SFPS-EX, ZX and EZX series.

SFP Single-Mode, Single Fiber transceiver
for 100Mbps to 1.25Gbps FE/GbE /1GFC

Features

- Data rate up to 1.25Gbps
- Tx/Rx Wavelength are compliant with ITU-T G.694.2
- Spacing > 60nm
- 40/80/120 km with 9/125µm SMF
- Single 3.3V Power supply and TTL Logic Interface
- Hot Pluggable
- Simplex LC connector
- Class 1 FDA and IEC60825-1 laser safety compliant
- Compliant with SFP MSA
- Digital diagnostics SFF-8472

Applications

- Fiber Channel links
- Gigabit Ethernet
- Fast Ethernet
- WDM Gigabit Ethernet links

Product description

The SFPS-EX-xx, SFPS-ZX-xx, SFPS-EZX-xx and SFPS-XZX-xx series are Single Fiber, bidirectional small form factor pluggable modules for GBE/FC single fiber communications. It is with the SFP 20-pin connector to allow hot plug capability. The SFPS-EX-xx, SFPS-ZX-xx and SFPS-EZX-xx series are designed to be compliant with SFF-8472.

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Opticonnect SYSTEMS B.V., an Optical Networking vendor with its headquarters in the Netherlands, provides Optical Transport solutions and Optical Transceivers at the best price performance ratio possible. Our goal is to simplify the planning, deployment and maintenance of complex Optical Networks. This is achieved by our user friendly planning apps and information, sophisticated products and transparent support. Relying on our superior product quality, all items are supplied with life time warranty.

Ordering information

Part No.	Data rate	Wavelength	Distance (Km)	Interface	Temp.
SFPS-EX-4931D	1.25Gbps	1490nm	40	LC	Standard
SFPS-EX-3149D	1.25Gbps	1310nm	40	LC	Standard
SFPS-ZX-4955D	1.25Gbps	1490nm	80	LC	Standard
SFPS-ZX-5549D	1.25Gbps	1550nm	80	LC	Standard
SFPS-EZX-4955D	1.25Gbps	1490nm	120	LC	Standard
SFPS-EZX-5549D	1.25Gbps	1550nm	120	LC	Standard

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: 30MHz to 6GHz. 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 80MHz to 1GHz. 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*note1

Note1: For update of the equipments and strict control of raw materials, Opticonnect 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 Opticonnect's transceivers, because Opticonnect's transceivers use glass, which may contain Pb, for components such as lenses, windows, isolators, and other electronic components.

Absolute maximum ratings*note2

Parameter	Symbol	Min.	Max.	Unit
Storage temperature	T_S	-40	+85	°C
Supply voltage	V_{CC}	-0.5	3.6	V
Operating relative humidity		-	95	%

Note 2:Exceeding any one of these values may destroy the device immediately.

Performance specifications - Electrical

Parameter		Symbol	Min.	Typ.	Max	Unit	Notes
Transmitter							
LVPECL inputs (differential)		Vin	400		2000	mVpp	AC coupled inputs*(note5)
Input impedance (differential)		Zin	85	100	115	ohm	Rin > 100 kohm @ DC
TX_Dis	Disable		2		V_{CC}+0.3	V	
	Enable		0		0.8		
TX_FAULT	Fault		2		V_{CC}+0.3	V	
	Normal		0		0.5		
Receiver							
LVPECL outputs (differential)		Vout	370		2000	mVpp	AC coupled outputs*(note5)
Output impedance (differential)		Zout	85	100	115	ohm	
RX_LOS	LOS		2		V_{CC}+0.3	V	
	Normal		0		0.8	V	
MOD_DEF (0:2)		VoH	2.5			V	With Serial ID
		VoL	0		0.5	V	

Performance specifications - Optical
SFPS-EX-4931D/3149D, 40km (CWDM DFB and PIN-TIA with 19dB Power Budget)

