



TOPSTAR TECHNOLOGY INDUSTRIAL CO., LIMITED

# 产 品 规 格 书

## *Product Specification Sheet*

**TOP-QSFP28-100G-LR4**

**100G QSFP28 LR4 10km Transceiver**



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## 1.Features

- Compliant to IEEE 802.3ba and 100GBASE-LR4 standard.
- QSFP28 MSA compliant.
- Up to 25Gbps data rate per wavelength.
- Up to 10km transmission on single mode fiber (SMF).
- Operating case temperature : 0~70 C.
- Maximum 4.0W operation power
- LC duplex connector.
- RoHS-6 compliant.

## 2.Applications

100GBASE-LR4 Ethernet Links  
Infiniband QDR and DDR interconnects  
Client-side 100G Telecom connections

## 3.Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Unit	Note
Storage Temperature	Tst	-40	85	degC	
Relative Humidity (non-condensation)	RH	0	85	%	
Operating Case Temperature	Topc	0	70	degC	
Damage Threshold, each Lane	THd	5.5		dBm	
Supply Voltage	VCC	-0.5	3.6	V	

## 4.Recommended Operating Environment

Parameter	Symbol	Min	Typ.	Max	Unit
Operating Case Temperature	T <sub>OP</sub>	0		70	degC
Power Supply Voltage	V <sub>CC</sub>	3.14	3.30	3.47	V
Data Rate, each Lane			25.78125		Gb/s
Control Input Voltage High		2		V <sub>cc</sub>	V
Control Input Voltage Low		0		0.8	V
Link Distance with G.652	D	0.002		10	Km



### 5. Electrical Characteristics

Parameter	Symbol	Min.	Typ.	Max	Unit	Notes
Power Consumption				4.0	W	
Supply Current	I <sub>cc</sub>			1.21	A	
Power-on Initialization Time				2000	ms	1
Transmitter (each Lane)						
Single-ended Input Voltage Tolerance (Note 2)		-0.3		4	V	Referred to TP1 signal common
AC Common Mode Input Voltage Tolerance		15			mV	RMS
Differential Input Voltage Swing Threshold		50			mV <sub>pp</sub>	LOSA Threshold
Differential Input Impedance	Z <sub>in</sub>	90	100	110	ohm	
Differential Input Swing	V <sub>in, pp</sub>	190		700	mV <sub>pp</sub>	

Receiver (each Lane)						
Parameter	Symbol	Min.	Typ.	Max	Unit	Notes
Single-ended Output Voltage		-0.3		4.0	V	Referred to signal common
AC Common Mode Output Voltage				7.5	mV	RMS
Differential Output Impedance	Z <sub>out</sub>	90	100	110	ohm	
Differential Output Voltage Swing	V <sub>out, pp</sub>	300		850	mV <sub>pp</sub>	

**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. The single ended input voltage tolerance is the allowable range of the instantaneous input signals.



## 6. Optical Parameters

Parameter	Symbol	Min.	Typ.	Max	Unit	Notes
Wavelength Assignment	L0	1294.5 3	1295.5 6	1296.5 9	nm	
	L1	1299.0 2	1300.0 5	1301.0 9	nm	
	L2	1303.5 4	1304.5 8	1305.6 3	nm	
	L3	1308.0 9	1309.1 4	1310.1 9	nm	
<b>Transmitter</b>						
Side-mode Suppression Ratio	SMSR	30			dB	
Total Average Launch Power	P <sub>T</sub>			10.5	dBm	
Average Launch Power, each Lane	P <sub>AVG</sub>	-4.3		4.5	dBm	
Optical Modulation Amplitude, each Lane	P <sub>OMA</sub>	-1.3		4.5	dBm	1
Difference in Launch Power between any two Lanes (OMA)	P <sub>tx,diff</sub>			5	dB	
Launch Power in OMA minus Transmitter and Dispersion Penalty (TDP), each Lane		-2.3			dBm	
TDP, each Lane	TDP			2.2	dB	
Extinction Ratio	ER	4			dB	
Relative Intensity Noise	RIN			-130	dB/Hz	
Optical Return Loss Tolerance	TOL			20	dB	
Transmitter Reflectance	R <sub>T</sub>			-12	dB	
Transmitter Eye Mask Definition {X1, X2, X3, Y1, Y2, Y3}		{0.25,0.4,0.45,0.25,0.28,0.4}				
Average Launch Power OFF Transmitter, each Lane	P <sub>off</sub>			-30	dBm	



