

QSFP28 100G Duplex LWDM4 40km LC

Q13L2E-IN

FEATURES

- Compliant to Ethernet 100GBASE-ER4
- Supports 103.125Gb/s aggregate bit rate
- Transmitter: cooled 4x25Gb/s LAN WDM TOSA (1295.56, 1300.05, 1304.58,1309.14nm)
- Receiver: 4x25Gb/s APD ROSA
- Up to 40km reach for G.652 SMF
- Built-in 4-channel Clock and Data Recovery (CDR) in TX and RX
- Duplex LC optical receptacle
- 4x25G electrical interface (OIF CEI-28G-VSR)
- RoHS-10 compliant and lead-free
- Single +3.3V power supply
- Maximum power consumption 4.5W
- Case operating temperature Industrial: -40 ~ 85°C

Applications

- 100GBASE-ER4 Ethernet Links
- Infiniband QDR and DDR interconnects
- Client-side 100G Telecom connections

ORDERING INFORMATION

Part Number	Form Factor	Data Rate (Gbps)	Media	Distance (km)	Wavelength (nm)	Temperature (°C)
TQ13L2E-IN	QSFP28	103.125	SMF	40	1310	-40~85

1 ABSOLUTE MAXIMUM PARAMETERS

Exceeding the limits below may damage the active optical cable permanently.

Parameter	Symbol	Min.	Max.	Unit.
Storage Temperature Range	Ts	-40	85	°C
Relative Humidity	RH	0	85	%
Maximum Supply Voltage	Vcc	-0.5	4.0	V
Damage Threshold	THd	-3.0		dBm

2 . RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	Min.	Typ.	Max.	Unit.
Operating Case Temperature Range	Tc	-40		85	°C
Power Supply Voltage	Vcc	3.14	3.3	3.46	V
Bit Rate	BR			103.125	GBd
Bit Error Ratio	BER			1E-12	
Max Supported Link Length	L			40	Km

3 . ELECTRICAL CHARACTERISTICS

Electrical transmitter Characteristics						
Parameter	Symbol	Min.	Typ.	Max.	Unit.	Notes
Power Consumption	P			4.5	W	
Supply Current	Icc			1360	mA	
Transmitter(each lane)						
Input Differential Impedance	Rin		100		Ω	
Differential Termination Mismatch				10	%	
Differential Data Input Amplitude	Vin,pp	180		1000	mV	
LPMode, Reset and ModSell	VIL	-0.3		0.8	V	
	VIH	2		Vcc+0.3	V	
Receiver						
Differential Data Output Amplitude	Vout, pp	350		900	mV	

Differential Termination Mismatch				10	%	
Transition Time, 20 to 80%		9.5			ps	
ModPrsL and IntL	VOL	0		0.4	V	
	VOH	Vcc-0.5		Vcc+0.3	V	

4 . OPTICAL CHARACTERISTICS

Optical transmitter Characteristics						
Parameter	Symbol	Min.	Typ.	Max.	Unit.	Notes
Signaling Speed Per Channel			25.78125		GBd	
Lane Wavelength (range)	L0	1294.53	/	1296.59	nm	
	L1	1299.02	/	1301.09		
	L2	1303.54	/	1305.63		
	L3	1308.09	/	1310.19		
Total Average Launch Power	Pout			10.5	dBm	
Transmit OMA Per Lane	Tx _{OMA}	0.1		4.5	dBm	
Average Launch Power Per Lane	TXPx	-2.9		4.5	dBm	
Optical Extinction Ratio	ER	4			dB	
Side-Mode Suppression Ratio (SMSR)	SMSR	30			dB	
Difference in Launch Power between any Two Lanes (OMA)	Ptx,diff			3.6	dB	
Transmitter and Dispersion Penalty, each lane	TDP			2.5	dB	
OMA minus TDP, each lane		-0.65			dBm	
Relative Intensity Noise	RIN			-130	dB/Hz	
Average launch power of OFF Transmitter, Each lane	Poff			-30	dBm	
Transmitter Reflectance				-12	dB	
Optical Return Loss Tolerance	ORLT			20	dB	
Transmitter Eye Mask Definition {X1,X2,X3, Y1,Y2,Y3}		{0.25,0.4,0.45,0.25,0.28,0.4}				
Optical Receiver Characteristics						
Parameter	Symbol	Min.	Typ.	Max.	Unit.	Notes

Signaling Rate, Each lane			25.78125		GBd	
Average Receive Power, Each Lane		-20		-4.9	dBm	
Receive Power (OMA), Each Lane				-4.9	dBm	
Receive Sensitivity (OMA) ,Each Lane	Sen.1			14.65	dBm	BER = 1×10^{-12}
Receiver Sensitivity (OMA), Each Lane	Sen.2			-18.65	dBm	BER = 5×10^{-5}
Receiver Reflectance				-26	dB	
Difference in Receive Power between any Two Lanes (Average and OMA)	Ptx,diff			3.6	GHz	
LOS Assert	LOS_D			-20	dBm	
LOS Deassert	LOS_A	-35			dBm	
LOS Hysteresis	LOS_H	0.5			dB	

5 . DIGITAL DIAGNOSTIC FUNCTIONS

Parameter	Symbol	Min.	Max.	Unit	Range
Temperature Monitor Absolute Error	DMI_Temp	-3	3	°C	0~85°C
Supply Voltage Monitor Absolute Error	DMI_VCC	-3	3	%	0~Vcc
RX Power Monitor Absolute Error	DMI_RX	-3	3	dB	-5~-20dBm
Bias Current Monitor Error	DMI_bias	-10	10	%	0~100mA
TX Power Monitor Absolute Error	DMI_TX	-3	3	dB	-2.9~4.5dBm

6 . PIN DESCRIPTIONS

Pin	Symbol	Description	Notes
1	GND	Ground	
2	Tx2n	Transmitter Inverted Data Input	
3	Tx2p	Transmitter Non-Inverted Data Input	
4	GND	Ground	
5	Tx4n	Transmitter Inverted Data Input	

6	Tx4p	Transmitter Non-Inverted Data Input	
7	GND	Ground	
8	ModSelL	Module Select	
9	ResetL	Module Reset	
10	Vcc Rx	+3.3 V Power supply receiver	
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	
17	Rx1p	Receiver Non-Inverted Data Output	
18	Rx1n	Receiver Inverted Data Output	
19	GND	Ground	
20	GND	Ground	
21	Rx2n	Receiver Inverted Data Output	
22	Rx2p	Receiver Non-Inverted Data Output	
23	GND	Ground	
24	Rx4n	Receiver Inverted Data Output	
25	Rx4p	Receiver Non-Inverted Data Output	
26	GND	Ground	
27	ModPrsL	Module Present	
28	IntL	Interrupt	
29	Vcc Tx	+3.3 V Power supply transmitter	
30	Vcc1	+3.3 V Power Supply	
31	LPMMode	Low Power Mode	
32	GND	Ground	
33	Tx3p	Transmitter Non-Inverted Data Input	
34	Tx3n	Transmitter Inverted Data Input	
35	GND	Ground	
36	Tx1p	Transmitter Non-Inverted Data Input	
37	Tx1n	Transmitter Inverted Data Input	
38	GND	Ground	

