EB45(54)X-80D(I)

10Gb/s SFP+ BIDI 80km DDM Transceiver

PRODUCT FEATURES

- Support data rate up to 11.3Gb/s
- Hot-Pluggable SFP Footprint and Single LC Connector
- Up to 80km reach for G.652 SMF
- 1490nm EML Transmitter and 1550 APD receiver for EB45X-80D(I)
- 1550nm EML Transmitter and 1490 APD receiver for EB54X-80D(I)
- Temperature Range:

  Commercial:0°C ~70°C

  Industrial: -40°C ~85°C
- Power consumption:

  Commercial:1.5W

  Industrial: 1.8W
- Compliant with SFP-8431
- Compliant with SFP-8432
- Compliant with SFP-8472
- Compliant with IEEE802.3ae
- RoHS 6 compliance
- Complies with EU Directive 2015/863/EU



APPLICATIONS

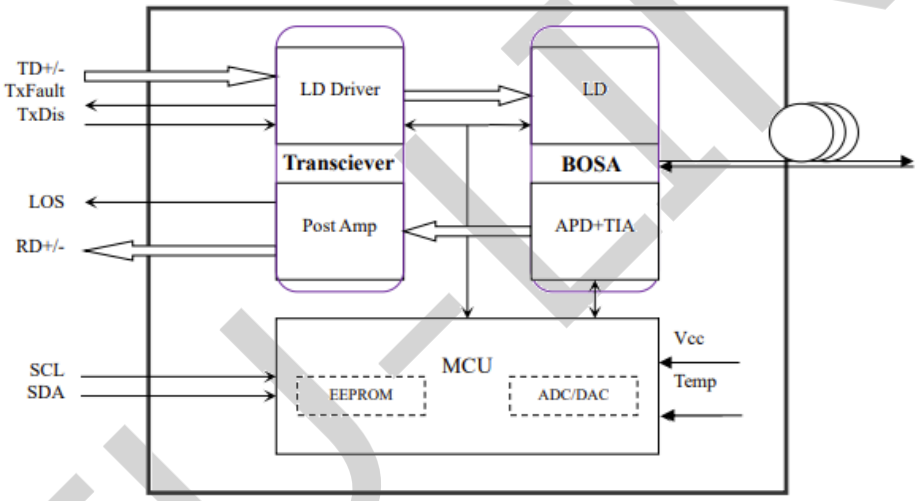
- 10GBASE-LR at 10.3125Gbps
- 10GBASE-LW at 9.953Gbps
- Other Optical Links

DESCRIPTIONS

The EB45(54)X-80D(I) series single mode transceiver is small form factor pluggable module for duplex optical data communications such as 10GBASE-LR defined by IEEE 802.3. The EB45(54)X-80D(I) module is designed for single mode fiber and operates at a nominal wavelength of 1490nm or 1550nm; the transmitter section uses a multiple quantum well EML, which is class 1 laser compliant according to International Safety Standard IEC-60825.

The SFP+ 80km 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.

Module Block Diagram



Ordering Information

Part No.	Data Rate(optical)	Laser	Fiber Type	Distance	Optical Interface	Temp	DDMI	Latch Color
EB45X-80D	10.3125Gbps	EML	SMF	80km	LC	0~70℃	Y	Purple
EB54X-80D	10.3125Gbps	EML	SMF	80km	LC	0~70℃	Y	Yellow
EB45X-80DI	10.3125Gbps	EML	SMF	80km	LC	-40~85℃	Y	Purple
EB54X-80DI	10.3125Gbps	EML	SMF	80km	LC	-40~85℃	Y	Yellow

Absolute Maximum Ratings

Parameter	Symbol	Min.	Typical	Max.	Unit
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

Recommended Operating Conditions

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Case Operating Temperature	T_{op}	0	-	70	℃	Commercial
		-40		85		Industrial
Power Supply Voltage	V_{CC}	3.13	3.3	3.47	V	
Transmission Distance	TD	-	-	80	km	Over SMF

Electrical Characteristics

High-Speed Signal: Compliant to CEI-11G-SR
Low-Speed Signal: Compliant to SFF-8431

