CrystaLatch™
High Return Loss 1×3/1×4 Sensor Fiber Optic Switch
(PM, High Power)

(Protected by U.S. patents 7224860，6757101，6577430 and pending patents)

DATASHEET

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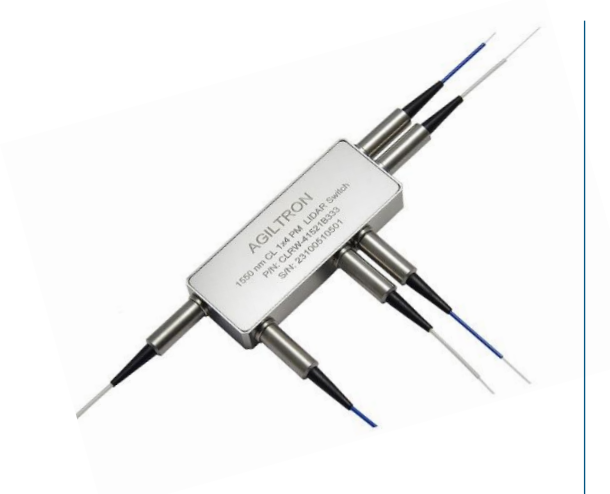

The CLLD Series fiber optic switch is a non-mechanical, all-solid-state device optimized for LIDAR applications, offering high power handling (5W CW and 100 µJ pulse) and scanning a probing laser among four output fiber ports while redirecting reflected light into a dedicated receiving fiber port. Its patent-pending design minimizes system optical loss by reducing the need for additional circulators or couplers, achieving over 60dB isolation for the receiving signal from the probe beam. With low insertion loss, high extinction ratio, excellent channel isolation, and exceptional reliability, the CLLD switch performs under extreme conditions, including shock, vibration, temperature fluctuations, and continuous operation. Suitable for aerospace, deep-sea, outer-space, and outdoor applications, it features magneto-optical crystals resistant to fatigue or drift, ensuring consistent performance. The design has passed aerospace and out-space application qualifications. An optional electronic driver is available for enhanced control.

Features

- Low Loss
- High Reliability
- High Power Handling 5W
- High Isolation 65dB
- Compact
- High-Speed (<10µs rise/fall)

Applications

- Gain Control
- Power Equalizer

Specifications

Parameter		Min	Typical	Max	Unit
Operation Wavelength [1]		1520	1550	1580	nm
		1295	1310	1325	nm
Insertion Loss [2]		1.1	1.2	1.8	dB
Receive Signal Isolation [3]		60	65	70	dB
Optical Switch Speed (Rise, Fall)		5		20	µs
Repetition Rate			2K		Hz
Channel Crosstalk		23	28		dB
Optical Power Handling	CW			5 [4]	W
	Pulse			100	µJ
Durability		10^{15}			cycles
Operating Temperature [5]		-20		+70	°C
Storage Temperature		-40		+85	°C
Fiber Type		Panda or equivalent			

Notes:

[1]. Agiltron can achieve same SPEC at L band.

[2]. Measured without connectors. For all ports. We offer high power connectors.

[3]. Receiving signal isolation from probing laser, the value is for PM version. Measured using ASE source.

[4]. Continuous operation.

[5]. Standard version -5 ~ +70°C, premium version extends the range.

