MLC-25-7-X-TL Optical ATM OC-48 --- +3.3V Small Form Factor (SFF) Transceiver - 2.488 GBaud

ORDERING INFORMATION

MLC- 25 - 7 - X - TL

+3.3V POWER SUPPLY

SIGNAL DETECT
T - TTL Output

WAVELENGTH
1 - 850 nm (multimode)
2 - 1300 nm (single mode) 2 km
2M - 1300 nm (single mode) 10 km
2L - 1300 nm (single mode) 20 km

COMMUNICATIONS PROTOCOL
7 - ATM OC-48, 2.488GBaud
2 - ATM OC-3, 155.52MBaud
3 - ATM OC-12, 622MBaud
4 - Gigabit Ethernet, 1.25GBaud
6 - FIbre Channel, 1.0625GBaud
8 - Fibre Channel, 2.125GBaud

Features

- 2.488 Gbps ATM OC-48 Performance
- TTL Signal Detect Output
- Transmitter Disable Input
- Low profile fits Mezzanine Card Applications
- Single +3.3V Power Supply
- Wave Solderable / Aqueous Washable
- Class 1 Laser Safety Compliant
- UL 1950 Approved

PRODUCT OVERVIEW

The MLC-25-7-X-TL Small Form Factor (SFF) optical transceivers are high performance integrated duplex data links for bi-directional communication over multimode or single mode optical fiber. The MLC-25-7 module is specifically designed to be used in ATM OC-48 applications. The MLC-25 transceivers are provided with the LC receptacle which is compatible with the industry standard LC connector. The Methode 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. The MLC-25-7-X-TL 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.

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 2.488GBaud.

LONG WAVELENGTH LASER

The MLC-25-7-2-TL is provided with single mode optics. The 1300 nm laser provides highly reliable single mode communications which meets or exceeds the ATM OC-48 requirements.

ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	MIN	MAX	UNITS	NOTES
Storage Temperature	Tstg	-40	85	°C	
Soldering Temperature			260	°C	10 seconds on leads only
Supply Voltage	Vcc		6.0	V	Vcc - ground
Data AC Voltage	Tx+, Tx-		2.6	Vpp	Differential
Data DC Voltage	Tx+, Tx-	-10	10	Vpk	V (Tx+ or Tx-) - ground

RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	MIN	TYP	MAX	UNITS	NOTES
Ambient Operating Temperature	Ta	0		70	°C	
Supply Voltage	Vcc	3.0	3.3	3.6	VDC	
Baud Rate	BRate		2.488		GBaud	±100ppm

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MODULE SPECIFICATIONS - ELECTRICAL **Ta = 25° C, Vcc =3.3V**

PARAMETER	SYMBOL	MIN	TYP	MAX	UNITS	NOTES
Supply Current	Icc		140	150	mA	Ta = 25°C, Vcc = 3.3 V
	Icc			175	mA	0° C <Ta< 70°C, 3.0 V< Vcc <3.6V
TRANSMITTER						
ECL Input (Single Ended)		350	720	1250	mVpp	AC coupled inputs
ECL Input (Differential)		700	1440	2500	mVpp	AC coupled inputs
Input Impedance	Zin		50		ohms	Rin > 100 kohms @ DC
RECEIVER						
ECL Output (Single Ended)		300	750	930	mVpp	AC coupled outputs
ECL Output (Differential)		600	1500	1860	mVpp	AC coupled outputs
Total Jitter	TJ			133	psec	
TTL Signal Detect Output - Low				0.5	V	IOL = -1.6 mA, 1 TTL Unit Load
TTL Signal Detect Output - High		2.4	3.0		V	IOH = 40µA, 1 TTL Unit Load

PERFORMANCE SPECIFICATIONS - OPTICAL 850 nm Laser Multimode **Ta = 25° C, Vcc =3.3 V**

