

# 25G DWDM SFP28 100GHz 10km Industrial Optical Transceivers GSS-Dxx250-LRT

## Features

- Hot-pluggable SFP28 form factor
- Full-duplex transceiver module
- Cooled DWDM EML TOSA and APD ROSA
- Internal CDR on both transmitter and receiver channels
- Compliant with SFP28 MSA and CPRI/eCPRI specifications
- Data rate up to 25Gbps
- ITU-T G.694.1 DWDM frequency grid with 100GHz spacing
- Reach up to 10km over SMF
- Power consumption < 3.5W
- Duplex LC receptacle
- Operating case temperature range -40°C to +85°C
- Single 3.3V power supply
- RoHS compliant (lead free)

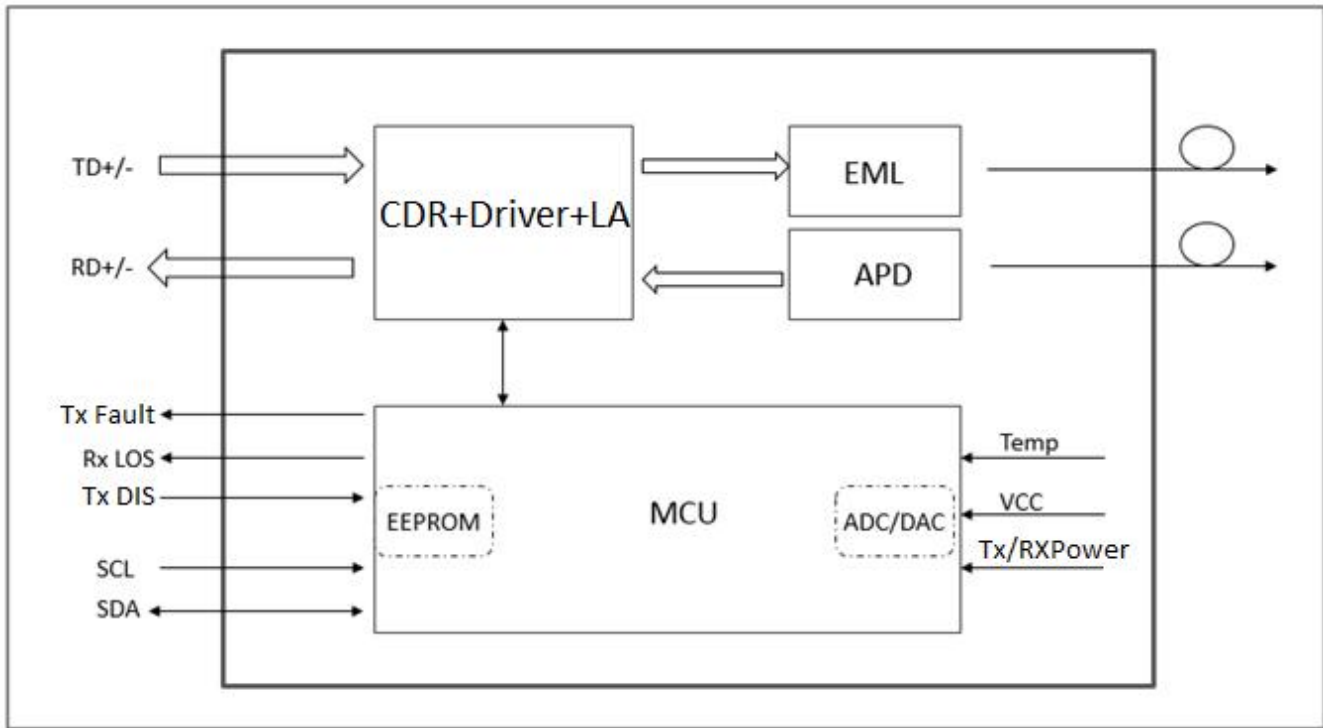


## Applications

- 25G Ethernet
- CPRI Option 10
- eCPRI

## Description

The Gigalight 25G DWDM SFP28 100GHz 10km industrial optical transceivers are designed for 25G Ethernet and CPRI/eCPRI links reach up to 10km over Single-Mode Fiber (SMF). Its high-performance cooled DWDM EML transmitter and high-sensitivity APD receiver provide superior performance for 4G/5G fronthaul applications.



