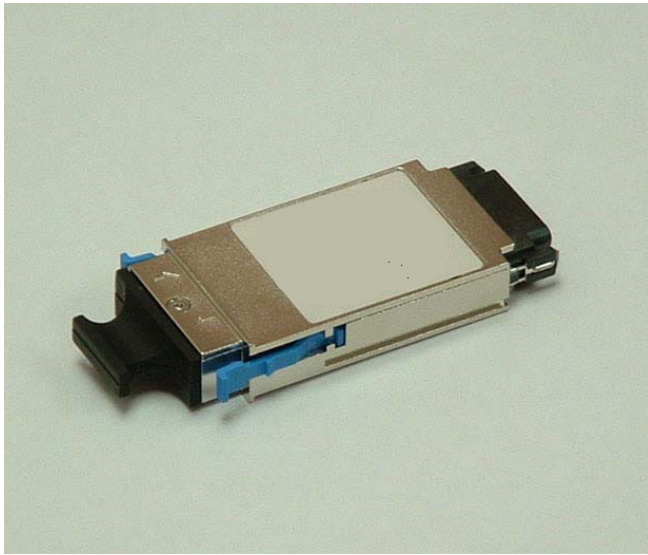


# CWDM 1550nm Single-mode Transceiver

## 23dB Margin Gigabit Interface Converters (GBIC)

### 3.3V/5V 1.25Gbps Gigabit Ethernet



#### Features

- Compliant with Gigabit Interface Converter Specification
- 8 channels can be selected from 1470 nm to 1610 nm in wavelength
- SCA-2 Host connector
- Duplex SC connector
- Differential PECL inputs and outputs
- Dual power supply 3.3V/5V
- TTL signal detect indicator
- Hot Pluggable
- Class 1 laser product complies with EN 60825-1

#### Application

- Coarse WDM application
- Distributed multi-processing
- Switch to switch interface
- High speed I/O for file server
- Bus extension application
- Channel extender, data storage

#### Ordering Information

<i>PART NUMBER</i>	<i>WAVELENGTH</i>	<i>INPUT/OUTPUT</i>	<i>SIGNAL DETECT</i>	<i>VOLTAGE</i>	<i>TEMPERATURE</i>
GBIC-ZX-47	1470 nm	AC/AC	TTL	3.3/5V	0°C to 70°C
GBIC-ZX-49	1490 nm	AC/AC	TTL	3.3/5V	0°C to 70°C
GBIC-ZX-51	1510 nm	AC/AC	TTL	3.3/5V	0°C to 70°C
GBIC-ZX-53	1530 nm	AC/AC	TTL	3.3/5V	0°C to 70°C
GBIC-ZX-55	1550 nm	AC/AC	TTL	3.3/5V	0°C to 70°C
GBIC-ZX-57	1570 nm	AC/AC	TTL	3.3/5V	0°C to 70°C
GBIC-ZX-59	1590 nm	AC/AC	TTL	3.3/5V	0°C to 70°C
GBIC-ZX-61	1610 nm	AC/AC	TTL	3.3/5V	0°C to 70°C

### Absolute Maximum Ratings

PARAMETER	SYMBOL	MIN	MAX	UNITS	NOTE
Storage Temperature	$T_S$	-40	85	°C	
Supply Voltage	$V_{CC}$	-0.5	6.0	V	
Input Voltage	$V_{IN}$	-0.5	$V_{CC}$	V	
Output Current	$I_o$	---	50	mA	
Operating Current	$I_{OP}$	---	500	mA	

### Transmitter Electro-optical Characteristics

$V_{CC} = 3.1 \text{ V to } 5.25 \text{ V}, T_A = 0^\circ \text{C to } 70^\circ \text{C}$