PARAMETER	SYMBOL	MIN	TYP	MAX	UNITS	NOTES
FIBER LENGTH						
50 µm Core Diameter MMF		150			m	BER < 1.0E-12 @ 2.488GBaud
62.5 µm Core Diameter MMF		100[1]			m	BER < 1.0E-12 @ 2.488GBaud
TRANSMITTER						
Optical Transmit Power	Popt	-8		-4	dBm	average @ 850 nm
Optical Center	λ	830	850	860	nm	
Spectral Width	$\Delta\lambda$			0.85	nm	RMS
Extinction Ratio	ER	6			dB	P1/P0
Relative Intensity Noise	RIN			-116	dB/Hz	
Total Jitter [2]	TJ			113	psec	
Output Rise, Fall Time	t_R, t_F		350	400	psec	20 - 80% values, measured unfiltered
RECEIVER						
Optical Input	λ	770		860	nm	
Optical Input Power	Pr	-14		0	dBm	BER < 1.0E-12
Optical Return Loss	ORL	12	30		dB	
Signal Detect - Asserted	Pa			-14	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:

[1]This is the link length for at least 95% of the installed fiber base.

[2]Measured with a 2^{23} -1 pseudorandom bit sequence

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MLC-25-7-2-TL PERFORMANCE SPECIFICATIONS - OPTICAL

Ta=25°C, Vcc=3.3V

PARAMETER	SYMBOL	MIN	TYP	MAX	UNITS	NOTES
FIBER LENGTH						
9.0 µm Core Diameter SMF		2	5		km	BER < 1.0E-12 @ 2.488 GBaud
TRANSMITTER						
Optical Center	λ	1270	1310	1355	nm	
RMS Spectral Width	Δλ			4	nm	RMS
Extinction Ratio	ER	6			dB	P1/P0
Optical Transmit Power	Popt	-10		-3	dBm	average @ 1310 nm
RECEIVER						
Optical Input Power	Pr	-18		-3	dBm	average power for BER < 1.0E-12
Optical Center	λ	1270	1310	1355	nm	
Optical Return Loss	ORL	12	30		dB	
SIgnal Detect - Asserted	Pa			-18	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	

MLC-25-7-2M-TL PERFORMANCE SPECIFICATIONS - OPTICAL

Ta=25°C, Vcc=3.3V

PARAMETER	SYMBOL	MIN	TYP	MAX	UNITS	NOTES
FIBER LENGTH						
9.0 µm Core Diameter SMF		10	20		km	BER < 1.0E-12 @ 2.488 GBaud
TRANSMITTER						
Optical Center	λ	1285	1310	1335	nm	
RMS Spectral Width	Δλ			3	nm	RMS
Extinction Ratio	ER	6			dB	P1/P0
Optical Transmit Power	Popt	-8.5		-3	dBm	average @ 1310 nm
RECEIVER						
Optical Input Power	Pr	-18		-3	dBm	average power for BER < 1.0E-12
Optical Center	λ	1270	1310	1355	nm	
Optical Return Loss	ORL	12	30		dB	
Signal Detect - Asserted	Pa			-18	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	

MLC-25-7-2L-TL PERFORMANCE SPECIFICATIONS - OPTICAL

Ta=25°C, Vcc=3.3V

PARAMETER	SYMBOL	MIN	TYP	MAX	UNITS	NOTES
FIBER LENGTH						
9.0 µm Core Diameter SMF		20	25		km	BER < 1.0E-12 @ 2.488 GBaud
TRANSMITTER						
Optical Center	λ	1300	1310	1320	nm	
RMS Spectral Width	Δλ			2	nm	RMS
Extinction Ratio	EP	6			dB	P1/P0
Optical Transmit Power	Popt	-5		0	dBm	average @ 1310 nm
RECEIVER						
Optical Input Power	Pr	-18		-0	dBm	average power for BER < 1.0E-12
Optical Center	λ	1270	1310	1355	nm	
Optical Return Loss	ORL	12	30		dB	
Signal Detect - Asserted	Pa			-18	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	

TERMINATION CIRCUITS

Inputs to the MLC-25 transmitter are AC coupled and internally terminated through 50 ohms to AC ground. These transceivers can operate with LVPECL or ECL logic levels. The input signal must have at least a 0.35 V peak-to-peak (single ended) signal swing. Output from the receiver section of the module is also 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 MLC-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 MLC-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 Methode MLC-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 receiver input data lines, which require a +3.3V LVPECL termination. Other equivalent circuits can be readily calculated for other bias voltages.

