FluxLight
OPTICAL TRANSCEIVERS

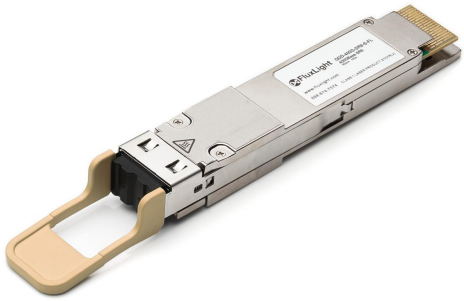
Datasheet

QDD-400G-SR8-S-FL

400G, QSFP-DD, MPO-16 APC, 850nm, MMF, 70m/100m, COM

Quick Spec

Rate Category:	400G
Form Factor:	QSFP-DD
Interface Type:	400GBASE-SR8
Standard / Protocol:	IEEE 802.3cm 400GBASE-SR8; IEEE 802.3bs 400GAUI-8; QSFP-DD MSA
TX Wavelength:	850nm
RX Wavelength:	850nm
Cable Type:	MMF
Reach:	70m (OM3), 100m (OM4) with host FEC
DDM:	Supported
Connector Type:	MPO-16 APC
Power Consumption:	12W max
Operating Temperature:	0°C to +70°C (COM)



Overview

The FluxLight QDD-400G-SR8-S-FL is a hot-pluggable 400G QSFP-DD SR8 optical transceiver for short-reach links over parallel multimode fiber. It provides eight independent transmit and receive channels at 850 nm, each running at 53.125 Gb/s (26.5625 GBd PAM4), for an aggregate of 400 Gb/s over a single MPO-16 APC connector. The optical interface is compliant with IEEE 802.3cm 400GBASE-SR8, and the electrical interface is 400GAUI-8 per IEEE 802.3bs. The module also supports breakout to 8×50G or 2×200G. With FEC on the host, links reach up to 70 m over OM3 and 100 m over OM4 multimode fiber. The module follows the QSFP-DD MSA (Type 2), runs from a single +3.3V supply at 12 W maximum, and provides full real-time digital diagnostic monitoring.

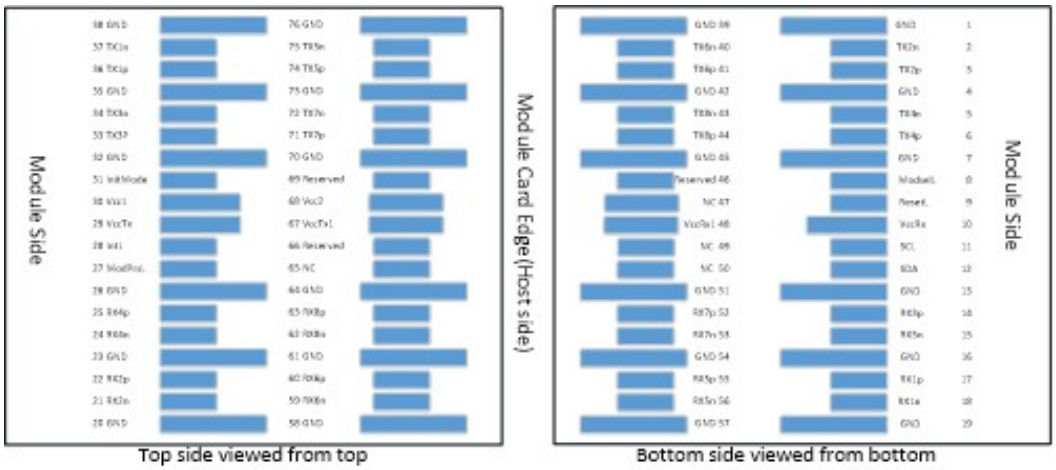
Features

- QSFP-DD MSA compliant, hot-pluggable
- Compliant with IEEE 802.3cm 400GBASE-SR8
- 8 parallel lanes at 850 nm, 53.125 Gb/s (26.5625 GBd PAM4) per lane
- 8×53.125 Gb/s electrical interface (IEEE 802.3bs 400GAUI-8)
- Supports 8×50G and 2×200G breakout
- Up to 70 m on OM3 and 100 m on OM4 multimode fiber with host FEC
- MPO-16 APC connector
- Real-time digital diagnostic monitoring
- Single +3.3V power supply, 12 W maximum power consumption
- Operating case temperature: 0°C to +70°C (COM)
- RoHS compliant, Class 1 laser product (EN 60825-1)
- 100% compatible with and programmed for the target OEM platform
- Backed by a FluxLight lifetime warranty

