

QSFP28 2km Single Lamda Transceiver QSFP28-100G-FR1

Product Features

- Compliant with QSFP28 Standard: SFF-8636 Rev 2.10a
- Compliant with IEEE802.3cu-2021 100GBASE-FR .
- High speed I/O electrical interface (CAUI-4)
- Single 3.3V Supply Voltage
- Maximum power consumption 4W
- 0-70 °C Case Operating Temperature
- 1311nm EML laser and PIN Receiver
- Hermetically sealed TO Based design
- QSFP28 MSA package with duplex LC connector
- Two Wire Serial Interface with Digital Diagnostic Monitoring
- KP4 FEC termination inside module
- Supporting 2km reach of single mode fiber
- Complies with EU Directive 2011/65/EU (RoHS compliant)
- Class 1 Laser



Applications

- Data Center and Cloud services
- 100GBASE-FR1 2km Ethernet
- Servers, Switches, Storage and Host Card Adapters

Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Unit	Notes
Storage Temperature	TS	-40	85	°C	
Supply Voltage	VCC	-0.3	3.6	V	
Relative Humidity (non-condensing)	RH	5	95	%	
Data Input Voltage – Differential	IVDIP-VDINI	-	1	V	
Control Input Voltage	VI	-0.3	Vcc+0.3	V	
Control Output Current	IO	-20	20	mA	

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	-	-	1600	mA	
Sustained peak current at hot plug	ICC_SP	-	-	1320	mA	
Maximum Power Dissipation	PD	-	-	4	W	

Maximum Power Dissipation,	PDLP	-	-	1.5	W	
Low Power Mode						
Signalling Rate	SR	-	53.125	-	GBd	
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	
Power Supply Noise	-	-	-	66	mVpp	10Hz - 10MHz
Rx Differential Data Output Load	-	-	100	-	ohms	
Operating Distance	-	-	-	2000	m	

Functional Characteristics (Optical)

The following tables list the performance specifications for the various functional blocks of the integrated optical transceiver module.

Transmitter Optical Specifications

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Wavelength	λ_C	1304.5	1311	1317.5	nm	
Side mode suppression ratio	SMSR	30	-	-	dB	
Average Optical Launch Power	POUT	-2.4	-	4	dBm	1
Average launch power of OFF transmitter	POUT_OFF	-	-	-15	dBm	
Extinction Ratio	ER	3.5	-	-	dB	
Outer Optical Modulation Amplitude (OMA _{outer})	OMA _{outer}	-0.8	-	4.2	dBm	
Launch power in OMA _{outer} minus TDECQ	OMA _{outer} -TDECQ					
TDECQ: for extinction ratio ≥ 5 Db for extinction ratio < 5 dB		-2.2 -1.9	-	-	dBm	
Transmitter and dispersion eye closure	TDECQ	-	-	3.4	dB	
TDECQ – $10\log_{10}(C_{eq})$	CEQ	-	-	3.4	dB	
RIN _{15.5OMA}	RIN	-	-	-136	dB/Hz	
Optical return loss tolerance	ORLT	-	-	15.5	dB	
Transmitter transition time		-	-	17	ps	
Transmitter reflectance	TR	-		-26	dB	

Note 1: Average launch power is informative and not the principal indicator of signal strength.

Receiver Optical Specifications

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Wavelength	λ_C	1304.5	1311	1317.5	nm	
Damage Threshold		5	-	-	dBm	
Average receive power		-6.4	-	4	dBm	1

Receive power (OMA _{outer})	RP	-	-	4.2	dBm	
Receiver reflectance	RR	-	-	-26	dB	
Receiver sensitivity (OMA _{outer})	RS	-	-	Max(-3.9, SECQ-5.3)	dBm	
Stressed receiver sensitivity	SRS	-	-	-1.9	dBm	2
Stressed Receiver Sensitivity Test Conditions:	-	-		-		
Stressed eye closure for PAM4 (SECQ)	SECQ	-	3.4	-	dB	
SECQ – 10log10(Ceq)	-	-	-	3.4	dB	

Note 1: Average receive power, (min) is informative and not the principal indicator of signal strength.

