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SKU: 00E0T01

400G QSFP-DD SR8 Transceiver
Hot Pluggable, MPO-16, 850nm VCSEL, MMF 100M, DDM, C-Temp

Part Number: FQDD-TX-M85-X1D



Overview

FQDD-TX-M85-X1D is a parallel fiber optical transceiver module for 400Gbit/s data transmission applications at 850nm. It is ideally suited for 400G datacom & storage area network (SAN/NAS) applications based on the IEEE 802.3bs 400GBASE-SR8 standard. Designed for short range multi-lane data communication and integrates eight independent optical transmit and receive channels. Each capable 53.125Gbps operation for an aggregate data rate of 425Gbps over 100m using multi-mode OM4 fiber. An optical fiber cable with an MPO-16 connector can be plugged into the 400G QSFP-DD SR8 module receptacle.

Applications

- 400GBASE Ethernet
- Data Center Interconnect
- Enterprise Networking
- Infiniband Interconnects

Features

- Compliant to QSFP-DD MSA
- Compliant to IEEE 802.3bs 400GBASE-SR8
- Parallel 8 optical lanes
- 8x53.125Gb/s electrical interface (400GAUI-8)
- Up to 53.125Gb/s (PAM4) per lane
- 850nm VCSEL array transmitter
- Multi-mode MPO-16 optical connector
- Built-in digital diagnostic function
- Single 3.3V power supply
- Link distance 100m over MM OM4 fiber and 70m over MM OM3 fiber with FEC
- Operating Temperature 0~+70°C
- Maximum power consumption 12W
- RoHS compliant

Laser Safety

- This is a Class 1 Laser Product complies with 21 CFR 1040.10 and 1040.11 except for conformance with IEC 60825-1 Ed. 3., as described in Laser Notice No. 56, dated May 8, 2019.
- Caution: Use of control or adjustments or performance of procedure other than those specified herein may result in hazardous radiation exposure.

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Absolute Maximum Ratings

Parameters	Symbol	Min.	Max.	Unit
Storage Temperature	TST	-40	+85	°C
Storage Relative Humidity	RH	0	85	%
Supply Voltage	VCC	-0.5	+3.6	V

Recommended Operating Conditions

Parameters	Symbol	Min.	Typ.	Max.	Unit
Case Operating Temperature	TOP	0	-	+70	°C
Supply Voltage	VCC	+3.135	+3.3	+3.465	V
Supply Current	ICC			3.63	A
Power Consumption	P			12	W
Electrical Data Rate, each Lane (PAM4)			26.5625		GBd
Optical Data Rate, each Lane (PAM4)			26.5625		GBd
Data Rate Accuracy		-100		+100	ppm
Pre-FEC Bit Error Ratio				$2.4x10^{-4}$	1
Post-FEC Bit Error Ratio				$1x10^{-12}$	1

Note1: FEC provided by host system.

Transmitter Electro-optical Characteristics

VCC = 3.13V to 3.47V, TOP = 0 °C to 70 °C

Parameters	Symbol	Min.	Typ.	Max.	Unit	Note
Optical Center Wavelength	λ	840	850	860	nm	
Average Optical Power, each Lane	PAVG	-6		+4	dBm	1
Optical Modulation Amplitude (OMA), each Lane	POMA	-4		+3	dBm	2
Launch Power in OMA minus TDECQ, each Lane		-5			dB	
Transmitter and Dispersion Eye Closure for PAM4, each Lane	TDECQ			4	dB	
Spectral Width (RMS)	Δλ			0.6	dB	
Optical Extinction Ratio	ER	3			dB	
Average Launch Power OFF, each Lane	POFF			-30	dBm	
Optical Return Loss Tolerance	TOL			12	dB	
Encircled Flux		≥ 86% at 19μm ; ≤ 30% at 4.5μm				

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Differential pk-pk Input Voltage Tolerance	$V_{IN-DIFF}$	900			mVpp	
Single-ended Voltage Tolerance Range	RIN	-0.4 to +3.3			dB/Hz	
DC Common Mode Input Voltage		-350		2850	mV	

Note1: 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.

