

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



### Features :

- Full Compliance with the Optical Performance Requirements of the ATM 100Mbps and 100 Base-FX Version of IEEE 802.3u.
- Multisource 2x5 package styles with LC Receptacle.
- Single 5V (LC-155B1 and LC-155B3 Series) or 3.3V (LC-155B2 and LC-155B4 Series) Power Supply.
- PECL Differential Inputs and Outputs.
- PECL (LC-155B1 and LC-155B2 Series) or TTL (LC-155B3 and LC-155B4 Series) Receiver Signal Detect Indicator.
- Wave Solder and Aqueous Wash Process Compatible.

### Description :

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

All LC-155Bxxxx 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.

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	
Supply Voltage	V <sub>CC</sub>	0		6	V	

**Recommended Operating Conditions**

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Data Rate		100	155.52	200	Mbps	
Operating Temperature						
LC-155Bxxx	T <sub>A</sub>	0	25	70	°C	
LC-155BxxxT		-40	25	85		
Supply Voltage						
LC-155B1 and LC-155B3 Series	V <sub>CC</sub>	4.75	5	5.25	V	
LC-155B2 and LC-155B4 Series		3.15	3.3	3.45		

**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	
<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	LVTTTL
SD Output Voltage-High	V <sub>SDL-VCC</sub>	2.4			V	

**Optical Characteristics**

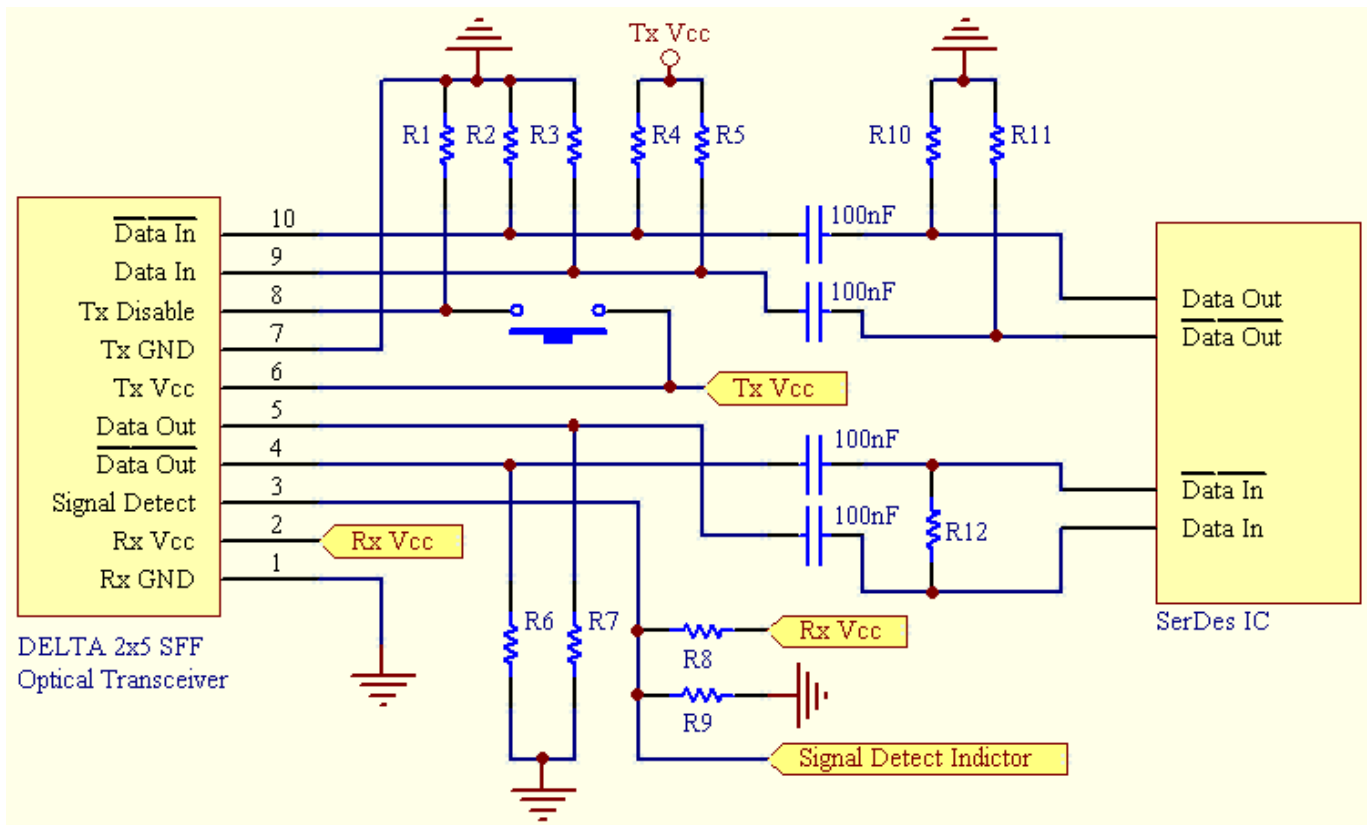
 ( Data Rate = 155.52Mbps, PRBS=2<sup>23</sup>-1, NRZ, 9/125um SMF )