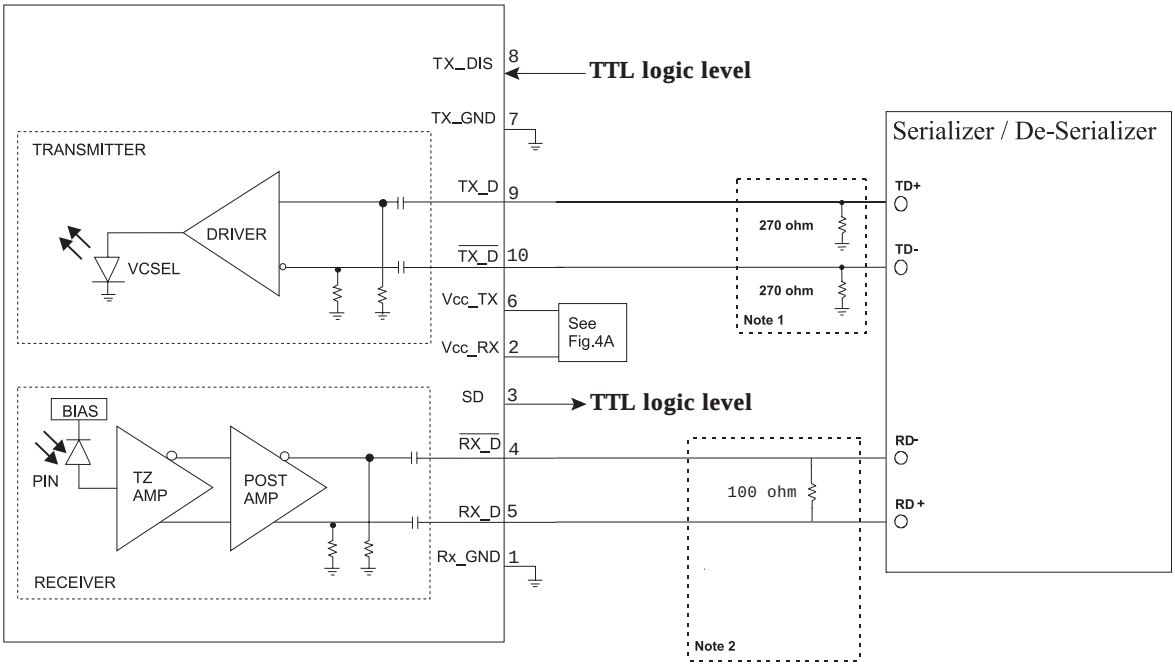


Figure 1. Recommended TRANSMIT and RECEIVE Data Terminations

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.

