

## 155Mbps, SFF LC Duplex Optical Transceiver Module for Fast Ethernet, ATM, SONET/SDH STM-1/OC-3



### Description :

The LC-155Bxxxxxx series from DELTA are SFF (Small Form Factor) optical transceiver modules designed expressly for high-speed communication applications that require rates of up to 155Mbps. They are all compliant with the SONET/SDH standards.

The LC-155Bxxxxxx transceivers are supplied in 2x5 DIP package style with duplex LC connector and are fully compliant with SFF Multi Source Agreement (MSA).

All LC-155Bxxxxxx series can meet Class-1 eye safety standard and effective distance depends on ITU-T G.957 standard or power penalty.

The transmitter sections utilize 1310nm Edge Emitting InGaAsP Laser Diode. This Laser Diode is packaged in the optical subassembly portion of the transmitter section. A custom silicon IC that converts differential PECL logical signals into an analog LD driving current then drive it.

### Features :

- Full Compliance with the Optical Performance Requirements of the ATM 100Mbps and 100 Base-LX Version of IEEE 802.3u.
- Multisource 2x5 package styles with LC Receptacle.
- Single 3.3V Power Supply.
- PECL Differential Inputs and Outputs.
- PECL ( LC-155B2xxxxxx Series ) or TTL ( LC-155B4xxxxxx Series ) Receiver Signal Detect Indicator.
- Wave Solder and Aqueous Wash Process Compatible.
- RoHS Compliant per Directive 2002/95/EC.

The receiver sections utilize InGaAs PIN photodiodes coupled into a custom silicon transimpedance preamplifier IC. These are packaged in the optical subassembly portion of receiver.

These PIN / Preamplifier combinations are coupled into a custom quantizer IC which provides the final pulse shaping for the logic output and the Signal Detect function. The data output is differential. The signal detect output is single-ended.

### Application :

- Single-mode Fiber Backbone Links.
- Fast Ethernet and ATM Compatible.
- Single-mode Fiber Media Converter.

**Absolute Maximum Ratings**

| Parameter                  | Symbol            | Min. | Typ. | Max. | Unit | Note |
|----------------------------|-------------------|------|------|------|------|------|
| Storage Temperature        | T <sub>s</sub>    | -40  |      | 85   | °C   |      |
| Lead Soldering Temperature | T <sub>SOLD</sub> |      |      | 260  | °C   |      |
| Lead Soldering Time        | t <sub>SOLD</sub> |      |      | 10   | Sec. |      |
| Supply Voltage             | V <sub>CC</sub>   | 0    |      | 5    | V    |      |

**Recommended Operating Conditions**

| Parameter                     | Symbol          | Min. | Typ.   | Max. | Unit | Note |
|-------------------------------|-----------------|------|--------|------|------|------|
| Data Rate                     |                 | 100  | 155.52 | 200  | Mbps |      |
| Ambient Operating Temperature | T <sub>A</sub>  | 0    |        | 70   | °C   | 1    |
| Supply Voltage                | V <sub>CC</sub> | 3.15 | 3.3    | 3.45 | V    |      |

Note: See ordering information for detail

**Electrical Characteristics**

| Parameter                           | Symbol               | Min.   | Typ. | Max.                 | Unit | Note       |
|-------------------------------------|----------------------|--------|------|----------------------|------|------------|
| <b>Transmitter</b>                  |                      |        |      |                      |      |            |
| Transmitter Data Input Voltage-Low  | V <sub>IL-VCC</sub>  | -1.81  |      | -1.48                | V    |            |
| Transmitter Data Input Voltage-High | V <sub>IH-VCC</sub>  | -1.16  |      | -0.88                | V    |            |
| Transmitter Disable Input-High      | V <sub>DISH</sub>    | 2      |      | V <sub>CC</sub> +0.3 | V    |            |
| Transmitter Disable Input-Low       | V <sub>DISL</sub>    | 0      |      | 0.8                  | V    |            |
| <b>Receiver</b>                     |                      |        |      |                      |      |            |
| Data Output Voltage-Low             | V <sub>OL-VCC</sub>  | -1.95  |      | -1.62                | V    |            |
| Data Output Voltage-High            | V <sub>OH-VCC</sub>  | -1.045 |      | -0.74                | V    |            |
| SD Output Voltage-Low               | V <sub>SDH-VCC</sub> | -1.95  |      | -1.62                | V    | ECL Family |
| SD Output Voltage-High              | V <sub>SDL-VCC</sub> | -1.05  |      | -0.74                | V    |            |
| SD Output Voltage-Low               | V <sub>SDH-VCC</sub> |        |      | 0.8                  | V    | LVTTL      |
| SD Output Voltage-High              | V <sub>SDL-VCC</sub> | 2      |      |                      | V    |            |

