

EXB45(54)X-40D(I)

10Gb/s XFP BIDI 40km DDM Transceiver

PRODUCT FEATURES

- Supports 9.95Gb/s to 11.3Gb/s bit rates
- 1490nm DFB laser and APD receiver
- 1550nm DFB laser and APD receiver
- Up to 40KM on 9/125μm SMF
- Hot-pluggable XFP footprint
- Duplex LC/UPC type pluggable optical interface
- Metal enclosure, for lower EMI
- RoHS compliant and lead-free
- Support Digital Diagnostic Monitoring interface
- Single +3.3V power supply
- Maximum power consumption 2.0W
- Case operating temperature:
Commercial: 0°C ~70°C
Industrial: -40°C ~85°C

APPLICATIONS

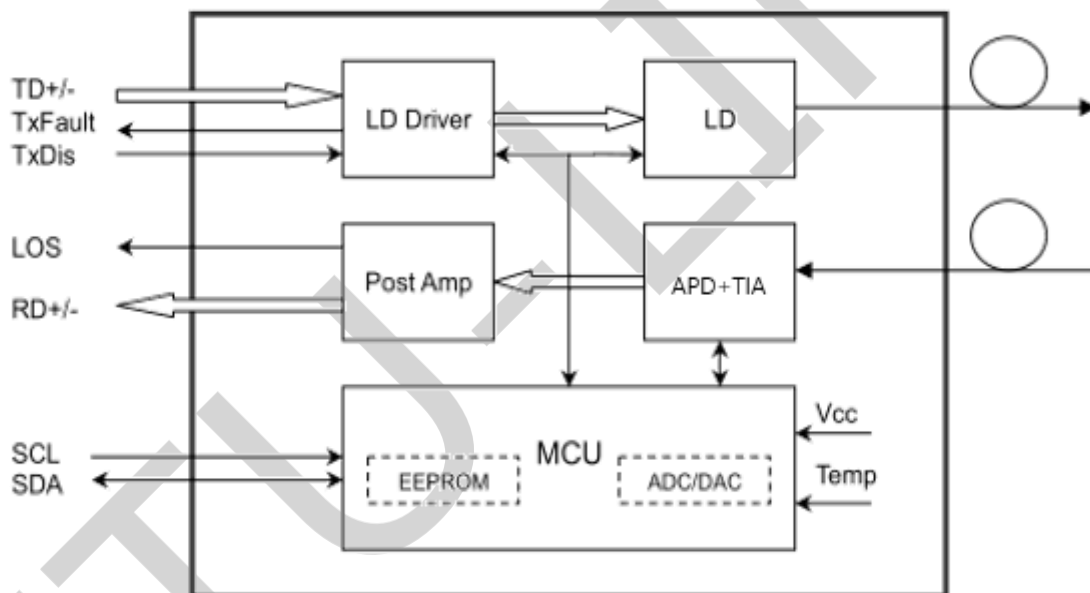
- 10GBASE-BX 10.3125Gb/s Ethernet
- 10GBASE-BX 9.95Gb/s Ethernet
- OTN OTU2

DESCRIPTIONS

ETU-Link EXB45(54)X-40D(I) transceiver is designed for use in 10-Gigabit Ethernet links up to 40KM over single mode fiber. The module consists of EML Laser, APD and Preamplifier in a high-integrated optical sub-assembly. Digital diagnostics functions are available via a 2-wire serial interface, as specified in XFP MSA.

EXB45(54)X-40D(I) transceivers provide a unique enhanced digital diagnostic monitoring interface, which allows real-time access to device operating parameters such as transceiver temperature, laser bias current, transmitted optical power, received optical power and transceiver supply voltage. It also defines a sophisticated system of alarm and warning flags, which alerts end-users when particular operating parameters are outside of a factory set normal range.

Module Block Diagram



Ordering Information

Part No.	Data Rate(optical)	Laser	Fiber Type	Distance	Optical Interface	Temp	DDMI
EB45X-40D	10.3125Gbps	DFB	SMF	40km	LC	0~70°C	Y
EB54X-40D	10.3125Gbps	DFB	SMF	40km	LC	0~70°C	Y
EB45X-40DI	10.3125Gbps	DFB	SMF	40km	LC	-40~85°C	Y
EB54X-40DI	10.3125Gbps	DFB	SMF	40km	LC	-40~85°C	Y

Absolute Maximum Ratings

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Storage Temperature	T _s	-40	-	85	°C	
Power Supply Voltage	V _{CC}	-0.5	-	3.6	V	
Relative Humidity (non-condensation)	RH	5	-	95	%	
Damage Threshold	TH _d	0			dBm	