Note2: Even if the TDECQ < 1dB, the P_{OMA}(min) must exceed the minimum value specified here.

Receiver Electro-optical Characteristics

V_{CC} = 3.13V to 3.47V, T_{OP} = 0 °C to 70 °C

Parameters	Symbol	Min.	Typ.	Max.	Unit	Note
Optical Center Wavelength	λ	840	850	860	nm	
Damage Threshold, each Lane	TH_D	+5			dBm	1
Average Receiver Input Power, each Lane	P_{IN_AVG}	-7.9		+4	dBm	2
Receiver Power (OMA), each Lane				+3	dBm	
Receiver Sensitivity in OMA, each Lane	P_{IN_SEN}			-7	dBm	3
Stressed Receiver Sensitivity in OMA, each Lane	P_{IN_SRS}			-3	dBm	4
Receiver Reflectance	R_R			-12	dB	
LOS De-Assert	LOS_D			-12	dBm	
LOS Assert	LOS_A	-30			dBm	
LOS Hysteresis	LOS_{HY}	0.5			dB	
Differential pk-pk Output Voltage Tolerance	$V_{OUT-DIFF}$			900	mVpp	
AC Common Mode Output Voltage, RMS				17.5	mV	
Common Mode Output Voltage		-350		2850	mV	

Note1: The receiver shall be able to tolerate, without damage, continuous exposure to an optical input signal having this average power level on one lane.

Note2: 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.

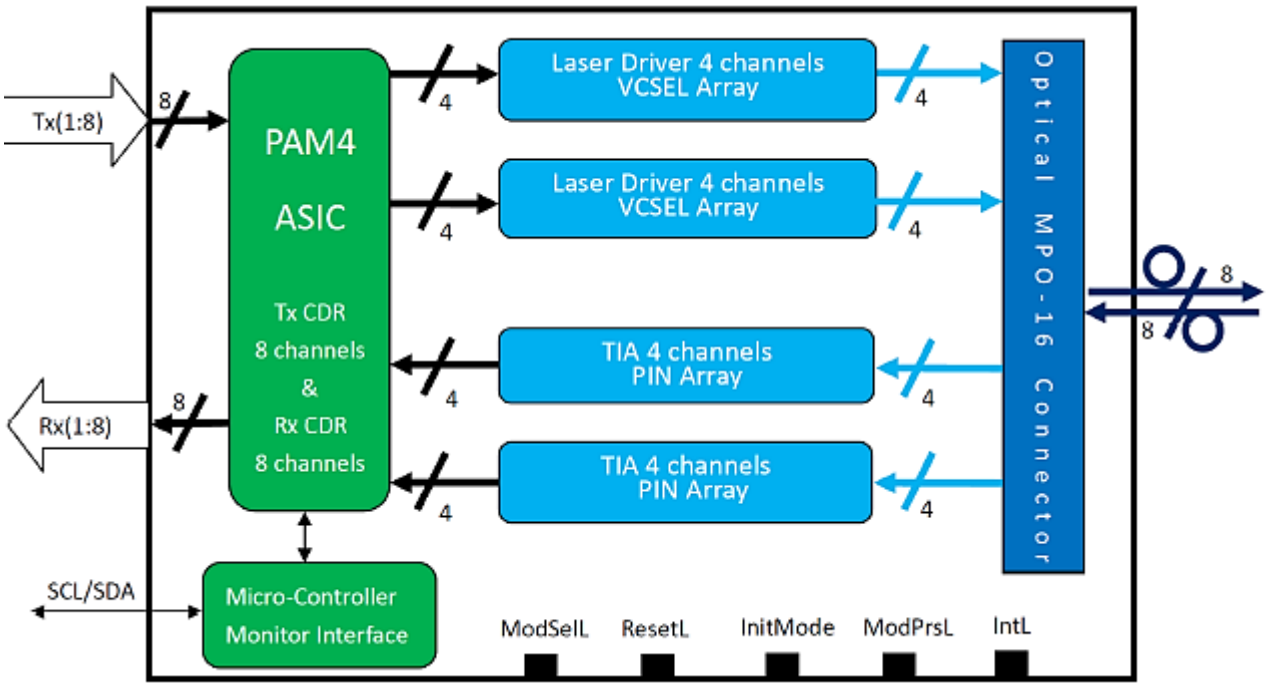
Note3: Receiver sensitivity (OMA), each lane (max) is informative and is defined for a BER equal to $2.4x10^{-4}$.

