Technical Specification
for
Small Form Factor Pluggable (SFP)

SCP9FB8-GL-CN-xxxx (Diagnostic Monitoring with Internal Calibration)

☐ 155.52Mbps	☐ 622.08Mbps	☑ other Up to 2.7Gbps Multi Rate
☐ Short Haul Intermediate Reach	☐ Long Haul Long Reach	☑ other 3200ps/nm
☐ Single 5.0 V	☑ Single 3.3 V	☐ other
☐ 1.3 µm	☐ 1.55 µm	☑ other DWDM (APD)
☑ W/ Diagnostic Monitor	☐ W/O Diagnostic Monitor	

SUMITOMO ELECTRIC

#Safety Precaution Symbols This specification uses various picture symbols to prevent possible injury to operator or other persons or damage to properties for appropriate use of the product. The symbols and definitions are as shown below. Be sure to be familiar with these symbols before reading this specification.

⚠ Warning	Wrong operation without following this instruction may lead to human death or serious injury.
⚠ Caution	Wrong operation without following this instruction may lead to human injury or property damage.

Example of picture symbols ❗ indicates prohibition of actions. Action details are explained thereafter.
⃠ indicates compulsory actions or instructions. Action details are explained thereafter.

1. General

Features and applications of SCP9FB8-GL-CN-xxxx are listed below.

Features

* RoHS 6/6 Compliant
* C-band DWDM Transceivers
* Cooled DWDM DFB laser transmitter
* Compliant with SFP MSA.
* SFF-8472 rev.9.3 compliant diagnostic monitoring implemented.
* DWDM SFP Rev1.0 Variable Decision threshold Control implemented.
* Multiple Bit Rate Operation 622.08Mbps to 2.7Gbps
* Power Supply voltage Single 3.3V
* Compact package size 56.5 x 13.7 x 8.6mm
* Electrical Interface AC coupled for DATA, LVTTL for Tx Disable and open collector output for LOS and Tx Fault. Circuit ground is internally isolated from frame ground.
* Fiber Coupled Power 0 to +4dBm
* Input Power Range -28 to -9dBm
* Link budget 28dB
* Dispersion Penalty Max. 3.5dB (3200ps/nm)

Applications

* Switch to Switch interface
* Switch backbone applications
* High speed interface for file server

2. Block Diagram

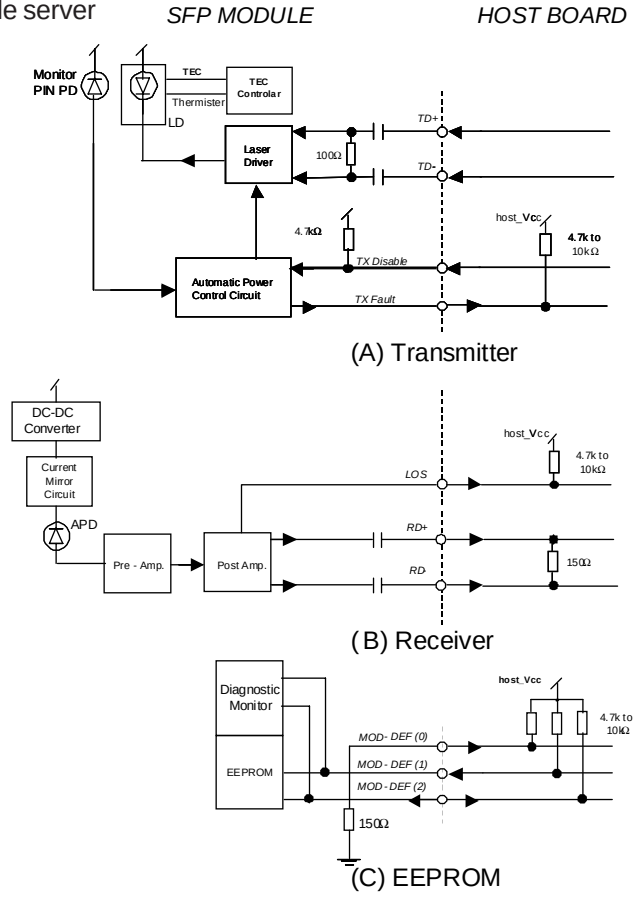
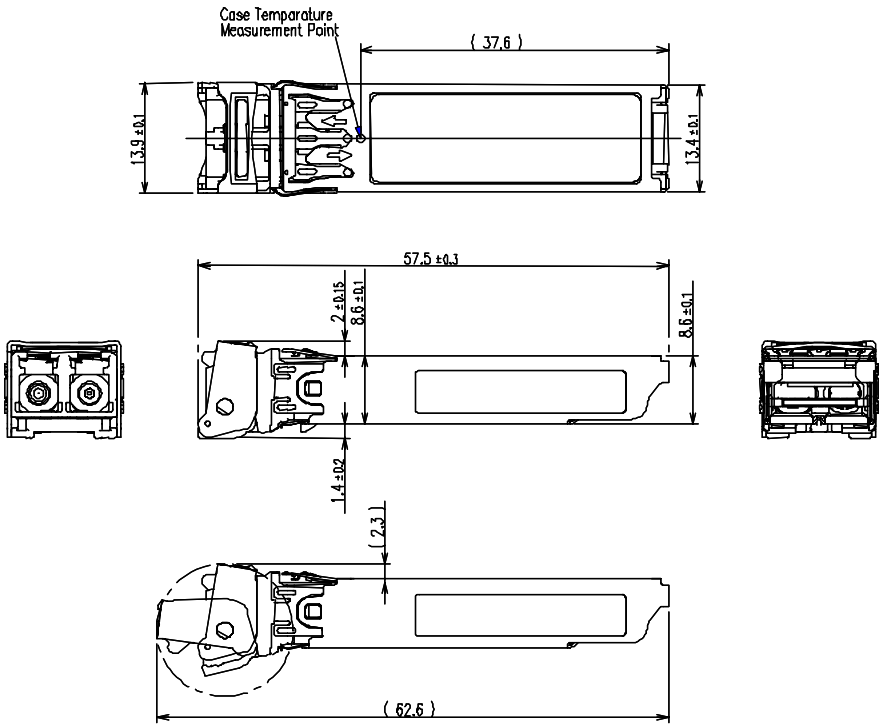


Figure 1. Block Diagram

⚠Caution
⃠ Do not disassemble this product. Otherwise, failure, electrical shock, overheating or fire may occur.

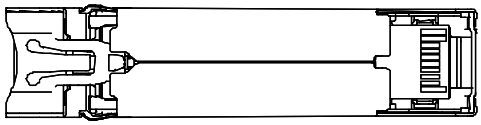
3. Package Dimensions

All dimensions are in mm.



*Bail material: Stainless Steel

NOTES:
1.UNIT;mm



* Recommended Cage and Connector

-Top EMI Cage 1367035-1(Tyco/Electronics:1308292--AMP-04/00)
-Bottom EMI Cage 1367034-1(Tyco/Electronics:1308292--AMP-04/00)
-Host Connector 1367073-1(Tyco/Electronics:1308292--AMP-04/00)

Please refer to their latest specifications.

