SLC-25-9-2-X Optical SMPTE 292M/297M/259M 1310nm Video SFF (V_SFF) 2x5 Transceiver --- +3.3V

ORDERING INFORMATION

SLC - 25 - 9 - 2 - X

GROUNDING CLIP
N = No Clip
I = Individual Mount Clip (.600")
G = Gang Mount Clip (.550")

WAVELENGTH
2 = 1310nm (single mode)

PROTOCOL
9 = Multi-Protocol Video
143MBaud to 1.485GBaud

STRATOS
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FEATURES

- SMPTE 292M/297M/259M Compatible
- RoHS-6 compliant
- Handles Pathological test pattern
- TTL Signal Detect Output and Transmitter disable input
- Die cast metal package
- Low profile fits Mezzanine Card Applications
- 100Ω differential AC coupled CML level Outputs
- Single +3.3V Power Supply
- Wave Solderable / Aqueous Washable
- UL 1950 Approved

PRODUCT OVERVIEW

The SLC-25-9-2-X Video Small Form Factor (V_SFF) optical transceivers are high performance integrated duplex data links for bi-directional communication over single mode optical fiber. The SLC-25-9 transceivers are designed to transmit/receive data rates from 143Mbps to 1.485Gbps. These transceivers are compatible with the following standards:

- SMPTE 297M/292M (HDTV -- 1.485Gbps)
- SMPTE 297M/259M (SDTV -- 143/177/270/360Mbps)

The SLC-25 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. The SLC-25-9-2-X operates at +3.3V.

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.

LONG WAVELENGTH LASER

The SLC-25-9-2-X transmitter is provided with 1310nm FP single mode laser with angle polished fiber stub.

LONG WAVELENGTH RECEIVER

The SLC-25-9-2-X receiver is provided with 1310nm single mode integrated PIN pre-amp subassembly with angle polished fiber stub.

ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	MIN	MAX	UNITS	NOTES
Storage Temperature	Tstg	-40	+85	°C	
Soldering Temperature			260	ºC	10 seconds on leads only
Supply Voltage	$V_{CC}T$, $V_{CC}R$		6.0	V	VCC - ground
Data AC Voltage	Tx+, Tx-		2.6	Vpp	Differential
Data DC Voltage	Tx+, Tx-	-10	10.0	Vpk	V (Tx+ or Tx-) - ground

RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	MIN	TYP	MAX	UNITS	NOTES
Operating Case Temperature	Tc	0		+70	°C	
Supply Voltage	Vcc	+3.0	+3.3	+3.6	VDC	
Baud Rate	Brate	143		1485	MBaud	143/177/270/360/1485MBaud

MODULE SPECIFICATIONS - ELECTRICAL

0º<Tc<+70°C, +3.0<Vcc<+3.6V

PARAMETER	SYMBOL	MIN	TYP	MAX	UNITS	NOTES
Supply Current	Icc		150	200	mA	Tc=+25ºC; Vcc=+3.3V
				250	mA	0ºC<Tc<+70ºC; 3.0V<Vcc<3.6V
TRANSMITTER						
CML/LVPECL Inputs (Differential)		300		1860	mVpp	AC coupled inputs
TX_DISABLE input Voltage - HIGH	V_{IH}	2.0		Vcc+0.3	V	
TX_DISABLE input Voltage - LOW	V_{IL}	0		0.8	V	
RECEIVER						
CML Outputs (Differential)		400	800	1200	mVpp	AC coupled outputs
Output Inpedance (Differential)	Zout	90	100	110	ohms	
Total Jitter	TJ			135	ps	Measured with Color Bar Test Signal @1.485GBaud (Note 1)
				740	ps	Measured with Color Bar Test Signal @143/177/270/360MBaud
Return Loss		15			dB	Worst case @ 10KHz to 3GHz
TTL Signal Detect Output - LOW				0.5	V	I_{OL}= -1.6mA, 1 TTL unit load
TTL Signal Detect Output - HIGH		2.4	3.0		V	I_{OH}= 40µA, 1 TTL unit load

Note 1: Maximum Jitter is specified for single module point-to-point applications only. In cascaded configurations, where the receiver electrical output is directly interfaced with the transmitter electrical input of a separate module, accumulated jitter may result in CRC errors to occur during pathological pattern transmission. For error-free operation in such a situation, use of re-clocker device is recommended at the output of the receiver before interfacing to the inputs of the optical transmitter. This will ensure that the output jitter will not exceed the input jitter tolerance of the succeeding transmitter input.

