DIxx-SFP-LC.S120

SFP Single-Mode for DWDM Application
Duplex SFP Transceiver
Digital Diagnostic Function
RoHS6 Compliant

Features

- Operating Data Rate up to 2.67Gbps
- Available in all C-Band and L-Band Wavelengths on the 100GHz DWDM ITU Grid
- Single 3.3V Power Supply and TTL Logic Interface
- Hot-Pluggable SFP Footprint Duplex LC Connector Interface
- Compliant with Class 1 FDA and IEC60825-1 Laser Safety
- Compliant with SFP MSA
- Compliant with SFF-8472
- Operating Case Temperature:
  Standard: 0°C to 70°C

Applications

- Amplified DWDM networks
- Ring topologies with fixed and reconfigurable OADMs
- Fast Ethernet, Giga Ethernet
- Fiber Channel
- CPRI rate: 2.4576Gb/s

Ordering Information

Part No.	Data Rate	Laser	Power budget *(note2)	Temp.
DIxx-SFP-LC.S120(note1)	Up to 2.67Gbps	DWDM DFB	33dB	Standard

Note1: XX refers to DWDM Wavelength range as ITU-T specified, please refer the following table for detailed center wavelength information.

Note2: The power budget which is guaranteed.

XX- Channel refers to the following table:

Channel (XX)	Part NO.	Frequency (THz)	Center Wavelength (nm)
17	DI17-SFP-LC.S120	191.7	1563.86
18	DI18-SFP-LC.S120	191.8	1563.05
19	DI19-SFP-LC.S120	191.9	1562.23
20	DI20-SFP-LC.S120	192.0	1561.42
21	DI21-SFP-LC.S120	192.1	1560.61
22	DI22-SFP-LC.S120	192.2	1559.79
23	DI23-SFP-LC.S120	192.3	1558.98
24	DI24-SFP-LC.S120	192.4	1558.17
25	DI25-SFP-LC.S120	192.5	1557.36
26	DI26-SFP-LC.S120	192.6	1556.55
27	DI27-SFP-LC.S120	192.7	1555.75
28	DI28-SFP-LC.S120	192.8	1554.94
29	DI29-SFP-LC.S120	192.9	1554.13
30	DI30-SFP-LC.S120	193.0	1553.33
31	DI31-SFP-LC.S120	193.1	1552.52
32	DI32-SFP-LC.S120	193.2	1551.72
33	DI33-SFP-LC.S120	193.3	1550.92
34	DI34-SFP-LC.S120	193.4	1550.12
35	DI35-SFP-LC.S120	193.5	1549.32
36	DI36-SFP-LC.S120	193.6	1548.51
37	DI37-SFP-LC.S120	193.7	1547.72
38	DI38-SFP-LC.S120	193.8	1546.92
39	DI39-SFP-LC.S120	193.9	1546.12
40	DI40-SFP-LC.S120	194.0	1545.32
41	DI41-SFP-LC.S120	194.1	1544.53
42	DI42-SFP-LC.S120	194.2	1543.73
43	DI43-SFP-LC.S120	194.3	1542.94
44	DI44-SFP-LC.S120	194.4	1542.14
45	DI45-SFP-LC.S120	194.5	1541.35
46	DI46-SFP-LC.S120	194.6	1540.56
47	DI47-SFP-LC.S120	194.7	1539.77
48	DI48-SFP-LC.S120	194.8	1538.98
49	DI49-SFP-LC.S120	194.9	1538.19
50	DI50-SFP-LC.S120	195.0	1537.40
51	DI51-SFP-LC.S120	195.1	1536.61
52	DI52-SFP-LC.S120	195.2	1535.82
53	DI53-SFP-LC.S120	195.3	1535.04
54	DI54-SFP-LC.S120	195.4	1534.25
55	DI55-SFP-LC.S120	195.5	1533.47

56	DI56-SFP-LC.S120	195.6	1532.68
57	DI57-SFP-LC.S120	195.7	1531.90
58	DI58-SFP-LC.S120	195.8	1531.12
59	DI59-SFP-LC.S120	195.9	1530.33
60	DI60-SFP-LC.S120	196.0	1529.55

Regulatory Compliance*

Product Certificate	Certificate Number	Applicable Standard
TUV	R50135086	EN 60950-1:2006+A11+A1+A12
		EN 60825-1:2007
		EN 60825-2:2004+A1+A2
UL	E317337	UL 60950-1
		CSA C22.2 No. 60950-1-07
EMC CE	AE 50285865 0001	EN 55022:2010
		EN 55024:2010
CB	JPTUV-049251	IEC 60825-1
		IEC 60950-1
FCC	WTF14F0514437E	47 CFR PART 15 OCT., 2013
FDA	1331340-000	CDRH 1040.10
ROHS	RHS01G006464	2011/65/EU

*The above certificate number updated to June 2014, because some certificate will be updated every year, such as FCC, FDA and ROHS. For the latest certification information, please check with Eoptolink.

