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## HD-QSFP+/40G-SR4

- ◆ Hot Pluggable QSFP+ form factor
- ◆ Supports 41.25Gb/s aggregate bit rate
- ◆ Multi rate capability: 1.06Gb/s to 10.5Gb/s per channel
- ◆ Maximum link length of 100m on OM3 MMF and 150m on OM4 MMF
- ◆ Single MPO-12 receptacle
- ◆ Power dissipation: <1.5 W
- ◆ Single 3.3V power supply
- ◆ 4x10Gb/s 850nm VCSEL and PIN array
- ◆ Unretimed XLPP electrical interface
- ◆ Commercial case temperature range of 0°C to 70°C
- ◆ I2C management interface

### Applications

- ◆ 40GBASE-SR4 40G Ethernet
- ◆ 40G-IB-QDR /20G-IB-DDR / 10G-IB-SDR InfiniBand
- ◆ Breakout to 4 x 10GBASE-SR
- ◆ Proprietary interconnections

### Standards

- ◆ Compliant with QSFP+ MSA
- ◆ Compliant to IEEE 802.3bm
- ◆ Compliant to SFF-8436
- ◆ Compliant with RoHS-6

## Specification

Absolute Maximum Ratings				
Parameter	Symbol	Min	Max	Unit
Storage Ambient Temperature	T <sub>STG</sub>	-40	85	°C
Relative Humidity(Non-condensing)	H <sub>s</sub>	5	90	%
Power Supply Voltage	V <sub>CC</sub>	-0.3	+3.6	V
Input Voltage	V <sub>IN</sub>	-0.3	V <sub>CC</sub> +0.3	V
Damaged Threshold,per Lane	DT	3.4		dBm

Recommended Operating Conditions					
Parameter	Symbol	Min	Typical	Max	Unit
Operating Case Temperature	T <sub>C</sub>	0		70	°C
Operating Humidity	Rh	5		85	%
Data Rate,per Lane	DR		10.3	10.5	Gbps
Power Consumption	P <sub>W</sub>			1.5	W

Electrical Characteristics						
Parameter	Symbol	Min	Typical	Max	Unit	Notes
Power Supply Voltage	V <sub>CC</sub>	3.13	3.3	3.47	V	
Power Supply Current	I <sub>CC</sub>			450	mA	
<b>Transmitter</b>						
Differential input impedance	R <sub>in</sub>		100		Ω	
Differential data input swing	V <sub>in,pp</sub>	300		1100	mV	
Single ended input voltage tolerance	V <sub>inT</sub>	-0.3		4.0	V	
<b>Receiver</b>						
Differential data output swing	V <sub>out,pp</sub>	300		850	mV	
Single-ended output voltage		-0.3		4.0	V	

Optical Transmitter Characteristics						
Parameter	Symbol	Min	Typical	Max	Unit	Notes
Center Wavelength	$\lambda_{out}$	840	850	860	nm	
Average Launch Power each lane	$P_{out}$	-7.6		2.4	dBm	
Difference in Power between any two lanes [OMA]	$DP_x$			4.0	dB	
Peak Power per Lane	$PP_x$			4.0	dBm	
Spectral Width (RMS)	$\sigma$			0.65	nm	
Optical Extinction Ratio	ER	3.0			dB	
Transmitter and Dispersion Penalty each lane	TDP			3.5	dB	
Optical Return Loss Tolerance	ORL			12	dB	
Average launch power of OFF transmitter, per lane				-30	dBm	
Transmitter eye mask definition{X1,X2,X3,Y1,Y2,Y3}	{0.23,0.34,0.43,0.27,0.35,0.4}					
Optical Receiver Characteristics						
Parameter	Symbol	Min	Typical	Max	Unit	Notes
Receiver Wavelength	$\lambda_{in}$	840		860	nm	
Average Receive Power per Lane	$RXP_x$	-9.5		2.4	dBm	
Stressed Receiver Sensitivity in OMA	SRS			-5.4	dBm	1
LOS Assert	LOSA	-30			dBm	
LOS De-Assert	LOSD			-12	dBm	
LOS Hysteresis		0.5			dB	
Receiver Reflectance	Rfl			-12	dB	