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SLC-25-9-2-X OPTICAL SPECIFICATIONS -- 1310nm Laser Single Mode **0º<Tc<+70°C, +3.0<Vcc<+3.6V**

PARAMETER	SYMBOL	MIN	TYP	MAX	UNITS	NOTES
LINK DISTANCE						
9.0µm Core Diameter SMF(Note 2)		10			km	1.485Gbps
		15			km	143/170/270/360Mbps
TRANSMITTER						
Optical Center	λ	1290	1310	1330	nm	Tcase = +25ºC
Spectral Width	$\Delta\lambda$			2.5	nm	RMS
Optical Transmit Power	Popt	-9		-3	dBm	Average @ 1310nm
Extinction Ratio	ER	9			dB	P1/P0
Relative Intensity Noise	RIN			-117	dB/Hz	
Total Jitter	TJ		120	135	ps	Measured with Color Bar Test Signal @1.485GBaud
				740	ps	Measured with Color Bar Test Signal @143/170/270/360MBaud
Output Rise/Fall Time	t_R, t_F		80	120	ps	20-80%; measured unfiltered @1.485GBaud
			240	270	ns	20-80%; measured unfiltered @143/170/270/360MBaud
RECEIVER						
Optical Input Wavelength	λ	1270		1610	nm	AC coupled inputs
Optical Input Power	Pr	-20		-1	dBm	Note 3
Optical Return Loss	ORL	29			dB	
Signal Detect - Asserted	Pa			-20	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 2: Assumes minimum transmitter output power of -9dBm with minimum extinction ratio of 9dB over 9/125µm Single Mode Fiber (SMF) at 140/177/270/360/1485Mbps. The minimum link distances are based on worst case receiver sensitivity with color bar test signal. The minimum link distances will be reduced with SDI test matrix.

Note 3: Minimum receiver input power is defined for line BER < 1×10^{-10} running PRBS $2^{23} - 1$ at 140/177/270/360/1485Mbps

TERMINATION CIRCUITS

Inputs to the SLC-25-9-2-X transmitter are AC coupled and internally 100 ohm differential terminated . These transceivers can operate with CML/LVPECL logic levels. The input signal must have at least a 300 mV peak-to-peak differential signal swing. Output from the receiver section of the module is also AC coupled CML level output and is expected to drive into a 50ohm load. Different termination strategies may be required depending on the particular chip being interfaced to.

The SLC-25-9-2-X product family is designed with AC coupled data inputs and outputs to provide the following advantages:

- Close positioning of Tx/Rx chipset with respect to transceiver; allows for shorter line lengths and at gigabit speeds reduces jitter and 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 chip-set being interfaced to as close to the SLC-25-9-2-X as possible and save valuable real estate on small circuit assemblies. At high data rates this can provide a significant advantage resulting in better transmission performance and accordingly better signal integrity.

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 receiver input data lines, which require a +3.3V CML termination. Other equivalent circuits can be readily calculated for other bias voltages.

