

## C-1XX-2500(C)-FDFB-SLCX



## Features

- Duplex LC Single Mode Transceiver
- Small Form Factor Multi-sourced 2x5 Pin Package
- Complies with SONET OC-48 / SDH STM-16
- 1270 nm to 1610 nm Wavelength, CWDM DFB Laser
- Single +3.3V Power Supply
- LVPECL Differential Inputs and Outputs
- LVTTTL Signal Detection Output (C-1XX-2500C-FDFB-SLCX)
- LVPECL Signal Detection Output (C-1XX-2500-FDFB-SLCX)
- Class 1 Laser International Safety Standard IEC 825 compliant
- Solderability to MIL-STD-883, Method 2003
- Pin Coating is Sn/Pb with minimum 2% Pb content
- Flammability to UL94V0
- Humidity RH 5-85% (5-90% short term) to IEC 68-2-3
- Complies with Bellcore GR-468-CORE
- Uncooled laser diode with MQW structure

## 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 |
| Operating Temperature | $T_{opr}$ | 0    | 70   | °C   |                          |
| 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 (Case) | $T_{opr}$ | 0    | -    | 70   | °C   |
| Data rate                    |           | -    | 2488 | -    | Mbps |

## Transmitter Specifications

| Parameter                   | Symbol          | Min                         | Typical     | Max               | Unit  | Notes                         |
|-----------------------------|-----------------|-----------------------------|-------------|-------------------|-------|-------------------------------|
| <b>Optical</b>              |                 |                             |             |                   |       |                               |
| Optical Transmit Power      | $P_o$           | -5                          | -           | 0                 | dBm   | C-1XX-2500(C)-FDFB-SLC2       |
| Optical Transmit Power      | $P_o$           | 0                           | -           | +5                | dBm   | C-1XX-2500(C)-FDFB-SLC4       |
| Output center Wavelength    | $\lambda$       | $\lambda_p - 5.5$           | $\lambda_p$ | $\lambda_p + 7.5$ | nm    | $\lambda_p = 1XX0$ nm         |
| Output Spectrum Width       | $\Delta\lambda$ | -                           | -           | 1                 | nm    | -20 dB width                  |
| Side Mode Suppression Ratio | Sr              | 30                          | 35          | -                 | dBm   | CW, $P_o = 5$ mW              |
| Extinction Ratio            | ER              | 8.2                         | -           | -                 | dB    |                               |
| Output Eye                  |                 | Compliant with G.957 STM-16 |             |                   |       |                               |
| Optical Rise Time           | $t_r$           | -                           | -           | 150               | ps    | 20% to 80% Values             |
| Optical Fall Time           | $t_f$           | -                           | -           | 150               | ps    | 20% to 80% Values             |
| Relative Intensity Noise    | RIN             | -                           | -           | -120              | dB/Hz |                               |
| Total Jitter                | TJ              | -                           | -           | 150               | ps    | Measured with $2^{23}-1$ PRBS |

## C-1XX-2500(C)-FDFB-SLCX

## Transmitter Specifications

| Parameter                       | Symbol          | Min | Typical | Max      | Unit | Notes                                                                       |
|---------------------------------|-----------------|-----|---------|----------|------|-----------------------------------------------------------------------------|
| <b>Electrical</b>               |                 |     |         |          |      |                                                                             |
| Power Supply Current            | $I_{CC}$        | -   | -       | 200      | mA   | Maximum current is specified at $V_{CC}$ =<br>Maximum @ maximum temperature |
| Transmit Enable Voltage         | $V_{EN}$        | 0   | -       | 0.8      | V    | LVTTTL input                                                                |
| Transmit Disable Voltage        | $V_D$           | 2.0 | -       | $V_{CC}$ | V    |                                                                             |
| Differential Data Input Voltage | $V_{IH}-V_{IL}$ | 300 | -       | -        | mV   | AC-coupled                                                                  |

