

# SLC-25-8-1-X Optical 2x FC/GbE/1x FC -- +3.3V SFF 2x5 Transceiver -- 2.125/1.25/1.0625 GBaud



## ORDERING INFORMATION

**SLC - 25 - 8 - 1 - X**

### GROUNDING CLIP

- N** = No Clip
- E** = Individual Clip (0.600" center)
- K** = Ext. Individual Clip (0.600" center)
- G** = Gang Mount Clip (0.550" center)

### WAVELENGTH

- 1** = 850nm (Multimode)

### PROTOCOL

- 8** = 2x FC/GbE/1x FC;  
2.125/1.25/1.0625 GBaud



## Optoelectronic Products

7444 West Wilson Avenue • Chicago, IL 60656  
(708) 867-9600 • (800) 323-6858 • Fax: (708) 867-0996  
email:optoinfo@stratoslightwave.com  
http://www.stratoslightwave.com

## Features

- 2.125 Gbps Fibre Channel Compliant
- 1.25 Gbps Gigabit Ethernet compliant
- 1.0625 Gbps Fibre Channel compliant
- Die Cast Metal Package
- TTL Signal Detect Output
- Transmitter Disable Input
- Low profile fits Mezzanine Card Applications
- 100Ω differential AC coupled CML level Outputs
- Single +3.3V Power Supply
- Wave Solderable / Aqueous Washable
- Class 1 Laser Safety Compliant
- UL 1950 Approved

## PRODUCT OVERVIEW

The SLC-25-8-1-X Small Form Factor (SFF) optical transceivers are high performance integrated duplex data links for bi-directional communication over multimode fiber. The SLC-25-8-1-X module is specifically designed to be used in multi mode Fibre Channel applications with data rate up to 2.125GBaud. The SLC-25-8-1-X transceivers are provided with the LC receptacle which is compatible with the industry standard LC connector. The Stratos Lightwave SFF transceivers measure 0.532 inches in width. These transceivers provide double port densities by fitting twice the number of transceivers into the same board space as a 1x9 transceiver. This saves on system costs and can reduce overall design time.

This optoelectronic transceiver module is a class 1 laser product compliant with FDA Radiation Performance Standards, 21 CFR Subchapter J. This component is also class 1 laser compliant according to International Safety Standard IEC-825-1.

## SHORT WAVELENGTH LASER

The use of short wavelength VCSELs (Vertical Cavity Surface-Emitting Laser) and high volume production processes has resulted in a low cost, high performance product available in various data transfer rates up to 2.125GBaud.

## ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	MIN	MAX	UNITS	NOTES
Storage Temperature	Tstg	-50	+100	°C	
Soldering Temperature			260	°C	10 seconds on leads only
Supply Voltage	V <sub>CC</sub> T, V <sub>CC</sub> R		6.0	V	VCC - ground
Data AC Voltage	Tx+, Tx-		2.6	V <sub>pp</sub>	Differential
Data DC Voltage	Tx+, Tx-	-10	10.0	V <sub>pk</sub>	V (Tx+ or Tx-) - ground

## RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	MIN	TYP	MAX	UNITS	NOTES
Operating Case Temperature	Tc	-5		+80	°C	
Supply Voltage	Vcc	+3.0	+3.3	+3.6	VDC	
Baud Rate	Brate	1.0625		2.125	GBaud	1.0625/1.25/2.125GBaud

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## MODULE SPECIFICATIONS - ELECTRICAL

-5°C<Tc<+80°C; +3.0<Vcc<+3.6V

PARAMETER	SYMBOL	MIN	TYP	MAX	UNITS	NOTES
Supply Current	I <sub>cc</sub>		150	200	mA	-5°C<Tc<+80°C; +3.0V<Vcc<+3.6V
<b>TRANSMITTER</b>						
CML/PECL Inputs (Differential)		400		2500	mVpp	AC coupled inputs
Input Impedance	Z <sub>in</sub>	85	100	115	ohms	
TX_DISABLE input Voltage - HIGH	V <sub>IH</sub>	2.0		Vcc+0.3	V	
TX_DISABLE input Voltage - LOW	V <sub>IL</sub>	0		0.8	V	
<b>RECEIVER</b>						
CML Outputs (Differential)		400	600	1000	mVpp	AC coupled outputs
Output Impedance (Differential)	Z <sub>in</sub>	90	100	110	ohms	
Total Jitter	T <sub>J</sub>			75	ps	Mesured with 2 <sup>7</sup> -1 PRBS @ 2.125GBaud
				130	ps	Mesured with 2 <sup>7</sup> -1 PRBS @ 1.25/1.0625GBaud
TTL Signal Detect Output - LOW				0.8	V	I <sub>OL</sub> = -1.6mA, 1 TTL unit load
TTL Signal Detect Output - HIGH		2.4	3		V	I <sub>OH</sub> = 40μA, 1 TTL unit load