**Figure 1. Module Block Diagram**

The 25G DWDM SFP28 transceivers can be contacted through I<sup>2</sup>C system.

### Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Unit
Supply Voltage	V <sub>cc</sub>	-0.3	3.6	V
Input Voltage	V <sub>in</sub>	-0.3	V <sub>cc</sub> +0.3	V
Storage Temperature	T <sub>s</sub>	-40	85	°C
Case Operating Temperature	T <sub>c</sub>	-40	85	°C
Humidity (non-condensing)	Rh	0	85	%

### Recommended Operating Conditions

Parameter	Symbol	Min	Typical	Max	Unit
Supply Voltage	V <sub>cc</sub>	3.13	3.3	3.47	V
Operating Case Temperature	T <sub>c</sub>	-40		85	°C
Data Rate Per Lane	fd		24.33	25.78	Gb/s
Humidity	Rh	0		85	%
Power Dissipation	P <sub>m</sub>			2	W
Fiber Bend Radius	R <sub>b</sub>	3			cm

## Electrical Specifications

Parameter	Symbol	Min	Typical	Max	Unit
Differential Input Impedance	$Z_{in}$	90	100	110	ohm
Differential Output Impedance	$Z_{out}$	90	100	110	ohm
Differential Input Voltage Amplitude <sup>1</sup>	$\Delta V_{in}$	300		1100	mVp-p
Differential Output Voltage Amplitude <sup>2</sup>	$\Delta V_{out}$	500		800	mVp-p
Skew	Sw			300	ps
Bit Error Rate	BER		$5 \times 10^{-5}$		
Input Logic Level High	$V_{IH}$	2.0		$V_{cc}$	V
Input Logic Level Low	$V_{IL}$	0		0.8	V
Output Logic Level High	$V_{OH}$	$V_{cc}-0.5$		$V_{cc}$	V
Output Logic Level Low	$V_{OL}$	0		0.4	V

### Notes:

1. Differential input voltage amplitude is measured between TxnP and TxnN.
2. Differential output voltage amplitude is measured between RxnP and RxnN.

## Optical Characteristics

Parameter	Symbol	Min	Typical	Max	Unit
<b>Transmitter</b>					
Optical Wavelength	$\lambda_c$	As per ITU-T 694.1			nm
Side-Mode Suppression Ratio	SMSR	30			dB
Average Launch Power	$P_{out}$	0		4	dBm
Optical Modulation Amplitude	OMA	0		4	dBm
Extinction Ratio	ER	3			dB
Average Launch Power of OFF Transmitter	$P_{off}$			-30	dB
$Rin_{20}OMA$				-130	dB/HZ
Optical return loss tolerance				20	dB
Eye Mask Coordinates <sup>1</sup> : X1, X2, X3, Y1, Y2, Y3		{0.31, 0.4, 0.45, 0.34, 0.38, 0.4}			
<b>Receiver</b>					
Center Wavelength	$\lambda_c$	1260		1600	nm
Receiver Sensitivity in OMA <sup>2</sup>				-19	dBm
Stressed Receiver Sensitivity in OMA <sup>2</sup>				-16.5	dBm
Average Power at Receiver Input (each lane)		-27		-5	dBm
Receiver Reflectance	$R_R$			-26	dB
LOS Assert	$LOS_A$	-30			dBm
LOS De-Assert – OMA	$LOS_D$			-17	dBm
LOS Hysteresis	$LOS_H$	0.5			dB

