

## EOLG-1612-X-X Series

**Single-Mode CWDM 1.25Gbps FC/GBE  
Duplex GBIC Transceiver  
RoHS6 Compliant**

### Features

- ◆ Operating data rate up to 1.25Gbps
- ◆ 18-Wavelength CWDM DFB LD Transmitter from 1270nm to 1610nm, with step 20nm
- ◆ 19dB Power Budget at Least  
24dB Power Budget at Least  
27dB Power Budget at Least  
32dB Power Budget at Least  
36dB Power Budget at Least
- ◆ 3.3/5V Power Supply and TTL Logic Interface
- ◆ Hot Pluggable with Duplex SC Connector Interface
- ◆ Class 1 FDA and IEC60825-1 Laser Safety Compliant
- ◆ Operating Case Temperature  
Standard: 0°C~+70°C  
Industrial: -40°C~+85°C
- ◆ Compliant with GBIC Specification Rev. 5.5
- ◆ Compliant with IEEE 802.3z Gigabit Ethernet



### Applications

- ◆ Gigabit Ethernet
- ◆ Fiber Channel
- ◆ Other Optical Link

### Ordering information

Part No.	Data Rate	Fibre	Link Budget <sup>*(note2)</sup>	Interface	Temperature	DDMI
EOLG-1612-19-X <sup>*(note1)</sup>	1.25Gbps	SMF	≥19dB	LC	Standard	NO
EOLG-1612-19-XI	1.25Gbps	SMF	≥19dB	LC	Industrial	NO
EOLG-1612-24-X <sup>*(note1)</sup>	1.25Gbps	SMF	≥24dB	LC	Standard	NO
EOLG-1612-24-XI	1.25Gbps	SMF	≥24dB	LC	Industrial	NO
EOLG-1612-27-X <sup>*(note1)</sup>	1.25Gbps	SMF	≥27dB	LC	Standard	NO
EOLG-1612-27-XI	1.25Gbps	SMF	≥27dB	LC	Industrial	NO
EOLG-1612-32-X <sup>*(note1)</sup>	1.25Gbps	SMF	≥32dB	LC	Standard	NO
EOLG-1612-32-XI	1.25Gbps	SMF	≥32dB	LC	Industrial	NO
EOLG-1612-36-X <sup>*(note1)</sup>	1.25Gbps	SMF	≥36dB	LC	Standard	NO

EOLG-1612-36-XI	1.25Gbps	SMF	≥36dB	LC	Industrial	NO
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Note1: Standard version.

Note2: X refer to CWDM Wavelength range 1270nm to 1610nm, A=1270, B=1290, ..., R=1610.

## CWDM\* Wavelength(0~70 °C)

Band	Nomenclature	Wavelength(nm)		
		Min.	Typ.	Max.
O-band Original	A	1264	1270	1277.5
	B	1284	1290	1297.5
	C	1304	1310	1317.5
	D	1324	1330	1337.5
	E	1344	1350	1357.5
E-band Extended	F	1364	1370	1377.5
	G	1384	1390	1397.5
	H	1404	1410	1417.5
	I	1424	1430	1437.5
	J	1444	1450	1457.5
S-band Short Wavelength	K	1464	1470	1477.5
	L	1484	1490	1497.5
	M	1504	1510	1517.5
	N	1524	1530	1537.5
C-band Conventional	O	1544	1550	1557.5
L-band Long Wavelength	P	1564	1570	1577.5
	Q	1584	1590	1597.5
	R	1604	1610	1617.5

CWDM\*: 18 Wavelengths from 1270 nm to 1610 nm, each step 20 nm.

## 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	Compliant with standards

	GR-1089-CORE	
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 IEC 61000-4-3	Compliant with standards. 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 <sup>*note3</sup>

Note3: For update of the equipments and strict control of raw materials, EOPTOLINK has the ability to supply the customized products since Jan 1th, 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, Item13: 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 components such as lenses, windows, isolators, and other electronic components.

### Product Description

The EOLG-1612-X series single mode transceiver meets the Gigabit Interface Converter (GBIC) specification Rev.5.5, for serial optical data communications such as Gigabit Ethernet 1000BASE-ZX and Fiber Channel 1x SM-LC-L FC-PI application.

This module is designed for single mode fiber and operates at a nominal wavelength of CWDM wavelength. There are eighteen center wavelengths available from 1270 nm to 1610 nm, with each step 20 nm.