Parameter		Symbol	Min.	Typical	Max.	Unit	Notes
Supply Voltage		V_{CC}	3.13		3.6	V	
Supply Current		I_{CC}			450	mA	Commercial
					540		Industrial
Power Consumption		P			1.5	W	Commercial
					1.8		Industrial
Transmitter (Module Input)							
Differential Input Resistance		R_R_{din}	80	100	120	Ω	
Input Differential Voltage		R_V_{diff}	110	-	1050	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	80	100	120	Ohm	
Output Differential Voltage		T_V_{diff}	360	-	770	mVpp	
Differential Termination Resistance Mismatch		T_R_{dm}	-	-	5	%	
Rx los	Normal Operation	V_{OL}	-0.3	-	0.4	V	
	Loss Signal	V_{OH}	2		VCCHOST	V	

Optical and Characteristics

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Transmitter						

Average Output Power	POUT	0		5	dBm	1
Average Output Power(Laser Off)	POFF			-30	dBm	
Wavelength	λ	1480	1490	1500	nm	EB45X-80D(I)
		1540	1550	1560		EB54X-80D(I)
Spectrum Bandwidth @ -20dB	Δλ			1	nm	
Side mode suppression ratio(SMSR)	SMSR	30			dB	
Extinction ratio	ER	8.2			dB	
$RIN_{20}OMA$	RIN			-128	dB/Hz	2
Receiver						
Wavelength	λ	1540	1550	1560	nm	EB45X-80D(I)
		1480	1490	1500		EB54X-80D(I)
Received Sensitivity	P_{IN}			-23	dBm	3
Optical Power Overload	P_{IN} (SAT)	-6			dBm	
Rx_LOS of Signal Assert	P_A	-38			dBm	
Rx_LOS of Signal De-assert	P_D			-24	dBm	
Rx_LOS of Signal Hysteresis	PHy	0.5		6	dB	

Notes:

1. Output is coupled into a 9/125um SMF.
2. 12dB reflection.
3. Measured with worst ER, BER less than 1E-12 and PRBS 2^31-1 at 10.3125Gbps.

Digital Diagnostics

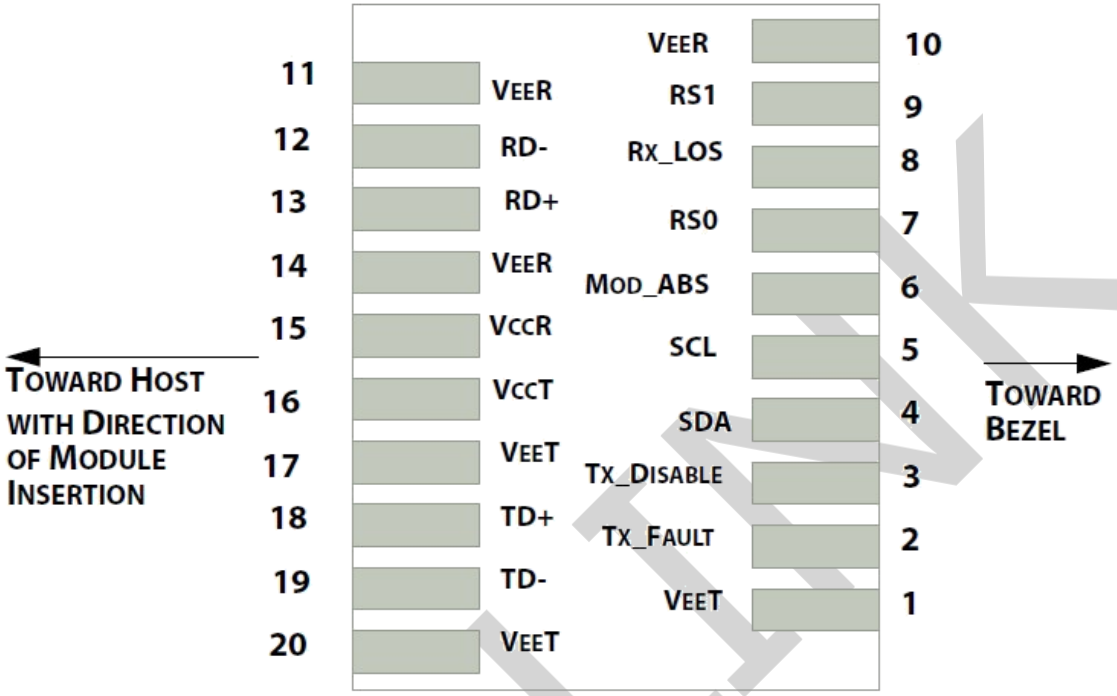
Parameter	Range	Accuracy	Unit	Calibration
Temperature	-40 to 85	±3	℃	Internal
Voltage	0 to Vcc	±3%	V	Internal
Tx Bias Current	0 to 100	±10%	mA	Internal
Tx Output Power	-1 to 4	±3	dB	Internal
Rx Input Power	-24 to 0.5	±3	dB	Internal

