

Product Description

The 400G-FR4 QSFP112 Optical transceiver for 400Gb/s optical links. It adheres to the hardware specifications outlined in the QSFP112 MSA, providing compatibility with various networking devices. Additionally, it is compliant with CMIS 5.2, a common management interface specification that enables efficient and standardized management of the optical transceiver through software. The module operates on a 3.3V DC power supply within the commercial temperature range. It achieves an aggregate link bandwidth 400Gbit/s through CWDM4 optical lanes, with each lane capable of transmitting PAM4 53.125GBd over 2km on SMF optical fiber. It is fabricated in a rugged die-cast metal housing and cage assembly. This device also meets the EU Directive 2002/95/EC for RoHS compliance.

Applications

- High performance computing interconnect
- Data Centers
- Cloud Networks

Features

- 4 independent electrical input/output channels
- CWDM4 wavelength
- LC optical connector
- Hot Pluggable
- 2km link on SMF single-mode Fiber
- Cooled CWDM4 EML/ Pin PD Array
- QSFP112 MSA Compatible electrical I/O
- CMIS 5.2 Compliance
- IEEE802.3cu CL 151 Compliance
- Case Operating Temperature: 0 to 70°C
- +3.3V power supply

Ordering Information	
Part Number	Case Operating Temperature
400G-FR4 QSFP112 Transceiver	0 to 70 °C

Absolute Maximum Ratings					
Parameter	Symbol	Min	Max	Units	Notes
Storage Ambient Temperature	T _{stg}	-40	+85	°C	Exceeding the Absolute Maximum Ratings may cause irreversible damage to the device. The device is not intended to be operated under the condition of simultaneous Absolute Maximum Ratings, a condition which may cause irreversible damage to the device. RH is Non-condensing condition.
Relative Humidity - Storage	RH _S	0	95	%	
Relative Humidity - Operating	RH _O	0	85	%	
Module Supply Voltage	V _{CC}	-0.5	3.6	V	

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Recommended Operating Conditions						
Parameter	Symbol	Min	Typ	Max	Units	Notes
PAM4 Signaling rate, each lane	Rate	-	53.125	-	GBaud	range: $\pm 100\text{ppm}$
Case Operating Temperature	T_{case}	0	+25	70	$^{\circ}\text{C}$	Temperature Range = C
Module Supply Voltage	V_{CC}	3.14	3.3	3.46	V	
Power Consumption	Pcon	-	-	8	W	

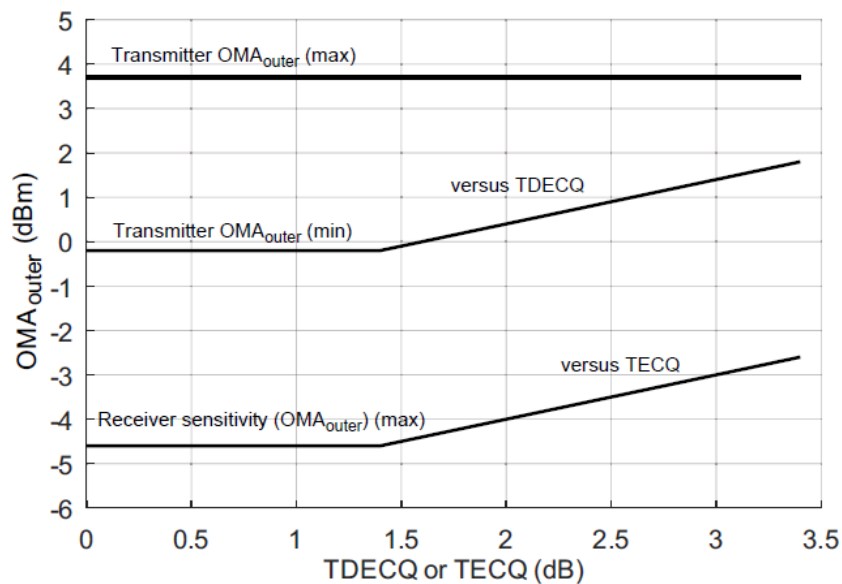
Transmitter Electrical Interfaces						
Parameter	Symbol	Min	Typ	Max	Units	Notes
Signaling Rate per Lane		$53.125 \pm 100\text{ppm}$			GBaud	
Tx_Data Differential Input Voltage	V_{IN}	-	-	900	mV	
Tx_Data Differential Input Impedance	Z_{IN}	90	100	110	Ω	