Notes:

1. Measured with a PRBS 2<sup>31</sup>-1 test pattern, @10.3125Gb/s, BER<1E-12.

Digital Diagnostic Monitoring Information			
Parameter	Accuracy	Calibration	Note
Temperature	±3°C	Internal	0~70°C
Voltage	±3%	Internal	3.1~3.5V
Bias Current	±10%	Internal	Specified by normal value
TX Power	±2dB	Internal	-7.6~2.4dBm
RX Power	±2dB	Internal	-9.5~2.4dBm

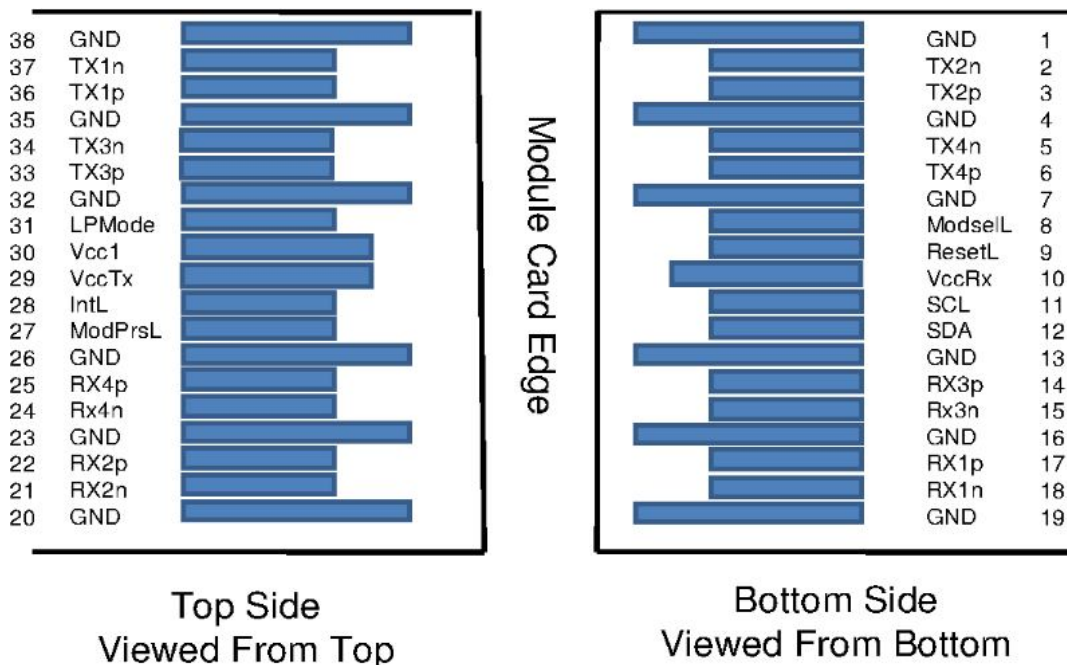
## Pin Assignment

Pin	Symbol	Name/Description	Notes
1	GND	Transmitter Ground	1
2	Tx2n	Transmitter Inverted Data Input	
3	Tx2p	Transmitter Non-Inverted Data output	
4	GND	Transmitter Ground	1
5	Tx4n	Transmitter Inverted Data Input	
6	Tx4p	Transmitter Non-Inverted Data output	
7	GND	Transmitter Ground	1
8	ModSelL	Module Select	
9	ResetL	Module Reset	
10	VccRx	3.3V Power Supply Receiver	2
11	SCL	2-Wire serial Interface Clock	
12	SDA	2-Wire serial Interface Data	
13	GND	Receiver Ground	1
14	Rx3p	Receiver Non-Inverted Data Output	
15	Rx3n	Receiver Inverted Data Output	
16	GND	Receiver Ground	1
17	Rx1p	Receiver Non-Inverted Data Output	
18	Rx1n	Receiver Inverted Data Output	
19	GND	Receiver Ground	1
20	GND	Receiver Ground	1
21	Rx2n	Receiver Inverted Data Output	
22	Rx2p	Receiver Non-Inverted Data Output	
23	GND	Receiver Ground	1
24	Rx4n	Receiver Inverted Data Output	
25	Rx4p	Receiver Non-Inverted Data Output	
26	GND	Receiver Ground	1
27	ModPrsl	Module Present	
28	IntL	Interrupt	
29	VccTx	3.3V power supply transmitter	2
30	Vcc1	3.3V power supply	2
31	LPMode	Low Power Mode, not connect	
32	GND	Transmitter Ground	1
33	Tx3p	Transmitter Non-Inverted Data Input	
34	Tx3n	Transmitter Inverted Data Output	
35	GND	Transmitter Ground	1
36	Tx1p	Transmitter Non-Inverted Data Input	

