

## QSFP-100G-SR4-S-COM

### 100Gb/s QSFP28 SR4 100m Optical Transceiver Module

#### Features

- Hot-pluggable QSFP28 form factor
- Supports 103.1Gb/s aggregate bit rate
- 4x25G electrical interface
- Compliant to IEEE 802.3bm 100GBASE-SR4
- MTP/MPO optical connector
- Up to 100m OM4 MMF transmission
- Digital diagnostic SFF-8636 compliant
- RoHS-6 compliant and lead-free
- Compliant with QSFP28 MSA
- Single +3.3V power supply
- Maximum power consumption 2.0W
- Case operating temperature  
Commercial: 0 ~ +70°C



#### Applications

- Data Center
- Fiber channel
- Ethernet switches and router applications

#### Part Number Ordering Information

Part Number	Data Rate (Gb/s)	Wavelength (nm)	Transmission Distance(m)	Temperature (°C) (Operating Case)
<b>QSFP-100G-SR4-S-COM</b>	100	850	100m MMF	0~70 commercial

#### Absolute Maximum Ratings

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

Parameter	Symbol	Min	Max	Unit	Notes
Storage Temperature	T <sub>s</sub>	-40	85	°C	
Power Supply Voltage	V <sub>CC</sub>	-0.3	4.0	V	
Relative Humidity (non-condensation)	RH	5	95	%	
Damage Threshold	TH <sub>d</sub>		5.0	dBm	

## Recommended Operating Conditions and Power Supply Requirements

Parameter	Symbol	Min	Typical	Max	Unit	Notes
Operating Case Temperature	T <sub>OP</sub>	0		70	°C	commercial
Power Supply Voltage	V <sub>CC</sub>	3.135	3.3	3.465	V	
Data Rate			100		Gb/s	
Control Input Voltage High		2		V <sub>CC</sub>	V	
Control Input Voltage Low		0		0.8	V	
Link Distance (OM3)	D1			70	m	
Link Distance (OM4)	D2			100	m	

## General Description

This product 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 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. Electrical connection is achieved through an MSA-compliant 38-pin edge type connector.

The module operates by a 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 offers very high functionality and feature integration, accessible via a two-wire serial interface.

This product converts parallel electrical input signals into parallel optical signals, by a driven Vertical Cavity Surface Emitting Laser (VCSEL) array. The transmitter module accepts electrical input signals compatible with Common Mode Logic (CML) levels. All input data signals are differential and internally terminated. The receiver module converts parallel optical input signals via a photo detector array into parallel electrical output signals. The receiver module outputs electrical signals are also voltage compatible with Common Mode Logic (CML) levels. All data signals are differential and support a data rates up to 25Gb/s per channel. Figure 1 shows the functional block diagram of this product.

A single +3.3V power supply is required to power up the module. Both power supply pins VccTx and VccRx are internally connected and should be applied concurrently. As per MSA specifications the module offers 7 low speed hardware control pins (including the 2-wire serial interface): ModSelL, SCL, SDA, ResetL, LPMode, ModPrsL and IntL.

Module Select (ModSelL) is an input pin. When held low by the host, the module responds to 2-wire serial communication commands. The ModSelL allows the use of multiple QSFP28 modules on a single 2-wire interface bus – individual ModSelL lines for each QSFP28 module must be used.

Serial Clock (SCL) and Serial Data (SDA) are required for the 2-wire serial bus communication interface and enable the host to access the QSFP28 memory map.

The ResetL pin enables a complete module reset, returning module settings to their default state, when a low level on the ResetL pin is held for longer than the minimum pulse length. During the execution of a reset the host shall disregard all status bits until the module indicates a completion of the reset interrupt. The module indicates this by posting an IntL (Interrupt) signal with the Data\_Not\_Ready bit negated in the memory map. Note that on power up (including hot insertion)

the module should post this completion of reset interrupt without requiring a reset.

