

EOL9-1303-20 & EOL9-1303-40 & EOL9-1303-60

EOL9-1303-80 Series

**1310nm Single-Mode 155Mbps
Duplex 1 x 9 Transceiver
RoHS6 Compliant**

Features

- ◆ Duplex SC/FC/ST Single-Mode Transceiver
- ◆ Industry Standard 1 x 9 Footprint
- ◆ 1310nm FP-LD or DFB-LD Transmitter
- ◆ 3.3V or 5V single power supply
- ◆ PECL signal input and output, supporting 125MHz signaling ^{*note1}
- ◆ Signal detect indicator (PECL/TTL version) ^{*note1}
- ◆ Wave Solderable and Aqueous Washable with process plug inserted
- ◆ Class 1 FDA and IEC60825-1 laser safety compliant
- ◆ 20/40/60/80km with 9/125 um SMF
- ◆ Operating Case Temperature
 - Standard: 0°C~+70°C
 - Industrial:-40°C~+85°C



Applications

- ◆ ATM 155 Mbps Links
- ◆ SONET/SDH Equipment Interconnect
- ◆ Fast Ethernet
- ◆ Switch to Switch Interface
- ◆ Digital video transmission system

Ordering information

Part No.	Input	Output	SD	Distance	Voltage	Interface	Temp.
EOL9-1303-20-X	AC	DC	PECL	20km	3.3/5V	SC	Standard
EOL9-1303-20-IX	AC	DC	PECL	20km	3.3/5V	SC	Industrial
EOL9-1303-40-X	AC	DC	PECL	40km	3.3/5V	SC	Standard
EOL9-1303-40-IX	AC	DC	PECL	40km	3.3/5V	SC	Industrial
EOL9-1303-60-X	AC	DC	PECL	60km	3.3/5V	SC	Standard
EOL9-1303-60-IX	AC	DC	PECL	60km	3.3/5V	SC	Industrial
EOL9-1303-80-X	AC	DC	PECL	80km	3.3/5V	SC	Standard

EOL9-1303-80-IX	AC	DC	PECL	80km	3.3/5V	SC	Industrial
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*Other ordering information in detail refers to the denominate rule on next page.

Note1: 5V for PECL or TTL, 3.3V for LVPECL or LVTTTL

Nomenclature

Symmetrical 1X9 Duplex

EOL□-□□□-□-□-□□□□□□□□

A-BCD-E-F-GHIJKLMN

No.	Description	Option
A	Package	9=1x9
B	Laser Type	Blank=Duplex BI=BI-Direction
C	Wavelength	85 =850nm; 13=1310; 15=1550; 16=CWDM/DWDM; 13=TX:1310/RX:1550(For BIDI Except the same wavelength); 15=TX:1550/RX:1310(For BIDI Except the same wavelength) 13=TX:1310/RX:1310(For the same wavelength of BIDI module); 15=TX:1550/RX:1550(For the same wavelength of BIDI module);
D	Data Rate	00=0-1M; 01=1-100M; 03=155M; 04=300M; 06=622M; 12=1.25G; 24=2.5G; 30=2.97G; 48=4.25G (Asymmetrical: TX: 0=0-1M; 1=1-100M; 3=155M; 4=300M; 6=622M; 2=1.25G; 5=2.5G; 7=2.97G; 8=4.25G RX: 0=0-1M; 1=1-100M; 3=155M; 4=300M; 6=622M; 2=1.25G; 5=2.5G; 7=2.97G; 8=4.25G)
E	Module Type	Blank=Transceiver, T=Single transmitter, DT=Duplex transmitter, R=Single receiver, DR=Duplex receiver, A= Asymmetrical(for transceiver); BT= Asymmetrical(for Dual transmitter); BR= Asymmetrical(for Dual Receiver); S=Same Wavelength(only for BIDI module)
F	Distance ^{*note1}	Blank=CWDM/DWDM Series ; 850nm MMF ≤2km: 02; 1310nm/1550nm MMF≤1km: M; 1310nm/1550nm MMF≤2km: 2M; 1310nm/1550nm SMF≤2km: 02; SMF: 10*X km (X=1,2,3, ...)A=100km, B=120km, C=160km, D=200km
G	Power budget ^{*note1}	XX, X=1, 2, 3 ...9 and 0, for CWDM/DWDM only.
H	CWDM Tx & Rx Wavelength	CWDM: Refer the following table1, A~R; DWDM (100GHZ): Refer the following table2, 15~61. DWDM (50GHZ): Refer the following table3 C-Band,
I	DDM	Blank=Non DDM D=DDM