Applications

- 400G Ethernet over parallel multimode fiber
- Breakout to 8×50G or 2×200G Ethernet
- Data center interconnect
- Enterprise networking

Pin Map and Description



Top side viewed from top

Bottom side viewed from bottom

Pin	Logic	Symbol	Description
1		GND	Ground
2	CML	Tx2n	Transmitter Inverted Data Input
3	CML	Tx2p	Transmitter Non-Inverted Data Input
4		GND	Ground
5	CML	Tx4n	Transmitter Inverted Data Input

Pin Map and Description (Continued)

Pin	Logic	Symbol	Description
6	CML	Tx4p	Transmitter Non-Inverted Data Input
7		GND	Ground
8	LVTTL	ModSelL	Module Select
9	LVTTL	ResetL	Module Reset
10		VccRx	Receiver +3.3V DC Power Supply
11	LVCMOS	SCL	2-wire serial interface clock
12	LVCMOS	SDA	2-wire serial interface data
13		GND	Ground
14	CML	Rx3p	Receiver Non-Inverted Data Output
15	CML	Rx3n	Receiver Inverted Data Output
16		GND	Ground
17	CML	Rx1p	Receiver Non-Inverted Data Output
18	CML	Rx1n	Receiver Inverted Data Output
19		GND	Ground
20		GND	Ground
21	CML	Rx2n	Receiver Inverted Data Output
22	CML	Rx2p	Receiver Non-Inverted Data Output
23		GND	Ground
24	CML	Rx4n	Receiver Inverted Data Output
25	CML	Rx4p	Receiver Non-Inverted Data Output
26		GND	Ground
27	LVTTL	ModPrsL	Module Present
28	LVTTL	IntL	Interrupt
29		VccTx	Transmitter +3.3V DC Power Supply
30		Vcc1	+3.3V DC Power Supply
31	LVTTL	InitMode	Initialization Mode (called LPMode in legacy QSFP applications)
32		GND	Ground
33	CML	Tx3p	Transmitter Non-Inverted Data Input
34	CML	Tx3n	Transmitter Inverted Data Input
35		GND	Ground
36	CML	Tx1p	Transmitter Non-Inverted Data Input
37	CML	Tx1n	Transmitter Inverted Data Input

Pin Map and Description (Continued)

Pin	Logic	Symbol	Description
38		GND	Ground
39		GND	Ground
40	CML	Tx6n	Transmitter Inverted Data Input
41	CML	Tx6p	Transmitter Non-Inverted Data Input
42		GND	Ground
43	CML	Tx8n	Transmitter Inverted Data Input
44	CML	Tx8p	Transmitter Non-Inverted Data Input
45		GND	Ground
46		Reserved	For future use
47		VS1	Module Vendor Specific 1
48		VccRx1	+3.3V DC Power Supply
49		VS2	Module Vendor Specific 2
50		VS3	Module Vendor Specific 3
51		GND	Ground
52	CML	Rx7p	Receiver Non-Inverted Data Output
53	CML	Rx7n	Receiver Inverted Data Output
54		GND	Ground
55	CML	Rx5p	Receiver Non-Inverted Data Output
56	CML	Rx5n	Receiver Inverted Data Output
57		GND	Ground
58		GND	Ground
59	CML	Rx6n	Receiver Inverted Data Output
60	CML	Rx6p	Receiver Non-Inverted Data Output
61		GND	Ground
62	CML	Rx8n	Receiver Inverted Data Output
63	CML	Rx8p	Receiver Non-Inverted Data Output
64		GND	Ground
65		NC	No Connect
66		Reserved	For future use
67		VccTx1	+3.3V DC Power Supply
68		Vcc2	+3.3V DC Power Supply

Pin Map and Description (Continued)

Pin	Logic	Symbol	Description
69		Reserved	For future use
70		GND	Ground
71	CML	Tx7p	Transmitter Non-Inverted Data Input
72	CML	Tx7n	Transmitter Inverted Data Input
73		GND	Ground
74	CML	Tx5p	Transmitter Non-Inverted Data Input
75	CML	Tx5n	Transmitter Inverted Data Input
76		GND	Ground

Optical Port Description

The optical port is an MPO-16 APC receptacle carrying 8 transmit and 8 receive multimode fibers. Proper alignment is ensured by the guide pins inside the receptacle; the cable should not be twisted, to keep channel-to-channel alignment.

