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**40GBASE-ER4 QSFP+ 1310nm 40km DDM SMF Transceiver**  
**P/N: AE-QSFP-ER4**

**Features**

- Hot-pluggable QSFP+ form factor
- Supports 41.3 Gb/s aggregate bit rate
- Power dissipation < 3.5W
- 18.5 dB link insertion loss budget
- RoHS-6 compliant
- Commercial case temperature range 0°C to 70°C
- Single 3.3V power supply
- Maximum link length of 40km on Single Mode Fiber (SMF)
- Uncooled 4x10Gb/s CWDM transmitter
- XLPPI electrical interface
- Duplex LC receptacles
- Built-in digital diagnostic functions, including Tx/Rx power monitoring

**Applications**

- 40GBASE-ER4 40G Ethernet

### I. Absolute Maximum Ratings

Parameter	Symbol	Min	Typ	Max	Unit	Ref.
Maximum Supply Voltage	Vcc1,VccTx, VccRx	-0.5		3.6	V	
Storage Temperature	TS	-40		85	°C	
Case Operating Temperature	TOP	0		70	°C	
Relative Humidity	RH	0		85	%	1
Damage Threshold, per Lane	DT	3.8			dBm	

Notes:

1. Non-condensing.

### II. Environmental Specifications

Environmental Specifications	Symbol	Min	Typ	Max	Units	Ref.
Case Operating Temperature	T <sub>op</sub>	0		70	°C	
Storage Temperature	T <sub>sto</sub>	-40		85	°C	

### III. Electrical Characteristics (TOP = 0 to 70°C, VCC = 3.1 to 3.47 Volts)

Parameter	Symbol	Min	Typ	Max	Unit	Ref.
Supply Voltage	Vcc1,VccTx, VccRx	3.1		3.47	V	
Supply Current	I <sub>cc</sub>			1.13	A	
Link turn-on time						
Transmit turn-on time				2000	ms	2
Transmitter (per Lane)						
Single ended input voltage tolerance	V <sub>inT</sub>	-0.3		4.0	V	
Differential data input swing	V <sub>in,pp</sub>	120		1200	mVpp	3
Differential input threshold			50		mV	
AC common mode input voltage tolerance (RMS)		15			mV	
Differential input return loss		Per IEEE P802.3ba, Section 86A.4.1.1			dB	4
J2 Jitter Tolerance	J <sub>t2</sub>	0.17			UI	
J9 Jitter Tolerance	J <sub>t9</sub>	0.29			UI	
Data Dependent Pulse Width Shrinkage	DDPWS	0.07			UI	
Eye mask coordinates {X1, X2 Y1, Y2}			0.11, 0.31 95, 350		UI mV	5
Receiver (per Lane)						
Single-ended output voltage		-0.3		4.0	V	
Differential data output swing	V <sub>out,pp</sub>	0		800	mVpp	6
AC common mode output voltage (RMS)				7.5	mV	
Termination mismatch at 1 MHx				5	%	
Differential output return loss		Per IEEE P802.3ba, Section 86A.4.2.1			dB	4

Common mode output return loss		Per IEEE P802.3ba, Section 86A.4.2.2			dB	4
Output transition time, 20% to 80%		28			ps	
J2 Jitter output	Jo2			0.42	UI	
J9 Jitter output	Jo9			0.65	UI	
Eye mask coordinates #1 {X1, X2, Y1, Y2}		0.29, 0.5 150, 425			UI mV	5
Power Supply Ripple Tolerance	PSR	50			mVpp	

**Notes:**

1. Maximum total power value is specified across the full temperature and voltage range.
2. From power-on and end of any fault conditions.
3. After internal AC coupling. Self-biasing 100 differential input.
4. 10 MHz to 11.1 GHz range.
5. Hit ratio =  $1 \times 1E-12$ .
6. AC coupled with 100 differential output impedance.

