

SO-QSFP28-SR4

QSFP, 100GBASE-SR, 850nm, MM, 100m@OM4, MPO

OVERVIEW

The SO-QSFP28-SR4 is a parallel 100 Gbps 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 25 Gbps operation for an aggregate data rate of 100 Gbps on 100 meters of OM4 multi-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. The module operates by a single +3.3V power supply. 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 offers very high functionality and feature integration, accessible via a two-wire serial interface.

PRODUCT FEATURES

- 4 independent full-duplex channels
- Up to 25Gbps data rate per channel
- QSFP28 MSA compliant
- Up to 100m over OM4 MMF transmission
- Up to 70m over OM3 MMF transmission
- Operating case temperature: 0 to 70°C
- Single 3.3V power supply
- Maximum power consumption 3.5W
- MTP/MPO optical connector
- RoHS-6 compliant

APPLICATIONS

- Data Center, Rack to rack
- Infiniband QDR, DDR and SDR
- 100G Ethernet

ORDERING INFORMATION

Part Number	Description
SO-QSFP28-SR4	QSFP, 100GBASE-SR, 850nm, MM, 100m@OM4, MPO

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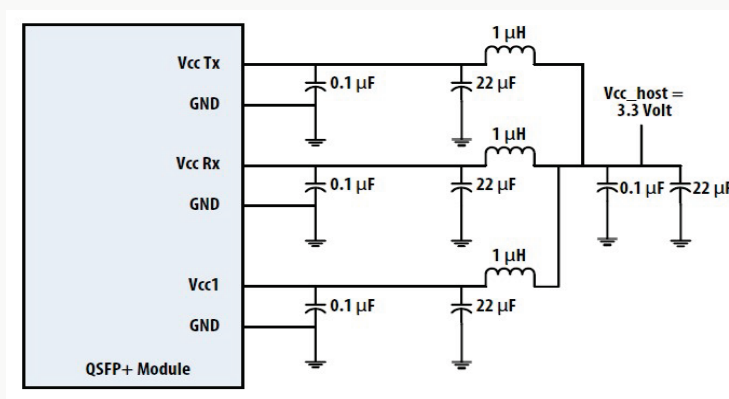
ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Min	Max	Unit
Storage Temperature	T_s	-40	+85	degC
Operating Case Temperature	TOP	0	70	degC
Power Supply Voltage	V_{cc}	-0.5	3.6	V
Relative Humidity (non-condensation)	RH	5	85	%
Damage Threshold, each Lane	THd	3.4		dBm

RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	Min	Typ	Max	Unit
Operating Case Temperature	TOP	0		70	degC
Power Supply Voltage	V_{cc}	3.135	3.3	3.465	V
Data Rate, each Lane			25.78125		Gb/s
Control Input Voltage High		2		V_{cc}	V
Control Input Voltage Low		0		0.8	V
Link Distance (OM4)	D			100	m

RECOMMENDED POWER SUPPLY FILTER



ELECTRICAL CHARACTERISTICS

Parameter	Symbol	Min	Typ	Max	Unit
Power Consumption, each Terminal				3.5	W
Supply Current, each Terminal	I_{cc}			1060	mA
Transceiver Power-on Initialization Time				2000	ms

ELECTRICAL CHARACTERISTICS – TRANSMITTER (EACH LANE)

Parameter	Symbol	Min	Typ	Max	Unit	Notes
Differential Input Voltage Swing	$V_{in,pp}$	150		1050	mV _{pp}	
Differential Input Impedance	Z_{in}	85	105	110	Ohm	

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ELECTRICAL CHARACTERISTICS – RECEIVER (EACH LANE)

Parameter	Symbol	Min	Typ	Max	Unit	Notes
Differential Output Voltage Swing	$V_{out,pp}$	200		1100	mV _{pp}	
Differential Output Impedance	A_{out}	85	100	115	Ohm	

OPTICAL CHARACTERISTICS – TRANSMITTER

Parameter	Symbol	Min	Typ	Max	Unit	Notes
Signalling Speed per Lane			25.78		Gbps	
Centre Wavelength	λ_0	840	850	860	nm	
RMS Spectral Width	$\Delta\lambda_{rms}$			0.6	nm	
Average Launch Power (each Lane)	P_{AVG}	-9.1		2.4	dBm	
Optical Modulation Amplitude (OMA) (each Lane)	P_{OMA}			+4	dBm	
Launch Power in OMA minus Transmitter and Dispersion Penalty (TDP), each Lane		-8.0			dBm	
Extinction Ratio	ER	3.0			dB	
Optical Return Loss Tolerance	TOL			12	dB	
Transmitter Eye Mask Definition {X1, X2, X3, Y1, Y2, Y3}			IEEE 802.3bm 100Gbase-SR4			
Average Launch Power OFF (each Lane)	P_{off}			-30	dBm	

Note: Transmitter optical characteristics are measured with a multimode fiber.

