

NPD-XX48-04C(D)
2.67Gbps DWDM SFP Transceiver, 40km Reach

Features

Wavelength selectable to C-band ITU-T grid wavelengths

Suitable for use in 100GHz channel spacing DWDM systems

DWDM SFP MSA Compliant

Up to 2.67Gb/s data rate

OC48 Long Reach 40km

Cold Start up Wavelength Compliance

Low Power Dissipation <1.3W Maximum


-5°C to 70°C Operating Case Temperature

Diagnostic Performance Monitoring of module temperature, supply

Voltages, laser bias current, transmit optical power, receive optical power,

Laser temperature and TEC current

Extended link budget with APD receiver technology

RoHS compliant and lead free 



Applications

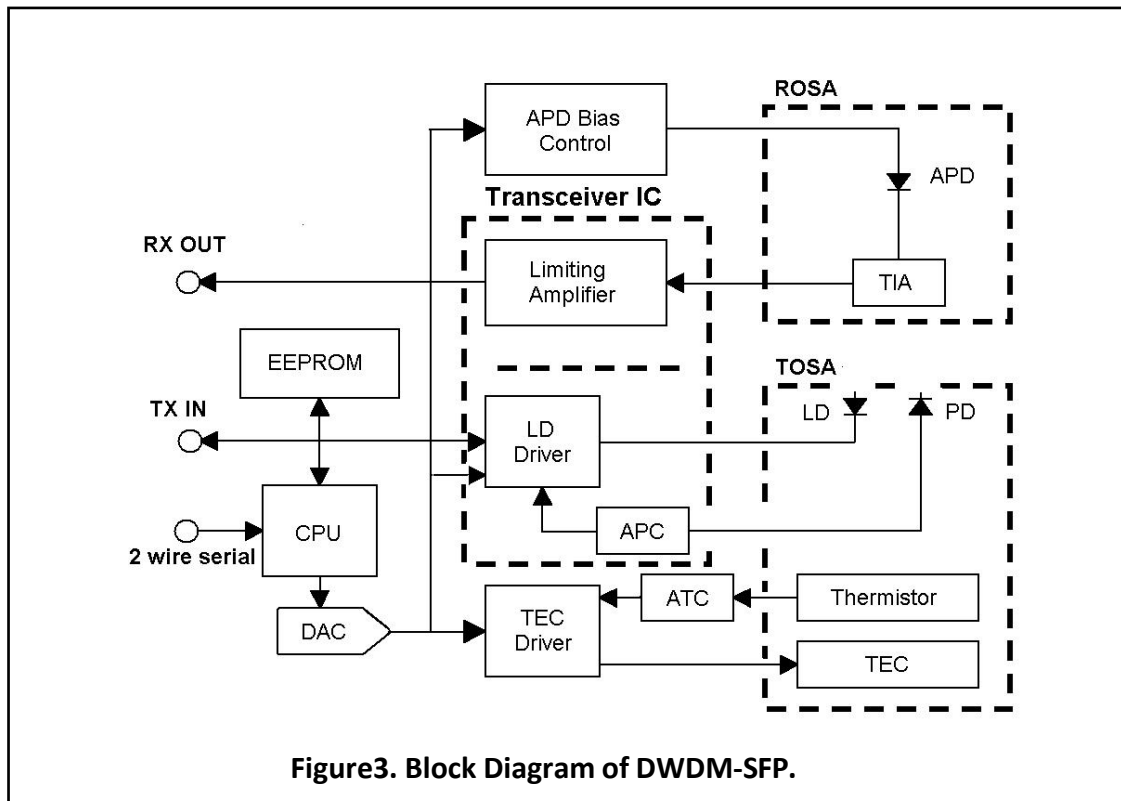
SFP Transceivers for DWDM SONET/ SDH

Ethernet IEEE 802.3ae

Fiber Channel

Description

DWDM SFP Transceiver exhibits excellent wavelength stability, supporting operation at 100 GHz channel, cost effective module. It is designed for DWDM SONET/ SDH, Gigabit Ethernet and Fiber- Channel applications. The transceiver consists of two sections: The transmitter section incorporates a cooled DFB laser. And the receiver section consists of a APD photodiode integrated with a TIA. All modules satisfy class I laser safety requirements. DWDM SFP transceiver provides an enhanced monitoring interface, which allows real-time access to device operating parameters such as transceiver temperature, laser bias current, transmitted optical power, received optical power and transceiver supply voltage, laser temperature and TEC current.



Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Unit
Supply Voltage	Vcc	-0.3	4.0	V
Storage Temperature	Tst	-40	85	°C
Data AC Voltage	TX+-AC	-	2.4	Vpp
Data DC Voltage	TX+-DC	-0.5	2.5	V
Optical Input Received Power	PIN	-	+5	dBm

Operating Conditions

Parameter	Symbol	Min	Typical	Max	Unit
Supply Voltage	Vcc	3.13	3.3	3.47	V
Operating Case temperature	Tca	-5	-	70	°C
Total Current	Icc	-	-	380	mA
Module Power Dissipation	Pm	-	0.8	1.3	W

C-band λ_c Wavelength Guide

ITU Channel Product Code	Frequency (THz)	Wavelength	ITU Channel Product Code	Frequency (THz)	Wavelength
17	191.7	1563.86	40	194.0	1545.32
18	191.8	1563.05	41	194.1	1544.53
19	191.9	1562.23	42	194.2	1543.73
20	192.0	1561.42	43	194.3	1542.94
21	192.1	1560.61	44	194.4	1542.14
22	192.2	1559.79	45	194.5	1541.35
23	192.3	1558.98	46	194.6	1540.56
24	192.4	1558.17	47	194.7	1539.77
25	192.5	1557.36	48	194.8	1538.98
26	192.6	1556.55	49	194.9	1538.19
27	192.7	1555.75	50	195.0	1537.40
28	192.8	1554.94	51	195.1	1536.61
29	192.9	1554.13	52	195.2	1535.82
30	193.0	1553.33	53	195.3	1535.04
31	193.1	1552.52	54	195.4	1534.25
32	193.2	1551.72	55	195.5	1533.47
33	193.3	1550.92	56	195.6	1532.68
34	193.4	1550.12	57	195.7	1531.90
35	193.5	1549.32	58	195.8	1531.12
36	193.6	1548.51	59	195.9	1530.33
37	193.7	1547.72	60	196.0	1529.55
38	193.8	1546.92	61	196.1	1528.77
39	193.9	1546.12			

Transmitter Specifications – Optical

Parameter	Symbol	Min	Typical	Max	Unit
Data Rate Multirate	Mra	155		2667	Mbps
Center Wavelength (SOL) Δ	λ_c	$\lambda_c - 25$	λ_c	$\lambda_c + 25$	pm
Center Wavelength (EOL) \blacktriangle	λ_c	$\lambda_c - 100$	λ_c	$\lambda_c + 100$	pm
Optical Transmit Power	Po	-4	2	3	dBm
Optical Transmit Power (disabled)	PTX_DISABLE	-	-	-40	dBm
Extinction Ratio	ER	8.2		-	dB
Channel Spacing	Δf	-	100	-	GHz
Jitter Generation	TJP-P	-	-	70	mUI
Spectral Width (-20dB)	DI20	-	0.1	0.3	nm
Side Mode Suppression Ratio	SMSR	30	-	-	dB
Eye Mask	Compliant with Bell core GR-253-CORE & ITU G.957 for SONET/SDH and with IEEE 802.3ae for Ethernet and Fibre Channel				

Δ Laser- Start of Life

\blacktriangle Laser End of life

Transmitter Specifications – Electrical

Parameter	Symbol	Min	Typical	Max	Unit
Supply Voltage	VccTX	3.13	3.3	3.47	V
PECL/CML Input	VtxDIFF	500	-	1600	mV
Input Rise/Fall	TR / TF	-	-	160	ps
TX-Fault Fault	Vf	2	-	Vcc	V
TX-Fault Normal	Vn	Vee	-	Vee+0.5	V
TX_DISABLE (asserted)	VDH	2	-	Vcc	V
TX_DISABLE (negated)	VDL	Vee	-	Vee+0.8	V

APD Receiver Specifications – Optical

Parameter	Symbol	Min	Typical	Max	Unit
Receiver Sensitivity (OC48)		-	-	-18	dBm
Maximum Input Power	RX-overload	-3	-	-	dBm
Input Operating Wavelength	λ	1528	-	1564	nm
Reflectance	Rrx	-	-	-27	dB
Loss of Signal Asserted		-40	-	-	dBm
LOS De-Asserted		-	-	-24	dBm
LOS Hysteresis		0.5	-	-	dB