The transmitter section uses a multiple quantum well CWDM DFB laser and is a class 1 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.

## Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Unit
Storage Temperature	T <sub>s</sub>	-40	+85	°C
Supply Voltage	V <sub>cc3</sub>	-0.5	3.6	V
	V <sub>cc5</sub>	-0.5	6.0	
Operating Relative Humidity		-	95	%

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

## Recommended Operating Conditions

Parameter	Symbol	Min.	Typical	Max.	Unit
Operating Case Temperature	T <sub>A</sub>	EOLG-1612-X	0	+70	°C
Power Supply Voltage	V <sub>cc</sub>	3.15	3.3	3.45	V
Power Supply Current	I <sub>cc</sub>			300	mA
Data Rate	GBE		1.25		Gbps
	FC		1.063		

## Performance Specifications - Electrical

Parameter	Symbol	Min.	Typ.	Max	Unit	Notes
<b>Transmitter</b>						
LVPECL Inputs(Differential)	V <sub>in</sub>	400		2000	mVpp	AC coupled inputs*(note4)
Input Impedance (Differential)	Z <sub>in</sub>	85	100	115	ohms	R <sub>in</sub> > 100 kohms @ DC
Tx_Dis	Disable	2		V <sub>cc</sub>	V	
	Enable	0		0.8		
Tx_FAULT	Fault	2		V <sub>cc</sub>	V	
	Normal	0		0.8		
<b>Receiver</b>						
LVPECL Outputs (Differential)	V <sub>out</sub>	400		2000	mVpp	AC coupled outputs*(note4)
Output Impedance (Differential)	Z <sub>out</sub>	85	100	115	ohms	
Rx_LOS	LOS	2		V <sub>cc</sub>	V	
	normal	0		0.8	V	
MOD_DEF ( 0:2 )	VoH	2.5			V	
	VoL	0		0.8	V	

## Performance Specifications - Optical

**(CWDM DFB and PIN/TIA, 19dB Power Budget at Least)**

Parameter	Symbol	Min.	Typical	Max.	Unit
Data Rate			1.063/1.25		Gbps
<b>Transmitter</b>					
Centre Wavelength	$\lambda_c$	$\lambda_c-6$	$\lambda_c$	$\lambda_c+7.5$	nm
Spectral Width (-20dB)	$\Delta\lambda$			1	nm
Average Output Power <sup>*(note5)</sup>	P <sub>out</sub>	-5		0	dBm
Side Mode Suppression Ratio	SMSR	30			dB
Extinction Ratio <sup>*(note6)</sup>	ER	9			dB
Rise/Fall Time(20%~80%)	tr/tf			0.26	ns
Total Jitter	TJ			56.5	ps
Output Optical Eye <sup>*(note5)</sup>	Compatible with IEEE 802.3ah-2004 <sup>*(note9)</sup>				
TX_Disable Assert Time	t <sub>off</sub>			10	□us
P <sub>out</sub> @TX Disable Asserted	P <sub>out</sub>			-45	dBm
<b>Receiver</b>					
Centre Wavelength	$\lambda_c$	1260		1600	nm
Receiver Sensitivity <sup>*(note7)</sup>	P <sub>min</sub>			-24	dBm
Receiver Overload	P <sub>max</sub>	-3			dBm
Return Loss		12			dB
Optical Path Penalty <sup>*(note8)</sup>				1	dB
LOS De-Assert	LOSD			-25	dBm
LOS Assert	LOSA	-42			dBm
LOS Hysteresis <sup>*(note10)</sup>		0.5			dB

**(CWDM DFB and PIN/TIA, 24dB Power Budget at Least)**

Parameter	Symbol	Min.	Typical	Max.	Unit
Data Rate			1.063/1.25		Gbps
<b>Transmitter</b>					
Centre Wavelength	$\lambda_c$	$\lambda_c-6$	$\lambda_c$	$\lambda_c+7.5$	nm
Spectral Width (-20dB)	$\Delta\lambda$			1	nm
Average Output Power <sup>*(note5)</sup>	P <sub>out</sub>	0		+5	dBm
Side Mode Suppression Ratio	SMSR	30			dB
Extinction Ratio <sup>*(note6)</sup>	ER	9			dB
Rise/Fall Time(20%~80%)	tr/tf			0.26	ns
Total Jitter	TJ			56.5	ps
Output Optical Eye <sup>*(note5)</sup>	Compatible with IEEE 802.3ah-2004 <sup>*(note9)</sup>				
TX_Disable Assert Time	t <sub>off</sub>			10	□us
P <sub>out</sub> @TX Disable Asserted	P <sub>out</sub>			-45	dBm
<b>Receiver</b>					
Centre Wavelength	$\lambda_c$	1260		1600	nm
Receiver Sensitivity <sup>*(note7)</sup>	P <sub>min</sub>			-24	dBm
Receiver Overload	P <sub>max</sub>	-3			dBm
Return Loss		12			dB

