

## 12Gbps Video SFP Optical Transceiver, 20km Reach GHB-XX12GL-L2CDM

### Features

- ✓ SD/HD/3G/6G/12G-SDI SFP Transceiver
- ✓ ST 259, ST 292-1, ST 424, ST-2081 and ST-2082 compatible
- ✓ Metal enclosure for Lower EMI
- ✓ A:1270nm DFB Laser transmitter, 1330nm receiver  
B:1330nm DFB Laser transmitter, 1270nm receiver
- ✓ Supports SDI pathological patterns for SD-SDI, HD-SDI, 3G-SDI, 6G-SDI and 12G SDI
- ✓ Compliant with SFP MSA
- ✓ Simplex LC connector
- ✓ The module's receiver contains reclocker
- ✓ ROHS compliant(lead free)
- ✓ single 3.3V power supply
- ✓ Hot-pluggable SFP footprint
- ✓ Operating case temperature range: 0 to +70°C



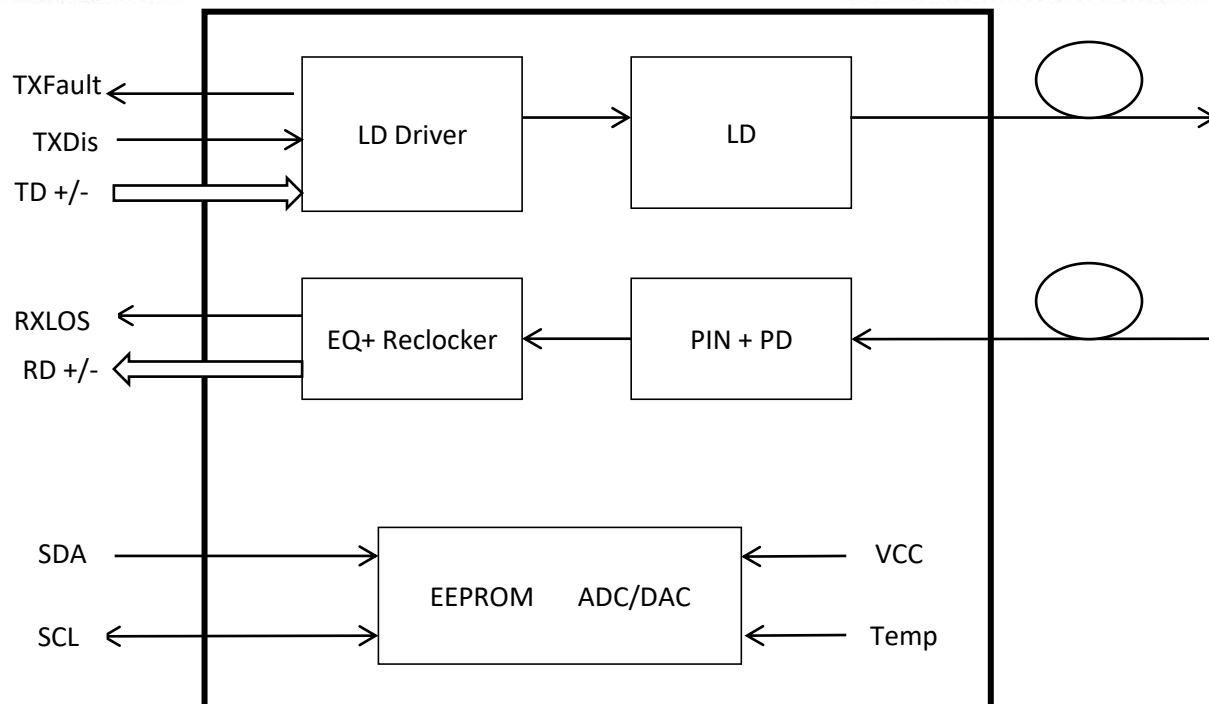
### Applications

- ✓ ST 259, ST 292-1, ST 424, ST-2081 and ST-2082 Electrical-to-Optical Interfaces
- ✓ UHDTV/HDTV/SDTV Service Interfaces

### Description

Gigalight's Video transceiver is designed to transmit/receive data rates from 50Mbps to 11.88Gbps, compliant with SMPTE ST 2082-1 (12G UHD-SDI), ST 2081-1 (6G UHD-SDI), ST424 (3G SDI), ST 292-1 (HD-SDI), and ST 259 (SD-SDI). Gigalight's Video transceiver supports SDI pathological patterns signals.

