HD-QSFP28/100G-SR4

- Hot Pluggable QSFP28 form factor
- Supports 101.3Gb/s aggregate bit rate
- Maximum link length of 70m on OM3 MMF and 100m on OM4 MMF
- Single MPO-12 receptacle
- Power dissipation: <2.5 W
- Single 3.3V power supply
- 4x25Gb/s 850nm VCSEL and PIN array
- 4x25G electrical interface (CAUI-4)
- Commercial case temperature range of 0°C to 70°C
- I2C management interface

Applications

- 100GBASE-SR4 100G Ethernet

Standards

- Compliant with QSFP28 MSA
- Compliant to IEEE 802.3bm
- Compliant to SFF-8636
- Compliant with RoHS-6

Specification

Absolute Maximum Ratings				
Parameter	**Symbol**	**Min**	**Max**	**Unit**
Storage Ambient Temperature	T_{STG}	-40	85	℃
Relative Humidity(Non-condensing)	H_S	5	90	%
Power Supply Voltage	V_{CC}	-0.3	+3.6	V
Input Voltage	V_{IN}	-0.3	V_{CC}+0.3	V
Damaged Threshold,per Lane	DT	3.0		dBm

Recommended Operating Conditions					
Parameter	**Symbol**	**Min**	**Typical**	**Max**	**Unit**
Operating Case Temperature	T_C	0		70	℃
Operating Humidity	Rh	5		85	%
Data Rate,per Lane	DR		25.78125		Gbps
Power Consumption	P_W			2.5	W

Electrical Characteristics						
Parameter	**Symbol**	**Min**	**Typical**	**Max**	**Unit**	**Notes**
Power Supply Voltage	V_{CC}	3.13	3.3	3.47	V	
Power Supply Current	I_{CC}			750	mA	
Transmitter						
Differential input impedance	Rin		100		Ω	
Differential data input swing	Vin,pp	180		1000	mV	
Single ended input voltage tolerance	VinT	-0.3		4.0	V	
Receiver						
Differential data output swing	Vout,pp	300		850	mV	
Single-ended output voltage		-0.3		4.0	V	

Optical Transmitter Characteristics						
Parameter	**Symbol**	**Min**	**Typical**	**Max**	**Unit**	**Notes**
Center Wavelength	λ_{out}	840	850	860	nm	
Average Launch Power each lane	P_{out}	-8.4		2.4	dBm	
Optical Power OMA, each Lane	P_{OMA}	-6.4		3	dBm	
Transmitter and dispersion eye closure(TDEC),each lane	TDEC			4.3	dB	
Spectral Width (RMS)	σ			0.6	nm	
Optical Extinction Ratio	ER	2.0			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}	{0.3, 0.38, 0.45, 0.35, 0.41, 0.5}					1
Optical Receiver Characteristics						
Parameter	**Symbol**	**Min**	**Typical**	**Max**	**Unit**	**Notes**
Receiver Wavelength	λ_{in}	840		860	nm	
Average Receive Power per Lane	RXPx	-10.3		2.4	dBm	
Stressed Receiver Sensitivity in OMA	SRS			-5.2	dBm	1
LOS Assert	LOSA	-30			dBm	
LOS De-Assert	LOSD			-13	dBm	
LOS Hysteresis		0.5			dB	
Receiver Reflectance	Rfl			-12	dB	

Notes:

1. Measured with a PRBS 2^{31}-1 test pattern, @25.78125Gb/s, BER<5E-5.

Digital Diagnostic Monitoring Information

Parameter	Accuracy	Calibration	Note
Temperature	±3°C	Internal	0~70℃
Voltage	±3%	Internal	3.1~3.5V
Bias Current	±10%	Internal	Specified by normal value
TX Power	±3dB	Internal	-8.4~2.4dBm
RX Power	±3dB	Internal	-10.3~2.4dBm

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 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.
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 QSFP28 Module in any combination. Theconnector pins are each rated for a maximum current of 500 mA.