### Notes:

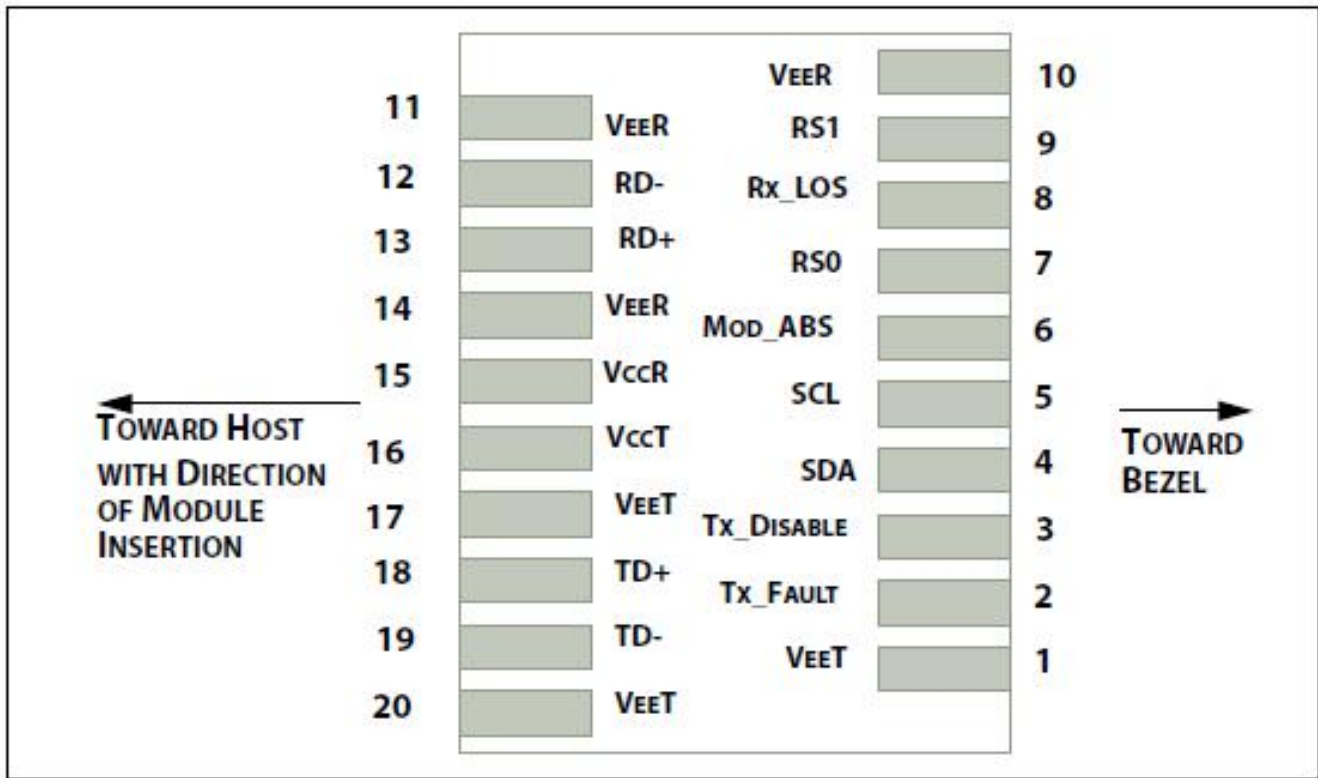
1. Hit Ratio =  $5 \times 10^{-5}$
2. Measured with conformance test signal at TP3 for BER= $10^{-5}$

## Pin Description

Pin	Logic	Symbol	Name/Description	Note
1		VeeT	Module Transmitter Ground	1
2	LVTTL-O	TX_Fault	Module Transmitter Fault	2
3	LVTTL-I	TX_Dis	Transmitter Disable; Turns off transmitter laser output	
4	LVTTL-I/O	SDA	2-Wire Serial Interface Data Line	2
5	LVTTL-I	SCL	2-Wire Serial Interface Clock	2
6		MOD_ABS	Module Definition, Grounded in the module	
7	LVTTL-I	RS0	Receiver Rate Select	
8	LVTTL-O	RX_LOS	Receiver Loss of Signal Indication Active LOW	
9	LVTTL-I	RS1	Transmitter Rate Select (not used)	
10		VeeR	Module Receiver Ground	1
11		VeeR	Module Receiver Ground	1
12	CML-O	RD-	Receiver Inverted Data Output	
13	CML-O	RD+	Receiver Data Output	
14		VeeR	Module Receiver Ground	1
15		VccR	Module Receiver 3.3 V Supply	
16		VccT	Module Receiver 3.3 V Supply	
17		VeeT	Module Transmitter Ground	1
18	CML-I	TD+	Transmitter Non-Inverted Data Input	
19	CML-I	TD-	Transmitter Inverted Data Input	
20		VeeT	Module Transmitter Ground	1

### Notes:

1. Module ground pins GND are isolated from the module case.
2. Shall be pulled up with 4.7K-10K ohms to a voltage between 3.15V and 3.45V on the host board.



