

CSMQ28HGC3102

100 Gbps QSFP28 FR1 Single-Lambda Transceiver, 2 km Reach

Description

The CSMQ28HGC3102 is a transceiver module designed for 2 km optical communication applications. It converts four channels of 25.78125 Gbit/s electrical data into a single 106.25 Gbit/s optical signal and converts the received optical signal back into four electrical output channels. Designed for 100 Gb/s high-speed data communications over single-mode fiber (SMF), it transmits the optical signal through an industry-standard LC connector.

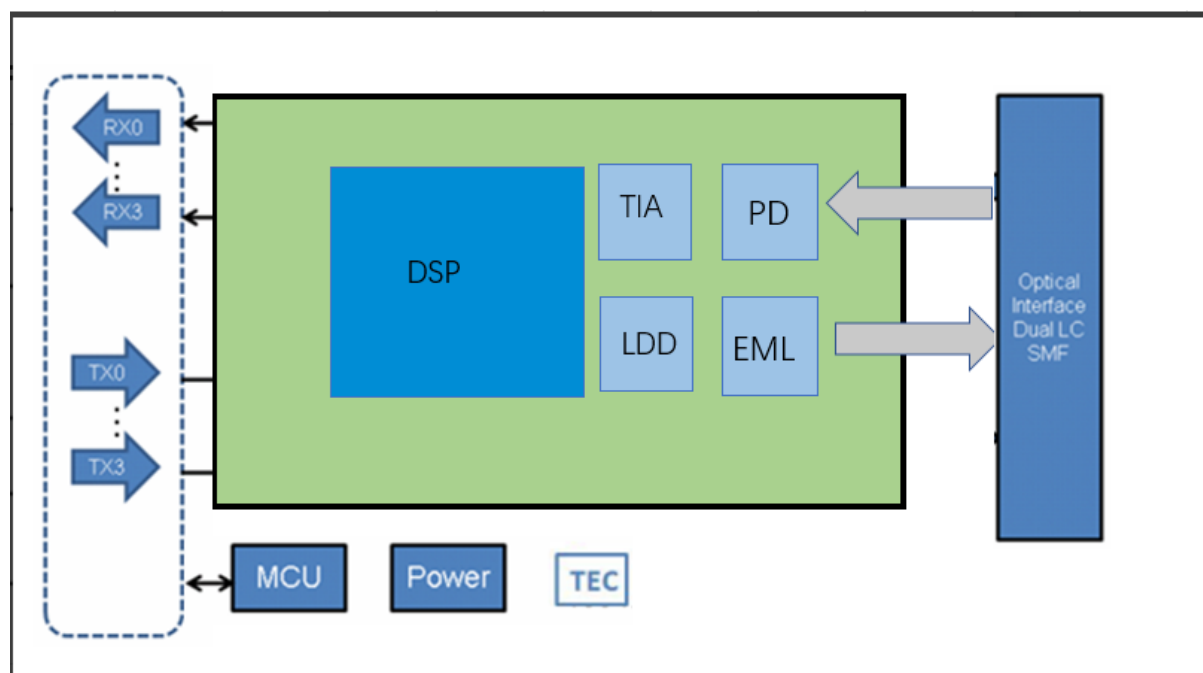
Features

- Compliant with QSFP28 Standard: SFF-8636 Rev 2.10a
- Compliant with IEEE 802.3cu D3.2 100GBASE-FR1
- High-Speed I/O Electrical Interface (CAUI-4)
- Single 3.3 V Supply Voltage
- Maximum Power Consumption: 4 W
- 0 °C to +70 °C Case Operating Temperature
- 1311 nm EML Laser and PIN Receiver
- Hermetically Sealed TO-Based Design
- QSFP28 MSA Package with Duplex LC Connector
- 2-Wire Serial Interface with Digital Diagnostic Monitoring
- KP4 FEC Termination Inside Module
- Supports 2 km Reach over Single-Mode Fiber
- Complies with EU Directive 2011/65/EU (RoHS Compliant)
- Class 1 Laser Product

Applications

- Data Centers
- 100 Gigabit Ethernet

Module Block Diagram



Absolute Maximum Ratings

Parameter	Symbol	Min	Typical	Max	Unit
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
Operating Case Temperature	T _C	0		+70	°C
Power Supply Voltage	V _{CC}	3.13	3.3	3.47	V
Transmission Distance	TD			2	km
Supply Current	I _{CC}			1.06	A

Electrical Characteristics

The following electrical characteristics are defined over the Recommended Operating Environment unless otherwise specified.

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, Reset, and ModSelL / TxDis	V _{IL}	-0.3		0.8	V	
LPMode, Reset, 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	λ _c	1304.5	1311	1317.5	nm	
Signaling Rate	SR			53.125	GBd	
Frequency Offset	Foffset	-100		100	ppm	
Average Launch Power	PTX	-2.4		4	dBm	1
Outer Optical Modulation Amplitude	OMA	-0.2		4.2	dBm	1
Transmitter and Dispersion Eye Closure for PAM4 (TDECQ) (Max)	TDECQ			3.4	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/Hz	
Transmitter Reflectance	T _{ref}			-26	dB	
Optical Return Loss Tolerance	ORLT			17.1	dB	

