TSQL4-E11JE3C Optical Transceiver

Single-Mode CPRI/100GBASE Transceiver, With Diagnostic Monitoring
Duplex QSFP28 CWDM4 10km Transceiver

Features

- Electrical interface: retimed CAUI-4 per 100G Ethernet IEEE 802.3bm Annex 83E
- Hot pluggable
- Link budget assumes the use of KR4 FEC by the host
- Uncooled CWDM DFB lasers, directly modulated
- User controllable Transmit Input Equalization and Receiver Output Amplitude
- Fiber connector: SMF LC duplex connector
- Power dissipation < 3.5W
- Distance up to 10km
- 2-wire interface with integrated Digital Diagnostic monitoring
- Operating case temperature: 0°C~+70°C
- RoHS6 compliant (lead free)

Applications

- Data Center Interconnect
- 100G CWDM4 applications with FEC

Description

The QSFP28 100G-CWDM4-10km module is a highly integrated 4x25G transceiver focused on reach, bandwidth, density and cost for high port-count 100G systems, and client-side 100G interfaces. It is compliant with the 100G 4WDM-10 MSA, which is based on the CWDM4 MSA version 1.1. It is interoperable with CWDM4 transceivers over a 10 km reach.

Absolute Maximum Ratings

These values represent the damage threshold of the module. Stress in excess of any of the individual Absolute Maximum Ratings can cause immediate catastrophic damage to the module even if all other parameters are within Recommended Operating Conditions.

Parameters	Symbol	Min.	Max.	Unit
Power Supply Voltage	VCC	-0.5	+3.6	V
Storage Temperature	Tc	-40	+85	°C
Relative Humidity	RH	0	85	%

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Recommended Operating Conditions

Parameter	Symbol	Min	Typical	Max	Unit
Power Supply Voltage	VCC	3.15	3.30	3.45	V
Operating Case Temperature	Tca	0		70	°C

Electrical Characteristics

Parameter	Symbol	Min.	Typical	Max	Unit	Ref.
Transmitter						
Input differential impedance	Rin	-	100	-	Ω	1
Single-ended Input Voltage Tolerance		-0.3	-	4.0	V	
AC Common Mode Input Voltage Tolerance		15		-	mV	
Differential Input Voltage		50	-	-	mV	
Differential Input Voltage swing, per lane	Vin	190		1000	mV	
Receiver						
Output differential impedance	Rout		100		Ω	1
Differential Output Swing, per lane	Vout	300		900	mV	2
AC Common Mode Output Voltage Tolerance				7.5	mV	
Single-ended Output Voltage		-0.3		4.0	V	

Notes:
[1] AC coupled.
[2] Into 100 ohm differential termination.

Transmitter Specifications – Optical

Parameter		Symbol	Min	Typical	Max	Unit	
Center Wavelength	Ch0	λ0	1264.5	1271	1277.5	nm	
	Ch1	λ1	1284.5	1291	1297.5	nm	
	Ch2	λ2	1304.5	1311	1317.5	nm	
	Ch3	λ3	1324.5	1331	1337.5	nm	
Bit Rate per Channel		DR	25.78125±100ppm			Gbps	1
Side Mode Suppression Ratio		SMSR	30	-	-	dB	
Average launch power each lane			-6.5		2.5	dBm	7
Optical Modulation Amplitude (each lane)		OMA	-4.0		2.5	dBm	
Transmit OMA per Lane @TDP max			-2.0			dBm	2
Launch power in OMA minus TDP, each lane		OMA-TDP	-5.0			dBm	
Transmission & dispersion penalty, each lane		TDP			3.0	dB	3

Transmitter Reflectance				-12	dB	
Extinction Ratio	ER	3.5			dB	
Transmitter eye mask definition {X1, X2, X3, Y1, Y2, Y3}	{0.31, 0.4, 0.45, 0.34, 0.38, 0.4} CWDM4 MSA Technical Specifications Rev 1.1					
Total average launch power	Po			8.5	dBm	
Average launch power of OFF transmitter, each lane	Poff			-30	dBm	
Optical return loss tolerance	ORL			20	dB	

