

40G QSFP+ SWDM4 Optical Transceiver

P/N: AE-QSFP-SWDM4

The Aerech 40G QSFP+ SWDM4 transceiver modules are designed for use in 40G Ethernet links over duplex multimode fiber. Four channels/lanes in the 850-940nm region @ 10Gbps to transport the Ethernet signal. Digital diagnostics functions are available via an I2C interface, as specified by the QSFP+ MSA.

Feature

- Compliant with QSFP+ MSA
- Compliant with SWDM MSA
- Compliant with SFF-8636
- Compliant with IEEE 802.3ba
- Hot-pluggable QSFP+ form factor
- 4x10Gb/s VCSEL-based SWDM transmitter
- Supports 41.2Gbps aggregate bit rate
- Power dissipation<3.5W
- Maximum link length of 240m on OM3 MMF and 350m on OM4 MMF
- Case temperature range of 0°C to 70°C
- Duplex LC receptacles
- XLPPI electrical interface
- RoHS compliant

Applications

- 40G Ethernet over Duplex MMF

Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Units
Storage Temp Range	Ts	-40	+85	°C
Supply Voltage	Vcc	-0.5	3.6	V
Relative Humidity	RH	15%	85%	

Operating Conditions

Parameter	Symbol	Min	Max	Units
Case Temp-Operating	Tcase	0	70	°C
Supply Voltage	Vcc	3.14	3.46	V
Power Consumption	P		3.5	W
Link Distance on OM3 Fiber		2	240	M
Link Distance on OM4 Fiber		2	350	M
Link Distance on OM5 Fiber		2	440	M

Optical Characteristics

Transmitter Parameter	Lane	Min	Typical	Max	Unit	Note
Signaling rate, each lane		10.3125, 9.953±100ppm			Gb/s	
Lane Wavelength Range	Lane0	844		858	nm	
	Lane1	874		888		
	Lane2	904		918		
	Lane3	934		948		
Difference in launch power between any two lanes				4.5	dBm	
RMS Spectral width @850nm @880nm,910nm,940nm	Lane0			0.53	nm	
	Lane1,2,3			0.59		
Optical Modulation Amplitude (OMA), each lane		-5.5		3	dBm	
Average Launch power per Lane		-7.5		3	dBm	
Launch Power Tx OMA-TDP	Lane0	-6.4			dBm	
	Lane1	-6.0				
	Lane2	-6.5				
	Lane3	-7.0				

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Transmitter and Dispersion Eye Closure	Lane0 Lane1 Lane2 Lane3			3.7 4.0 4.5 5.0	dB	
Extinction Ratio		2			dB	
Optical Return Loss Tolerance		12			dB	
Average Launch Power per Lane @ TX Off State				-30	dBm	
Encircled Flux		>=86% at 19um <=30% at 4.5um				
Transmitter eye mask definition {X1, X2, X3, Y1, Y2, Y3} Hit ratio 5x10-5 hits per sample		{0.23,0.34,0.43,0.27,0.35,0.4}				
Receiver Parameter	Lane	Min	Typical	Max	Unit	Note
Signaling rate, each lane		10.3125 , 9.953±100ppm			Gb/s	
Lane Wavelength Range	Lane0	844		858	nm	
	Lane1	874		888		
	Lane2	904		918		
	Lane3	934		948		
Damage threshold, each lane		3.8			dBm	
Average Receive Power, each lane		-12.9 -12.5 -12.2 -11.9		2.4	dBm	
Receiver Power, each lane (OMA)				3	dBm	
Receiver sensitivity OMA, per lane				-9.1	dB	
Difference in receive power between any two lanes(OMA)				5	dB	
RX_Los_Assert		-30			dBm	
RX_Los_De-ASSERT				-13	dBm	
RX_Los_Hysteresis		0.5			dBm	
Return reflectance				-12	dB	

Digital Diagnostic Monitoring Specifications

Parameters	Unit	Specification
Temperature Monitor	°C	± 3
Voltage Monitor	V	± 5 %
I_bias Monitor	mA	± 10 %
Received Power (Rx) Monitor	dB	± 3.0
Transmit Power (Tx) Monitor	dB	± 3.0

