Features

- Hot pluggable QSFP28 MSA form factor
- Compliant to IEEE 802.3ba 100GBASE-LR4
- Digital diagnostic monitoring support
- Hot pluggable 38 pin electrical interface
- Transmitter cooled 4x25Gb/s LAN WDM DFB TOSA (1295.56, 1300.05,1304.58, 1309.14nm)
- Receiver 4x25G PIN ROSA
- Maximum power consumption 4W
- LC duplex connector
- Supports 103.1Gb/s bit rate
- Up to 10kmreach for G.652 SMF
- Commercial case temperature range of 0°C to 70°C
- Single 3.3V power supply
- RoHS-6 compliant

Applications

- 100GBASE-LR4 Ethernet Links
- Infiniband QDR and DDR interconnects
- Datacenter and Enterprise networking

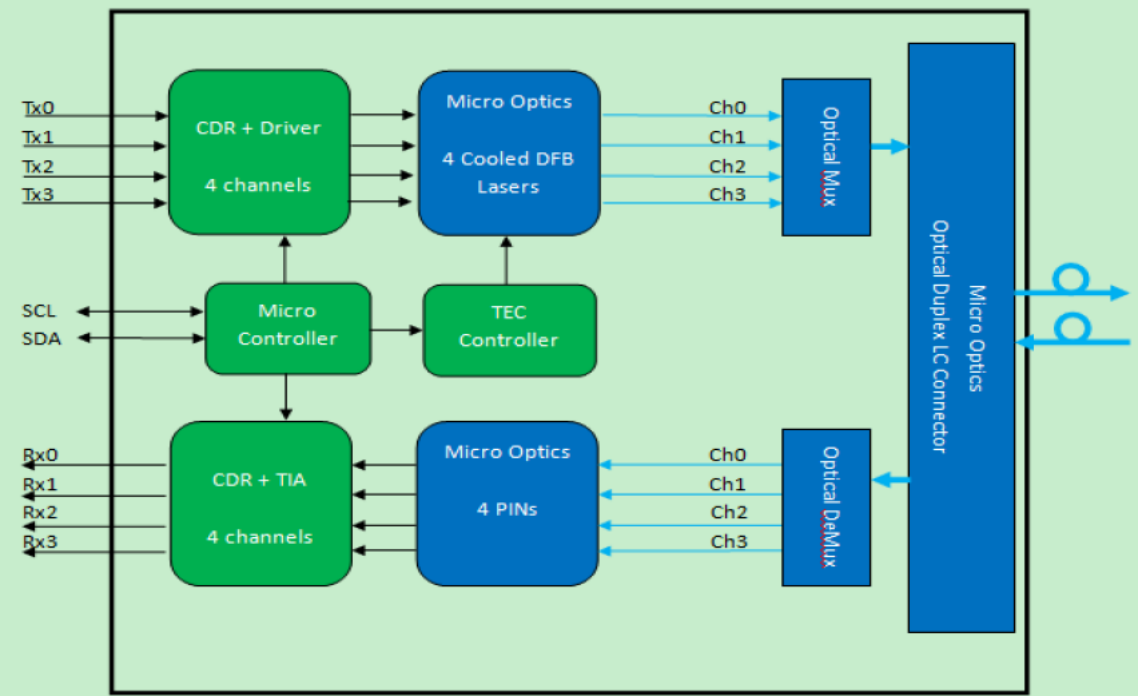
Description

This product is a 100Gb/s transceiver module designed for optical communication applications compliant to 100GBASE-LR of the IEEE 802.3ba standard. The module converts 4 input channels of 25Gb/s electrical data to 4 channels of LAN WDM optical signals and then multiplexes them into a single channel for 100Gb/s optical transmission. Reversely on the receiver side, the module demultiplexes a 100Gb/s optical input into 4 channels of LAN WDM optical signals and then converts them to 4 output of electrical data.

The central wavelengths of the 4 LAN WDM channels are 1295.56, 1300.05, 1304.58 and 1309.14nm as members of the LAN WDM wavelength grid defined in IEEE 802.3ba. The high performance cooled LAN WDM DFB transmitters and high sensitivity PIN receivers provide superior performance for 100Gigabit Ethernet applications up to 10km links and compliant to optical interface with 100GBASE-LR4 requirements specified in IEEE 802.3ba Clause 88.

The Product is designed with form factor optical/electrical connection and digital diagnostic interface according to the QSFP+ Multi-Source Agreement (MSA). It has been designed to meet the harshest external operating conditions including temperature, humidity and EMI interference.

