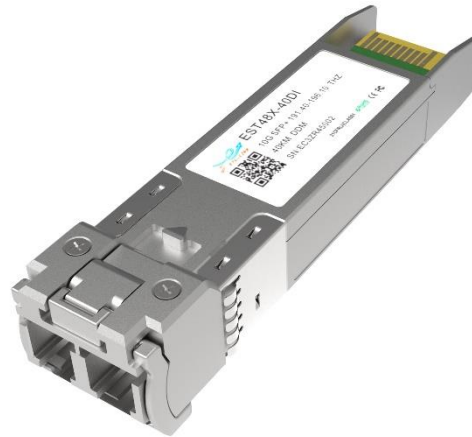


EST48X-40D(I)

10Gb/s SFP+ Tunable DWDM ZR 40km DDM Transceiver

PRODUCT FEATURES

- Support data rate up to 11.3Gb/s
- Support 40 km link distances
- 100GHz ITU-based channel spacing
- (C-Band) with a wavelength locker
- Monolithic MZM Tunable TOSA
- PIN receiver with limiting amplifier
- Duplex LC connector
- Low power consumption:
 - Commercial:<1.8W
 - Industrial: <2.5W
- Positive power supply lines: 3.3 V
- Operating case temperature range:
 - Commercial:0 to 70 deg C
 - Industrial: -40 to 85 deg C
- RoHS 6 compliant
- Compliant with SFF-8431 / SFF-8690



APPLICATIONS

- DWDM 10Gb/s SONET/SDH
- DWDM 10Gb/s Ethernet
- DWDM 10Gb/s SONET/SDH w/FEC

Description

The EST48X-40D(I) is a hot pluggable 3.3V Small-Form-Factor pluggable tunable SFP+ transceiver module for use in the up to 11.3Gb/s single mode high-speed communications equipment . Digital diagnostic functions are available via 2-wire serial interface, as specified in SFF-8431.

Ordering information

| Part Number | Product Description |
|-------------|---|
| EST48X-40D | 10G SFP+ 40km Tunable transceiver, 100GHz Spacing, 48ch,191.40~196.10 THz (1566.31~1528.77nm),RX PIN,C-TEMP |
| EST48X-40DI | 10G SFP+ 40km Tunable transceiver, 100GHz Spacing, 48ch,191.40~196.10 THz (1566.31~1528.77nm),RX PIN,I-TEMP |

I.Wavelength Guide Table

EST48X-40D(I) Wavelength table:

| Channel | Wavelength (nm) | Frequency(THZ) | Channel | Wavelength (nm) | Frequency(THZ) |
|---------|-----------------|----------------|---------|-----------------|----------------|
| 1 | 1566.31 | 191.4 | 26 | 1546.12 | 193.9 |
| 2 | 1565.5 | 191.5 | 27 | 1545.32 | 194 |
| 3 | 1564.68 | 191.6 | 28 | 1544.53 | 194.1 |
| 4 | 1563.86 | 191.7 | 29 | 1543.73 | 194.2 |
| 5 | 1563.05 | 191.8 | 30 | 1542.94 | 194.3 |
| 6 | 1562.23 | 191.9 | 31 | 1542.14 | 194.4 |
| 7 | 1561.42 | 192 | 32 | 1541.35 | 194.5 |
| 8 | 1560.61 | 192.1 | 33 | 1540.56 | 194.6 |
| 9 | 1559.79 | 192.2 | 34 | 1539.77 | 194.7 |
| 10 | 1558.98 | 192.3 | 35 | 1538.98 | 194.8 |
| 11 | 1558.17 | 192.4 | 36 | 1538.19 | 194.9 |
| 12 | 1557.36 | 192.5 | 37 | 1537.4 | 195 |
| 13 | 1556.55 | 192.6 | 38 | 1536.61 | 195.1 |
| 14 | 1555.75 | 192.7 | 39 | 1535.82 | 195.2 |
| 15 | 1554.94 | 192.8 | 40 | 1535.04 | 195.3 |
| 16 | 1554.13 | 192.9 | 41 | 1534.25 | 195.4 |
| 17 | 1553.33 | 193 | 42 | 1533.47 | 195.5 |
| 18 | 1552.52 | 193.1 | 43 | 1532.68 | 195.6 |
| 19 | 1551.72 | 193.2 | 44 | 1531.9 | 195.7 |
| 20 | 1550.92 | 193.3 | 45 | 1531.12 | 195.8 |

