

Product Features

- Compliant with IEEE 802.3bs and OSFP MSA
- Four Parallel 1310nm Optical Lanes
- 4* 106.25Gbps (PAM4) Optical Interface (1*12 APC MPO)
- Up to 500m Transmission on Single Mode Fiber (SMF) with FEC
- Maximum Power Consumption: 12W
- Operation Case Temperature: 0 to 70°C
- Compatible with CMIS 4.0 I2C Interface
- RoHS Compliant

Application

- 400G Ethernet
- Data Centers and Enterprise Networking
- Infiniband Interconnect

Description

400G OSFP DR4 is a transceiver module designed for 500 m optical communication applications, and it is compliant with OSFP MSA. The 425 Gigabit signal is carried over four parallel lanes by one wavelength per lane. It has been designed to meet the harshest external operating conditions including temperature, humidity and EMI interference. The module offers very high functionality and feature integration, accessible via the I2C interface.

Absolute Maximum Ratings:

Parameter	Unit	Min.	Max.
Storage Temperature	°C	-40	85
Operating Relative Humidity	%	0	85
Power Supply Voltage	V	-0.5	3.63
Damage Threshold	dBm	5	

Recommended Operating Conditions:

Parameter	Unit	Min.	Typ	Max.
Operating Case Temperature	°C	0		70
Power Supply Voltage	V	3.135	3.3	3.465
Power Consumption	W			12
Pre-FEC Bit Error Ratio			2.4E-4	
Post-FEC Bit Error Ratio			1E-12	
Link Distance (DR4)	m	2		500

Notes:

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

Electrical Characteristics:

Parameter	Unit	Min.	Typ	Max.	Notes
Power Consumption	W			12	
Supply Current	A			3.64	
Transmitter					
Signaling Rate per Lane (Range)	GBd	53.125 ±100 ppm			
Differential Pk-pk Input Voltage Tolerance	mVpp	900			2
Differential Input Return Loss	dB	Equation (83E-5)			
Differential to Common Mode Input Return Loss	dB	Equation (83E-6)			
Differential Termination Mismatch	%			10	
Module Stressed Input Test		See120E.3.4.1			3
Single-ended Voltage Tolerance Range	V	-0.4		3.3	
DC Common Mode Voltage	mV	-350		2850	4
Receiver					
Signaling Rate per Lane (Range)	GBd	53.125 ±100 ppm			
Peak-to-peak Differential Output Voltage	mVpp			900	
AC Common-Mode Output Voltage, RMS	mV			17.5	
Differential Output Return Loss		Equation(83E-2)			

Common to Differential Mode Conversion		Equation(83E-3)			
Differential Termination Mismatch	%			10	
Transition Time, 20% to 80%	ps	9.5			
Near-end ESMW (Eye Symmetry Mask Width)	UI		0.265		
Near-end Eye Height, Differential	mV	70			
Far-end ESMW (Eye Symmetry Mask Width)	UI		0.2		
Far-end Eye Height, Differential	mV	30			
Far-end Pre-cursor ISI Ratio	%	-4.5		2.5	
DC Common Mode Voltage	mV	-350		2850	4

Notes:

1. The location of TP1, TP1a and TP4 are defined in IEEE 802.3bs Figure 120E - 5 and Figure 120E - 6.
2. With the exception to IEEE 802.3bs 120E.3.1.2 that the pattern is PRBS31Q or scrambled idle.
3. Meets BER specified in IEEE 802.3bs 120E.1.1.
4. DC common mode voltage generated by the host. Specification includes effects of ground offset voltage.

Optical Characteristics:

Parameter	Unit	Min.	Typ	Max.	Notes
Transmitter					
Signaling Rate, per Lane	GBd	53.125±100ppm			PAM4
TX Central Wavelength	nm	1304.5	1311	1317.5	
Side-mode Suppression Ratio (SMSR)	dB	30			
Average Launch Power, per Lane	dBm	-2.9		4	1
Outer Optical Modulation Amplitude (OMA _{Outer}), per Lane	dBm	-0.8		4.2	2
Launch Power in OMA _{Outer} Minus TDECQ, each Lane	dBm	-2.2			
Transmitter and Dispersion Eye Closure for PAM4 (TDECQ), per Lane	dB			3.4	3
Average Launch Power of OFF Transmitter, per Lane	dBm			-15	
Extinction Ratio, per Lane	dB	3.5			
Optical Return Loss Tolerance	dB			21.4	
RIN _{21.4OMA}	dB/Hz			-136	

