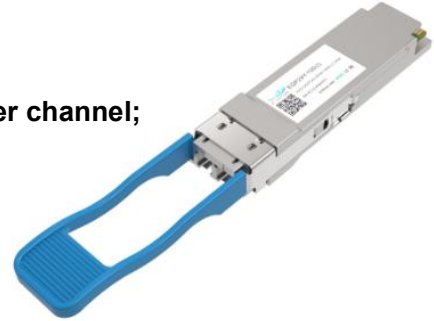


EQ23110X-3LID10

QSFP28 100Gb/s Single-mode 10km DDM Transceiver

PRODUCT FEATURES

- Support line rates from 103.125 Gbps to 111.8 Gbps;
- Transmission data rate up to 25.78 and 27.95 Gbps (NRZ) per channel;
- Up to 10km transmission on single mode fiber;
- 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; Dissipation:
 - Commercial(0~70): < 4W
 - Industrial(-40~85): < 5W
- Complies with EU Directive 2015/863/EU;



APPLICATIONS

- 100GBASE-LR4 Ethernet
- 100G Datacom & Telecom connections
- ITU-T OTU4

DESCRIPTIONS

100G QSFP LR4 Transceiver is designed for 10km 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.

Ordering information

Package	Product part NO.	Data Rate(Gbps)	Media	Transmission Distance(km)	Temperature Range (°C)		Laser	Power Dissipation (W)
QSFP28	EQ23110 X-3LCD10	103.125 to 111.8	SMF	10	0~70	Commercial	LWDM	<4
QSFP28	EQ23110 X-3LID10	103.125 to 111.8	SMF	10	-40~85	Industrial	LWDM	<5

I. Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Unit
Storage Temperature	TS	-40	+85	°C
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	Top	0		+70	°C	EQP29Y-10D	
		-40		+85		EQP29Y-10DI	
Power Supply Voltage	V _{CC}	3.13	3.3	3.47	V		
Power Supply Current	I _{CC}			1.21	A	EQP29Y-10D	
				1.51	A	EQP29Y-10DI	
Maximum Power Dissipation	P _D			4	W	EQP29Y-10D	
				5		EQP29Y-10DI	
Aggregate Bit Rate	BR _{AVE}		103.125	111.8	Gb/s		
Lane Bit Rate	BR _{LANE}		25.78125	27.95	Gb/s		
Transmission Distance	TD			10	km		
Coupled fiber	Single mode fiber						9/125um SMF

III. Optical Characteristics

Specifications for 100Gbase-LR4

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Transmitter						
Signaling Speed per Lane			25.78125		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			10.5	dBm	1
Average Launch Power per Lane,	P_{avg}	-4.3		4.5	dBm	1
OMA, each Lane	P_{OMA}	-1.3		4.5	dBm	1
Difference in launch power between any two lanes(Average and OMA) between any Two Lanes (OMA)	$P_{tx,diff}$			3	dB	
Average Output Power (Laser Turn off)	P_{off}			-30	dBm	
Side Mode Suppression Ratio	SMSR	30			dB	
Extinction Ratio	ER	4			dB	
RIN_{20OMA}	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		Gbps	
Center Wavelength Lane 0	λ_0	1294.53	1295.56	1296.59	nm	
Center Wavelength Lane 1	λ_1	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	P_{damage}	5.5			dBm	
Average Receive Power, each lane		-10.6		4.5	dBm	
Receiver Sensitivity (OMA) per Lane	SEN			-8.6	dBm	3
Los Assert	LosA	-30			dBm	
Los De-assert	LosDA			-12	dBm	
Los Hysteresis	LosH	0.5			dB	

Note:

1. The optical power is launched into SMF.
2. Measured with a PRBS $2^{31}-1$ test pattern @25.78125, Hit ratio $\leq 5E-5$.
3. Measured with a PRBS $2^{31}-1$ test pattern @25.78125 Gb/s, BER $\leq 1E-12$.