The transceiver includes these sections: a DFB laser, a PIN photodiode integrated with a trans-impedance preamplifier (TIA), Reclocker, and a MCU controller. The transceiver is compliant with SFP Multi-Source Agreement (MSA).


**Figure 1. Module Block Diagram**
**Absolute Maximum Ratings**

Parameter	Symbol	Min	Max	Unit
Supply Voltage	$V_{CC}$	-0.5	4	V
Storage Temperature	$T_s$	0	+85	°C
Operating Humidity	-	5	85	%

**Recommended Operating Conditions**

Parameter	Symbol	Min	Typical	Max	Unit
Operating Case Temperature	$T_c$	0		+70	°C
Power Supply Voltage	$V_{CC}$	3.13	3.3	3.47	V
Power Supply Current	$I_{CC}$		280	400	mA
Data Rate			12		Gbps

**A: (GHB-2612GL-L2CDM) Optical and Electrical Characteristics**

Parameter	Symbol	Min	Typical	Max	Unit	Notes
<b>Transmitter</b>						
Center Wavelength	$\lambda_c$	1260	1270	1280	nm	
Spectral Width (-20dB)	$\sigma$			1	nm	

Side Mode Suppression Ratio		SMSR	30				dB		
Average Output Power		P <sub>out</sub>	-3		1		dBm	1	
Extinction Ratio		ER	3.5				dB		
Data Input Swing Differential		V <sub>IN</sub>	400		1000		mV	2	
Input Differential Impedance		Z <sub>IN</sub>	90	100	110		Ω		
Rise/Fall Time (20%~80%)		SD-SDI				1500	ps	3	
		HD-SDI				270			
		3G-SDI				135			
		6G-SDI				80			
		12G-SDI				45			
Output Jitter	Timing Jitter	SD-SDI				0.2	UI	4	
		HD-SDI				1			
		3G-SDI				2			
		6G-SDI				4			
		12G-SDI				8			
	Alignment Jitter	SD-SDI							0.2
		HD-SDI							0.2
		3G-SDI							0.3
		6G-SDI							0.3
		12G-SDI							0.3
TX Disable	Disable		2.0			V <sub>cc</sub>	V		
	Enable		0			0.8	V		
TX Fault	Fault		2.0			V <sub>cc</sub>	V		
	Normal		0			0.8	V		
<b>Receiver</b>									
Center Wavelength		λ <sub>c</sub>	1320	1330	1340		nm		
Receiver Sensitivity@ 11.88Gbps						-11	dBm	5	
Receiver Sensitivity@ 5.94Gbps						-13	dBm		
Receiver Sensitivity@ 2.97Gbps						-13	dBm		
Receiver Overload			1				dBm	6	
LOS De-Assert		LOS <sub>D</sub>				-18	dBm		
LOS Assert		LOS <sub>A</sub>	-28				dBm		
LOS Hysteresis		LOS <sub>H</sub>	1		4		dB		

Data Output Swing Differential	Vout	400	800	800	mV	3
LOS	High	2.0		Vcc	V	
	Low			0.8	V	

**B: (GHB-6212GL-L2CDM) Optical and Electrical Characteristics**

Parameter		Symbol	Min	Typical	Max	Unit	Notes	
<b>Transmitter</b>								
Center Wavelength		$\lambda_c$	1320	1330	1340	nm		
Spectral Width (-20dB)		$\sigma$			1	nm		
Side Mode Suppression Ratio		SMSR	30			dB		
Average Output Power		Pout	-3		1	dBm	1	
Extinction Ratio		ER	3.5			dB		
Data Input Swing Differential		V <sub>IN</sub>	400		1000	mV	2	
Input Differential Impedance		Z <sub>IN</sub>	90	100	110	$\Omega$		
Rise/Fall Time (20%~80%)	SD-SDI	tr/tf			1500	ps	3	
	HD-SDI				270			
	3G-SDI				135			
	6G-SDI				80			
	12G-SDI				45			
Output Jitter	Timing Jitter	SD-SDI			0.2	UI	4	
		HD-SDI			1			
		3G-SDI			2			
		6G-SDI			4			
		12G-SDI			8			
	Alignment Jitter	SD-SDI						0.2
		HD-SDI						0.2
		3G-SDI						0.3
		6G-SDI						0.3
		12G-SDI						0.3
TX Disable	Disable		2.0		Vcc	V		
	Enable		0		0.8	V		
TX Fault	Fault		2.0		Vcc	V		
	Normal		0		0.8	V		

