

# GIGALIGHT 40KM DWDM SFP+ Optical Transceiver GDP-XX192-04T

## Features

- ◆ Hot-pluggable SFP+ footprint
- ◆ Supports 1.2288 to 10.3125 Gb/s
- ◆ Link length up to 40km on G.652D SMF
- ◆ Suitable for use in 100GHz channel spacing DWDM systems
- ◆ Link budget up to 24dB
- ◆ Operating case temperature range:-40°C to +85°C
- ◆ Cooled EML transmitter and APD receiver
- ◆ Maximum power dissipation <2.0W (Typical 1.4W)
- ◆ Single 3.3V power supply
- ◆ Duplex LC connector
- ◆ Built-in digital diagnostic interface
- ◆ RoHS compliant (lead free)



## Applications

- ◆ CPRI standard
- ◆ 10G Ethernet
- ◆ 10G SONET/SDH
- ◆ 10G Fiber 8.5G and 10G
- ◆ ITU-T G.698.1 DS100S1-2Dz(C)

## Description

The Gigalight DWDM 40km SFP+ Transceiver is a “Limiting module”, designed for CPRI, 10GBASE-ZR, SDH/SONET and 10G Fiber Channel applications, link length up to 40km on G.652D SMF, link budget can reach 24dB. They are compliant with SFF-8431 Rev 4.1, SFF-8432 and SFF-8472 Rev 10.3.

The transmitter section incorporates a cooled EML laser, and the receiver section consists of a APD photodiode integrated with TIA.

Digital diagnostics functions are available via a 2-wire serial interface, as specified in SFF-8472, which allows real-time access to device operating parameters such as case temperature, laser bias current, transmitted optical power, received optical power and module supply voltage.