APD Receiver Specifications – Electrical

Parameter	Symbol	Min	Typical	Max	Unit
Supply Voltage	VccRX	3.13	3.3	3.47	V
Differential Output Swing	Vout P-P	370	-	2000	mV
Rise/Fall Time	Tr / Tf	-	-	175	ps
Loss of Signal –Asserted	VOH	2	-	Vcc	V
Loss of Signal –Negated	VOL	Vee	-	Vee+0.5	V

Low Speed Electrical Signal Timings

Parameter	Symbol	Min	Typical	Max	Unit
TX Disable Negate Time	t-on	-	-	20	ms
TX Disable Assert Time	t-off	-	-	20	ms
Time to initialize, including reset of TX_FAULT	t_init	-	-	300	ms
Start-up Time	t_startup	-	-	90	s
TX_FAULT/INT Assert Time	t_fault	-	-	50	ms
TX_DISABLE to Reset	t_reset	10	-	-	ms
LOS Assert Time	t_los_on	-	-	100	us
LOS Negate Time	t_los_off	-	-	100	us
Serial ID Clock Rate	f_serial_clock	-	-	100	kHz

EEPROM Serial ID Memory Contents (A0h):

Data Address	Field Size (Bytes)	Value	Name of Field	Description and Contents
Base ID Fields				
0	1	0Bh	Identifier	Type of Serial transceiver
1	1	24h	Ext. Identifier	Extended identifier of type serial transceiver
2	1	07h	Connector	Code of optical connector type
3-10	8	00h,0Ch,44h,00h,80h,10h,01h,00h	Transceiver	Code for electronic compatibility or optical compatibility
11	1	03h	Encoding	Code for serial encoding algorithm
12	1	19h	BR,Nominal	Nominal baud rate, unit of 100Mbps
13-14	2	78h(120km)	Length (9µm) – km	Link length supported for 9/125µm fiber, units in km
15	1	46h	Max Temp	Maximum operating case temperature in °C
16	1	FBh	Min Temp	Minimum operating case temperature in °C
17	1	5Fh	Max Supply Current	Maximum supply current in units of 4mA
18	1	00h	Reserved	-
19	1	41h	Channel spacing and number	Channel spacing compatibility and number and tuning of ITU channels supported
20-35	16	Module dependent	Vendor Name	SFP vendor name: "Gigalight" (ASCII)
36	1	02h	Reserved	Optional DWDM features
37-39	3	-	Vendor OUI	SFP transceiver vendor IEEE company ID
40-55	16	GPD-XXXX-XX	Vendor PN	Part number provided by SFP transceiver vendor (ASCII)
56-59	4	Module dependent	Vendor rev	Revision level for part number provided by vendor (ASCII)
60-61	2	Module dependent	wavelength	Laser wavelength (in nm)
62	1	Module dependent	wavelength	Laser wavelength (fractional part in units of 10pm)
63	1	Module dependent	CC_BASE	Check sum of bytes 0 - 62
Extended ID Fields				
64-65	2	1Ah	Option	Indicates which optical SFP signals are implemented
66	1	00h	BR, max	Upper bit rate margin, units of %
67	1	00h	BR, min	Lower bit rate margin, units of %
68-83	16	Module dependent	Vendor SN	Serial number (ASCII)
84-91	8	Module dependent	Date code	Year(2 bytes), Month(2 bytes), Day (2 bytes)
92	1	68h	Diagnostic type	Indicates the type of diagnostics implemented in Monitoring Type the transceiver
93	1	F0h	Enhanced option	Indicates which optional enhanced features Options are implemented
94	1	01h	SFF-8472	"01" Diagnostics(SFF-8472 Rev 9.3)
95	1	Module dependent	CC_EX	Check sum of bytes 64 - 94
Vendor Specific ID fields				
96-127	32	-	Vendor Specific	Vendor Specific EEPROM (Vendor specific data; Specific read only)
128-255	128	-	Reserved	Reserved for future use

Serial ID Memory Contents: (A2H)