Product Description

The DIxx-SFP-LC.S120 series single mode transceiver is small form factor pluggable module for duplex optical data communications. This module is designed for single mode fiber and operates at a nominal DWDM wavelength from 1528.77nm to 1565.50nm (C band) and 1578.69nm to 1610.06nm (L band) as specified by the ITU-T. It is designed to deploy in the DWDM networking equipment in metropolitan access and core networks. And they are designed to be compliant with SFF-8472 Multi-Source Agreement (MSA).

It is with the SFP 20-pin connector to allow hot plug capability. The transmitter section uses a DWDM multiple quantum well DFB laser and is a class 1 laser compliant according to International Safety Standard IEC-60825.

Absolute Maximum Ratings*[Note3]

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	%

*Note3: Exceeding any one of these values may destroy the device permanently.

Recommended Operating Conditions

Parameter		Symbol	Min.	Typical	Max.	Unit
Operating Case Temperature		T_C	0	-	+70	°C
Power Supply Voltage		V_{CC}	3.15	3.3	3.45	V
Power Supply Current		I_{CC}	-	-	450	mA
Power dissipation		P_W			1.5	W
Date Rate	OC-48/STM-16 FEC			2.67		Gbps
	OC-48/STM-16		-	2.488	-	
	2FC		-	2.125	-	
	GBE		-	1.25	-	
	FC		-	1.063	-	
	OC-12/STM-4		-	622	-	Mbps
	OC-3/STM-1		-	155	-	
	FE		-	100	-	

Performance Specifications - Electrical

Parameter		Symbol	Min.	Typ.	Max	Unit	Notes
Transmitter							
CML Inputs(Differential)		Vin	400		1600	mVpp	AC coupled inputs
Input Impedance (Differential)		Zin	85	100	115	ohm	Rin > 100 kohm @ DC
TX_Dis	Disable		2		Vcc	V	
	Enable		0		0.8		
TX_FAULT	Fault		2		Vcc	V	
	Normal		0		0.8		
Receiver							
CML Outputs (Differential)		Vout	400	800	1200	mVpp	AC coupled outputs
Output Impedance (Differential)		Zout	85	100	115	ohm	
RX_LOS	LOS		2		Vcc	V	
	Normal		0		0.8	V	
MOD_DEF (0:2)		VoH	2.5			V	
		VoL	0		0.8	V	

Performance Specifications – Optical

(DWDM DFB and APD, 30dB Power Budget at Least)

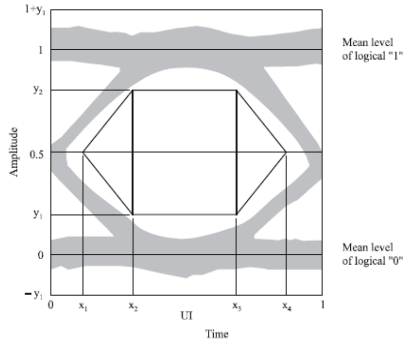
Parameter	Symbol	Min.	Typical	Max.	Unit
Data Rate			2.5		Gbps
Transmitter					
Center Wavelength	λ	1528		1610	nm
Spectral Width (-20dB)	Δλ			0.3	nm
Side Mode Suppression Ratio	SMSR	30			dB
Channel Spacing	Δf		100		GHz
Deviation From Central Frequency@EOL		-12		12	GHz
Average Output Power*(Note4)	Pout	2		5	dBm
Average Launch Power (Tx: OFF)	Poff			-45	dBm
Extinction Ratio*(Note4)	ER	8.2			dB
Rise/Fall Time(20%～80%)	tr/tf			150	ps
Output Optical Eye*(Note4)	Compatible with IEEE 802.3*(Note7)				
TX_Disable Assert Time	t_off			10	us
P_{out}@TX Disable Asserted	Pout			-45	dBm
Optical Signal Noise Ratio@0.1nm*(Note9)	OSNR		40		dB
Relative Intensity Noise	RIN			-135	dB/Hz
Dispersion Tolerance	DT		2080		ps/nm
Receiver					
Center Wavelength	λ	1528		1620	nm
Receiver Sensitivity*(Note6) Multirate*(Note5)	Pmin			-31	dBm
Receiver Overload	Pmax	-9			dBm
LOS De-Assert	LOSD			-30	dBm
LOS Assert	LOSA	-42			dBm
LOS Hysteresis*(Note8)		0.5			dB

Note4: Filtered, measured with a PRBS 2^{23}-1 test pattern @2.5Gbps.

