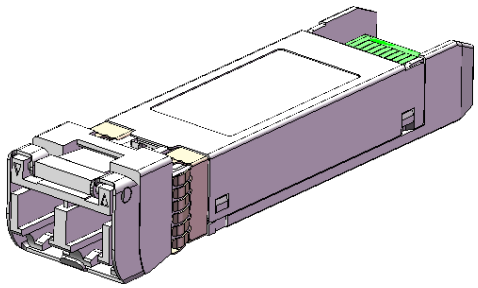
DQxx-SFP-LC.S40 series

SFP28 Single-Mode for O-Band DWDM Application
Duplex SFP28 Transceiver, With DDM and Dual CDR
Digital Diagnostic Function
RoHS Compliant



Features

- Operating data rate support 25.78Gbps/24.33Gbps
- O-band DWDM EML Transmitter
- Duplex LC Connector
- Power Dissipation ＜ 2.5W
- With CDR function
- Hot-Pluggable
- Compliant with SFF-8402
- Operating Case Temperature:

  Commercial: 0°C~+70°C

  Industrial: -40°C ~85°C

- Safety Certification: TUV/UL/FDA*Note1
- RoHS Compliant

Applications

- 25GbE
- CPRI Option 10
- 10.3125G
- 9.8304G
- 4.9152G
- 2.4576G
- 1.2288G

Ordering Information

Part No.	Data Rate	Laser	Link budget	CDR	Case Temp.
DQxx-SFP-LC.S40*Note2	25.78Gbps	EML	20dB @ 25G	YES	0°C to 70°C
DQxx-SFP-LC.S40(WT)	25.78Gbps	EML	20dB @ 25G	YES	-40°C to 85°C

Note1: For the latest certification information, please check with Data Controls Inc.

Note2: X refers to O-band WDM wavelength channel, please refer the following table for detailed center wavelength information.

*The product image is only for reference purpose.

Channel refers to the following table*[Note3]:

Item	Part NO.	Typical Wavelength (nm)	Frequency (THz)
1	DQ32-SFP-LC.S40	1309.71	228.900
2	DQ31-SFP-LC.S40	1309.14	229.000
3	DQ30-SFP-LC.S40	1308.57	229.100
4	DQ22-SFP-LC.S40	1305.15	229.700
5	DQ21-SFP-LC.S40	1304.58	229.800
6	DQ20-SFP-LC.S40	1304.01	229.900
7	DQ12-SFP-LC.S40	1300.62	230.500
8	DQ11-SFP-LC.S40	1300.05	230.601
9	DQ10-SFP-LC.S40	1299.49	230.700
10	DQ02-SFP-LC.S40	1296.12	231.300
11	DQ01-SFP-LC.S40	1295.56	231.400
12	DQ00-SFP-LC.S40	1295.00	231.500
13	DQ72-SFP-LC.S40	1287.22	232.900
14	DQ71-SFP-LC.S40	1286.66	233.001
15	DQ70-SFP-LC.S40	1286.11	233.100
16	DQ62-SFP-LC.S40	1282.81	233.700
17	DQ61-SFP-LC.S40	1282.26	233.800
18	DQ60-SFP-LC.S40	1281.71	233.900
19	DQ52-SFP-LC.S40	1278.43	234.500
20	DQ51-SFP-LC.S40	1277.89	234.600
21	DQ50-SFP-LC.S40	1277.34	234.700

*Note3: Please contact with Data Controls Inc. for the channel availability.

Product Description

The DQxx-SFP-LC.S40 series single mode transceiver is SFP28 module for duplex optical data communications support 25.78Gb/s. This module is designed for single mode fiber and operates at a nominal O-Band DWDM wavelength from 1277nm to 1310nm.

It is with the SFP+ 20-pin connector to allow hot plug capability. The transmitter section uses a DWDM EML laser and is a class 1 laser compliant according to International Safety Standard IEC-60825-1 class I. The receiver section uses an integrated InGaAs detector preamplifier (IDP) mounted in an optical header.

The DQxx-SFP-LC.S40 series is designed to be compliant with SFP28 Multi-Source Agreement (MSA) Specification SFF-8402.

