

# 10GE/CPRI CWDM SFP+ ER

## GCP-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 20nm channel spacing CWDM systems
- ✓ Link budget up to 24dB
- ✓ Operating case temperature range: -40°C to +85°C
- ✓ Cooled EML transmitter and APD receiver
- ✓ Maximum power dissipation < 1.8W (Typical 1.4W)
- ✓ Single 3.3V power supply
- ✓ Duplex LC connector
- ✓ Built-in digital diagnostic interface
- ✓ RoHS compliant (lead free)



## Applications

- ✓ CPRI standard
- ✓ 10G SONET/SDH
- ✓ 10G Ethernet
- ✓ 10G Fibre channel

## Description

GIGALIGHT's 10GE/CPRI CWDM SFP+ ER transceiver is a "Limiting module" designed for 10G Ethernet, CPRI, SONET/SDH and Fibre Channel applications, and supports link length up to 40km on G.652D SMF with up to 24dB link budget. The module is 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 photo-diode 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

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temperature, laser bias current, transmitted optical power, received optical power and module supply voltage.

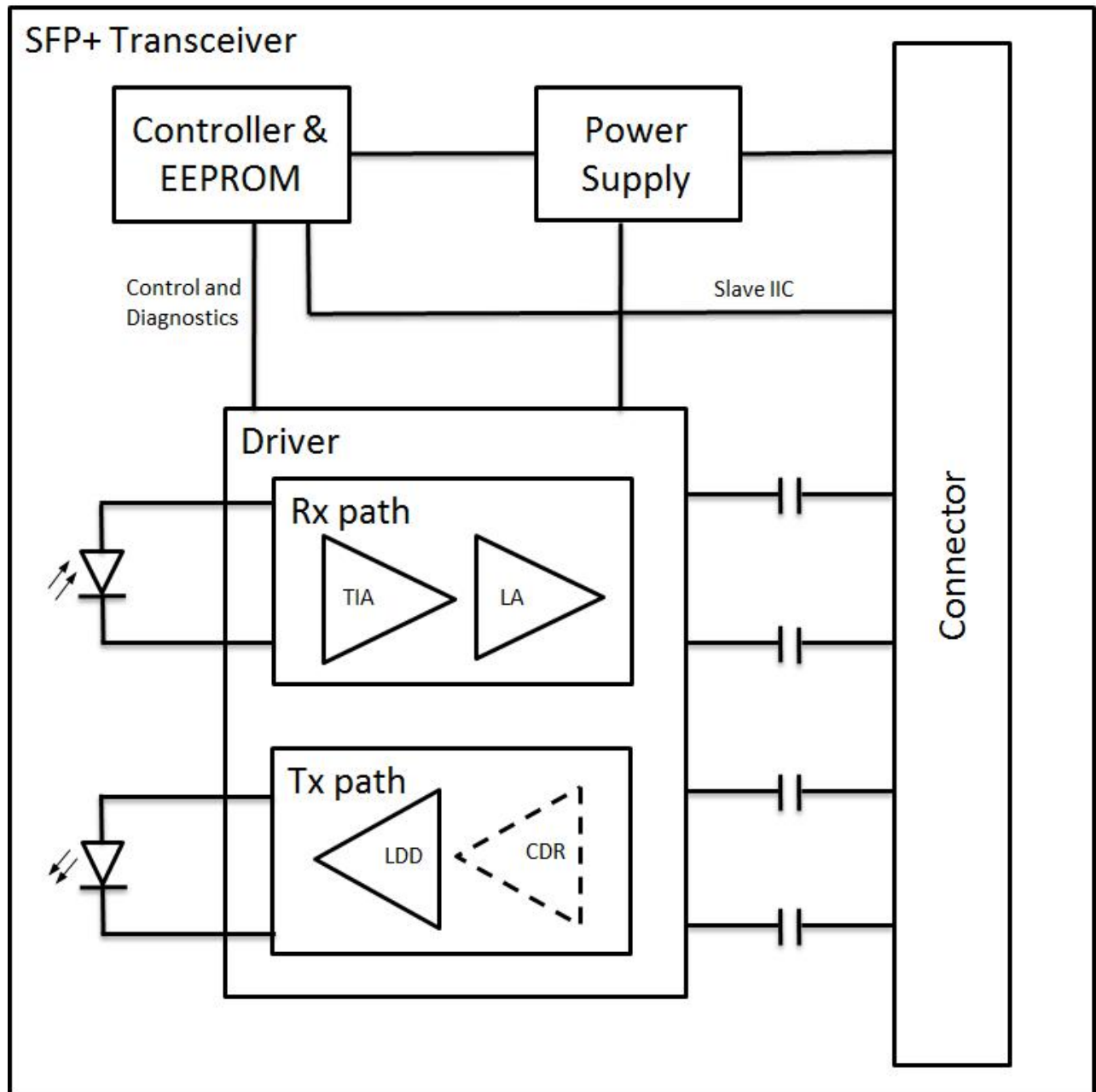


Figure1. Module Block Diagram



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### 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

