

<b>TITLE</b>  <b>100G QSFP28 CWDM4 Transceiver</b>	<b>DOC No.</b>	<b>DTRX-1700007</b>
	<b>REVISION :</b> <b>01</b>	<b>AUTHORIZED BY :</b> <b>Mike Sun</b>
	<b>DATE :</b> <b>2017.01.19</b>	<b>CLASSIFICATION :</b> <b>CONFIDENTIAL</b>

## 1. SCOPE

The transceiver consists of two sections: The transmitter section incorporates four CWDM DFB laser. And the receiver section consists of a PIN photodiode integrated with a TIA. All modules satisfy class I laser safety requirements. Digital diagnostics functions are available via a 2-wire serial interface, as specified in SFF-8636 which allows real-time access to device operating parameters such as transceiver temperature, laser bias current, transmitted optical power, and received optical power and transceiver supply voltage.

## 2. PRODUCT FEATURES

- Hot pluggable QSFP28 form factor
- Supports 103.1Gb/s aggregate bit rate
- Power dissipation < 3.5W
- RoHS-6 compliant
- Commercial case temperature range of 0°C to 70°C
- Single 3.3 V power Supply
- Maximum link length of 2Km over Single mode Fiber (SMF)
- 4X25G electrical interface
- I2C management interface
- 100BASE-CWDM4 100G Ethernet

## 3. PRODUCT DESCRIPTION

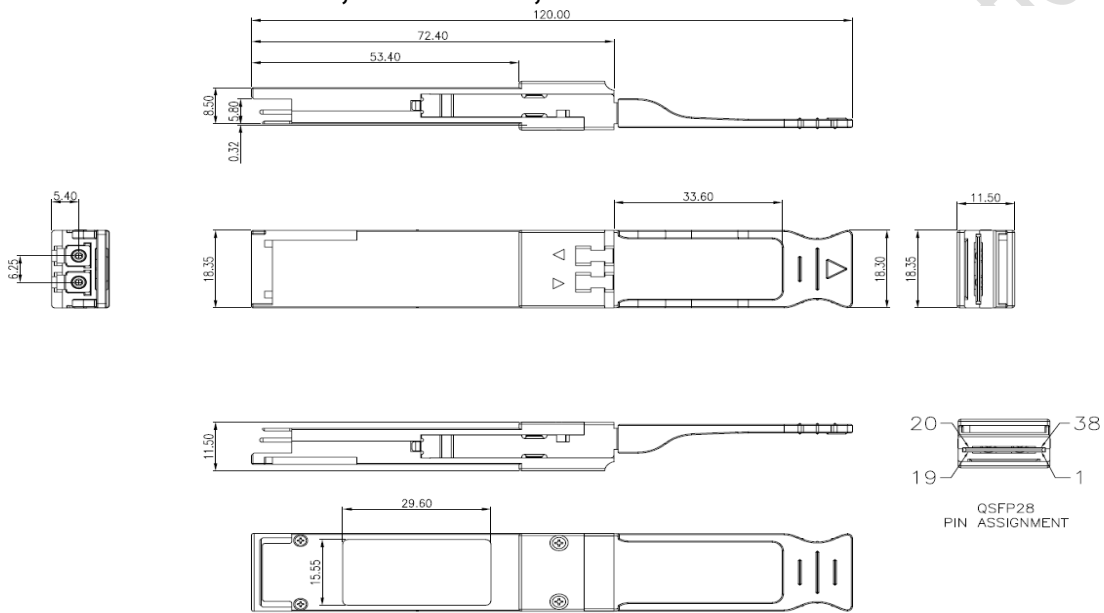
### 3.1 PRODUCT NAME AND SERIES NUMBER(S)

#### 100G QSFP28 CWDM4 Transceiver

Part Number	Data Rate	Wavelength (nm)	Distance	Media	Power (dBm)	Sen. (dBm)	Connector	Tem.
P58000ECCK02-1	100G	CWDM 4	2km	SMF	-4 ~ 2.5	-10	LC	C

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**3.2 DIMENSIONS, MATERIALS, PLATINGS AND MARKING**



Unit is millimeter. All dimensions are  $\pm 0.1$ mm unless otherwise specified.

