

QD1310-SFP-LC.S03 series

1310nm SFP28 Single-Mode Transceiver, With DDM and Dual CDR
Duplex SFP28 Transceiver, RoHS 6 Compliant

Features

- ◆ Operating data rate support 24.33Gbps and 25.78Gbps with CDR engaged mode
- ◆ Operating data rate support 9.95Gbps and 10.31Gbps with CDR bypassed mode
- ◆ 1310nm DFB-LD Transmitter
- ◆ Distance up to 300m(SMF)
- ◆ Single 3.3V Power supply
- ◆ Duplex LC Connector Interface, Hot Pluggable
- ◆ Built-in dual CDR
- ◆ Compliant with MSA SFP+ Specification SFF-8402
- ◆ Safety Certification: TUV/UL/FDA**Note**
- ◆ Power Dissipation < 1.2W
- ◆ Operating Case Temperature

Standard: 0°C~+70°C

Industrial: -40°C~+85°C



Applications

- ◆ CPRI Option 10
- ◆ 25GbE
- ◆ 10GbE Optical Link

Ordering information

Part No.	Data Rate	Laser	Fiber Type	Distance	Temp.	CDR	DDMI
QD1310-SFP-LC.S03* <i>Note</i> 1	24.33Gbps and 25.78Gbps	1310nm DFB	SMF	300m(SMF)	0°C ~+70°C	Yes	Yes
QD1310-SFP-LC.S03(WT)* <i>Note</i> 2	24.33Gbps and 25.78Gbps	1310nm DFB	SMF	300m(SMF)	-40°C ~+85°C	Yes	Yes

*Note*1: Standard version

*Note*2: Industrial version

*Note**: For the latest certification information, please check with Data Controls.

*The product image only for reference purpose.

Product Description

The QD1310-SFP-LC.S03 series single-mode transceiver is SFP28 module for duplex optical data communications support 24.33Gb/s and 25.78Gb/s with CDR engaged, while, 10G Ethernet optical data communication can be supported when CDR is bypassed. It is with the SFP+ 20-pin connector to allow hot plug capability. Digital diagnostic functions are available via an I²C. It has built-in clock and data recovery (CDR). This module is designed for single-mode fiber and operates at a nominal wavelength of 1310nm.

The transmitter section uses a 1310nm multiple quantum well DFB laser and is a class 1 laser compliant according to International Safety Standard IEC 60825. The receiver section uses an integrated InGaAs detector preamplifier (IDP) mounted in an optical header and a limiting post-amplifier IC.

Absolute Maximum Ratings^{*Note3}

Parameter	Symbol	Min.	Max.	Unit
Storage Temperature	T _S	-45	+85	°C
Supply Voltage	V _{CC}	-0.5	4.0	V
Operating Relative Humidity	RH	5	85	%

Note3: Exceeding any one of these values may destroy the device permanently.

Note4: Non Condensing.

Recommended Operating Conditions

Parameter	Symbol		Min.	Typical	Max.	Unit
Operating Case Temperature	T _C	Standard	0		70	°C
		Industrial	-40		85	
Power Supply Voltage	V _{CC}		3.135		3.465	V
Power Supply Current	I _{CC}				365	mA

Performance Specifications – Electrical

Parameter	Symbol	Min.	Typ.	Max	Unit	Notes
Transmitter						
CML Inputs(Differential)	V _{in}	200		900	mVpp	AC coupled inputs
Input Impedance (Differential)	Z _{in}		100		ohms	Connected directly to TX pins
Tx_DISABLE Input		2		V _{cc} +0.3	V	