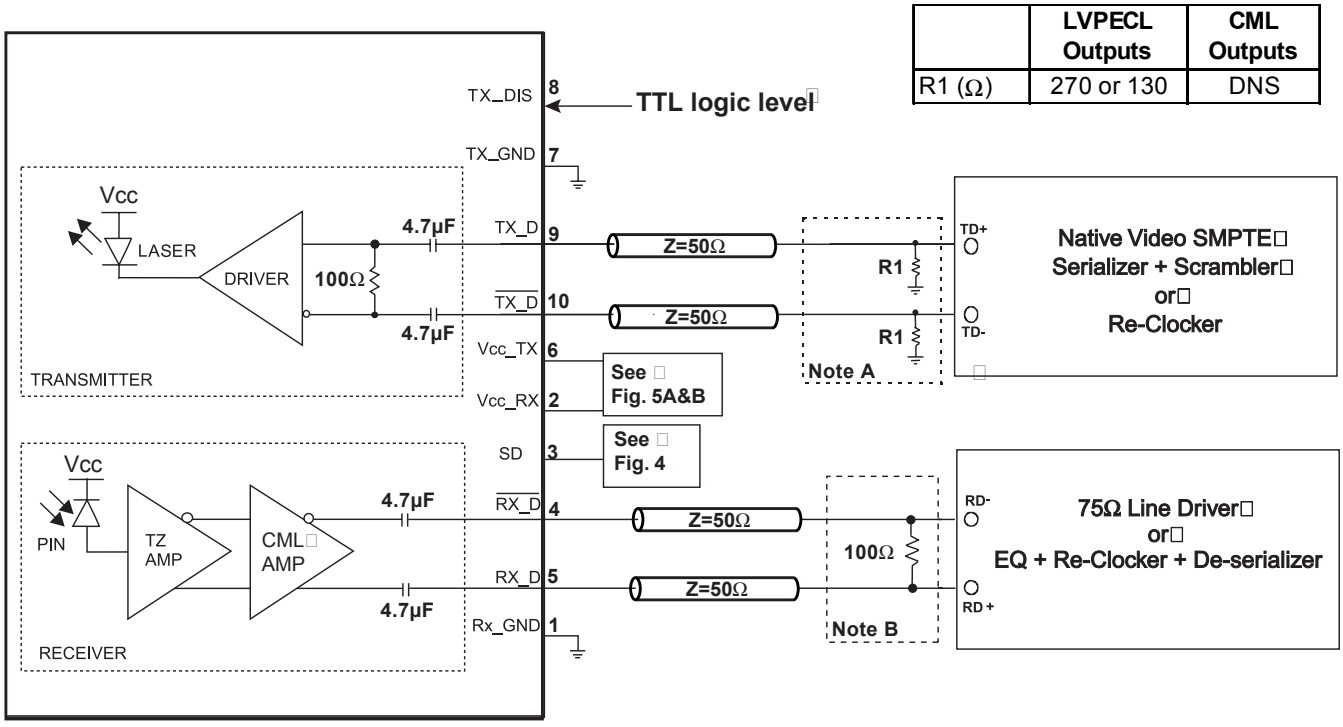


Figure 1. Recommended TRANSMIT and RECEIVE Data Terminations

Notes:

A. Consult the Chipset manufacturer's applications information for biasing required for Tx outputs. Some chipset outputs are internally biased and may not need external bias resistors.

