Features

- Compliant with QSFP28 Standard:
  SFF-8665 Revision 1.9, SFF-8636 Revision 2.9
- Supports 50GBASE-ER
- Compliant with IEEE802.3 50GAUI-2 C2M electrical interface
- Single 3.3V Supply Voltage
- Maximum power consumption 4.5W
- 0-70 ºC Case Operating Temperature
- EML laser and APD Receiver
- 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

Absolute Maximum Ratings

Table 1 – Absolute Maximum Ratings

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Storage Temperature	T_S	-40	-	+85	ºC	
Supply Voltage	V_{CC}	-0.5	-	3.6	V	
Relative Humidity (non-condensing)	RH	5	-	85	%	

Recommended Operating Conditions

Table 2 – Recommended Operating Conditions

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Operating Case Temperature	T_{OPR}	0	-	70	ºC	
Power Supply Voltage	V_{CC}	3.135	3.3	3.465	V	
Steady state current	Isupply	-	-	1298.7	mA	
Instantaneous peak current at hot plug	I_{CC_IP}	-	-	1800	mA	Per pin
Sustained peak current at hot plug	I_{CC_SP}	-	-	1485	mA	Per pin
Maximum Power Dissipation	P_D	-	-	4.5	W	
Maximum Power Dissipation, Low Power Mode	P_{DLP}	-	-	1.5	W	
Data Rate	DRL	-	26.5625	-	GBaud/s	
		-	26.5625x2	-	GBit/s	
Two Wire Serial Interface Clock Rate	-	-	-	400	kHz	

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Power Noise and Ripple noise tolerance 10 Hz to 10 MHz (peak-to-peak)	-	-	-	66	mVpp	
Rx Differential Data Output Load	-	-	100	-	ohms	
Operating Distance	-	2	-	40000	m	

Optical and Electrical Characteristics

Table 3 – Transmitter Optical Specifications

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Wavelength	λ	1304.5	1311	1317.5	nm	
Side-mode suppression ratio	SMSR	30			dB	
Average launch power	P_{OUT}	0.4	-	6.63	dBm	
Average launch power of OFF transmitter	P_{OUT_OFF}	-	-	-15	dBm	
Outer Optical Modulation Amplitude (OMAouter)	P_{OUTL}	3.4	-	7.4	dBm	
Extinction ratio	ER	6	-	-	dB	
Launch power in OMAouter minus TDECQ	OMA-TDECQ	2	-	-	dBm	
Transmitter and dispersion eye closure for PAM4 (TDECQ)	TDECQ	-	-	3.2	dB	Note
Transmitter reflectance		-	-	-26	dB	

Note: Measured with a PRBS2^{15}-1 test pattern @53.125Gbps, 40km fiber.

Table 4 – Receiver Optical Specifications

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Wavelength	λ	1304.5	1311	1317.5	nm	
Receiver sensitivity (OMAouter)				max(−15.1, SECQ − 16.5)	dBm	Note
Damage Threshold	P_damage	-2.37	-	-	dBm	
Overload		-3.37	-	-	dBm	
Average Receive Power	-	-17.6	-	-3.37	dBm	
Receive power (OMAouter)	OMA	-	-	-2.6	dBm	
Receiver Reflectance	RXR	-	-	-26	dB	
LOS assert	LOSA	-30			dBm	
LOS de-assert	LOSD			-20	dBm	
LOS hysteresis	LOSH	0.5			dB	

Note: Measured with a PRBS2^{31}-1 test pattern @53.125Gbps, BER≦2.4E-4. IEEE 802.3cd clause 139 equation 139-2.

Table 5 – Electrical Specifications

High-Speed Signal: **Compliant to 50GAUI-2 C2M (IEEE 802.3cd)**
Low-Speed Signal: **Compliant to SFF-8679**

Transmitter (Module Input)						
Parameter	**Symbol**	**Min.**	**Typical**	**Max.**	**Unit**	**Notes**
Differential Data Input Amplitude	$V_{IN,P-P}$	-	-	900	mVpp	Note 1
Differential Termination Mismatch		-	-	10	%	
LPMode, Reset and ModSelL	V_{IL}	-0.3	-	0.8	V	
	V_{IH}	2	-	V_{CC}+0.3	V	
Receiver (Module Output)						
Differential Data Output Amplitude	$V_{OUT,P-P}$	-	-	900	mVpp	Note 1
Differential Termination Mismatch		-	-	10	%	
Output Rise/Fall Time, 20%~80%	T_R	12	-	-	ps	
ModPrsL and IntL	V_{OL}	0	-	0.4	V	I_{OL}=4mA
	V_{OH}	V_{CC}-0.5	-	V_{CC}+0.3	V	I_{OL}=-4mA

Note 1: Amplitude customization beyond these specs is dependent on validation in customer system.

