ESP312X-40D(I)

25Gb/s SFP28 ER 40km DDM Transceiver

PRODUCT FEATURES

- **Support data rate up to 25.78125Gb/s**
- **Hot-Pluggable SFP Footprint and Single LC Connector**
- **Up to 10km reach for G.652 SMF**
- **1310nm EML laser and APD receiver**
- **Temperature Range:**
  - **Commercial:0°C ~70°C**
  - **Industrial: -40°C ~85°C**
- **Power consumption**
  - **Commercial:1.5W**
  - **Industrial:1.8W**
- **RoHS 6 compliance**
- **Compliant to IEEE 802.3cc, SFF-8472 and SFF-8419**
- **Complies with EU Directive 2015/863/EU**

APPLICATIONS

- **25GBASE-ER Ethernet**
- **CPRI option 10**

DESCRIPTIONS

The ESP312X-40D(I) is a single-Channel, Pluggable, Fiber-Optic SFP28 for 25 Gigabit Ethernet and Infiniband EDR Applications. It is a high performance module for short-range data communication and interconnect applications which operate at 25.78125 Gbps up to 40km. They are compliant with SFF-8431,SFF-8432. The transmitter converts serial CML electrical data into serial optical data. The receiver converts serial optical data into serial CML electrical data.Digital diagnostics functions are available via a 2-wire serial interface, as specified in SFF-8472.

Ordering Information

Part No.	Data Rate (optical)	Laser	Fiber Type	Distance	Optical Interface	Temp	DDMI	Latch Color
ESP312X-40D	25.78125Gbps	EML	SMF	40km	LC	0~70℃	Y	Red
ESP312X-40DI	25.78125Gbps	EML	SMF	40km	LC	-40~85℃	Y	Red

I.Absolute Maximum Ratings

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Storage Temperature	T_{stg}	-40		+85	°C	
Case Operating Temperature(Commercial)	T_O	0		70	°C	
Case Operating Temperature (Industrial)	T_O	-40		85	°C	
Relative Humidity - Storage	R_{HS}	5		95	%	
Relative Humidity - Operating	R_{HO}	5		85	%	
DC Supply Voltage	V_{CC}	0		3.6	V	

II.Recommended Operating Conditions

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Case Operating Temperature	Top	0	-	70	℃	Commercial
		-40		85		Industrial
Power Supply Voltage	V_{CC}	3.13	3.3	3.47	V	
Transmission Distance	TD	-	-	40	km	Over SMF

III.Electrical Characteristics

High-Speed Signal: Compliant to CEI-25G-VSR

Low-Speed Signal: Compliant to SFF-8419

Parameter		Symbol	Min.	Typical	Max.	Unit	Notes
Transmitter (Module Input)							
Differential Input Resistance		R_R_{din}	90	100	110	Ω	
Input Differential Voltage		R_V_{diff}	-	-	900	mVpp	
Tx_Disable	Normal Operation	V_{IL}	-0.3	-	0.8	V	
	Laser Disable	V_{IH}	2.0	-	V_{CC}+0.3	V	
Receiver (Module Output)							
Differential Resistance		T_R_d	90	100	110	Ohm	
Output Differential Voltage		T_V_{diff}	-	-	900	mVpp	
Differential Termination Resistance Mismatch		T_R_{dm}	-	-	10	%	
Rx los	Normal Operation	V_{OL}	-0.3	-	0.4	V	
	Loss Signal	V_{OH}	2		VCCHOST	V	

IV.Optical and Characteristics

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Transmitter						
Optical Modulation Amplitude(OMA)	POMA	0		6	dBm	
Average Output Power	POUT	-3		6	dBm	
Average Output Power(Laser Off)	POFF			-30	dBm	
Wavelength	λ	1295		1310	nm	
Spectrum Bandwidth @ -20dB	Δλ			1	nm	
Side mode suppression ratio(SMSR)	SMSR	30			dB	
Extinction ratio	ER	4			dB	
Transmitter and dispersion penalty (TDP)				2.7	dB	
$RIN_{20}OMA$	RIN			-130	dB/Hz	
Receiver						
Wavelength	λ	1295		1325	nm	
Received Sensitivity(OMA)	$P_{SEN-OMA}$			-19	dBm	1
Stressed receiver sensitivity (OMA)	$R_{SEN-OMA-stress}$	-	-	-16.5	dBm	1
Optical Power Overload	P_{IN}(SAT)	-4			dBm	
Damage threshold		3			dBm	2
Receiver Reflectance	RFL			-26	dB	
Rx_LOS of Signal Assert	P_A	-35			dBm	
Rx_LOS of Signal De-assert	P_D			-21	dBm	
Rx_LOS of Signal Hysteresis	P_{Hy}	0.5		5	dB	
Optical Return Loss Tolerance	ORLT	20			dB	

Notes:

1. Test pattern: PRBS31. BER<$5x10^{-5}$;
2. The receiver shall be able to tolerate, without damage, continuous exposure to an optical input signal having this average power level. The receiver does not have to operate correctly at this input power.