Note4: Measured with conformance test signal at receiver input for the BER equal to $2.4x10^{-4}$.

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Transceiver Block Diagram

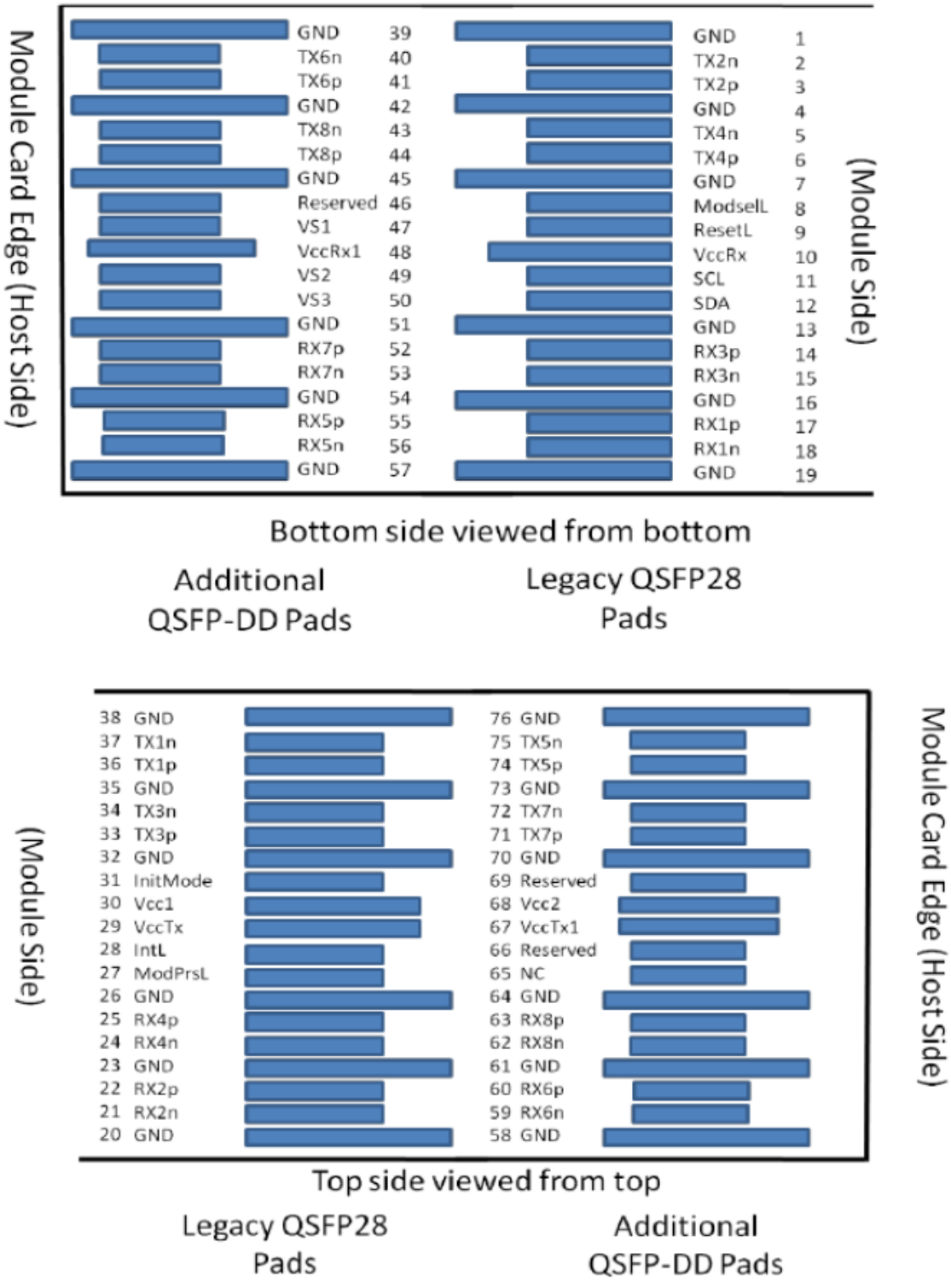


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Pin Assignment



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Pin Description

