RoHS Compliant

GbE SFP DWDM Transceiver (80km)

RDP12SZX-SxxC/H

Applications

- 1X Fiber Channel
- Gigabit Ethernet

Features

- 1.25Gb/s, DWDM optical data link
- Available all 50GHz C- band wavelengths on the ITU grid
- Cold start up wavelength compliance
- Compliant with DWDM SFP MSA
- Diagnostic Performance Monitoring of Transmit Power, Receive Power, Laser Bias, Module Temperature, Laser Temperature, Supply Voltage, TEC Current
- Very low jitter
- Metal package for lower EMI
- Single power supply voltage : +3.3V
- Low power dissipation < 1.5W maximum
- LC duplex connector
- Operating case temperature : 0℃ to 70℃

Description

OE Solutions' DWDM SFP transceivers are compatible with the Small Form Factor Pluggable 20pin DWDM Multi-Source Agreement (MSA). RDP12SZX-SxxC and RDP12SZX-SxxH complies with Gigabit Ethernet as specified in IEEE 802.3, and Fiber Channel FC-PI 13.0.

Digital diagnostics functions are available via the 2-wire serial bus specified in the SFF-8472 rev 11.0.

The transmitter features ac-coupled differential data inputs, and an LVTTL for Tx disable input and Tx fault output. The receiver features differential ac-coupled data outputs and LVTTL for LOS (Loss of Signal) output. Circuit ground is internally isolated from frame ground.

1. General Operating Conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Absolute Supply Voltage	Vcc_max	0	-	4.0	V	-
Operating Voltage	Vcc	3.135	-	3.465	V	-
Total Current	Icc	-	-	400	mA	-
Operating Case Temperature	Top	0	-	70	℃	1
Storage Temperature	Tst	-40	-	85	℃	-

Notes : 1. Measured on top side front center of SFP module.

2. Transmitter Specifications (Over Operating Case Temperature Range, Vcc = 3.135V to 3.465V)

Electrical Characteristics							
Parameter		**Symbol**	**Min.**	**Typ.**	**Max.**	**Unit**	**Notes**
Input Differential Impedance		Rin	-	100	-	Ω	-
Differential Data Input Swing		Vin,pp	500	-	2000	mV	-
Tx Disable Voltage		Vd	2	-	Vcc	V	-
Tx Enable Voltage		Ven	-	-	0.8	V	-
TxFault_Fault		Vfault	2		Vcc	V	-
TxFault_Normal		Vnormal	0		0.8	V	-
Optical Characteristics							
Optical Power		Pout	0	-	5	dBm	-
Center Wavelength	EOL	λ_0	X-50	X	X+50	pm	1
Optical Extinction Ratio		ER	9	-	-	dB	2
Eye Mask		IEEE 802.3 and SONET/SDH Compliant					
TX off Power		Poff	-	-	-30	dBm	
Channel Spacing		Δf	-	50	-	GHz	-
Side Mode Suppression Ratio		SMSR	35	-	-	dB	
Optical Rise/Fall Time		tr/tf	-	-	180	ps	3
Spectral Width (-20dB)		Dλ	-	-	0.3	nm	-
Total Generated Transmitter Jitter (peak-to-peak)		JTXp-p	-	-	0.07	UI	-
Dispersion Penalty (1600ps/nm)		DP	-	-	2	dB	4

Notes : 1. X is specified center of a channel
2. 9dB minimum for Gigabit Ethernet and Fiber Channel
3. Unfiltered, 20%~80% values
4. Measured with a PRBS of 2^7-1 at 1.25Gb/s and 1x 10^{-12} BER

Laser Safety: All transceivers in this datasheet are Class I Laser products per FDA/CDRH and IEC-60825 standards. They must be operated under specified operating conditions.

3. Receiver Specifications (Over Operating Case Temperature Range, Vcc = 3.135V to 3.465V)

Electrical Characteristics							
Parameter		**Symbol**	**Min.**	**Typ.**	**Max.**	**Unit**	**Notes**
Differential Data Output Swing		Vout,pp	400	-	1600	mV	-
Data Output Rise/Fall Time		tr/tf	-	-	180	ps	1
Optical Characteristics							
Receiver Sensitivity	BOL	RSENS	-	-	-25	dBm	2
	EOL				-24		
Maximum Input Power		Pmax	0	-	-	dBm	-
Optical Damage Threshold of Receiver		Pdamage		-	3	dBm	-
Optical Input Wavelength		λc	1525	-	1565	nm	-
LOS Assert		LOS_A	-35	-	-	dBm	-
LOS De-assert		LOS_D	-	-	-25	dBm	-
LOS Hysteresis		-	0.5	2	5	dB	-

