1.25 Gbps Single Mode SFF LC Transceiver

C-13-1250-F-SLC(2)

Features

- Duplex LC Single Mode Transceiver
- Small Form Factor Multi-sourced 2x5 Pin Package
- Complies with IEEE 802.3 Gigabit Ethernet
- Single +3.3V Power Supply
- LVTTL Signal Detection Output (C-13-1250C-F-SLCX)
- LVPECL Signal Detection Output (C-13-1250-F-SLCX)
- LVPECL Differential Inputs and Outputs
- Class 1 Laser International Safety Standard IEC 825 Compliant
- Solder ability to MIL-STD-883, Method 2003
- Pin coating is Sn/Pb with minimum 2% Pb content
- Flammability to UL94V0
- Humidity RH-5-85% (5-95% short term) to IEC 68-2-3
- Complies with Telcordia(Bellcore) GR-468-CORE
- Uncooled laser diode with MQW structure
- 1.25 Gbps Ethernet Links
- 1.06 Gbps Fiber Channel
- RoHS compliance available

Absolute Maximum Rating

Parameter	Symbol	Min.	Max.	Unit	Note
Power Supply Voltage	V_{cc}	0	3.6	V	
Output Current	I_{out}	0	30	mA	
Soldering Temperature	-	-	260	°C	10 seconds on leads only
Storage Temperature	T_{stg}	-40	85	°C	

Recommended Operating Condition

Parameter	Symbol	Min.	Typ.	Max.	Unit
Power Supply Voltage	V_{cc}	3.1	3.3	3.5	V
Operating Temperature [1]	T_{opr}	0	-	70	°C
Operating Temperature [1]	T_{opr}	-40	-	85	°C
Data Rate	-	-	1250	-	Mbps

Note1: Please refer to ordering information

20550 Nordhoff St. • Chatsworth, CA 91311 • tel: 818.773.9044 • fax: 818.576.9486
9F, No 81, Shui Lee Rd. • Hsinchu, Taiwan, R.O.C. • tel: 886.3.5169222 • fax: 886.3.5169213

Transmitter Specifications,

Parameter	Symbol	Min	Typical	Max	Unit	Notes
Optical						
Optical Transmit Power	P_o	-10	-	-3	dBm	C-13-1250-F-SLC
Optical Transmit Power	P_o	-5	-	0	dBm	C-13-1250-F-SLC2
Output center Wavelength	λ	1270	1310	1355	nm	
Output Spectrum Width	$\Delta\lambda_{rms}$	-	-	4	nm	RMS(σ), C-13-1250-F-SLC
Output Spectrum Width	$\Delta\lambda_{rms}$	-	-	2.5	nm	RMS(σ), C-13-1250-F-SLC2
Extinction Ratio	ER	9	-	-	dB	
Output Eye		Compliant with IEEE 802.3				
Optical Rise Time	t_r	-	-	0.26	ns	20% to 80% Values
Optical Fall Time	t_f	-	-	0.26	ns	20% to 80% Values
Relative Intensity Noise	RIN	-	-	-120	dB/Hz	
Total Jitter	TJ	-	-	0.27	ns	Measured with 2^7-1 PRBS

Transmitter Specifications,

Parameter	Symbol	Min	Typical	Max	Unit	Notes
Electrical						
Power Supply Current	I_{CC}	-	-	160	mA	Maximum current is specified at Vcc= Maximum @ maximum temperature
Transmitter Enable Voltage	V_{EN}	0	-	0.8	V	LVTTL input
Transmitter Disable Voltage	V_D	2.0	-	Vcc	V	
Differential Data Input Voltage	V_{IH}-V_{IL}	650	-	2000	mV	AC-coupled, C-13-1250AC-F-SLC(2)
Data Input Voltage-Low	V_{IL}-V_{CC}	-2.0	-	-1.58	V	These inputs are compatible with 10K, 10KH and 100K ECL and PECL inputs
Data Input Voltage-High	V_{IH}-V_{CC}	-1.1	-	-0.74	V	