Parameter	Symbol	Min.	Typical	Max.	Unit
Power budget		19			dB
Data rate		100		1250	Mbps
Transmitter					
Channel centre wavelength*(note9)		λ_C-6.5	λ_C	λ_C+7	nm
Spectral width (-20dB)	Δλ			1	nm
Average output power*(note3)	Pout	-5		0	dBm
Extinction ratio*(note4)	ER	9			dB
Side mode suppression ratio	SMSR	30			dB
Rise/Fall time(20%~80%)	t_r/t_f			2	ns

Parameter	Symbol	Min.	Typical	Max.	Unit
Output optical eye*(note4)	IUT-T G.957 compliant*(note7)				
TX_Disable assert time	t_off			10	μs
Receiver					
Channel centre wavelength*(note9)		λ-20	λ	λ+20	nm
Receiver sensitivity*(note6)	Pmin			-24	dBm
Receiver overload	Pmax	-3			dBm
Return loss		12			dB
Optical path penalty				1	dB
LOS De-Assert	LOSD			-25	dBm

SFPS-ZX-4955D/5549D, 80km (CWDM DFB and PIN-TIA with 26dB Power Budget)

Parameter	Symbol	Min.	Typical	Max.	Unit
Power budget		26			dB
Data rate		100		1250	Mbps
Transmitter					
Channel centre wavelength*(note9)		λ_C-6.5	λ_C	λ_C+7	nm
Spectral width (-20dB)	Δλ			1	nm
Average output power*(note3)	Pout	0		+5	dBm
Extinction ratio*(note4)	ER	9			dB
Side mode suppression ratio	SMSR	30			dB
Rise/Fall time(20%~80%)	t_r/t_f			2	ns
Output optical eye*(note4)	IUT-T G.957 compliant*(note7)				
TX_Disable assert time	t_off			10	μs
Receiver					
Channel centre wavelength*(note9)		λ-20	λ	λ+20	nm
Receiver sensitivity*(note6)	Pmin			-26	dBm
Receiver overload	Pmax	-3			dBm
Return loss		12			dB
Optical path penalty				1	dB
LOS De-Assert	LOSD			-27	dBm
LOS Assert	LOSA	-45			dBm
LOS Hysteresis*(note8)		0.5			dB

SFPS-EZX-4955D/5549D, 120km (CWDM DFB and APD-TIA with 36dB Power Budget)

Parameter	Symbol	Min.	Typical	Max.	Unit
Power budget		36			dB
Data rate		100		1250	Mbps
Transmitter					
Channel centre wavelength*(note9)		λ_C-6.5	λ_C	λ_C+7	nm
Spectral width (-20dB)	Δλ			1	nm
Average output power*(note3)	Pout	2		+7	dBm
Extinction ratio*(note4)	ER	9			dB
Side mode suppression ratio	SMSR	30			dB
Rise/Fall time(20%~80%)	t_r/t_f			2	ns
Output optical eye*(note4)	IUT-T G.957 compliant*(note7)				
TX_Disable assert time	t_off			10	μs
Receiver					
Channel centre wavelength*(note9)		λ-20	λ	λ+20	nm
Receiver sensitivity*(note6)	Pmin			-34	dBm
Receiver overload	Pmax	-8			dBm
Return loss		12			dB
Optical path penalty				1	dB
LOS De-Assert	LOSD			-35	dBm
LOS Assert	LOSA	-45			dBm
LOS Hysteresis*(note8)		0.5			dB

Note3: Output is coupled into a 9/125μm single-mode fiber.

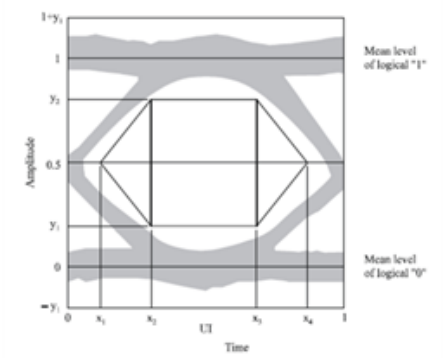
Note4: Filtered, measured with a PRBS 2^7-1 test pattern @1250Mbps.