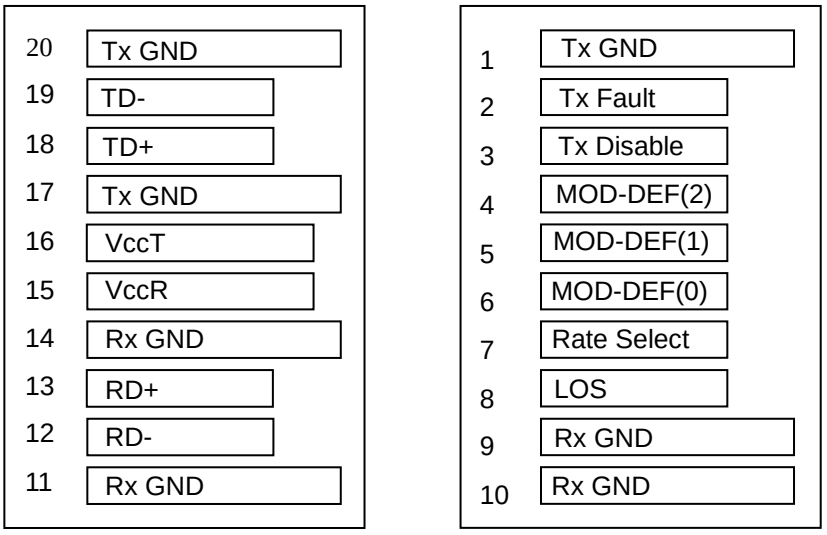
Notes : 1. 20%~80% values
2. Measured with a PRBS of 2^7-1 at 1 x 10^{-12} BER and 9dB extinction ratio

4. ITU Channel and Wavelength Guide

ITU Channel	Frequency (THz)	Wavelength (nm)	ITU Channel	Frequency (THz)	Wavelength (nm)
17C	191.70	1563.86	34C	193.40	1550.12
17H	191.75	1563.45	34H	193.45	1549.72
18C	191.80	1563.05	35C	193.50	1549.32
18H	191.85	1562.64	35H	193.55	1548.91
19C	191.90	1562.23	36C	193.60	1548.51
19H	191.95	1561.83	36H	193.65	1548.11
20C	192.00	1561.42	37C	193.70	1547.72
20H	192.05	1561.01	37H	193.75	1547.32
21C	192.10	1560.61	38C	193.80	1546.92
21H	192.15	1560.20	38H	193.85	1546.52
22C	192.20	1559.79	39C	193.90	1546.12
22H	192.25	1559.39	39H	193.95	1545.72
23C	192.30	1558.98	40C	194.00	1545.32
23H	192.35	1558.58	40H	194.05	1544.92
24C	192.40	1558.17	41C	194.10	1544.53
24H	192.45	1557.77	41H	194.15	1544.13
25C	192.50	1557.36	42C	194.20	1543.73
25H	192.55	1556.96	42H	194.25	1543.33
26C	192.60	1556.55	43C	194.30	1542.94
26H	192.65	1556.15	43H	194.35	1542.54
27C	192.70	1555.75	44C	194.40	1542.14
27H	192.75	1555.34	44H	194.45	1541.75
28C	192.80	1554.94	45C	194.50	1541.35
28H	192.85	1554.54	45H	194.55	1540.95
29C	192.90	1554.13	46C	194.60	1540.56
29H	192.95	1553.73	46H	194.65	1540.16
30C	193.00	1553.33	47C	194.70	1539.77
30H	193.05	1552.93	47H	194.75	1539.37
31C	193.10	1552.52	48C	194.80	1538.98
31H	193.15	1552.12	48H	194.85	1538.58
32C	193.20	1551.72	49C	194.90	1538.19
32H	193.25	1551.32	49H	194.95	1537.79
33C	193.30	1550.92	50C	195.00	1537.40
33H	193.35	1550.52	50H	195.05	1537.00

ITU Channel	Frequency (THz)	Wavelength (nm)
51C	195.10	1536.61
51H	195.15	1536.22
52C	195.20	1535.82
52H	195.25	1535.43
53C	195.30	1535.04
53H	195.35	1534.64
54C	195.40	1534.25
54H	195.45	1533.86
55C	195.50	1533.47
55H	195.55	1533.07
56C	195.60	1532.68
56H	195.65	1532.29
57C	195.70	1531.90
57H	195.75	1531.51
58C	195.80	1531.12
58H	195.85	1530.72
59C	195.90	1530.33
59H	195.95	1529.94
60C	196.00	1529.55
60H	196.05	1529.16
61C	196.10	1528.77

5. Pin Descriptions



SFP Transceiver Electrical Pad Layout

Pin Descriptions (continued)

Pin	Symbol	Description	Plug Seq. *	Notes
1	Tx GND	Transmitter Ground	1	1
2	Tx Fault	Transmitter Fault Indication	3	2
3	Tx Disable	Transmitter Disable	3	3
4	MOD-DEF2	Module Definition 2	3	4
5	MOD-DEF1	Module Definition 1	3	4
6	MOD-DEF0	Module Definition 0	3	4
7	Rate-Select	No User Connection	3	5
8	LOS	Los of Signal	3	6
9	Rx GND	Receiver Ground	1	1
10	Rx GND	Receiver Ground	1	1
11	Rx GND	Receiver Ground	1	1
12	RD-	Receiver Negative Data Out	3	-
13	RD+	Receiver Positive Data Out	3	-
14	Rx GND	Receiver Ground	1	1
15	VccR	Receiver Power	2	3.3V±5%
16	VccT	Transmitter Power	2	3.3V±5%
17	Tx GND	Transmitter Ground	1	1
18	TD+	Transmitter Positive Data In	3	-
19	TD-	Transmitter Negative Data In	3	-
20	Tx GND	Transmitter Ground	1	1

