

LQP100-ER4

QSFP28 100Gb/s Single-mode 40km DDM Transceiver

PRODUCT FEATURES

- Support line rates from 111.81 Gb/s;
- Transmission data rate up to 27.95Gbps per channel
- Up to 40km transmission on single mode fiber
- LAN WDM EML laser and PIN receiver with SOA;
- Support Multi-Pin function with IntL/RxLOSL and LPMode/TxDIS;
- High speed I/O electrical interface (CAUI-4);
- I2C interface with integrated Digital Diagnostic monitoring;
- QSFP28 MSA package with duplex LC connector;
- Single +3.3V power supply;
- Maximum power consumption 6.5 W;
- Operating case temperature: 0 to +70 °C;
- Complies with EU Directive 2015/863/EU;

APPLICATIONS

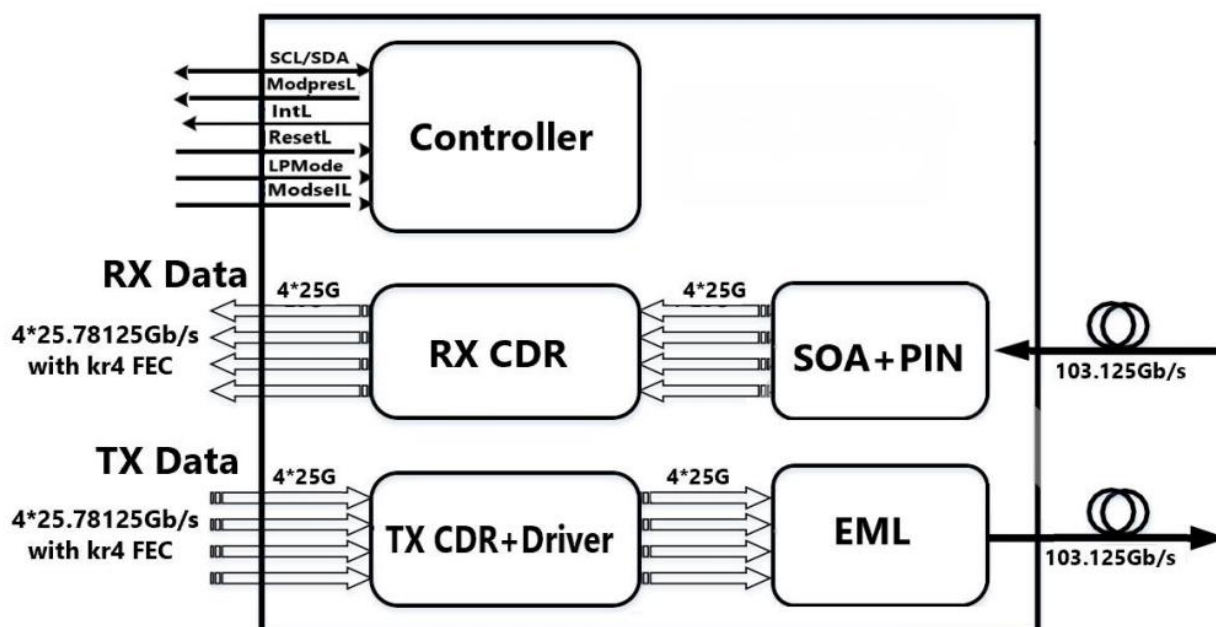
- 100GBASE-ER4 Ethernet
- ITU-T G.959.1 OTU4 (4L1-9C1F)
- 100G Datacom& Telecom connections

DESCRIPTIONS

Lightrend LQP100-ER4 is designed for 40km optical communication applications. This module contains 4-lane optical transmitter, 4-lane optical receiver and module management block

including 2 wire serial inter-face. The optical signals are multiplexed to a single-mode fiber through an industry standard LC connector. A block diagram is shown in Figure

Transceiver Block Diagrams



Ordering information

Package	Part No.	Data Rate(Gbps)	Laser	Fiber Type	Distance(k m)	Temp (℃)	Power Dissipation (W)
QSFP28	LQP100-ER4	111.81	LWDM	SMF	40	0~70	<6.5

I. Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Unit
Storage Temperature	TS	-40	+85	℃
Maximum Supply Voltage	VCC	-0.5	3.6	V
Operating Relative Humidity	RH		85	%

