

EB23(32)X6-10D(I)

16Gb/s SFP28 BIDI 10km DDM Transceiver

PRODUCT FEATURES

- Supports up to 14.025Gbps bit rates
- Hot-Pluggable SFP Footprint and Single LC Connector
- Up to 10km reach for G.652 SMF
- 1270nm DFB Transmitter and 1330 PIN receiver for EB23X6-10D(I)
- 1330nm DFB Transmitter and 1270 PIN receiver for EB32 X6-10D(I)
- Temperature Range:
 - Commercial: 0°C ~70°C
 - Industrial: -40°C ~85°C
- Low power consumption:
 - Commercial: <1W
 - Industrial: <1.2W
- Compliant with SFP-8431
- Compliant with SFP-8432
- Compliant with SFP-8472
- Compliant with IEEE802.3cc
- RoHS 6 compliance
- Complies with EU Directive 2015/863/EU



APPLICATIONS

- 14.025G Fiber channel

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The SFP+ 10km module electrical interface is compliant to SFI electrical specifications. The transmitter input and receiver output impedance is 100 Ohms differential. Data lines are internally AC coupled. The module provides differential termination and reduce differential to common mode conversion for quality signal termination and low EMI.

The block diagram illustrates the system architecture. It features a central MCU (Microcontroller Unit) connected to an EEPROM (Electrically Erasable Programmable Read-Only Memory) and an ADC/DAC (Analog-to-Digital Converter/Digital-to-Analog Converter). The MCU is also connected to a Transceiver, which in turn is connected to a Post Amp (Power Amplifier) and a PIN+TIA (Photodiode and Transimpedance Amplifier). The Transceiver is also connected to an LD Driver (Laser Diode Driver) and an LD (Laser Diode). The LD Driver is connected to a BOSA (Balanced Optical Signal Amplifier) and a PIN+TIA. The BOSA is connected to a PIN+TIA. The PIN+TIA is connected to a Vcc (Voltage) and Temp (Temperature) input. The LD Driver is connected to a TD+/- (Transmit Data) and TxFault (Transmit Fault) input. The LD is connected to a TxDis (Transmit Disable) input. The BOSA is connected to a LOS (Loss of Signal) input. The PIN+TIA is connected to an RD+/- (Receive Data) input. The MCU is connected to an SCL (Serial Clock Line) and SDA (Serial Data Line) input. The MCU is also connected to a Vcc (Voltage) and Temp (Temperature) input.

Part No.	Data Rate(optical)	Laser	Fiber Type	Distance	Optical Interface	Temp	DDMI	Latch Color
EB23X6-10D	14.025Gbps	DFB	SMF	10km	LC	0~70℃	Y	Blue
EB23 X6-10DI	14.025Gbps	DFB	SMF	10km	LC	-40~85℃	Y	Blue
EB32X6-10D	14.025Gbps	DFB	SMF	10km	LC	0~70℃	Y	Yellow
EB32X6-10DI	14.025Gbps	DFB	SMF	10km	LC	-40~85℃	Y	Yellow

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Storage Temperature	T _{stg}	-40		+85	°C	1
Case Operating Temperature (Commercial)	T _o	0		+70	°C	
Case Operating Temperature (Industrial)	T _o	-40		+85	°C	

Relative Humidity - Storage	RH _S	5		95	%	1
Relative Humidity - Operating	RH _O	5		85	%	1
DC Supply Voltage	VCC	0		3.6	V	2

Notes:

- Exceeding the Absolute Maximum Ratings may cause irreversible damage to the device.
- The device is not intended to be operated under the condition of simultaneous Absolute Maximum Ratings, a condition which may cause irreversible damage to the device.

Recommended Operating Conditions

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Case Operating Temperature (Commercial)	T _{case}	0		+70	°C	
Case Operating Temperature (Industrial)		-40		+85	°C	
Supply Voltage	VCC	3.13		3.46	V	
Power Supply Current(Commercial)	I _{cc}	-		300	mA	
Power Supply Current(Industrial)				360		

Electrical Characteristics

High-Speed Signal: Compliant to CEI-28G-VSR

Low-Speed Signal: Compliant to SFF-8419

Parameter		Symbol	Min.	Typical	Max.	Unit	Notes
Supply Voltage		V _{CC}	3.135		3.465	V	
Supply Current		I _{CC}			300	mA	Commercial
					360		Industrial
Power Consumption		P			1	W	Commercial
					1.2		Industrial
Transmitter (Module Input)							
Differential Data Input Amplitude		V _{IN,P-P}	-	-	900	mVpp	
Differential Impedance			90	100	110	Ω	
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 Data Output Amplitude		V _{OUT,P-P}	-	-	900	mVpp	
Differential Termination Mismatch (1MHZ)			-	-	10	%	
Differential Impedance			90	100	110	Ω	
Rx_LOS	Normal Operation	V _{OL}	-0.3	-	0.4	V	
	Loss Signal	V _{OH}	2	-	V _{CC} HOST	V	