OPTICAL CHARACTERISTICS – RECEIVER

Parameter	Symbol	Min	Typ	Max	Unit	Notes
Signalling Speed per Lane			25.78		Gbps	
Centre Wavelength	λ_0	840	850	860	nm	
Damage Threshold (each Lane)	Thd	3.4			dBm	3
Average Receive Power (each Lane)		-10.3		+2.4	dBm	
Receiver Reflectance	R_R			-12	dB	
Stressed Receiver Sensitivity (OMA), each Lane				-5.2	dBm	4
LOS Assert	LOS_A	-20			dBm	
LOS Deassert	LOS_D			-12	dBm	
LOS Hysteresis	LOS_H	0.5			dB	

Note: Receiver optical characteristics are measured with a multimode fiber.

DIGITAL DIAGNOSTIC FUNCTIONS

The following digital diagnostic characteristics are defined over the normal operating conditions unless otherwise specified.

Parameter	Symbol	Min	Typ	Max	Unit	Notes
Temperature monitor absolute error	DMI_{TEMP}	-3		3	deg. C	Over operating temperature range
Supply voltage monitor absolute error	DMI_{VCC}	-0.15		0.15	V	Over Full operating range
Channel RX power monitor absolute error	DMI_{RX_CH}	-2		2	dB	1
Channel Bias current monitor	DMI_{Ibias_CH}	-10%		10%	mA	Ch1~Ch4

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Channel TX power monitor absolute error	DMI_{TX_CH}	-2	2	dB	1
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Note 1: Due to measurement accuracy of different multi-mode fibers, there could be an additional ± 1 dB fluctuation, or ± 3 dB total accuracy.

MODE-CONDITIONING PATCH CABLE

Figure 2. shows the orientation of the multi-mode facets of the optical connector.

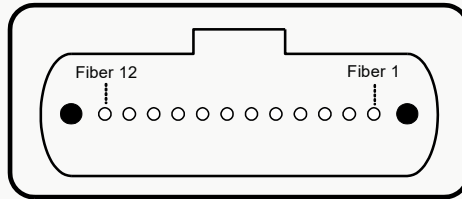


Figure 2. Optical connector

PATCH CABLE PIN LAYOUT

Fiber	Description	PIN	Description
1	Rx (0)	7	Not used
2	Rx (1)	8	Not used
3	Rx (2)	9	Tx (3)
4	Rx (3)	10	Tx (2)
5	Not used	11	Tx (1)
6	Not used	12	Tx (0)

OPTICAL AND ELECTRICAL CHARACTERISTICS

Parameter	Symbol	Min	Typ	Max	Unit
50 / 125 um MMF			300		m
Data Rate			25		Gbps

OPTICAL AND ELECTRICAL CHARACTERISTICS TRANSMITTER

Parameter	Symbol	Min	Typ	Max	Unit
Centre Wavelength	λ_c	840	850	860	nm
Spectral Width (RMS)	$\Delta\lambda$			0.45	nm
Average Output Power	P_{out}	-6		-1	dBm
Extinction Ratio	E_r	3.0	5.0		dB
Output Optical Eye		IEEE 802.3-2005 Compliant			
Transmitter Dispersion Penalty	TDP			3.9	dB
Input Differential Impedance	Z_{IN}	90	100	110	Ω
TX_Disable Assert Time	t_{off}			10	us
TX_DISABLE Negate Time	t_{on}	-	-	1	ms
TX_BISABLE time to start reset	t_{reset}	10	-	-	us
Time to initialize, include reset of TX_FAULT	t_{init}	-	-	300	ms
TX_FAULT from fault to assertion	t_{fault}	-	-	100	us

