



Datasheet

No.

DS10-U002

Initial Date

2017-12-28

OU

OU8C341

Written Team

R&D Dept.

GH Zheng

## I Preview


PN	OU8C341
Description	100G QSFP28 CWDM4 1310nm 2KM LC DDMI 0~70 °C

## II Contents

1. Features
2. Applications
3. Description
4. Absolute maximum Ratings
5. Operating Environment
6. Optical Characteristics
7. Electrical Specifications
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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						

 Communication Limited	Datasheet		DS10-U002 Final Rev.: 2017-12-28	
	Product	100G QSFP28 transceiver OU serials	Ver.	000
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## 1. Features

- ◆ Four-channel full-duplex transceiver modules
- ◆ Transmission data rate up to 25.78125Gbit/s per channel
- ◆ Up to 2km transmission of single mode fiber
- ◆ 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
- ◆ LC connector receptacle
- ◆ Built-in digital diagnostic function

## 2. Applications

- ◆ 100G CWDM4 application
- ◆ Proprietary High Speed Interconnections
- ◆ Data center
- ◆ Other links

## 3. Description

The OCRECOM's OU8C341 is a Four-Channel, Pluggable, dual LC, and Fiber-Optic QSFP28 Transceiver for 100G Ethernet applications. The QSFP28 full-duplex optical module offers 4 independent transmit and receive channels, each capable of 25.78125Gbps operation for an aggregate data rate of 103.1Gbps 2km using single mode fiber. These modules are designed to operate over single mode fiber systems using 1271nm, 1291nm, 1311nm, 1331nm DFB laser array. QSFP28 CWDM4 is one kind of transceiver which provides increased port density and total system cost savings. They are compliant with the QSFP28 MSA, CWDM4 MSA and portions of IEEE 802.3bm.

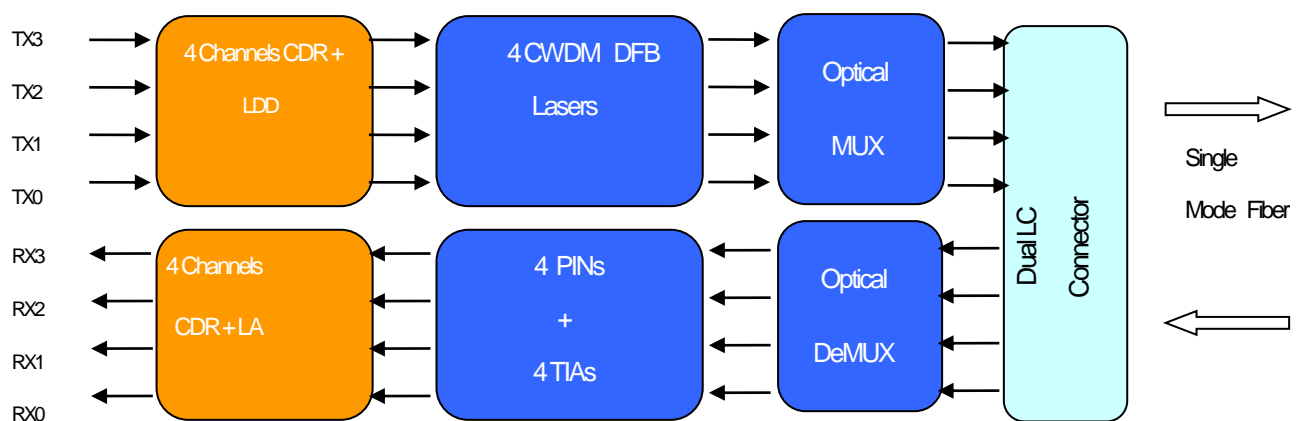



Figure 1. Block Diagram of Transceiver

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#### 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	-0.3	3.6	V	
Damage Threshold each lane	TH <sub>d</sub>	3.5		dBm	

#### 5. Operating Environment

Parameter	Symbol	Min	Typical	Max	Unit
Operating Case Temperature	TOPC	0		70	degC
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 G.652	D	0.002		10	km


#### 6. Optical Characteristics

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

##### 6.1 without FEC


Parameter	Symbol	Min	Typical	Max	Units	Notes
<b>Transmitter</b>						
Signaling Rate, each Lane		25.78125±100ppm			Gb/s	
BER		1×10 <sup>-12</sup>				
Lane Wavelength	L0	1264.5	1271	1277.5	nm	
	L1	1284.5	1291	1297.5		
	L2	1304.5	1311	1317.5		
	L3	1324.5	1331	1337.5		
Side Mode Suppression Ratio	SMSR	30			dB	
Total Average Launch Power	P <sub>T</sub>			8.5	dBm	
Average Launch Power, each Lane	P <sub>AVG</sub>	-6.5		2.5	dBm	
Optical Modulation Amplitude (OMA),	P <sub>OMA</sub>	-4.0		2.5	dBm	1