B. Consult Chipset manufacturer's data sheet and application data for appropriate receiver input biasing network.

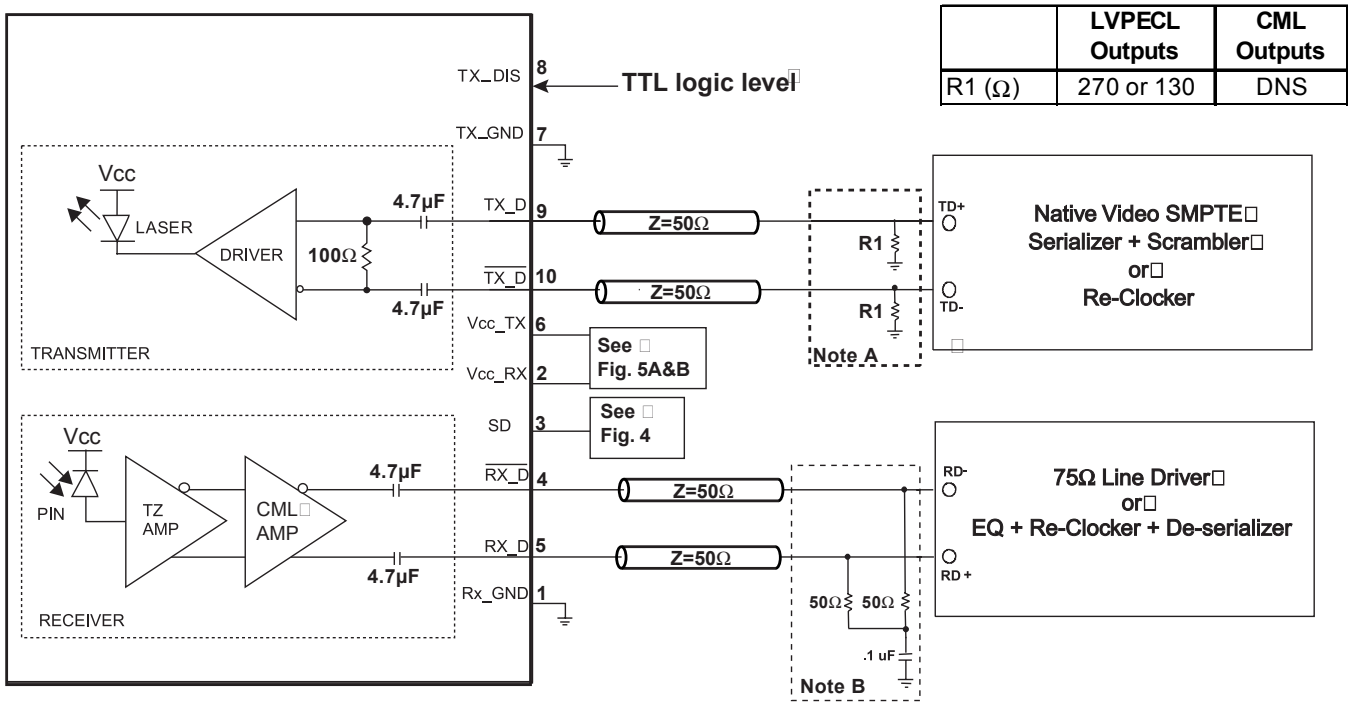


Figure 2. Alternative TRANSMIT and RECEIVE Data Terminations

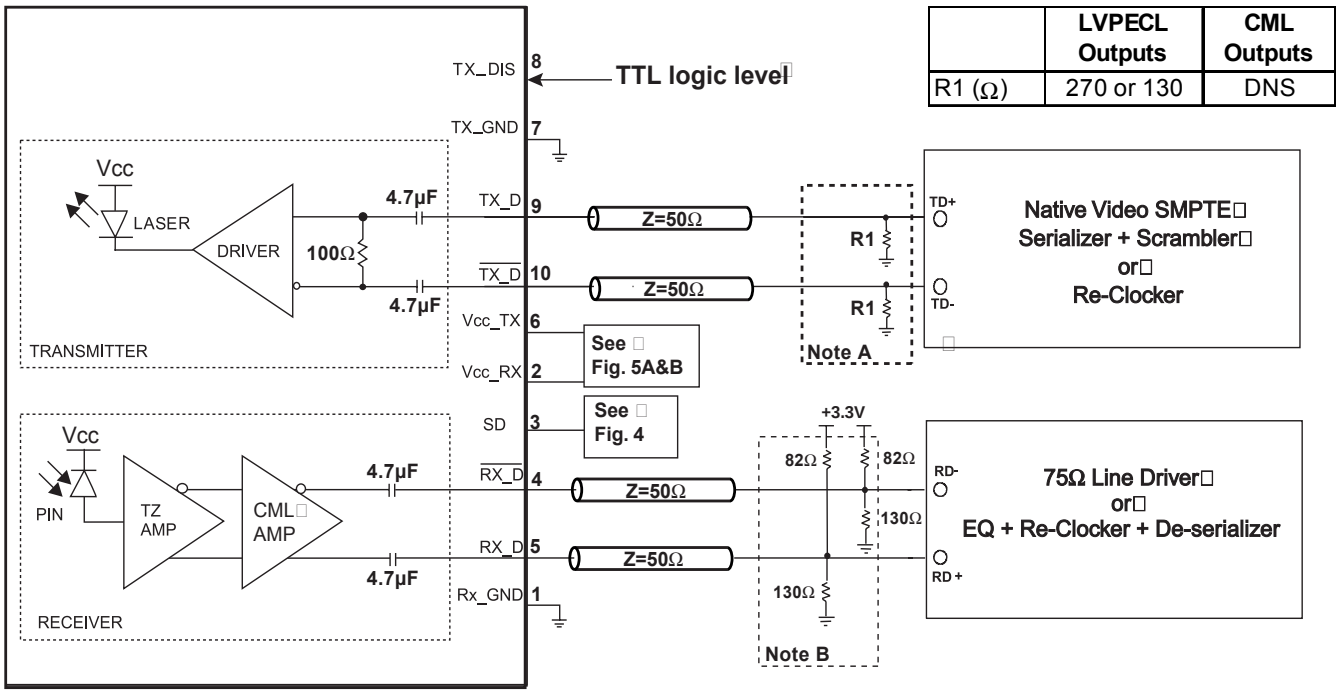


Figure 3. Thevenin Equivalent RECEIVE Data Terminations

Notes:

A. Consult the Chipset manufacturer's applications information for biasing required for Tx outputs. Some chipset outputs are internally biased and may not need external bias resistors.

B. Consult Chipset manufacturer's data sheet and application data for appropriate receiver input biasing network.

SIGNAL DETECT

The SLC-25-9-2-X transceivers are equipped with TTL signal detect outputs. The standard TTL output 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.

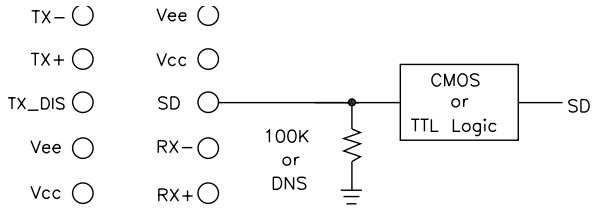
