

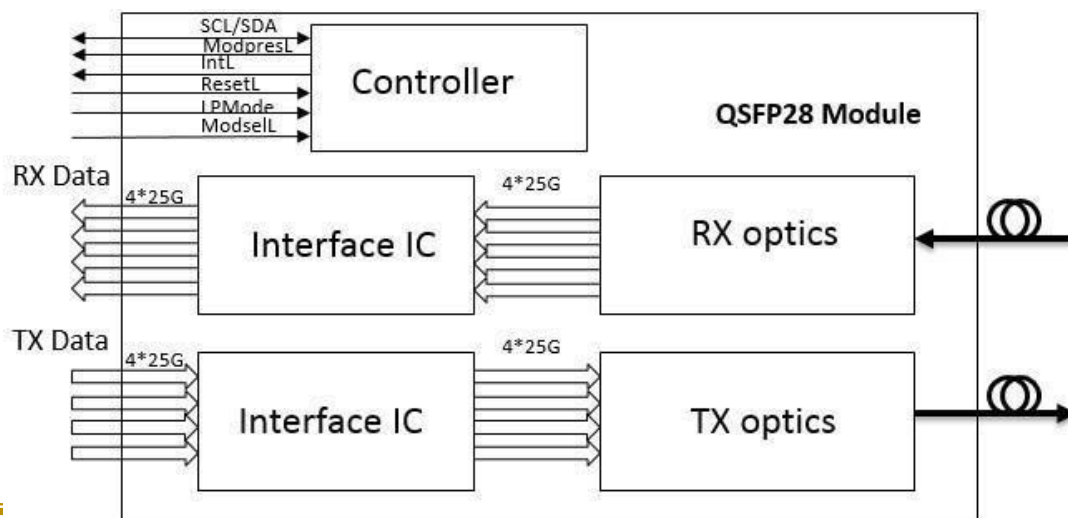
## Features

- Compliant with QSFP28 Standard: SFF-8661 Revision 1.9, SFF-8636 Revision 2.10a
- Compliant to IEEE 802.3-2018 100GBASE-LR4 and OTU4 411-9D1F
- High speed I/O electrical interface (CAUI-4) compliant with IEEE 802.3-2018
- Single 3.3V Supply Voltage
- LAN WDM EML laser and PIN Receiver Array
- QSFP28 MSA package with duplex LC connector
- Two Wire Serial Interface with Digital Diagnostic Monitoring
- Maximum power consumption 3.5W
- LC duplex connector
- Complies with EU Directive 2011/65/EU (RoHS compliant)
- Class 1 Laser
- Commercial case temperature range of 0°C to 70°C

## Description

This 100G LR4 product is designed for 10km optical communication applications, and it is compliant to IEEE 802.3ba for 100GE Ethernet. 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.

## Block Diagram of Transceiver



### Absolute Maximum Ratings

Parameter	Symbol	Min.	Typ.	Max.	Units	Note
Storage Temperature	$T_S$	-40		85	°C	
Supply Voltage	$V_{CC}$	-0.3		3.6	V	
Relative Humidity	$RH$	5		95	%	1
Data Input Voltage-Differential	$ V_{DIP}-V_{DIN} $			1.0	V	
Control Input Voltage	$V_I$	-0.3		$V_{CC}+0.5$	V	
Control Output Current	$I_O$	-20		20	mA	

Note:

1. non-condensing.

### Recommended Operating Conditions

Parameter	Symbol	Min.	Typ.	Max.	Units	Note
Supply Voltage	$V_{CC}$	3.135	3.3	3.465	V	
Case Temperature	$T_{OP}$	0		70	°C	
Instantaneous Peak Current at Hot Plug	$I_{CC\_IP}$			1400	mA	
Sustained Peak Current at Hot Plug	$I_{CC\_SP}$			1155	mA	
Maximum Power Dissipation	$P_D$			3.5	W	
Maximum Power Dissipation. Low Power Mode	$P_{DLP}$			1.5	W	
Aggregate Bit Rate	$ABR$		103.125	111.8	Gb/s	
Data Rate Per Lane	$DRL$		25.78	27.95	Gb/s	
Control Input Voltage-High	$V_{IH}$	$V_{CC}+0.7$		$V_{CC}+0.3$	V	
Control Input Voltage-Low	$V_{IL}$	-0.3		$V_{CC}+0.3$	V	
Two Wire Serial Interface Clock Rate				400	kHz	
Module Power Supply Noise Tolerance 10Hz-10MHz (peak to peak)				66	mVpp	