Table 6 – Digital Diagnostics

Parameter	Range	Accuracy	Unit	Calibration
Temperature	0 to 70	±3	ºC	Internal
Voltage	0 to V_{CC}	±3%	V	Internal
Tx Bias Current	0 to 100	±10%	mA	Internal
Tx Output Power	0.4 to 6.63	±3	dB	Internal
Rx Power	-17.6 to -3.37	±3	dB	Internal

Table 7 – Control and status timing requirement

Item	symbol	Min	Max	Unit	Notes
Initialization time	t_init		10	s	1
Reset Init Assert Time	t_reset_init	10		us	
Serial Bus Hardware Ready Time	t_serial		2	s	
Monitor Data Ready Time	t_data		2	s	
Reset Assert Time	t_reset		10	s	1
LPMode Assert Time	ton_LPMode		100	ms	
LPMode De-assert Time	toff_LPMode		10	s	1
IntL Assert Time	ton_IntL		200	ms	

IntL Deassert Time	toff_IntL		500	us	
Rx LOS Assert Time	ton_los		100	ms	
Flag Assert Time	ton_flag		200	ms	
Mask Assert Time	ton_mask		100	ms	
Mask Deassert Time	toff_mask		100	ms	
Power_over-ride or Power-set Assert Time	ton_Pdown		100	ms	
Power_over-ride or Power-set Deassert Time	toff_Pdown		10	s	1

Note 1：Timing not compliant with SFF-8679 V1.8.

Table 8 – Squelch and disable timing

Item	symbol	Min	Max	Unit	Notes
Rx Squelch Assert Time	ton_Rxsq		15	ms	
Rx Squelch Deassert Time	toff_Rxsq		350	ms	1
Tx Squelch Assert Time	ton_Txsq		400	ms	
Tx Squelch Deassert Time	toff_Txsq		400	ms	
Tx Disable Assert Time	ton_txdis		100	ms	
TX_Disable Deassert Time	toff_txdis		400	ms	
Rx Output Disable Assert Time	ton_rxdis		100	ms	
Rx Output Disable Deassert Time	toff_rxdis		350	ms	1
Squelch Disable Assert Time	ton_sqdis		100	ms	
Squelch Disable Deassert Time	toff_sqdis		100	ms	

Note 1：Timing not compliant with SFF-8679 V1.8.

Table 9 – 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	3
6	CML-I	Tx4p	Transmitter Non-Inverted Data Input	3	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	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	1
14	CML-O	Rx3p	Receiver Non-Inverted Data Output	3	3

15	CML-O	Rx3n	Receiver Inverted Data Output	3	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	3
25	CML-O	Rx4p	Receiver Non-Inverted Data Output	3	3
26		GND	Ground	1	1
27	LVTTL-O	ModPrsL	Module Present	3	
28	LVTTL-O	IntL/Rx LOS	Interrupt/Rx LOS	3	4
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/Tx disable	3	4
32		GND	Ground	1	1
33	CML-I	Tx3p	Transmitter Non-Inverted Data Input	3	3
34	CML-I	Tx3n	Transmitter Inverted Data Input	3	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