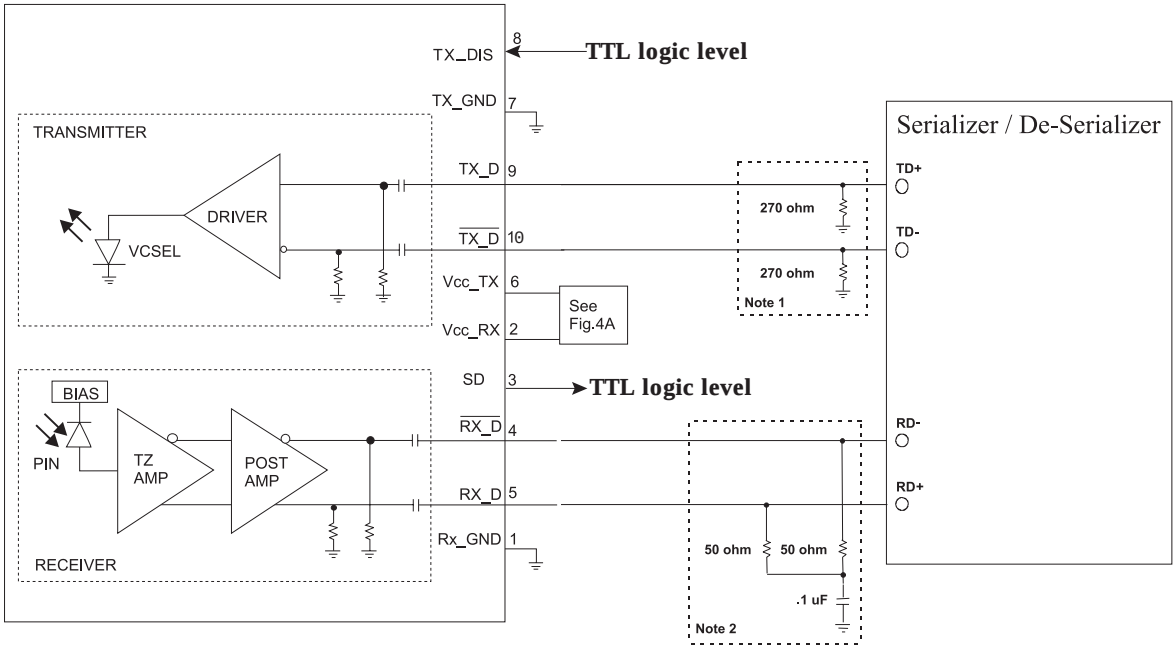


Figure 2. Alternative TRANSMIT and RECEIVE Data Terminations

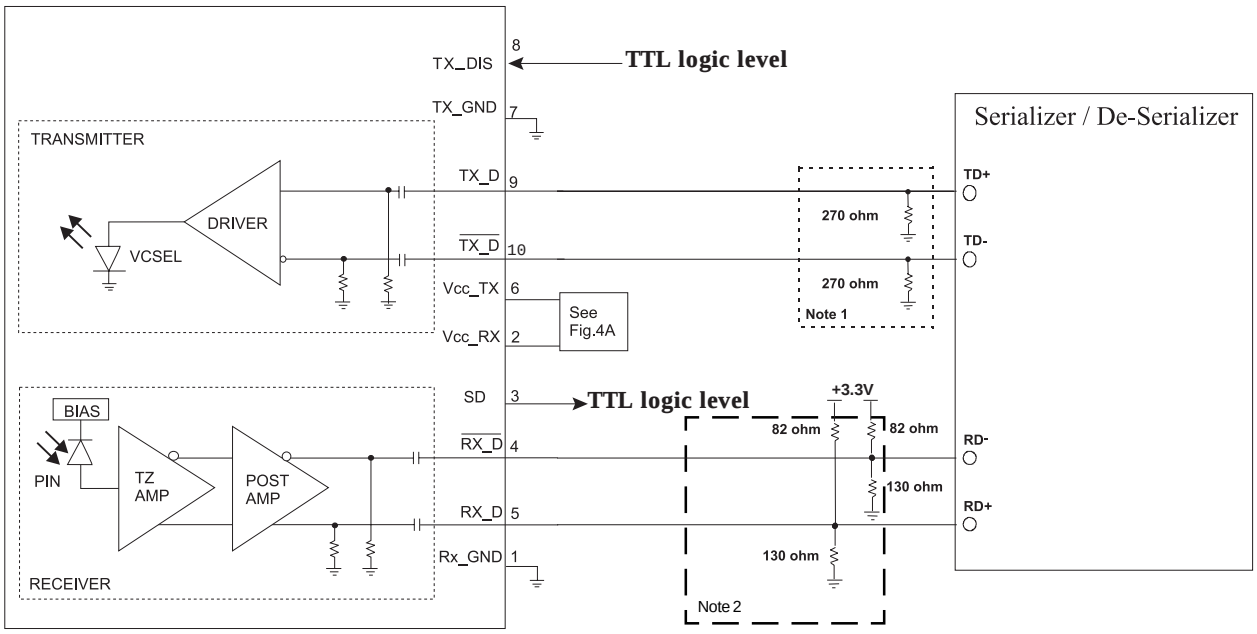


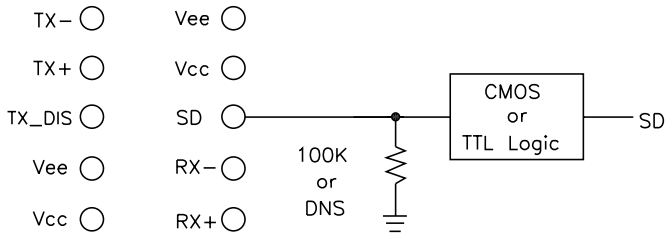
Figure 3. Thevenin Equivalent RECEIVE Data Terminations

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.

SIGNAL DETECT

The MLC-25 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.



POWER COUPLING

A suggested layout for power and ground connections is given in figure 4B 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 50 to 100 ohms at 100 to 1000 MHz. Bypass capacitors should be placed as close to the 10-pin connector as possible.

