.

[4]. LSDB: LB Straight Dual 2x2 Bypass Switch.

[5]. N/T: Non-Latching type, Normally Transparent.

[6]. N/D: Non-Latching type, Normally Dark.

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### Applications Notes

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#### 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.