## SLC-25-8-1-XX OPTICAL SPECIFICATIONS - 8500 nm Multimode Laser

-5°C<Tc<+80°C; +3.0<Vcc<+3.6V

PARAMETER	SYMBOL	MIN	TYP	MAX	UNITS	NOTES
50µm Core Diameter MMF		300	500		m	BER<1.0E-12 @ 2.125GBaud
		550	1000		m	BER<1.0E-12 @ 1.25/1.0625GBaud
62.5µm Core Diameter MMF		200	300		m	BER<1.0E-12 @ 2.125GBaud
		300	500		m	BER<1.0E-12 @ 1.25/1.0625GBaud
TRANSMITTER						
Optical Center Wavelength	λ	830	850	860	nm	
Spectral Width	Δλ			0.85	nm	RMS
Optical Transmit Power	Popt	-9.5		-2 <sup>1</sup>	dBm	Average @ 850nm
Optical Modulation Amplitude	OMA	225			µW	pk-pk
Extinction Ratio	ER	9			dB	P1/P0
Relative Intensity Noise	RIN			-117	dB/Hz	
Total Jitter	TJ			85	ps	Mesured with 2 <sup>7</sup> -1 PRBS @ 2.125GBaud
				170	ps	Mesured with 2 <sup>7</sup> -1 PRBS @ 1.25/1.0625GBaud
Output Rise/Fall Time	t <sub>R</sub> , t <sub>F</sub>			160	ps	20-80%; measured unfiltered @ 2.125GBaud
				260	ps	20-80%; measured unfiltered @ 1.25/1.0625GBaud
RECEIVER						
Optical Input Wavelength	λ	770		860	nm	
Optical Input Power	Pr	-17		0	dBm	BER<1.0E-12 @ 2.125/1.25/1.0625GBaud
Optical Modulation Amplitude	OMA	31			µw	pk-pk @ 2.125/1.25/1.0625GBaud
Optical Return Loss	ORL	12			dB	
Signal Detect - Asserted	Pa			-17	dBm	Measured on transition - Low to High
Signal Detect - Deasserted	Pd	-29			dBm	Measured on transition - High to Low
Signal Detect - Hysteresis	Pa-Pd		1.5	5.0	dB	

Note<sup>1</sup>: Lessor of Class 1 Laser Safety Limits (CDRH or EN 60825) or Receiver power, max.

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## TERMINATION CIRCUITS

Inputs to the SLC-25-8-1-X transmitter are AC coupled and internally terminated with 100ohms differential. These transceivers can operate with CML or PECL logic level. The input signal must have at least a 400 mV peak-to-peak (differential) signal swing. Output from the receiver section of the module is CML level AC coupled and is expected to drive into a 50 ohm load. Different termination strategies may be required depending on the particular Serializer/Deserializer chip set used.

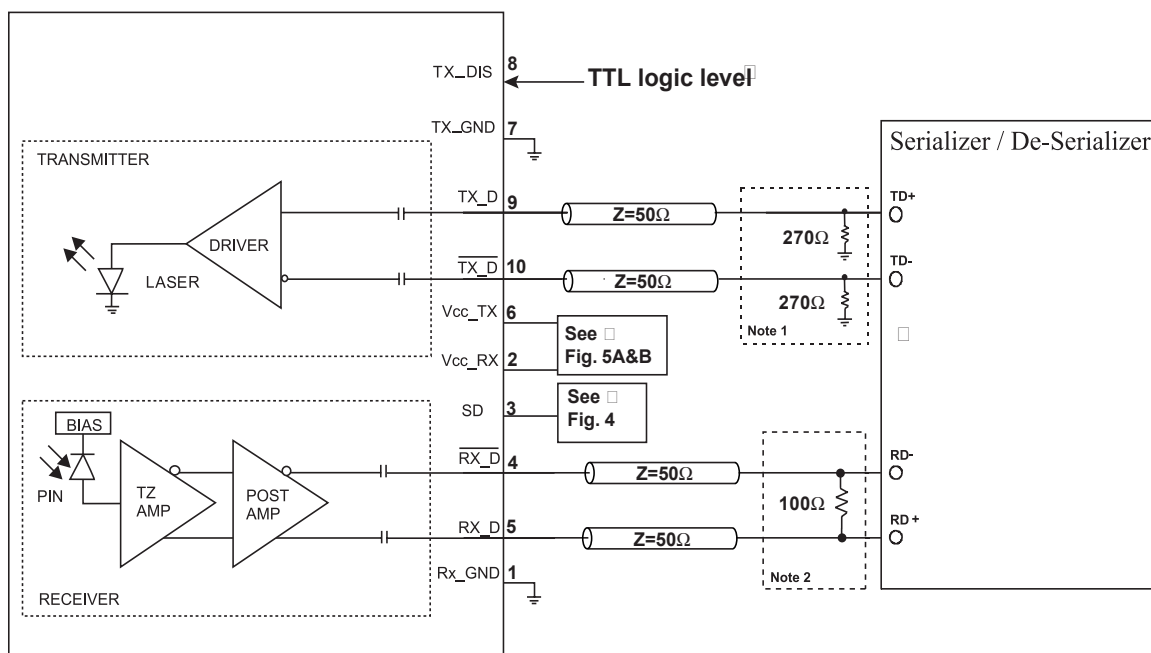
The SLC-25 product family is designed with AC coupled data inputs and outputs to provide the following advantages:

- Close positioning of SERDES with respect to transceiver; allows for shorter line lengths and at gigabit speeds reduces EMI.
- Minimum number of external components.
- Internal termination reduces the potential for unterminated stubs which would otherwise increase jitter and reduce transmission margin.