Receiver Electrical Interfaces						
Parameter	Symbol	Min	Typ	Max	Units	Notes
Signaling Rate per Lane		$53.125 \pm 100\text{ppm}$			GBaud	
Rx_Data Differential Output Voltage	V_{OUT}	-	-	900	mV	
Rx_Data Differential Output Impedance	Z_{OUT}	90	100	110	Ω	

Transmitter Optical Characteristics						
Parameter	Symbol	400G-FR4 QSFP112			Units	Notes
		Min	Typ	Max		
PAM4 Signaling rate, each lane			53.125		GBaud	range: ±100ppm
Transmitter Type		CWDM EML				
Average Total Optical Power	P _{TOTAL}	-	-	10.4	dBm	
Average Launch Power, each lane	P _{OUT}	-3.2	-	4.4	dBm	Average Optical Output
Optical Output with Tx OFF	P _{OFF}	-	-	-16	dBm	Each lane
Center Wavelength, each Lane	λ	1264.5-1277.5			nm	
		1284.5-1297.5				
		1304.5-1317.5				
		1324.5-1337.5				
Extinction Ratio, each lane (min)	ER	3.5	-	-	dB	
OMAouter, each lane (max)	OMA			3.7	dBm	
Outer Optical Modulation Amplitude (OMAouter), each lane (min) for TDECQ < 1.4 dB for 1.4dB ≤ TDECQ < 3.4 dB	OMA	-0.2 TDECQ-1.6	-	-	dBm	
Transmitter power excursion (max)				1.8	dBm	
Optical Return Loss tolerance (max)	ORL	-	-	17.1	dB	
Side Mode Suppression Ratio (min)	SMSR	30			dB	
Transmitter and dispersion eye closure for PAM4, each lane (max)	TDECQ			3.4	dB	
RIN _{17.1} OMA				-136	dB/Hz	
Transmit Reflectance (max)	RFL	-	-	-26	dB	

