40G and 100G Compatible Rate QSFP28 SWDM4 Optical Transceiver

P/N: AE-QSFP28-SWDM4

The 40G/100G QSFP28 SWDM4 transceiver modules are designed for use in 40G/100G Ethernet links over duplex multimode fiber. Four channels/lanes in the 850-940nm region @10.3125Gb/s / @ 25.78Gbps to transport the Ethernet signal. Digital diagnostics functions are available via an I2C interface, as specified by the QSFP28 MSA.

Feature

- Compliant with QSFP28 MSA
- Compliant with SWDM MSA
- Compliant with IEEE802.3bm CAUI-4
- Hot-pluggable QSFP28 form factor
- 4x25Gb/s 850nm VCSEL-based transmitter
- Supports 40G/100G Dual-Rate operation
- Power dissipation<3.5W
- Maximum link length of 150m on OM5 multimode Fiber
- Case temperature range of 0°C to 70°C
- Duplex LC receptacles
- CAUI-4 electrical interface
- RoHS compliant

Applications

- 40G Ethernet over Duplex MMF
- 100G Ethernet over Duplex MMF

1. Absolute Maximum Ratings

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

2. Operating Conditions

Parameter	Symbol	Min	Max	Units
Case Temp-Operating	Tcase	0	70	℃
Supply Voltage	Vcc	3.14	3.46	V
Power Consumption	P		3.5	W
Link Distance on OM3 Fiber (100G)			75	M
Link Distance on OM4 Fiber (100G)			100	M
Link Distance on OM5 Fiber (100G)			150	M
Link Distance on OM3 Fiber (40G)			240	M
Link Distance on OM4 Fiber (40G)			350	M
Link Distance on OM5 Fiber (40G)			440	M

3. Optical Characteristics @25.78125Gb/s

Transmitter Parameter	Lane	Min	Typical	Max	Unit	Note
Signaling rate, each lane		25.78125±100ppm			Gb/s	
Lane Wavelength Range	Lane0 Lane1 Lane2 Lane3	844 874 904 934		858 888 918 948	nm	
Modulation Format		NRZ				
Difference in launch power between any two lanes				4.5	dBm	
RMS Spectral width				0.59	nm	1
Optical Modulation Amplitude (OMA), each lane		-5.5		3	dBm	2
Average Launch Power per Lane @ TX Off State				-30	dBm	
Launch Power in OMA minus TDEC	Lane0 Lane1 Lane2 Lane3	-7 -7 -7.4 -7.7			dBm	
Transmitter and Dispersion Eye Closure	Lane0 Lane1 Lane2 Lane3			4 4 4.4 4.8	dB	3
Extinction Ratio		2			dB	
Optical Return Loss Tolerance				12	dB	
Encircled Flux		≥86% at 19 um ≤30% at 4.5 um				4
Transmitter eye mask definition {X1, X2, X3, Y1, Y2, Y3} Hit ratio 1.5x10-3 hits per sample		{0.3,0.38,0.45,0.35,0.41,0.5}				

Notes:

1. RMS spectral width is the standard deviation of the spectrum.
2. The normative lowest value of OMA for a compliant transmitter is ‘Launch power in OMA minus TDEC, each lane (min)’ plus the actual value of ‘TDEC’, but with a value of at least ‘OMA, each lane (min)’.
3. TDEC is calculated from the measured TDECm using the methods in 3.6. TDECm is measured following the method in IEEE 802.3 clause 95.8.5 using a 12.6 GHz bandwidth reference receiver for all lanes.
4. If measured into type A1a.2 or type A1a.3 50 um fiber in accordance with IEC 61280-1-4.

Receiver Parameter	Lane	Min	Typical	Max	Unit	Note
Signaling rate, each lane		25.78125±100ppm			Gb/s	
Lane Wavelength Range	Lane0 Lane1 Lane2 Lane3	844 874 904 934		858 888 918 948	nm	
Modulation Format		NRZ				
Damage Threshold		4.4			dBm	
Average Receive Power, each lane	Lane0 Lane1 Lane2 Lane3	-9.5 -9.4 -9.4 -9.4		3.4	dBm	
Receiver Power, each lane (OMA)				3	dBm	
Receiver Reflectance				-12	dB	
unStressed Receiver Sensitivity(OMA)	Lane0 Lane1 Lane2 Lane3			-8.2 -8.4 -8.6 -8.8	dBm	1
RX_Los_Assert		-30			dBm	
RX_Los_De-ASSERT				-12	dBm	
RX_Los_Hysteresis		0.5			dBm	

1.unstressed sensitivity at BER of 5E-5(pre FEC)