Figure 2. Outline Dimensions

4. Pin Assignment

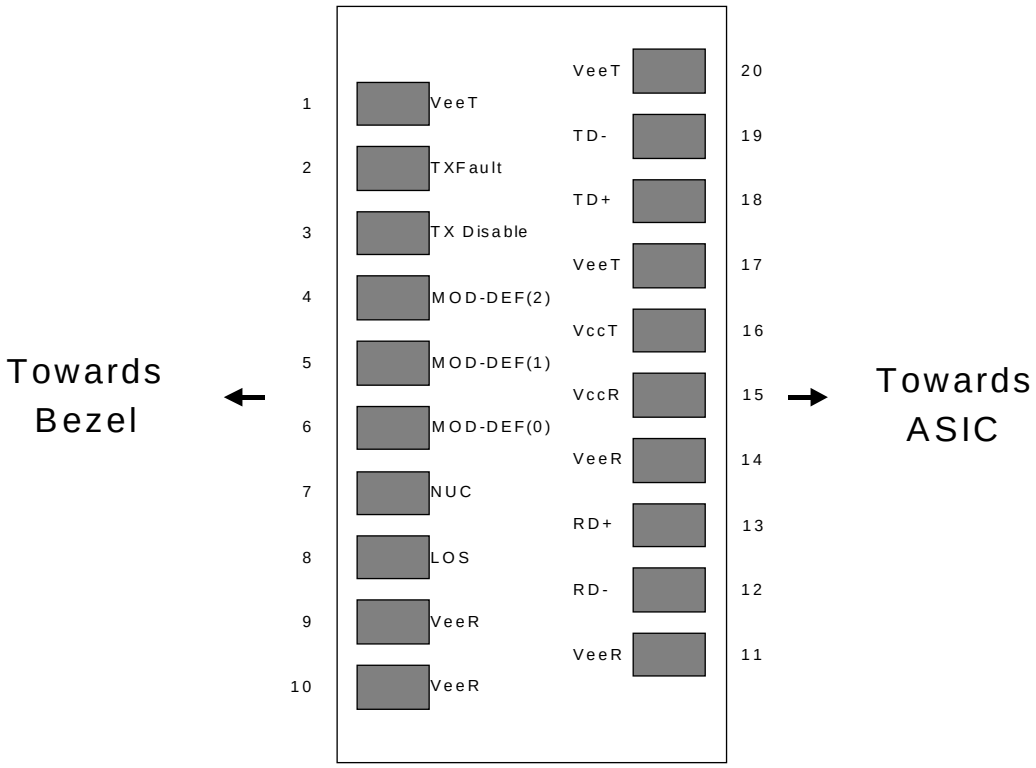


Figure 3. Diagram of Host Board Connector Block Pin Numbers and Names

Pin Num.	Name	Function	Plug Seq.	Notes
1	VeeT	Transmitter Ground	1	
2	TX Fault	Transmitter Fault Indication	3	Note 1
3	TX Disable	Transmitter Disable	3	Note 2 Module disables on high or open
4	MOD-DEF2	Module Definition 2	3	Note 3, 2 wire serial ID and Interface
5	MOD-DEF1	Module Definition 1	3	Note 3, 2 wire serial ID and Interface
6	MOD-DEF0	Module Definition 0	3	Note 3 Grounded internally via R (TBD)
7	NUC	NUC	3	No User Connection, reserved for future function.
8	LOS	Loss of Signal	3	Note 4
9	VeeR	Receiver Ground	1	
10	VeeR	Receiver Ground	1	
11	VeeR	Receiver Ground	1	
12	RD-	Inv. Receiver Data Out	3	Note 5
13	RD+	Receiver Data Out	3	Note 5
14	VeeR	Receiver Ground	1	
15	VccR	Receiver Power	2	3.3V± 5%
16	VccT	Transmitter Power	2	3.3V± 5%
17	VeeT	Transmitter Ground	1	
18	TD+	Transmitter Data In	3	Note 6
19	TD-	Inv. Transmitter Data In	3	Note 6
20	VeeT	Transmitter Ground	1	

Plug Seq.: Pin engagement sequence during hot plugging.

Note

1) Tx Fault is an open collector output that shall be pulled up with a 4.7k - 10kΩ resistor on the host board. Pull up voltage between 2.4V and VccT V. When high, output indicates a laser fault of some kind. Low indicates normal operation.
   Tx Fault is asserted when a) bias current of laser, b) LD temperature exceed the factory-calibrated threshold level.

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 4.7kΩ resistor.

3) Mod-Def 0,1,2. These are the module definition pins. They should be pulled up with a 4.7k - 10kΩ resistor on the host board. The pull-up voltage shall be VccT.

   Mod-Def 0 indicates 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 output that shall be pulled up with a 4.7k - 10kΩ resistor. Pull up voltage between 2.4V and VccR V. Low indicates normal operation.

5) 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.

6) 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.

