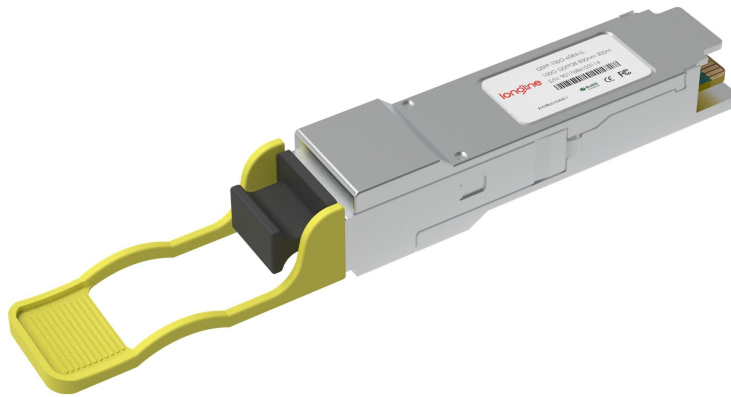


# 100GBASE-ESR4 QSFP28 850nm 300m DOM Transceiver

QSFP-100G-eSR4-LL



## Application

- 100G BASE-ESR4

## Standards

- SFF-8665
- SFF-8636
- SFF-8679
- IEEE 802.3cd

## Features

- 100Gigabit Ethernet (100GbE) 100GBASE-SR4
- Supports Operations at 100GE (103.1Gbit/s)
- Compliant to IEEE 802.3 100GBASE-SR4
- 25.78125 Gbit/s x 4 Channel, Electrical Interface (CAUI-4)
- RoHS6 Compliant
- Low Power Consumption  $\leq 1.5W$
- Compliant to "QSFP+ 28Gb/s 4X Pluggable Transceiver Solutions" (SFF-8665)
- Optical Light Source: 4 x 850NM (VCSEL)
- Transmission Length up to 200M on OM3(MMF), 300M on OM4 (MMF)
- 12 MM Fiber MPO Connector
- Operating Temperature Range: 0°C to 70°C
- Hot Z-Pluggable to 38-Pin Electrical Connector
- Latching Mechanism: Pull Tab
- Two-Wire Common Management Interface (SFF-8636)

## Description

The 100GBASE-ESR4 QSFP28 Optical Transceiver Module is designed for use in 100GBASE Ethernet throughput up to 200m over OM3 MMF or 300m over OM4 MMF using a wavelength of 850nm via a MTP/MPO-12 connector. This transceiver is compliant with IEEE 802.3bm 100GBASE-SR4 and CAUI-4 standard. Digital diagnostics functions are also available via the I2C interface, as specified by the QSFP28 MSA, to allow access to real-time operating parameters.

With these features, this easy-to-install, hot swappable transceiver is suitable to be used at key locations optical networks like 100GBASE Ethernet.

## Product Specifications

### I. Absolute Maximum Ratings ( $T_C=25^{\circ}\text{C}$ , Unless Otherwise Noted)

Stresses in excess of the absolute maximum ratings can cause permanent damage to the device. These are absolute stress ratings only. Functional operation of the device is not implied at these or any other conditions in excess of those given in the operational sections of the data sheet. Exposure to absolute maximum ratings will cause permanent damage and/or adversely affect device reliability.

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
<b>Storage Temperature</b>	$T_s$	-40	-	+85	$^{\circ}\text{C}$	
<b>Maximum Supply Voltage</b>	$V_{CC}$	-0.3	-	3.6	V	
<b>Operating Relative Humidity</b>	RH	15	-	+85	%	

### II. Recommended Operating Conditions

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
<b>Data Rate</b>	DR		103.1		Gb/s	1
<b>Bit Error Rate</b>	BER			5E-5		2
<b>Operating Case Temperature</b>	$T_{case}$	0		70	$^{\circ}\text{C}$	
<b>Fiber Length on MMF(OM4)</b>	L			300	m	3

#### Notes:

1. Supports 100GBASE-SR4 per IEEE 802.3-2018.
2. Tested with a 231 – 1 PRBS.
3. Requires FEC on the host to support maximum distance, per 100GBASE-SR4.

