

CSMQ28HGBxx20

100 Gbps QSFP28 BIDI LR1 20 km DDM Transceiver

Description

The CSMQ28HGBxx20 is a 100 Gbps QSFP28 BIDI LR1 DDM optical transceiver designed for 20 km optical communication applications over single-mode fiber (SMF). The module uses a simplex LC connector and is available in two wavelength configurations: 1291 nm Tx / 1311 nm Rx and 1311 nm Tx / 1291 nm Rx. It supports real-time digital diagnostic monitoring (DDM) via an I²C interface and is compliant with QSFP28 MSA, SFF-8636, SFF-8679, and 100G Lambda MSA 100G-LR1 Optical Specifications.

Features

- Lane signaling rate of 106.25 Gbps with PAM4
- Up to 20 km transmission over SMF
- EML laser and PIN receiver
- 4 × 25.78125 Gbps NRZ electrical interface (CAUI-4)
- Supports KP4 FEC inside the module
- High-speed I/O electrical interface
- I²C interface with integrated digital diagnostic monitoring
- QSFP28 MSA package with simplex LC connector
- Single +3.3 V power supply
- Power consumption < 4 W
- Compliant with SFF-8636 and SFF-8679 standards
- Compliant with 100G Lambda MSA 100G-LR1 Optical Specifications
- Compliant with EU Directive 2015/863/EU
- Operating case temperature: 0 °C to +70 °C

Applications

- Data center
- 100GBASE-LR1 BIDI

Absolute Maximum Ratings

Parameter	Symbol	Min	Typical	Max	Unit	Notes
Storage Temperature	T _s	-40		+85	°C	
Supply Voltage	V _{CC}	-0.5		+4.0	V	
Operating Relative Humidity	RH			85	%	

Recommended Operating Conditions

Parameter	Symbol	Min	Typical	Max	Unit	Notes
Operating Case Temperature	T _C	0		+70	°C	
Power Supply Voltage	V _{CC}	3.13	3.3	3.47	V	
Transmission Distance	TD			20	km	Over SMF

Electrical Specifications

Parameter	Symbol	Min	Typical	Max	Unit	Notes
Transmitter (Module Input)						
Input Differential Impedance	R _{in}		100		Ohm	
Differential Data Input Amplitude	V _{IN,P-P}			900	mVpp	
Differential termination mismatch (max)	D-mismatch			10	%	
DC common-mode input voltage		-0.3		2.8	V	
Transition Time, 20% to 80%	Tr/Tf	10			ps	
LPMODE, ResetL, and ModSelL / TxDIS	V _{IL}	-0.3		0.8	V	
LPMODE, ResetL, and ModSelL / TxDIS	V _{IH}	2.0		V _{CC} +0.3	V	
Receiver (Module Output)						
Output Differential Impedance	R _{out}		100		Ohm	
Differential Data Output Amplitude	V _{OUTP-P}			900	mVpp	
Differential termination mismatch (max)	D-mismatch			10	%	
Transition Time, 20% to 80%	Tr/Tf	12			ps	
ModPrsL and IntL / RxLOS	V _{OL}	0		0.4	V	
ModPrsL and IntL / RxLOS	V _{OH}	V _{CC} -0.5		V _{CC} +0.3	V	