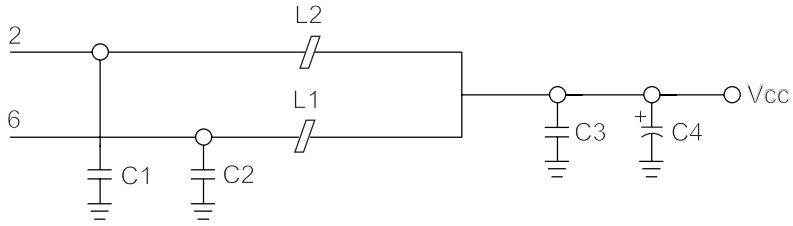


Figure 4. Signal Detect

POWER COUPLING

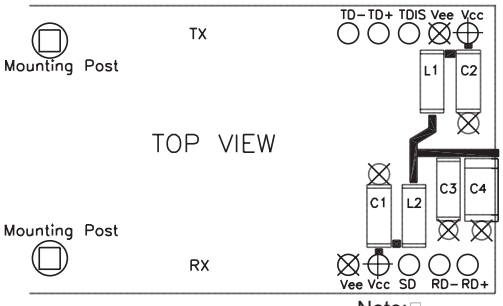
A suggested layout for power and ground connections is given in figure 5B below. Connections are made via separate voltage and ground planes. The mounting posts are at case ground and should not be connected to circuit ground. The ferrite bead should provide a real impedance of 220ohms at 100MHz. Bypass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



Values:

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

Figure 5A. Suggested Power Coupling - Electrical Schematic



Values:
C1, C2 = 1000pF, COG
C3 = 0.1µF
C4 = 10µF, Tantilum
L1, L2 = Impedence of 220Ω @ 100MHz

Note:
(1) Components shown are placed on the bottom layer and are viewed through the board.