Rx Differential Data Output Load			100		ohms
Operating Distance			2	10	km

### Diagnostics Monitoring

<i>Performance Item</i>	<i>Range</i>	<i>Monitor Error</i>	<i>Notes</i>
Module Temperature	0~70	±3°C	
Module Voltage	0 to Vcc	±3%	
Tx Bias Current ,each Lane	0 to 100	± 10%	
Tx Output Power ,each Lane	-4.3 to 4.5	± 3dB	
Rx Power, each Lane	-10.6 to 4.5	± 3dB	

**Optical Characteristics**

<i>Parameter</i>	<i>Symbol</i>	<i>Min.</i>	<i>Typ.</i>	<i>Max.</i>	<i>Units</i>	<i>Note</i>
Transmit Wavelengths		1294.53	1295.56	1296.59	nm	
		1299.02	1300.05	1301.09	nm	
		1303.54	1304.58	1305.63	nm	
		1308.09	1309.14	1310.19	nm	
<b>Transmitter</b>						
Side-mode Suppression Ratio	SMSR	30			dB	
Total Average Launch Power				10.5	dBm	
Average launch power, each Lane	$P_{AVG}$	-4.3	4.5	-4.3	dBm	
Optical Modulation Amplitude (OMA), each Lane	$P_{OMA}$	-1.3	4.5	-1.3	dBm	
Transmitter and Dispersion Penalty (TDP), each lane				2.2	dB	
Extinction Ratio	$ER$	4			dB	
Launch Power in OMA minus TDP, each Lane	$OMA-TDP$	-2.3			dBm	
Difference in Launch Power Between Any Two Lanes (OMA)	$DT\_OMA$		5		dB	
Transmitter and Dispersion Penalty, each Lane	$TDP$		2.2		dB	
Optical Return Loss Penalty, each Lane	$ORLT$		20		dB	
Transmitter Eye Mask Definition {X1, X2, X3, Y1, Y2, Y3}		{0.25, 0.4, 0.45, 0.25, 0.28, 0.4}				
RIN20OMA	$RIN$		-130		dB/Hz	
<b>Receiver</b>						
Receiver Sensitivity (OMA), each Lane				-8.6	dBm	
Stressed Receiver Sensitivity in OMA, each Lane				-6.8	dBm	
Damage Threshold for Receiver	$Pin, Damage$	5.5			dBm	
Average Receiver Power, each Lane		-10.6		4.5	dBm	
Receiver Power in OMA, each Lane, Overload	$OMA$			.5	dBm	
Difference in Receive Power Between Any Two Lanes (OMA)	$DR\_OMA$			5.5	dB	
Reflectance of Optical Network Element				-26	dB	
Receiver 3dB Electrical Upper Cut-off Frequency, each Lane	$F\_C$			31	GHz	
Receiver Reflectance	$RXR$			-26	dB	
Vertical Eye Closure Penalty, each Lane		1.8			dB	
Stressed Eye J2 Jitter, each Lane		0.3			UI	

