CrystaLatch™ 1x16 Series Fiber Optic Switch

(SM, PM, Unidirectional, Bidirectional)

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

DATASHEET

BUY NOW

The CL Series 1x16 Bidirectional Solid State fiber optical switch connects optical channels by redirecting an incoming optical signal into a selected output fiber without mechanical movement. This is achieved using patented magneto-optical configurations and activated via an electrical control signal. The latching operation preserves the selected optical path after removing the drive signal. The all solid sate CL 1x16 Bidirectional fiberoptic switch features low insertion loss, high extinction ratio, high channel isolation, and extremely high reliability and repeatability. It is designed to meet the most demanding switching requirements of continuous operation without failure, longevity, operation under shock/vibration environment and large temperature variations, and fast response time. The switch also has build-in Circulator And Isolator functions. An electronic driver is available for this series of switches.

The magneto-optical crystals used in the CL switches have no fatigue or drift effect.

Features

- High Speed
- Non-Mechanical
- High Reliability
- Fail-Safe Latching
- Low Insertion Loss
- Rugged
- Compact
- Cost Effective
- Direct Low Voltage Drive

Applications

- Optical Signal Routing
- Network Protection
- Burst Switching
- Configurable Add/Drop
- Signal Monitoring
- Instrumentation

Specifications

Parameter			Min	Typical	Max	Unit
Operation Wavelength [1]			1520	1550	1580	nm
			1295	1310	1325	nm
Insertion Loss [2]	1-Stage			1.3	2.0	dB
	2-Stage			1.5	2.6	dB
Cross Talk [2]	Bidirectional Series Switch	1-Stage	17	25		dB
		2-Stage	34	50		dB
	Other Series	1-Stage	18	25		dB
		2-Stage	36	50		dB
Return Loss [2]			50			dB
PDL (Except PM Series Switch)				0.15	0.3	dB
Extinction Ratio (PM Series only)			18	25		dB
Polarization Mode Dispersion					0.2	ps
Optical Switching Speed (Rise, Fall)			5		10	µs
Repetition Rate				2K		Hz
Durability			10^{15}			cycle
Optical Power				200	300	mW
Operating Temperature			-5		+65	°C
Storage Temperature			-40		+85	°C
Weight (without connectors)				100		g

Notes:

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

[2]. Measured without connectors

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]:

Rev 06/26/24

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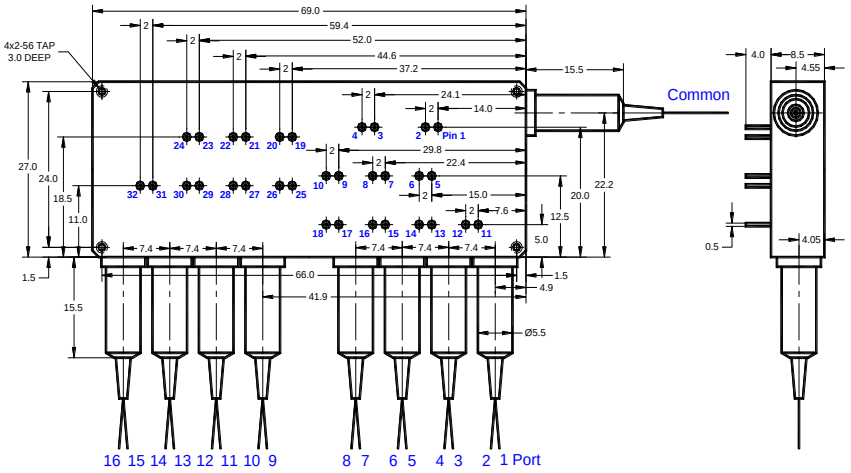
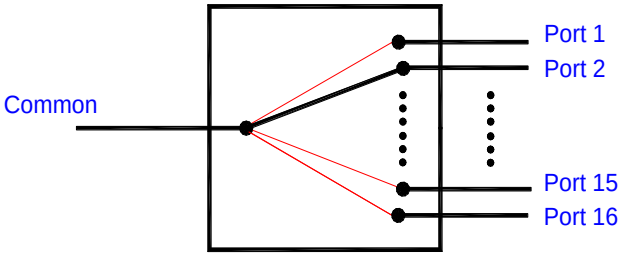
Mechanical Dimensions (Unit: mm)



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

Functional Diagram



CL 1x16 Series Switch

Electrical Driving Information

Each switching point is actuated by applying a voltage pulse. Applying one polarity pulse, one light path will be connected and latched to the position. Applying a reversed polarity pulse, another light path will be connected and latched to the position after pulse removed.