Receiver Specifications – Optical

Parameter		Symbol	Min	Typical	Max	Unit	
Center Wavelength	Ch0	λ0	1264.5	1271	1277.5	nm	
	Ch1	λ1	1284.5	1291	1297.5	nm	
	Ch2	λ2	1304.5	1311	1317.5	nm	
	Ch3	λ3	1324.5	1331	1337.5	nm	
Bit Rate per Channel		DR	25.78125±100ppm			Gbps	4
Unstressed Sensitivity (OMA)		OMAin	-	-	-11.5	dBm	5
Receiver Overload		PMAX	2.5				
Stressed Sensitivity (OMA)		OMAin,str	-		-8.6	dBm	6
Optical Return Loss		ORL			-26	dB	
Vertical eye closure penalty, each lane		VECP			1.9	dB	
Stressed eye J2 Jitter, each lane		J2			0.3	UI	
Stressed eye J9 Jitter, each lane		J9			0.5	UI	
Stressed eye J4 Jitter, each lane		J4			0.48	UI	
SRS eye mask definition {X1, X2, X3, Y1, Y2, Y3}		{0.39, 0.5, 0.5, 0.39, 0.39, 0.4} CWDM4 MSA Technical Specifications Rev 1.1					
Damage threshold, each lane			3.5			dB	

Notes:

[1] Transmitter consists of 4 lasers operating at 25.78Gb/s each.

[2] At maximum TDP.

[3] TDP value does not include MPI penalty.

[4] Receiver consists of 4 photodetectors operating at 25.78Gb/s each.

[5] Sensitivity is specified at 5x10-5 BER.

[6] Measured with CWDM4 MSA conformance test signal at TP3 for 5x10-5 BER.

[7] Power value and power accuracy are with all channels on.

General Specifications

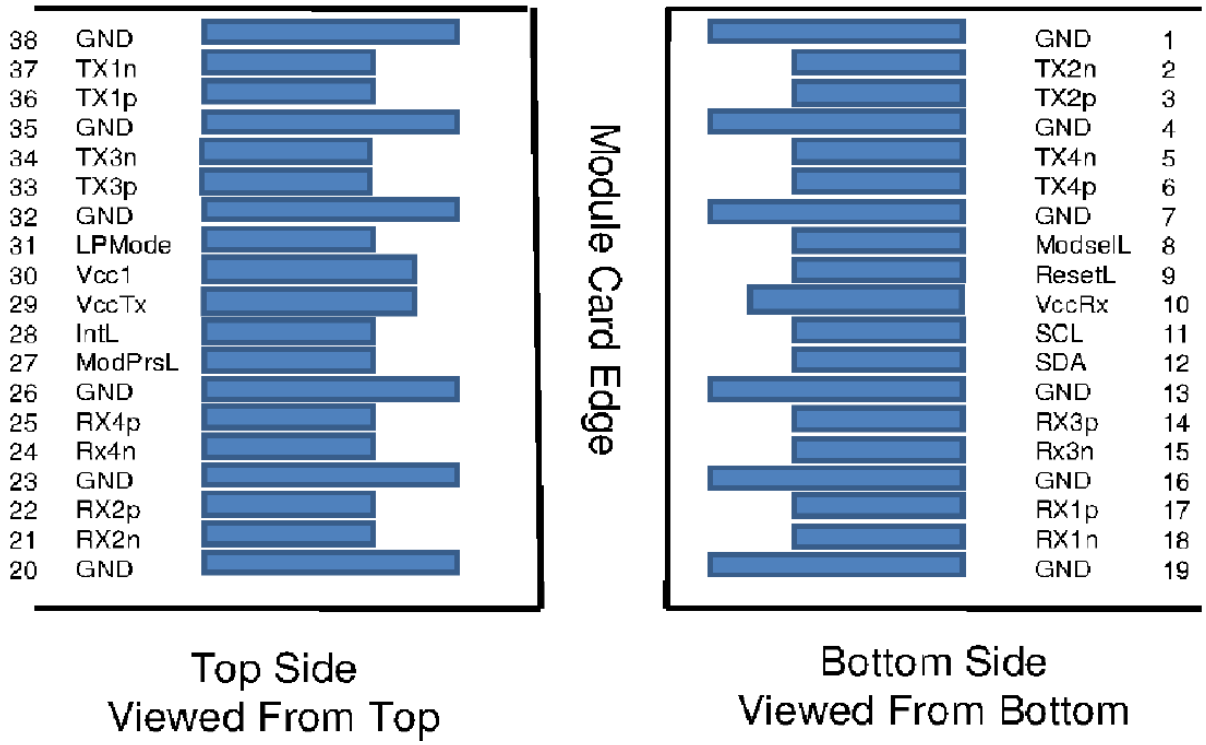
Parameter	Symbol	Min	Typical	Max	Unit	Ref.
Bit Rate (all wavelengths combined)	BR			103.1	Gb/s	
Bit Error Ratio @25.78Gb/s	BER			$5x10^{-5}$		1
Maximum Supported Distances						
Fiber Type						
SMF per G.652	LossBdgt			5	dB	2

Notes:

[1] Tested with a 231 – 1 PRBS.

