	Datasheet	No.	DS10-U001
		Initial Date	2017-12-28
OU	OU8M8A1	Written Team	R&D Dept.
			GH Zheng

I Preview


PN	OU8M8A1
Description	100G QSFP28 SR4 850nm 0.1KM MPO DDMI 0~70 °C

II Contents

1. Features
2. Applications
3. Description
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III Revision History

No.	Date	Items	Change Recording	Ver.	Rev.	Customer
1	2017-12-28	All	Initial registration	000	000	Standard
2						
3						
4						
5						
6						

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1. Features

- ◆ Four-channel full-duplex transceiver modules
- ◆ Transmission data rate up to 28Gbit/s per channel
- ◆ Up to 70m on OM3/ 100m on OM4 Multimode Fiber (MMF)
- ◆ Low power consumption <3.5W
- ◆ Operating case temperature 0 °C to +70 °C
- ◆ 3.3V power supply voltage
- ◆ RoHS 6 compliant
- ◆ Hot Pluggable QSFP28 form factor
- ◆ MTP/MPO connector receptacle
- ◆ Built-in digital diagnostic function

2. Applications

- ◆ IEEE 802.3bm 100GBASE SR4 and 40GBASE SR4
- ◆ Proprietary High Speed Interconnections
- ◆ Data center
- ◆ Other links

3. Description

OCRECOM's 100G QSFP28 is a Four-Channel, Pluggable, Parallel, Fiber-Optic QSFP28 Transceiver for IEEE 802.3bm, 100GBASE SR4 Applications , or 40 Gigabit Ethernet and Infiniband FDR/EDR Applications.. The QSFP28 full-duplex optical module offers 4 independent transmit and receive channels, each capable of 25Gbps operation for an aggregate data rate of 100Gbps 70m using OM3 fiber and 100m using OM4 fiber. These modules are designed to operate over multimode fiber systems using 850nm VCSEL laser array. An optical fiber ribbon cable with an MPO/MTP™ connector can be plugged into the QSFP module receptacle. QSFP28 SR4 is one kind of parallel transceiver which provides increased port density and total system cost savings.

4. Absolute Maximum Ratings


The operation in excess of any absolute maximum ratings might cause permanent damage to this module.

Parameter	Symbol	Min	Max	Unit	Note
Storage Temperature	TST	-40	85	°C	
Relative Humidity(non-condensing)	RH	0	85	%	
Operating Case Temperature	TOPC	0	70	°C	
Supply Voltage	VCC	-0.5	3.6	V	
Damage Threshold each lane	TH _d	3.4		dBm	

5. Operating Environment

Parameter	Symbol	Min	Typical	Max	Unit
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Operating Case Temperature	TOPC	0		70	°C
Power Supply Voltage	VCC	3.13	3.3	3.47	V
Power Consumption		-		3.5	W
Data Rate	DR		25.78125		Gbps
Control Input Voltage High		2		Vcc	V
Control Input Voltage Low		0		0.8	V
Link Distance with OM3 fiber	D	0.002		70	m
Link Distance with OM4 fiber	D	0.002		100	m

6. Optical Characteristics

All parameters are specified under the recommended operating conditions with PRBS31 data pattern unless otherwise specified.

Parameter	Symbol	Min	Typical	Max	Unit	Notes
Transmitter						
Center Wavelength	λ_C	840	850	860	nm	
RMS Spectral Width	λ_{rms}	-		0.6	nm	
Average Launch Power, each lane	PAVG	-8.4		2.4	dBm	
Optical Modulation Amplitude (OMA)	POMA	-6.4		3	dBm	1
Difference in Launch Power between any two lanes	Ptx,diff			4.0	dB	
Launch Power in OMA minus Transmitter and Dispersion Penalty (TDP), each Lane	OMA-TDP	-7.3			dBm	
Transmitter and Dispersion Eye Closure each lane				4.3	dB	
Extinction Ratio	ER	2.0			dB	
Optical Return Loss Tolerance	TOL			12	dB	
Average Launch Power off transmitter each lane	Poff			-30	dBm	
Encircled Flux			$\geq 86\%$ at 19 μ m $\leq 30\%$ at 4.5 μ m			
Transmitter Eye Mask Definition {X1, X2, X3, Y1, Y2, Y3}		{0.3, 0.38, 0.45, 0.35, 0.41, 0.5}				2
Receiver						
Center Wavelength	λ_c	840	850	860	nm	