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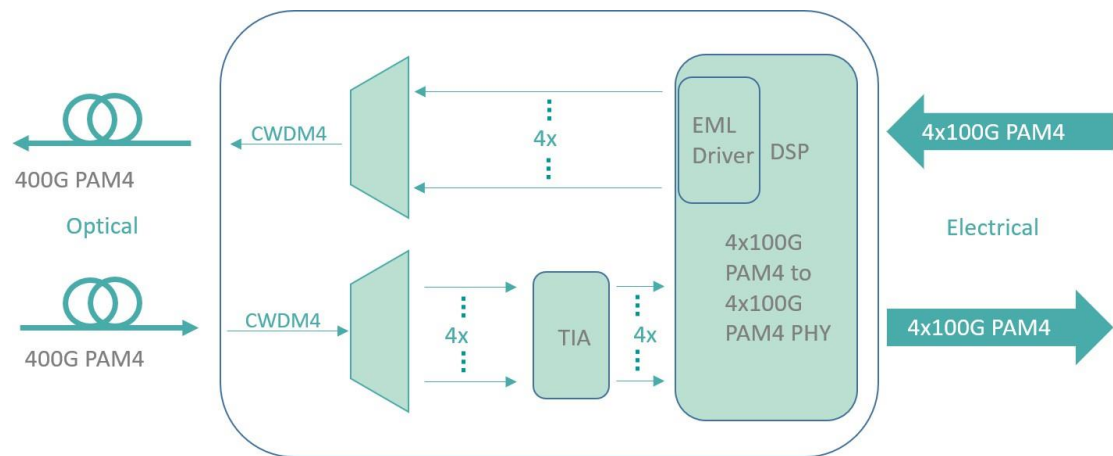
Receiver Optical Characteristics						
Parameter	Symbol	400G-FR4 QSFP112			Units	Notes
		Min	Typ	Max		
Receiver Type		CWDM and PIN/TIA				
Damage threshold, each lane	P _D	5.4	-	-	dBm	
Receive sensitivity OMA _{outer} for TECQ<1.4dB, min for 1.4dB ≤ TECQ ≤ 3.4dB, max	P _{IN}	-4.6	-	-6 + TECQ	dBm	Each Lane (Note1)
Receive power, each lane(OMA _{outer})(max)	P _{INouter}			3.7	dBm	
Average receive power	P	-7.2	-	4.4	dBm	Each Lane (Note2)
Receive Reflectance	RFL	-	-	-26	dB	
Difference in receive power between any two lanes(OMA _{outer}) (max)	P _{dif}			4.1	dB	
Center Wavelength	λ	1264.5-1277.5			nm	For each optical Port
		1284.5-1297.5				
		1304.5-1317.5				
		1324.5-1337.5				
Rx_LOS of Signal - Assert	P _A	-20	-	-	dBm	
Rx_LOS of Signal - Deassert	P _D	-	-	-9	dBm	
Note 1: The values for receiver sensitivity (OMA _{outer}), each lane (max) vary depending on the value of TECQ for the test source used for measurement. Note 2: Average receive power, each lane (min) is informative and not the principal indicator of signal strength. A receive power below this value can't be compliant; however, a value above this do not ensure compliance.						



Transmitter OMA_{outer} each lane versus TDECQ and receiver sensitivity (OMA_{outer}) each lane versus TECQ for 400GBASE-FR4.