Absolute Maximum Ratings*Note4

Parameter	Symbol	Min.	Max.	Unit
Storage temperature	Ts	-40	+85	°C
Supply voltage	Vcc	-0.5	3.6	V
Operating relative humidity	RH	5	85	%

Note4: Exceeding any one of these values may destroy the device immediately.

Recommended Operating Conditions

Parameter	Symbol	Min.	Typical	Max.	Unit
Operating case temperature	T_c_c-temp	0		70	°C
	T_c_I-temp*(WT)	-40		85	°C
Power supply voltage	Vcc	3.15	3.3	3.45	V
Power supply current	Icc_ c-temp			700	mA
	Icc_ I-temp*(WT)			750	mA

Performance Specifications – Electrical

Parameter		Symbol	Min.	Typ.	Max	Unit	Notes
Transmitter							
CML inputs (Differential)		Vin	40		1000	mVpp	AC coupled input*Note5
Input impedance (Differential)		Zin		100		ohm	Rin > 100 kohm @ DC
TX_Dis	Disable		2		Vcc+0.3	V	
	Enable		0		0.8		
TX_FAULT	Fault		2.4		Vcc+0.3	V	
	Normal		0		0.4		
Receiver							
CML outputs (Differential)		Vout	450		1050	mVpp	AC coupled output*(Note5)
Output impedance (Differential)		Zout	85	100	115	ohm	
RX_LOS	LOS		2.4		Vcc+0.3	V	
	Normal		0		0.4	V	

Performance Specifications – Optical

Parameter	Symbol	Min.	Typical	Max.	Unit
Transmitter					
Center wavelength spacing			0.55		nm
			100		GHz

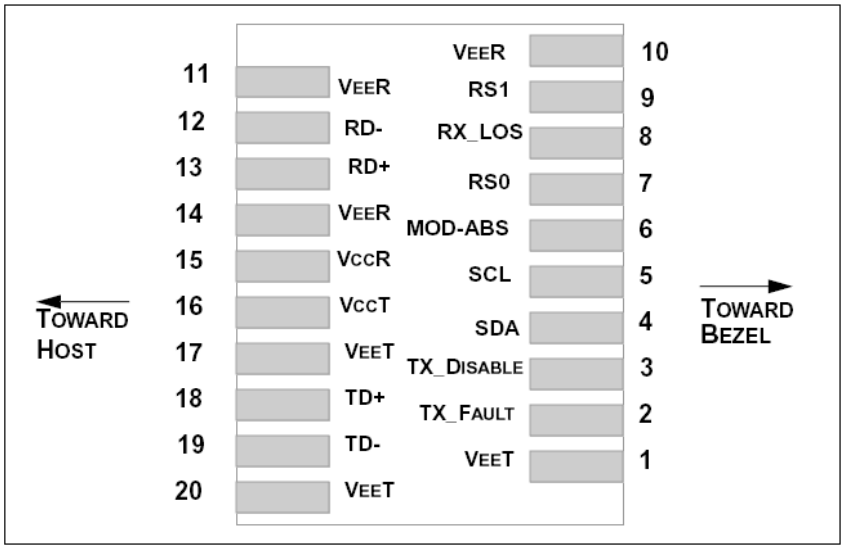
Central Frequency Deviation		-10		+10	GHz
Spectral width (-20dB)	Δλ			0.3	nm
Side mode suppression ratio	SMSR	30			dB
Average output power@25.78Gb/s*Note6	Pout	0		5.5	dBm
Extinction ratio	ER	6			dB
Optical Path Penalty (40km)	OPP			3	dB
Relative intensive noise	RIN			-130	dB/Hz
Return Loss				-12	dB
Transmitter eye mask definition {X1、X2、X3、Y1、Y2、Y3} Hit ratio 5E-5 Hits per Sample		{0.31,0.40,0.45,0.34,0.38,0.4}			
Receiver					
Receiver sensitivity@25.78Gb/s*Note7	Pmin			-20	dBm
Receiver sensitivity@≤10.3125Gb/s*Note7				-22	dBm
Receiver sensitivity@≤9.8304Gb/s*Note7				-22	dBm
Receiver sensitivity@≤4.9152Gb/s*Note7				-22	dBm
Receiver sensitivity@≤2.4576Gb/s*Note7				-22	dBm
Receiver sensitivity@≤1.2288Gb/s*Note7				-22	dBm
Receiver overload	Pmax	-5			dBm
Receiver damage threshold	Pmax	-3			dBm
LOS De-assert	LOSD			-24	dBm
LOS assert	LOSA	-33			dBm
LOS hysteresis	Hy	0.5			dB
Receiver reflectance				-26	dB
Optical Signal To Noise Rate Tolerance	OSNR			33	dB