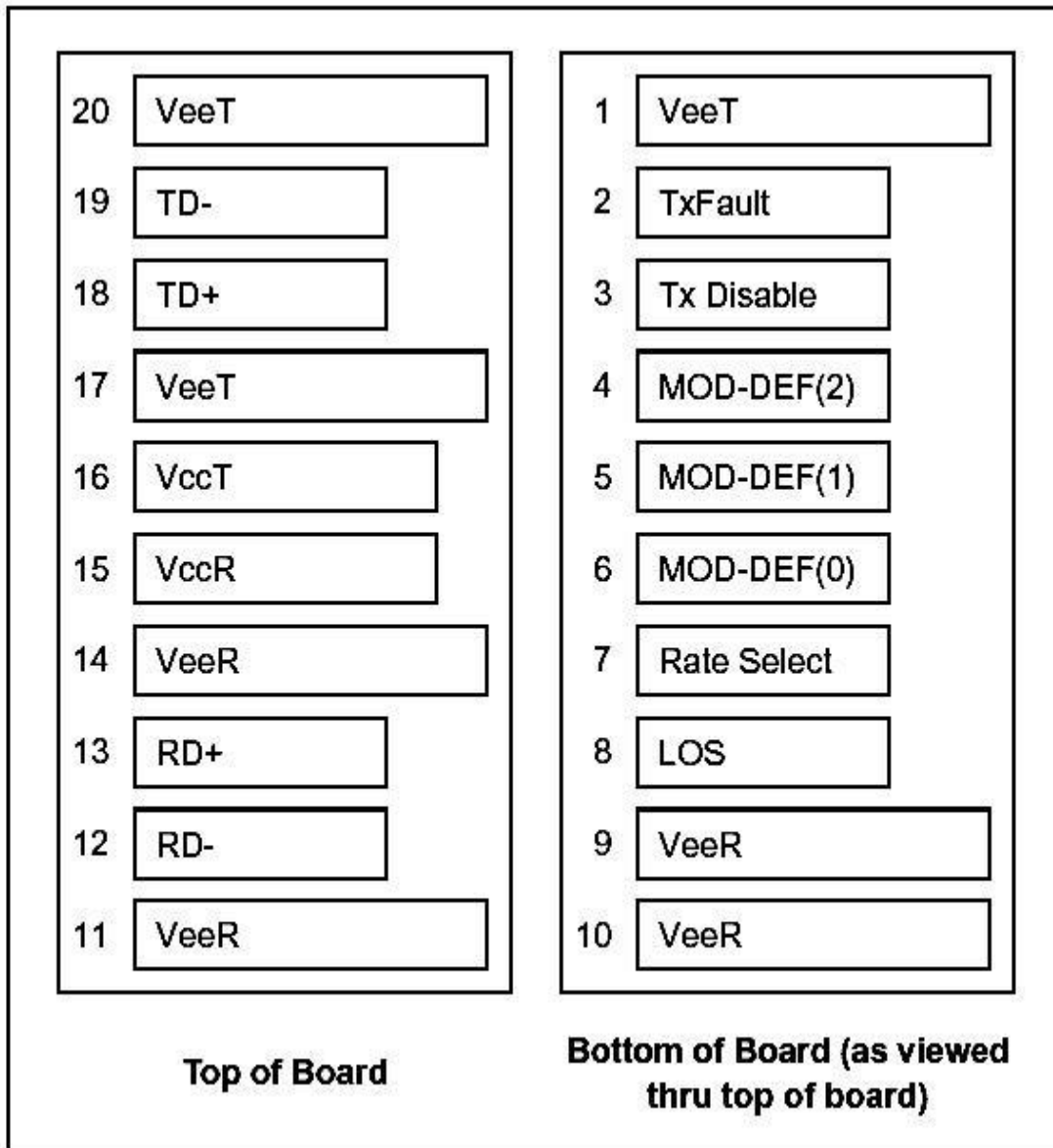
Address	# Bytes	Name	Description
00-55	56	Alarm and Warning Levels	Temp/ Vcc/ Bias Current /TX Power/ RX Power/ LD Temp/ TEC Current, High/Low Alarm and Warning Levels
56-94	39		Not used in DWDM devices. All Bytes Set to 0.
95	1	Checksum	Low order 8 bits of the sum of bytes 0-94
96-109	8	A/D Values	A/D binary values of the following enhanced diagnostics(Real-time): module temperature, supply voltage, laser bias current, transmit optical power, receive optical power, laser temperature and TEC current. These values are Internally calibrated absolute measurements. All diagnostic parameters implemented in these address locations have a corresponding high and low, alarm and warning thresholds assigned in address locations 00-55.
110	1	Soft Control Signals	Soft control signals monitored over the 2-wire access port. can updated real-time status of the following control signals: TX_FAULT, TX_DISABLE, Rate Select, and LOS.
111	1	Reserved	Reserved
112-117	5	Alarm/Warning Flags	Optional Alarm and Warning Flag and Mask Bits Corresponding to levels detailed in addresses 00-39 above.
118-119	2	Warning Mask	Masking bits corresponding to Warning bits of bytes 116 and 117 respectively
120-126	8	Vendor Specific	Vendor specific data
127	1	Table Select	The byte value defines the Table location for subsequent reads and writes to bytes locations 128-255
128-247	120	User EEPROM	User writable EEPROM
248-255	8	Vendor Specific	Vendor specific control functions