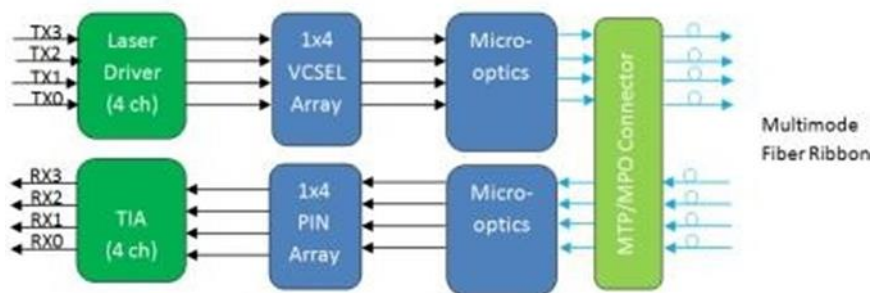
Low Power Mode (LPMode) pin is used to set the maximum power consumption for the module in order to protect hosts that are not capable of cooling higher power modules, should such

modules be accidentally inserted.

Module Present (ModPrsL) is a signal local to the host board which, in the absence of a module, is normally pulled up to the host Vcc. When a module is inserted into the connector, it completes the path to ground through a resistor on the host board and asserts the signal. ModPrsL then indicates a module is present by setting ModPrsL to a “Low” state.

Interrupt (IntL) is an output pin. Low indicates a possible module operational fault or a status critical to the host system. The host identifies the source of the interrupt using the 2-wire serial interface. The IntL pin is an open collector output and must be pulled to the Host Vcc voltage on the Host board.

## Transceiver Block Diagram



## Pin Assignment and Pin Description

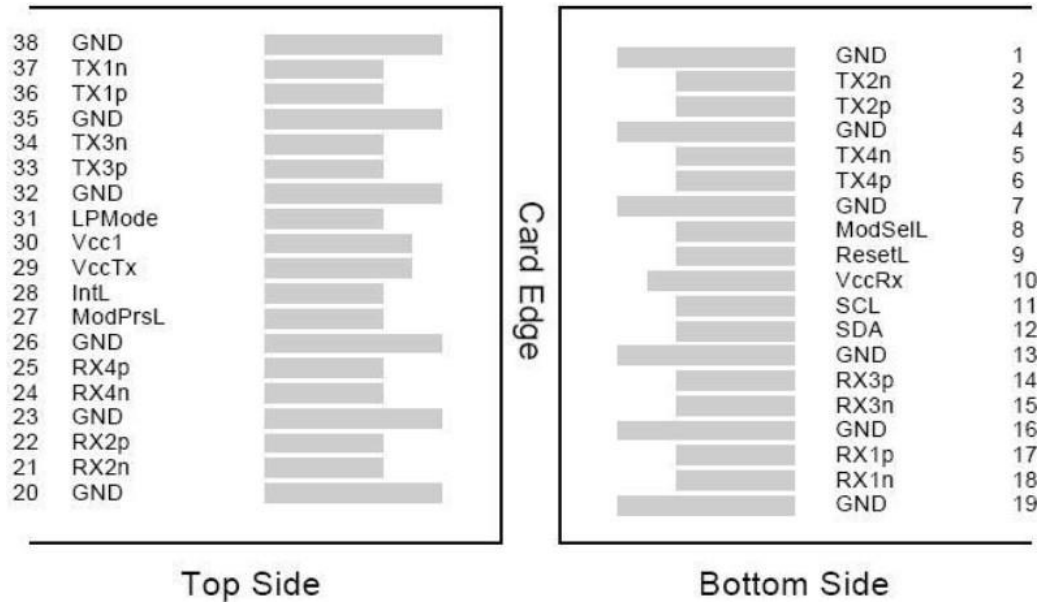


Diagram of host board connector block pin numbers and names

Pin	Symbol	Name/Description	Notes
1	GND	Transmitter Ground (Common with Receiver Ground)	1
2	Tx2n	Transmitter Inverted Data Input	
3	Tx2p	Transmitter Non-Inverted Data output	
4	GND	Transmitter Ground (Common with Receiver Ground)	1
5	Tx4n	Transmitter Inverted Data Input	
6	Tx4p	Transmitter Non-Inverted Data output	
7	GND	Transmitter Ground (Common with Receiver Ground)	1
8	ModSelL	Module Select	
9	ResetL	Module Reset	
10	VccRx	3.3V Power Supply Receiver	2