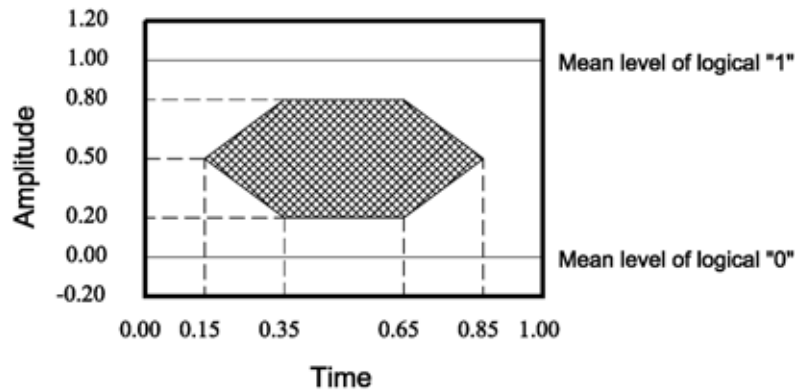
**Optical Characteristics**

( Data Rate = 155.52Mbps, PRBS=2<sup>23</sup>-1, NRZ, 9/125um SMF )

| Parameter                | Symbol                                    | Min. | Typ. | Max. | Unit | Note           |
|--------------------------|---|------|------|------|------|----------------|
| <b>Transmitter</b>       |   |      |      |      |      |                |
| Supply Current           | I <sub>CC</sub>                           |      |      | 150  | mA   |                |
| Mean Launch Power        | P <sub>O</sub>                            | -15  |      | -8   | dBm  | LC-155BxMxxxxx |
|                          |   | -5   |      | 0    |      |                |
| Optical Extinction Ratio | E.R.                                      | 9    |      |      | dB   |                |
| Center Wavelength        | c   | 1280 | 1310 | 1340 | nm   |                |
| Spectral Width (RMS)     |   |      |      | 7.7  | nm   | LC-155BxMxxxxx |
|                          |   |      |      | 3    |      |                |
| Output Eye Diagram       | Compliant with ITU-T recommendation G.957 |      |      |      |      |                |
| <b>Receiver</b>          |   |      |      |      |      |                |
| Supply Current           | I <sub>CC</sub>                           |      |      | 150  | mA   |                |
| Sensitivity              | P <sub>IN</sub>                           |      |      | -31  | dBm  | LC-155BxMxxxxx |
|                          |   |      |      | -34  |      |                |
| Overload                 | P <sub>OL</sub>                           | -8   |      |      | dBm  | LC-155BxMxxxxx |
|                          |   | -10  |      |      |      |                |
| Signal Detect-Asserted   | P <sub>A</sub>                            |      |      | -31  | dBm  | LC-155BxMxxxxx |
|                          |   |      |      | -34  |      |                |
| Signal Detect-DeAsserted | P <sub>D</sub>                            | -45  |      |      | dBm  |                |
| Signal Detect-Hysteresis | P <sub>A</sub> -P <sub>D</sub>            | 0.5  |      |      | dB   |                |

Notes : The sensitivity should be tested at BER of 1×10<sup>-10</sup> or better with an input signal consisting of 155Mb/s,

NRZ, PRBS=2<sup>23</sup>-1 and E.R.= 9dB.

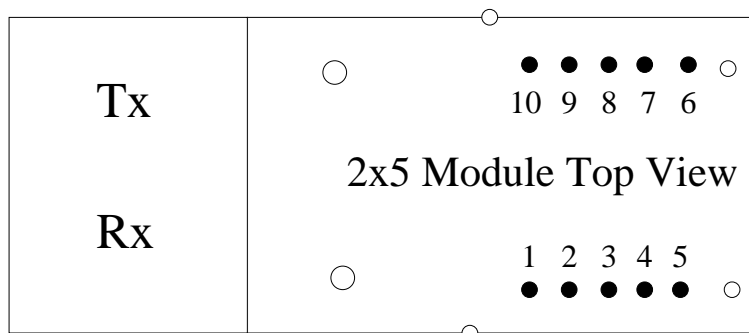


Optical Pulse Mask with Bessel Filter Specified in ITU-T G.957  
Mask of the eye diagram for the optical transmit signal

