QSFP-ER4L-100G

QSFP28 100GBASE-ER4 Lite | 1310 nm | 30 / 40 km

1. Product overview

100 Gb/s optical transceiver converting four 25 Gb/s electrical inputs to four LAN WDM optical signals, multiplexed onto one fiber. The receive path demultiplexes the optical input and converts it to four electrical outputs. Cooled EA-DFB / EML transmitters and APD receivers support G.652 SMF links up to 30 km without FEC and 40 km with FEC. TX and RX CDR circuits retime signals and reduce jitter; automatic power control maintains optical output.

2. Key features

- Hot-pluggable QSFP28 MSA form factor; Ethernet 100GBASE-ER4 Lite
- 103.1 Gb/s aggregate; four cooled 25 Gb/s LAN WDM EML TOSA channels and APD ROSA
- 4 x 25G electrical interface, OIF CEI-28G-VSR; single 3.3 V supply
- Digital diagnostics over two-wire serial interface; RoHS-6 compliant

3. Applications

100GBASE-ER4 Ethernet links; client-side 100G telecom connections.

4. Technical data

Parameter	Specification
Aggregate / per-lane rate	103.1 Gb/s / 25.78125 Gb/s typical; accuracy -100 to +100 ppm
Reach on G.652 SMF	30 km without FEC; 40 km with FEC; based on 0.4 dB/km fiber insertion loss
Maximum power / supply current	4.5 W / 1.36 A
Storage / relative humidity	-40 to +85°C; 0-85%, non-condensing
Control input voltage	High: 2 V to Vcc; low: 0 to 0.8 V
Supply filtering	Each VccTx/VccRx/Vcc1 branch: 1 µH series, 0.1 µF and 22 µF shunts; host 3.3 V: 0.1 µF and 22 µF shunts
Supply pins	Apply VccRx, VccTx and Vcc1 concurrently; may be internally connected. Each connector pin: 1000 mA maximum.
Mechanical drawing values	122.00 ±1; 78.00; 18.35 ±0.12; 8.50 ±0.10; 2.25 ±0.10; 2.40; 1.50; 6.25 (source drawing units not stated)

Electrical characteristics: EOL; case 0-70°C; supply 3.135-3.465 V. Per lane.

TX input	Specification	RX output	Specification
Overload differential p-p, TP1a	900 mV min	Differential p-p, TP4	900 mV max
Common-mode, TP1	-350 to 2850 mV	Common-mode, TP4	-350 to 2850 mV
Termination mismatch, TP1	10% max at 1 MHz	Termination mismatch, TP4	10% max at 1 MHz
Differential return loss SDD11	CEI-28G-VSR Eq. 13-19	Differential return loss SDD22	CEI-28G-VSR Eq. 13-19
Mode conversion SDC11/SCD11	CEI-28G-VSR Eq. 13-20	Mode conversion SDC22/SCD22	CEI-28G-VSR Eq. 13-21
Stressed input, TP1a	CEI-28G-VSR 13.3.11.2.1	Common-mode RMS noise	17.5 mV max
Host-generated Vcm	Includes ground offset	Common-mode return loss SCC22	-2 dB max
Source frequency note	250 MHz to 30 GHz	Transition time 20-80%	9.5 ps min
Interface	CEI-28G-VSR	VEC / eye width at 10^-15	5.5 dB max / 0.57 UI min

5. Recommended operating conditions

Parameter	Specification
Operating case temperature	0 to +70°C
Supply voltage (min / typ / max)	3.135 / 3.3 / 3.465 V

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6. Optical characteristics

EOL; case 0-70°C; Vcc 3.135-3.465 V. Per lane unless stated otherwise. Min/typ/max are explicitly identified.