Recommended Operating Conditions

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Case Operating Temperature	T _{op}	0	-	70	°C	Commercial
		-40		85		Industrial
Power Supply Voltage	V _{CC}	3.135	3.3	3.465	V	
Data Rate			10.3125		Gb/s	
Control Input Voltage High		2		V _{CC}	V	
Control Input Voltage Low		0		0.8	V	
Link Distance (SMF)	D			40	km	9/125um

Electrical Characteristics

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Power Consumption	P			2	W	1
Supply Current	I _{CC}			600	mA	
Transmitter (Module Input)						
Single-ended Input Voltage Tolerance	V _{CC}	-0.3		4.0	V	
Differential Input Voltage Swing	V _{in,pp}	120		820	mVpp	
Differential Input Impedance	Z _{in}	85	100	115	Ohm	2
Transmit Disable Assert Time				10	us	
Transmit Disable Voltage	V _{dis}	V _{CC} -1.3		V _{CC}	V	3
Transmit Enable Voltage	V _{en}	V _{EE}		V _{EE} +0.8	V	
Receiver (Module Output)						
Differential Output Voltage Swing	V _{out,pp}	300	650	850	mVpp	
Differential Output Impedance	Z _{out}	80	100	120	Ohm	4
Data output rise/fall time	Tr/Tf			40	ps	5
LOS Assert Voltage	V _{losH}	V _{CC} -1.3		V _{CC}	V	6
LOS De-assert Voltage	V _{losL}	V _{EE}		V _{EE} +0.8	V	6
Power Supply Rejection	PSR					7

Notes:

1. Maximum total power value is specified across the full temperature and voltage range.
2. After internal AC coupling.
3. Or open circuit.
4. In to 100 ohms differential termination.
5. These are unfiltered 20-80% values
6. Loss of Signal is open collector to be pulled up with a 4.7k Ω – 10k Ω resistor to 3.15 – 3.6V. Logic 0 indicates normal operation; logic 1 indicates no signal detected.
7. Per Section 2.7.1. in the XFP MSA Specification1.

Optical and Characteristics

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Transmitter						
Average Launched Power	PO	0	-	4	dBm	
Average Launched Power(Laser Off)	POUT-OFF	-	-	-30	dBm	Note (1)
Optical Modulation Amplitude	OMA	-3	-	-	dBm	Note (1)
Center Wavelength Range	λ C		1490/1550		nm	
Side mode suppression ratio	SMSR	30	-	-	dB	
Spectrum Bandwidth(-20dB)	σ	-	-	1	nm	
Extinction Ratio	ER	3.5	6	-	dB	Note (2)
Output Eye Mask	Compliant with FC_PI_4 REV 7.0					Note (2)

Notes:

- 1) The optical power is launched into SMF
- 2) Measured with RPBS 2³¹-1 test pattern @10.3125Gbs

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Receiver						
Input Optical Wavelength	λ IN		1490/1550		nm	
Receiver Sensitivity in average	PIN	-	-	-16	dBm	Note (1)
Input Saturation Power (Overload)	PSAT	-6	-	-	dBm	Note (1)
LOS Assert	PA	-30	-	-	dBm	
LOS De-Assert	PD	-	-	-20	dBm	
LOS -Hysteresis	PHys	0.5	1.0	-	dB	

Notes:

