

ESP3103-40D(I)

155M SFP Optical Transceiver 40KM Reach

Features

- Up to 155M data links
- FP laser transmitter and PIN photo-detector
- Up to 40km on 9/125μm SMF
- Hot-pluggable SFP footprint
- Duplex LC/UPC type pluggable optical interface
- Low power dissipation
- RoHS-10 compliant and lead-free
- Support Digital Diagnostic Monitoring interface
- Single +3.3V power supply
- Compliant with SFF-8472
- Metal enclosure, for lower EMI
- Meet ESD requirements, resist 8KV direct contact voltage
- Case operating temperature:
 - Commercial : 0°C to 70°C
 - Extended: -20 ~ +80°C
 - Industrial: -40 ~ +85°C



Applications

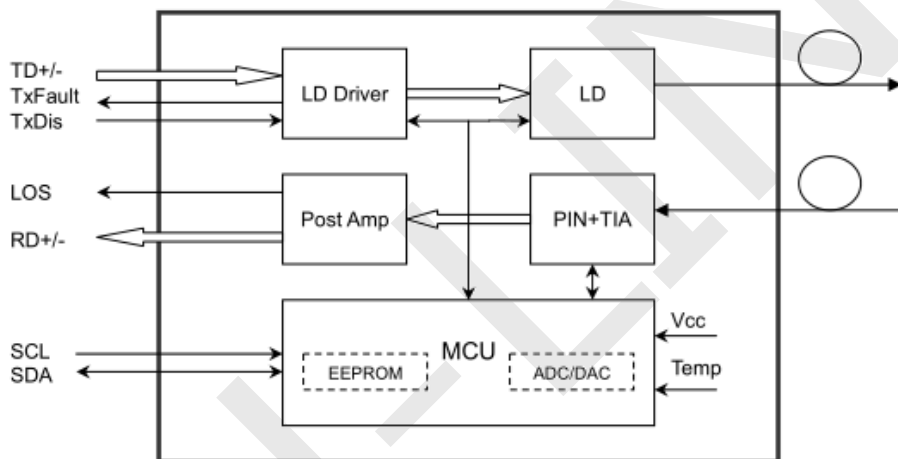
- SDH STM-1, S-1.1,L-1.1, L-1.2
- SONET OC-3 IR1,LR1,LR2
- Other optical links

Description

ETU-LINK's ESP3103-40D(I) Small Form Factor Pluggable (SFP) transceivers are compatible with the Small Form Factor Pluggable Multi-Sourcing Agreement (MSA). The transceiver consists of five sections: the LD driver, the limiting amplifier, the digital diagnostic monitor, the 1310nm FP laser and the PIN photo detector. The module data link up to 40KM in 9/125um single mode fiber.

The optical output can be disabled by a TTL logic high-level input of Tx Disable, and the system also can disable the module via I2C. Tx Fault is provided to indicate that degradation of the laser. Loss of signal (LOS) output is provided to indicate the loss of an input optical signal of receiver or the link status with partner. The system can also get the LOS (or Link)/Disable/Fault information via I2C register access.

Module Block Diagram



Ordering Information

Part No.	Data Rate(optical)	Laser	Fiber Type	Distance	Optical Interface	Temp	DDMI
ESP3103-40D	155M	FP	SMF	40km	LC	0~70°C	Y
ESP3103-40DE	155M	FP	SMF	40km	LC	-20~80°C	Y
ESP3103-40DI	155M	FP	SMF	40km	LC	-40~85°C	Y

Absolute Maximum Ratings

It has to be noted that the operation in excess of any individual absolute maximum ratings might cause permanent damage to this module.

Parameter	Symbol	Min	Max	Unit	Notes
Storage Temperature	T _s	-40	85	°C	

Operating Case Temperature	T_{case}	See order Information		°C	
Power Supply Voltage	V_{CC}	-0.5	3.6	V	
Relative Humidity (non-condensation)	RH	5	95	%	
Damage Threshold	TH_d	5		dBm	

Recommended Operating Conditions and Power Supply Requirements

Parameter	Symbol	Min	Typical	Max	Unit	Notes
Operating Case Temperature	T_{OP}	0		70	°C	Commercial
		-40		85		Industrial
Power Supply Voltage	V_{CC}	3.135	3.3	3.465	V	
Power Supply Current	ICC		185	250	mA	
Data Rate			155		Mb/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

Specification of Transmitter Electrical Characteristics

The following electrical characteristics are defined over the Recommended Operating Environment unless otherwise specified.