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#### **4. APPLICABLE DOCUMENTS AND SPECIFICATIONS**

- Compliant with 103G Ethernet IEEE 802.3ba 100GBASE CWDM standard
- Electrical interface specifications per SFF-8636
- QSFP28 MSA package with duplex LC connector

#### **5. QUALIFICATION**

- Electrostatic Discharge (ESD) to the Electrical Pins
- Electrostatic Discharge (ESD) to the LC Connector
- RoHS compliance

#### **6. Absolute Maximum Ratings & Recommended Operating Conditions**

<b>Absolute Maximum Ratings</b>				
<b>Parameter</b>	<b>Symbol</b>	<b>Min.</b>	<b>Max.</b>	<b>Unit</b>
Storage Temperature	TS	-40	+85	°C
Supply Voltage	VCC3	-0.5	3.6	V
Relative Humidity(Non-condensing)	RH	15	85	%
Receiver Damage Threshold, per Lane	Prdmg	3.5		

<b>Recommended Operating Conditions</b>					
<b>Parameter</b>	<b>Symbol</b>	<b>Min.</b>	<b>Typical</b>	<b>Max.</b>	<b>Unit</b>
Operating Case Temperature	T <sub>C</sub>	0		70	°C
Power Supply Voltage	V <sub>CC3</sub>	3.13	3.3	3.5	V
Power Dissipation(C-temp)	I <sub>CC3</sub>			1200	mA
	P <sub>D</sub>			3.5	W
Data Rate			25.78		Gbps
Operating Distance	D		2		km

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<b>Transmitter Operating Characteristic-Optical, Electrical</b>						
<b>Parameter</b>	<b>Symbol</b>	<b>Min.</b>	<b>Typical</b>	<b>Max.</b>	<b>Unit</b>	<b>Note</b>
<b>Optical Characteristic</b>						
Bit Rate	BR	10.3125	25.78125	-	Gbps	1
Center Wavelength	$\lambda_1$	1264.5		1277.5	nm	
	$\lambda_2$	1284.5		1297.5	nm	
	$\lambda_3$	1304.5		1317.5	nm	
	$\lambda_4$	1324.5		1337.5	nm	
OMA Optical Power, each lane	$P_0$	-4		2.5	dBm	
OMA Optical Power, each lane @TDP max	TxOMA	-2			dBm	2
Transmit Average Power per Lane				2.5	dBm	5
Launch Power (OMA-TDP)	OMA-TDP	-5			dBm	
Transmitter and Dispersion Penalty	TDP			3	dB	3
Extinction Ratio	ER	3.5	-	-	dB	
Side Mode Suppression Ratio	SMSR	30			dB	
Transmitter Reflectance				-12	dB	
Transmitter Eye Mask Definition		{0.31, 0.4, 0.45, 0.34, 0.38, 0.4}				4
<b>Electrical Characteristic</b>						
Differential Data Input Swing	Vin,P-P		-	900	mVPP	
Differential Termination Mismatch				10	%	
Eye Width			0.46		UI	
Applied pk-pk Sinusoidal Jitter		Per IEEE 802.3bm Table 88-13				
Eye height			95		mV	
DC common mode voltage		350		2850	mV	

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Notes:

1. Transmitter consists of 4 lasers operating at 25.78Gb/s each
2. At maximum TDP.
3. TDP value does not include MPI penalty.
4. Hit ratio of  $5 \times 10^{-5}$ , per IEEE.
5. Power value and power accuracy are with all channels on.