Electrical Characteristics

Transmitter electrical input signal characteristics(TP1)	Min	Typical	Max	Units	Conditions
Single ended input voltage tolerance	-0.3		4	V	Referred to TP1 signal common
AC common-mode input voltage tolerance	15			mV	RMS
Differential input return loss	See 86A.4.1.1			dB	10MHz to 11.1GHz
Differential to common-mode input return loss	10			dB	10MHz to 11.1GHz
J2 Jitter tolerance	0.17			UI	
J9 Jitter tolerance	0.29			UI	
Data Dependent Pulse Width Shrinkage (DDPWS) tolerance	0.07			UI	
Specification values					
Eye mask coordinates: X1,X2 Y1,Y2	0.11,0.31 95,350			UI mV	Hit Ratio=5E-5
Crosstalk calibration signal VMA	850			mV	While calibrating compliance signal
Crosstalk calibration signal transition times, 20% to 80%	34			ps	
Receiver electrical output signal characteristics(TP4)	Min	Typical	Max	Unit	
Single ended output voltage tolerance range	-0.3		4	V	Referred to signal common
AC common-mode output voltage (RMS)			7.5	mV	
Termination mismatch at 1MHz			5	%	
Differential output return loss	See 86A.4.2.1			dB	10MHz to 11.1 GHz
Common-mode output return loss	See 86A.4.2.2			dB	10MHz to 11.1 GHz
Output transition time,20% to 80%	28			ps	
J2 Jitter output			0.42	UI	

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J9 Jitter output		0.65	UI	
Specification values				
Eye mask coordinates: X1,X2 Y1,Y2	0.29,0.5 150,425		UI mV	Hit ratio=5E-5
Crosstalk source VMA, each lane	700		mV	At TP1a
Crosstalk source transition times,20% to 80%	37		PS	At TP1a

QSFP+ Connector and Pinout Description

The electrical interface to the transceiver is a 38 pins edge connector. The 38 pins provide high speed data, low speed monitoring and control signals, I2C communication, power and ground connectivity. The top and bottom views of the connector are provided below, as well as a table outlining the contact numbering, symbol and full description.

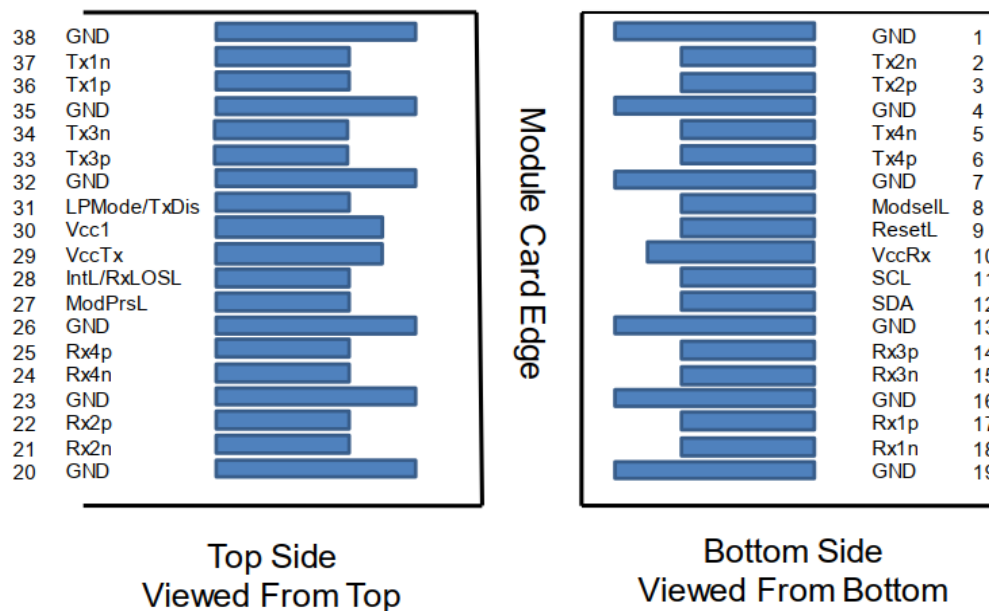


Figure 1. QSFP+ 38-pin connector

Pin	Symbol	Name/Description	NOTE
1	GND	Transmitter Ground (Common with Receiver Ground)	1
2	Tx2n	Transmitter Inverted Data Input	
3	Tx2p	Transmitter Non-Inverted Data output	
4	GND	Transmitter Ground (Common with Receiver Ground)	1
5	Tx4n	Transmitter Inverted Data Input	
6	Tx4p	Transmitter Non-Inverted Data output	
7	GND	Transmitter Ground (Common with Receiver Ground)	1
8	ModSelL	Module Select	
9	ResetL	Module Reset	