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each Lane						
Launch Power in OMA minus Transmitter and Dispersion Penalty (TDP), each Lane		-5.0			dBm	
TDP, each Lane	TDP			3.3	dB	2
Extinction Ratio	ER	3.5			dB	
Relative Intensity Noise	RIN <sub>20OMA</sub>			-130	dB/Hz	
Optical Return Loss Tolerance	TOL			20	dB	
Transmitter Reflectance	R <sub>T</sub>			-20	dB	
Average Launch Power OFF Transmitter, each Lane	P <sub>off</sub>			-30	dBm	
Transmitter Eye Mask Definition {X1, X2, X3, Y1, Y2, Y3}		{0.25, 0.42, 0.46, 0.28, 0.3, 0.4}				
<b>Receiver</b>						
BER		1x10 <sup>-12</sup>				
Lane Wavelength	L0	1264.5	1271	1277.5	nm	
	L1	1284.5	1291	1297.5		
	L2	1304.5	1311	1317.5		
	L3	1324.5	1331	1337.5		
Damage Threshold, each Lane	TH <sub>d</sub>	3.5			dBm	3
Average Receive Power, each Lane		-10		2.5	dBm	4
Receiver Reflectance	R <sub>R</sub>			-26	dB	
Receive Power (OMA), each Lane				2.5	dBm	
Receiver Sensitivity (OMA), each Lane	SEN			-8.1	dBm	5
Stressed Receiver Sensitivity (OMA), each Lane				-5.6	dBm	
Difference in Receive Power between any Two Lanes (OMA)	Pr <sub>x,diff</sub>			5.5	dB	
LOS Assert	LOSA	-30		-16	dBm	

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LOS Deassert	LOSD			-12	dBm	
LOS Hysteresis	LOSH	0.5			dB	
Receiver Electrical 3 dB upper Cutoff Frequency, each Lane	Fc			31	GHz	
Conditions of Stress Receiver Sensitivity Test						6
Vertical Eye Closure Penalty, each Lane				1.95	dB	
Stress Eye J2 Jitter, each Lane	J2			0.3	UI	
Stress Eye J9 Jitter, each Lane	J9			0.5	UI	


Notes:

- 1, Even if the TDP < 1 dB, the OMA min must exceed the minimum value specified here.
- 2, A tradeoff regarding the transmitter launch power can be made.
- 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, Average receiver power, each lane (min) is informative and not the principal indicator of signal strength. A received power below this value cannot be compliant; however, a value above this does not ensure compliance.
- 5, Receiver sensitivity (OMA), each lane(max) is informative.
- 6, Vertical eye closure penalty, stress eye J2 jitter, and stressed eye J9 jitter are test conditions for measuring stressed receiver sensitivity. They are not characteristics of the receiver. A max TDP of 3.3dB is assumed.

6.2 with FEC


Parameter	Symbol	Min	Typical	Max	Units	Notes
<b>Transmitter</b>						
Signaling Rate, each Lane		25.78125±100ppm			Gb/s	
Pre-FEC BER		2.1x10 <sup>-5</sup>				
Lane Wavelength	L0	1264.5	1271	1277.5	nm	
	L1	1284.5	1291	1297.5		
	L2	1304.5	1311	1317.5		
	L3	1324.5	1331	1337.5		
Side Mode Suppression Ratio	SMSR	30			dB	
Total Average Launch Power	P <sub>T</sub>			8.5	dBm	
Average Launch Power, each Lane	P <sub>AVG</sub>	-6.5		2.5	dBm	