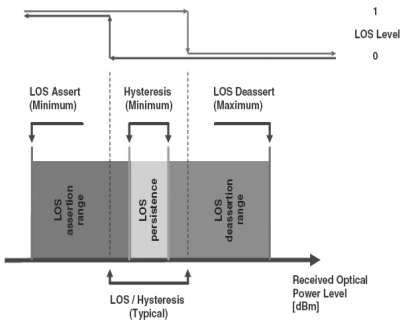
Note5: LVPECL logic, internally AC coupled.

Note6: Measured at all data rates specified in Data Rate table with ER=9 dB, 2^7-1 PRBS data pattern, BER <1E-12.

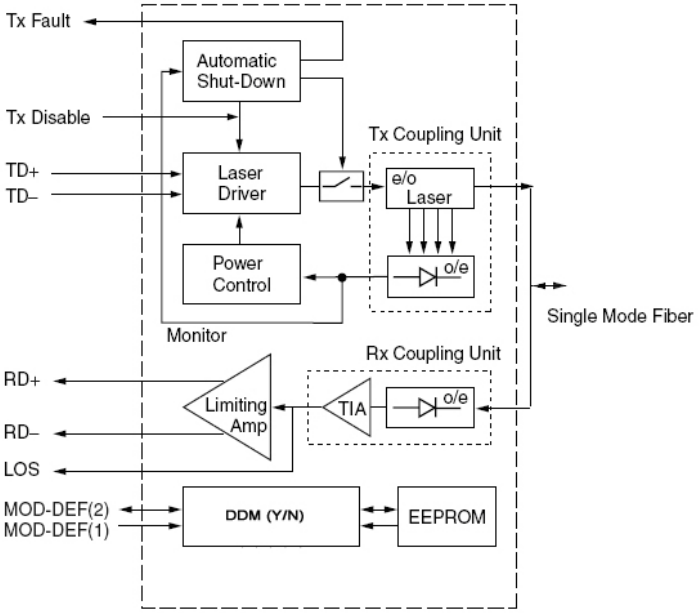
Note7: Eye pattern mask

Note8: LOS Hysteresis

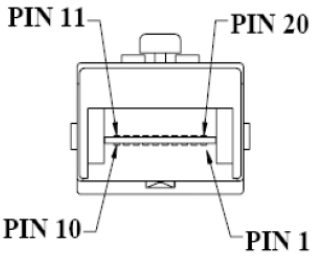


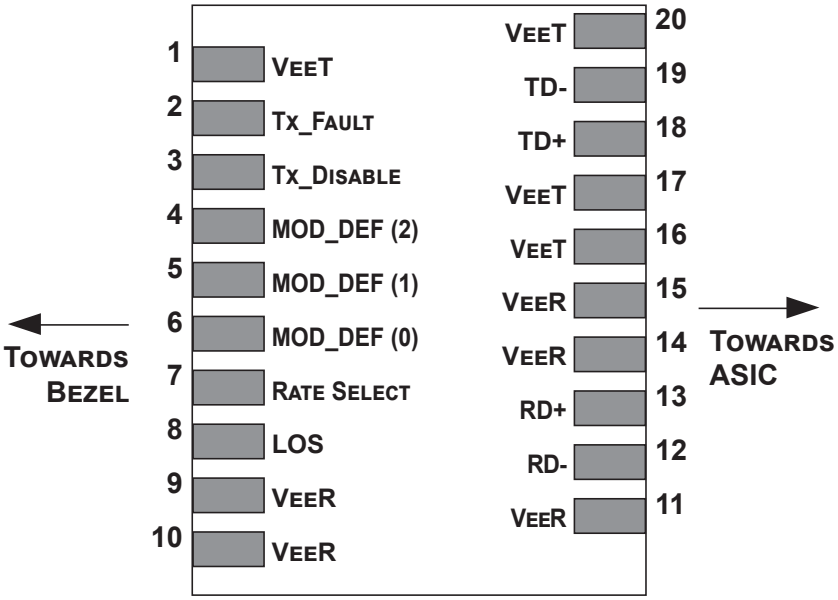


Functional description of transceiver



SFP Transceiver electrical pad layout





Pin function definitions

Pin no.	Name	Function	Plug seq.	Notes
1	VeeT	Transmitter Ground	1	5)
2	TX Fault	Transmitter Fault Indication	3	1)
3	TX Disable	Transmitter Disable	3	2) Module disables on high or open
4	MOD-DEF2	Module Definition 2	3	3) Data line for Serial ID.
5	MOD-DEF1	Module Definition 1	3	3) Clock line for Serial ID.
6	MOD-DEF0	Module Definition 0	3	3) Grounded within the module.
7	Rate Select	Not Connect	3	Function not available
8	LOS	Loss of Signal	3	4)
9	VeeR	Receiver Ground	1	5)
10	VeeR	Receiver Ground	1	5)
11	VeeR	Receiver Ground	1	5)
12	RD-	Inv. Received Data Out	3	6)
13	RD+	Received Data Out	3	7)
14	VeeR	Receiver Ground	1	5)
15	VccR	Receiver Power	2	7) 3.3 ± 5%
16	VccT	Transmitter Power	2	7) 3.3 ± 5%
17	VeeT	Transmitter Ground	1	5)
18	TD+	Transmit Data In	3	8)
19	TD-	Inv. Transmit Data In	3	8)
20	VeeT	Transmitter Ground	1	5)

1) TX Fault is an open collector/drain output, which should be pulled up with a 4.7K – 10KΩ resistor on the host board. Pull up voltage between 2.0V and VccT, R+0.3V. When high, output indicates a laser fault of some kind. Low indicates normal operation. In the low state, the output will be pulled to < 0.8V.