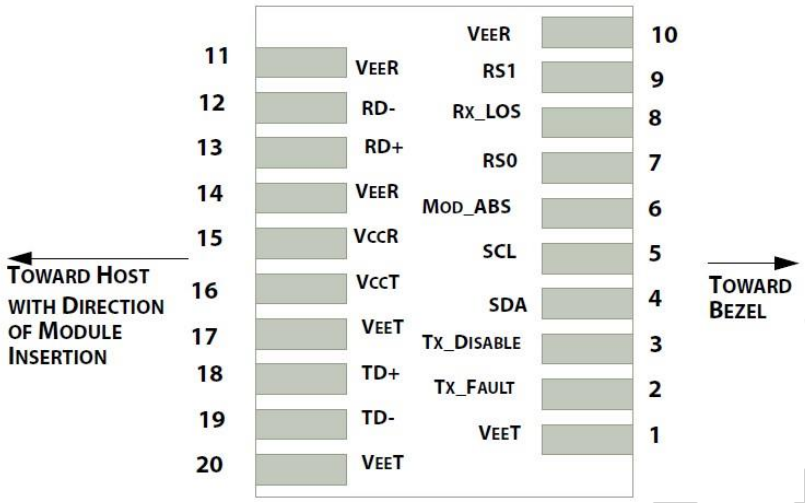
V.Digital Diagnostics

Parameter	Range	Accuracy	Unit	Calibration
Temperature	-40 to 85	±3	ºC	Internal
Voltage	3.13 to 3.47	±3%	V	Internal
Tx Bias Current	0 to 100	±10%	mA	Internal
Tx Output Power	-3 to 6	±3	dB	Internal
Rx Input Power	-21 to 4	±3	dB	Internal

VI.Communication Interface Timing Characteristics

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
TX_Disable Assert Time	t_off			100	us	
TX_Disable Negate Time	t_on			2	ms	
Time to Initialize Include Reset of TX_FAULT	t_int			300	ms	
TX_FAULT from Fault to Assertion	t_fault			100	us	
TX_Disable Time to Start Reset	t_reset	10			us	
Receiver Loss of Signal Assert Time	T_A,RX_LOS			100	us	
Receiver Loss of Signal Deassert Time	T_d,RX_LOS			100	us	
Rate-Select Chage Time	t_ratesel			10	us	

VII.Pin Diagram



VIII.Pin Definitions

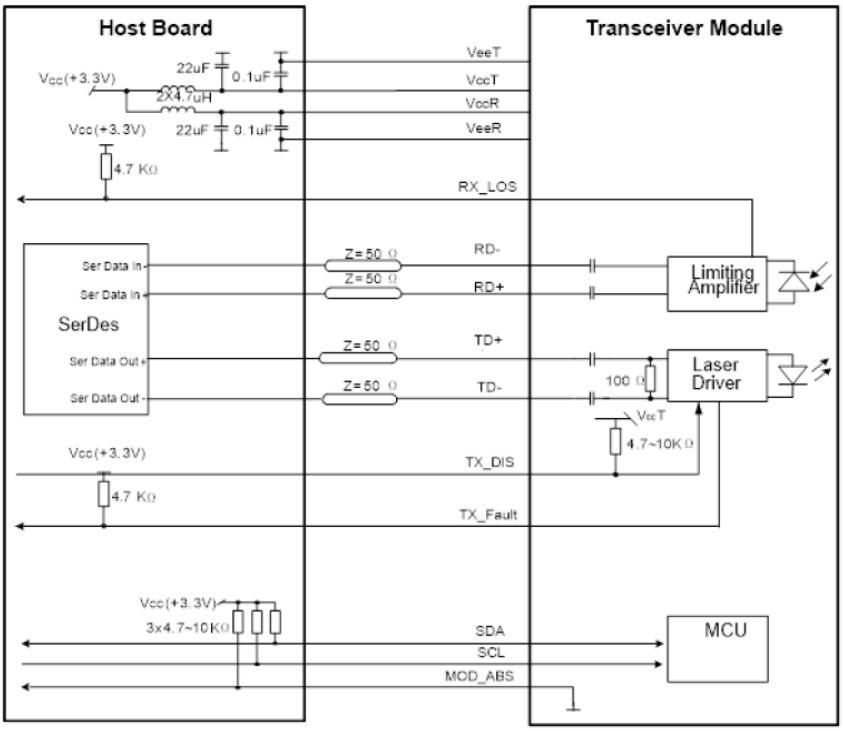
PIN #	Name	Function	Notes
1	VeeT	Transmitter Ground	1
2	Tx Fault	Transmitter Fault - High indicates a fault condition	2
3	Tx Disable	Transmitter Disable – High or open disables the transmitter	
4	SDL	2-wire Serial Interface Data Line (MOD-DEF2)	3
5	SCL	2-wire Serial Interface Clock (MOD-DEF1)	3
6	MOD-ABS	Module Absent, connected to VeeT or VeeR in the module	
7	RS0	Rate Select 0	5
8	RX_LOS	Receiver Loss of Signal(LVTTL-O). Logic 0 indicates normal operation	4
9	RS1	Rate Select 1	1
10	VeeR	Receiver Ground	1
11	VeeR	Receiver Ground	1
12	RD-	Inverse Received Data out (CML-O), AC Coupled	
13	RD+	Receiver Non-inverted DATA out. AC Coupled	
14	VeeR	Receiver Ground	1
15	VccR	Receiver Power Supply	
16	VccT	Transmitter Power Supply	
17	VeeT	Transmitter Ground	1
18	TD+	Transmitter Non-Inverted DATA in. AC Coupled.	
19	TD-	Transmitter Inverted DATA in. AC Coupled.	
20	VeeT	Transmitter Ground	1