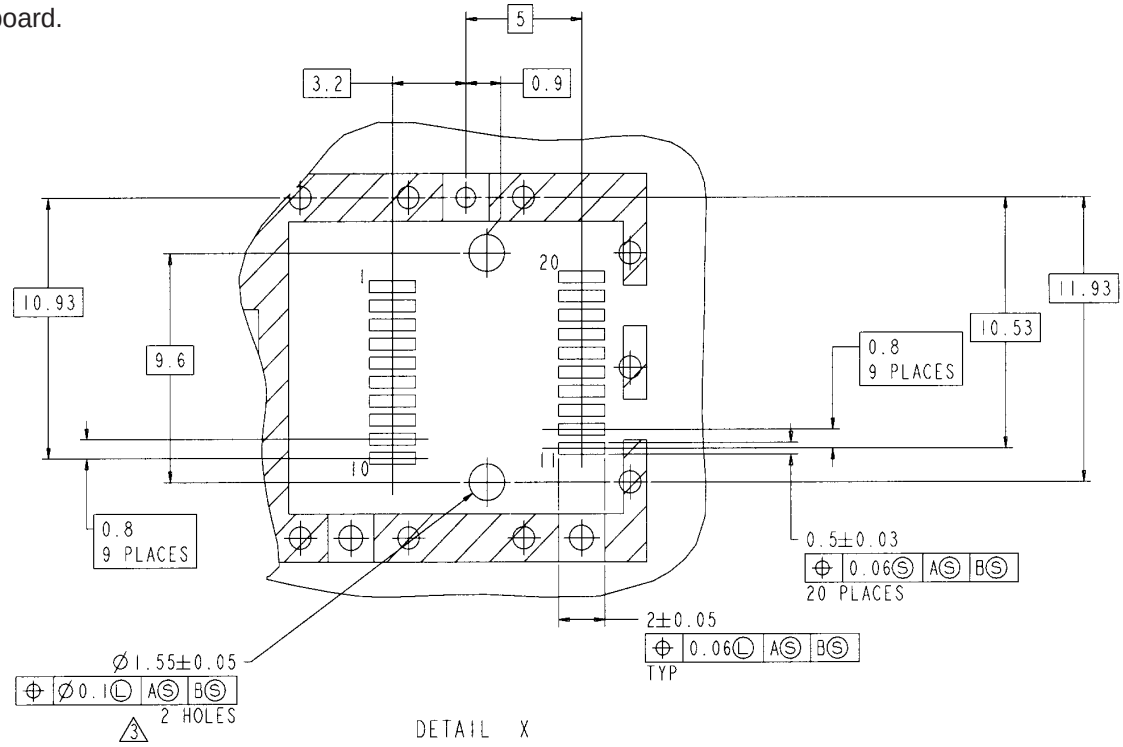


Figure 4. SFP Host Board Mechanical Layout

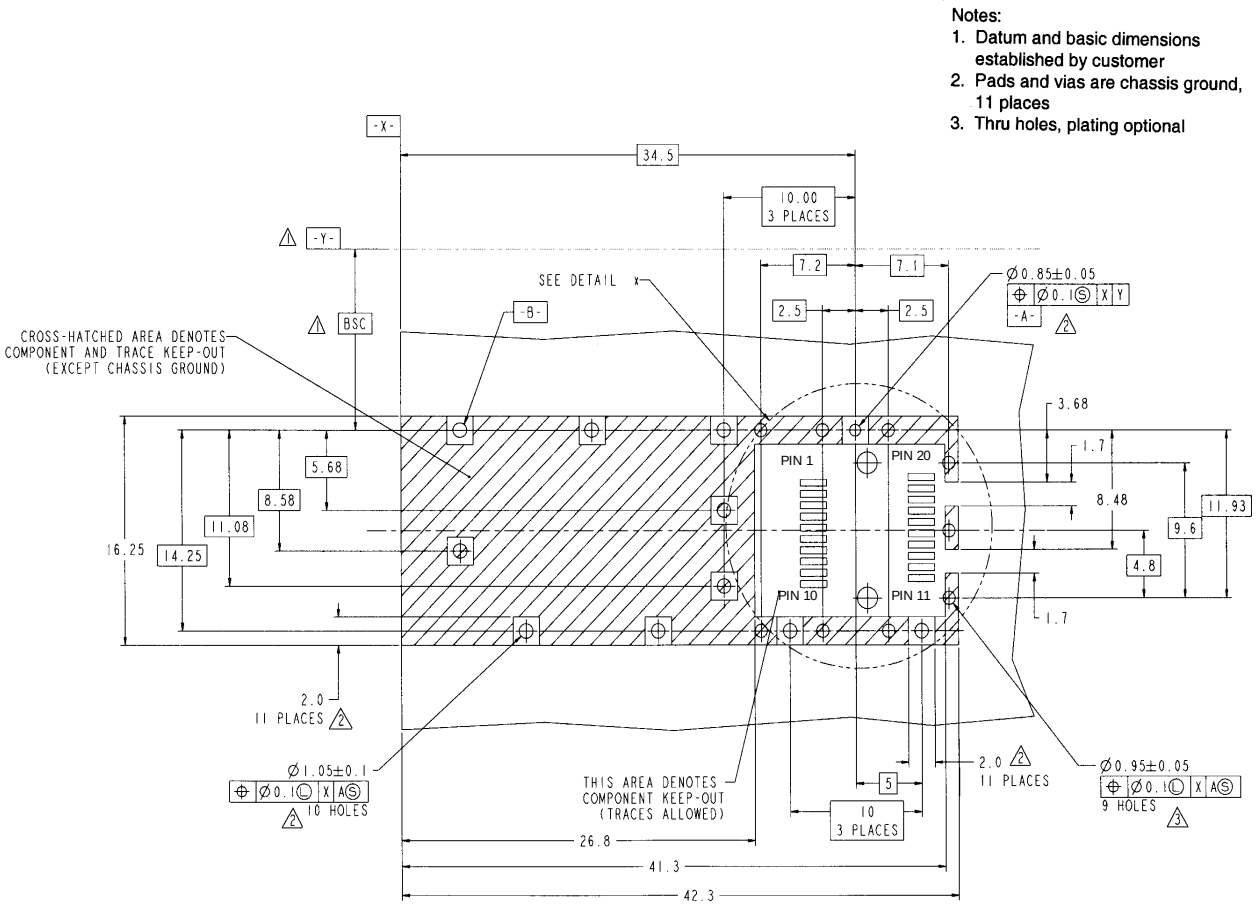
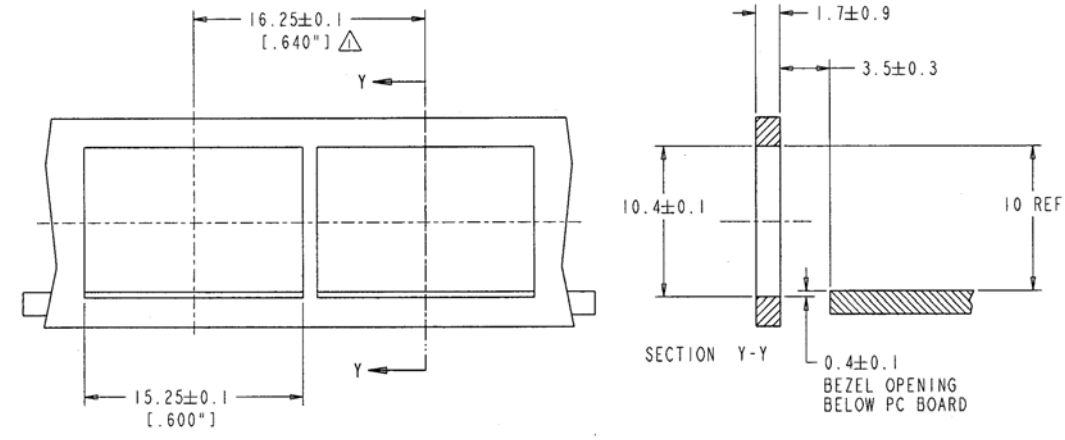


Figure 5. SFP Host Board Mechanical Layout (Cont.)



NOTES:
1. MINIMUM PITCH ILLUSTRATED, ENGLISH DIMENSIONS ARE FOR REFERENCE ONLY
2. NOT RECOMMENDED FOR PCI EXPANSION CARD APPLICATIONS

Figure 6. Recommended Bezel Design

5. Absolute Maximum Ratings

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Storage Ambient Temperature	Ts	-40	-	85	°C	1
Operating Case Temperature	Tc	-5	-	70	°C	
Operating Relative Humidity	H_A	0		85	%	
Optical Input Level	Pin			5	dBm	
Supply Voltage	VccT,R	-0.3	-	4.0	V	
Input Voltage	Vi	0	-	VccT,R+0.3	V	2
Differential Input Voltage Swing (TD+,TD-)	Vin			2.5	Vp-p	

Notes

1. No condensation allowed. 2: For MODE-DEF (1:2) and Tx_Disable

⚠ Warning

Use the product with the rated voltage described in the specification. If the voltage exceeds the maximum rating, overheating or fire may occur.

⚠ Caution

Do not store the product in the area where temperature exceeds the maximum rating, where there is too much moisture or dampness, where there is acid gas or corrosive gas, or other extreme conditions. Otherwise, failure, overheating or fire may occur.

6. Electrical Interface

(Unless otherwise specified, VccT,R = 3.135 to 3.465 V and all operating temperature shall apply.)

6-1. Operating Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Supply Voltage	VccT,R	3.135	3.30	3.465	V	
Supply Current	Icc	-	-	375	mA	1
Inrush Current	Icc'	-	-	415	mA	2

Note

1. 2488.32Mbps, PRBS2^23-1, NRZ, 50% duty cycle data.
2. Narrow current spikes due to capacitor charging is excluded

6-2. Transmitter side

Parameter		Symbol	Min.	Typ.	Max.	Unit	Note
Differential Input Voltage Swing (TD+,TD-)		Vin	0.5		1.6	Vp-p	1
Input Differential Impedance		Zin	80	100	120	Ω	
Tx Fault	Fault	VfaultH	2.4		VccT	V	2
	Normal	VfaultL	0		0.6	V	2, 3
Tx Disable	Disable	Vdi	2.0		VccT+0.3	V	4
	Enable	Vei	0		0.8	V	

Notes

1. Refer to Figure 7.
2. Tx Fault is pulled up to VccT with a 4.7k-10kΩ resistor on the host board.
   When high, output indicates a laser fault of some kind. Low indicates normal operation.
3. Sink Current : 1mA
4. Tx Disable input is internally terminated to VccT via 4.7 kΩ resistor. If pin3 is left open, Tx is disable.