Optical Path Penalty <sup>*(note8)</sup>				1	dB
LOS De-Assert	LOSD			-25	dBm
LOS Assert	LOSA	-42			dBm
LOS Hysteresis <sup>*(note10)</sup>		0.5			dB

**(CWDM DFB and PIN/TIA, 27dB Power Budget at Least)**

Parameter	Symbol	Min.	Typical	Max.	Unit
Data Rate			1.063/1.25		Gbps
<b>Transmitter</b>					
Centre Wavelength	$\lambda_c$	$\lambda_c-6$	$\lambda_c$	$\lambda_c+7.5$	nm
Spectral Width (-20dB)	$\Delta\lambda$			1	nm
Average Output Power <sup>*(note5)</sup>	P <sub>out</sub>	0		+5	dBm
Side Mode Suppression Ratio	SMSR	30			dB
Extinction Ratio <sup>*(note6)</sup>	ER	9			dB
Rise/Fall Time(20%~80%)	tr/tf			0.26	ns
Total Jitter	TJ			56.5	ps
Output Optical Eye <sup>*(note5)</sup>	Compatible with IEEE 802.3ah-2004 <sup>*(note9)</sup>				
TX_Disable Assert Time	t <sub>off</sub>			10	□us
P <sub>out</sub> @TX Disable Asserted	P <sub>out</sub>			-45	dBm
<b>Receiver</b>					
Centre Wavelength	$\lambda_c$	1260		1600	nm
Receiver Sensitivity <sup>*(note7)</sup>	P <sub>min</sub>			-27	dBm
Receiver Overload	P <sub>max</sub>	-3			dBm
Return Loss		12			dB
Optical Path Penalty <sup>*(note8)</sup>				1	dB
LOS De-Assert	LOSD			-28	dBm
LOS Assert	LOSA	-42			dBm
LOS Hysteresis <sup>*(note10)</sup>		0.5			dB

**(CWDM DFB and APD/TIA, 32dB Power Budget at Least)**

Parameter	Symbol	Min.	Typical	Max.	Unit
Data Rate			1.063/1.25		Gbps
<b>Transmitter</b>					
Centre Wavelength	$\lambda_c$	$\lambda_c-6$	$\lambda_c$	$\lambda_c+7.5$	nm
Spectral Width (-20dB)	$\Delta\lambda$			1	nm
Average Output Power <sup>*(note5)</sup>	P <sub>out</sub>	0		+5	dBm
Side Mode Suppression Ratio	SMSR	30			dB
Extinction Ratio <sup>*(note6)</sup>	ER	9			dB
Rise/Fall Time(20%~80%)	tr/tf			0.26	ns
Total Jitter	TJ			56.5	ps
Output Optical Eye <sup>*(note5)</sup>	Compatible with IEEE 802.3ah-2004 <sup>*(note9)</sup>				
TX_Disable Assert Time	t <sub>off</sub>			10	□us
P <sub>out</sub> @TX Disable Asserted	P <sub>out</sub>			-45	dBm
<b>Receiver</b>					

Centre Wavelength	$\lambda_c$	1260		1600	nm
Receiver Sensitivity <sup>*(note7)</sup>	Pmin			-32	dBm
Receiver Overload	Pmax	-10			dBm
Return Loss		12			dB
Optical Path Penalty <sup>*(note8)</sup>				1	dB
LOS De-Assert	LOSD			-33	dBm
LOS Assert	LOSA	-42			dBm
LOS Hysteresis <sup>*(note10)</sup>		0.5			dB