Subsequently, this affords the customer the ability to optimally locate the SERDES as close to the SLC-25 as possible and save valuable real estate on PCI cards and other small circuit assemblies. At gigabit rates this can provide a significant advantage resulting in better transmission performance and accordingly better signal integrity.

AC coupling allows the Stratos Lightwave SLC-25 to be applied across a wider range of applications without modification. This benefits users in terms of enhanced RF performance, reduced component count, tighter layout and fewer design problems.

Figure 1 illustrates the recommended transmit and receive data line terminations and Figure 2 describes an alternative termination approach. Figure 3 illustrates a Thevenin equivalent 50 ohm termination circuit for the SERDES receiverinput data lines, which require a +3.3V CML termination. Other equivalent circuits can be readily calculated for other bias voltages.

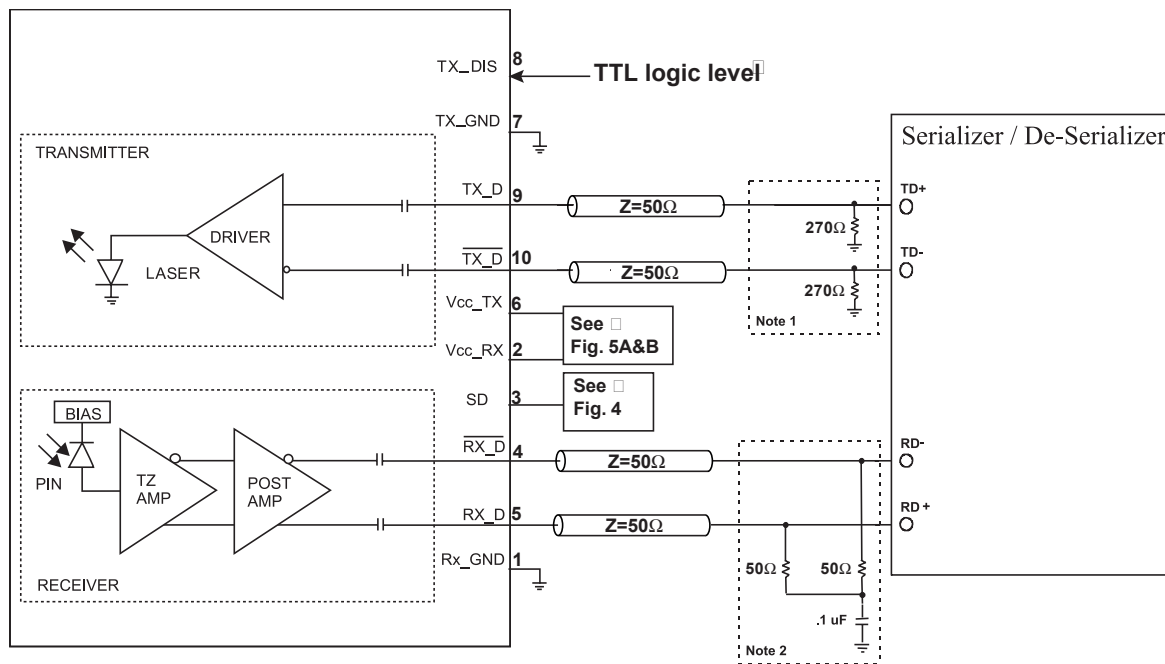


**Figure 1. Recommended TRANSMIT and RECEIVE Data Terminations**

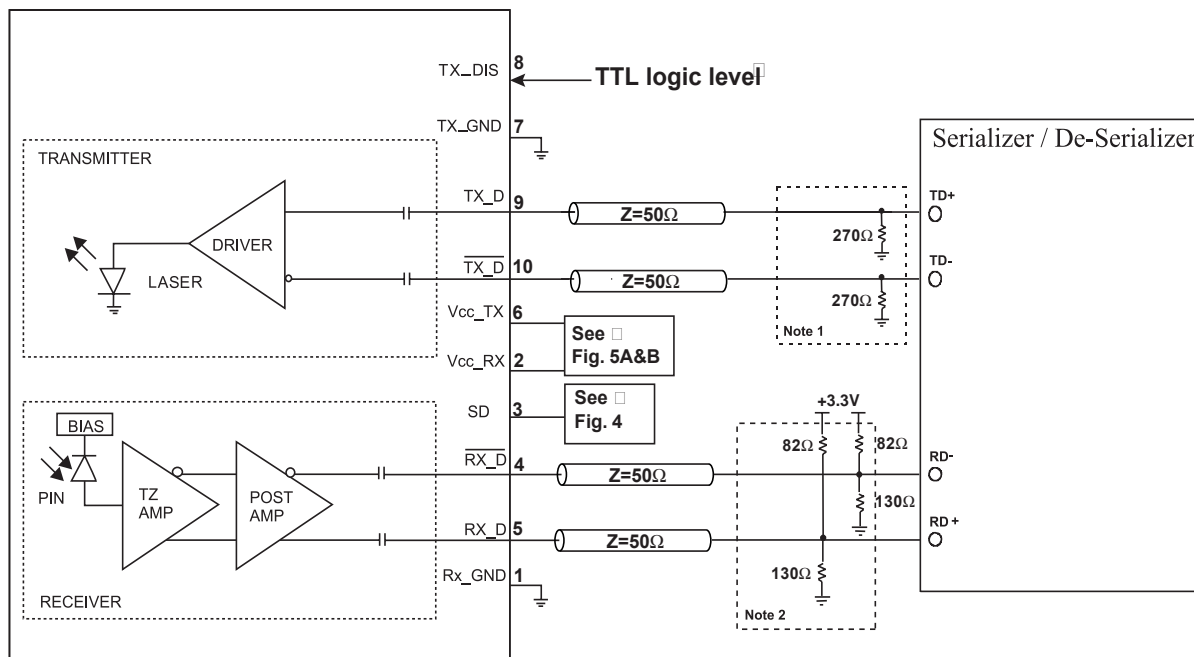
### Notes:

1. Consult the SERDES manufacturer's applications information for biasing required for Tx outputs. Some serializer outputs are internally biased and may not need external bias resistors.
2. Consult SERDES manufacturer's data sheet and application data for appropriate receiver input biasing network.

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**Figure 2. Alternative TRANSMIT and RECEIVE Data Terminations**



**Figure 3. Thevenin Equivalent RECEIVE Data Terminations**

## Notes:

1. Consult the SERDES manufacturer's applications information for biasing required for Tx outputs. Some serializer outputs are internally biased and may not need external bias resistors.
2. Consult SERDES manufacturer's data sheet and application data for appropriate receiver input biasing network.

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## SIGNAL DETECT

The SLC-25-8-1-X transceivers are equipped with TTL signal detect outputs. The TTL option eliminates the need for a PECL to TTL level shifter in most applications. The SFF adhoc industry standard provides for a TTL level Signal Detect output.

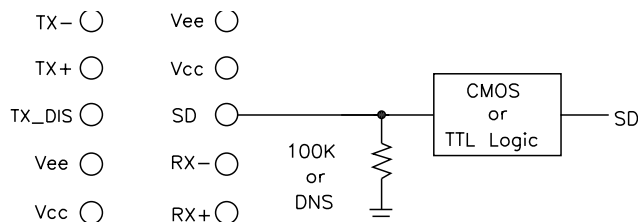
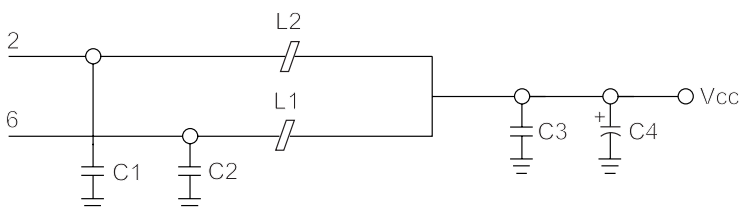


Figure 4. Signal Detect

## POWER COUPLING

A suggested layout for power and ground connections is given in figure 5B below. Connections are made via separate voltage and ground planes. The mounting posts are at case ground and should not be connected to circuit ground. The ferrite bead should provide a real impedance of 220ohms at 100MHz. Bypass capacitors should be placed as close to the 10-pin connector as possible.



Values:

- C1, C2 = 1000pF, COG
- C3 = 0.1μF
- C4 = 10μF, Tantulum
- L1, L2 = Real Impedence of 220Ω @ 100MHz