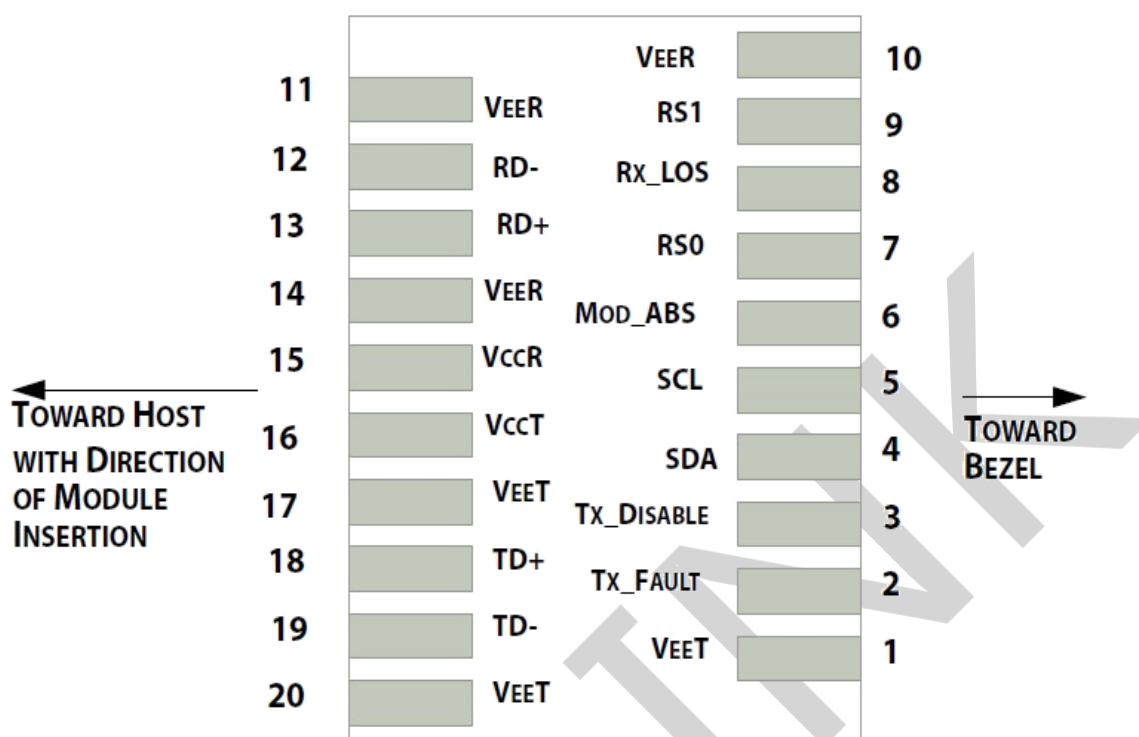
Optical and Characteristics

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Transmitter						
Optical Modulation Amplitude (OMA)	POMA	-4	-	2.2	dBm	
Average Output Power	POUT	-7	-	2	dBm	
Average Output Power (Laser Off)	POFF	-	-	-30	dBm	
Wavelength	λ	1260		1280	nm	EB23X6-10D(I)
		1320		1340		EB32X6-10D(I)
Spectrum Bandwidth @ -20dB	$\Delta\lambda$	-	-	1	nm	
Side mode suppression ratio (SMSR)	SMSR	30	-	-	dB	
Extinction ratio	ER	3.5	-	-	dB	
Transmitter and dispersion penalty (TDP)				2.7	dB	
RIN20OMA	RIN	-	-	-130	dB/Hz	
Transmitter Reflectance (max)	TFL			-26	dB	
Receiver						
Wavelength	λ	1320		1340	nm	EB23X6-10D(I)
		1260		1280		EB32X6-10D(I)
Received Sensitivity (OMA)	P_{IN} (OMA)	-	-	-12	dBm	BER<1x10 ⁻¹² PRBS2 ³¹ -1;
Optical Power Overload	P_{IN} (SAT)	2	-	-	dBm	
Damage threshold		3			dBm	
Receiver Reflectance	RFL	-	-	-26	dB	
Rx_LOS of Signal Assert	P_A	-30	-	-	dBm	
Rx_LOS of Signal De-assert	P_D	-	-	-17	dBm	
Rx_LOS of Signal Hysteresis	PHy	0.5	-	5	dB	
Optical Return Loss Tolerance	ORLT	-	-	20	dB	

Digital Diagnostics

Parameter	Range	Accuracy	Unit	Calibration
Temperature	-40 to 85	±3	°C	Internal
Voltage	3.13 to 3.47	±3%	V	Internal
Tx Bias Current Per Lane	0 to 100	±10%	mA	Internal
Tx Output Power Per Lane	-7 to 2	±3	dBm	Internal
Rx Power	-17 to 3	±3	dBm	Internal