### III. Electric Characteristics

Parameter	Symbol	Min.	Typical	Max.	Units	Notes
<b>Supply Voltage</b>	$V_{CC}$	3.135		3.465	V	
<b>Supply Current</b>	$I_{CC}$			0.75	A	
<b>Module Total Power</b>	P			2.5	W	1

#### Transmitter

<b>Signaling Rate Per Lane</b>				$25.78125 \pm 100\text{ppm}$	Gb/s	
<b>Differential Input Impedance</b>	$Z_{in}$		100		Ohm	
<b>Differential Input Voltage Amplitude</b>	$V_{in}$			900	mVp-p	

#### Receiver

<b>Signaling Rate Per Lane</b>				$25.78125 \pm 100\text{ppm}$	Gb/s	
<b>Differential Output Impedance</b>	$Z_{out}$		100		Ohm	
<b>Differential Output Voltage Amplitude</b>	$V_{out}$	400		900	mVp-p	
<b>Eye Width</b>			0.57		UI	
<b>Vertical Eye Closure</b>			5.5		dB	
<b>Transition Time, 20% to 80%</b>	$T_r/T_f$		12		ps	

#### Notes:

1. Maximum total power value is specified across the full temperature and voltage range.

## IV. Optical Characteristics

Parameter	Symbol	Min.	Typical	Max.	Units	Notes
<b>Transmitter</b>						
<b>Signaling Rate Per Lane</b>		25.78125 ± 100ppm			Gb/s	1
<b>Center Wavelength</b>	$\lambda$	840	850	860		
<b>RMS Spectral Width</b>	SW			0.6	nm	
<b>Transmit OMA Per Lane</b>	TXP	-6.4		3	dBm	
<b>Transmit Average Power Per Lane</b>	Pout	-8.4		2.4	dBm	
<b>Launch Power in OMA Minus TDEC(Min.)</b>	P-TDEC	-7.3			dBm	
<b>Transmitter and Dispersion Eye closure(TDEC), Each Lane(Max.)</b>	TDEC			4.3	dB	
<b>Optical Extinction Ratio</b>	ER	2			dB	
<b>Average Launch Power of OFF Transmitter, Per Lane</b>				-30	dBm	
<b>Optical Return Loss Tolerance</b>	RL			12	dB	
<b>Transmitter Eye Mask Definition {X1, X2, X3, Y1, Y2, Y3}</b>		{0.3, 0.38, 0.45, 0.35, 0.41, 0.5}			dB	Hit Ratio $1.5 \times 10^{-3}$ Hits Per Sample
<b>Receiver</b>						
<b>Signaling Rate Per Lane</b>		25.78125 ± 100ppm			Gb/s	1
<b>Damage Threshold</b>	DT	3.4			dBm	
<b>Average Receive Power Per Lane</b>	RXP	-10.3		2.4	dBm	
<b>Receive Power(OMA) Per Lane</b>	RxOMA			3	dBm	

Parameter	Symbol	Min.	Typical	Max.	Units	Notes
<b>Receiver Reflectance</b>	R <sub>fl</sub>			-12	dB	
<b>Stressed Receiver Sensitivity(OMA), Each Lane(Max.)</b>	SEN			-5.2	dBm	2
<b>LOS De-Assert</b>	LOS <sub>D</sub>			-13	dBm	
<b>LOS Assert</b>	LOS <sub>A</sub>	-30			dBm	
<b>LOS Hysteresis</b>	LOS <sub>H</sub>	0.5			dB	

**Notes:**

1. Transmitter and Receiver consists of 4 lasers and photodiode operating at 25.78Gb/s each.
2. Measured with conformance test signal at TP3 (see 95.8.8) for the BER specified in 95.1.1 of IEEE Std 802.3-2018.