Notes:

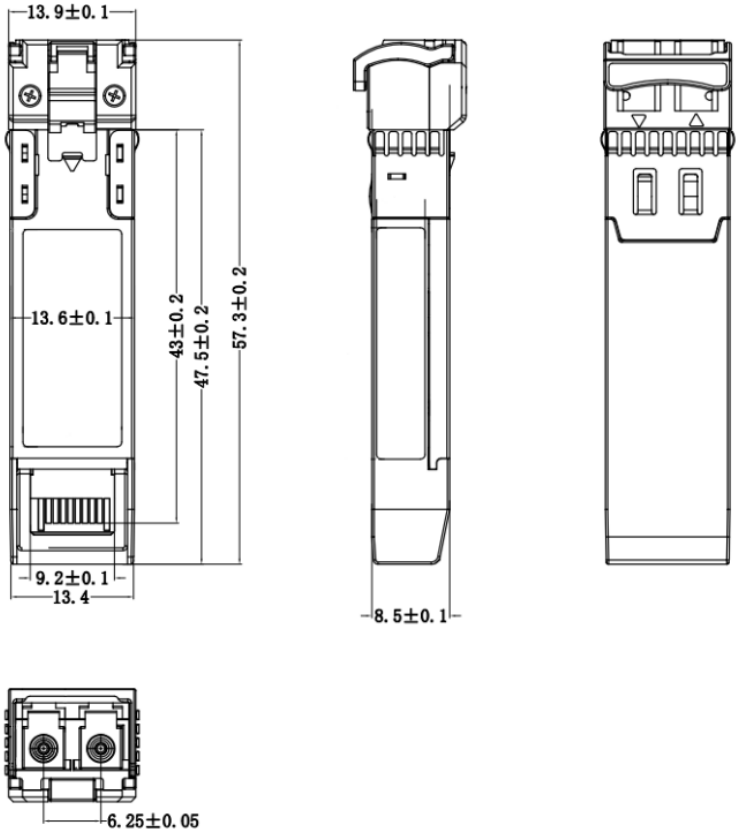
1. Module ground pins GND are isolated from the module case.
2. Tx_Fault is an open collector/drain output, which should be pulled up with a 4.7k – 10k Ohms resistor on Host board.
3. Should be pulled up with 4.7k–10kohms on host board to a voltage between 2.0V and 3.6V.
4. LOS is open collector output. Should be pulled up with 4.7k–10kohms on host board to a voltage between 2.0V and 3.6V.

5. RS0 and RS1 pins are pulled low to GND with a resistor > 30KΩ in module.

IX.Recommended Interface Circuit



X.Mechanical Diagram



XI.Revision History

Version No.	Date	Description
1.0	April,19, 2019	Preliminary datasheet
2.0	November,8,2023	Product upgrades

Company: ETU-Link Technology Co., LTD
Address: Right side of 3rd floor, No. 102 building, Longguan expressway, Dalang street, Longhua District, Shenzhen city, GuangDong Province,China 518109
Tel: +86-755 2328 4603
Addresses and phone number also have been listed at www.etulinktechnology.com.
Please e-mail us at sales@etulinktechnology.com or call us for assistance.