J	Temp.	Blank=0~70 °C; I=-40~+85 °C(include the extended temperature)
K	Others	Blank=SC; T=ST Plastics ;M = ST Metal; F=FC; N=FC Plastics; P=Pigtail/SC/PC; PF=Pigtail/FC/PC; PT=Pigtail/ST/PC
L	Input/Output & SD ^{note2}	Blank: AC/AC SD-TTL Q: AC/AC SD-PECL R: DC/DC SD-TTL U: DC/DC SD-PECL W: AC/DC SD-TTL X: AC/DC SD-PECL Y: DC/AC SD-TTL Z: DC/AC SD-PECL 0: AC/AC LOS-TTL 1: AC/AC LOS-PECL 2: DC/DC LOS-TTL 3: DC/DC LOS-PECL 4: AC/DC LOS-TTL 5: AC/DC LOS-PECL 8: DC/AC LOS-TTL 9: DC/AC LOS-PECL J: DC for single or duplex TX or RX k: AC for single or duplex TX or RX
M	Voltage	Blank=3.3/5V; V=3.3V; H=5V
N	Case type	Blank= Duplex M=BIDI Middle Export S= BIDI Side Export

Regulatory Compliance

Feature	Standard	Performance
Electrostatic Discharge (ESD) to the Electrical Pins	MIL-STD-883G Method 3015.7	Class 1C (>1000 V)
Electrostatic Discharge to the enclosure	EN 55024:1998+A1+A2 IEC-61000-4-2 GR-1089-CORE	Compliant with standards
Electromagnetic Interference (EMI)	FCC Part 15 Class B EN55022:2006 CISPR 22B :2006 VCCI Class B	Compliant with standards Noise frequency range: 30 MHz to 6 GHz. Good system EMI design practice required to achieve Class B margins. System margins are dependent on customer host board and chassis design.
Immunity	EN 55024:1998+A1+A2	Compliant with standards.

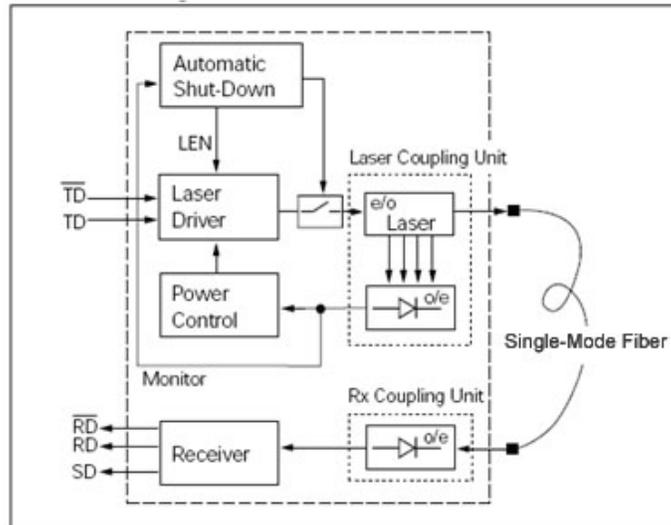
	IEC 61000-4-3	1kHz sine-wave, 80% AM, from 80 MHz to 1 GHz. No effect on transmitter/receiver performance is detectable between these limits.
Laser Eye Safety	FDA 21CFR 1040.10 and 1040.11 EN (IEC) 60825-1:2007 EN (IEC) 60825-2:2004+A1	CDRH compliant and Class I laser product. TüV Certificate No. 50135086
Component Recognition	UL and CUL EN60950-1:2006	UL file E317337 TüV Certificate No. 50135086 (CB scheme)
RoHS6	2002/95/EC 4.1&4.2 2005/747/EC 5&7&13	Compliant with standards ^{*note2}

Note2: For update of the equipments and strict control of raw materials, EOPTOLINK has the ability to supply the customized products since Jan 1st, 2007, which meet the requirements of RoHS6 (Restrictions on use of certain Hazardous Substances) of European Union.

In light of item 5 in RoHS exemption list of RoHS Directive 2002/95/EC, Item 5: Lead in glass of cathode ray tubes, electronic components and fluorescent tubes.