Pin Diagram



Pin Definitions

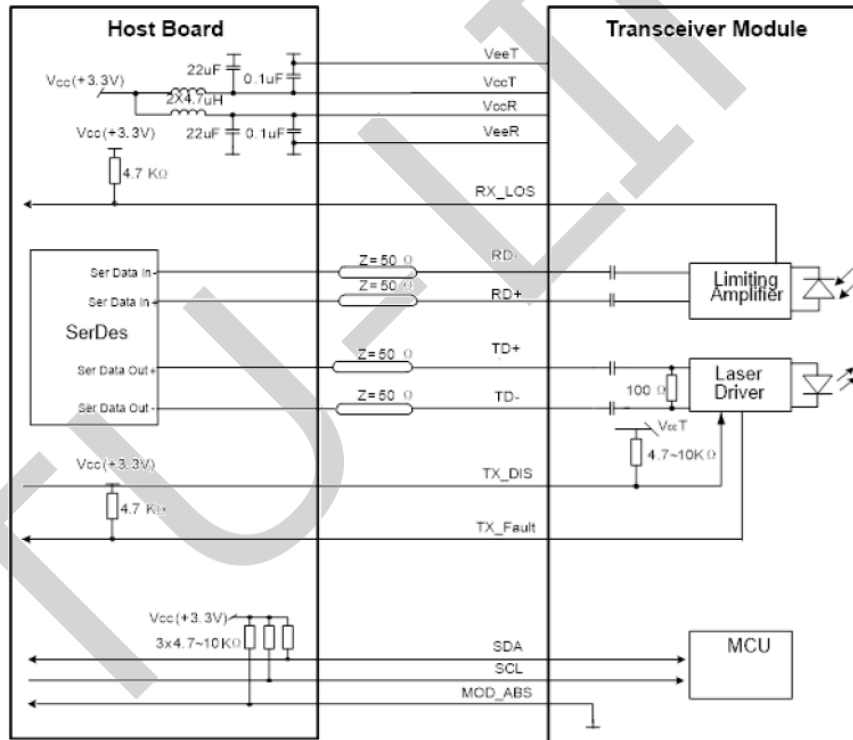
PIN #	Name	Function	Notes
1	VeeT	Transmitter Ground	1
2	Tx_Fault	Transmitter Fault - High indicates a fault condition	2
3	Tx_Disable	Transmitter Disable – High or open disables the transmitter	
4	SDA	2-wire Serial Interface Data Line (MOD-DEF2)	3
5	SCL	2-wire Serial Interface Clock (MOD-DEF1)	3
6	MOD_ABS	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	5
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

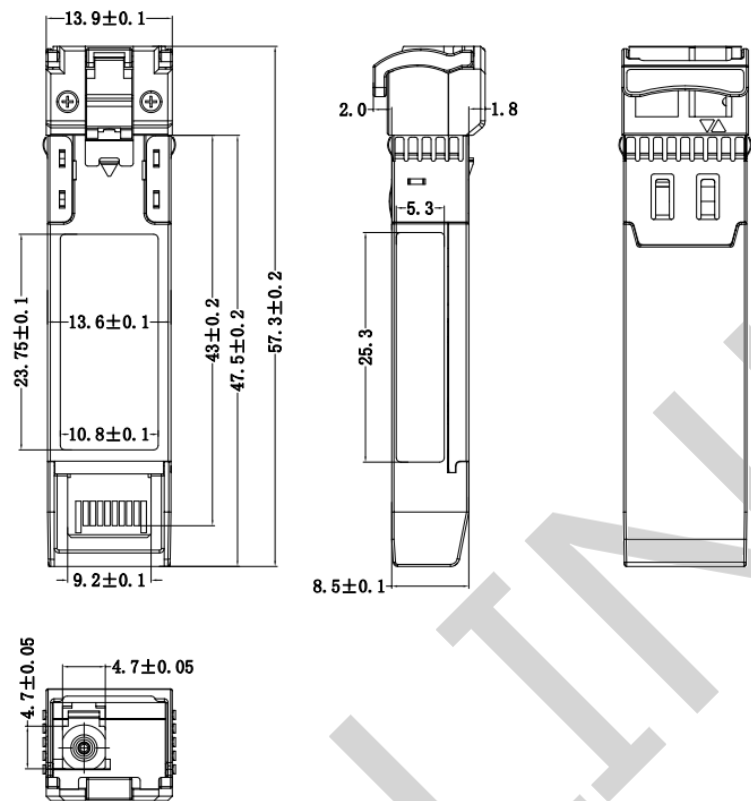
Notes:

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.

Recommended Interface Circuit



Mechanical Diagram



Revision History

Version No.	Date	Description
1.0	June 10, 2019	Preliminary datasheet
2.0	January 20,2024	Product upgrades
2.1	Aug 21, 2024	Format change

Company: ETU-Link Technology Co., LTD
Production base: Right side of 3rd floor, No. 102 building, Longguan expressway, Dalang street, Longhua District, Shenzhen city, GuangdongProvince,China 518109
R&D base: Floor 4, Building 4, Nanshan Yungu Phase LI, Taoyuan Community, XiliStreet,Nanshan District, Shenzhen
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.