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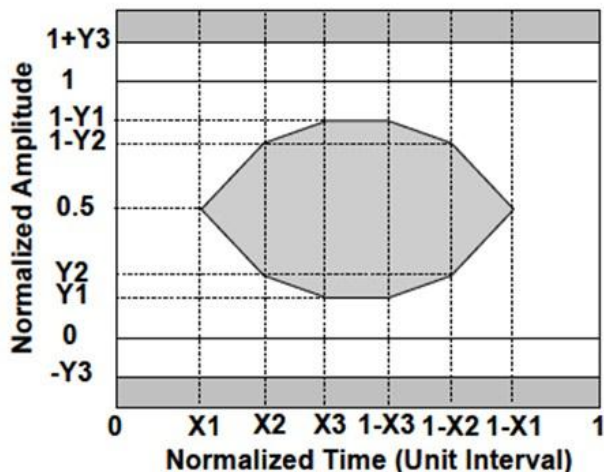
Damage Threshold	THd	+3.4			dBm	3
Overload, each lane	OVL	+2.4			dBm	
Average Receiver Power each lane		-10.3		2.4	dBm	
Receiver Sensitivity in OMA, each Lane	SEN			-9.2	dBm	
Receiver Reflectance	R _R			-12	dB	
Receiver power(OMA) each lane				3.0	dBm	
Stressed Receiver Sensitivity(OMA) each lane				-5.2	dBm	4
Signal Loss Assert Threshold	LOSA	-30			dBm	
Signal Loss Deassert Threshold	LOSD			-12	dBm	
LOS Hysteresis	LOSH	0.5			dB	
Conditions of Stress Receiver Sensitivity Test						5
Stressed Eye Closure(SEC) lane under test			4.3		dB	
Stressed Eye J2 Jitter Lane under test			0.39		UI	
Stressed Eye J4 Jitter Lane under test					UI	
OMA of each Aggressor Lane			3		dBm	
Stressed Eye Mask Definition {X1, X2, X3, Y1, Y2, Y3}		{0.28, 0.5, 0.5, 0.33, 0.33, 0.4}				

Notes:

1. Even if the TDP < 0.9 dB, the OMA min must exceed the minimum value specified here.
2. See Figure below.

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3. The receiver shall be able to tolerate, without damage, continuous exposure to a modulated optical input signal having this power level on one lane. The receiver does not have to operate correctly at this input power.
4. Measured with conformance test signal at receiver input for BER = 1×10^{-12} .
5. Stressed eye closure and stressed eye jitter are test conditions for measuring stressed receiver sensitivity. They are not characteristics of the receiver.

7. Electrical Characteristics

The following electrical characteristics are defined over the recommended Operating Environment unless otherwise specified

Parameter	Symbol	Min	Typical	Max	Unit	Notes
Power Consumption				3.5	W	
Supply Current	I _{cc}			1060	mA	
Transceiver Power-on Initialization				2000	ms	1
Transmitter						
Single Ended Input Voltage Tolerance		-0.3		3.6	V	2
AC Common Mode Input Voltage Tolerance		15			mV	RMS
Differential Input Voltage Swing Threshold		50			mV _{pp}	LOSA Threshold
Differential Input Voltage Swing	V _{in,pp}	180		1000	mV _{pp}	
Differential Input Impedance	Z _{in}	90	100	110	Ohm	
Total Jitter				0.40	UI	
Deterministic Jitter				0.15	UI	
Receiver (each Lane)						
Single Ended Output Voltage		-0.3		4	V	
AC Common Mode Output Voltage				7.5	mV	RMS
Differential Output Voltage Swing	V _{out,pp}	300		900	mV _{pp}	
Differential Output Impedance	Z _{out}	90	100	110	Ohm	