37	Tx1n	Transmitter Inverted Data Output	
38	GND	Transmitter Ground	1

**Notes:**

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.
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 Table 6. Recommended host board power supply filtering is shown in Figures 3 and 4. Vcc Rx Vcc1 and Vcc Tx may be internally connected within the QSFP+ Module in any combination. The connector pins are each rated for a maximum current of 500 mA.



**Figure 1. Electrical Pin-out Details**

## Memory Map

2-Wire Serial Address 1010000x	
Lower Page 00h	
0-2	ID and status
3-21	Interrupt Flags
22-33	Module Monitors
34-81	Chanel Monitors
82-85	Reserved
86-97	Control
98-99	Reserved
100-106	Free Side Device and Channel Mask
107	Reserved
108-111	Free Side Device Properties
s112-118	Reserved
119-122	Password Change Entry Area(Optional)
123-126	Password Entry Area(Optional)
127	Page Select Byte

	Optional	Optional	Optional
Upper Page 00h	Page 01h	Page 02h	Page 03h
128-191 Base ID Fields	128 CC_APPS	128-255 User EEPROM Data	128-175 Free Side Device Thresholds
	129 AST Table Length (TL)		176-223 Channel Thresholds
	130-131 Application Code Entry 0		224-225 Reserved
	132-133 Application Code Entry 1		226-237 Vender Specific
192-223 Extended ID	134-253 Others Entries		238-241 Channel Controls
224-255 Vendor Specific ID	254-255 Application Code Entry TL		242-253 Channel Monitor Masks
			254-255 Reserved

**EEPROM Serial ID Memory Contents (Upper Memory Map Page 00h)**

Address	Name of field	Hex	Description
<b>BASE ID Fields</b>			
128	Identifier	0D	Identifier Type of serial Module
129	Ext. Identifier	00	Extend Identifier of free side device
130	Connector	0C	MPO 1*12 (Multifiber Parallel Optic)
131-138	Specification Compliance	04 00 00 00 40 40 02 00	Code for electronic or optical compatibility
139	Encoding	05	Code for serial encoding algorithm
140	BR, nominal	67	Nominal bit rate per channel, units of 100Mbps
141	Extended Rate Select Compliance	00	Tags for extended rate select compliance
142	Length (SMF)	00	Transceiver link length support for different fibers
143	Length (OM3 50 um)	32	
144	Length (OM2 50 um)	00	
145	Length (OM162.5 um)	00	
146	Length(copper)	4B	
147	Device tech	00	Device technology
148-163	Vendor name	4F 45 4D 20 20 20 20 20 20 20 20 20 20 20 20 20	QSFP+ vendor name (ASCII)
164	Extended Module	00	Extended Module codes for InfiniBand
165-167	Vendor OUI	00 00 00	Free side device vendor IEEE company ID
168-183	Vendor PN	XX.....XX	Part number provided by QSFP+ vendor(ASCII) device vendor(ASCII)
184-185	Vendor rev	41 30	"A0"(ASCII character)
186-187	Wave length or Copper Copper cable Attenuation	42 68	Nominal laser wavelength or copper cable attenuation in dB at 2.5 GHz and 5.0 GHz
188-189	Wavelength tolerance	07 D0	Guaranteed range of laser wavelength from nominal wavelength or copper cable attenuation in dB at 7.0 GHz and 12 GHz
190	Max case temp.	00	Maximum case temperature in degrees

