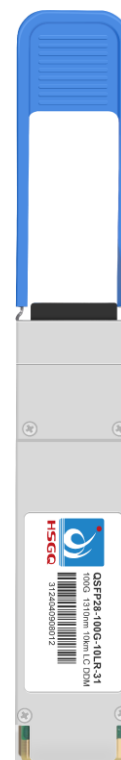


Product Features

- Support line rates from 103.125 Gb/s
- Transmission data rate up to 25.78 (NRZ) per channel
- Up to 10km transmission on single mode fiber
- High speed I/O electrical interface (CAUI-4)
- I2C interface with integrated Digital Diagnostic monitoring
- QSFP28 MSA package with duplex LC connector
- Single +3.3V power supply
- Power dissipation: Commercial(0 ~ 70°C): < 4W
- Complies with EU Directive 2015/863/EU



Applications

- 100GBASE-LR4 Ethernet
- 100G Datacom & Telecom connections

Description

HSGQ QSFP28-100G-10LR Transceiver is designed for 10km optical communication applications. This module contains 4-lane optical transmitter, 4-lane optical receiver and module management block including 2 wire serial inter-face. The optical signals are multiplexed to a single-mode fiber through an industry standard LC connector.

Product specifications

(1) Absolute Maximum Ratings

Parameter	Symbol	Min	Typ	Max	Units	Notes
Storage Temperature	TS	-40		85	°C	
Maximum Supply Voltage	VCC	-0.5		3.6	V	
Operating Relative Humidity	RH			85	%	

Note:

- 1、Exceeding any of these values may immediately damage the device.

(2) Recommended Operating Conditions

Parameter	Symbol	Min	Typ	Max	Units	Notes
Operating Case Temperature	Top	0		+70	°C	
Power Supply Voltage	Vcc	3.13	3.3	3.47	V	
Power Supply Current	Icc			1.21	A	
Maximum Power Dissipation	Pd			4	W	
Aggregate Bit Rate	BR _{AVE}		103.125		Gb/s	
Lane Bit Rate	BR _{LANE}		25.78125		Gb/s	
Transmission Distance	TD			10	km	
Coupled fiber	Single mode fiber					9/125um SMF

(3) Optical and Characteristics

Parameter	Symbol	Min	Typ	Max	Unit	Notes
Transmitter						
Signaling Speed per Lane	/		25.78125		Gbps	
Center Wavelength Lane 0	λ_0	1294.53	1295.56	1296.59	nm	
Center Wavelength Lane 1	λ_1	1299.02	1300.05	1301.09	nm	
Center Wavelength Lane 2	λ_2	1303.54	1304.58	1305.63	nm	
Center Wavelength Lane 3	λ_3	1308.09	1309.14	1310.19	nm	
Total Average Launch Power	P _T			10.5	dBm	1
Average Launch Power per Lane,	P _{avg}	-4.3		4.5	dBm	1
OMA, each Lane	P _{OMA}	-1.3		4.5	dBm	1
Difference in launch power between any two lanes (Average and OMA) between any Two Lanes (OMA)	P _{tx,diff}			3	dB	
Average Output Power (Laser Turn off)	P _{off}			-30	dBm	
Side Mode Suppression Ratio	SMSR	30			dB	
Extinction Ratio	ER	4			dB	
RIN20OMA	RIN			-130	dB/Hz	
Optical Return Loss Tolerance	TOL			20	dB	
Transmitter Reflectance	RT			-12	dB	
Optical Eye Mask	{0.25,0.4, 0.45, 0.25, 0.28, 0.4}				%	2
Receiver						
Signaling rate, each lane	/		25.78125		Gbps	
Center Wavelength Lane 0	λ_0	1294.53	1295.56	1296.59	nm	
Center Wavelength Lane 1	λ_1	1299.02	1300.05	1301.09	nm	
Center Wavelength Lane 2	λ_2	1303.54	1304.58	1305.63	nm	

