

<b>TITLE</b> <b>100Gbps QSFP28 ZR4 80km Transceiver</b>	<b>DOC No. RFD-20220513003-001</b>	
	<b>REVISION :</b> <b>01</b>	<b>AUTHORIZED BY :</b> <b>Mike Sun</b>
	<b>DATE :</b> <b>2021.05.17</b>	<b>CLASSIFICATION :</b> <b>Optical Transceiver</b>

## **1. SCOPE**

QSFP28 transceiver modules are designed for use in 100 Gigabit Ethernet links over single mode fiber. They are compliant with SFF-8665, INF-8438i and IEEE 802.3ba 100GBASE-ZR4. Digital diagnostics functions are available via an I2C interface, as specified by the QSFP28 MSA.



## **2. PRODUCT FEATURES**

- Compliant with QSFP28 MSA
- Up to 80km transmission on single mode fiber
- 4 channels full- duplex transceiver modules
- Transmission data rate up to 27.95 Gbps Per channel
- 4 X 25/28 G LAN-WDM EML Integrated TOSA Cooling transmitter
- 4 X PIN+SOA Receivers
- LC duplex connect
- Single +3.3V power supply
- DDM function implemented
- 2 Wire Serial Interface for module management
- Maximum power dissipation < 6W
- Operating temperature range: 0°C ~ 70°C
- RoHS compliant (lead free)

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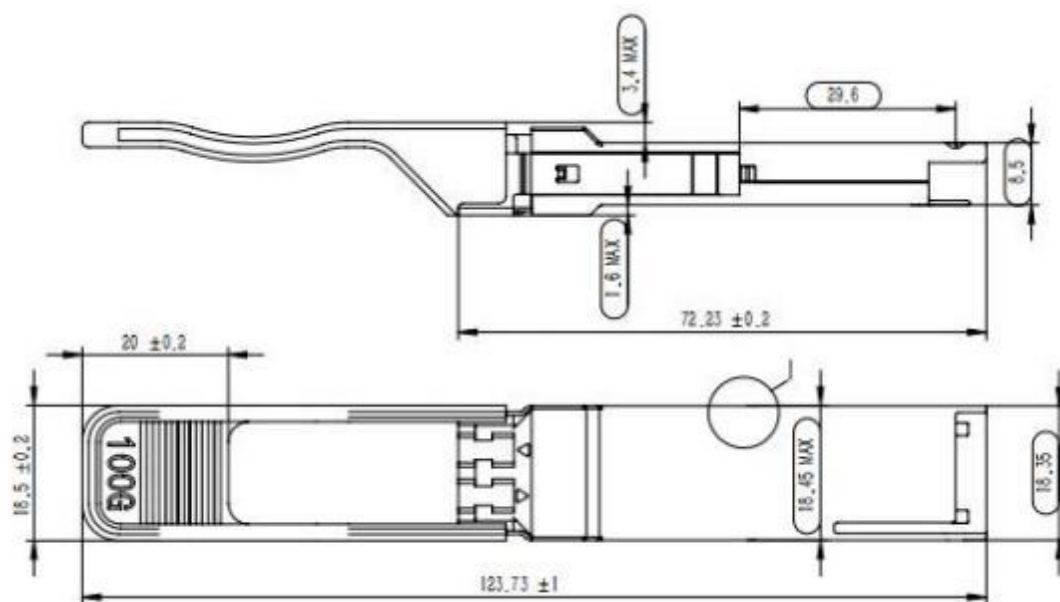
### **3. PRODUCT DESCRIPTION**

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

##### **100G QSFP28 ZR Transceiver**

Part Number	Data Rate	Wavelength (nm)	Distance	Media	Power (dBm)	Sen. (dBm)	Connector	Tem.
P58000EGCU80-1	100G	PIN-SOA	80 km	SMF	2 ~ 6.5	-28	LC	C

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



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

- 100GBASEE-ZR4 Ethernet
- Telecom Networking

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## **5. 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	0	95	%

