

<b>TITLE</b>  <b>100G QSFP28 SR4 Transceiver</b>	<b>DOC No.</b>	<b>DTRX-170003</b>
	<b>REVISION :</b> <b>01</b>	<b>AUTHORIZED BY :</b> <b>Mike Sun</b>
	<b>DATE :</b> <b>2017.01.05</b>	<b>CLASSIFICATION :</b> <b>CONFIDENTIAL</b>

## **1. SCOPE**

P59000ECCA01-1 transceiver is a Parallel 100Gb/s Quad Small Form-factor, Hot-Pluggable optical module. The module integrates 4 independent transmitters And 4 independent receivers inside. Four-channel 850nm VCSEL array, PIN array , amplifier and driver are used in the module for compact size, low power consumption and low cost. Each channel can operate at 25Gbps up to 70m using OM3 fiber. The transceiver is compliant to the industry standard SFF-8636 QSFP28 r specification. A digital diagnostic function is provided to monitor the working of the module. The electrical interface uses a 38 contact edge type connector. The optical interface uses an 8 or 12 fiber MTP (MPO) connector.

## **2. PRODUCT FEATURES**

- Supports 103.1Gb/s aggregate bit rate
- Hot pluggable QSFP28 form factor
- Power dissipation < 2.5W
- RoHS-6 compliant
- Commercial case temperature range of 0°C to 70°C
- Single 3.3 V power Supply
- Maximum link length of 100m on OM4 Multimode Fiber(MMF)
- 4X25Gb/s 850nm VCSEL-based transmitter
- 4X25G electrical interface
- Single MPO12 receptacle
- I2C management interface
- 100BASE-SR4 100G Ethernet

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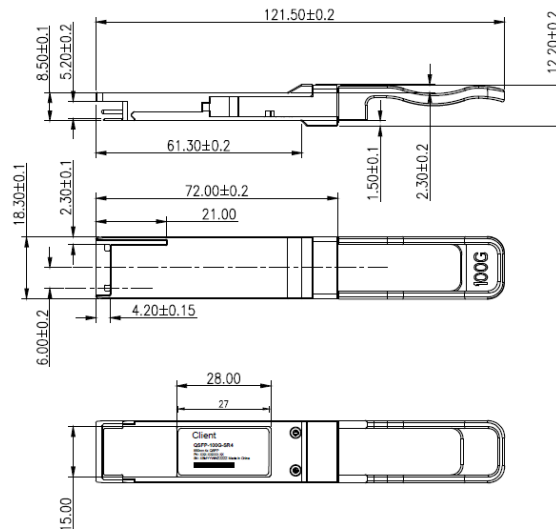
### 3. PRODUCT DESCRIPTION

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

##### 100G QSFP28 SR4 Transceiver

Part Number	Data Rate	Wavelength (nm)	Distance	Media	Power (dBm)	Sen. (dBm)	Connector	Tem.
P59000ECCA01-1	100G	850	70m	MMF	-6.4 ~ 3	-5.2	MPO	C

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



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

To minimize MPO connection induced reflections, an MPO receptacle with 8-degree angled end-face is utilized for this product. A female MPO connector with 8-degree end-face should be used with this product as illustrated in below.

### 4. APPLICABLE DOCUMENTS AND SPECIFICATIONS

- Compliant with 100G Ethernet
- IEEE 802.3 bm100GBASE-SR4
- Compliant to SFF-8665 (QSFP28 Solution) Revision 1.8
- MPO optical connector

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## 5. QUALIFICATION

- Electrostatic Discharge (ESD) to the Electrical Pins
- Electrostatic Discharge (ESD) to the MPO 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	T <sub>s</sub>	-40	+85	°C
Supply Voltage	VCC3	-0.5	4	V
Relative Humidity(Non-condensing)	RH	15	85	%
Receiver Damage Threshold ,per Lane	Prdmg	3.4		dBm

<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	25	70	°C
Operating Case Temperature	T <sub>I</sub>	-40	25	85	°C
Power Supply Voltage	VCC3	3.1	3.3	3.5	V
Data Rate PER Channel	-	-	25.78125	-	Gbps
Supply Current	ICC3			0.8	A
Module Total Power	PD			2.5	W

Notes:

*Module Total Power : Maximum total power value is specified across the full operational temperature and voltage range when CDRs are locked or a lack of input signal results in squelch being activated. If incorrect frequencies cause the CDRs to continuously attempt to lock, maximum power dissipation may reach 3.5 W.*

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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 Range	$\lambda_c$	840	850	860	nm		
RMS Spectral Width	$\Delta\lambda$	-	-	0.6	nm		
Average Launch Power per Lane	TXPx	-8.4		2.4	dBm		
Average Launch power Tx_off	Poff	-		--30	dBm		
Transmit OMA per Lane	TxOMA	-6.4		3	dBm		
Extinction Ratio	ER	2	-	-	dB		
Eye Mask {X1, X2, X3, Y1, Y2, Y3}		{0.3, 0.38, 0.45, 0.35, 0.41, 0.5}					2
<b>Electrical Characteristic</b>							
Signaling rate per lane		25.78125 $\pm$ 100ppm			Gb/s		
Differential Data Input Swing	$V_{in,P-P}$		-	900	mV		
Single-ended voltage tolerance	$V_{in,PP}$	-0.35		3.3	V		

**Notes:**

1. Transmitter consists of 4 lasers operating at a maximum speed of 25.78125Gb/s  $\pm$ 100ppm each.
2. Hit Ratio 1.5 x 10<sup>-3</sup> hits/sample.