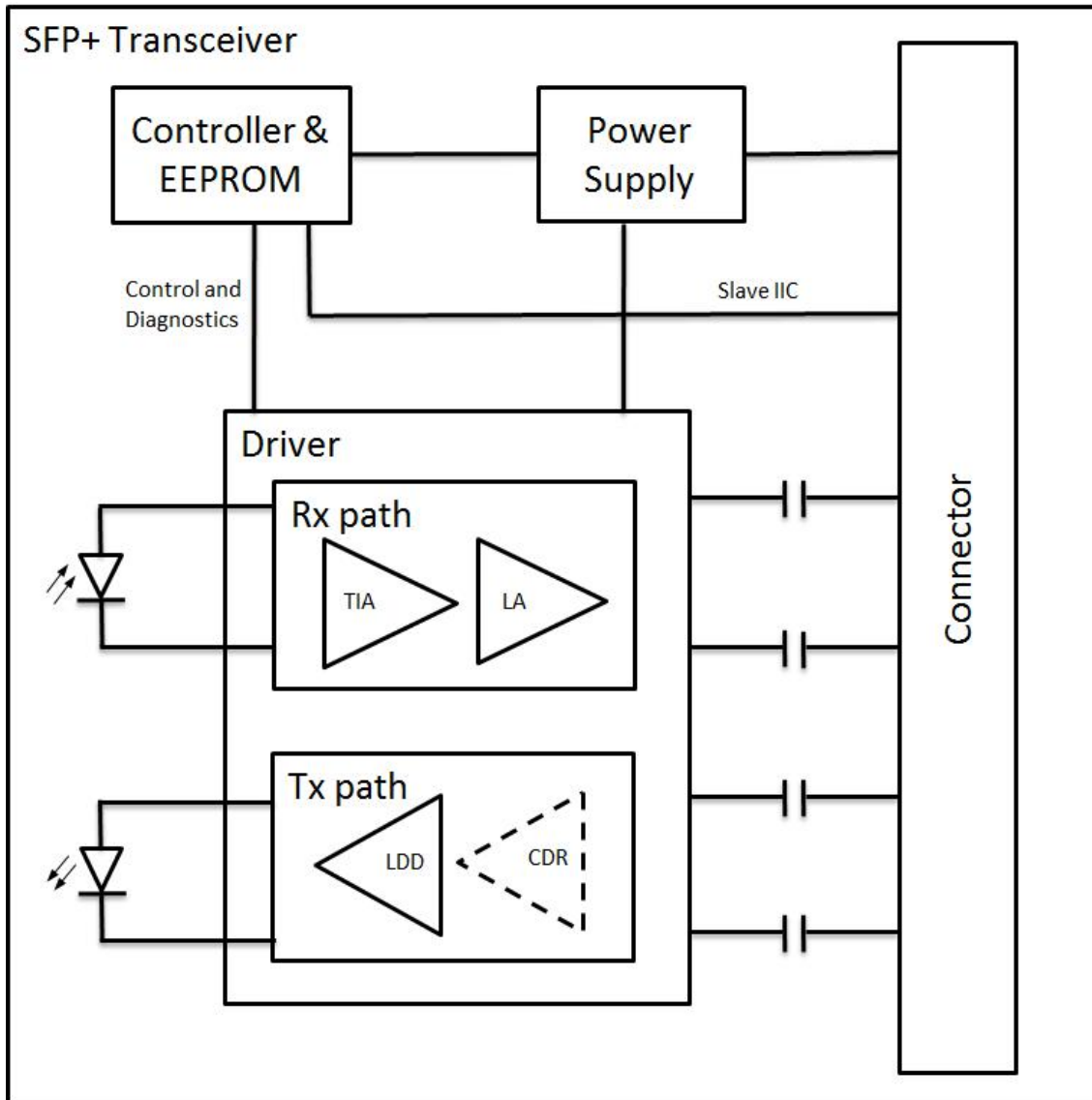


Figure1. Module Block Diagram

### Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Unit
Supply Voltage	Vcc	-0.5	+3.8	V
Operating Case temperature	Top	-40	+85	°C
Operating Relative Humidity	RHop	5	85	%
Storage and Transportation Temperature	Tst	-40	+85	°C
Storage and Transportation Relative Humidity	-	5	85	%

Max Link Length	Lmax		40	km
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### Operating Conditions

Parameter	Symbol	Min	Typical	Max	Unit
Supply Voltage	Vcc	3.13	3.3	3.46	V
Supply current	Icc	-	420	650	mA
Operating Case temperature	Tca	-40	-	+85	°C
Module Power Dissipation <sup>[1]</sup>	Pm	-	1.4	1.8	W
ESD(High speed pins) <sup>[2]</sup>	-	-	-	1000	V

#### Notes:

[1].Power consumption over -40~+85°C case temperature and BOL

[2].Human body model per JEDEC JESD22-A114-B,compliant with INF-077i Rev.4.5 August 31,2005

### Transmitter Optical Specifications

Parameter	Symbol	Min	Typical	Max	Unit
Laser Safety	Class I according to IEC60825				
Optical Wavelength	$\lambda$	As per ITU-T 694.1			nm
Average Optical Power <sup>[1]</sup>	Pout	0	-	+4	dBm
Optical Transmit Power (disabled)	Pout_off	-	-	-30	dBm
Spectral Width (-20dB)	$\Delta\lambda_{20}$	-	-	0.3	nm
Side Mode Suppression Ratio <sup>[2]</sup>	SMSR	30	-	-	dB
Wavelength Deviation (100GHz spacing) <sup>[3]</sup>	BOL	$\Delta\lambda_T$	-50	+50	pm
	EOL	$\Delta\lambda_a$	-100	+100	pm
Extinction Ratio	ER	8.2	-	-	dB
Relative Intensity Noise	RIN	-	-	-128	dB/Hz
Optical Return Loss Tolerance	Orl	-	-	21	dB

#### Notes:

[1].Average power measured at output over the operating temperature

[2].Ratio of the average output power in the dominant longitudinal mode to the power in the most significant side mode peak under full modulation condition

[3].Deviation from the ITU standardized wavelength

**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.**

### Receiver Optical Specifications

Parameter	Symbol	Min	Typical	Max	Unit
Input Operating Wavelength	$\lambda$	1260	-	1620	nm
Average receive power	Pavg	-24	-	-5	dBm
Maximum Input Power	Poverload	-5			dBm
Sensitivity(0km,10.3125Gbps) <sup>[1]</sup>	Rsen1	-	-	-24	dBm

Sensitivity(40km,10.3125Gbps) <sup>[1]</sup>	Rsen2	-	-	-22	dBm
Optical Path Penalty (over 40km G.652D SMF)	DP	-	-	2	dB
Reflectance	Rrx	-	-	-27	dB
LOS Asserted	LOS <sub>A</sub>	-34	-	-	dBm
LOS De-Asserted	LOS <sub>D</sub>	-	-	-24	dBm
LOS Hysteresis	LOS <sub>H</sub>	0.5	-	-	dB

**Notes:**

[1] Measured with PRBS2<sup>31</sup>-1 for BER =10<sup>-12</sup>.

