

LQ-SM3150-LR1C

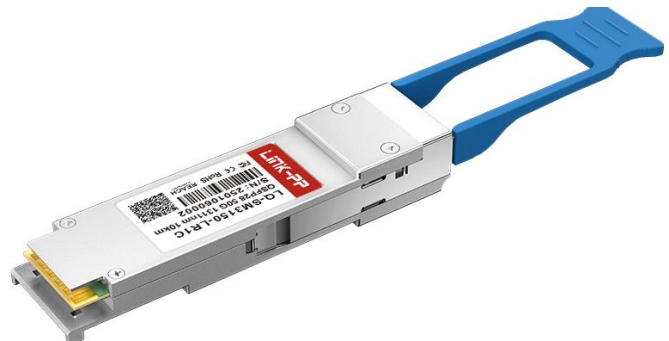
50G QSFP28 LR1 10KM Optical Transceiver

Features

- Compliant with QSFP28 Standard:
- SFF-8665 Revision 1.9 with timing in table 7 and 8 in this document , SFF-8636 Revision 2.9
- Compliant with IEEE 802.3cd_D3p5 50GBASE-LR
- Compliant with IEEE802.3 50GAUI-2 C2M electrical interface
- Single 3.3V Supply Voltage
- Maximum power consumption 3.5W
- DML laser and PIN Receiver
- QSFP28 MSA package with duplex LC connector
- Two Wire Serial Interface with Digital Diagnostic Monitoring
- Complies with EU Directive 2011/65/EU (RoHS compliant)
- Supports operation for a case temperature of 0°C to +70 °C.
- Class 1 Laser

Applications

- 50GBASE-LR1 Ethernet Links
- Client-side 50G Telecom connections



Absolute Maximum Ratings

It has to be noted that the operation in excess of any individual absolute maximum ratings might cause permanent damage to this module.

Parameter	Symbol	Min	Max	Units	Notes
Storage Temperature	TS	-40	85	degC	
Power Supply Voltage	VCC	-0.5	3.6	V	
Relative Humidity (non-condensation)	RH	0	85	%	

Recommended Operating Conditions and Power Supply Requirements

Parameter	Symbol	Min	Typical	Max	Unit	Notes
Operating Case Temperature	TOPR	0	-	70	°C	
Power Supply Voltage	VCC	3.135	3.3	3.465	V	
Instantaneous peak current at hot plug	ICC_IP	-	-	1400	mA	Per pin
Sustained peak current at hot plug	ICC_SP	-	-	1155	mA	Per pin
Maximum Power Dissipation	PD	-	-	3.5	W	
Maximum Power Dissipation, Low Power Mode	PDLP	-	-	1.5	W	
Data Rate	DRL	-	26.5625	-	GBaud/s	
		-	26.5625x2	-	GBit/s	
Two Wire Serial Interface Clock Rate	-	-	-	400	kHz	
Power Supply Noise Tolerance	-	-	-	66	mVpp	
Rx Differential Data Output Load	-	-	100	-	ohms	
Operating Distance	-	2	-	10000	m	

Optical and Electrical Characteristics

The following electrical characteristics are defined over the Recommended Operating Environment unless otherwise specified.

Parameter	Symbol	Min	Typical	Max	Units	Notes
Transmitter (each Lane)						
Wavelength	λ	1304.5	1311	1317.5	nm	
Side-mode suppression ratio	SMSR	30			dB	
Average launch power	POUT	-4.5	-	4.2	dBm	
Average launch power of OFF transmitter	POUT_OFF	-	-	-30	dBm	
Outer Optical Modulation Amplitude	POUTL	-1.5	-	4	dBm	

(OMAAouter)						
Extinction ratio	ER	3.5	-	-	dB	
Launch power in OMAouter minus TDECQ	OMA-TDECQ	-2.9	-	-	dBm	
Transmitter and dispersion eye closure for PAM4 (TDECQ)	TDECQ	-	-	3.2	dB	Note 1
Spectrum wavelength	λ -20	-	-	1	nm	
Optical return loss tolerance	ORLT	-	-	15.6	dB	
RIN15.6OMA	RIN	-	-	-132	dB/Hz	
Transmitter reflectance		-	-	-26	dB	
Receiver (each Lane)						
Wavelength	λ	1304.5	1311	1317.5	nm	
Receiver sensitivity (OMAAouter)				max(-8.4; SECQ - 9.8)	dBm	Note 2
Stressed receiver sensitivity (OMAAouter)	-	-	-	-6.6	dBm	
Conditions of stressed receiver sensitivity test:						
Stressed eye closure for PAM4 (SECQ)	-	-	-	3.2	dB	
Damage Threshold	P_damage	5.2	-	-	dBm	
Average Receive Power	-	-10.8	-	4.2	dBm	
Receive power (OMAAouter)	OMA	-	-	4	dBm	
Receiver Reflectance	RXR	-	-	-26	dB	
LOS assert	LOSA	-30			dBm	
LOS de-assert	LOSD			-11	dBm	
LOS hysteresis	LOSH	0.5			dB	

Note 1: Measured with a PRBS2³¹-1 test pattern @53.125Gbps, BER $\leq$ 2.4E-4.