Note 2: Measured with conformance test signal at TP3 for the BER = 2.4×10^{-4}

Functional Characteristics (Electrical)

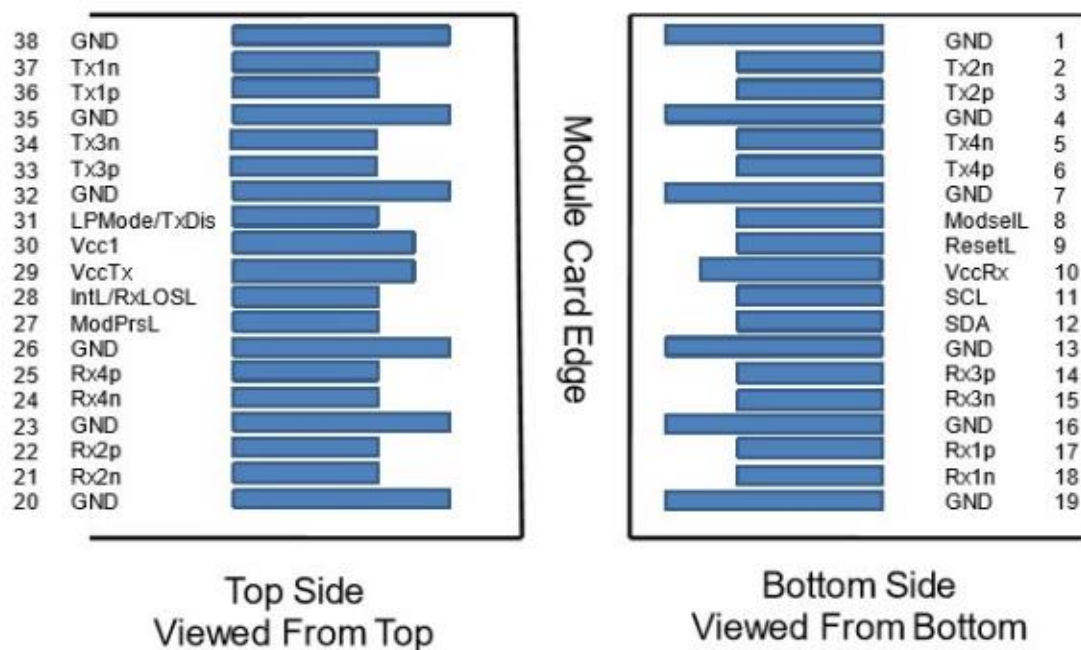
Electrical Specification High Speed Signal (compliant with IEEE 802.3 CAUI-4)

Receiver (Module Output)						
Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
AC common-mode output Voltage (RMS)		-	-	17.5	mV	
Differential output Voltage		-	-	900	mV	
Eye width		0.57	-	-	UI	
Eye height differential		228	-	-	mV	
Vertical eye closure		-	-	5.5	dB	
Differential Termination Mismatch		-	-	10	%	
Transition Time (min, 20% to 80%)		12	-	-	ps	
DC common mode Voltage		-350	-	2850	mV	
Transmitter (Module Input)						
Differential pk-pk input Voltage tolerance		900	-	-	mV	
Differential termination mismatch		-	-	10	%	
Single-ended voltage tolerance range		-0.4	-	3.3	V	
DC common mode Voltage		-350	-	2850	mV	

Electrical Specification Low Speed Signal (compliant with SFF-8679 Rev 1.8)

Parameter	Symbol	Min.	Max.	Unit	Condition
Module output SCL and SDA	VOL	0	0.4	V	
	VOH	V _{CC} -0.5	V _{CC} +0.3	V	
Module Input SCL and SDA	VIL	-0.3	V _{CC} *0.3	V	
	VIH	V _{CC} *0.7	V _{CC} +0.5	V	
LPMode/TxDis, ResetL and ModSelL	VIL	-0.3	0.8	V	
	VIH	2	V _{CC} +0.3	V	
ModPrsL and IntL/RxLOSL	VOL	0	0.4	V	
	VOH	V _{CC} -0.5	V _{CC} +0.3	V	

QSFP28 Module Pad Layout



Recommended Host Board Power Supply Filtering See SFF-8679

Module Pin Definitions

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	ModPrsL	Module Present	3	
28	LVTTL-O	IntL/RxLOSL	Interrupt. Optionally configurable as RxLOSL via the management interface (SFF-8636). Interrupt. Optionally configurable as RxLOSL via the management interface (SFF-8636).	3	
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