Specifications for OUT4 4I1-9D1F

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Transmitter						
Signaling Speed per Lane			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			10	dBm	1
Average Launch Power per Lane,	P_{avg}	-0.6		4	dBm	1
Difference in launch power between any two lanes(Average and OMA) between any Two Lanes (OMA)	$P_{tx,diff}$			3	dB	
Average Output Power (Laser Turn off)	P_{off}			-30	dBm	
Side Mode Suppression Ratio	SMSR	30			dB	
Extinction Ratio	ER	4		7	dB	
Optical Eye Mask		{0.25,0.4, 0.45, 0.25, 0.28, 0.4}			%	2
Receiver						
Signaling rate, each lane			27.95		Gbps	
Center Wavelength Lane 0	λ_0	1294.53	1295.56	1296.59	nm	
Center Wavelength Lane 1	λ_1	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	P_{damage}	5.5			dBm	
Average Receive Power, each lane		-6.9		4	dBm	
Receiver Sensitivity (OMA) per Lane	SEN			-8.6	dBm	4
Los Assert	LosA	-30			dBm	
Los De-assert	LosDA			-12	dBm	
Los Hysteresis	LosH	0.5			dB	

Note:

4. Measured with a PRBS $2^{31}-1$ test pattern @27.95 Gb/s, BER $\leq 1E-12$.

IV. Electrical Characteristics

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Transmitter (Module Input)						
Data Rate, each lane			25.78125	27.95	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	27.95	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%.

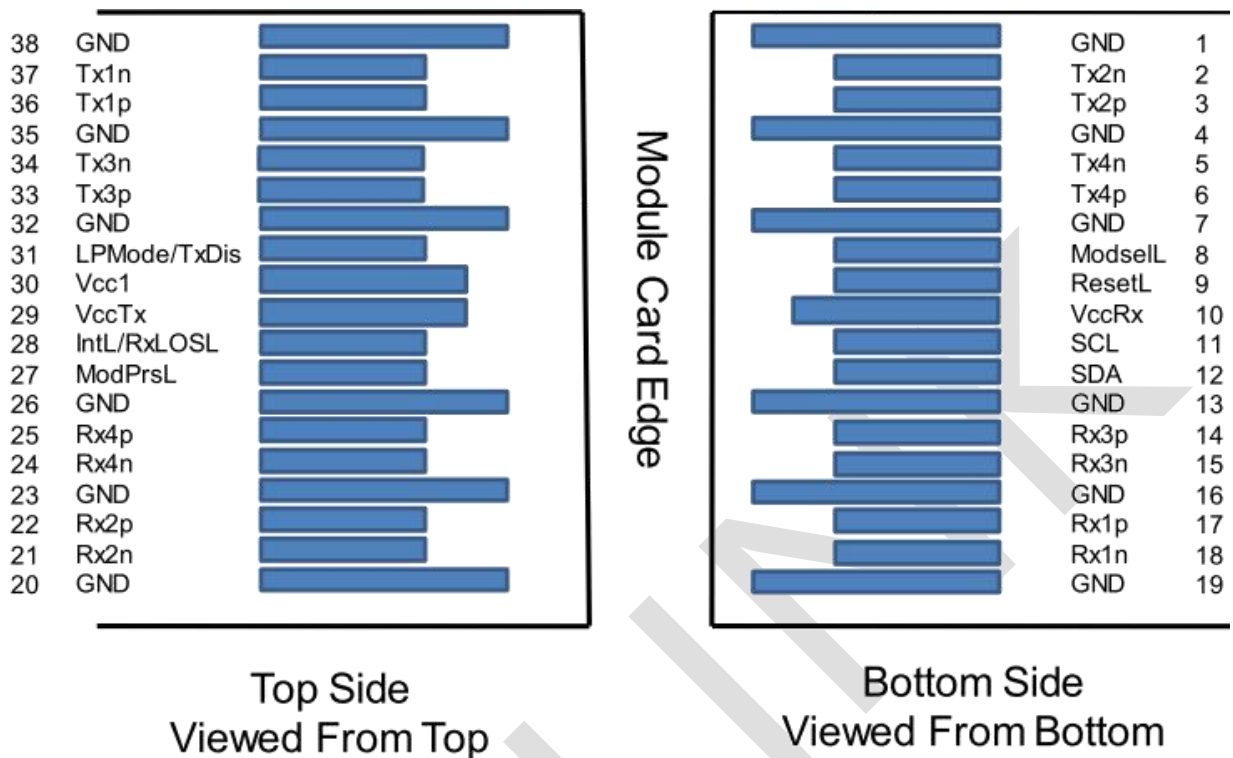
V. Digital Diagnostics

Parameter	Range	Unit	Accuracy	Calibration
Temperature	-40 to +85	°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	-4.3 to 4.5	dBm	±3dB	Internal / External
RX Power	-10.6 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	