Optical Specifications

Parameter	Symbol	Min	Typical	Max	Unit	Notes
Transmitter						
Center Wavelength	CW	1284.5	1291	1297.5	nm	
		1304.5	1311	1317.5	nm	
Signaling Rate	SR			53.125	GBd	
Frequency Offset	Foffset	-100		100	ppm	
Average Launch Power	PTX	-0.2		6.6	dBm	1
Outer Optical Modulation Amplitude (OM _{Aouter}) for TDECQ < 1.4 dB for 1.4 dB ≤ TDECQ ≤ TDECQ (max)	OM _{Aouter}	2.8			dBm	TDECQ < 1.4 dB
		1.4+TDECQ			dBm	TDECQ ≥ 1.4 dB
Transmitter and Dispersion Eye Closure for PAM4 (TDECQ) (Max)	TDECQ			3.6	dB	
Average Output Power (Laser Turn-Off)	P _{off}			-30	dBm	
Side Mode Suppression Ratio	SMSR	30			dB	
Extinction Ratio	ER	3.5			dB	
RIN_OMA	RIN			-136	dB/H _z	
Transmitter Reflectance	T _{ref}			-26	dB	
Optical Return Loss Tolerance	ORLT			15.6	dB	
Receiver						
Center Wavelength	CW	1284.5	1291	1297.5	nm	
		1304.5	1311	1317.5	nm	
Damage Threshold	P _{damage}	7.6			dBm	2
Average Rx Power	PR _x	-10		6.6	dBm	3
Receive Power (OM _{Aouter})	POM _A			6.8	dBm	
Receiver Sensitivity (OM _{Aouter}) for TDECQ < 1.4 dB for 1.4 dB ≤ TDECQ ≤ 3.4 dB	SEN_OMA			-7.6 -9+TDECQ	dBm	4
Reflectance	Ref			-26	dB	
LOS Assert	LosA	-26			dBm	
LOS De-Assert	LosDA			-10	dBm	
LOS Hysteresis	LosH	0.5			dB	
Stressed Receiver Sensitivity (OM _{Aouter})	SRS			-5.4	dBm	5
Conditions of Stressed Receiver Sensitivity Test:						
Stressed eye closure for PAM4 (SECQ)				3.6	dB	

Notes:

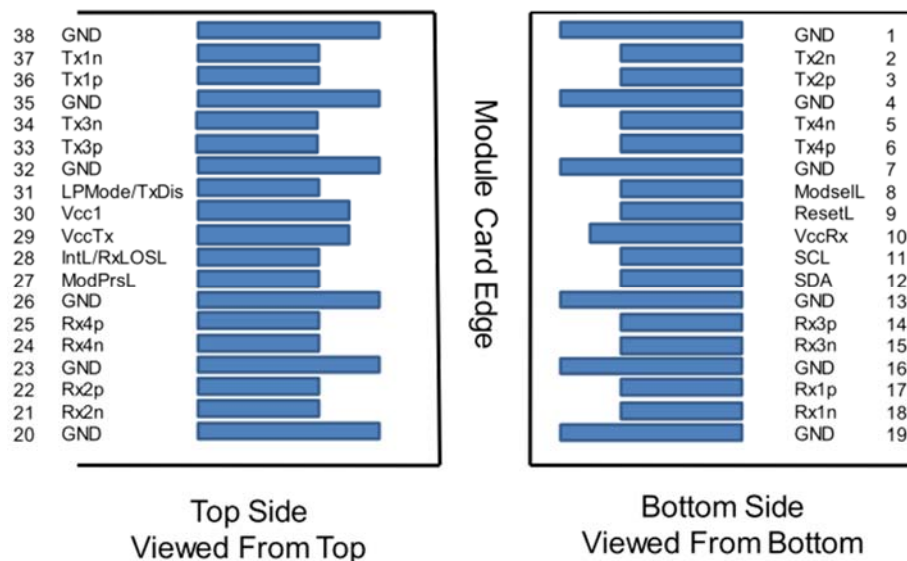
1. The optical power is launched into SMF.
2. The receiver shall be able to tolerate, without damage, continuous exposure to an optical input signal having this average power level. The receiver does not have to operate correctly at this input power.
3. Average receive power, each lane (min) is informative and not the principal indicator of signal strength.
4. Measured with conformance test signal at TP3 using the test pattern PRBS31Q or scrambled idle for stressed receiver sensitivity for BER = 2.4×10^{-4} .
5. Measured with conformance test signal at TP3 (see 3.11) for the BER specified in IEEE Std 802.3cu.