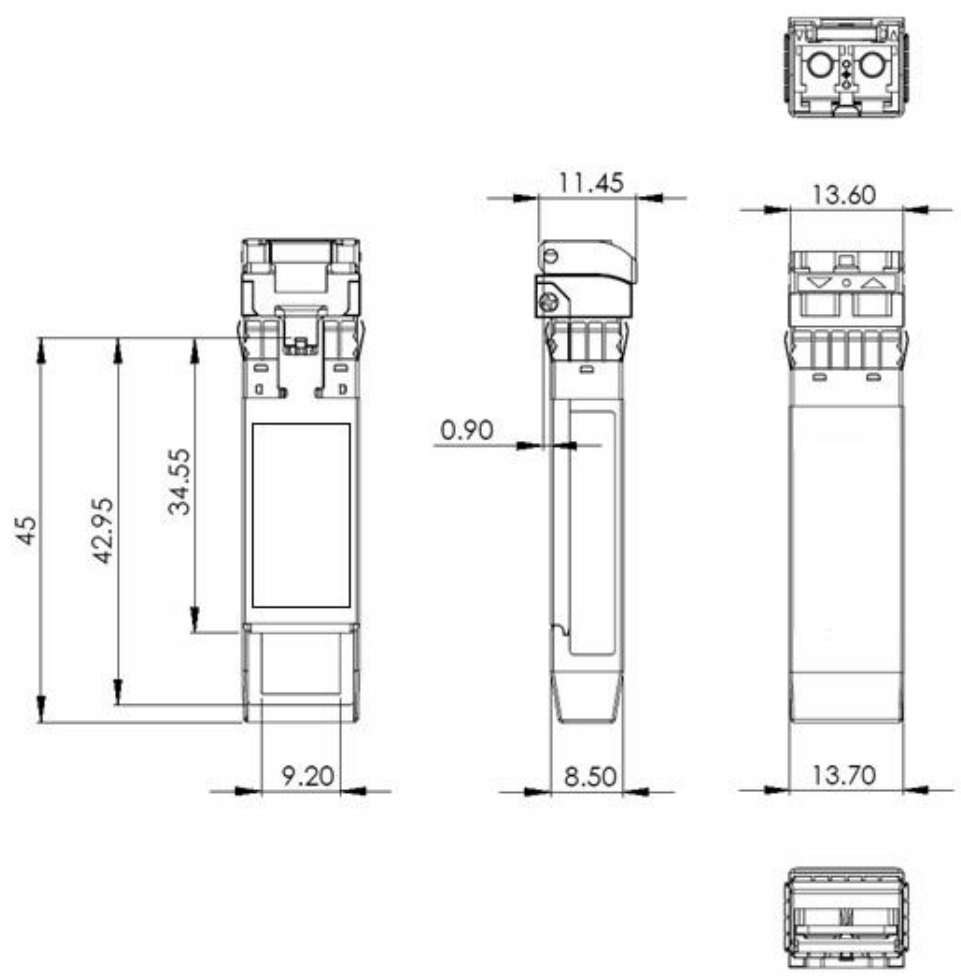
*Plug Seq. : Pin engagement sequence during hot plugging

Notes :

1. Circuit ground is internally isolated from frame ground. Tx GND and Rx GND may be internally isolated within the TRx module.
2. Tx Fault is an open collector output that shall be pulled up with a 4.7kΩ ~ 10kΩ on the host board. Pull up voltage between 2.0V and VccT + 0.3V. When high, output indicates a laser fault of some kind. When low, output indicates normal operation. The LD output is not turned off in case of Tx Fault
3. Tx Disable is an input that is used to shut down the transmitter optical output. It is pulled up within the TRx with a 4.7kΩ ~ 10kΩ.
4. MOD-DEF 0, 1, 2 are the SFP module definition pins. They should be pulled up with a 4.7kΩ ~ 10kΩ on the host board. The pull-up voltage shall be VccT.
   MOD-DEF0 indicates that the module is present.
   MOD-DEF1 is the clock line of 2-wire serial interface for serial ID
   MOD-DEF2 is the data line of 2-wire serial interface for serial ID
5. OE Solutions RDP12SZX DWDM SFP transceivers operate at SONET /SDH data rates, 1x and 2x Fiber Channel, Gigabit Ethernet data rates, and respective protocols without active control.
6. LOS is an open collector output. Shall be pulled up with a 4.7kΩ ~ 10kΩ on host board. Pull up voltage between 2.0 and VccR+0.3. Logic 0 indicates normal operation.

