

### QSFP-100GB-ER1-C-C

Cisco® Compatible TAA Compliant 100GBase-ER1 QSFP28 Single Lambda Transceiver (SMF, 1310nm, 40km, LC, DOM)

#### Features:

- Supports 106.25Gb/s(PAM4)
- Compliant with QSFP28 MSA
- Aligned with IEEE 802.3bs and 100G Lambda MSA
- Single 3.3V power supply
- High Sensitivity APD Receiver
- Duplex LC Connector
- IIC management interface
- Up to 40km over single-mode fiber
- Commercial Temperature 0 to 70 Celsius
- Hot Pluggable
- Metal with Lower EMI
- Excellent ESD Protection
- RoHS Compliant and Lead Free



#### Applications:

- 100GBase Ethernet
- Access and Enterprise

#### Product Description

This Cisco® compatible QSFP28 transceiver provides 100GBase-ER1 throughput up to 40km over single-mode fiber (SMF) using a wavelength of 1310nm via an LC connector. It is guaranteed to be 100% compatible with the equivalent Cisco® transceiver. This easy to install, hot swappable transceiver has been programmed, uniquely serialized and data-traffic and application tested to ensure that it will initialize and perform identically. Digital optical monitoring (DOM) support is also present to allow access to real-time operating parameters. This transceiver is Trade Agreements Act (TAA) compliant. We stand behind the quality of our products and proudly offer a limited lifetime warranty.

ProLabs' transceivers are RoHS compliant and lead-free.

TAA refers to the Trade Agreements Act (19 U.S.C. & 2501-2581), which is intended to foster fair and open international trade. TAA requires that the U.S. Government may acquire only "U.S. – made or designated country end products."



## Regulatory Compliance

- ESD to the Electrical PINs: compatible with MIL-STD-883E Method 3015.4
- ESD to the LC Receptacle: compatible with IEC 61000-4-3
- EMI/EMC: compatible with FCC Part 15 Subpart B Rules, EN55022:2010
- Laser Eye Safety: compatible with FDA 21CFR, EN60950-1& EN (IEC) 60825-1,2
- RoHS compliant with EU RoHS 2.0 directive 2015/863/EU

## Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Unit
Maximum Supply Voltage	V <sub>CC</sub>	0	3.6	V
Storage Temperature	T <sub>S</sub>	-40	85	°C
Operating Case Temperature	T <sub>c</sub>	0	70	°C
Relative Humidity (No Condensation)	RH	0	85	%
Damage Threshold	THd	0		dBm
Link Distance	D		40	km

## Electrical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Supply Voltage	V <sub>CC</sub>	3.135	3.3	3.465	V	
Supply Current	I <sub>CC</sub>			1.66	A	
Power Consumption	P <sub>DISS</sub>		4.5	5.5	W	
<b>Transmitter High-Speed Electrical Characteristics</b>						
Signaling Rate	Rate	25.78125 ± 100ppm			Gbps	
Input Differential Impedance	Z <sub>IN</sub>		100		Ω	
Differential Input Voltage Per Lane				900	mV	
Input Impedance Mismatch				10	%	
Input High Voltage	V <sub>IH</sub>	2		V <sub>CC</sub> +0.3	V	
Input Low Voltage	V <sub>IL</sub>	-0.3		0.8	V	
<b>Receiver High-Speed Electrical Characteristics</b>						
Signaling Rate	Rate	25.78125 ± 100ppm			Gbps	
Common-Mode Voltage	V <sub>CM</sub>	-350		2850	mV	
Common-Mode Noise (RMS)				17.5	mV	
Differential Termination Resistance Mismatch (At 1MHz)				10	%	
Differential Return Loss (SDD22)				Per CEI-28G-VSR	dB	