### (CWDM DFB and APD/TIA, 36dB Power Budget at Least)

Parameter	Symbol	Min.	Typical	Max.	Unit
Data Rate			1.063/1.25		Gbps
<b>Transmitter</b>					
Centre Wavelength	$\lambda_c$	$\lambda_c-6$	$\lambda_c$	$\lambda_c+7.5$	nm
Spectral Width (-20dB)	$\Delta\lambda$			1	nm
Average Output Power <sup>*(note5)</sup>	Pout	4		8	dBm
Side Mode Suppression Ratio	SMSR	30			dB
Extinction Ratio <sup>*(note6)</sup>	ER	9			dB
Rise/Fall Time(20%~80%)	tr/tf			0.26	ns
Total Jitter	TJ			56.5	ps
Output Optical Eye <sup>*(note5)</sup>	Compatible with IEEE 802.3ah-2004 <sup>*(note9)</sup>				
TX_Disable Assert Time	t_off			10	$\mu$ s
P <sub>out</sub> @TX Disable Asserted	Pout			-45	dBm
<b>Receiver</b>					
Centre Wavelength	$\lambda_c$	1260		1600	nm
Receiver Sensitivity <sup>*(note7)</sup>	Pmin			-32	dBm
Receiver Overload	Pmax	-10			dBm
Return Loss		12			dB
Optical Path Penalty <sup>*(note8)</sup>				1	dB
LOS De-Assert	LOSD			-33	dBm
LOS Assert	LOSA	-42			dBm
LOS Hysteresis <sup>*(note10)</sup>		0.5			dB

Note4: LVPECL logic, internally AC coupled.

Note5: Output is coupled into a 9/125 $\mu$ m single-mode fiber.

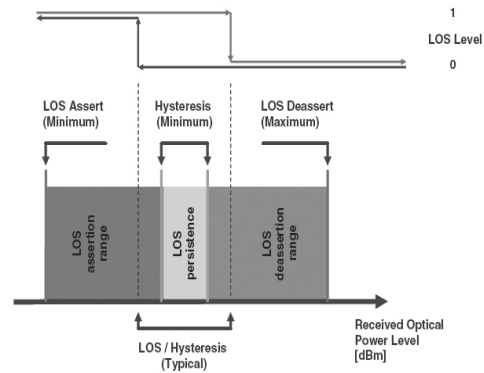
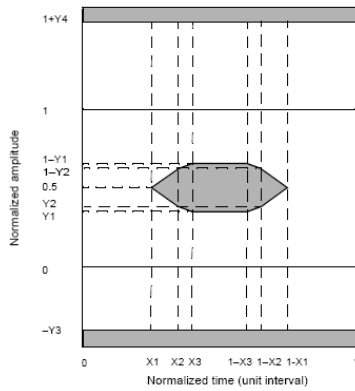
Note6: Filtered, measured with a PRBS 2<sup>7</sup>-1 test pattern @1.25Gbps

Note7: Minimum average optical power measured at BER less than 1E-10, with a 2<sup>7</sup>-1 PRBS and ER=9dB.

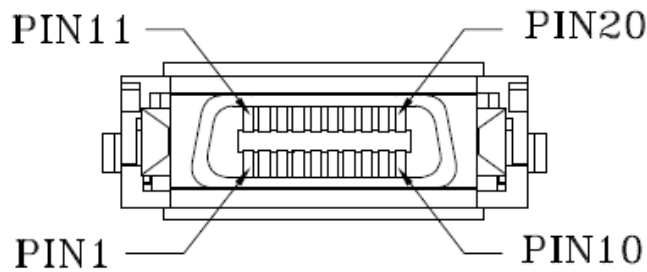
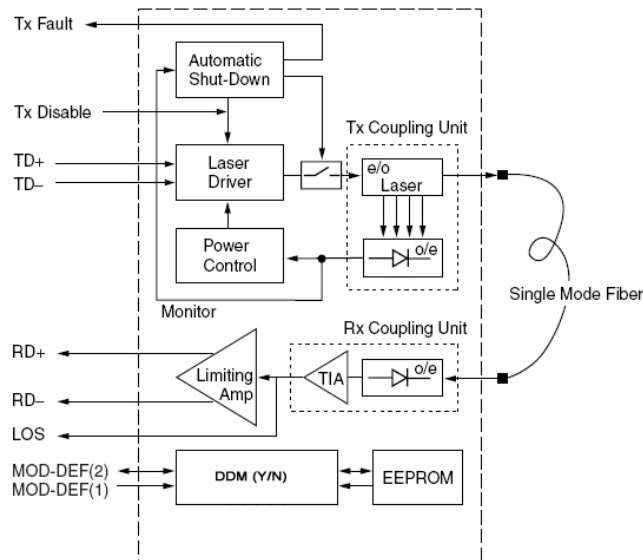
Note8: Measured with a PRBS 2<sup>7</sup>-1 test pattern @1.25Gbps, BER  $\leq 1 \times 10^{-10}$ .