II. Recommended Operating Conditions

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Operating Case Temperature	T _C	0		+70	°C	
Power Supply Voltage	V _{CC}	3.13	3.3	3.47	V	
Power Supply Current	I _{CC}			1.95	A	
Maximum Power Dissipation	P _D			6.5	W	
Aggregate Bit Rate	BR _{AVE}		103.125	111.81	Gb/s	
Lane Bit Rate	BR _{LANE}		25.78125	27.9525	Gb/s	
Transmission Distance	TD			40	km	
Coupled fiber	Single mode fiber					9/125um SMF

III. Optical Characteristics

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Transmitter						
Signaling Speed per Lane			25.78125	27.9525	Gbps	
Lane Wavelength	L0	1294.53	1295.56	1296.59	nm	
	L1	1299.02	1300.05	1301.09	nm	
	L2	1303.54	1304.58	1305.63	nm	
	L3	1308.09	1309.14	1310.19	nm	
Total Average Launch Power	P _T			8.9	dBm	1
Average Launch Power per Lane,	P _{avg}	-2.7		2.9	dBm	1
OMA, each Lane	P _{OMA}	0		4.5	dBm	1
Difference in launch power between any two lanes(Average and OMA) between any Two Lanes (OMA)	P _{tx,diff}			3.6	dB	
Average Output Power (Laser Turn off)	P _{off}			-30	dBm	
Side Mode Suppression Ratio	SMSR	30			dB	
Extinction Ratio, 100GE	ER	8.2			dB	
RIN20OMA	RIN			-130	dB/Hz	
Optical Return Loss Tolerance	TOL			20	dB	
Transmitter Reflectance	R _T			-12	dB	
Optical Eye Mask	{0.25,0.4, 0.45, 0.25, 0.28, 0.4}				%	2
Receiver						
Signaling rate, each lane			25.78125	27.9525	Gbps	
Center Wavelength Lane 0	λ0	1294.53	1295.56	1296.59	nm	
Center Wavelength Lane 1	λ1	1299.02	1300.05	1301.09	nm	

Center Wavelength Lane 2	λ_2	1303.54	1304.58	1305.63	nm	
Center Wavelength Lane 3	λ_3	1308.09	1309.14	1310.19	nm	
Damage threshold , each lane	Pdamage	4.5			dBm	
Average Receive Power, each lane		-23.2		4.5	dBm	
Receiver sensitivity Average, each lane (100GbE)	SEN			-21.4	dBm	3
Equivalent Sensitivity for Each Lane (OTU4)	SEN			-23.2		4
Los Assert	LosA	-30			dBm	
Los De-assert	LosDA			-24	dBm	
Los Hysteresis	LosH	0.5			dB	

Note:

1. The optical power is launched into SMF.
2. Measured with a PRBS 2³¹-1 test pattern @25.78125, Hit ratio≤5E-5.
3. Measured with a PRBS 2³¹-1 test pattern @25.78125 Gb/s, BER≤1E-12.
4. Measured with a PRBS 2³¹-1 test pattern @27.9525 Gb/s, BER≤5E-5.

IV. Electrical Characteristics

High-Speed Signal: Compliant to CAUI-4 (IEEE 802.3bm)

Low-Speed Signal: Compliant to SFF-8679.

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Transmitter (Module Input)						
Data Rate, each lane			25.78125	27.9525	Gbps	
Differential Voltage pk-pk	Vpp			900	mV	1
Common Mode Voltage	Vcm	-350		2850	mV	
Transition time	Trise/Tfall	10			ps	2
Receiver (Module Output)						
Data Rate, each lane			25.78125	27.9525	Gbps	
Common Mode Noise, RMS	Vrms			17.5	mV	
Differential output voltage swing	Vout, pp			900	mV	
Eye width	EW15	0.57			UI	
Eye height	EH15	228			mV	
Differential Termination Resistance Mismatch				10	%	1
Transition time	Trise/Tfall	12			ps	

Notes:

1. At 1 MHz.
2. 20%~80%.

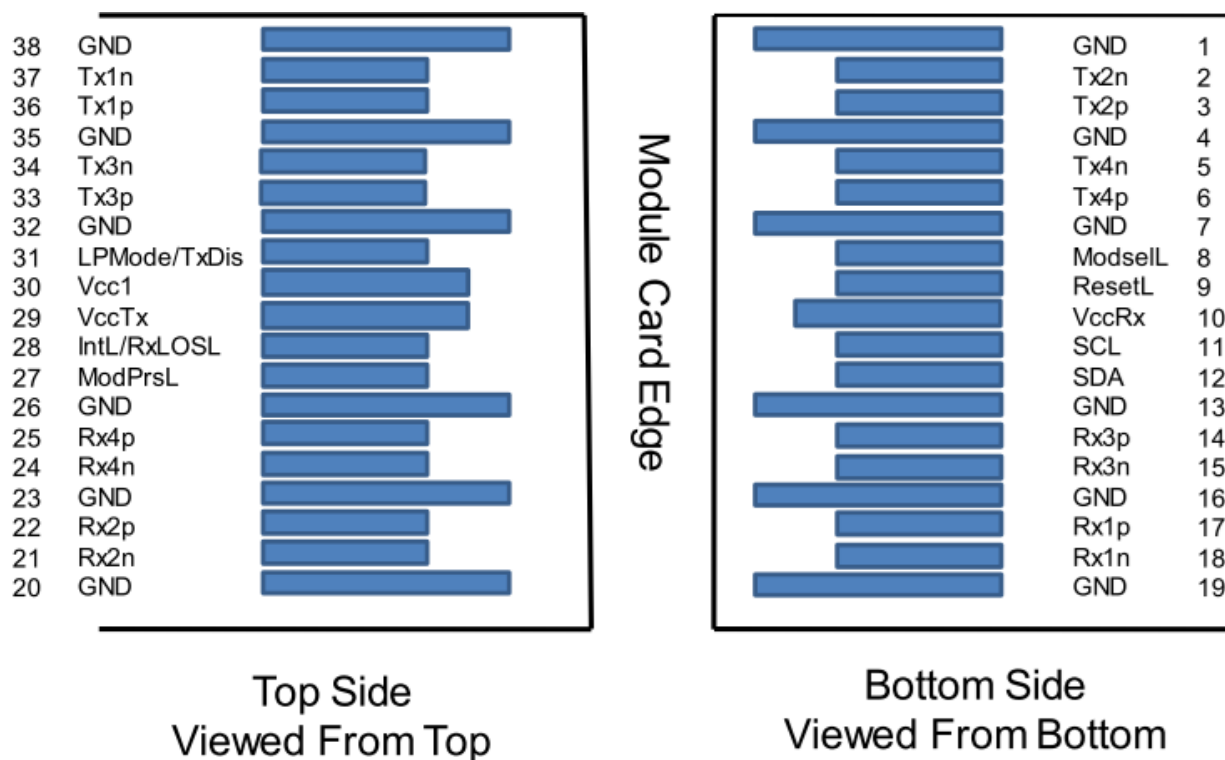
V. Digital Diagnostics

Parameter	Range	Unit	Accuracy	Calibration
Temperature	0 to +70	°C	±3°C	Internal / External
Voltage	3.0 to 3.6	V	±3%	Internal / External
Bias Current	30 to 100	mA	±10%	Internal / External
TX Power	1 to 6.5	dBm	±3dB	Internal / External
RX Power	-28 to 4.5	dBm	±3dB	Internal / External

Note:

The transceivers provide serial ID memory contents and diagnostic information about the present operating conditions by the 2-wire serial interface (SCL, SDA). The diagnostic information with internal calibration or external calibration all are implemented, including received power monitoring, transmitted power monitoring, bias current monitoring, supply voltage monitoring and temperature monitoring.

VI. Pin Diagram



VII. Pin Descriptions

PIN	Logic	Symbol	Description	Plug Seq.	Notes
1		GND	Ground	1	1
2	CML-I	Tx2n	Transmitter Inverted Data Input	3	
3	CML-I	Tx2p	Transmitter Non-Inverted Data output	3	
4		GND	Ground	1	1
5	CML-I	Tx4n	Transmitter Inverted Data Input	3	
6	CML-I	Tx4p	Transmitter Non-Inverted Data output	3	
7		GND	Ground	1	1
8	LVTLL-I	ModSelL	Module Select	3	
9	LVTLL-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	
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	1
25	CML-O	Rx4p	Receiver Non-Inverted Data Output	3	
26		GND	Ground	1	1
27	LVTTL-O	ModPrsL	Module Present	3	
28	LVTTL-O	IntL/Rx_LOS	Interrupt/Rx_LOS	3	
29		VccTx	+3.3 V Power Supply transmitter	2	2
30		Vcc1	+3.3 V Power Supply	2	2
31	LVTTL-I	LPMo de/TxDI S	Low Power Mode/Tx_Disable	3	
32		GND	Ground	1	1
33	CML-I	Tx3p	Transmitter Non-Inverted Data Input	3	
34	CML-I	Tx3n	Transmitter Inverted Data Output	3	
35		GND	Ground	1	1
36	CML-I	Tx1p	Transmitter Non-Inverted Data Input	3	