4. Optical Characteristics @10.3125Gb/s

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

5. 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

6. Electrical Characteristics

Transmitter electrical input signal characteristics (TP1)	Min	Typical	Max	Unit
Signaling rate per lane (range)	25.78125 ± 100 ppm			GBd
Differential input return loss	Equation (83E–5)			dB
Differential to common mode input return loss	Equation (83E–6)			dB
Differential termination mismatch			10	%
Module stressed input test	See 83E3.4.1			
Differential pk-pk input voltage tolerance	900			mV
DC common mode voltage	-350		2850	mV
Single ended voltage tolerance range	-0.4		3.3	V
Receiver electrical output signal characteristics (TP4)	**Min**	**Typical**	**Max**	**Unit**
Signaling rate per lane (range)	25.78125 ± 100 ppm			GBd
AC common-mode output voltage (RMS)			17.5	mV
Differential output voltage			900	mV
Eye width	0.57			UI
Eye height, differential	228			mV
Vertical eye closure			5.5	dB
Differential output return loss	Equation (83E–2)			dB
Common to differential mode conversion return loss	Equation (83E–3)			dB
Differential termination mismatch			10	%
Transition time (20% to 80%)	12			ps
DC common mode voltage	-350		2850	mV

7.QSFP28 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.

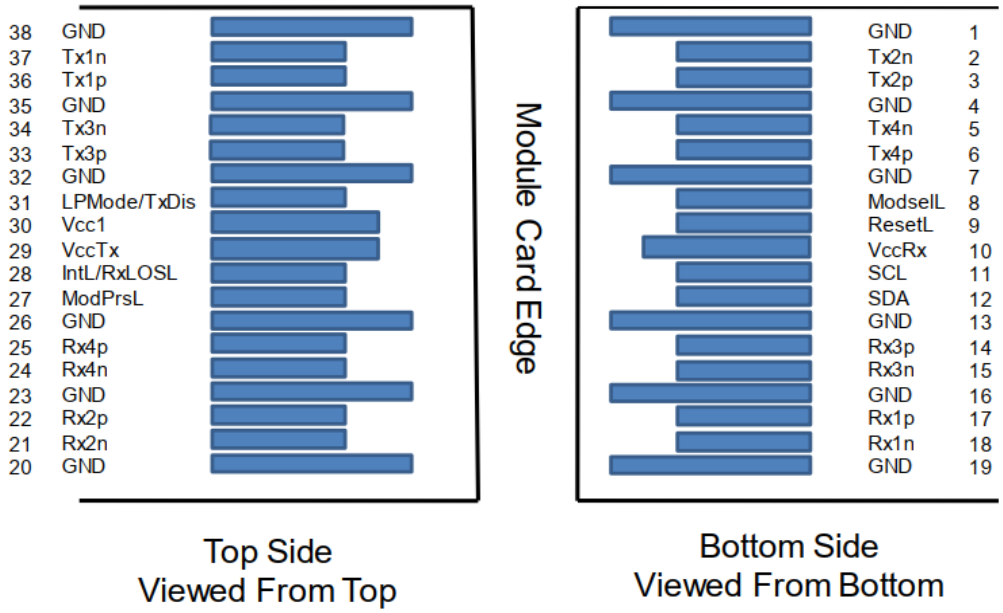

Figure 1. QSFP28-compliant 38-pin connector

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	
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	
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 QSFP28 modules. All are common within the QSFP28 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 QSFP28 transceiver module in any combination. The connector pins are each rated for a maximum current of 1000mA.

8. Memory map

Compatible with SFF-8636

9. Mechanical Dimensions

Unit: mm

Pull tab color: Gray, Pantone 424U

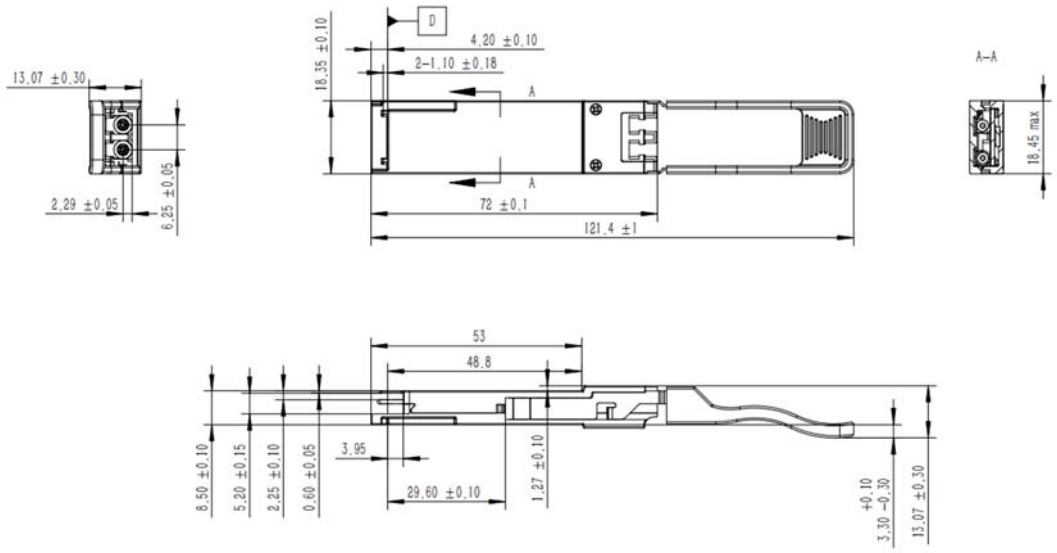

Figure 2. Mechanical dimensions