Receiver						
Center Wavelength	$\lambda_c$	1260	1270	1280	nm	
Receiver Sensitivity@ 11.88Gbps				-11	dBm	5
Receiver Sensitivity@ 5.94Gbps				-13	dBm	
Receiver Sensitivity@ 2.97Gbps				-13	dBm	
Receiver Overload		1			dBm	6
LOS De-Assert	LOS <sub>D</sub>			-18	dBm	
LOS Assert	LOS <sub>A</sub>	-28			dBm	
LOS Hysteresis	LOS <sub>H</sub>	1		4	dB	
Data Output Swing Differential	V <sub>out</sub>	400	800	800	mV	3
LOS	High	2.0		V <sub>cc</sub>	V	
	Low			0.8	V	

**Note:**

1. The optical power is launched into SMF.
2. PECL input, internally AC-coupled and terminated.
3. Rise and fall times, 20% to 80%, are measured following a fourth-order Bessel-Thompson filter with a bandwidth of 0.75 x clock frequency corresponding to the serial data rate.
4. UI means one period.
5. Measured with Pathological Patterns 11.88Gbps(4096\*2160 P60,100% Bars);5.94Gbps (4096\*2160 P29.97,100% Bars);2.97Gbps (2048\*1080 P50,100% Bars).
6. Internally AC-coupled, minimum input overload power for SMPTE ST 2081-1, SMPTE ST 2082-1.

**Timing and Electrical**

Parameter	Symbol	Min	Typical	Max	Unit
Tx Disable Negate Time	t <sub>on</sub>			1	ms
Tx Disable Assert Time	t <sub>off</sub>			10	μs
Time To Initialize, including Reset of Tx Fault	t <sub>init</sub>			300	ms
Tx Fault Assert Time	t <sub>fault</sub>			100	μs
Tx Disable To Reset	t <sub>reset</sub>	10			μs
Serial ID Clock Rate	f <sub>serial_clock</sub>		100		KHz
MOD_DEF (0:2)-High	V <sub>H</sub>	2		V <sub>cc</sub>	V
MOD_DEF (0:2)-Low	V <sub>L</sub>			0.8	V

**Diagnostics Specification**

Parameter	Range	Unit	Accuracy	Calibration
Tx Disable Negate Time	0 to +70	°C	±3°C	Internal / External
Voltage	3.0 to 3.6	V	±3%	Internal / External
Bias Current	0 to 100	mA	±10%	Internal / External
TX Power	-3to +1	dBm	±3dB	Internal / External
RX Power	-24to +1	dBm	±3dB	Internal / External

## I<sup>2</sup>C Bus Interface

The I<sup>2</sup>C bus interface uses the 2-wire serial CMOS E2PROM protocol. The serial interface meets the following specifications:

- 1.Support a maximum clock rate of 280Khz.
2. Input/Output levels comply with LVCMOS/LVTTL or compatible logics.

Low: 0 – 0.8 V

High: 2.0 – 3.3 V

Undefined: 0.8 – 2.0 V

## Pin Description

Pin	Signal Name	Description	Plug Seq.	Notes
1	VEET	Transmitter Ground	1	
2	TX FAULT	Transmitter Fault Indication	3	Note 1
3	TXDISABLE	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	VEER	Receiver ground	1	
10	VEER	Receiver ground	1	
11	VEER	Receiver ground	1	
12	RD-	Inv. Received Data Out	3	Note 5
13	RD+	Received Data Out	3	Note 5
14	VEER	Receiver ground	1	
15	VCCR	Receiver Power Supply	2	
16	VCCT	Transmitter Power Supply	2	
17	VEET	Transmitter Ground	1	