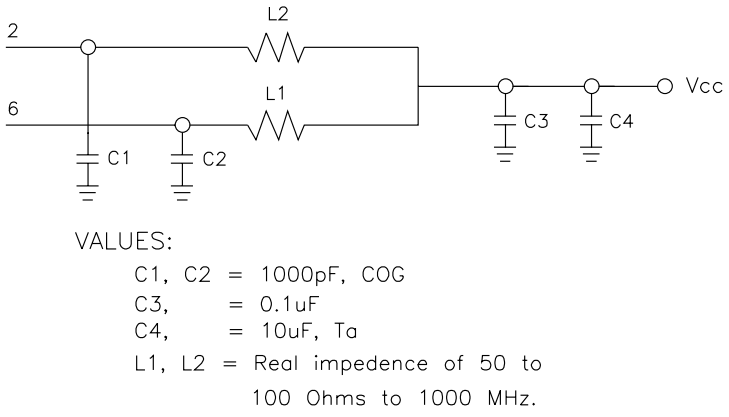


Figure 4A. Suggested Power Coupling - Electrical Schematic

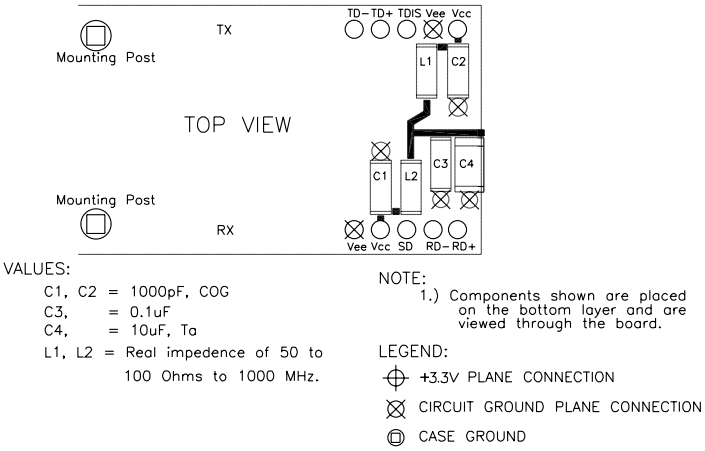


Figure 4B. Suggested Power Coupling - Component Placement

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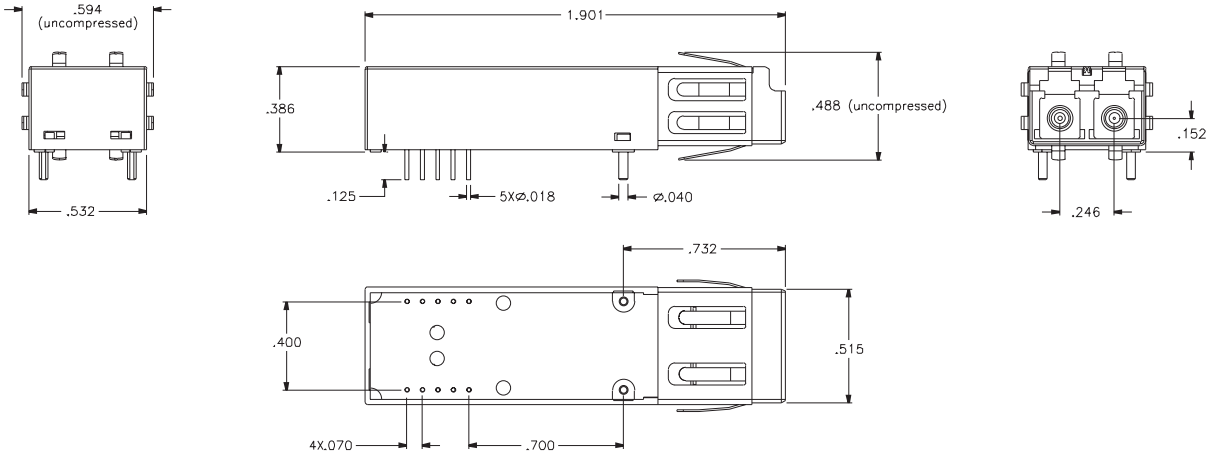
EMI and ESD CONSIDERATIONS

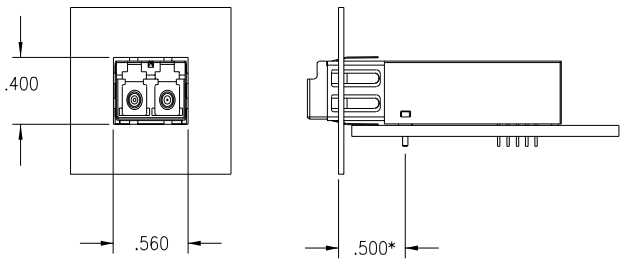
Methode optoelectronic transceivers offer a metalized plastic case and a special chassis grounding clip. As shown in the drawing, this clip connects the module case to chassis ground when installed flush through the panel cutout. The grounding clip in this way brushes the edge of the cutout in order 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 by eliminating the metal from the transmitter and receiver diode housings which extend into the connector space. 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 DIMENSIONS –