<b>Common-Mode to Differential Conversion and Differential to Common-Mode Conversion (SDC22, SCD22)</b>				Per CEI-28G-VSR	dB	
<b>Common-Mode Return Loss (SCC22): From 250MHz to 30GHz</b>				-2		
<b>Transition Time: 20-80%</b>		9.5			ps	
<b>Vertical Eye Closure</b>	VEC			6.5	dB	
<b>Eye Width at 10-15 Probability</b>	EW15	0.57			UI	
<b>Eye Height at 10-15 Probability</b>	EH15	228			mV	

## Optical Characteristics (EOL)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
<b>Transmitter</b>						
Data Rate Per Lane		53.125 ± 100ppm			Gbps	
Modulation Format		PAM4				
Wavelength	$\lambda$	1308.09	1309.09	1310.19	nm	
Side-Mode Suppression Ratio	SMSR	30			dB	
Average Launch Power	$P_{avg}$	1.7		7.1	dBm	1
Outer Optical Modulation Amplitude (OMA <sub>outer</sub> )	TDP<1.4dB	POMA	4.7		7.9	dBm
	TDP>1.4dB		3.3+TDP			
Transmitter and Dispersion Penalty	TDP			3.9	dB	
TECQ	TECQ			3.9	dB	
TDP-TECQ (Maximum)				2.7	dB	
Extinction Ratio	ER	5.0			dB	
Optical Return Loss Tolerance	ORLT			15	dB	
Transmitter Reflectance	RL			-26	dB	2
Average Launch Power Off Transmitter	$P_{off}$			-15	dBm	
RIN <sub>15.6 OMA</sub>	RIN			-136	dB/Hz	
<b>Receiver</b>						
Data Rate Per Lane		53.125 ± 100ppm			Gbps	
Modulation Format		PAM4				
Lane Wavelength	$\lambda$	1304.5~1317.5			nm	
Damage Threshold	THd	-2.4			dBm	3
Average Receive Power		-16		-3.4	dBm	4
Receive Power (OMA <sub>outer</sub> )				-2.6	dBm	
Receiver Reflectance	RL			-26	dB	
Receiver Sensitivity (OMA <sub>outer</sub> )	TECQ<1.4 dB			-13.8	dBm	
	TECQ>1.4 dB			TECQ-15.2		
Stressed Receiver Sensitivity (OMA <sub>outer</sub> ) Per Lane - Maximum	SRS			-11.3	dBm	5
LOS Assert	LOSA	-30		-19.5	dBm	
LOS De-Assert	LOSD			-16.5	dBm	
LOS Hysteresis	LOSH	0.5			dB	
<b>Conditions of Stress Receiver Sensitivity Test</b>						
Stressed Eye Closure for PAM4 (SECQ) Lane Under Test				3.9	dB	

**Notes:**

1. Average launch power (minimum) is informative and not the principal indicator of signal strength. A transmitter with launch power below this value cannot be compliant; however, a value above this does not ensure compliance.
2. Transmitter Reflectance is defined looking into the transmitter.
3. The receiver shall be able to tolerate, without damage, continuous exposure to a modulated optical input signal having this power level on one lane.
4. Average receive power (minimum) is informative and not the principal indicator of signal strength. A received power below this value cannot be compliant; however, a value above this does not ensure compliance.
5. Measured with a conformance test signal at TP3 for the BER specified in IEEE Std 802.3cd.