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10	VccRx	3.3V Power Supply Receiver	2
11	SCL	2-Wire serial Interface Clock	
12	SDA	2-Wire serial Interface Data	
13	GND	Transmitter Ground (Common with Receiver Ground)	
14	Rx3p	Receiver Non-Inverted Data Output	
15	Rx3n	Receiver Inverted Data Output	
16	GND	Transmitter Ground (Common with Receiver Ground)	1
17	Rx1p	Receiver Non-Inverted Data Output	
18	Rx1n	Receiver Inverted Data Output	
19	GND	Transmitter Ground (Common with Receiver Ground)	1
20	GND	Transmitter Ground (Common with Receiver Ground)	1
21	Rx2n	Receiver Inverted Data Output	
22	Rx2p	Receiver Non-Inverted Data Output	
23	GND	Transmitter Ground (Common with Receiver Ground)	1
24	Rx4n	Receiver Inverted Data Output	1
25	Rx4p	Receiver Non-Inverted Data Output	
26	GND	Transmitter Ground (Common with Receiver Ground)	1
27	ModPrsl	Module Present	
28	IntL	Interrupt	
29	VccTx	3.3V power supply transmitter	2
30	Vcc1	3.3V power supply	2
31	LPMode	Low Power Mode, not connect	
32	GND	Transmitter Ground (Common with Receiver Ground)	1
33	Tx3p	Transmitter Non-Inverted Data Input	
34	Tx3n	Transmitter Inverted Data Output	
35	GND	Transmitter Ground (Common with Receiver Ground)	1
36	Tx1p	Transmitter Non-Inverted Data Input	
37	Tx1n	Transmitter Inverted Data Output	
38	GND	Transmitter Ground (Common with Receiver Ground)	1

Notes:

1. GND is the symbol for signal and supply (power) common for QSFP+ modules. All are common within the QSFP+ module and all module voltages are referenced to this potential unless otherwise noted. Connect these directly to the host board signal common ground plane.
2. VccRx, Vcc1 and VccTx are the receiving and transmission power suppliers and shall be applied concurrently. Recommended host board power supply filtering is shown below. Vcc Rx, Vcc1 and Vcc Tx may be internally connected within the QSFP+ transceiver module in any combination. The connector pins are each rated for a maximum current of 1000mA.

Compatible with SFF-8636

Unit: mm

Technical drawing of a mechanical part, likely a bracket or connector, showing three views: a top view, a side view, and a cross-section A-A. The top view shows a rectangular base with a central slot and a smaller rectangular feature on the right. The side view shows the profile of the part, including a curved section on the right. The cross-section A-A shows the internal structure of the part. Dimensions are given in millimeters with tolerances.

Top View Dimensions:

- Overall width: 13.07 ± 0.30
- Overall height: 6.25 ± 0.05
- Distance from left edge to center of slot: 2.29 ± 0.05
- Distance from center of slot to right edge: 4.20 ± 0.10
- Distance from left edge to center of slot (alternative): $2-1.10 \pm 0.18$

Side View Dimensions:

- Overall length: 121.4 ± 1
- Distance from left edge to center of slot: 72 ± 0.1
- Distance from left edge to center of slot (alternative): 18.35 ± 0.10
- Distance from left edge to center of slot (alternative): 4.20 ± 0.10
- Distance from left edge to center of slot (alternative): $2-1.10 \pm 0.18$

Cross-section A-A Dimensions:

- Overall width: 18.45 max

Side View Dimensions (continued):

- Distance from left edge to center of slot: 53
- Distance from left edge to center of slot: 48.8
- Distance from left edge to center of slot: 29.60 ± 0.10
- Distance from left edge to center of slot: 1.27 ± 0.10
- Distance from left edge to center of slot: 0.60 ± 0.05
- Distance from left edge to center of slot: 2.25 ± 0.10
- Distance from left edge to center of slot: 5.20 ± 0.15
- Distance from left edge to center of slot: 8.50 ± 0.10
- Distance from left edge to center of slot: $3.30 -0.30$
- Distance from left edge to center of slot: 13.07 ± 0.30
- Distance from left edge to center of slot: 4.0 ± 0.10

Figure 2. Mechanical dimensions

Part Number	Description
AE-QSFP-SWDM4	40G QSFP+ SWDM4 Optical Transceiver