			C.
191	CC_BASE	Programmed by Factory	Check code for base ID fields
<b>Extended ID Fields</b>			
192-195	Options	02 07 F0 0A	Rate Select, TX Disable, TX Fault, LOS, Warning indicators for: Temperature, TX Bias
196-211	Vendor SN	xx.....xx	Serial number provided by vendor(ASCII)
212-219	Date Code	xx.....xx	Data Code
220	Diagnostic Monitoring Type	0C	Indicates which type of diagnostic monitoring is implemented
221	Enhanced Options	00	Indicates which optional enhanced features are implemented in the free side device
222	Reserved	00	
223	CC_EXT	Programmed by Factory	Check code for the Extended ID Fields
<b>Vendor Specific ID Field</b>			
224-255	Vendor Specific	00	Vendor specific EEPROM

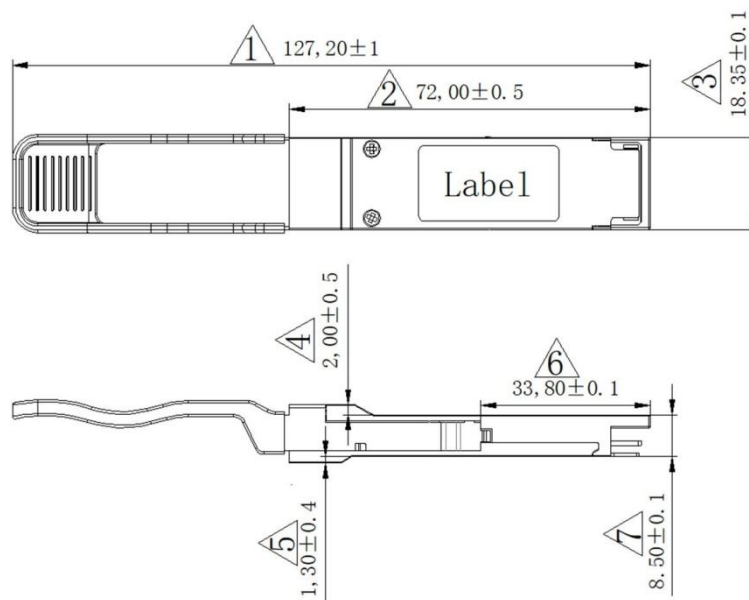
### Module and Channel Thresholds (Page 03)

Address	#Bytes	Name of field	Real Value	Unit	Hex
128-129	2	Temp High Alarm	80	°C	
130-131	2	Temp Low Alarm	-10	°C	
132-133	2	Temp High Warning	70	°C	
134-135	2	Temp Low Warning	0	°C	
136-143	8	Reserved	Reserved		
144-145	2	Vcc High Alarm	3.63	V	
146-147	2	Vcc Low Alarm	2.97	V	
148-149	2	Vcc High Warning	3.47	V	
150-151	2	Vcc Low Warning	3.14	V	
152-159	8	Reserved	Reserved		
160-175	16	Vendor Specific			
176-177	2	RX Power High Alarm	5.4	dBm	
178-179	2	RX Power Low Alarm	-12.5	dBm	



180-181	2	RX Power High Warning	2.4	dBm	
182-183	2	RX Power Low Warning	-9.5	dBm	
184-185	2	TX Bias High Alarm	14	mA	
186-187	2	TX Bias Low Alarm	2	mA	
188-189	2	TX Bias High Warning	13	mA	
190-191	2	TX Bias Low Warning	3	mA	
192-193	2	TX Power High Alarm	5.4	dBm	
194-195	2	TX Power Low Alarm	-10.6	dBm	
196-197	2	TX Power High Warning	2.4	dBm	
198-199	2	TX Power Low Warning	-7.6	dBm	
200-207	8	Reserved	Reserved		
208-223	16	Vendor Specific			

## Package Outline



## Ordering information

Part. No	Specifications								
	Pack	Rate* (Gbps)	Po (dBm)	RX	Sen* (dBm)	Temp (°C)	Reach (m)	Pull tap Color	DDM
HD-QSFP+/40G-SR4	QSFP+	4*10.3125	-7.6~2.4	PIN	<-9.5	0~+70	150	Beige	Y

\*Note:

1.Measured with a PRBS 2<sup>31</sup>-1 test pattern, @10.3125Gb/s, BER<1E-12.

2.Receiver sensitivity in OMA