6-3. Receiver side

Parameter		Symbol	Min.	Typ.	Max.	Unit	Note
Output differetial impedance		Rout	80	100	120	Ω	
Differential Output Voltage Swing (RD+,RD-)		Vout	0.37		2.0	Vp-p	1
LOS	High	Vloh	2.4		VccR	V	2
Output Voltage	Low	Vlol	0		0.6	V	2, 3
Data Rise / Fall Time		tr / tf			175	ps	4

Notes

1. Vcc=+3.3V+/-5%, Output load resistance Rdif=100Ω. Refer to Figure1-(B).
   Refer to Figure7. about definition of differential swing.
2. LOS is pulled up to VccR with a 4.7k-10kΩ resistor on the host board. Low indicates normal operation.
3. Sink Current : 1mA
4. 20 to 80%, 2488.32Mbps, PRBS 2^23-1, NRZ, 50% duty cycle data.

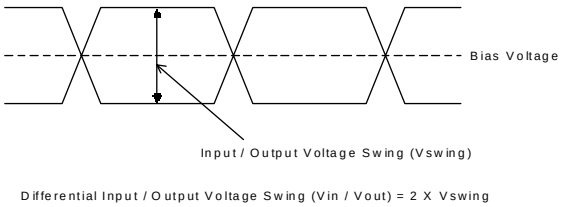


Figure 7. Definition of Differential Input / Output Voltage Swing

6-4. Module Definition

Parameter		Symbol	Min.	Typ.	Max.	Unit	Note
MOD_DEF(1:2)	High	Vih	2.0		VccT+0.3	V	1
Input Voltage	Low	Vil	0		0.8	V	
MOD_DEF(2)	High	Voh	2.4		VccT	V	1
Output Voltage	Low	Vol1	0		0.6	V	1, 2

Notes

1. They shall be pulled up to VccT with a 4.7k - 10kΩ resistor on the host board.
2. Sink Current : 3mA

7. Optical Interface

7-1. Transmitter Side

Parameter	Symbol	Min.	Typ	Max.	Units	Notes
Bit Rate Range	-	622.08	-	2666.06	Mbps	
Center Wavelength	-	C-Band (See section 17)			nm	
Average Output Power (Enable)	Po	0	-	4	dBm	1
Average Output Power (Disable)	Pdis	-	-	-45	dBm	
Extinction Ratio	Er	8.2	-	-	dB	
Spectral width	Δλ	-	-	0.3	nm	2
Side Mode Suppression Ratio	SMSR	30	-	-	dB	1
Eye Mask for Optical Output	Compliant with Telecordia GR-253 CORE and ITU-T G957					
Transmitter Jitter	Tjpkt	-	-	0.07	UIpp	3
	Tjrms			0.007	UIrms	
Wavelength Stability	$\Delta\lambda_C$	-100	-	100	pm	1, 4
Wavelength Deviation from Grit at turn on	$\Delta\lambda_{c\text{-}on}$	-400	-	400	pm	1, 5

Notes

1. Measured at PRBS 2^{23}-1, 50% duty cycle, NRZ.
2. RBW 0.01nm.
3. For the jitter measurements, the device was driven with SONET OC-48 data pattern with 2^{23}-1 PRBS payload. Measured with a bandpass filter having a high-pass cutoff frequency of 12k Hz and a low-pass frequency of 20MHz.
4. After the wavelength is stabilized to the specified channel.
5. The laser transmitter will not be turned on until its temperature is adjusted to ensure operation within $\Delta\lambda_{c\text{-}on}$. This temperature stabilization will occur within t_startup (refer to section 7.4)

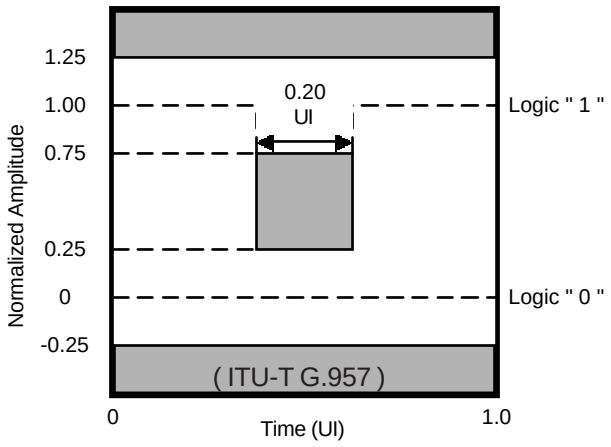


Figure 8. Eye Diagram Mask for Optical Output

⚠Warning
Do not look at the laser beam projection area (e.g. end of optical connector) with naked eyes or through optical equipment while the power is supplied to this product. Otherwise, your eyes may be injured.

7-2. Receiver side

Parameter	Symbol	Min.	Typ	Max	Units	Notes
Bit Rate Range	-	622.08	-	2666.06	Mbps	
Center Wavelength	-	1290	-	1610	nm	
Minimum Sensitivity (EOL)	Pmin	-	-	-28.0	dBm	1,2
Overload	Pmax	-9.0	-	-	dBm	1,2
LOS Activation Level	P_{La}	-45.0	-	-28.3	dBm	2
LOS Deactivation Level	P_{Ld}	-44.7	-	-28.0	dBm	
LOS Hysteresis	Phys	0.3	-	6.0	dB	
Optical Reflectance	REFr	-	-	-27.0	dB	

Notes

1. BER = 10^-12
2. Worst case extinction ratio. Measured at PRBS 2^{23}-1 test pattern, NRZ, EOL

7-3 Transmisson Characteristics.

Parameter	Symbol	Min.	Typ	Max.	Units	Notes
Dispersion Power Penalty	Dp	-	-	3.5	dB	1, 2, 3
OSNR @0.1nm BW, B2B	-	18	-	-	dB	1, 2, 4
Dispersion OSNR Penalty	Np	-	-	3.5	dB	1, 2, 4, 5

Notes

1. BER=10^-12
2. Measured at PRBS 2^{23}-1, 50% duty cycle, NRZ.
3. Power Penalty between B2B and 3200ps/nm, OSNR=21dB @ 0.1nm BW.
4. Optical Input Power of -22 to -9dBm.
5. OSNR penalty between B2B at and 3200ps/nm at the optical input power of -22dBm

7-4. Transceiver Timing Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Tx Disable Assert Time	t_off			20	ms	1
Tx Disable Negate Time	t_on			20	ms	2
Start up time	t_startup			15	s	3
Time to Initialize	t_init			300	ms	
Tx Fault Assert Time	t_fault			50	ms	4
Tx Disable to Reset	t_reset	10		-	us	5
LOS Assert Time	t_loss_on	2.3		100	us	6
LOS Deassert Time	t_loss_off			100	us	7
Serial ID Clock Rate	f_serial_clock			100	kHz	

1. Time from rising edge of TX Disable to when the optical output falls below 10% of nominal.
2. Time from falling edge of TX Disable to when the modulated optical output rises above 90% of nominal.