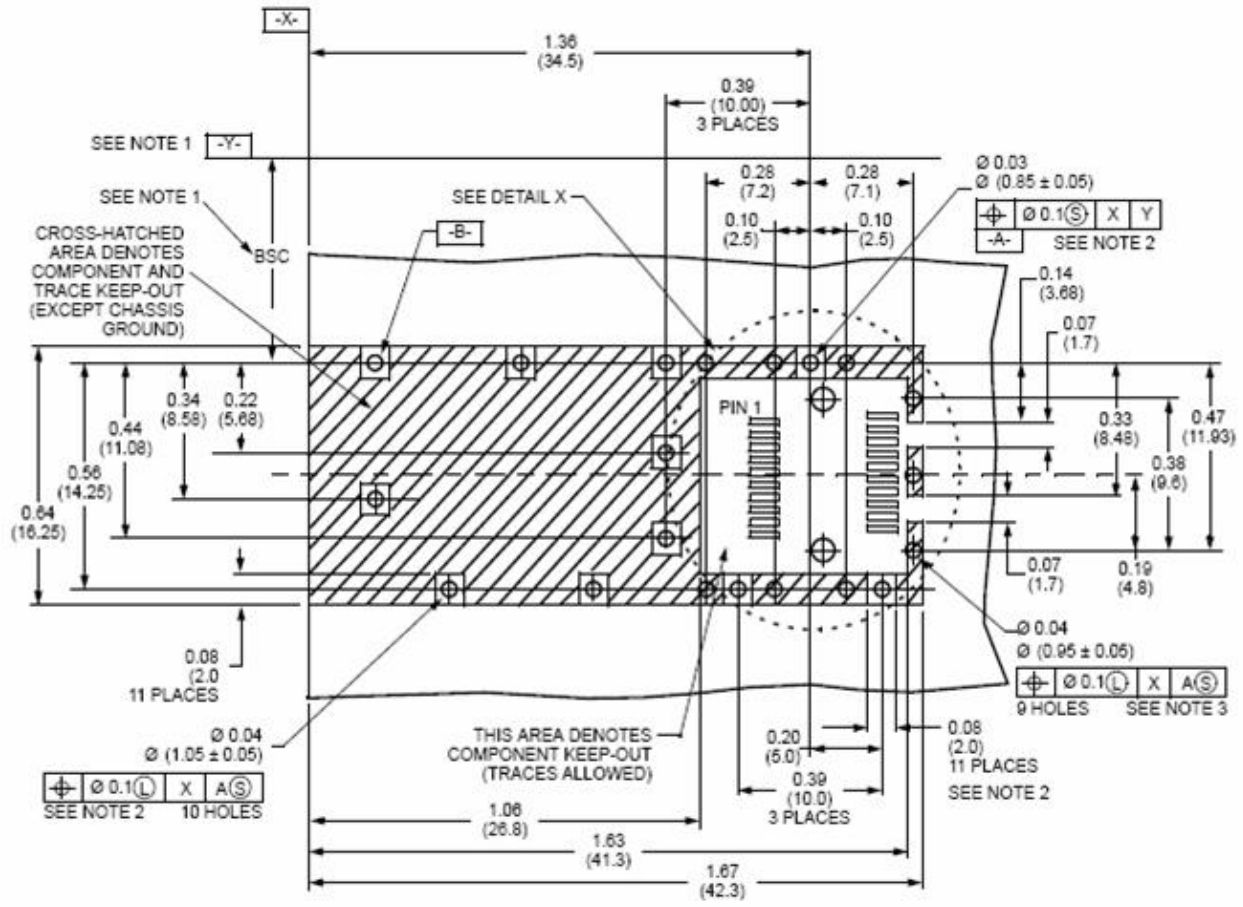
6. Outline Drawings

Dimensions are in millimeters (inches)



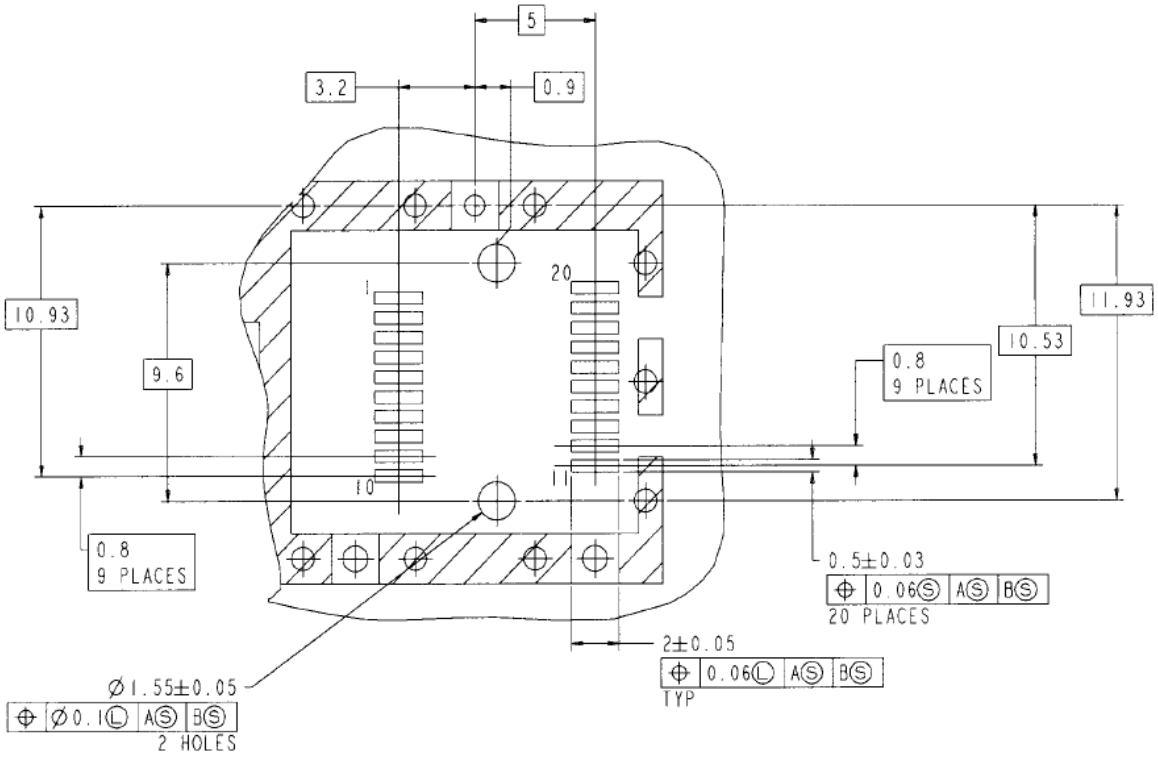
7. PCB layout and Bezel recommendation

Dimensions are in inches (millimeters)