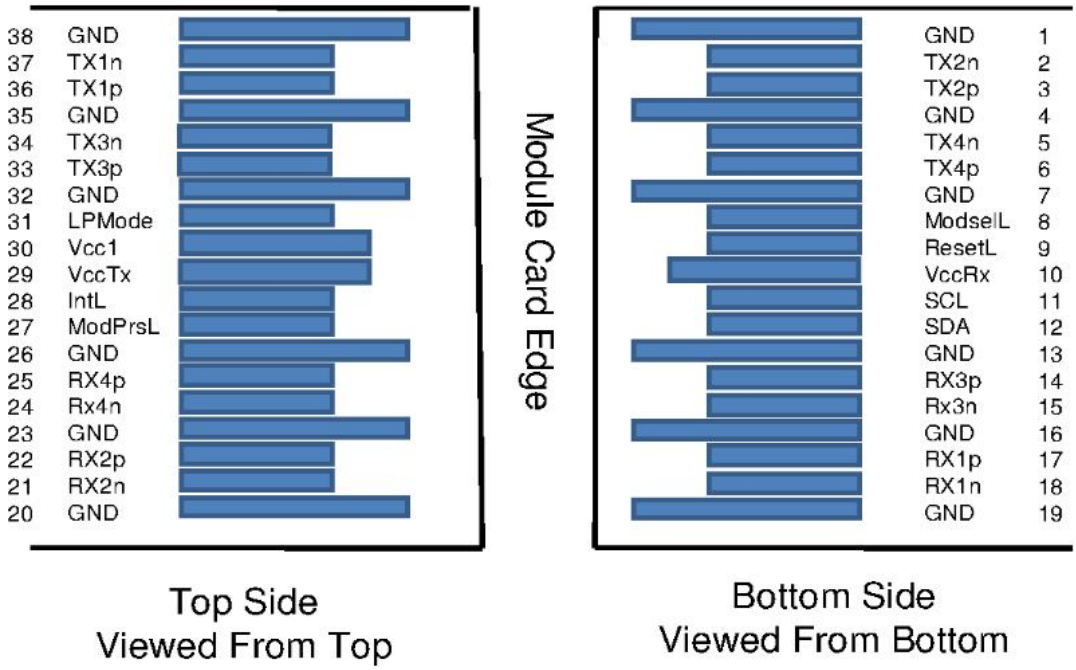


Figure 1.Electrical Pin-out Details

EEPROM Memory Map

2-Wire Serial Address 1010000x
Lower Page 00h
0 Identifier
1-2 Statues
3-21 Interrupt Flags
22-33 Free Side Device Monitors
34-81 Chanel Monitors
82-85 Reserved
86-98 Control
99 Reserved
100-104 Hardware Interrupt Pin Masks
105-106 Vendor Specific
107 Reserved
108-110 Free Side Device Properties
111-112 Assigned for use by PCI Express
113 Free Side Device Properties
114-118 Reserved
119-122 Password Change Entry Area(Optional)
123-126 Password Entry Area(Optional)
127 Page Select Byte

<table>
<tr><td></td><td>Optional</td><td>Optional</td><td>Optional</td></tr>
<tr><td>Upper Page 00h</td><td>Page 01h</td><td>Page 02h</td><td>Page 03h</td></tr>
<tr><td>128 Identifier</td><td>128 CC_APPS</td><td rowspan="8">128-255 User EEPROM Data</td><td>128-175 Free Side Device Thresholds</td></tr>
<tr><td rowspan="3">129-191 Base ID Fields</td><td>129 AST Table Length (TL)</td><td>176-223 Channel Thresholds</td></tr>
<tr><td>130-131 Application Code Entry 0</td><td>224 TX EQ & RX Emphasis Magnitude ID</td></tr>
<tr><td>132-133 Application Code Entry 1</td><td>225 RX output amplitude indicators</td></tr>
<tr><td rowspan="2">192-223 Extended ID</td><td rowspan="2">134-253 Others Entries</td><td>226-241 Channel Controls</td></tr>
<tr><td rowspan="2">242-251 Channel Monitor Masks</td></tr>
<tr><td rowspan="2">224-255 Vendor Specific ID</td></tr>
<tr><td>254-255 Application Code Entry TL</td><td>252-255 Reserved</td></tr>
</table>