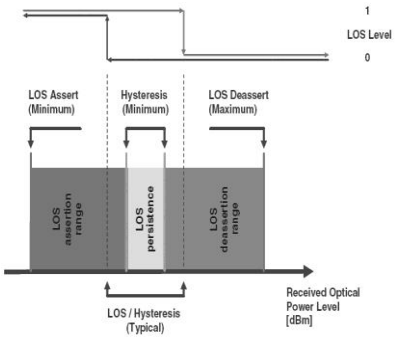
Note5: OC-48/2X FC/1X FC/OC-12/OC-03.

Note6: Measured with a PRBS 2^{23}-1 tests pattern @2.5Gbps, G.652 SMF, BER ≤1×10^{-12}.

Note7: Eye Pattern Mask

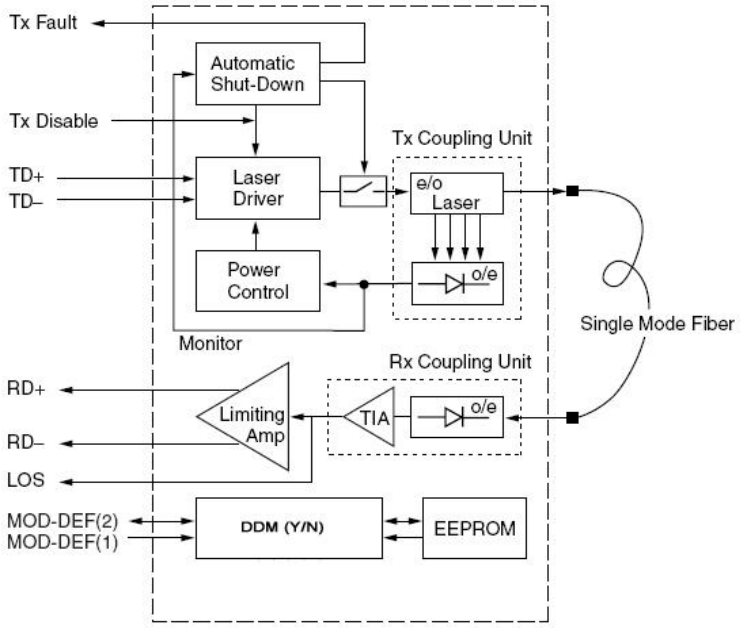


Note8: LOS Hysteresis

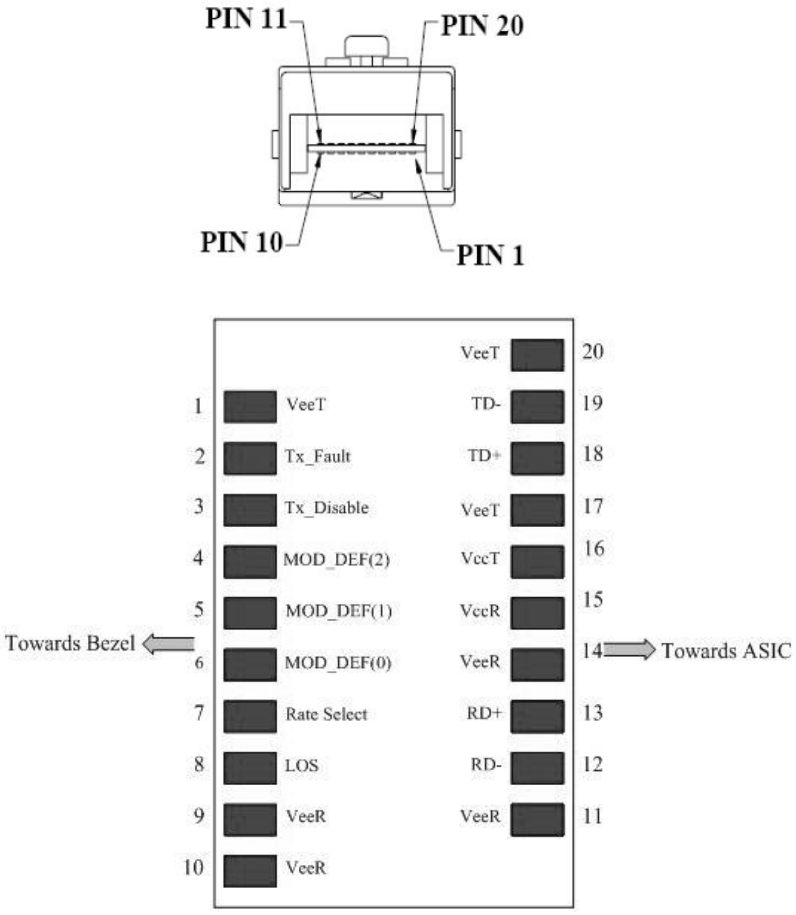


Note9: OSNR at a BER of 10e-12

Functional Description of Transceiver



SFP Transceiver Electrical Pad Layout



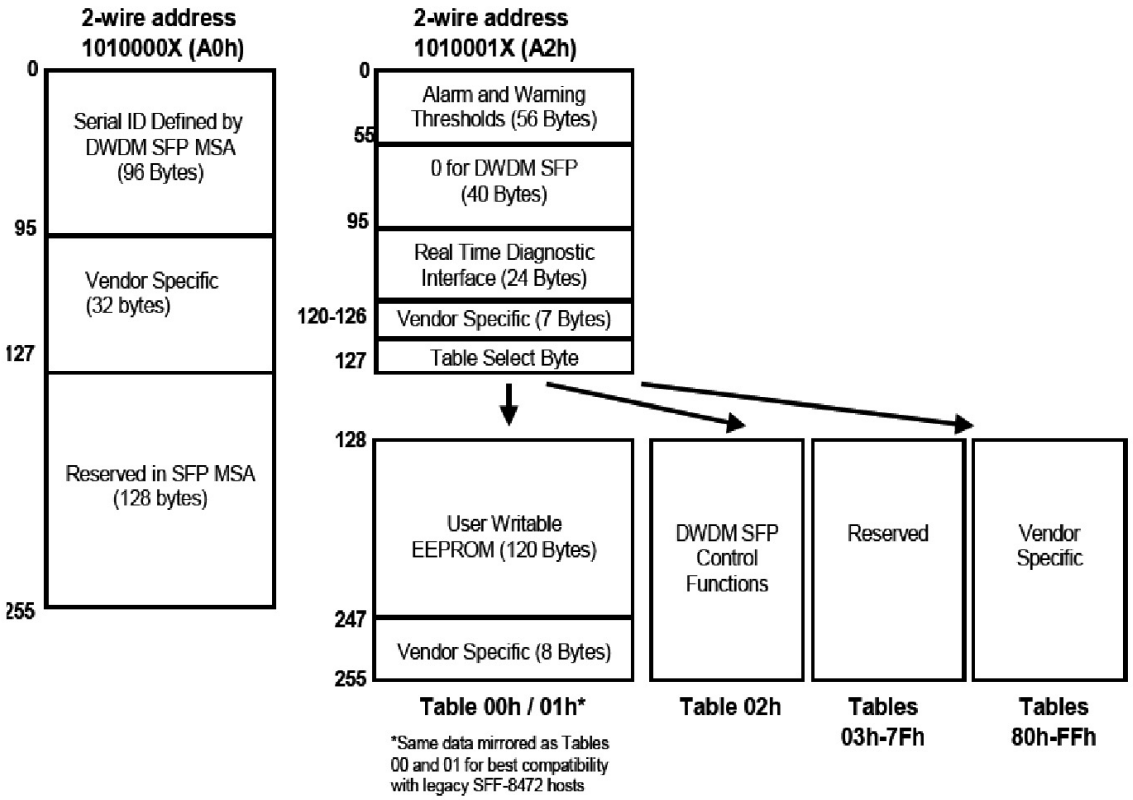
Pin Function Definitions

Pin Num.	Name	Function Description
1	VeeT	Transmitter Ground
2	TX Fault	Transmitter Fault Indication, open collector/drain output
3	TX Disable	Transmitter Disable
4	MOD-DEF2	Module Definition 2, Data line for Serial ID.
5	MOD-DEF1	Module Definition 1, Clock line for Serial ID.
6	MOD-DEF0	Module Definition 0, Grounded within the module.
7	Rate Select	Not Connect, Function not available
8	LOS	Loss of Signal, open collector/drain output
9	VeeR	Receiver Ground
10	VeeR	Receiver Ground
11	VeeR	Receiver Ground
12	RD-	Inv. Received Data Out
13	RD+	Received Data Out
14	VeeR	Receiver Ground
15	VccR	Receiver Power, 3.3 ± 5%
16	VccT	Transmitter Power, 3.3 ± 5%
17	VeeT	Transmitter Ground
18	TD+	Transmit Data In
19	TD-	Inv. Transmit Data In
20	VeeT	Transmitter Ground

