

RQ-100G-BDLR-28/ RQ-100G-BDLR-31

100G QSFP28 BiDi Optical Transceiver

1280/1310nm, LWDM4,20km, Simplex LC, -20~+85 °C, with DDM

Features

- Hot pluggable QSFP28 MSA form factor
- Supports 103.1Gb/s aggregate bit rate
- Up to 20km reach for G.652 SMF with RS (528,514) FEC
- Single +3.3V power supply
- Extended case temperature range of -20 to 85°C
- Cooled 4x25Gb/s LAN WDM Blue or Red Side TOSA

LAN WDM Red or Blue Side ROSA

- Maximum power consumption 5.5W
- Single LC receptacle
- Compliant with the QSFP28 and 4WDM-20 MSA
- Compatible with RoHS2.0
- DDM function



Applications

- Ethernet Links
- 100G 4WDM-20 applications with FEC

Ordering Information

Part Number	Product Description
RQ-100G-BDLR-28	100Gbps QSFP28 BiDi, T1280nm/R1310nm, LWDM4, 20km, Simplex LC, -20~+85 °C, with DDM
RQ-100G-BDLR-31	100Gbps QSFP28 BiDi, T1310nm/R1280nm, LWDM4, 20km, Simplex LC, -20~+85 °C, with DDM

Absolute Maximum Ratings

Exceeding the limits below may damage the transceiver module permanently.

Parameter	Symbol	Min	Typical	Max	Units
Storage Temperature	T_s	-40		+85	degC
Storage Relative Humidity	RH	5		95	%
Power Supply Voltage	V_{CC}	-0.3		+3.6	V
Case Temperature Range	T_c	-20		85	degC
Mean Receiver Damage Threshold Per Lane	P_{dag}			+6.0	dBm
ESD (HBM)				1000	V

Recommended Operating Conditions

Parameter	Symbol	Min	Typical	Max	Units	Notes
Operating Case Temperature	T_c	-20		85	degC	
Relative Humidity	RH	0		90	%	
Power Supply Voltage	V_{CC}	3.135	3.3	3.465	V	
Total Power Dissipation	P_w			5.5	W	
Data rate (each line)			25.78125	-	Gb/s	

Electrical Characteristics

Parameter	Symbol	Min	Typical	Max	Units	Notes
Pattern			PRBS9			
Transmitter Electrical Input from Host at TP1a (detailed specification in CEI-28G-VSR)						
Differential Voltage Pk-Pk				900	mV	
Common Mode Noise (RMS)				17.5	mV	
Eye Height		95			mV	
Eye Width		0.46			UI	
Differential Termination Mismatch				10	%	1
Transition Time		10			ps	
Common Mode Voltage		-0.3		2.8	V	
Receiver Electrical Output to Host at TP4 (detailed specification in CEI-28G-VSR)						
Differential Voltage Pk-Pk				900	mV	
Common Mode Noise (RMS)				17.5	mV	
Eye Height		228			mV	
Eye Width		0.57			UI	
Differential Termination Mismatch				10	%	
Transition Time		9.5			ps	1
Vertical Eye Closure				5.5	dB	

Notes:

- 20%~80%

Voltage Supply Electrical Characteristics

Parameter	Symbol	Min	Typical	Max	Units	Notes
Steady State Supply Current	I _{cc}	-	-	1443.0	mA	
Sustained peak current	I _{sp}			1650	mA	
Instantaneous peak current	I _p			2000		
Power Dissipation	P _w			5.5	W	
Low Power Dissipation	P _{low}			1.5	W	

3.3V LVTTTL Electrical Characteristics

Parameter	Symbol	Min	Typical	Max	Units	Notes
Input High Voltage	V _{IH}	2.0	-	V _{cc} +0.3	V	
Input Low Voltage	V _{IL}	-0.3	-	0.8	V	
Input Leakage Current	I _{IN}	-10	-	+10	uA	
Output High Voltage (I _{OH} =100uA)	V _{OH}	V _{cc} -0.5	-	V _{cc} +0.3	V	
Output Low Voltage (I _{OL} =100uA)	V _{OL}	0		0.4	V	

3.3V LVCMOS Electrical Characteristics

Parameter	Symbol	Min	Typical	Max	Units	Notes
Input High Voltage	V _{IH}	V _{cc} *0.7	-	V _{cc} +0.5	V	
Input Low Voltage	V _{IL}	-0.3	-	V _{cc} *0.3	V	
Output High Voltage (I _{OH} =100uA)	V _{OH}	V _{cc} -0.5	-	V _{cc} +0.3	V	
Output Low Voltage (I _{OL} =100uA)	V _{OL}	0		0.4	V	
I/O Pin Capacitance	C _i			14	pF	