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

Address	Name of field	Hex	Description
BASE ID Fields			
128	Identifier	11	QSFP28 transceiver
129	Ext. Identifier	9C	Extend Identifier of free side device
130	Connector Type	0C	MPO 1*12 (Multifiber Parallel Optic)
131-138	Specification Compliance	80 00 00 00 40 40 02 00	Code for electronic or optical compatibility
139	Encoding	05	Code for serial encoding algorithm
140	BR, nominal	FF	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 50um)	23	
144	Length(OM2 50um)	00	
145	Length(OM1 62.5um)	00	
146	Length(passive copper or active cable or OM4 50um))	32	
147	Device technology	00	Device technology
148-163	Vendor name	4F 45 4D 20 20 20 20 20 20 20 20 20 20 20 20 20	QSFP28 vendor name (ASCII)
164	Extended Module	10	Extended Module codes for InfiniBands
165-167	Vendor OUI	00 00 00	Free side device vendor IEEE company ID
168-183	Vendor PN	51 53 46 50 32 38 2D 31 30 30 47 2D 53 52 34 20	Part number provided by QSFP28 vendor(ASCII) device vendor(ASCII)
184-185	Vendor rev	41 30	“A0”(ASCII character)
186-187	Wavelength or 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	07 D0	Guaranteed range of laser wavelength

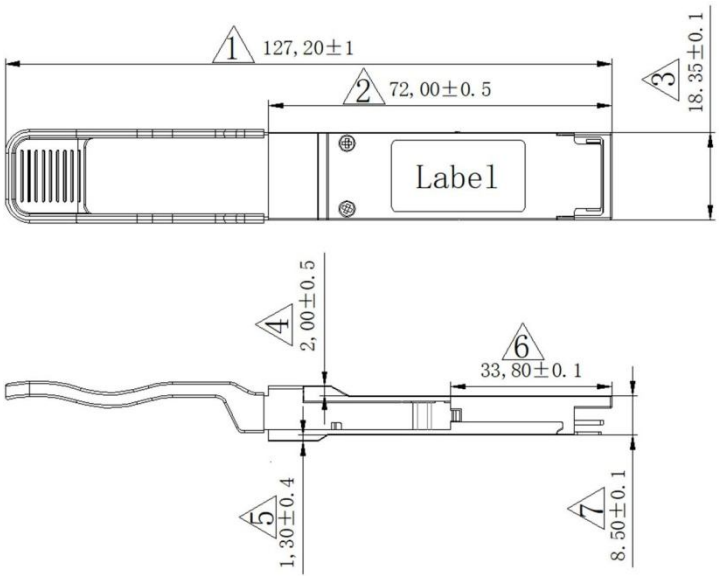
	tolerance or Copper Cable Attenuation		from nominal wavelength or copper cable attenuation in dB at 7.0 GHz and 12 GHz
190	Max case temp.	00	Maximum case temperature in degrees C.
191	CC_BASE	Programmed by Factory	Check code for base ID fields
Extended ID Fields			
192	Link codes	02	100GBASE-SR4
193-195	Options	00 F0 DA	,
196-211	Vendor SN	xx……xx	Serial number provided by vendor(ASCII)
212-219	Date Code	xx……xx	Vendor's manufacturing date 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	BR, nominal	68	Nominal bit rate per channel, units of 250 Mbps.
223	CC-EXT	Programmed by Factory	Check code for the Extended ID Fields
Vendor Specific ID Field			
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	-13.3	dBm	
180-181	2	RX Power High Warning	2.4	dBm	
182-183	2	RX Power Low Warning	-10.3	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	-11.4	dBm	
196-197	2	TX Power High Warning	2.4	dBm	
198-199	2	TX Power Low Warning	-8.4	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 (℃)	Reach (m)	Pull tap Color	DDM
HD-QSFP28/100G-SR4	QSFP28	4*25.78	-8.4~2.4	PIN	<-10.3	0~+70	100	Beige	Y

*Note:

1.Measured with a PRBS 2^{31}-1 test pattern, @25.78125Gb/s, BER<5E-5.

2.Receiver sensitivity in OMA