

100Gbps QSFP28 ER4 Lite 40Km with FEC **Hot Pluggable, Duplex LC, Single Mode** **PQSFP28-2541SF**

Features

- ◆ Hot pluggable QSFP28 MSA form factor
- ◆ Compliant to IEEE 802.3ba 100GBASE-ER4
- ◆ Up to 30km reach for G.652 SMF without FEC
- ◆ Up to 40km reach for G.652 SMF with FEC
- ◆ Duplex LC receptacle
- ◆ 4x25Gb/s DFB-based LAN-WDM Cooling transmitter
- ◆ 4x25Gb/s APD ROSA
- ◆ 4x28G Electrical Serial Interface (CEI-28G-VSR)
- ◆ Single +3.3V power supply
- ◆ Power dissipation < 4.5W
- ◆ Operating case temperature: 0~70°C
- ◆ RoHS-6 compliant

Applications

- ◆ 100GBASE-ER4 Ethernet Links
- ◆ Infiniband QDR and DDR interconnects
- ◆ Client-side 100G Telecom connections

Ordering Information

Part Number	Product Description
PQSFP28-2541SF	100G QSFP28 ER4 Lite 40Km with FEC

Overview

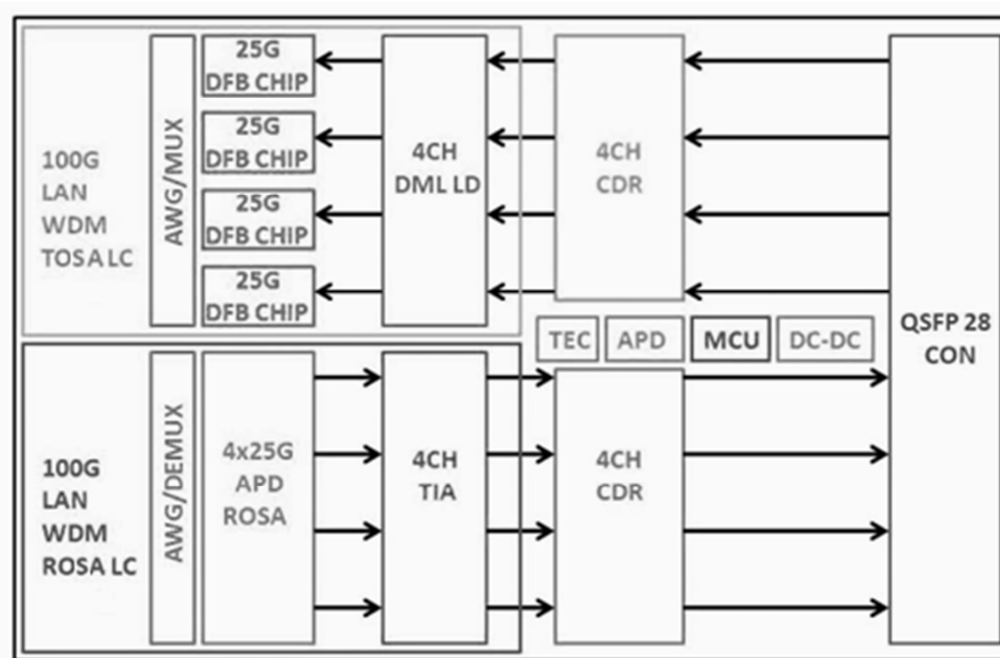
PQSFP28-2541SF a 100Gb/s transceiver module designed for optical communication applications compliant to 100GBASE-ER4 Lite standard. The module converts 4 input channels of 25Gb/s electrical data to 4 channels of LAN WDM optical signals and then multiplexes them into a single channel for 100Gb/s optical transmission. Reversely on the receiver side, the module de-multiplexes a 100Gb/s optical input into 4 channels of LAN WDM optical signals and then converts them to 4 output channels of electrical data.

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The central wavelengths of the 4 LAN WDM channels are 1295.56, 1300.05, 1304.58 and 1309.14 nm as members of the LAN WDM wavelength grid defined in IEEE 802.3ba. The high performance cooled LAN WDM DFB transmitters and high sensitivity APD receivers provide superior performance for 100Gigabit Ethernet applications up to 30km links without FEC and up to 40km links with FEC interconnections.