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Optical Modulation Amplitude (OMA), each Lane	$P_{OMA}$	-4.0		2.5	dBm	1
Launch Power in OMA minus Transmitter and Dispersion Penalty (TDP), each Lane		-5.0			dBm	
TDP, each Lane	TDP			2.7	dB	2
Extinction Ratio	ER	3.5			dB	
Relative Intensity Noise	$RIN_{20OMA}$			-130	dB/Hz	
Optical Return Loss Tolerance	TOL			20	dB	
Transmitter Reflectance	$R_T$			-20	dB	
Average Launch Power OFF Transmitter, each Lane	$P_{off}$			-30	dBm	
Transmitter Eye Mask Definition {X1, X2, X3, Y1, Y2, Y3}		{0.31, 0.4, 0.45, 0.34, 0.38, 0.4}				
<b>Receiver</b>						
Pre-FEC BER		$2.1 \times 10^{-5}$				
Lane Wavelength	L0	1264.5	1271	1277.5	nm	
	L1	1284.5	1291	1297.5		
	L2	1304.5	1311	1317.5		
	L3	1324.5	1331	1337.5		
Damage Threshold, each Lane	$TH_d$	3.5			dBm	3
Average Receive Power, each Lane		-12.5		2.5	dBm	4
Receiver Reflectance	$R_R$			-26	dB	
Receive Power (OMA), each Lane				2.5	dBm	
Receiver Sensitivity (OMA), each Lane	SEN			-10.9	dBm	5
Stressed Receiver Sensitivity (OMA), each Lane				-8.5	dBm	
Difference in Receive Power between any Two Lanes (OMA)	$Prx_{diff}$			5.5	dB	
LOS Assert	LOSA	-30		-16	dBm	

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LOS Deassert	LOSD			-12	dBm	
LOS Hysteresis	LOSH	0.5			dB	
Receiver Electrical 3 dB upper Cutoff Frequency, each Lane	Fc			31	GHz	
Conditions of Stress Receiver Sensitivity Test						6
Vertical Eye Closure Penalty, each Lane				1.95	dB	
Stress Eye J2 Jitter, each Lane	J2			0.33	UI	
Stress Eye J9 Jitter, each Lane	J9			0.48	UI	


**Notes:**

- 1, Even if the TDP < 1 dB, the OMA min must exceed the minimum value specified here.
  - 2, A tradeoff regarding the transmitter launch power can be made.
  - 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, Average receiver power, each lane (min) is informative and not the principal indicator of signal strength. A received power below this value cannot be compliant; however, a value above this does not ensure compliance.
  - 5, Receiver sensitivity (OMA), each lane (max) is informative.
  - 6, Vertical eye closure penalty, stress eye J2 jitter, and stressed eye J9 jitter are test conditions for measuring stressed receiver sensitivity. They are not characteristics of the receiver. A max TDP of 3.3dB is assumed.
- With-FEC numbers provided for reference; each parameter is met if the equivalent CLR4 parameter without FEC is met.

**7. Electrical Specifications**

Parameter	Symbol	Min	Typical	Max	Units	Notes
Power Consumption				3.5	W	
Supply Current	Icc			1.1	A	
Transceiver Power-on Initialization Time				2000	ms	1
Module input characteristics (each Lane)						
Parameter	Test Point	Min	Typical	Max	Units	Notes
Signal Rate, each Lane	TP1	25.78125±100ppm			Gb/s	
Differential pk-pk Input Voltage Tolerance	TP1a	900			mV	
Differential Input Return Loss	TP1	IEEE802.3bm Equation 83E-5			dB	

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Differential to Common Mode Input Return Loss	TP1	IEEE802.3bm Equation 83E-6			dB	
Differential Termination Mismatch	TP1			10	%	
Module Stressed Input Test	TP1a	IEEE802.3bm 83E.3.4.1				2
Single End Voltage Tolerance Range	TP1a	-0.4		3.3	V	
DC Common Mode Voltage	TP1	-350		2850	mV	3
Receiver (each Lane)						
<b>Parameter</b>	<b>Test Point</b>	<b>Min</b>	<b>Typical</b>	<b>Max</b>	<b>Units</b>	<b>Notes</b>
Signaling Rate, each Lane	TP4	25.78125±100ppm			Gb/s	
AC Common Mode Output Voltage (RMS)	TP4			17.5	mV	
Differential Output Voltage	TP4			900	mV	
Eye Width	TP4	0.57			UI	
Eye Height, Differential	TP4	228			mV	
Vertical Eye Closure	TP4			5.5	dB	
Differential Output Return Loss	TP4	IEEE802.3bm Equation 83E-2			dB	
Common to Differential Mode Conversion Return Loss	TP4	IEEE802.3bm Equation 83E-3			dB	
Differential Termination Mismatch	TP4			10	%	
Transition Time (20% to 80%)	TP4	12			ps	
DC Common Mode Voltage	TP4	-350		2850	mV	3

Notes:

1. 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.
2. Meets BER specified in IEEE802.3bm 83E.1.1.
3. DC common mode voltage is generated by the host. Specification includes effects of ground offset voltage.