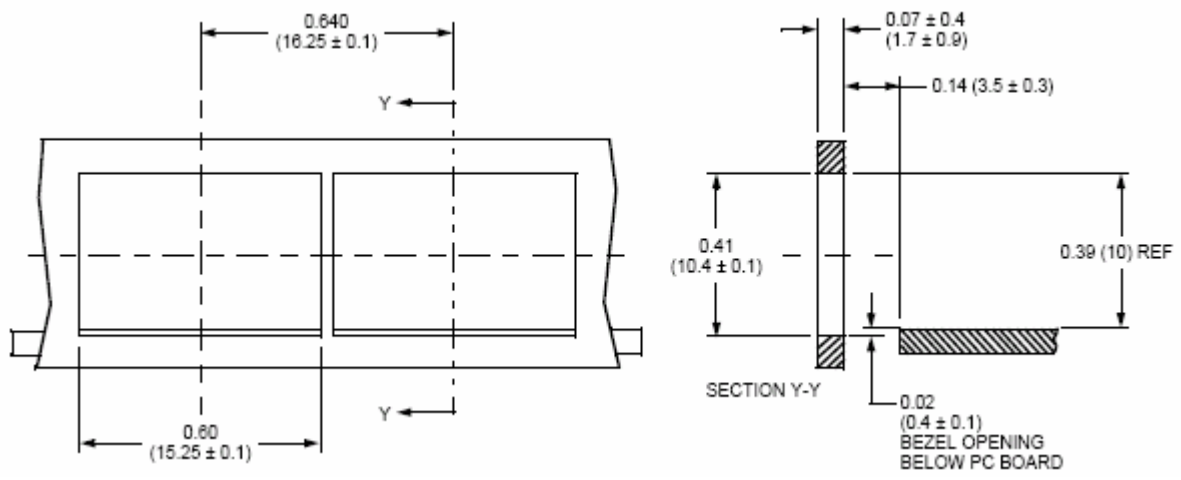


Notes : 1. Datum and basic dimensions established by customer.
2. Pads and vias are chassis ground, 11 locations
3. Thru holes, plating optional.

8. PCB layout and Bezel recommendation (continued)

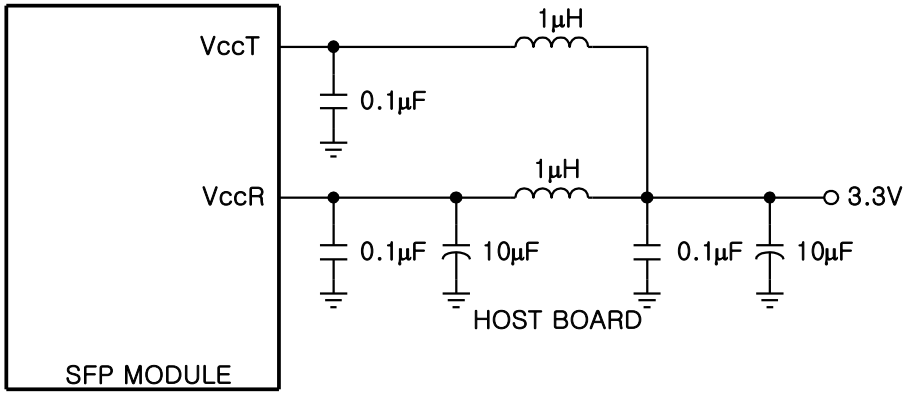


Notes : Thru holes, plating optional.