## Pin Descriptions

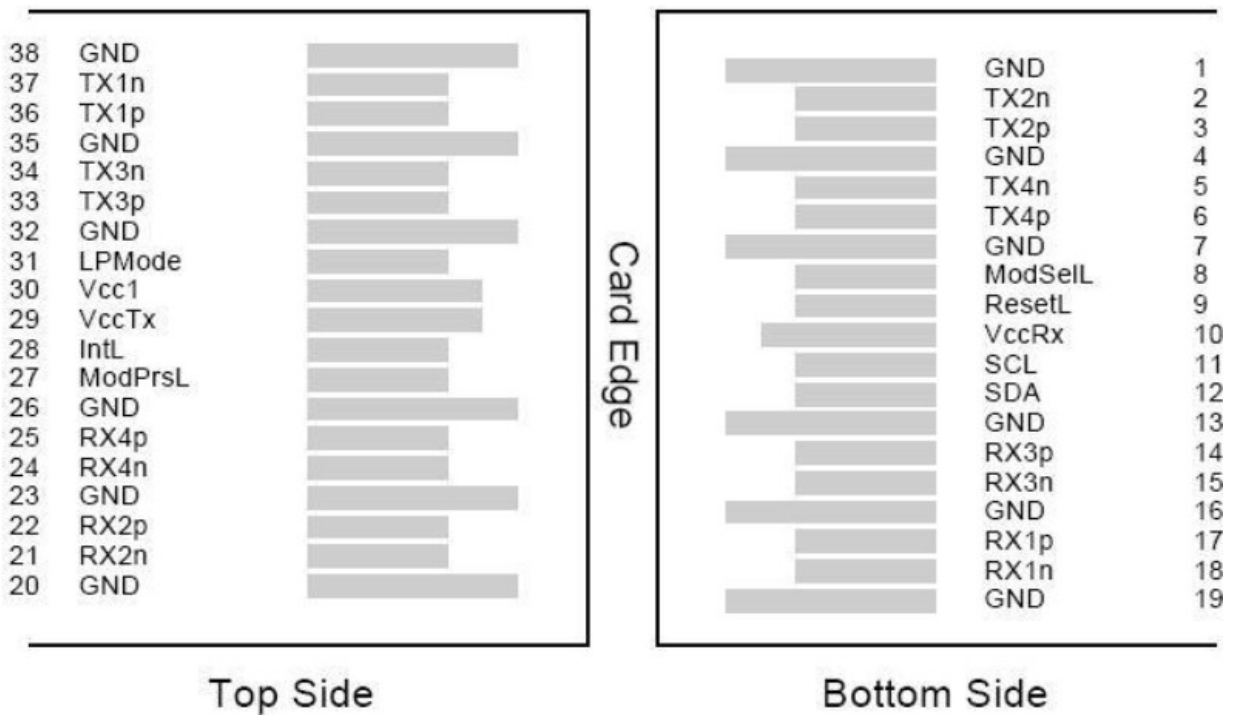
Pin	Symbol	Name/Descriptions	Ref.
1	GND	Transmitter Ground (Common with Receiver Ground).	1
2	Tx2-	Transmitter Inverted Data Input.	
3	Tx2+	Transmitter Non-Inverted Data Output.	
4	GND	Transmitter Ground (Common with Receiver Ground).	1
5	Tx4-	Transmitter Inverted Data Input.	
6	Tx4+	Transmitter Non-Inverted Data Output.	
7	GND	Transmitter Ground (Common with Receiver Ground).	1
8	ModSelL	Module Select.	2
9	ResetL	Module Reset.	2
10	VccRx	+3.3V Power Supply Receiver.	
11	SCL	2-Wire Serial Interface Clock.	2
12	SDA	2-Wire Serial Interface Data.	2
13	GND	Transmitter Ground (Common with Receiver Ground).	1
14	Rx3+	Receiver Non-Inverted Data Output.	
15	Rx3-	Receiver Inverted Data Output.	
16	GND	Transmitter Ground (Common with Receiver Ground).	1
17	Rx1+	Receiver Non-Inverted Data Output.	
18	Rx1-	Receiver Inverted Data Output.	
19	GND	Transmitter Ground (Common with Receiver Ground).	1
20	GND	Transmitter Ground (Common with Receiver Ground).	1
21	Rx2-	Receiver Inverted Data Output.	
22	Rx2+	Receiver Non-Inverted Data Output.	
23	GND	Transmitter Ground (Common with Receiver Ground).	1
24	Rx4-	Receiver Inverted Data Output.	1
25	Rx4+	Receiver Non-Inverted Data Output.	
26	GND	Transmitter Ground (Common with Receiver 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	Transmitter Ground (Common with Receiver Ground).	1
33	Tx3+	Transmitter Non-Inverted Data Input.	
34	Tx3-	Transmitter Inverted Data Output.	