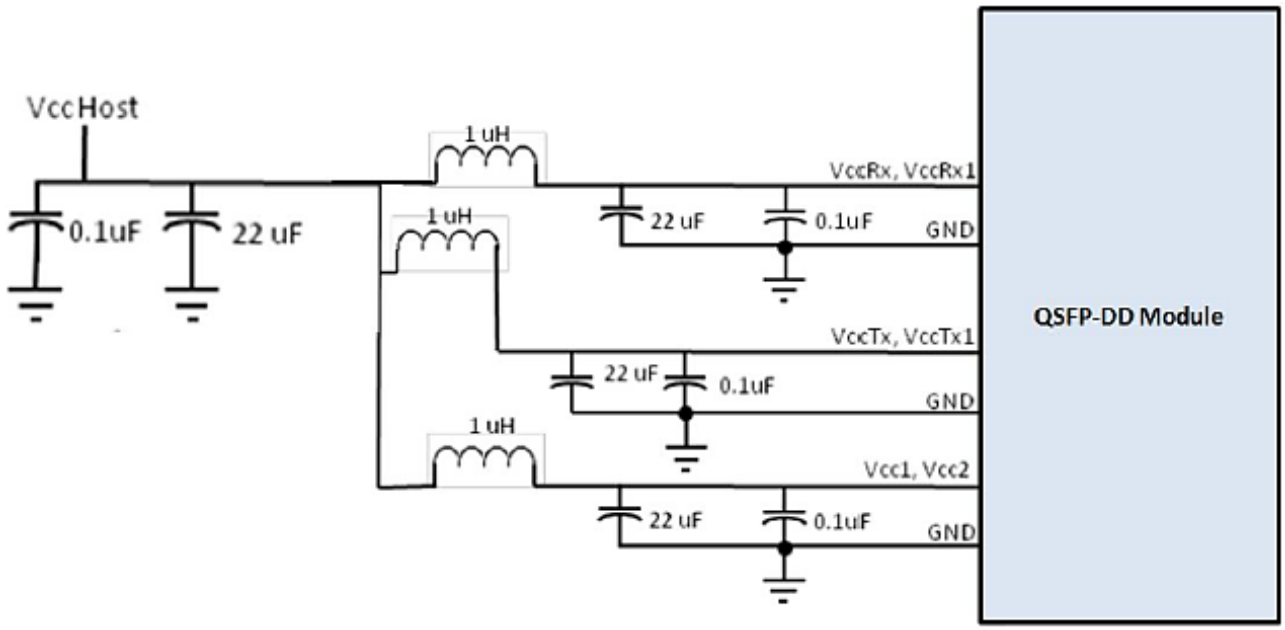
Pin	Logic	Name	Function / Description
1		GND	Module Ground
2	CML-I	Tx2n	Transmitter Inverted Data Input
3	CML-I	Tx2p	Transmitter Non-Inverted Data Input
4		GND	Module Ground
5	CML-I	Tx4n	Transmitter Inverted Data Input
6	CML-I	Tx4p	Transmitter Non-Inverted Data Input
7		GND	Module Ground
8	LVTLL-I	ModSelL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