**Receiver Operating Characteristic-Optical, Electrical**

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
<b>Optical Characteristic</b>						
Center Wavelength	$\lambda_1$	1264.5		1277.5	nm	
	$\lambda_2$	1284.5		1297.5	nm	
	$\lambda_3$	1304.5		1317.5	nm	
	$\lambda_4$	1324.5		1337.5	nm	
Receive Saturation (OMA) per Lane	Rmax	2.5			dBm	
Receiver Sensitivity	S			-10	dBm	1
Damage Threshold per Lane		3.5			dBm	
Stressed Receiver Sensitivity per Lane	SRS			-7.3	dBm	2
Vertical Eye Closure Penalty	VECP	1.9	-	-	dB	
LOS Assert	LOS_A	-24	-	-13.6	dBm	
LOS Dessert	LOS_D		-	-11.6	dBm	
LOS Hysteresis		1.5	-	-	dB	
<b>Electrical Characteristic</b>						
Signaling rate per lane	$V_{out}$	25.78125 $\pm$ 100 ppm			GBd	
Center Wavelength	$\lambda_1$	100		400	mVpp	3
	$\lambda_2$	300		600		
	$\lambda_3$	400		800		

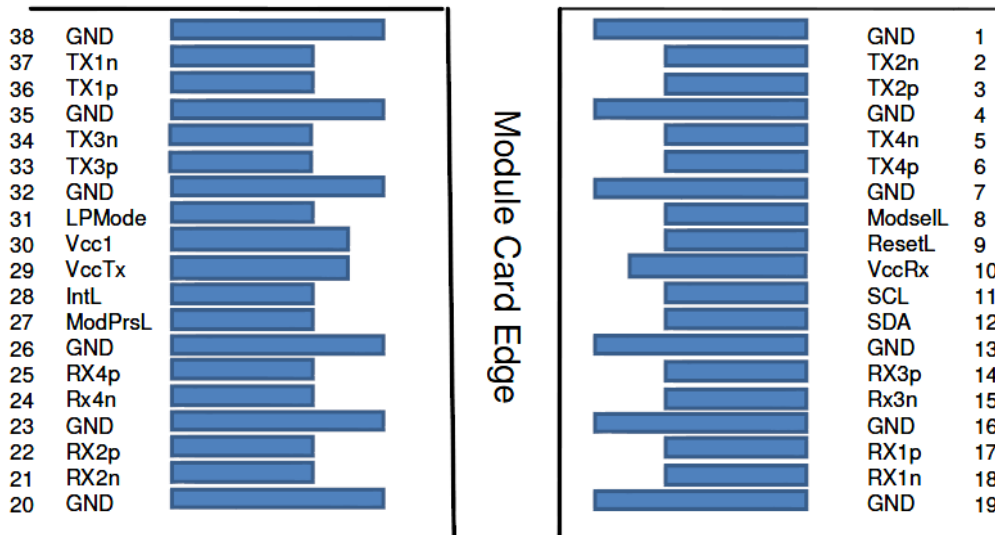
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	$\lambda$	600		1200	
Eye width		0.57	-		UI
Vertical Eye Closure	$Z_D$			5.5	dB
Differential Termination Mismatch				10	%
Transition time, 20% to 80%	tr tf	12			ps

**Note:**

- Sensitivity is specified at  $5 \times 10^{-5}$  BER
- Measured with CWDM4 MSA2 conformance test signal at TP3 for  $5 \times 10^{-5}$  BER.
- Output voltage is settable in 4 discrete ranges via I2C. Default range is Range 2 (400 – 800 mV)

