

## 155Mbps 1x9 SC/ST Duplex Optical Transceiver Module for Fast Ethernet, ATM, SONET/OC-3, SDH/STM-1



### Features:

- Full Compliance with the Optical Performance Requirement of ATM 100Mbps and 100 Base-FX Version of IEEE 802.3u.
- Industry Standard 1x9 Footprint and Duplex SC or ST Connector Interface.
- Single 5V OPT-155A1Hxx or 3.3V OPT-155A2Hxx Power Supply.
- PECL Differential Inputs and Outputs.
- PECL Receiver Signal Detect Indicator.
- Wave Solder and Aqueous Wash Process Compatible.
- RoHS Compliant per Directive 2002/95/EC.

### Description

The OPT-155AxHxx 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-155AxHxx transceivers are supplied in industry standard 1x9 SIP package style with either duplex SC or duplex ST connector. Moreover the OPT-155AxHxx series also include a Signal-Detect circuit that provides PECL logic output state.

The OPT-155AxHxx series meet Class-1 eye safety standard and effective distance up to 2Km.

The transmitter sections utilize 1310nm Surface Emitting InGaAsP LEDs. These LEDs are packaged in the optical subassembly portion of the transmitter section. A custom silicon IC that converts differential PECL logical signals into an analog LED driving current drives it.

The receiver sections utilize InGaAs PIN photodiodes coupled into a custom silicon

trans-impedance preamplifier IC. These are packaged in the optical subassembly portion of receiver.

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

### Application:

- Multimode Fiber Backbone Links.
- Fast Ethernet and ATM Compatible.
- Multimode Fiber Media Convert

**Absolute Maximum Ratings**

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Storage Temperature	$T_s$	-40		85	°C	
Lead Soldering Temperature	$T_{sold}$			260	°C	
Lead Soldering Time	$t_{sold}$			10	Second	
Supply Voltage	Vcc	0		6	V	

**Recommended Operating Conditions**

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Data Rate		100	155.52	200	Mbps	
Ambient Operating Temperature	$T_A$	0		70	°C	
Supply Voltage						
OPT-155A1Hxx	Vcc	4.75	5	5.25	V	
OPT-155A2Hxx		3.15	3.3	3.45		

**Electrical Characteristics**

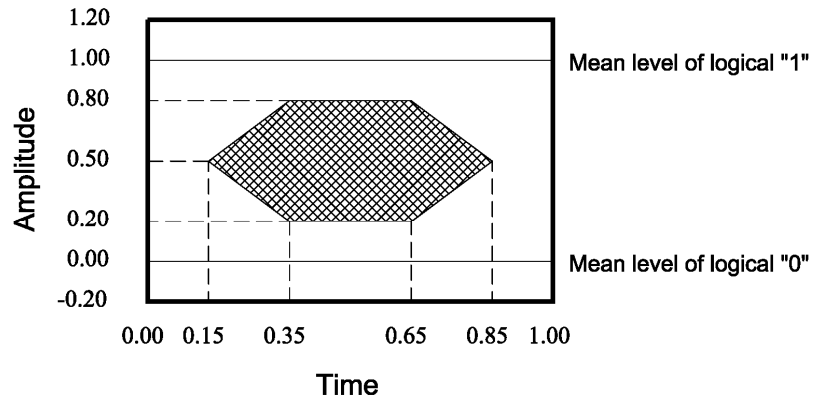
Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
<b>Transmitter</b>						
Transmitter Data Input Voltage-Low	$V_{IL-VCC}$	-1.81		-1.48	V	
Transmitter Data Input Voltage-High	$V_{IH-VCC}$	-1.16		-0.88	V	
<b>Receiver</b>						
Data Output Voltage-Low	$V_{OL-VCC}$	-1.95		-1.62	V	
Data Output Voltage-High	$V_{OH-VCC}$	-1.045		-0.74	V	
SD Output Voltage-Low	$V_{SDL-VCC}$	-1.95		-1.62	V	
SD Output Voltage-High	$V_{SDH-VCC}$	-1.045		-0.74	V	

