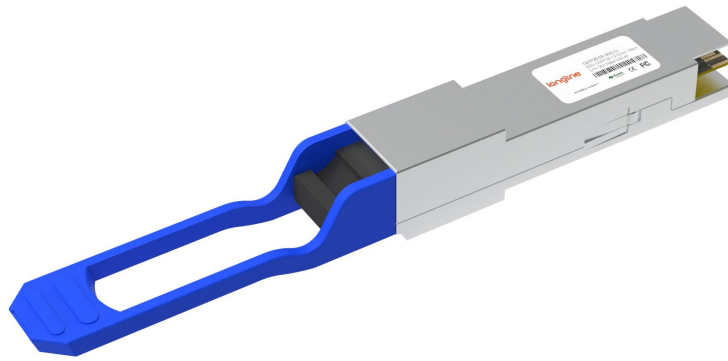


# QSFP28 50GBASE-ER 1310nm 40km Transceiver

QSFP28-ER-50G-LL



## Application

- 50GBASE-ER 50G Ethernet
- Data Center

## Features

- Supports 50GBASE-ER
- Lane signaling rate 26.5625 Gb/s with PAM4
- Up to 40km transmission on SMF
- QSFP28 MSA package with duplex LC connector
- High speed I/O electrical interface (CAUI-4)
- I2C interface with integrated Digital Diagnostic monitoring
- Cooled TOSA and APD ROSA
- Maximum power consumption 4.5W
- Operating case temperature: 0 ~ +70°C
- Compliant to SFF-8636 and SFF-8679
- RoHS-6 complaint

## Product Specifications

### I. Absolute Maximum Ratings

Parameter	Symbol	Min	Typ.	Max	Unit	Ref.
Storage Temperature	T <sub>s</sub>	-40		+85	° C	
Operating Relative Humidity	RH			+85	%	
Supply Voltage	V <sub>cc</sub>	-0.5		+4.0	V	

### II. Recommended Operating Environment

Parameter	Symbol	Min	Typ.	Max	Unit	Ref.
Operating Case Temperature	T <sub>c</sub>	0		+70	°C	
Power Supply Voltage	V <sub>cc</sub>	3.13	3.3	3.47	V	
Power Supply Current	I <sub>cc</sub>			1.3	A	
Maximum Power Dissipation	P <sub>D</sub>			4.5	W	
Data Rate (optical)	DR <sub>o</sub>		53.125		Gb/s	
Data Rate (Electrical)	DR <sub>e</sub>		26.5625		Gb/s	
Transmission Distance	TD			40	km	Over SMF

### III. Optical Characteristics

Parameter	Symbol	Min	Typ.	Max	Unit	Ref.
<b>Transmitter</b>						
Center Wavelength	CW	1304.5	1311	1317.5	nm	

<b>Average Launch Power</b>	$P_{TX}$	0.4	6.6	dBm	1
<b>Outer Optical Modulation Amplitude</b>	OMA	3.4	7.4	dBm	1
<b>Launch Power in OMA Minus TDECQ (min)</b>	OMA-TDECQ	2		dBm	
<b>Transmitter and Dispersion Eye Closure for PAM4 (TDECQ) (max)</b>	TDECQ		3.2	dBm	
<b>Average Output Power (Laser Turn off)</b>	$P_{OUT-OFF}$		-30	dBm	
<b>Side Mode Suppression Ratio</b>	SMSR	30		dB	
<b>Extinction Ratio</b>	ER	6		dB	
<b>RIN OMA</b>	RIN		-132	dB/Hz	
<b>Transmitter Reflectance</b>	$T_{ref}$		-26	dB	
<b>Optical Return Loss Tolerance</b>	ORLT		20	dB	

**Receiver**

<b>Center Wavelength</b>	CW	1304.5	1311	1317.5	nm
<b>Damage Threshold</b>	$P_{damage}$	-6			dBm
<b>Average Rx Power</b>	$P_{RX}$	-17.6	-7	dBm	2
<b>Receive Power _OMA</b>	$P_{OMA}$		-2.6	dBm	2

<b>Receiver Sensitivity _OMA</b>	SEN _OMA			-15.1	dBm	2,3
<b>Reflectance</b>	Ref			-26	dB	
<b>Stressed Receiver Sensitivity _OMA</b>	SRS			-13.3	dBm	2,3
<b>Conditions of Stressed Receiver Sensitivity Test</b>						
<b>Stressed Eye Closure for PAM4 (SECQ)</b>	SECQ			3.2	dB	4

**Notes:**

- 1.The optical power is launched into SMF.
- 2.Receiver sensitivity (OMA), each lane (max) is informative. Measured with test pattern PRBS2^31-1.
- 3.Measured with a PRBS2^31-1@26.5625G/s, BER≤2.4E-4.
- 4.These test conditions are for measuring stressed receiver sensitivity. They are not characteristics of the receiver.

### IV. Electrical Characteristics

High-Speed Signal: Compliant to CAUI-4 (IEEE 802.3bm Annex 83E)

Low-Speed Signal: Compliant to QSFP-8679.