**6. Applications Note :**



Top Side  
Viewed From Top

Bottom Side  
Viewed From Bottom

**Pin Definitions**

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**Pin Assignment**

Pin	Logic	Name/Description	Note
1	GND	Ground	1
2	Tx2n	Transmitter Inverted Data Input	
3	Tx2p	Transmitter Non-Inverted Data Input	
4	GND	Ground	1
5	Tx4n	Transmitter Inverted Data Input	
6	Tx4p	Transmitter Non-Inverted Data Input	
7	GND	Ground	1
8	ModSelL	Module Select	2
9	ResetL	Module Reset	2
10	Vcc Rx	+3.3V Power Supply Receiver	
11	SCL	2-wire serial interface clock	2
12	SDA	2-wire serial interface data	2
13	GND	Ground	1
14	Rx3p	Receiver Non-Inverted Data Output	
15	Rx3n	Receiver Inverted Data Output	
16	GND	Ground	1
17	Rx1p	Receiver Non-Inverted Data Output	
18	Rx1n	Receiver Inverted Data Output	
19	GND	Ground	1
20	GND	Ground	1
21	Rx2n	Receiver Inverted Data Output	
22	Rx2p	Receiver Non-Inverted Data Output	
23	GND	Ground	1
24	Rx4n	Receiver Inverted Data Output	1
25	Rx4p	Receiver Non-Inverted Data Output	
26	GND	Ground	1
27	ModPrsL	Module Present	
28	IntL	Interrupt	2
29	VccTx	+3.3V Power supply transmitter	
30	Vcc1	+3.3V Power supply	
31	LPMoDe	Low Power Mode	2

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32	GND	Ground	1
33	Tx3p	Transmitter Non-Inverted Data Input	
34	Tx3n	Transmitter Inverted Data Input	
35	GND	Ground	1
36	Tx1p	Transmitter Non-Inverted Data Input	
37	Tx1n	Transmitter Inverted Data Input	
38	GND	Ground	1

Notes :

[1] GND is the symbol for signal and supply (power) common for the QSFP28 module. All are common within the QSFP+ module and all module voltages are referenced to this potential unless otherwise noted. Connect these directly to the host board signal-common ground plane.

[2] VccRx, Vcc1 and VccTx are the receiver and transmitter power supplies and shall be applied concurrently. Recommended host board power supply filtering is shown. VccRx, Vcc1 and VccTx may be internally connected within the QSFP28 Module in any combination. The connector pins are each rated for a maximum current of 500 mA.

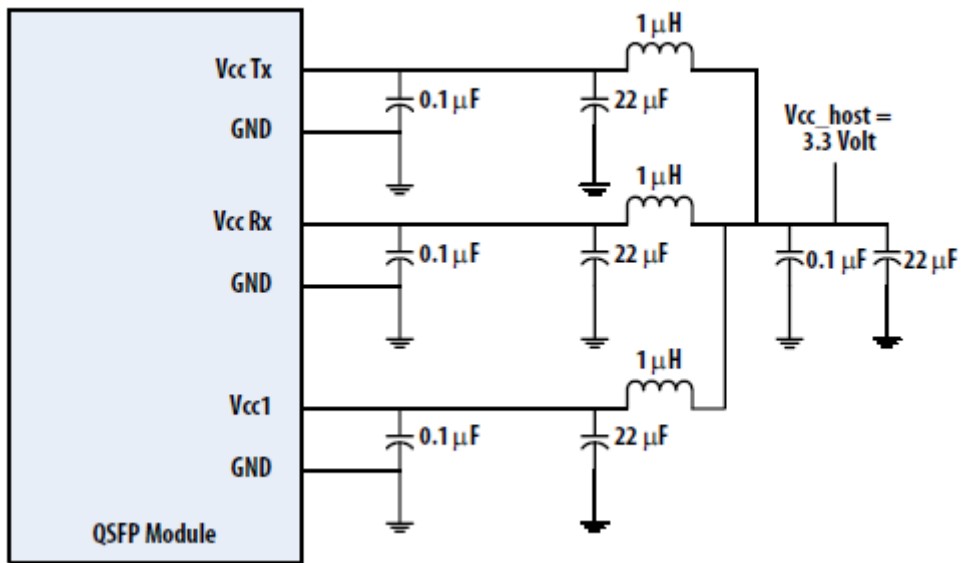
**Digital Diagnostic Function**

Parameters	Unit	Accuracy
Temperature	°C	±3
Voltage	V	±3%
Ibias	mA	±10%
Rx power	dB	±3
Tx power	dB	±3



