

100G QSFP28 ER4 40km Transceiver Product Specification

Product Features:

- Compliant with QSFP28 Standard: SFF-8661 Rev 2.5, SFF-8636 Rev 2.10a
- High speed I/O electrical interface (CAUI-4) compliant with IEEE 802.3bm-2015
- Compliant with 100GBASE-ER4 standard
- Single 3.3V Supply Voltage
- Maximum power consumption 5.5 W at 70°C Case Operating Temperature
- LAN WDM EML laser and APD Receiver
- 0-70 °C Case Operating Temperature
- Universal QSFP28 MSA package with duplex LC connector
- Two Wire Serial Interface with Digital Diagnostic Monitoring
- Complies with EU Directive 2011/65/EU (RoHS compliant)
- Class 1 Laser

Applications:

- 100GBASE-ER4

1. Absolute Maximum Ratings

It has to be noted that the operation in excess of any individual absolute maximum ratings might cause permanent damage to this module.

Parameter	Symbol	Min.	Max.	Unit	Notes
Storage Temperature	T _S	-40	85	°C	
Supply Voltage	V _{CC}	-0.5	3.6	V	
Relative Humidity (non-condensing)	RH	5	95	%	
Data Input Voltage Differential	IV _{DIP} -V _{DIN} I	-	1	V	
Control Input Voltage	V _I	-0.3	V _{CC} +0.5	V	
Control Output Current	I _O	-20	20	mA	

2. Recommended Operating Conditions

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Operating Case Temperature	TOPR	0	-	70	°C	
Power Supply Voltage	VCC	3.135	3.3	3.465	V	
Instantaneous peak current at hot plug	ICC_IP	-	-	2200	mA	
Sustained peak current at hot plug	ICC_SP	-	-	1815	mA	
Maximum Power Dissipation	PD	-	-	5.5	W	
Maximum Power Dissipation, Low Power Mode	PDLF	-	-	1.5	W	
Aggregate Bit Rate	ABR	-	103.125	-	Gb/s	
Data Rate per Lane	DRL	-	25.78	-	Gb/s	
Control Input Voltage High	VIH	VCC*0.7	-	VCC+0.3	V	
Control Input Voltage Low	VIL	-0.3	-	VCC*0.3	V	
Two Wire Serial Interface Clock Rate	-	-	-	400	kHz	
Module power supply noise tolerance 10 Hz - 10MHz (peak-to-peak)	-	-	-	66	mVpp	
Rx Differential Data Output Load	-	-	100	-	ohms	
Operating Distance	-	2	-	40,000	m	Note 1

Note 1: 40km without FEC

3. Transmitter Optical Specifications

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Wavelength L0	λ_{C0}	1294.53	1295.56	1296.59	nm	
Wavelength L1	λ_{C1}	1299.02	1300.05	1301.09	nm	
Wavelength L2	λ_{C2}	1303.54	1304.58	1305.63	nm	
Wavelength L3	λ_{C3}	1308.09	1309.14	1310.19	nm	
Side-mode suppression ratio	SMSR	30			dB	
Total Average Optical Launch Power	POUT	-	-	12	dBm	
Average Launch Power Tx_Off (Each Lane)	POUT_OF F	-	-	-30	dBm	
Average Optical Launch Power (Each Lane)	POUTL	-2	-	5	dBm	
Extinction Ratio	ER	8	-	-	dB	

Optical Modulation Amplitude (Each Lane)	OMA	0.1	-	4.5	dBm	
Transmitter and Dispersion Penalty (Each Lane)	TDP	-	-	2.5	dB	
Difference in launch power between any two lanes (Average and OMA)	DT_OMA	-	-	3.6	dB	
Optical Return Loss Tolerance	ORLT	-	-	20	dB	
RIN20OMA	RIN	-	-	-130	dB/Hz	
Transmitter Reflectance	TR	-	-	-26	dB	
Transmitter Eye Mask Definition	-	{0.25, 0.4, 0.45, 0.25, 0.28, 0.4}				