Digital Diagnostic Monitoring A/D Accuracy

Parameter	Range	Accuracy	Unit
Temperature	-40~100	± 3	$^{\circ}\text{C}$
Voltage	0~Vcc	0.1	V
Bias Current	0~120	5	mA
TX Power	-4~-3	± 2	dBm
RX Power	-18~-3	± 2	dBm
TEC Current	-1200~1200	± 65	mA
LD Temperature	20~70	± 0.25	$^{\circ}\text{C}$

Pin Definitions

Pin Diagram



Pin Descriptions

Pin	Signal Name	Description	Plug Seq.	Notes
1	V _{EET}	Transmitter Ground	1	
2	TX FAULT	Transmitter Fault Indication	3	Note 1
3	TX DISABLE	Transmitter Disable	3	Note 2
4	MOD_DEF(2)	SDA Serial Data Signal	3	Note 3
5	MOD_DEF(1)	SCL Serial Clock Signal	3	Note 3
6	MOD_DEF(0)	TTL Low	3	Note 3
7	Rate Select	Not Connected	3	
8	LOS	Loss of Signal	3	Note 4
9	V _{EER}	Receiver ground	1	
10	V _{EER}	Receiver ground	1	
11	V _{EER}	Receiver ground	1	
12	RD-	Inv. Received Data Out	3	Note 5
13	RD+	Received Data Out	3	Note 5
14	V _{EER}	Receiver ground	1	
15	V _{CCR}	Receiver Power Supply	2	
16	V _{CCT}	Transmitter Power Supply	2	
17	V _{EET}	Transmitter Ground	1	
18	TD+	Transmit Data In	3	Note 6
19	TD-	Inv. Transmit Data In	3	Note 6
20	V _{EET}	Transmitter Ground	1	