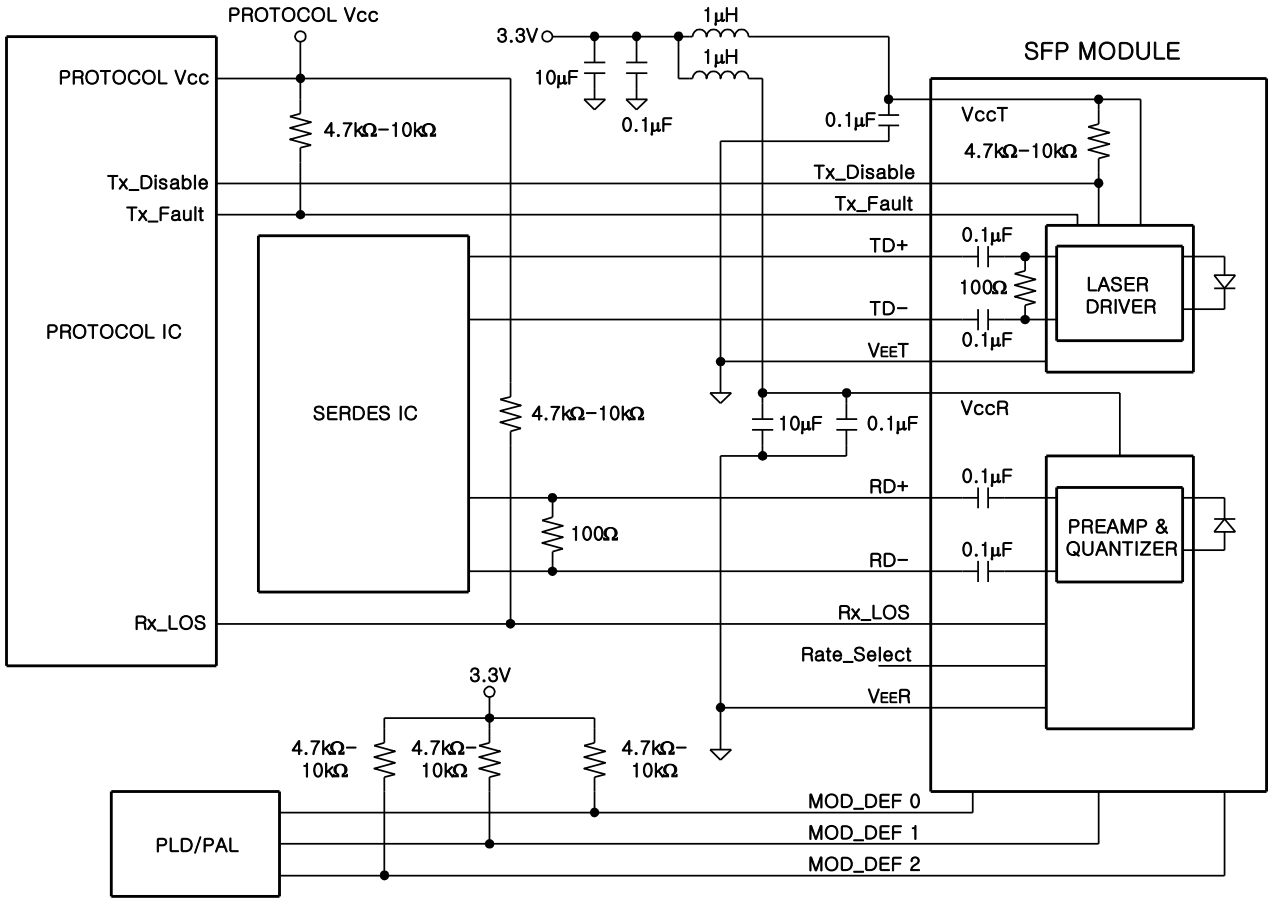


Recommended Panel Opening

9. Power Supply Information



Recommended Host Board Supply Filtering Network



SFP Host Board Schematic

10. EEPROM Serial ID

(I2C communication by both random and sequential access)

10.1 2wire address A0h

Address	HEX	Name of Fields	Description
0	0B	Identifier	[0Bh]DWDM SFP
1	24	Ext. Identifier	[10b]DWDM [01b][1W,1.5W] [00b][0,70C]
2	07	Connector	LC
3	00	Infiniband Compliance	Unpecified
4	08	Reach Specifier	SONET LR-2 compliant
5	44	SONET	OC-12, single mode long reach OC-03, single mode long reach
6	00	Gigabit Ethernet	Unspecified
7	00	Fiber Channel link length	Unspecified
8	10	Transmitter technology	[4]Longwave laser (LL)
9	01	Transmission media	[0]Single Mode (SM)
10	00	Fiber Channel Speed	
11	03	Encoding	[03h]NRZ
12	0C	Nominal Bit Rate	1.25 Gbps
13	00	Rate Identifier	Unspecified
14	50	Length(9um)-km	80km
15	46	Max Case Temp	+70C
16	00	Min Case Temp	0C
17	64	Max Supply Current	400mA
18	00	Reserved	
19	41	Channel Spacing and Tunning	Channel spacing compatibility and number of ITU channels supported
20	4F	Vendor Name	O
21	45		E
22	20		
23	53		S
24	4F		O
25	4C		L
26	55		U
27	54		T
28	49		I

29	4F		O
30	4E		N
31	53		S
32-35	20		
36	02	Opt. Features	[000b] No Pilot Tone Functionality [0b] Default TX Power Monitoring [1b] Monitor is Laser Temperature
37	00	Vendor OUI	00
38	19		19
39	3A		3A
40	52	Vendor PN	R
41	44		D
42	50		P
43	31		1
44	32		2
45	53		S
46	5A		Z
47	58		X
48	2D		-
49	53		S
50	xx		xx = (1:31h,2:32h,3:33h,4:34h,5:35h,6:36h, 7:37h, 8:38h, 9:39h, 0:30h)
51	xx		xx = (0:30h,1:31h,2:32h,3:33h,4:34h,5:35h, 6:36h,7:37h,8:38h,9:39h)
52	43/48		C : DYxx0, H : DYxx1
53-55	20		
56	30	Vendor Rev.	0
57	2E		.
58	31		1
59	Varies		Varies
60	Note 1	Wavelength[nm]	
61			
62		Wavelength(@10pm)	
63	Note 2	CC_BASE	
64	00	Reserved	
65	1A	Option Values [5]Rate Select [4]Tx Disable	[4] Tx Disable [3] TX Fault [1] LOS

