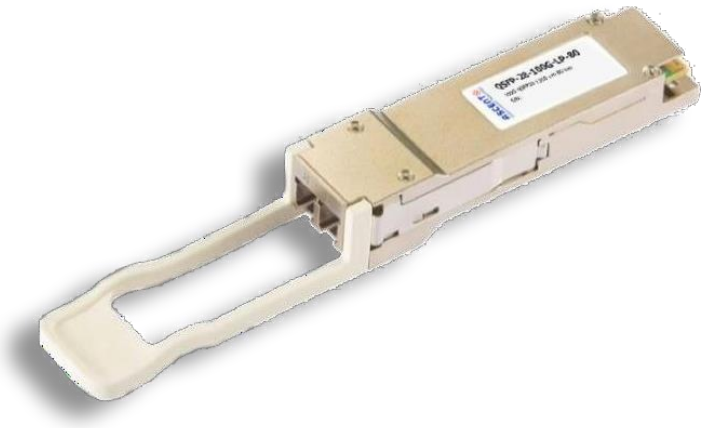
QSFP28 ZR4
100 Gb/s 80 km
Transceiver

QSFP28 Series



- **Support line rates from 103.125 Gb/s**
- **Up to 80km transmission with KR4-FEC**
- **Single +3.3V Power Supply**
- **Low Power Dissipation**
- **Support Commercial and Industrial Temperature**
- **Complies with EU Directive 2015/863/EU**

Ascent's QSFP28-100G-LP80 is designed for 80km 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.

Ascent's QSFP28-100G-LP80 is MSA compatible 100GBASE-ZR4 QSFP28 (Quad Small Form-Factor Pluggable 28) transceiver, operating over a pair of single- mode optical fibers with four independent optical communication lanes separated from each other using LAN WDM technology. It is widely deployed by Internet Service Provider (ISP) Fiber to the Home Aggregation and Backbone, Mobile Operator Core Networks and Mobile Backhaul and Data Center networking site interconnections.

The module uses EML cooled 4x25Gb/s LAN WDM TOSA (1295.56, 1300.05, 1304.58, 1309.14nm) laser transmitters and 4x25Gb/s SOA+PIN receivers. It has a minimum guaranteed optical budget of 27 dB (with host FEC), which in most cases is enough to reach 80 km distance (with host FEC) and 40 km distance (without host FEC) using a single-mode cable.

The module supports DDM/DOM optical diagnostics, which provide diagnostic information about the present operating conditions. Additionally, the module supports a KR4 FEC (Forward Error Correction) function which will help the receiving side detect and correct bit errors and improve the overall quality of the link.

Key Features

- Support line rates from 103.125 Gb/s
- Lane bit rate 25.78 Gb/s 100GE
- Up to 80km transmission with KR4-FEC
- LAN WDM EML laser and PIN receiver with SOA
- Support Multi-Pin function with IntL/RxLOSL and LPMode/TxDIS
- 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

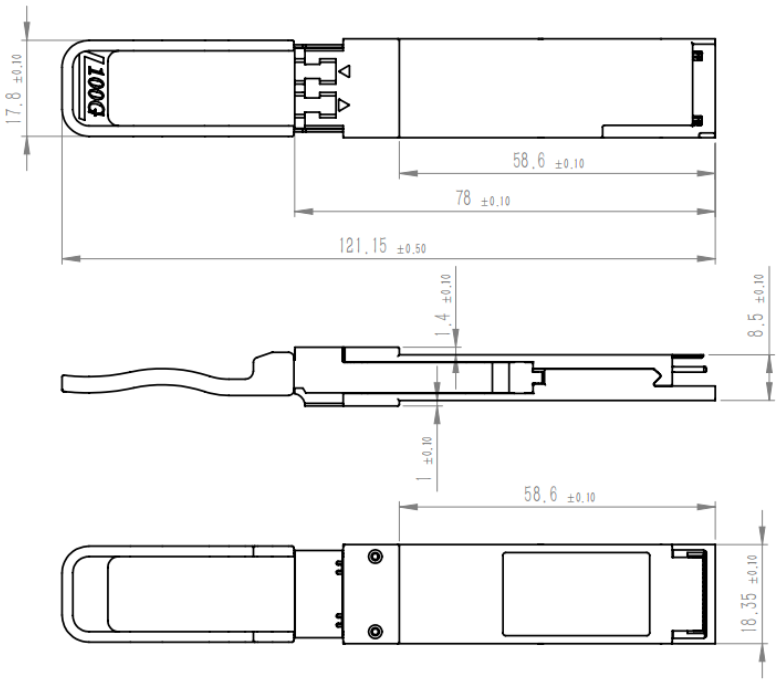
  Commercial：< 4.5W

  Industrial：<6W
- Temperature Range:

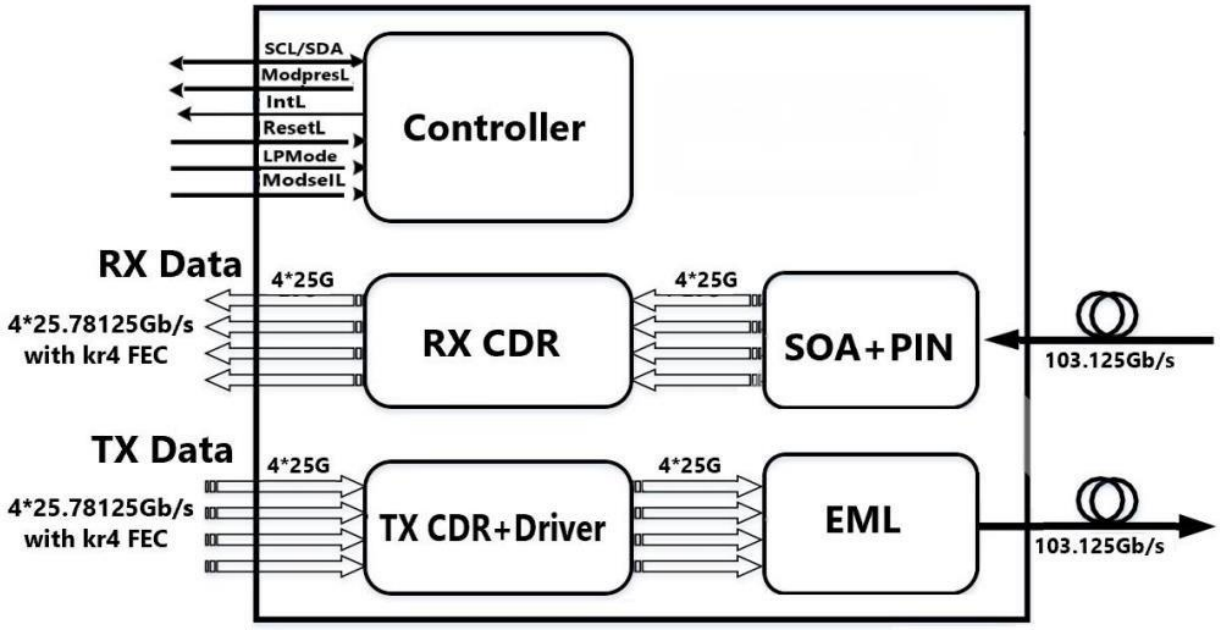
  Commercial：0°C to +70°C

  Industrial：-40°C to +85°C
- Complies with EU Directive 2015/863/EU

Outline Dimension

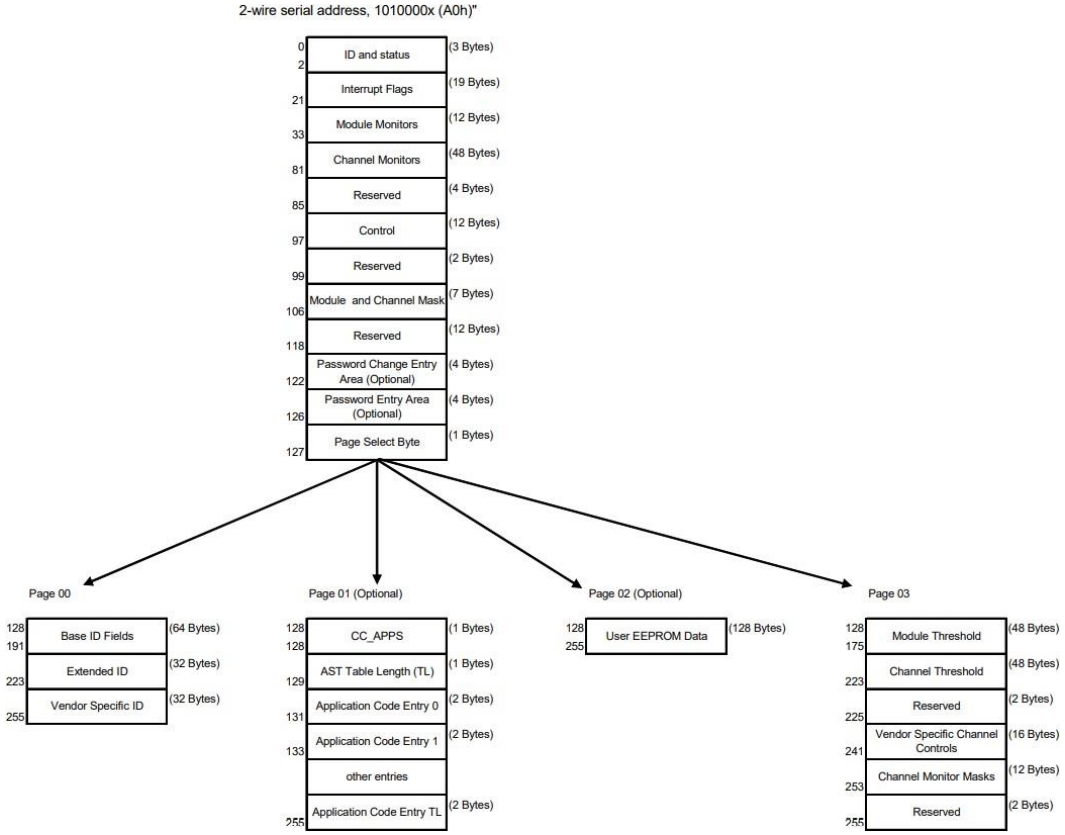


Transceiver Block Diagram

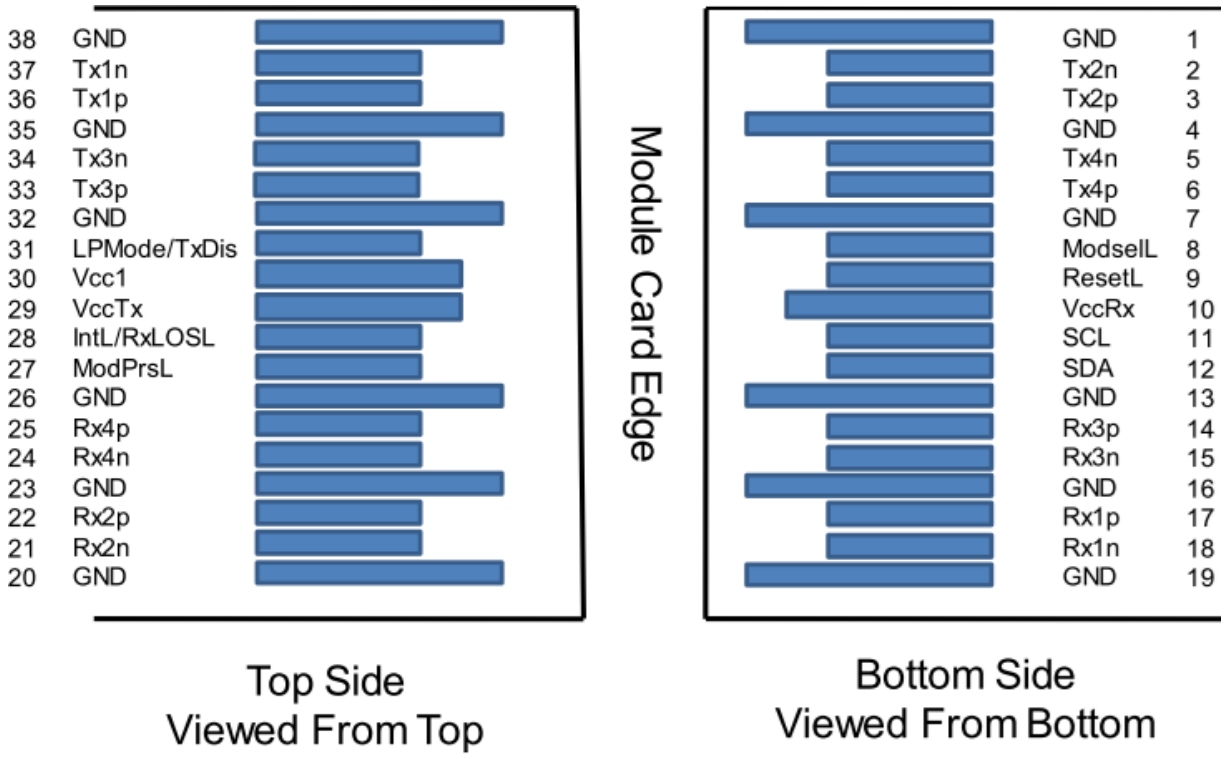


EEPROM Information

EEPROM memory map specific data field description is as below:



Pin Assignment



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	LVCMOS-I/O	SCL	2-Wire Serial Interface Clock	3	
12	LVCMOS-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

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. 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 500 Ma.

Digital Diagnostics

Parameter	Range	Unit	Accuracy	Calibration
Commercial Temperature	0 to +70	°C	±3°C	Internal / External
Industrial Temperature	-40 to +85	°C	±3°C	Internal / External
Voltage	3.0 to 3.6	V	±3%	Internal / External
Bias Current	30 to 100	Ma	±10%	Internal / External
TX Power	1 to 6.5	dBm	±3Db	Internal / External
RX Power	-29 to 4.5	dBm	±3Db	Internal / External

Note:

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.