Figure 5A. Suggested Power Coupling - Electrical Schematic

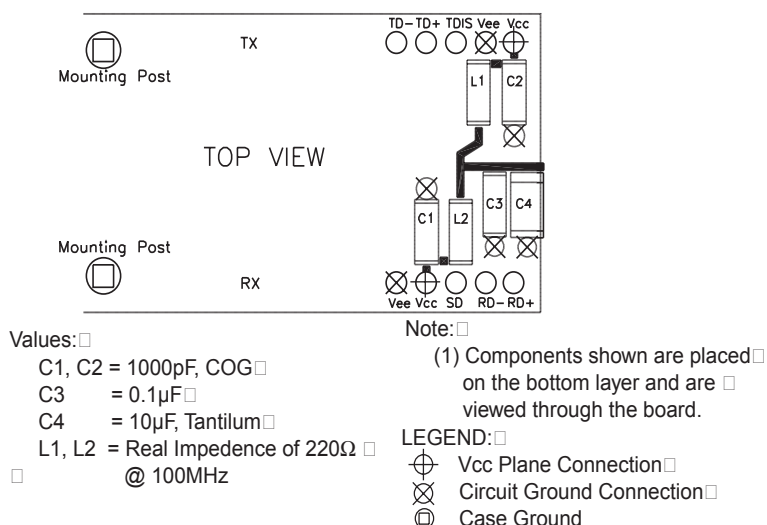


Figure 5B. Suggested Power Coupling - Component Placement

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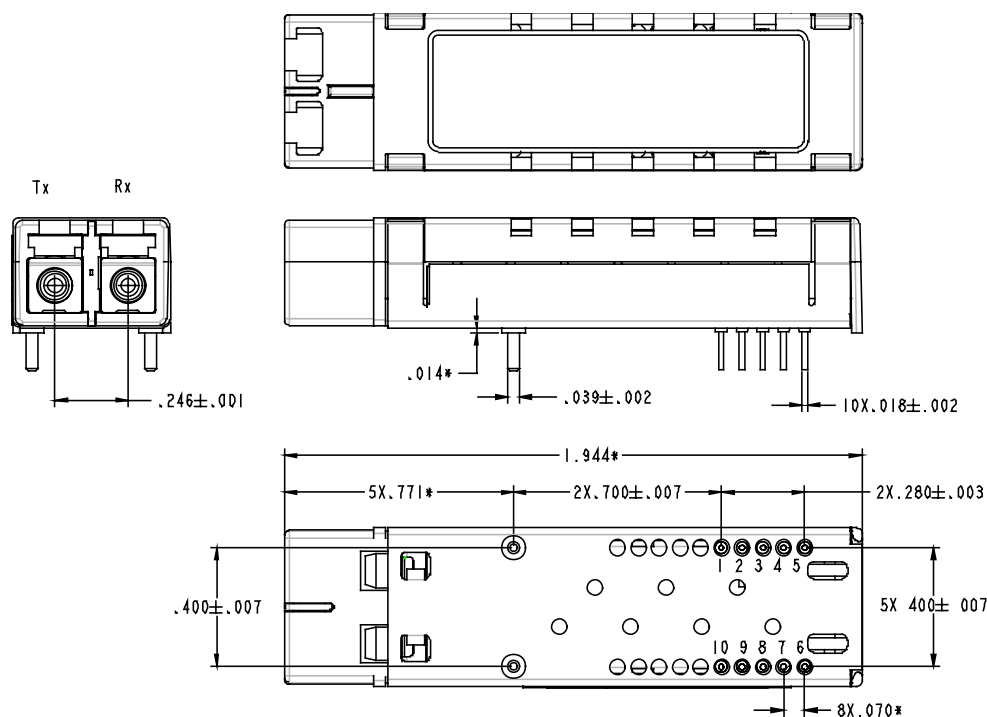


## EMI and ESD CONSIDERATIONS

Stratos Lightwave optoelectronic transceivers offer a Die Cast Metal case and three types of chassis grounding clips (Individual, extended individual, and gang mount). As shown in the drawing, this clips connect the module case to chassis ground when installed flush through the panel cutout. The grounding clip in this way brushes the edge of the cutout in order to make a proper contact. The use of a grounding clip also provides increased electrostatic protection and helps reduce radiated emissions from the module or the host circuit board through the chassis faceplate. The attaching posts are at case potential and may be connected to chassis ground. They should not be connected to circuit ground.

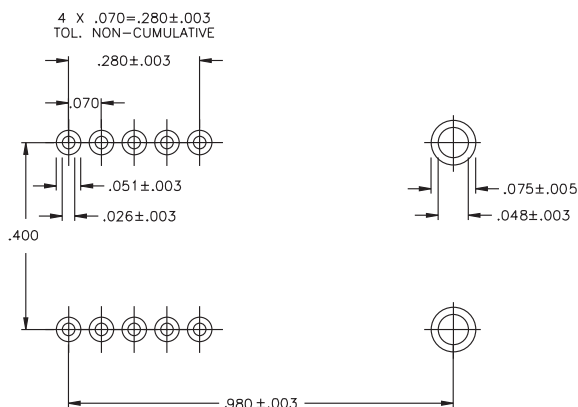
Plastic optical subassemblies are used to further reduce the possibility of radiated emissions in multimode transceiver. By providing a non-metal receptacle for the optical cable ferrule, the gigabit speed RF electrical signal is isolated from the connector area thus preventing radiated energy leakage from these surfaces to the outside of the panel.

## MECHANICAL PACKAGE DIMENSIONS (No Clip)



NOTE:  
1. DIMENSIONS ARE IN INCHES.  
2. \* DIMENSIONS ARE FOR REFERENCE ONLY.

