

100Gbps QSFP28 SR BiDi BIQSFP28-SR-PLU*

Features

- QSFP28 MSA compliant
- Support 100GE aggregate bit rates
- Support KP4 FEC @100G data rate
- Two independent full-duplex channels
- Up to 100m OM4 MMF transmission
- Operating case temperature: 0 to 70°C
- Single 3.3V power supply
- Maximum power consumption 4W
- LC optical connector
- RoHS-6 compliant



Applications

- Data Center Interconnect
- 100G Ethernet
- Infiniband HDR

Description

This product can support 100Gb/s bit rates. It is a parallel Quad Small Form-factor Pluggable (QSFP28) Bi-Direction optical module. The module integrates four host electrical data into two optical lanes (by Dual Wavelength VCSEL Bi-Directional Optical Interface, 850nm and 900nm) to allow optical communication over a 2-fiber duplex LC optical multi-mode fiber. Reversely, on the receiver side, the module de-multiplexes 2 sets of optical input signal and converts them to 4 channels of electrical data.

An optical fiber ribbon cable with an LC 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 spec sheet is also for other vendor compatible units with the last 3 digits of the part number varying based on vendor code. Please see the last page of this specification sheet for a list of vendor codes. All SFP are commercial grade unless the SKU has an "I" after the 3 digit vendor code for example SFP-1G-2KM-MOXI is a Moxa compatible

Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Units	Note
Storage Temperature	T_s	-40	85	°C	
Operating Case Temperature	T_{op}	10	70	°C	
Power Supply Voltage	V_{cc}	-0.5	3.6	V	
Relative Humidity (non-condensation)	RH	0	85	%	
Damage Threshold, each Lane	TH_d	5		dBm	

Recommended Operating Conditions

Parameter	Symbol	Min.	Typ.	Max.	Units	Note
Operating Case Temperature	T_{op}	10		70	°C	
Power Supply Voltage	V_{cc}	3.135	3.3	3.465	V	
Data Rate Accuracy		-100		100	ppm	
Pre-FEC Bit Error Ratio				2.4×10^{-4}		
Post-FEC Bit Error Ratio				1×10^{-12}		1
Control Input Voltage High		2		V_{cc}	V	
Control Input Voltage Low		0		0.8	V	
Link Distance	OM3			70	m	2
	OM4			100	m	2
	OM5			150	m	2

Notes:

1. FEC provided by host system.
2. FEC required on host system to support maximum distance.

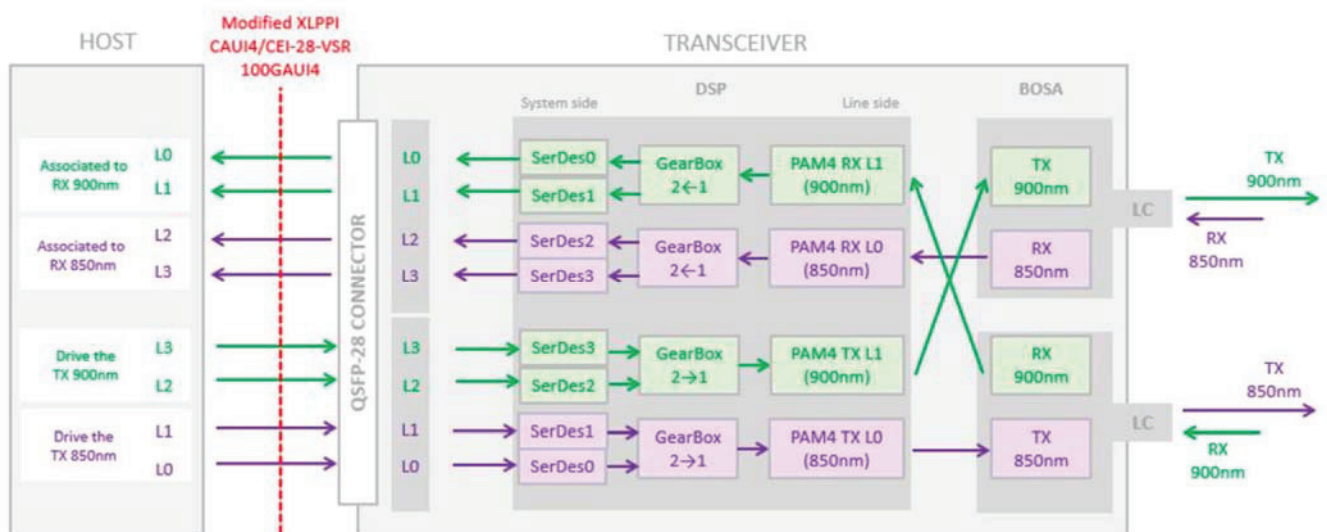
Diagnostics Monitoring

Parameter	Symbol	Accuracy	Unit	Notes
Temperature monitor absolute error	DMI_Temp	± 3	$^{\circ}\text{C}$	Over operating temperature range
Supply voltage monitor absolute error	DMI_VCC	± 0.15	V	Over full operating range
Channel RX power monitor absolute error	DMI_RX_Ch	± 2	dB	1
Channel Bias current monitor	DMI_Ibias_Ch	$\pm 10\%$	mA	
Channel TX power monitor absolute error	DMI_TX_Ch	± 2	dB	1

Notes:

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

Transceiver Block Diagram



Optical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Units	Note
Center Wavelength Line0	λ_c	844	850	863	nm	
Center Wavelength Line1	λ_c	900	910	918	nm	
Transmitter						
RMS Spectral Width	$\Delta\lambda_{rms}$			$\lambda 1: 0.6$ $\lambda 2: 0.65$	nm	
Average Launch Power, each lane	P_{AVG}	-6.2		4	dBm	
Optical Modulation Amplitude (OMA _{outer}), each lane	P_{OMA}	-4.2		3	dBm	1
Peak Power, each Lane				--	dBm	
Launch power in OMA minus TDP, each lane		-5.6			dBm	
TDECQ, each lane				4.5	dB	
Extinction Ratio	ER	3.0			dB	
Transmitter transition time, each lane				31	ps	
RIN 12 OMA				-128	dB/Hz	
Optical Return Loss Tolerance	TOL			12	dB	
Average Launch Power of OFF Transmitter, each Lane	P_{off}			-30	dBm	
Encircled Flux		$\geq 86\%$ at 19 μm $\geq 30\%$ at 4.5 μm				2
Signaling rate, each lane		26.5625 \pm 100ppm			Gbps	
Receiver						
Damage Threshold, each Lane	TH_d	5			dBm	3
Average Receiver Power, each Lane		-8.2			dBm	4
Average power at receiver input, each lane (overload)				4	dBm	
Receiver Reflectance	R_R			-12	dB	
Stressed receiver sensitivity in OMA Lane2				-3.5	dBm	5
Receiver sensitivity (OMA outer), each lane				Max (-6.6, SECQ-8) as per IEEEcl150	dBm	
LOS Assert	$LOSA$	-30		-14.2	dBm	

LOS Deassert	<i>LOSD</i>	-11.2	dBm
LOS Hysteresis	<i>LOSH</i>	0.5	dB

Note:

- 1, Even if the mTDEC<0.9dB, the OMA (min) must exceed this value.
2. If measured into type A1a.2 50um fiber in accordance with IEC 61280-1-4.
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. Average receive power, each lane (min) is informative and not the principal indicator of signal strength. A received power below this value cannot be compliant; however, a value above this does not ensure compliance.
5. Measured with conformance test signal at TP3 as per following:

Stressed eye closure (SECq), each lane	4.5	dB
OMA of each aggressor, each lane	3	dBm

Electronical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Units	Note
Power Consumption				4	W	
Supply Current	<i>I_{cc}</i>			1.21	A	
Transmitter (each lane)						
Overload Differential Voltage pk-pk	<i>TP1a</i>	900			mV	
Common Mode Voltage (V _{cm})	<i>TP1</i>	-350		2850	mV	1
Differential Termination Resistance Mismatch	<i>TP1</i>			10	%	at 1MHz
Differential Return Loss (SDD11)	<i>TP1</i>			See CEI-28G-VSR Equation 13-19	dB	
Common Mode to Differential conversion and Differential to Common Mode conversion (SDC11, SCD11)	<i>TP1</i>			See CEI-28G-VSR Equation 13-20	dB	2
Stressed Input Test	<i>TP1a</i>	See CEI-28G-VSR Section 13.3.11.2.1				V
Receiver (each lane)						
Differential Voltage, pk-pk	<i>TP4</i>			900	mV	
Common Mode Voltage (V _{cm})	<i>TP4</i>	-350		2850	mV	1
Common Mode Noise, RMS	<i>TP4</i>			17.5	mV	
Differential Termination Resistance Mismatch	<i>TP4</i>			10	%	at 1 MHz
Differential Return Loss (SDD22)	<i>TP4</i>			See CEI-28G-VSR Equation 13-19	dB	
Common to Mode to Differential Conversion and Differential to Common Mode conversion (SDC22, SCD22)	<i>TP4</i>			See CEI-28G-VSR Equation 13-21	dB	