PARAMETER	SYMBOL	MIN	TYP.	MAX	UNITS	NOTE
Output Optical Power 9/125 $\mu\text{m}$ fiber	$P_{out}$	0	---	+5	dBm	Average
Extinction Ratio	$ER$	9	---	---	dB	
Central Wavelength (GBIC-ZX-47)	$\lambda_c$	1464	1470	1477.5	nm	
Central Wavelength (GBIC-ZX-49)		1484	1490	1497.5	nm	
Central Wavelength (GBIC-ZX-51)		1504	1510	1517.5	nm	
Central Wavelength (GBIC-ZX-53)		1524	1530	1537.5	nm	
Central Wavelength (GBIC-ZX-55)		1544	1550	1557.5	nm	
Central Wavelength (GBIC-ZX-57)		1564	1570	1577.5	nm	
Central Wavelength (GBIC-ZX-59)		1584	1590	1597.5	nm	
Central Wavelength (GBIC-ZX-61)		1604	1610	1617.5	nm	
Spectral Width (-20dB)	$\Delta\lambda$	---	---	1	nm	
Side Mode Suppression Ratio	$SNSR$	30	---	---	dB	
Rise/Fall Time, (20–80%)	$T_{r,f}$	---	---	260	ps	
Relative Intensity Noise	$RIN$	---	---	-120	dB/Hz	
Total Jitter	$TJ$	---	---	227	ps	
Output Eye	Compliant with IEEE802.3z					
Max. Pout TX-DISABLE Asserted	$P_{OFF}$	---	---	-35	dBm	
Differential Input Voltage	$V_{DIFF}$	0.65	---	2.0	V	
Transmit Fault Output-Low	$TX\_FAULT_L$	0.0	---	0.5	V	
Transmit Fault Output-High	$TX\_FAULT_H$	2.4	---	$V_{CC}$	V	
TX_DISABLE Assert Time	$t_{off}$	---	---	10	$\mu\text{s}$	
TX_DISABLE Negate Time	$t_{on}$	---	---	1	ms	
Time to initialize, include reset of TX_FAULT	$t_{init}$	---	---	300	ms	
TX_FAULT from fault to assertion	$t_{fault}$	---	---	7	ms	
TX_DISABLE time to start reset	$t_{reset}$	10	---	---	$\mu\text{s}$	

### Recommended Operating Conditions

PARAMETER	SYMBOL	MIN	MAX	UNITS	NOTE
Ambient Operating Temperature	$T_{AMB}$	0	70	°C	
Supply Voltage	$V_{CC}$	3.1	5.25	V	
Supply Current (3.3V)	$I_{TX} + I_{RX}$	---	300	mA	
Supply Current (5V)	$I_{TX} + I_{RX}$	---	400	mA	

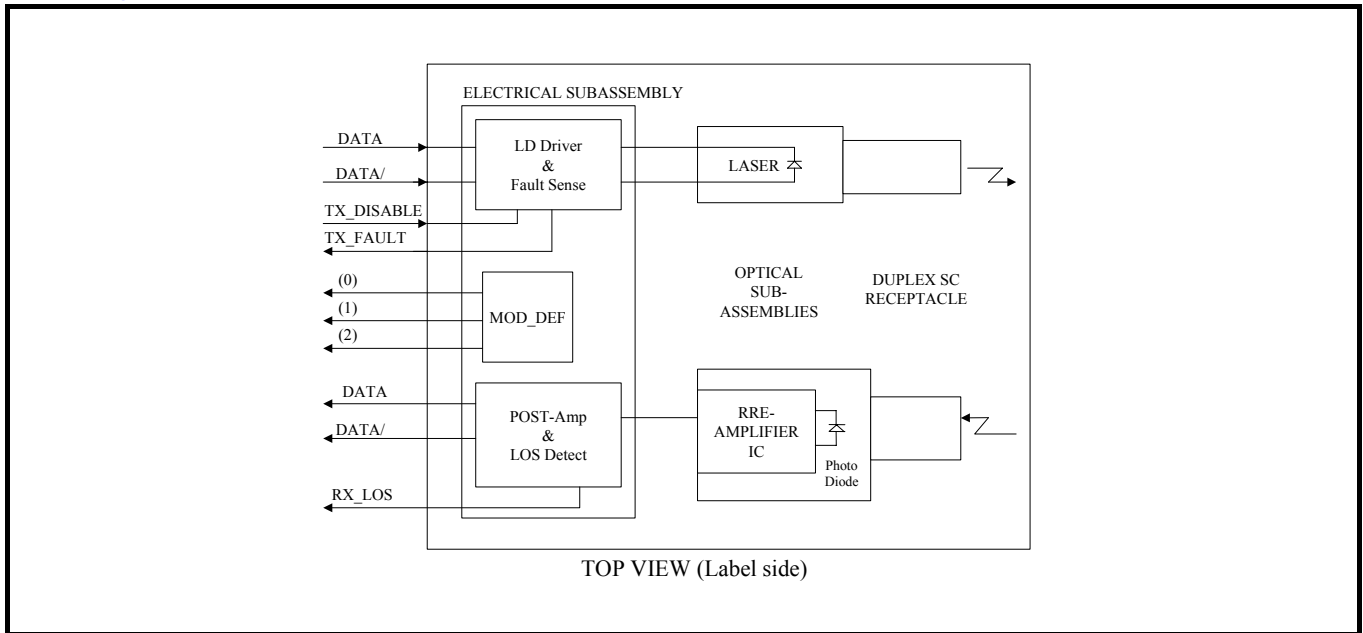
### Receiver Electro-optical Characteristics

