

100Gbps QSFP28 PSM4 2Km

SLQS28-100G-PSM4



Overview

SLQS28-100G-PSM4 is a parallel 100Gb/s Quad Small Form-factor Pluggable (QSFP28) optical module. It provides increased port density and total system cost savings. The QSFP28 full-duplex optical module offers 4 independent transmit and receive channels, each capable of 25Gb/s operation for an aggregate data rate of 100Gb/s on 2km of single mode fiber.

An optical fiber ribbon cable with an MTP/MPO connector can be plugged into the QSFP28 module receptacle. Proper alignment is ensured by the guide pins inside the receptacle. The cable usually cannot be twisted for proper channel to channel alignment. Electrical connection is achieved through an MSA-compliant 38-pin edge type connector.

The module operates with single +3.3V power supply. LVCMOS/LVTTL global control signals, such as Module Present, Reset, Interrupt and Low Power

Mode, are available with the modules. A 2-wire serial interface is available to send and receive more complex control signals, and to receive digital diagnostic information. Individual channels can be addressed and unused channels can be shut down for maximum design flexibility.

The product is designed with form factor, optical/electrical connection and digital diagnostic interface according to the QSFP28 Multi-Source Agreement (MSA). It has been designed to meet the harshest external operating conditions including temperature, humidity and EMI interference. The module can be managed through the I2C two-wire serial interface.

Features

- ◆ 4 independent full-duplex channels
- ◆ Up to 28Gb/s data rate per channel
- ◆ QSFP28 MSA compliant
- ◆ Compliant to IEEE 802.3bm 100GBASE PSM4
- ◆ Up to 2km reach for G.652 SMF
- ◆ Maximum power consumption 3.5W
- ◆ Single +3.3V power supply
- ◆ Operating case temperature: 0 to 70°C
- ◆ RoHS-6 compliant

Applications

- ◆ 100G Ethernet Links
- ◆ Infiniband QDR and DDR interconnects
- ◆ Datacenter and Enterprise networking

Ordering Information

Part Number	Product Description
SLQS28-100G-PSM4	100G QSFP28 PSM4 2Km SMF

Module Block Diagram

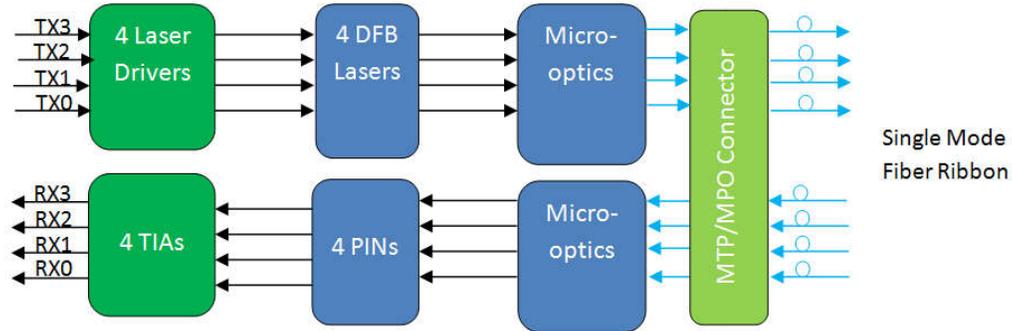


Figure1. Module Block Diagram

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
Relative Humidity (non-condensing)	Rh	0	85	%
Damage Threshold, each Lane	TH_d	4.5		dBm

Recommended Operating Conditions and Power Supply Requirements

Parameter	Symbol	Min	Typical	Max	Unit
Supply Voltage	V_{CC}	3.135	3.3	3.465	V
Operating Case temperature	T_{op}	0		70	°C
Data Rate Per Lane	fd		25.78125		Gbps
Control Input Voltage High		2		V_{CC}	V
Control Input Voltage Low		0		0.8	V
Link Distance with G.652	D	0.002		2	km

Electrical Specifications

The following electrical characteristics are defined over the Recommended Operating Environment unless otherwise specified.

