# EB35(53)12-40D(I)

## 1.25Gbps SFP Bi-Directional 40km SFP Transceiver

## PRODUCT FEATURES

- Dual data-rate of 1.25Gbps/1.063Gbps operation
- 1310nm DFB laser and PIN photodetector for 40KM transmission
- 1550nm DFB laser and PIN photodetector for 40KM transmission
- Compliant with SFP MSA and SFF-8472 with simplex LC receptacle
- Digital Diagnostic Monitoring:

  Internal Calibration or External Calibration
- Compatible with SONET OC-24-LR-1
- Compatible with RoHS
- +3.3V single power supply
- Operating case temperature range:

  0 ° C to +70 ° C (Commercial)

  -40 ° C to +85 ° C (Industrial)



## APPLICATIONS

- Gigabit Ethernet
- Fiber Channel
- Switch to Switch interface
- Switched backplane applications
- Router/Server interface
- Other optical transmission systems

ETU-LINK

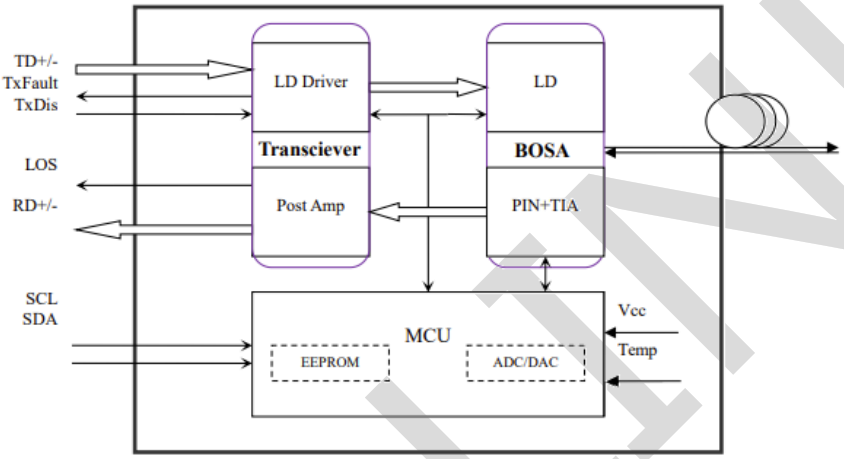
## DESCRIPTIONS

The SFP-BIDI transceivers are high performance, cost effective modules supporting dual data-rate of 1.25Gbps/1.0625Gbps and 40KM transmission distance with SMF.

The transceiver consists of three sections: a DFB laser transmitter, a PIN photodiode integrated with a trans-impedance preamplifier (TIA) and MCU control unit. All modules satisfy class I laser safety requirements.

The transceivers are compatible with SFP Multi-Source Agreement (MSA) and SFF-8472. For further information, please refer to SFP MSA.

## Module Block Diagram




## Ordering Information

| Part No. | Data Rate(optical) | Laser | Fiber Type | Distance | Optical Interface | Temp | DDMI | Latch Color |
|---|---|---|---|---|---|---|---|---|
| EB3512-40D | 1.25G | DFB | SMF | 40KM | LC | 0~70℃ | Y | Blue |
| EB5312-40D | 1.25G | DFB | SMF | 40KM | LC | 0~70℃ | Y | Yellow |
| EB3512-40DE | 1.25G | DFB | SMF | 40KM | LC | -20~85℃ | Y | Blue |
| EB5312-40DE | 1.25G | DFB | SMF | 40KM | LC | -20~85℃ | Y | Yellow |
| EB3512-40DI | 1.25G | DFB | SMF | 40KM | LC | -40~85℃ | Y | Blue |
| EB5312-40DI | 1.25G | DFB | SMF | 40KM | LC | -40~85℃ | Y | Yellow |

## Absolute Maximum Ratings

| Parameter | Symbol | Min. | Typical | Max. | Unit | Notes |
|---|---|---|---|---|---|---|
| Maximum Supply Voltage | Vcc | -0.5 | | 4.7 | V | |
| Storage Temperature | TS | -40 | | 85 | °C | |
| Case Operating Temperature | TOP | 0 | | 70 | °C | (Commercial) |
| Case Operating Temperature | TOP | -40 | | 85 | °C | (Industrial) |

