

## QSFP28

### EQ2xx10X-3LCD80

#### 100Gb/s QSFP28 ZR4 Transceiver

- Compliant with 100GBASE-ZR4
- Support line rates from 103.125 Gb/s to 111.81 Gb/s OTU4
- LAN WDM EML laser and PIN receiver with SOA
- Up to 80km reach for G.652 SMF
- Transmission wavelength: 1294 nm- >1311 nm
- Hot pluggable 38 pin electrical interface
- QSFP28 MSA compliant
- Duplex LC optical receptacle
- RoHS-10 compliant and lead-free
- Single +3.3V power supply
- Maximum power consumption 6.5W
- Warranty period: 2 Years
- Case operating temperature  
Commercial: 0 ~ +70°C



## Applications

- 100GBASE-ZR4 Ethernet Links
- Infiniband QDR and DDR interconnects
- Telecom networking

## 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	Ts	0	70	°C	
Power Supply Voltage	VCC	-0.3	4.0	V	
Relative Humidity (non-condensation)	RH	15	85	%	
Damage Threshold	THd	6.5		dBm	

## Recommended Operating Conditions

Parameter	Symbol	Min	Typical	Max	Unit	Notes
Operating Case Temperature	TOP	0		70	°C	commercial
Power Supply Voltage	VCC	3.13 5	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	
Link Distance (SMF)	D			80	km	1

Notes:

1. Depending on actual fiber loss/km (link distance specified is for fiber insertion loss of 0.35dB/km)

## General Description

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Designed for 80km optical communication applications. This module contains 4-lane optical transmitter, 4-lane optical receiver and module management block including 2-wire serial interface. The optical signals are multiplexed to a single-mode fiber through an industry standard LC connector. A block diagram is shown in Figure 1.

## ModSelL

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The 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 modules on a single 2-wire interface bus. When the ModSelL is "High", the module shall not respond to or acknowledge any 2-wire interface communication from the host. ModSelL signal input node shall be biased to the "High" state in the module.

In order to avoid conflicts, the host system shall not attempt 2-wire interface communications within the ModSelL de-assert time after any modules are deselected. Similarly, the host shall wait at least for the period of the ModSelL assert time before communicating with the newly selected module. The assertion and de-asserting periods of different modules may overlap as long as the above timing requirements are met.

## ResetL

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The ResetL pin shall be pulled to Vcc in the module. A low level on the ResetL pin for longer than the minimum pulse length ( $t_{\text{Reset\_init}}$ ) initiates a complete module reset, returning all user module settings to their default state. Module Reset Assert Time ( $t_{\text{init}}$ ) starts on the rising edge after the low level on the ResetL pin is released. During the execution of a reset ( $t_{\text{init}}$ ) the host shall disregard all status bits until the module indicates a completion of the reset interrupt. The module indicates this by asserting "low" an IntL signal with the Data Not\_Ready bit negated. Note that on power up (including hot insertion) the module should post this completion of reset interrupt without requiring a reset.

## LPMODE

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LPMODE: The LPMODE pin shall be pulled up to Vcc in the module. The pin is a hardware control used to put modules into a low power mode when high. By using the LPMODE pin and a combination of the Power override, Power\_set and High\_Power\_Class\_Enable software control bits (Address A0h, byte 93 bits 0,1,2).

## ModPrsL

ModPrsL is pulled up to Vcc\_Host on the host board and grounded in the module. The ModPrsL is asserted "Low" when inserted and deasserted "High" when the module is physically absent from the host connector.

## IntL

IntL is an output pin. When IntL is "Low", it 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 shall be pulled to host supply voltage on the host board. The INTL pin is deasserted "High" after completion of reset, when byte 2 bit 0 (Data Not Ready) is read with a value of '0' and the flag field is read.

