



### Features

- Duplex LC Single Mode Transceiver
- Small Form Factor Multi-sourced 2x5 Pin Package
- Ultra Long reach SONET OC-3/SDH STM-1 Compliant
- Single +3.3V Power Supply
- LVPECL Differential Inputs and Outputs
- LVTTTL Signal Detection Output (C-13-155C-F-SLCx)
- LVPECL Signal Detection Output (C-13-155-F-SLCx)
- Temperature Range: 0 to 70 °C [C-13-155(C)-F-SLCx]
- Temperature Range: -40 to 85 °C [C-13-155(C)-F-SLCxA]
- 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
- EMI Shielding Finger Optional
- ATM 155 Mbps links
- RoHS compliance available

**Table 1 – Absolute Maximum Rating**

| Parameter             | Symbol           | Min. | Typical | Max. | Unit | Notes |
|-----------------------|------------------|------|---------|------|------|-------|
| Power Supply Voltage  | V <sub>cc</sub>  | 0    | -       | 3.6  | V    |       |
| Output Current        | I <sub>out</sub> | -    | -       | 30   | mA   |       |
| Soldering Temperature | -                | -    | -       | 260  | °C   | 1     |
| Storage Temperature   | T <sub>stg</sub> | 0    | -       | 70   | °C   |       |
| Storage Temperature   | T <sub>stg</sub> | -40  | -       | 85   | °C   |       |

Note 1: 10 seconds on leads only

**Table 2 – Recommended Operating Condition**

| Parameter                    | Symbol           | Min. | Typical | Max. | Unit | Notes |
|------------------------------|------------------|------|---------|------|------|-------|
| Power Supply Voltage         | V <sub>cc</sub>  | 3.1  | 3.3     | 3.5  | V    |       |
| Operating Temperature (Case) | T <sub>opr</sub> | 0    | -       | 70   | °C   |       |
| Operating Temperature (Case) | T <sub>opr</sub> | -40  | -       | 85   | °C   |       |
| Data Rate                    | DR               | -    | 155     | -    | Mbps |       |

**Table 3 – Transmitter Specifications (Optical)**

| Parameter                | Symbol           | Min.   | Typical | Max. | Unit  | Notes |
|--------------------------|------------------|--|---------|------|-------|-------|
| Optical Transmit Power   | $P_o$            | -19  | -       | -12  | dBm   | 2     |
| Optical Transmit Power   | $P_o$            | -15  | -       | -8   | dBm   | 3     |
| Optical Transmit Power   | $P_o$            | -5   | -       | 0    | dBm   | 4     |
| Optical Transmit Power   | $P_o$            | -3   | -       | +2   | dBm   | 5     |
| Optical Transmit Power   | $P_o$            | 0  | -       | +5   | dBm   | 6     |
| Output Center Wavelength | $\lambda_c$      | 1261   | 1310    | 1360 | nm    | 7     |
| Output Center Wavelength | $\lambda_c$      | 1263   | 1310    | 1360 | nm    | 8     |
| Output Center Wavelength | $\lambda_c$      | 1270   | 1310    | 1350 | nm    | 9     |
| Output Center Wavelength | $\lambda_c$      | 1275   | 1310    | 1345 | nm    | 10    |
| Output Spectrum Width    | $\Delta \lambda$ | -  | -       | 7.7  | nm    | 11    |
| Output Spectrum Width    | $\Delta \lambda$ | -  | -       | 3    | nm    | 12    |
| Output Spectrum Width    | $\Delta \lambda$ | -  | -       | 2.5  | nm    | 13    |
| Extinction Ratio         | ER               | 8.2  | -       | -    | dB    | 14    |
| Extinction Ratio         | ER               | 10   | -       | -    | dB    | 15    |
| Output Eye               |                  | Compliant with Bellcore GR-253-CORE and ITU Recommendation |         |      |       |       |
| Optical Rise/Fall Time   | $t_r / t_f$      | -  | -       | 2    | ns    | 16    |
| Relative Intensity Noise | RIN              | -  | -       | -116 | dB/Hz |       |
| Total Jitter             | $T_J$            | -  | -       | 1.2  | ns    | 17    |

Note 2: C-13-155(C)-F-SLC

Note 3: C-13-155(C)-F-SLC3

Note 4: C-13-155(C)-F-SLC5

Note 5: C-13-155(C)-F-SLC7

Note 6: C-13-155(C)-F-SLC9

Note 7: C-13-155(C)-F-SLC(3)