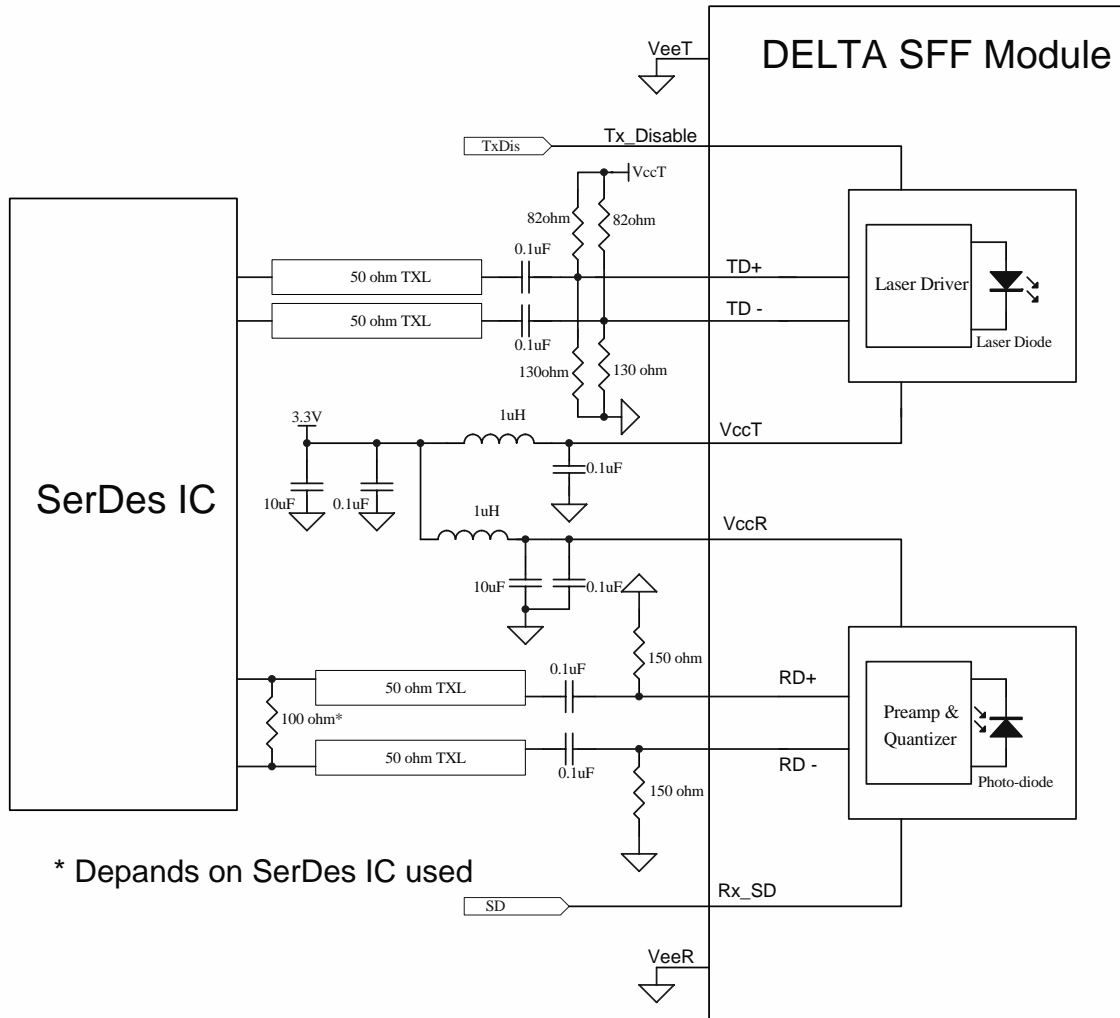
**Pin Definition :**

| PIN | Symbol | Functional description                         |
|-----|--------|--|
| 1   | GND    | Receiver Signal Ground                         |
| 2   | VccR   | Receiver Power Supply                          |
| 3   | SD     | Receiver Signal Detect (LVPECL, LVTTTL or TTL) |
| 4   | RD (-) | Receiver Data Out Bar (LVPECL or PECL)         |
| 5   | RD (+) | Receiver Data Out (LVPECL or PECL)             |
| 6   | VccT   | Transmitter Power Supply                       |
| 7   | GND    | Transmitter Signal Ground                      |
| 8   | TxDis  | Transmitter Disable                            |
| 9   | TD (+) | Transmitter Data In (LVPECL or PECL)           |
| 10  | TD (-) | Transmitter Data In Bar (LVPECL or PECL)       |

**Pin Out Drawing:**



Recommend Circuit Schematic :