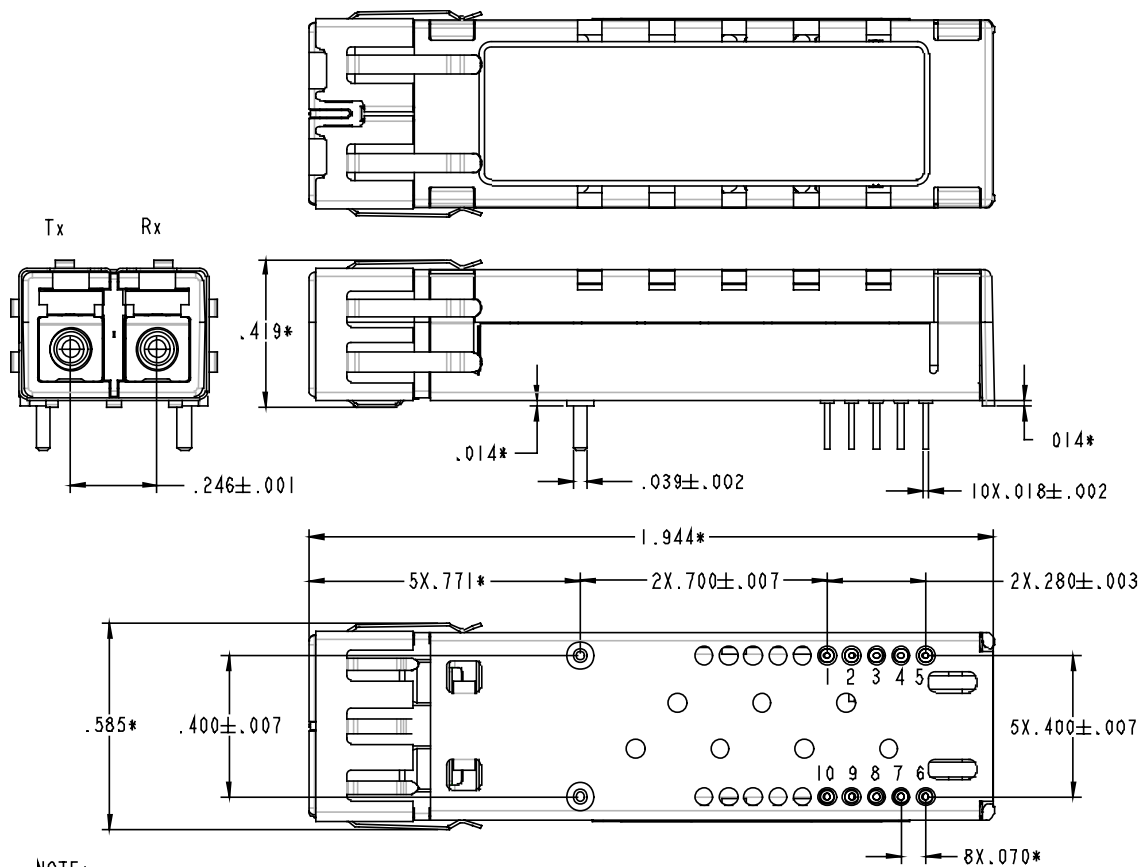
## SUGGESTED PCB LAND PATTERN



# SLC-25-8-1-X Optical 2x FC/GbE/1x FC -- +3.3V SFF 2x5 Transceiver -- 2.125/1.25/1.0625 GBaud

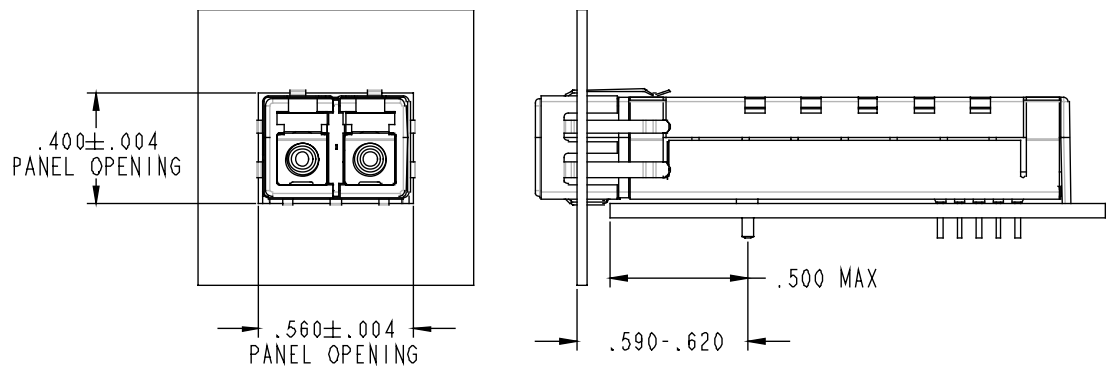


## MECHANICAL PACKAGE DIMENSIONS ("E" Clip)



NOTE:  
1. DIMENSIONS ARE IN INCHES.  
2. \* DIMENSIONS ARE FOR REFERENCE ONLY.