**Optical Characteristics**

 (Data Rate = 155.52Mbps, PRBS=2<sup>23</sup>-1, NRZ, 62.5/125um MMF)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
<b>Transmitter</b>						
Supply Current	Icc			185	mA	OPT-155A1 Series
				165	mA	OPT-155A2 Series
Mean Launch Power 62.5/125um, NA=0.275 Fiber 50/125um, NA=0.20 Fiber	Po	-20 -22.5		-14 -14	dBm	
Optical Extinction Ratio	E.R	9			dB	
Center Wavelength	$\lambda_c$		1310		nm	
Spectral Width (RMS)	$\sigma$			200	nm	
Optical Risetime /Falltime	$t_r/r_f$			3.0	ns	10%~90%
Output Eye Diagram	Compliant with ITU-T recommendation G.957					
<b>Receiver</b>						
Supply Current	Icc			145	mA	OPT-155A1 Series
				120	mA	OPT-155A2 Series
Sensitivity	$P_{IN}$			-31	dBm	
Input Optical Wavelength	$\lambda$	1100		1600	nm	
Signal Detect-Asserted	$P_A$			-31	dBm	
Signal Detect-DeAsserted	$P_D$	-45			dBm	
Signal Detect-Hysteresis	$P_A-P_D$	0.5			dB	
Overload	$P_{SAT}$	-14			dBm	

Note: The Sensitivity should be tested at BER of  $1 \times 10^{-10}$  or better with an input signal consisting of 155Mbps, NRZ, PRBS= $2^{23}-1$  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	RD(+)	Receiver Data Out Non-inverted (PECL)
3	RD(-)	Receiver Data Out Inverted (PECL)
4	SD	Receiver Signal Detect (PECL)
5	VccR	Receiver Power Supply
6	VccT	Transmitter Power Supply
7	TD(-)	Transmitter Data In Inverted (PECL)
8	TD(+)	Transmitter Data In Non-inverted (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 Non-inverted (LVPECL), RD(+)**

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

**Pin 3 Receiver Data Out Inverted (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/5V DC power supply.

**Pin 6 Transmitter Power Supply, VccT**

Provide 3.3V/5V DC Power Supply.

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

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

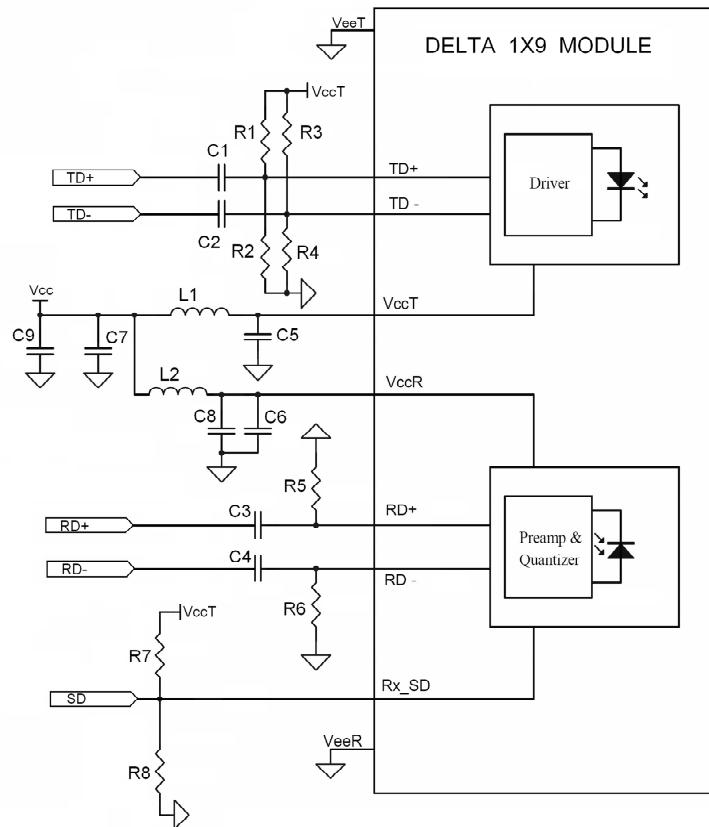
**Pin 8 Transmitter Data In Non-inverted (LVPECL), TD(+)**

Pin 8 Transmitter Data Input Non-inverted (LVPECL), TD(+).

**Pin 9 Transmitter Signal Ground, GND**

Directly connect these pins to the ground plane.