Note 8: C-13-155(C)-F-SLC5

Note 9: C-13-155(C)-F-SLC7

Note 10: C-13-155(C)-F-SLC9

Note 11: C-13-155(C)-F-SLC(3)

Note 12: C-13-155(C)-F-SLC5

Note 13: C-13-155(C)-F-SLC7(9)

Note 14: C-13-155(C)-F-SLC(3)

Note 15: C-13-155(C)-F-SLC5(7/9)

Note 16: 10% to 90% Values

Note 17: Measured with  $2^{23}-1$  PRBS with 72 ones and 72 zeros.

**Table 4 – Transmitter Specifications (Electrical)**

| Parameter                   | Symbol          | Min. | Typical | Max.     | Unit    | Notes |
|-----------------------------|-----------------|------|---------|----------|---------|-------|
| Power Supply Current        | $I_{CC}$        | -    | -       | 180      | mA      | 18    |
| Transmitter Enable Voltage  | $V_{EN}$        | 0    | -       | 0.8      | V       |       |
| Transmitter Disable Voltage | $V_D$           | 2    | -       | $V_{CC}$ | V       |       |
| Data Input Current-Low      | $I_{IL}$        | -200 | -       | -        | $\mu A$ |       |
| Data Input Current-High     | $I_{IH}$        | -    | -       | 200      | $\mu A$ |       |
| Data Input Voltage-Low      | $V_{IL}-V_{CC}$ | -2.0 | -       | -1.58    | V       | 19    |
| Data Input Voltage-High     | $V_{IH}-V_{CC}$ | -1.1 | -       | -0.74    | V       |       |

Note 18: Maximum current is specified at  $V_{CC}$  = Maximum @ maximum temperature

Note 19: These inputs are compatible with 10K, 10KH and 100K ECL and PECL inputs

**Table 5 – Receiver Specifications (Optical)**

| Parameter                | Symbol   | Min. | Typical | Max. | Unit | Notes |
|--------------------------|----------|------|---------|------|------|-------|
| Sensitivity              | -        | -    | -       | -30  | dBm  | 20    |
| Sensitivity              | -        | -    | -       | -34  | dBm  | 21    |
| Sensitivity              | -        | -    | -       | -35  | dBm  | 22    |
| Sensitivity              | -        | -    | -       | -36  | dBm  | 23    |
| Sensitivity              | -        | -    | -       | -37  | dBm  | 24    |
| Maximum Input Power      | $P_{in}$ | -7   | -       | -    | dBm  | 25    |
| Maximum Input Power      | $P_{in}$ | -3   | -       | -    | dBm  | 26    |
| Maximum Input Power      | $P_{in}$ | 0    | -       | -    | dBm  | 27    |
| Signal Detect-Asserted   | $P_a$    | -    | -       | -30  | dBm  | 28    |
| Signal Detect-Asserted   | $P_a$    | -    | -       | -34  | dBm  | 29    |
| Signal Detect-Asserted   | $P_a$    | -    | -       | -35  | dBm  | 30    |
| Signal Detect-Asserted   | $P_a$    | -    | -       | -36  | dBm  | 31    |
| Signal Detect-Asserted   | $P_a$    | -    | -       | -37  | dBm  | 32    |
| Signal Detect-Deasserted | $P_d$    | -48  | -       | -    | dBm  |       |
| Signal Detect-Hysteresis | -        | 1    | -       | 4    | dB   |       |
| Wavelength of Operation  | -        | 1100 | -       | 1600 | nm   |       |

Note 20, 28: C-13-155(C)-F-SLC

Note 21, 29: C-13-155(C)-F-SLC3

Note 22, 30: C-13-155(C)-F-SLC5

Note 23, 31: C-13-155(C)-F-SLC7

Note 24, 32: C-13-155(C)-F-SLC9

Note 25: C-13-155(C)-F-SLC(3)

Note 26: C-13-155(C)-F-SLC5(7)