## 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 |

## Electrical Characteristics(TOP = 0 to 70℃, VCC = 3.15 to 3.60Volts)

| Parameter | Symbol | Min. | Typical | Max. | Unit | Notes |
|---|---|---|---|---|---|---|
| Supply Voltage | Vcc | 3.15 | 3.3 | 3.6 | V | |
| Supply Current | Icc | | 185 | 280 | mA | |
| **Transmitter (Module Input)** | | | | | | |
| Input differential impedance | Rin | | 100 | | Ω | 1 |
| Single ended data input swing | Vin,pp | 250 | | 1200 | mV | |
| Transmit Disable Voltage | VD | Vcc–1.3 | | Vcc | V | |
| Transmit Enable Voltage | VEN | Vee | | Vee+ 0.8 | V | 2 |
| Transmit Disable Assert Time | | | | 10 | us | |
| **Receiver (Module Output)** | | | | | | |
| Single ended data output swing | Vout,pp | 250 | | 800 | mV | 3 |
| Data output rise time | tr | | 100 | 175 | ps | 4 |
| Data output fall time | tf | | 100 | 175 | ps | 4 |
| LOS Fault | VLOS fault | Vcc–0.5 | | VccHOST | V | 5 |
| LOS Normal | VLOS norm | Vee | | Vee+0.5 | V | 5 |
| Power Supply Rejection | PSR | 100 | | | mVpp | 6 |

**Notes:**

1. Connected directly to TX data input pins. AC coupled thereafter.
2. Or open circuit.
3. Into 100 ohms differential termination.
4. 20 – 80 %
5. Loss Of Signal is LVTTL. Logic 0 indicates normal operation; logic 1 indicates no signal detected.
6. Receiver sensitivity is compliant with power supply sinusoidal modulation of 20 Hz to 1.5 MHz up to specified value applied through the recommended power supply filtering network.

## Optical and Characteristics

| Parameter | Symbol | Min. | Typical | Max. | Unit | Notes |
|---|---|---|---|---|---|---|
| **Transmitter** | | | | | | |
| Operating Wavelength | λC | 1260<br>1530 | 1310<br>1550 | 1360<br>1570 | nm | EB3512-40D(I)<br>EB5312-40D(I) |
| Ave. output power (Enabled) | Po | -5 | | 0 | dBm | 1 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Extinction Ratio | ER | 10 | | | dB | 1 |
| RMS spectral width | Δλ | | | 4 | nm | |
| Rise/Fall time (20%~80%) | Tr/Tf | | | 0.26 | ps | 2 |
| Output Eye Mask | Telcordia GR-253-CORE and ITU-T G.957 compatible | | | | | |
| **Receiver** | | | | | | |
| Operating Wavelength | | 1530<br>1260 | | 1570<br>1360 | nm | EB3512-40D(I)<br>EB5312-40D(I) |
| Sensitivity | Psen | | | -24 | dBm | 3 |
| Min. overload | Pimax | -3 | | | dBm | |
| LOS Assert | Pa | -36 | | | dBm | |
| LOS De-assert | Pd | | | -26 | dBm | 4 |
| LOS Hysteresis | Pd-Pa | 0.5 | | 6 | dB | |

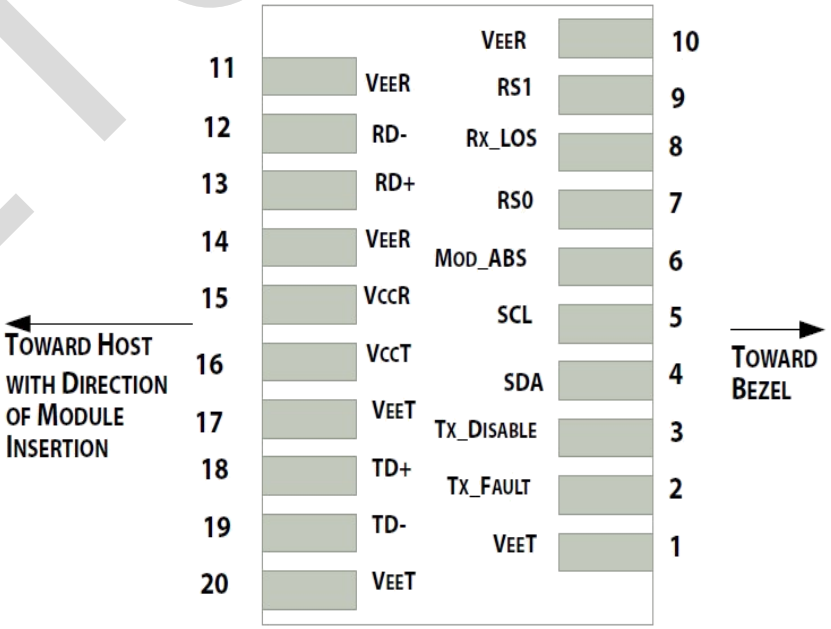
**Notes:**

1. Measure at 2^7-1 NRZ PRBS pattern
2. Transmitter eye mask definition
3. Measured with Light source 1310nm (1550nm), ER=10dB; BER =<10^-12 @PRBS=2^7-1 NRZ.
4. When LOS de-asserted, the RX data+/- output is signal output.