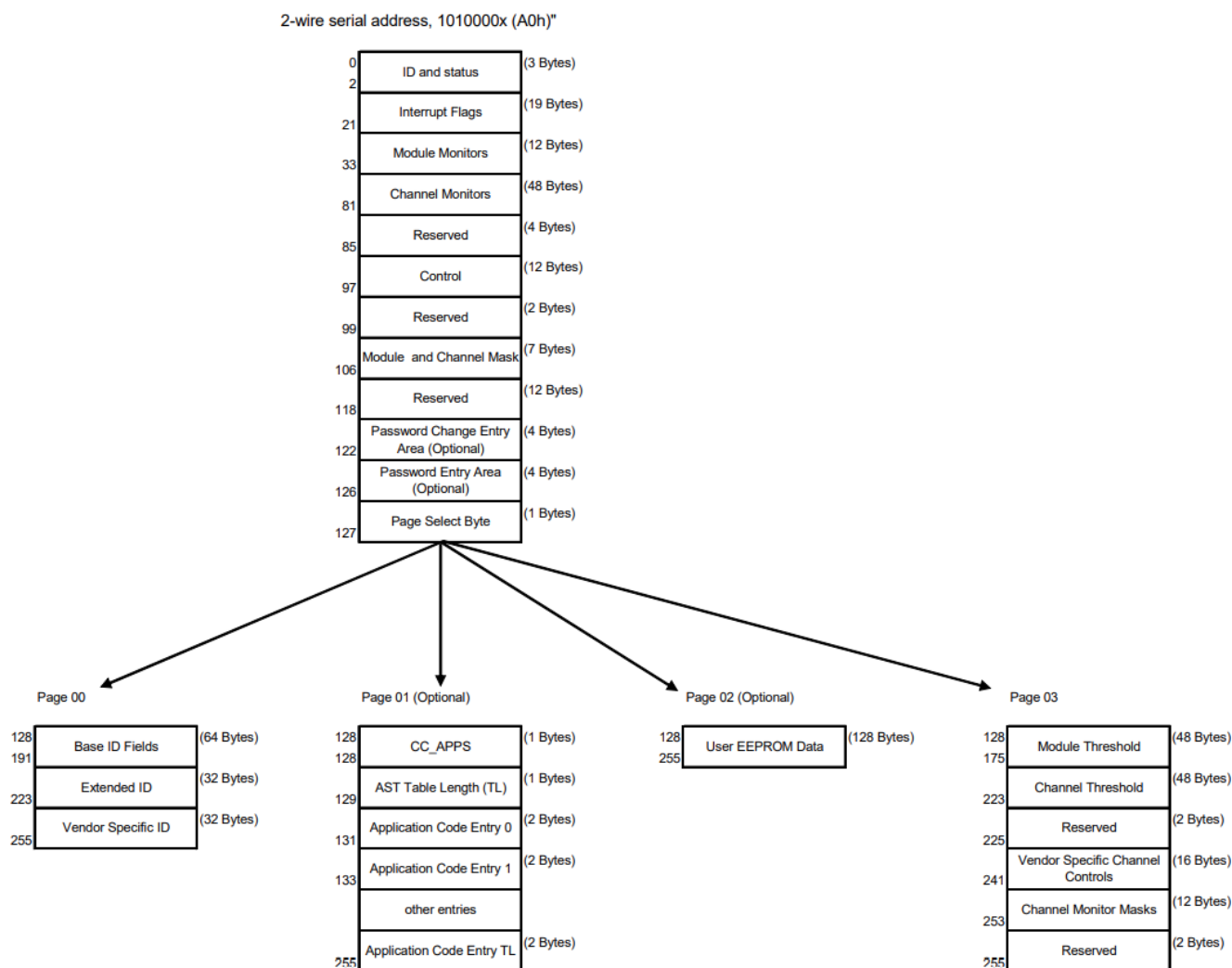
37	CML-I	Tx1n	Transmitter Inverted Data Output	3	
38		GND	Ground	1	1