Note 27: C-13-155(C)-F-SLC9

Note 33: Measured on transition: high to low

**Table 6 – Receiver Specifications (Electrical)**

| Parameter                         | Symbol           | Min. | Typical | Max.  | Unit | Notes |
|-----------------------------------|------------------|------|---------|-------|------|-------|
| Power Supply Current              | $I_{CC}$         | -    | -       | 100   | mA   | 34    |
| Data Output Voltage-Low           | $V_{OL}-V_{CC}$  | -2   | -       | -1.58 | V    | 35    |
| Data Output Voltage-High          | $V_{OH}-V_{CC}$  | -1.1 | -       | -0.74 | V    |       |
| Signal Detect Output Voltage-Low  | $V_{SDL}-V_{CC}$ | -2   | -       | -1.58 | V    | 36    |
| 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    | 37    |
| Signal Detect Output Voltage-High | $V_{SDH}-V_{CC}$ | 2.0  | -       | -     | V    |       |

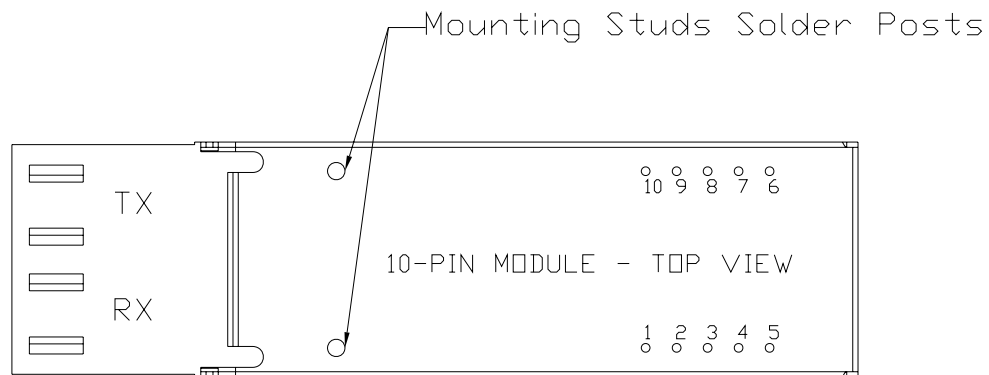
Note 34: The current excludes the output load current

Note 35: These outputs are compatible with 10K, 10KH and 100KECL and LVPECL outputs.