Center Wavelength Lane 3	λ_3	1308.09	1309.14	1310.19	nm	
Damage threshold , each lane	Pdamage	5.5			dBm	
Average Receive Power, each lane	/	-10.6		4.5	dBm	
Receiver Sensitivity (OMA) per Lane	SEN			-8.6	dBm	3
Los Assert	LosA	-30			dBm	
Los De-assert	LosDA			-12	dBm	
Los Hysteresis	LosH	0.5			dB	

Note:

- 1、The optical power is launched into SMF.
- 2、Measured with a PRBS 231-1 test pattern @25.78125, Hit ratio $\leq$ 5E-5.
- 3、Measured with a PRBS 231-1 test pattern @25.78125 Gb/s, BER $\leq$ 1E-12.

(4) Electrical Characteristics

Parameter	Symbol	Min	Typ	Max	Unit	Notes
Transmitter (Module Input)						
Data Rate, each lane	/		25.78125		Gbps	
Differential Voltage pk-pk	Vpp			900	Mv	1
Common Mode Voltage	Vcm	-350		2850	Mv	
Transition time	Trise/Tfall	10			ps	2
Receiver (Module Output)						
Data Rate, each lane	/		25.78125		Gbps	
Common Mode Noise, RMS	Vrms			17.5	Mv	
Differential output voltage swing	Vout, pp			900	Mv	
Eye width	EW15	0.57			UI	
Eye height	EH15	228			mV	
Differential Termination Resistance Mismatch	/			10	%	1
Transition time	Trise/Tfall	12			ps	

Note: 1.At 1 MHz. 2.20%~80%.