		[3]TX Fault [2]SD [1]LOS	
66	00	Bit Rate, max[%]	Unspecified
67	00	Bit Rate, min[%]	Unspecified
68-83	Note 3	Vendor S/N	
84-91	Note 4	Date Code	
92	68	Diagnostic Monitoring Type Digital diagnostic[6] Internally Cailbrated[5] Externally Calibrated[4] Average Power[3] Address change req[2]	[6] Digital diagnostic [5] Internally Calibrated [3] Average Power
93	F0	Enhanced Options [7]Alarm/Warm Impl. [6]Soft TX Dis Control [5]Soft TX Fault monitor [4]Soft Rx LOS monitor [3]Soft RATE_SEL Control [2]App Select Control [1]Rate Select Control	[7] Alarm/Warm Impl. [6] Soft TX Dis Control [5] Soft TX Fault monitor [4] Soft Rx LOS monitor
94	05	SFF-8472 Compliance	Rev. 11.0 of SFF-8472
95	Note 5	CC_EXT	
96~127	00	Vendor Specific(Read only)	

Note 1. 16-bit integer value in nm with byte 60 as high byte, byte 61 as low byte. The fractional part of the wavelength in units of 0.01nm written in byte 62. Varies

Note 2. Address 63 is check sum of byte 0-62.Varies

Note 3. Address 68-83 is Vendor Serial Number. Varies

Note 4. Address 84-91 is Date Code. Varies

Note 5: Address 95 is check sum of byte 64-94, Varies

10.2 2wire address A2h

Address	HEX	Name of Fields	Description
0	55	Temp High Alarm	85.00 [℃]
1	00		
2	F6	Temp Low Alarm	-10.00 [℃]
3	00		
4	50	Temp High Warning	80.00 [℃]

5	00		
6	FB	Temp Low Warning	-5.00 [℃]
7	00		
8	8D	Voltage High Alarm	3.63 [V]
9	CC		
10	74	Voltage Low Alarm	2.97 [V]
11	04		
12	87	Voltage High Warning	3.47 [V]
13	8C		
14	7A	Voltage Low Warning	3.14 [V]
15	A8		
16	88	Bias High Alarm	70.00 [mA]
17	B8		
18	01	Bias Low Alarm	1.00 [mA]
19	F4		
20	75	Bias High Warning	60.00 [mA]
21	30		
22	03	Bias Low Warning	2.00 [mA]
23	E8		
24	C3	Tx High Alarm	7.00 [dBm]
25	C7		
26	18	Tx Low Alarm	-2.00 [dBm]
27	A6		
28	AE	Tx High Warning	6.50 [dBm]
29	7C		
30	1B	Tx Low Warning	-1.50 [dBm]
31	A7		
32	31	Rx High Alarm	1.00 [dBm]
33	2D		
34	00	Rx Low Alarm	-29.00 [dBm]
35	0D		
36	27	Rx High Warning	0.00 [dBm]
37	10		
38	00	Rx Low Warning	-26.00 [dBm]
39	19		
40	Note 1	Laser T/High Alarm	Set=Laser temp + 1 ℃
41			
42		Laser T/Low Alarm	Set=Laser temp -1 ℃

43			
44		Laser T/High Warning	Set=Laser temp + 1 ℃
45			
46		Laser T/Low warning	Set=Laser temp – 1 ℃
47			
48	1B	TEC Current High Alarm	700.00 [mA]
49	58		
50	E4	TEC Current Low Alarm	-700.00 [mA]
51	A8		
52	17	TEC Current High Warning	600.00 [mA]
53	70		
54	E8	TEC Current Low Warning	-600.00 [mA]
55	90		
56~59	00	Rx PWR(4)	0.00
60~63	00	Rx PWR(3)	0.00
64~67	00	Rx PWR(2)	0.00
68	3F	Rx PWR(1)	1.00
69	80		
70	00		
71	00		
72~75	00	Rx PWR(0)	0.00
76	01	Bias (Slope)	1.00
77	00		
78~79	00	Bias (Offset)	0.00
80	01	Tx Power (Slope)	1.00
81	00		
82~83	00	Tx Power (Offset)	0.00
84	01	Temp (Slope)	1.00
85	00		
86~87	00	Temp (Offset)	0.00
88	01	Vcc (Slope)	1.00
89	00		
90~91	00	Vcc (Offset)	0.00
92~94	00	Reserved	
95	Note 2	Checksum	
96	Note 3	Temperature MSB	
97		Temperature LSB	
98		Vcc MSB	

99		Vcc LSB	
100		TX Bias MSB	
101		TX Bias LSB	
102		TX Power MSB	
103		TX Power LSB	
104		RX Power MSB	
105		RX Power LSB	
106		Laser Temp MSB	
107		Laser Temp LSB	
108		TEC Current MSB	
109		TEC Current LSB	
110	Note 4	Optional Status Tx Disable Input[7] Soft TX Disable[6] RX Rate Select State[4] Tx Fault Output[2] Loss of Signal Output[1] Data_Ready_Bar[0]	
111	17	Reserved	
112	Note 5	Alarm Flag [7]Temp High Alarm [6]Temp Low Alarm [5]Vcc High Alarm [4]Vcc Low Alarm [3]TX Bias High Alarm [2]TX Bias Low Alarm [1]TX Power High Alarm [0]TX Power Low Alarm	
113		[7]RX Power High Alarm [6]RX Power Low Alarm [5]Laser T High Alarm [4]Laser T Low Alarm [3]TEC Current High Alarm [2]TEC Current Low Alarm [1] Reserved [0] Reserved	
114	00	Alarm Mask	Masking bit corresponding to alarm bits of Byte 112
115	00	Alarm Mask	Masking bit corresponding to alarm bits of Byte 113