The product is designed with form factor, optical/electrical connection and digital diagnostic interface according to the QSFP+ Multi-Source Agreement (MSA). It has been designed to meet the harshest external operating conditions including temperature, humidity and EMI interference.

Module Block Diagram



Functional Block Diagram

Absolute Maximum Ratings

It has to be noted that operation in excess of any individual absolute maximum ratings might cause permanent damage to this module.

Parameter	Symbol	Min	Max	Unit
Supply Voltage	V _{CC}	-0.5	3.6	V
Storage Temperature	T _{st}	-40	85	°C
Case Operating Temperature	T _{op}	0	70	°C
Humidity (non-condensing)	RH	0	85	%
Damage Threshold, each Lane	THd	-3.0		dBm

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Recommended Operating Conditions

Parameter	Symbol	Min	Typical	Max	Unit
Supply Voltage	V_{CC}	3.135	3.3	3.465	V
Supply Current	I_{CC}			1.36	A
Operating Case temperature	Top	0		70	°C
Data Rate	DR		103.125		Gbps
Power Consumption	P			4.5	W
Link Distance with G.652	Without FEC	D		30	km
	With FEC			40	km

Electrical Specifications

Parameter	Test Point	Min	Typical	Max	Unit	Notes
Power Consumption				4.5	W	
Supply Current	I_{CC}			1.36	A	
Supply Voltage	V_{CC}	3.135	3.3	3.465	V	
Transmitter (Each Lane)						
Input differential impedance	R_{IN}		100		Ω	1
Differential data input swing	$V_{IN, PP}$	180		1000	mV	
Transmit Disable Voltage	V_D	$V_{CC}-1.3$		V_{CC}	V	
Transmit Enable Voltage	V_{EN}	V_{ee}		$V_{ee}+8$	V	2
Receiver (Each Lane)						
Differential data output swing	$V_{OUT, PP}$	300		850	mV	3
LOS Fault	$V_{LOS\ fault}$	$V_{CC}-1.3$		$V_{CC}HOST$	V	4
LOS Normal	$V_{LOS\ norm}$	V_{ee}		$V_{ee}+8$	V	4

Notes:

1. Connected directly to TX data input pins. AC coupled thereafter
2. Optional for TX disable
3. Into 100 Ω differential termination
4. Loss Of Signal is LVTTTL. Logic 0 indicates normal operation; logic 1 indicates no signal detected

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Optical Characteristics

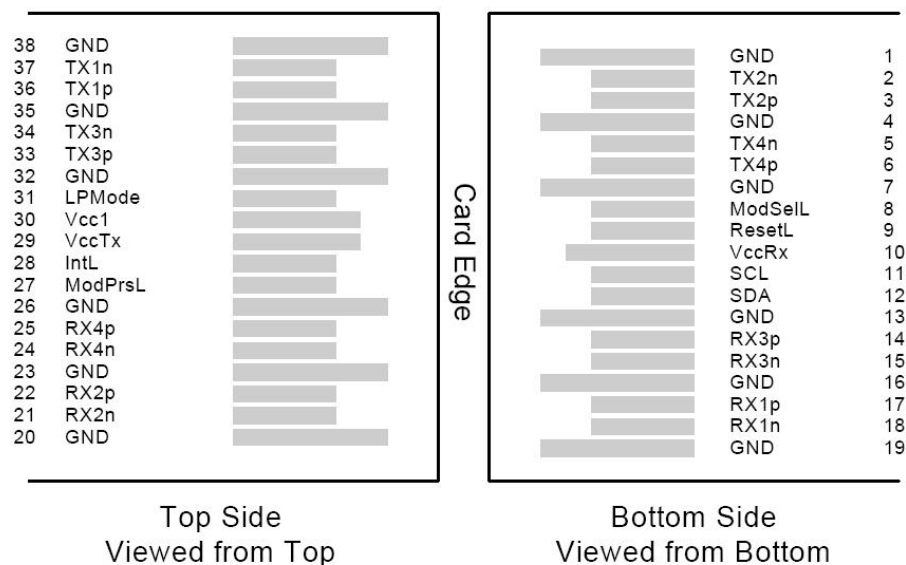
Parameter	Symbol	Min	Typical	Max	Unit	Notes
Data Rate Each Lane	DR	25.78125 ±100 ppm			Gbps	
Lane Wavelength	L0	1294.53	1295.56	1296.59	nm	
	L1	1299.02	1300.05	1301.09	nm	
	L2	1303.54	1304.58	1305.63	nm	
	L3	1308.09	1309.14	1310.19	nm	
Transmitter						
SMSR	SMSR	30			dB	
Total Average Launch Power	P _T			12.5	dBm	
Average Launch Power, each Lane	P _{AVG}	-2.5		6.5	dBm	
OMA, each Lane	P _{OMA}	0.5		6.5	dBm	1
Extinction Ratio	ER	4			dB	
RIN ₂₀ OMA	RIN			-130	dB/Hz	
Transmitter Reflectance	R _T			-12	dB	
Eye Mask {X1, X2, X3, Y1, Y2, Y3}		{0.25, 0.4, 0.45, 0.25, 0.28, 0.4}				2
Average Launch Power OFF Transmitter, each Lane	P _{OFF}			-30	dBm	
Receiver						
Damage Threshold, each Lane	THd			-7	dBm	3
Average Receive Power, each Lane		-16.9		-7	dBm	30km link distance
		-20.5		-7	dBm	40km link distance
Receiver Sensitivity (OMA), each Lane	SEN1			-18.5	dBm	BER = 5x10 ⁻⁵
Receiver Sensitivity (OMA), each Lane	SEN2			-15	dBm	BER = 1x10 ⁻⁵
Stressed Receiver Sensitivity (OMA), each Lane (BER = 5x10 ⁻⁵)	SEN3			-16	dBm	4
Receiver reflectance				-26	dB	
LOS Assert	LOS _A	-33			dBm	
LOS De-Assert	LOS _D			-23	dBm	
LOS Hysteresis	LOS _H	0.5		6	dB	