**Figure 2. Electrical Pin-out Details**

### TX\_FAULT Pin

Tx\_Fault is a module output that when high, indicates that the module transmitter has detected a fault condition related to laser operation or safety. The Tx\_Fault output is an open drain/collector and shall be pulled up to the Vcc\_Host in the host with a resistor in the range 4.7 kΩ to 10 kΩ.

### TX\_DISABLE Pin

When Tx\_Disable is asserted high or left open, the SFP+ module transmitter output shall be turned off unless the module is a passive cable assembly. This contact shall be pulled up to VccT with a 4.7 kΩ to 10 kΩ resistor in modules and cable assemblies. Tx\_Disable is a module input contact.

### RS0/RS1 Pin

RS0 and RS1 are module inputs and are pulled low to VeeT with > 30 kΩ resistors in the module. RS0 optionally selects the optical receive signaling rate coverage. RS1 optionally selects the optical transmit signaling rate coverage.

### MOD\_ABS Pin

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. In the SFP MSA (INF-8074i) this contact has the same function but is called MOD\_DEF0.

### RX\_LOS Pin

Rx\_LOS when high indicates an optical signal level below that specified in the relevant standard. Rx\_LOS is an open drain/collector output, but may also be used as an input by supervisory circuitry in the module. For a nominally 3.3 V Vcc\_Host using a resistive pull up to Vcc\_Host the resistor value shall be in the range 4.7 kΩ to 10 kΩ. For a nominally 2.5 V Vcc\_Host using a resistive pull up to Vcc\_Host the resistor value shall be in the range 4.7 kΩ to 7.2 kΩ.