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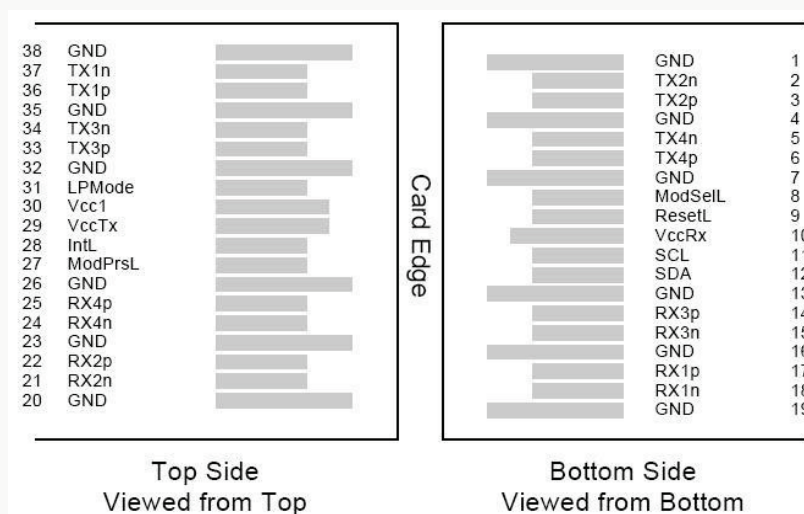
Total Jitter	<i>TJ</i>	-	-	0.28	UI(p-p)
Data Dependant Jitter	<i>DDJ</i>	-	-	0.1	UI(p-p)
Uncorrelated Jitter	<i>UJ</i>	-	-	0.023	RMS

OPTICAL AND ELECTRICAL CHARACTERISTICS RECEIVER

Parameter	Symbol	Min	Typ	Max	Unit
Centre Wavelength	λ_c	840	850	860	nm
Receiver Sensitivity	<i>P_{min}</i>			-11.1	dBm
Output Differential Impedance	<i>R_{IN}</i>	90	100	110	Ω
Receiver Overload2	<i>P_{max}</i>	-1			dBm
Optical Return Loss	<i>ORL</i>			-12	dB
LOS De-Assert	<i>LOSD</i>			-12.5	dBm
LOS Assert	<i>LOSA</i>	25			dBm
LOS Hysteresis		0.5			dB
LOS	High	2.0		VCC+0.3	V
	Low	0		0.8	

PIN ASSIGNMENT AND FUNCTION DEFINITIONS

PIN ASSIGNMENT



PIN DEFINITION

PIN	Signal Name	Description	PIN	Signal Name	Description
1	GND	Ground (1)	20	GND	Ground (1)
2	Tx2n	CML-I Transmitter 2 Inverted Data Input	21	Rx2n	CML-O Receiver 2 Inverted Data Output
3	Tx2p	CML-I Transmitter 2 Non-Inverted Data Input	22	Rx2p	CML-O Receiver 2 Non-Inverted Data Output
4	GND	Ground (1)	23	GND	Ground (1)
5	Tx4n	CML-I Transmitter 4 Inverted Data Input	24	Rx4n	CML-O Receiver 4 Inverted Data Output