Optical Characteristics

Parameter	Symbol	Min	Typical	Max	Units	Notes
Transmitter						
Signaling Rate for Each Lane		-	25.78125		Gbps	
Signaling Speed Accuracy		-100			ppm	
Blue Side Four Lane WavelengthRange	λ_1	1272.55	1273.55	1274.54	nm	
	λ_2	1276.89	1277.89	1278.89	nm	
	λ_3	1281.25	1282.26	1283.27	nm	
	λ_4	1285.65	1286.66	1287.68	nm	
Red Side Four Lane WavelengthRange	λ_5	1294.53	1295.56	1296.59	nm	
	λ_6	1299.02	1300.05	1301.09	nm	
	λ_7	1303.54	1304.58	1305.63	nm	
	λ_8	1308.09	1309.14	1310.19	nm	
Side Mode Suppression Ratio (min)	SMSR	30				
Total Average Launch Power	Pt	-		10.5	dBm	
Average Launch Power for EachLane	Pa	-4.3		+4.5	dBm	1
Optical Modulation Amplitude forEach Lane	OMA	-1.3		4.5	dBm	2
Launch power in OMA minus TDP,per Lane(min)		-2.3			dB	
Difference in launch power between any two lanes(OMA)(max)				5.0	dB	
Transmitter and Dispersion Penaltyfor Each Lanes	TDP			2.8	dB	4
Average Launch Power of Off	Poff	-		-30	dBm	
Extinction Ratio	EX	4			dB	
Optical Return Loss Tolerance				20	dB	
Transmitter Reflectance				-26	dB	3
Eye Diagram		{0.25, 0.4, 0.45, 0.25, 0.28, 0.4}				5
Eye Mask Margin			$\geq 10\%$			

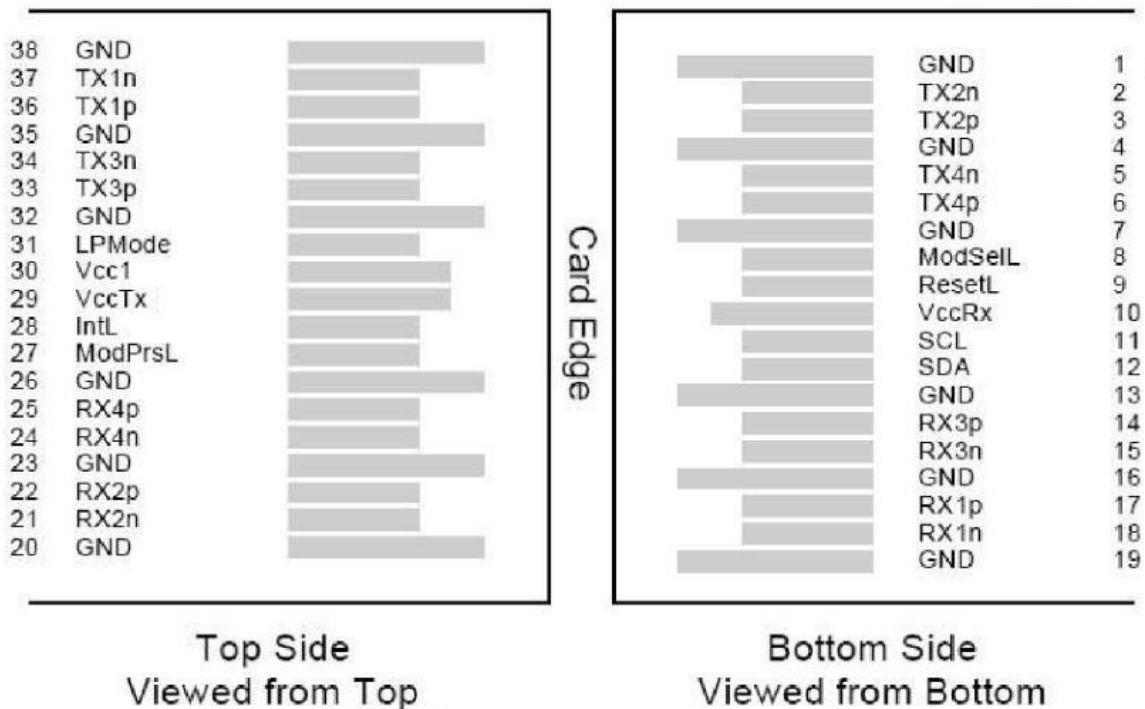
Optical Path & Power Budget						
Power budget (for max TDP)				13	dB	
Operating distance		20			km	
Channel insertion loss		0		10.2	dB	
Maximum discrete reflectance				-26	dB	
Allocation for penalties (for max TDP)				2.8	dB	
Dispersion @Blue side Neg		-102		-70	ps/nm	
Dispersion @Blue side Pos		-53		-23	ps/nm	
Dispersion @Red side Neg		-53		-26	ps/nm	
Dispersion @Red side Pos		-10		19	ps/nm	
Receiver						
Receive Rate for Each Lane		-	25.78125		Gbps	
Signaling Speed Accuracy		-100			ppm	
Red Side Four Lane Wavelength Range	$\lambda 5$	1294.53	1295.56	1296.59	nm	
	$\lambda 6$	1299.02	1300.05	1301.09	nm	
	$\lambda 7$	1303.54	1304.58	1305.63	nm	
	$\lambda 8$	1308.09	1309.14	1310.19	nm	
Blue Side Four Lane Wavelength Range	$\lambda 1$	1272.55	1273.55	1274.54	nm	
	$\lambda 2$	1276.89	1277.89	1278.89	nm	
	$\lambda 3$	1281.25	1282.26	1283.27	nm	
	$\lambda 4$	1285.65	1286.66	1287.68	nm	
Overload Input Optical Power	Pmax	5.5			dBm	6
Average Receive Power for Each Lane	Pin	-14.5				7
Receive Power In OMA for Each Lane	PinOMA				dBm	
Receiver reflectance						
Receiver Sensitivity in OMA for Each Lane(100GbE) at BER= 5×10^{-5} BER	S _{OMA}				dBm	8
Stressed Receiver Sensitivity in OMA for Each Lane					dBm	9

