

SO-QSFP28-ER4

QSFP28, 100GBase, 1310nm, SM, DDM, 25km, LC

OVERVIEW

The SO-QSFP28-ER4 is a 103 Gbps transceiver module designed for optical communication applications compliant to 100GBASE-LR4 of the IEEE P802.3ba standard. The module converts 4 input channels of 25 Gbps electrical data to 4 channels of LAN WDM optical signals and then multiplexes them into a single channel for 103 Gbps optical transmission. Reversely on the receiver side, the module de-multiplexes a 103 Gbps optical input into 4 channels of LAN WDM optical signals and then converts them to 4 output channels of electrical data. The central wavelengths of the 4 LAN WDM channels are 1295.56, 1300.05, 1304.58 and 1309.14 nm as members of the LAN WDM wavelength grid defined in IEEE 802.3ba. The high performance cooled LAN WDM EA-DFB transmitters and high sensitivity APD receivers provide superior performance for 100G applications up to 25km links and compliant to optical interface with IEEE802.3ba Clause 88 100GBASE-LR4. The product is designed with form factor, optical/electrical connection and digital diagnostic interface according to the QSFP+ Multi-Source Agreement (MSA).

PRODUCT FEATURES

- Hot pluggable QSFP28 MSA form factor
- Supports 103 Gbps
- Up to 25km reach for G.652 SMF
- Single +3.3V power supply
- Operating case temperature: 0~70°C
Transmitter: cooled 4x25 Gbps LAN WDM EML TOSA (1295.56, 1300.05, 1304.58, 1309.14nm)
- Receiver: 4x25 Gbps APD ROSA
- 4x25G Electrical Serial Interface
- Maximum power consumption 4.5W
- RoHS-6 compliant (lead-free)
- Duplex LC receptacle
- I²C interface with integrated Digital Diagnostic Monitoring

APPLICATIONS

- 100GBASE-ER4 Ethernet links

ORDERING INFORMATION

Part Number	Description
SO-QSFP28-ER4	QSFP28, 100GBase, 1310nm, SM, DDM, 25km, LC

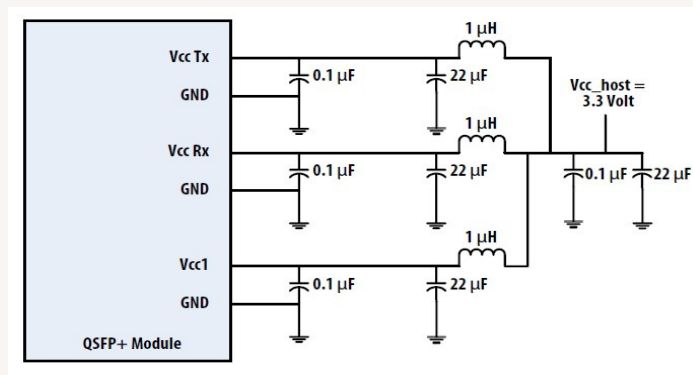
ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Min	Max	Unit
Storage Temperature	T_s	-40	+85	degC
Operating Case Temperature	TOP	0	70	degC
Power Supply Voltage	Vcc	-0.5	3.6	V
Relative Humidity (non-condensation)	RH	5	85	%

RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	Min	Typ	Max	Unit
Operating Case Temperature	TOP	0		70	degC
Power Supply Voltage	Vcc	3.135	3.3	3.465	V
Data Rate, each Lane			25.78125 / 27.95		Gb/s
Control Input Voltage High		2		Vcc	V
Control Input Voltage Low		0		0.8	V
Link Distance with G.652	D			10	km

RECOMMENDED POWER SUPPLY FILTER



ELECTRICAL CHARACTERISTICS

Parameter	Symbol	Min	Typ	Max	Unit
Power Consumption		-		4.5	W
Supply Current	I_{cc}			1.21	A

ELECTRICAL CHARACTERISTICS – TRANSMITTER (EACH LANE)

Parameter	Symbol	Min	Typ	Max	Unit
Differential Input Voltage Swing	$V_{in,pp}$	150		1200	mVpp
Differential Input Impedance	Z_{in}	85	100	115	Ω

ELECTRICAL CHARACTERISTICS – RECEIVER

Parameter	Symbol	Min	Typ	Max	Unit
Differential Output Voltage Swing	$V_{out,pp}$	200		1100	mVpp
Differential Output Impedance	Z_{out}	85	100	115	ohm

OPTICAL CHARACTERISTICS

Parameter	Symbol	Min	Typ	Max	Unit
Lane Wavelength	L_0	1294.53	1295.56	1296.59	nm
	L_1	1299.02	1300.05	1301.09	nm
	L_2	1303.54	1304.58	1305.63	nm
	L_3	1308.09	1309.14	1310.19	nm

OPTICAL CHARACTERISTICS – TRANSMITTER – 100GBASE-LR4 OPERATION

Parameter	Symbol	Min	Typ	Max	Unit	Notes
Signaling Speed per Lane	BR		25.78		Gbps	
Side-mode Suppression Ratio	$SMSR$	30			dB	
Total Average Launch Power	P_T			10.5	dBm	
Average Launch Power (each Lane)	P_{AVG}	-2.9		4.5	dBm	
Optical Modulation Amplitude (each Lane)	$POMA$	0.1		4.5	dBm	1
Extinction Ratio	ER	7			dB	
Optical Return Loss Tolerance	TOL			20	dB	
Eye Mask (X1, X2, X3, Y1, Y2, Y3)		IEEE 802.3 Clause 88 100GBase-LR4				
Average Launch Power OFF (each Lane)	P_{off}			-30	dBm	

Note: Transmitter optical characteristics are measured with a single mode fiber.