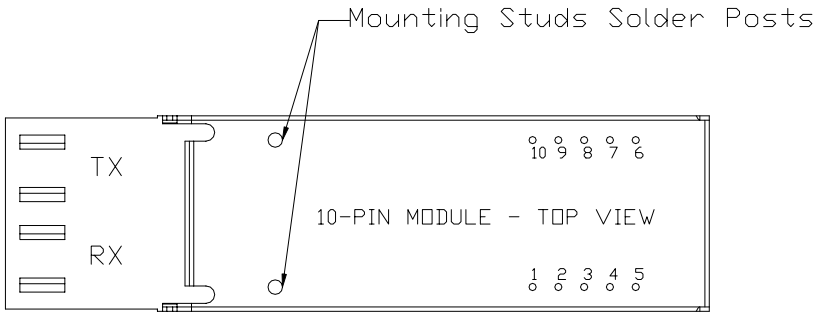
Receiver Specifications,

Parameter	Symbol	Min	Typical	Max	Unit	Notes
Optical						
Sensitivity	-	-	-25	-24	dBm	Measured with 2^7-1 PRBS, BER=1E-12
Maximum Input Power	P_{in}	-3	-	-	dBm	
Signal Detect-Asserted	Pa	-	-	-24	dBm	Measured on transition: low to high
Signal Detect-Deasserted	Pd	-38	-	-	dBm	Measured on transition: high to low
Signal Detect-Hysteresis		1	-	-	dB	
Wavelength of Operation		1100	-	1600	nm	

Receiver Specifications,

Parameter	Symbol	Min	Typical	Max	Unit	Note
Electrical						
Power Supply Current	I_{CC}	-	-	120	mA	The current excludes the output load current
Data Output Voltage-Low	V_{OL} -V_{cc}	-1.98	-	-1.71	V	These outputs are compatible with 10K, 10KH and 100KECL and LVPECL outputs
Data Output Voltage-High	V_{OH}- V_{cc}	-1.1	-	-0.91	V	
Differential Data Output Voltage	V_{pp}	600	-	1600	mV	AC-coupled, C-13-1250AC-F-SLC(2)
Signal Detect Output Voltage-Low	V_{SDL}-V_{cc}	-2.0	-	-1.58	V	C-13-1250-F-SLC(2)
Signal Detect Output Voltage-High	V_{SDH}- V_{cc}	-1.1	-	-0.74	V	
Signal Detect Output Voltage-Low	V_{SDL}	-	-	0.5	V	C-13-1250(A)C-F-SLC(2)
Signal Detect Output Voltage-High	V_{SDH}	2.0	-	-	V	

Connection Diagram



PIN	Symbol	Notes
1	RxGND	Directly connect this pin to the receiver ground plane
2	RxVcc	+3.3V dc power for the receiver section
3	SD	Active high on this indicates a received optical signal(LVTTL)
4	RD-	Receiver Data Out Bar (LVPECL)
5	RD+	Receiver Data Out (LVPECL)
6	TxVcc	+3.3V dc power for the trasmitter section
7	TxGND	Directly connect this pin to the transmitter ground plane
8	TxDIS	Transmitter disable (LVTTL)
9	TD+	Transmitter Data In (LVPECL)
10	TD-	Transmitter Data In Bar (LVPECL)
Attaching Posts		The attaching posts are at case potential and may be connected to chassis ground. They are isolated from circuit ground.

Recommended Circuit Schematic

C-13-1250AC-F-SLC(2)

