100Gb/S QSFP28 SR4 Transceiver

P/N: TQSFP28-EJ1A85A

Product Features

- Compliant with 100G Ethernet IEEE 802.3bm 100G BASE-SR4 standards
- QSFP28 MSA compliant
- Supports 103.1 Gbps data rate links
- Up to 100m OM4 MMF transmission
- Maximum power consumption 2.5W
- Four independent full-duplex channels
- Using standard 12/8 lane optical fiber with MPO pluggable optical connector.
- Single 3.3V power supply
- 0°C to 70°C case temperature operating range
- 4x25G electrical interface (OIF CEI-28G-VSR)
- I2C management interface
- RoHS-6 Compliant

Application

- Ethernet for 100GBASE-SR4
- InfiniBand DDR, SDR, & QDR
- Data Center
- Rack to Rack

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Absolute Maximum Rating

Parameter	Min	Max	Unit	Note
Storage Temperature	-40	85	℃	
3.3V Power Supply Voltage	-0.5	3.6	V	
Relative Humidity	0	85	%	
Damage Threshold, each Lane	3.4		dBm	

Recommended Operating Conditions

Parameter	Min	Typical	Max	Unit	Note
Case Operating Temperature	0		70	℃	
Power Supply Voltage	3.135	3.3	3.465	V	
Date Rate per Channel		25.78125		Gbps	
Control Input Voltage High	2		Vcc	V	
Control Input Voltage Low	0		0.8	V	
Data Rate Accuracy	-10		100	ppm	
Fiber Length: 50/125μm MMF (OM3)			70	m	
Fiber Length: 50/125μm MMF (OM4)			100	m	

Electrical Characteristics

Parameter	Min	Typical	Max	Unit	Note
Transceiver Electrical Characteristics					
TRx Power Consumption			2.5	W	
Supply Current			757	mA	
Transmitter (each Lane)					
Overload Differential Voltage pk-pk	900			mV	
Common Mode Voltage (Vcm)	-350		2850	mV	1
Differential Termination Resistance Mismatch			10	%	At 1MHz
Differential Return Loss (SDD11)			See CEI-28G-VSR Equation 13-19	dB	

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Common Mode to Differential conversion and Differential to Common Mode conversion (SDC11, SCD11)			See CEI-28G-VSR Equation 13-20	dB	
Stressed Input Test	See CEI-28G-VSR Section 13.3.11.2.1				
Receiver (each Lane)					
Differential Voltage, pk-pk			900	mV	
Common Mode Voltage (Vcm)	-350		2850	mV	1
Common Mode Noise, RMS			17.5	mV	
Differential Termination Resistance Mismatch			10	%	At 1MHz
Differential Return Loss (SDD22)			See CEI-28G-VSR Equation 13-19	dB	
Common Mode to Differential conversion and Differential to Common Mode conversion (SDC22, SCD22)			See CEI-28G-VSR Equation 13-21	dB	
Common Mode Return Loss (SCC22)			-2	dB	2
Transition Time, 20 to 80%	9.5			ps	
Vertical Eye Closure (VEC)			5.5	dB	
Eye Width at 10^{-15} probability (EW15)	0.57			UI	
Eye Height at 10^{-15} probability (EH15)	228			mV	