Digital Diagnostic Specifications

Parameter	Range	Accuracy	Unit	Calibration
Temperature	0 to 70	± 3	$^{\circ}\text{C}$	Internal
Voltage	0 to Vcc	$\pm 3 \%$	V	Internal
Tx Bias Current	0 to 100	$\pm 10 \%$	mA	Internal
Tx Output Power	-0.2 to 6.8	± 3	dB	Internal
Rx Input Power	-10 to 6.6	± 3	dB	Internal

Communication Interface Timing Characteristics

Parameter	Symbol	Min	Max	Unit	Calibration	Notes
Initialization Time	t_init		10	s	Room Temperature	Time from power on or hot plug until the module is fully functional. This time applies to Power Class 2 or higher modules when LPMODE is pulled low by the host, and to all Power Class 1 modules.

Pin Diagram


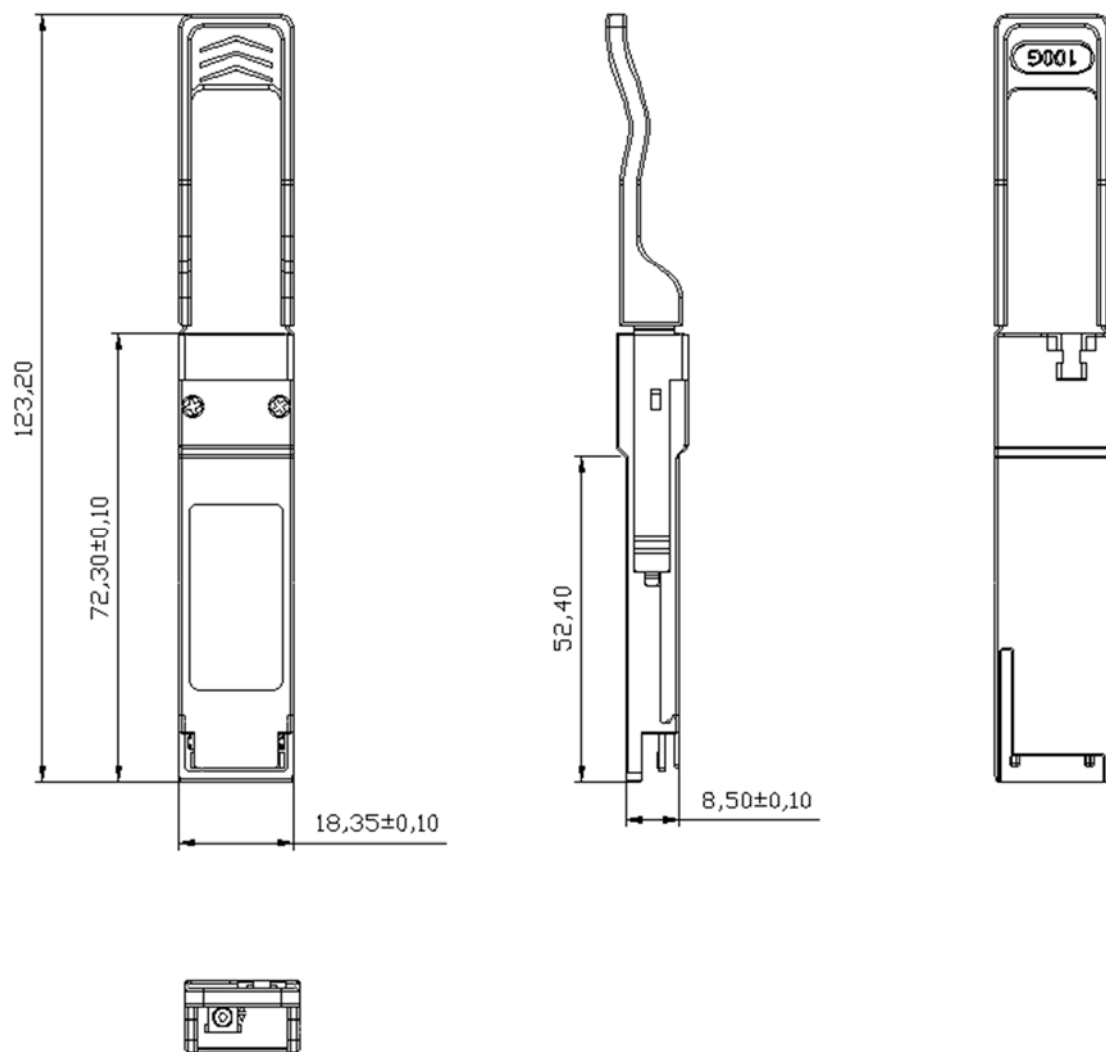
Pin Definitions

Pin	Logic	Symbol	Description	Plug Seq.	Notes
1		GND	Ground	1	1
2	CML-I	Tx2n	Transmitter Inverted Data Input	3	
3	CML-I	Tx2p	Transmitter Non-Inverted Data Input	3	
4		GND	Ground	1	1
5	CML-I	Tx4n	Transmitter Inverted Data Input	3	
6	CML-I	Tx4p	Transmitter Non-Inverted Data Input	3	
7		GND	Ground	1	1
8	LVTTL-I	ModSelL	Module Select	3	
9	LVTTL-I	ResetL	Module Reset	3	
10		VccRx	+3.3 V Power Supply Receiver	2	2
11	LVC MOS-I/O	SCL	2-Wire Serial Interface Clock	3	
12	LVC MOS-I/O	SDA	2-Wire Serial Interface Data	3	
13		GND	Ground	1	
14	CML-O	Rx3p	Receiver Non-Inverted Data Output	3	
15	CML-O	Rx3n	Receiver Inverted Data Output	3	
16		GND	Ground	1	1
17	CML-O	Rx1p	Receiver Non-Inverted Data Output	3	
18	CML-O	Rx1n	Receiver Inverted Data Output	3	
19		GND	Ground	1	1
20		GND	Ground	1	1