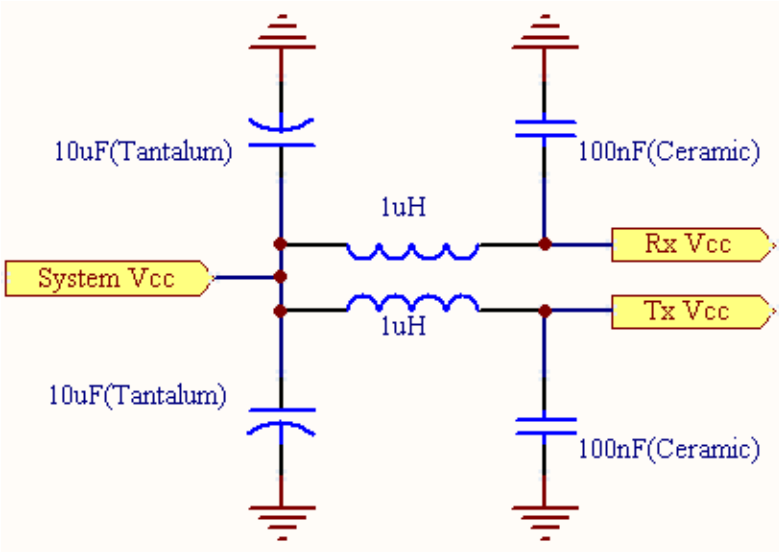
Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
<b>Transmitter</b>						
Supply Current	I <sub>CC</sub>			150 120	mA	LC-155B1、B3 Series LC-155B2、B4 Series
Mean Launch Power	P <sub>O</sub>	-20 -15 -8 -5		-15 -8 -5 0	dBm	LC-155BxHxxx LC-155BxJxxx LC-155BxLxxx LC-155BxMxxx
Optical Extinction Ratio	E.R.	9			dB	
Center Wavelength	λ <sub>C</sub>	1280	1310	1340	nm	
Spectral Width (RMS)	σ			2	nm	
Optical Risetime / Falltime	t <sub>r</sub> /t <sub>f</sub>			0.7	ns	10%~90%
Output Eye Diagram	Compliant with ITU-T recommendation G.957					
<b>Receiver</b>						
Supply Current	I <sub>CC</sub>			120 100	mA	LC-155B1、B3 Series LC-155B2、B4 Series
Sensitivity	P <sub>IN</sub>			-32 -34	dBm	LC-155BxMxxx
Overload	P <sub>OL</sub>	-8			dBm	
Signal Detect-Asserted	P <sub>A</sub>			-34	dBm	
Signal Detect-DeAsserted	P <sub>D</sub>	-45			dBm	
Signal Detect-Hysteresis	P <sub>A</sub> -P <sub>D</sub>	1			dB	

Notes : The sensitivity should be tested at BER of  $1 \times 10^{-10}$  or better with an input signal consisting of 155Mb/s, NRZ, PRBS= $2^{23}-1$  and E.R.= 9dB.