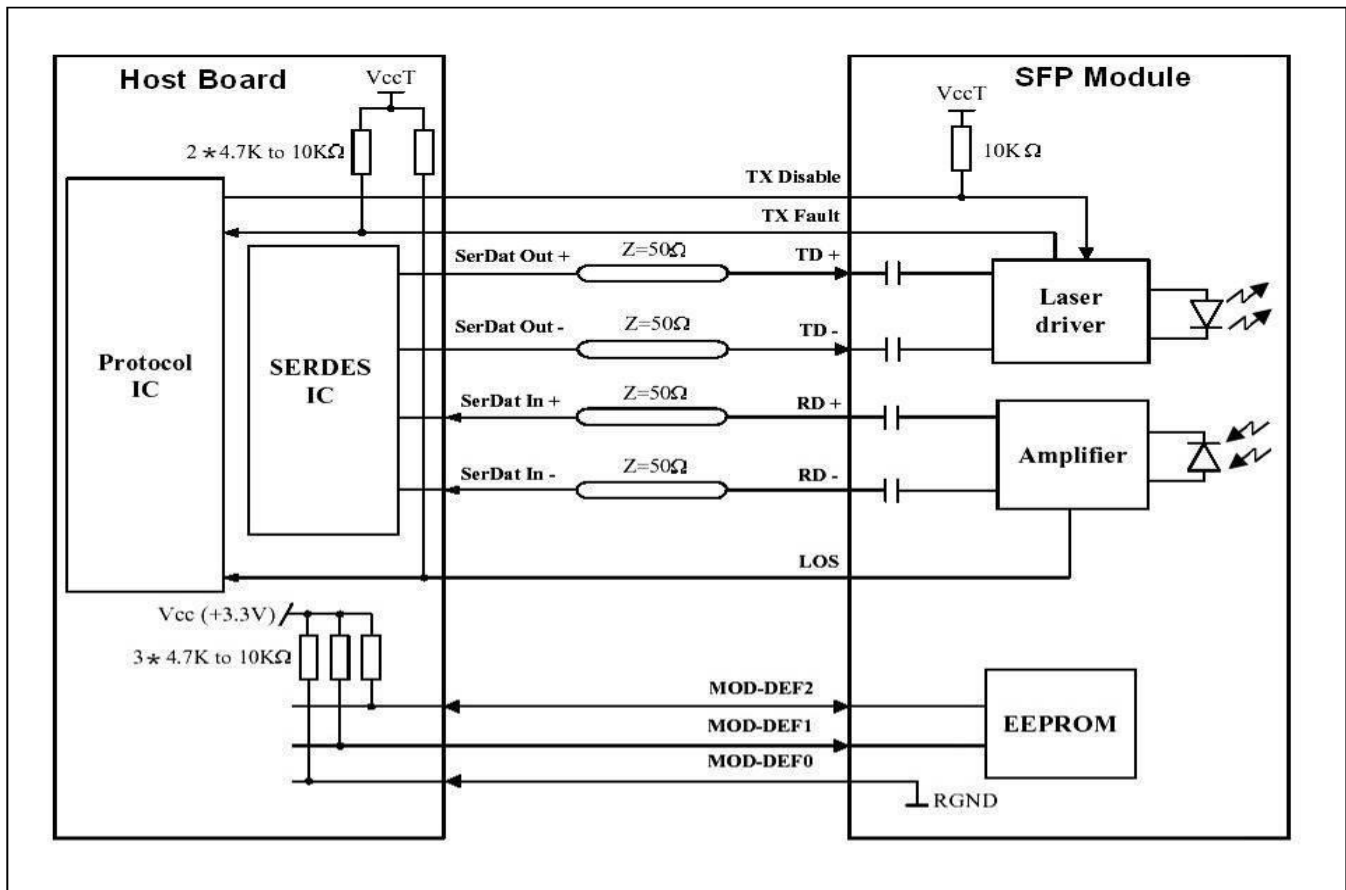
Notes:

Plug Seq.: Pin engagement sequence during hot plugging.