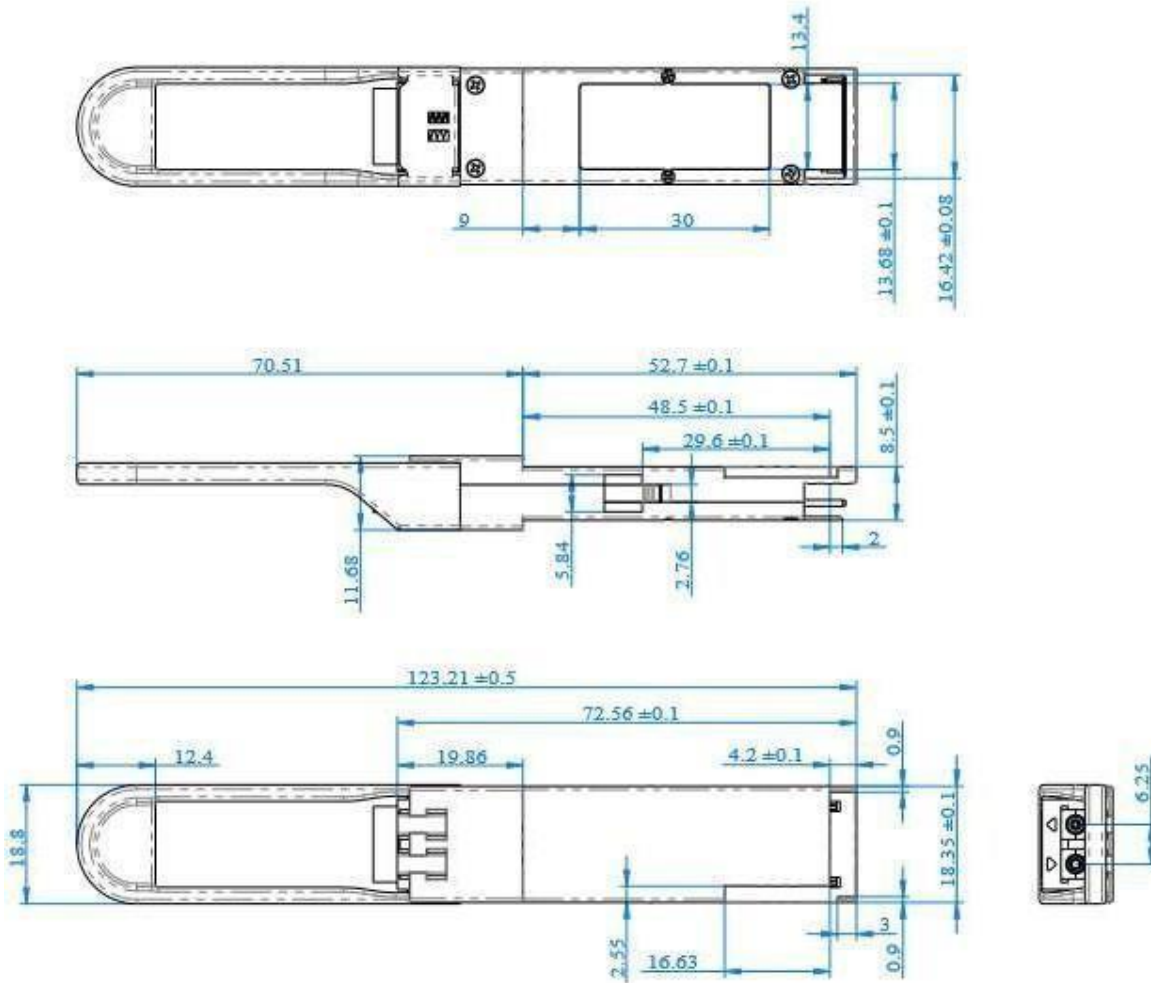
Stressed Eye J9 Jitter, each Lane		0.47			UI	
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Notes: Measure with a PRBS2<sup>31</sup>-1 test pattern @25.78125Gbps, BER $\leq$ 10<sup>-12</sup>

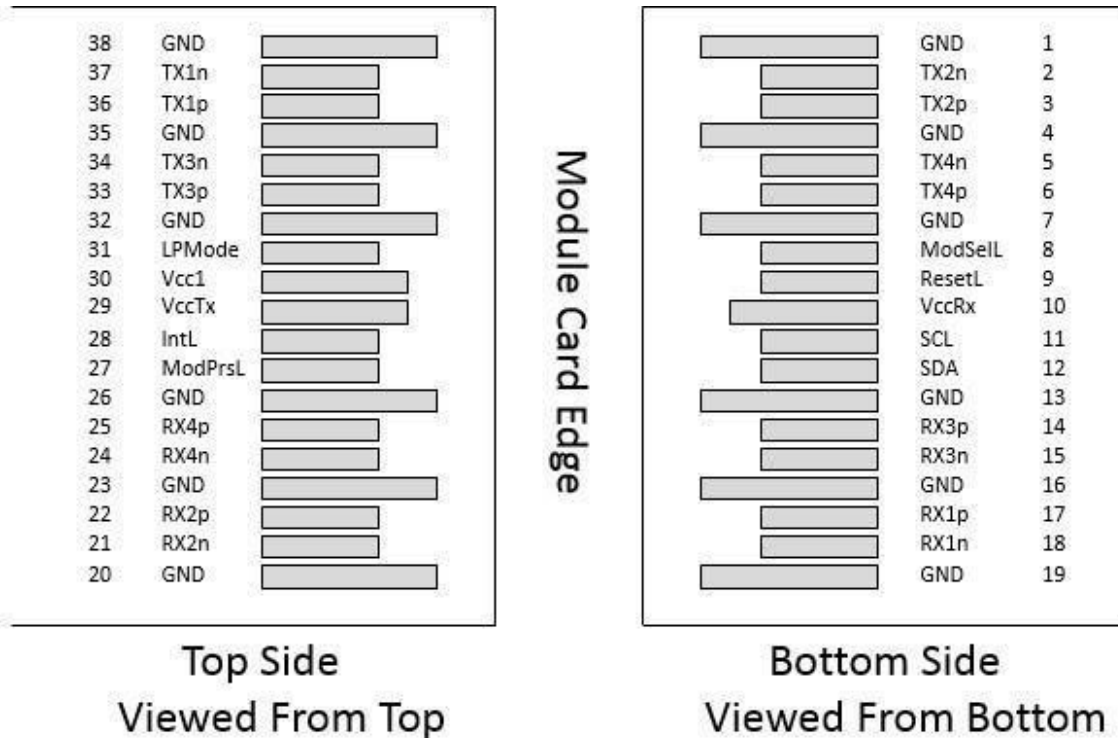
### Electrical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Units	notes
Power Consumption				3.5	W	
<b>Transmitter (each Lane)</b>						
Differential Data Input Amplitude	$V_{in, pp}$	95	900	mV	At 1 Hz	
Differential Termination Mismatch			10	%		
	$V_{IL}$	-0.3	0.8	V		
LPMode, Reset and ModSell	$V_{IH}$	2	Vcc+0.3	V		
Differential output voltage swing	$V_{out, pp}$		900	mVpp		
Differential Termination Resistance Mismatch			10	%	At 1 MHz	
Transition Time (20% ~ 80%)	Trise/Tfall	12		ps		
ModPrsL, and IntL	$V_{OL}$	0	0.4	V		
	$V_{OH}$	Vcc-0.5	Vcc+0.3	V		