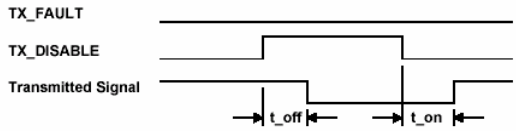


Fig9-1. Tx_Disable timing during normal operation

3. From power on.

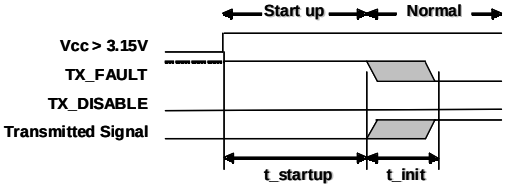


Fig9-2. Power ON initialization of SFP, Tx_Disable negated

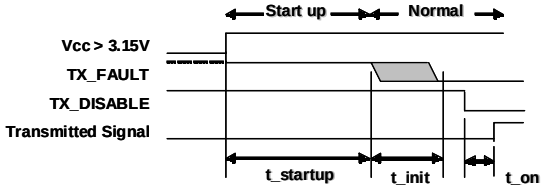


Fig9-3. Power ON initialization of SFP, Tx_Disable asserted

4. Time from fault to TX fault on.

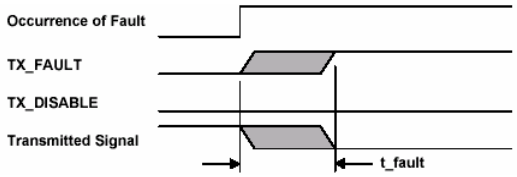


Fig9-4. Detection of transmitter safety fault condition

5. Time Tx Disable must be held high to reset TX_fault.

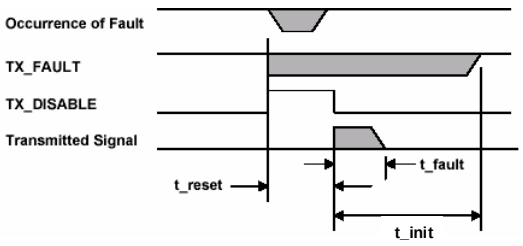


Fig9-5. Unsuccessful recovery from safety fault condition

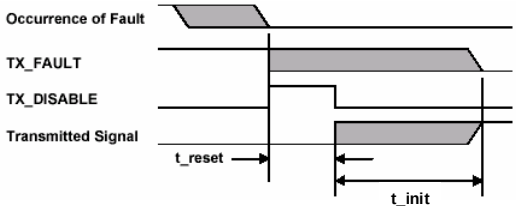


Fig9-6. Successful recovery from transient safety fault condition

6. Time from LOS state to RX LOS assert.
7. Time from non-LOS state to RX LOS deassert.

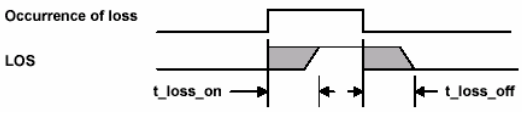


Fig9-7 Timing of LOS detection

7-5. Tx_ Fault and Tx_Shutdown Behavior

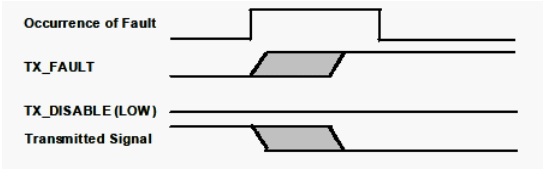
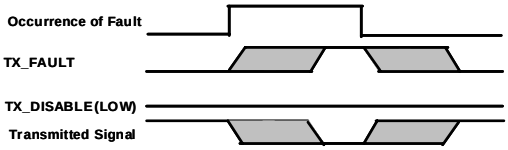


Fig10-1. Tx shutdown behavior on Tx_fault assertion by Bias current.



The transceiver will automatically swich off the laser under wavelength deviation +/-200pm from grid.

Fig10-2. Tx shutdown behavior on Tx_fault assertion by LD temperature.

8. Digital Diagnostic Memory Map

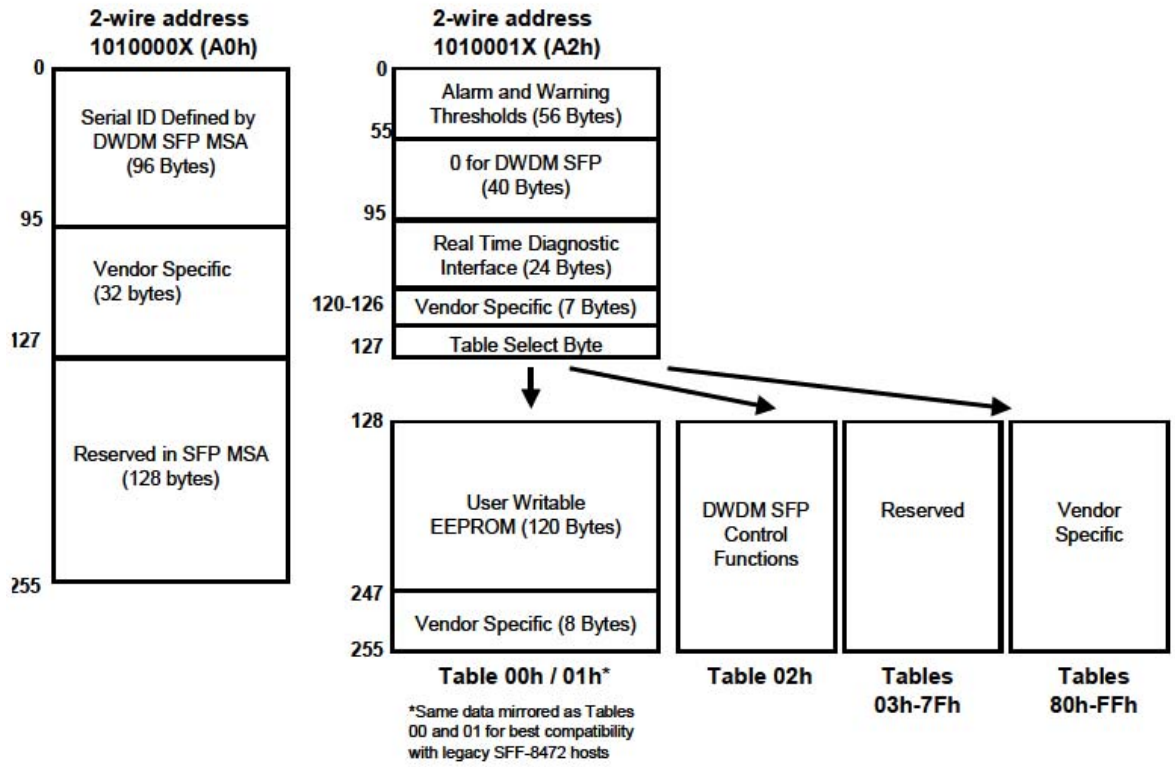


Figure 11. Digital Diagnostic Memory Map

9. EEPROM Serial ID Memory Contents

The data can be read using the 2-wire serial CMOS EEPROM protocol of the Atmel AT24C01A or equivalent.

