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QSFP-100G-ER4L-S Compatible 100GBASE-ER4L QSFP28 1310nm 40km	
LC Type with DDM	QT-SM-DXLC-QSFP28-100G-40KM

Description

General

This QuickTreX® QSFP28 is a small form factor pluggable module for serial optical data communications such as IEEE 802.3cc 25GBASE-LR/LW. It is with the SFP28 and SFP+ 20-pin connector to allow hot plug capability. Digital diagnostic functions are available via an I2C. This module is designed for single-mode-fiber (SMF) and operates at a nominal wavelength of 1310nm.

Transmitter Section

The transmitter consists of a high-performance 1310 nm MQW DFB structure laser in the optical subassembly (OSA), which is housed within a metal barrel package. In addition, this component is also class 1 laser that compliant with International Safety Standard IEC-60825-1:2014. It complies with EN60825-1:2014/A11:2021 and FDA 21 CFR 1040.10 and 1040.11.

Receiver Section

The receiver contains of an InGaAs PIN photodiode that coupled to a high sensitivity transimpedance amplifier (TIA) in an OSA. This OSA combination is mated to a post amplifier IC that provides the post amplification SD (Signal Detection) or LOS (Loss of Signal) indication circuit which provides the logic high state output when an unusable input optical signal level detected

Features

- Single +3.3V Power Supply
- Compliant with SFP+ MSA SFF-8402
- Compliant to IEEE 802.3cc 10GBASE-LR/LW
- Compliant to SFF-8472 Digital Diagnostic Function
- Class 1 Laser International Safety Standard IEC IEC 60825-1:2014 Compliant. Complies with EN60825-1:2014/A11:2021 and FDA 21 CFR 1040.10 and 1040.11
- Built-in CDR on both Transmitter and Receiver
- Support Digital Diagnostic Monitor interface
- Hot-pluggable SFP+ footprint
- Metal enclosure, for lower EMI
- Commercial Operation Temp.: 0 oC to +70 oC
- Industrial Operation Temp.: -40 oC to +85 oC
- RoHS Compliant

Applications

- Data center and enterprise storage system
- Computer Cluster Cross-connect
- 25G BASE-LR Ethernet
- Custom High-speed Data Pipes
- eCPRI

Performance Specifications

Absolute Maximum Ratings					
Parameter	**Symbol**	**Min**	**Typ**	**Max**	**Unit**
Supply Voltage	V_{CC}	-0.5	-	3.6	V
Storage Temperature	T_S	-40	-	85	°C
Relative Humidity(non-condensing)	RH	0	-	85	%

Recommended Operating Conditions and Power Supply Requirements					
Parameter	**Symbol**	**Min**	**Typ**	**Max**	**Units**
Operating Case Temperature	T_{OP}	0	-	70	°C
Supply Voltage	V_{CC}	3.13	3.3	3.47	V
Supply Current	I_{CC}	-	-	1360	mA
Power Dissipation	PD	-	-	4.5	W

Optical and Electrical Characteristics

Transmitter Electrical Characteristics					
Parameter	**Symbol**	**Min**	**Typ**	**Max**	**Unit**
Data Rate, Each Lane	B	-	25.78125	-	Gbps
Supported Link Length on 9/125μm SMF	L	-	40	-	km
Data Differential Input Voltage(at 1 MHz)	$V_{in,\ pp}$	-	-	900	mV
Common mode Voltage	V_{cm}	-350	-	2850	mV
Transition time(20%~80%)	Tr/Tf	10	-	-	ps
Transmitter Optical Characteristics					
Parameter	**Symbol**	**Min**	**Typ**	**Max**	**Unit**
Average Launch Power, each Lane	$P_{O,\ AVG}$	0	-	6.5	dBm
Optical Modulation Amplitude(OMA), each Lane	$P_{O,OMA}$	0	-	6.5	dBm
Total Average Launch Power	$P_{O,\ Total}$	-	-	12.5	dBm
Difference in Launch Power between any two lanes(OMA)	$P_{tx,\ diff}$	-	-	3	dB
Center Wavelength	λ_C	1294.53	1295.56	1296.59	nm
		1299.02	1300.05	1301.09	
		1303.54	1304.58	1305.63	
		1308.09	1309.14	1310.19	
Side Mode Suppression Ratio	SMSR	30	-	-	dB
Extinction Ratio	ER	4.5	-	-	dB
Transmitter Eye Mask Definition(hit ratio<$5E^{-5}$)	-	{0.25, 0.4, 0.45, 0.25, 0.28, 0.4}			%
Relative Intensity Noise	RIN	-	-	-130	dB/Hz
Optical Return Loss Tolerance	TOL	-	-	20	dB
Transmitter Reflectance	R_T	-	-	-26	dB
Average Launch Power of OFF Transmitter, each Lane	-	-	-	-30	dBm