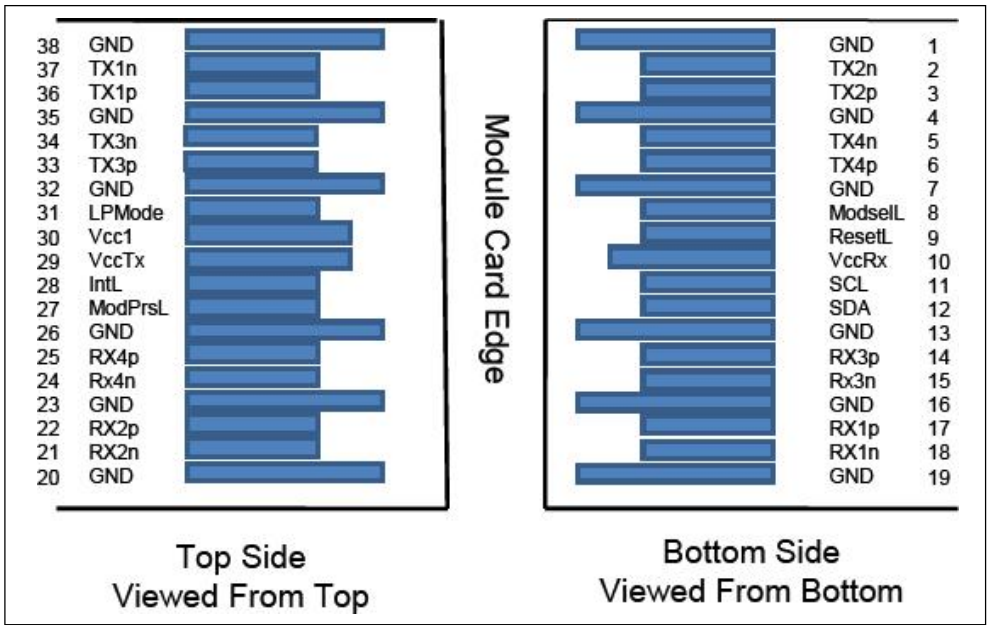
Note 1: GND is the symbol for signal and supply (power) common for the QSFP+ module. All are common within the QSFP+ module and all module voltages are referenced to this potential unless otherwise noted. Connect these directly to the host board signal-common ground plane.

Note 2: Vcc Rx, Vcc1 and Vcc Tx are the receiver and transmitter power supplies and shall be applied concurrently.

Note 3: Not used.

Note 4: Dual function pin as specified into SFF-8679**.**

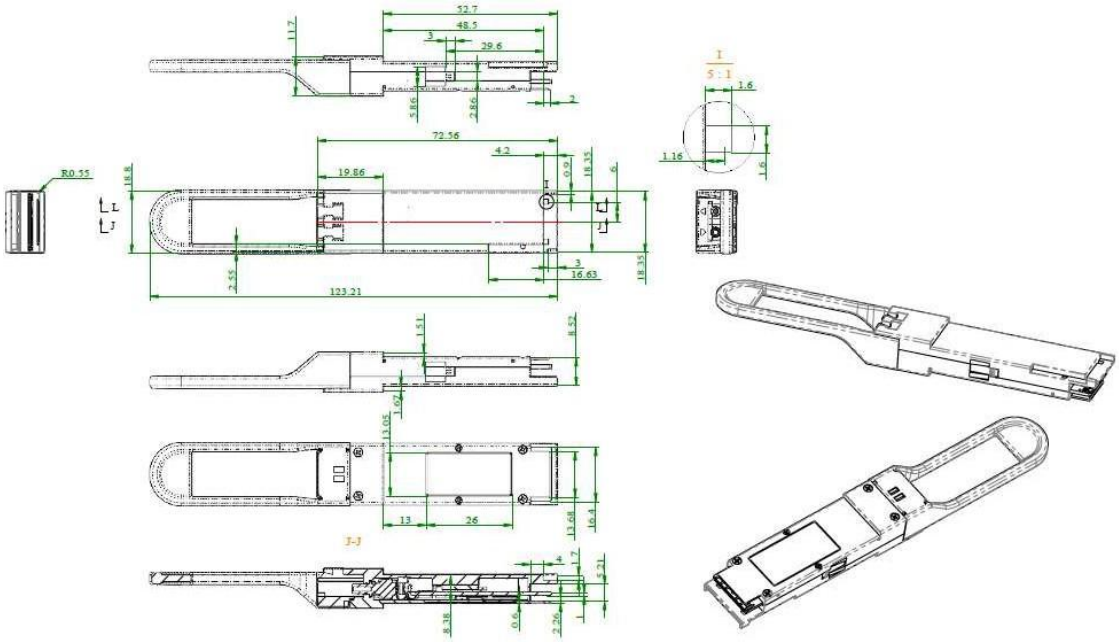
QSFP+ Module Pad Layout



Recommended Host Board Power Supply Filtering

See SFF-8679

Mechanical Diagram



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Order Information

Table 10 – Order Information

Part No.	Application	Data Rate	Laser Source	Fiber Type
OPQG40	50GBASE-ER	53.125 Gb/s	EML Laser	SMF

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