## Digital Diagnostics

| Parameter | Range | Accuracy | Unit | Calibration |
|---|---|---|---|---|
| Temperature | -40 to 85 | ±3 | ºC | Internal |
| Voltage | 0 to Vcc | ±3% | V | Internal |
| Tx Bias Current | 0 to 100 | ±10% | mA | Internal |
| Tx Output Power | -5 to 0 | ±3 | dB | Internal |
| Rx Input Power | -24 to -3 | ±3 | dB | Internal |

## Pin Diagram



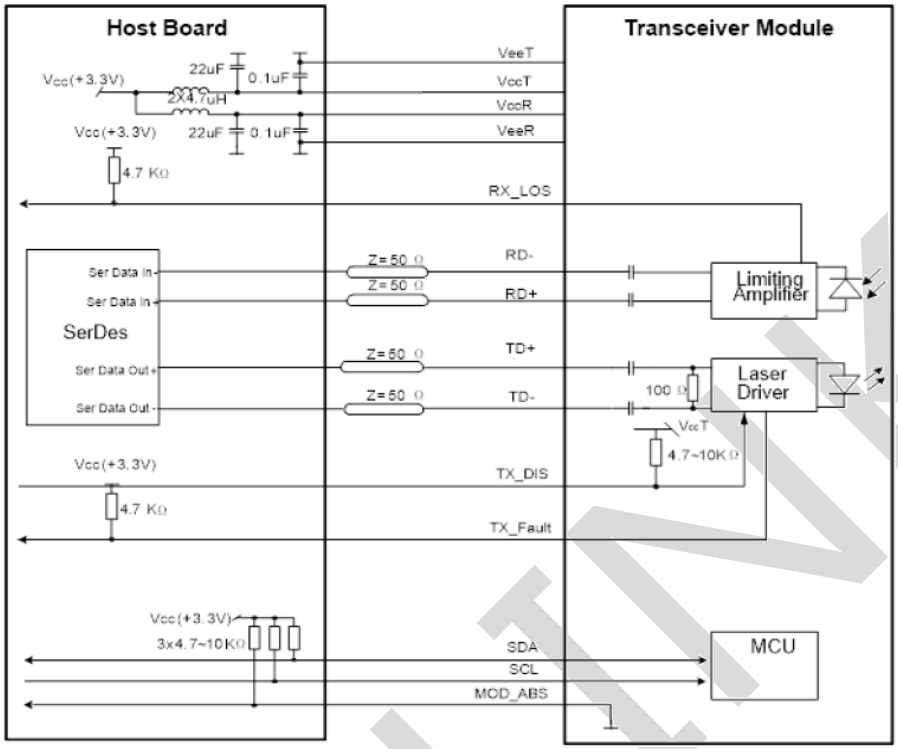
## Pin Definitions

| PIN # | Name | Function | Notes |
|---|---|---|---|
| 1 | VeeT | Tx ground | |
| 2 | Tx Fault | Tx fault indication, Open Collector Output, active “H” | 1 |
| 3 | Tx Disable | LVTTL Input, internal pull-up, Tx disabled on “H” | 2 |
| 4 | MOD-DEF2 | 2 wire serial interface data input/output (SDA) | 3 |
| 5 | MOD-DEF1 | 2 wire serial interface clock input (SCL) | 3 |
| 6 | MOD-DEF0 | Model present indication | 3 |
| 7 | Rate select | No connection | |
| 8 | LOS | Rx loss of signal, Open Collector Output, active “H” | 4 |
| 9 | VeeR | Rx ground | |
| 10 | VeeR | Rx ground | |
| 11 | VeeR | Rx ground | |
| 12 | RD- | Inverse received data out | 5 |
| 13 | RD+ | Received data out | 5 |
| 14 | VeeR | Rx ground | |
| 15 | VccR | Rx power supply | |
| 16 | VccT | Tx power supply | |
| 17 | VeeT | Tx ground | |
| 18 | TD+ | Transmit data in | 6 |
| 19 | TD- | Inverse transmit data in | 6 |
| 20 | VeeT | Tx ground | |