### Recommended Interface Circuit

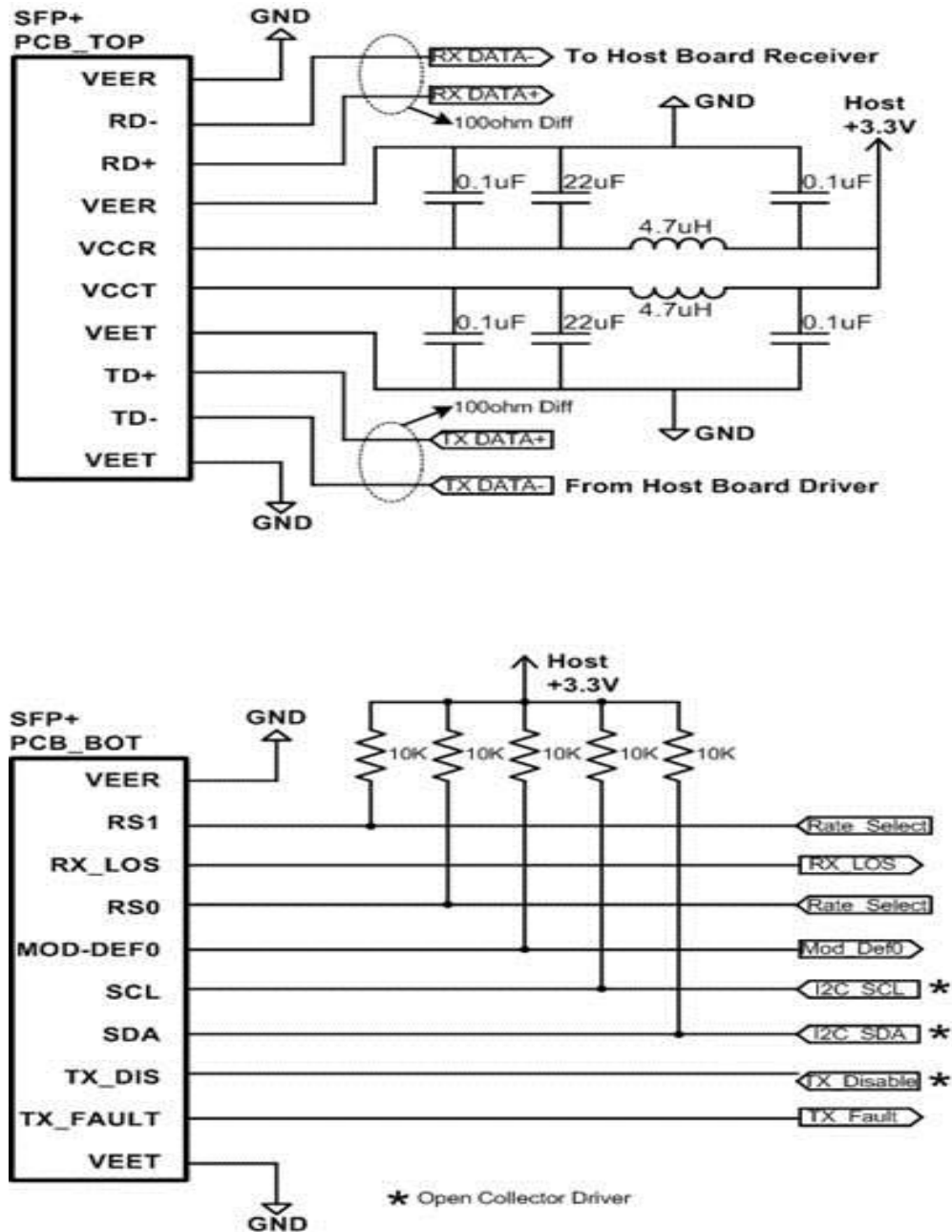


Figure 3. Recommended Interface Circuit

## Memory Organization

The transceivers provide serial ID memory contents and diagnostic information about the present operating conditions by the 2-wire serial interface (SCL, SDA). The memory map specific data field defines as following.