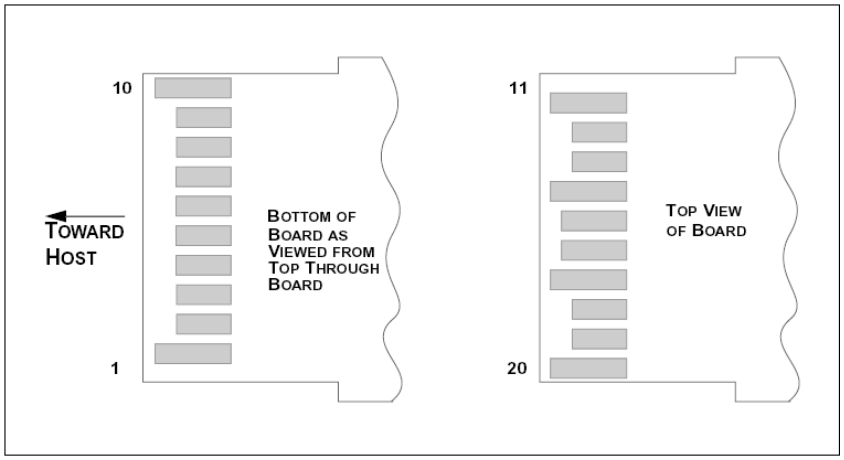
Note5: CML logic, internally AC coupled.

Note6: Output is coupled into a 9/125μm single-mode fiber.

Note7: Minimum average optical power measured at the BER less than 5E-5 @25G,. The measure pattern is PRBS 2^{31}-1.

SFP28 Transceiver Electrical Pad Layout





Pin Function Definition

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	Note 3, Data line for Serial ID.
5	SCL	Module Definition 1	3	Note 3, Clock line for Serial ID.
6	MOD-ABS	Module Definition 0	3	Note 3
7	RS0	RX Rate Select (LVTTL).	3	This pin has an internal 47k pull down to ground. RS0=1 sets Rx CDR enable, while RS0=0 sets Rx CDR bypass.
8	RX_LOS	Loss of Signal	3	Note 4

9	RS1	TX Rate Select (LVTTL).	1	This pin has an internal 47k pull down to ground. RS0=1 sets Tx CDR enable, while RS0=0 sets Tx CDR bypass.
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 7
14	VeeR	Receiver Ground	1	Note 5
15	VccR	Receiver Power	2	3.3 ± 5%, Note 7
16	VccT	Transmitter Power	2	3.3 ± 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:

1) TX Fault is an open collector/drain output, which should be pulled up with a 4.7KΩ – 10KΩ resistor on the host board. Pull up voltage between 2.4V and VccT/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.

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 4.7KΩ - 10KΩ resistor. Its states are:
Low (-0.3 – 0.8V): Transmitter on
(>0.8, < 2.0V): Undefined
High (2.0 – VccT/R+0.3V): Transmitter Disabled
Open: Transmitter Disabled

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

4) RX_LOS (Loss of Signal) is an open collector/drain output, which should be pulled up with a 4.7KΩ – 10KΩ 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.