### Operating Conditions

Parameter	Symbol	Min	Typical	Max	Unit
Supply Voltage	Vcc	3.13	3.3	3.46	V
Supply current	Icc	-	420	550	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.



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### Transmitter Optical Specifications

Parameter	Symbol	Min	Typical	Max	Unit
Laser Safety	Class I according to IEC60825				
Optical Wavelength	$\lambda$	As per ITU-T G.694.2			nm
Wavelength Deviation <sup>[3]</sup>	$\Delta\lambda$	-6.5		+6.5	nm
Average Optical Power <sup>[1]</sup>	P <sub>out</sub>	0	-	+4	dBm
Optical Transmit Power (disabled)	P <sub>out_off</sub>	-	-	-30	dBm
Spectral Width (-20dB)	$\Delta\lambda_{20}$	-	-	0.3	nm
Side Mode Suppression Ratio <sup>[2]</sup>	SMSR	30	-	-	dB
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 G.694.2, wavelength range 1471nm~1611nm.

**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.



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### Receiver Optical Specifications

Parameter	Symbol	Min	Typical	Max	Unit
Input Operating Wavelength	$\lambda$	1260	-	1620	nm
Average Receive Power	Pavg	-24	-	-5	dBm
Sensitivity (0km,10.3125Gbps) <sup>[1]</sup>	Rsen1	-	-	-24	dBm
Sensitivity (40km,10.3125Gbps) <sup>[1]</sup>	Rsen2	-	-	-22	dBm
Maximum Input Power	RX-overload	-5			dBm
Optical Path Penalty (over 40km G.652D SMF)	DP	-	-	2	dB
Reflectance	Rrx	-	-	-27	dB
LOS Asserted	LOSA	-34	-	-	dBm
LOS De-Asserted	LOSD	-	-	-24	dBm
LOS Hysteresis	LOSH	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	$\Omega$



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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_off	-	-	100	us
Tx Enable Assert Time	t_on	-	-	2	ms
Tx_Fault Assert Time for cooled SFP+	Tx_f_on	-	-	50	ms
Tx_Fault Reset Time <sup>[1]</sup>	t_reset	10	-	-	us
Initialization Time for cooled SFP+	t_start_up	-	-	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	$\Omega$
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



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LOS Assert/Deassert Time Delay	T_los on/off	-	-	100/100	us
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### Digital Diagnostic Functions

Parameter	Symbol	Min.	Max	Unit	Notes
Accuracy					
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	
Dynamic Range Accuracy					
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	

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### Wavelength Guide

Channel	Wavelength (nm)
11	1471
12	1491
13	1511
14	1531
15	1551
16	1571
17	1591
18	1611

Table 1. Product ordering codes: the central wavelength is defined as per ITU-T G.694.2