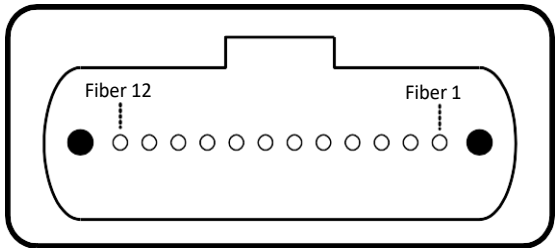
11	SCL	2-Wire serial Interface Clock	
12	SDA	2-Wire serial Interface Data	
13	GND	Transmitter Ground (Common with Receiver Ground)	
14	Rx3p	Receiver Non-Inverted Data Output	
15	Rx3n	Receiver Inverted Data Output	
16	GND	Transmitter Ground (Common with Receiver Ground)	1
17	Rx1p	Receiver Non-Inverted Data Output	
18	Rx1n	Receiver Inverted Data Output	
19	GND	Transmitter Ground (Common with Receiver Ground)	1
20	GND	Transmitter Ground (Common with Receiver Ground)	1
21	Rx2n	Receiver Inverted Data Output	
23	GND	Transmitter Ground (Common with Receiver Ground)	1
24	Rx4n	Receiver Inverted Data Output	1
25	Rx4p	Receiver Non-Inverted Data Output	
26	GND	Transmitter Ground (Common with Receiver Ground)	1
27	ModPrsl	Module Present	
28	IntL	Interrupt	
29	VccTx	3.3V power supply transmitter	2
30	Vcc1	3.3V power supply	2
31	LPMODE	Low Power Mode	
32	GND	Transmitter Ground (Common with Receiver Ground)	1
33	Tx3p	Transmitter Non-Inverted Data Input	
34	Tx3n	Transmitter Inverted Data Output	
35	GND	Transmitter Ground (Common with Receiver Ground)	1

36	Tx1p	Transmitter Non-Inverted Data Input	
37	Tx1n	Transmitter Inverted Data Output	
38	GND	Transmitter Ground (Common with Receiver Ground)	1

**Notes:**

1. GND is the symbol for signal and supply (power) common for QSFP28 modules. All are common within the QSFP28 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. VccRx, Vcc1 and VccTx are the receiving and transmission power suppliers and shall be applied concurrently. Recommended host board power supply filtering is shown below. Vcc Rx, Vcc1 and Vcc Tx may be internally connected within the QSFP28 transceiver module in any combination. The connector pins are each rated for a maximum current of 500mA.

## 6 Optical Interface Lanes and Assignment



Outside View of the QSFP28 Module MPO Receptacle

### Lane Assignment

Fiber #	Lane Assignment
1	RX0
2	RX1
3	RX2
4	RX3
5,6,7,8	Not used

9	TX3
10	TX2
11	TX1
12	TX0

## Electrical Characteristics

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

Parameter	Symbol	Min.	Typ.	Max	Unit	Notes
Power Consumption	p			2.0	W	
Supply Current	I <sub>cc</sub>			600	mA	
<b>Transmitter</b>						
Single-ended Input Voltage Tolerance	V <sub>cc</sub>	-0.3		4.0	V	
Differential Input Voltage Swing	V <sub>in,pp</sub>	180		1000	mV <sub>pp</sub>	
Differential Input Impedance	Z <sub>in</sub>	90	100	110	Ohm	1
Transmit Disable Assert Time				10	us	
Transmit Disable Voltage	V <sub>dis</sub>	V <sub>cc</sub> -1.3		V <sub>cc</sub>	V	
Transmit Enable Voltage	V <sub>en</sub>	V <sub>ee</sub>		V <sub>ee</sub> +0.8	V	2
<b>Receiver</b>						
Differential Output Voltage Swing	V <sub>out,pp</sub>	300		850	mV <sub>pp</sub>	
Differential Output Impedance	Z <sub>out</sub>	90	100	110	Ohm	3
Data output rise/fall time	Tr/Tf	28			ps	4
LOS Assert Voltage	V <sub>losH</sub>	V <sub>cc</sub> -1.3		V <sub>cc</sub>	V	5