Specifications

Absolute Maximum Ratings

Parameter	Symbol	Min.	Typ.	Max.	Unit
Storage Temperature	Ts	-40		85	°C
Maximum Supply Voltage	Vcc	0.5		3.6	V
Operating Relative Humidity	RH			85	%

Recommended Operating Environments

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Operating Case Temperature	T_{op}	0		70	°C	QSFP28-100G-LP80
		-40		85	°C	Q28-100G-LP80A
Power Supply Voltage	V_{cc}	3.13	3.3	3.47	V	
Power Supply Current	I_{CC}			1.36	A	QSFP28-100G-LP80
				1.81	A	Q28-100G-LP80A
Maximum Power Dissipation	P_D			4.5	W	QSFP28-100G-LP80
				6		Q28-100G-LP80A
Aggregate Bit Rate	BR_{AVE}		103.125		Gb/s	
Lane Bit Rate	BR_{LANE}		25.78125		Gb/s	
Transmission Distance	T_D			80	km	
Coupled fiber	Single mode fiber					9/125um SMF

Optical Characteristics

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Transmitter						
Signaling Speed per Lane			25.78125		Gbps	
Lane Wavelength	L0	1294.53	1295.56	1296.59	nm	
	L1	1299.02	1300.05	1301.09	nm	
	L2	1303.54	1304.58	1305.63	nm	
	L3	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	R_T			-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	λ0	1294.53	1295.56	1296.59	nm	
Center Wavelength Lane 1	λ1	1299.02	1300.05	1301.09	nm	
Center Wavelength Lane 2	λ2	1303.54	1304.58	1305.63	nm	
Center Wavelength Lane 3	λ3	1308.09	1309.14	1310.19	nm	
Damage threshold , Each lane	Pdamage	5.5			dBm	
Los Assert	LosA	-40			dBm	
Los De-assert	LosDA			-28	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≤$5E^{-5}$.
3. Measured with a PRBS 231-1 test pattern @25.78125 Gb/s, BER≤$5E^{-5}$.

Electrical Characteristics

High-Speed Signal: Compliant to CAUI-4 (IEEE 802.3bm)
Low-Speed Signal: Compliant to SFF-8679.

Parameter	Symbol	Min	Typ	Max	Unit	Note
Transmitter (Module Input)						
Data Rate, Each Lane			25.78125		Gbps	
Differential Voltage pk-pk	V_{pp}			900	mV	1
Common Mode Voltage	V_{cm}	-350		2850	mV	
Transition Time	Trise/Tf all	10			ps	2
Receiver (Module Output)						
Data Rate, Each Lane			25.78125		Gbps	
Common Mode Noise, RMS	Vrms			17.5	mV	
Differential Output Voltage Wwing	V_{out}, pp			900	mV	
Eye Width	EW15	0.57			UI	
Eye Height	EH15	228			mV	
Differential Termination Resistance Mismatch				10	%	1
Transition Time	Trise/Tf all	12			ps	

Notes:

1. At 1 MHz
2. 20% to 80%

Ordering Information

Product Name	Product Description
QSFP28-100G-LP80	QSFP28 Plug-in, compatible with QSFP-100G-ZR4 (with FEC), 80 km Optical Transceiver, Duplex LC, DOM
QSFP28-100G-L80A	QSFP28 Plug-in, compatible with QSFP-100G-ZR4 (with FEC), 80 km Optical Transceiver, Duplex LC, DOM, -40 to 85°C
JQ28-100G-LP80	QSFP28 Plug-in, compatible with QSFP-100G-ZR4 (with FEC), 80 km Optical Transceiver, Duplex LC, DOM
JQ28-100G-LP80A	QSFP28 Plug-in, compatible with QSFP-100G-ZR4 (with FEC), 80 km Optical Transceiver, Duplex LC, DOM, -40 to 85°C, Compatible with Juniper

Contact Information

Ascent Communication Technology Ltd

AUSTRALIA
140 William Street, Melbourne
Victoria 3000, AUSTRALIA
Phone: +61-3-8691 2902

CHINA
Unit 1933, 600 Luban Road
200023, Shanghai, CHINA
Phone: +86-21-60232616

EUROPE
Pfarrer-Bensheimer-Strasse 7a
55129 Mainz, GERMANY
Phone: +49 (0) 6136 926 3246

Hong Kong SAR
Unit 9, 12th Floor, Wing Tuck Commercial Centre
177 Wing Lok Street, Sheung Wan, Hong Kong SAR
Phone: +852-2851 4722

USA
2710 Thomes Ave
Cheyenne, WY 82001, USA
Phone: +1 203 350 9822

VIETNAM
11th Floor, Hoa Binh Office Tower
106 Hoang Quoc Viet Street, Nghia Do Ward
Cau Giay District, Hanoi 10649, VIETNAM
Phone: +84-24-37955917

WEB: www.ascentcomtec.com

EMAIL: sales@ascentcomtec.com

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