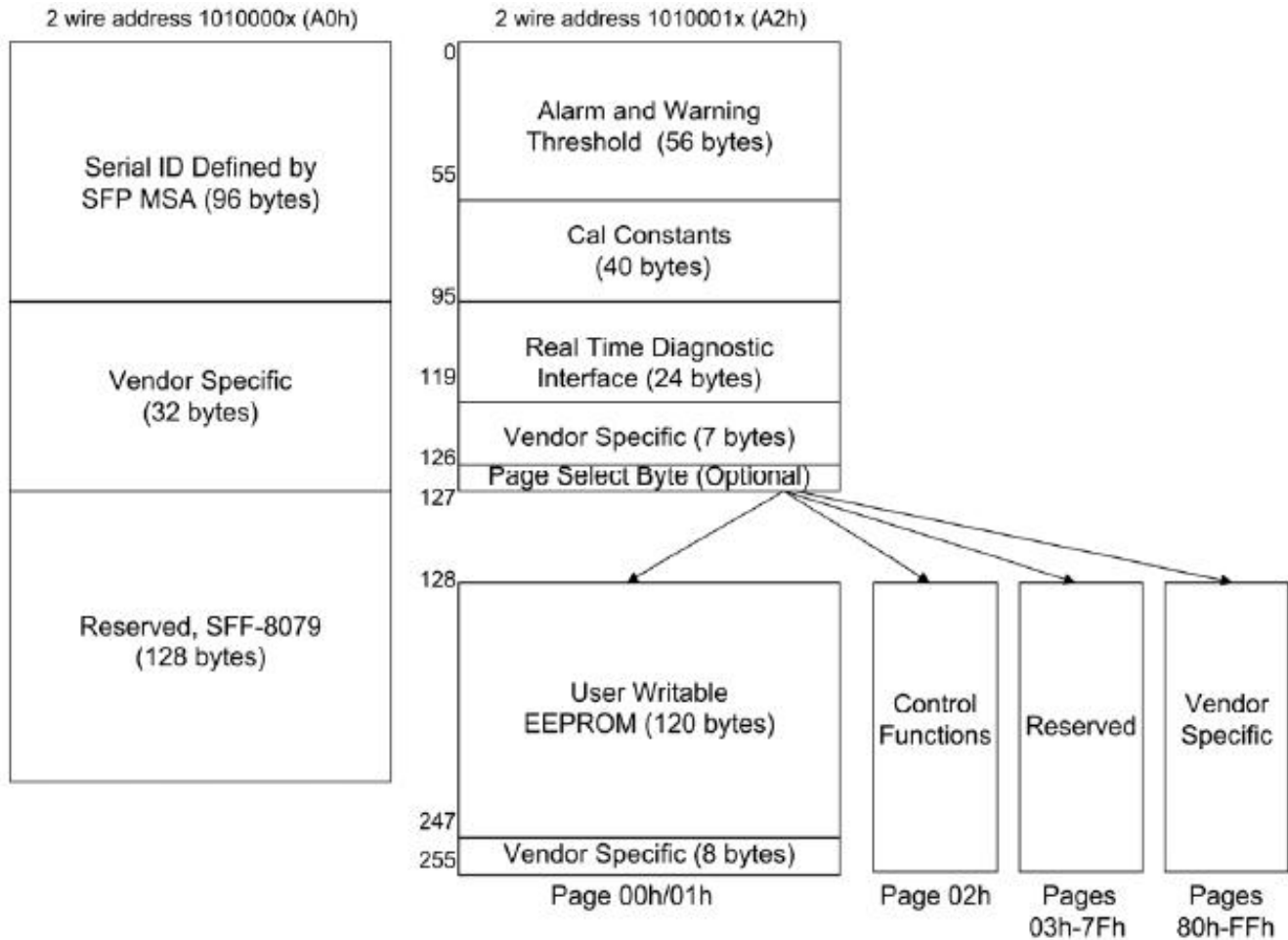


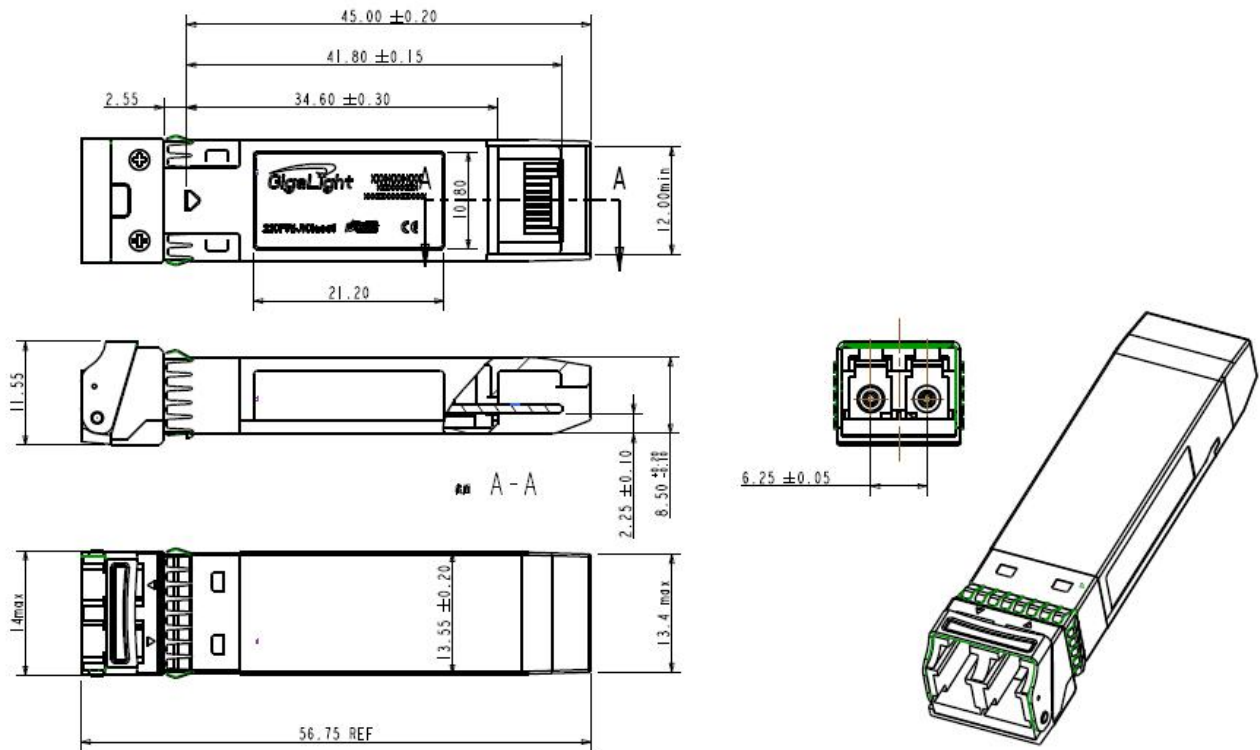
Figure 5. SFP28 Memory Map

## Timing and Electrical

<i>Parameter</i>	<i>Symbol</i>	<i>Min.</i>	<i>Max.</i>	<i>Unit</i>	<i>Conditions</i>
Tx_Disable assert time	t_off		100	μs	Rising edge of Tx_Disable to fall of output signal below 10% of nominal
Tx_Disable negate time	t_on		2	ms	Falling edge of Tx_Disable to rise of output signal above 90% of nominal. This only applies in normal operation, not during start up or fault recovery.
Time to initialize 2-wire interface	t_2w_start_up		300	ms	From power on or hot plug after the supply meeting Table 8.
Time to initialize	t_start_up		300	ms	From power supplies meeting Table 8 or hot plug or Tx disable negated during power up, or Tx_Fault recovery, until non-cooled power level I part (or non-cooled power level II part already enabled at power level II for Tx_Fault recovery) is fully operational.
Time to initialize cooled module and time to power up a cooled module to Power Level II	t_start_up_cooled		90	s	From power supplies meeting Table 8 or hot plug, or Tx disable negated during power up or Tx_Fault recovery, until cooled power level I part (or cooled power level II part during fault recovery) is fully operational. Also, from stop bit low-to-high SDA transition enabling Power Level II until cooled module is fully operational
Time to Power Up to Level II	t_power_level2		300	ms	From stop bit low-to-high SDA transition enabling power level II until non-cooled module is fully operational