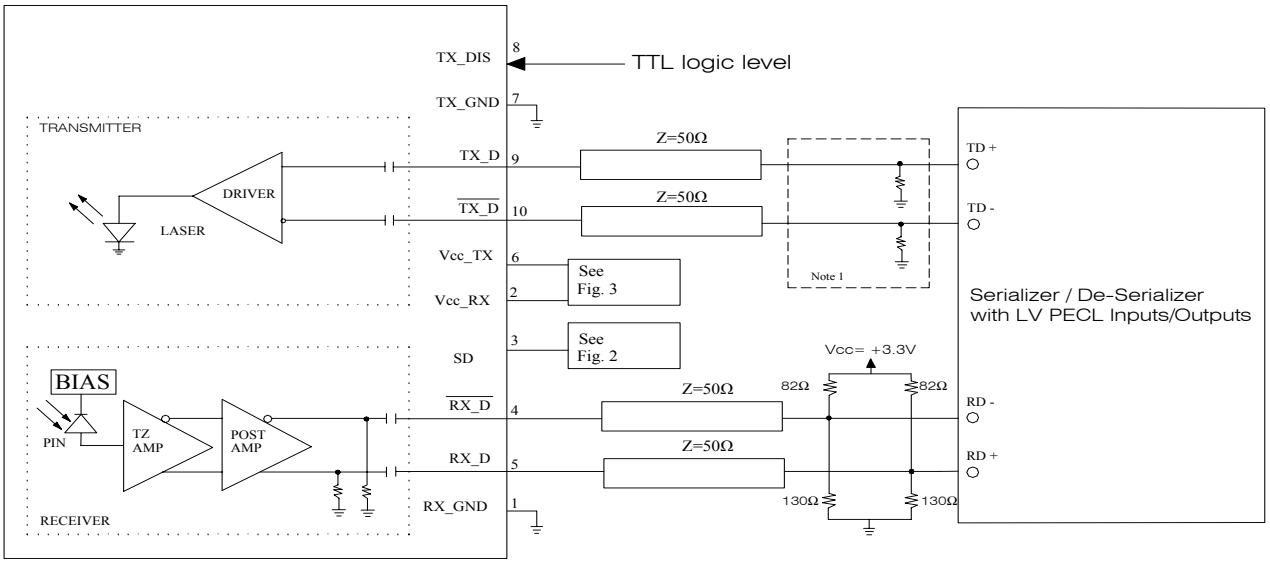


Figure 1: Recommended Transceiver and Receive Data Terminations (AC-coupled)

C-13-1250-F-SLC(2)