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	

Pin Diagram



Pin Definitions

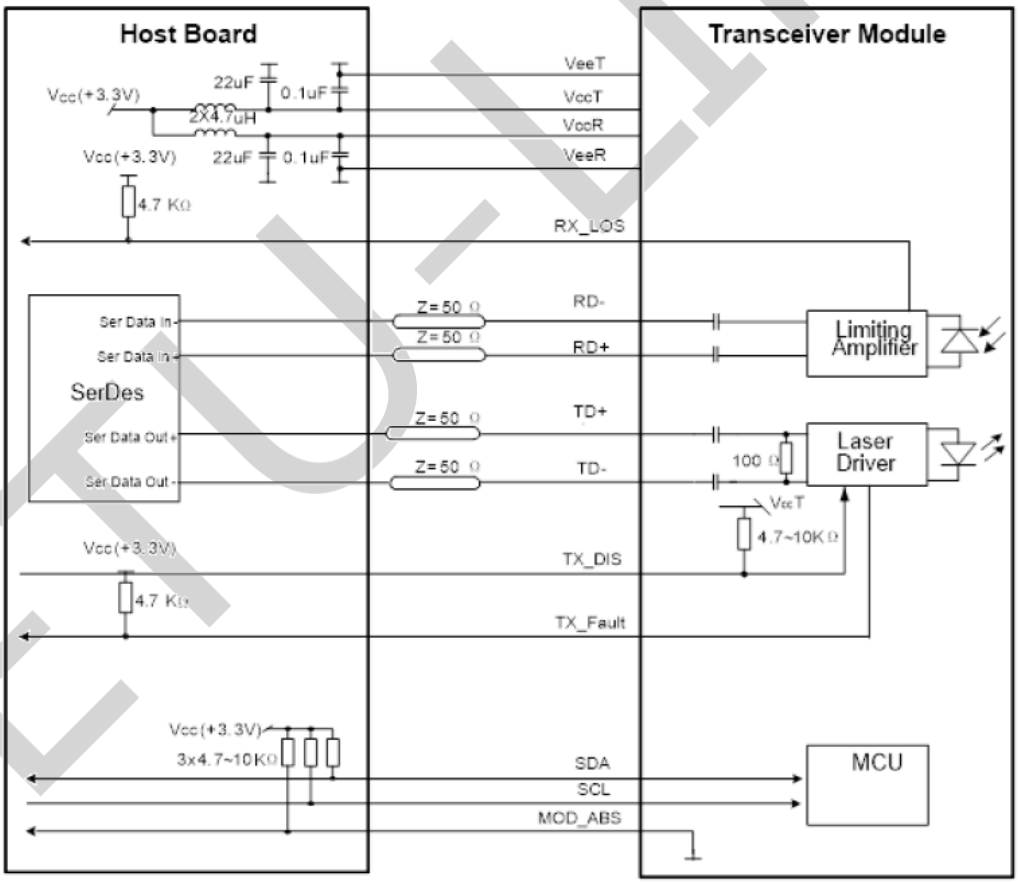
PIN #	Name	Function	Notes
1	VeeT	Module transmitter ground	1
2	Tx Fault	Module transmitter fault	2
3	Tx Disable	Transmitter Disable; Turns off transmitter laser output	3
4	SDL	2 wire serial interface data input/output (SDA)	4
5	SCL	2 wire serial interface clock input (SCL)	4
6	MOD-ABS	Module Absent, connect to VeeR or VeeT in the module	4
7	RS0	Rate select0, optionally control SFP+ receiver. When high, input data rate >4.5Gb/ s; when low, input data rate <=4.5Gb/s	5
8	LOS	Receiver Loss of Signal Indication	6
9	RS1	Rate select0, optionally control SFP+ transmitter. When high, input data rate >4.5Gb/s; when low, input data rate <=4.5Gb/s	1
10	VeeR	Module receiver ground	1
11	VeeR	Module receiver ground	1
12	RD-	Receiver inverted data output	
13	RD+	Receiver non-inverted data output	
14	VeeR	Module receiver ground	1
15	VccR	Module receiver 3.3V supply	