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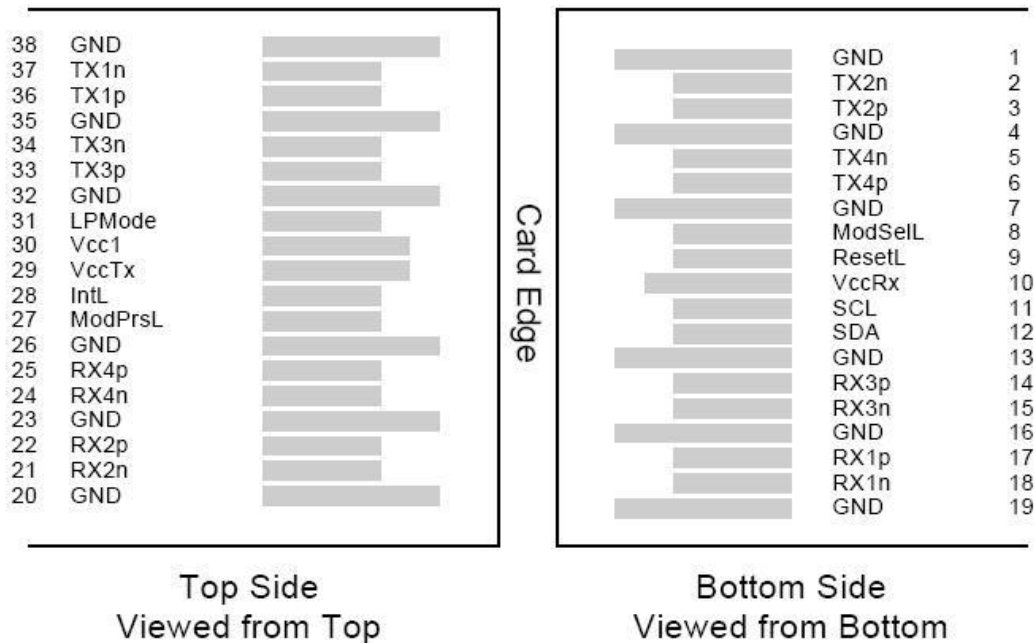
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Total Jitter				0.3	UI	
Deterministic Jitter				0.15	UI	

Notes:


- Power-on Initialization Time is the time from when the power supply voltages reach and remain above the minimum recommended operating supply voltages to the time when the module is fully functional.
- The single ended input voltage tolerance is the allowable range of the instantaneous input signals.

8. Pin Descriptions



PIN	Logic	Symbol	Name/Description	Note
1		GND	Ground	1
2	CML-I	Tx2n	Transmitter Inverted Data Input	
3	CML-I	Tx2p	Transmitter Non-Inverted Data output	
4		GND	Ground	1
5	CML-I	Tx4n	Transmitter Inverted Data Input	
6	CML-I	Tx4p	Transmitter Non-Inverted Data output	
7		GND	Ground	1
8	LVTLL-I	ModSelL	Module Select	
9	LVTLL-I	ResetL	Module Reset	
10		VccRx	+ 3.3V Power Supply Receiver	2
11	LVC MOS-I/O	SCL	2-Wire Serial Interface Clock	
12	LVC MOS-I/O	SDA	2-Wire Serial Interface Data	
13		GND	Ground	
14	CML-O	Rx3p	Receiver Non-Inverted Data Output	
15	CML-O	Rx3n	Receiver Inverted Data Output	

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16		GND	Ground	1
17	CML-O	Rx1p	Receiver Non-Inverted Data Output	
18	CML-O	Rx1n	Receiver Inverted Data Output	
19		GND	Ground	1
20		GND	Ground	1
21	CML-O	Rx2n	Receiver Inverted Data Output	
22	CML-O	Rx2p	Receiver Non-Inverted Data Output	
23		GND	Ground	1
24	CML-O	Rx4n	Receiver Inverted Data Output	1
25	CML-O	Rx4p	Receiver Non-Inverted Data Output	
26		GND	Ground	1
27	LVTTIL-O	ModPrsL	Module Present	
28	LVTTIL-O	IntL	Interrupt	
29		VccTx	+3.3 V Power Supply transmitter	2
30		Vcc1	+3.3 V Power Supply	2
31	LVTTIL-I	LPMode	Low Power Mode	
32		GND	Ground	1
33	CML-I	Tx3p	Transmitter Non-Inverted Data Input	
34	CML-I	Tx3n	Transmitter Inverted Data Output	
35		GND	Ground	1
36	CML-I	Tx1p	Transmitter Non-Inverted Data Input	
37	CML-I	Tx1n	Transmitter Inverted Data Output	
38		GND	Ground	1