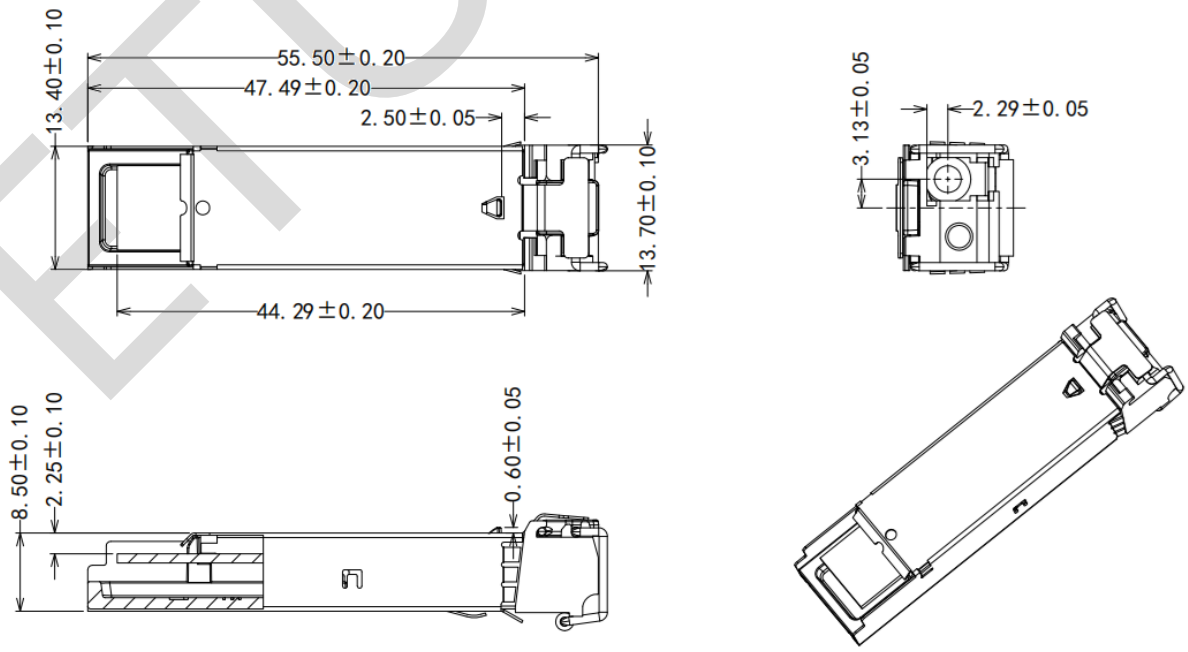
**Notes:**

1. When high, this output indicates a laser fault of some kind. Low indicates normal operation. And should be pulled up with a 4.7 – 10KΩ resistor on the host board.
2. TX disable is an input that is used to shut down the transmitter optical output. It is pulled up within the module with a 4.7 – 10KΩ resistor. Its states are:
   Low (0 – 0.8V): Transmitter on (>0.8, < 2.0V): Undefined
   High (2.0V~Vcc+0.3V): Transmitter Disabled Open: Transmitter Disabled
3. Mod-Def 0,1,2. These are the module definition pins. They should be pulled up with a 4.7K – 10KΩ resistor on the host board. The pull-up voltage shall be VccT or VccR.
   Mod-Def 0 has been grounded by the module to indicate that the module is present
   Mod-Def 1 is the clock line of two wire serial interface for serial ID
   Mod-Def 2 is the data line of two wire serial interface for serial ID
4. When high, this output indicates loss of signal (LOS). Low indicates normal operation.
5. RD+/-: These are the differential receiver outputs. They are AC coupled 100Ω differential lines which should be terminated with 100Ω (differential) at the user SERDES. The AC coupling is done inside the module and is thus not required on the host board.
6. TD+/-: These are the differential transmitter inputs. They are AC-coupled, differential lines with 100Ω differential termination inside the module. The AC coupling is done inside the module and is thus not required on the host board.

## Recommended Interface Circuit




## Mechanical Diagram



## Revision History

| Version No. | Date | Description |
|---|---|---|
| 1.0 | Nov 18, 2015 | Preliminary datasheet |
| 2.0 | October 11,2018 | Product upgrades |
| 3.0 | July 29, 2024 | Format change |

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