Address	Name of field	Hex	ASCII	Description	Address	Name of field	Hex	ASCII	Description
0	Identifier	0B		DWDM SFP	64	Options	00		
1	Ext. Identifier	24			65		1A		
2	Connector	07		LC Connector	66	BR max	00		
3		00			67	BR min	00		
4		0C		00001100	68				
5		00			69				
6	Transceiver	00			70				
7		00			71				
8		00			71				
9		01		FC Single Mode	73				
10		05		FC speed 100M&200M	74				
11	Encoding	05		SONET Scrambled	75	Vender SN	Note 3		
12	BR, Nominal	19		2488.32Mbps	76				
13	Length(9um)-km	00			77				
14		A0		160km	78				
15	Max Case Temp	46		+70C	79				
16	Min Case Temp	FB		-5C	80				
17	Max Supply Current	5E		units of 4mA(376mA)	81				
18	Reserved	00			82				
19	Chan spacing and Tuni	41			83				
20	Vendor Name	53	S		84				
21		75	u		85				
22		6D	m		86				
23		69	i		87	Date Code	Note 4		
24		74	t		88				
25		6F	o		89				
26		6D	m		90				
27		6F	o		91				
28		45	E		92	Daiagnostic Monitoring Type	68	Note5	
29		6C	l		93	Enhanced Options	F0		
30		65	e		94	SFF-8472 Compliance	01		Rev 9.3 of SFF-8472
31		63	c		95	CC EXT	Note6		
32		74	t		96		20		
33		72	r		97		20		
34		69	i		98		20		
35		63	c		99		20		
36	Opt.features	83		Note6	100		20		
37	Vendor OUI	00			101		20		
38		00			102		20		
39		5F			103		20		
40		53	S		104		20		
41		43	C		105		20		
42		50	P		106		20		
43		39	9		107		20		
44		46	F		108		20		
45		42	B		109		20		
46		38	8		110		20		
47		2D	-		111		20		
48	Vendor PN	47	G		112	Read Only	20		
49		4C	L		113		20		
50		2D	-		114		20		
51		43	C		115		20		
52		4E	N		116		20		
53		20			117		20		
54		20			118		20		
55		20			119		20		
56		41to5A	AtoZ		120		20		
57	Vendor Rev.	20			121		20		
58		20			122		20		
59		20			123		20		
60					124		20		
61	Wavelength	Note1			125		20		
62	Wavelength(@10pm)				126		20		
63	CC BASE	Note2			127		20		

Note1. 16-bit interper representation value in nm with byte 60 as high byte. Use 00 for FE
The DWDM wavelength fraction is: Fraction= (Byte62)* 0.01nm
The final formula of the Laser Wavelength: (Byte60, 61) + (Byte62)*0.01nm
Note2. Address 63 is check sum of byte0-62. Note3. Address 68-83 is Vendor Serial Number.
Note4. Address 84-91 is Date Code. Note5. Refer to Section 10.(Enhanced Monitoring Function)
Note6. Refer to Section11.

10. Enhanced Monitoring Functions

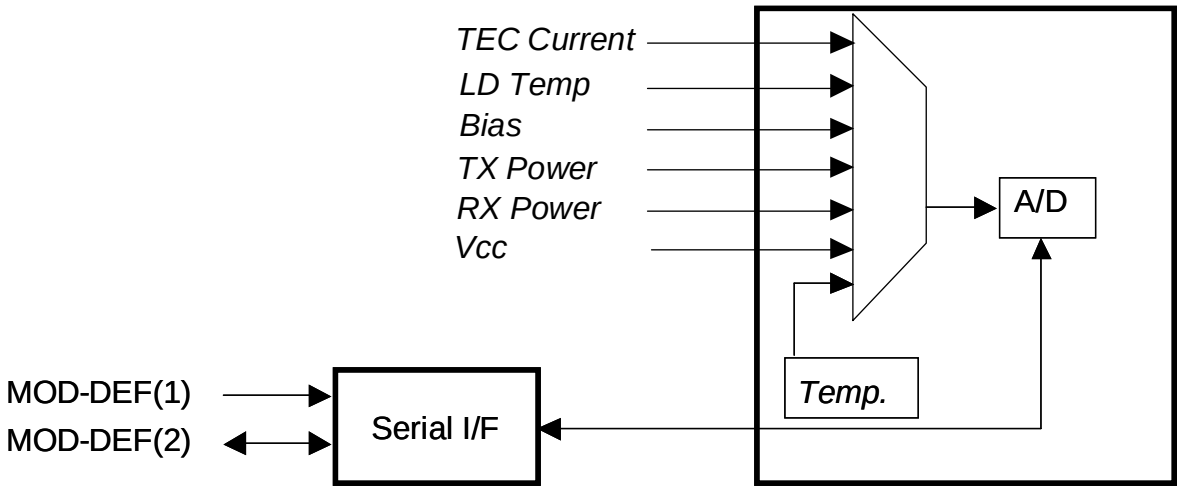


Figure 12. Block Diagram

Diagnostic Monitoring Type, 2 wire address A0h

Data Address	Bits	Description	Status(SEI)
92	7	Reserved for legacy diagnostic implementations. Must be '0' for compilance with SFF-8472.	0
92	6	Digital diagnostic monitoring implemented (described in SFF-8472). Must be '1' for compliance with SFF-8472.	1
92	5	Internally Calibrated	1
92	4	Externally Calibrated	0
92	3	Received power measurement type 0 = OMA, 1 = Average Power	1
92	2	Address change required. (Refer to SFF-8472)	0
92	1-0	Reserved	0

Enhanced Options, 2 wire address A0h

Data Address	Bits	Description	Status(SEI)
93	7	Optional Alarm/warning flags implemented for all monitored quantities	1
93	6	Optional Soft TX_DISABLE control and monitoring implemented	1
93	5	Optional Soft TX_FAULT monitoring implemented	1
93	4	Optional Soft RX_LOS monitoring implemented	1
93	3	Optional Soft RATE_SELECT control and monitoring implemented	0
93	2-0	Reserved	0

11. Optical DWDM Features

Optical DWDM Features,2wire address A0H

Data Address	bit	Description	Status(SEI)
36	7	Optional Interrupt Pin Functionality Supported (1 if supported)	1
36	6-4	Pilot Tone Functionality 000b: No Pilot Tone Functionality 001b: No Pilot Detection Only 010b: No Pilot Injection Only 011b: No Pilot Injection and Detection 100b: Enhanced Pilot Tone Functionality 101b-111b: Reserved	0
36	3	Variable Optical Attenuator Implemented (1 if implemented)	0
36	2	Extended Transmit Power Monitoring 0: Deafult (SFF-8472) TX Power Monitoring 1: Extended TX Power Monitoring (+18.2 dBm MAX)	0
36	1	Wavelength Monitor Type in A2 Byte 106-107 0: Monitor is Waqvelength 1: Monitor is Laswer Temeperature	1
36	0	Variable Decision Threshold (1 if implemented)	1

Variable Decision Threshold Control

Byte 131 of Table 02h is used to control the variable decision threshold function. The availability of this function is indicated in Bit 0, Byte 36 of A0 in the serial ID section. Byte 131 is a 2's complement 7 bit value (-128 - +127) The decision threshold set is given by:

Decision Threshold = 50% + [Byte(131)/256]*100%

12. Calibration Calculation

A/D Accuracy, 2 wire address A2h

Data Address	***Parameter***	***Accuracy***	***Units Display***	***Note***
96-97	Temperature	+/-3 deg-C	Signed 2's complement integer deg-C	Internal temperature mesurement by monitor IC
98-99	Vcc	+/-3%	x100μVolt	
100-101	TX Bias	+/-10%	x2μA	Specified by nominal value
102-103	TX Power	+/-3dB	x0.1μW	0 to 4dBm
104-105	RX Power	+/-3dB (-28 to -9dBm)	x0.1μW	At specified transmitter wavelength (Section 7-1)
106-107	Laser Temperature	+/-0.2deg-C	Signed 2's complement integer deg-C	
108-109	TEC Current	+/-60mA	Signed 2's complement integer x 0.1mA	