Common Mode Return Loss (SCC22)	TP4	-2	dB	2
Transition Time 20% to 80%	TP4	9.5	ps	
Vertical Eye Closure (VEC)	TP4	5.5	dB	
Eye Width at 10 ⁻¹⁵ probability (EW15)	TP4	0.57	UI	
Eye Height at 10 ⁻¹⁵ probability (EH15)	TP4	228	mV	

Notes:

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

Optical Interface Lanes and Assignment

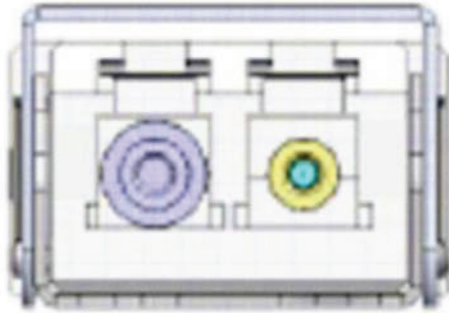


Figure 3: Outside View of the QSFP28 Module LC Receptacle

Recommended Power Supply Filter

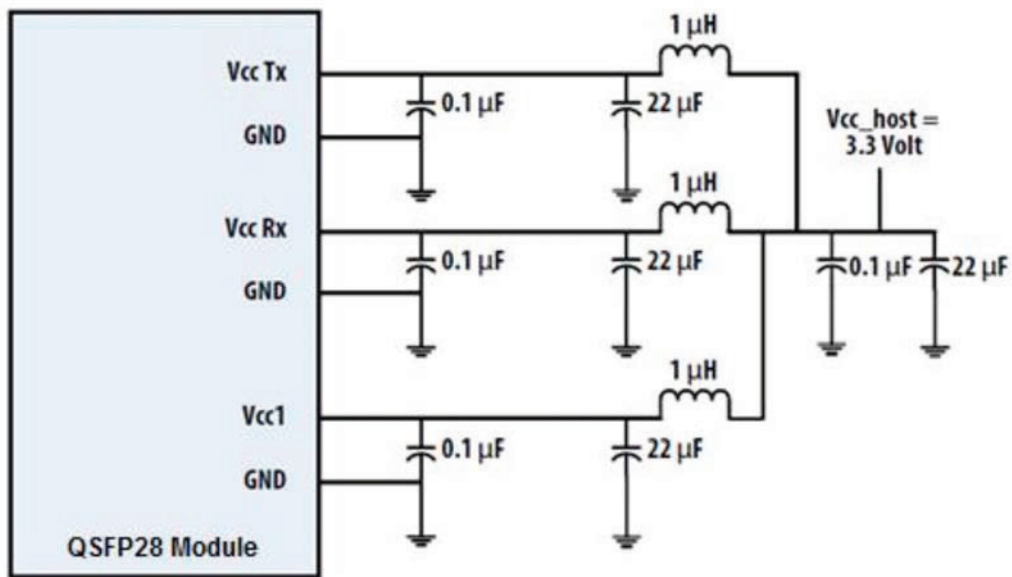


Figure 4. Recommended Power Supply Filter

Pin Descriptions

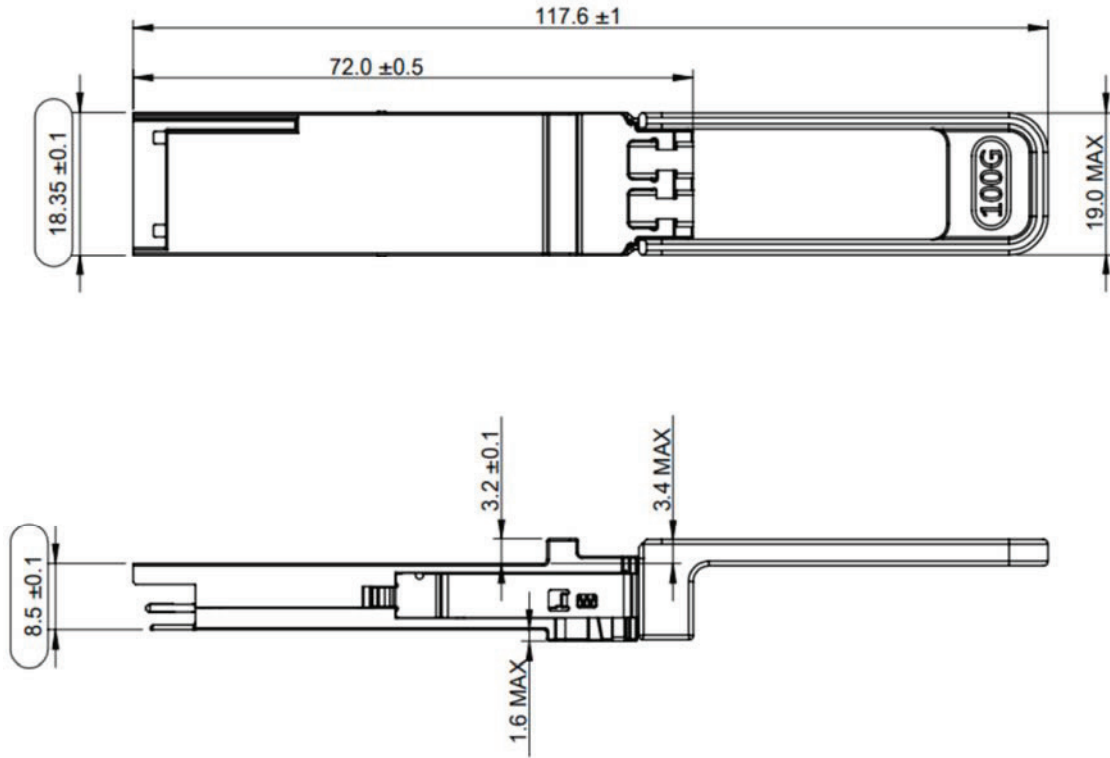
Pin	Logic	Symbol	Name/Description	Notes
1		GND	Ground	1
2	CML-I	Tx2n	Transmitter Inverted Data Input	
3	CML-I	Tx2p	Transmitter Non-Inverted Data Input	
4		GND	Ground	1
5	CML-I	Tx4n	Transmitter Inverted Data Input	
6	CML-I	Tx4p	Transmitter Non-Inverted Data Input	
7		GND	Ground	1
8	LVTTL-I	ModSelL	Module Select	
9	LVTTL-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	1
14	CML-O	Rx3p	Receiver Non-Inverted Data Output	
15	CML-O	Rx3n	Receiver Inverted Data Output	
16	GND	Ground	1B	GND
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	
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	+3.3V Power supply transmitter	2
30		Vcc1	+3.3V 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 Input	
35		GND	Ground	1
36	CML-I	Tx1p	Transmitter Non-Inverted Data Input	
37	CML-I	Tx1n	Transmitter Inverted Data Input	
38		GND	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 receiver and transmitter 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 QSFP28 transceiver module in any combination. The connector pins are each rated for a maximum current of 1000mA