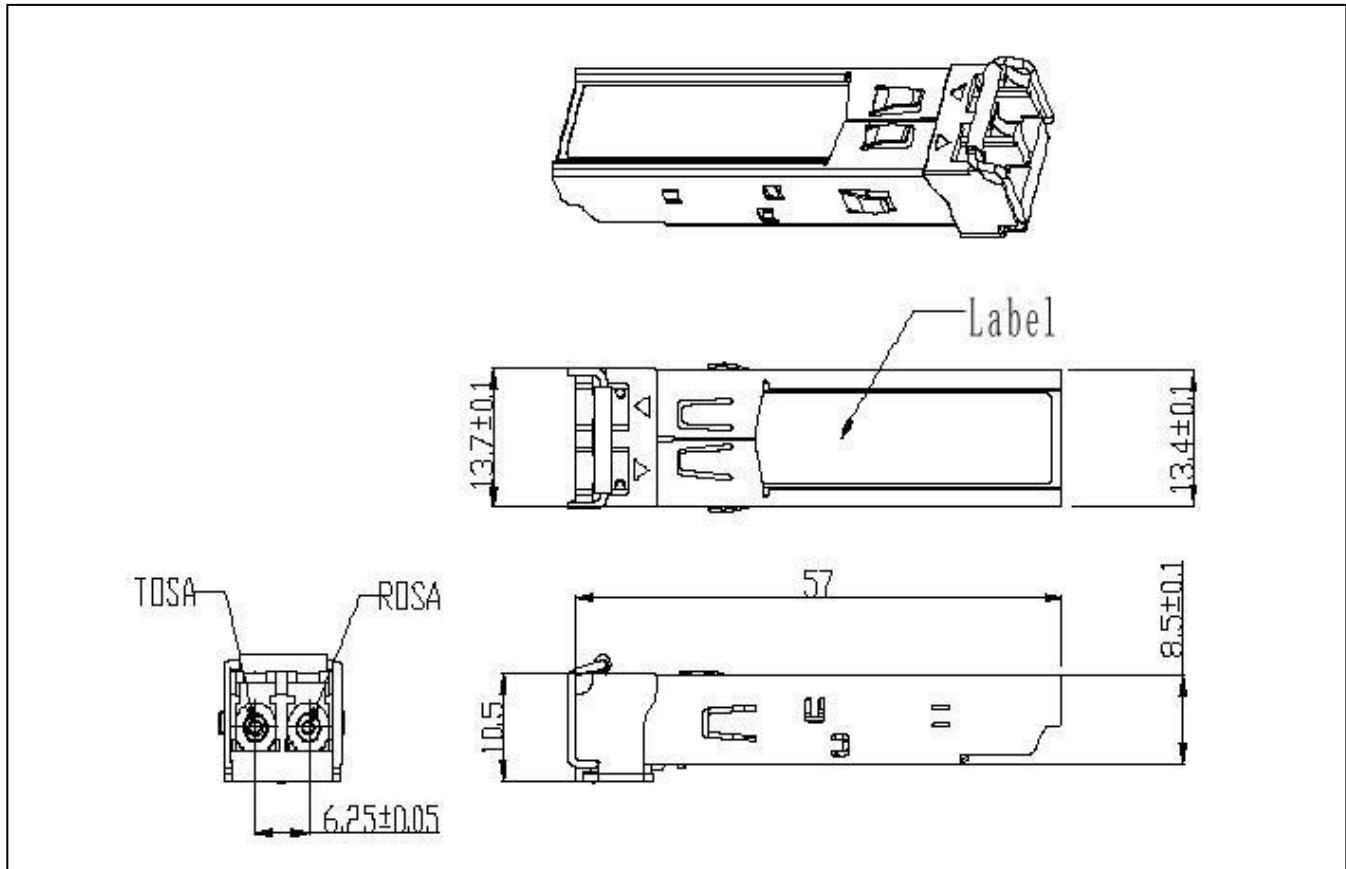
- TX Fault is an open collector output, which should be pulled up with a 4.7k~10kΩ resistor on the host board to a voltage between 2.0V and V_{cc}+0.3V. Logic 0 indicates normal operation; Logic 1 indicates a laser fault of some kind. In the low state, the output will be pulled to less than 0.8V.
- TX Disable is an input that is used to shut down the transmitter optical output. It is pulled up within the module with a 4.7k~10kΩ resistor. Its states are:

Low (0 to 0.8V):	Transmitter on
(>0.8V, < 2.0V):	Undefined
High (2.0 to 3.465V):	Transmitter Disabled
Open:	Transmitter Disabled
- 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 V_{ccT} or V_{ccR}.
 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
- LOS is an open collector output, which should be pulled up with a 4.7k~10kΩ resistor. Pull up voltage between 2.0V and V_{cc}+0.3V. Logic 1 indicates loss of signal; Logic 0 indicates normal operation. In the low state, the output will be pulled to less than 0.8V.
- RD-/+ : These are the differential receiver outputs. They are internally AC-coupled 100 differential lines which should be terminated with 100Ω (differential) at the user SERDES.
- TD-/+ : These are the differential transmitter inputs. They are internally AC-coupled, differential lines with 100Ω differential termination inside the module.

Recommended Interface Circuit



Mechanical Dimensions



Regulatory Compliance

SFP transceiver is designed to be Class I Laser safety compliant and is certified per the following standards

Feature	Agency	Standard	Certificate / Comments
Laser Safety	FDA	CDRH 21 CFR 1040 and Laser Notice No. 50	1120294-000
Product Safety	BST	EN 60825-1: 2007 EN 60825-2: 2004 EN 60950-1: 2006	BT0905142002
Environmental protection	SGS	RoHS Directive 2002/95/EC	GZ0902008346/CHEM
EMC	CCIC	EN 55022: 2006+A1: 2007 EN 55024: 1998+A1: 2001+A2: 2003	CTE09050018

Ordering information

Part Number	Product Description
NPD-xx48-04CD	DWDM SFP, xx=17~61 (ITU Channel C-band), 2.67Gbps, 40km, -5°C ~ +70°C, Digital Diagnostic Monitoring