Note 36: LVPECL, C-13-155-F-SLCX

Note 37: LVTTTL, C-13-155C-F-SLCX

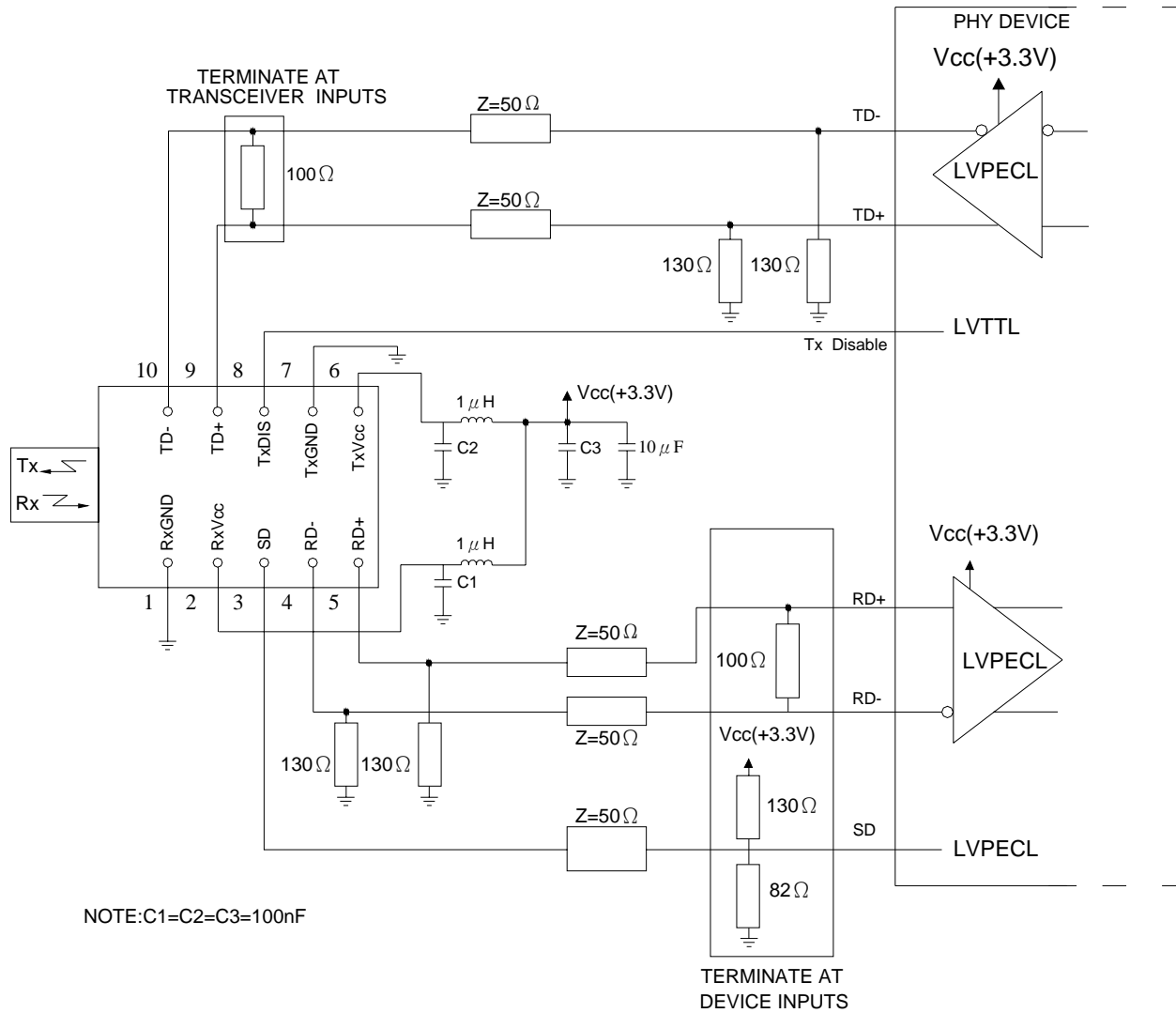
### Connection Diagram



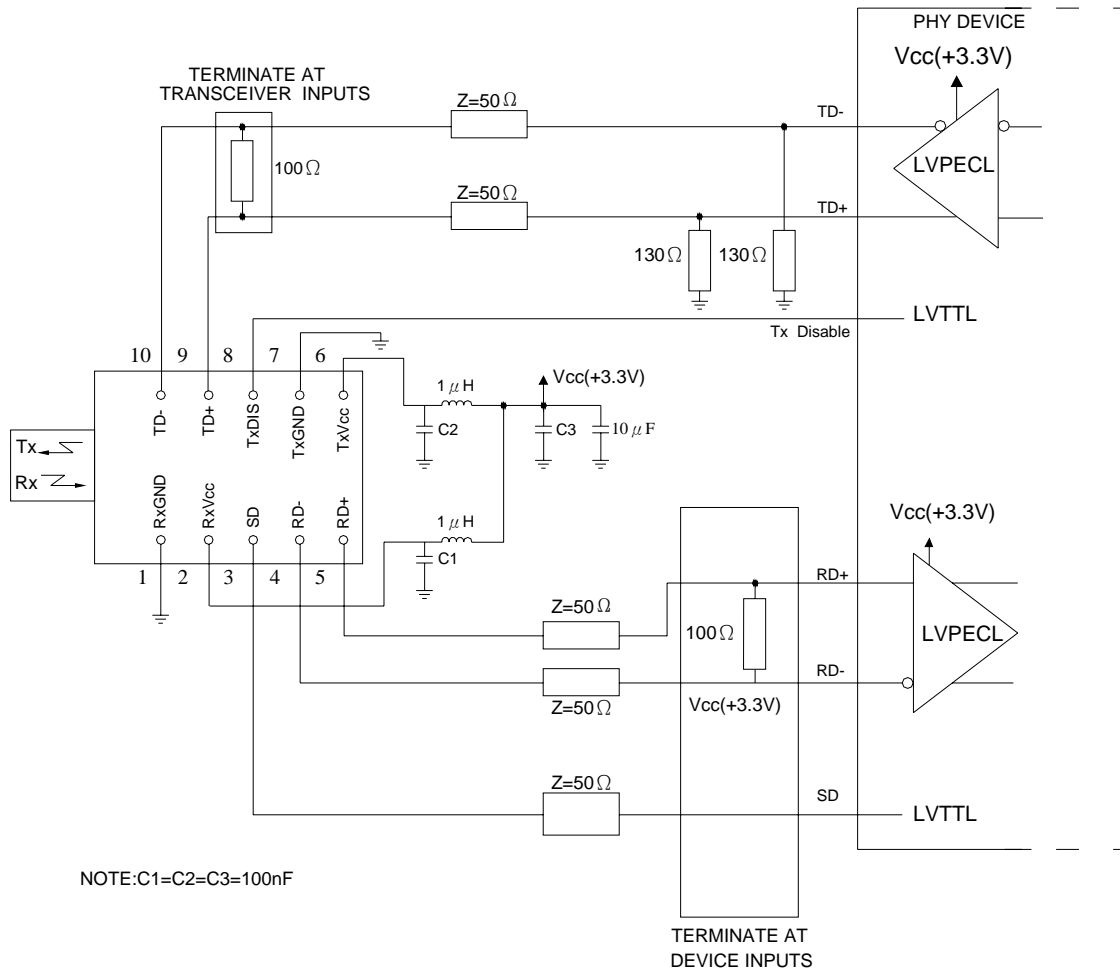
**Table 7 – Pin Definitions**

| Pin             | Unit  | 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 (LVPECL/LVTTL)   |
| 4               | RD-   | Receiver Data Out Bar (LVPECL)   |
| 5               | RD+   | Receiver Data Out (LVPECL)   |
| 6               | TxVcc | +3.3V 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)   |