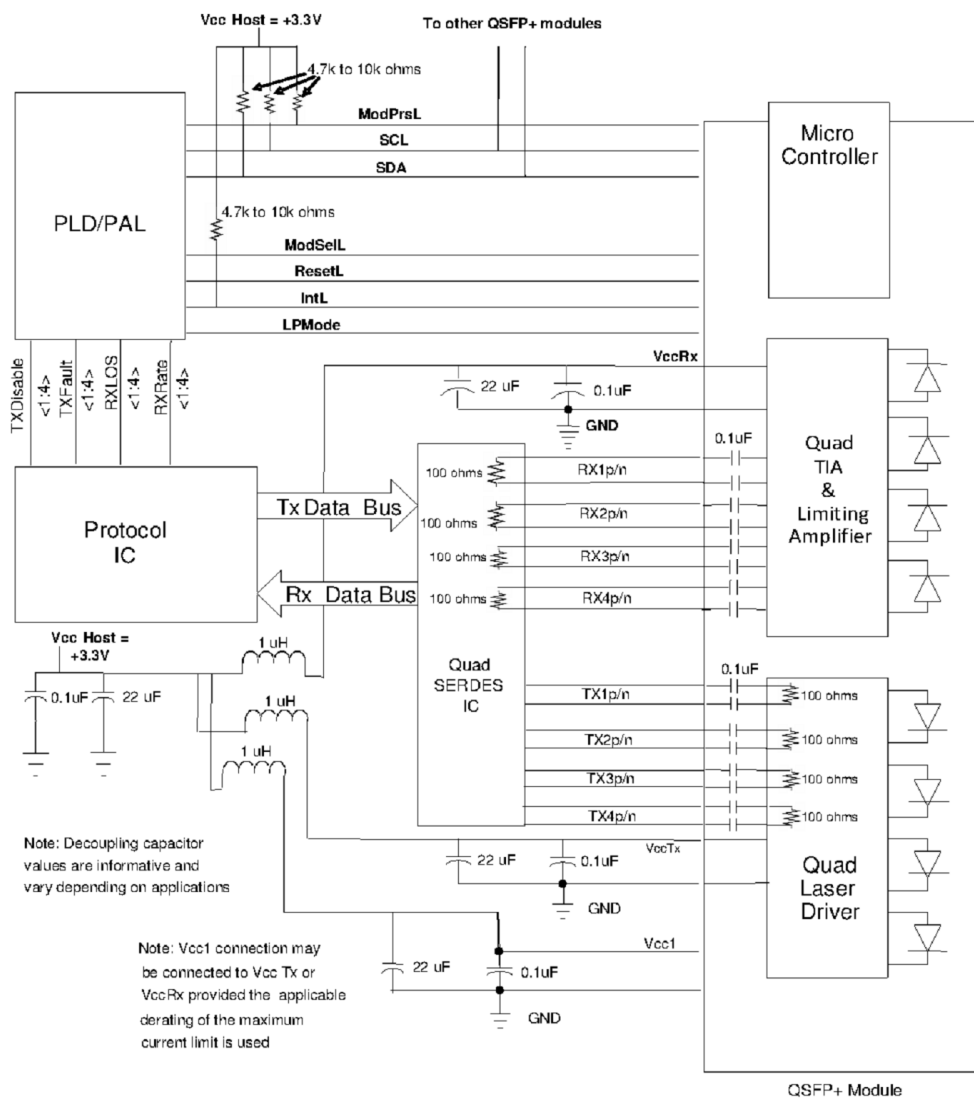
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**Recommended Host Board Power Supply Filter Network**



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**Recommended Application Interface Block Diagram**



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**7. Modification History**

Rev.	Comments	Date	Originator	Approval
01	Preliminary Draft	19/01/2017		Ray Yang