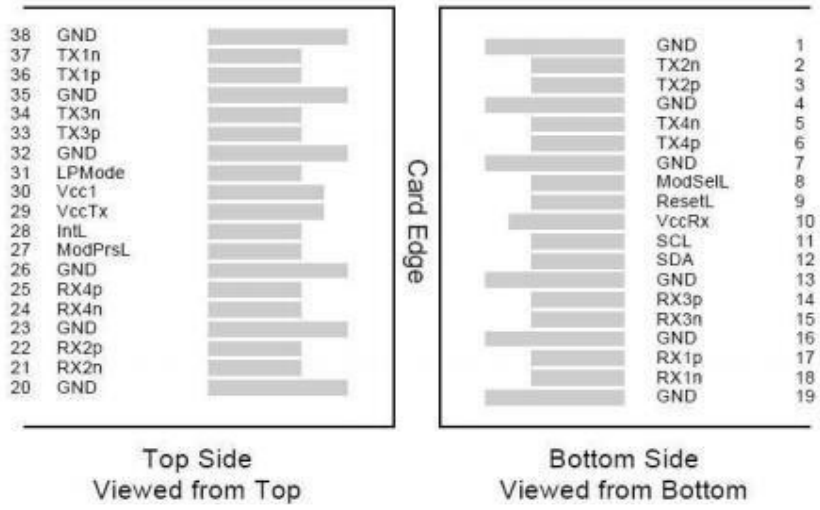
Receiver Electrical Characteristics					
Parameter	**Symbol**	**Min**	**Typ**	**Max**	**Unit**
Data Differential Output Voltage	$V_{out, pp}$	-	-	900	mV
Common mode Noise, RMS	V_{rms}	-	-	17.5	mV
Eye width	EW15-	0.57	-	-	UI
Eye height	EH15-	228	-	-	mV
Differential Termination Resistance Mismatch	-	-	-	10	%
Transition time(20%~80%)	Tr/Tf	12	-	-	ps
Receiver Optical Characteristics					
Parameter	**Symbol**	**Min**	**Typ**	**Max**	**Unit**
Damage Threshold, each Lane	THd	-2.5	-	-	dBm
Average receive power, each Lane	P_{in}	-23	-	-3.5	dBm
Center Wavelength	λ_C	1294.53	1295.56	1296.59	nm
		1299.02	1300.05	1301.09	
		1303.54	1304.58	1305.63	
		1308.09	1309.14	1310.19	
*Receiver Sensitivity(OMA), each Lane	$P_{S,OMA}$	-	-	-16	dBm
Signal Detect-Asserted	P_A	-30	-	-	dBm
Signal Detect-Deasserted	P_D	-	-	-22	dBm.
Signal Detect-Hysteresis	P_A-P_D	0.5	-	-	dB

*Measured with a PRBS 2^{31}-1 test pattern @25.78125 Gbps, BER≤10^{-12}.