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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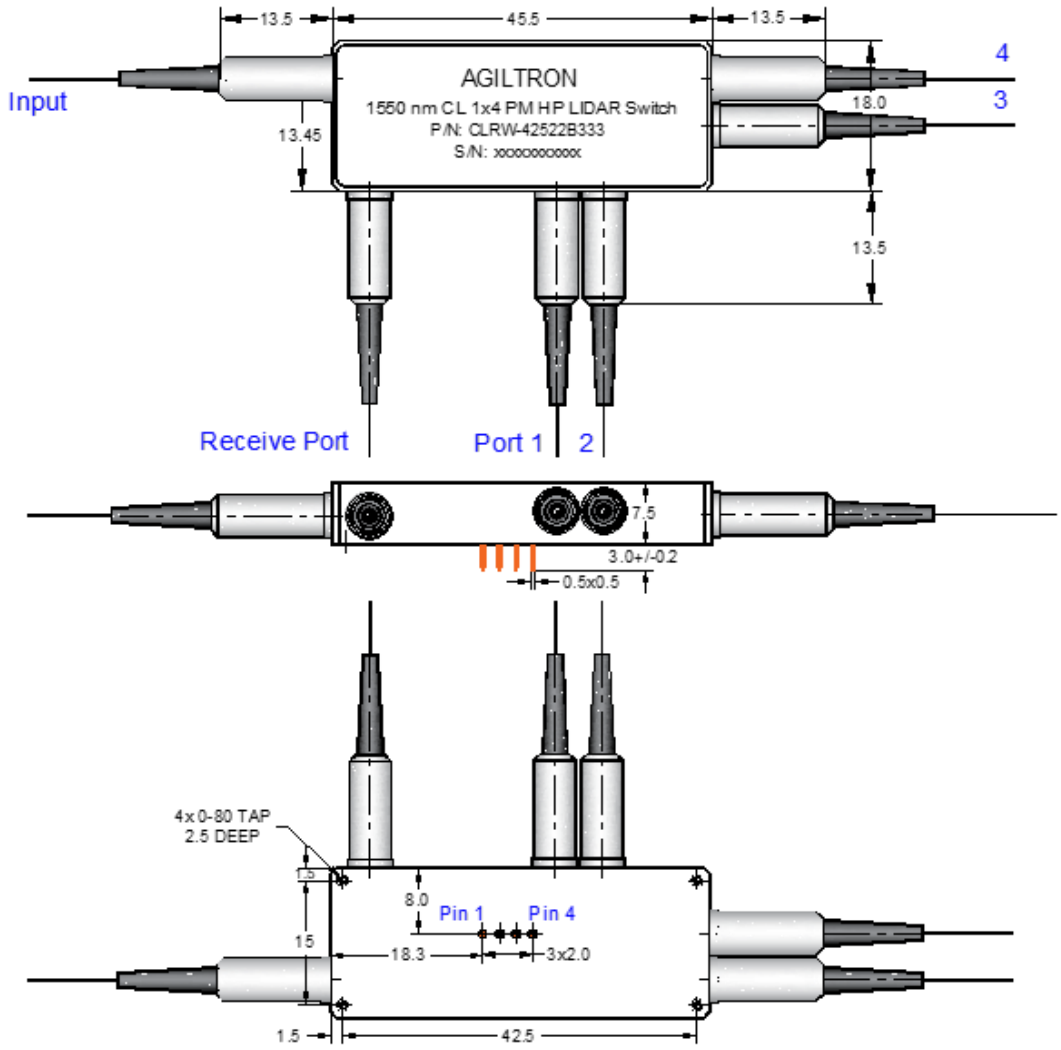
Mechanical Dimensions (mm)



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

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Electric Instruction – Coil Parameters and Driving Table

Each switching point is actuated by applying a polarity voltage pulse through a pair of PINS, and latched after pulse removed.

Parameter	Minimum	Typical	Maximum	Unit
Resistance (each group)	15	18	22	Ω
Switch Voltage	2.25	2.5	2.75 [1]	V
Pulse Duration	0.2	0.3	0.5	ms

[1]. Over this value will damage the device.

Optical Path	Pin Group 1		Pin Group 2	
	Pin 1	Pin 2	Pin 3	Pin 4
IN → P1 & P1 → R [1]	+ [2]	0	+	0
IN → P2 & P2 → R	0	+	0	+
IN → P3 & P3 → R	0	+	+	0
IN → P4 & P4 → R	+	0	0	+

[1]. **IN**: Input Port; **P1**: Port 1; **R**: Receive Port
[2]. "**+**": 2.25~2.75V Pulse, Topical is 2.5V pulse

Driving kit with USB and/or RS232 or TTL interfaces is available. We provide GUI for USB and RS232 interface. Please contact sales for more information.

Note:

The driving voltage value is transient voltage with a full load. The driver circuitry needs to provide sufficient current (~300mA) during the switching. Inside the switch core is an electromagnet with a residual magnetic field. The residual magnetic field will be established when an electrical current flows in one direction through the coil for a sufficiently long period. The residual magnetic field latches the switch state even without applying a voltage (the current flow stopped). Flowing a current in the opposite direction for a sufficient time changes the switch stage by establishing a reversal magnetic field. The coil is forgiving to the driver unless one burns it by applying a higher voltage or a current for too long (day). The switch can also be operated at high repetition rates of kHz, where the residual magnetic field may not be fully established.