| | | | | | |
|----|---------|-------|----|---------|-------|
| 21 | 1550.12 | 193.4 | 46 | 1530.33 | 195.9 |
| 22 | 1549.32 | 193.5 | 47 | 1529.55 | 196 |
| 23 | 1548.51 | 193.6 | 48 | 1528.77 | 196.1 |
| 24 | 1547.72 | 193.7 | | | |
| 25 | 1546.92 | 193.8 | | | |

Notes:

1. EST48X-40D(I) module default channel is channel1(1566.31nm) for the first time power on.
2. The Module will remain last channel selected when power cycled.

II. Absolute Maximum Ratings

| Parameter | Symbol | Min | Typ | Max | Units |
|-------------------------------|-----------------|------|-----|-----|-------|
| Storage Temperature | T_{stg} | -40 | - | 85 | °C |
| Relative Humidity - Storage | RH _o | 5 | - | 95 | % |
| Relative Humidity - Operating | RH _s | 5 | - | 85 | % |
| Power Supply | V_{cc} | -0.5 | - | 3.6 | V |

III. Recommended Operating Conditions

| Parameter | Symbol | Min | Typ | Max | Units | Notes |
|----------------------------|----------|------|-----|------|-------|-----------------------|
| Case Operating Temperature | | -40 | 25 | 85 | °C | Temperature Range = I |
| Case Operating Temperature | | 0 | 25 | 70 | °C | Temperature Range = C |
| DC Supply Voltage | V_{cc} | 3.13 | - | 3.47 | V | |

IV. Electrical Characteristics

| Parameter | Symbol | Min | Typ | Max | Units | Notes |
|--------------------------------|------------|-----|-----|----------|-------|----------------------|
| Transmitter | | | | | | |
| Differential Data input Swing | V_{in} | | - | 900 | mV | Refer to CEI-28G_VSR |
| Input Differential Impedance | Z_{in} | - | 100 | - | Ω | |
| Transmitter Disable Voltage | V_D | 2 | - | V_{cc} | V | |
| Transmitter Enable Voltage | V_{EN} | 0 | - | 0.8 | V | |
| Receiver | | | | | | |
| Differential Data Output Swing | V_{out} | 450 | 600 | 750 | mV | |
| Output Differential Impedance | Z_{out} | - | 100 | - | Ω | |
| LOS Assert Voltage | V_{LOSA} | 2 | - | V_{cc} | V | |
| LOS De-assert Voltage | V_{LOSD} | 0 | - | 0.8 | V | |

V. Timing Characteristics

| Parameter | Symbol | Min | Typ | Max | Units | Notes |
|----------------------------------|-------------------|-----|-----|-----|-------|-------|
| Time to initialize cooled module | t_start_up_cooled | - | - | 90 | S | |

VI. Optical Characteristics

| Parameter | Symbol | Min | Typ | Max | Units | Notes |
|--------------------------------------|--------------------|-------|-----|-------|-------|-------|
| Transmitter | | | | | | |
| Average Output Power | P _{OUT} | -1 | - | 4 | dBm | |
| Center Wavelength | λ_{c_BOL} | z-1.5 | z | Z+1.5 | GHz | |
| Center Wavelength | λ_{c_EOL} | z-2.5 | z | Z+2.5 | GHz | |
| Center Wavelength Spacing | | - | 100 | - | GHz | |
| Side Mode Suppression Ratio | SMSR | 30 | - | - | dB | |
| Average Output Power (Laser Off) | P _{OFF} | - | - | -30 | dBm | |
| Dispersion Penalty | DP | - | - | 3 | dB | |
| Extinction ratio | ER | 8.2 | - | - | dB | |
| Relative Intensity Noise | RIN | - | - | -128 | dB/Hz | |
| Optical Return Loss Tolerance | ORLT | - | - | 20 | dB | |
| Receiver | | | | | | |
| Center Wavelength | | 1260 | | 1600 | nm | |
| Received Sensitivity (Average Power) | PIN | - | - | -16 | dBm | Note3 |
| Optical Power Overload | POL | -1 | - | - | dBm | |
| Rx_LOS of Signal Assert | PA | -26 | - | - | dBm | |
| Rx_LOS of Signal De-assert | PD | - | - | -16 | dBm | |
| Rx_LOS of Signal Hysteresis | PHy | 0.5 | - | 6 | dB | |