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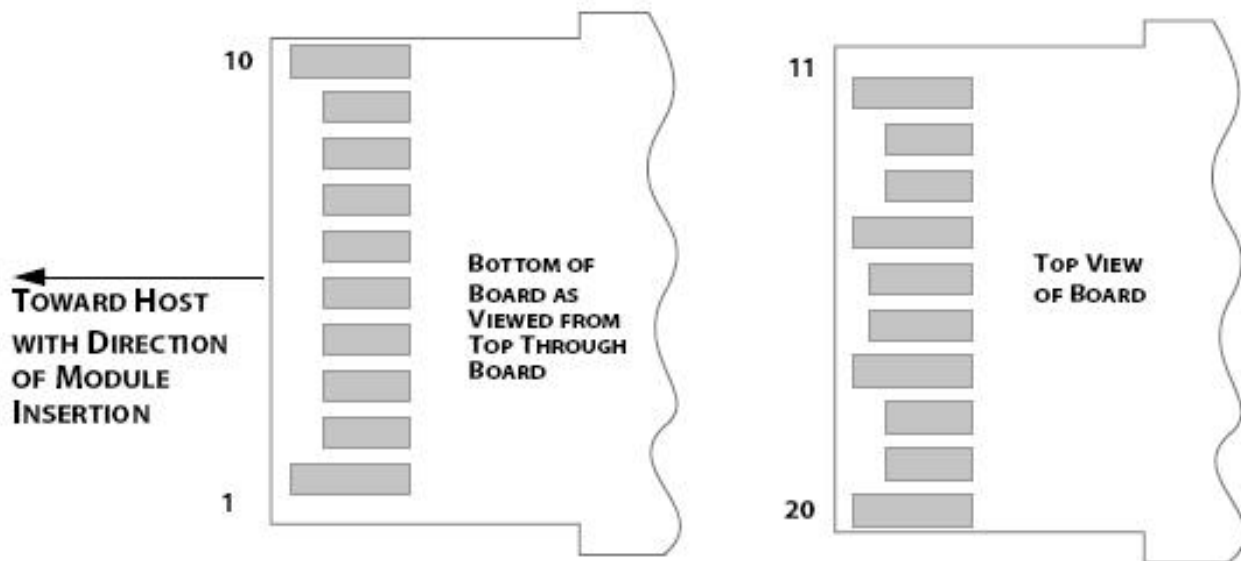
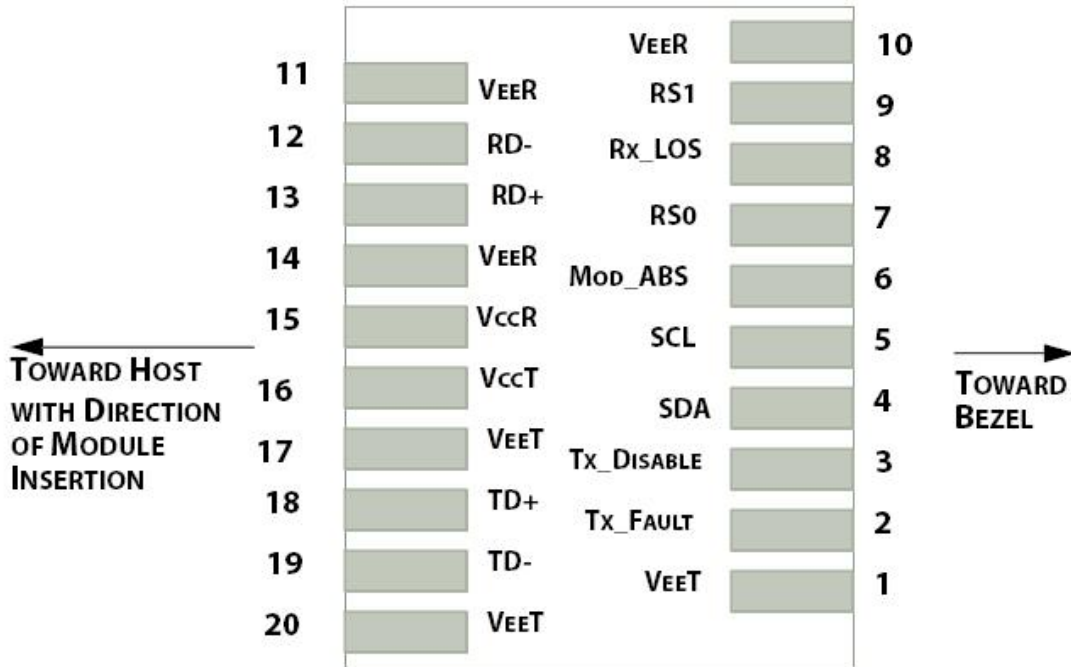


Figure2. Electrical Pin-out Details



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### Pin Descriptions

Pin	Symbol	Name/Description
1	VEET <sup>[1]</sup>	Transmitter Ground
2	Tx_FAULT <sup>[2]</sup>	Transmitter Fault
3	Tx_DIS <sup>[3]</sup>	Transmitter Disable. Laser output disabled on high or open
4	SDA <sup>[2]</sup>	2-wire Serial Interface Data Line
5	SCL <sup>[2]</sup>	2-wire Serial Interface Clock Line
6	MOD_ABS <sup>[4]</sup>	Module Absent. Grounded within the module
7	RS0 <sup>[5]</sup>	Rate Select 0
8	RX_LOS <sup>[2]</sup>	Loss of Signal indication. Logic 0 indicates normal operation
9	RS1 <sup>[5]</sup>	Rate Select 1
10	VEER <sup>[1]</sup>	Receiver Ground
11	VEER <sup>[1]</sup>	Receiver Ground
12	RD-	Receiver Inverted DATA out. AC Coupled
13	RD+	Receiver DATA out. AC Coupled
14	VEER <sup>[1]</sup>	Receiver Ground
15	VCCR	Receiver Power Supply
16	VCCT	Transmitter Power Supply
17	VEET <sup>[1]</sup>	Transmitter Ground