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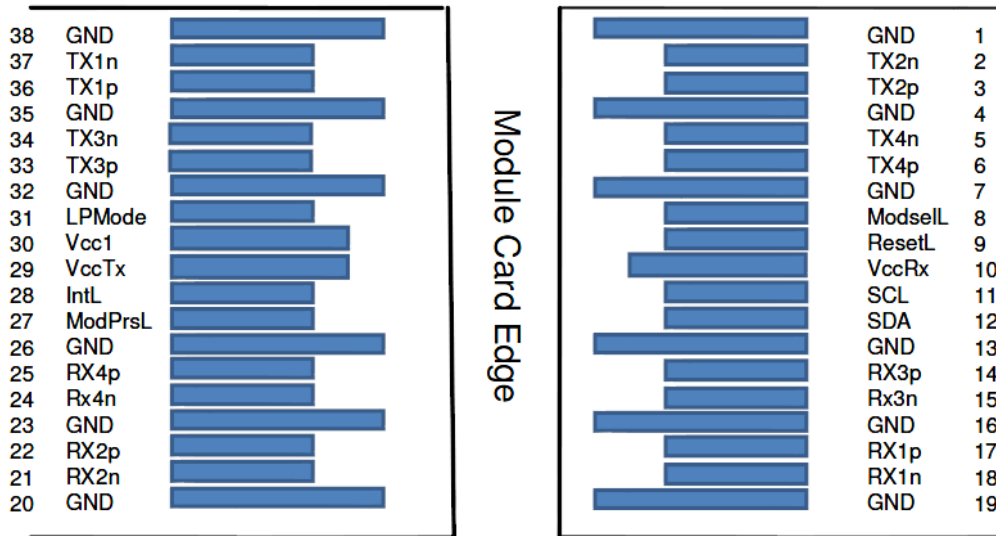
<b>Receiver Operating Characteristic-Optical, Electrical</b>						
<b>Parameter</b>	<b>Symbol</b>	<b>Min.</b>	<b>Typ.</b>	<b>Max.</b>	<b>Unit</b>	<b>Note</b>
<b>Optical Characteristic</b>						
Signaling Speed per Lane	BR	10.3125	25.78125	-	Gbps	
Center Wavelength Range	$\lambda_c$	840	-	860	nm	
Damage Thredhold	DT	3.4			dBm	
Average Receive Power per Lane	RXP <sub>x</sub>	-10.3		2.4	dBm	1
Stressed receiver sensitivity in OMA	RxSOMA			-5.2	dBm	2
Receive Power (OMA) per Lane	RxOMA			3	dBm	
LOS Assert	-	-30	-	-	dBm	
LOS De-Assert	-	-	-	-12	dBm	
LOS Hysteresis		0.5	2		dB	
<b>Electrical Characteristic</b>						
Differential Date Output Swing	V <sub>out</sub>	100	-	400	mVpp	3
		300		600		
		400	600	800		
		600		1200		
Eye width		0.57			UI	
Eye HEIGHT, differential		228			mV	
Vertical eye closure	VEC	5.5			dB	
Transition time(20% ~ 80%)	tr,tf	12			ps	

**Note:**

1. Minimum value is informative only and not the principal indicator of signal strength.
2. Hit Ratio  $5 \times 10^{-5}$  hits/sample.
3. Output voltage is settable in 4 discrete ranges via I2C. Default range is Range 2 (400 – 800 mV).

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**6. Applications Note :**



Top Side  
Viewed From Top

Bottom Side  
Viewed From Bottom

**Pin Definitions**

**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

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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
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.