In light of item 13 in RoHS exemption list of RoHS Directive 2005/747/EC, Item 13: Lead and cadmium in optical and filter glass. The three exemptions are being concerned for Eoptolink's transceivers, because Eoptolink's transceivers use glass, which may contain Pb, for optical components such as lenses, isolators, and other electronic components.

Functional Diagram



The Signal Detect (SD, active high), Normal optical input of receiver represents to a logic "1" level, which means asserted.

Product Description

The EOL9-1303-X Series Single-mode transceivers are low power, high performance modules for

duplex optical data communications such as SONET OC-3/SDH STM-1 and Fast Ethernet.

The transmitter section uses a FP or DFB laser and is a class1 laser compliant according to International Safety Standard IEC-60825. The receiver section uses an integrated InGaAs detector preamplifier (IDP) mounted in an optical header and a limiting post-amplifier IC.

A PECL or TTL logic interface simplifies interface to the external circuitry.

Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Unit	
Storage Temperature	T_s	-40	+85	°C	
Supply Voltage	V_{CC}	5V	-0.5	7.0	V
		3.3V	-0.5	5.5	
Operating Relative Humidity	-		95	%	
Soldering Conditions Temp/Time			260/10	°C/s	

*Exceeding any one of these values may destroy the device immediately.

Recommended Operating Conditions

Parameter	Symbol	Min.	Typical	Max.	Unit
Power Supply Voltage	V_{CC}	4.75	5	5.25	V
		3.15	3.3	3.45	
Operating Case Temperature	T_C	EOLS-1303-X	0	+70	°C
		EOLS-1303-X-I	-40	+85	
Power Supply Current ^{*(note3)}	I_{CC}			300	mA
Data Rate			155		Mbps

Note3: Maximum current is specified at V_{CC} equaling to Maximum @ maximum temperature.

Optical and Electrical Characteristic

(EOL9-1303-20 Series, FP and PIN)

Parameter	Symbol	Min.	Typical	Max.	Unit
Data Rate		100	155		Mbps
Transmitter					
Centre Wavelength	λ_C	1260	1310	1360	nm
Spectral Width	$\Delta\lambda$			4	nm
Average Output Power ^{*(Note4)}	P_{out}	-15		-8	dBm
Extinction Ratio	ER	9			dB
Rise/Fall Time (20%---80%)	tr/tf			2	ns
Relative Intensity Noise	RIN			-117	dB/Hz
Total Jitter	TJ			1	ns
Data Input Swing Differential	V_{in}	400		2000	mV
Input Differential Impedance	Z_{in}	90	100	110	Ω

Input High Voltage	V_H	-1165		-880	mV
Input Low Voltage	V_L	-1810		-1475	mV
Eye Diagram	ITU-T G.957 Compliant ^{*(Note6)}				
Data Input	PECL ^{*(note1)}				
Receiver					
Input center wavelength	λ_C	1260		1620	nm
Receiver Sensitivity ^{*(Note5)}	P_{min}			-34	dBm
Receiver Overload	P_{max}	-3			dBm
SD Assert	SDA			-35	dBm
SD De-Assert	SDD	-45			dBm
SD Hysteresis ^{*(Note7)}		0.5			dB
Output High Voltage	V_H	-1165		-880	mV
Output Low Voltage	V_L	-1810		-1475	mV
SD Voltage(TTL-H) ^{*(note1)}	V_H	2			V
SD Voltage (TTL-L) ^{*(note1)}	V_L			0.8	V
SD Voltage(PECL-H) ^{*(note1)}	V_H	-1.1		-0.74	V
SD Voltage (PECL-L) ^{*(note1)}	V_L	-2.0		-1.58	V
Data Output	PECL ^{*(note1)}				

(EOL9-1303-40 Series, FP and PIN)