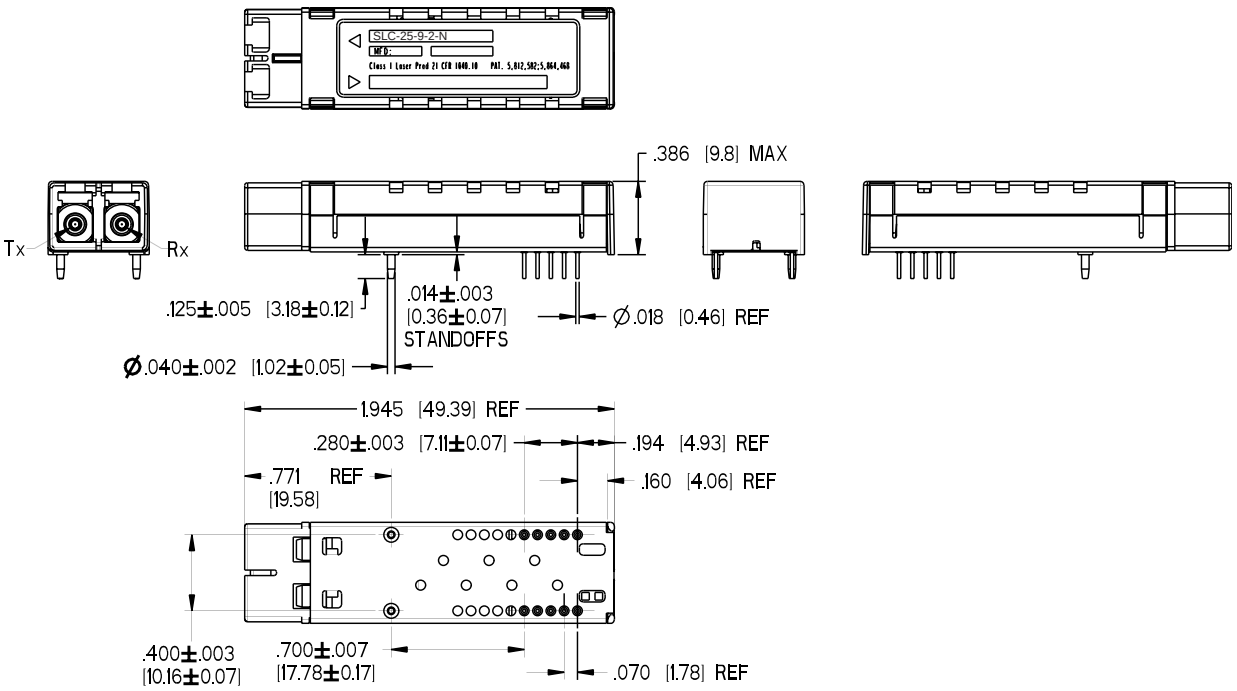
LEGEND:
Vcc Plane Connection
Circuit Ground Connection
Case Ground

Figure 5B. Suggested Power Coupling - Component Placement

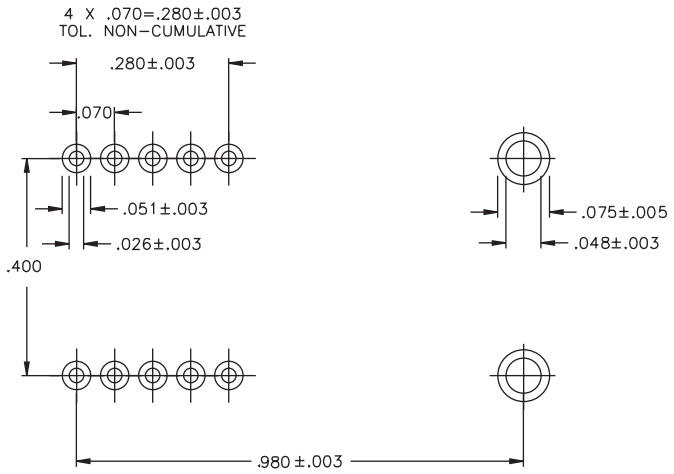
EMI and ESD CONSIDERATIONS

Stratos Lightwave optoelectronic transceivers offer a Die Cast Metal case and two types of chassis grounding clips (Individual & Gang Mount). As shown in the drawing, All 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.