**Transmitter Specifications – Electrical**

Parameter	Symbol	Min	Typical	Max	Unit
Data Rate	Mra	1.2288		10.3125	Gbps
Input differential impedance	Rim	80	100	120	Ω
Differential data Input	VtxDIFF	120	-	850	mVpp
Transmit Disable Voltage	VD	2.0	-	Vcc3+0.3	V
Transmit Enable Voltage	Ven	-0.3	-	+0.8	V
Transmit Disable Assert Time	t <sub>off</sub>	-	-	100	us
Tx Enable Assert Time	t <sub>on</sub>	-	-	2	ms
Tx_Fault Assert Time for cooled SFP+	Tx_f_on	-	-	50	ms
Tx_Fault Reset Time <sup>[1]</sup>	t <sub>reset</sub>	10	-	-	us
Initialization Time for cooled SFP+	t <sub>start_up</sub>	-	-	10	s

**Notes:**

[1] Time Tx\_Disable must be held high to reset Tx\_Fault

**Receiver Specifications – Electrical**

Parameter	Symbol	Min	Typical	Max	Unit
Data Rate	Mra	1.2288		10.3125	Gbps
Differential Output Impedance	Rout	80	100	120	Ω
Differential Output Swing	Vout P-P	350	-	800	mVpp
Rise/Fall Time	Tr / Tf	24	-	-	ps
Loss of Signal –Asserted	VOH	2	-	Vcc3+0.3-	V
Loss of Signal –Negated	VOL	0	-	+0.4	V
LOS Assert/Deassert Time Delay	T <sub>los on/off</sub>	-	-	100/100	us

**Digital Diagnostic Functions**

Parameter	Symbol	Min.	Max	Unit	Notes
<b>Accuracy</b>					
Transceiver Temperature	DMI_Temp	-3	+3	°C	
TX Output optical power	DMI_TX	-2	+2	dB	
RX Input optical power	DMI_RX	-2	+2	dB	
Transceiver Supply voltage	DMI_VCC	-3%	+3%	V	Full operating
Bias current monitor	DMI_Ibias	-10%	10%	mA	
<b>Dynamic Range Accuracy</b>					
Transceiver Temperature	DMI_Temp	-40	+85	°C	
TX Output optical power	DMI_TX	-1	+5	dBm	
RX Input optical power	DMI_RX	-28	-5	dBm	
Transceiver Supply voltage	DMI_VCC	3.0	3.6	V	
Bias current monitor	DMI_Ibias	0	120	mA	

**C-band  $\lambda$ 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			

Table 1. Product ordering codes: the central wavelength is defined as per ITU-T 694.1