RX Los Assert level		The assert level occurs for the RX input power to a lane corresponding to an equivalent BER of 1E-2 to 1E-4			
Los Hysteresis		0.5			dBm

Notes:

1. Average launch power, each lane (min) is informative and not the principal indicator of signal strength. A transmitter with launch power below this value cannot be compliant; however, a value above this does not ensure compliance.
2. Even if the TDP<1dB, the OMA (min) must exceed this value.
3. Transmitter reflectance is defined looking into the transmitter.
4. TDP does not include a penalty for multi-path interference (MPI).
5. Eye mask hit ratio is 5E-5.
6. The receiver shall be able to tolerate, without damage, continuous exposure to an optical input signal having this average power level.
7. 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.
8. Receiver sensitivity (OMA), each lane (max) at 5 x 10⁻⁵ BER is a normative specification.
9. Measured with conformance test signal at TP3 (Refer to IEEE Std 802.3™-2015 Cl.88.8.10) for BER = 5x10⁻⁵

Pin Description



MSA Compliant Connector

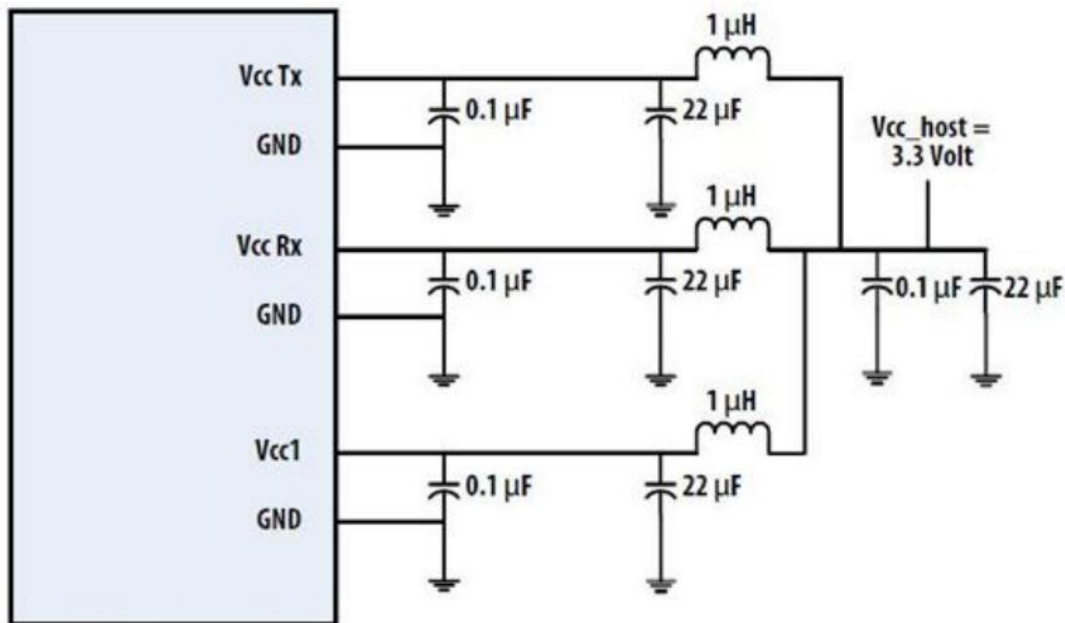
PIN	Symbol	Name/Description	Notes
1	GND	Ground	1
2	Tx2n	Transmitter Inverted Data Input	
3	Tx2p	Transmitter Non-Inverted Data output	
4	GND	Ground	1
5	Tx4n	Transmitter Inverted Data Input	
6	Tx4p	Transmitter Non-Inverted Data Input	
7	GND	Ground	1
8	ModSelL	Module Select	
9	ResetL	Module Reset	
10	VccRx	+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 / RxLOSL	Interrupt. Optionally configurable as RxLOSL via the management interface (SFF-8636).	