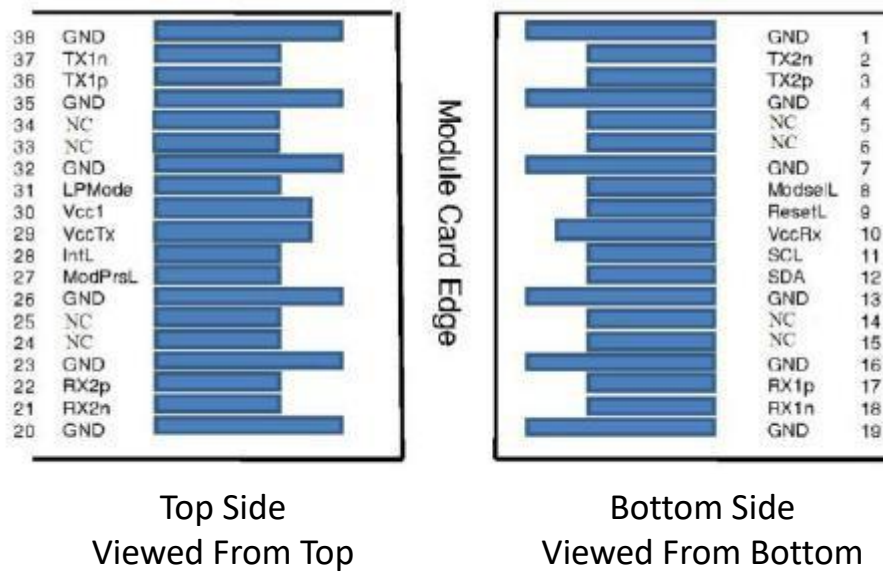
Parameter	Symbol	Min	Typ.	Max	Unit	Ref.
<b>Transmitter (Module Input)</b>						
<b>Input Differential Impedance</b>	Rin		100		Ohm	
<b>Differential Data Input Amplitude</b>	V <sub>IN,P-P</sub>	80		900	mVpp	
<b>Differential Termination Mismatch (max)</b>	D-mismatch			10%		
<b>DC Common-Mode Input Voltage</b>		-0.3		2.8	V	
<b>Transition Time(20%~80%)</b>	Tr Tf	10			ps	

<b>LPMODE, Reset and ModSelL / Tx dis</b>	$V_{IL}$	-0.3		0.8	V	
<b>LPMODE, Reset and ModSelL / Tx dis</b>	$V_{IH}$	2.0		$V_{CC}+0.3$	V	
<b>Receiver (Output)</b>						
<b>Output Differential Impedance</b>	$R_{out}$		100		Ohm	
<b>Differential Data Output Amplitude</b>	$V_{OUT,P-P}$			900	mVpp	
<b>Differential Termination Mismatch (max)</b>	D-mismatch			10	%	
<b>Transition Time, 20% to 80%</b>	$T_{r Tf}$	12			ps	
<b>ModPrsL and IntL/ Rx Los</b>	$V_{OL}$	0		0.4	V	
<b>ModPrsL and IntL/ Rx Los</b>	$V_{OH}$	$V_{CC}-0.5$		$V_{CC}+0.3$	V	

### V. Digital Diagnostic Monitoring Information

Parameter	Range	Accuracy	Unit	Calibration
<b>Temperature</b>	0 to 70	$\pm 3$	$^{\circ}C$	Internal
<b>Voltage</b>	0 to $V_{CC}$	0.1	V	Internal
<b>Tx Bias Current</b>	0 to 100	10%	mA	Internal
<b>Tx Output Power</b>	-4.5 to 4.2	$\pm 3$	dBm	Internal
<b>Rx Power</b>	-10.8 to 4.2	$\pm 3$	dBm	Internal

## VI. Pin Assignment



Pin	Logic	Symbol	Description	Plug Sequence <sup>4</sup>	Notes
1		GND	Ground	1	1
2	CML-I	Tx2n	Transmitter Inverted Data Input	3	
3	CML-I	Tx2p	Transmitter Non-Inverted Data output	3	
4		GND	Ground	1	1
5		NC		3	
6		NC		3	
7		GND	Ground	1	1
8	LVTLL-I	ModSelL	Module Select	3	
9	LVTLL-I	ResetL	Module Reset	3	

10		VccRx	+3.3V Power Supply Receiver	2	2
11	LVC MOS-I/O	SCL	2-Wire Serial Interface Clock	3	
12	LVC MOS-I/O	SDA	2-Wire Serial Interface Data	3	
13		GND	Ground	1	
14		NC		3	
15		NC		3	
16		GND	Ground	1	1
17	CML-O	Rx1p	Receiver Non-Inverted Data Output	3	
18	CML-O	Rx1n	Receiver Inverted Data Output	3	
19		GND	Ground	1	1
20		GND	Ground	1	1
21	CML-O	Rx2n	Receiver Inverted Data Output	3	
22	CML-O	Rx2p	Receiver Non-Inverted Data Output	3	
23		GND	Ground	1	1
24		NC		3	
25		NC		3	
26		GND	Ground	1	1
27	LV TTL-O	ModPrsL	Module Present	3	
28	LV TTL-O	IntL	Interrupt	3	
29		VccTx	+3.3 V Power Supply Transmitter	2	2
30		Vcc1	+3.3 V Power Supply	2	2
31	LV TTL-I	LPMode	Low Power Mode	3	
32		GND	Ground	1	1

33		NC		3	
34		NC		3	
35		GND	Ground	1	1
36	CML-I	Tx1p	Transmitter Non-Inverted Data Input	3	
37	CML-I	Tx1n	Transmitter Inverted Data Output	3	
38		GND	Ground	1	1

**Notes:**

- 1.GND is the symbol for signal and supply (power) common for the QSFP28 module. All are common within the QSFP28 module and all module voltages are referenced to this potential unless otherwise noted. Connect these directly to the host board signal-common groundplane.
- 2.Vcc Rx, Vcc1 and Vcc Tx are the receiver and transmitter power supplies and shall be applied concurrently. Requirements defined for the host side of the Host Edge Card Connector are listed in MSA. The connector APDs are each rated for a maximum current of 1000mA.

**VII. Mechanical Dimension**