Absolute Maximum Ratings

Operation in excess of any individual absolute maximum rating may cause permanent damage to the 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 (non-condensation)	RH	0	85	%

Recommended Operating Conditions

Parameter	Symbol	Min	Typical	Max	Unit	Notes
Operating Case Temperature	TOP	0		70	°C	
Power Supply Voltage	VCC	3.135	3.3	3.465	V	
Data Rate, each Lane			26.5625		GBd	PAM4
Data Rate Accuracy		-100		100	ppm	
Pre-FEC Bit Error Ratio				2.4×10^{-4}		
Post-FEC Bit Error Ratio				1×10^{-12}		1
Link Distance with OM3	D	0.5		70	m	2

Recommended Operating Conditions (Continued)

Parameter	Symbol	Min	Typical	Max	Unit	Notes
Link Distance with OM4	D	0.5		100	m	2

1. FEC provided by host system.
2. FEC required on host system to support maximum distance.

Electrical Characteristics

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

Parameter	Test Point	Min	Typical	Max	Unit	Notes
Power Consumption				12	W	
Supply Current	Icc			3.63	A	
Transmitter (each Lane)						
Signaling Rate, each Lane	TP1	26.5625 ± 100 ppm			GBd	
Differential pk-pk Input Voltage Tolerance	TP1a	900			mVpp	1
Differential Termination Mismatch	TP1			10	%	
Differential Input Return Loss	TP1	IEEE 802.3-2015 Equation (83E-5)			dB	
Differential to Common Mode Input Return Loss	TP1	IEEE 802.3-2015 Equation (83E-6)			dB	
Module Stressed Input Test	TP1a	See IEEE 802.3bs 120E.3.4.1				2
Single-ended Voltage Tolerance Range	TP1a	-0.4		3.3	V	
DC Common Mode Input Voltage	TP1	-350		2850	mV	3
Receiver (each Lane)						
Signaling Rate, each Lane	TP4	26.5625 ± 100 ppm			GBd	
Differential Peak-to-Peak Output Voltage	TP4			900	mVpp	
AC Common Mode Output Voltage, RMS	TP4			17.5	mV	
Differential Termination Mismatch	TP4			10	%	
Differential Output Return Loss	TP4	IEEE 802.3-2015 Equation (83E-2)			dB	
Common to Differential Mode Conversion Return Loss	TP4	IEEE 802.3-2015 Equation (83E-3)			dB	
Transition Time, 20% to 80%	TP4	9.5			ps	
Near-end Eye Symmetry Mask Width (ESMW)	TP4		0.265		UI	
Near-end Eye Height, Differential	TP4	70			mV	
Far-end Eye Symmetry Mask Width (ESMW)	TP4		0.2		UI	
Far-end Eye Height, Differential	TP4	30			mV	

Electrical Characteristics (Continued)

Parameter	Test Point	Min	Typical	Max	Unit	Notes
Far-end Pre-cursor ISI Ratio	TP4	-4.5		2.5	%	
Common Mode Output Voltage (Vcm)	TP4	-350		2850	mV	3

1. With the exception to IEEE 802.3bs 120E.3.1.2 that the pattern is PRBS31Q or scrambled idle.
2. Meets BER specified in IEEE 802.3bs 120E.1.1.
3. DC common mode voltage generated by the host. Specification includes effects of ground offset voltage.

Optical Characteristics

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

Parameter	Symbol	Min	Typical	Max	Unit	Notes
Transmitter						
Center Wavelength	λC	840	850	860	nm	
Data Rate, each Lane		26.5625 ± 100 ppm			GBd	
Modulation Format		PAM4				
RMS Spectral Width	Δλrms			0.6	nm	Modulated
Average Launch Power, each Lane	PAVG	-6.5		4	dBm	1
Outer Optical Modulation Amplitude (OMAouter), each Lane	POMA	-4.5		3	dBm	2
Launch Power in OMAouter minus TDECQ, each Lane		-5.9			dBm	
Transmitter and Dispersion Eye Closure for PAM4 (TDECQ), each Lane	TDECQ			4.5	dB	
Extinction Ratio	ER	3			dB	
Optical Return Loss Tolerance	TOL			12	dB	
Average Launch Power of OFF Transmitter, each Lane	Poff			-30	dBm	
Encircled Flux		≥ 86% at 19 µm; ≤ 30% at 4.5 µm				
Receiver						
Center Wavelength	λC	840	850	860	nm	
Data Rate, each Lane		26.5625 ± 100 ppm			GBd	
Modulation Format		PAM4				
Damage Threshold, each Lane	THd	5			dBm	3
Average Receive Power, each Lane		-7.9		4	dBm	4
Receive Power (OMAouter), each Lane				3	dBm	
Receiver Sensitivity (OMAouter), each Lane	SEN			-6.5	dBm	5
Stressed Receiver Sensitivity (OMAouter), each Lane	SRS			-3	dBm	6
Receiver Reflectance	RR			-12	dB	
LOS Assert	LOSA	-30			dBm	