Notes

1. Vcm is generated by the host. Specification includes effects of ground offset voltage.
2. From 250MHz to 30GHz.

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Optical Characteristics

Parameter	Symbol	Min	Typical	Max	Unit	Note
Transmitter Optical Characteristics						
Center Wavelength	λ	840	850	860	nm	
Spectral Width – RMS	Δλ			0.6	nm	
Average Launch Optical Power, each lane	LOP	-8.4		2.4	dBm	
Optical Modulation Amplitude, each lane	OMA	-6.4		3	dBm	1
Launch power in OMA minus TDEC		-7.3			dBm	
Transmitter and dispersion eye closure (TDEC), each lane	TDEC			4.3	dB	
Average launch power of OFF transmitter, each lane	Poff			-30	dBm	
Extinction Ratio	ER	2			dB	
Optical return loss tolerance				12	dB	
Encircled Flux		≥ 86% @ 19um, ≤ 30% at 4.5um				
Transmitter Eye Mask Definition {X1, X2, X3, Y1, Y2, Y3}		{0.3, 0.38, 0.45, 0.35, 0.41, 0.5}				2
Receiver Optical Characteristics						
Center wavelength, each lane	λ	840	850	860	nm	
Damage Threshold	THd	3.4			dBm	3
Average power at receiver input, each lane		-10.3		2.4	dBm	
Receiver Power, each lane (OMA)				3	dBm	
Receiver Reflectance				-12	dB	
Receiver sensitivity (OMA),each Lane	Sen			-9.2	dBm	for BER = $5x10^{-5}$
Stressed receiver sensitivity in OMA				-5.2	dBm	4

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LOS Assert	LosA	-30			dBm	
LOS Deassert	LosD			-12	dBm	
LOS Hysteresis	LosH	0.5			dB	
Conditions of stressed receiver sensitivity test(Note5):						
Stressed eye closure (SEC)			4.3		dB	
Stressed eye J2 Jitter			0.39		UI	
Stressed eye J4 Jitter,				0.53	UI	
OMA of each aggressor lane			3		dBm	
Stressed receiver eye mask definition (Hit ratio $5x10^{-5}$ hit per sample)		(X1, X2, X3, Y1, Y2, Y3) = (0.28, 0.5, 0.5, 0.33, 0.33, 0.4}				

Notes

1. Even if the TDP < 0.9 dB, the OMA min must exceed the minimum value specified here.
2. Hit ratio $1.5x10^{-3}$ hits per sample.
3. The receiver shall be able to tolerate, without damage, continuous exposure to a modulated optical input signal having this power level on one lane. The receiver does not have to operate correctly at this input power.
4. Measured with conformance test signal at receiver input for BER = $5x10^{-5}$.
5. Vertical eye closure penalty, stressed eye J2 jitter, stressed eye J4 jitter, and stressed receiver eye mask definition are test conditions for measuring stressed receiver sensitivity. They are not characteristics of the receiver.

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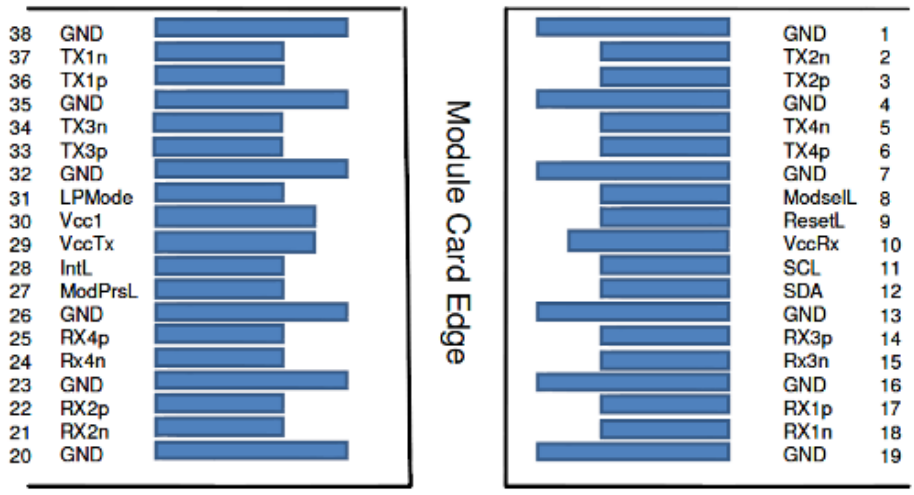
QSFP28 Module Pad Assignments and Descriptions