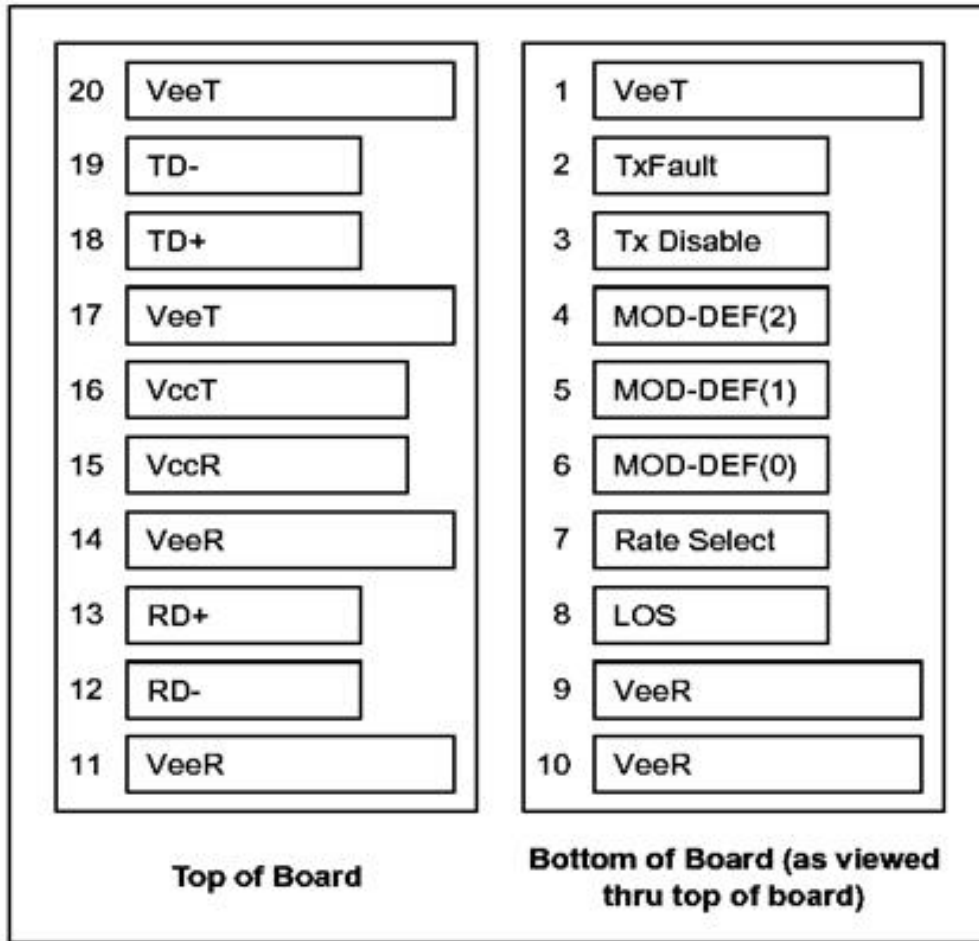
18	TD+	Transmit Data In	3	Note 6
19	TD-	Inv. Transmit Data In	3	Note 6
20	VEET	Transmitter Ground	1	

**Note:**

Plug Seq.: Pin engagement sequence during hot plugging.

1. 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 Vcc+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.
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 4.7k~10kΩ resistor. Its states are:
  - Low (0 ~0.8V): Transmitter on
  - (0.8V ~ 2.0V): Undefined
  - High (2.0 ~3.465V): Transmitter Disabled
  - Open: Transmitter Disabled
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 to VCCT or VCCR.
  - 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.
4. LOS is an open collector output, which should be pulled up with a 4.7k~10kΩ resistor on the host board to a voltage between 3.15V and 3.6V. 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.
5. RD-/+: These are the differential receiver outputs. They are internally AC-coupled 100 differential lines which should be terminated with 100Ω (differential) on the host .
6. TD-/+: These are the differential transmitter inputs. They are internally AC-coupled, differential lines with 100Ω differential termination inside the module.