<b>Recommended Operating Conditions</b>					
<b>Parameter</b>	<b>Symbol</b>	<b>Min.</b>	<b>Typical</b>	<b>Max.</b>	<b>Unit</b>
Temperature	Tc	0	-	70	°C
Power Supply Voltage	VCC3	3.135	3.3	3.465	V
Power Supply Current	Icc	-	-	1.9	A
Max Supported Link Length	L	-	-	80	km
Bit Rate (26G Mode)	BR	-	103.125	-	Gbps
Bit Rate (28G Mode)	BR	-	111.81	-	Gbps
Module Power		-	--	6	W

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**Transmitter Operating Characteristic-Optical, Electrical**

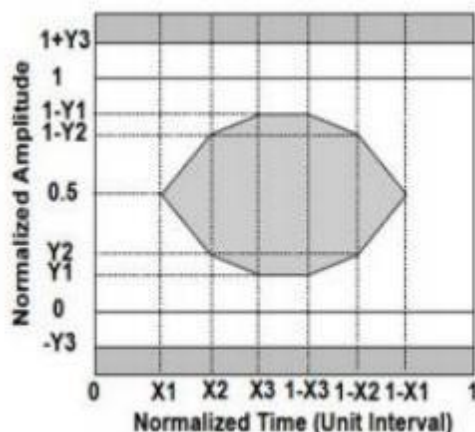
Parameter	Symbol	Min.	Typical	Max.	Unit	Note
Signaling Speed per Lane (26G mode)	-	25.78125 ± 100 ppm			GBd	
Signaling Speed per Lane (28G mode)	-	27.9525 ± 100 ppm			GBd	
Lane Wavelength (range): L0 L1 L2 L3	-	1294.53 – 1296.59 1299.02 – 1301.09 1303.54 – 1305.63 1308.09 – 1310.19			nm	
Total Average Launch Power	Pout	8	-	10.5	dBm	
Average Launch Power per Lane	TxPx	2	-	6.5	dBm	
Optical Extinction Ratio	ER	8	-	-	dB	
Side-Mode Suppression Ratio (SMSR)	SMSR	30	-	-	dB	
Difference in launch power between any two lanes (Average and OMA) between any Two Lanes (OMA)	Ptx, diff	-	-	3.6	dB	
Average launch power of OFF transmitter, per lane	-	-	-	-30	dBm	
Relative Intensity Noise	RIN	-	-	-128	dB/Hz	
Optical Return Loss Tolerance	-	-	-	20	dB	
Transmitter Reflectance	-	-	-	-12	dB	
Transmitter Eye mask definition {X1, X2, X3, Y1, Y2, Y3}	-	{0.25,0.4,0.45,0.25,0.28,0.4}				1
Input Differential Impedance	RIN	85	100	115	Ω	
Differential Data Input	VIN	-	-	1000	mVp-p	
J2 Jitter Tolerance	Jt2	0.17	-	-	UI	
J9 Jitter Tolerance	Jt9	0.29	-	-	UI	
Data Dependent Pulse Width Shrinkage	DDPWS	0.07	-	-	UI	
Eye mask coordinates{X1,X2,Y1,Y2}	-	0.11, 0.31 / 95, 350			UI/mV	

Note:

1. See Figure below.

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**Receiver Operating Characteristic-Optical, Electrical**

Parameter	Symbol	Min.	Typical	Max.	Unit	Note
Signaling Speed per Lane (26G mode)	-	25.78125 ± 100 ppm			GBd	
Signaling Speed per Lane (28G mode)	-	27.9525 ± 100 ppm			GBd	
Lane Wavelength (range): L0 L1 L2 L3	-	1294.53 – 1296.59 1299.02 – 1301.09 1303.54 – 1305.63 1308.09 – 1310.19			nm	
Average Receiver Sensitivity per Lane (100GE)	Rxsens	-	-	-29	dBm	1
Average Receiver Sensitivity per Lane (OUT4)	Rxsens	-	-	-28	dBm	1
Average Received Power per Lane (100GE)	RXPx	-29	-	-3.5	dBm	
Average Received Power per Lane (OUT4)	RXPx	-28	-	-3.5	dBm	
Vertical eye closure penalty, per lane	-	-	-	1.9	dB	
Receiver electrical 3dB upper cutoff frequency, per lane	-	-	-	31	GHz	
LOS De-Assert	LOSD	-	-	-29	dBm	
LOS Assert	LOSA	-38	-	-	dBm	