Parameter	Symbol	Min	Typical	Max	Unit	Notes
Power Consumption				3.5	W	
Supply Current	I_{CC}			1.1	A	
Transceiver Power-on Initialization Time				2000	ms	1

Datasheet

Transmitter (Each Lane)						
Single-ended Input Voltage Tolerance (Note 2)		-0.3		4.0	V	Referred to TP1 signal common
AC Common Mode Input Voltage Tolerance		15			mV	RMS
Differential Input Voltage Swing Threshold		50			mVpp	LOSA Threshold
Differential Input Voltage Swing	V _{in} , pp	190		700	mVpp	
Differential Input Impedance	Z _{in}	90	100	110	ohm	
Receiver (Each Lane)						
Single-ended Output Voltage		-0.3		4.0	V	Referred to signal common
AC Common Mode Output Voltage				7.5	mV	RMS
Differential Output Voltage Swing	V _{out} , pp	300		850	mVpp	
Differential Output Impedance	Z _{out}	90	100	110	ohm	

Notes:

1. Power-on Initialization Time is the time from when the power supply voltages reach and remain above the minimum recommended operating supply voltages to the time when the module is fully functional.
2. The single ended input voltage tolerance is the allowable range of the instantaneous input signals.

Optical Characteristics

Parameter	Symbol	Min	Typical	Max	Unit	Notes
Transmitter						
Center Wavelength	λ_c	1295	1310	1325	nm	
Side Mode Suppression Ratio	SMSR	30			dB	
Total Average Launch Power	P _T			8.0	dBm	
Average Launch Power, each Lane	P _{AVG}	-5.5		2.0	dBm	
Optical Modulation Amplitude OMA, each Lane	P _{OMA}	-3.5		2.2	dBm	1
Difference in Launch Power between any Two Lanes (OMA)	P _{tx,diff}			5	dB	
Launch Power in OMA minus Transmitter and Dispersion Penalty (TDP), each Lane		-4.3			dBm	
TDP, each Lane	TDP			2.9	dB	
Extinction Ratio	ER	3.5			dB	
Relative Intensity Noise	RIN			-128	dB/Hz	
Optical Return Loss Tolerance	TOL			20	dB	

Datasheet

Transmitter Reflectance	R_T			-12	dB	
Transmitter Eye Mask Definition {X1, X2, X3, Y1, Y2, Y3}		{0.31, 0.4, 0.45, 0.34, 0.38, 0.4}				2
Average Launch Power OFF Transmitter, each Lane	P_{OFF}			-30	dBm	
Receiver						
Center Wavelength	λ_c	1295	1310	1325	nm	
Damage Threshold, each Lane	THd	4.5			dBm	3
Average Receive Power, each Lane		-10.2		2.0	dBm	
Receive Power (OMA), each Lane				2.2	dBm	
Receiver Sensitivity (OMA), each Lane	SEN1			-9.0	dBm	
Receiver Sensitivity (OMA), each Lane	SEN2			-12.0	dBm	
Difference in Receive Power between any Two Lanes (OMA)	Prx,diff			5.5	dB	
LOS Assert	LOS_A		-20		dBm	
LOS De-Assert	LOS_D		-18		dBm	
LOS Hysteresis	LOS_H	0.5			dB	
Receiver Electrical 3 dB upper Cutoff Frequency, each Lane	F_c			31	GHz	

Notes:

1. Even if the TDP < 0.8 dB, the OMA min must exceed the minimum value specified here.
2. See Figure 2 below.
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 at receiver input for BER = 1×10^{-12}
5. Measured at receiver input for BER = 5×10^{-5}