| 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-13-155-F-SLCx(-G5)



**Recommended Circuit Schematic**  
**C-13-155C-F-SLCx(-G5)**

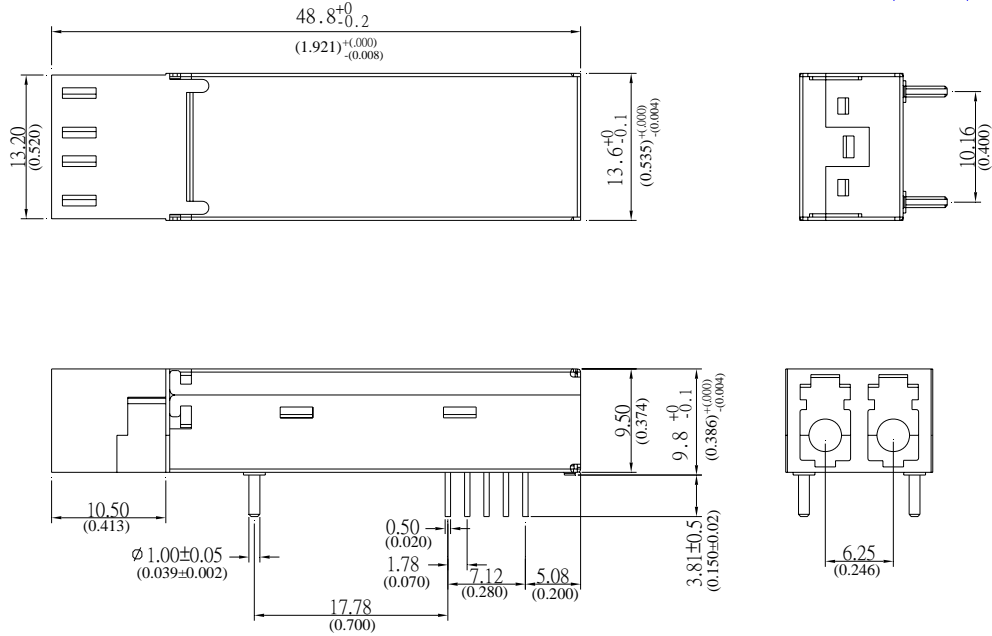


The split-loaded terminations for ECL signals need to be located at the input of devices receiving those ECL signals. The power supply filtering is required for good EMI performance. Use short tracks from the inductor L1/L2 to the module Rx Vcc.

A GND plane under the module is required for good EMI and sensitivity performance.