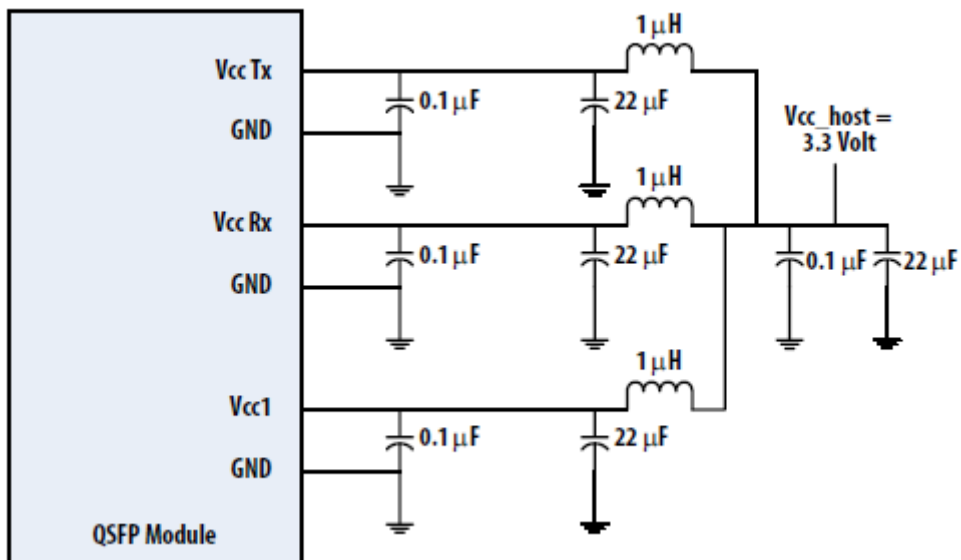
[2] VccRx, Vcc1 and VccTx are the receiver and transmitter power supplies and shall be applied concurrently. Recommended host board power supply filtering is shown. VccRx, Vcc1 and VccTx may be internally connected within the QSFP28 Module in any combination. The connector pins are each rated for a maximum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

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**Digital Diagnostic Function**

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

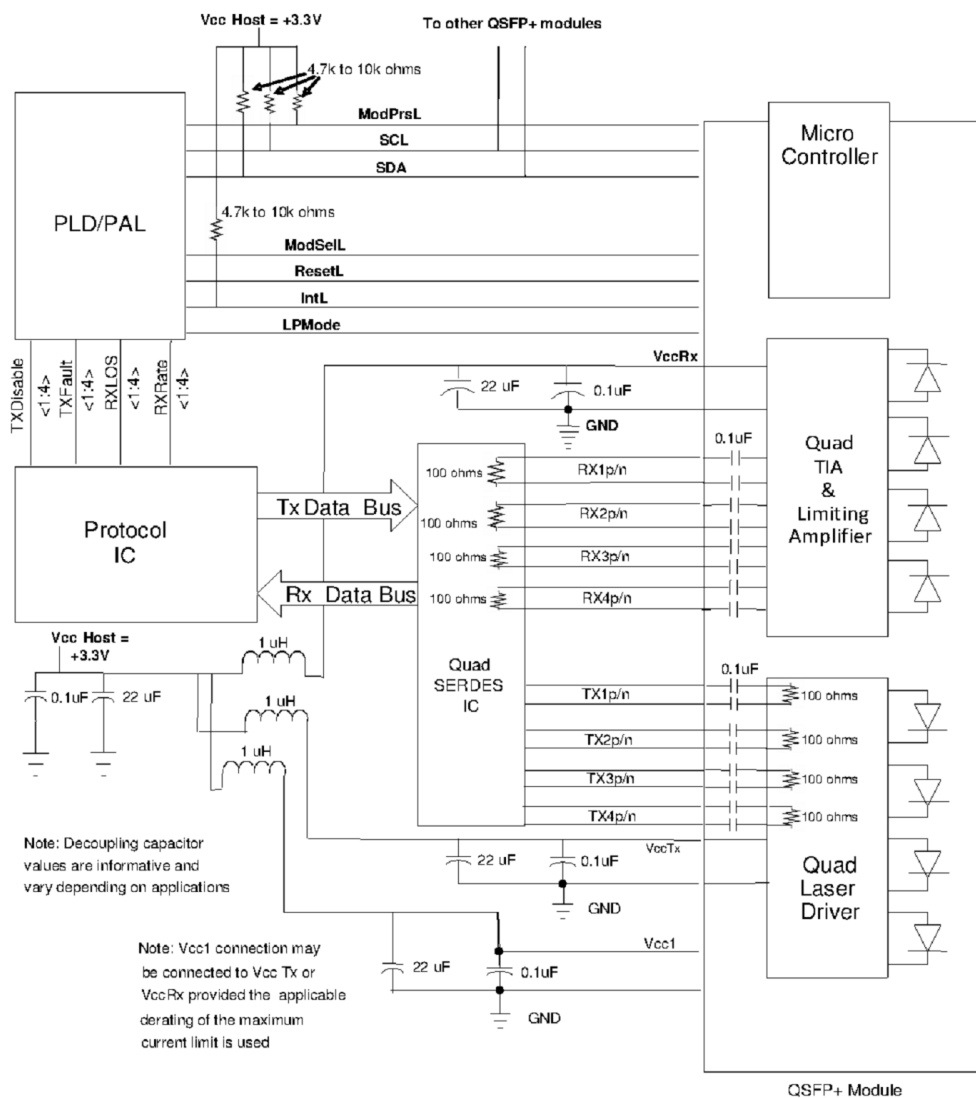
**Recommended Host Board Power Supply Filter Network**





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**Recommended Application Interface Block Diagram**



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**7. Modification History**

<b>Rev.</b>	<b>Comments</b>	<b>Date</b>	<b>Originator</b>	<b>Approval</b>
01	Preliminary Draft	01/05/2017		Ray Yang
02	Spec. Revised	02/17/2019		Ray Yang