2) TX disable is an input that is used to shut down the transmitter optical output. It is pulled up within the module with a 4.7 – 10K Ω resistor. Its states are: Low (0 – 0.8V): Transmitter on (>0.8, < 2.0V): Undefined High (2.0 – 3.465V): Transmitter Disabled Open: Transmitter Disabled

3) Mod-Def 0,1,2. These are the module definition pins. They should be pulled up with a 4.7K – 10KΩresistor on the host board. The pull-up voltage shall be VccT or VccR (see Section IV for further details). Mod-Def 0 is grounded by the module to indicate that the module is present Mod-Def 1 is the clock line of two wire serial interface for serial ID Mod-Def 2 is the data line of two wire serial interface for serial ID

4) LOS (Loss of Signal) is an open collector/drain output, which should be pulled up with a 4.7K – 10KΩ resistor. Pull up voltage between 2.0V and VccT, R+0.3V. When high, this output indicates the received optical power is below the worst-case receiver sensitivity (as defined by the standard in use). Low indicates normal operation. In the low state, the output will be pulled to < 0.8V.

5) VeeR and VeeT may be internally connected within the SFP module.

6) RD-/+: These are the differential receiver outputs. They are AC coupled 100Ω differential lines which should be terminated with 100Ω (differential) at the user SERDES. The AC coupling is done inside the module and is thus not required on the host board. The voltage swing on these lines will be between 370 and 2000 mV differential (185 –1000 mV single ended) when properly terminated.

