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**100GBASE-ER4 QSFP28 1310nm 40km DDM SMF Transceiver**  
**P/N: AE-QSFP28-ER4**

**Features**

- QSFP28 MSA package with duplex LC receptacles
- Compliant with 100Gb/s QSFP28 ER4
- 100Gb/s transceiver module should support 103Gb/s
- EML LAN-WDM lasers on transmitter side
- SOA&PD on the receiver side
- Reaches up to 40km on SMF
- High speed I/O electrical interface
- Two Wire Serial Interface with Digital Diagnostic Monitoring
- Operating case temperature range 0°C to +70°C
- Maximum power consumption 4.5W
- 3.3V power supply voltage
- Compliant to RoHS
- Class 1 Laser

**Applications**

- 100G Datacom& Telecom connections
- 100Gbase-ER4

## I. Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Unit
Storage Temperature	TS	-40	+85	°C
Operating Case Temperature	Tcase	-5	+75	°C
Relative Humidity	RH	5	85	%
Supply Voltage	VCC	-0.3	3.6	V
ESD Sensitivity		±500V for high speed lines; ±2kV for others		V

## II. Recommended Operating Conditions

Parameter	Symbol	Min.	Typical	Max.	Unit
Operating Case Temperature	Tcase	0	-	70	°C
Supply Voltage	VCC	3.135	3.3	3.465	V
Relative Humidity	RH	5	-	85	%
Power Dissipation	PD	-	-	4.5	W
Data Rate (optical)	DRO	-	4*25.78125	-	Gbps
Data Rate (Electrical)	DRE	-	4*25.78125	-	Gbps
Operating Link Distance	LD	-	-	40	Km

## III. Optical Characteristics

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Transmitter						
Data Rate	DR	-	4*25.78125	-	GBd	
Data rate variation	DRV	-100	-	+100	ppm	
Modulation Format		NRZ				
Wavelength L0	WL0	1294.53	1295.56	1296.59	nm	
Wavelength L1	WL1	1299.02	1300.05	1301.09	nm	
Wavelength L2	WL2	1303.54	1304.58	1305.63	nm	
Wavelength L3	WL3	1308.09	1309.14	1310.19	nm	
Total Launch Power	Ptotal	-	-	8.9	dBm	
Average Optical Launch Power Per Lane	Pout	-2.9	-	4.5	dBm	1
Power Optical modulation amplitude Per Lane	POMA	0.1	-	4.5	dBm	2
Extinction Ratio	ER	4	-	-	dB	
Side-mode suppression ratio	SMSR	30	-	-	dB	
Launch power of OFF Transmitter per lane		-	-	-30	dBm	
Eye mask		IEEE 802.3 Clause 88 100Gbase-ER4, {0.25,0.4,0.45,0.25,0.28,0.4}				
Optical Return Loss Tolerance	ORLT	-	-	20	dB	
Transmitter reflectance	TR	-	-	-12	dB	3

Receiver						
Data Rate	DR	-	4*25.78125	-	GBd	
Data rate variation	DRV	-100	-	+100	ppm	
Modulation Format		NRZ				
Wavelength L0	WL0	1294.53	1295.56	1296.59	nm	
Wavelength L1	WL1	1299.02	1300.05	1301.09	nm	
Wavelength L2	WL2	1303.54	1304.58	1305.63	nm	
Wavelength L3	WL3	1308.09	1309.14	1310.19	nm	
Damage Threshold for Receiver per lane	Pdamage	5.5			dBm	4
Average receiver power	Rpow	-20.9	-	-3.5	dBm	5
Receiver sensitivity per lane (OMA)				-18.9	dBm	5
Receiver Reflectance	RXR	-	-	-26	dB	
LOS assert per lane	LOSA	-	-	-27	dBm	
LOS de-assert per lane	LOSD	-	-	-24	dBm	
LOS Hysteresis		0.5	-	5	dB	

Note1. 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.

Note2. Even if the TDP < 1dB, the OMA (min) must exceed this value.

Note3. Transmitter reflectance is defined looking into the transmitter.