## V. Pin Definitions

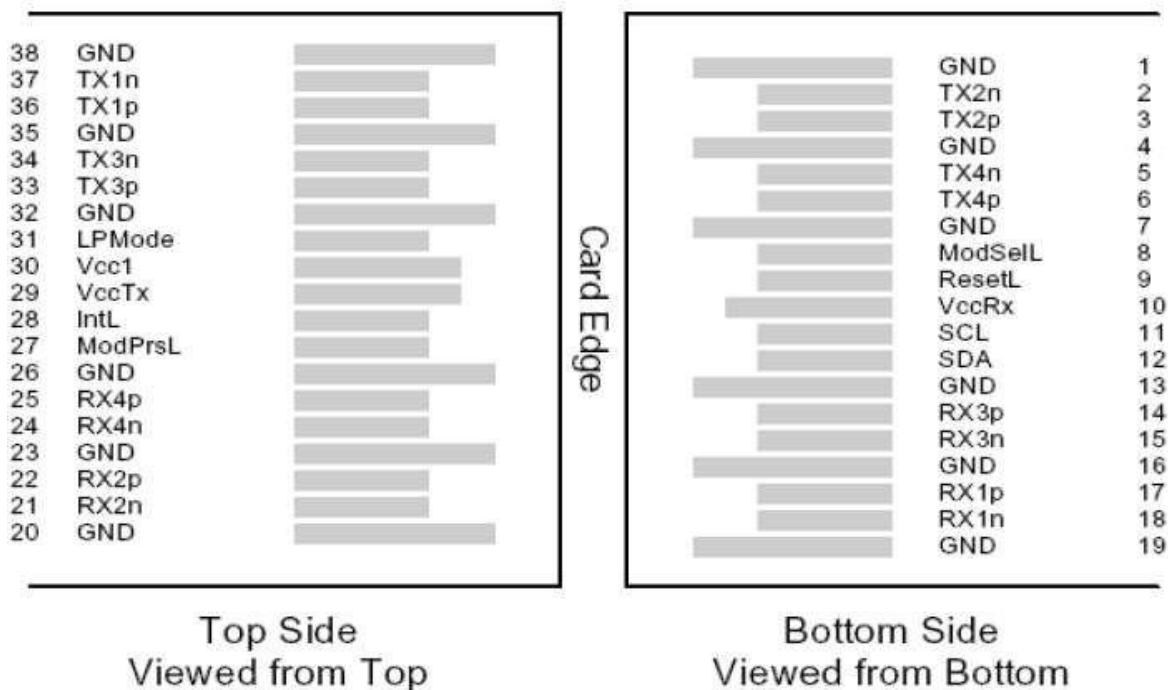


Figure 1 – QSFP28-Compliant 38-Pin Connector (Per SFF-8679)

## VI. Pin Descriptions

Pin	Symbol	Name/Description	Ref.
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	

Pin	Symbol	Name/Description	Ref.
7	GND	Ground	1
8	ModSelL	Module Select	
9	ResetL	Module Reset	
10	V <sub>CC</sub> Rx	+3.3V Power Supply Receiver	
11	SCL	2-Wire Serial Interface Clock	
12	SDA	2-Wire Serial Interface Data	
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	

Pin	Symbol	Name/Description	Ref.
23	GND	Ground	1
24	Rx4n	Receiver Inverted Data Output	
25	Rx4p	Receiver Non-Inverted Data Output	
26	GND	Ground	1
27	ModPrsL	Module Present	
28	IntL	Interrupt	2
29	V <sub>cc</sub> Tx	+3.3V Power Supply Transmitter	
30	V <sub>cc</sub> 1	+3.3V Power Supply	
31	LPMoDe	Low Power Mode	
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. Circuit ground is internally isolated from chassis ground.
2. IntL is an open collector/drain output, which should be pulled up with a 4.7k – 10k Ohms resistor on the host board. The INTL pin is deasserted "High" after completion of reset, when byte 2 bit 0 (Data Not Ready) is read with a value of '0' and the flag field is read (see SFF-8636).