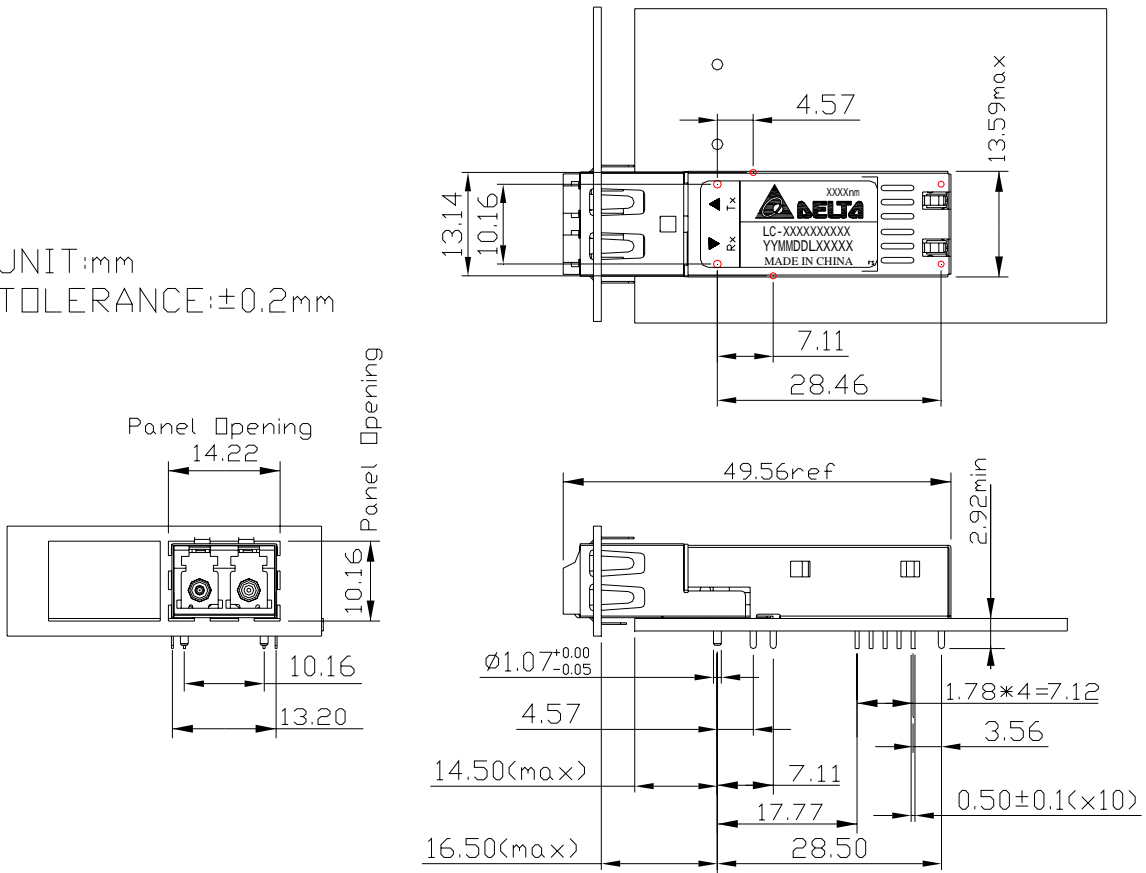
\* Depends on SerDes IC used

Note:

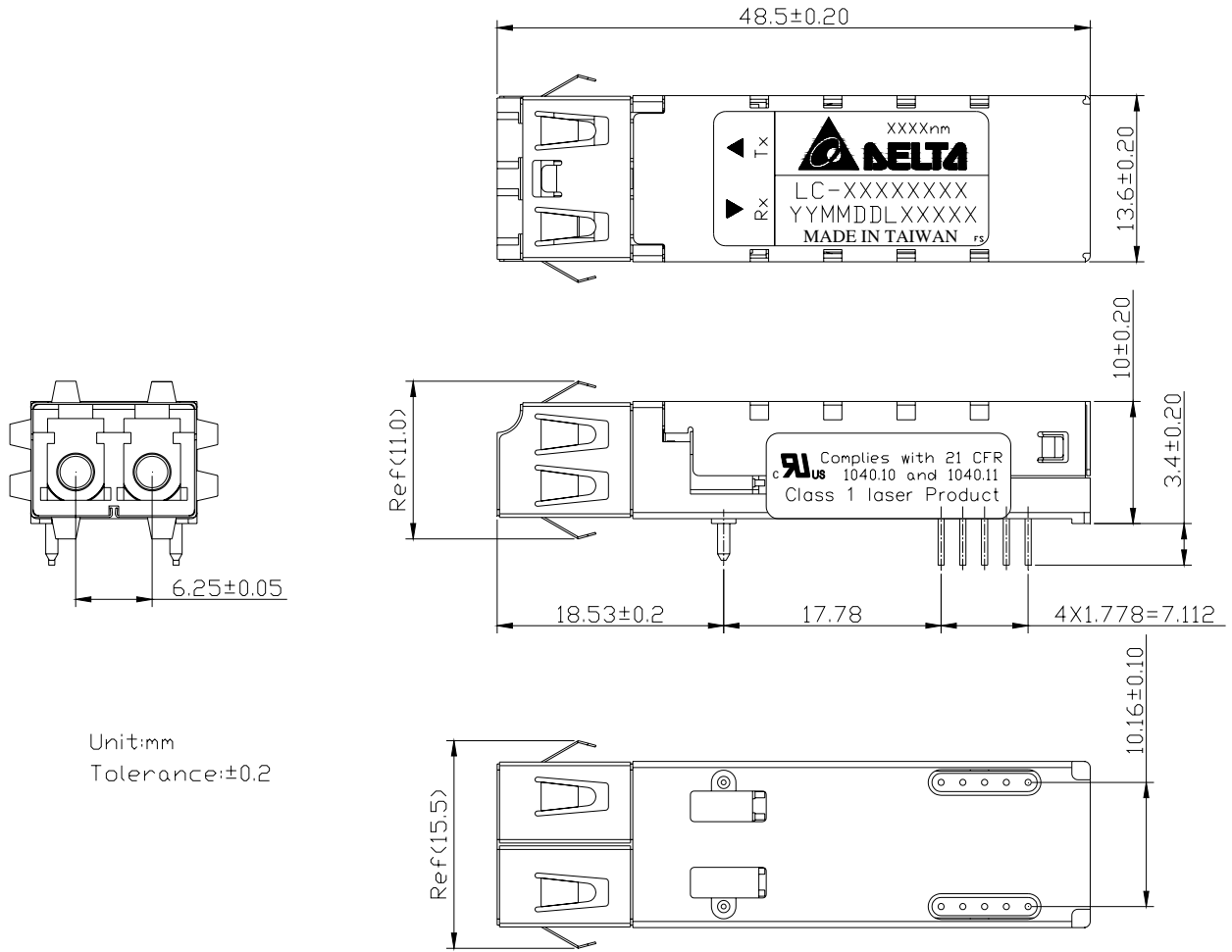
1. 270 Ohm (3.3V), 510 Ohm (5V) SD Output pull-down resistors required for LVPECL SD Output.
2. No connected for TTL SD Output.

Package Outline (Plastic Housing) :

UNIT:mm  
TOLERANCE:±0.2mm



Package Outline (Metal Housing) :



Unit:mm  
Tolerance:±0.2

### Regulatory Compliance

| Feature   | Reference   | Performance  |
|---|---|--|
| Electromagnetic Interference (EMI)                  | FCC Class B<br>EN 55022 Class B (CISPR 22A)   | (1) Satisfied with electrical characteristics of product spec.<br><br>(2) No physical damage |
| Radio Frequency Electromagnetic Field               | EN 61000-4-3<br>IEC 1000-4-3  |  |
| Electrostatic Discharge to the Duplex LC Receptacle | EN 61000-4-2<br>IEC 1000-4-2<br>IEC 801.2   |  |
| Electrostatic Discharge to the Electrical Pins      | MIL-STD-883E Method 3015.7  |  |
| Eye Safety  | US FDA CDRH AEL Class 1<br>EN 60950: 2000<br>EN 60825-1: 1994+A11+A2<br>EN 60825-2: 2000  | CDRH File # 0321539-00<br><br>TUV Certificate No. R50032471                                  |
| Component Recognition                               | Underwriters Laboratories and Canadian Standards Association Joint Component Recognition for Information Technology Equipment Including Electrical Business Equipment | UL File # E239394  |

**Order information :**LC-155B $x_1x_2x_3x_4x_5x_6x_7$  **$x_1$  : Power Supply Voltage and SD Level**

2 : 3.3V ; Data In/Out ( PECL ) ; SD Output ( PECL )

4 : 3.3V ; Data In/Out ( PECL ) ; SD Output ( TTL )

 **$x_2$  : Effective Distance Grade**

J : 15Km

M : 40Km

 **$x_3$  : Package type & coupling type**

1 : 2X5LC DC/DC

 **$x_4$  : RoHS**

Blank : Non-RoHS Compliant

R : RoHS Compliant

 **$x_5$  : Housing Type**

Blank : Plastic Housing

M : Metal Housing

MU : W/O Shielding

 **$x_6$  : Performance**

Blank : Old Design

A : New Design

 **$x_7$  : Temperature**

Blank : 0 to 70

H : -10 to 85

T : -40 to 85