$V_{CC} = 3.1\text{ V to }5.25\text{ V}$ ,  $T_A = 0\text{ °C to }70\text{ °C}$

PARAMETER	SYMBOL	MIN	TYP.	MAX	UNITS	NOTE
Optical Input Power-maximum (BER < 10 <sup>-12</sup> )	$P_{IN}$	-3	---	---	dBm	
Optical Input Power-minimum (Sensitivity) (BER < 10 <sup>-12</sup> )	$P_{IN}$	---	---	-23	dBm	Note 1
Operating Center Wavelength	$\lambda_C$	1200	---	1620	nm	
Optical Return Loss	$ORL$	12	---	---	dB	
Receiver Electrical 3dB Upper Cutoff Frequency	---	---	---	1500	MHz	
Signal Detect-Asserted	$P_A$	---	---	-23	dBm	
Signal Detect-Deasserted	$P_D$	-31	---	---	dBm	
Differential Output Voltage	$V_{DIFF}$	0.37	---	2.0	V	
Data Output Rise, Fall Time (20–80%)	$T_{r,f}$	---	---	0.35	ns	
Receiver Loss of Signal Output Voltage-Low	$RX\_LOS_L$	0	---	0.5	V	
Receiver Loss of Signal Output Voltage-High	$RX\_LOS_H$	2.4	---	$V_{CC}$	V	
Receiver Loss of Signal Assert Time (off to on)	$t_{A,RX\_LOS}$	---	---	100	μs	
Receiver Loss of Signal Assert Time (on to off)	$t_{D,RX\_LOS}$	---	---	100	μs	

Note 1: The receiver photo diode may be destroyed if the received optical power higher than maximum optical input power. A 5dB single-mode optical attenuator may be introduced when the transmission distance is under 30km.

**Block Diagram of Transceiver**



**Transmitter Section**

The transmitter section consists of an InGaAsP laser in an eye safe optical subassembly (OSA) which mates to the fiber cable. The laser OSA is driven by a LD driver IC which converts differential input PECL logic signals into an analog laser driving current.

**TX\_FAULT**

When sensing an improper power level in the laser driver, the GBIC set this signal high and turns off the Laser. TX\_FAULT can be reset with the TX\_DISABLE line. The signal is in TTL level.

**TX\_DISABLE**

The TX\_DISABLE signal is high (TTL logic "1") to turn off the laser output. The laser will turn on within 1ms when TX\_DISABLE is low (TTL logic "0").