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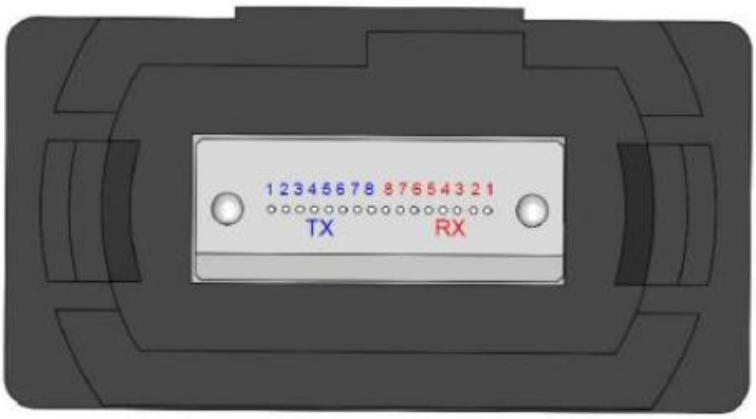
33	CML-I	Tx3p	Transmitter Non-Inverted Data Input
34	CML-I	Tx3n	Transmitter Inverted Data Input
35		GND	Module Ground
36	CML-I	Tx1p	Transmitter Non-Inverted Data Input
37	CML-I	Tx1n	Transmitter Inverted Data Input
38		GND	Module Ground
39		GND	Module Ground
40	CML-I	Tx6n	Transmitter Inverted Data Input
41	CML-I	Tx6p	Transmitter Non-Inverted Data Input
42		GND	Module Ground
43	CML-I	Tx8n	Transmitter Inverted Data Input
44	CML-I	Tx8p	Transmitter Non-Inverted Data Input
45		GND	Module Ground
46		Reserved	For Future Use
47		VS1	Module Vendor Specific 1
48		VccRx1	+3.3V Power Supply Receiver
49		VS2	Module Vendor Specific 2
50		VS3	Module Vendor Specific 3
51		GND	Module Ground
52	CML-O	Rx7p	Receiver Non-Inverted Data Output
53	CML-O	Rx7n	Receiver Inverted Data Output
54		GND	Module Ground
55	CML-O	Rx5p	Receiver Non-Inverted Data Output
56	CML-O	Rx5n	Receiver Inverted Data Output
57		GND	Module Ground
58		GND	Module Ground
59	CML-O	Rx6n	Receiver Inverted Data Output
60	CML-O	Rx6p	Receiver Non-Inverted Data Output
61		GND	Module Ground
62	CML-O	Rx8n	Receiver Inverted Data Output
63	CML-O	Rx8p	Receiver Non-Inverted Data Output
64		GND	Module Ground
65		NC	No Connect
66		Reserved	For Future Use
67		VccTx1	+3.3V Power Supply Transmitter

68		Vcc2	+3.3V Power Supply
69		Reserved	For Future Use
70		GND	Module Ground
71	CML-I	Tx7p	Transmitter Non-Inverted Data Input
72	CML-I	Tx7n	Transmitter Inverted Data Input
73		GND	Module Ground
74	CML-I	Tx5p	Transmitter Non-Inverted Data Input
75	CML-I	Tx5n	Transmitter Inverted Data Input
76		GND	Module Ground

Recommended Power Supply Filter



Optical Interface Lanes and Assignment



Outside view of the QSFP-DD SR8 module MPO

Attention: To minimize MPO connection induced reflections, an MPO receptacle with 8-degree angled end-face is utilized for this product. A female MPO plug connector with 8-degree end-face should be used with this product as illustrated in Figure 1.