Pin	Logic	Symbol	Description	Plug Sequence	Notes
1		GND	Ground	1	
2	CML-I	Tx2n	Transmitter Inverted Data Input	3	
3	CML-I	Tx2p	Transmitter Non-Inverted Data Input	3	
4		GND	Ground	1	
5	CML-I	Tx4n	Transmitter Inverted Data Input	3	
6	CML-I	Tx4p	Transmitter Non-Inverted Data Input	3	
7		GND	Ground	1	
8	LVTTL-I	ModSelL	Module Select	3	
9	LVTTL-I	ResetL	Module Reset	3	
10		Vcc Rx	+3.3V Power Supply Receiver	2	
11	LVCMOS-I/O	SCL	2-wire serial interface clock	3	
12	LVCMOS-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	
17	CML-O	Rx1p	Receiver Non-Inverted Data Output	3	
18	CML-O	Rx1n	Receiver Inverted Data Output	3	

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19		GND	Ground	1	
20		GND	Ground	1	
21	CML-O	Rx2n	Receiver Inverted Data Output	3	
22	CML-O	Rx2p	Receiver Non-Inverted Data Output	3	
23		GND	Ground	1	
24	CML-O	Rx4n	Receiver Inverted Data Output	3	
25	CML-O	Rx4p	Receiver Non-Inverted Data Output	3	
26		GND	Ground	1	
27	LVTTL-O	ModPrsL	Module Present	3	
28	LVTTL-O	IntL	Interrupt	3	
29		Vcc Tx	+3.3V Power supply transmitter	2	
30		Vcc1	+3.3V Power supply	2	
31	LVTTL-I	LPMode	Low Power Mode	3	
32		GND	Ground	1	
33	CML-I	Tx3p	Transmitter Non-Inverted Data Input	3	
34	CML-I	Tx3n	Transmitter Inverted Data Input	3	
35		GND	Ground	1	
36	CML-I	Tx1p	Transmitter Non-Inverted Data Input	3	
37	CML-I	Tx1n	Transmitter Inverted Data Input	3	
38		GND	Ground	1	

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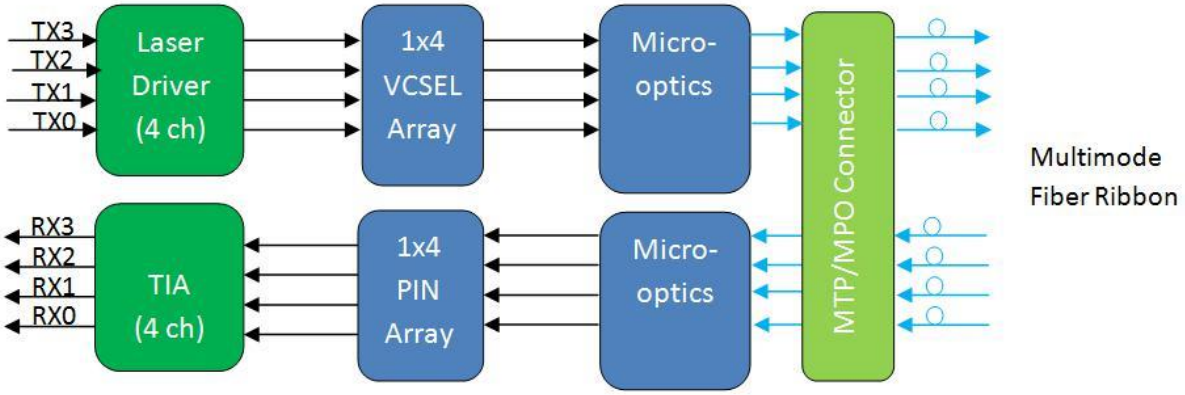
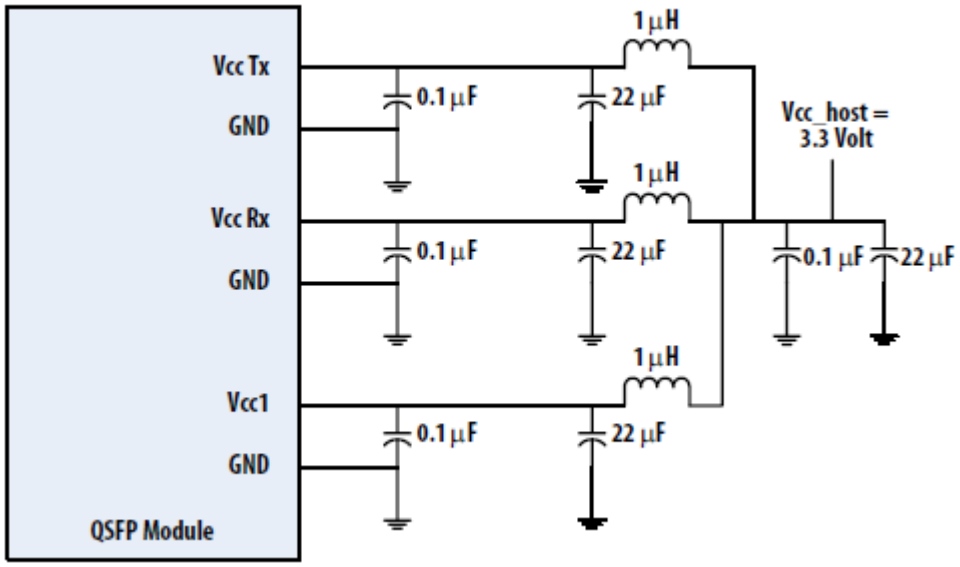
Transceiver Block Diagram