400G-FR4 QSFP112 Transceiver

400G-FR4 QSFP112 Transceiver Block Diagram



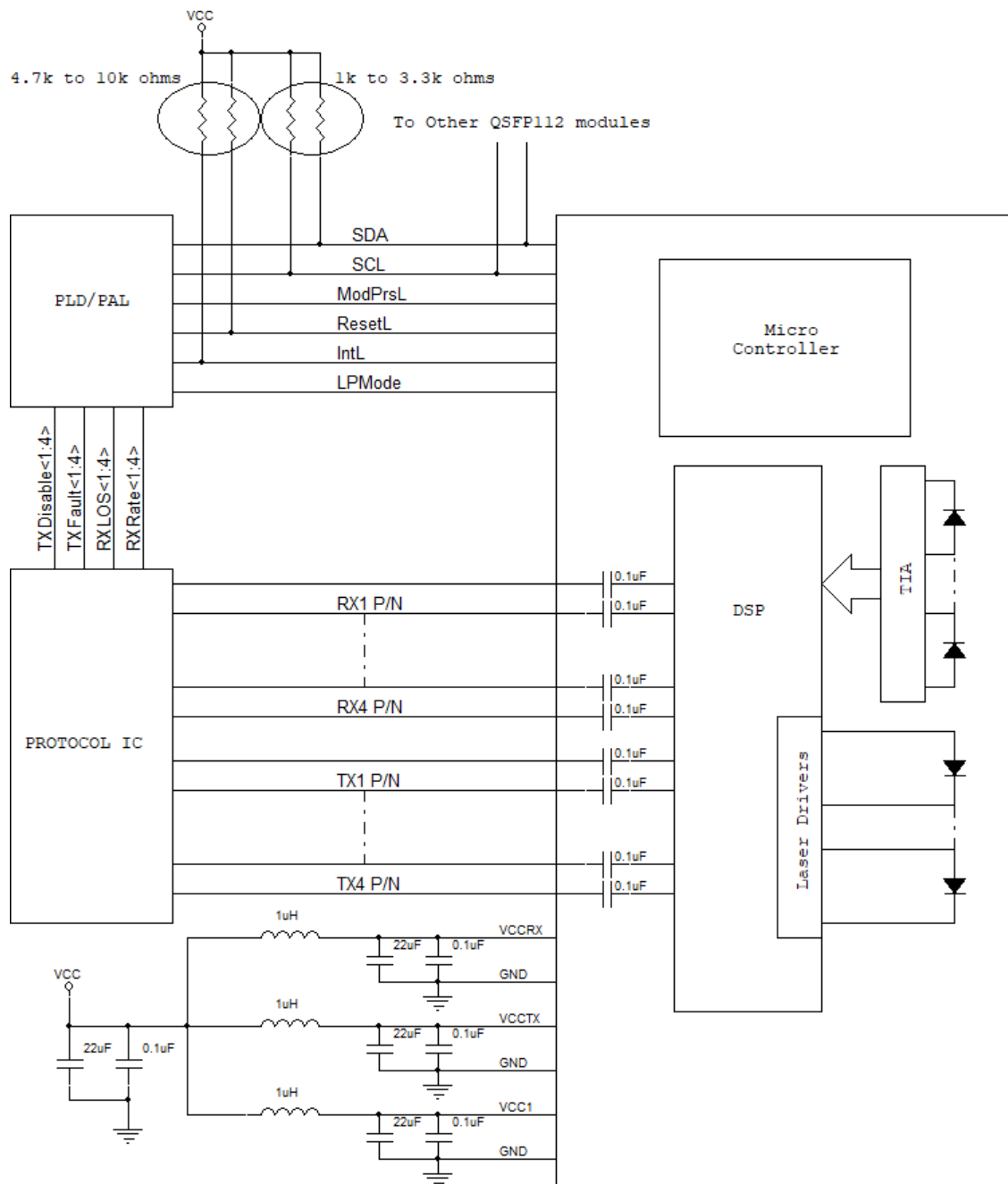
Pin Assignment

Bottom side viewed from bottom		Top side viewed form top	
1	GND	GND	38
2	TX2n	TX1n	37
3	TX2p	TX1p	36
4	GND	GND	35
5	TX4n	TX3n	34
6	TX4p	TX3p	33
7	GND	GND	32
8	ModselL	LPMode/TxDis	31
9	ResetL	Vcc1	30
10	VccRx	VccTx	29
11	SCL	IntL/RxLOS	28
12	SDA	ModPrsL	27
13	GND	GND	26
14	RX3p	RX4p	25
15	RX3n	RX4n	24
16	GND	GND	23
17	RX1p	RX2p	22
18	RX1n	RX2n	21
19	GND	GND	20