**IV. Optical Characteristics (TOP = 0 to 70°C, VCC = 3.1 to 3.47 Volts)**

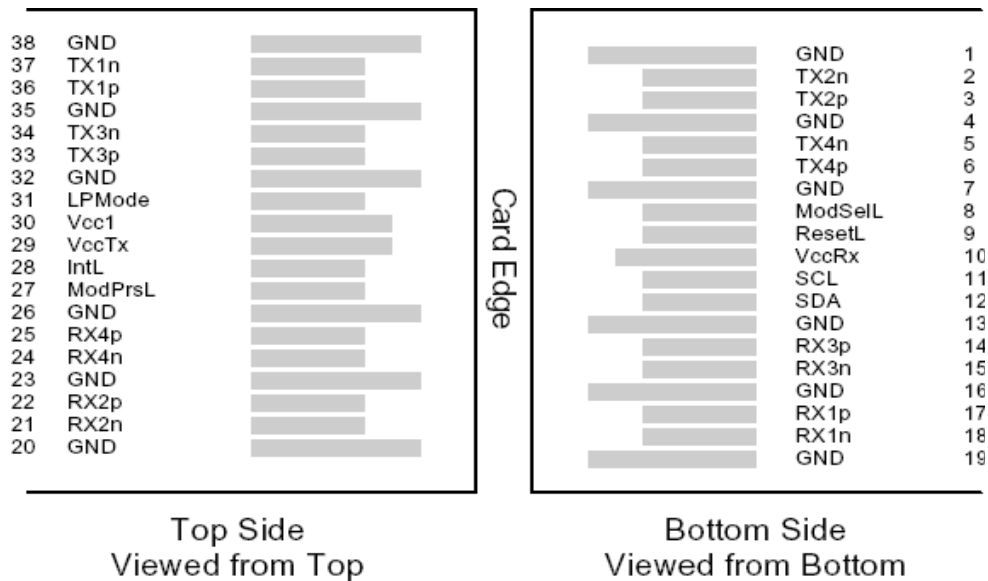
Parameter	Symbol	Min	Typ	Max	Unit	Ref.
Transmitter						
Signaling Speed per Lane			10.3125		GBd	1
Lane center wavelengths (range)			1264.5 – 1277.5 1284.5 – 1297.5 1304.5 – 1317.5 1324.5 – 1337.5		nm	
Total Average Launch Power	POUT			10.5	dBm	
Transmit OMA per Lane	TxOMA	0.3		5.0	dBm	
Average Launch Power per Lane	TXPx	-2.7		4.5	dBm	2
Difference in launch power between any two lanes (OMA)				4.7	dB	
Transmitter Dispersion Penalty	TDP			2.6	dB	
Launch power (OMA) minus TDP per lane		-0.5			dBm	
Optical Extinction Ratio	ER	5.5			dB	
Sidemode Suppression ratio	SSRmin	30			dB	
Average launch power of OFF transmitter, per lane				-30	dBm	
Relative Intensity Noise	RIN			-128	dB/Hz	3
Optical Return Loss Tolerance				20	dB	
Transmitter Reflectance				-12	dB	
Transmitter eye mask definition {X1, X2, X3, Y1, Y2, Y3}		{0.25, 0.4, 0.45, 0.25, 0.28, 0.4}				
Receiver						
Signaling Speed per Lane			10.3125		GBd	4
Lane center wavelengths (range)			1264.5 – 1277.5 1284.5 – 1297.5 1304.5 – 1317.5 1324.5 – 1337.5		nm	
Receive Power (OMA) per Lane	RxOMA			-4.0	dBm	
Average Receive Power per Lane	RXPx	-21.2		-4.5	dBm	5, 6

Receiver Sensitivity (OMA) per Lane	Rxsens			-21.2	dBm	
Stressed Receiver Sensitivity (OMA) per Lane	SRS			-16.8	dBm	
Damage Threshold per Lane	PMAX			3.8	dBm	
Return Loss	RL			-26	dB	
Vertical eye closure penalty, per lane				2.2	dB	
Receive electrical 3 dB upper cutoff frequency, per lane				12.3	GHz	
LOS De-Assert	LOSD			-23	dBm	
LOS Assert	LOSA	-35			dBm	
LOS Hysteresis			1		dB	

**Notes:**

1. Transmitter consists of 4 lasers operating at up to 10.3 Gb/s each,  $\pm 100\text{ppm}$
2. Minimum value is informative.
3. RIN is scaled by  $10 \cdot \log(10/4)$  to maintain SNR outside of transmitter.
4. Receiver consists of 4 photodetectors operating at up to 10.3125 Gb/s each,  $\pm 100\text{ppm}$
5. Minimum value is informative, equals  $\min TxOMA$  with infinite ER and max channel insertion loss.
6. Maximum value is based on a min. of 9dB loss. Additional attenuation may be required when connected in loopback or short fiber link.

**V. Pin Descriptions**



Pin	Symbol	Name/Description	Notes
1	GND	Ground	1
2	Tx2n	Transmitter Inverted Data Input	
3	Tx2p	Transmitter Non-Inverted Data Input	
4	GND	Ground	1
5	Tx4n	Transmitter Inverted Data Input	

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

#### Notes

1. Circuit ground is internally isolated from chassis ground.

## VI. Ordering information

Part Number	Product Description
AE-QSFP-ER4	QSFP+, 40Gb/s , 1271~1331nm, SMF, 40KM, DDM, LC connector, 0°C to 70°C