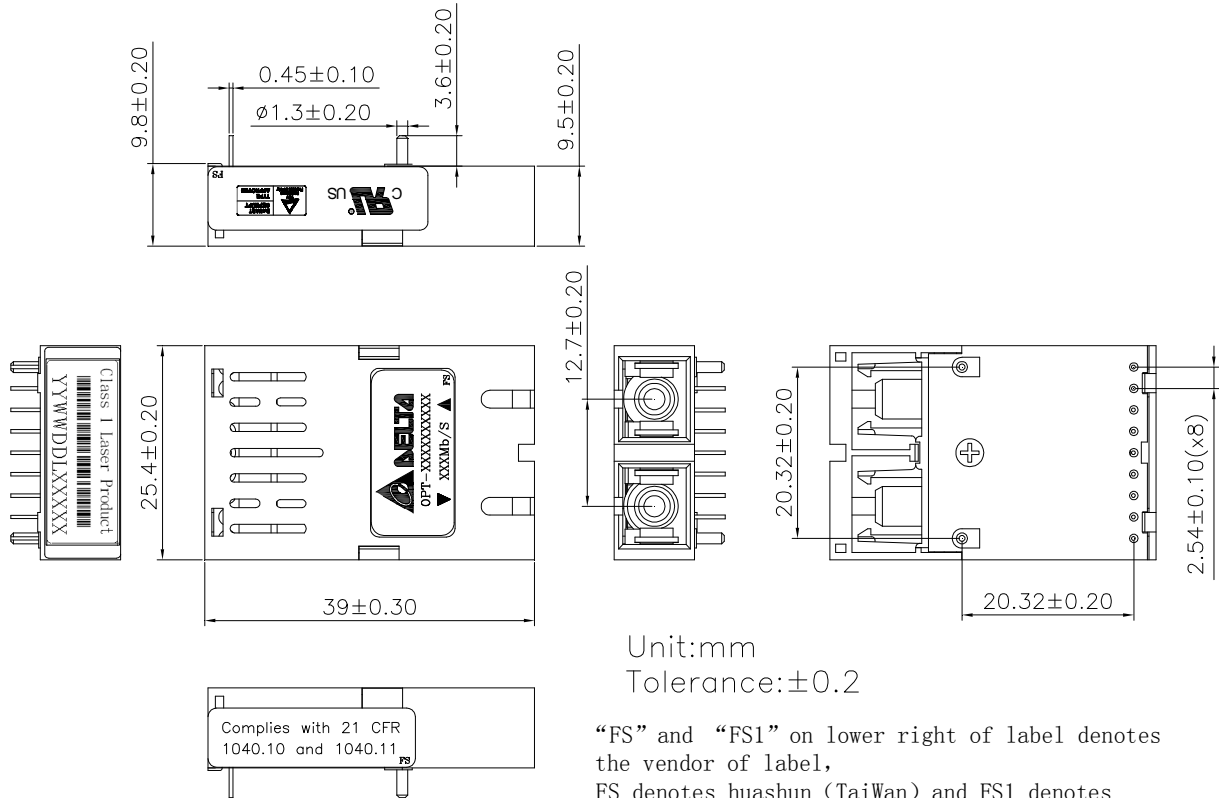
### Recommend Circuit Schematic for Internal DC Coupled Transceivers