Parameter	Symbol	Min.	Typical	Max	Unit	Notes
Transmitter						
Single-ended Input Voltage Tolerance	V_{CC}	-0.3		4.0	V	
Differential Input Voltage Swing	$V_{in,pp}$	200		2400	mVpp	
Differential Input Impedance	Z_{in}	90	100	110	Ohm	
Transmit Disable Assert Time				5	us	
Transmit Disable Voltage	V_{dis}	$V_{CC}-1.3$		V_{CC}	V	
Transmit Enable Voltage	V_{en}	$V_{EE}-0.3$		0.8	V	
Receiver						
Differential Output Voltage Swing	$V_{out,pp}$	500		900	mVpp	

Differential Output Impedance	Zout	90	100	110	Ohm	
Data output rise/fall time	Tr/Tf		100		ps	20% to 80%
LOS Assert Voltage	VlosH	Vcc-1.3		Vcc	V	
LOS De-assert Voltage	VlosL	Vee-0.3		0.8	V	

Optical Characteristics

The following optical characteristics are defined over the Recommended Operating Environment unless otherwise specified.

Parameter	Symbol	Min.	Typical	Max	Unit	Notes
Transmitter						
Optical Wavelength	λ_c	1260	1310	1360	nm	1
Wavelength Temperature Dependence			0.08	0.125	nm/°C	
Spectral Width (-20dB)				3.0	dB	
Average Optical Power	P _{AVG}	-5		0	dBm	1
Optical Extinction Ratio	ER	9			dB	
Transmitter OFF Output Power	P _{Off}			-45	dBm	
Transmitter Eye Mask	Compliant with 802.3z(class 1 laser safety)					
Receiver						
Center Wavelength	λ_c	1270		1610	nm	
Receiver Sensitivity (Average Power)	Sen.			-32	dBm	2
Input Saturation Power (overload)	P _{sat}	-3			dBm	
LOS Assert	LOSA	-36			dB	3
LOS De-assert	LOSD			-27	dBm	3
LOS Hysteresis	LOSH	0.5	2	6	dBm	

Notes:

1. Measure at 2²³-1 NRZ PRBS pattern
2. Measured with Light source 1310nm, ER=8.2dB; BER =<10⁻¹² @PRBS=2²³-1 NRZ

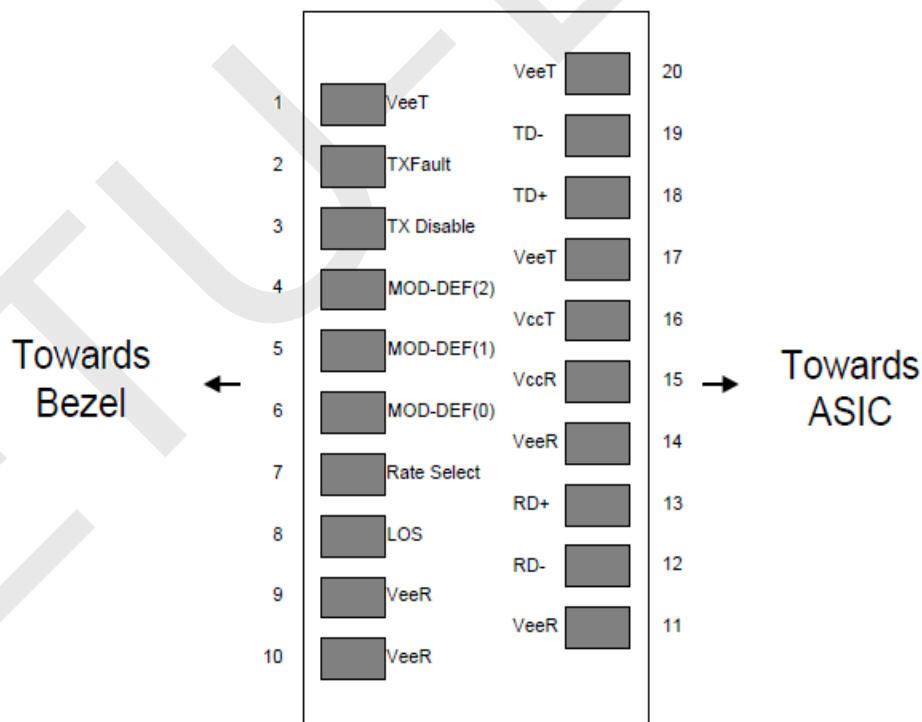
3. When LOS de-asserted, the RX data+/- output is High-level (fixed).