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. If the module is defined as external calibrated, 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.



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

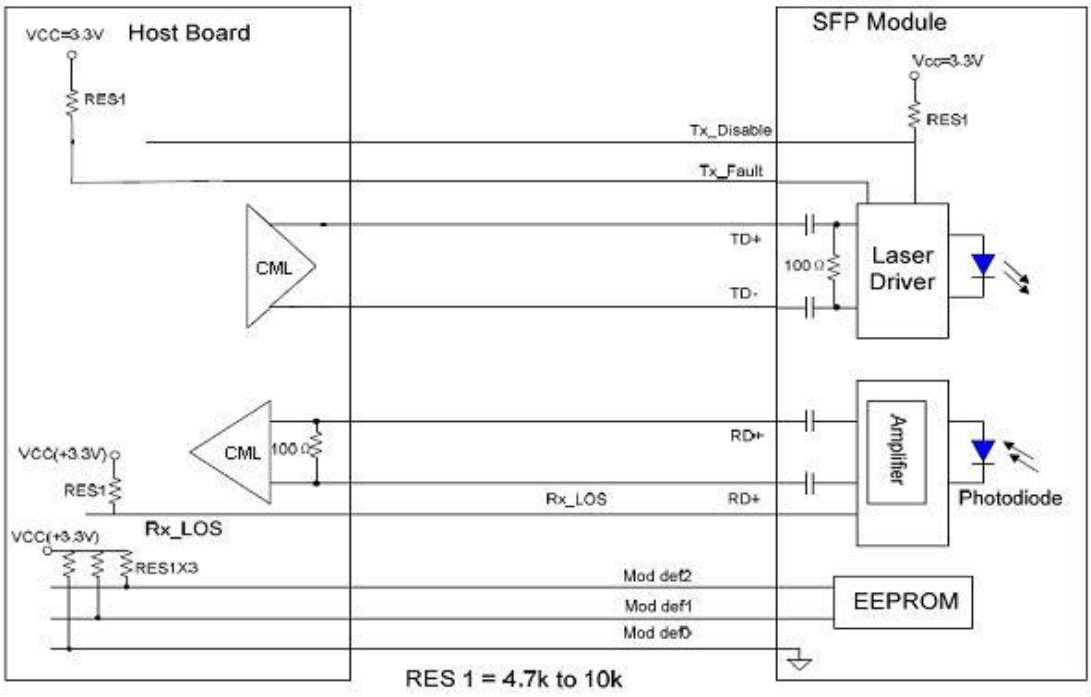
Addr.	Size (bytes)	Name of field	Vaule(Hex)	Description
0	1	Identifier	0B	DWDM SFP
1	1	Ext. Identifier	XX	
2	1	Connector	07	LC connector
3-10	8	Transceiver Codes	00	Reserved
			00	-
			00	-
			XX	
			XX	
			XX	
			01	Single mode
			XX	
11	1	Encoding	XX	
12	1	BR, Nominal	XX(Note10)	
13	1	Reserved	00	-
14	1	Length (9µm)km	XX	

15	1	Length(9μm)100m	FF	
16	1	Length (50μm) 10m	00	
17	1	Length(62.5μm)10 m	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 XX XX XX XX XX XX XX XX(Note10)	Vendor name
36	1	Implemented Optional DWDM Features	00	-
37-39	3	Vendor OUI	00 00 00	-
40-55	16	Vendor PN	XX XX XX XX XX XX XX XX XX XX XX XX XX XX XX XX(Note10)	PN
56-59	4	Vendor Rev	XX XX XX XX(Note10)	
60-62	3	Wavelength	XX	Laser Wavelength
63	1	CC-BASE	XX	CC for Base ID fields implemented (addresses 0 to62)
64~65	2	Options	00	Reserved
			1A	1.TX_DISABLE is implemented and disables the serial output; 2.TX_FAULT signal implemented; 3.Loss of Signal implemented
66	1	BR, max	00	-
67	1	BR, max	00	-
68~83	16	Vendor SN	XX	Serial number of Transceiver (ASCII)
84~89	6	Date code	XX	The vendor’s date code (ASCII)
90~91	2	Vendor specific lot code	XX XX	-
92	1	Diagnostic Monitoring Type	XX	1. Digital diagnostic monitoring implemented 2.Internally/Externally Calibrated; 3.Received power measurement type is