35	GND	Transmitter Ground (Common with Receiver Ground).	1
36	Tx1+	Transmitter Non-Inverted Data Input.	
37	Tx1-	Transmitter Inverted Data Output.	
38	GND	Transmitter Ground (Common with Receiver Ground).	1

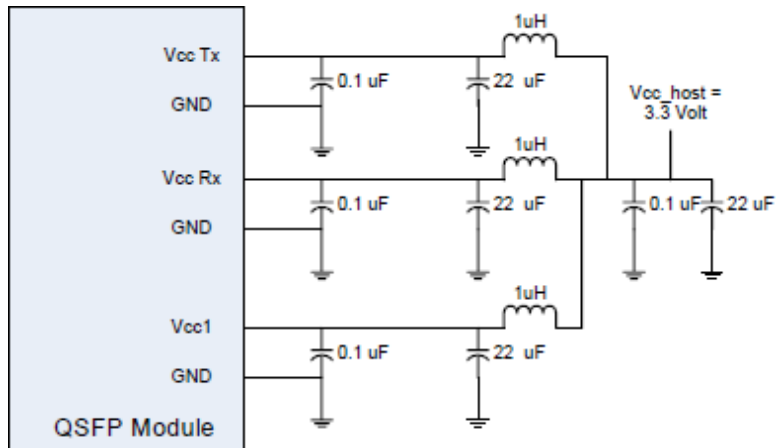
**Notes:**

1. The module signal grounds are isolated from the module case.
2. This is an open collector/drain output that, on the host board, requires a 4.7KΩ to 10KΩ pull-up resistor to Host\_Vcc.