Parameter	Symbol	Min.	Typical	Max.	Unit
Data Rate		100	155		Mbps
Transmitter					
Centre Wavelength	λ_C	1260	1310	1360	nm
Spectral Width	$\Delta\lambda$			4	nm
Average Output Power ^{*(Note4)}	P_{out}	-5		0	dBm
Extinction Ratio	ER	9			dB
Rise/Fall Time (20%---80%)	tr/tf			2	ns
Relative Intensity Noise	RIN			-117	dB/Hz
Total Jitter	TJ			1	ns
Data Input Swing Differential	V_{in}	400		2000	mV
Input Differential Impedance	Z_{in}	90	100	110	Ω
Input High Voltage	V_H	-1165		-880	mV
Input Low Voltage	V_L	-1810		-1475	mV
Eye Diagram	ITU-T G.957 Compliant ^{*(Note6)}				
Data Input	PECL ^{*(note1)}				
Receiver					
Input center wavelength	λ_C	1260		1620	nm
Receiver Sensitivity ^{*(Note5)}	P_{min}			-34	dBm
Receiver Overload	P_{max}	-3			dBm
SD Assert	SDA			-35	dBm
SD De-Assert	SDD	-45			dBm
SD Hysteresis ^{*(Note7)}		0.5			dB

Output High Voltage	V _H	-1165		-880	mV
Output Low Voltage	V _L	-1810		-1475	mV
SD Voltage(TTL-H) ^{*(note1)}	V _H	2			V
SD Voltage (TTL-L) ^{*(note1)}	V _L			0.8	V
SD Voltage(PECL-H) ^{*(note1)}	V _H	-1.1		-0.74	V
SD Voltage (PECL-L) ^{*(note1)}	V _L	-2.0		-1.58	V
Data Output	PECL ^{*(note1)}				

(EOL9-1303-60 Series, FP and PIN)

Parameter	Symbol	Min.	Typical	Max.	Unit
Data Rate		100	155		Mbps
Transmitter					
Centre Wavelength	λ _C	1260	1310	1360	nm
Spectral Width	Δλ			4	nm
Average Output Power ^{*(Note4)}	P _{out}	-5		0	dBm
Extinction Ratio	ER	9			dB
Rise/Fall Time (20%---80%)	tr/tf			2	ns
Relative Intensity Noise	RIN			-117	dB/Hz
Total Jitter	TJ			1	ns
Data Input Swing Differential	V _{in}	400		2000	mV
Input Differential Impedance	Z _{in}	90	100	110	Ω
Input High Voltage	V _H	-1165		-880	mV
Input Low Voltage	V _L	-1810		-1475	mV
Eye Diagram	ITU-T G.957 Compliant ^{*(Note6)}				
Data Input	PECL ^{*(note1)}				
Receiver					
Input center wavelength	λ _C	1260		1620	nm
Receiver Sensitivity ^{*(Note5)}	P _{min}			-34	dBm
Receiver Overload	P _{max}	-3			dBm
SD Assert	SDA			-37	dBm
SD De-Assert	SDD	-45			dBm
SD Hysteresis ^{*(Note7)}		0.5			dB
Output High Voltage	V _H	-1165		-880	mV
Output Low Voltage	V _L	-1810		-1475	mV
SD Voltage(TTL-H) ^{*(note1)}	V _H	2			V
SD Voltage (TTL-L) ^{*(note1)}	V _L			0.8	V
SD Voltage(PECL-H) ^{*(note1)}	V _H	-1.1		-0.74	V
SD Voltage (PECL-L) ^{*(note1)}	V _L	-2.0		-1.58	V
Data Output	PECL ^{*(note1)}				

(EOL9-1303-80 Series, DFB and PIN)