21	CML-O	Rx2n	Receiver Inverted Data Output	3	
22	CML-O	Rx2p	Receiver Non-Inverted Data Output	3	
23		GND	Ground	1	1
24	CML-O	Rx4n	Receiver Inverted Data Output	3	1
25	CML-O	Rx4p	Receiver Non-Inverted Data Output	3	
26		GND	Ground	1	1
27	LVTTL-O	ModPrsL	Module Present	3	
28	LVTTL-O	IntL / RxLOS	Interrupt / RxLOS	3	3
29		VccTx	+3.3 V Power Supply Transmitter	2	2
30		Vcc1	+3.3 V Power Supply	2	2
31	LVTTL-I	LPMODE / TxDIS	Low Power Mode / Tx Disable	3	3
32		GND	Ground	1	1

33	CML-I	Tx3p	Transmitter Non-Inverted Data Input	3	
34	CML-I	Tx3n	Transmitter Inverted Data Input	3	
35		GND	Ground	1	1
36	CML-I	Tx1p	Transmitter Non-Inverted Data Input	3	
37	CML-I	Tx1n	Transmitter Inverted Data Input	3	
38		GND	Ground	1	1

Notes:

1. GND is the symbol for signal and supply (power) common for the QSFP28 module. 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 receiver and transmitter power supplies and shall be applied concurrently. Requirements defined for the host side of the host edge card connector are listed in the MSA. The connector pins are each rated for a maximum current of 1000 mA.
3. Two multi-purpose pins support the TxDIS and RxLOS functions in the 100G QSFP28 LR1 BIDI module.

Mechanical Diagram


Unit: mm

Ordering Information

Part Number	Product Description
CSMQ28HGB1920	1291T/1311R, 106.25 Gbps, LC, 20 km, 0 °C to +70 °C, Latch Color: Purple
CSMQ28HGB9120	1311T/1291R, 106.25 Gbps, LC, 20 km, 0 °C to +70 °C, Latch Color: Red

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