

QDD-400G-ER4

400GBASE-ER4 QSFP-DD | 1310 nm | 30 / 40 km SMF | duplex LC

1. Product overview

QSFP-DD optical transceiver with four LAN-WDM EML transmitters, APD receivers, optical MUX/DEMUX and a DSP gearbox with an eight-channel retimer and FEC block. Eight electrical PAM4 channels are converted to four optical channels and vice versa. Supports 30 km with host KP4 FEC or 40 km with built-in PFEC.

2. Key features

QSFP-DD MSA; IEEE 802.3bs electrical/optical interfaces; LAN-WDM grid per IEEE 802.3ba; 76-pin connector; 8x53.125 Gb/s electrical (400GAUI-8); 106.25 Gb/s optical per channel; 12 W maximum; single 3.3 V supply; DOM.

3. Applications

Data Center Interconnect; 400G Ethernet; enterprise networking.

4. Technical data

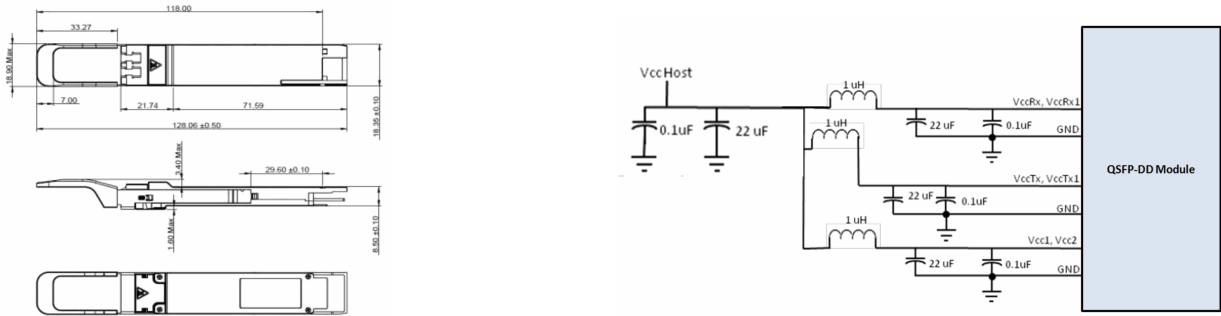
Parameter	Specification	Parameter	Specification
Form factor / optical interface	QSFP-DD / duplex LC	Absolute supply / humidity	-0.5 to 3.6 V / 0-85%, non-condensing
Supply current / power	3.64 A max / 12 W max	Absolute damage threshold, per lane	-5.0 dBm min
Storage / absolute case temperature	-40 to +85°C / 0 to +70°C		

Electrical characteristics

Parameter	Specification	Parameter	Specification
TX / RX signaling rate	26.5625 ±100 ppm GBd (TP1 / TP4)	RX differential p-p / AC common-mode RMS	900 mVpp max / 17.5 mV max
TX differential p-p tolerance	900 mVpp min (TP1a) [E1]	RX termination mismatch / return loss	10% max / IEEE 802.3-2015 Eq. 83E-2
TX termination mismatch	10% max (TP1)	RX transition (20-80%)	9.5 ps min
TX differential / diff-to-common return loss	IEEE 802.3-2015 Eq. 83E-5 / 83E-6; dB	RX near / far eye symmetry mask width	0.265 / 0.2 UI min
TX stressed input test	IEEE 802.3bs 120E.3.4.1 (TP1a) [E2]	RX near / far differential eye height	70 / 30 mV min
TX single-ended voltage tolerance	-0.4 to 3.3 (source unit omitted; TP1a)	RX far-end pre-cursor ISI ratio	-4.5 to +2.5%
TX / RX DC common-mode voltage	-350 to +2850 mV (TP1 / TP4) [E3]		

[E1] Pattern PRBS31Q or scrambled idle, exception to IEEE 802.3bs 120E.3.1.2. [E2] BER per IEEE 802.3bs 120E.1.1. [E3] Host-generated DC common mode includes ground-offset effects.

