GNQ1M0C85

100Gb/s QSFP28 SR4 Optical Transceiver

Features

- QSFP28 MSA compliant
- Compliant to IEEE802.3bm 100GBASE-SR4
- Four independent full-duplex channels
- Supports 103.1Gb/s aggregate bit rate
- Up to 100m OM4 MMF transmission
- Operating case temperature: 0 to 70ºC
- Single 3.3V power supply
- 4x25G electrical interface (OIF CEI-28G-VSR)
- Maximum power consumption 2.5W
- MTP/MPO optical connector
- RoHS-6 compliant

Applications

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

General Description

This product is a parallel 100Gb/s Quad Small Form-factor Plug-gable (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 muti-mode fiber.

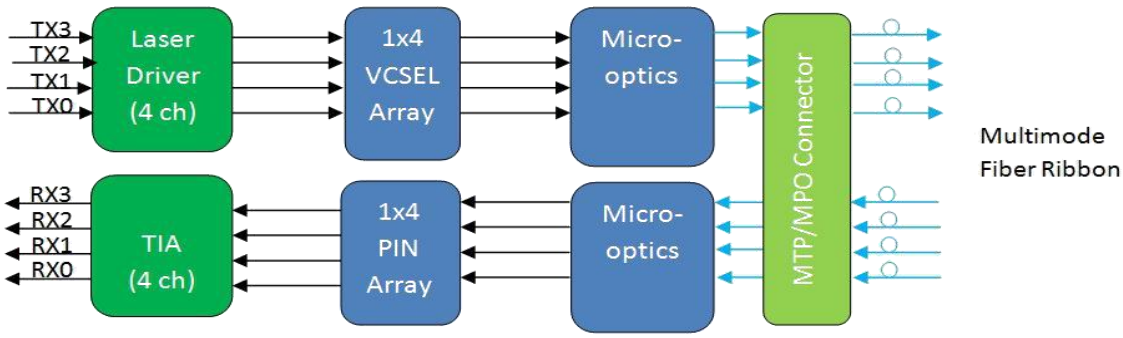
An optical fiber ribbon cable with an MTP/MPO connector can be plugged into the QSFP28 module receptacle. Proper alignment is ensured by the guide pins inside the receptacle. The cable usually cannot be twisted for proper channel to channel alignment. Electrical connection is achieved through an MSA-compliant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