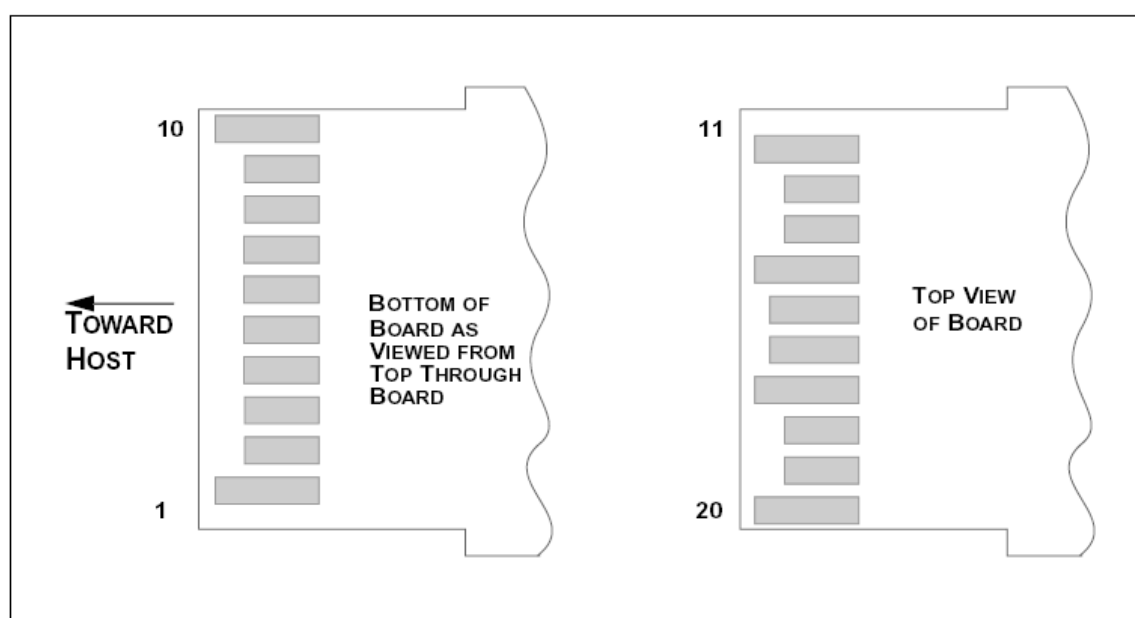
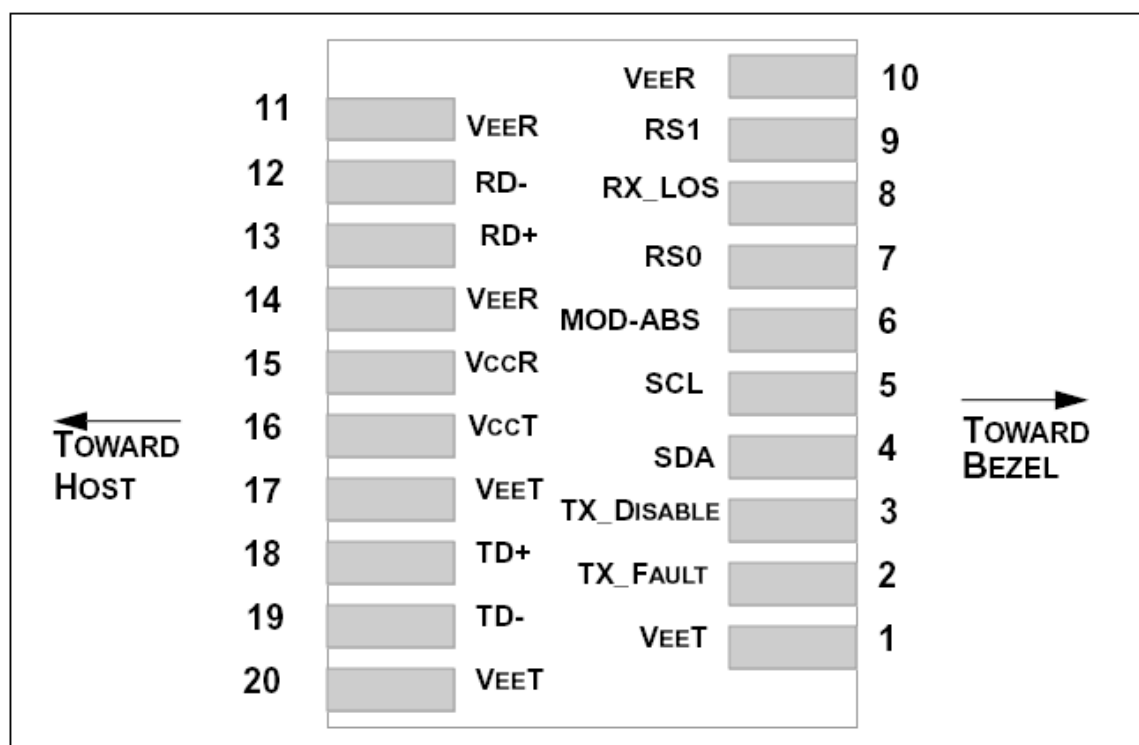
Voltage – High						
Tx_DISABLE Input Voltage – Low		-0.3		0.8	V	
Receiver						
CML Outputs (Differential)	Vout	300		1000	mVpp	AC coupled outputs
Rx_LOS Output Voltage – High		2		Vcc+0.3	V	
Rx_LOS Output Voltage – Low		-0.3		0.8	V	

