

## 155Mbps 1x9 SC 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-LX Version of IEEE 802.3u.
- Industry Standard 1x9 Footprint and Duplex SC Connector Interface.
- Single 5V (OPT-155B1xxx) or 3.3V (OPT-155B2xxx) Power Supply.
- PECL Differential Inputs and Outputs.
- PECL Receiver Signal Detect Indicator.
- RoHS Compliant per Directive 2002/95/EC.
- Wave Solder and Aqueous Wash Process Compatible.

### Description :

The OPT-155Bxxxx series are 1x9 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 OPT-155Bxxxx transceivers are supplied in industry standard 1x9 SIP package style with duplex SC connector.

The OPT-155Bxxxx also includes a Signal-Detect circuit that provides PECL logic output state.

The OPT-155Bxxxx transceivers are Class-1 eye safety products 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	
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		6	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						
OPT-155B1xxxx	V <sub>CC</sub>	4.75	5	5.25	V	
OPT-155B2xxxx		3.15	3.3	3.45		

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	
<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	
SD Output Voltage-High	V <sub>SDL-VCC</sub>	-1.045		-0.74	V	

### Optical Characteristics

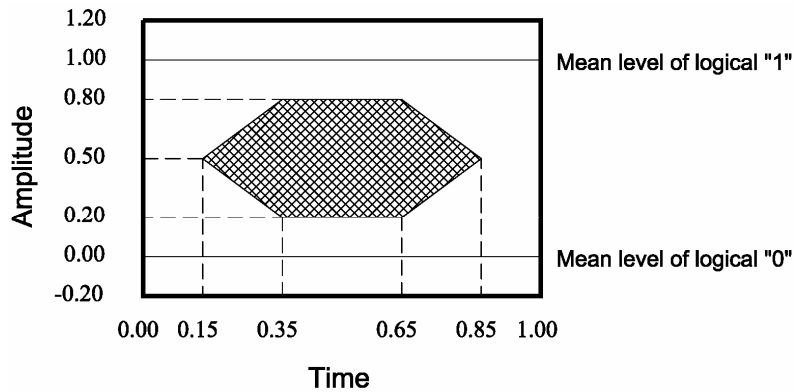
(Data Rate = 155.52Mbps, PRBS=2<sup>23</sup>-1, NRZ, 9/125um SMF)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
<b>Transmitter</b>						
Supply Current	I <sub>cc</sub>			165	mA	
Mean Launch Power						
OPT-155BxHxxx	P <sub>O</sub>	-20		-15	dBm	
OPT-155BxJxxx		-15		-8		
OPT-155BxLxxx		-8		-5		
OPT-155BxMxxx		-5		0		
Optical Extinction Ratio						
OPT-155BxHxxx	E.R.			8.2	dB	
OPT-155BxJxxx				8.2		
OPT-155BxLxxx				8.2		
OPT-155BxMxxx				10		
Center Wavelength	λ <sub>c</sub>	1270	1310	1360	nm	
Spectral Width (RMS)						
OPT-155BxHxxx	σ			7.7	nm	
OPT-155BxJxxx				7.7		
OPT-155BxLxxx				7.7		
OPT-155BxMxxx				3		
Output Eye Diagram	Compliant with ITU-T recommendation G.957					
<b>Receiver</b>						
Supply Current	I <sub>cc</sub>			145	mA	

Sensitivity OPT-155BxHxxx OPT-155BxJxxx OPT-155BxLxxx OPT-155BxMxxx	$P_{IN}$	-31 -31 -31 -34	dBm	1
Overload	$P_{ol}$	-8	dBm	
Signal Detect-Asserted OPT-155BxHxxx OPT-155BxJxxx OPT-155BxLxxx OPT-155BxMxxx	$P_A$	-31 -31 -31 -34	dBm	
Signal Detect-DeAsserted	$P_D$	-45	dBm	
Signal Detect-Hysteresis	$P_A-P_D$	0.5	dB	

Notes:

- The sensitivity is provided at a BER of  $1 \times 10^{-10}$  or better with an input signal consisting of 155Mb/s,  $2^{23}-1$  PRBS and ER=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	RD (+)	Receiver Data Out (LVPECL or PECL)
3	RD (-)	Receiver Data Out Bar (LVPECL or PECL)
4	SD	Receiver Signal Detect (LVPECL or PECL)
5	VccR	Receiver Power Supply
6	VccT	Transmitter Power Supply
7	TD (-)	Transmitter Data In Bar (LVPECL or PECL)
8	TD (+)	Transmitter Data In (LVPECL or PECL)
9	GND	Transmitter Signal Ground

**Pin Descriptions:**
**Pin 1 Receiver Signal Ground, GND**

Directly connect these pins to the ground plane.