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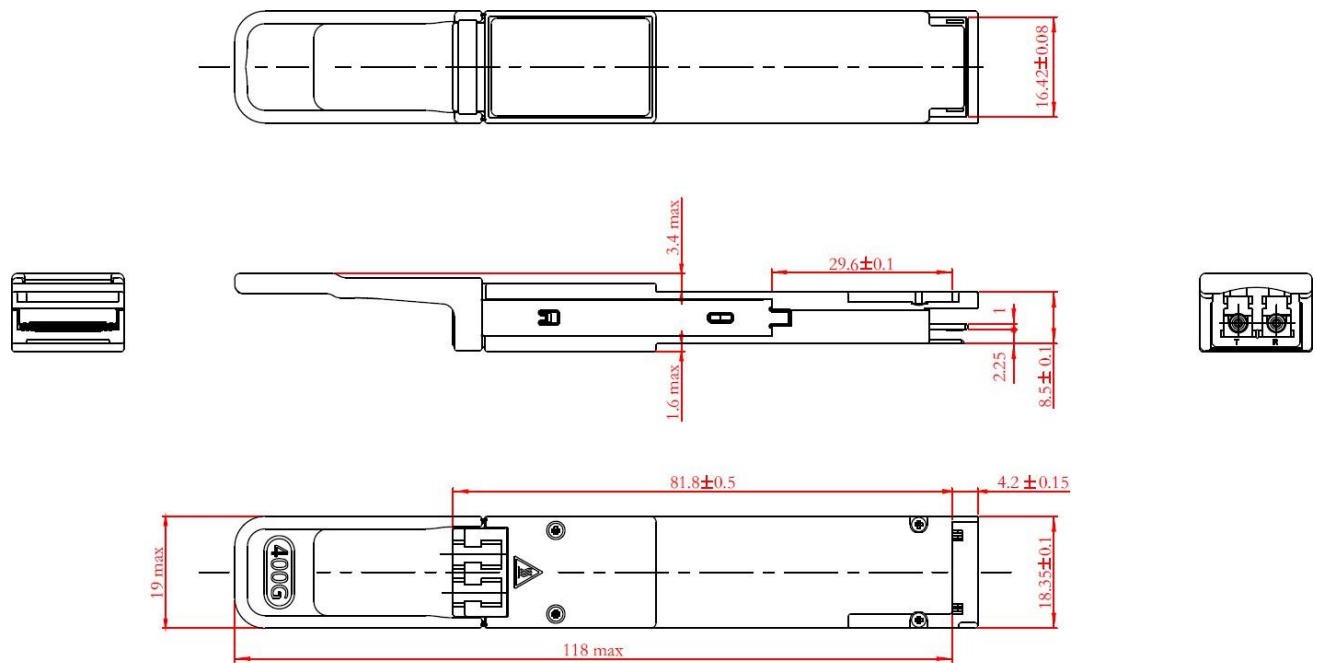
Pin Description							
Pin	Symbol	Description	Notes	Pin	Symbol	Description	Notes
1	GND	Ground		20	GND	Ground	
2	Tx2n	Transmitter Inverted Data Input		21	Rx2n	Receiver Inverted Data Output	
3	Tx2p	Transmitter Non-Inverted Data Input		22	Rx2p	Receiver Non-Inverted Data Output	
4	GND	Ground		23	GND	Ground	
5	Tx4n	Transmitter Inverted Data Input		24	Rx4n	Receiver Inverted Data Output	
6	Tx4p	Transmitter Non-Inverted Data Input		25	Rx4p	Receiver Non-Inverted Data Output	
7	GND	Ground		26	GND	Ground	
8	ModSelL	Select		27	ModPrsL	Present	
9	ResetL	Reset		28	IntL/RxLOS	Interrupt/optional RxLOS	
10	Vcc Rx	+3.3 V Power supply receiver		29	Vcc Tx	+3.3 V Power supply transmitter	
11	SCL	2-wire serial interface clock		30	Vcc1	+3.3 V Power Supply	
12	SDA	2-wire serial interface data		31	LPMode/TxDis	Low Power Mode/optional TX Disable	
13	GND	Ground		32	GND	Ground	
14	Rx3p	Receiver Non-Inverted Data Output		33	Tx3p	Transmitter Non-Inverted Data Input	
15	Rx3n	Receiver Inverted Data Output		34	Tx3n	Transmitter Inverted Data Input	
16	GND	Ground		35	GND	Ground	
17	Rx1p	Receiver Non-Inverted Data Output		36	Tx1p	Transmitter Non-Inverted Data Input	
18	Rx1n	Receiver Inverted Data Output		37	Tx1n	Transmitter Inverted Data Input	
19	GND	Ground		38	GND	Ground	

Host Board and Module Board



400G-FR4 QSFP112 Transceiver

Mechanical Dimensions



NOTES:

- 1.TOLERANCE: ± 0.1 mm.
- 2.OTHERS ACCORDING WITH QSFP112 MSA OR CUSTOMER SPEC.
- 3.LIGHT PORT ACCORDING WITH FIBER CONNECTOR SPEC.