Optical and Electrical Characteristics

Parameter	Symbol	Min.	Typical	Max.	Unit
9um Core Diameter SMF				300	m
Transmitter					
Centre Wavelength	λ_C	1295	1310	1325	nm
Spectral Width (-20dB)	$\Delta\lambda$			1	nm
Average Output Power@25.78Gb/s	P _{out}	-5		2	dBm
Extinction Ratio	ER	3			dB
Receiver					
Centre Wavelength	λ_C	1260	1310	1355	nm
Receiver Sensitivity(OMA)*Note5	R _{XOMA}			-8.4	dBm
Receiver Overload	P _{max}	2			dBm
Receiver Reflectance				-26	dB
LOS De-Assert	LOS _D			-14	dBm
LOS Assert	LOS _A	-22			dBm
LOS Hysteresis	HY	0.5			dB

Note5: Measured with data rate at 25.78Gb/s, BER less than 5E-5 with PRBS 2³¹-1.

SFP28 Transceiver Electrical Pad Layout



Pin Function Definitions

Pin Num.	Name	Function	Plug Seq.	Notes
1	VeeT	Transmitter Ground	1	Note 5)
2	TX Fault	Transmitter Fault Indication	3	Note 1)
3	TX Disable	Transmitter Disable	3	Note 2), Module disables on high or open
4	SDA	Module Definition 2	3	Data line for Serial ID.
5	SCL	Module Definition 1	3	Clock line for Serial ID.
6	MOD-ABS	Module Definition 0	3	Note 3)
7	RS0	RX Rate Select (LVTTTL).	3	Rate Select 0, optionally controls SFP28 module receiver. This pin is pulled low to VeeT with a >30K resistor.
8	RX LOS	Loss of Signal	3	Note 4)
9	RS1	TX Rate Select (LVTTTL).	1	Rate Select 1, optionally controls SFP28 module transmitter. This pin is pulled low to VeeT with a >30K resistor.
10	VeeR	Receiver Ground	1	Note 5)
11	VeeR	Receiver Ground	1	Note 5)
12	RD-	Inv. Received Data Out	3	Note 6)
13	RD+	Received Data Out	3	Note 6)
14	VeeR	Receiver Ground	1	Note 5)
15	VccR	Receiver Power	2	3.3V \pm 5%, Note 7)
16	VccT	Transmitter Power	2	3.3V \pm 5%, Note 7)
17	VeeT	Transmitter Ground	1	Note 5)
18	TD+	Transmit Data In	3	Note 8)
19	TD-	Inv. Transmit Data In	3	Note 8)
20	VeeT	Transmitter Ground	1	Note 5)

Notes:

Note 1) TX Fault is an open collector/drain output, which should be pulled up with a 4.7K – 10K Ω resistor on the host board. Pull up voltage between 2.4V and $V_{ccT/R}+0.3V$. When high, output indicates a laser fault of some kind. Low indicates normal operation. In the low state, the output will be pulled to < 0.4V.

Note 2) TX disable is an input that is used to shut down the transmitter optical output. It is pulled up within the module with a 4.7K~10 K Ω resistor. Its states are:

Low (-0.3 – 0.8V): Transmitter on

(>0.8, < 2.0V): Undefined

High (2.0 – $V_{ccT/R}+0.3V$): Transmitter Disabled

Open: Transmitter Disabled

Note 3) Module Absent, connected to VeeT or VeeR in the module.

Note 4) RX LOS (Loss of Signal) is an open collector/drain output, which should be pulled up with a 4.7K – 10K Ω resistor. Pull up voltage between 2.4V and VccT/R+0.3V. When high, this output indicates the received optical power is below the worst-case receiver sensitivity (as defined by the standard in use). Low indicates normal operation. In the low state, the output will be pulled to < 0.4V.

Note 5) VeeR and VeeT may be internally connected within the SFP28 module.