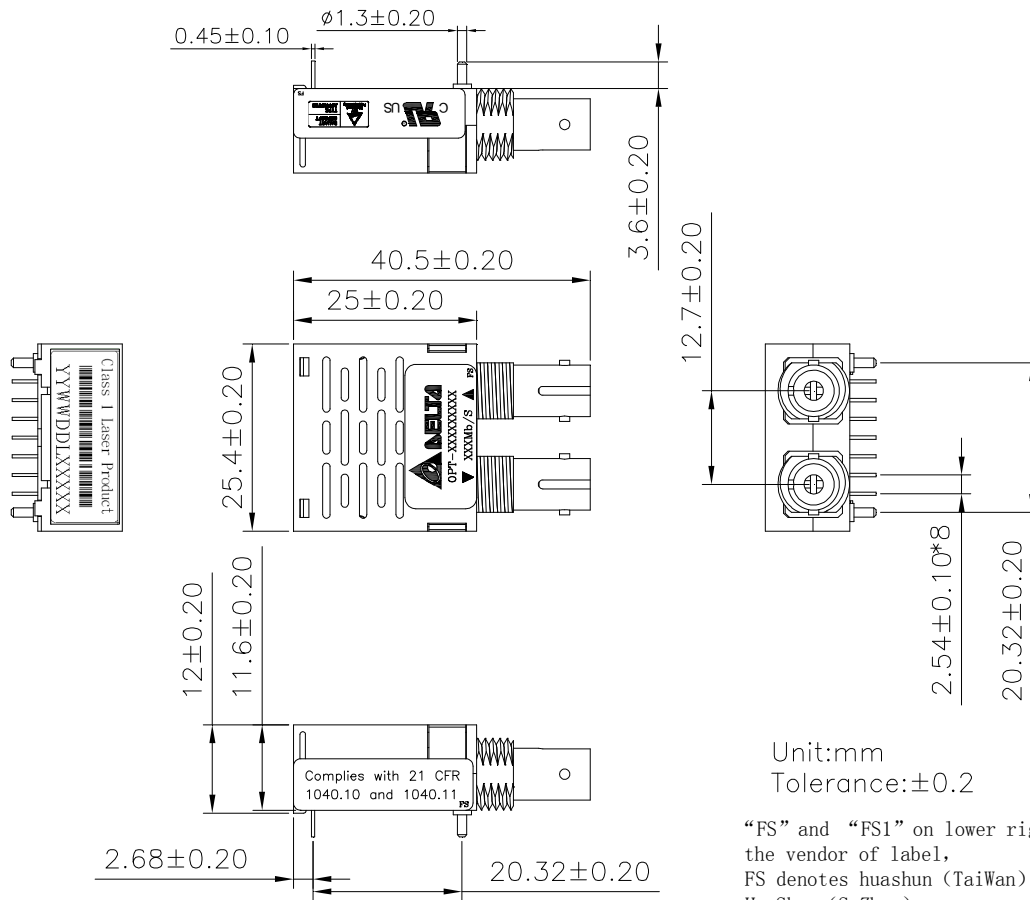
- R1=R3=82 ohm (3.3V), 68 ohm (5V)
- R2=R4=130 ohm (3.3V), 191 ohm (5V)
- R5=R6=150 ohm (3.3V), 270 ohm (5V)
- R7=130 ohm (3.3V PECL), 82 ohm (5V), NC (TTL)
- R8=82 ohm (3.3V PECL), 130 ohm (5V), NC (TTL)
- C1=C2=C3=C4=C5=C6=C7=100 nF
- C8=C9=10uF
- L1=L2=1uH

Package Outline

(1) OPT-155AxH1x Series with SC-type Connector



(2) OPT-155AxH4x Series with ST-type Connector



**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 60950-1 : 2001+ALL EN 60825-2 : 2007 EN60825-2 : 2004+A1	
Component Recognition	Underwriters Laboratories and Canadian Standards Association Joint Component Recognition for Information Technology Equipment Including Electrical Business Equipment	

**Order Information:**

**OPT – 155AX<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>1</sub> Power Supply Voltage and SD Level**  
 1: 5.0V, PECL SD Level  
 2: 3.3V, PECL SD Level

**X<sub>4</sub> RoHS**  
**Blank:** Non-RoHS Compliant  
**R:** RoHS Compliant

**X<sub>2</sub> Effective Distance Grade**  
**H:** 2km, Multi-mode

**X<sub>5</sub> Performance**  
**Blank:** Old Design  
**A:** New Design

**X<sub>3</sub> Package type & coupling type**  
 1: 1x9 SC DC/DC  
 4: 1x9 ST DC/DC

**X<sub>6</sub> Temperature**  
**Blank:** 0 to + 70 degree C  
**H:** -10 to + 85 degree C  
**T:** -40 to + 85 degree C



**Appendix A. Document Revision**

Version No.	Date	Description
0E	2006-09	Release
0F	2008-01	Update Optical Receiver Overload, Correct Schematic, Pin Definition, Package Outline, Order Information
0G	2008-12	Update Output Package Instruction
S0	2010-03	1. Add label information on PD drawing 2. Updated the Regulatory Compliance information