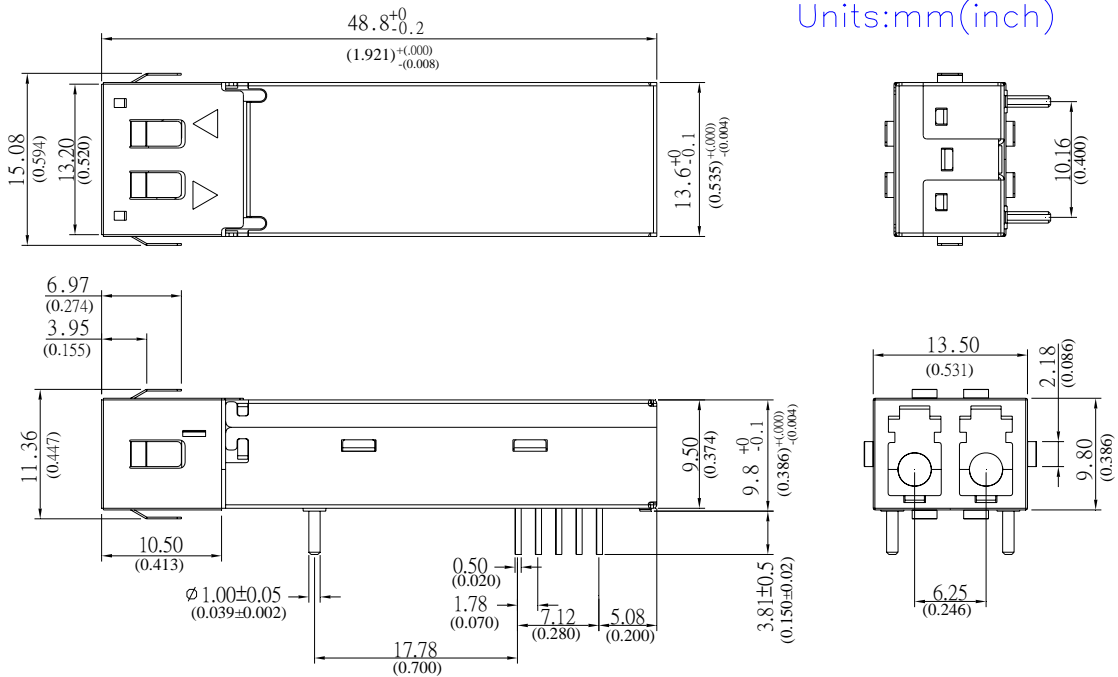
**Package Diagram**  
**C-13-155(C)-F-SLCx(-G5)**

Units:mm(inch)



**C-13-155(C)-F-SLCxS(-G5)**

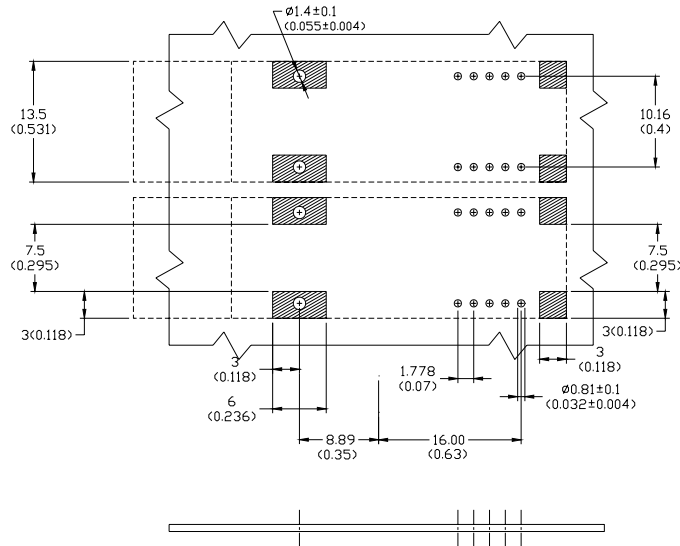
Units:mm(inch)