Digital Diagnostic Accuracy

Parameter	Typical Value	Note
Transceiver Temperature	± 3ºC	T_{OP-min} ~T_{OP-max}
Power Supply Voltage	± 3%	V_{CC}
TX Bias Current	± 10%	
TX Optical Power	± 3dB	$P_{O, AVG-min}$ ~ $P_{O, AVG-max}$
RX Optical Power	± 3dB	P_{in-min} ~ P_{in-max}

QSFP+ Transceiver Electrical Pad Layout



Pinout Table

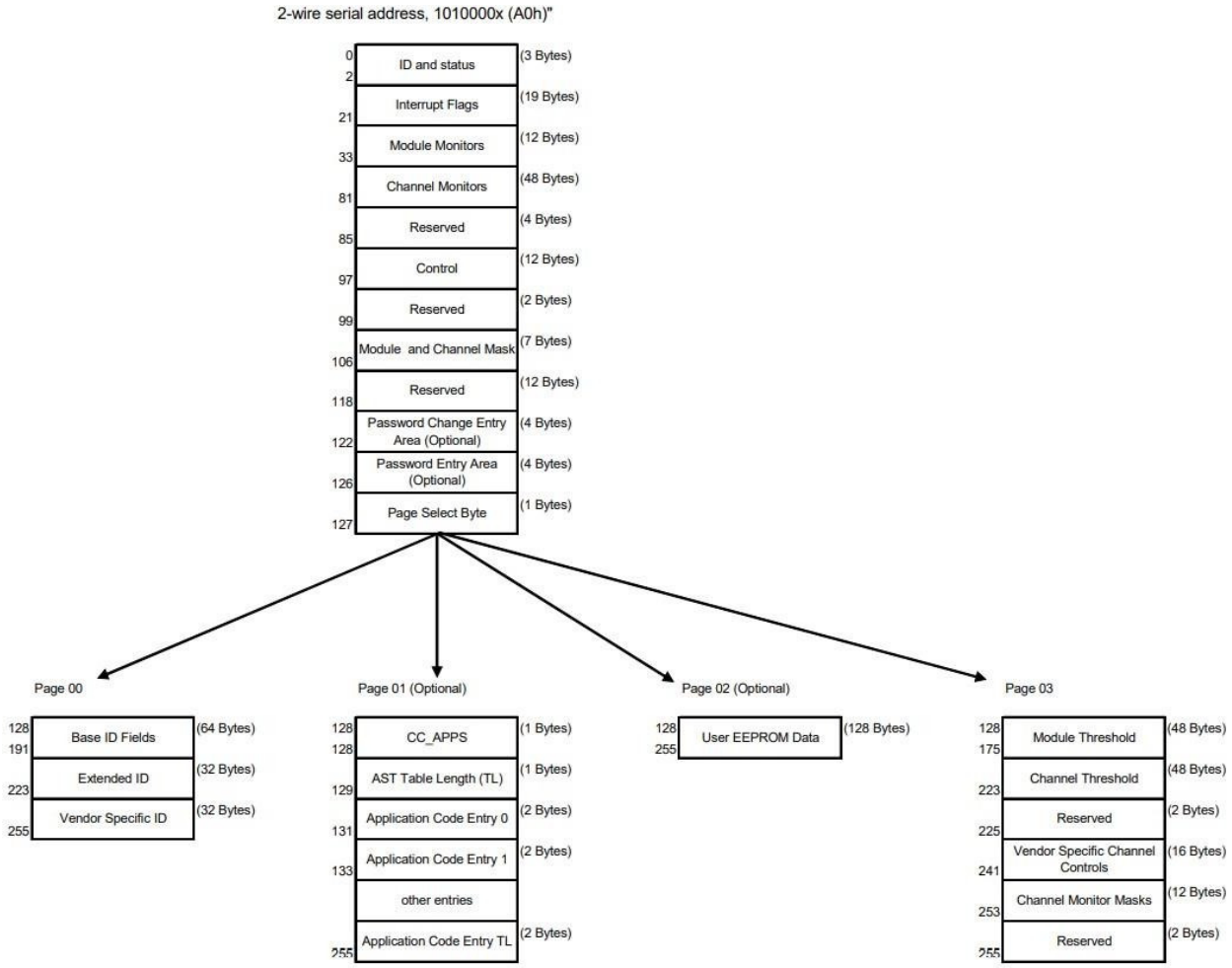
Pin	Symbol	Name/Description	Ref.
1	GND	Ground	1
2	Tx2n	Transmitter Inverted Data Input	
3	Tx2p	Transmitter Non-Inverted Data output	
4	GND	Ground	1
5	Tx4n	Transmitter Inverted Data Input	
6	Tx4p	Transmitter Non-Inverted Data output	
7	GND	Ground	1
8	ModSelL	Module Select	
9	ResetL	Module Reset	
10	VccRx	+3.3V Power Supply Receiver	2
11	SCL	2-Wire Serial Interface Clock	
12	SDA	2-Wire Serial Interface Data	
13	GND	Ground	
14	Rx3p	Receiver Non-Inverted Data Output	
15	Rx3n	Receiver Inverted Data Output	
16	GND	Ground	1
17	Rx1p	Receiver Non-Inverted Data Output	