Notes:

1. GND is the symbol for signal and supply (power) common for QSFP28 modules. 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. VccRx, Vcc1 and VccTx are the receiver and transmitter power suppliers and shall be applied concurrently. Recommended host board power supply filtering is shown in Figure below. Vcc Rx, Vcc1 and Vcc Tx may be internally connected within the QSFP28 transceiver module in any combination. The connector pins are each rated for a maximum current of 1000mA.

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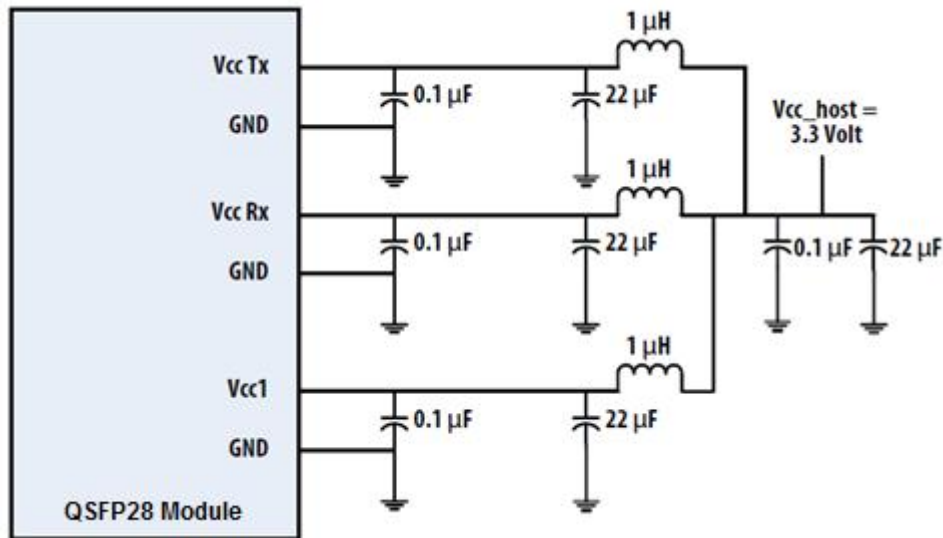


Figure Host Board Power Supply Filtering

ModSelL Pin

Module Select (ModSelL) is an input pin. When held low by the host, the module responds to 2-wire serial communication commands. The ModSelL allows the use of multiple QSFP28 modules on a single 2-wire interface bus – individual ModSelL lines for each QSFP28 module must be used.

Serial Clock (SCL) and Serial Data (SDA) are required for the 2-wire serial bus communication interface and enable the host to access the QSFP28 memory map.

ResetL Pin

The ResetL pin enables a complete module reset, returning module settings to their default state, when a low level on the ResetL pin is held for longer than the minimum pulse length. During the execution of a reset the host shall disregard all status bits until the module indicates a completion of the reset interrupt. The module indicates this by posting an IntL (Interrupt) signal with the Data_Not_Ready bit negated in the memory map. Note that on power up (including hot insertion) the module should post this completion of reset interrupt without requiring a reset.

LPMode Pin

Low Power Mode (LPMode) pin is used to set the maximum power consumption for the module in order to protect hosts that are not capable of cooling higher power modules, should such modules be accidentally inserted.


ModPrsL Pin

Module Present (ModPrsL) is a signal local to the host board which, in the absence of a module, is normally pulled up to the host Vcc. When a module is inserted into the connector, it completes the path to ground through a resistor on the host board and asserts the signal. ModPrsL then indicates a module is present by setting ModPrsL to a “Low” state.