## Receiver Specifications

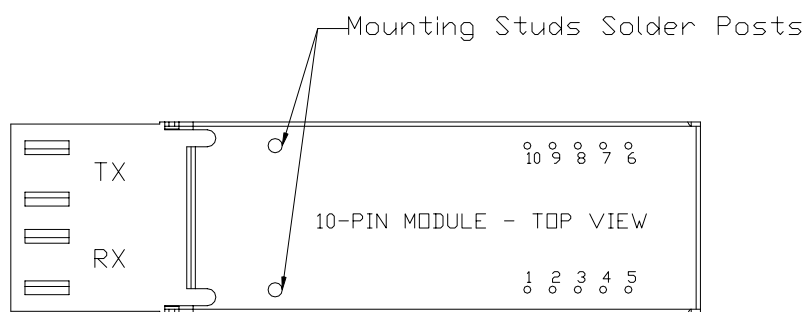
| Parameter                | Symbol   | Min  | Typical | Max  | Unit | Notes                                                          |
|--------------------------|----------|------|---------|------|------|----------------------------------------------------------------|
| <b>Optical</b>           |          |      |         |      |      |                                                                |
| Sensitivity              | -        | -    | -       | -20  | dBm  | Measured with 2 <sup>23</sup> -1 PRBS, BER = 10 <sup>-10</sup> |
| Maximum Input Power      | $P_{in}$ | 0    | -       | -    | dBm  |                                                                |
| Signal Detect-Asserted   | $P_a$    | -    | -       | -20  | dBm  | Measured on transition: low to high                            |
| Signal Detect-Deasserted | $P_d$    | -38  | -       | -    | dBm  | Measured on transition: high to low                            |
| Signal Detect-Hysteresis |          | 0.5  | -       | -    | dB   |                                                                |
| Wavelength of Operation  |          | 1100 | -       | 1620 | nm   |                                                                |

## Receiver Specifications

| Parameter                         | Symbol           | Min  | Typical | Max   | Unit | Note                                         |
|-----------------------------------|------------------|------|---------|-------|------|----------------------------------------------|
| <b>Electrical</b>                 |                  |      |         |       |      |                                              |
| Power Supply Current              | $I_{CC}$         | -    | -       | 120   | mA   | The current excludes the output load current |
| Differential Data Output Voltage  | $V_{OH}-V_{OL}$  | 370  | -       | 1600  | mV   | AC-coupled                                   |
| Signal Detect Output Voltage-Low  | $V_{SDL}-V_{CC}$ | -2   | -       | -1.58 | V    | LVPECL, C-1XX-2500-FDFB-SLCX                 |
| Signal Detect Output Voltage-High | $V_{SDH}-V_{CC}$ | -1.1 | -       | -0.74 | V    |                                              |
| Signal Detect Output Voltage-Low  | $V_{SDL}-V_{CC}$ | -    | -       | 0.5   | V    | LVTTTL, C-1XX-2500C-FDFB-SLCX                |
| Signal Detect Output Voltage-High | $V_{SDH}-V_{CC}$ | 2.0  | -       | -     | V    |                                              |

## C-1XX-2500(C)-FDFB-SLCX

## Connection Diagram



## Legal Notice

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

## C-1XX-2500(C)-FDFB-SLCX

## Recommended Circuit Schematic

Inputs to the C-1XX-2500(C)-FDFB-SLCX series transmitters are AC coupled and internally terminated through 50 ohms to AC ground. These transceivers can operate with LVPECL or CML logic levels. The input signal must have at least a 200 mV peak to (single ended) signal swing. Output from the receiver section of the module is also AC coupled and is expected to drive into 50 ohm load. Different termination strategies may be required depending on the particular Serializer / Deserializer chip set used.

The C-1XX-2500(C)-FDFB-SLCX series product family are 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.

Figure 1 & Figure 2 illustrates the recommended transmit and receive data line terminations for SERDES with CML and LVPECL Inputs / Outputs respectively.