Case with metal shielding finger



### Recommended Board Layout Hole Pattern

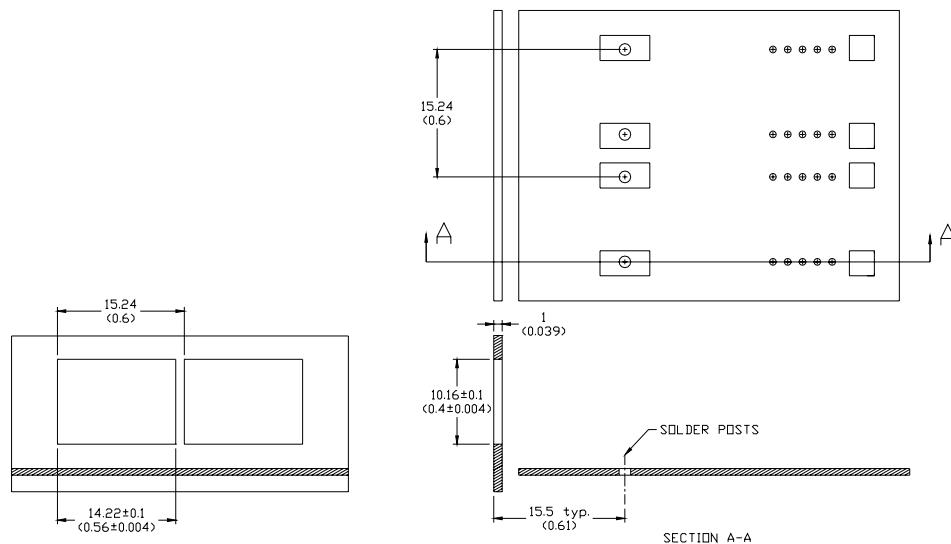


DIMENSION IN MILLIMETER (INCHES)

#### 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



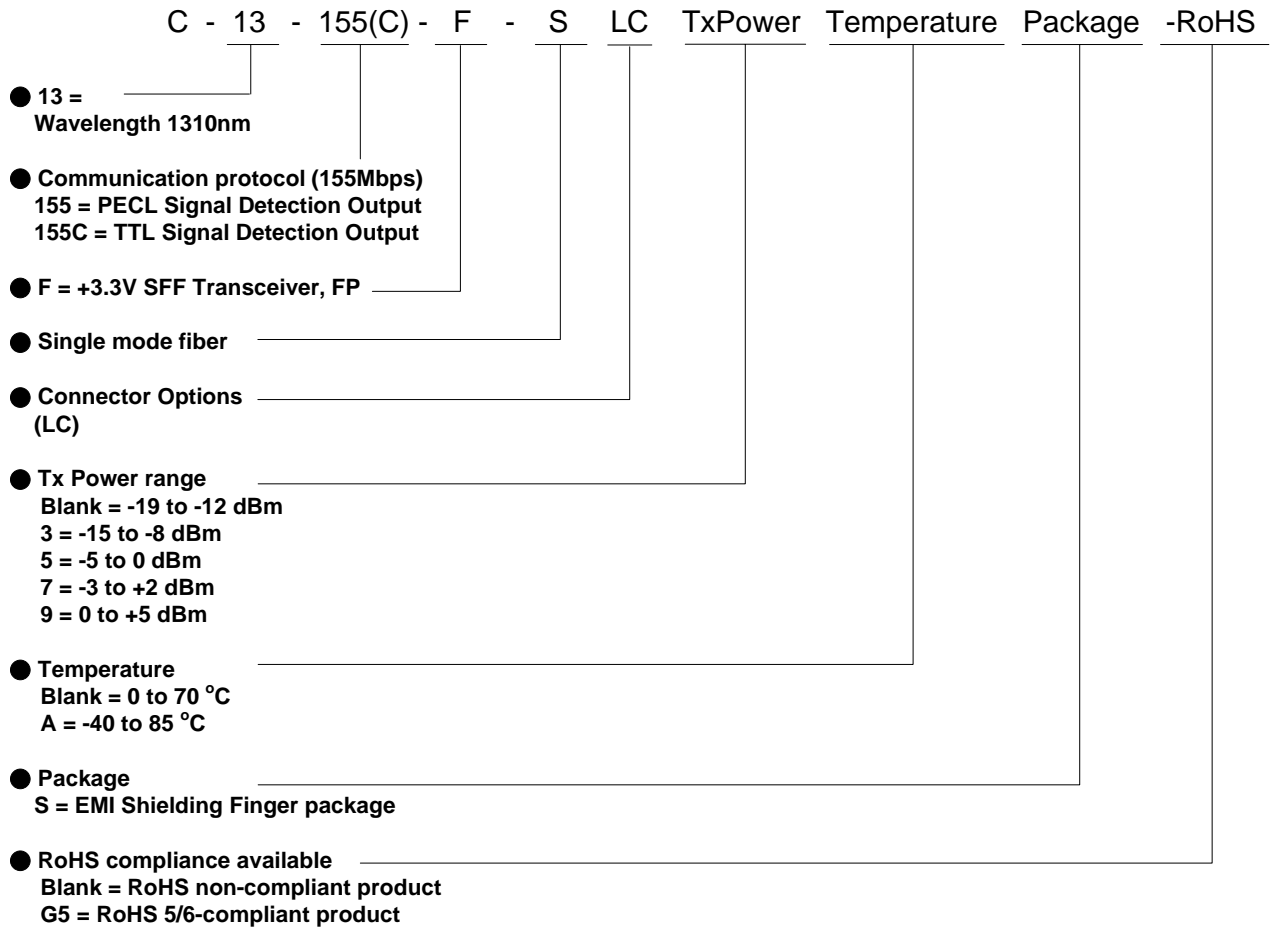
DIMENSION IN MILLIMETER (INCHES)