Parameter	Minimum	Typical	Maximum	Unit
Resistance (each Pin 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

Driving kit with USB and TTL interfaces and Windows™ GUI is available. We also offer RS232 interface as an option – please contact Agiltron sales.

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Electrical Driving Information (continue 1)

CL 1x16 1-Stage Switch Driving Table: TBD

2-Stage Unidirectional Series 1x16 Switch Driving Table

Optical Path	PG 1 [1]		PG 2		PG 3		PG 4		PG 5		PG 6		PG 7		PG 8		PG 9		PG 10		PG 11		PG 12		PG 13		PG 14		PG 15		PG 16	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
C → P1 [2]	+	0	+	0	+	0	+	0	+	0	+	0	0	+	0	+	0	+	0	0	0	0	0	0	0	+	0	+	0	+	0	+
C → P2	0	+	0	+	+	0	+	0	+	0	+	0	0	+	0	+	0	+	0	0	0	0	0	0	0	+	0	+	0	+	0	+
C → P3	+	0	+	0	0	+	+	0	+	0	0	+	+	0	0	+	0	+	0	0	0	0	0	0	0	+	0	+	0	+	0	+
C → P4	0	+	0	+	0	+	+	0	+	0	0	+	+	0	0	+	0	+	0	0	0	0	0	0	0	+	0	+	0	+	0	+
C → P5	+	0	+	0	0	+	0	+	+	0	0	+	0	+	+	0	0	+	0	0	0	0	0	0	0	+	0	+	0	+	0	+
C → P6	0	+	0	+	0	+	0	+	+	0	0	+	0	+	+	0	0	+	0	0	0	0	0	0	0	+	0	+	0	+	0	+
C → P7	+	0	+	0	0	+	0	+	0	+	0	+	0	+	0	+	+	0	0	0	0	0	0	0	0	+	0	+	0	+	0	+
C → P8	0	+	0	+	0	+	0	+	0	+	0	+	0	+	0	+	+	0	0	0	0	0	0	0	0	+	0	+	0	+	0	+
C → P9	+	0	0	+	0	0	0	0	0	0	0	+	0	+	0	+	0	+	0	+	0	+	0	+	+	0	0	+	0	+	0	+
C → P10	0	+	+	0	0	0	0	0	0	0	0	+	0	+	0	+	0	+	0	+	0	+	0	+	+	0	0	+	0	+	0	+
C → P11	+	0	0	+	0	0	0	0	0	0	0	+	0	+	0	+	0	+	+	0	0	+	0	+	0	+	+	0	0	+	0	+
C → P12	0	+	+	0	0	0	0	0	0	0	0	+	0	+	0	+	0	+	+	0	0	+	0	+	0	+	+	0	0	+	0	+
C → P13	+	0	0	+	0	0	0	0	0	0	0	+	0	+	0	+	0	+	+	0	+	0	0	+	0	+	0	+	+	0	0	+
C → P14	0	+	+	0	0	0	0	0	0	0	0	+	0	+	0	+	0	+	+	0	+	0	0	+	0	+	0	+	+	0	0	+
C → P15	+	0	0	+	0	0	0	0	0	0	0	+	0	+	0	+	0	+	+	0	+	0	+	0	0	+	0	+	0	+	+	0
C → P16	0	+	+	0	0	0	0	0	0	0	0	+	0	+	0	+	0	+	+	0	+	0	+	0	0	+	0	+	0	+	+	0

[1]. **PG**1: **P**in **G**roup 1.
[2]. **C**: **C**ommon Port. **P**1: **P**ort 1.