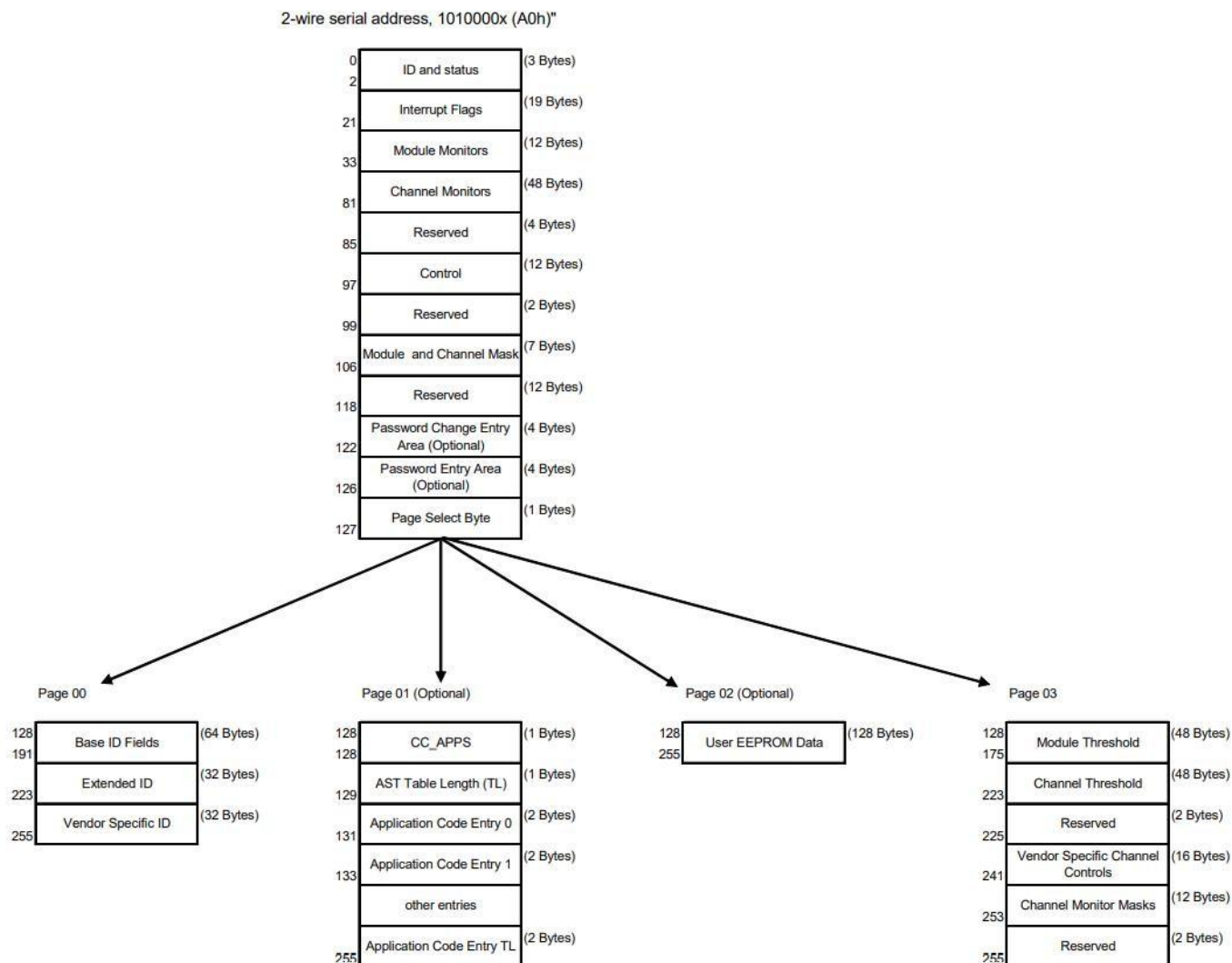
(5) Digital Diagnostics

Parameter	Range	Accuracy	Unit	Calibration	Notes
Temperature	-40 to +85	± 3	$^{\circ}\text{C}$	Internal/External	
Voltage	3.0 to 3.6	$\pm 3\%$	V	Internal/External	
Bias Current	30 to 100	$\pm 10\%$	mA	Internal/External	
TX Power	-4.3 to 4.5	± 3	dB	Internal/External	
RX Power	-10.6 to 4.5	± 3	dB	Internal/External	

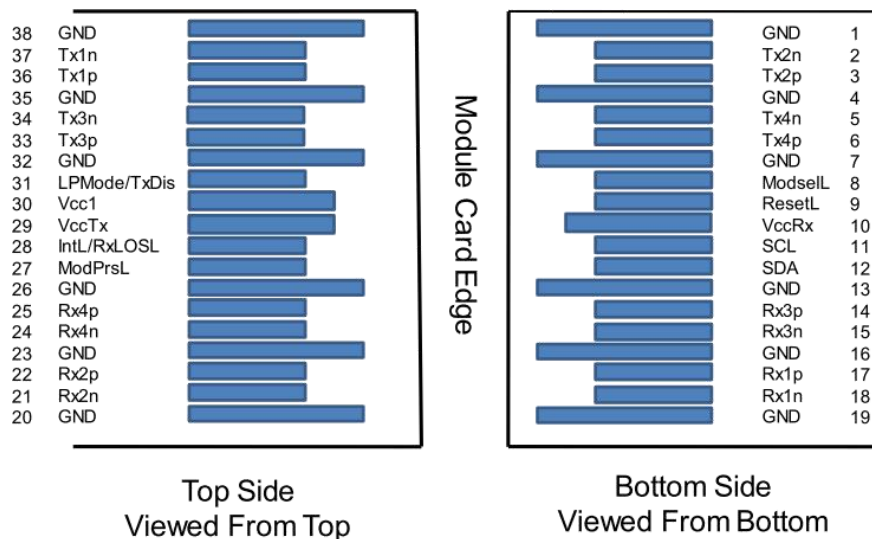
Note:

- 1、The transceivers provide serial ID memory contents and diagnostic information about the present operating conditions by the 2-wire serial interface (SCL, SDA). The diagnostic information with internal calibration or external calibration all are implemented, including received power monitoring, transmitted power monitoring, bias current monitoring, supply voltage monitoring and temperature monitoring.