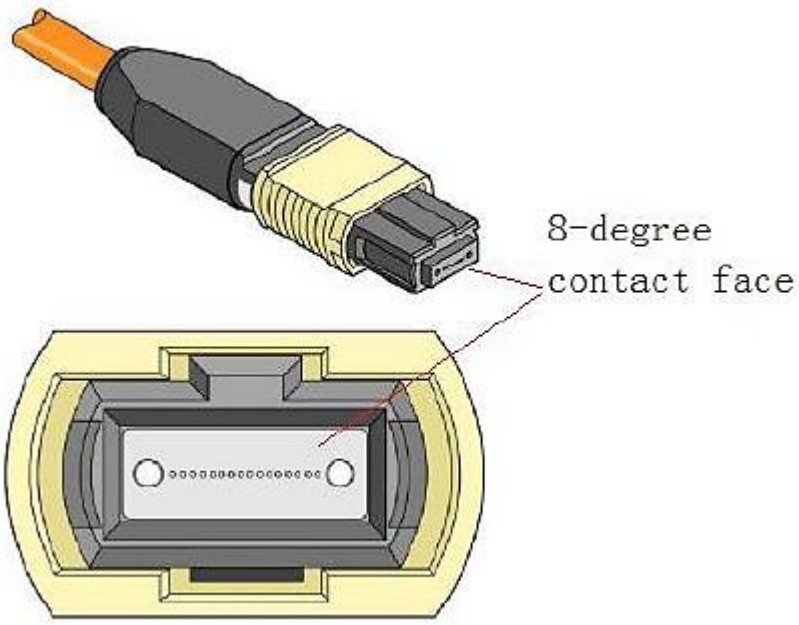
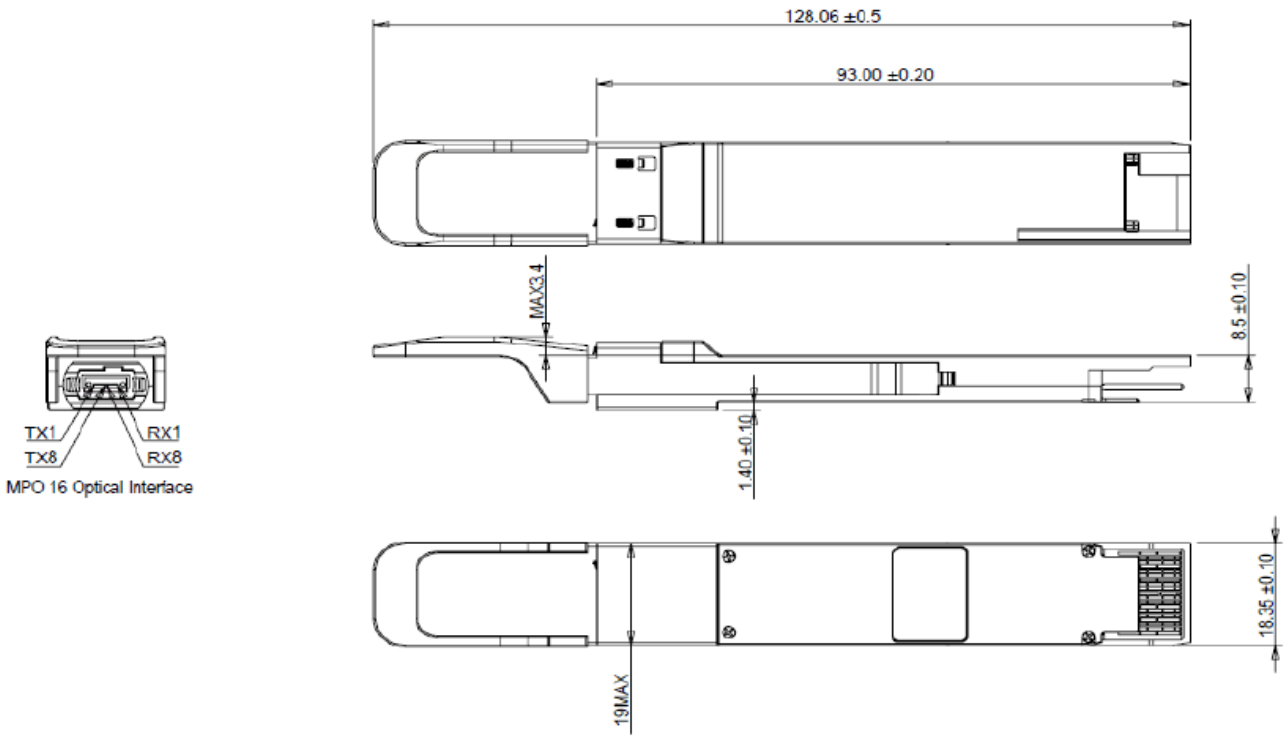


Figure.1 Female MPO Connector with 8-degree end-face (MPO-16 APC)

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Mechanical Dimensions



(All Dimensions are ±0.20mm Unless Otherwise Specified, Unit: mm)

Ordering Information

Part No.	Tx	Rx	Link	DDM	Temp.
FQDD-TX-M85-X1D	850nm	850nm	MMF OM4 100m MMF OM3 70m	Yes	0~70°C

Note: FEC required on host system to support maximum distance.