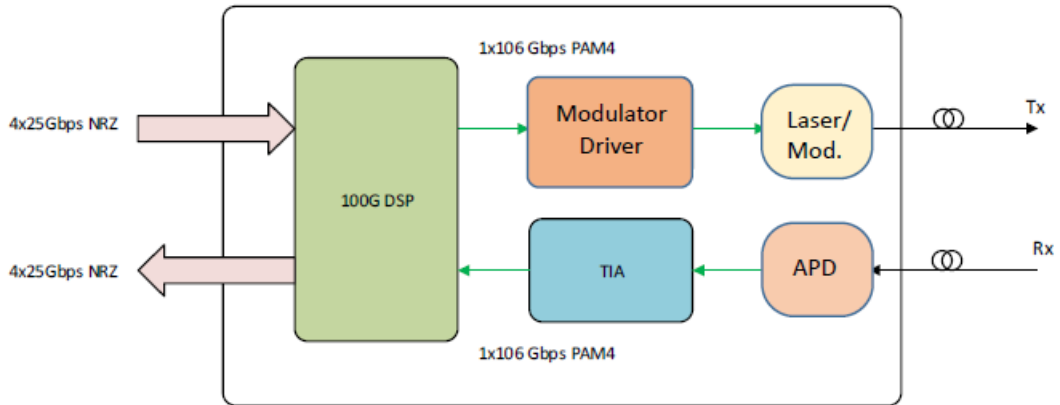
**Electrical Pin-Out Details**



### Recommended Power Supply Filter Network

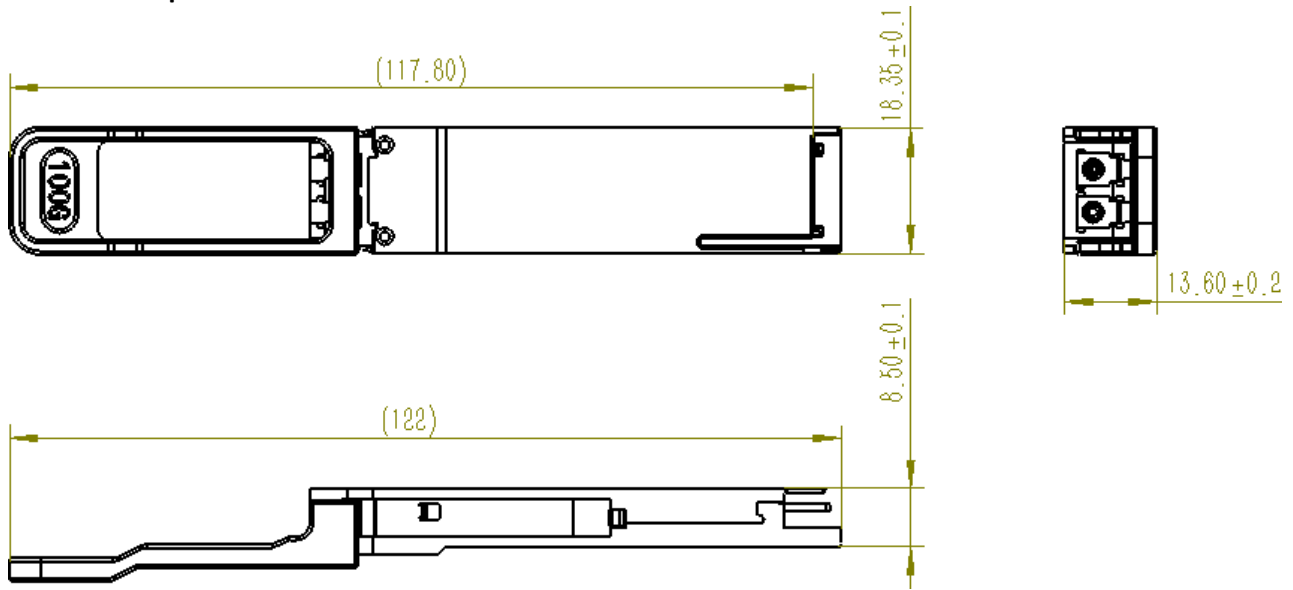


### Block Diagram





## Mechanical Specifications



## Digital Diagnostics

Parameter	Symbol	Min.	Max.	Unit	Notes
Temperature Monitor Absolute Error	DMI_Temp	-3	3	°C	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	-3	3	dB	1
Channel Bias Current Monitor	DMI_Ibias_Ch	-10%	10%	mA	
Channel Tx Power Monitor Absolute Error	DMI_Tx_Ch	-3	3	dB	1

### Notes:

1. Due to the measurement accuracy of different single-mode fibers, there could be an additional ±1dB fluctuation or a ±3dB total accuracy.

**About ProLabs**

Our experience comes as standard; for over 15 years ProLabs has delivered optical connectivity solutions that give our customers freedom and choice through our ability to provide seamless interoperability. At the heart of our company is the ability to provide state-of-the-art optical transport and connectivity solutions that are compatible with over 90 optical switching and transport platforms.

**Complete Portfolio of Network Solutions**

ProLabs is focused on innovations in optical transport and connectivity. The combination of our knowledge of optics and networking equipment enables ProLabs to be your single source for optical transport and connectivity solutions from 100Mb to 400G while providing innovative solutions that increase network efficiency. We provide the optical connectivity expertise that is compatible with and enhances your switching and transport equipment.

**Trusted Partner**

Customer service is our number one value. ProLabs has invested in people, labs and manufacturing capacity to ensure that you get immediate answers to your questions and compatible product when needed. With Engineering and Manufacturing offices in the U.K. and U.S. augmented by field offices throughout the U.S., U.K. and Asia, ProLabs is able to be our customers best advocate 24 hours a day.

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