Note 6) RD-/+ : These are the differential receiver outputs. They are AC coupled 100 Ω differential lines which should be terminated with 100 Ω (differential) at the user SERDES. The AC coupling is done inside the module and is thus not required on the host board. The voltage swing on these lines will be between 150 mV-500mV single-ended when properly terminated.

Note 7) VccR and VccT are the receiver and transmitter power supplies. They are defined as 3.3V \pm 5% at the SFP+ connector pin. Maximum supply current is 365mA. Inductors with DC resistance of less than 1 ohm should be used in order to maintain the required voltage at the SFP28 input pin with 3.3V supply voltage. When the recommended supply-filtering network is used, hot plugging of the SFP28 transceiver module will result in an inrush current of no more than 30mA greater than the steady state value. VccR and VccT may be internally connected within the SFP28 transceiver module.

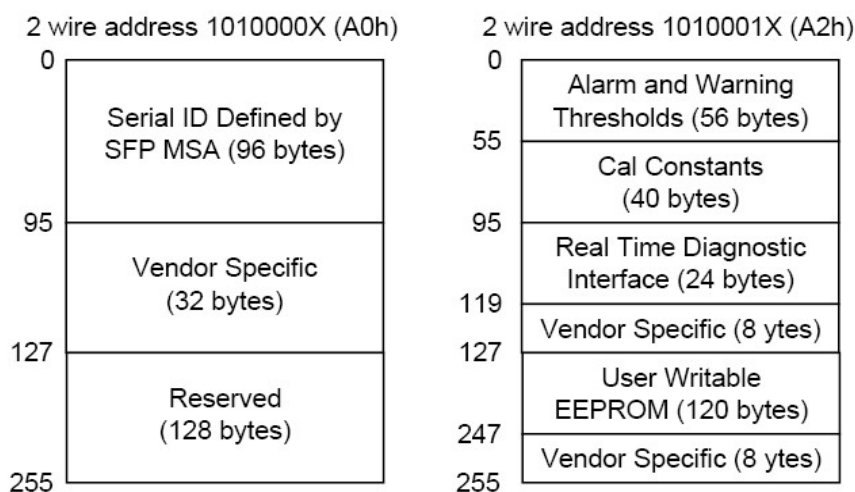
Note 8) TD-/+ : These are the differential transmitter inputs. They are AC-coupled, differential lines with 100 Ω differential termination inside the module. The AC coupling is done inside the module and is thus not required on the host board. The inputs will accept swings of 90mV-800mV single-ended, though it is recommended that values between 100mV-450mV single-ended be used for best EMI performance.

EEPROM

The serial interface uses the 2-wire serial CMOS EEPROM protocol. When the serial protocol is activated, the host generates the serial clock signal (SCL). The positive edge clocks data into those segments of the EEPROM that are not writing protected within the SFP28 transceiver. The negative edge clocks data from the SFP28 transceiver. The serial data signal (SDA) is bi-directional for serial data transfer. The host uses SDA in conjunction with SCL to mark the start and end of serial protocol activation. The memories are organized as a series of 8-bit data words that can be addressed individually or sequentially.

The Module provides diagnostic information about the present operating conditions. The transceiver generates this diagnostic data by digitization of internal analog signals. Calibration and alarm/warning threshold data is written during device manufacture. Received power monitoring, transmitted power monitoring, bias current monitoring, supply voltage monitoring and temperature monitoring all are implemented. If the module is defined as external calibrated, the diagnostic data are raw A/D values and must be converted to real world units using calibration constants stored in EEPROM locations 56 – 95 at wire serial bus address A2H. The digital diagnostic memory map

specific data field define as following .For detail EEPROM information, please refer to the related document of SFF 8472 Rev 12.2.