18	Rx1n	Receiver Inverted Data Output	
19	GND	Ground	1
20	GND	Ground	1
21	Rx2n	Receiver Inverted Data Output	
22	Rx2p	Receiver Non-Inverted Data Output	
23	GND	Ground	1
24	Rx4n	Receiver Inverted Data Output	1
25	Rx4p	Receiver Non-Inverted Data Output	
26	GND	Ground	1
27	ModPrsL	Module Present	
28	IntL/Rx_LOS	Interrupt/Rx_LOS	
29	VccTx	+3.3 V Power Supply transmitter	2
30	Vcc1	+3.3 V Power Supply	2
31	LPMode/TxDIS	Low Power Mode/Tx_Disable	
32	GND	Ground	1
33	Tx3p	Transmitter Non-Inverted Data Input	
34	Tx3n	Transmitter Inverted Data Output	
35	GND	Ground	1
36	Tx 1p	Transmitter Non-Inverted Data Input	
37	Tx 1n	Transmitter Inverted Data Output	
38	GND	Ground	1

Notes:

1. Module ground pins GND are isolated from the module case and chassis ground within the module.
2. Vcc Rx, Vcc1 and Vcc Tx are the receiver and transmitter power supplies and shall be applied concurrently. Vcc Rx Vcc1 and Vcc Tx may be internally connected within the QSFP+ module in any combination.