## VII. Digital Diagnostic Functions

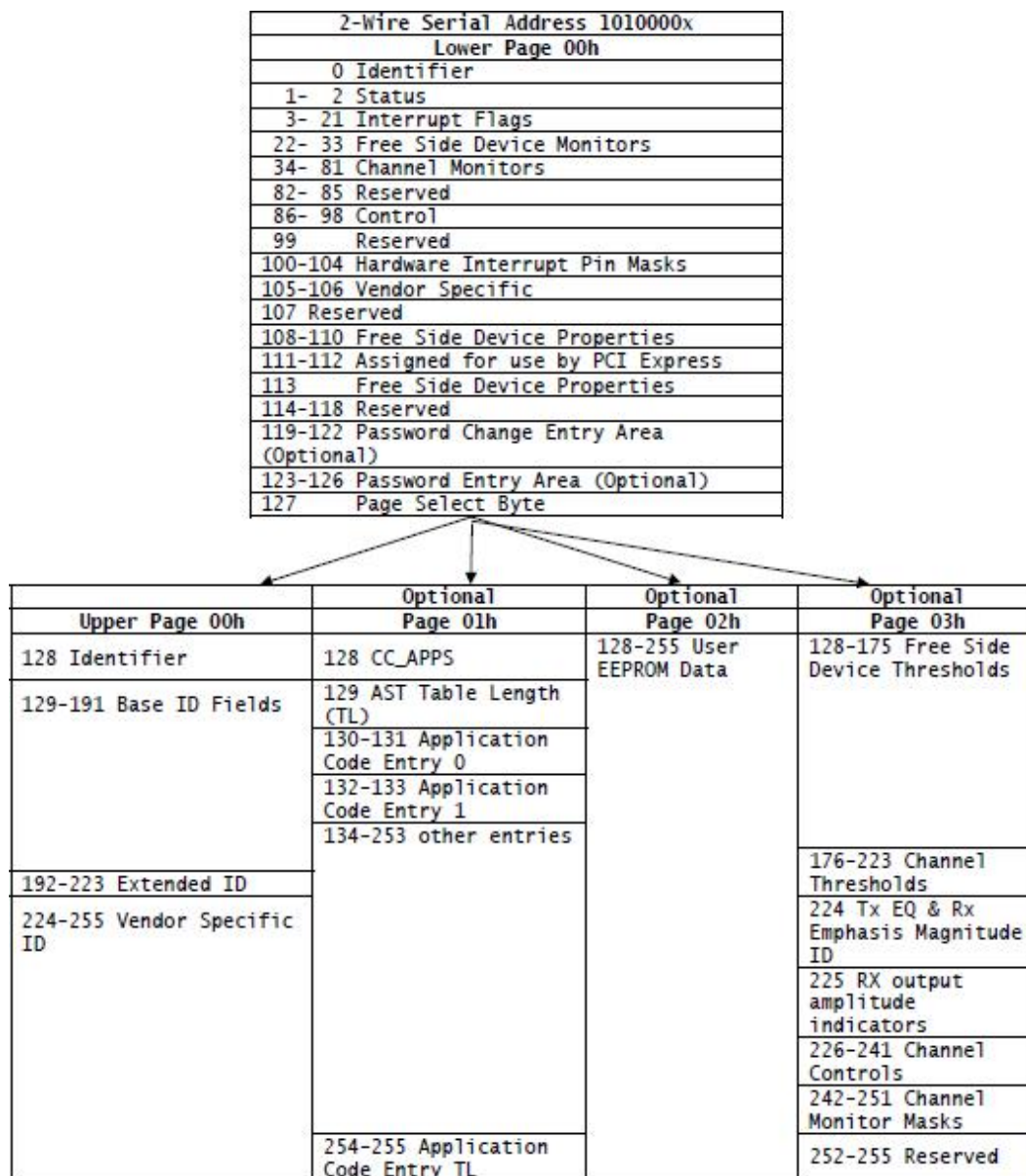


Figure 2 – Two-Wire Interface Fields

The operating and diagnostics information is monitored and reported by a Digital Diagnostics Transceiver Controller (DDTC) inside the transceiver, which is accessed through a 2-wire serial interface. The 2-wire serial interface shall consist of a master and slave. The fixed side shall be the master and the free side shall be the slave. Control and data are transferred serially. The master shall initiate all data transfers. Data can be transferred from the master to the slave and from the slave to the master. The 2-wire interface shall consist of clock (SCL) and data (SDA) signals. The master utilizes SCL to clock data and control information on the 2-wire bus. The master and slave shall latch the state of SDA on the positive transitioning edge of SCL. The SDA signal is bi-directional. During data transfer, the SDA signal shall transition when SCL is low. A transition on the SDA signal while SCL is high shall indicate a stop or start condition.