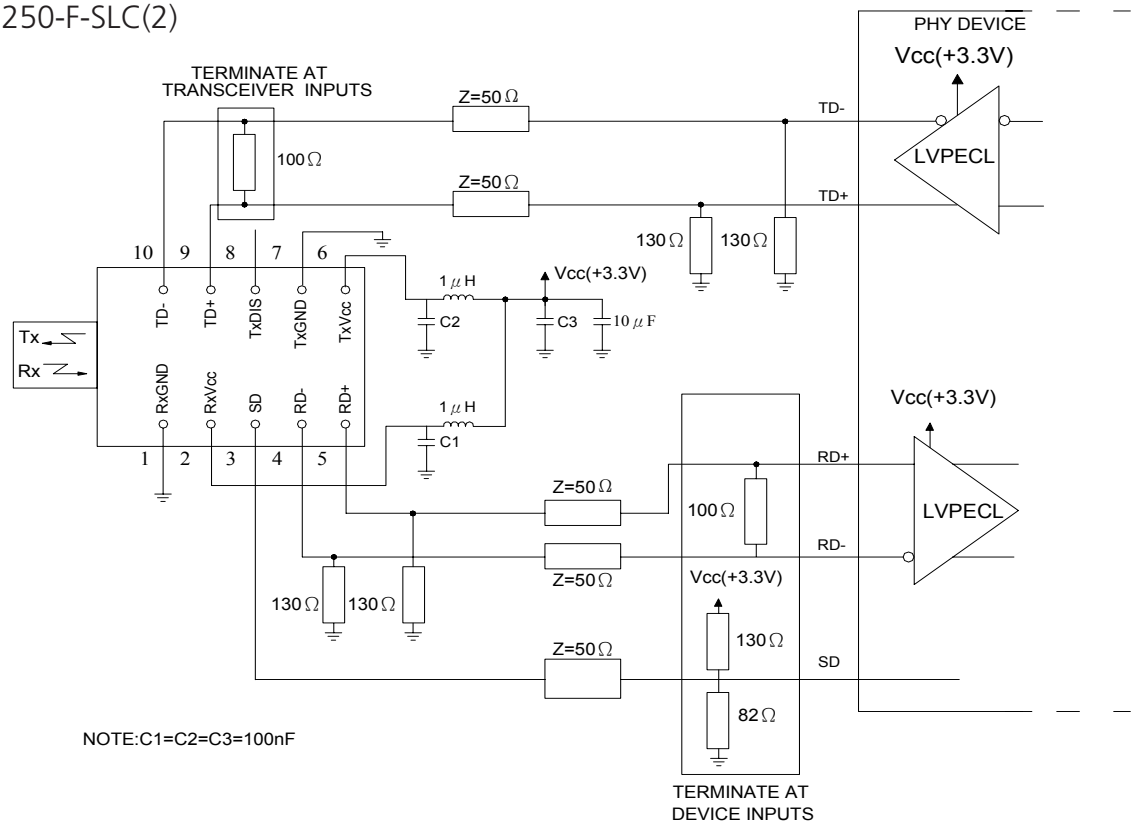
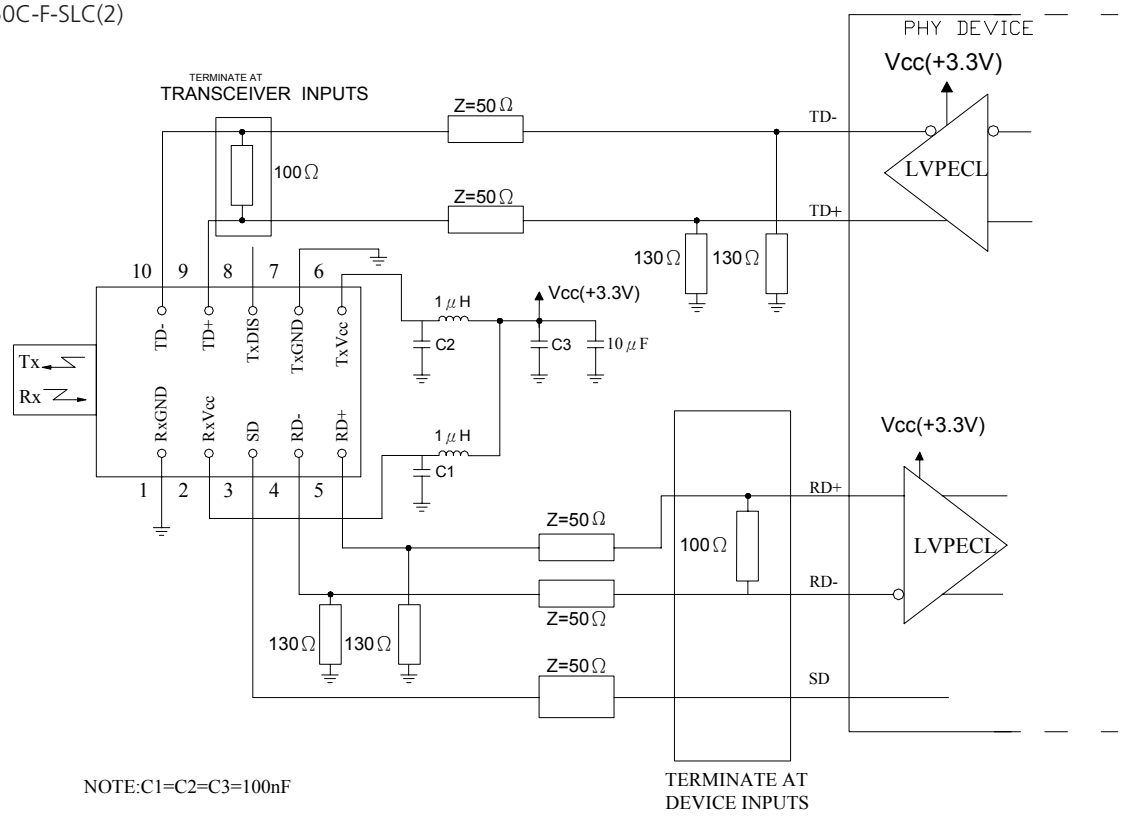


Figure 1b: Recommended Transceiver and Receive Data Terminations (AC-coupled)

Recommended Circuit Schematic

C-13-1250C-F-SLC(2)



The split-loaded terminations for ECL signals need to be located at the input of devices receiving those ECL signals.
The power supply filtering is required for good EMI performance. Use short tracks from the inductor L1/L2 to the module Rx Vcc.
A GND plane under the module is required for good EMI and sensitivity performance.