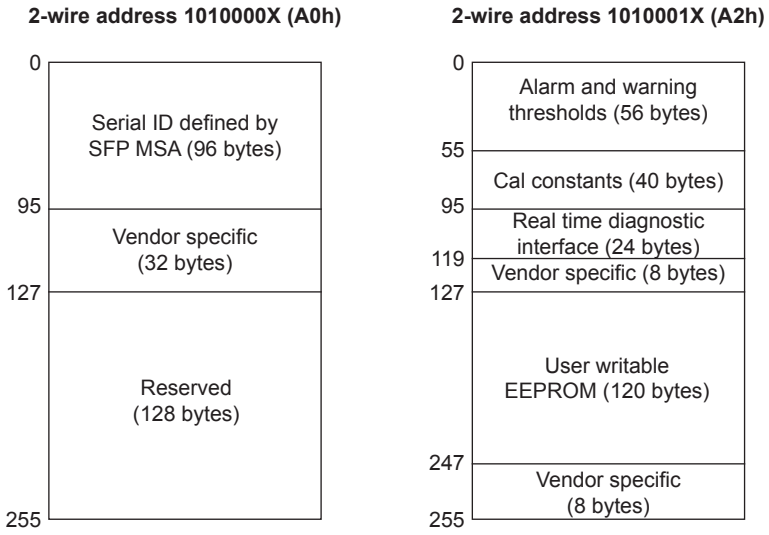
7) VccR and VccT are the receiver and transmitter power supplies. They are defined as 3.3V ±5% at the SFP connector pin. Maximum supply current is 300mA. Recommended host board power supply filtering is shown below. Inductors with DC resistance of less than 1 ohm should be used in order to maintain the required voltage at the SFP input pin with 3.3V supply voltage. When the recommended supply-filtering network is used, hot plugging of the SFP transceiver module will result in an inrush current of no more than 30mA greater than the steady state value. VccR and VccT may be internally connected within the SFP transceiver module.

8) TD-/+: These are the differential transmitter inputs. They are AC-coupled, differential lines with 100Ω differential termination inside the module. The AC coupling is done inside the module and is thus not required on the host board. The inputs will accept differential swings of 500 – 2400 mV (250 – 1200mV single-ended), though it is recommended that values between 500 and 1200 mV differential (250 – 600mV single-ended) be used for best EMI performance

