Features

- Supports 100GBASE-ER1;
- Lane bit rate 106.25 Gb/s with PAM4;
- Up to 40km transmission on SMF;
- 1310nm laser and APD receiver;
- 4x25.78Gb/s with NRZ electrical interface (CAUI-4);
- I2C interface with integrated Digital Diagnostic monitoring;
- QSFP28 MSA package with LC duplex connector;
- Single +3.3V power supply;
- Maximum power consumption 4.5 W;
- Operating case temperature: 0 to +70 °C;
- Compliant to 802.3cd, SFF-8636&SFF-8679 standard;
- Complies with EU Directive 2015/863/EU;

Application

- 100GBASE-ER1;
- Data center / Cloud application;
- Other application.

Order Information

Table 1- order information

Part No.	Data Rate	Laser	Fiber Type	Distance	Optical Interface	Temp	DDMI
UDQ1HE4S	100Gbps	1310nm	SMF	40km	SMF	0~70C	Y

Absolute Maximum Ratings

Table 2-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	5	-	+85	%	

Recommended Operating Conditions

Table 3-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	
Power Supply Current	I_{CC}	-	-	1.29	A	
Maximum Power Dissipation	P_D	-	-	4.5	W	
Lane Bit Rate	BR_{LANE}	-	103.125	106.25	Gb/s	With PAM4
Transmission Distance	TD	-	-	40	km	SMF with FEC

Optical Characteristics

Table 4-Optical Characteristics

Transmitter						
Parameter	**Symbol**	**Min.**	**Typical**	**Max.**	**Unit**	**Notes**
Center Wavelength	λ	1304.5	-	1317.5	nm	
Average Launch Power [a]	P_{TX_LANE}	0	-	5.6	dBm	SMF
Outer optical modulation amplitude (OMAouter)	OMA_{outer}	3.0	-	6.4	dBm	TDECQ < 1.4 dB
		1.6+TDECQ	-		dBm	1.4 dB < TDECQ < TDECQ (max)
Transmitter and dispersion eye closure for PAM4 (TDECQ)	TDECQ	-	-	3.9	dB	
TECQ(Max)		-	-	3.9	dB	
|TDECQ-TECQ|(max)		-	-	2.7	dB	
Average Output Power (Laser Turn off)	$P_{OUT-OFF}$	-	-	-15	dBm	
Side Mode Suppression Ratio	SMSR	30	-	-	dB	
Extinction Ratio	ER	5	-	-	dB	
Transmitter over/under-shoot (max)				22	%	
Transmitter peak-to-peak power		-	-	8.4	dBm	
Optical return loss tolerance				15	dB	
Transmitter reflectance [b] (max)	T_{rf}	-	-	-26	dB	
Receiver						
Parameter	**Symbol**	**Min.**	**Typical**	**Max.**	**Unit**	**Notes**
Center Wavelength	λ	1304.5	-	1317.5	nm	
Damage threshold [c]	Pdamage	-2.4	-	-		
Average Rx Power [d]	P_{RX_LANE}	-14.7	-	-3.4	dBm	
Receiver power (OMA_{outer})	P_{OMA_LANE}	-	-	-2.6	dBm	
Receiver sensitivity (OMA_{outer}) [e]	SEN_{OMA}	-	-	-12.5	dBm	TECQ < 1.4 dB
		-	-	-13.9+TECQ	dBm	1.4 < TECQ < 3.9 dB
Los Assert(OMA)	LosA	-26	-	-	dBm	
Los De-assert(OMA)	LosDA	-	-	-16	dBm	

Notes:

a. Average launch power, (min) is informative and not the principal indicator of signal strength. A transmitter with launch power below this value cannot be compliant; however, a value above this does not ensure compliance.

b. Transmitter reflectance is defined looking into the transmitter

c. The receiver shall be able to tolerate, without damage, continuous exposure to an optical signal having this average power level. The receiver does not have to operate correctly at this input power.

d. Average receive power, (min) is informative and not the principal indicator of signal strength. A received power below this value cannot be compliant; however, a value above this does not ensure compliance.

e. Receiver sensitivity (OMA outer) (max) is defined for a transmitter with a value of TECQ up to 3.6 dB for 100G-LR1 20 and 3.9 dB for 100G-ER1-30

f. Measured with conformance test signal at TP3，for the BER specified in IEEE Std 802.3cd clause 140.1.1.