## PANEL CUTOUT DIMENSIONS ("E" Clip)

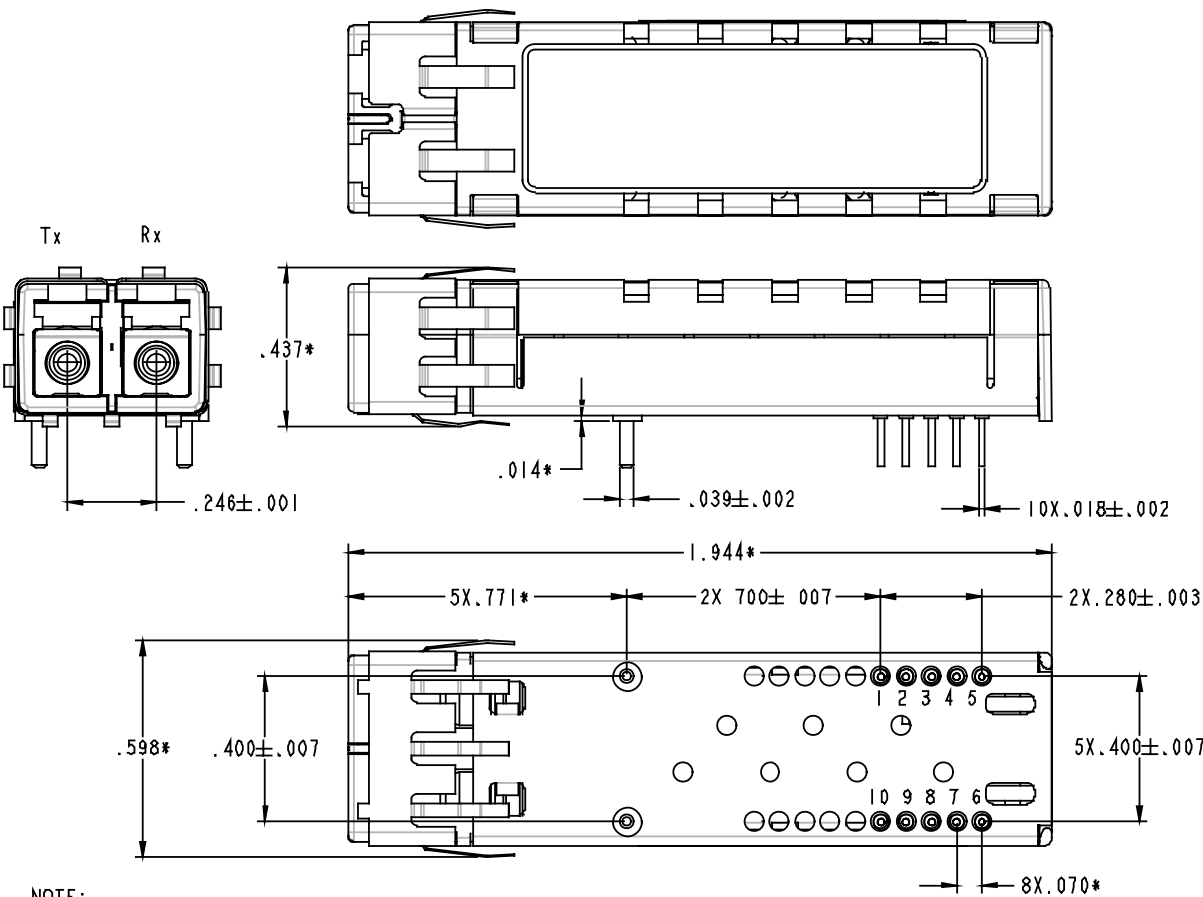


NOTE: DIMENSIONS ARE IN INCHES.

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SFF 2x5 Transceiver -- 2.125/1.25/1.0625 GBaud**

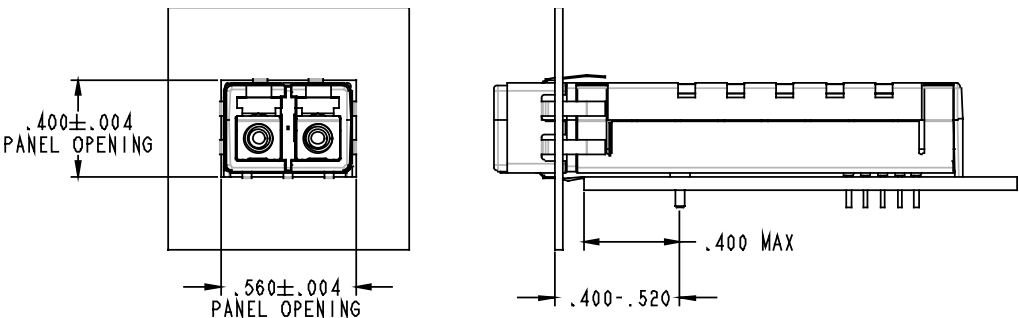


**MECHANICAL PACKAGE DIMENSIONS ("K" Clip):** This grounding clip allows the SLC-25 (die cast metal) transceiver to be inserted in the foot print designed for MLC-25 (metalized plastic package) transceiver.



NOTE:  
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2. \* DIMENSIONS ARE FOR REFERENCE ONLY.

**PANEL CUTOUT DIMENSIONS ("K" Clip)**



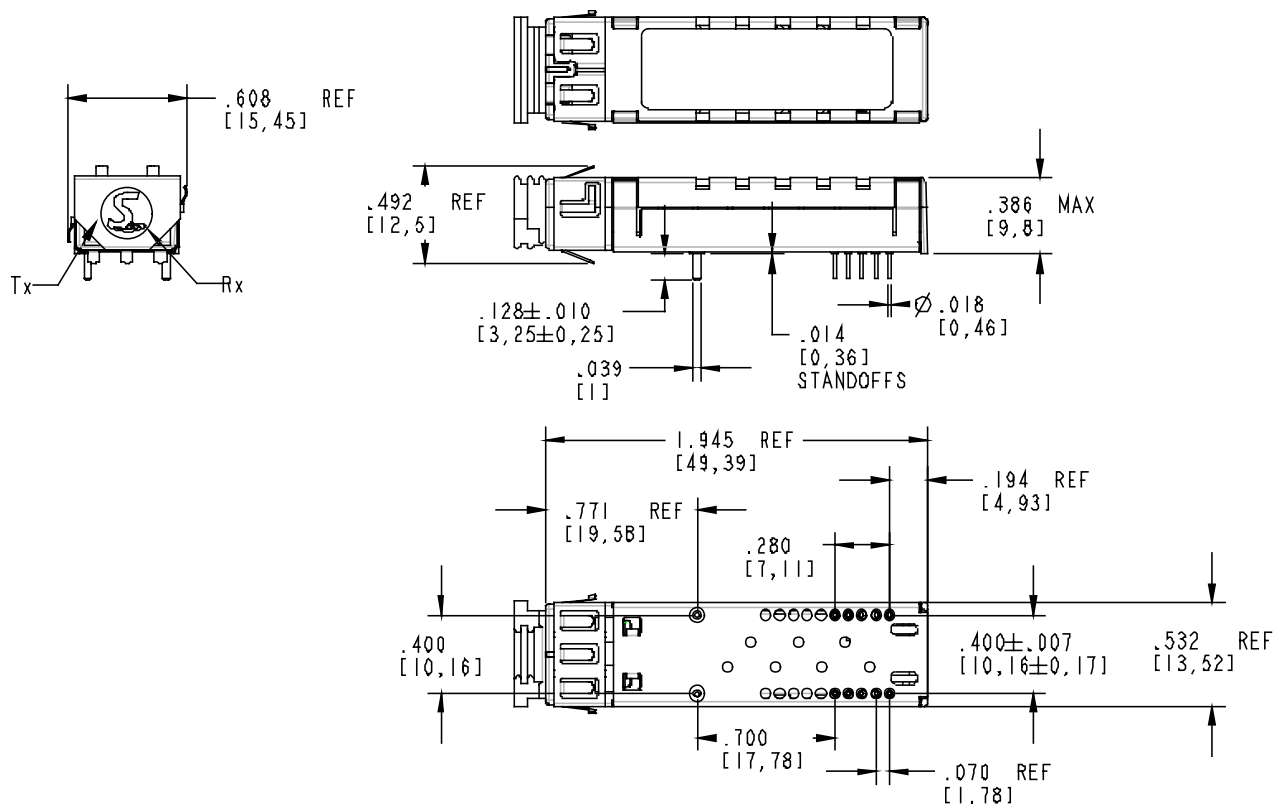
NOTE: DIMENSIONS ARE IN INCHES.



