FluxLight
OPTICAL TRANSCEIVERS

Datasheet

QSFP-100G-LR-FL

100G, QSFP28, Duplex LC, 1311nm, SMF, 10km, COM

Quick Spec

Rate Category:	100G
Form Factor:	QSFP28
Interface Type:	100GBASE-LR1
Standard/Protocol:	IEEE 802.3cu 100GBASE-LR1; QSFP28 MSA (SFF-8636)
TX Wavelength:	1311nm
RX Wavelength:	1311nm
Cable Type:	SMF
Reach:	10km (SMF)
DDM:	Supported
Connector Type:	Duplex LC (UPC)
Power Consumption:	4.5W max
Operating Temperature:	0°C to +70°C (COM)



Overview

The FluxLight QSFP-100G-LR-FL is a 100G QSFP28 single-wavelength optical transceiver for 100 Gigabit Ethernet links up to 10 km over duplex single-mode fiber. An internal DSP gearbox converts the four 25 Gb/s NRZ host lanes (CAUI-4) into a single 53.125 GBd PAM4 optical signal at 1311 nm, with KP4 FEC terminated inside the module. The transmitter uses a 1310 nm EML laser and the receiver a PIN photodiode, behind a duplex LC connector. The optical interface is compliant with IEEE 802.3cu 100GBASE-LR1, and the module follows the QSFP28 MSA (SFF-8636) for form factor and digital diagnostic monitoring, with 4.5 W maximum power dissipation.

Features

- Hot-pluggable QSFP28 footprint with duplex LC receptacle
- Compliant with IEEE 802.3cu 100GBASE-LR1
- Single 1311 nm wavelength at 53.125 GBd PAM4
- CAUI-4 electrical interface with KP4 FEC terminated inside the module
- 1310 nm EML transmitter and PIN receiver
- Up to 10 km over single-mode fiber
- Average launch power −1.9 to +4.8 dBm; stressed receiver sensitivity −4.1 dBm (OMAouter)
- Real-time Digital Diagnostic Monitoring (DDM/DOM) per SFF-8636
- Single +3.3V power supply, power dissipation ≤ 4.5 W
- Operating case temperature: 0°C to +70°C (COM)
- QSFP28 MSA compliant, RoHS compliant, and Class 1 laser eye safety certified (IEC 60825-1)
- 100% compatible with and programmed for the target OEM platform
- Backed by a FluxLight lifetime warranty

Applications

- 100 Gigabit Ethernet over duplex single-mode fiber up to 10 km
- Data center interconnect

Absolute Maximum Rating

The operation in excess of any absolute maximum ratings might cause permanent damage to this module.

Parameter	Symbol	Min	Max	Unit
Storage Temperature	TS	-40	85	°C
Operating Case Temperature	TOP	0	70	°C
Power Supply Voltage	VCC	-0.5	3.6	V
Relative Humidity	RH	0	85	%

Recommended Operating Conditions

Parameter	Symbol	Min	Typical	Max	Unit	Notes
Operating Case Temperature	TC	0		70	°C	
Power Supply Voltage	VCC	3.135	3.3	3.465	V	
Instantaneous Peak Current at Hot Plug	ICC_IP			1800	mA	
Sustained Peak Current at Hot Plug	ICC_SP			1485	mA	
Maximum Power Dissipation	PD			4.5	W	
Maximum Power Dissipation, Low Power Mode	PDLP			1.5	W	

Recommended Operating Conditions (Continued)

Parameter	Symbol	Min	Typical	Max	Unit	Notes
Signaling Rate	SR		53.125		GBd	PAM4
Control Input Voltage High	VIH	VCC×0.7		VCC+0.3	V	
Control Input Voltage Low	VIL	-0.3		VCC×0.3	V	
Two-Wire Serial Interface Clock Rate				400	kHz	
Power Supply Noise				66	mVpp	10 Hz – 10 MHz
Rx Differential Data Output Load			100		Ω	
Operating Distance (SMF)				10	km	