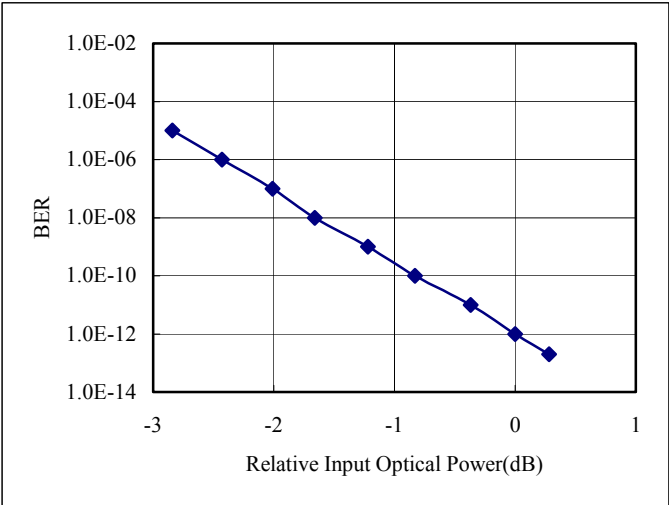
**Receiver Section**

The receiver utilizes an InGaAs PIN photodiode mounted together with a trans-impedance preamplifier IC in an OSA. This OSA is connected to a circuit providing post-amplification quantization, and optical signal detection.

**Receive Loss (RX\_LOS)**

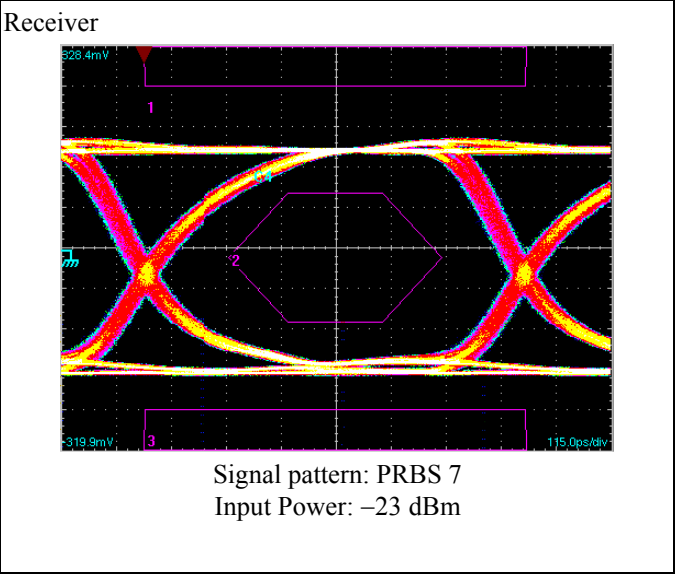
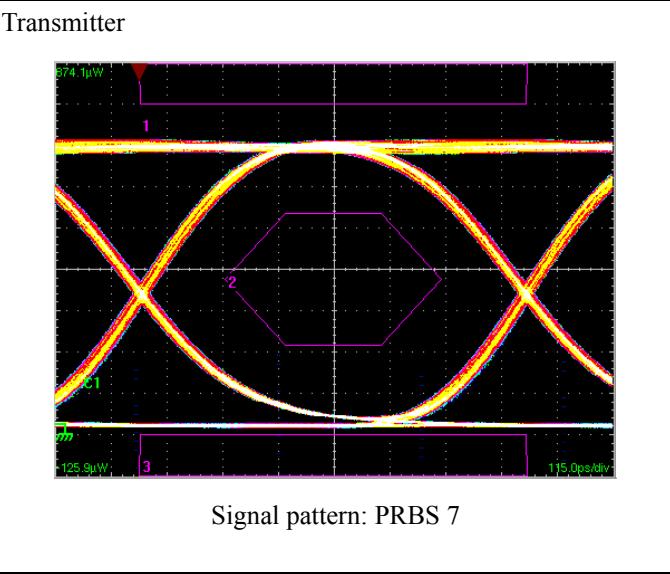
The RX\_LOS is high (logic "1") when there is no incoming light from the companion transceiver. This signal is normally used by the system for the diagnostic purpose. The signal is operated in TTL level.