## Order Information

**Table 8 – Order Information**

| Part No.          | Part No.             | Part No.           | Part No.              |
|-------------------|----------------------|--------------------|-----------------------|
| C-13-155-F-SLC    | C-13-155-F-SLC-G5    | C-13-155-F-SLCS    | C-13-155-F-SLCS-G5    |
| C-13-155C-F-SLC   | C-13-155C-F-SLC-G5   | C-13-155C-F-SLCS   | C-13-155C-F-SLCS-G5   |
| C-13-155-F-SLC3   | C-13-155-F-SLC3-G5   | C-13-155-F-SLC3S   | C-13-155-F-SLC3S-G5   |
| C-13-155C-F-SLC3  | C-13-155C-F-SLC3-G5  | C-13-155C-F-SLC3S  | C-13-155C-F-SLC3S-G5  |
| C-13-155-F-SLC5   | C-13-155-F-SLC5-G5   | C-13-155-F-SLC5S   | C-13-155-F-SLC5S-G5   |
| C-13-155C-F-SLC5  | C-13-155C-F-SLC5-G5  | C-13-155C-F-SLC5S  | C-13-155C-F-SLC5S-G5  |
| C-13-155-F-SLC7   | C-13-155-F-SLC7-G5   | C-13-155-F-SLC7S   | C-13-155-F-SLC7S-G5   |
| C-13-155C-F-SLC7  | C-13-155C-F-SLC7-G5  | C-13-155C-F-SLC7S  | C-13-155C-F-SLC7S-G5  |
| C-13-155-F-SLC9   | C-13-155-F-SLC9-G5   | C-13-155-F-SLC9S   | C-13-155-F-SLC9S-G5   |
| C-13-155C-F-SLC9  | C-13-155C-F-SLC9-G5  | C-13-155C-F-SLC9S  | C-13-155C-F-SLC9S-G5  |
| C-13-155-F-SLCA   | C-13-155-F-SLCA-G5   | C-13-155-F-SLCAS   | C-13-155-F-SLCAS-G5   |
| C-13-155C-F-SLCA  | C-13-155C-F-SLCA-G5  | C-13-155C-F-SLCAS  | C-13-155C-F-SLCAS-G5  |
| C-13-155-F-SLC3A  | C-13-155-F-SLC3A-G5  | C-13-155-F-SLC3AS  | C-13-155-F-SLC3AS-G5  |
| C-13-155C-F-SLC3A | C-13-155C-F-SLC3A-G5 | C-13-155C-F-SLC3AS | C-13-155C-F-SLC3AS-G5 |
| C-13-155-F-SLC5A  | C-13-155-F-SLC5A-G5  | C-13-155-F-SLC5AS  | C-13-155-F-SLC5AS-G5  |
| C-13-155C-F-SLC5A | C-13-155C-F-SLC5A-G5 | C-13-155C-F-SLC5AS | C-13-155C-F-SLC5AS-G5 |
| C-13-155-F-SLC7A  | C-13-155-F-SLC7A-G5  | C-13-155-F-SLC7AS  | C-13-155-F-SLC7AS-G5  |
| C-13-155C-F-SLC7A | C-13-155C-F-SLC7A-G5 | C-13-155C-F-SLC7AS | C-13-155C-F-SLC7AS-G5 |
| C-13-155-F-SLC9A  | C-13-155-F-SLC9A-G5  | C-13-155-F-SLC9AS  | C-13-155-F-SLC9AS-G5  |
| C-13-155C-F-SLC9A | C-13-155C-F-SLC9A-G5 | C-13-155C-F-SLC9AS | C-13-155C-F-SLC9AS-G5 |

**Part Numbering Definition:**



## 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.

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