4. Receiver Optical Specifications

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Wavelength L0	λ_{C0}	1294.53	1295.56	1296.59	nm	
Wavelength L1	λ_{C1}	1299.02	1300.05	1301.09	nm	
Wavelength L2	λ_{C2}	1303.54	1304.58	1305.63	nm	
Wavelength L3	λ_{C3}	1308.09	1309.14	1310.19	nm	
Receiver Sensitivity (OMA) per Lane				-21.4	dBm	Note 1
Stressed Receiver Sensitivity in OMA (Each Lane)	-	-	-	-18	dBm	Note 1
Stressed Receiver Sensitivity Test Conditions:						
Stressed Eye J2 Jitter (Each Lane)	-	-	0.3	-	UI	
Stressed Eye J9 Jitter (Each Lane)	-	-	0.47	-	UI	
Vertical Eye Closure Penalty	-	-	3.5	-	dB	
Damage Threshold for Receiver	$P_{in, damage}$	3	-	-	dBm	
Average Receive Power (Each Lane)	-	-20.9	-	4.5	dBm	
Receive Power in OMA (Each Lane), Overload	OMA	-	-	4.5	dBm	
Receiver Reflectance	RXR	-	-	-26	dB	

Note 1: Measured with conformance test signal at TP3 for the BER = 1×10^{-12}

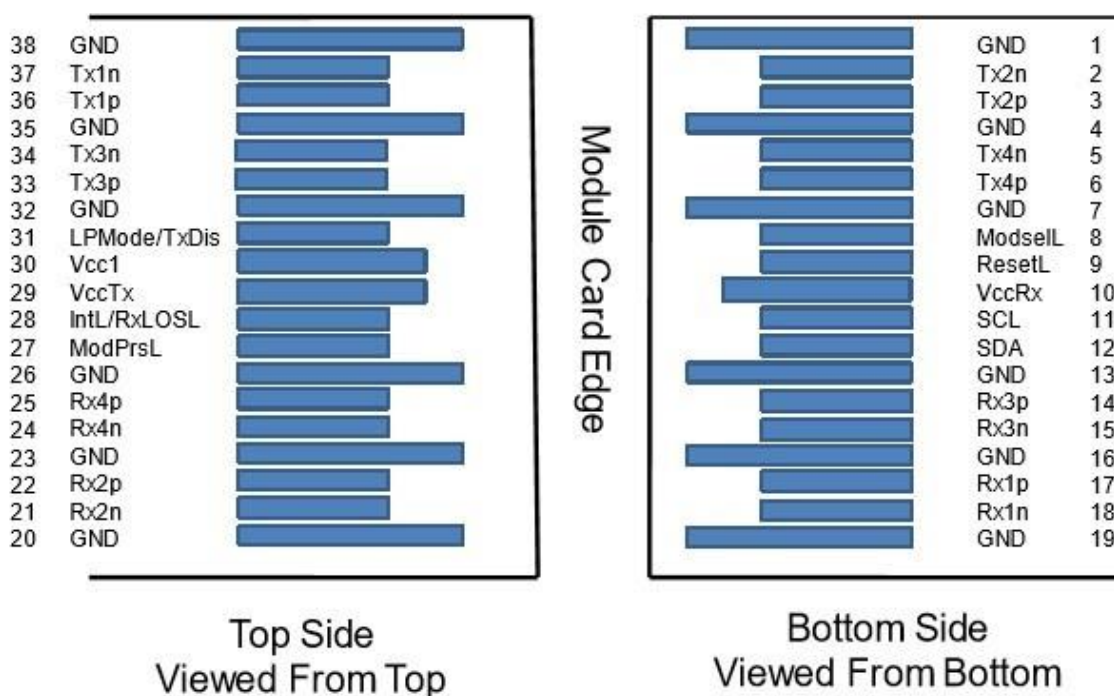
5. Electrical Specification

High-Speed Signal: Compliant to IEEE802.3 CAUI-4 C2M

Low-Speed Signal: Compliant to SFF-8679

Transmitter (Module Input)						
Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Differential Data Input Amplitude	VIN,P-P	95	-	900	mVpp	
Differential Termination Mismatch		-	-	10	%	
LPMode, Reset and ModSelL	VIL	-0.3	-	0.8	V	
	VIH	2	-	VCC+0.3	V	
Receiver (Module Output)						
Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Differential Data Output Amplitude	VOUT,P-P	-	-	900	mVpp	
Differential Termination Mismatch		-	-	10	%	
Output Rise/Fall Time, 20%~80%	TR	12	-	-	ps	
ModPrsL and IntL	VOL	0	-	0.4	V	IOL=4mA
	VOH	VCC-0.5	-	VCC+0.3	V	IOL=-4mA