(6) EEPROM Information



(7) Pin Assignment and Description



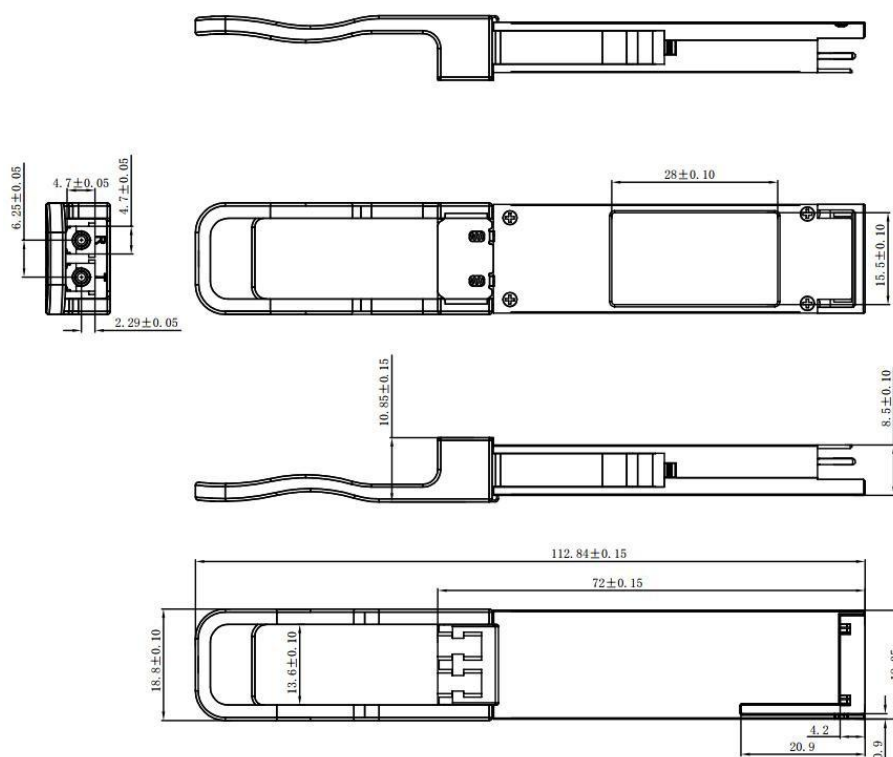
PIN Definition					
PIN	Logic	Symbol	Description	Plug Seq	Notes
1		GND	Ground	1	1
2	CML-I	Tx2n	Transmitter Inverted Data Input	3	
3	CML-I	Tx2p	Transmitter Non-Inverted Data output	3	
4		GND	Ground	1	1
5	CML-I	Tx4n	Transmitter Inverted Data Input	3	
6	CML-I	Tx4p	Transmitter Non-Inverted Data output	3	
7		GND	Ground	1	1
8	LVTLL-I	ModSelL	Module Select	3	
9	LVTLL-I	ResetL	Module Reset	3	
10		VccRx	+ 3.3V 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/Rx_LOS	Interrupt/Rx_LOS	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	
32		GND	Ground	1	1
33	CML-I	Tx3p	Transmitter Non-Inverted Data Input	3	
34	CML-I	Tx3n	Transmitter Inverted Data Output	3	
35		GND	Ground	1	1
36	CML-I	Tx1p	Transmitter Non-Inverted Data Input	3	

37	CML-I	Tx1n	Transmitter Inverted Data Output	3	
38		GND	Ground	1	1

Note:

- 1、GGND 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、Vcc Rx, Vcc1 and Vcc Tx 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 MSA. The connector pins are each rated for a maximum current of 1000 mA.

(8) Mechanical Specifications



Ordering Information

Model	Specification Description
QSFP28-100G-10LR-31	QSFP28 103.125G/1310nm/10km/LC/DDM/LWDM/0 ~ 70℃
QSFP28-100G-40ER-31	QSFP28 103.125G/1310nm/40km/LC/DDM/LWDM/0 ~ 70℃
QSFP28-100G-80ZR-31	QSFP28 103.125G/1310nm/80km/LC/DDM/LWDM/0 ~ 70℃