Electrical Characteristics

High-Speed Signal: **Compliant to CAUI-4 (IEEE 802.3bm)**

Low-Speed Signal: **Compliant to SFF-8679.**

Table 5-Electrical Characteristics

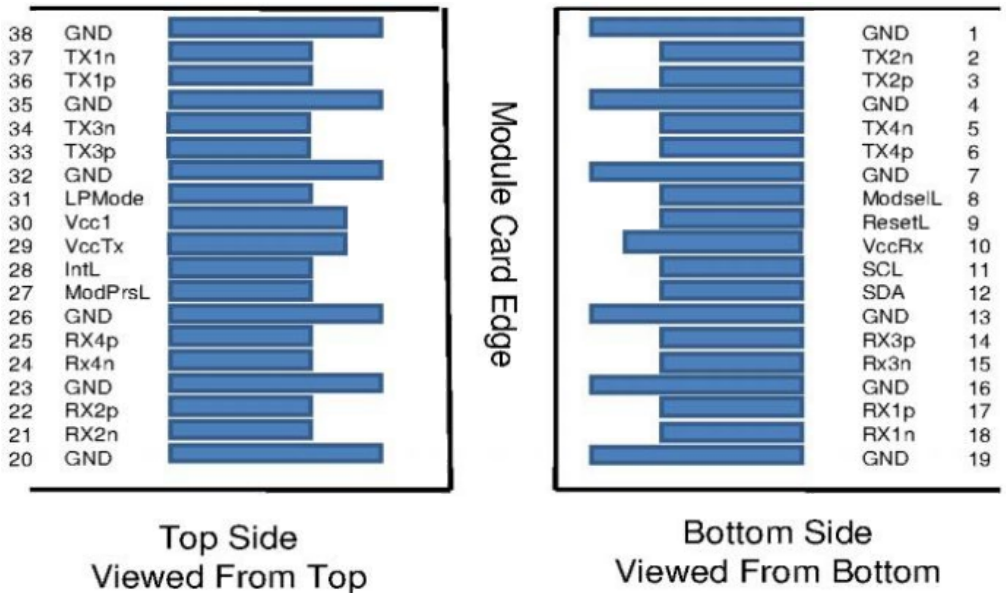
Transmitter (Module Input)						
Parameter	**Symbol**	**Min.**	**Typical**	**Max.**	**Unit**	**Notes**
Differential Data Input Amplitude	$V_{IN,P-P}$	85	-	900	mVpp	
Differential Termination Mismatch		-	-	10	%	
LPMode, Reset and ModSelL, V in low	V_{IL}	-0.3	-	0.8	V	
LPMode, Reset and ModSelL, V in high	V_{IH}	2.0	-	V_{CC}+0.3	V	
Receiver (Module Output)						
Differential Data Output Amplitude	$V_{OUT,P-P}$	200	-	900	mVpp	
Differential Termination Mismatch		-	-	10	%	
Transition time, 20% to 80%	Tr Tf	12			ps	
ModPrsL and IntL, V out low	V_{OL}	0	-	0.4	V	
ModPrsL and IntL, V out high	V_{OH}	V_{CC}-0.5	-	V_{CC}+0.3	V	

Digital Diagnostics

Table 6-Digital Diagnostics

Parameter	Range	Accuracy	Unit	Calibration
Temperature	0 to 70	±3	ºC	Internal
Voltage	0 to V_{CC}	±10%	V	Internal
Tx Bias Current	0 to 100	±10%	mA	Internal
Tx Output Power	0 to 6.4	±3	dBm	Internal
Rx Input Power	-14.7 to -3.4	±3	dBm	Internal

Pin Definitions



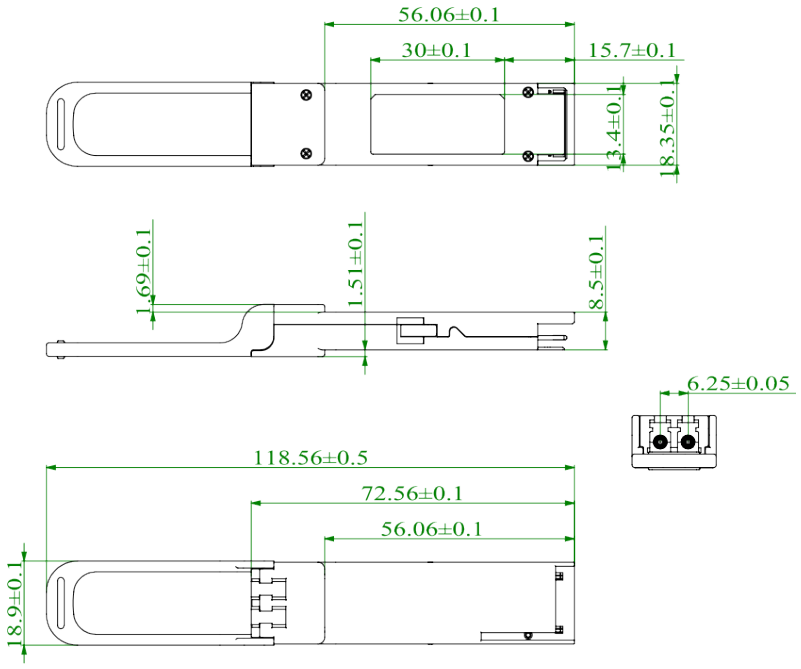
PIN	Logic	Symbol	Description	Plug Seq.	Notes
1		GND	Ground	1	1
2	CML-I	Tx2n	Transmitter Inverted Data Input	3	
3	CML-I	Tx2p	Transmitter Non-Inverted Data output	3	
4		GND	Ground	1	1
5	CML-I	Tx4n	Transmitter Inverted Data Input	3	
6	CML-I	Tx4p	Transmitter Non-Inverted Data output	3	
7		GND	Ground	1	1
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	
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	Interrupt	3	
29		VccTx	+3.3 V Power Supply transmitter	2	2
30		Vcc1	+3.3 V Power Supply	2	2
31	LVTTL-I	LPMode	Low Power Mode	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: 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.

Note 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.

Mechanical Dimension



Warnings

Handling Precautions: This device is susceptible to damage as a result of electrostatic discharge (ESD). A static free environment is highly recommended. Follow guidelines according to proper ESD procedures.

Laser Safety: The Moduletek family Transceiver uses a semiconductor laser system and is a laser class1 product acc. FDA, complies with 21CFR1040. 10 and 1040.11. Also this product is a laser class 1 product acc. IEC 60825-1