Notes:

1. Even if the TDP < 1 dB, the OMA min must exceed the minimum value specified here
2. Hit ratio 5x10⁻⁵
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 @25.78125Gbps.

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Pin Assignment



Electrical Pin-out Details

Pin Descriptions

Pin	Logic	Symbol	Name/Description	Notes
1		GND	Ground	1
2	CML-I	Tx2n	Transmitter Inverted Data Input	
3	CML-I	Tx2p	Transmitter Non-Inverted Data output	
4		GND	Ground	1
5	CML-I	Tx4n	Transmitter Inverted Data Input	
6	CML-I	Tx4p	Transmitter Non-Inverted Data output	
7		GND	Ground	1
8	LVTLL-I	ModSelL	Module Select	
9	LVTLL-I	ResetL	Module Reset	
10		VCCRx	+3.3V Power Supply Receiver	2
11	LVC MOS-I/O	SCL	2-Wire Serial Interface Clock	
12	LVC MOS-I/O	SDA	2-Wire Serial Interface Data	
13		GND	Ground	
14	CML-O	Rx3p	Receiver Non-Inverted Data Output	
15	CML-O	Rx3n	Receiver Inverted Data Output	
16		GND	Ground	1

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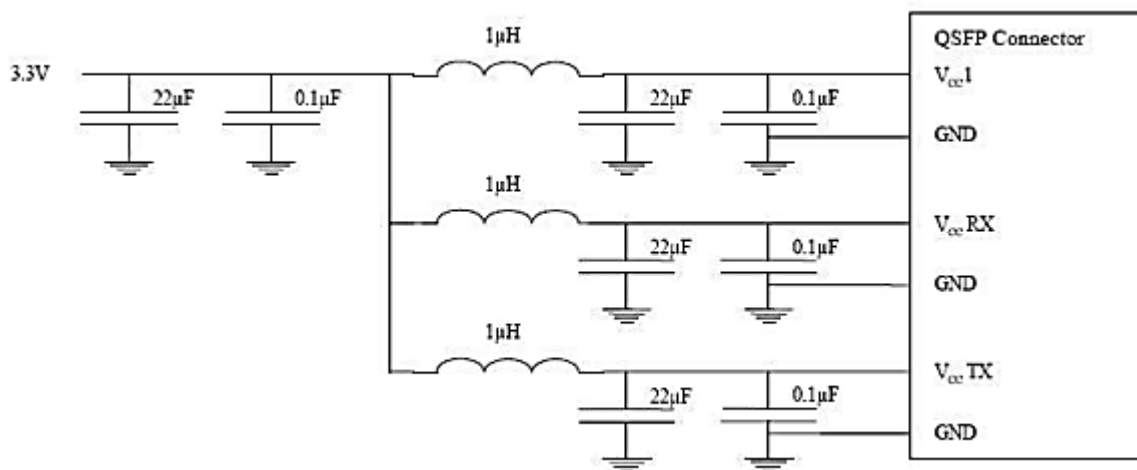
17	CML-O	Rx1p	Receiver Non-Inverted Data Output	
18	CML-O	Rx1n	Receiver Inverted Data Output	
19		GND	Ground	1
20		GND	Ground	1
21	CML-O	Rx2n	Receiver Inverted Data Output	