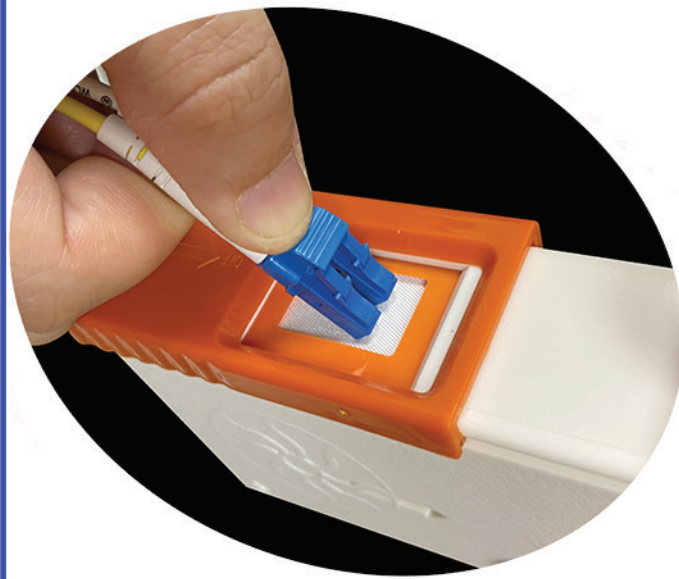
Dimensions



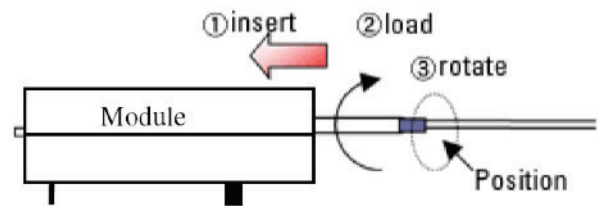
Optical Receptacle Cleaning Recommendations :

All fiber stubs inside the receptacle portions were cleaned before shipment. In the event of contamination of the optical ports, the recommended cleaning process is the use of forced nitrogen. If contamination is thought to have remained, the optical ports can be cleaned using a NTT international Cletop® stick type and HFE7100 cleaning fluid. Before the mating of patch-cord, the fiber end should be cleaned up by using Cletop® cleaning cassette.

Cleaning of patch-cord



Cleaning of fiber stub



1. Insert
Ensure that stick is held straight when inserting into sleeve.
2. Load
Apply sufficient pressure (approx 600-700g) to ensure ferrule a little depressed in sleeve.
3. Rotate
Rotate stick clockwise 4-5 times, while ensuring direct contact with ferrule end-face is maintained.

*Notice: Number of possible wipes:
Maintenance (repair) ~1 use / piece
Equipment construction: 4 uses / piece (max.)*

Note: The pictures were extracted from NTT-ME website. And the Cletop® is a trademark registered by NTT-ME

Ordering Information

When ordering, to choose the vendor you require such as Cisco, HP, Juniper etc you need to replace the 'XXX' at the end of each SKU with the relevant 3 digit vendor code, for instance if you wanted a Cisco Multimode 1.25Gb SFP then the SKU would read SFP-1G-550M-MMD-CIS.

VENDOR	CODE	VENDOR	CODE	VENDOR	CODE	VENDOR	CODE
3com	3CO	Cyan	CYN	Huawei	HUA	PlusOptic	PLU
Adtran	ADT	Compaq	COM	IBM	IBM	Q-logic	QLO
Alcatel-Lucent	ALC	Dell	DEL	Intel	INT	QNA	QNA
Allied Telesis	ATE	Delta	DTA	JDS Uniphase	JDS	RAD	RAD
Allnet	ALL	D-LINK	DLI	Juniper	JUN	Redback	RED
Arista Networks	ARI	EMC	EMC	LNV	LNV	Riverstone	RIV
Aruba Networks	ARU	EMU	EMU	Linksys	LIN	Silicom	SIL
Asante	ASA	Enterasys	ENT	Marconi	MAR	Smartoptic	SMO
Avago	AVA	Extreme	EXT	McAfee	McA	SMC	SMC
Avaya	AVY	F5 Networks	F5	Meraki	MER	Solarflare	SLF
Black Box	BLK	Finisar	FIN	Milan Techn	MIL	Sun	SUN
Blade	BLA	Fluke	FLU	Moxa	MOX	SuperMicro	SUP
Bluecoat	BLU	Force 10	F10	NetAPP	NAP	Telco	TEL
Broadcom	BRD	Fortinet	FOR	Netgear	NET	TP-Link	TPL
Brocade	BRO	Foundry	FOU	Nortel	NOR	Transition	TRA
Calix	CAL	Fujitsu	FUJ	Packeteer	PKT	Trendnet	TRE
Ceragon Networks	CRN	Gigamon	GIG	PacketLight	PKL	Voltaire	VOL
Check Point	CHE	H3C	H3C	Palo Alto	PAL	WGD	WGD
CHL	CHL	HIR	HIR	Penguin	PEN	WES	WES
Ciena	CIE	HP	HP	Perle	PER	ZTE	ZTE
Cisco	CIS	HP ProCurve	HPP	PicoLight	PIC	ZYXEL	ZYX
Citrix	CIX	Huawei	HUA	Planet	PLA		