Optical Characteristics

Parameter	Symbol	Min	Typical	Max	Unit	Notes
Transmitter						
Center Wavelength	λC	1304.5	1311	1317.5	nm	
Side Mode Suppression Ratio	SMSR	30			dB	
Average Optical Launch Power	POUT	-1.9		4.8	dBm	
Average Launch Power, Transmitter Off	POUT_OFF			-15	dBm	
Extinction Ratio	ER	3.5			dB	
Outer Optical Modulation Amplitude	OMAouter			5	dBm	
Transmitter and Dispersion Eye Closure for PAM4	TDECQ			3.4	dB	
Transmitter Eye Closure for PAM4	TECQ			3.4	dB	
|TDECQ – TECQ|				2.5	dB	
Over/Under-shoot				22	%	
Transmitter Power Excursion				2.8	dBm	
RIN15.6OMA	RIN			-136	dB/Hz	
Optical Return Loss Tolerance	ORLT			15.6	dB	
Transmitter Transition Time				17	ps	
Transmitter Reflectance	TR			-26	dB	
Receiver						
Center Wavelength	λC	1304.5	1311	1317.5	nm	
Damage Threshold		5.8			dBm	

Optical Characteristics (Continued)

Parameter	Symbol	Min	Typical	Max	Unit	Notes
Average Receive Power		-8.2		4.8	dBm	1
Receive Power (OMAouter)	RP			5	dBm	
Receiver Reflectance	RR			-26	dB	
Receiver Sensitivity (OMAouter)	RS			-6.1 (TECQ < 1.4 dB); -7.5 + TECQ (1.4 dB ≤ TECQ ≤ 3.4 dB)	dBm	2
Stressed Receiver Sensitivity (OMAouter)	SRS			-4.1	dBm	
Stressed Eye Closure for PAM4	SECQ			3.4	dB	

1. Average receive power (min) is informative and not the principal indicator of signal strength.
2. Measured with conformance test signal at TP3 for BER = 2.4×10^{-4}.