Source mechanical drawing and recommended host supply filter



5. Recommended operating conditions

Parameter	Specification	Parameter	Specification
Case temperature / supply	0 to 70°C / 3.135 / 3.3 / 3.465 V (min/typ/max)	Pre-FEC / post-FEC BER	2.4×10^{-4} / 1×10^{-13} max; host FEC
Lane rate / accuracy	26.5625 GBd typ, PAM4 / -100 to +100 ppm	Distance / required FEC	0.002-30 km with host FEC; 0.002-40 km with built-in PFEC

Simplified functional illustration



QDD-400G-ER4

6. Optical characteristics

Center wavelength	Min / typical / max (nm)	Center wavelength	Min / typical / max (nm)
L0	1294.53 / 1295.56 / 1296.59	L2	1303.54 / 1303.58 / 1303.63
L1	1299.02 / 1300.05 / 1301.09	L3	1308.09 / 1308.14 / 1310.19

Transmitter (per lane where stated)	Specification	Receiver / stressed test	Specification
Optical lane rate / modulation	53.125 ±100 ppm GBd / PAM4	Optical lane rate / modulation	53.125 ±100 ppm GBd / PAM4
SMSR	30 dB min	Damage threshold, each lane	-2.4 dBm min
Average launch power, each lane	0.4 to 6.5 dBm [O1]	Receiver saturation, each lane	-3.4 min; unit absent
Total average launch power	14.7 dBm max	Sensitivity, each lane, 30 km	Max(12.1, SECQ - 13.5) dBm
OMAAouter, each lane	3.4 to 9 dBm [O2]	Sensitivity, each lane, 40 km	Max(15.1, SECQ - 16.5) dBm
OMAAouter minus TDECQ, each lane	2 dB min (source unit)	Stress test: SECQ, lane under test	3.4 dB typ [O8]
TDECQ, each lane	3.9 dB max	Stress test: SECQ - 10*log10(Ceq)	Value blank in source (dB)
Extinction ratio	6 dB min	Stress test: aggressor lane OMAouter	-8 dBm typ
OMAAouter difference, any two lanes	4 dB max		
RIN17.1OMA	-132 dB/Hz min		
Optical return loss tolerance	15.6 dB max		
Transmitter reflectance	-26 dB max		
Average launch power, OFF / lane	-30 dBm max		

7. Digital diagnostics and management

Function	Source specification
Monitoring absolute error	Temperature ±3°C over operating temperature; Vcc ±0.1 V over full operating range; TX/RX optical power ±2 dB per lane; bias ±10% (source unit mA). Fiber-dependent fluctuation ±1 dB may yield ±3 dB total optical-power accuracy.
Controls / reset	ModSelL low selects 2-wire access; SCL/SDA access memory. ResetL low returns defaults; ignore status until IntL signals completion with Data_Not_Ready negated. Same completion interrupt at power-up/hot insertion.
InitMode / presence / interrupt	InitMode is pulled up to Vcc: high = host software control, remain low power until enabled; low = hardware control, may enter high power after management initializes. Do not change while present; legacy LPMode per SFF-8679. ModPrsL low = present; IntL low = fault/status, open collector with host pull-up. Pin 28 optionally RxLOSL via SFF-8636.

Pin assignment / interface notes: TX p/n lanes 1-8: 36/37, 3/2, 33/34, 6/5, 74/75, 41/40, 71/72, 44/43 (CML-I; p non-inverted/n inverted). RX p/n lanes 1-8: 17/18, 22/21, 14/15, 25/24, 55/56, 60/59, 52/53, 63/62 (CML-O). GND: 1,4,7,13,16,19,20,23,26,32,35,38,39,42,45,51,54,57,58,61,64,70,73,76. 3.3 V: VccRx10, VccTx29, Vcc1 30, VccRx1 48, VccTx1 67, Vcc2 68. Controls: ModSelL8, ResetL9, SCL11, SDA12, ModPrsL27, IntL28, InitMode31. Reserved46/66/69; VS1/2/3=47/49/50; NC65. All power pins internally connected; apply concurrently. Source sequence notes: pins1-38 suffix B,39-76 A; GND1, power2, other3.

8. Safety and regulatory

RoHS compliant. ESD: 1 kV high-speed data pins, 2 kV other electrical input pins; MIL-STD-883 Method 3015.4 / JESD22-A114-A (HBM). Use ESD-protected handling. Class 1 per EN 60825-1:2014; 21 CFR 1040.10 / 1040.11 except Laser Notice No. 50, June 24, 2007. Unspecified controls or procedures may cause hazardous radiation exposure.

9. Ordering information

Product / file identifier	Description
QDD-400G-ER4	QSFP-DD 400G-ER4 4x100Gbps up to 40km, 1310nm 17.7dB SM LC.