Note 2: IEEE 802.3cd clause 139 equation 139-2.

Electrical Specifications

High-Speed Signal: Compliant to 50GAUI-2 C2M (IEEE 802.3cd)

Low-Speed Signal: Compliant to SFF-8679

Parameter	Symbol	Min	Typical	Max	Unit	Notes
Transmitter (Module Input)						
Differential Data Input Amplitude	VIN,P-P	-	-	900	mVpp	Note 1
Differential Termination Mismatch		-	-	10	%	
LPMode, Reset and ModSelL	VIL	-0.3	-	0.8	V	
	VIH	2	-	VCC+0.3	V	
Receiver (Module Output)						
Differential Data Output Amplitude	VOUT,P-P	-	-	900	mVpp	Note 1
Differential Termination Mismatch		-	-	10	%	
Output Rise/Fall Time, 20%~80%	TR	12	-	-	ps	
ModPrsL and IntL	VOL	0	-	0.4	V	IOL=4mA
	VOH	VCC-0.5	-	VCC+0.3	V	IOL=-4mA

Note 1: Amplitude customization beyond these specs is dependent on validation in customer system.

Digital Diagnostic Functions

The following digital diagnostic characteristics are defined over the normal operating conditions unless otherwise specified.

Parameter	Range	Accuracy	Unit	Calibration
Temperature	0 to 70	±3	°C	Internal
Voltage	0 to VCC	±3%	V	Internal
Tx Bias Current	0 to 100	±10%	mA	Internal
Tx Output Power	-4.5 to 4.2	±3	dB	Internal
Rx Power	-10.8 to 4.2	±3	dB	Internal

QSFP28 Connector and Pinout Description

The electrical interface to the transceiver is a 38 pins edge connector. The 38 pins provide high speed data, low speed monitoring and control signals, I2C communication, power and ground connectivity. The top and bottom views of the connector are provided below, as well as a table outlining the contact numbering, symbol and full description.

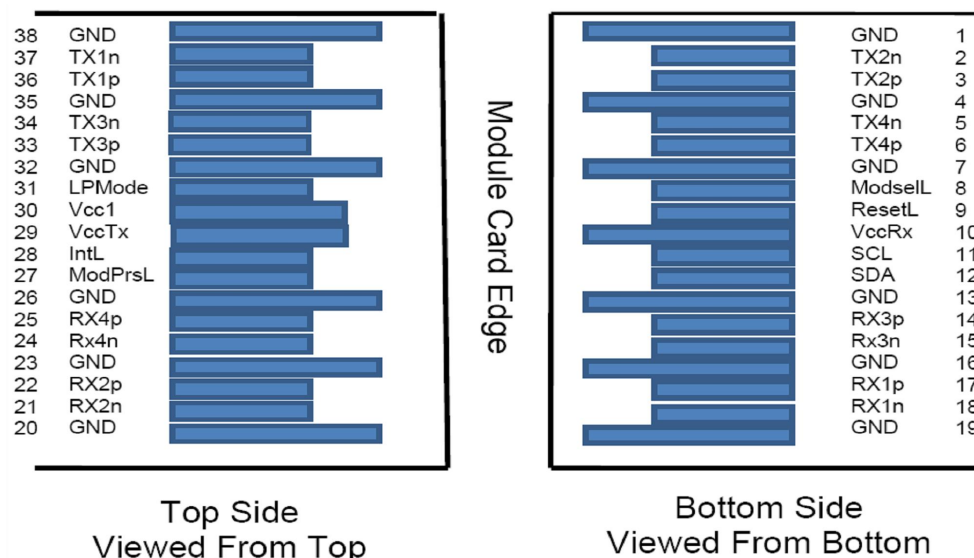


Figure 1. QSFP28-compliant 38-pin connector

PIN	Logic	Symbol	Name/Description	Notes
1		GND	Ground	1
2	CML-I	Tx2n	Transmitter Inverted Data Input	
3	CML-I	Tx2p	Transmitter Non-Inverted Data output	
4		GND	Ground	1
5	CML-I	Tx4n	Transmitter Inverted Data Input	
6	CML-I	Tx4p	Transmitter Non-Inverted Data output	
7		GND	Ground	1
8	LVTLL-I	ModSelL	Module Select	
9	LVTLL-I	ResetL	Module Reset	
10		VccRx	+3.3V Power Supply Receiver	2
11	LVC MOS-I/O	SCL	2-Wire Serial Interface Clock	
12	LVC MOS-I/O	SDA	2-Wire Serial Interface Data	
13		GND	Ground	
14	CML-O	Rx3p	Receiver Non-Inverted Data Output	
15	CML-O	Rx3n	Receiver Inverted Data Output	
16		GND	Ground	1
17	CML-O	Rx1p	Receiver Non-Inverted Data Output	