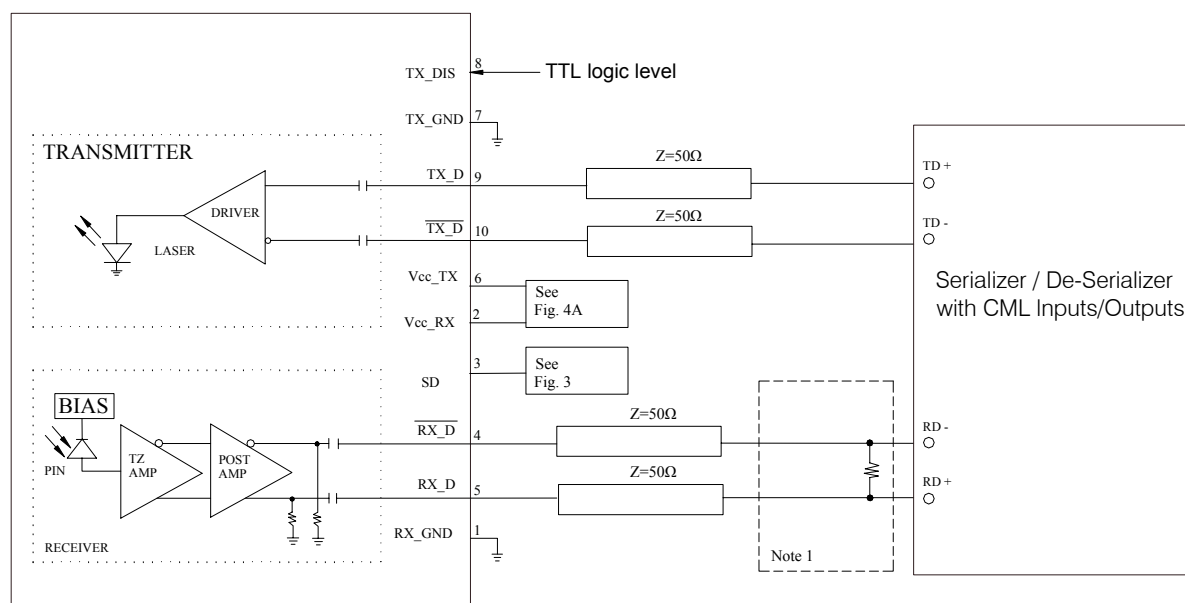


Figure 1. Recommended TRANSMIT and RECEIVE Data Terminations for SERDES with CML I/Os.

Note 1. Consult SERDES manufacturer's data sheet and application data for appropriate receiver input biasing network. Some deserializer inputs are internally terminated and may not need external termination resistors.

## C-1XX-2500(C)-FDFB-SLCX

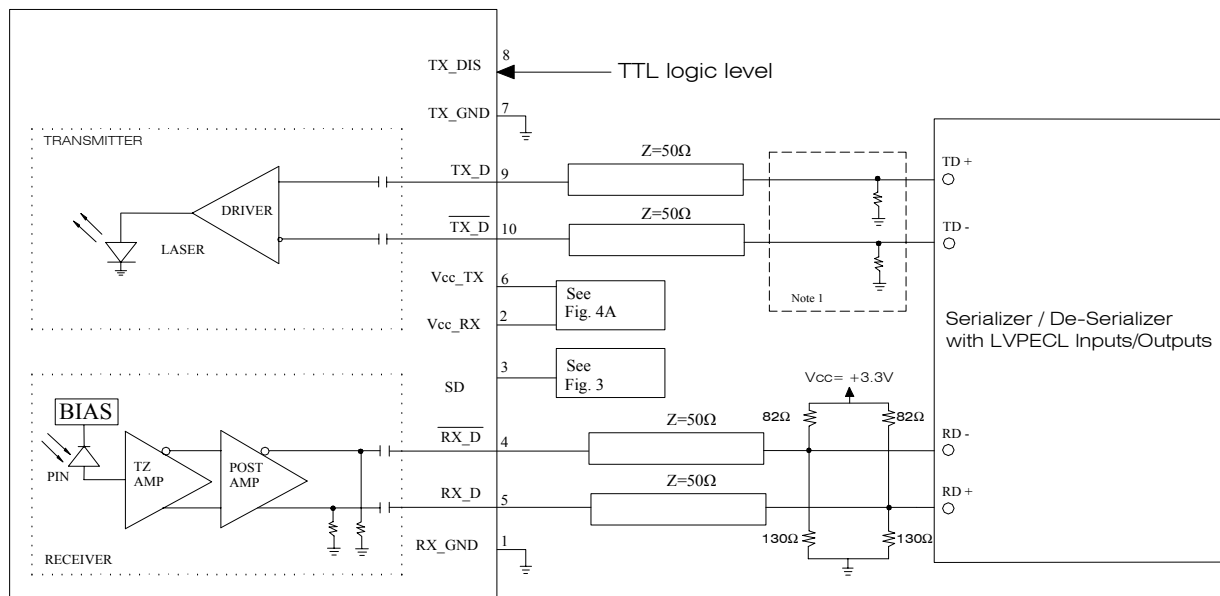


Figure 2. Recommended TRANSMIT and RECEIVE Data Terminations for SERDES with LVPECL I/Os.