## Pin Assignment and Pin Description

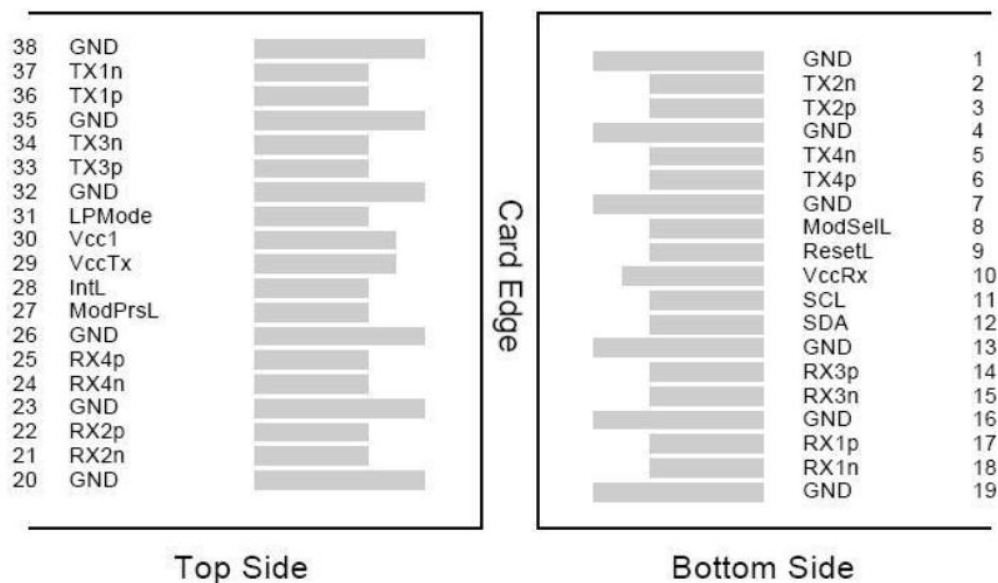


Figure2. Diagram of host board connector block pin numbers and names

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	
22	Rx2p	Receiver Non-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 1000mA.

## 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			6.5	W	
Supply Current	Icc			1876	mA	
<b>Transmitter (each Lane)</b>						
Overload Differential Voltage pk-pk	TP1a			900	mV	
Common Mode Voltage (Vcm)	TP1	-350		2850	mV	1
Differential Termination Resistance Mismatch	TP1			10	%	At 1MHz
Differential Return Loss (SDD11)	TP1			See CEI-28 G-VSR Equation 13-19	dB	
Common Mode to Differential conversion and Differential to Common Mode conversion (SDC11, SCD11)	TP1			See CEI-28 G-VSR Equation 13-20	dB	
Stressed Input Test	TP1a	See				

		CEI-28 G-VSR Section 13.3.11. 2.1				
<b>Receiver</b>						
Differential Voltage, pk-pk	TP4			900	mV	
Common Mode Voltage (Vcm)	TP4	-350		2850	mV	1
Common Mode Noise, RMS	TP4			10	%	At 1MHz
Differential Return Loss (SDD22)	TP4			See CEI-28 G-VSR Equatio n 13-19	dB	
Common Mode to Differential conversion and Differential to Common Mode conversion (SDC22, SCD22)	TP4			See CEI-28 G-VSR Equatio n 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 Characteristics

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

Parameter	Symbol	Min.	Typical	Max	Unit	Notes
<b>Transmitter</b>						
Lane wavelength (range)	L0	1294.53	1295.56	1296.59	nm	
	L1	1299.02	1300.05	1301.09	nm	
	L2	1303.54	1304.58	1305.63	nm	
	L3	1308.09	1309.14	1310.09	nm	
Signaling rate, each lane			25.78125		GBd	
Side-mode suppression ratio	SMSR	30				
Total launch power	$P_T$	4.0		8.0	dBm	
Average launch power, each lane	$P_{avg}$	0		2.0	dBm	
Extinction Ratio	ER	6.0			dB	
Difference in Launch Power between any Two Lanes (OMA)	$P_{tx,diff}$			3.6	dB	
Average launch power of OFF transmitter, each lane	$P_{off}$			-30	dBm	
Transmitter reflectance	$R_T$			-12	dB	
$RIN_{20OMA}$	RIN			-130	dB/Hz	
Optical Return Loss Tolerance	TOL			20	dB	
Transmitter eye mask {X1, X2,X3, Y1, Y2, Y3}			{0.25, 0.4, 0.45, 0.25, 0.28, 0.4}			
<b>Receiver</b>						
Signaling rate, each lane			25.78125		GBd	
Average Receive Power, each Lane		-28		-7	dBm	
Receive Power (OMA), each Lane				-7	dBm	
Receiver reflectance	SEN1			-20.9	dBm	BER = $1 \times 10^{-12}$
Receiver sensitivity Average,	SEN2			-28	dBm	BER =



each lane						5x10 <sup>-5</sup>
LOS Assert	LOSA	-40				dBm
LOS Deassert	LOSD				-29	dBm
LOS Hysteresis	LOSH	0.5				dB