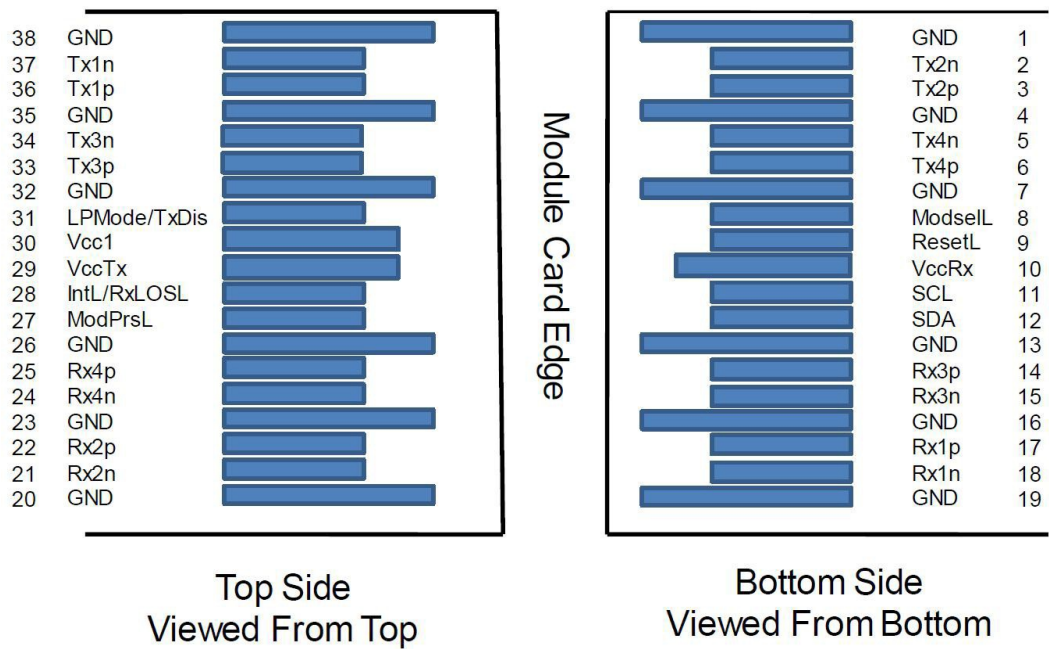
Note4. The receiver shall be able to tolerate, without damage, continuous exposure to an optical input signal having this average power level.

Note5. Measured with conformance test signal for BER = 10E-12@25.78125Gb/s.

#### IV. Electrical Specifications

Transmitter (Module Input)					
Parameter	Symbol	Min.	Typical	Max.	Unit
Input Differential Impedance	Rin	-	100	-	Ohm
Differential termination mismatch (max)	D-mismatch	-	-	10	%
Differential Data Input Amplitude	VIN,P-P	-	-	900	mVpp
LPMode, Reset and ModSelL	VIL	-0.3	-	0.8	V
	VIH	2.0	-	VCC+0.3	V
Receiver (Module Output)					
Output Differential Impedance	Rout	-	100	-	Ohm
Differential termination mismatch (max)	D-mismatch	-	-	10	%
Differential Data Output Amplitude	VOUT,P-P	-	-	900	mVpp
ModPrsL and IntL	VOL	0	-	0.4	V
	VOH	VCC-0.5	-	VCC+0.3	V