2-Stage Unidirectional Series 16x1 Switch Driving Table

Optical Path	PG 1 [1]		PG 2		PG 3		PG 4		PG 5		PG 6		PG 7		PG 8		PG 9		PG 10		PG 11		PG 12		PG 13		PG 14		PG 15		PG 16	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
P1 → C [2]	0	+	0	+	0	+	0	+	0	+	0	+	+	0	+	0	+	0	0	0	0	0	0	0	+	0	+	0	+	0	+	0
P2 → C	+	0	+	0	0	+	0	+	0	+	0	+	+	0	+	0	+	0	0	0	0	0	0	0	+	0	+	0	+	0	+	0
P3 → C	0	+	0	+	+	0	0	+	0	+	+	0	0	+	+	0	+	0	0	0	0	0	0	0	+	0	+	0	+	0	+	0
P4 → C	+	0	+	0	+	0	0	+	0	+	+	0	0	+	+	0	+	0	0	0	0	0	0	0	+	0	+	0	+	0	+	0
P5 → C	0	+	0	+	+	0	+	0	0	+	+	0	+	0	0	+	+	0	0	0	0	0	0	0	+	0	+	0	+	0	+	0
P6 → C	+	0	+	0	+	0	+	0	0	+	+	0	+	0	0	+	+	0	0	0	0	0	0	0	+	0	+	0	+	0	+	0
P7 → C	0	+	0	+	+	0	+	0	+	0	+	0	+	0	+	0	0	+	0	0	0	0	0	0	+	0	+	0	+	0	+	0
P8 → C	+	0	+	0	+	0	+	0	+	0	+	0	+	0	+	0	0	+	0	0	0	0	0	0	+	0	+	0	+	0	+	0
P9 → C	0	+	+	0	0	0	0	0	0	0	+	0	+	0	+	0	+	0	+	0	+	0	+	0	0	+	+	0	+	0	+	0
P10 → C	+	0	0	+	0	0	0	0	0	0	+	0	+	0	+	0	+	0	+	0	+	0	+	0	0	+	+	0	+	0	+	0
P11 → C	0	+	+	0	0	0	0	0	0	0	+	0	+	0	+	0	+	0	0	+	+	0	+	0	+	0	0	+	+	0	+	0
P12 → C	+	0	0	+	0	0	0	0	0	0	+	0	+	0	+	0	+	0	0	+	+	0	+	0	+	0	0	+	+	0	+	0
P13 → C	0	+	+	0	0	0	0	0	0	0	+	0	+	0	+	0	+	0	0	+	0	+	+	0	+	0	+	0	0	+	+	0
P14 → C	+	0	0	+	0	0	0	0	0	0	+	0	+	0	+	0	+	0	0	+	0	+	+	0	+	0	+	0	0	+	+	0
P15 → C	0	+	+	0	0	0	0	0	0	0	+	0	+	0	+	0	+	0	0	+	0	+	0	+	+	0	+	0	+	0	0	+
P16 → C	+	0	0	+	0	0	0	0	0	0	+	0	+	0	+	0	+	0	0	+	0	+	0	+	+	0	+	0	+	0	0	+

[1]. **PG**1: **P**in **G**roup 1.
[2]. **C**: **C**ommon Port. **P**1: **P**ort 1.

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Electrical Driving Information (continue 2)

2-Stage Bidirectional Series 1x16, or 16x1 Switch Driving Table

Optical Path	PG 1 [1]		PG 2		PG 3		PG 4		PG 5		PG 6		PG 7		PG 8		PG 9		PG 10		PG 11		PG 12		PG 13		PG 14		PG 15		PG 16	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
C ↔ P1 [2]	+	0	+	0	+	0	+	0	+	0	+	0	0	+	0	+	0	+	0	0	0	0	0	0	0	+	0	+	0	+	0	+
C ↔ P2	0	+	0	+	+	0	+	0	+	0	+	0	0	+	0	+	0	+	0	0	0	0	0	0	0	+	0	+	0	+	0	+
C ↔ P3	+	0	+	0	0	+	+	0	+	0	0	+	+	0	0	+	0	+	0	0	0	0	0	0	0	+	0	+	0	+	0	+
C ↔ P4	0	+	0	+	0	+	+	0	+	0	0	+	+	0	0	+	0	+	0	0	0	0	0	0	0	+	0	+	0	+	0	+
C ↔ P5	+	0	+	0	0	+	0	+	+	0	0	+	0	+	+	0	0	+	0	0	0	0	0	0	0	+	0	+	0	+	0	+
C ↔ P6	0	+	0	+	0	+	0	+	+	0	0	+	0	+	+	0	0	+	0	0	0	0	0	0	0	+	0	+	0	+	0	+
C ↔ P7	+	0	+	0	0	+	0	+	0	+	0	+	0	+	0	+	+	0	0	0	0	0	0	0	0	+	0	+	0	+	0	+
C ↔ P8	0	+	0	+	0	+	0	+	0	+	0	+	0	+	0	+	+	0	0	0	0	0	0	0	0	+	0	+	0	+	0	+
C ↔ P9	+	0	0	+	0	0	0	0	0	0	0	+	0	+	0	+	0	+	0	+	0	+	0	+	+	0	0	+	0	+	0	+
C ↔ P10	0	+	+	0	0	0	0	0	0	0	0	+	0	+	0	+	0	+	0	+	0	+	0	+	+	0	0	+	0	+	0	+
C ↔ P11	+	0	0	+	0	0	0	0	0	0	0	+	0	+	0	+	0	+	+	0	0	+	0	+	0	+	+	0	0	+	0	+
C ↔ P12	0	+	+	0	0	0	0	0	0	0	0	+	0	+	0	+	0	+	+	0	0	+	0	+	0	+	+	0	0	+	0	+
C ↔ P13	+	0	0	+	0	0	0	0	0	0	0	+	0	+	0	+	0	+	+	0	+	0	0	+	0	+	0	+	+	0	0	+
C ↔ P14	0	+	+	0	0	0	0	0	0	0	0	+	0	+	0	+	0	+	+	0	+	0	0	+	0	+	0	+	+	0	0	+
C ↔ P15	+	0	0	+	0	0	0	0	0	0	0	+	0	+	0	+	0	+	+	0	+	0	+	0	0	+	0	+	0	+	+	0
C ↔ P16	0	+	+	0	0	0	0	0	0	0	0	+	0	+	0	+	0	+	+	0	+	0	+	0	0	+	0	+	0	+	+	0