Parameter	Symbol	Min.	Typical	Max.	Unit
Data Rate		100	155		Mbps
Transmitter					

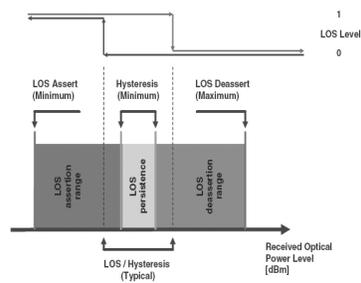
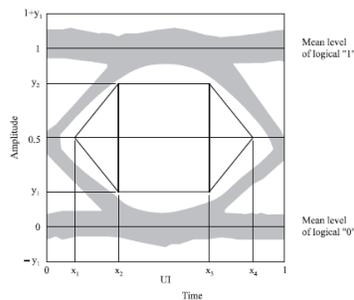
Centre Wavelength	λ_C	1260	1310	1360	nm
Spectral Width	$\Delta\lambda$			1	nm
Average Output Power ^{*(Note4)}	P_{out}	0		5	dBm
Extinction Ratio	ER	9			dB
Rise/Fall Time (20%---80%)	tr/tf			2	ns
Relative Intensity Noise	RIN			-117	dB/Hz
Total Jitter	TJ			1	ns
Data Input Swing Differential	V_{in}	400		2000	mV
Input Differential Impedance	Z_{in}	90	100	110	Ω
Input High Voltage	V_H	-1165		-880	mV
Input Low Voltage	V_L	-1810		-1475	mV
Eye Diagram	ITU-T G.957 Compliant ^{*(Note6)}				
Data Input	PECL ^{*(note1)}				
Receiver					
Input center wavelength	λ_C	1260		1620	nm
Receiver Sensitivity ^{*(Note5)}	P_{min}			-34	dBm
Receiver Overload	P_{max}	-10			dBm
SD Assert	SDA			-35	dBm
SD De-Assert	SDD	-45			dBm
SD Hysteresis ^{*(Note7)}		0.5			dB
SD Voltage(TTL-H) ^{*(note1)}	V_H	2			V
SD Voltage (TTL-L) ^{*(note1)}	V_L			0.8	V
Output High Voltage	V_H	-1165		-880	mV
Output Low Voltage	V_L	-1810		-1475	mV
SD Voltage(PECL-H) ^{*(note1)}	V_H	-1.1		-0.74	V
SD Voltage (PECL-L) ^{*(note1)}	V_L	-2.0		-1.58	V
Data Output	PECL ^{*(note1)}				

Note4: The optical power is launched into 9/125um SMF.

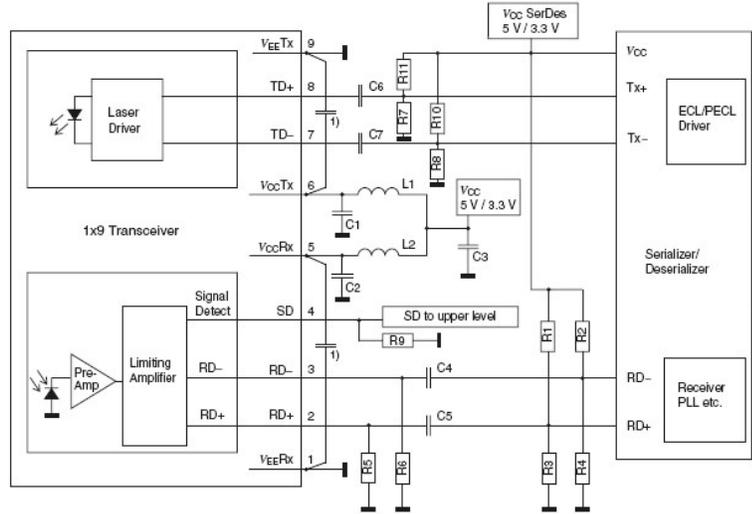
Note5: Minimum average optical power measured at BER less than 1E-12, with a 2²³-1 PRBS and ER=9 dB.

Note6: Eye pattern mask

Note7: LOS Hysteresis(SD signal coincides with the LOS signal inversion)