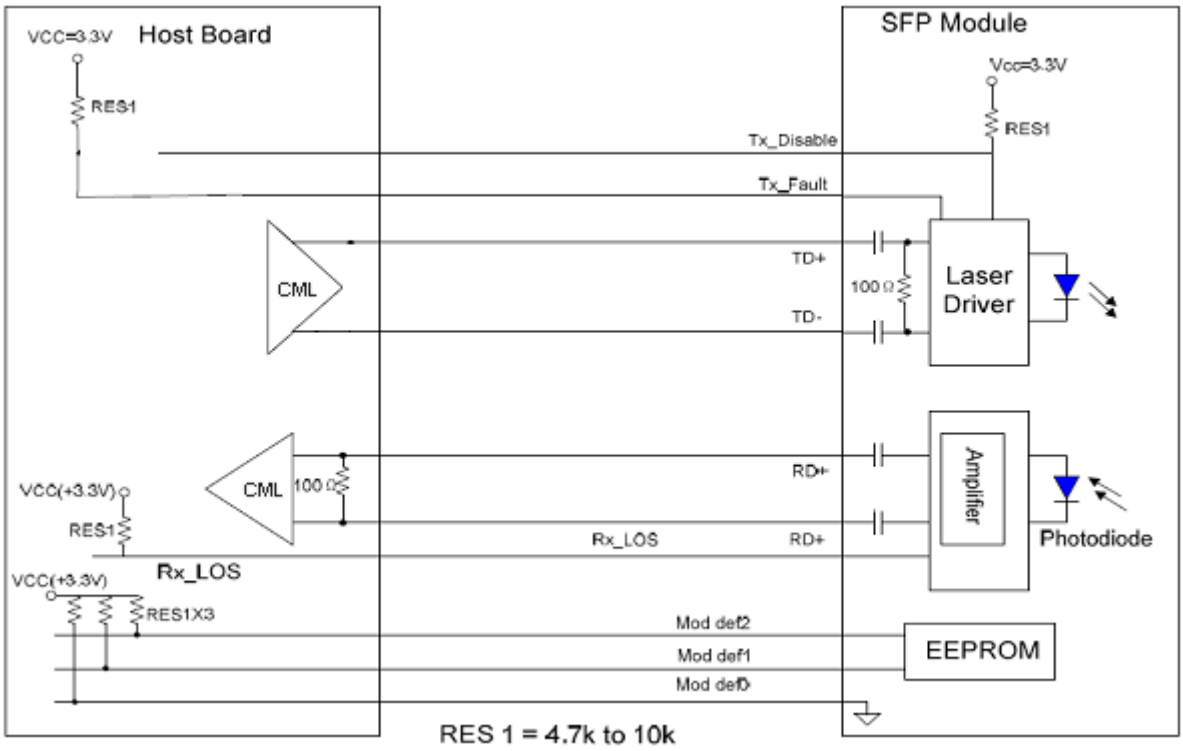
EEPROM

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 write protected within the SFP transceiver. The negative edge clocks data from the SFP 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.

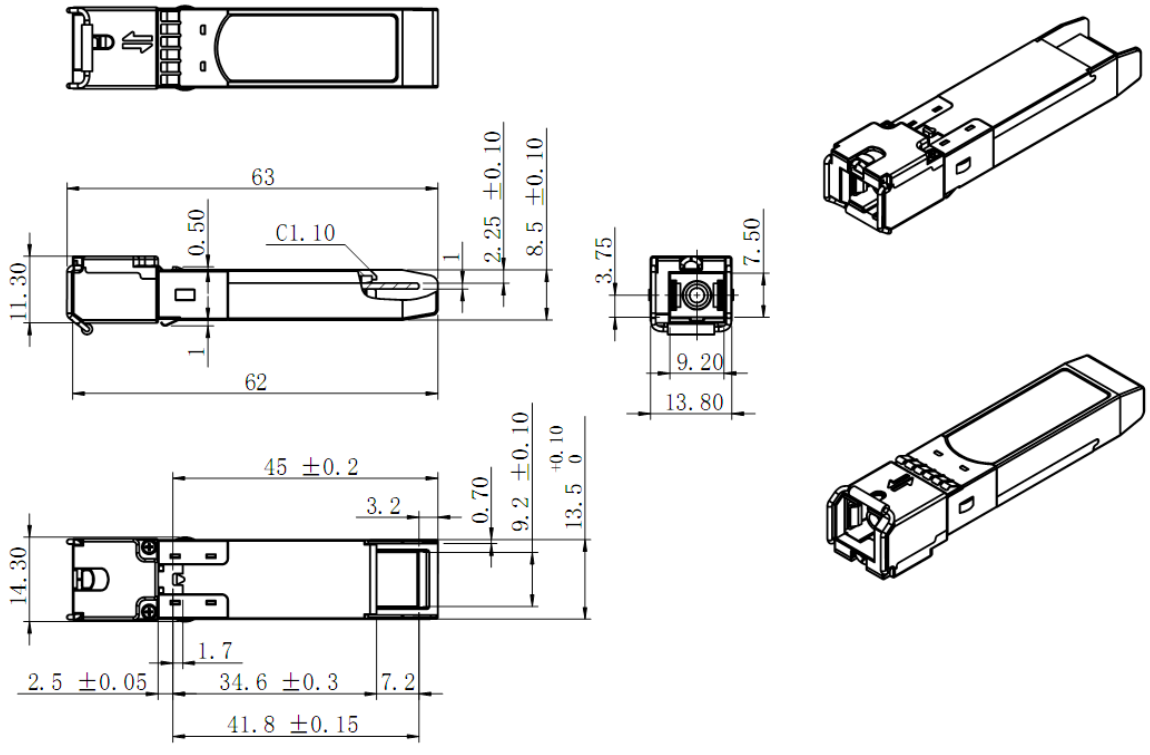
The Module provides diagnostic information about the present operating conditions. The transceiver generates this diagnostic data by digitization of internal analog signals. Calibration and alarm/warning threshold data is written during device manufacture. Received power monitoring, transmitted power monitoring, bias current monitoring, supply voltage monitoring and temperature monitoring all are implemented. The diagnostic data are raw A/D values and must be converted to real world units using calibration constants stored in EEPROM locations 56 – 95 at wire serial bus address A2h. The digital diagnostic memory map specific data field define as following .For detail EEPROM information, please refer to the related document of SFF 8472 Rev 9.3.