Transmitter Reflectance	dB			-26	
Receiver					
Signaling Rate, per Lane	GBd	53. 125±100ppm			PAM4
RX Central Wavelength	nm	1304.5	1311	1317.5	
Damage Threshold	dBm	5			4
Average Receive Power per Lane	dBm	-5.9		4.0	5
Receiving Power (OMAOuter) per Lane	dBm			4.2	
Receive Reflectance (max.)	dB			-26	
Receiver Sensitivity (OMAOuter), per Lane (Max.)	dBm				6
Stressed Receiver Sensitivity (OMAOuter), per Lane	dBm			-1.9	7
Conditions of Stressed Receiver Sensitivity					8
Stressed Eye Closure for PAM4 (SECQ), Lane Under Test	dB		3.4		8
OMAOuter of each Aggressor Lane	dBm			4.2	
LOS Assert	dBm	-15			

Notes:

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 < 1.4dB for an extinction ratio of ≥ 5 dB or TDECQ < 1.1dB for an extinction ratio of < 5dB, the OMAOuter (min) must exceed the minimum value specified here.
3. Ceq is a coefficient defined in IEEE Std 802.3-2018 clause 121.8.5.3 which accounts for reference equalizer noise enhancement.
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. The receiver shall be able to tolerate, without damage, continuous exposure to a modulated optical input signal having this power level on one lane. The receiver does not have to operate correctly at this input power.
6. Receiver sensitivity (OMAOuter), each lane (max) is informative and is defined for a transmitter with a value of SECQ up to 3.4 dB. It should meet Equation (1), which is illustrated in Figure 1.
7. Measured with conformance test signal at TP3 for the BER equal to $2.4E-4$.
8. These test conditions are for measuring stressed receiver sensitivity. They are not characteristics of the receiver.

Pin Definition and Description

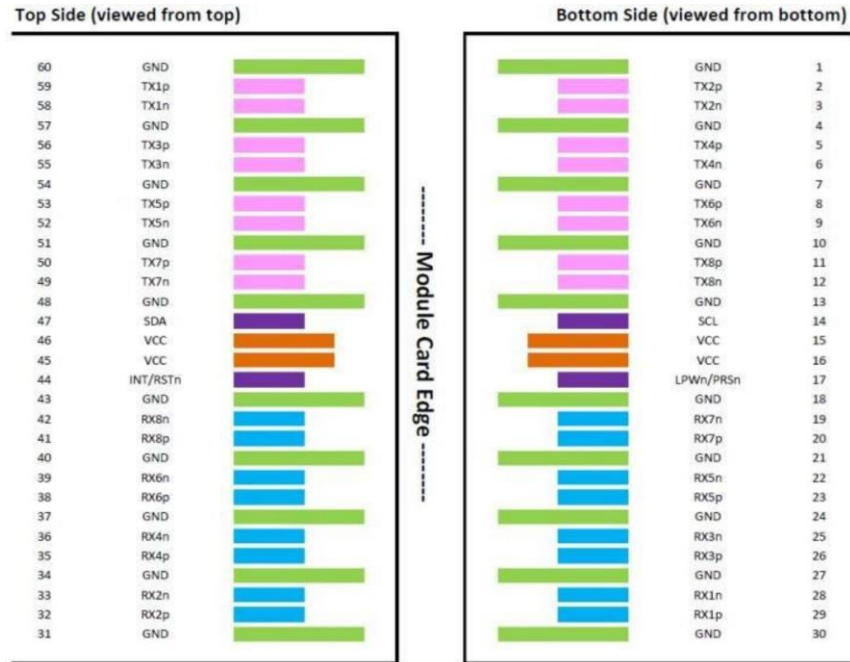


Table 1. Pin definition and descriptions

Pin	Symbol	Description	Plug Sequence	Notes
1	GND	Ground	1	
2	TX2p	Transmitter Data Non-Inverted	3	
3	TX2n	Transmitter Data Inverted	3	
4	GND	Ground	1	
5	TX4p	Transmitter Data Non-Inverted	3	
6	TX4n	Transmitter Data Inverted	3	
7	GND	Ground	1	
8	TX6p	Transmitter Data Non-Inverted	3	
9	TX6n	Transmitter Data Inverted	3	
10	GND	Ground	1	
11	TX8p	Transmitter Data Non-Inverted	3	
12	TX8n	Transmitter Data Inverted	3	
13	GND	Ground	1	
14	SCL	2-wire Serial Interface Clock	3	
15	VCC	3.3V Power	2	
16	VCC	3.3V Power	2	
17	LPWn/PRSn	Low-Power Mode/Module Present	3	
18	GND	Ground	1	