Time to Power Down from Level II	t_power_down		300	ms	From stop bit low-to-high SDA transition disabling power level II until module is within power level I requirements
Tx_Fault assert	Tx_Fault_on		1	ms	From occurrence of fault to assertion of Tx_Fault
Tx_Fault assert for cooled module	Tx_Fault_on_cooled		50	ms	From occurrence of fault to assertion of Tx_Fault
Tx_Fault Reset	t_reset	10		μs	Time Tx_Disable must be held high to reset Tx_Fault
RS0, RS1 rate select timing for FC	t_RS0_FC, t_RS1_FC		500	μs	From assertion till stable output
RS0, RS1 rate select timing non FC	t_RS0, t_RS1		24	ms	From assertion till stable output
Rx_LOS assert delay	t_los_on		100	μs	From occurrence of loss of signal to assertion of Rx_LOS
Rx_LOS negate delay	t_los_off		100	μs	From occurrence of presence of signal to negation of Rx_LOS



## Mechanical Dimensions



**Figure 6. Mechanical Specifications**

## Regulatory Compliance

The Gigalight GSS-Dxx250-LRT transceivers are Class 1 Laser products. They are 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

## References

1. SFP28 MSA
2. Ethernet IEEE 802.3cc
3. Directive 2011/65/EU of the European Parliament and of the Council, "on the restriction of the use

of certain hazardous substances in electrical and electronic equipment," July 1, 2011.

**⚠ 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
GSS-Dxx250-LRT	25G DWDM SFP28 100GHz 10km Industrial Optical Transceivers
The xx means the wavelength options from 17 to 61.	

### Important Notice

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### Revision History

Revision	Date	Description
V0	May-07-2019	Advance Release.