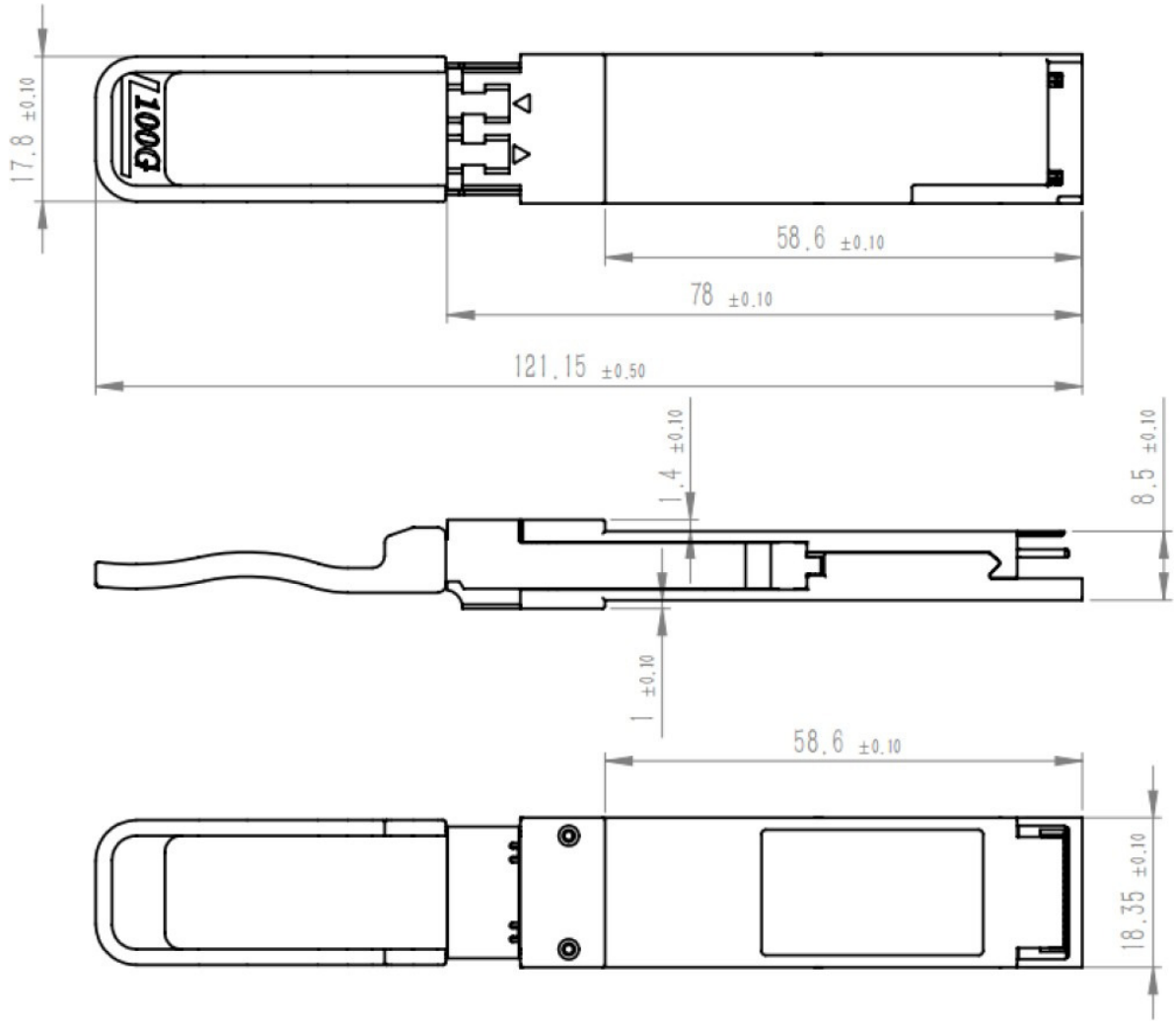
Memory Map


2-wire serial address, 1010000x (A0h)"
0
ID and status
(3 Bytes)
2
Interrupt Flags
(19 Bytes)
21
Module Monitors
(12 Bytes)
33
Channel Monitors
(48 Bytes)
81
Reserved
(4 Bytes)
85
Control
(12 Bytes)
97
Reserved
(2 Bytes)
99
Module and Channel Mask
(7 Bytes)
106
Reserved
(12 Bytes)
118
Password Change Entry Area (Optional)
(4 Bytes)
122
Password Entry Area (Optional)
(4 Bytes)
126
Page Select Byte
(1 Bytes)
127
Page 00
128
Base ID Fields
(64 Bytes)
191
Extended ID
(32 Bytes)
223
Vendor Specific ID
(32 Bytes)
255
Page 01 (Optional)
128
CC_APPS
(1 Bytes)
128
AST Table Length (TL)
(1 Bytes)
129
Application Code Entry 0
(2 Bytes)
131
Application Code Entry 1
(2 Bytes)
133
other entries
Application Code Entry TL
(2 Bytes)
255
Page 02 (Optional)
128
User EEPROM Data
(128 Bytes)
255
Page 03
128
Module Threshold
(48 Bytes)
175
Channel Threshold
(48 Bytes)
223
Reserved
(2 Bytes)
225
Vendor Specific Channel Controls
(16 Bytes)
241
Channel Monitor Masks
(12 Bytes)
253
Reserved
(2 Bytes)
255

Package Outline Drawing

LC Type (SQ Series)

DIMENSIONS ARE IN MILLIMETERS (unit:mm)



Eye Safety

The transceiver is a class 1 laser product. It complies with EN60825-1:2014/A11:2021 and FDA 21 CFR 1040.10 and 1040.11. In order to meet laser safety requirements the transceiver shall be operated within the Absolute Maximum Ratings.

Caution

All adjustments have been done at the factory before the shipment of the devices. No maintenance and user serviceable part is required. Tampering with and modifying the performance of the device will result in voided product warranty.