Typical BER Performance of Receiver versus Input Optical Power Level

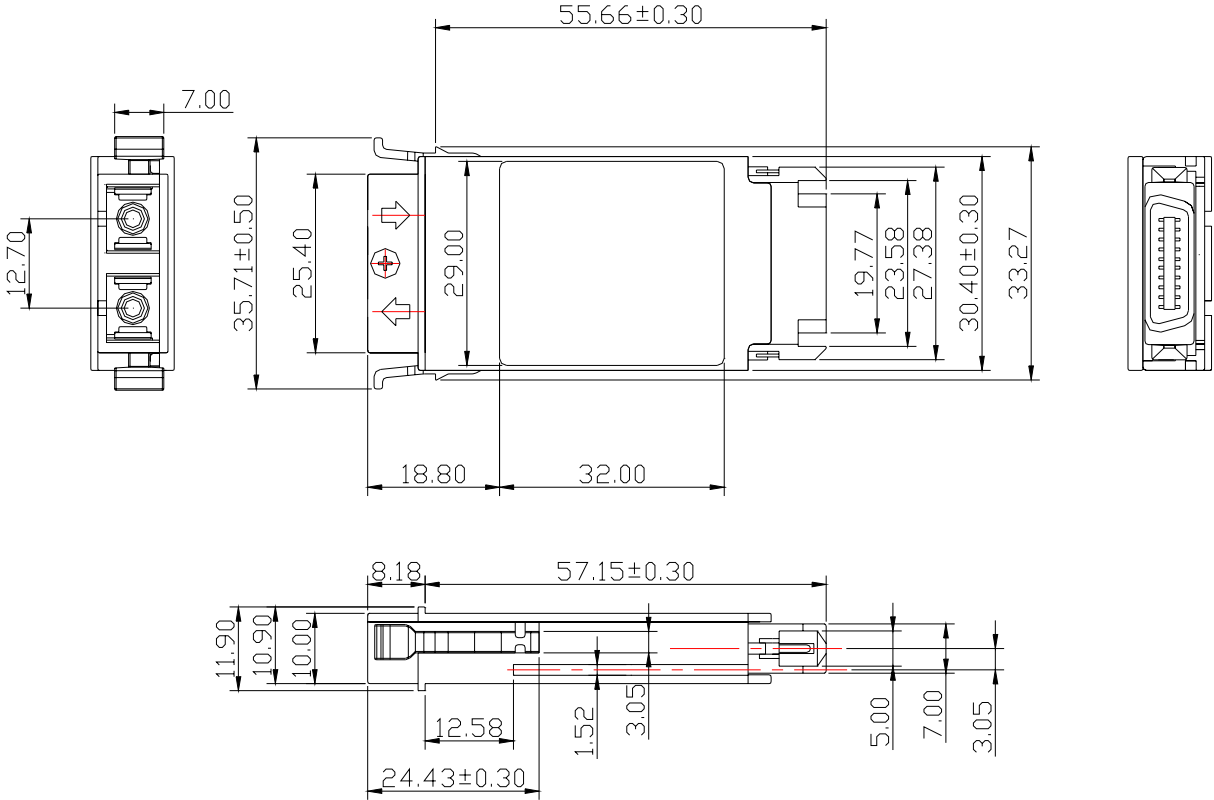


The figure shows the relationship between typical trade-off of BER and Relative Input Optical Power. Besides the required BER =  $1 \times 10^{-12}$  of the Gigabit Ethernet Physical Layer Standard, the transceiver can be operated at other Bit-Error-Rate conditions. The Relative Input Optical Power in dB is referenced to the actual sensitivity of the device. For BER conditions better than  $1 \times 10^{-12}$ , more input signal is needed (+dB).