Recommended Host Board Power Supply Circuit



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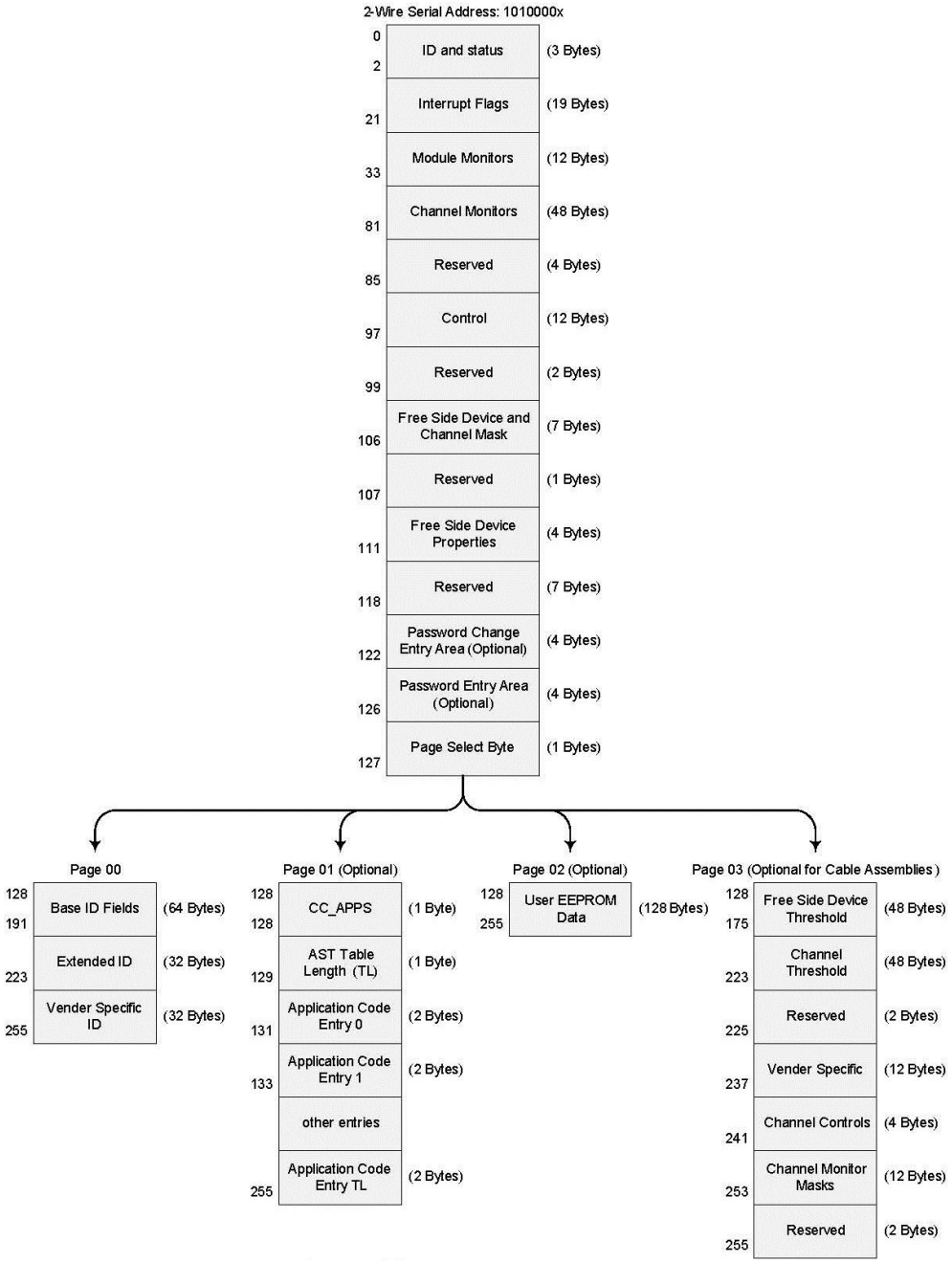
Memory Map