Notes:

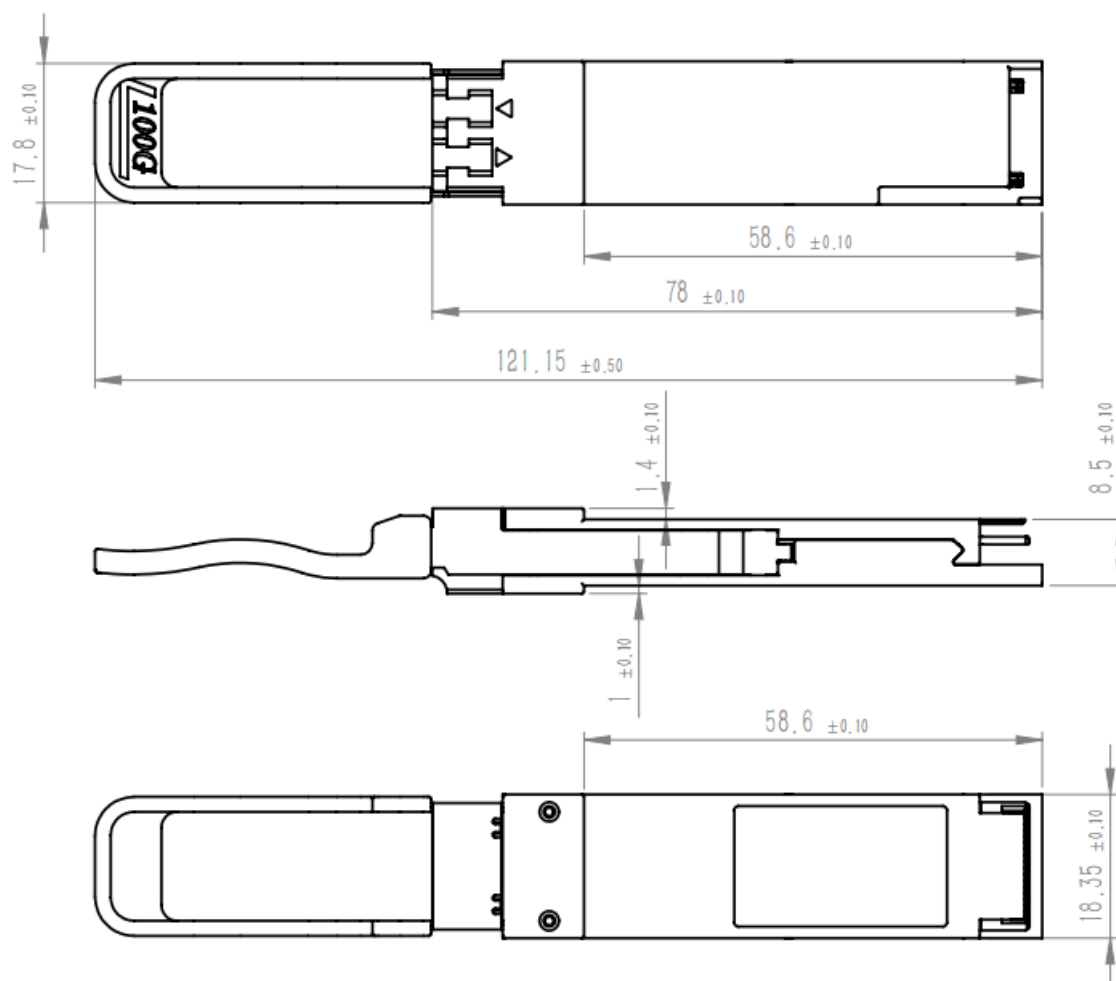
1. GND is the symbol for signal and supply (power) common for the QSFP28 module. All are common within the QSFP28 module and all module voltages are referenced to this potential unless otherwise noted. Connect these directly to the host board signal-common ground plane.
2. Vcc Rx, Vcc1 and Vcc Tx are the receiver and transmitter power supplies and shall be applied concurrently. Requirements defined for the host side of the Host Edge Card Connector are listed in MSA. The connector pins are each rated for a maximum current of 500 mA.

VIII.EEPROM Information

EEPROM memory map specific data field description is as below



IX. Mechanical Specifications(Unit: mm)



Revision History

Version No.	Date	Description
1.0	June 22, 2021	Preliminary datasheet

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