116	Note 6	Warning Flag [7]Temp High Warning [6]Temp Low Warning [5]Vcc High Warning [4]Vcc Low Warning [3]TX Bias High Warning [2]TX Bias Low Warning [1]TX Power High Warning [0]TX Power Low Warning	
117		[7]RX Power High Warning [6]RX Power Low Warning [5]Laser T High Warning [4]Laser T Low Warning [3]TEC Current High Warning [2]TEC Current Low Warning [1]Reserved [0]Reserved	
118	00	Warning Mask	Masking bit corresponding to warning bits of Byte 116
119	00	Warning Mask	Masking bit corresponding to warning bits of Byte 117
120~149	00	Vendor Specific	
150~247	00	User EEPROM	User writable EEPROM
248~255	00	Vendor Specific	Vendor Specific control functions

Note 1. Warning/Alarm threshold value for Laser temperature. Varies

Note 2. Address 95 is check sum of byte 0-94, Varies

Note 3. Real time Diagnostic register value, Varies

Note 4. Optional Status and Control register value, Varies

Note 5. Alarm Status register value, Varies

Note 6. Warning Status register value, Varies

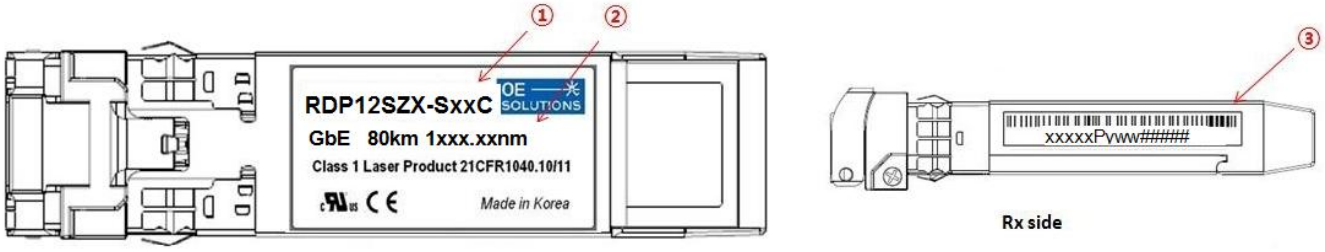
Note 7, The Byte value defines the table location for subsequent reads and writes to Bytes locations 128-255

11. Diagnostics

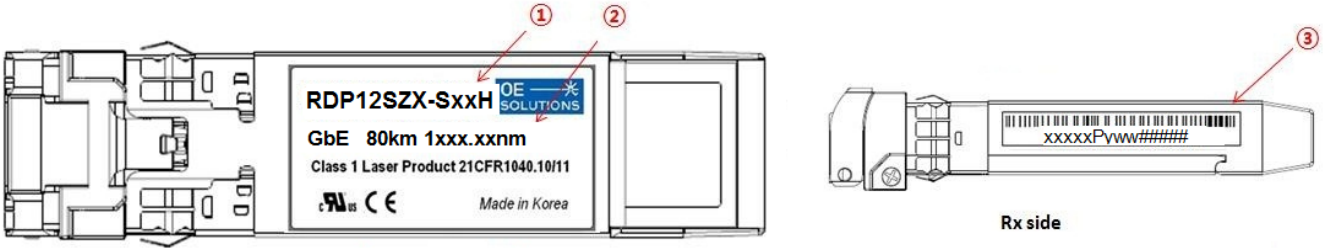
Parameter	Accuracy	Range
Temperature	+/- 3 ^{o}C	0 to 70 (^{o}C)
Voltage	0.1 V	0 to Vcc (V)
Tx bias Current	5 mA	0 to 120 (mA)
Tx power	+/- 2dB	0 to 5 (dBm)
Rx Power	+/- 2dB	-25 to 0 (dBm)
TEC Current	+/- 60mA	-1200 to 1200 (mA)
TEC Temperature [1]	+/- 0.25 ^{o}C	20 to 70 (^{o}C)

Note 1: Relative Accuracy. Absolute accuracy is +/- 3 ^{o}C

12. Label



1. P/N : RDP12SZX-SxxC / 2. Bit rate , Reach , Wavelength : GbE 80km 1xxx.xxnm / 3. S/N



1. P/N : RDP12SZX-SxxH / 2. Bit rate , Reach , Wavelength : GbE 80km 1xxx.xxnm / 3. S/N

13. Ordering Information

OES Model Name [1]	OES P/C	Operating Temperature	Latch Color	Distance
RDP12SZX-SxxC	DYxx0	0ºC to 70ºC	White	80km
RDP12SZX-SxxH	DYxx1	0ºC to 70ºC	White	80km

Note1: xx denotes the ITU channel shown in Section 4.

Revision history

Date	Rev. #	Description	Author
10/03/2013	Rev. A.0	First release	JSYU

Contact Information:

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