22	CML-O	Rx2p	Receiver Non-Inverted Data Output	
23		GND	Ground	1
24	CML-O	Rx4n	Receiver Inverted Data Output	1
25	CML-O	Rx4p	Receiver Non-Inverted Data Output	
26		GND	Ground	1
27	LVTTL-O	ModPrsL	Module Present	
28	LVTTL-O	IntL	Interrupt	
29		VccTx	+3.3 V Power Supply transmitter	2
30		Vcc1	+3.3 V Power Supply	2
31	LVTTL-I	LPMODE	Low Power Mode	
32		GND	Ground	1
33	CML-I	Tx3p	Transmitter Non-Inverted Data Input	
34	CML-I	Tx3n	Transmitter Inverted Data Output	
35		GND	Ground	1
36	CML-I	Tx1p	Transmitter Non-Inverted Data Input	
37	CML-I	Tx1n	Transmitter Inverted Data Output	
38		GND	Ground	1

Notes:

1. GND is the symbol for signal and supply power) common for the QSFP28 module. All are common within the 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. V_{CC}Rx, V_{CC}1 and V_{CC}Tx are applied concurrently and may be internally connected within the module in any combination. V_{CC} contacts in SFF-8662 and SFF-8672 each have a steady state current rating of 1 A

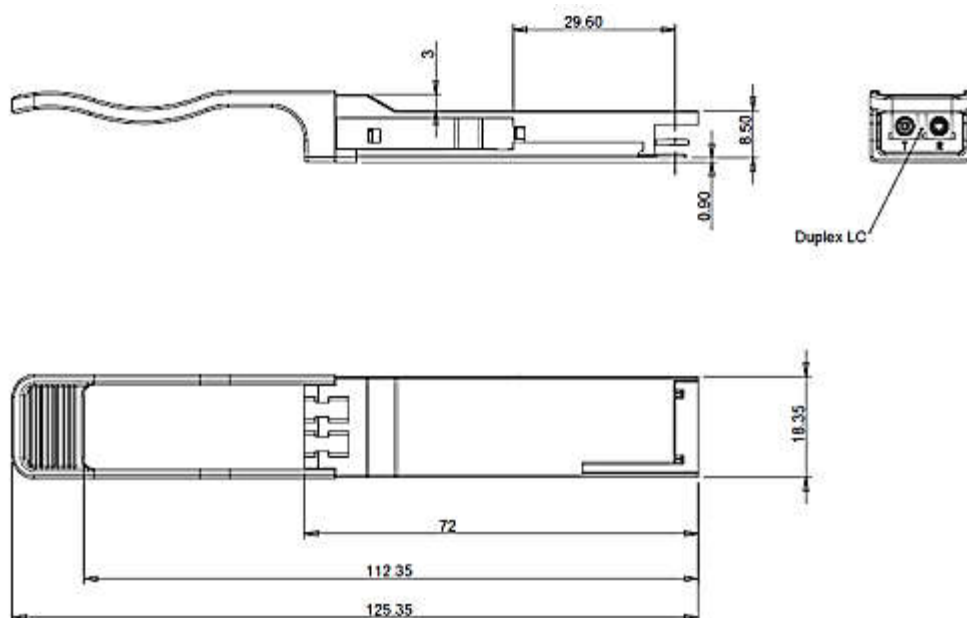
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Power Supply Filter



Host Board Power Supply Filter

Mechanical Dimensions



Mechanical Specifications