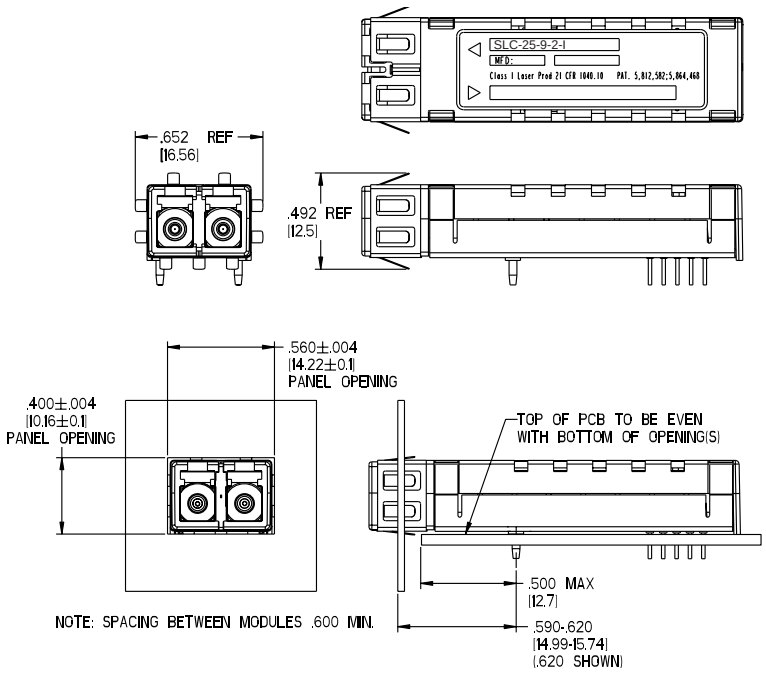
NO GROUNDING CLIP MECHANICAL DIMENSIONS (SLC-25-9-2-N):



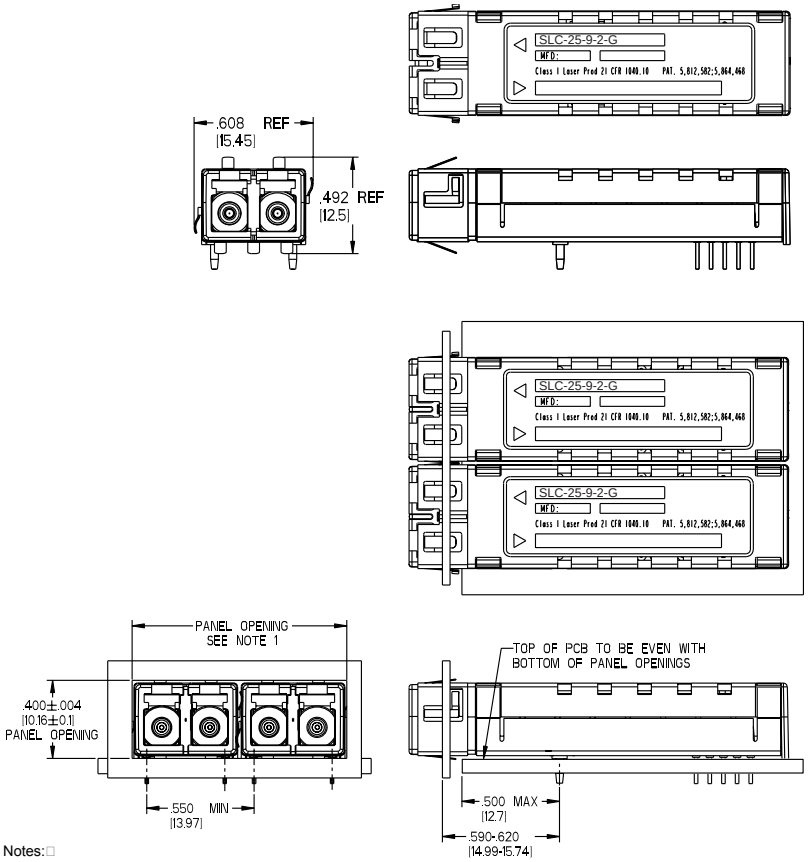
SUGGESTED PCB LAND PATTERN



INDIVIDUAL MOUNT GROUNDING CLIP MECHANICAL DIMENSIONS (SLC-25-9-2-I):



GANG MOUNT GROUNDING CLIP MECHANICAL DIMENSIONS (SLC-25-9-2-G):



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-25-9-2-X features a compact design with a standard LC duplex connector for fibre optic connections. The 10-pin connector (70 mil spacing) provides the electrical connection for all operations. With a height of 9.8mm, the SLC-25-9-2-X 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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