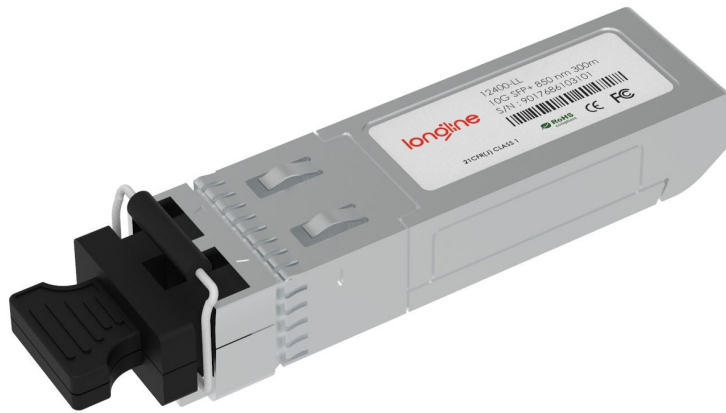


10GBASE-ZR SFP+ 1550nm 80Km DOM Transceiver

12400-LL



Application

- 10G Ethernet ZR and 10G Fibre Channel
- OTN G.709 OTU1e/2/2e FEC bit rates
- 8.5Gb/s Fibre Channel

Features

- Hot-pluggable SFP+ footprint
- Supports 8.5 and 9.95 to 11.3 Gb/s
- 80km link length
- 0/70° C case temperature range
- Cooled 1550nm EML laser
- Limiting electrical interface receiver
- Duplex LC connector
- Built-in digital diagnostic functions
- RoHS-6 compliant (lead-free)

Description

10GGBASE-ZR SFP+ transceivers are Enhanced Small Form Factor Pluggable SFP+ transceivers designed for use in 10-Gigabit multi-rate links up to 80km of G.652 single mode fiber. They support 10G Ethernet ZR and 10G Fibre Channel.

Digital diagnostics functions are available via a 2-wire serial interface. The optical transceiver is compliant per the RoHS Directive 2011/65/EU.

Product Specifications

I.General Specifications

| Parameter | Symbol | Min | Typ. | Max | Unit | Ref. |
|-----------------------------------|------------------|-----|------|---------|------|------|
| Bit Rate | BR | 8.5 | | 11.3168 | Gb/s | 1 |
| Max. Supported Link Length | L _{MAX} | | | 80 | km | 2 |

Notes:

1. Tested with a 231 –1 PRBS pattern at the BER defined in Table IV.
2. Over G.652 single mode fiber.

II. Absolute Maximum Ratings

| Parameter | Symbol | Min | Typ. | Max | Unit | Ref. |
|--|-----------------|------|------|-----|------|------|
| Maximum Supply Voltage | V _{CC} | -0.5 | | 4.0 | V | |
| Storage Temperature | T _S | -40 | | 85 | ° C | |
| Case Operating Temperature | T _{OP} | 0 | | 70 | ° C | |
| Relative Humidity | RH | 0 | | 85 | % | 1 |
| Receiver Optical Damage Threshold | RxDamage | 5 | | | dBm | |

Note:

1. Non-condensing.

III. Electrical Characteristics

| Parameter | Symbol | Min | Typ. | Max | Unit | Ref. |
|-----------------------|------------|------|------|------|------|------|
| Supply Voltage | V_{CC} | 3.13 | | 3.30 | V | |
| Supply Current | P_{diss} | | | 1.5 | W | 1 |

Transmitter

| | | | | | | |
|--------------------------------------|-------------|--------------|-----|----------|----------|---|
| Input differential impedance | R_{in} | 80 | 100 | 110 | Ω | 1 |
| Differential data input swing | $V_{in,pp}$ | 120 | | 850 | mV | 2 |
| Transmit Disable Voltage | V_D | $V_{CC}-0.8$ | | V_{CC} | V | |
| Transmit Enable Voltage | V_{EN} | 0 | | 0.8 | V | |

Receiver

| | | | | | | |
|---------------------------------------|------------------|--------------|----------------------|----------|----------|---|
| Differential data output swing | $V_{out,pp}$ | 300 | | 850 | mV | 2 |
| Output rise time and fall time | R_{out} | 80 | 100 | 120 | Ω | |
| LOS asserted | $V_{LOS A}$ | $V_{CC}-0.8$ | | V_{CC} | V | 4 |
| LOS de-asserted | $V_{LOS D}$ | 0 | | 0.8 | V | 4 |
| Power Supply Noise Tolerance | V_{CC}/V_{CCR} | | Per SFF-8431 Rev 4.1 | | mVpp | 5 |

Notes:

1. 70°C case temperature and beginning of life
2. Internally AC coupled.
3. 20°C–80%. Measured with Module Compliance Test Board and OMA test pattern. Use of four 1's and four 0's sequence in the PRBS 9 is an acceptable alternative. SFF-8431 Rev 4.1.
4. LOS is an open collector output. Should be pulled up with 4.7k Ω –10k Ω on the host board. Normal operation is logic 0; loss of signal is logic 1.
5. See Section 2.8.3 of SFF-8431 Rev 4.1.

