

CSMQ28HGBxx40

100 Gbps QSFP28 BIDI ER1 40 km DDM Transceiver

Description

The CSMQ28HGBxx40 is a 100 Gbps QSFP28 BIDI ER1 DDM optical transceiver designed for 40 km optical communication applications over single-mode fiber (SMF). The module uses a simplex LC connector and is available in two wavelength configurations: 1305 nm Tx / 1309 nm Rx and 1309 nm Tx / 1305 nm Rx. It supports real-time digital diagnostic monitoring (DDM) via an I²C interface and is compliant with QSFP28 MSA, SFF-8636, SFF-8679, IEEE 802.3cu, and 100G Lambda MSA 100G-ER1 Optical Specifications.

Features

- Supports 100GBASE-ER1 BIDI
- Lane signaling rate of 106.25 Gbps with PAM4
- Up to 40 km transmission over SMF
- EML laser and APD 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
- Operating case temperature: 0 °C to +70 °C
- Compliant with IEEE 802.3cu, SFF-8636, and SFF-8679 standards
- Compliant with 100G Lambda MSA 100G-ER1 Optical Specifications
- Compliant with EU Directive 2015/863/EU

Applications

- Data center
- 100 Gigabit Ethernet

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			40	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%	T_r/T_f	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%	T_r/T_f	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	1303.54	1304.58	1305.63	nm	
		1308.09	1309.14	1310.19	nm	
Signaling Rate	SR			53.125	GBd	
Frequency Offset	Foffset	-100		100	ppm	
Average Launch Power	PTX	1.7		7.1	dBm	1
Outer Optical Modulation Amplitude	OMA	4.7		7.9	dBm	TDECQ < 1.4 dB
		3.3 +TDECQ			dBm	TDECQ ≥ 1.4 dB
Transmitter and Dispersion Eye Closure for PAM4 (TDECQ) (Max)	TDECQ			3.9	dB	
Average Output Power (Laser Turn-Off)	Poff			-30	dBm	
Side Mode Suppression Ratio	SMSR	30			dB	
Extinction Ratio	ER	5			dB	
RIN_OMA	RIN			-136	dB/Hz	
Transmitter Reflectance	Tref			-26	dB	
Optical Return Loss Tolerance	ORLT			15.6	dB	
Receiver						
Center Wavelength	CW	1303.54	1304.58	1305.63	nm	
		1308.09	1309.14	1310.19	nm	
Damage Threshold	Pdamage	-2.4			dBm	2
Average Rx Power	PRx	-16		-3.4	dBm	3
Receive Power (OMAouter)	POMA			-2.6	dBm	
Receiver Sensitivity (OMAouter)	SEN_OMA			max(-13.8, -5.2+TDECQ)	dBm	4
Reflectance	Ref			-26	dB	
LOS Assert	LosA	-26			dBm	
LOS De-Assert	LosDA			-15	dBm	
LOS Hysteresis	LosH	0.5			dB	

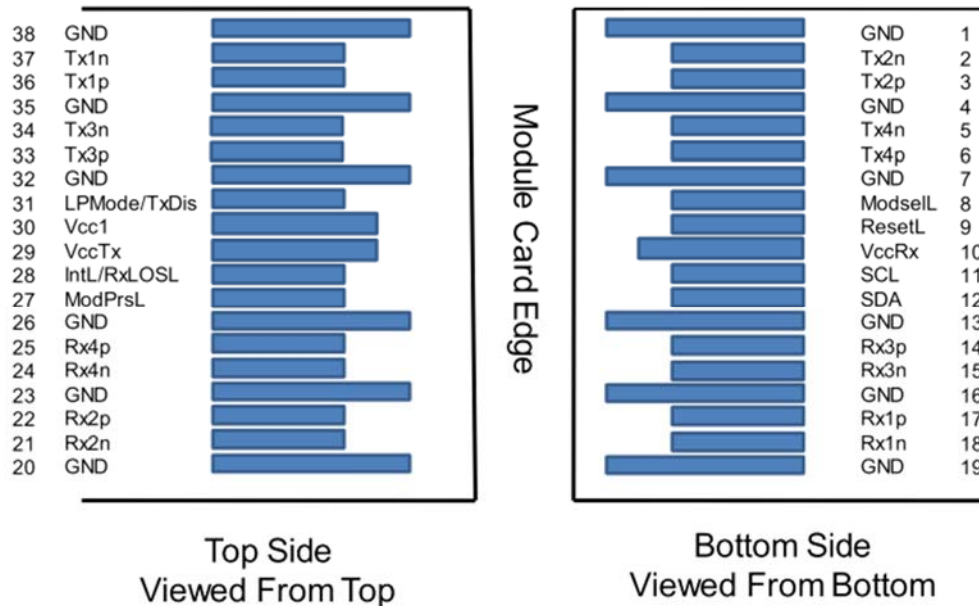
Notes:

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} .

Digital Diagnostic Specifications

Parameter	Range	Accuracy	Unit	Calibration
Temperature	0 to 70	± 3	°C	Internal
Voltage	0 to V _{cc}	± 3 %	V	Internal
Tx Bias Current	0 to 100	± 10 %	mA	Internal
Tx Output Power	1 to 7	± 3	dB	Internal
Rx Input Power	-14.7 to -3.4	± 3	dB	Internal

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 ER1 BIDI module.