**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)

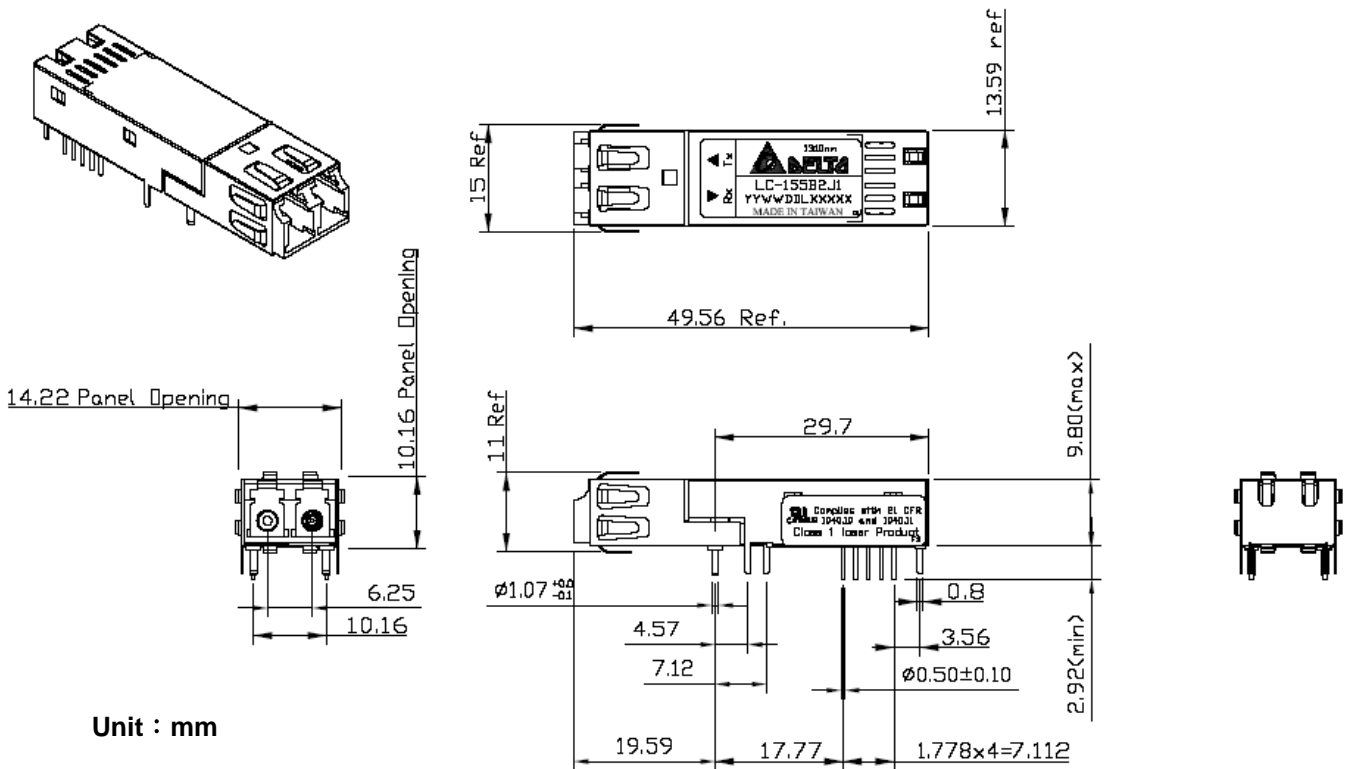
**Recommend Circuit Schematic :**




Note :