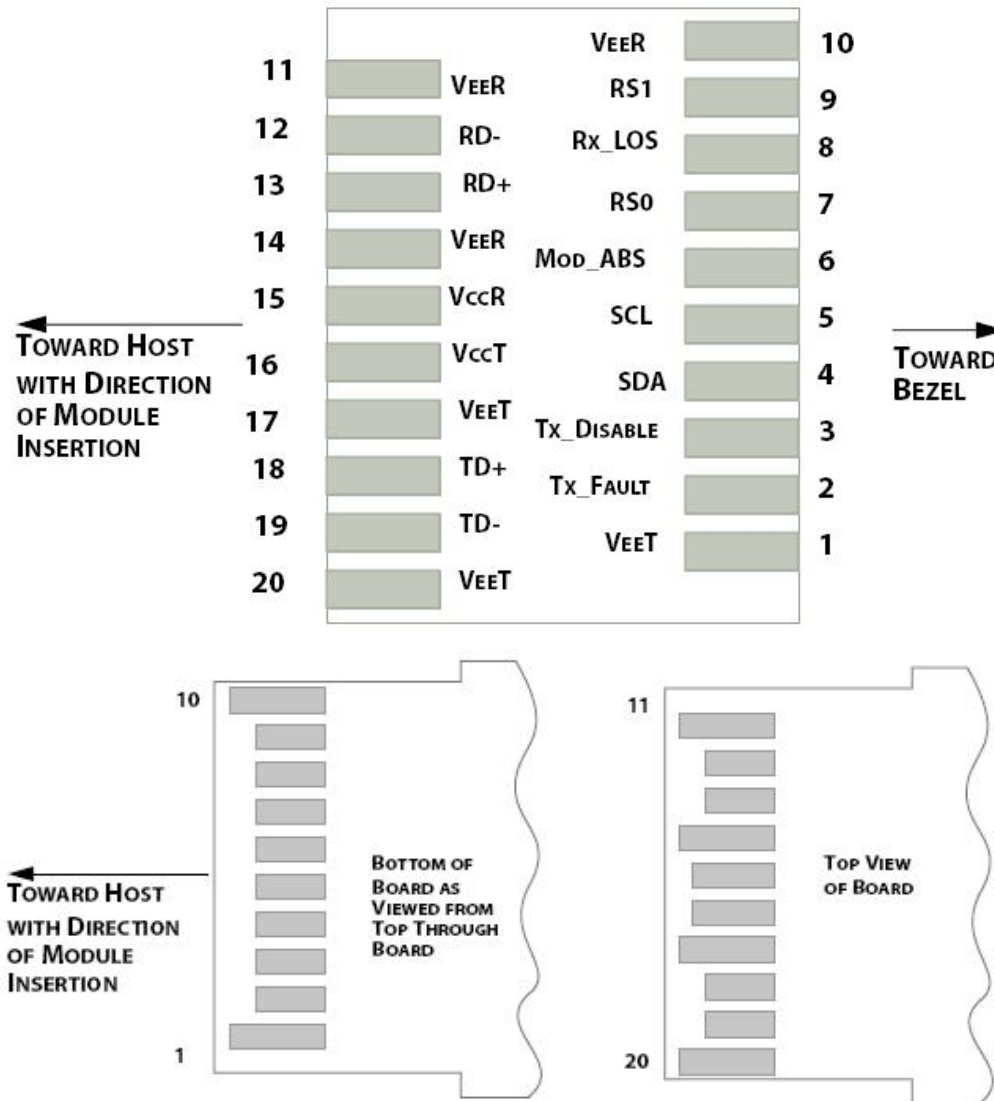


Figure2.Electrical Pin-out Details

**Pin Descriptions**

Pin	Symbol	Name/Description
1	VEET [1]	Transmitter Ground
2	Tx_FAULT [2]	Transmitter Fault
3	Tx_DIS [3]	Transmitter Disable. Laser output disabled on high or open
4	SDA [2]	2-wire Serial Interface Data Line
5	SCL [2]	2-wire Serial Interface Clock Line

6	MOD_ABS [4]	Module Absent. Grounded within the module
7	RS0 [5]	Rate Select 0
8	RX_LOS [2]	Loss of Signal indication. Logic 0 indicates normal operation
9	RS1 [5]	Rate Select 1
10	VEER [1]	Receiver Ground
11	VEER [1]	Receiver Ground
12	RD-	Receiver Inverted DATA out. AC Coupled
13	RD+	Receiver DATA out. AC Coupled
14	VEER [1]	Receiver Ground
15	VCCR	Receiver Power Supply
16	VCCT	Transmitter Power Supply
17	VEET [1]	Transmitter Ground
18	TD+	Transmitter DATA in. AC Coupled
19	TD-	Transmitter Inverted DATA in. AC Coupled
20	VEET [1]	Transmitter Ground

**Notes:**

- [1] Module circuit ground is isolated from module chassis ground within the module.
- [2].should be pulled up with 4.7k – 10k ohms on host board to a voltage between 3.15V and 3.6V.
- [3]Tx\_Disable is an input contact with a 4.7 kΩ to 10 kΩ pullup to VccT inside the module.
- [4]Mod\_ABS is connected to VeeT or VeeR in the SFP+ module. The host may pull this contact up to Vcc\_Host with a resistor in the range 4.7 kΩ to 10 kΩ.Mod\_ABS is asserted “High” when the SFP+ module is physically absent from a host slot.
- [5] RS0 and RS1 are module inputs and are pulled low to VeeT with > 30 kΩ resistors in the module.