13. A/D Values and Status

Converted analog values, 2wire address A2h

Byte	Bit	Name	Description
96	All	Temperature MSB	Signed 2's complement integer temperature(-40 to +125C) Based on internal temperature measurement
97	All	Temperature LSB	Fractional part of temperature(count/256)
98	All	Vcc MSB	Internally measured supply voltage in transeciver. Actual voltage is full 16 bit value *100uVolt.(Yields range of 0-6.55V)
99	All	Vcc LSB	
100	All	TX Bias MSB	Measured Laser Bias Current in mA. Bias current is full 16 bit value *2μA.(Full range of 0-131mA)
101	All	TX Bias LSB	
102	All	TX Power MSB	Measured TX output power in mW. TX power is full 16 bit value*0.1μW.(Full range of -40 to+8.2dBm)
103	All	TX Power LSB	
104	All	RX Power MSB	Measured RX input power in mW. RX power is full 16 bit value*0.1μW.(Full range of -40 to+8.2dBm)
105	All	RX Power LSB	
106	All	Laser Temperature / Wavelength MSB	Measured Laser Temperature or Wavelength (choice defined in A0 Byte 36 bit 1)
107	All	Laser Temperature / Wavelength LSB	
108	All	TEC Current MSB	Measured TEC Current (positive is cooling)
109	All	TEC Current LSB	
Optional Status/Control Bits			
110	7	TX Disable State	Digital state of the TX Disable Input Pin. Updated within 100msec of change on pin.
110	6	Soft TX Disable	Read/write bit that allows software disable of laser. Writing '1' disables laser. Turn on/off time is 100 msec max from acknowledgement of serial byte transmission. This bit is "OR"d with the hard TX_DISABLE pin value. Note, per SFP MSA TX_DISABLE pin is default anabled unless pulled low by hardware. if Soft TX Disable is not implemented, the transceiver ignores the value of this bit. Default power up value is 0.
110	5	Reserved	
110	4	RX Rate Select State	RATE SELECT is not suppoted by DWDM SFP Bit 4 is always set at 0
110	3	Soft RX Rate Select	RATE SELCT is not supported by DWDM SFP The transceiver ignores the value of this bit
110	2	TX Fault	Digital state of the TX Fault Output Pin. Updated within 100msec of change on pin.
110	1	LOS	Digital state of the LOS Output Pin. Updated within 100msec of change on pin.
110	0	Data_Ready_Bar	Indicates transceiver has achieved power up and data is ready. Bit remains high until data is ready to be read at which time the device sets the bit low.
111	7-0	Reserved	Reserved.

14. Alarm and Warning Flags

Alarm and Warning Flags, 2wire address A2h

Byte	Bit	Name	Description
112	7	Temp High Alarm	Set when internal temperature exceeds high alarm level.
112	6	Temp Low Alarm	Set when internal temperature is below low alarm level.
112	5	Vcc High Alarm	Set when internal supply voltage exceeds high alarm level.
112	4	Vcc Low Alarm	Set when internal supply voltage is below low alarm level.
112	3	TX Bias High Alarm	Set when TX Bias current exceeds high alarm level.
112	2	TX Bias Low Alarm	Set when TX Bias current is below low alarm level.
112	1	TX Power High Alarm	Set when TX output power exceeds high alarm level.
112	0	TX Power Low Alarm	Set when TX output power is below low alarm level.
113	7	RX Power High Alarm	Set when Received Power exceeds high alarm level.
113	6	RX Power Low Alarm	Set when Received Power is below low alarm level.
113	5	Laser T/λ High Alarm	Set when laser temperature or wavelength exceeds high alarm level.
113	4	Laser T/λ Low Alarm	Set when laser temperature or wavelength is below low alarm level.
113	3	TEC Current High Alarm	Set when TEC current exceeds high alarm level.
113	2	TEC Current Low Alarm	Set when TEC current is below low alarm level.
113	1	Reserved Alarm	
113	0	Reserved Alarm	
114	All	Alarm Mask	Please contact SEI when you used this address.
115	All	Alarm Mask	
116	7	Temp High Warning	Set when internal temperature exceeds high warning level.
116	6	Temp Low Warning	Set when internal temperature is below low warning level.
116	5	Vcc High Warning	Set when internal supply voltage exceeds high warning level.
116	4	Vcc Low Warning	Set when internal supply voltage is below low warning level.
116	3	TX Bias High Warning	Set when TX Bias current exceeds high warning level.
116	2	TX Bias Low Warning	Set when TX Bias current is below low warning level.
116	1	TX Power High Warning	Set when TX output power exceeds high warning level.
116	0	TX Power Low Warning	Set when TX output power is below low warning level.
117	7	RX Power High Warning	Set when Received Power exceeds high warning level.
117	6	RX Power Low Warning	Set when Received Power is below low warning level.
117	5	Laser T/λ High Warning	Set when laser temperature or wavelength exceeds high warning level.
117	4	Laser T/λ Low Warning	Set when laser temperature or wavelength is below low warning level.
117	3	TEC Current High Warning	Set when TEC current exceeds high warning level.
117	2	TEC Current Low Warning	Set when TEC current is below low warning level.
117	1	Reserved Warning	
117	0	Reserved Warning	
118	All	Warning Mask	Masking bits corresponding to Warning bits of Byte 116
119	All	Warning Mask	Masking bits corresponding to Warning bits of Byte 117