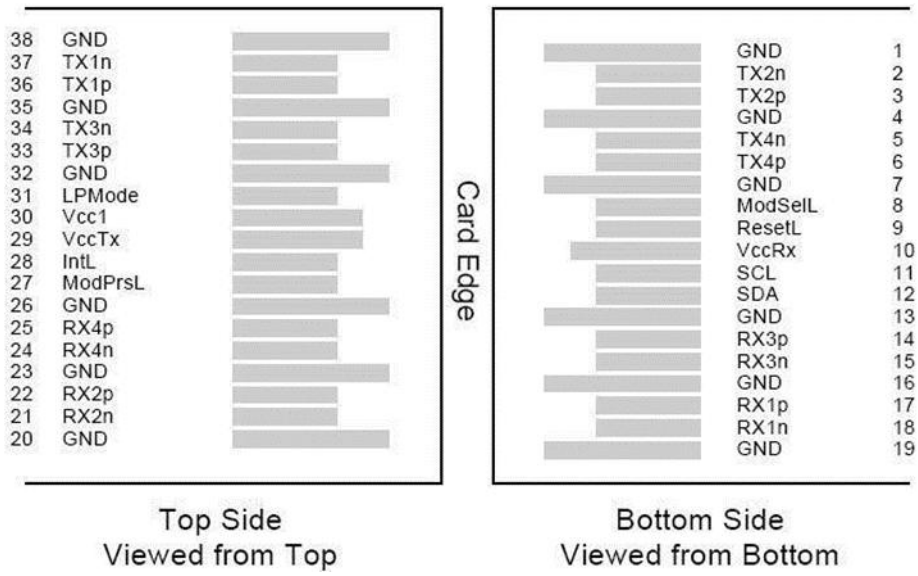
Transceiver Block Diagram

Figure 1. Transceiver Block Diagram



Pin Assignment

Figure 2. MSA Compliant connector



Optical Interface Lanes and Assignment

Figure 3. the orientation of the muti-mode fiber facets of the optical connector

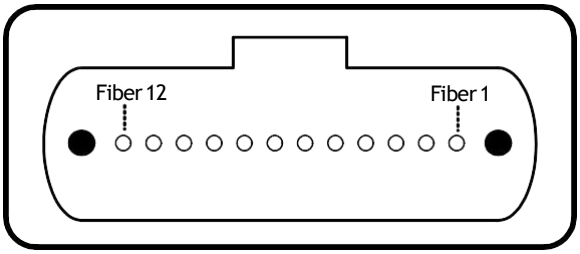
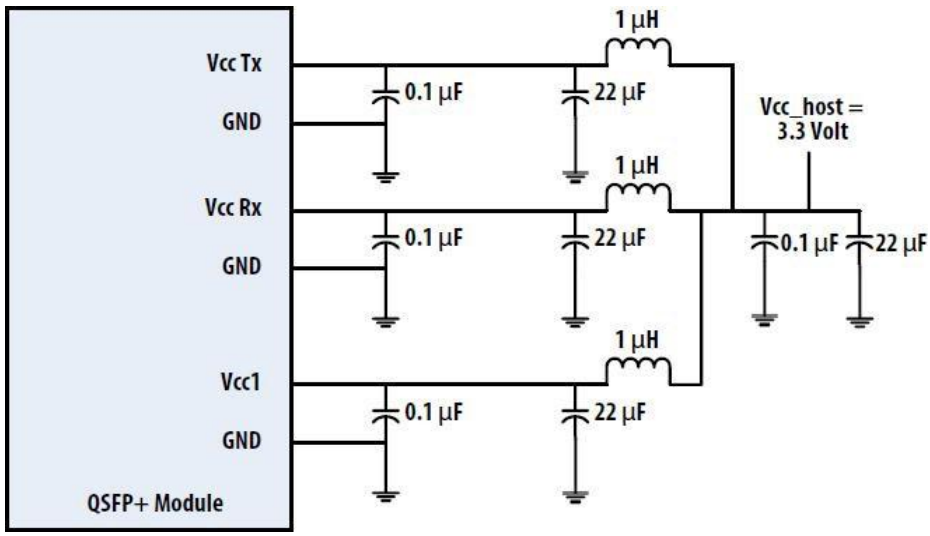


Table 1. provides the lane assignment.

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

Recommended Power Supply Filter

Recommended Operating Environment specifies parameters for which the electrical and optical characteristics hold unless otherwise noted.



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.

Tarameter	Symbol	Min	Max	Units	Note
Storage Temperature	T_S	-40	85	℃	
Operating Case Temperature	TOP	0	70	℃	
Power Supply Voltage	VCC	-0.5	3.6	V	
Damage Threshold, each Lane	TH_d	3.4		dBm	

Recommended Operating Conditions and Power Supply Requirements

Parameter	Symbol	Min	Typical	Max	Units	Note
Operating Case Temperature	TOP	0		70	degC	
Power Supply Voltage	VCC	3.135	3.3	3.465	V	
Data Rate, each Lane			25.78125		Gb/s	
Control Input Voltage High		2		Vcc	V	
Control Input Voltage Low		0		0.8	V	
Pre-FEC Bit Error Ratio				5x10-5		
Post-FEC Bit Error Ratio				1x10-12		1
Link Distance (OM3 MMF)	D1			70	m	2
Link Distance (OM4 MMF)	D2			100	m	2

Notes:

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

Electrical Characteristics

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

Parameter	Symbol	Min	Typical	Max	Units	Notes
Power Consumption				2.5	W	
Supply Current	Icc			750	mA	
Transmitter (each Lane)						
Over load Differential Voltage pk-pk	TP1a	900			mV	
AC Common Mode Input Voltage Tolerance	TP1	-350		2850	mV	1
Differential Termination Resistance Mismatch	TP1			10	%	At 1MHz
Differential Return Loss (SDD11)	TP1	See CEI- 28G-VSR Equation 13-19			dB	
Common Mode to Differential conversion and Differential to Common Mode conversion	TP1	See CEI- 28G-VSR Equation 13-20			dB	(SDC11, SCD11)
Receiver (each Lane)						
Differential Voltage, pk-pk	TP4			900	mV	
Common Mode Voltage (Vcm)	TP4	-350		2850	mV	1
Common Mode Noise, RMS	TP4			17.5	mV	
Differential Termination	TP4			10	%	At 1MHz
Differential Return Loss (SDD22)	TP4	See CEI- 28G-VSR Equation 13-19			dB	
Common Mode to Differential conversion and Differential to Common Mode conversion	TP4	See CEI- 28G-VSR Equation 13-21			dB	(SDC22, SCD22)
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 Characteristics