IntL Pin

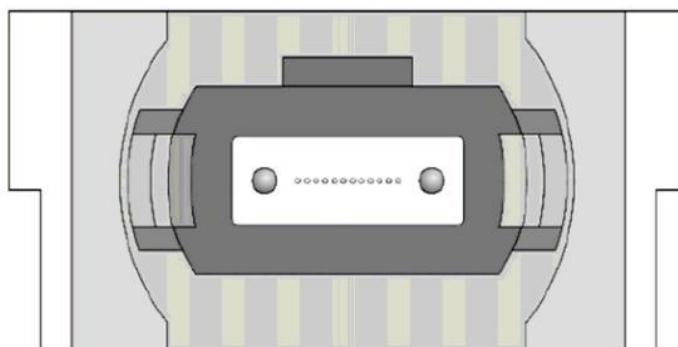
Interrupt (IntL) is an output pin. Low indicates a possible module operational fault or a status critical to the host system. The host identifies the source of the interrupt using the 2-wire serial interface. The IntL pin is an open collector output and must be pulled to the Host Vcc voltage on the Host board.

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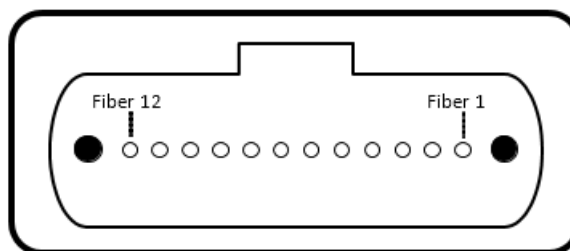
9. Optical Interface Lanes and Assignment

The optical interface port is a male MPO connector. The four fiber positions on the left as shown in Figure 2, with the key up, are used for the optical transmit signals (Channel 1 through 4). The fiber positions on the right are used for the optical receive signals (Channel 4 through 1). The central four fibers are physically present.



Transmit Channels: 1 2 3 4
 Unused positions: x x x x
 Receive Channels: 4 3 2 1


Figure 2. Optical Receptacle and Channel Orientation



Lane Assignment:

Fiber #	Lane Assignment
1	RX0
2	RX1
3	RX2
4	RX3
5,6,7,8	Not used

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9	TX3
10	TX2
11	TX1
12	TX0

10. Diagnostic Monitoring Interface

Digital diagnostics monitoring function is available on all OCRECOM's 100G QSFP28 SR4. A 2-wire serial interface provides user to contact with module. The structure of the memory is shown in followed sheet. The memory space is arranged into a lower, single page, address space of 128 bytes and multiple upper address space pages. This structure permits timely access to addresses in the lower page, such as Interrupt Flags and Monitors. Less time critical time entries, such as serial ID information and threshold settings, are available with the Page Select function. The interface address used is A0xh and is mainly used for time critical data like interrupt handling in order to enable a one-time-read for all data related to an interrupt situation. After an interrupt, IntL, has been asserted, the host can read out the flag field to determine the affected channel and type of flag.


Address	Size (Bytes)	Name	Description of Base ID Field	Optical Module
128	1	Identifier	Identifier Type of serial Module	
129	1	Ext. Identifier	Extended Identifier of Serial Module	
130	1	Connector	Code for connector type	
131-138	8	Specification compliance	Code for electronic compatibility or optical compatibility	
139	1	Encoding	Code for serial encoding algorithm	
140	1	BR, nominal	Nominal bit rate, units of 100 Mbits/s	
141	1	Extended rateselect Compliance	Tags for extended rate select compliance	
142	1	Length(SMF)	Link length supported for SMF fiber in km (note 1)	
143	1	Length(OM3 50 um)	Link length supported for EBW 50/125 um fiber (OM3), units of 2m (note 1)	