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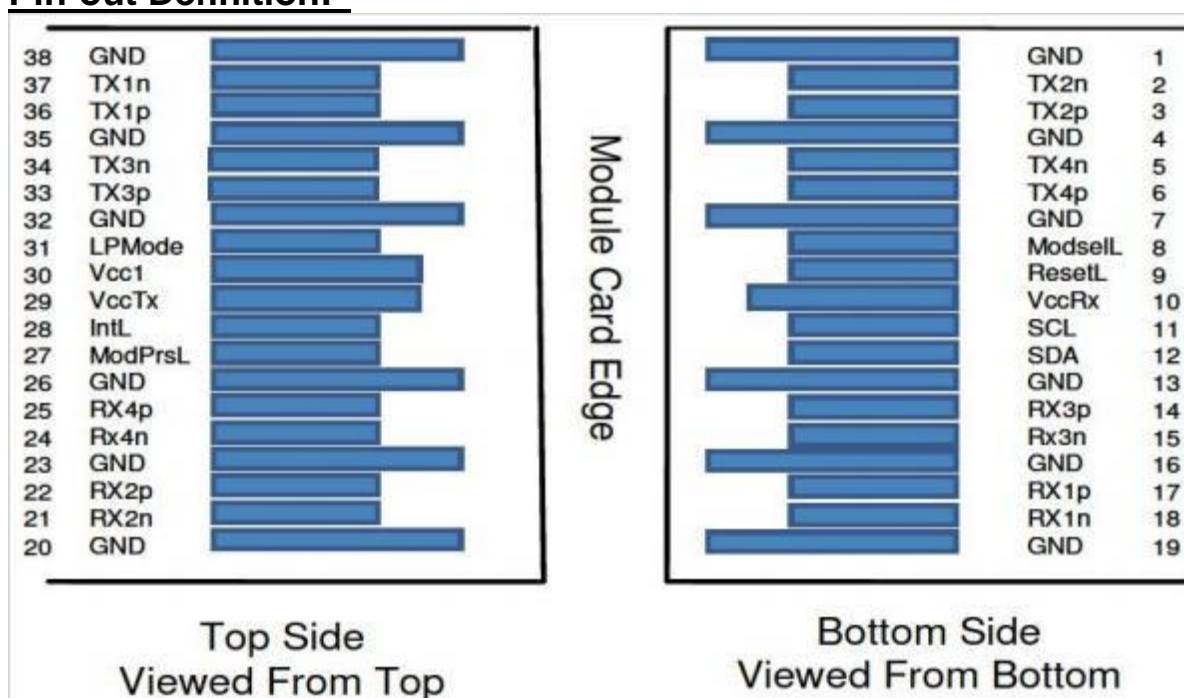
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LOS Hysteresis	-	0.5	-	-	dB
Differential Data Output	VOD	300	800	900	mVp-p
AC common mode output voltage (RMS)	-	-	-	7.5	mV
Termination mismatch at 1MHz	-	-	-	5	%
Differential output return loss	-	Per IEEE P802.3ba, Section 83E-2			dB
Common mode output return loss	-	Per IEEE P802.3ba, Section 83E-3			dB
Output transition time,20% to80%	-	28	-	-	ps
J2 Jitter output	Jo2	-	-	0.42	UI
J9 Jitter output	Jo9	-	-	0.65	UI
Eye mask coordinates {X1, X2, Y1, Y2}	-	0.29, 0.5 / 150, 425			UI/mV

Notes:

- Sensitivity is specified at BER@5E-5 with FEC

**6. Pin-out Definition:**



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**Pin Assignment**

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

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30	Vcc1	+3.3 V Power Supply	2	
31	LPMode	Low Power Mode	3	2
32	GND	Ground	1	1
33	Tx3p	Transmitter Non-Inverted Data Input	3	
34	Tx3n	Transmitter Inverted Data Input	3	
35	GND	Ground	1	1
36	Tx1p	Transmitter Non-Inverted Data Input	3	
37	Tx1n	Transmitter Inverted Data Input	3	
38	GND	Ground	1	1