19	RX7n	Receiver Data Inverted	3	
20	RX7p	Receiver Data Non-Inverted	3	
21	GND	Ground	1	
22	RX5n	Receiver Data Inverted	3	
23	RX5p	Receiver Data Non-Inverted	3	
24	GND	Ground	1	
25	RX3n	Receiver Data Inverted	3	
26	RX3p	Receiver Data Non-Inverted	3	
27	GND	Ground	1	
28	RX1n	Receiver Data Inverted	3	
29	RX1p	Receiver Data Non-Inverted	3	
30	GND	Ground	1	
31	GND	Ground	1	
32	RX2p	Receiver Data Non-Inverted	3	
33	RX2n	Receiver Data Inverted	3	
34	GND	Ground	1	
35	RX4p	Receiver Data Non-Inverted	3	
36	RX4n	Receiver Data Inverted	3	
37	GND	Ground	1	
38	RX6p	Receiver Data Non-Inverted	3	
39	RX6n	Receiver Data Inverted	3	
40	GND	Ground	1	
41	RX8p	Receiver Data Non-Inverted	3	
42	RX8n	Receiver Data Inverted	3	
43	GND	Ground	1	
44	INT/RSTn	Module Interrupt/ Module Reset	3	
45	VCC	3.3V Power	2	
46	VCC	3.3V Power	2	
47	SDA	2-wire Serial Interface Data	3	
48	GND	Ground	1	
49	TX7n	Transmitter Data Inverted	3	
50	TX7p	Transmitter Data Non-Inverted	3	
51	GND	Ground	1	
52	TX5n	Transmitter Data Inverted	3	
53	TX5p	Transmitter Data Non-Inverted	3	
54	GND	Ground	1	
55	TX3n	Transmitter Data Inverted	3	
56	TX3p	Transmitter Data Non-Inverted	3	

57	GND	Ground	1	
58	TX1n	Transmitter Data Inverted	3	
59	TX1p	Transmitter Data Non-Inverted	3	
60	GND	Ground	1	

Digital Diagnostic Monitoring Functions

Parameter	Units	Error	Notes
Temperature Monitor	°C	±3	1LSB=1/256°C
Supply Voltage Monitor	V	±0.1	1LSB=100uV
Bias Current Monitor	mA	±10%	1LSB=2uA
TX Power Monitor	dBm	±3	1LSB=0.1uW
RX Power Monitor	dBm	±3	1LSB=0.1uW

Mechanical Specifications

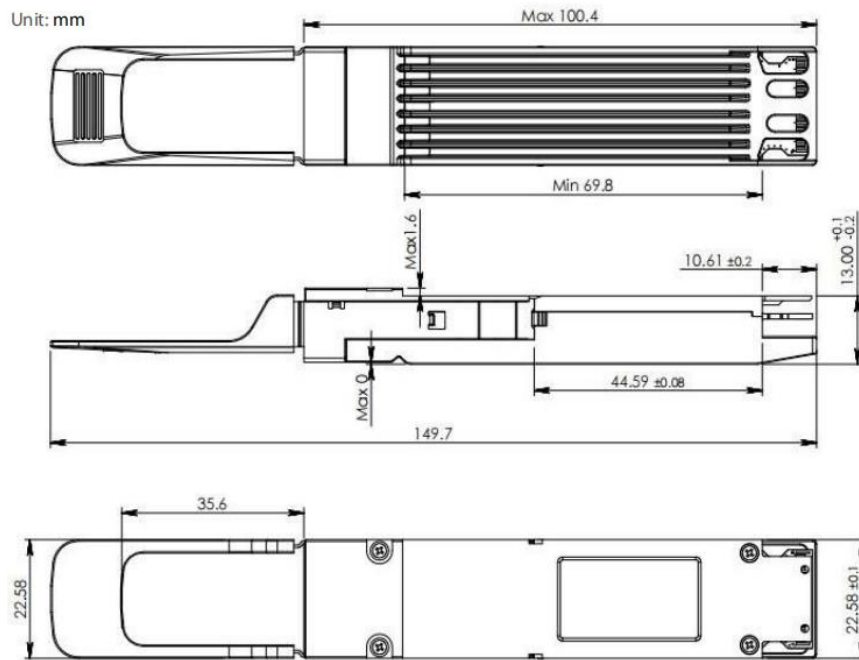


Figure 5: Diagram Mechanical Drawing