Note9: Eye pattern mask

Note10: LOS Hysteresis



### Functional Description of Transceiver



Pin Name	Pin#	Sequence
RX_LOS	1	2
RGND	2	2
RGND	3	2
MOD_DEF(0)	4	2

MOD_DEF(1)	5	2
MOD_DEF(2)	6	2
TX_DISABLE	7	2
TGND	8	2
TGND	9	2
TX_FAULT	10	2
RGND	11	1
-RX_DAT	12	1
+RX_DAT	13	1
RGND	14	1
VDDR	15	2
VDDT	16	2
TGND	17	1
+TX_DAT	18	1
-TX_DAT	19	1
TGND	20	1

### Pin Function Definitions

Pin Name	Pin #	Name/Function	Signal Specification
<b>Receiver Signals</b>			
RGND	2,3,11, 14	Receiver Ground(may be connected with TGND in GBIC)	Ground, to GBIC
VDDR	15	Receiver +5 volt (may be connected with VDDT in GBIC)	Power, to GBIC
-RX_DAT	12	Receive Data, Differential PECL	High speed serial, from GBIC
+RX_DAT	13	Receive Data, Differential PECL	High speed serial, from GBIC
RX_LOS	1	Receiver Loss of Signal, logic high, open collector compatible,4.7 K to 10 K Ohm pullup to VDDT on host	Low speed, from GBIC
<b>Transmitter Signals</b>			
TGND	8,9,17, 20	Transmitter Ground (may be connected with RGND internally)	Ground, to GBIC
VDDT	16	Transmitter +5 volt (may be connected with VDDR in GBIC)	Power, to GBIC
+TX_DAT	18	Transmit Data, Differential PECL	High speed serial, to GBIC
-TX_DAT	19	Transmit Data, Differential PECL	High speed serial, to GBIC

TX_DISABLE	7	Transmitter Disable, logic high, open collector compatible, 4.7K to 10 K Ohm pullup to VDDT on GBIC	Low speed, to GBIC
TX_FAULT	10	Transmitter Fault, logic high, open collector compatible, 4.7 K to 10 K Ohm pullup to VDDT on host	Low speed, from GBIC
<b>Control Signals</b>			
MOD_DEF(0)	4	GBIC module definition and presence, bit 0, 4.7 K to 10 K Ohm pullup to VDDT on host	Low speed, from GBIC
MOD_DEF(1)	5	GBIC module definition and presence, bit 1, 4.7 K to 10 K Ohm pullup to VDDT on host	Low speed, from GBIC
MOD_DEF(2)	6	GBIC module definition and presence, bit 2, 4.7 K to 10 K Ohm pullup to VDDT on host	Low speed, from GBIC

## EEPROM

The serial interface uses the 2-wire serial CMOS EEPROM protocol defined for the ATMEL AT24C02/04 family of components. When the serial protocol is activated, the host generates the serial clock signal (SCL). The positive edge clocks data into those segments of the EEPROM that are not writing protected within the GBIC transceiver. The negative edge clocks data from the GBIC transceiver. The serial data signal (SDA) is bi-directional for serial data transfer. The host uses SDA in conjunction with SCL to mark the start and end of serial protocol activation. The memories are organized as a series of 8-bit data words that can be addressed individually or sequentially.

## EEPROM Serial ID Memory Contents

Accessing Serial ID Memory uses the 2 wire address 1010000X (A0H). Memory Contents of Serial ID are shown in Table 1.