### V. QSFP+ Module Pad



### VI. Pin Definitions

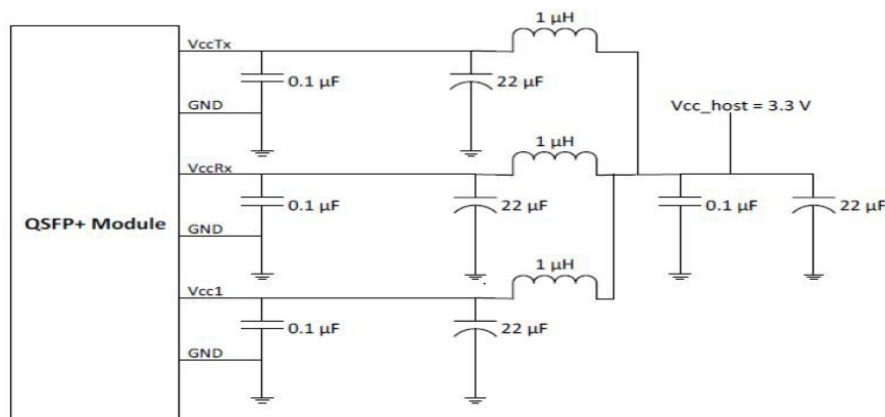
PAD	Logic	Symbol	Description	Plug sequence	Note
1		GND	Ground	1	1
2	CML-I	Tx2n	Transmitter Inverted Data Input	3	
3	CML-I	Tx2p	Transmitter Non-Inverted Data Input	3	
4		GND	Ground	1	1
5	CML-I	Tx4n	Transmitter Inverted Data Input	3	
6	CML-I	Tx4p	Transmitter Non-Inverted Data Input	3	
7		GND	Ground	1	1
8	LVTTL-I	ModSelL	Module Select	3	
9	LVTTL-I	ResetL	Module Reset	3	
10		VccRx	+3.3V Power Supply Receiver	2	2
11	LVC MOS-I/O	SCL	2-wire serial interface clock	3	
12	LVC MOS-I/O	SDA	2-wire serial interface data	3	
13		GND	Ground	1	1
14	CML-O	Rx3p	Receiver Non-Inverted Data Output	3	
15	CML-O	Rx3n	Receiver Inverted Data Output	3	
16		GND	Ground	1	1
17	CML-O	Rx1p	Receiver Non-Inverted Data Output	3	
18	CML-O	Rx1n	Receiver Inverted Data Output	3	
19		GND	Ground	1	1
20		GND	Ground	1	1
21	CML-O	Rx2n	Receiver Inverted Data Output	3	

22	CML-O	Rx2p	Receiver Non-Inverted Data Output	3	
23		GND	Ground	1	1
24	CML-O	Rx4n	Receiver Inverted Data Output	3	
25	CML-O	Rx4p	Receiver Non-Inverted Data Output	3	
26		GND	Ground	1	1
27	LVTTL-O	ModPrsL	Module Present		
28	LVTTL-O	IntL/RxL OSL	Interrupt. Optionally configurable as RxLOSL via the management interface		
29		VccTx	+3.3V Power supply transmitter	2	2
30		Vcc1	+3.3V Power supply	2	2
31	LVTTL-I	LPMODE	Low Power Mode. Optionally configurable as TxDis via the management interface		
32		GND	Ground	1	1
33	CML-I	Tx3p	Transmitter Non-Inverted Data Input	3	
34	CML-I	Tx3n	Transmitter Inverted Data Input	3	
35		GND	Ground	1	1
36	CML-I	Tx1p	Transmitter Non-Inverted Data Input	3	
37	CML-I	Tx1n	Transmitter Inverted Data Input	3	
38		GND	Ground	1	1

Note1. GND is the symbol for signal and supply (power) common for the QSFP28 module. 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.

Note2. VccRx, Vcc1 and VccTx are applied concurrently and may be internally connected within the module in any combination. Vcc contacts in SFF-8662 and SFF-8672 each have a steady state current rating of 1A.

## VII. Host Board Power Supply Filtering



## VIII. ESD and Reliability

The module meet ESD requirements given in EN61000-4-2, criterion B test specification when installed in a properly grounded cage and chassis. The units are subjected to 15kV air discharges during operation and 8kV direct contact discharges to the case. The module high speed signal contacts shall withstand electrostatic discharge based on Human Body Model per JEDEC JESD22-A114-B.

The module reliability test and ESD test comply with MIL-STD-883H and Telcordia GR-468-CORE (2004)

## IX. Ordering information

Part Number	Product Description
AE-QSFP28-ER4	QSFP28, 100Gb/s, LAN WDM, DDM, LC Connector, 40km, 0°C~+70°C