Block Diagram of Transceiver



Absolute Maximum Ratings

Parameter	Symbol	Min.	Typ.	Max.	Units	Note
Storage Temperature	T_S	-40		85	°C	
Operating Case Temperature	T_{OP}	0		70	°C	
Maximum Supply Voltage	V_{cc}	-0.5		3.6	V	
Relative Humidity	*RH*	0		85	%	
Damaged Threshold, each Lane	*THd*	5.5			dBm	

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	*Top*	0		70	°C	
Data Rate, each lane			25.78125		Gb/s	
Data Rate Accuracy		-100		100	ppm	
Control Input Voltage-High		2		Vcc	V	
Control Input Voltage-Low		0		0.8	V	
Link Distance with G.652	*D*	0.002		10	km	

Diagnostics Monitoring

Parameter	Symbol	Accuracy	Unit	Notes
Temperature monitor absolute error	DMI_Temp	± 3	°C	
Supply voltage monitor absolute error	DMI_VCC	± 0.1	V	
Channel RX power monitor absolute error	DMI_RX_Ch	± 2	dB	1
Channel Bias current monitor	DMI_Ibias_Ch	± 10%	mA	
Channel TX power monitor absolute error	DMI_TX_Ch	± 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.

Optical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Units	Note
Transmit wavelengths	*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	1310.19	nm	
Transmitter (each Lane)						
Side Mode Suppression Ration	*SMSR*	30			dB	
Total Average Launch Power	P_T			10.5	dBm	
Average Launch Power, each lane	P_{AVG}	-4.3		4.5	dBm	
OMA, each lane	P_{OMA}	-1.3		4.5	dBm	1
Launch Power in OMA minus Transmitter and Dispersion Penalty (TDP), each lane		-2.3			dBm	
TDP, each lane	*TDP*			2.2	dB	
Extinction Ratio	*ER*	4			dB	
Difference in Launch Power between any Two Lances (OMA)	*Ptx,diff*			5	dB	
RIN20OMA	*RIN*			-130	dB/Hz	
Optical Return Loss Tolerance	*TOL*			20	dB	
Transmitter Reflectance	*RT*			-12	dB	
Average Launch Power OFF Transmitter, each lane	*Poff*			-30	dBm	
Eye Mask (X1,X2,X3,Y1,Y2,Y3)		{0.25,0.4,0.45,0.25,0.28,0.4}				2
Receiver						
Damage Threshold, each lane	TH_d	5.5			dBm	3
Average Receiver Power, each lane		-10.6		4.5	dBm	
Receiver Power (OMA), each lane				4.5	dBm	
Receiver Sensitivity (OMA), each lane	*SEN*			-8.6	dBm	
Stressed Receiver Sensitivity (OMA), each lane				-6.8	dBm	4
Receiver Reflectance	R_R			-26	dB	
Difference in Receiver Power between any Two Lanes (OMA)	*Prx,diff*			5.5	dB	

LOS Assert	*LOSA*	-30		dBm
LOS Deassert	*LOSD*		-13	dBm
LOS Hysteresis	*LOSH*	0.5		dB
Receiver Electrical 3 dB upper Cutoff Frequency, each lane	*Fc*		31	GHz
Conditions of Stress Receiver Sensitivity Test (Note 5)				
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

Notes:

1. Even if th TDP< 1 dB, the OMA min must exceed the minimum value specified here.
2. Hit ratio $5x10^{-5}$
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. Measured with conformance test signal at receiver input for BER=$1x10^{-12}$
5. Vertical eye closure penalty, stressed eye J2 jitter, and stressed eye J9 jitter are test conditions for measwing stressed receiver sensitivity. They are not characteristics of the receiver.