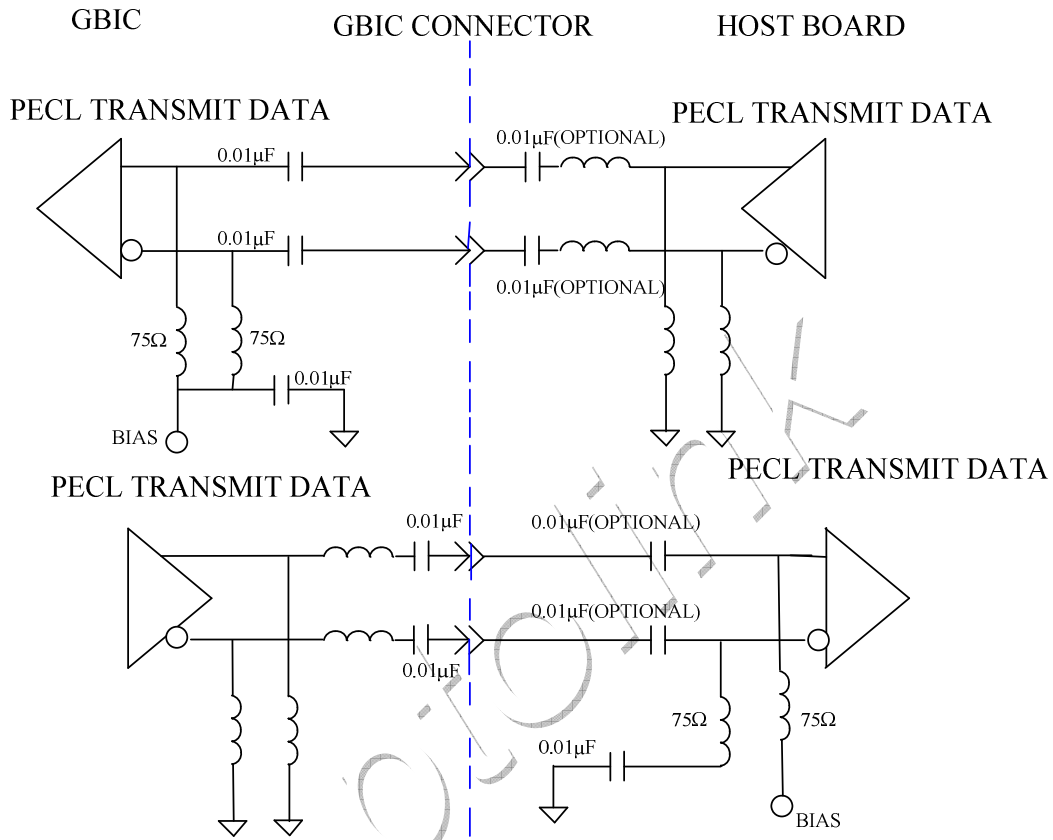
**Table 1 Serial ID Memory Contents**

Addr.	Size (Bytes)	Name of Field	Hex	Description
<b>BASE ID FIELDS</b>				
0	1	Identifier	01	GBIC
1	1	Ext. Identifier	04	GBIC function is defined by serial ID only
2	1	Connector	01	SC Connector
3-10	8	Transceiver	00 00 00 22 10 10 01 01	Transceiver Code
11	1	Encoding	01	8B10B
12	1	BR, Nominal	0D	1.25Gbps
13	1	Reserved	00	
14	1	Length (9µm)km	XX	Transceiver transmit