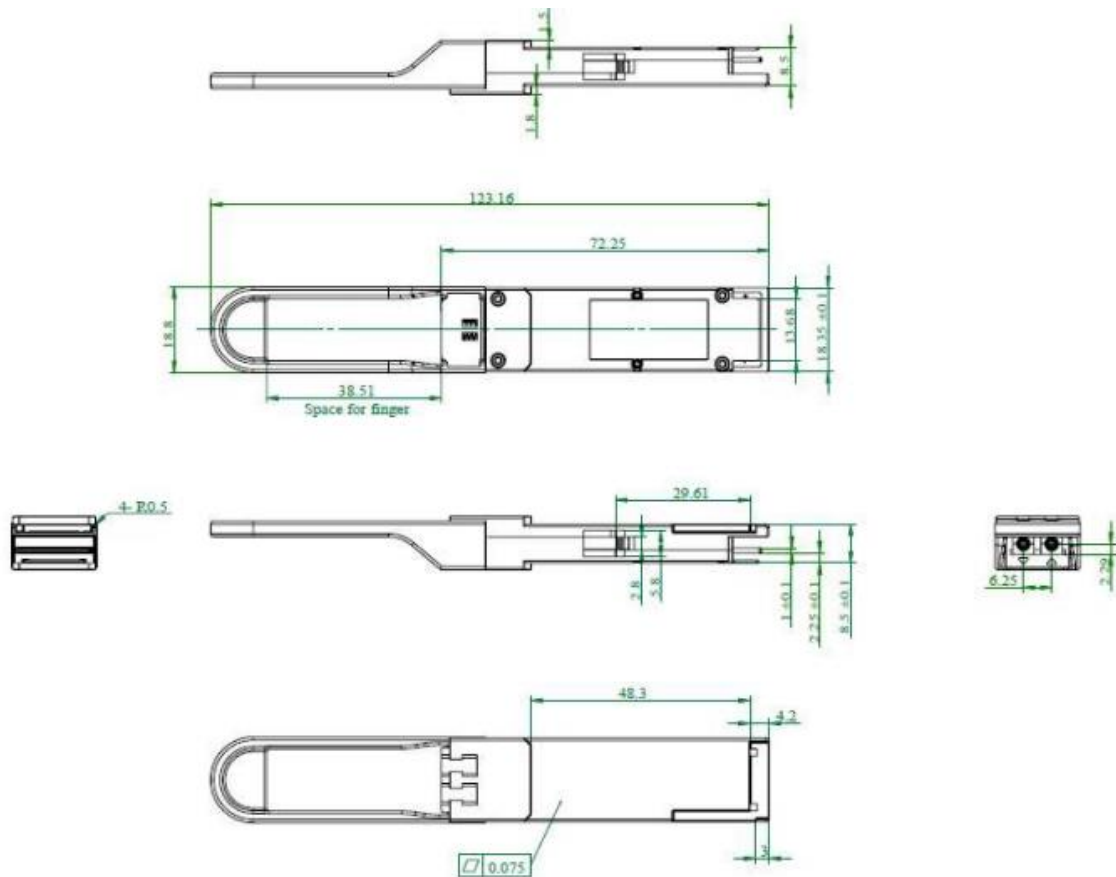
Note 1: GND is the symbol for signal and supply (power) common for the module. All are common within the module and all module voltages are referenced to this potential unless otherwise noted. Connect these directly to the host board signal-common ground plane.

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.

Digital Diagnostics

Parameter	Range	Accuracy	Unit	Calibration
Temperature	0 to 70	±3	°C	Internal
Voltage	0 to VCC	±3%	V	Internal
Tx Bias Current	0 to 100	±10%	mA	Internal
Tx Output Power	-2.9 to +4	±3	dB	Internal
Rx Receive Power	-5.9 to +4	±3	dB	Internal

Mechanical Dimension



Ordering Information

Part No.	Data Rate	Laser Source	Fiber Type	Connector	Temp.
QSFP28-100G-FR1	100GE	1311nm EML	< SMF 2km	LC/UPC	0°C~70°C

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