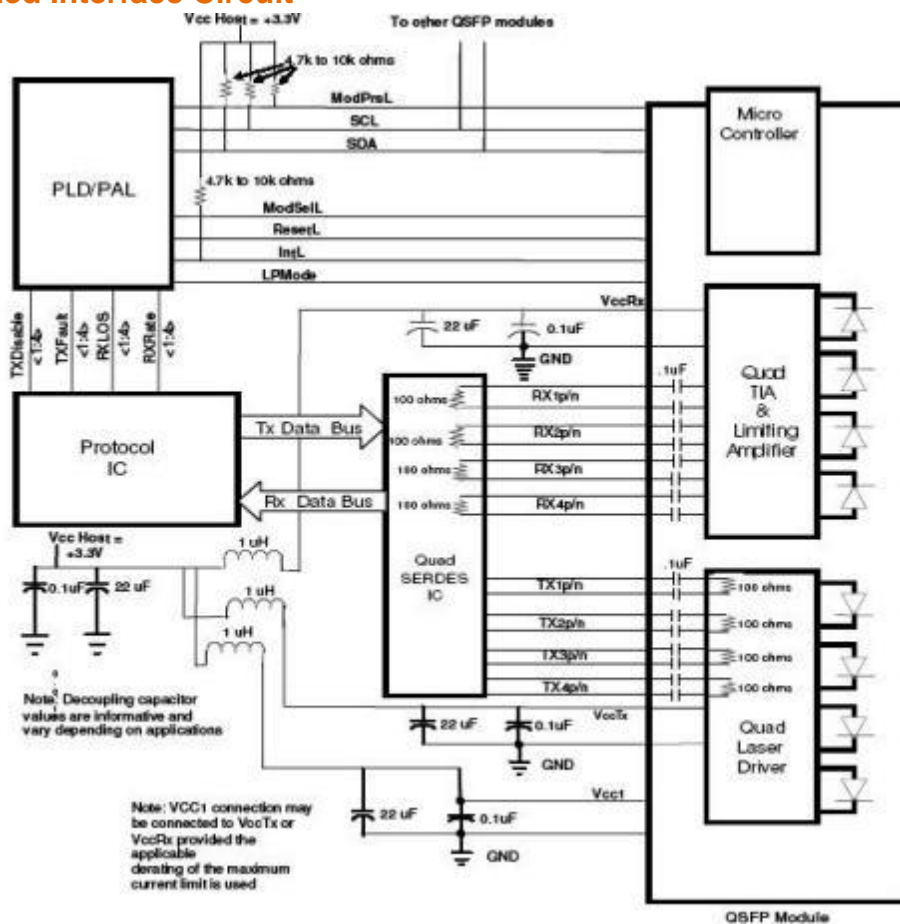
*Notes:*

1. *Module circuit ground is isolated from module chassis ground within the module.*
2. *Open collector/Open Drain; should be pulled up with 4.7k – 10k ohms on host board to a voltage between*



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**Recommended Interface Circuit**



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## **7. Digital Diagnostic Memory Map**

As defined by the SFF-8665 –Specification for QSFP28 Copper and Optical Transceiver. Our QSFP28 transceivers provide digital diagnostic functions via a 2-wire serial interface, which allows real-time access to the following operating parameters:

<b>Parameter</b>	<b>Symbol</b>	<b>Min</b>	<b>Max</b>	<b>Units</b>	<b>Notes</b>
Temperature monitor absolute error	DMI_Temp	-3	3	degC	Over operating temperature range
Supply voltage monitor absolute error	DMI_VCC	-0.1	0.1	V	Over full operating range
Channel RX power monitor absolute error	DMI_RX_Ch	-2	2	dB	-
Channel Bias current monitor	DMI_Ibias_Ch	-10%	10%	mA	-
Channel TX power monitor absolute error	DMI_TX_Ch	-2	2	dB	-

It also provides a sophisticated system of alarm and warning flags, which may be used to alert end-users when particular operating parameters are outside of a factory-set normal range. The operating and diagnostics information is monitored and reported by a Digital Diagnostics Transceiver Controller (DDTC) inside the transceiver, which is accessed through the 2-wire serial interface. When the serial protocol is activated, the serial clock signal (SCL pin) is generated by the host.

## **8. Modification History**

<b>Rev.</b>	<b>Comments</b>	<b>Date</b>	<b>Originator</b>	<b>Approval</b>
01	Preliminary Draft	2022.05.17	Albert Lin	Mike Sun