Figure 1c: Recommended Transceiver and Receive Data Terminations (DC-coupled)

Signal Detect (LVTTL output)

The C-13-1250(A)C-F-SLC(2) transceivers are equipped with LVTTL signal detect output. The standard LVTTL output eliminates the need for a LVPECL to LVTTL level shifter in most applications.

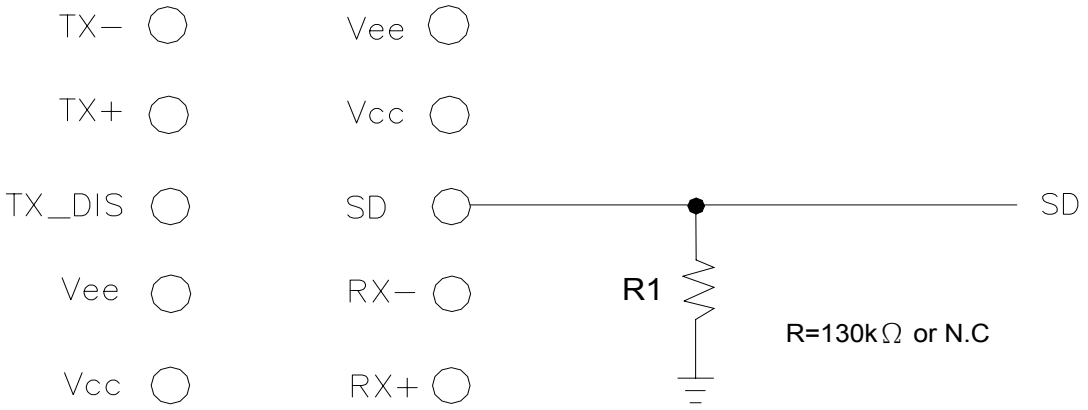
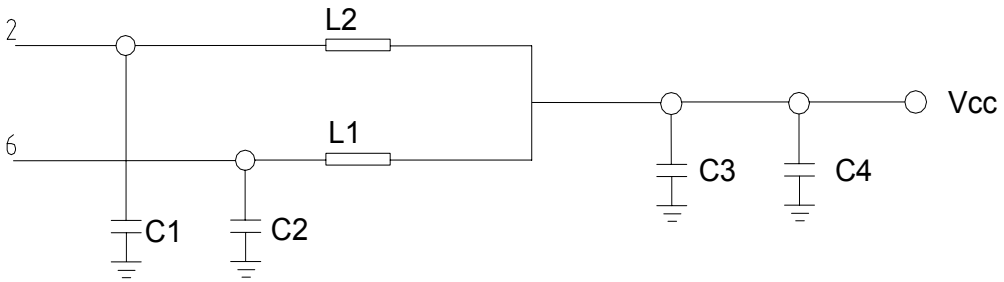


Figure 2: Signal Detect

Power Coupling

A suggested layout for power and ground connections is given in figure 3A 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 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. By-pass capacitors should be placed as close to the 10-pin connector as possible.