Optical Characteristics (Continued)

Parameter	Symbol	Min	Typical	Max	Unit	Notes
LOS De-assert	LOSD			-12	dBm	
LOS Hysteresis	LOSH	0.5			dB	
Stressed Conditions for Stressed Receiver Sensitivity						7
Stressed Eye Closure for PAM4 (SECQ), Lane under Test			4		dB	
OMAouter of each Aggressor Lane			3		dBm	

1. Average launch power, each lane (min) 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. Even if the TDECQ < 1 dB, the OMAouter (min) must exceed the minimum value specified here.
3. The receiver shall be able to tolerate, without damage, continuous exposure to an optical input signal having this average power level.
4. Average receive power, each lane (min) 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. Receiver sensitivity OMAouter, each lane (max) is informative and is defined for a BER of 2.4×10^{-4}.
6. Measured with conformance test signal at receiver input for a BER of 2.4×10^{-4}.
7. These test conditions are for measuring stressed receiver sensitivity. They are not characteristics of the receiver.

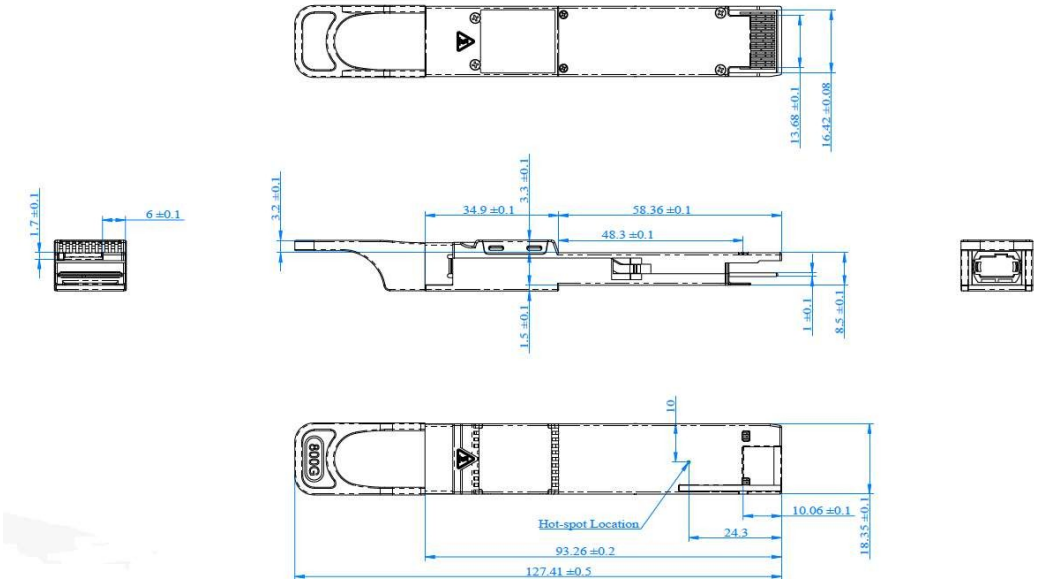
Digital Diagnostic Functions

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

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	-2	2	dB	1
Channel bias current monitor absolute error	DMI_Ibias_Ch	-10	10	%	
Channel TX power monitor absolute error	DMI_TX_Ch	-2	2	dB	1

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

Mechanical Drawing



Units: mm

ESD

This transceiver is specified as ESD threshold 1kV for high-speed data pins and 2kV for all other electrical input pins, tested per MIL-STD-883, Method 3015.4 /JESD22-A114-A (HBM). 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 EN 60825-1:2014. This product complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 50, dated (June 24, 2007).

Caution: Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.