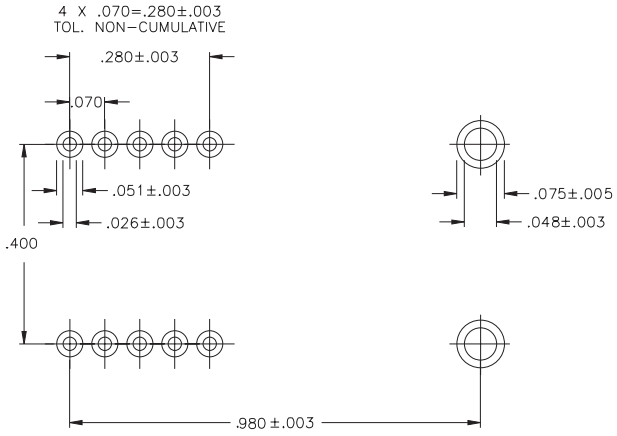


PANEL CUTOUT DIMENSIONS



*DIMENSION REFERRED TO OUTSIDE WALL

SUGGESTED PCB LAND PATTERN



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PHYSICAL DESCRIPTION

The MLC-25 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 MLC-25 fits mezzanine card applications. An epoxy encapsulation provides excellent protection from environmental hazards and assists in heat dissipation for all components. 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	**$\overline{\text{RX\_D}}$**	Receiver Data Inverted Differential Output
PIN 5	**RX_D**	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	**TX_D**	Transmitter Data Non-Inverted Differential Input
PIN 10	**$\overline{\text{TX\_D}}$**	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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