Parameter	Symbol	Min.	Typ.	Max	Unit	Notes
<b>Receiver</b>						
Damage Threshold, each Lane	TH <sub>d</sub>	5.5			dBm	2
Total Average Receive Power				10.5	dBm	
Average Power at Receiver Input, each Lane		-10.6		4.5	dBm	
Receiver Power (OMA), each Lane				4.5	dBm	
Stressed Receiver Sensitivity in OMA, each Lane				-6.8	dBm	3
Receiver Sensitivity, each Lane	SEN			-8.6	dBm	
Difference in Receive Power between any two Lanes (OMA)	P <sub>rx, diff</sub>			5.5	dB	
LOS Assert	LOSA		-18		dBm	
LOS Deassert	LOSD		-15		dBm	
LOS Hysteresis	LOSH	0.5			dB	
Receive Electrical 3 dB upper Cutoff Frequency, each Lane	F <sub>c</sub>			31	GHz	
<b>Conditions of Stress Receiver Sensitivity Test (Note 4)</b>						
Vertical Eye Closure Penalty, each Lane			1.8		dB	
Stressed Eye J2 Jitter, each Lane			0.3		UI	
Stressed Eye J9 Jitter, each Lane			0.47		UI	

**Notes:**

1. Even if the TDP < 1 dB, the OMA min must exceed the minimum value specified here.
2. 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.



3. Measured with conformance test signal at receiver input for BER =  $1 \times 10^{-12}$ .
4. Vertical eye closure penalty and stressed eye jitter are test conditions for measuring stressed receiver sensitivity. They are not characteristics of the receiver.

## 7. Digital Diagnostic Monitor Characteristics

The following digital diagnostic characteristics are defined over the Recommended Operating Environment unless otherwise specified. It is compliant to SFF8636 v2.4 with internal calibration mode.

Parameter	Symbol	Min.	Max.	Unit
Temperature monitor absolute error	DMI_Temp	-3	3	degC
Laser power monitor absolute error	DMI_TX	-3	3	dB
RX power monitor absolute error	DMI_RX	-3	3	dB
Supply voltage monitor absolute error	DMI_VCC	-0.08	0.08	V
Bias current monitor	DMI_Ibias	-10%	10%	mA