Electronical Characteristics

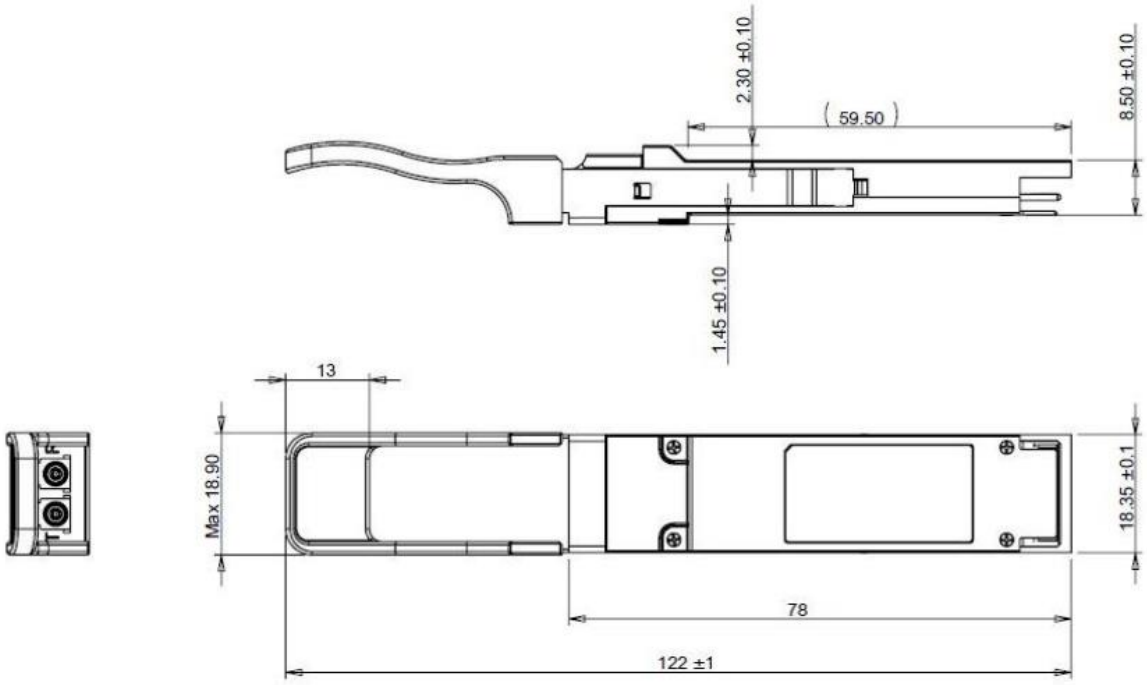
Parameter	Symbol	Min.	Typ.	Max.	Units	Note
Power Consumption				4.0	W	
Supply Current	*Icc*			1.21	A	
Transmitter (each Lane)						
Overload Differential Voltage pk-pk	*TP1a*	900			mV	
Common Mode Voltage (Vcm)	*TP1*	-350		2850	mV	1
Differential Termination Resistance Mismatch	*TP1*			10	%	At 1MHz
Differential Return Loss (SDD11)	*TP1*			See CEI-28G-VSR Equation 13-19	dB	
Common Mode to Differential conversion and Differential to Common Mode conversion (SDC11, SCD11)	*TP1*			See CEI-28G-VSR Equation 13-20	dB	
Stressed Input Test	*TP1a*	See CEI-28G-VSR Section 13.3.11.2.1				
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 Resistance Mismatch	*TP4*			10	%	At 1MHz
Differential Return Loss (SDD22)	*TP4*			See CEI-28GVSR Equation 13-19	dB	

Common Mode to Differential conversion and Differential to Common Mode conversion (SDC22, SCD22)	*TP4*		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	

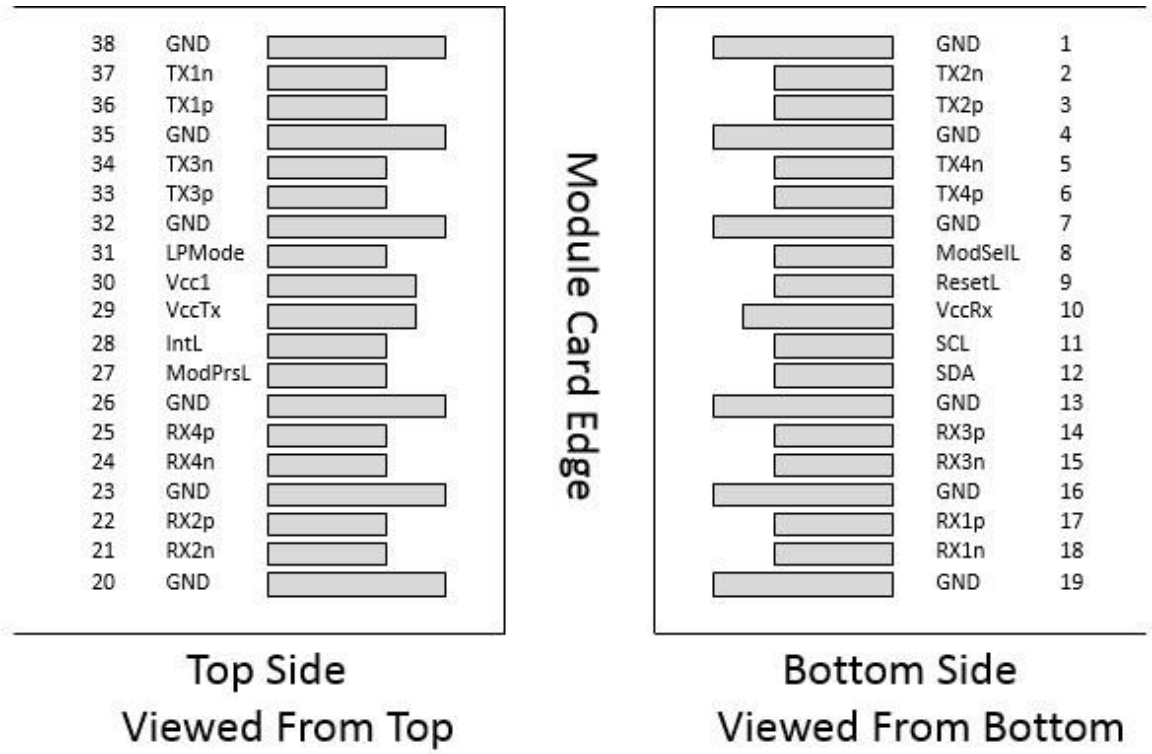
Note:

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

Dimensions



Pin Assignment and Description



Pin Descriptions

Pin	Symbol	Name/Description	Notes
1	GND	Transmitter Ground	1
2	Tx2n	Transmitter Inverted Data Input	
3	Tx2p	Transmitter Non-Inverted Data output	
4	GND	Transmitter Ground	1
5	Tx4n	Transmitter Inverted Data Input	
6	Tx4p	Transmitter Non-Inverted Data output	
7	GND	Transmitter 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	Receiver Ground	1
14	Rx3p	Receiver Non-Inverted Data Output	
15	Rx3n	Receiver Inverted Data Output	
16	GND	Receiver Ground	1
17	Rx1p	Receiver Non-Inverted Data Output	
18	Rx1n	Receiver Inverted Data Output	
19	GND	Receiver Ground	1
20	GND	Receiver Ground	1
21	Rx2n	Receiver Inverted Data Output	
22	Rx2p	Receiver Non-Inverted Data Output	
23	GND	Receiver Ground	1
24	Rx4n	Receiver Inverted Data Output	
25	Rx4p	Receiver Non-Inverted Data Output	
26	GND	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，not connect	
32	GND	Transmitter Ground	1
33	Tx3p	Transmitter Non-Inverted Data Input	
34	Tx3n	Transmitter Inverted Data Output	
35	GND	Transmitter Ground	1
36	Tx1p	Transmitter Non-Inverted Data Input	
37	Tx1n	Transmitter Inverted Data Output	
38	GND	Transmitter Ground	1

Notes:

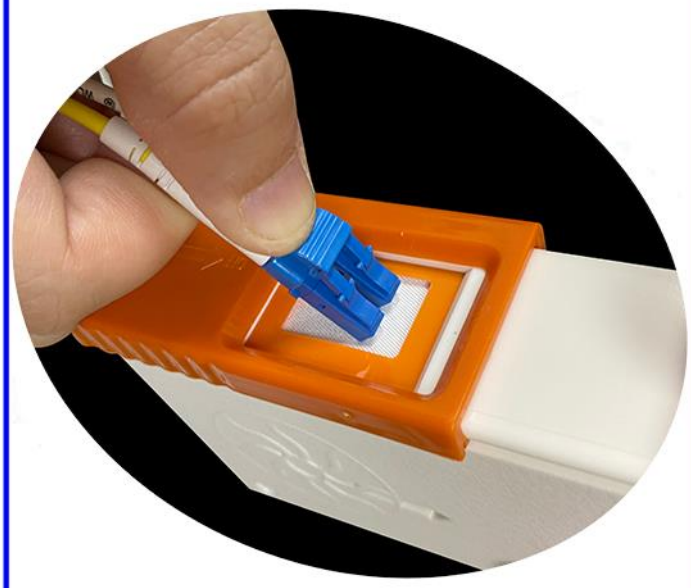
1.GNDis the symbol for signal and supply (power) common for the QSFP28 module. All are common within the module and all module voltages are referenced to this potential unless otherwise noted. Connect these directly to the host board signal common ground plane.

2. VccRx, Vcc1 and VccTx are the receiving and transmission power suppliers and shall be applied concurrently. Recommended host board power supply filtering is shown in Figure 3 below. Vcc Rx, Vcc1 and Vcc Tx may be internally connected within the module in any combination. The connector pins are each rated for a maximum current of 1000mA.

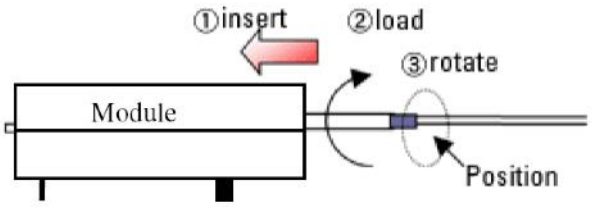
Optical Receptacle Cleaning Recommendations :

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

Model Number	Part Number	Voltage	Temperature
100G QSFP28 LR4	OPCW-S10 -13-CBD	3.3V	0°C to 70 °C

Modification History

Revision	Date	Description
A2	Dec. 2016	Initial Release

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