LOS De-assert Voltage	VlosL	Vee		Vee +0.8	V	5
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**Notes:**

1. Connected directly to TX data input pins. AC coupled thereafter.
2. Or open circuit.
3. Input 100 ohms differential termination.
4. These are unfiltered 20-80% values.
5. Loss of Signal is LVTTTL. Logic 0 indicates normal operation; logic 1 indicates no signal detected.

## Optical Characteristic

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

Parameter	Symbol	Min.	Typical	Max	Unit	Notes
<b>Transmitter</b>						
Center Wavelength	$\lambda_c$	840	850	860	nm	
Optical Spectral Width	$\Delta\lambda$			0.6	nm	
Average Launch Power each lane	$P_{AVG}$	-8.4		2.4	dBm	
Optical Extinction Ratio	ER	2			dB	
Transmitter and Dispersion Penalty	TDP			4.3	dB	
Transmitter OFF Output Power	Poff			-30	dBm	
Transmitter Eye Mask	Compliant with IEEE802.3ae					
<b>Receiver</b>						
Center Wavelength	$\lambda_c$	840		860	nm	
Rx Sensitivity per lane	Sen.			-10.3	dBm	1
Input Saturation Power (overload)	Psat	2.4			dBm	
LOS Assert	LOSA	-26			dBm	
LOS De-assert	LOSD			-12	dBm	

LOS Hysteresis	LOSH	0.5			dB	
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**Notes:**

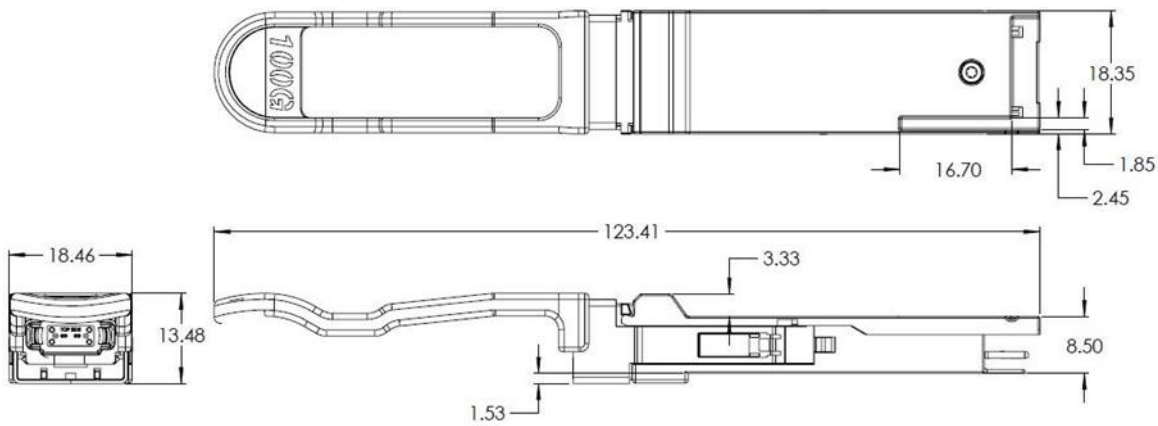
1. Measured with Light source 850nm, ER=2.0dB; BER<5.2\*10<sup>-5</sup> @25.78Gbps, PRBS=2<sup>31</sup>-1 NRZ.

## Digital Diagnostic Functions

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

Parameter	Symbol	Min.	Max	Unit	Notes
Temperature monitor absolute error	DMI_Temp	-3	3	degC	Over operating temp
Supply voltage monitor absolute error	DMI_VCC	-0.15	0.15	V	Full operating range
RX power monitor absolute error	DMI_RX	-2	2	dB	
Bias current monitor	DMI_bias	-10%	10%	mA	
TX power monitor absolute error	DMI_TX	-2	2	dB	

## Mechanical Dimensions



Mechanical Outline