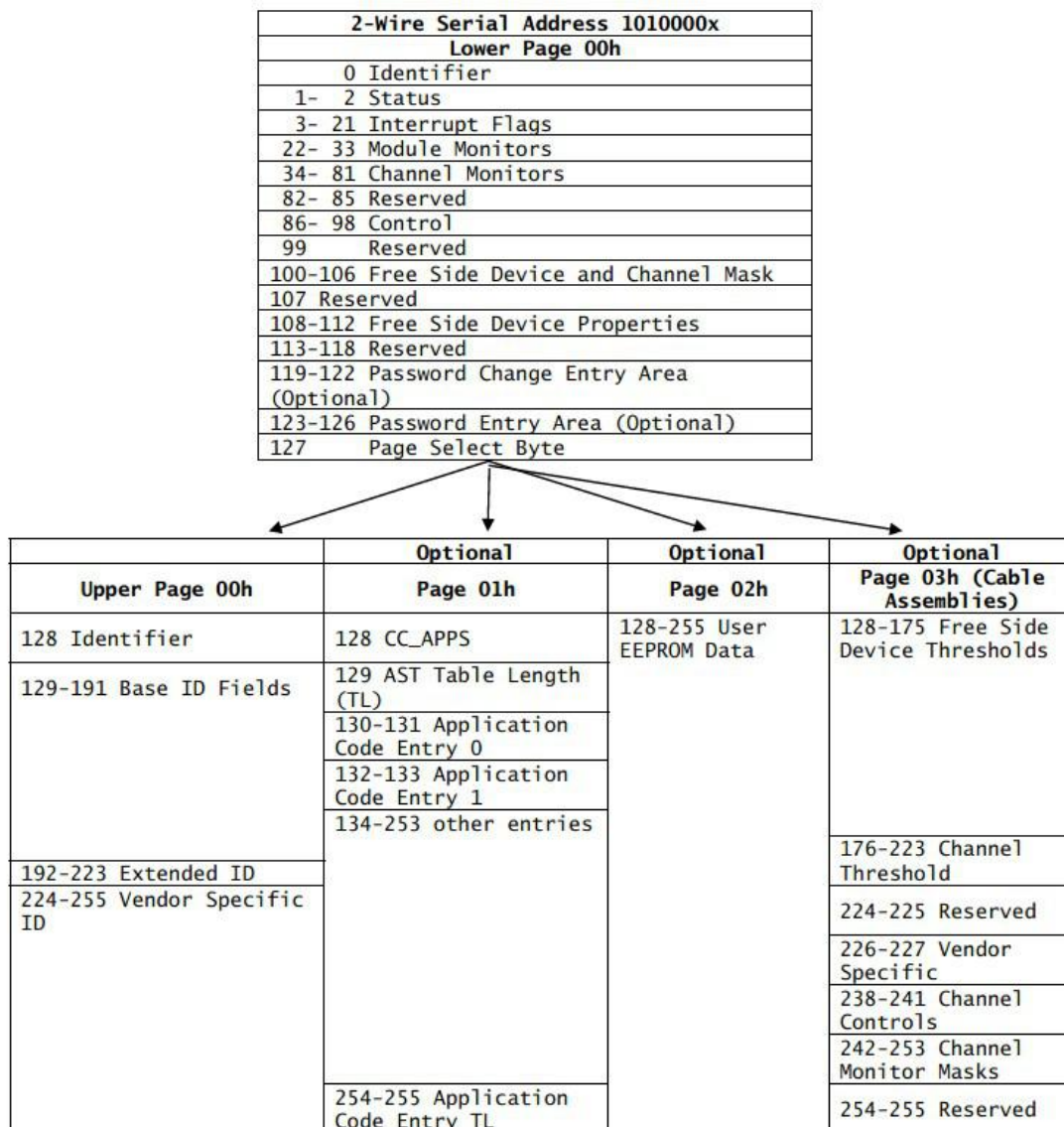
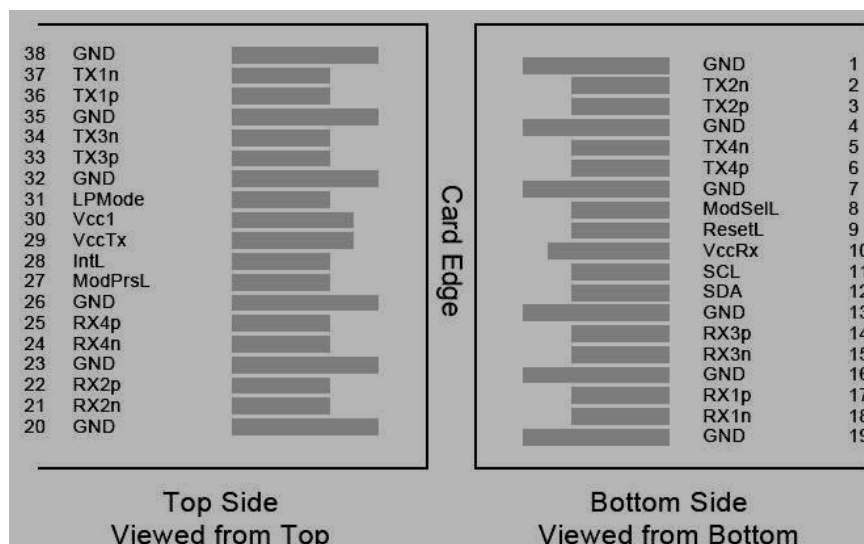


FIGURE 6-1 COMMON MEMORY MAP



## 8.Pin Assignment



## 9.Pin Description

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	LVTLL-I	ModSelL	Module Select	
9	LVTLL-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
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