Digital Diagnostic Functions

The following digital diagnostic characteristics are defined over the Recommended Operating Environment unless otherwise specified. It is compliant to SFF-8472 Rev10.2 with internal calibration mode. For external calibration mode please contact our sales staff.

Parameter	Symbol	Min.	Max	Unit	Notes
Temperature monitor absolute error	DMI_Temp	-3	3	degC	Over operating temp
Supply voltage monitor absolute error	DMI_VCC	-0.15	0.15	V	Full operating range
RX power monitor absolute error	DMI_RX	-3	3	dB	
Bias current monitor	DMI_bias	-10%	10%	mA	
TX power monitor absolute error	DMI_TX	-3	3	dB	

Pin Assignment



Pin Description

PIN	Name	Name/Description	Notes
1	VEET	Transmitter Ground (Common with Receiver Ground)	1
2	TXFAULT	Transmitter Fault.	
3	TXDIS	Transmitter Disable. Laser output disabled on high or open.	2
4	MOD_DEF(2)	Module Definition 2. Data line for Serial ID.	3
5	MOD_DEF(1)	Module Definition 1. Clock line for Serial ID.	3
6	MOD_DEF(0)	Module Definition 0. Grounded within the module.	3
7	Rate Select	No connection required	4
8	LOS	Loss of Signal indication. Logic 0 indicates normal operation.	5
9	VEER	Receiver Ground (Common with Transmitter Ground)	1
10	VEER	Receiver Ground (Common with Transmitter Ground)	1
11	VEER	Receiver Ground (Common with Transmitter Ground)	1
12	RD-	Receiver Inverted DATA out. AC Coupled	
13	RD+	Receiver Non-inverted DATA out. AC Coupled	
14	VEER	Receiver Ground (Common with Transmitter Ground)	1
15	VCCR	Receiver Power Supply	
16	VCCT	Transmitter Power Supply	
17	VEET	Transmitter Ground (Common with Receiver Ground)	1
18	TD+	Transmitter Non-Inverted DATA in. AC Coupled.	
19	TD-	Transmitter Inverted DATA in. AC Coupled.	
20	VEET	Transmitter Ground (Common with Receiver Ground)	1

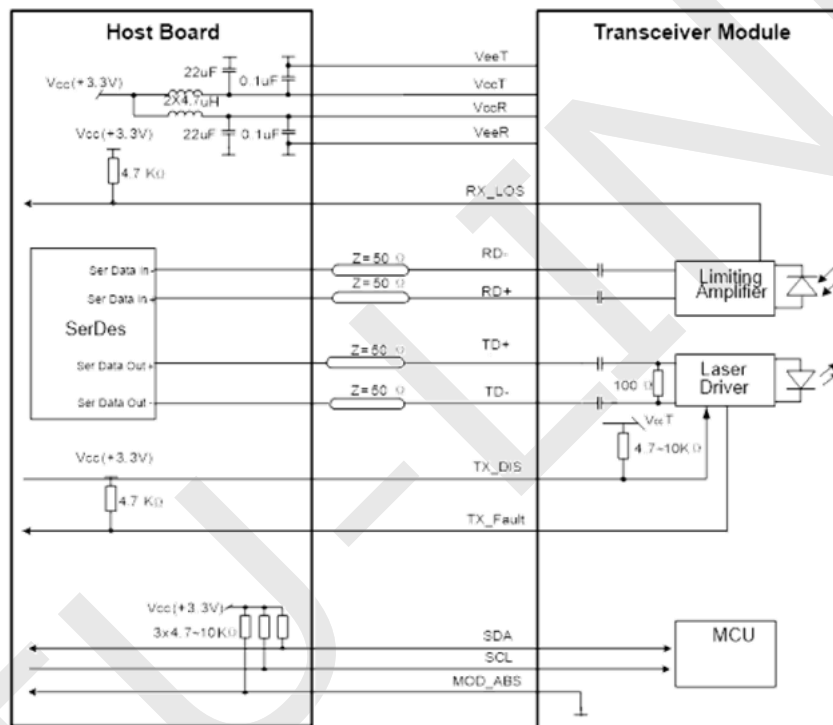
Notes:

1. Circuit ground is internally isolated from chassis ground.
2. Laser output disabled on TDIS >2.0V or open, enabled on TDIS <0.8V.
3. Should be pulled up with 4.7k-10k ohms on host board to a voltage between 2.0V and 3.6V. MOD_DEF (0) pulls line low to indicate module is plugged in.
4. This is an optional input used to control the receiver bandwidth for compatibility with multiple data rates (most likely Fiber Channel 1x and 2x Rates). If implemented, the input will be internally pulled down with > 30kΩ resistor. The input states are:

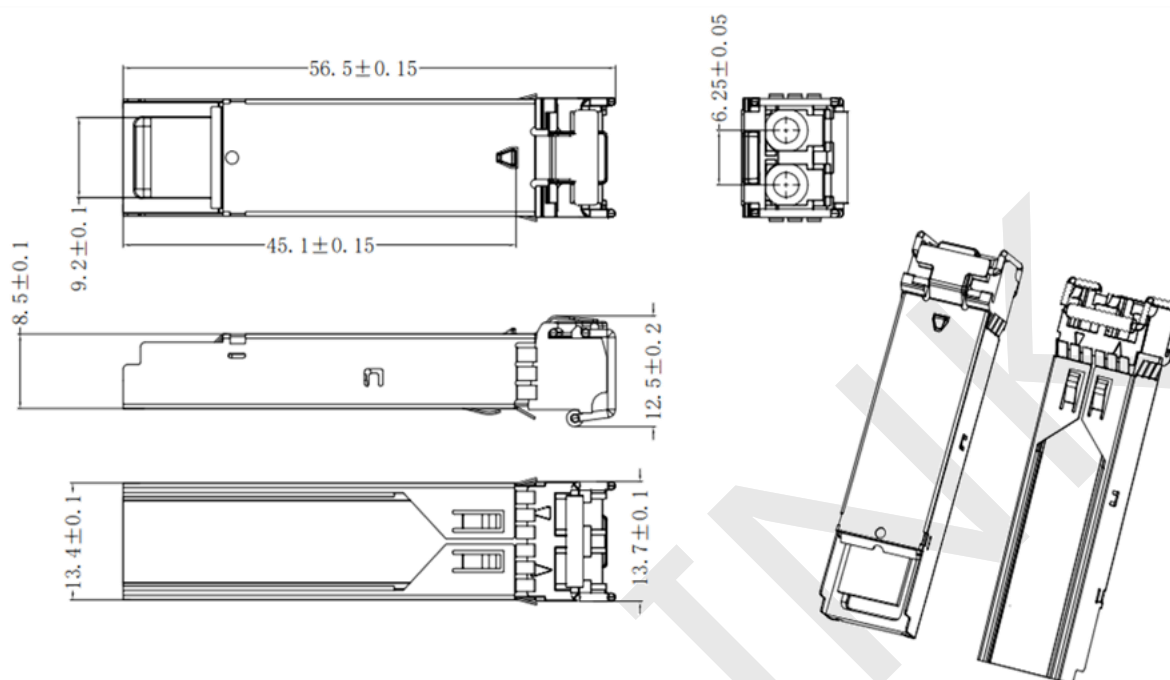
- 1) Low (0 – 0.8V): Reduced Bandwidth
- 2) (>0.8, < 2.0V): Undefined
- 3) High (2.0 – 3.465V): Full Bandwidth
- 4) Open: Reduced Bandwidth

5. LOS is open collector output should be pulled up with 4.7k-10k ohms 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 Dimensions



Revision History

Version No.	Date	Description
1.0	February 12, 2015	Preliminary datasheet
2.0	October 11, 2021	Product upgrades
3.0	July 26, 2024	Format change

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