Wavelengths / transmitter	Specification
L0 wavelength min/typ/max	1294.53 / 1295.56 / 1296.59 nm
L1 wavelength min/typ/max	1299.02 / 1300.05 / 1301.09 nm
L2 wavelength min/typ/max	1303.54 / 1304.58 / 1305.63 nm
L3 wavelength min/typ/max	1308.09 / 1309.14 / 1310.19 nm
SMSR	30 dB min
Total average launch power	10.5 dBm max
Average launch power	-2.9 to +4.5 dBm
OMA [1]	0.1 to 4.5 dBm
Launch OMA difference, any 2 lanes [2]	3.6 dB max
Launch OMA minus TDP	-0.65 dBm min
TDP	2.5 dB max
Extinction ratio	7 dB min
RIN20OMA	-130 dB/Hz max
Optical return loss tolerance	20 dB max
Transmitter reflectance	-12 dB max
TX-off average launch power	0 min / -30 max dBm
Eye mask X1/X2/X3/Y1/Y2/Y3	0.25 / 0.4 / 0.45 / 0.25 / 0.28 / 0.4

Receiver / stress test	Specification
Damage threshold [3]	-3.0 dBm min
Average receive power, 30 km	-16.9 to -4.9 dBm
Average receive power, 40 km	-20.9 to -4.9 dBm
Receive OMA	-1.9 dBm max
Sensitivity OMA, BER 1x10^-12	-14.65 dBm max
Stressed sensitivity OMA, BER 1x10^-12	-12.65 dBm max
Sensitivity OMA, BER 5x10^-5	-18.65 dBm max
Stressed sensitivity OMA, BER 5x10^-5	-16.65 dBm max
Receiver reflectance	-26 dB max
Receive power difference, any 2 lanes (average and OMA)	3.6 dB max
LOS Deassert, LOSA (source label)	-26 dBm typ
LOS Deassert, LOSD (source label)	-24 dBm typ
LOS hysteresis (listed twice)	0.5 dB min
Electrical 3 dB upper cutoff	31 GHz max
Stress test: vertical eye closure penalty [4]	1.5 dB typ
Stress test: J2 / J9 jitter [4]	0.3 / 0.47 UI typ

[1] Source note: minimum average launch power assumes ER no greater than 9.5 dB and OMA above 0.1 dBm. [2] Even for TDP <0.75 dB, OMA must exceed its specified minimum. [3] Continuous modulated input at the damage threshold must not cause damage; correct operation is not required. [4] Eye closure and jitter values are stressed-sensitivity test conditions, not receiver characteristics.

7. Digital diagnostics and management

Parameter	Specification
Monitor absolute error	Temperature: -3 to +3°C over operating temperature; supply: -0.1 to +0.1 V over full operating range; RX and TX channel power: -2 to +2 dB; channel bias: -10% to +10% (source unit mA). Fiber measurement variation may add ±1 dB, for ±3 dB total power accuracy.
Control / status	Two-wire SCL/SDA access QSFP28 memory map; ModSelL low selects module. ResetL low resets defaults; ignore status until IntL reset-completion with Data_Not_Ready negated, also after power-up. LPMode limits power; ModPrsL low indicates presence. TX_DIS and/or serial control disable TX; weak received signal triggers RX_LOS as described.

Source pin table: GND: 1,4,7,13,16,19,20,21,23,26. TX CML-I: 2 Tx2n, 3 Tx2p, 5 Tx4n, 6 Tx4p (p entries labelled “Data output”). RX CML-O: 14 Rx3p,15 Rx3n,17 Rx1p,18 Rx1n,22 Rx2p,24 Rx4n,25 Rx4p. Controls: 8 ModSelL,9 ResetL,11 SCL,12 SDA,27 ModPrsL,28 IntL,31 LPMode. Supply: 10 VccRx,29 VccTx,30 Vcc1. Signal/power grounds are common; connect directly to host ground plane.

8. Safety and regulatory

QSFP28 MSA; source description also references QSFP+ MSA; IEEE 802.3ba LAN WDM; 100GBASE-ER4 Lite; OIF CEI-28G-VSR; RoHS-6. ESD: 1 kV SFI pins, 2 kV other electrical inputs, MIL-STD-883 Method 3015.4 / JESD22-A114-A (HBM). Use ESD-protected handling. Class 1 laser, EN 60825-1:2014; 21 CFR 1040.10/1040.11 except Laser Notice 50 deviations (24 June 2007). Unspecified adjustments or procedures may cause hazardous radiation exposure.

9. Ordering information

Parameter	Specification
Q100G-ER4L	QSFP28 100GBASE-ER4, 1310 nm, 40 km transceiver (40 km with FEC)