- 1) Measured with RPBS 2³¹-1 test pattern @10.3125Gbs BER=<10⁻¹² ER=6DB

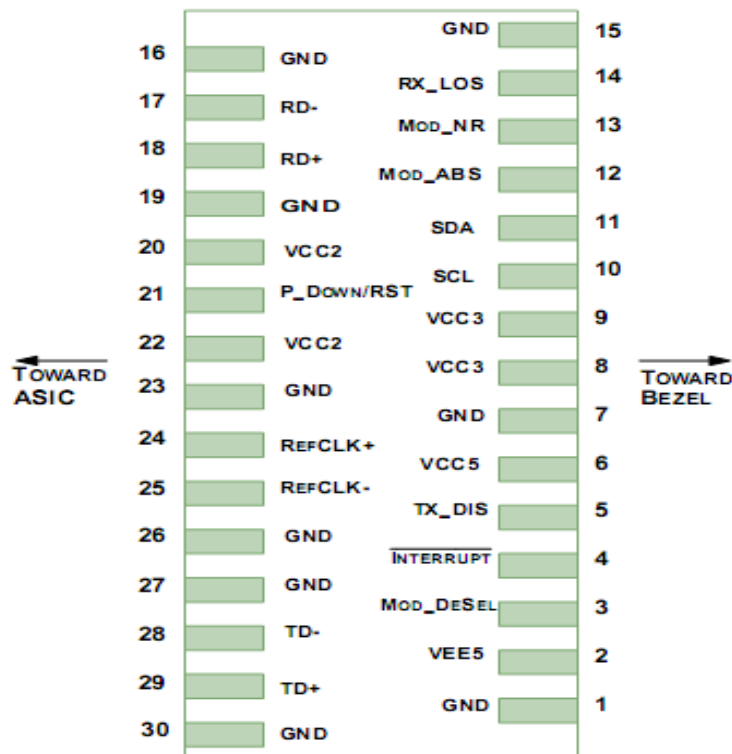
Digital Diagnostics

Parameter	Range	Accuracy	Unit	Calibration
Temperature	-40 to 85	± 3	$^{\circ}$ C	Internal
Voltage	0 to Vcc	$\pm 3\%$	V	Internal
Tx Bias Current	0 to 100	$\pm 10\%$	mA	Internal
Tx Output Power	0 to 4	± 3	dB	Internal
Rx Input Power	-16 to -6	± 3	dB	Internal

Communication Interface Timing Characteristics

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
TX_Disable Assert Time	t _{off}			10	us	
TX_Disable Negate Time	t _{on}			2	ms	
Time to Initialize	t _{int}			300	ms	
Interrupt assert delay	Interrupt _{on}			200	Ms	
Interrupt negate delay	Interrupt _{off}			500	us	
RX_LOS assert delay	t _{loss_on}			100	us	
RX_LOS negate delay	t _{loss_off}			100	us	

Pin Diagram



Pin Definitions

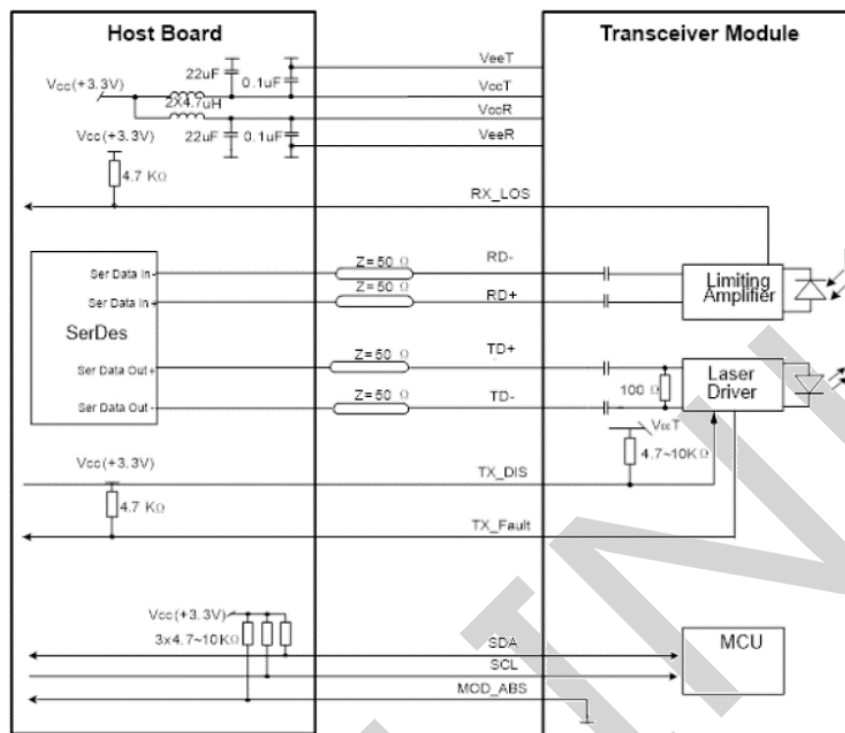
PIN #	Name	Function	Notes
1	GND	Module Ground	1
2	VEE5	Optional -5.2 Power Supply – Not required	
3	Mod-Desel	Module De-select; When held low allows the module to respond to 2-wire serial interface commands	
4	Interrupt	Interrupt (bar); Indicates presence of an important condition which can be read over	2