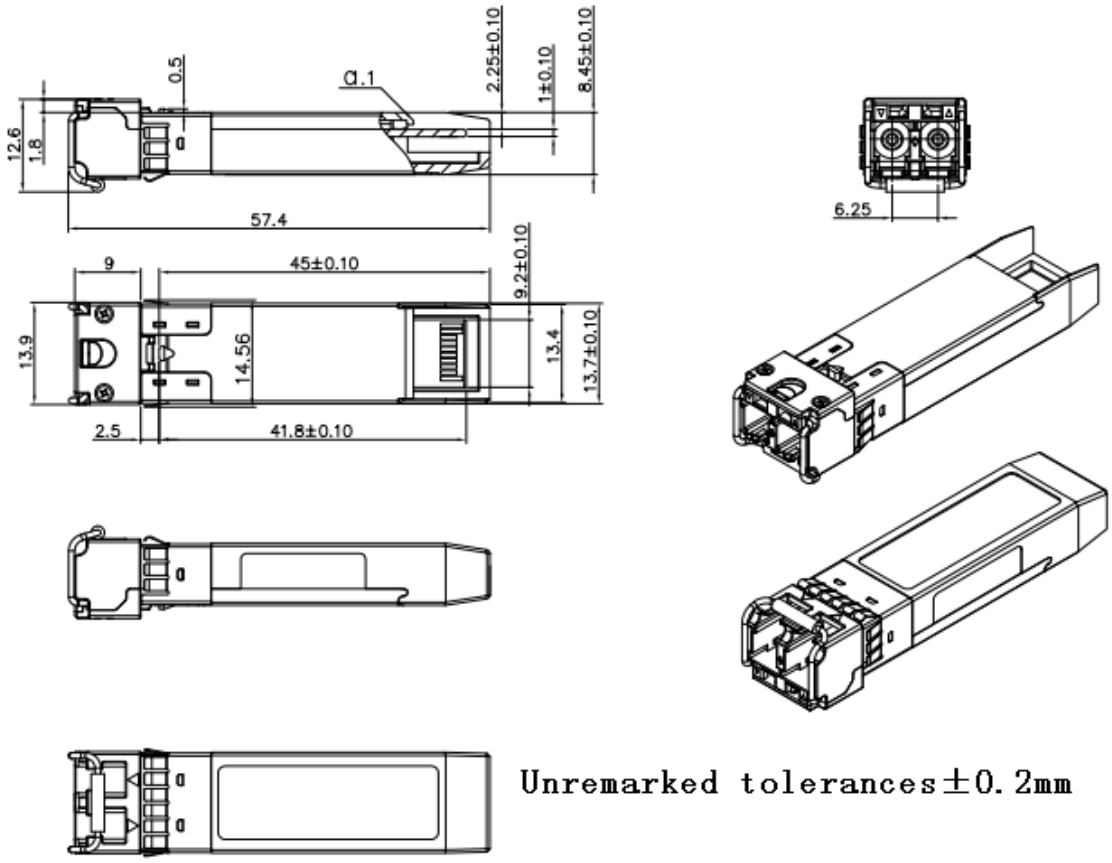
				Average Power
93	1	Enhanced Options	F0	1.Optional Alarm/warning flags implemented for all monitored quantities 2. Optional Soft TX_DISABLE control and monitoring implemented 3. Optional Soft TX_FAULT monitoring Implemented 4. Optional Soft RX_LOS monitoring Implemented
94	1	SFF-8472 Compliance	01	Includes functionality described in Rev 9.3 of SFF-8472.
95	1	CC_EXT	XX	CC for the extended ID Fields (addresses 64 to 94) implemented.
96~127	32	Vendor Specific	XX	Read only memory
128-255	128	Reserved	Read only	

Note10: The “XX” byte should be filled in according to practical case. For more information, please refer to the related document of SFP Multi-Source Agreement (MSA).

Recommend Circuit Schematic



Mechanical Specifications



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