Notes:

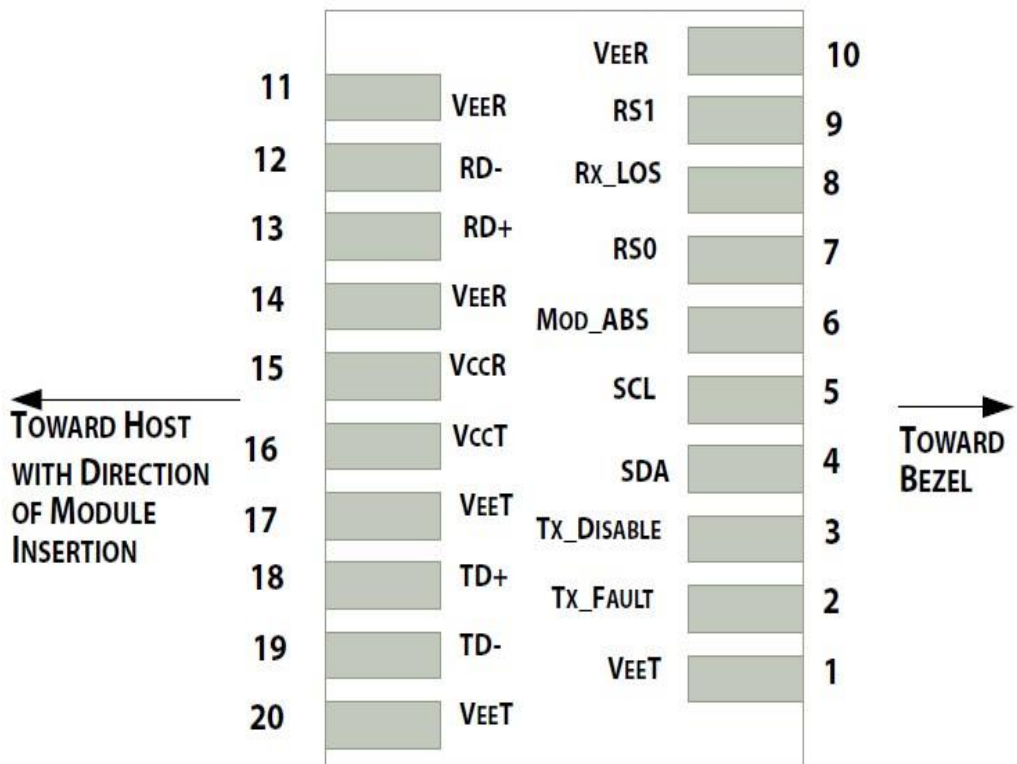
1. The optical power is launched into SMF
2. λ is wavelength of room temperature
3. Measured with RPBS 2*31-1 test pattern @10.3125Gb/s, ER=8.2dB, BER=1E-12

VII. Digital Diagnostic Monitor Accuracy

The following characteristics are defined over recommended operating condition

| Parameter | Range | Accuracy | Unit | Calibration |
|-----------------|-----------|----------|------|-------------|
| Temperature | -40 to 85 | ±3 | °C | 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 | -16 to 0 | ±3 | dB | Internal |