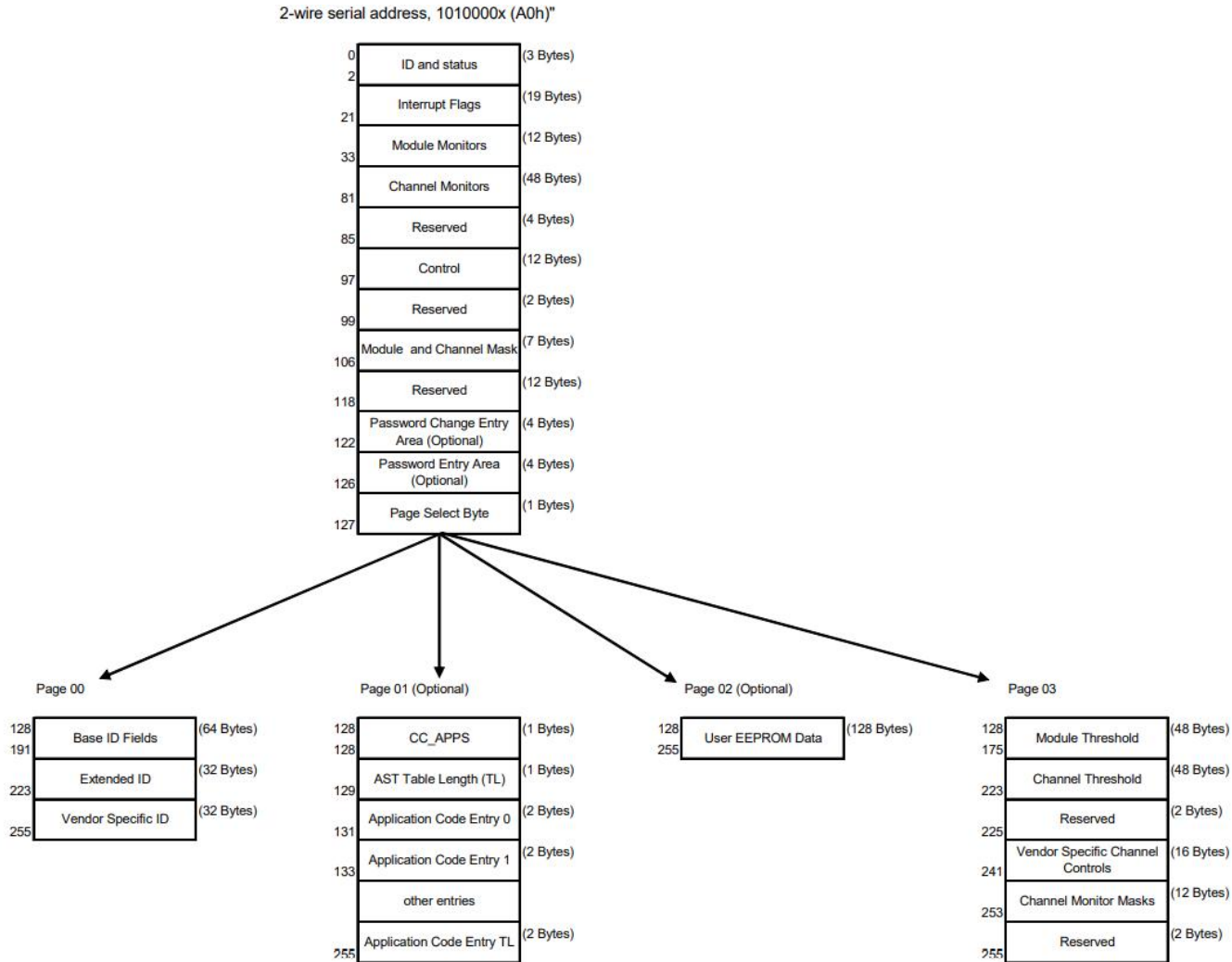
16		GND	Ground	1	1
17	CML-O	Rx1p	Receiver Non-Inverted Data Output	3	
18	CML-O	Rx1n	Receiver Inverted Data Output	3	
19		GND	Ground	1	1
20		GND	Ground	1	1
21	CML-O	Rx2n	Receiver Inverted Data Output	3	
22	CML-O	Rx2p	Receiver Non-Inverted Data Output	3	
23		GND	Ground	1	1
24	CML-O	Rx4n	Receiver Inverted 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	LPMoDe/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:

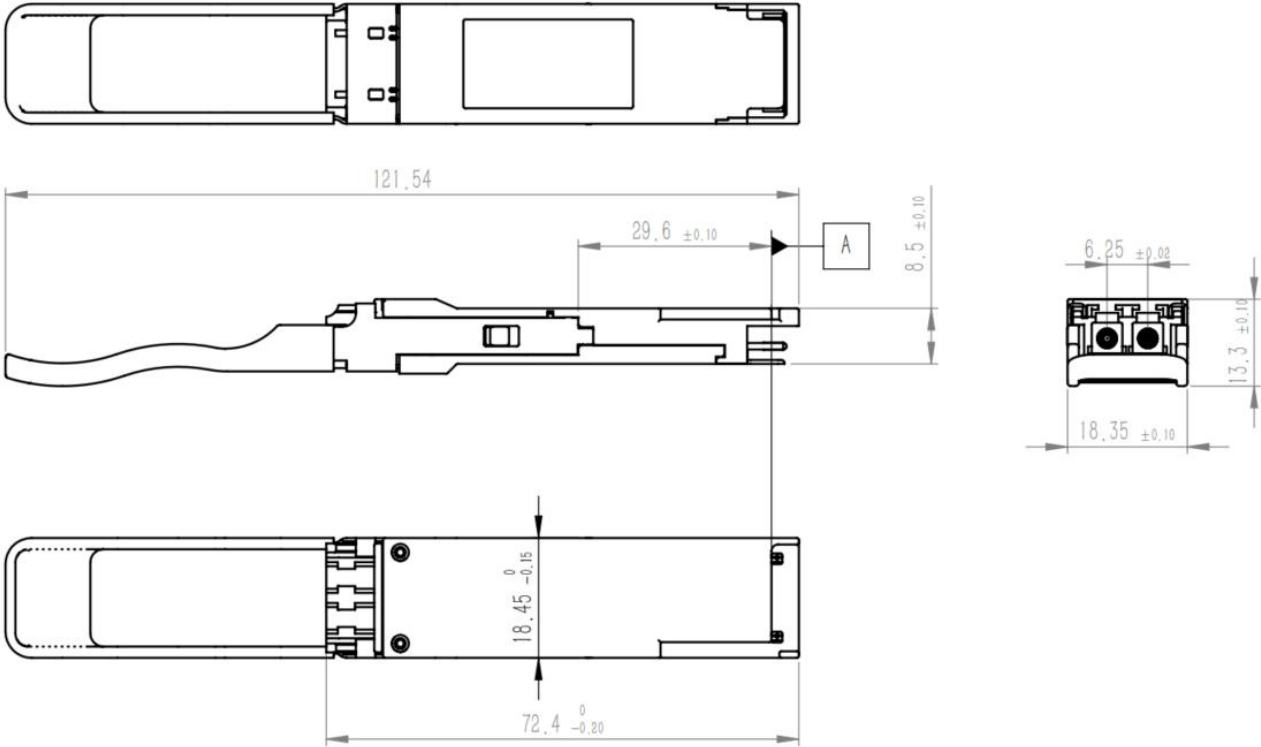
1. GND is the symbol for signal and supply (power) common for the QSFP28 module. All are common within the QSFP28 module and all module voltages are referenced to this potential unless otherwise noted. Connect these directly to the host board signal-common ground plane.
2. Vcc Rx, Vcc1 and Vcc Tx are 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 1000 mA.

VIII. EEPROM Information

EEPROM memory map specific data field description is as below



IX. Mechanical Specifications (Unit: mm)



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