Management Interface

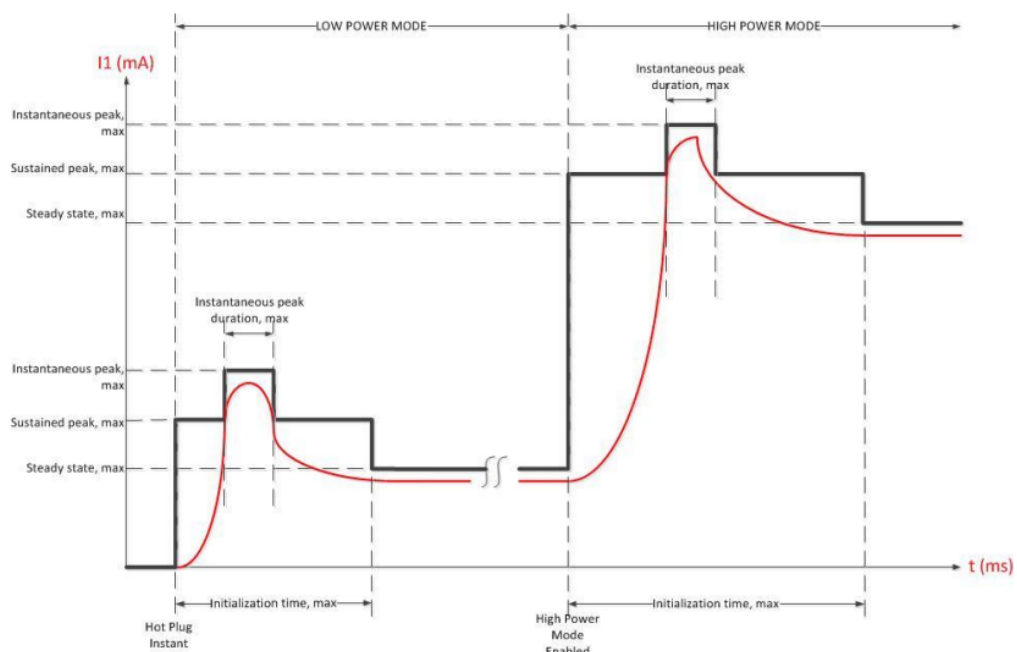
Page	Byte	Bit	Name	Description
00h	99	1	LP/TxDis ctrl	LPMode / TxDIS input signal control. See SFF-8679 for a complete description. 0b = LPMode; 1b = TxDIS
		0	IntL/LOSL ctrl	IntL / RxLOS output signal control. See SFF-8679 for a complete description. 0b = IntL; 1b = RxLOS

Module Power Supply Specification

The 100G QSFP28 ER1 BIDI module requires a 3.3 V power supply.

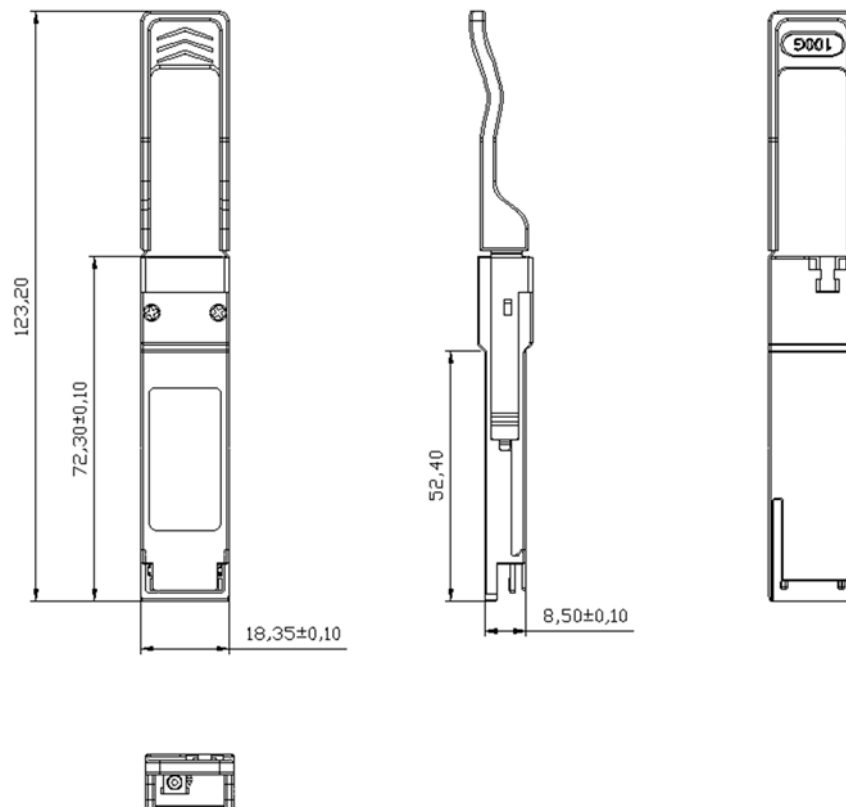
The following figure shows the timing of the initial module turn-on in Low Power Mode and the later transition to full power mode after the host system has enabled it via the two-wire interface. It also shows the module power supplies and the corresponding current values.

The module power supply requirements are defined in accordance with SFF-8679.



100G QSFP28 ER1 BIDI Inrush Current Timing

Mechanical Diagram



Unit: mm

Ordering Information

Part Number	Product Description
CSMQ28HGB4940	1305T/1309R, 106.25 Gbps, LC, 40 km, 0 °C to +70 °C, Latch Color: Green
CSMQ28HGB9440	1309T/1305R, 106.25 Gbps, LC, 40 km, 0 °C to +70 °C, Latch Color: Blue

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