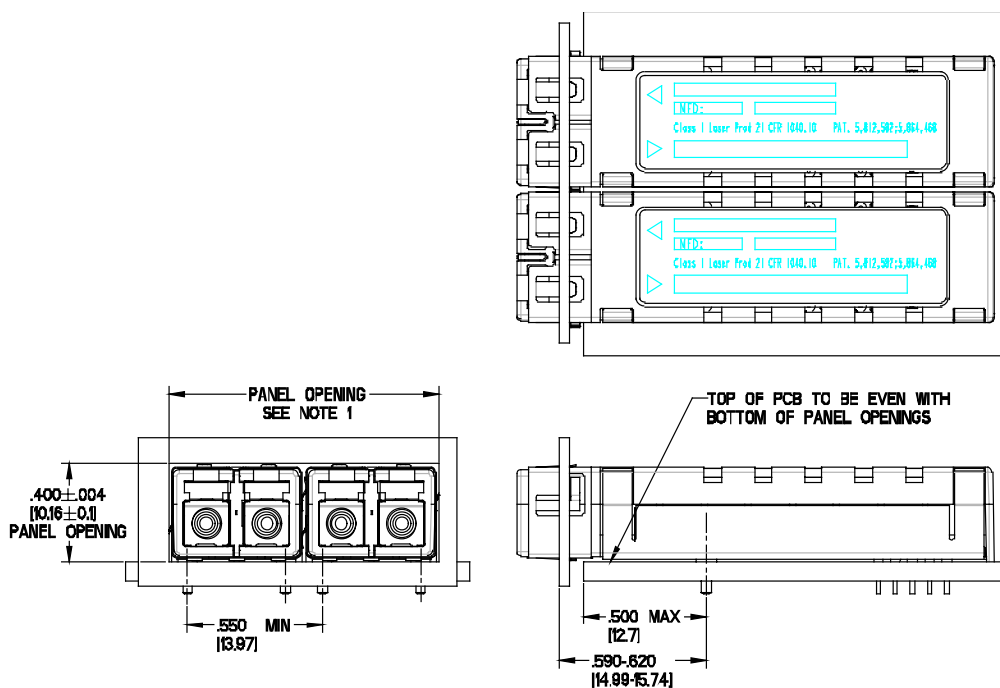
# SLC-25-8-1-X Optical 2x FC/GbE/1x FC -- +3.3V SFF 2x5 Transceiver -- 2.125/1.25/1.0625 GBaud



## MECHANICAL PACKAGE DIMENSIONS ("G" Clip)



## PANEL CUTOUT DIMENSIONS ("G" Clip)



NOTES:  
1. OPENING SIZE : .550" X N WHERE N = NUMBER OF MODULES.  
2. DIMENSIONS IN in/mm

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## PHYSICAL DESCRIPTION

The SLC-25-8-1-X features a compact design with a standard LC duplex connector for fiber optic connections. The 10-pin connector (70 mil spacing) provides the electrical connection for all operation. With a height of 9.8 mm the SLC-25 fits mezzanine card applications. Two wave-solderable posts are provided for attaching the package to the circuit board without the need for multiple attachment operations.

## ELECTRICAL INTERFACE, PIN DESCRIPTIONS

PIN 1	RX_GND	Ground
PIN 2	Vcc_RX	+3.3 volt supply for the Receiver Section
PIN 3	SD	Receiver Signal Detect TTL output. Active high on this line indicates a received optical signal.
PIN 4	RD-	Receiver Data Inverted Differential Output
PIN 5	RD+	Receiver Data Non-Inverted Differential Output
PIN 6	Vcc_TX	+3.3 volt supply for the Transmitter Section
PIN 7	TX_GND	Ground
PIN 8	TX_DIS	Transmitter Disable
PIN 9	TD+	Transmitter Data Non-Inverted Differential Input
PIN 10	TD-	Transmitter Data Inverted Differential Input
Attaching Posts		The attaching posts are at case potential and may be connected to chassis ground. They should not be connected to circuit ground.



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