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18	TD+	Transmitter DATA in. AC Coupled
19	TD-	Transmitter Inverted DATA in. AC Coupled
20	VEET <sup>[1]</sup>	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 4.7kΩ to 10kΩ pull up 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 4.7kΩ to 10kΩ. 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 > 30kΩ resistors in the module.

### Host Board SFP+ Connector Recommendations

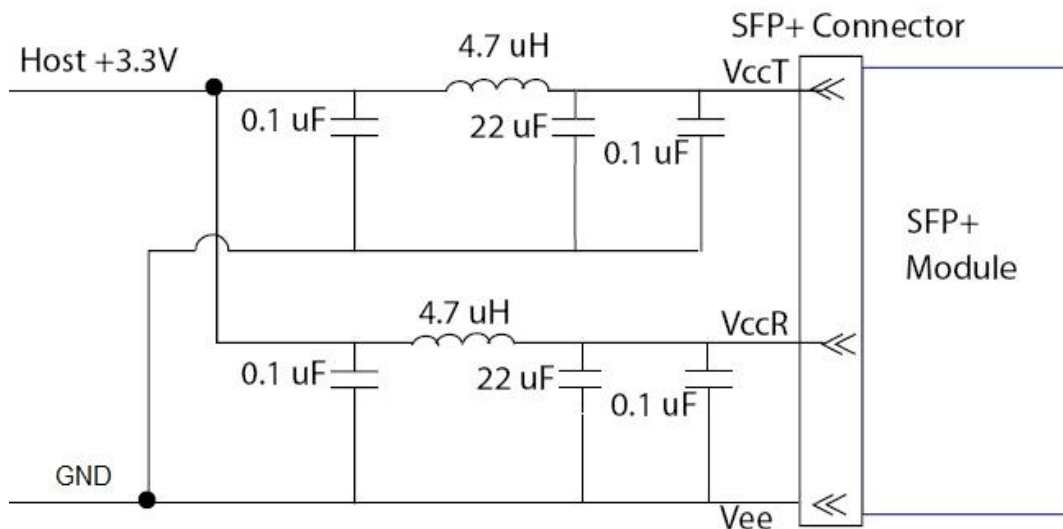


Figure3. Host Board Power Supply Filters Circuit

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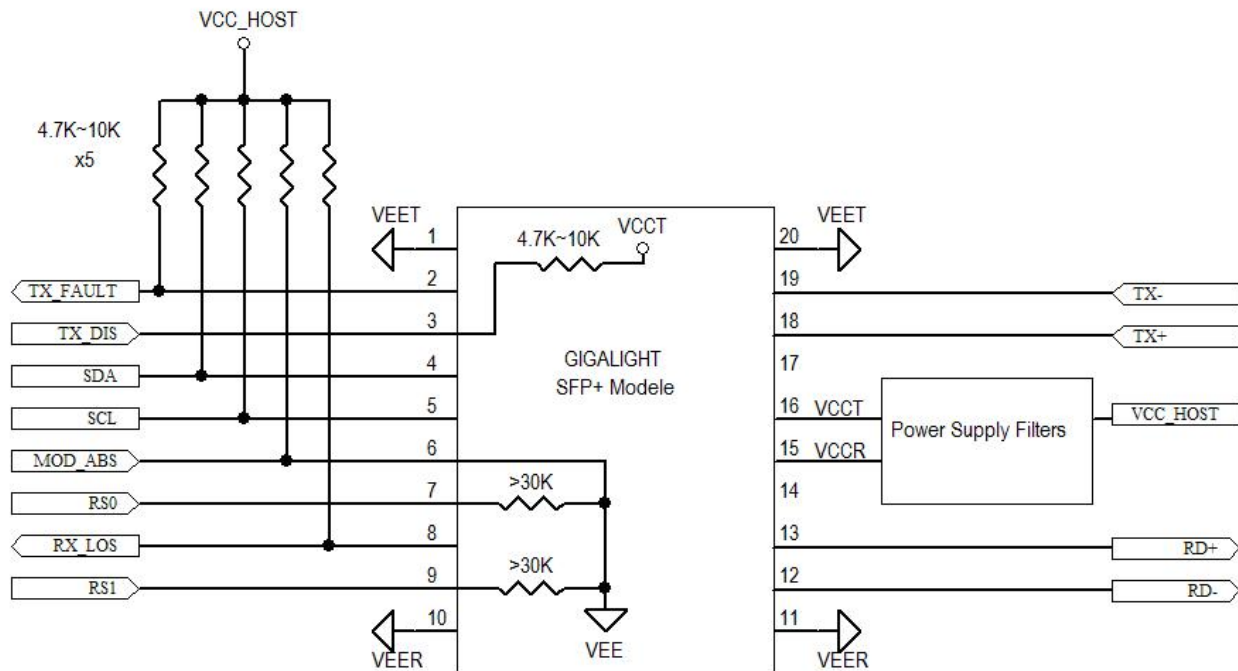