The memory map is structured as a single address and multiple page approaches, according to the QSFP28 SFF-8636 MSA specification as shown in the below. For more detailed description of this memory map or lower pages, please see our Memory Map document with flexible customization settings.



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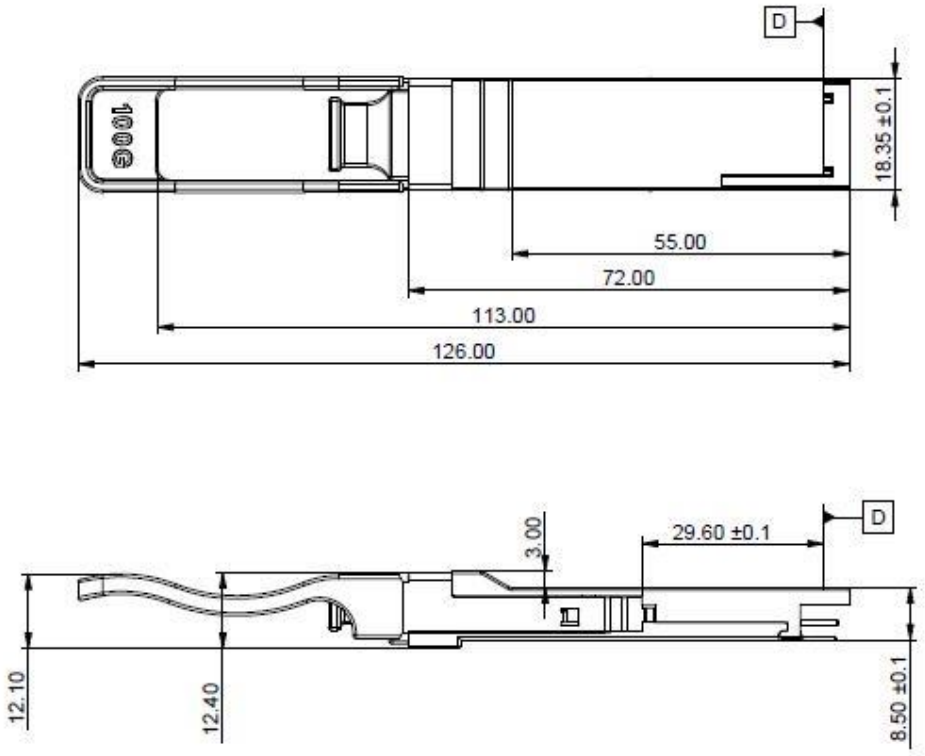
Mechanical Design Diagram

Unit: mm



ESD

This transceiver is specified as ESD threshold 1kV for high speed data pins and 2kV for all others electrical input pins, tested per MIL-STD-883, Method 3015.4 /JESD22-A114-A (HBM). However, normal ESD precautions are still required during the handling of this module. This transceiver is shipped in ESD protective packaging. It should be removed from the packaging and handled only in an ESD protected environment.

Laser Safety

This is a Class 1 Laser Product according to EN 60825-1:2014. This product complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 50, dated (June 24, 2007).

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