**Pin 2 Receiver Data Out (LVPECL), RD (+)**

PECL logic family. Output external biased and internal dc coupled.

**Pin 3 Receiver Data Out Bar (LVPECL), RD (-)**

PECL logic family. Output external biased and internal dc coupled.

**Pin 4 Receiver Signal Detect (LVPECL), SD**

PECL logic family. Normal Operation: Logic "1" Output.

Fault Condition: Logic "0" Output.

**Pin 5 Receiver Power Supply, VccR**

Provide +3.3V dc power supply.

**Pin 6 Transmitter Power Supply, VccT**

Provide +3.3V dc power supply.

**Pin 7 Transmitter Data In Bar (LVPECL), TD (-)**

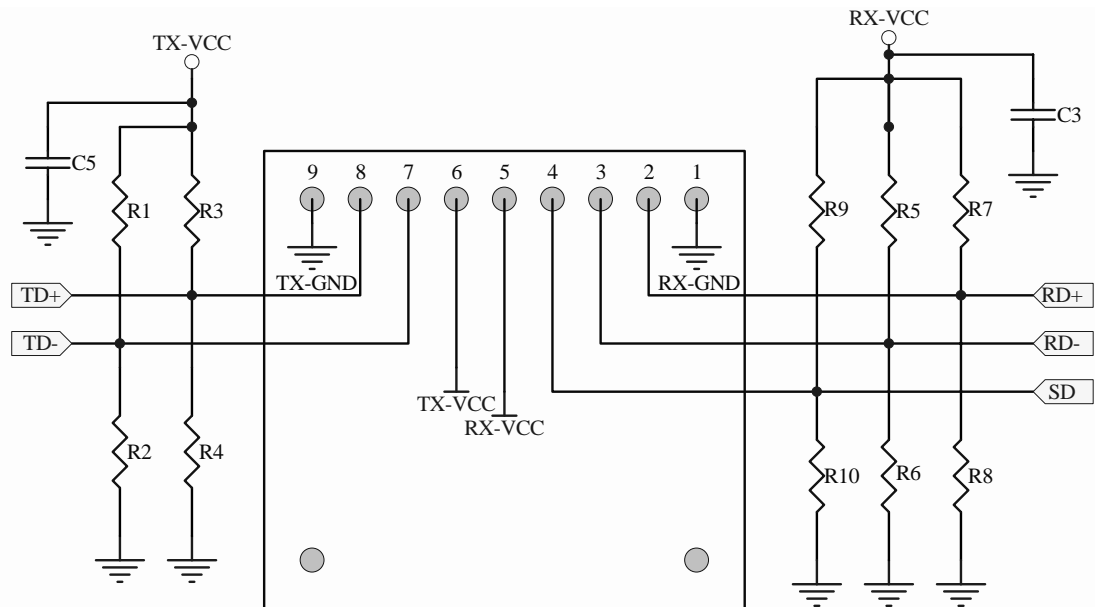
Pin 7 Transmitter Data Input (LVPECL), TD (-).

**Pin 8 Transmitter Data In (LVPECL), TD (+)**

Pin 8 Transmitter Data Input Bar (LVPECL), TD (+).

**Pin 9 Transmitter Signal Ground, GND**

Directly connect these pins to the ground plane.

**Recommend Circuit Schematic for Internal DC Coupled Transceivers**

**Transceiver Top View**

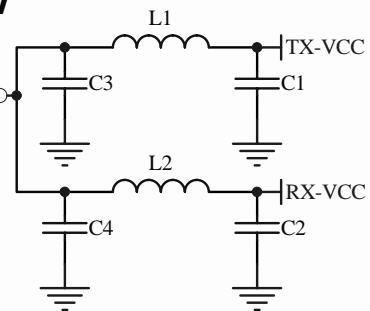
$R1=R3=R5=R7=R9=130\ \Omega$  (3.3V),  $82\ \Omega$  (5V)

$R2=R4=R6=R8=R10=82\ \Omega$  (3.3V),  $130\ \Omega$  (5V)