**Dimensions**



### Pin Assignment and Description



### Pin Descriptions

Pin	Symbol	Name/Description	Notes
1	GND	Ground	1
2	Tx2n	Transmitter Inverted Data Input	
3	Tx2p	Transmitter Non-Inverted Data Input	
4	GND	Ground	1
5	Tx4n	Transmitter Inverted Data Input	
6	Tx4p	Transmitter Non-Inverted Data Input	
7	GND	Ground	1
8	ModSelL	Module Select	
9	ResetL	Module Reset	
10	VCC Rx	+3.3V Power Supply Receiver	2
11	SCL	2-wire serial interface clock	
12	SDA	2-wire serial interface data	
13	GND	Ground	1

14	Rx3p	Receiver Non-Inverted Data Output	
15	Rx3n	Receiver Inverted Data Output	
16	GND	Ground	1
17	Rx1p	Receiver Non-Inverted Data Output	
18	Rx1n	Receiver Inverted Data Output	
19	GND	Ground	1
20	GND	Ground	1
21	Rx2n	Receiver Inverted Data Output	
22	Rx2p	Receiver Non-Inverted Data Output	
23	GND	Ground	1
24	Rx4n	Receiver Inverted Data Output	
25	Rx4p	Receiver Non-Inverted Data Output	
26	GND	Ground	1
27	ModPrsL	Module Present	
28	IntL	Interrupt	
29	Vcc Tx	+3.3V Power supply transmitter	
30	Vcc1	+3.3V Power supply	
31	LPMODE	Low Power Mode	
32	GND	Ground	
33	Tx3p	Transmitter Non-Inverted Data Input	
34	Tx3n	Transmitter Inverted Data Input	
35	GND	Ground	
36	Tx1p	Transmitter Non-Inverted Data Input	
37	Tx1n	Transmitter Inverted Data Input	
38	GND	Ground	


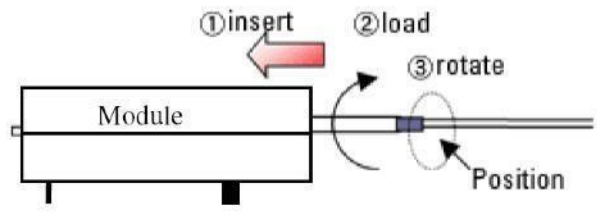
**Notes:**

1. GND is the symbol for signal and supply (power) common for the module. All any common within the 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 applied concurrently and may be internally connected within the module in any combination. Vcc contacts in SFF-8672 each have a steady state current rating of 1A.



**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.

<p><b>Cleaning of patch-cord</b></p> 	<p><b>Cleaning of fiber stub</b></p>  <ol style="list-style-type: none"> <li>1. Insert Ensure that stick is held straight when inserting into sleeve.</li> <li>2. Load Apply sufficient pressure (approx 600-700g) to ensure ferrule a little depressed in sleeve.</li> <li>3. Rotate Rotate stick clockwise 4-5 times, while ensuring direct contact with ferrule end-face is maintained.</li> </ol> <p><i>Notice: Number of possible wipes: Maintenance (repair) ~1 use / piece Equipment construction: 4 uses / piece (max.)</i></p>
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Note: The pictures were extracted from NTT-ME website. And the Cletop® is a trademark registered by NTT-ME

**Ordering Information**

Model Number	Part Number	Voltage	Temperature
AQSFP28-100G-LR4-CY	OPCW-S10-13-CY	3.3V	0°C to 70 °C

**Note: All information contained in this document is subject to change without notice.**