Parameter	Symbol	Min	Typical	Max	Units	Notes
Transmitter						
Center Wavelength	λC	840	850	860	nm	
RMS Spectral Width	Δλrms			0.6	nm	
Average Launch Power, each Lane	PAVG	-8.4		2.4	dBm	
Optical Modulation Amplitude (OMA), each Lane	POMA	-6.4		3.0	dBm	1
Launch Power in OMA minus TDEC, each Lane		-7.3			dBm	
Transmitter and Dispersion Eye Closure (TDEC), each Lane				4.3	dB	
Extinction Ratio	ER	2.0			dB	
Optical Return Loss Tolerance	TOL			12	dB	
Encircled Flux		≥86% at 19um, ≤30%at4.5um				
Transmitter Eye Mask Definition {X1, X2, X3, Y1, Y2, Y3}		{0.3, 0.38, 0.45, 0.35, 0.41, 0.5}				
Average Launch Power OFF Transmitter, each Lane	Poff			-30	dBm	
Receiver						
Center Wavelength	λC	840	850	860	nm	
Damage Threshold, each Lane	THd	3.4			dBm	2
Average Receive Power, each Lane		-10.3		2.4	dBm	
Receive Power (OMA), each Lane				3.0	dBm	
Receiver Sensitivity (OMA), each Lane	SEN			-9.2	dBm	BER= 5x10-5
Stressed Receiver Sensitivity (OMA),				-5.2	dBm	3 (each Lane)
Receiver Reflectance	RR			-12	dB	
LOS Assert	LOSA	-30			dBm	
LOS Deassert	LOSD			-12	dBm	
LOS Hysteresis	LOSH	0.5			dB	
Conditions of Stress Receiver Sensitivity Test (Note 5)						
Stressed Eye Closure (SEC), Lane under Test			4.3		dB	
Stressed Eye J2 Jitter, Lane under Test			0.39		UI	
Stressed Eye J4 Jitter, Lane under Test				0.53	UI	
OMA of each Aggressor Lane			3		dBm	
Stressed Receiver Eye Mask Definition {X1, X2, X3, Y1, Y2, Y3},		{0.28, 0.5, 0.5, 0.33, 0.33, 0.4} Hit ratio 5x10-5 hits per sample				

Notes:

1. **Even if the TDP < 0.9 dB, the OMA min must exceed the minimum value specified here.**
2. **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.**
3. **Measured with conformance test signal at receiver input for BER = $5x10^{-5}$.**

Digital Diagnostic Functions

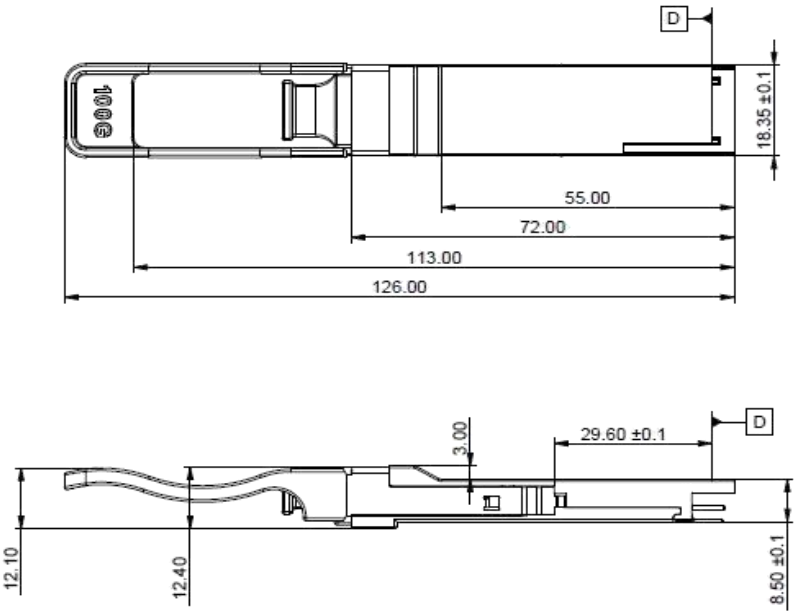
The following digital diagnostic characteristics are defined over the Recommended Operating Environment unless otherwise specified. It is compliant to SFF-8436.

Parameter	Symbol	Min	Max	Units	Notes
Temperature monitor absolute error	DMI_Temp	-3	3	degC	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
Channel TX power monitor absolute error	DMI_TX_Ch	-2	2	dB	1

Note:

1. 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



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.

Ordering Information

GNQ1M0C85	QSFP28 SR4 100m optical transceiver with full real- time digital diagnostic monitoring and pull tab