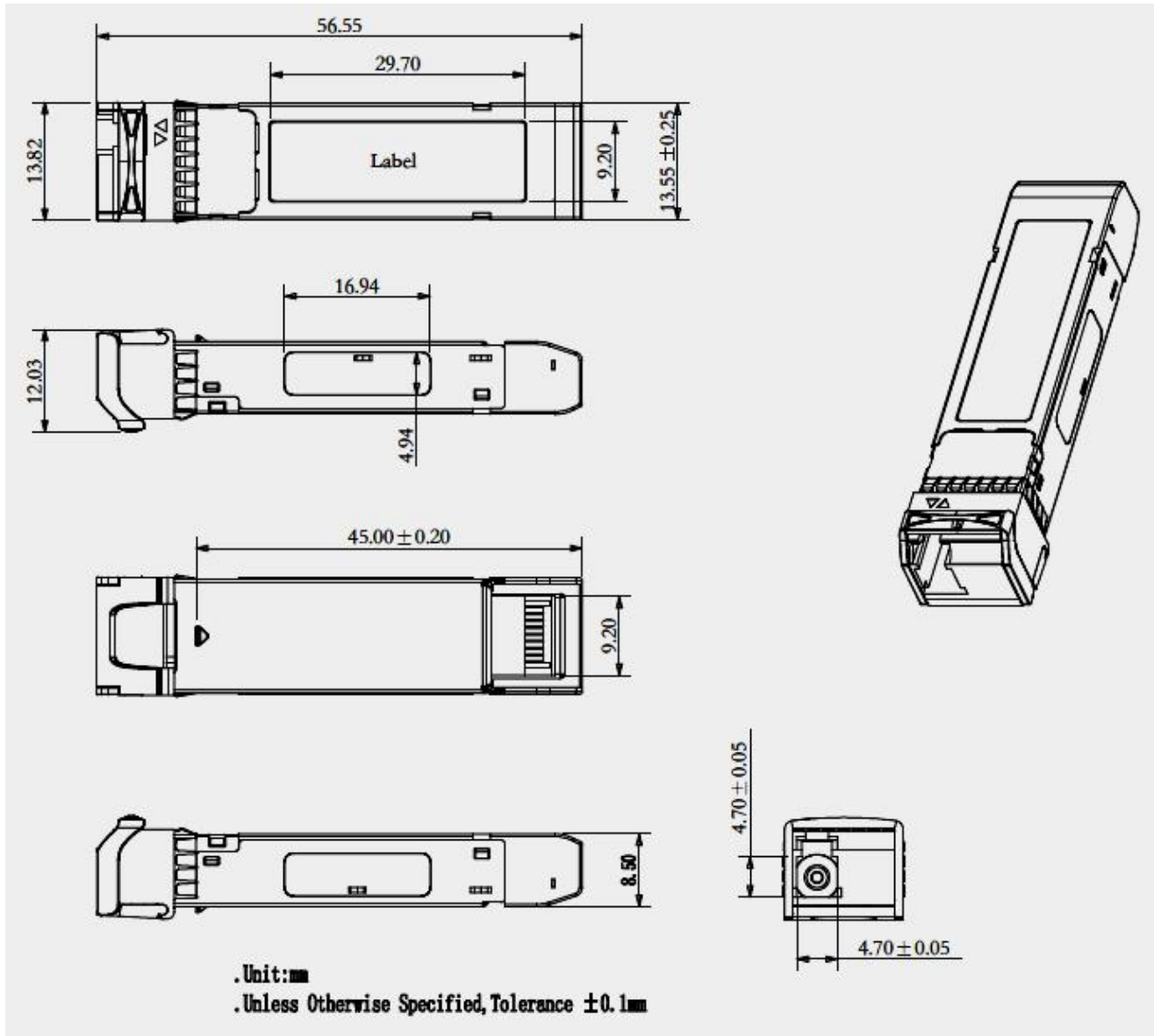
## Pin Definition



*Figure 2. Electrical Pin-out Details*



## Mechanical Dimensions



**Figure 3. Mechanical Specifications**

## Regulatory Compliance

Feature	Standard
Laser Safety	IEC 60825-1:2014 (Third Edition) EN 60825-2: 2004+A1+A2
Electrical Safety	EN 62368-1: 2014 IEC 62368-1: 2014 UL 62368-1: 2014
Environmental protection	2011/65/EU 2015/863/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

**⚠ CAUTION:**

Use of controls or adjustment or performance of procedures other than those specified herein may result in hazardous radiation exposure.

**Ordering Information**

Part Number	Product Description
GHB-2612GL-L2CDM	TX:1270nm,RX:1330nm,12Gbps,10/20km,SD/HD/3G/6G/12G SDI Transceiver, MSA, Simplex LC
GHB-6212GL-L2CDM	TX:1330nm,RX:1270nm,12Gbps,10/20km,SD/HD/3G/6G/12G SDI Transceiver, MSA, Simplex LC

**Important Notice**

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**Revision History**

Revision	Date	Description
V0	Mar-1- 2021	Advance Release.