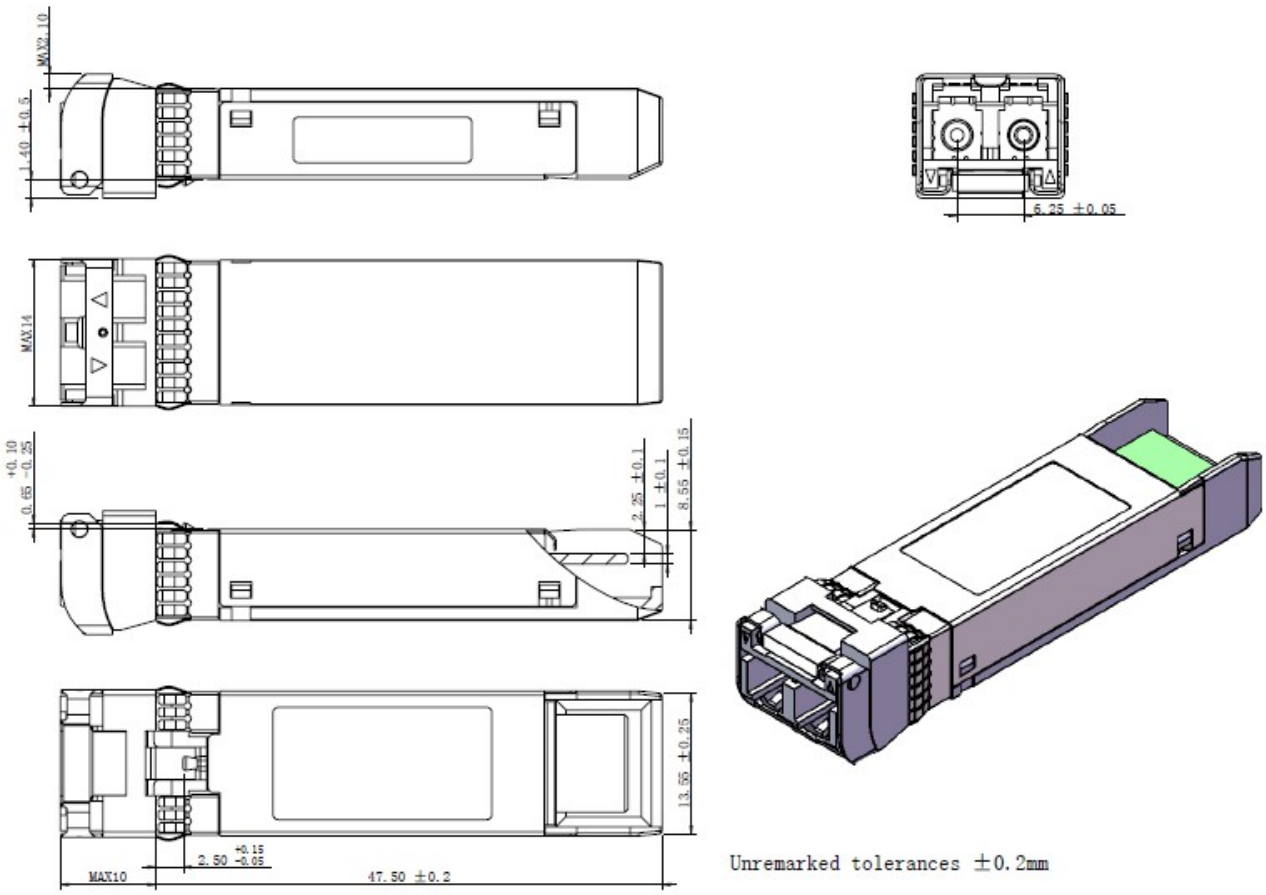
5) VeeR and VeeT may be internally connected within the SFP28 module.

6) RD-/+: These are the differential receiver outputs. They are AC coupled 100Ω differential lines which should be terminated with 100Ω (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 225 mV-525mV single-ended when properly terminated.

7) VccR and VccT are the receiver and transmitter power supplies. They are defined as 3.3V ±5% at the SFP+ connector pin. Maximum supply current is 750mA. 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.

8) TD-/+: These are the differential transmitter inputs. They are AC-coupled, differential lines with 100Ω 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 20mV-500mV single-ended, though it is recommended that values between 90mV-900mV single-ended be used for best EMI performance.

Mechanical Specifications



*This 2D drawing is only for reference, please check with Data Controls Inc. 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://dci.jp
Or contact Data Controls Inc., Ltd. Listed at the end of the documentation to get the latest documents.

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Contact:

Data Controls Inc.

E-mail: sales@dci.jp

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