Figure4. Host-Module Interface

## Mechanical Dimensions

GIGALIGHT's GCP-xx192-04T transceivers are compatible with the SFF-8432 specification for improved pluggable form factor, and shown here for reference purposes only.

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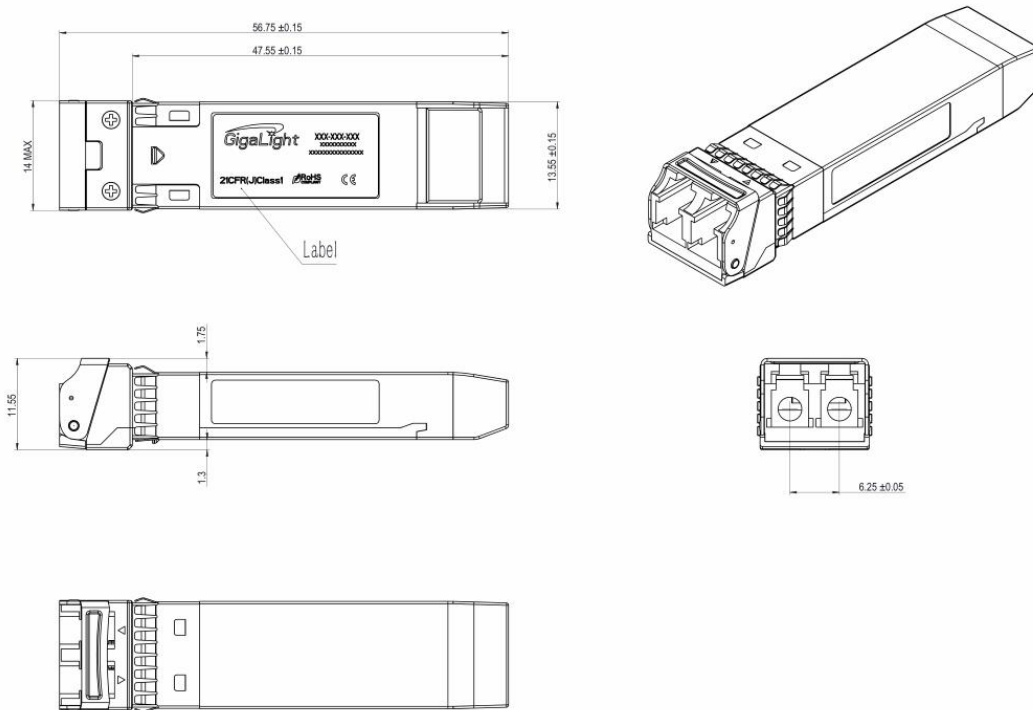


Figure5. Mechanical Specifications

## Regulatory Compliance

GIGALIGHT's SFP+ transceivers are 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



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FCC	FCC Part 15, Subpart B; ANSI C63.4-2014
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### Ordering information

Part Number	Product Description
GCP-xx192-04T	10GE/CPRI CWDM SFP+ ER, 1471nm-1611nm, 40km, SMF, Dual LC, I-Temp

**Notes:** xx=47, 49, ..., 61; 47=1471nm, 49=1491nm, ..., 61=1611nm.

### 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. IEEE 802.3ae – 2002
4. "Diagnostic Monitoring Interface for Optical Transceivers" SFF-8472, Rev 10.3, Dec 1, 2007.

### Important Notice

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