## 8. Pin Descriptions

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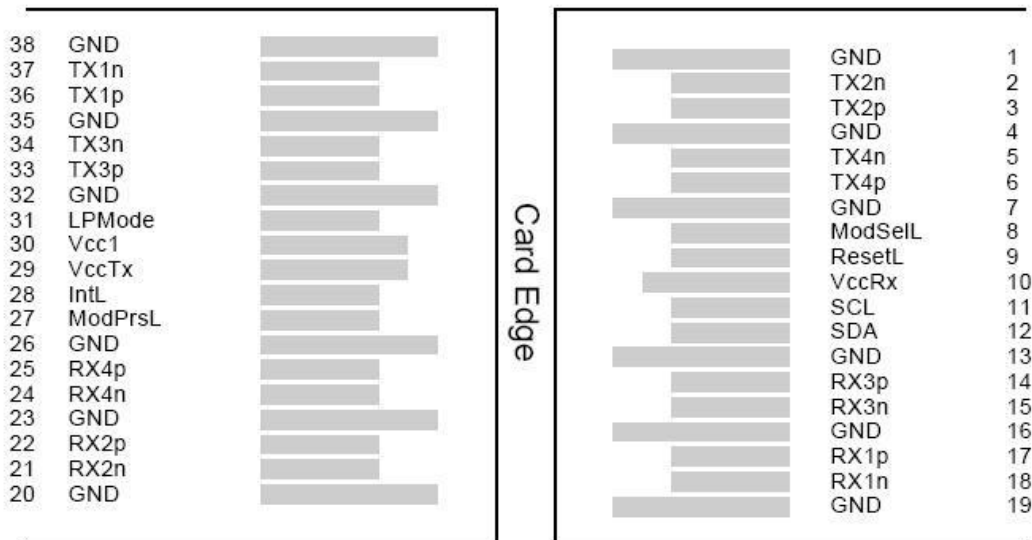


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Top Side  
Viewed from Top

Bottom Side  
Viewed from Bottom

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	LVTTLL-I	ModSelL	Module Select	
9	LVTTLL-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	
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

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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	LVTTL-O	ModPrsL	Module Present	
28	LVTTL-O	IntL	Interrupt	
29		VccTx	+3.3 V Power Supply transmitter	2
30		Vcc1	+3.3 V Power Supply	2
31	LVTTL-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 2 below. Vcc Rx, Vcc1 and VccTx 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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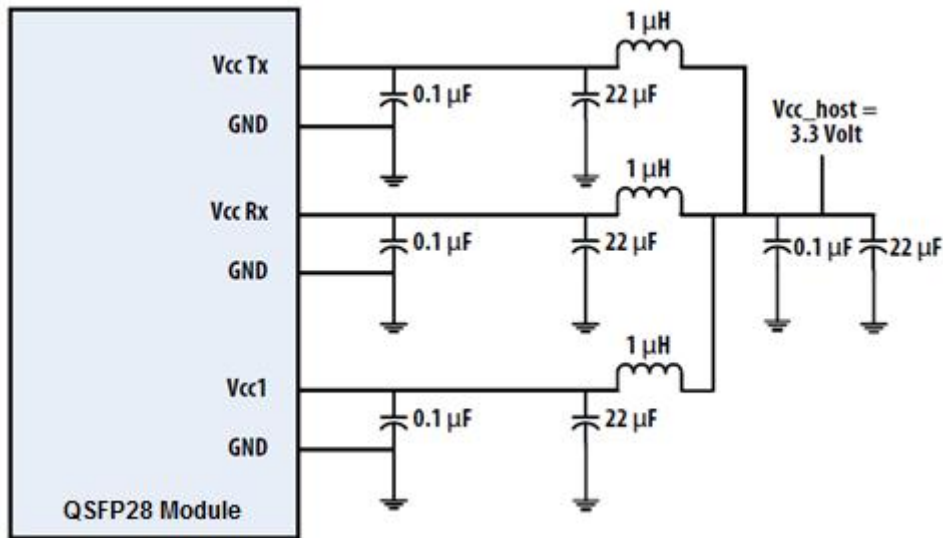


Figure 2 Power supply Filter

### ModSelL Pin

The 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

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

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.

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## IntL Pin

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.

## 9. Diagnostic Monitoring Interface

Digital diagnostics monitoring function is available on all OCRECOM's OU8C341 QSFP28 CWDM4. A 2-wire serial interface provides user to contact with module. The structure of the memory is shown in chart. 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.