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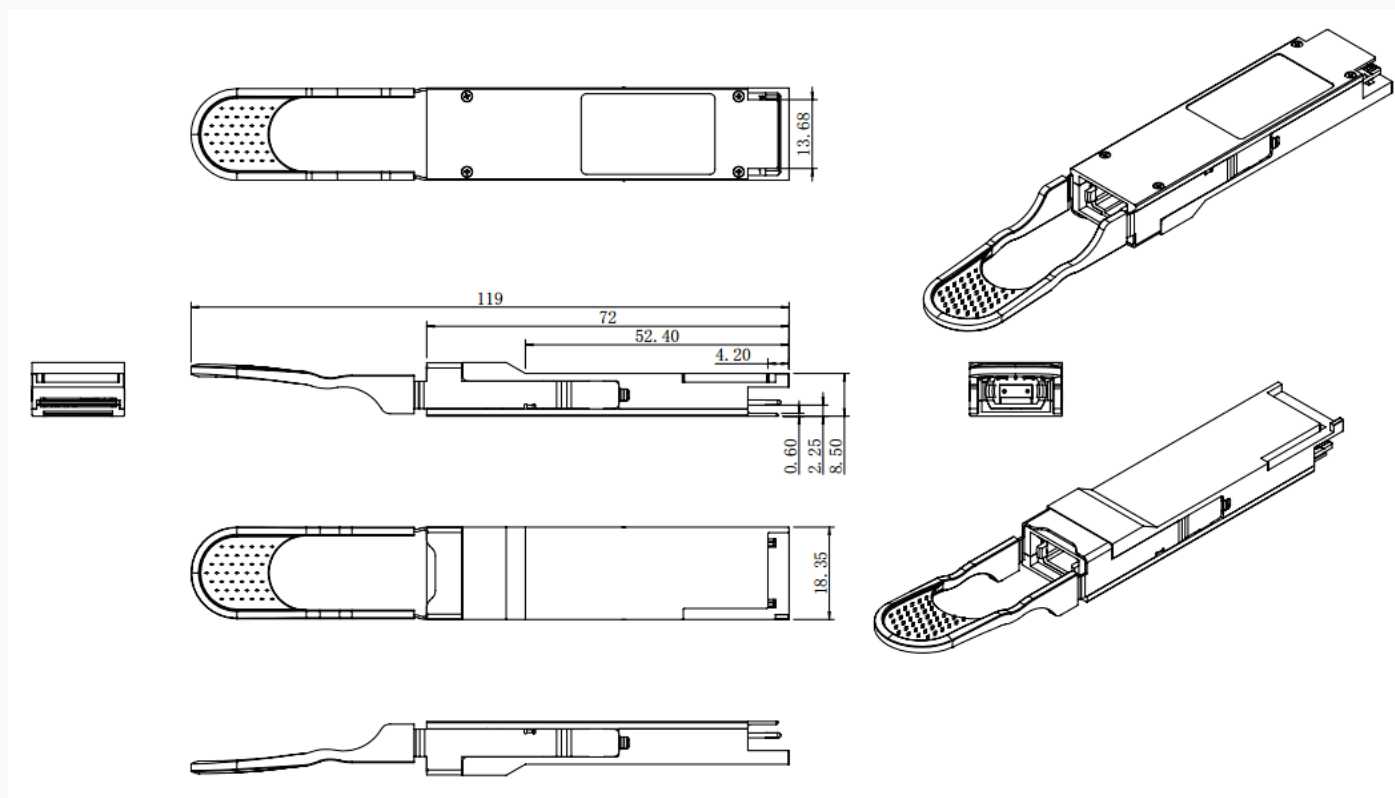
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6	Tx4p	CML-I Transmitter 4 Non-Inverted Data Input	25	Rx4p	CML-O Receiver 4 Non-Inverted Data Output
7	GND	Ground (1)	26	GND	Ground (1)
8	ModSelL	LVTTLL-I Module Select	27	ModPrsL	Module Present
9	ResetL	LVTTLL-I Module Reset	28	IntL	Interrupt
10	VccRx	+3.3V Power Supply Receiver (2)	29	VccTx	+3.3V Power Supply Transmitter (2)
11	SCL	LVC MOS-I/O 2-Wire Serial Interface Clock	30	Vcc1	+3.3V Power Supply
12	SDA	LVC MOS-I/O 2-Wire Serial Interface Data	31	LPMode	LVTTLL-I Low Power Mode
13	GND	Ground (1)	32	GND	Ground (1)
14	Rx3p	CML-O Receiver 3 Non-Inverted Data Output	33	Tx3p	CML-I Transmitter 3 Non-Inverted Data Input
15	Rx3n	CML-O Receiver 3 Inverted Data Output	34	Tx3n	CML-I Transmitter 3 Inverted Data Input
16	GND	Ground (1)	35	GND	Ground (1)
17	Rx1p	CML-O Receiver 1 Non-Inverted Data Output	36	Tx1p	CML-I Transmitter 1 Non-Inverted Data Input
18	Rx1n	CML-O Receiver 1 Inverted Data Output	37	Tx1n	CML-I Transmitter 1 Inverted Data Input
19	GND	Ground (1)	38	GND	Ground (1)

Notes:

1. All Ground (GND) are common within the QSFP+ module and all module voltages are referenced to this potential unless noted otherwise. Connect these directly to the host board signal common ground plane.
2. VccRx, Vcc1 and VccTx are the receiving and transmission power suppliers and shall be applied concurrently. The connector pins are each rated for a maximum current of 500mA.

MECHANICAL DRAWING



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