[1]. **PG**1: **P**in **G**roup 1.
[2]. **C**: **C**ommon Port. **P**1: **P**ort 1.

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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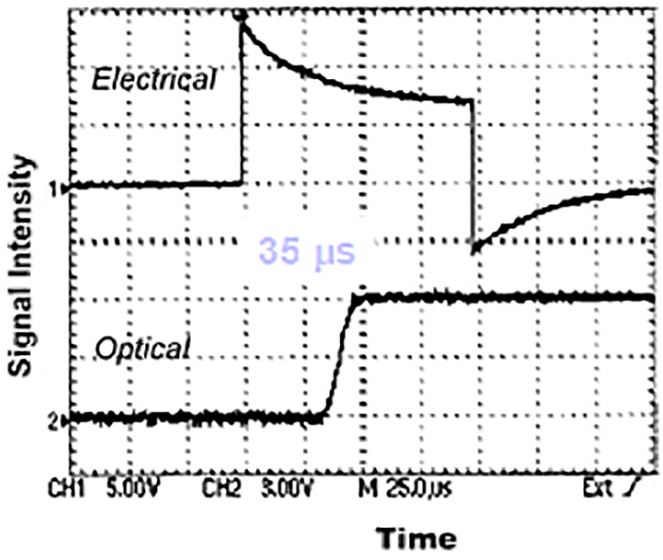
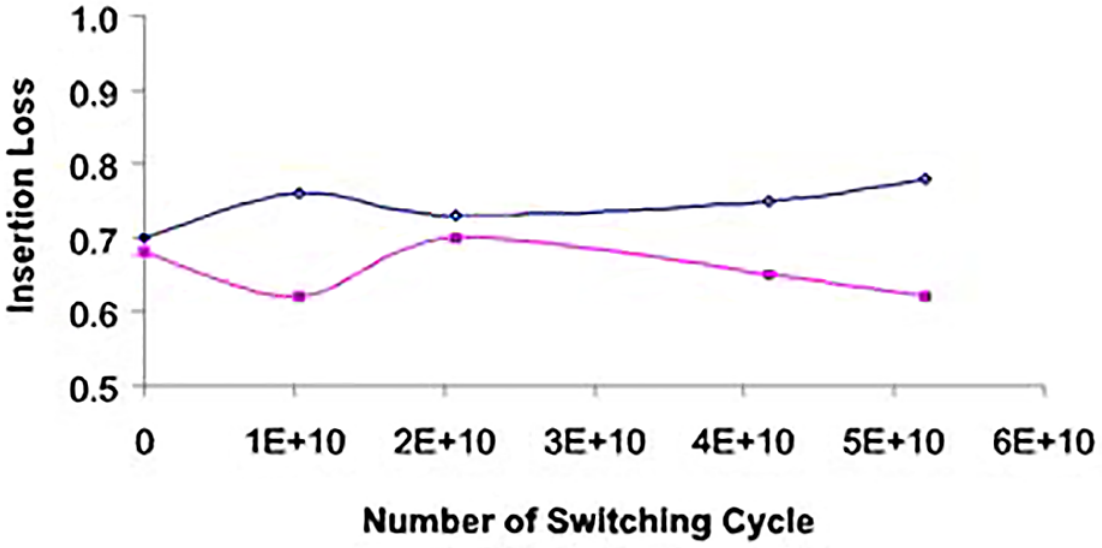
Typical Switching Response