VIII. Pin Diagram



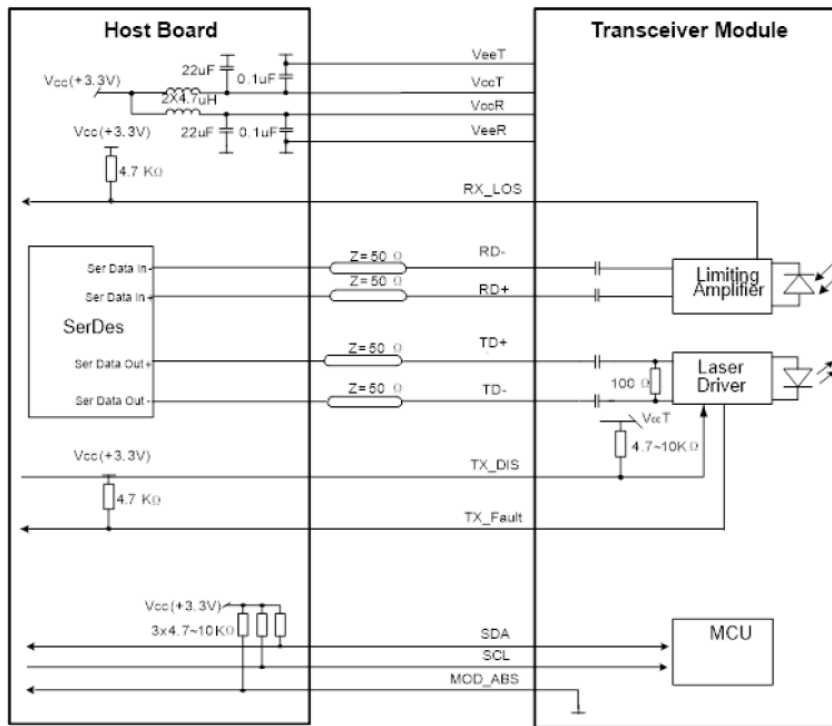
IX.Pin Descriptions

| 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 |

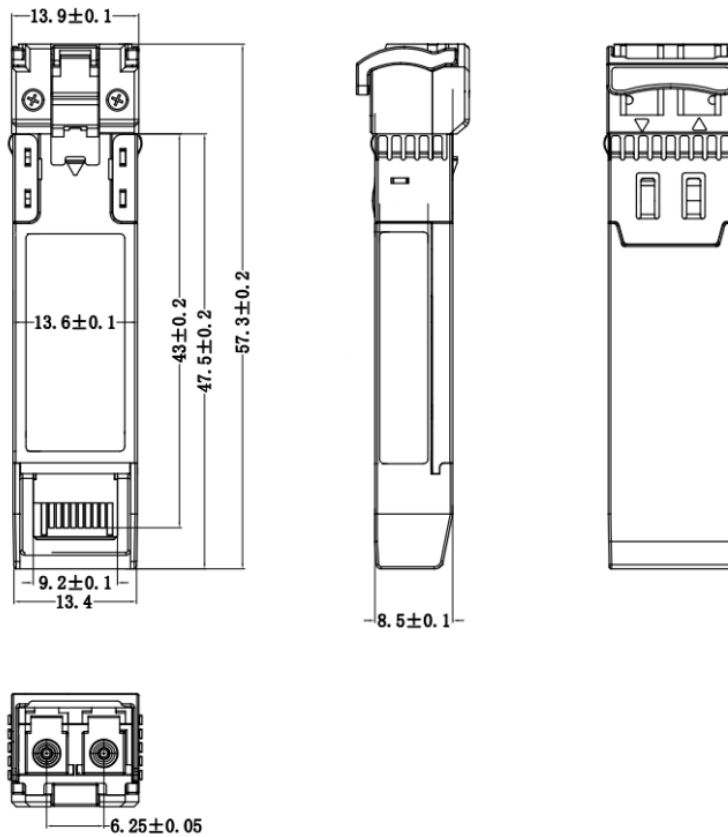
Notes:

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.

X.Recommend Circuit Schematic



XI.Mechanical Specifications(Unit: mm)



XII.Revision History

| Version No. | Date | Description |
|-------------|-------------|-----------------------|
| 1.0 | May 10 2022 | Preliminary datasheet |

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