18	CML-O	Rx1n	Receiver Inverted Data Output	
19		GND	Ground	1
20		GND	Ground	1
21	CML-O	Rx2n	Receiver Inverted Data Output	
22	CML-O	Rx2p	Receiver Non-Inverted Data Output	
23		GND	Ground	1
24	CML-O	Rx4n	Receiver Inverted Data Output	1
25	CML-O	Rx4p	Receiver Non-Inverted Data Output	
26		GND	Ground	1
27	LVTTL-O	ModPrsL	Module Present	
28	LVTTL-O	IntL	Interrupt	
29		VccTx	+3.3 V Power Supply transmitter	2
30		Vcc1	+3.3 V Power Supply	2
31	LVTTL-I	LPMode	Low Power Mode	
32		GND	Ground	1
33	CML-I	Tx3p	Transmitter Non-Inverted Data Input	
34	CML-I	Tx3n	Transmitter Inverted Data Output	
35		GND	Ground	1
36	CML-I	Tx1p	Transmitter Non-Inverted Data Input	
37	CML-I	Tx1n	Transmitter Inverted Data Output	
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 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 receiving and transmission power suppliers and shall be applied concurrently. Recommended host board power supply filtering is shown in Figure 3 below. Vcc Rx, Vcc1 and Vcc Tx may be internally connected within the module in any combination. The connector pins are each rated for a maximum current of 1000mA.

Recommended Power Supply Filter

See SFF-8679

Mechanical Specifications

Unit: mm

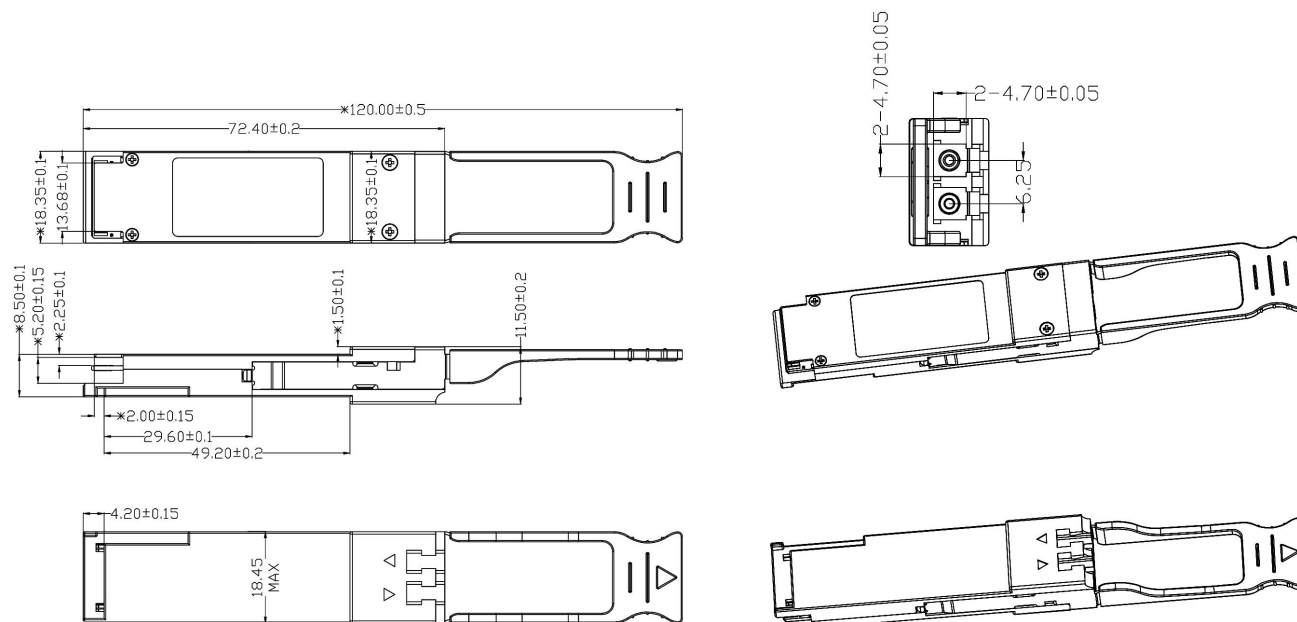


Figure 2. Mechanical Dimensions

Ordering information

Part Number	Product Description
LQ-SM3150-LR1C	53.125 Gb/s, 1311nm, SMF, LC, 10km, DML Laser, 0°C~+70°C,