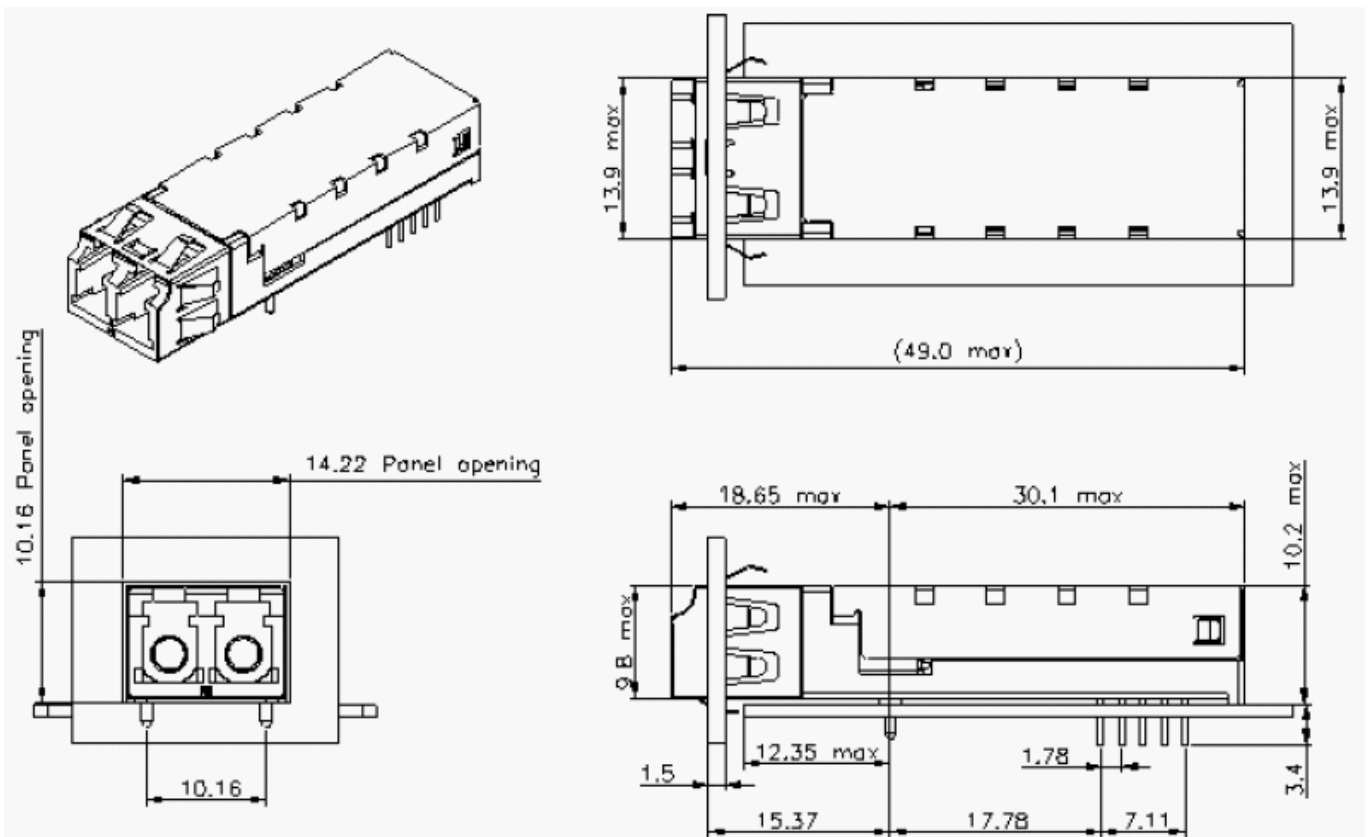
- When system Vcc is 5V, the resistors are as below:  
 • R1=150Ω  
 R2=R3=191Ω ; R4=R5=68Ω  
 R6=R7=270Ω ; R8=130Ω ; R9=82Ω
- When system Vcc is 3.3V, the resistors are as below:  
 R1=150Ω  
 R2=R3=130Ω ; R4=R5=82Ω  
 R6=R7=150Ω ; R8=82Ω ; R9=130Ω
- R10, R11, R12 depend on SerDes IC specification.
- For getting better EMI performance, the Tx Vcc and Rx Vcc should isolate each other as left photograph.

Package Outline :



Unit : mm

LC-155B Series with Plastic Housing



### LC-155B Series with Metal Housing

#### Order information :

LC-155B $x_1x_2x_3x_4$

#### $x_1$ : Power Supply Voltage and SD Level

- 1 : 5.0V ; Data In/Out ( PECL ) ; SD Output ( PECL )
- 2 : 3.3V ; Data In/Out ( PECL ) ; SD Output ( PECL )
- 3 : 5.0V ; Data In/Out ( PECL ) ; SD Output ( TTL )
- 4 : 3.3V ; Data In/Out ( PECL ) ; SD Output ( TTL )

#### $x_2$ : Effective Distance Grade

- H : 2Km
- J : 15Km
- L : 30Km
- M : 40Km

#### $x_3$ : Performance

- 1 : Normal

Other Symbol : It represents special specifications that depend on customers' requirement.

#### $x_4$ : Temperature

- Blank : 0°C to 70°C
- T : -40°C to 85°C

**Regulatory Compliance Table**

<b>Feature</b>	<b>Test Method</b>	<b>Performance</b>
Electrostatic Discharge (ESD) to the Electrical Pins	MIL-STD-883C Method 3015.4	Meets Class 2 (2000 to 3999 Volts) Withstand up to 2200 V applied between electrical pins.
Electrostatic Discharge (ESD) to the Duplex SC Receptacle	Variation of IEC 801-2	Typically withstand at least 25 kV without damage when the Duplex SC Connector Receptacle is contacted by a Human Body Model probe.
Electromagnetic Interference (EMC)	FCC Class B CENELEC CEN55022 Class B (CISPR 22B) VCCI Class 2	Typically provide a 13 dB margin (with duplex SC package) or a 9 dB margin (with duplex ST package) to the noted standard limits when tested at a certified test range with the transceiver mounted to a circuit card without a chassis enclosure.
Immunity	Variation of IEC 801-3	Typically show no measurable effect from a 10 V/m field swept from 10 to 450 MHz applied to the transceiver when mounted to a circuit card without a chassis enclosure.