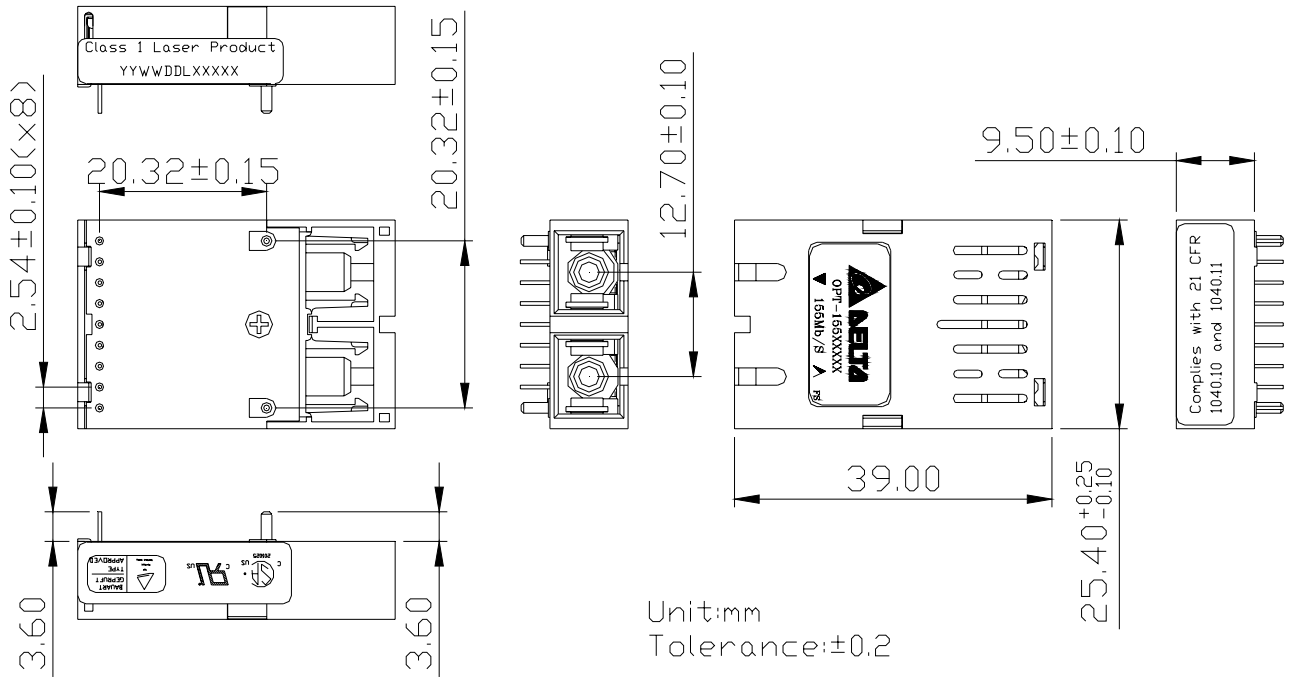
$C1=C2=C3=C5=C6=0.1\ \mu\text{F}$

$C4=10\ \mu\text{F}$

$L1=L2=1\ \mu\text{H}$  or ferrite inductor



Package Outline Drawing



## Regulatory Compliance

Feature	Reference	Performance
Electromagnetic Interference (EMI)	FCC Class B EN 55022 Class B (CISPR 22A)	(1) Satisfied with electrical characteristics of product spec. (2) No physical damage
Radio Frequency Electromagnetic Field	EN 61000-4-3 IEC 1000-4-3	
Electrostatic Discharge to the Duplex LC Receptacle	EN 61000-4-2 IEC 1000-4-2 IEC 801.2	
Electrostatic Discharge to the Electrical Pins	MIL-STD-883E Method 3015.7	
Eye Safety	US FDA CDRH AEL Class 1 EN 60950: 2000 EN 60825-1: 1994+A11+A2 EN 60825-2: 2000	CDRH File # 0321539-00 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

OPT- 155X<sub>1</sub>X<sub>2</sub>X<sub>3</sub>X<sub>4</sub>X<sub>5</sub>X<sub>6</sub>X<sub>7</sub>

**X<sub>1</sub>: Fiber**

**B:** Single-mode 1310nm

**X<sub>5</sub>: RoHS Compliant**

**Blank:** Non-RoHS Compliant  
**R:** RoHS Compliant

**X<sub>2</sub>: Power Supply Voltage and SD Level**

**1:** 5.0V, PECL SD Level  
**2:** 3.3V, PECL SD Level

**X<sub>6</sub>: Performance**

**Blank:** Old Design  
**A:** New Design

**X<sub>3</sub>: Distance**

**H:** 2km  
**J:** 15km  
**L:** 30km  
**M:** 40km

**X<sub>7</sub>: Temperature**

**Blank:** 0 to +70 degree C  
**H:** -10 to + 85 degree C  
**T:** -40 to + 85 degree C

**X<sub>4</sub>: Data Coupling**

**1:** 1x9SC DC/DC