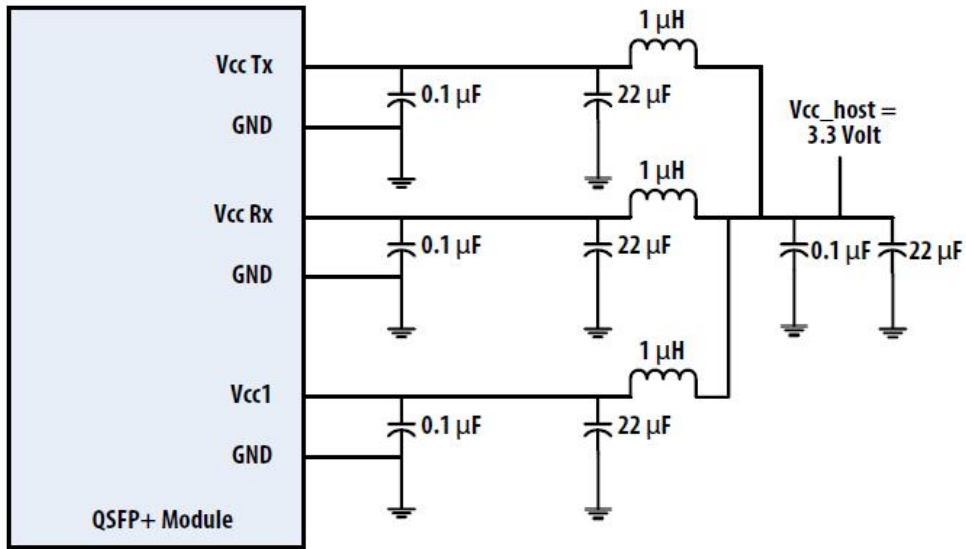
**Notes:**

1. GND is the symbol for signal and supply (power) common for the QSFP28 module. All are common within the 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 receiving and transmission power suppliers and shall be applied concurrently. Recommended host board power supply filtering is shown in Figure 3 below. Vcc Rx, Vcc1 and Vcc Tx may be internally connected within the module in any combination. The connector pins are each rated for a maximum current of 1000mA.

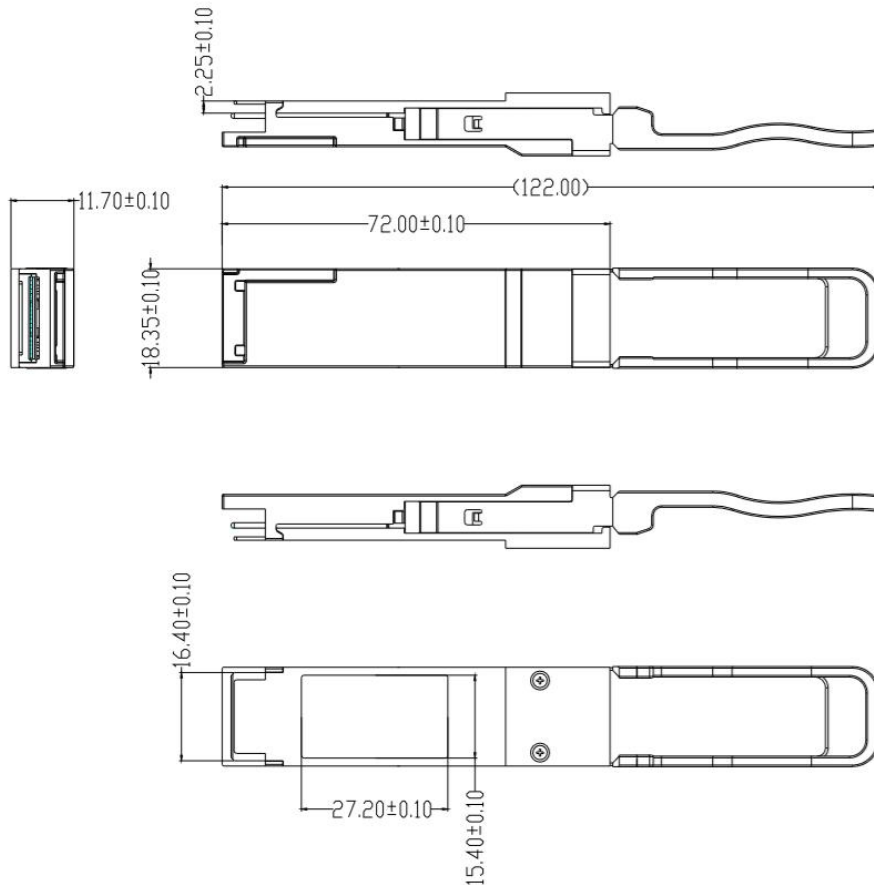




### 10.Recommended Power Interface Circuit



### 11.Mechanical Dimensions





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