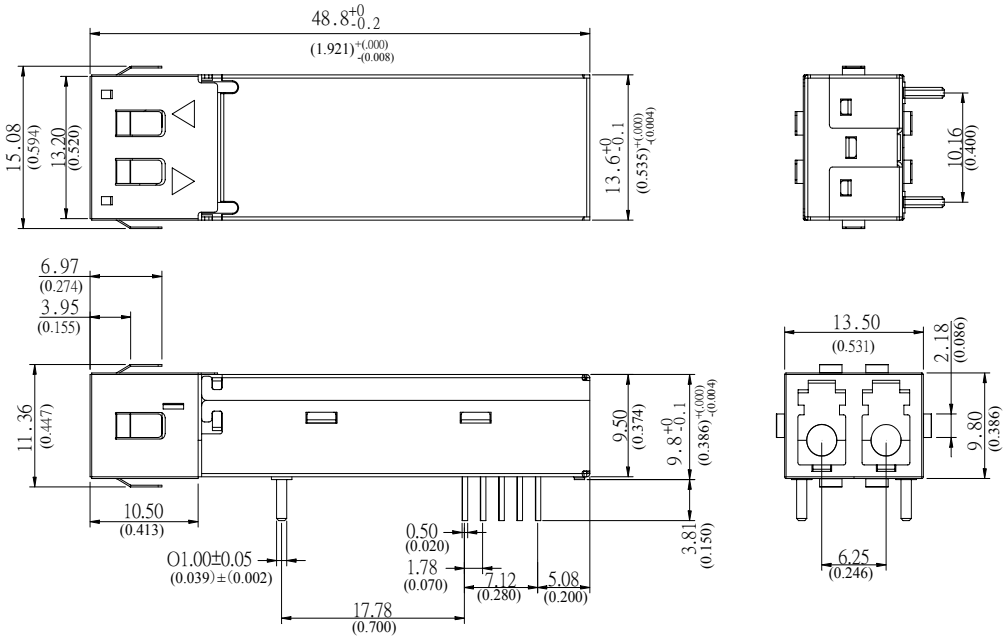


VALUES:
C1, C2 = 1000pF,
C3, = 0.1 uF
C4, = 10 uF,
L1, L2 = Real impednce of 50 to 100 Ohms to 1000 MHz.

Figure 3: Suggested Power Coupling-Electrical Schematic

Package Diagram

Units: mm (inches)



Printed Circuit Board Layout Consideration

A fiber-optic receiver employs a very high gain, wide bandwidth transimpedance amplifier. This amplifier detects and amplifies signals that are only tens of nA in amplitude when the receiver is operating near it's limit. Any unwanted signal current that couples into the receiver circuitry causes a decrease in the receiver's sensitivity and can also degrade the performance of the receiver's signal detect (SD) circuit. To minimize the coupling of unwanted noise into the receiver, careful attention must be given to the printed circuit board.

At a minimum, a double-sided printed circuit board(PCB) with a large component side ground plane beneath the transceiver must be used. In applications that include many other high speed devices, a multi-layer PCB is highly recommended. This permits the placement of power and ground on separate layers, wich allows them to be isolated from the signal lines. Multilayer construction also permits the routing of signal traces away from high level, high speed sinal lines. To minimize the possibility of coupling noise into the receiver section, high level, high speed signals such as transmitter inputs and clock lines should be routed as far away as possible from the receiver pins.

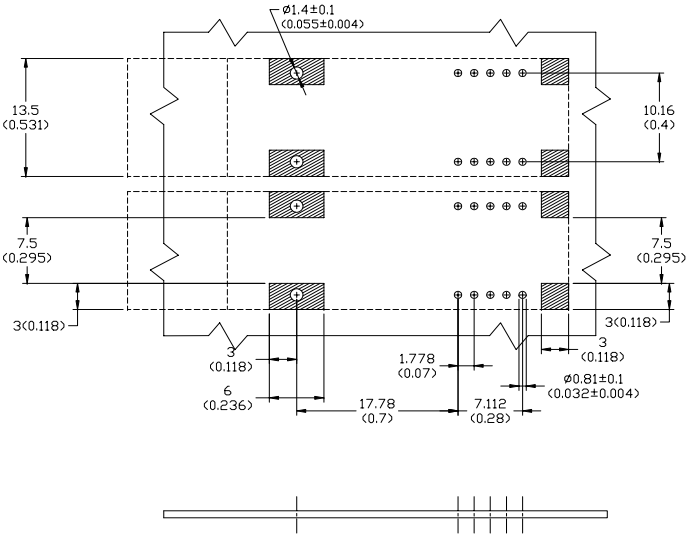
Noise that couples into the receiver through the power supply pins can also degrade performance. It is recommended that a pi filter be used in both transmitter and receiver power supplies.

EMI and ESC Consideration

LuminentOIC 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 then installs flush through the panel cutout. This way, the grounding clip 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 emission 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 emission by eliminating the metal from the transmitter and receiver diode housings, which extend into 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.