29	VccTx	+3.3 V Power Supply transmitter	2
30	Vcc1	+3.3 V Power Supply	2
31	LPMode	Low Power Mode. Optionally configurable as TxDis via the management interface (SFF-8636).	
32	GND	Ground	1
33	Tx3p	Transmitter Non-Inverted Data Input	
34	Tx3n	Transmitter Inverted Data Input	
35	GND	Ground	1
36	Tx1p	Transmitter Non-Inverted Data Input	
37	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 receiving and transmission power suppliers and shall be applied concurrently. 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.

Recommend Circuit



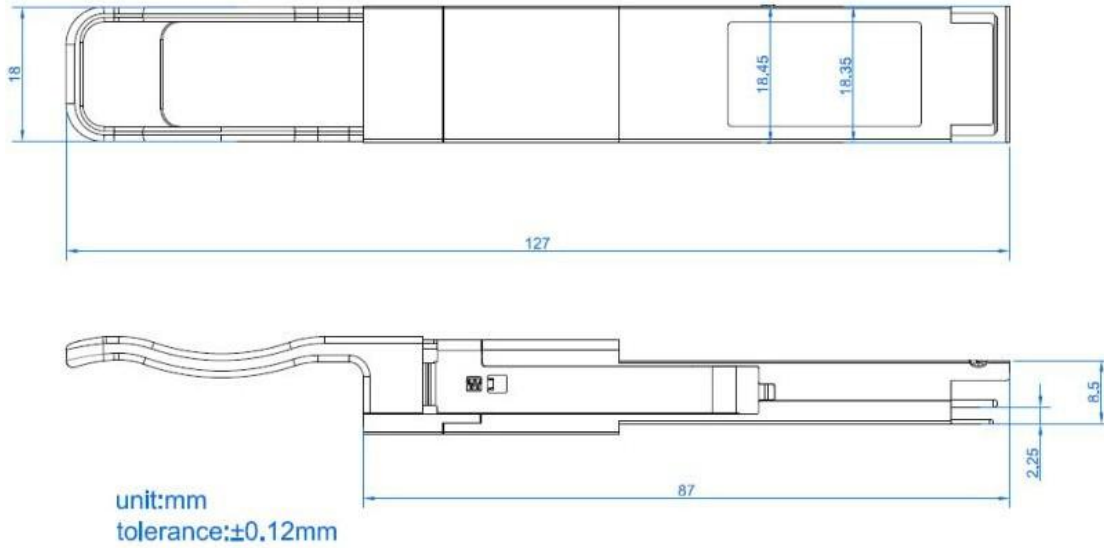
DDM Accuracy

Parameters	Requirements	Unit	Note
Temperature	+/-3	°C	
Voltage	+/-5%	V	
Rx power	+/-3.0	dB	
Tx power	+/-3.0	dB	

DDM Alarm & Warning Threshold

Parameters	Requirements	Unit	Description
Temp Low Warning	-20	°C	Min. case temperature
Temp High Warning	85	°C	Max. case temperature
Voltage Low Warning	3.135	V	-5% Vcc target
Voltage High Warning	3.465	V	+5% Vcc target
Tx Power Low Warning	-4.3	dBm	
Tx Power High Warning	4.5	dBm	
Rx Power Low Warning	-12.7	dBm	
Rx Power High Warning	4.5	dBm	
Temp Low Alarm	-23	°C	
Temp High Alarm	88	°C	
Voltage Low Alarm	3.041	V	
Voltage High Alarm	3.569	V	
Tx Power Low Alarm	-6.3	dBm	
Tx Power High Alarm	6.5	dBm	
Rx Power Low Alarm	-14.7	dBm	
Rx Power High Alarm	6.5	dBm	

Mechanical Dimensions



ESD Design

Normal ESD precautions are required during the handling of this module. This transceiver is shipped in ESD protective packaging. It should be removed from the packaging and otherwise handled in an ESD protected environment utilizing standard grounded benches, floor mats, and wrist straps.

Parameter	Threshold value	Notes
ESD of high-speed pins	1KV	Human Body Model
ESD of low-speed pins	2KV	Human Body Model
Air discharge during operation	15KV	
Direct contact discharges to the case	8KV	