[2] This 5 dB loss budget includes 2.5dB optical coding gain from FEC on the host [RS-FEC (528,514) per Clause 91]. The option to bypass RS-FEC is not supported. Loss budget may include up to 1dB MPI loss penalty with worse case Transmitter and worst case connector MPI.

Electrical Pad Layout

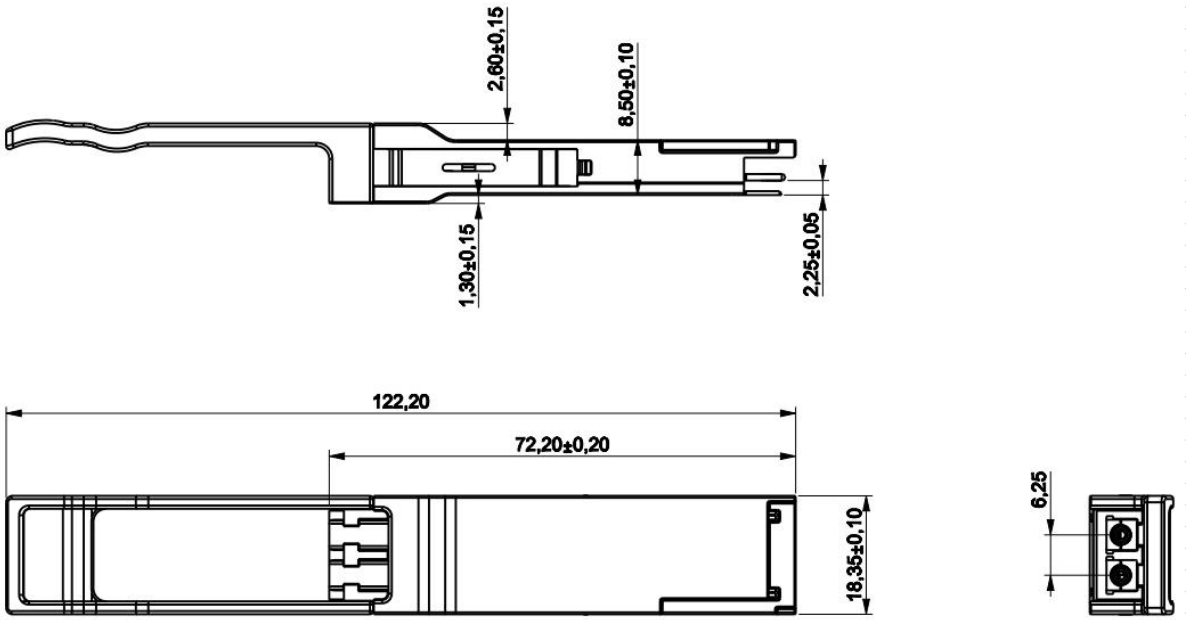


Pin Definition

Pin	Symbol	Name/Description
1	GND	Ground
2	Tx2n	Transmitter Inverted Data Input
3	Tx2p	Transmitter Non-Inverted Data Input
4	GND	Ground
5	Tx4n	Transmitter Inverted Data Input
6	Tx4p	Transmitter Non-Inverted Data Input
7	GND	Ground
8	ModSelL	Module Select

9	ResetL	Module Reset
10	VCC Rx	+3.3 V Power supply receiver
11	SCL	2-wire serial interface clock
12	SDA	2-wire serial interface data
13	GND	Ground
14	Rx3p	Receiver Non-Inverted Data Output
15	Rx3n	Receiver Inverted Data Output
16	GND	Ground
17	Rx1p	Receiver Non-Inverted Data Output
18	Rx1n	Receiver Inverted Data Output
19	GND	Ground
20	GND	Ground
21	Rx2n	Receiver Inverted Data Output
22	Rx2p	Receiver Non-Inverted Data Output
23	GND	Ground
24	Rx4n	Receiver Inverted Data Output
25	Rx4p	Receiver Non-Inverted Data Output
26	GND	Ground
27	ModPrsL	Module Present
28	IntL	Interrupt
29	VCC Tx	+3.3 V Power supply transmitter
30	VCC1	+3.3 V Power Supply
31	LPMode	Low Power Mode
32	GND	Ground
33	Tx3p	Transmitter Non-Inverted Data Input
34	Tx3n	Transmitter Inverted Data Input
35	GND	Ground
36	Tx1p	Transmitter Non-Inverted Data Input
37	Tx1n	Transmitter Inverted Data Input
38	GND	Ground

Mechanical



Unit: mm

Ordering Information

Part Number	Product Description
TSQL4-E11JE3C	100Gbps QSFP28 CWDM4 10km 0°C ~ +70°C

Important Notice

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