		the serial 2-wire interface	
5	TX_DIS	Transmitter Disable; Transmitter laser source turned off	
6	VCC5	+5 Power Supply – Not required	
7	GND	Module Ground	1
8	VCC3	+3.3V Power Supply	
9	VCC3	+3.3V Power Supply	
10	SCL	Serial 2-wire interface clock	
11	SDA	Serial 2-wire interface data line	2
12	Mod_Abs	Module Absent; Indicates module is not present. Grounded in the module.	2
13	Mod_NR	Module Not Ready; XGIGA's defines it as a logical OR between RX_LOS and Loss of Lock in TX/RX.	2
14	RX_LOS	Receiver Loss of Signal indicator	2
15	GND	Module Ground	1
16	GND	Module Ground	1
17	RD-	Receiver inverted data output	
18	RD+	Receiver non-inverted data output	
19	GND	Module Ground	1
20	VCC2	+1.8V Power Supply – Not required	
21	P_Down/RST	Power Down; When high, places the module in the low power stand-by mode and on the falling edge of P_Down initiates a module reset	
		Reset; The falling edge initiates a complete reset of the module including the 2-wire serial interface, equivalent to a power cycle.	
22	VCC2	+1.8V Power Supply – Not required	
23	GND	Module Ground	1
24	RefCLK+	Reference Clock non-inverted input, AC coupled on the host board – Not required	3
25	RefCLK-	Reference Clock inverted input, AC coupled on the host board – Not required	3
26	GND	Module Ground	1
27	GND	Module Ground	1
28	TD-	Transmitter inverted data input	
29	TD+	Transmitter non-inverted data input	
30	GND	Module Ground	1

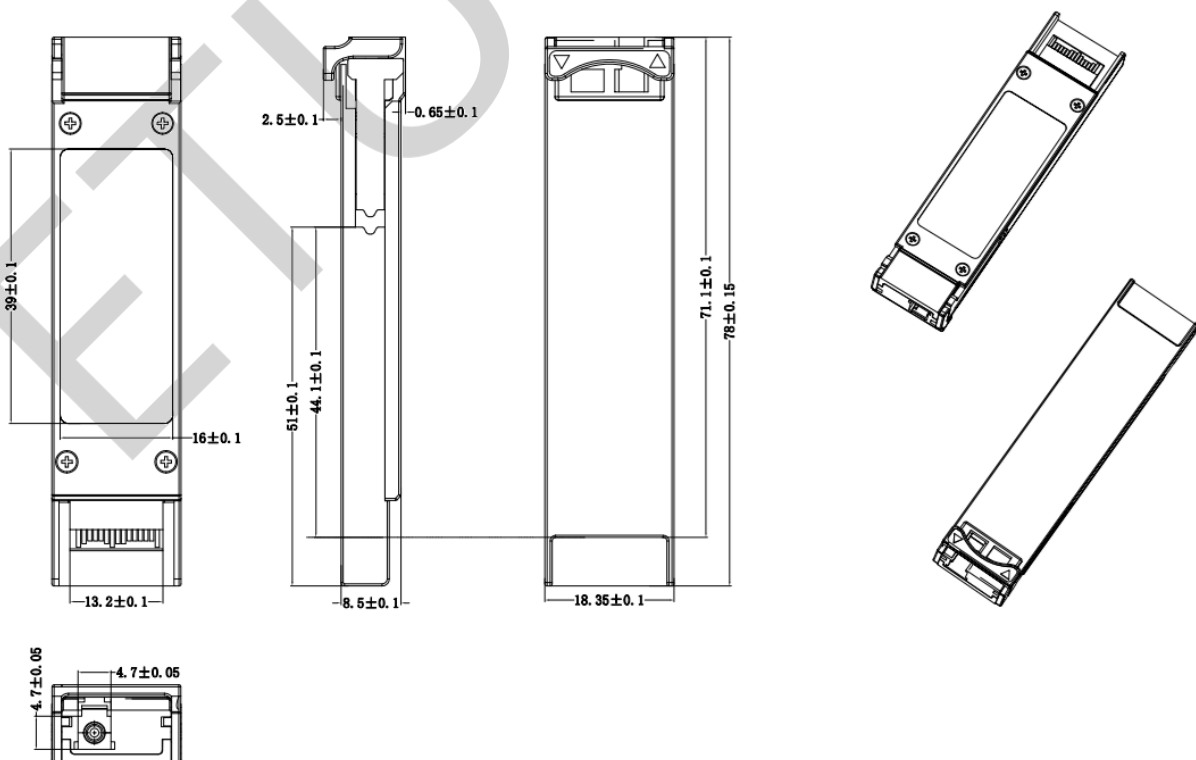
Notes:

- 1) Module circuit ground is isolated from module chassis ground within the module.
- 2) Open collector; should be pulled up with 4.7k – 10kohms on host board to a voltage between 3.15V and 3.6V.
- 3) A Reference Clock input is not required by the XFP-10GER. If present, it will be ignored.

Recommended Interface Circuit



Mechanical Diagram



Revision History

Version No.	Date	Description
1.0	February 18, 2016	Preliminary datasheet
2.0	September 28, 2023	Product upgrades
3.0	July 19, 2024	Format change

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