Note 1. Consult SERDES manufacturer's application information for biasing required for Tx outputs. Some serializer outputs are internally biased and may not need external bias resistors.

## Signal Detect

The C-1XX-2500(C)-FDFB-SLCX transceivers are equipped with LVTTTL / LVPECL signal detect outputs. The standard LVTTTL output eliminates the need for a LVPECL to LVTTTL level shifter in most in most applications.

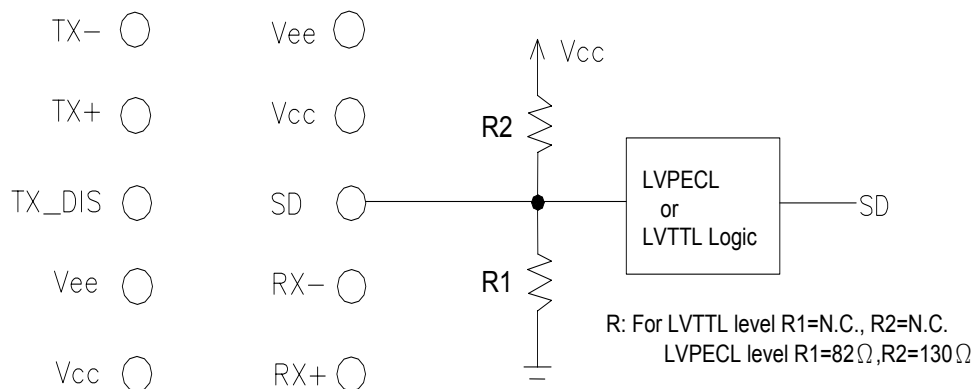


Figure 3: Signal Detect

Note:

C-1XX-2500-FDFB-SLCX with LVPECL SD output

C-1XX-2500C-FDFB-SLCX with LVTTTL SD output

## C-1XX-2500(C)-FDFB-SLCX

## 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 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.

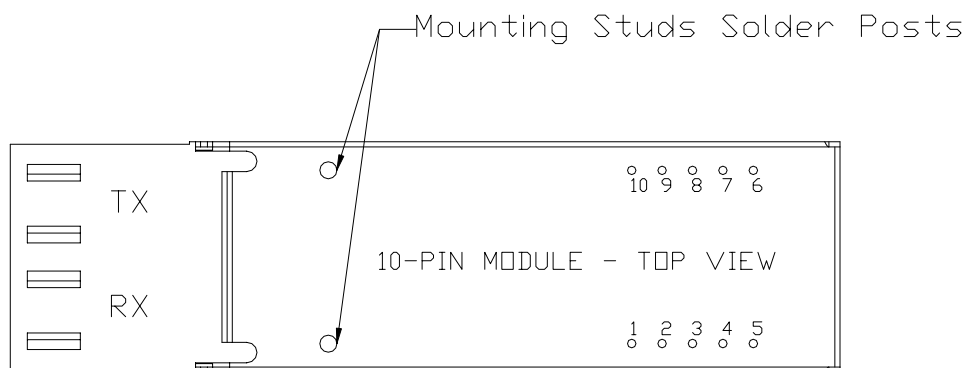


Figure 4A: Suggested Power Coupling-Electrical Schematic

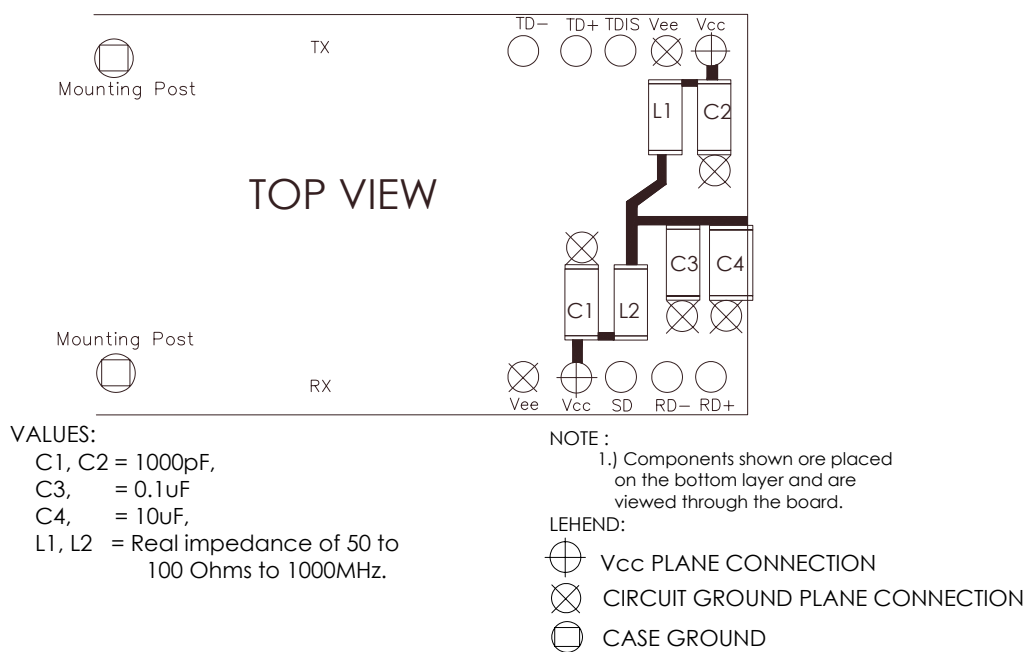
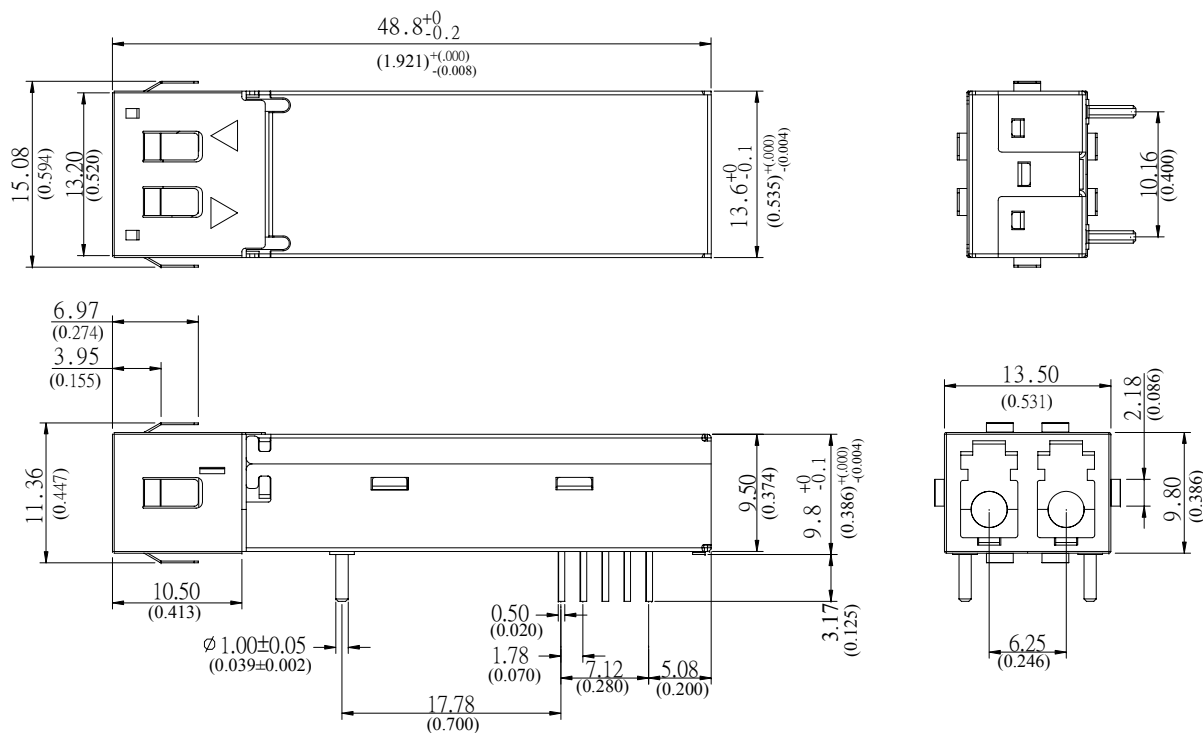


Figure 4B: Suggested Power Coupling-Component Placement

## C-1XX-2500(C)-FDFB-SLCX

Package Diagram

Units: mm (inches)



## C-1XX-2500(C)-FDFB-SLCX

## 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 its 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, which allows them to be isolated from the signal lines. Multilayer construction also permits the routing of signal traces away from high level, high speed signal 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.