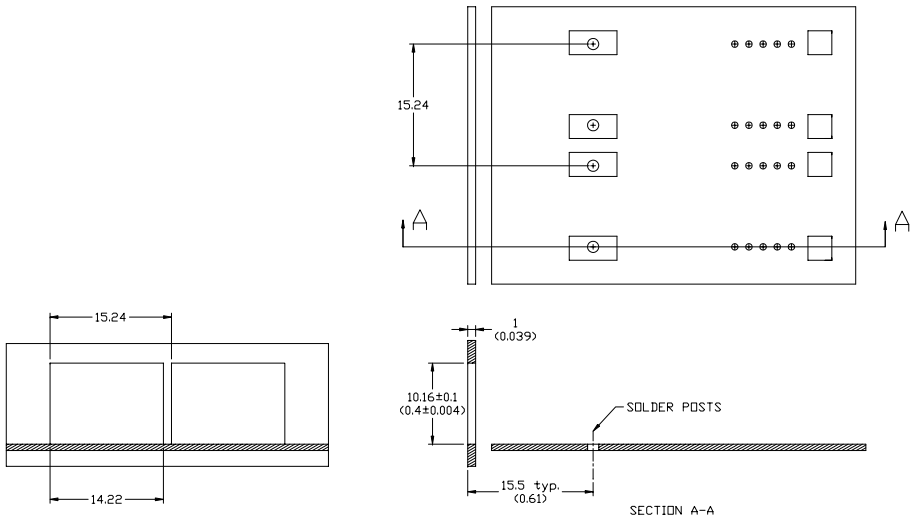
Recommended Board Layout Hole Pattern



DIMENSION IN MILLIMETER (INCHES)

NOTES:
1.THIS FIGURE DESCRIBE THE RECOMMAND CIRCUIT BOARD LAYOUT FOR THE SFF TRANSCEIVER.
2.THE HATCHED AREAS ARE KEEP-OUT AREAS RESERVED FOR HOUSING STANDOFF. NO METAL TRACES OR GROUND CONNECTION IN KEEP-OUT AREAS.
3.THE MOUNTING STUDS SHOULD BE SOLDERED TO CHASSIS GROUND FOR MECHANICAL INTEGRITY.

Recommended Panel mounting



DIMENSION IN MILLIMETER (INCHES)

Ordering Information

Available Option:

C-13-1250-F-SLC	C-13-1250C-F-SLC	C-13-1250AC-F-SLC
C-13-1250-F-SLC2	C-13-1250C-F-SLC2	C-13-1250AC-F-SLC2
C-13-1250-F-SLCA	C-13-1250C-F-SLCA	C-13-1250AC-F-SLCA
C-13-1250-F-SLC2A	C-13-1250C-F-SLC2A	C-13-1250AC-F-SLC2A
C-13-1250-F-SLC-G5	C-13-1250C-F-SLC-G5	C-13-1250AC-F-SLC-G5
C-13-1250-F-SLC2-G5	C-13-1250C-F-SLC2-G5	C-13-1250AC-F-SLC2-G5
C-13-1250-F-SLCA-G5	C-13-1250C-F-SLCA-G5	C-13-1250AC-F-SLCA-G5
C-13-1250-F-SLC2A-G5	C-13-1250C-F-SLC2A-G5	C-13-1250AC-F-SLC2A-G5

Part numbering Definition:

C - 13 - 1250XX - F - S LC TxPower Temperature and Package RoHS

- 13 = Wavelength 1310 nm
- 1250 Mbps
  1250 = DC-coupled signal, LVPECL SD output
  1250C = DC-coupled signal, LVTTL SD output
  1250AC = AC-coupled signal, LVTTL SD output
- F = +3.3V SFF Transceiver, FP
- Single mode fiber
- Connector options
- Tx Power range
  Blank = -10 to -3 dBm, 10km reach
  2 = -5 to 0 dBm, 20km reach
- Temperature range
  Blank = commercial temperature
  A = industrial temperature
- RoHS
  Blank = RoHS non-compliant product
  G5 = RoHS 5/6-compliant product (lead exemption)

Warnings:

Handling Precautions: This device is susceptible to damage as a result of electrostatic discharge (ESD). A static free environment is highly recommended. Follow guidelines according to proper ESD procedures.
Laser Safety: Radiation emitted by laser devices can be dangerous to human eyes. Avoid eye exposure to direct or indirect radiation.

Legal Notes:

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