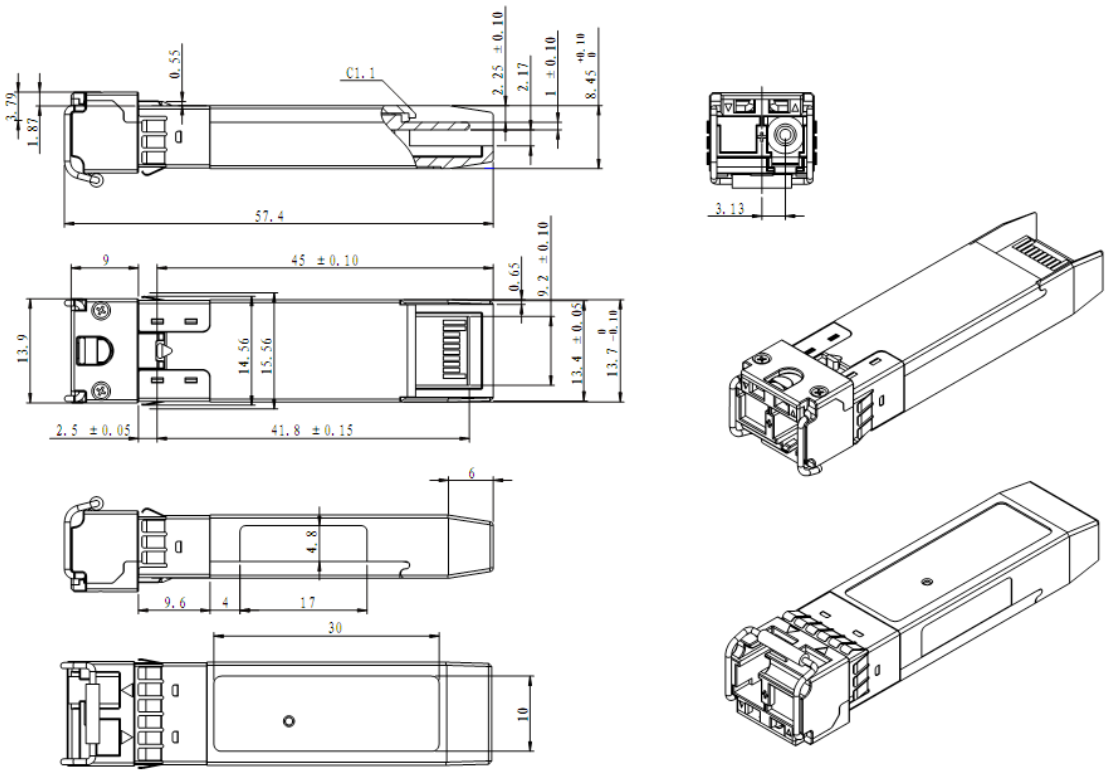
Recommend circuit schematic



Mechanical specifications

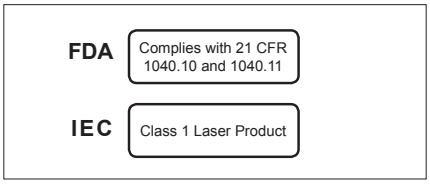


SC



LC

Class 1 Labels



Laser emission