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144	1	Length(OM2 50 um)	Link length supported for 50/125 um fiber (OM2), units of 1m (note 1)
145	1	Length(OM1 62.5 um)	Link length supported for 62.5/125 um fiber (OM1), units of 1m (note 1)
146	1	Length (Copper)	Link length of copper or active cable, units of 1 m (note 1)Link length supported for 50/125 um fiber (OM4), units of 2 m) when Byte 147 declares 850nm VCSEL as defined inTable 37
147	1	Device tech	Device technology
148-163	16	Vendor name	QSFP28 vendor name(ASCII)
164	1	Extended Module	Extended Module codes for InfiniBand
165-167	3	Vendor OUI	QSFP28 vendor IEEE company ID
168-183	16	Vendor PN	Part number provided by QSFP28 vendor(ASCII)
184-185	2	Vendor rev	Revision level for part number provided by vendor(ASCII)
186-187	2	Wave length or Copper cable Attenuation	Nominal laser wavelength (wavelength=value/20 in nm) or copper cable attenuation in dB at 2.5GH (Adrs 186) and 5.0GHz (Adrs 187)
188-189	2	Wavelength tolerance	Guaranteed range of laser wavelength(+/- value) from nominal wavelength.(wavelength Tol.=value/200 in nm)
190	1	Max case temp.	Maximum case temperature in degrees C
191	1	CC_BASE	Check code for base ID fields (addresses 128-190)
192-195	4	Options	Rate Select, TX Disable, TX Fault, LOS, Warning indicators for: Temperature, VCC, RX, power, TX Bias
196-211	16	Vendor SN	Serial number provided by vendor (ASCII)
212-219	8	Date Code	Vendor's manufacturing date code
220	1	Diagnostic Monitoring Type	Indicates which types of diagnostic monitoring are implemented (if any) in the Module. Bit 1,0 Reserved

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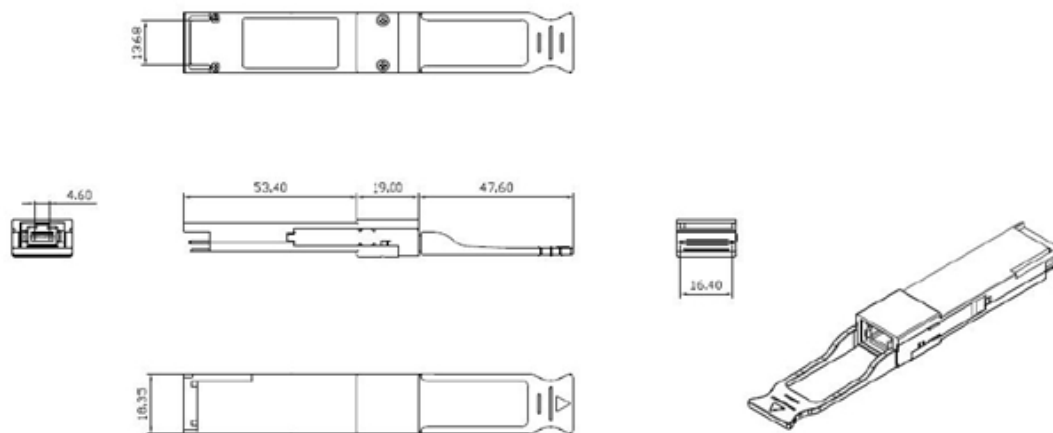
221	1	Enhanced Options	Indicates which optional enhanced features are implemented in the Module.
222	1	Reserved	
223	1	CC_EXT	Check code for the Extended ID Fields (addresses 192-222)
Vendor Specific ID Fields			
224-255	32	Vendor Specific EEPROM	

11. Digital Diagnostic Functions

The following digital diagnostic characteristics are defined over the Recommended Operating Environment unless otherwise specified. It is compliant to SFF-8436.

Parameter	Symbol	Min.	Max	Unit	Notes
Temperature monitor absolute error	DMI_Temp	-3	+3	degC	Over operating temp
Supply voltage monitor absolute error	DMI_VCC	-0.1	0.1	V	Full operating range
Channel RX power monitor absolute error	DMI_RX	-3	3	dB	Per channel
Channel Bias current monitor	DMI_Ibias	-10%	10%	mA	Per channel


12. Mechanical Dimensions



ESD

This transceiver is specified as ESD threshold 1KV for high speed data pins and 2KV for all others electrical input pins, tested per MIL-STD-883, Method 3015.4 /JESD22-A114-A (HBM). However, normal ESD precautions are still

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required during the handling of this module. This transceiver is shipped in ESD protective packaging. It should be removed from the packaging and handled only in an ESD protected environment.

Laser Safety

This is a Class 1 Laser Product according to IEC 60825-1:2007. This product complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 50, dated (June 24, 2007)

13. Module Ordering information

PN	Description
OU8M8A1	100G QSFP28 SR4 850nm 0.1KM MPO DDMI 0~70 °C

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