Eye Diagram



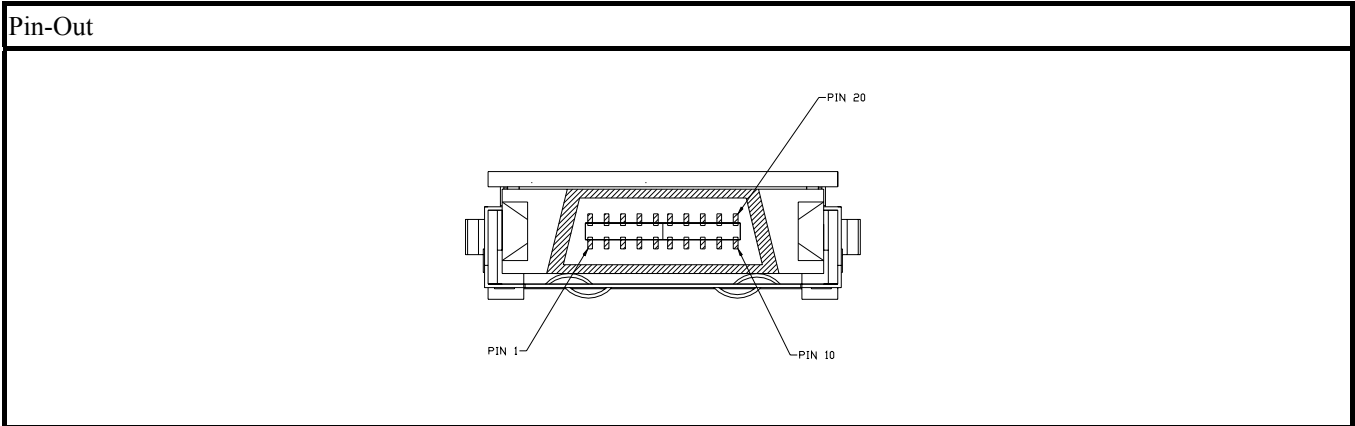
Dimensions



ALL DIMENSIONS ARE ± 0.20mm UNLESS OTHERWISE SPECIFIED

Unit: mm

**Pin Assignment**



<i>Pin</i>	<i>Signal Name</i>	<i>Description</i>
1	<i>RX LOS</i>	Receiver Loss of Signal, TTL High, open collector
2	<i>R<sub>GND</sub></i>	Receiver Ground
3	<i>R<sub>GND</sub></i>	Receiver Ground
4	<i>MOD DEF (0)</i>	TTL Low
5	<i>MOD DEF (1)</i>	SCL Serial Clock Signal
6	<i>MOD DEF (2)</i>	SDA Serial Data Signal
7	<i>TX DISABLE</i>	Transmit Disable
8	<i>T<sub>GND</sub></i>	Transmit Ground
9	<i>T<sub>GND</sub></i>	Transmit Ground
10	<i>TX FAULT</i>	Transmit Fault
11	<i>R<sub>GND</sub></i>	Receiver Ground
12	<i>RX-</i>	Receive Data Bar, Differential PECL, ac coupled
13	<i>RX+</i>	Receive Data, Differential PECL, ac coupled
14	<i>R<sub>GND</sub></i>	Receiver Ground
15	<i>V<sub>CCR</sub></i>	Receiver Power Supply
16	<i>V<sub>CCT</sub></i>	Transmitter Power Supply
17	<i>T<sub>GND</sub></i>	Transmitter Ground
18	<i>TX+</i>	Transmit Data, Differential PCEL, ac coupled
19	<i>TX-</i>	Transmit Data Bar, Differential PCEL, ac coupled
20	<i>T<sub>GND</sub></i>	Transmitter Ground

**Eye Safety**

Single-mode transceiver is a class 1 laser product. It complies with EN 60825-1 and FDA 21 CFR 1040.10 and 1040.11. In order to meet laser safety requirements the transceiver shall be operated within the Absolute Maximum Ratings.

**Caution**

All adjustments have been done at the factory before the shipment of the devices. No maintenance and user serviceable part is required. Tampering with and modifying the performance of the device will result in voided product warranty.

**Required Mark**

**Class 1 Laser Product  
Complies with  
21 CFR 1040.10 and 1040.11**