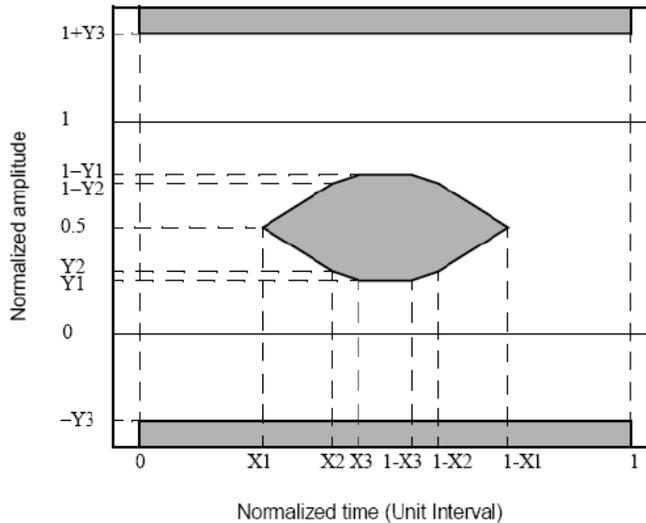


Figure2. Eye Mask Definition

Pin Assignment

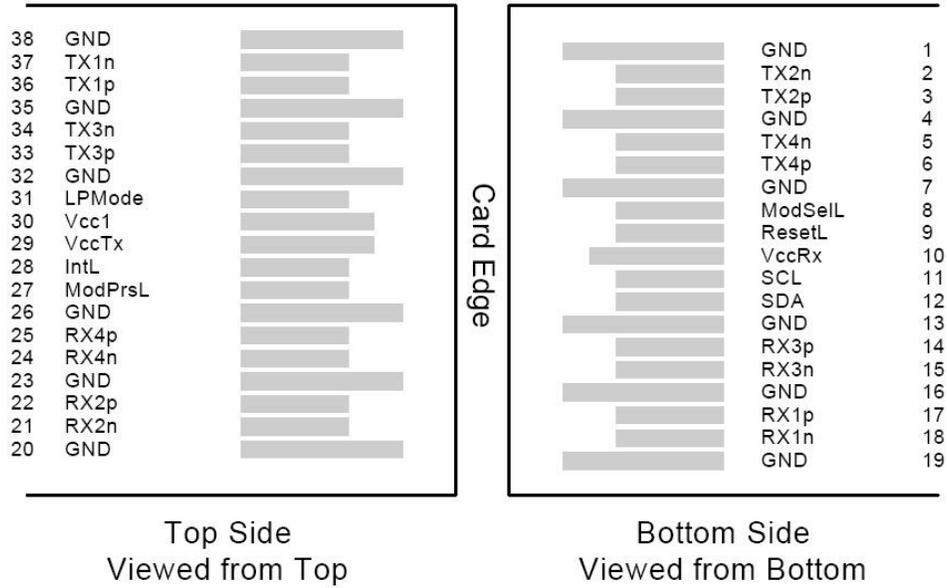


Figure3. Electrical Pin-out Details

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	LVTL-I	ModSelL	Module Select	
9	LVTL-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
17	CML-O	Rx1p	Receiver Non-Inverted Data Output	
18	CML-O	Rx1n	Receiver Inverted Data Output	

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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	LVTTTL-O	ModPrsL	Module Present	
28	LVTTTL-O	IntL	Interrupt	
29		VccTx	+3.3 V Power Supply transmitter	2
30		Vcc1	+3.3 V Power Supply	2
31	LVTTTL-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:

- 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.
- VccRx, Vcc1 and VccTx are the receiving and transmission power suppliers and shall be applied concurrently. Recommended host board power supply filtering is shown in Figure 4 below. Vcc Rx, Vcc1 and Vcc Tx may be internally connected within the module in any combination. The connector pins are each rated for a maximum current of 1000mA.

Recommended Power Supply Filter

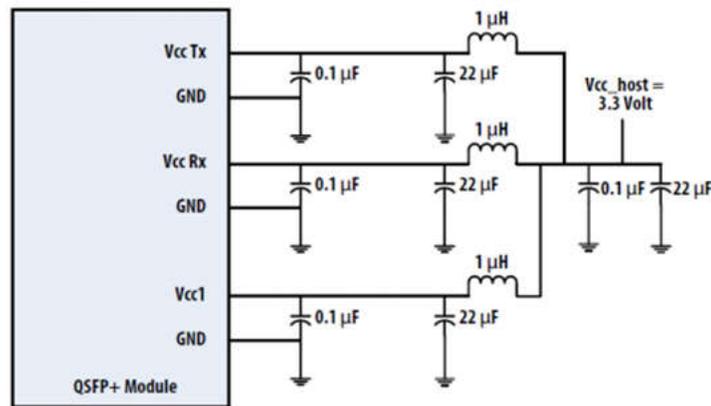


Figure4. Recommended Power Supply Filter

Digital Diagnostic Functions

The following digital diagnostic characteristics are defined over the Recommended Operating Environment unless otherwise specified.