16	VccT	Module transmitter 3.3V supply	
17	VeeT	Module transmitter ground	1
18	TD+	Transmitter inverted data output	
19	TD-	Transmitter non-inverted data output	
20	VeeT	Module transmitter ground	1

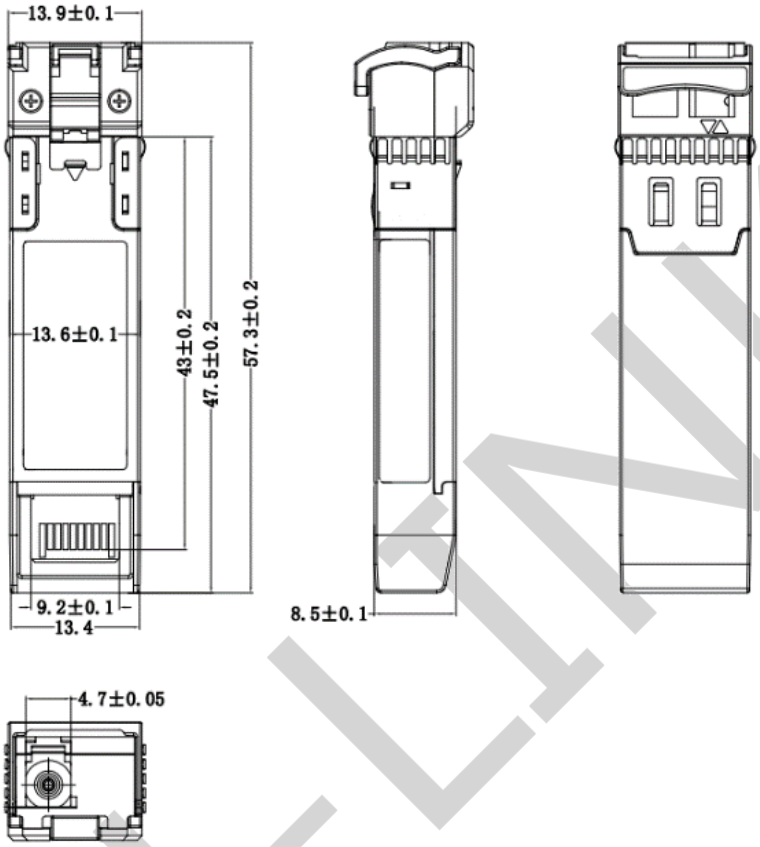
Notes:

1. Circuit ground is internally isolated from chassis ground
2. Tx FAULT is an open collector/drain output, which should be pulled up with a 4.7k – 10k Ohms resistor on the host board if intended for use. Pull up voltage should be between 2.0V to Vcc + 0.3V.A high output indicates a transmitter fault caused by either the TX bias current or the TX output power exceeding the preset alarm thresholds. A low output indicates normal operation. In the low state, the output is pulled to <0.8V.
3. Laser output disabled on Tx DIS >2.0V or open, enabled on Tx DIS <0.8V.
4. Should be pulled up with 4.7kΩ- 10kΩ host board to a voltage between 2.0V and 3.6V. MOD_ABS pulls line low to indicate module is plugged in.
5. Internally pulled down per SFF-8431 Rev 4.1.
6. LOS is open collector output. It should be pulled up with 4.7kΩ – 10kΩ on host board to a voltage between 2.0V and 3.6V. Logic 0 indicates normal operation; logic 1 indicates loss of signal.

Recommended Interface Circuit



Mechanical Diagram



Revision History

Version No.	Date	Description
1.0	Oct 22, 2016	Preliminary datasheet
2.0	July 8,2020	Product upgrades
3.0	Aug 27, 2024	Format change

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