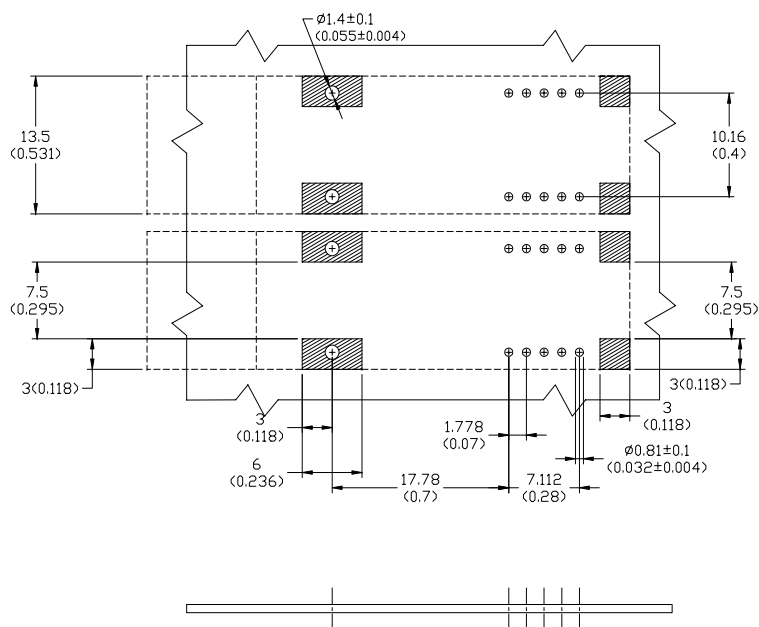
## EMI and ESC Consideration

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.

## C-1XX-2500(C)-FDFB-SLCX

## Recommended Board Layout Hole Pattern

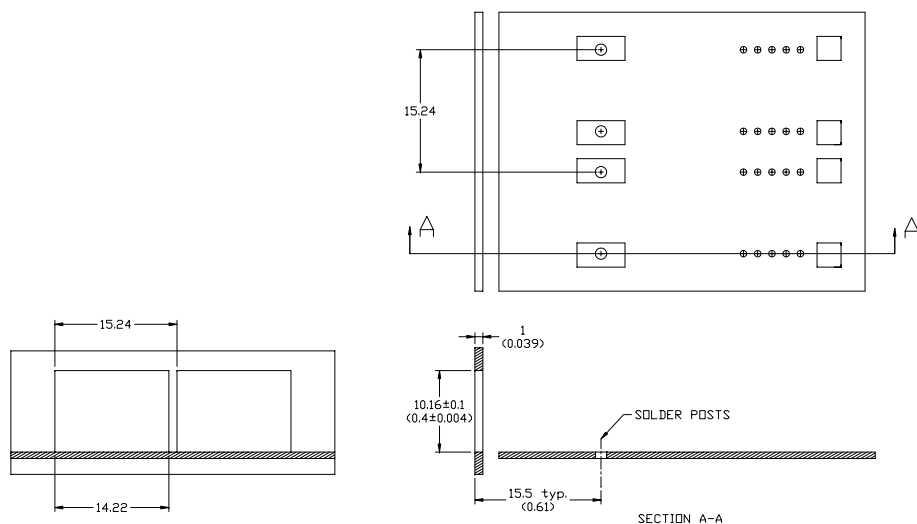


DIMENSION IN MILLIMETER (INCHES)

## NOTES:

1. THIS FIGURE DESCRIBE THE RECOMMEND 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)

## C-1XX-2500(C)-FDFB-SLCX

## Ordering Information

## Available Options:

C-1XX-2500-FDFB-SLC2  
 C-1XX-2500-FDFB-SLC4  
 C-1XX-2500C-FDFB-SLC2  
 C-1XX-2500C-FDFB-SLC4

## Part numbering Definition:

C - 1XX - 2500(C) - FDFB - S LC TxPower

- 1XX = Wavelength 1XX0 nm  
 XX=27, 29, 31, 33, 35, 37, 39, 41, 43,  
 45, 47, 49, 51, 53, 55, 57, 59, 61

- Communication protocol  
 2500= LVPECL SD output  
 2500C= LVTTTL SD output

- FDFB = +3.3V SFF Transceiver

- Single mode fiber

- Connector options

- Tx Power range  
 2 = -5 to 0 dBm  
 4 = 0 to +5 dBm

## 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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