Parameter	Symbol	Min	Max	Unit	Notes
Temperature monitor absolute error	DMI_Temp	-3	3	°C	1
Supply voltage monitor absolute error	DMI_VCC	-0.1	0.1	V	2
Channel RX power monitor absolute error	DMI_RX_Ch	-2	2	dB	3
Channel Bias current monitor	DMI_Ibias_Ch	-10%	10%	mA	4
Channel TX power monitor absolute error	DMI_TX_Ch	-2	2	dB	3

Notes:

- Due to measurement accuracy of different single mode fibers, there could be an additional +/-1 dB fluctuation, or a +/- 3 dB total accuracy.

Mechanical Dimensions

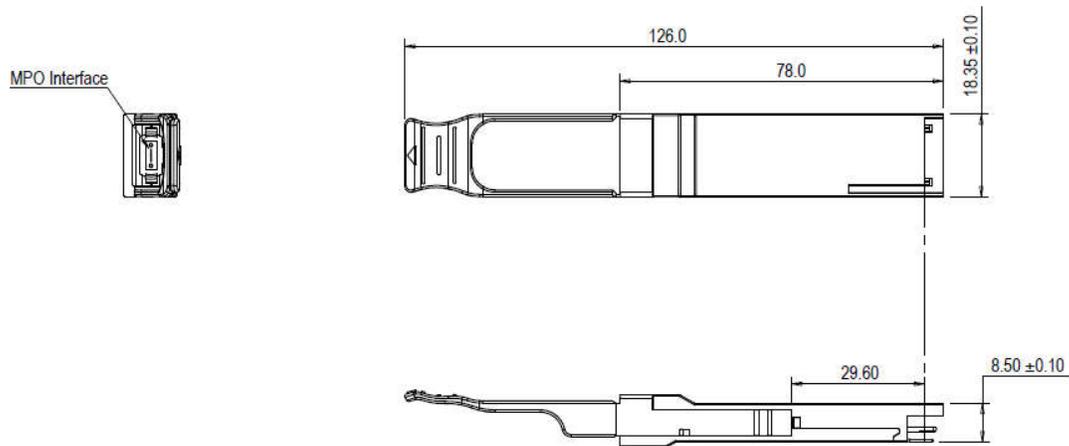


Figure5. Mechanical Specifications

Attention: To minimize MPO connection induced reflections, an MPO receptacle with 8-degree angled end-face is utilized for this product. A female MPO connector with 8-degree end-face should be used with this product as illustrated in Figure 6.

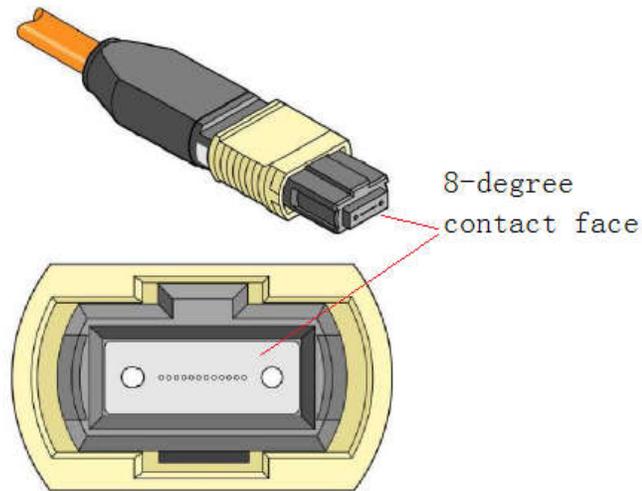


Figure6. Female MPO Connector with 8-degree End-face

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).

Caution: Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

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