**Host Board SFP+ Connector Recommendations**

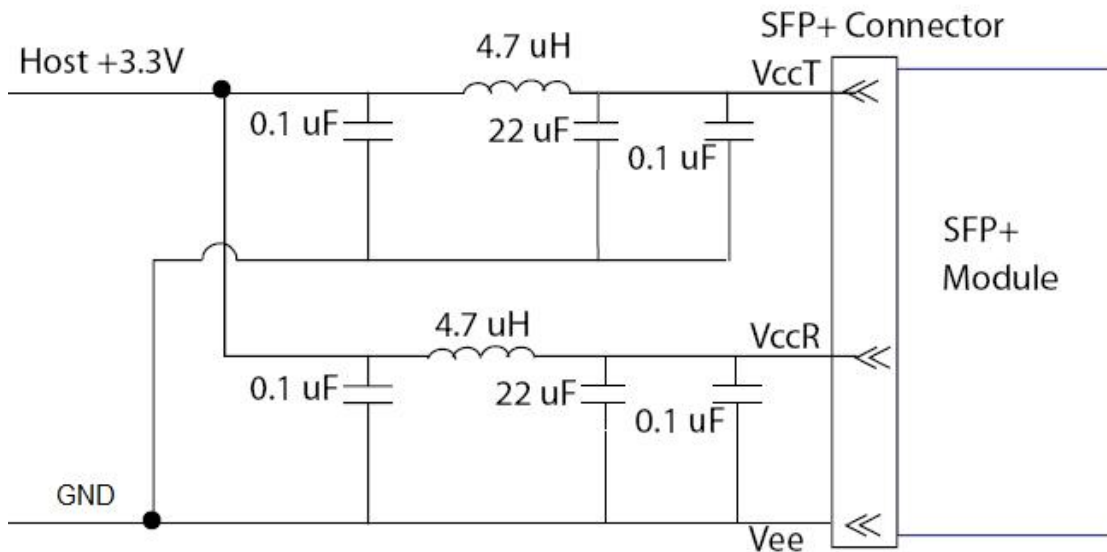


Figure3. Host Board Power Supply Filters Circuit

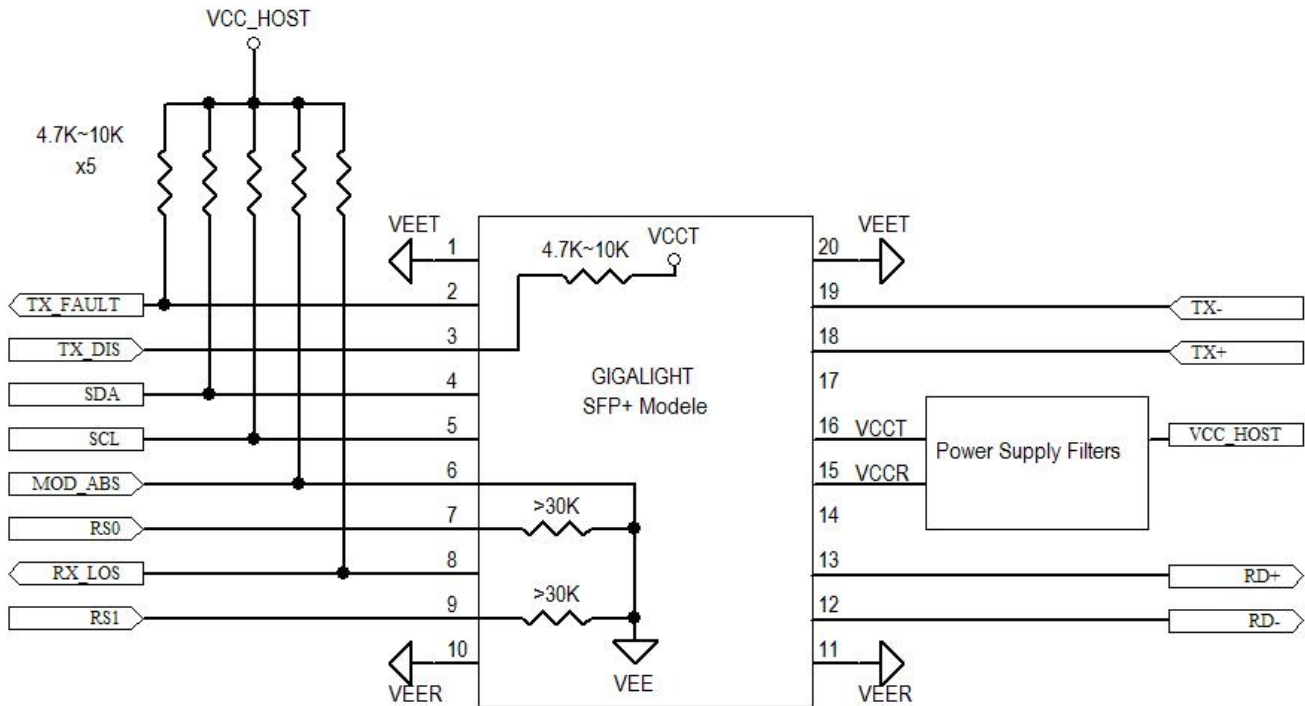
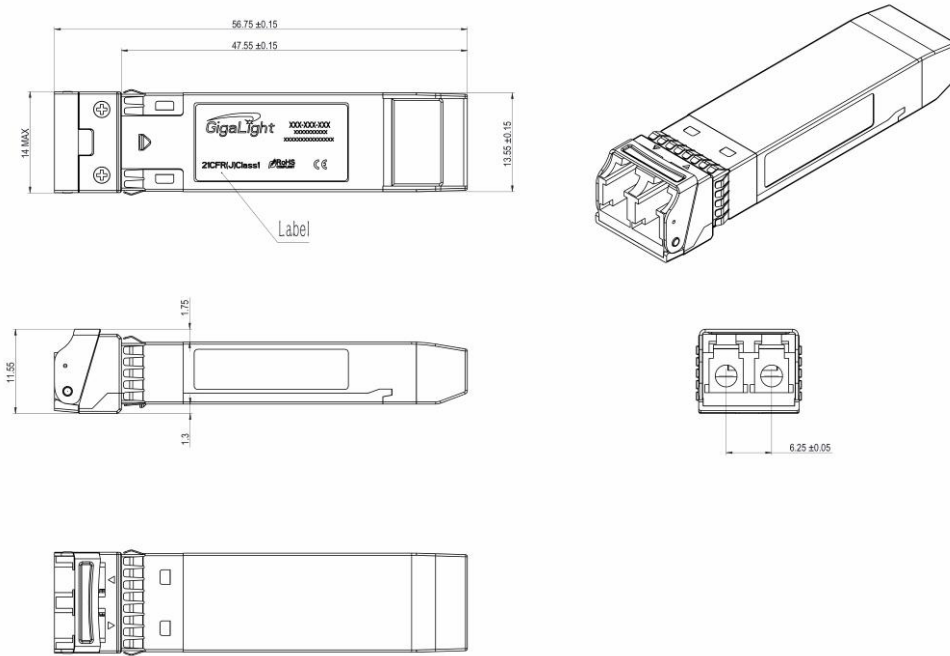


Figure4. Host-Module Interface

### Mechanical Dimensions

Gigalight GDP-XX192-04T SFP+ Transceiver are compatible with the SFF-8432 specification for improved pluggable form factor, and shown here for reference purposes only. Bail color is white.





**Figure5. Mechanical Specifications**

### Regulatory Compliance

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

Feature	Standard
Laser Safety	IEC 60825-1:2014 (Third Edition)
Environmental protection	2011/65/EU
CE EMC	EN55032: 2015 EN55035: 2017 EN61000-3-2:2014 EN61000-3-3:2013
FCC	FCC Part 15, Subpart B; ANSI C63.4-2014

### Ordering information

Part Number	Product Description
GDP-XX192-04T	XX= ITU Grid 18~61, 10Gbps, 40km DWDM SFP+, -40°C ~ +85°C

### References

1. "Specifications for Enhanced Small Form Factor Pluggable Module SFP+", SFF-8431, Rev 4.1, July 6, 2009.
2. "Improved Pluggable Formfactor", SFF-8432, Rev 4.2, Apr 18, 2007
3. IEEE802.3ae – 2002

## 4. “Diagnostic Monitoring Interface for Optical Transceivers” SFF-8472, Rev 10.3, Dec 1,2007

**Important Notice**

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**Revision History**

Revision	Date	Description
V0	Mar. 04,2019	Advance Release.
V1	Mar. 28,2019	Update details of Regulatory Compliance and Mechanical Specifications
V2	Apri.22, 2020	Revise power dissipation and supply current, viewing photo