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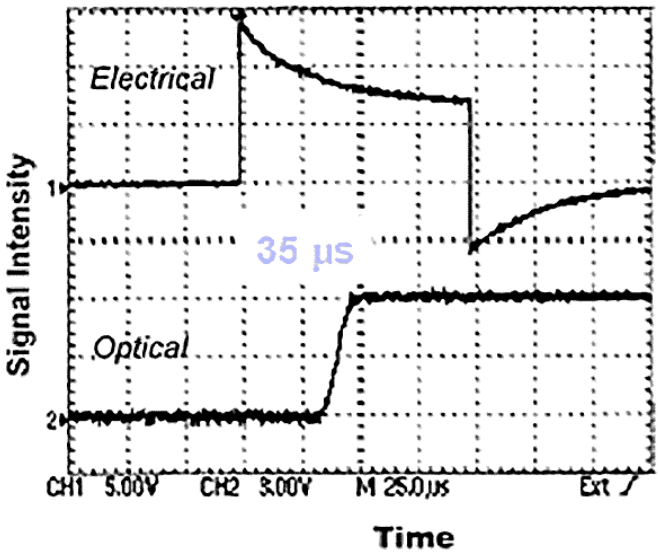
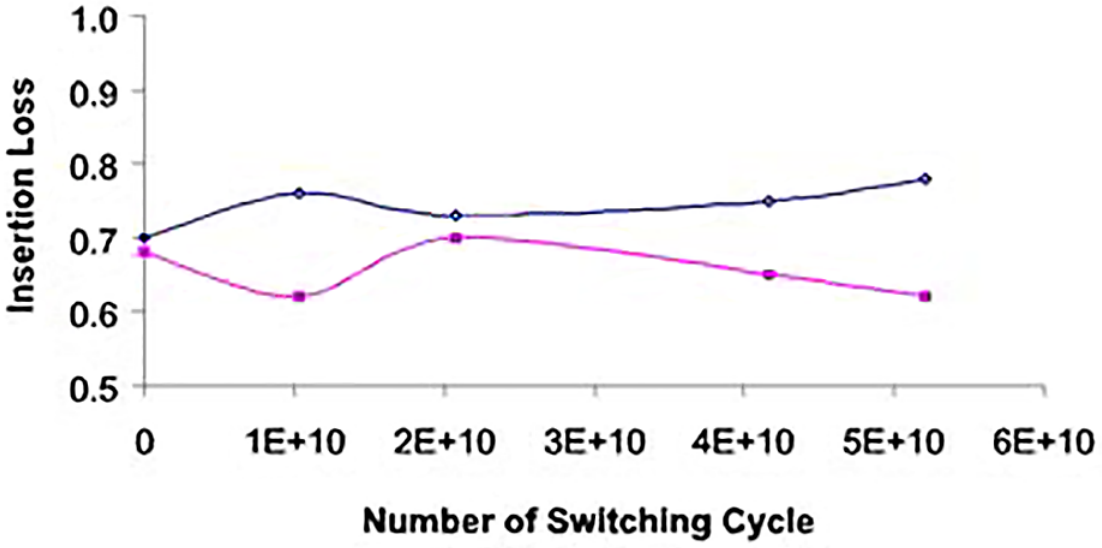
Typical Switching Response



Typical Loss Change of 1x2 vs Switching Numbers



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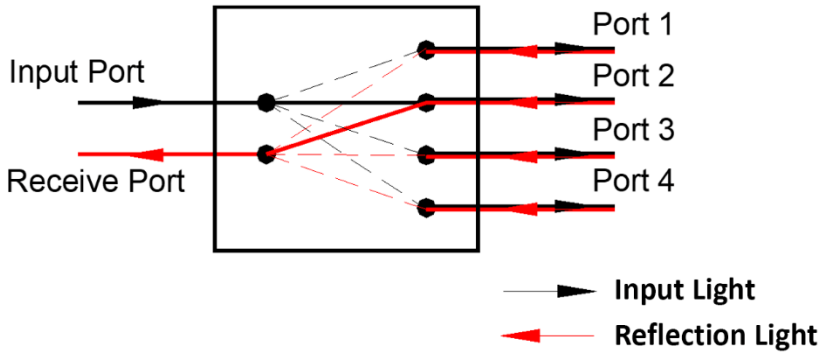
Optical Path Diagram