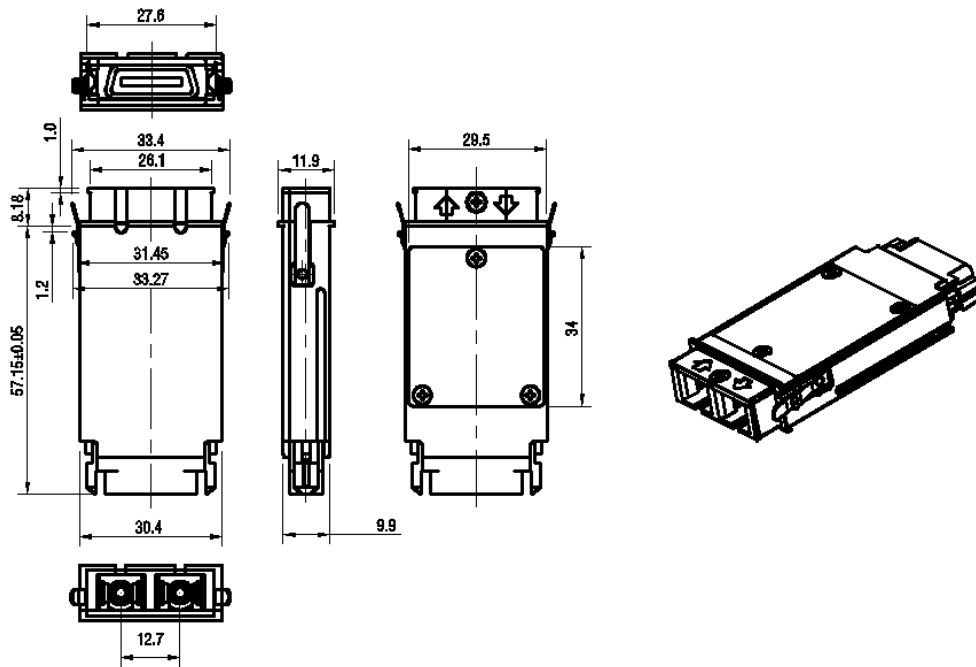
15	1	Length(9μm)100m	FF	distance
16	1	Length (50μm) 10m	00	
17	1	Length(62.5μm)10m	00	
18	1	Length (Copper)	00	Not compliant
19	1	Reserved	00	
20-35	16	Vendor name	XX XX XX XX XX XX XX XX <sup>(note9)</sup> 20 20 20 20 20 20 20 20	Vendor name (ASCII)
36	1	Reserved	00	
37-39	3	Vendor OUI	XX XX XX <sup>(note9)</sup>	
40-55	16	Vendor PN		Transceiver part number
56-59	4	Vendor rev	XX XX XX XX <sup>(note9)</sup>	
60-61	2	Wavelength	XX XX	CWDM
62	1	Reserved	00	
63	1	CC_BASE	Check Sum (Variable)	Check code for Base ID Fields
<b>EXTENDED ID FIELDS</b>				
64-65	2	Options	00 1A	TX_DISABLE, TX_FAULT and Loss of Signal implemented.
66	1	BR, max	00	
67	1	BR, min	00	
68-83	16	Vendor SN	XX XX XX XX XX XX XX XX 20 20 20 20 20 20 20 20 <sup>(note9)</sup>	Serial Number of transceiver (ASCII). For example "B000822".
84-91	8	Date code	XX XX XX XX XX XX XX XX <sup>(note9)</sup>	Manufactory date code. For example "080405".
92	1	Diagnostic Monitoring Type	00	Digital diagnostic monitoring implemented
93	1	Enhanced Options	00	Optional flags
94	1	SFF_8472 Compliance	00	01 for diagnostics (Rev9.3 SFF-8472).
95	1	CC_EXT	Check Sum (Variable)	Check sum for Extended ID Field.
<b>VENDOR SPECIFIC ID FIELDS</b>				
96-127	32	Vendor Specific	Read only	Depends on customer information
128-255	128	Reserved	Read only	

Note9: The "XX" byte should be filled in according to practical case. For more information, please refer to the related document of GBIC Multi-Source Agreement (MSA).

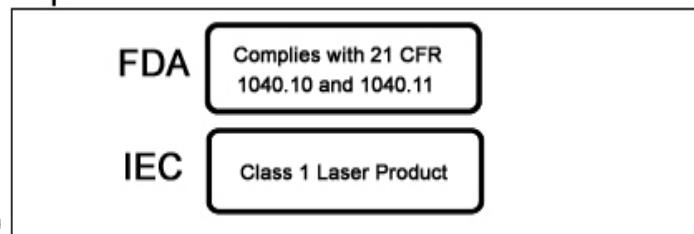
**Recommend Circuit Schematic**



**Mechanical Specifications**



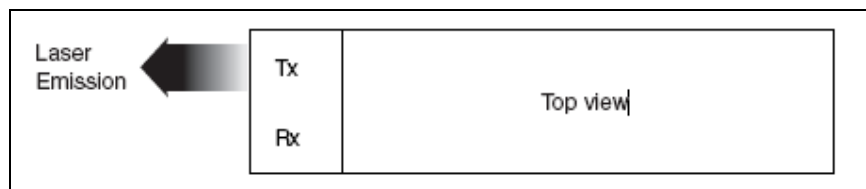
**Class 1 Labels**



**Laser Emission Data**

Wavelength	1550nm
Total output power (as defined by FDA: 7mm aperture at 20cm distance)	<0.076mW
Total output power (as defined by IEC: 7mm aperture at 10cm distance)	<0.778mW
Beam divergence	12°

**Laser Emission**



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**Revision History**

Revision	Initiated	Reviewed	Approved	DCN	Release Date
V3.a	Cathy	Kelly		Released.	Mar 23, 2006

**Notice:**

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