For more information, please see the QSFP28 MSA documentation.

### VIII. Digital Diagnostic Specifications

Parameter	Symbol	Accuracy	Units	Notes
<b>Transceiver Case Temperature</b>	DMI_TEMP	± 3	°C	Over Operating Temp.
<b>Supply Voltage</b>	DMI_V <sub>CC</sub>	± 3%	V	Full Operating Range
<b>Channel Bias Current</b>	DMI_IBIAS	± 10%	mA	Per Channel
<b>Channel RX Power</b>	DMI_RX	± 3	dB	Per Channel
<b>Channel TX Power</b>	DMI_TX	± 3	dB	Per Channel

### IX. Mechanical Specifications

Unit: mm

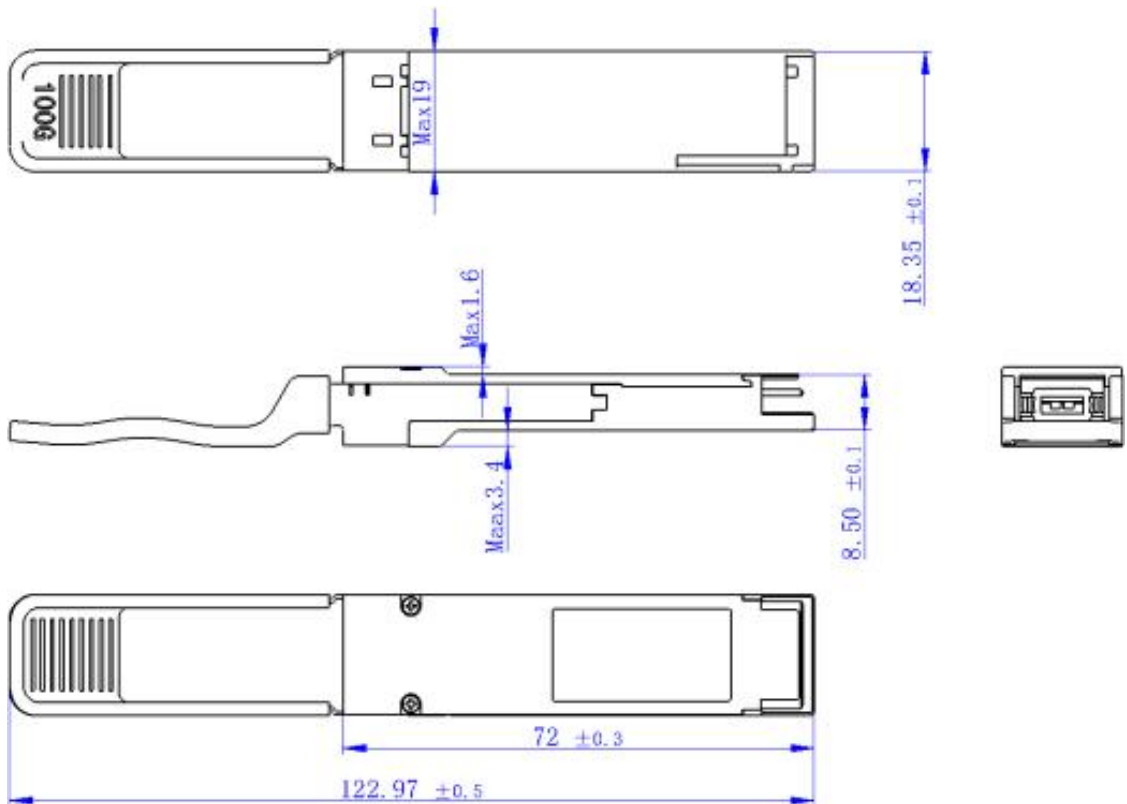


Figure 3 Mechanical Dimensions