6. Pin Descriptions



Pin	Logic	Symbol	Description	Plug Sequence	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		Vcc Rx	+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	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	ModPrs L	Module Present	3	
28	LVTTL-O	IntL/RxL O S L	Interrupt. Optionally configurable as RxLOSL via the management interface (SFF-8636). Interrupt.	3	

			Optionally configurable as RxLOSL via the management interface (SFF-8636).		
29		Vcc Tx	+3.3V Power supply transmitter	2	2
30		Vcc1	+3.3V 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

Note 1: GND is the symbol for signal and supply (power) common for the module. All are common within the 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: VccRx, Vcc1 and VccTx are applied concurrently and may be internally connected within the module in any combination. Vcc contacts in SFF-8662 and SFF-8672 each have a steady state current rating of 1 A.

7. Timing for Soft Control and Status Functions

Parameter	Symbol	Min.	Max.	Unit	Notes
Initialization Time	t_init	-	5	s	
Reset Init Assert Time	t_reset_init	10	-	μs	
Serial Bus Hardware Ready Time	t_serial	-	2000	ms	
Monitor Data Ready Time	t_data	-	2000	ms	
Reset Assert Time	t_reset	-	2	s	
LPMODE Assert Time	ton_LPMODE	-	100	ms	
LPMODE De-assert Time	toff_LPMODE	-	300	ms	
IntL Assert Time	ton_IntL	-	200	ms	
IntL Deassert Time	toff_IntL	-	500	μs	
RxLOSL Assert Time (Optional Fast Mode)	ton_f_LOS	-	1	ms	
RxLOSL Deassert Time (Optional Fast Mode)	toff_f_LOS	-	3	ms	

Rx LOS Assert Time	ton_lol	-	100	ms	
Tx Fault Assert Time	ton_Txfault	-	200	ms	
Flag Assert Time	ton_flag	-	200	ms	
Mask Assert Time	ton_mask	-	100	ms	
Mask Deassert Time	toff_mask	-	100	ms	
Application or Rate Select Change Time	t_ratesel	-	N/A	ms	
Power_override or Power-set Assert Time	ton_Pdown	-	100	ms	
Power_override or Power-set De-assert Time	toff_Pdown	-	300	ms	

8. I/O Timing for Squelch and Disable

Parameter	Symbol	Min.	Max.	Unit	Notes
Rx Squelch Assert Time	ton_Rxsq	-	15	ms	
Rx Squelch Deassert Time	toff_Rxsq	-	15	ms	
Tx Squelch Assert Time	ton_Txsq	-	400	ms	
Tx Squelch Deassert Time	toff_Txsq	-	400	ms	
Tx Disable Assert Time (fast mode)	ton_Txdisf	-	3	ms	
Tx Disable Deassert Time (fast mode)	toff_Txdisf	-	10	ms	
Rx Output Disable Assert Time	ton_Rxdis	-	100	ms	
Rx Output Disable Deassert Time	toff_Rxdis	-	100	ms	
Squelch Disable Assert Time	ton_sqdis	-	100	ms	
Squelch Disable Deassert Time	toff_sqdis	-	100	ms	

9. Digital Diagnostics Monitor Threshold

Item	Alarm-H	Warning-H	Warning-L	Alarm-L
Temp(°C)	75	70	0	-5
Voltage(V)	3.6	3.5	3.1	3
current(mA)	110	100	30	20
TX(dBm)	7.5	6.5	-3.5	-4.5
RX(dBm)	-6	-7	-22	-23

Ordering Information

Part No.	Data Rate	DDM	Wave	Fiber Type	Dist.	Temp.	Optical Interface
QSFP28-100G-ER4	100Gbps	yes	1310nm	SMF	40Km*	0~70°C	LC

*40km without FEC