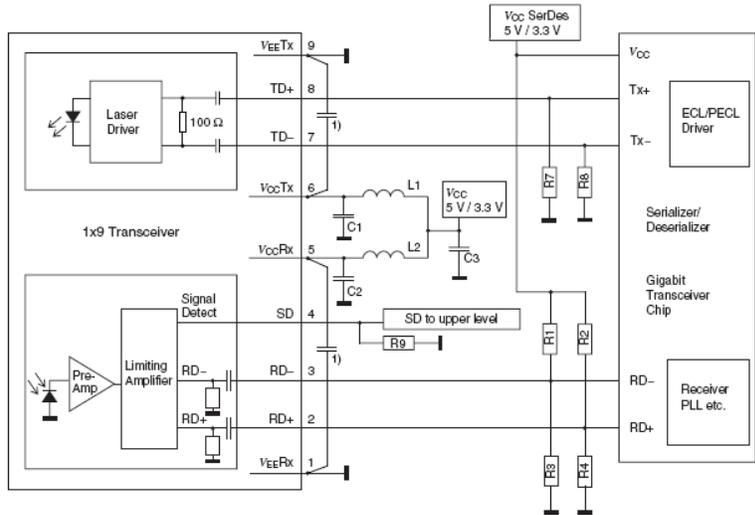


Recommended Circuit



- C1/2/3 = 4.7 μ F
- C4/5/6/7 = 100 nF
- L1/2 = 1 μ H
- R5/6 = 270 Ω (5 V)
- = 150 Ω (3.3 V)
- R7/8 = 127 Ω (5 V)
- = 82 Ω (3.3 V)
- (depends on SerDes chip used)
- R9 = 510 Ω (5 V)
- = 270 Ω (3.3 V)
- R10/11 = 82 Ω (5 V)
- = 127 Ω (3.3 V)
- (depends on SerDes chip used)
- Place R1/2/3/4 close to SerDes chip, depends on SerDes chip used.
- Place R5/6/7/8/10/11 close to 1x9 transceiver.

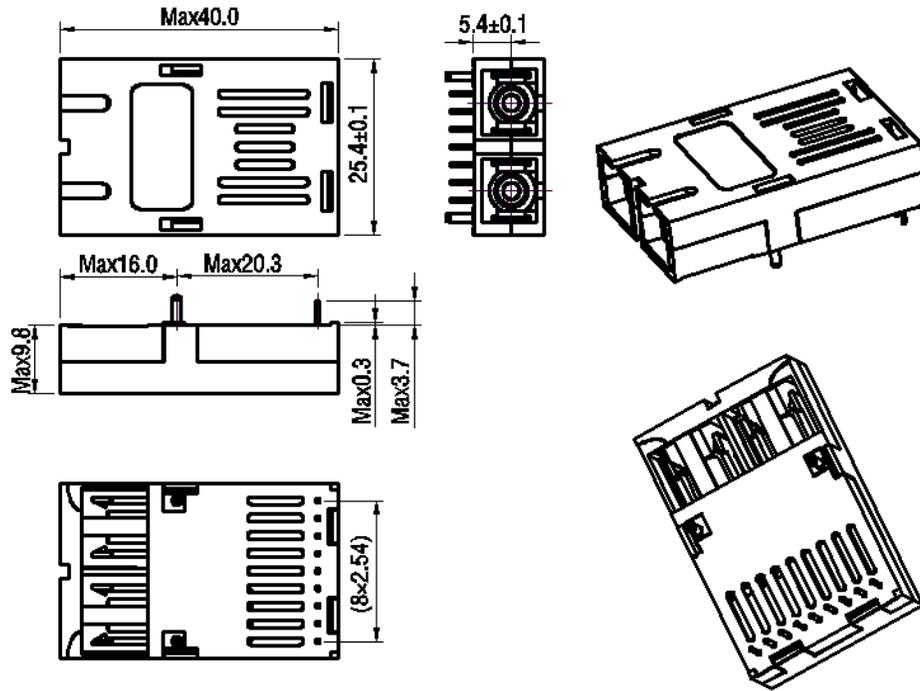
DC Coupling inside



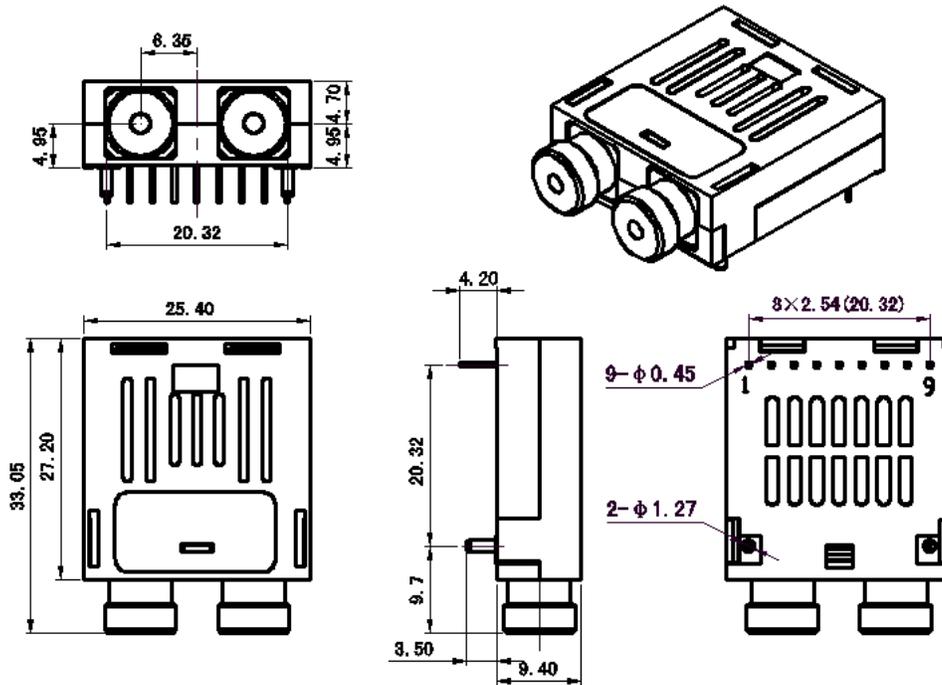
- C1/2/3 = 4.7 μ F
- L1/2 = 1 μ H
- R1/2/3/4 = Depends on SerDes chip used
- R7/8 = Biasing (depends on SerDes chip)
- R9 = open (5 V/3.3 V TTL)
- = 510 Ω (5 V PECL)
- = 270 Ω (3.3 V PECL)
- Place R1/2/3/4/7/8 close to SerDes chip.
- Place R5/6 close to 1x9 transceiver.