**Note:**

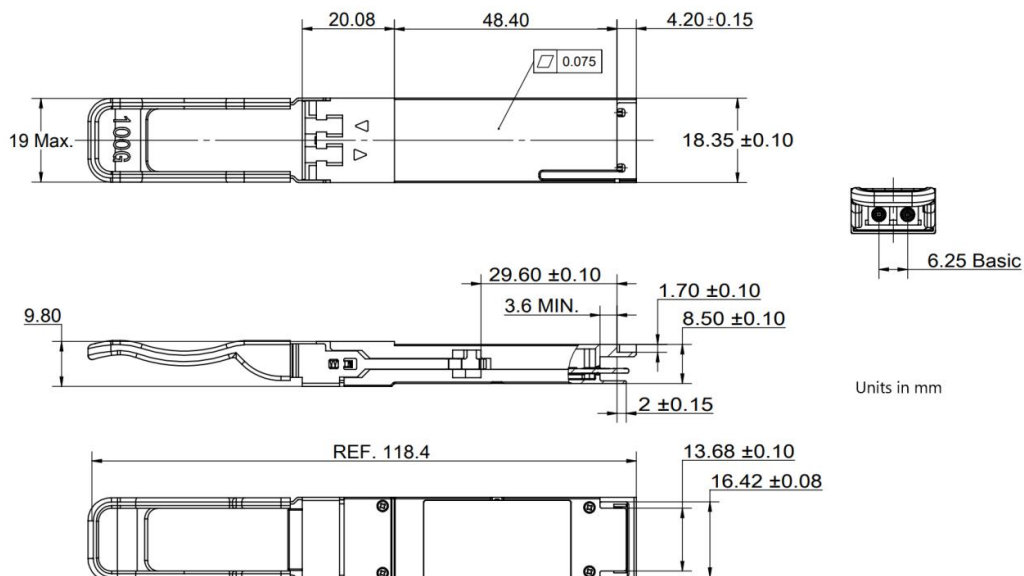
1. Receiver power -28dBm to -7dBm is better than - 22dBm to-1dBm.
2. Receive Power (OMA), each Lane, -7dBm is better than -8.6dBm.

## 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	°C	Over operating temp
Supply voltage monitor absolute error	DMI_VCC	-3	3	%	Full operating range
RX power monitor absolute error	DMI_RX	-3	3	dB	
Bias current monitor error	DMI_bias	-10	10	%	
TX power monitor absolute error	DMI_TX	-3	3	dB	

## Mechanical Dimensions



## Compatibility Test

In order to ensure the product compatibility, our products will be tested on the switch before shipment. Our modules can be compatible with many mainstream brand switches, such as Cisco, Juniper, Extreme, Brocade, IBM, H3C, HP, Huawei, D-Link, Mikrotik, ZTE, TP-Link...

Our test equipment: VOLKTEK MEN-4110, HP 2530-8G, CRS226-24G-25+RM, Catalyst 2960G Series, Catalyst 3850 XS 10G SFP+, Catalyst 3750-E Series, HUAWEI S5700Series, H3C S3100V2 Series, Juniper-EX4200, etc.



**Cisco Catalyst 3850**



**HUAWEI S5700**



**H3C S3100V2**



**HP J9264AR**



**Juniper EX 4200**



**Alcatel 6850E-U24X**



**Mikrotik CR5226-24G-25+RM**



**Cisco Catalyst 2960G**



**Volktek MEN-4110**

## Product Production Process

# Quality Assurance

Continuous introduction of new equipment, produced by strict standards, strict quality inspection, to guarantee the high quality standard of each product.



**Standardized  
Production Line**



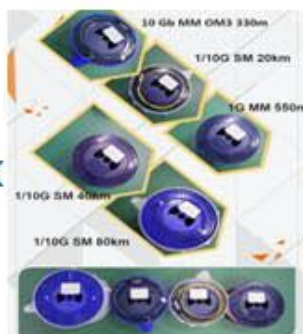
**Professional  
Welding**



**Assembling**



**Aging Testing**



**Distance Testing**



**Cleaning end face**



**Product Initial Test**



**Switch Testing**



**Product Final Test**

## Packaging

ETU-Link provides two kinds of packaging, 10pcs/Tray and individual package.



Company: ETU-Link Technology Co., LTD

Address: Right side of 3rd floor, No. 102 building, Longguan expressway, Dalang street,  
Longhua District, Shenzhen city, Guangdong Province, China 518109

Tel: +86-755 2328 4603

Addresses and phone number also have been listed at [www.etulinktechnology.com](http://www.etulinktechnology.com).

Please e-mail us at [sales@etulinktechnology.com](mailto:sales@etulinktechnology.com) or call us for assistance.