15. Recommended Interface Circuit

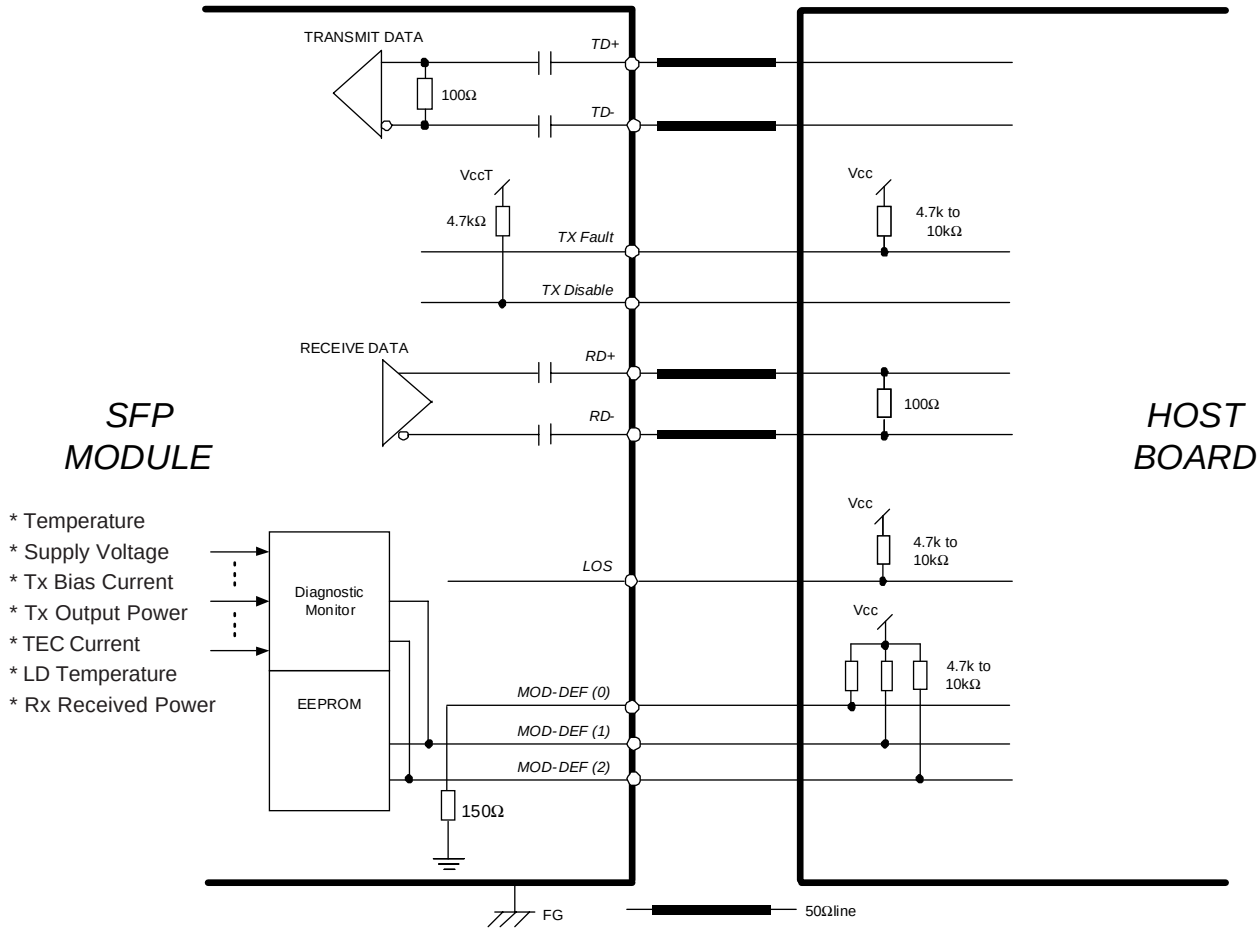


Figure 13. Recommended Interface Circuit

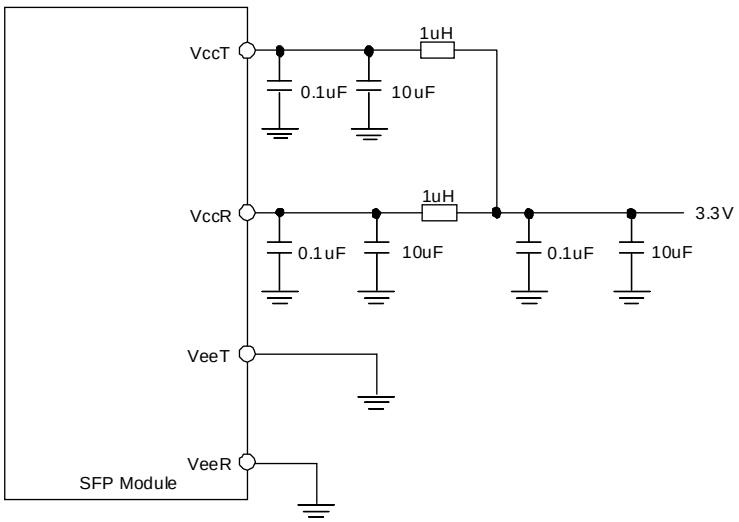
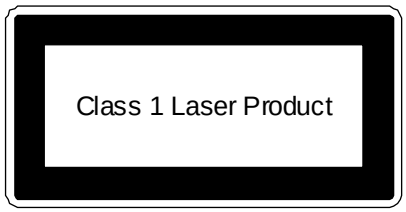


Figure 14. Recommended Supply Filtering Network

16. Laser Safety

This product uses a semiconductor laser system and is a laser class 1 product acceptable FDA, complies with 21CFR 1040. 10 and 1040.11. Also this product is a laser class 1 product acceptable IEC 60825.



⚠Caution
⃠ If this product is used under conditions not recommended in the specification or this product is used with unauthorized revision, classfication for laser product safety standard is invalid. Classify the product again at your responsibility and take appropriate actions.

17. RoHS COMPLIANCY

Compliancy versus requirements contained inside the following reference document is guaranteed: “Directive 2002/95/EC of 27 January 2003 on the restriction of the use of certain hazardous substances in electrical and electronic equipment from official journal of European Union (European Parliament and of the Council). This product is Compliant at RoHS-6/6 level and contains no leaded solders.

18. Other Precaution

Under such a strong vibration environment as in automobile, the performance and reliability are not guaranteed. The governmental approval is required to export this product to other countries. To dispose of these components, the appropriate procedure should be taken to prevent illegal exportation.

This module must be handled, used and disposed of according to your company's safe working practice.

⚠ Warning
⃠ Operating transceiver products can have an outer package temperature exceeding 70 degC. To reduce the risk of injury from burns, do not touch the transceiver module under any circumstances while it is operational. When installing or uninstalling products that have been operating, handle with extreme care.

⚠ Warning
⃠ Do not put this product or components of this product into your mouth. This product contains material harmful to health.

⚠ Caution.
⃠ Dispose this product or equipment including this product properly as an industrial waste according to the regulations.

19. Ordering Information

Operating Case Temperature	Tc = -5 to 70°C
Ordering Number	SCP9FB8-GL-CN-XXXX

XXXX : Channel No.

Channel No.	Frequency (THz)	Wavelength (nm)	Test & Measurement (nm)
F610	196.1	1528.77	1528.773
F600	196.0	1529.55	1529.553
F590	195.9	1530.33	1530.334
F580	195.8	1531.12	1531.116
F570	195.7	1531.90	1531.898
F560	195.6	1532.68	1532.681
F550	195.5	1533.47	1533.465
F540	195.4	1534.25	1534.250
F530	195.3	1535.04	1535.036
F520	195.2	1535.82	1535.822
F510	195.1	1536.61	1536.609
F500	195.0	1537.40	1537.397
F490	194.9	1538.19	1538.186
F480	194.8	1538.98	1538.976
F470	194.7	1539.77	1539.766
F460	194.6	1540.56	1540.557
F450	194.5	1541.35	1541.349
F440	194.4	1542.14	1542.142
F430	194.3	1542.94	1542.936
F420	194.2	1543.73	1543.730
F410	194.1	1544.53	1544.526
F400	194.0	1545.32	1545.322
F390	193.9	1546.12	1546.119
F380	193.8	1546.92	1546.917
F370	193.7	1547.72	1547.715
F360	193.6	1548.51	1548.515
F350	193.5	1549.32	1549.315
F340	193.4	1550.12	1550.116
F330	193.3	1550.92	1550.918
F320	193.2	1551.72	1551.721
F310	193.1	1552.52	1552.524
F300	193.0	1553.33	1553.329
F290	192.9	1554.13	1554.134
F280	192.8	1554.94	1554.940
F270	192.7	1555.75	1555.747
F260	192.6	1556.55	1556.555
F250	192.5	1557.36	1557.363
F240	192.4	1558.17	1558.173
F230	192.3	1558.98	1558.983
F220	192.2	1559.79	1559.794
F210	192.1	1560.61	1560.606
F200	192.0	1561.42	1560.419
F190	191.9	1562.23	1562.233

20. Label Information

21. For More Information

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