### EEPROM Serial ID Memory Contents:

Data Address (Dec)	Name of Field	Description	Value(Hex)
128	Identifier	QSFP28	0E
129	Extended Identifier	3.5W max. power consumption	CC
130	Connector type	LC Connector	0C
131	Transceiver Application supported	Reserved	80
132		0	
133		0	
134		Reserved	0
135		Intermediate distance	20
136		Shortwave laser w/o OFC (SN)	10
137		Single Mode (SM)	01
138		1200 Mbytes/Sec	80
139	Encoding	NRZ	03
140	BR, nominal	Nominal bit rate	67
141	Rate Select	QSFP Rate Select Version 1	0
142	Link Length(Standard	2KM	10

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	SM Fiber)		
143	Link Length(OM3)	Not supported	0
144	Link Length(OM2)	Not supported	0
145	Link Length(OM1)	Not supported	0
146	Link Length(Cooper)	Not supported	0
147	Device Tech	Uncooled transmitter device;1310nm DFB; No wavelength control; PIN detector; Transmitter not tunable	40
148	Vendor Name	OCRECOM	4F
149			43
150			52
151			45
152			43
153			4F
154			4D
155			
156			
157			
158			
159			
160			
161			
162			
163			
164	Electronic or optical interfaces for InfiniBand	4x SDR Speed(2.5Gb/s),DDR Speed(5.0Gb/s),QDR Speed(10Gb/s).	7
165	Vendor OUI	00	00
166		00	00
167		00	00
168	Vendor PN	OU8C341	
169			
170			
171			
172			
173			

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174			
175			
176			
177			
178			
179			
180			
181			
182			
183			
184	Vendor Rev	00	30
185			30
186	Wavelength	1310nm	66
187			58
188	Wavelength Tolerance	±50	0B
189			B8
190	Max Case Temp	Max Case Temp 70 °C	46
191	Check Sum	Address 128-190	
192	Options	Rate Select, TX Disable, TX Fault, LOS, Warning indicators for: Temperature, VCC, RX power, TX Bias	0
193			0
194			0
195			DE
196	Vendor SN	Serial number provided by vendor(ASCII)	
197			
198			
199			
200			
201			
202			
203			
204			
205			
206			
207			

OCRE COMMUNICATION LIMITED

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DESIGN	CHECK	CHECK	APPROVAL

 Communication Limited	Datasheet		DS10-U002 Final Rev.: 2017-12-28	
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208			
209			
210			
211			
212	Date Code	Programmed with manufacturing date	
213			
214			
215			
216			
217			
218	Lot Number	Programmed with manufacturing lot	
219			
220	Diagnostic Monitoring Type		8
221	Enhanced Options		0
222	Reserved	Reserved	Reserved
223	CC_EXT	Address 192-222	
224-255	Vendor Specific EEPROM		

### Digital Diagnostic Functions

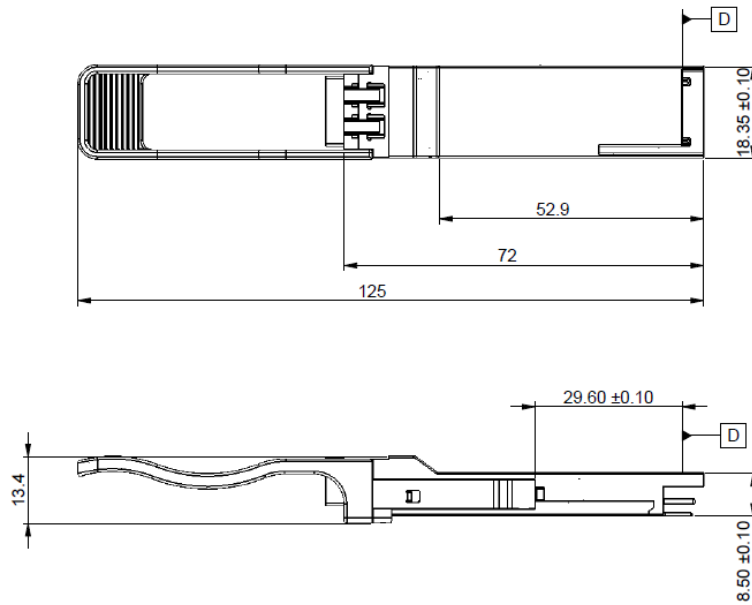
The following digital diagnostic characteristics are defined over the Recommended Operating Environment unless otherwise specified. It is compliant to SFF-8436.

Parameter	Symbol	Min	Max	Unit	Notes
Temperature monitor absolute error	DMI_Temp	-3	+3	°C	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
Channel TX power monitor absolute error	DMI_TX	-3	3	dB	Per channel

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 CRE Communication Limited	Datasheet		DS10-U002 Final Rev.: 2017-12-28	
	Product	100G QSFP28 transceiver OU serials	Ver.	000
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## 10. 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 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)

## 11. Module Ordering information

PN	Description
OU8C341	100G QSFP28 CWDM4 1310nm 2KM LCDDMI0~70 °C

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