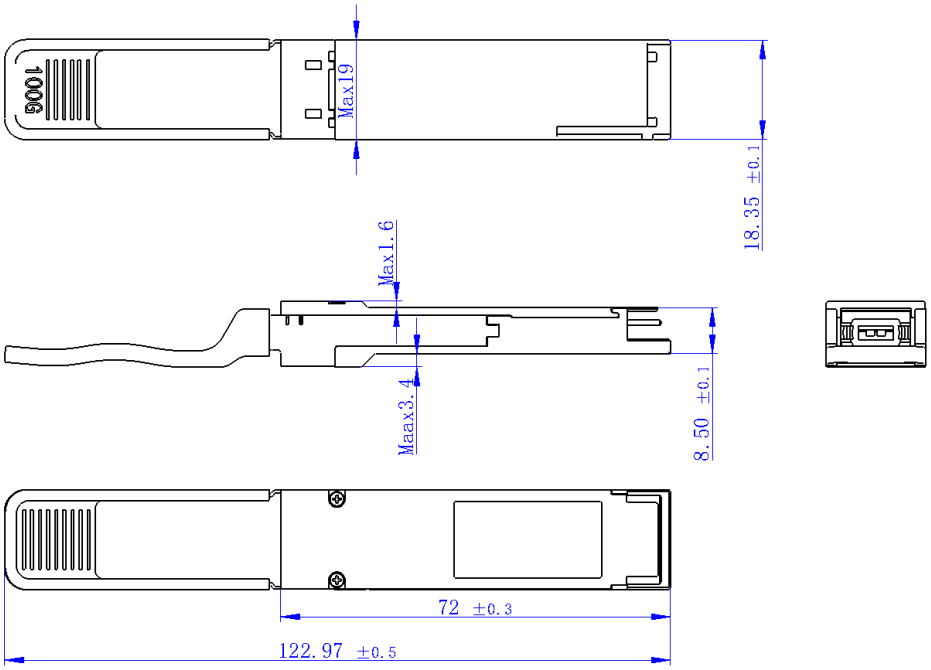
Digital Diagnostic Functions

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

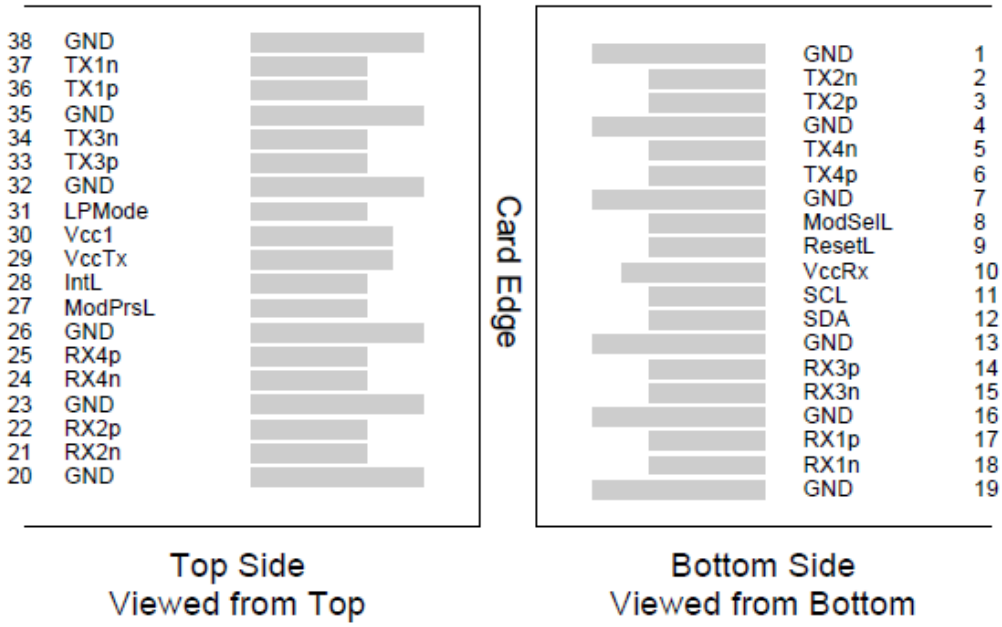
Parameter	Symbol	Min	Max	Unit
Temperature monitor absolute error	DMI_Temp	-5	5	°C
Supply voltage monitor absolute error	DMI_VCC	-0.1	0.1	V
Channel RX power monitor absolute error	DMI_RX_Ch	-3	3	dB
Channel bias current monitor absolute error	DMI_Ibias_Ch	-10%	10%	mA
Channel TX power monitor absolute error	DMI_TX_Ch	-3	3	dB

Mechanical Dimensions

Units: mm



Pin Assignment and Description



Pin	Logic	Symbol	Description	Plug Sequence
1		GND	Ground	1
2	CML-I	Tx2n	Transmitter Inverted Data Input	3
3	CML-I	Tx2p	Transmitter Non-Inverted Data Input	3
4		GND	Ground	1
5	CML-I	Tx4n	Transmitter Inverted Data Input	3
6	CML-I	Tx4p	Transmitter Non-Inverted Data Input	3
7		GND	Ground	1
8	LVTTL-I	ModSelL	Module Select	3
9	LVTTL-I	ResetL	Module Reset	3
10		VccRx	+3.3V Power Supply Receiver	2
11	LVCMOS-I/O	SCL	2-Wire Serial Interface Clock	3
12	LVCMOS-I/O	SDA	2-Wire Serial Interface Data	3
13		GND	Ground	1
14	CML-O	Rx3p	Receiver Non-Inverted Data Output	3
15	CML-O	Rx3n	Receiver Inverted Data Output	3
16		GND	Ground	1
17	CML-O	Rx1p	Receiver Non-Inverted Data Output	3
18	CML-O	Rx1n	Receiver Inverted Data Output	3
19		GND	Ground	1
20		GND	Ground	1
21	CML-O	Rx2n	Receiver Inverted Data Output	3
22	CML-O	Rx2p	Receiver Non-Inverted Data Output	3
23		GND	Ground	1
24	CML-O	Rx4n	Receiver Inverted Data Output	3
25	CML-O	Rx4p	Receiver Non-Inverted Data Output	3
26		GND	Ground	1
27	LVTTL-O	ModPrsL	Module Present	3
28	LVTTL-O	IntL	Interrupt	3
29		VccTx	+3.3V Power Supply Transmitter	2
30		Vcc1	+3.3V Power Supply	2
31	LVTTL-I	LPMode	Low Power Mode	3
32		GND	Ground	1
33	CML-I	Tx3p	Transmitter Non-Inverted Data Input	3
34	CML-I	Tx3n	Transmitter Inverted Data Input	3

Pin Assignment and Description (Continued)

Pin	Logic	Symbol	Description	Plug Sequence
35		GND	Ground	1
36	CML-I	Tx1p	Transmitter Non-Inverted Data Input	3
37	CML-I	Tx1n	Transmitter Inverted Data Input	3
38		GND	Ground	1

ESD

This transceiver is specified as an ESD threshold of 1kV for the high-speed data pins and 2kV for all other electrical input pins, tested per MIL-STD-883, Method 3015.4 / JESD22-A114-A (Human Body Model). However, normal ESD precautions are still required during the handling of this module. This transceiver is shipped in ESD-protective packaging. It should be removed from the packaging and handled only in an ESD-protected environment.

Laser Safety

This is a Class 1 Laser Product according to IEC 60825-1:2007. This product complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 50, dated (June 24, 2007).