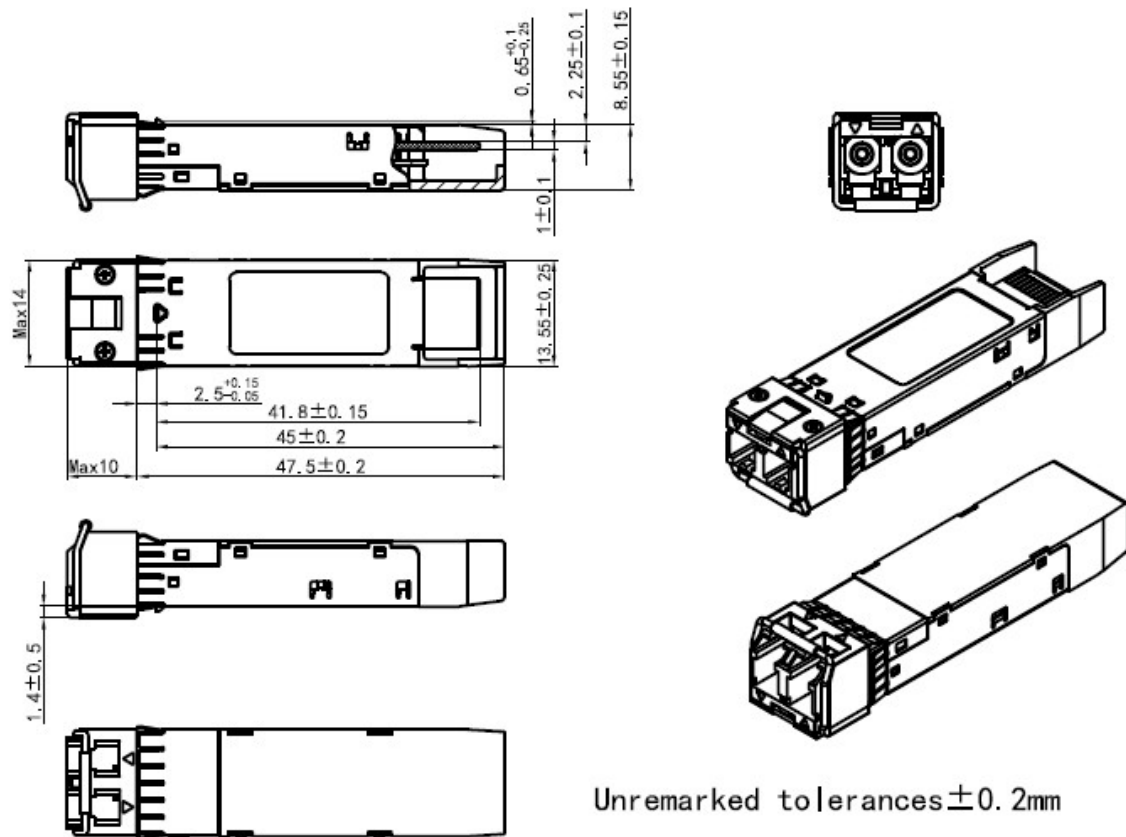


Operation about Retimer/CDR Rate Select Logic

The QD1310-SFP-LC.S03 series supports high data rates 24.33G/25.78G(CPRI options 10 /25GbE) and Low data rates 9.95G/10.31G. For more details, please contact Data Controls.

Logic OR of RS0 Pin and Bit110.3 of A2H	Logic OR of RS1 Pin and Bit118.3 of A2H	RX Data Rate	TX Data Rate	Status of RX CDR	Status of TX CDR
High/1	High/1	24.33G/25.78G	24.33G/25.78G	CDR Engaged	CDR Engaged
High/1	Low/0	24.33G/25.78G	9.95G/10.31G	CDR Engaged	CDR Bypassed
Low/0	High/1	9.95G/10.31G	24.33G/25.78G	CDR Bypassed	CDR Engaged
Low/0	Low/0	9.95G/10.31G	9.95G/10.31G	CDR Bypassed	CDR Bypassed

Mechanical Specifications*



*This 2D drawing only for reference, please check with Data Controls before ordering.

Eye Safety

This single-mode transceiver is a Class 1 laser product. It complies with IEC-60825 and FDA 21 CFR 1040.10 and 1040.11. The transceiver must be operated within the specified temperature and voltage limits. The optical ports of the module shall be terminated with an optical connector or with a dust plug.

Obtaining Document

You can visit our website: <https://www.dci.jp>

Or contact Data Controls Inc. Listed at the end of the documentation to get the latest documents.

Revision History

Revision	Initiate	Review	Approve	Revision History	Release Date
V1.a	Roty	Marvin/Airon/Nico/Kelly		Preliminary	Nov 20, 2018
V1.b	Roty	Marvin/Airon/Nico/ Kelly/Yi.Wan		Update Average Output Power, Receiver Overload and the features.	Dec 21, 2018

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