IV. Optical Characteristics (TOP = 0 to 70 °C, VCC = 3.14 to 3.46 V)

| Parameter | Symbol | Min | Typ. | Max | Unit | Note |
|--|-------------|------|------|-------|-------|------|
| Transmitter (Tx) | | | | | | |
| Average Launch Power | P_{OUT} | 0 | | 5 | dBm | |
| Optical Wavelength | λ | 1530 | 1550 | 1565 | nm | |
| Side-Mode Suppression Ratio | SMSR | 30 | | | dB | |
| Optical Extinction Ratio | | 9 | | | dB | |
| Average Launch power of OFF transmitter | P_{OFF} | | | -30 | dBm | |
| Relative Intensity Noise | RIN | | | -128 | dB/Hz | |
| Receiver (Rx) | | | | | | |
| Optical Center Wavelength | λ_C | 1260 | | 1600 | dBm | 4 |
| Overload (Average Power) | P_{AVE} | -7 | | | dBm | |
| Receiver Reflectance | R_{rx} | | | | dB | |
| LOS De-Assert LOS De-Assert | LOS_D | | | -23.5 | dBm | |
| LOS Assert | LOS_A | -37 | | -30 | dBm | |
| LOS Hysteresis | LOS_H | 0.5 | | 6 | dB | |
| Rx Sensitivity | R_{SENS1} | | | -23 | dBm | |

Notes:

1. Per Tradeoff Table 52.8, IEEE 802.3ae 2005
2. Average Power figures are informative only, per IEEE802.3ae.
3. Measured into Type A1a (50/125 μm multimode) fiber per ANSI/TIA/EIA-455-203-2.
4. Measured with worst ER; BER<10⁻¹²; 231 – 1 PRBS.
5. Per IEEE 802.3ae.

V. Digital Diagnostic Specifications

10GBASE-ZR SFP+ transceivers can be used in host systems that require either internally or externally calibrated digital diagnostics.

| Parameter | Symbol | Min | Max | Units | Accuracy | Ref. |
|---|-------------------------------------|------|-----|-------|----------|------|
| Transceiver temperature | $\Delta\text{DD}_{\text{Temp}}$ | -5 | +70 | °C | ± 5°C | 1 |
| Transceiver supply voltage | $\Delta\text{DD}_{\text{Voltage}}$ | -2.8 | 4.0 | V | ± 3% | |
| Transmitter bias current | $\Delta\text{DD}_{\text{Bias}}$ | 0 | 127 | mA | ± 10% | 2 |
| Transmitter output power | $\Delta\text{DD}_{\text{Tx-Power}}$ | -1 | +5 | dBm | ± 2dB | |
| Receiver average optical input power | $\Delta\text{DD}_{\text{Rx-Powe}}$ | -28 | -5 | dBm | ± 2dB | |

Notes:

1. Internally measured.
2. The accuracy of the Tx bias current is 10% of the actual current from the laser driver to the laser.

| Parameter | Symbol | Min | Typ. | Max | Units | Ref. |
|-----------|--------|-----|------|-----|-------|------|
|-----------|--------|-----|------|-----|-------|------|

Dynamic Range for Rated Accuracy

| | | | | | | |
|---|-----------------|------|--|------|-----|--|
| Internally measured transceiver temperature | DD_{Temp} | -40 | | 85 | °C | |
| Internally measured transceiver supply voltage | $DD_{Voltage}$ | 3.14 | | 3.46 | V | |
| Measured TX bias current | DD_{Bias} | 0 | | 20 | mA | |
| Measured TX output power | $DD_{Tx-Power}$ | -9 | | -2.5 | dBm | |
| Measured RX received average optical power | $DD_{Rx-Power}$ | -20 | | 0 | dBm | |

Max Reporting Range

| | | | | | | |
|---|-----------------|-----|--|-----|-----|--|
| Internally measured transceiver temperature | DD_{Temp} | -40 | | 125 | °C | |
| Internally measured transceiver supply voltage | $DD_{Voltage}$ | 2.8 | | 4.0 | V | |
| Measured TX bias current | DD_{Bias} | 0 | | 20 | mA | |
| Measured TX output power | $DD_{Tx-Power}$ | -10 | | -3 | dBm | |
| Measured RX received average optical power | $DD_{Rx-Powe}$ | -22 | | 0 | dBm | |

Note:

1. Accuracy of Measured Tx Bias Current is 10% of the actual Bias Current from the laser driver to the laser.

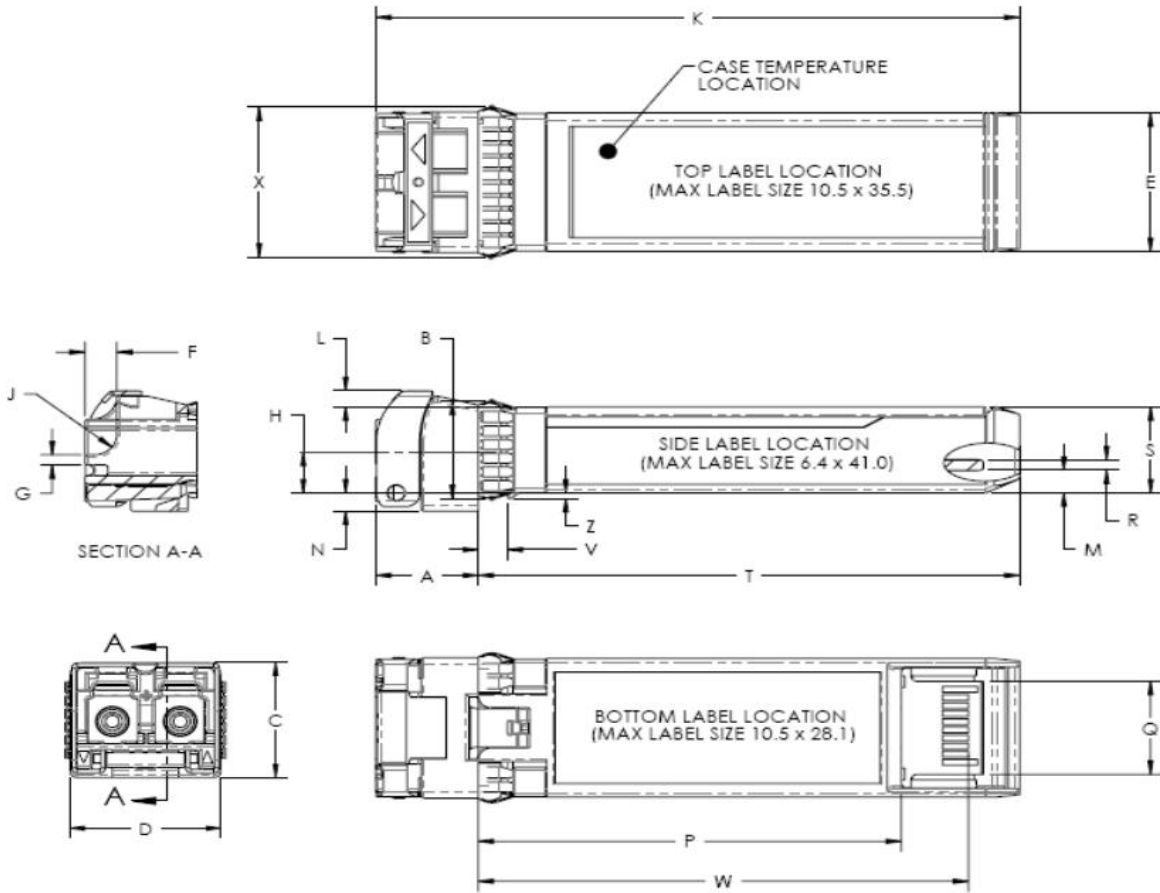
VI. Pin Description

| Pin | Symbol | Name/Description | Ref. |
|-----|--------------------|--|------|
| 1 | V _{EET} | Transmitter Ground(Common with Receiver Ground) | 1 |
| 2 | T _{FAULT} | Transmitter Fault | 2 |
| 3 | T _{DIS} | Transmitter Disable. Laser output disabled on high or open. | 3 |
| 4 | SDA | 2-wire Serial Interface Data Line | 2 |
| 5 | SCL | 2-wire Serial Interface Clock Line | 2 |
| 6 | MOD_ABS | Module Absent. Grounded within the module | 2 |
| 7 | RS0 | No connection required | 4 |
| 8 | RX_LOS | Loss of Signal indication. Logic 0 indicates normal operation. | 5 |
| 9 | RS1 | No connection required | 4 |
| 10 | V _{EER} | Receiver Ground(Common with Transmitter Ground) | 1 |
| 11 | V _{EER} | 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 | V _{EER} | Receiver Ground(Common with Transmitter Ground) | 1 |
| 15 | V _{CCR} | Receiver Power Supply | |
| 16 | V _{CCT} | Transmitter Power Supply | |
| 17 | V _{EET} | 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 | V _{EET} | Transmitter Ground(Common with Receiver Ground) | 1 |

Notes:

1. Circuit ground is internally isolated from chassis ground.
2. T 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 $V_{cc} + 0.3V$. 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 T DIS >2.0V or open, enabled on T DIS <0.8V.
4. Should be pulled up with 4.7k Ω – 10k Ω on host board to a voltage between 2.0V and 3.6V. MOD_ABS pulls line low to indicate module is plugged in.
5. LOS is open collector output. Should be pulled up with 4.7k Ω – 10k Ω on host board to a voltage between 2.0V and 3.6V. Logic 0 indicates normal operation; logic 1 indicates loss of signal.

VII. Mechanical Specifications



Note:

1. The option of the label on the top side of the transceiver is not recommended.