Receiver						
Center Wavelength	CW		1311		nm	
Damage Threshold	Pdamage	5.5			dBm	2
Average Rx Power	PRx	-6.4		4.5	dBm	3
Receive Power, OMAouter	POMA			4.7	dBm	
Receiver Sensitivity, OMAouter for TDECQ < 1.4 dB for 1.4 dB ≤ TDECQ ≤ 3.4 dB	SEN_OMA			-4.5 -5.9 + TECQ	dBm	4
Reflectance	Ref			-26	dB	
LOS Assert	LosA	-26			dBm	
LOS De-Assert	LosDA			-8	dBm	
LOS Hysteresis	LosH	0.5			dB	
Stressed Receiver Sensitivity, OMAouter	SRS			-2.5	dBm	5
Conditions of Stressed Receiver Sensitivity Test:						
Stressed eye closure for PAM4 (SECQ)				3.4	dB	6
SECQ - 10 × log(Ceq)				3.4	dB	6

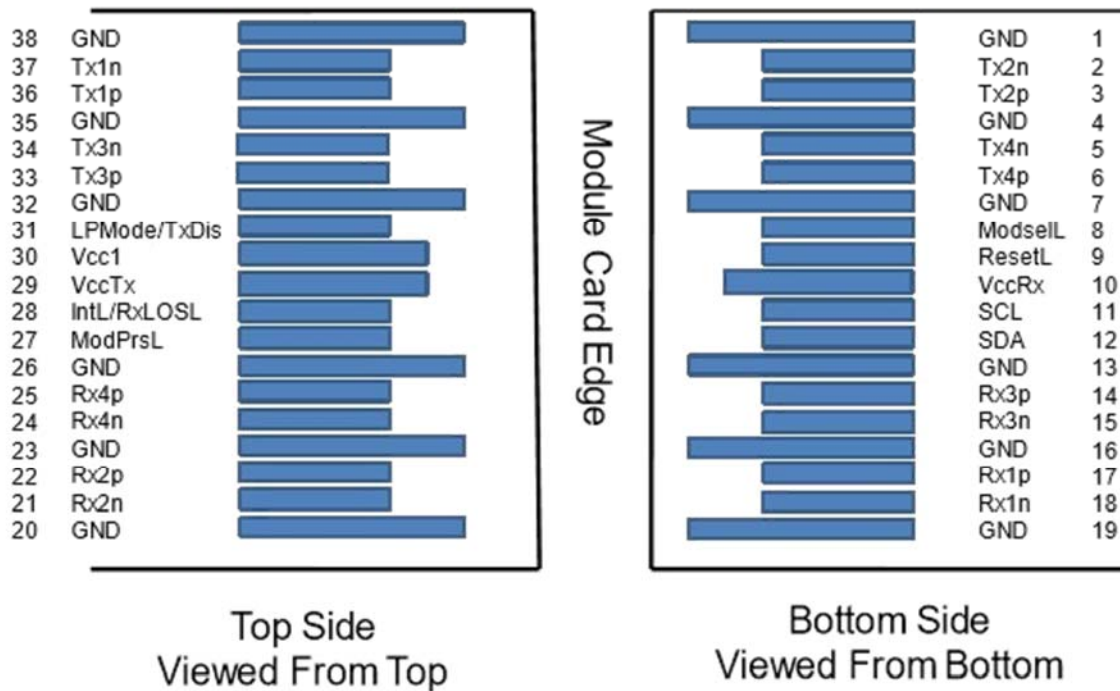
Notes:

1. The optical power is launched into SMF.
2. The receiver shall tolerate continuous exposure to an optical input signal at this average power level without damage, but it is not required to operate correctly at this power level.
3. Average receive power, each lane (min), is informative and is not the principal indicator of signal strength.
4. Measured with a conformance test signal at TP3 using the PRBS31Q test pattern or scrambled idle to determine stressed receiver sensitivity at a BER of 2.4×10^{-4} .
5. Measured with a conformance test signal at TP3 (see 3.11) for the BER specified in IEEE Std 802.3cu.
6. Ceq is a coefficient defined in IEEE Std 802.3-2022 Clause 121.8.5.3 that accounts for reference equalizer noise enhancement.

Digital Diagnostics

Parameter	Range	Accuracy	Unit	Calibration
Temperature	0 to 70	±3	°C	commercial
Voltage	0 to VCC	±3%	V	commercial
Tx Bias Current	0 to 100	±10%	mA	commercial
Tx Output Power	-2.4 to +4	±3	dB	commercial
Rx Receive Power	-6.4 to +4.5	±3	dB	commercial

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	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	
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/RxLOSL	Interrupt; optionally configurable as RxLOS via the management interface (SFF-8636).	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. Optionally configurable as TxDis via the management interface (SFF-8636).	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 common reference for signal and supply power in the module. All GND pins are common within the module, and all module voltages are referenced to this potential unless otherwise noted. These pins should be connected 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.
3. Vcc contacts in SFF-8662 and SFF-8672 each have a steady-state current rating of 1 A.

The diagram illustrates the power supply circuit for the QSF+ module. It features three input lines: VccTx, VccRx, and Vcc1. Each input line is connected to ground (GND) through a 0.1 μF capacitor. Additionally, each input line is connected to a common output line through a 1 μH inductor and a 22 μF capacitor. The output line is connected to Vcc_host = 3.3 V through a 0.1 μF capacitor and to ground through a 22 μF capacitor.

Technical drawings of the 500L model, showing front, side, and top views with dimensions:

- Front View:** Shows a vertical rectangular unit with a total height of 123,20 and a main body height of 72,30 ± 0,10. The width is 18,35 ± 0,10.
- Side View:** Shows the profile of the unit with a height of 52,40 and a base width of 8,50 ± 0,10.
- Top View:** Shows the top of the unit with a width of 18,35 ± 0,10 and a central rectangular opening.

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Ordering Information

Part Number	Product Description
CSMQ28HGC3102	QSFP28 FR1, 106.25 Gbit/s, 2 km, SMF, Duplex LC, 0 °C to +70 °C

For More Information

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