Ordering Information

	☐	1	☐	☐	☐	☐	☐	☐	☐
Prefix	**Type**	**Stage**	**Wavelength**	**Power Handling**	**Package**	**Fiber Type**	**Fiber Cover**	**Fiber Length**	**Connector ***
CLLD-	1x4 = 4 1x3 = 3 Special = 0	Single Stage = 1	1550 = 5 Special = 0	5 W = 2 100 µJ =1 Special = 0	Standard = 1 -40~+85°C = A -40~+70°C = B -20~+85°C = C Special = 0	PM1550 = B Special = 0	Bare fiber = 1 900µm tube = 3 Special = 0	0.25m = 1 0.5m = 2 1.0m = 3 Special = 0	None = 1 HP FC/PC = H HP FC/APC = A FC/APC =3 FC/PC =2 Special = 0

* Only the reflected signal port can use a regular connector. Regular connector on all other ports will be soon demaged. High-power connectors are designed to work exclusively in pairs. We offer a connectorized fiber pigtail for one end, allowing customers to splice it into their system for mating with the switch. Each connector is priced at $395.

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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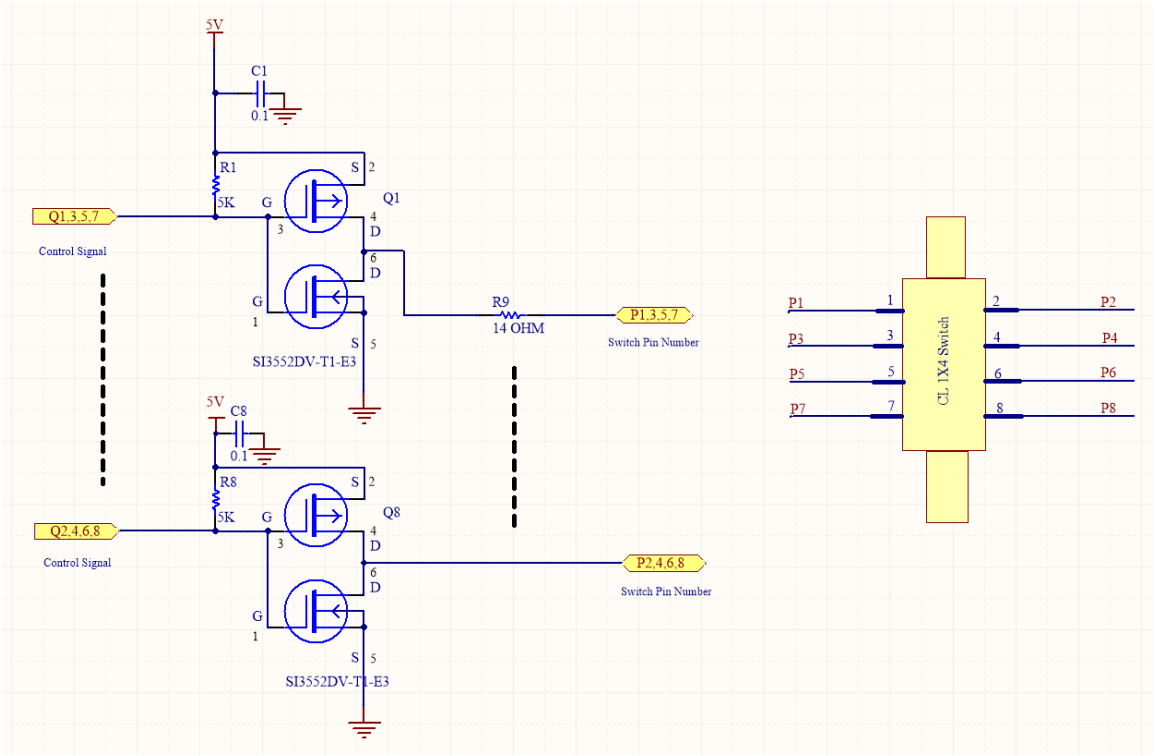
Driver Design Example for 1x4

A recommended +5VDC powered driving circuit is provided. The resistor network R1~R8 is to suppress the driving signal's voltage level to meet the "switch voltage" requirements. In specific applications, users can use lower voltage to eliminate the R1~R8. The Q1~Q8 is the control signal from either a function generator or a microcontroller general purpose I/O. The Q1-Q8 switching speed must meet the specific MOSFET switching requirement and CL 1x4 Switch specific requirement. Usually, the control signal speed is ≤ 2kHz.



Usually, a clean power supply source will be sufficient. However, decoupling capacitors for the transistor supply rail are recommended depending on different applications. Minimum the current loop on the switching circuits will minimize the switching noise. For other layout recommendations, please refer to books or application notes from the IC manufacturer.