OPTICAL CHARACTERISTICS – RECEIVER – 100GBASE-LR4 OPERATION

Parameter	Symbol	Min	Typ	Max	Unit	Notes
Signaling Speed per Lane	BR		25.78		Gbps	
Damage threshold		-3.0			dBm	
Average Receive Power, each Lane		-16.9		-4.9	dBm	@30km
Average Receive Power, each Lane		-20.9		-4.9	dBm	@40km
Receive Power (OMA) (each Lane)				-1.9	dBm	
Stressed Receiver Sensitivity (OMA), each Lane	$SEN1$			-12.65	dBm	
Receiver Sensitivity (OMA), each Lane				-14.65		
Stressed Receiver Sensitivity (OMA), each Lane	$SEN2$			-16.65	dBm	With FEC 5x10-5
Receiver Sensitivity (OMA), each Lane				-18.65		With FEC 5x10-5
LOS Assert	$LOSA$		-26		dBm	
LOS Deassert	$LOSD$		-24		dBm	
LOS Hysteresis	$LOSH$	0.5			dB	

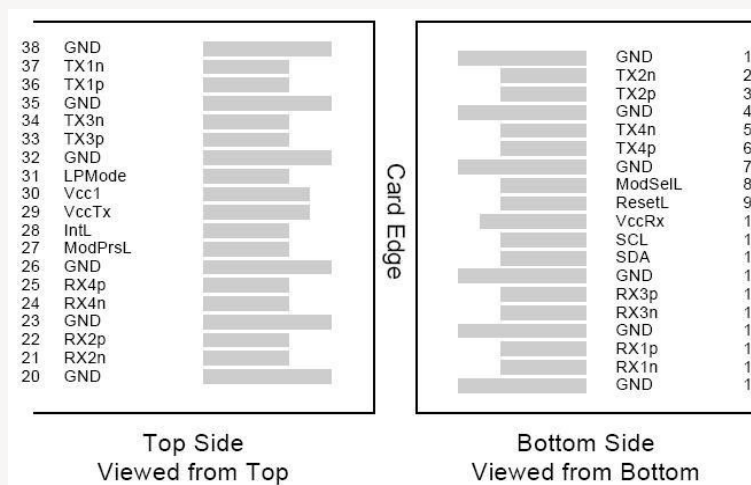
DIGITAL DIAGNOSTIC FUNCTIONS

The following digital diagnostic characteristics are defined over the normal operating conditions unless otherwise specified.

Parameter	Symbol	Min	Typ	Max	Unit	Notes
Temperature monitor absolute error	DMI_{TEMP}	-3		3	deg. C	Over operating temperature range
Supply voltage monitor absolute error	DMI_{VCC}	-0.1		0.1	V	Over Full operating range
Channel RX power monitor absolute error	DMI_{RX_CH}	-2		2	dB	1
Channel Bias current monitor	DMI_{bias_CH}	-10%		10%	mA	
Channel TX power monitor absolute error	DMI_{TX_CH}	-2		2	dB	1

PIN ASSIGNMENT AND FUNCTION DEFINITIONS

PIN ASSIGNMENT



PIN DEFINITION

PIN	Signal Name	Description	PIN	Signal Name	Description
1	GND	Ground (1)	20	GND	Ground (1)
2	Tx2n	CML-I Transmitter 2 Inverted Data Input	21	Rx2n	CML-O Receiver 2 Inverted Data Output
3	Tx2p	CML-I Transmitter 2 Non-Inverted Data Input	22	Rx2p	CML-O Receiver 2 Non-Inverted Data Output
4	GND	Ground (1)	23	GND	Ground (1)
5	Tx4n	CML-I Transmitter 4 Inverted Data Input	24	Rx4n	CML-O Receiver 4 Inverted Data Output
6	Tx4p	CML-I Transmitter 4 Non-Inverted Data Input	25	Rx4p	CML-O Receiver 4 Non-Inverted Data Output
7	GND	Ground (1)	26	GND	Ground (1)
8	ModSelL	LVTTLL-I Module Select	27	ModPrsL	Module Present
9	ResetL	LVTTLL-I Module Reset	28	IntL	Interrupt
10	VccRx	+3.3V Power Supply Receiver (2)	29	VccTx	+3.3V Power Supply Transmitter (2)
11	SCL	LVCMOS-I/O 2-Wire Serial Interface Clock	30	Vcc1	+3.3V Power Supply
12	SDA	LVCMOS-I/O 2-Wire Serial Interface Data	31	LPMODE	LVTTLL-I Low Power Mode
13	GND	Ground (1)	32	GND	Ground (1)
14	Rx3p	CML-O Receiver 3 Non-Inverted Data Output	33	Tx3p	CML-I Transmitter 3 Non-Inverted Data Input
15	Rx3n	CML-O Receiver 3 Inverted Data Output	34	Tx3n	CML-I Transmitter 3 Inverted Data Input

Subject to change without notice.

For more information, visit smaroptics.com.

16	GND	Ground (1)	35	GND	Ground (1)
17	Rx1p	CML-O Receiver 1 Non-Inverted Data Output	36	Tx1p	CML-I Transmitter 1 Non-Inverted Data Input
18	Rx1n	CML-O Receiver 1 Inverted Data Output	37	Tx1n	CML-I Transmitter 1 Inverted Data Input
19	GND	Ground (1)	38	GND	Ground (1)

Notes:

1. All Ground (GND) are common within the QSFP+ module and all module voltages are referenced to this potential unless noted otherwise. Connect these directly to the host board signal common ground plane.
2. V_{ccRx} , V_{cc1} and V_{ccTx} are the receiving and transmission power suppliers and shall be applied concurrently. The connector pins are each rated for a maximum current of 500mA.

MECHANICAL DRAWING