Typical Loss Change of 1x2 vs Switching Numbers



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Ordering Information

	☐☐☐	☐	☐	☐	☐	☐	☐	☐
Prefix	**Type**	**Wavelength**	**Switch**	**Package**	**Fiber Type**	**Fiber Cover**	**Fiber Length**	**Connector**
CLSW- [1] **CLPM-** [2] **CLBD-** [3] **CLPB-** [4]	1x9 = 109 9x1 = 091 1x10 = 110 10x1 = 101 ... 1x16 = 116 16x1 = 161 Special = 000	1310 = 3 1550 = 5 Special = 0	1-Stage = 1 2-Stage = 2 Special = 0	Standard = 1 Special = 0	SMF-28 = 1 PM1550 = B PM1310 = D Special = 0	Bare fiber = 1 900μm tube = 3 Special = 0	0.25m = 1 0.5m = 2 1.0m = 3 Special = 0	None = 1 FC/PC = 2 FC/APC = 3 SC/PC = 4 SC/APC = 5 ST/PC = 6 LC/PC = 7 Duplex LC/PC = 8 MTP = 9 LC/APC = A LC/UPC = U Special = 0

[1]. **CLSW**: **C**rysta**L**atch 1x16 **SW**ITCH.
[2]. **CLPM**: **C**rysta**L**atch 1x16 **PM** Switch.
[3]. **CLBD**: **C**rysta**L**atch 1x16 **BI**DIRECTIONAL Switch.
[4]. **CLPB**: **C**rysta**L**atch 1x16 **P**M **B**idirectional Switch.

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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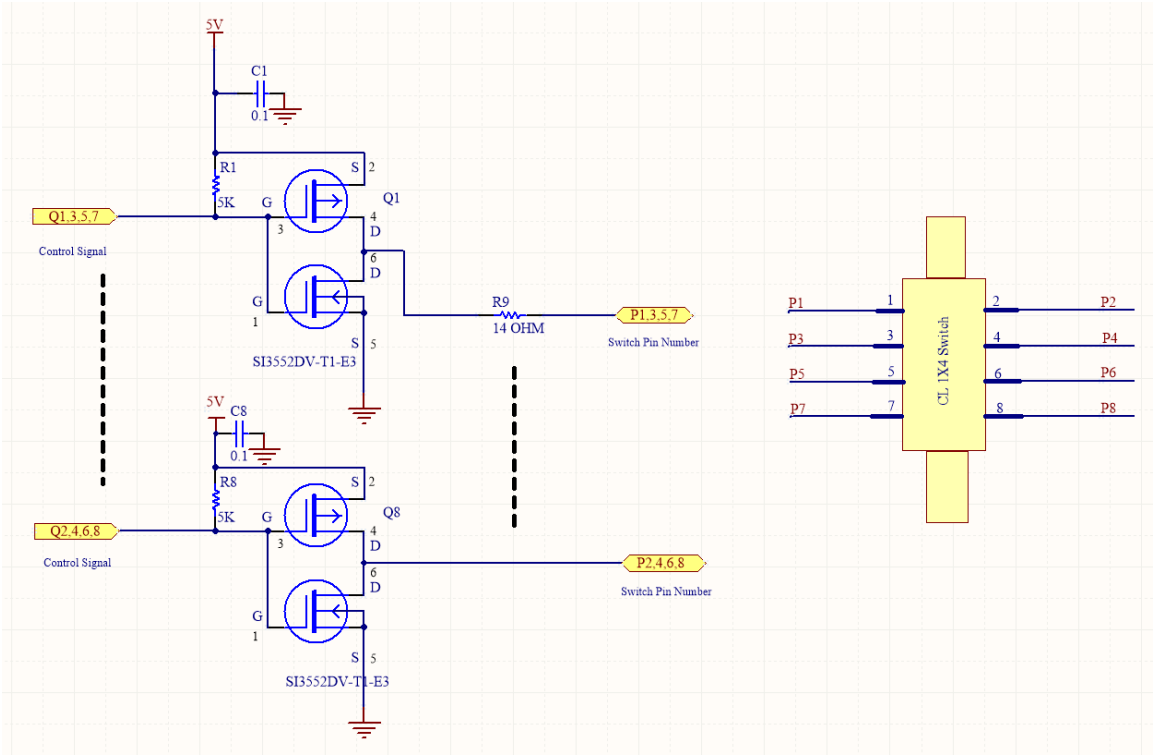
Driver Design Example for 1x4

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.