AC Coupling inside

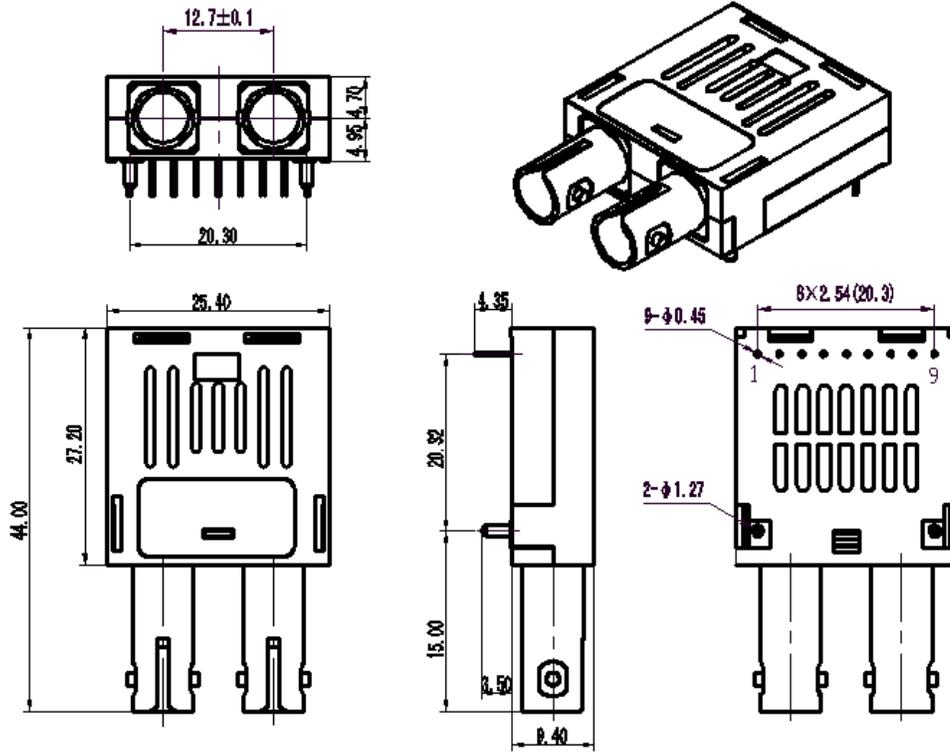
Package outline (Unit: mm)



SC receptacle

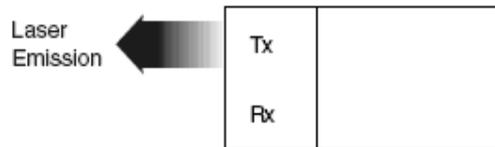


FC receptacle



ST receptacle

Laser Emission



Obtaining Document

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Revision History

Revision	Initiated	Reviewed	Approved	Revision History	Release Date
V3.a	Cathy	Kelly		Integrate 3 kinds of products & Released.	Feb 22, 2010
V3.b	Cathy			Update the nomenclature.	September 27, 2010
V3.a	Hunter			New released version.	2011-8-11
V3.b	David	Kelly		Correct 80km laser type & Sen. & Overload.	Dec 8, 2011
V3.c	Angela	Kelly		Update signal data rate	Nov 13,2012

Notice:

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