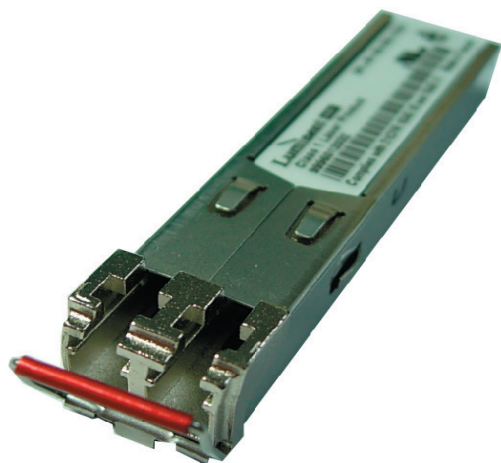


SP-48-LR1



Features

- Compliant with OC48/STM-16 Standards
- Single 3.3 V supply
- 40 km reach
- 25 dB min, 29.5 dB typical link budget
- Commercial Temperature Available (-CxA)
- Industrial Temperature Available (-TxA)
- Reduced Temperature Available (-RxA)
- 1310nm DFB Laser
- APD receiver
- SFP MSA SFF-8074i compliant
- GR 253/STM G.957 compliant
- Telcordia GR-468 compliant
- Digital Diagnostic SFF-8472 Rev. 9.3 compliant
- Color code Bail Latch : Red
- RoHS compliant

General Operating

| Parameter | Symbol | Min. | Typ. | Max. | Unit |
|---|------------------|-------|---------|-------|-------|
| Supply Voltage | V _{CC} | 3.135 | 3.3 | 3.465 | V |
| Total Current | I _{CC} | - | - | 300 | mA |
| Power Supply Noise Rejection ^a | PSR | 100 | - | - | mVp-p |
| Operating Temperature(-CDA) | T _{op} | -5 | - | 70 | °C |
| Operating Temperature(-RDA) | T _{op} | -20 | - | 85 | °C |
| Operating Temperature(-TDA) | T _{op} | -40 | - | 85 | °C |
| Storage Temperature | T _{stg} | -40 | - | 85 | °C |
| Data Rate OC48/STM-16 | DR | - | 2488.32 | - | Mbps |

a) 20Hz to 155MHz

Transmitter Specifications, Optical

| Parameter | Symbol | Min | Typical | Max | Unit |
|--|---------------------|------|---------|-------|-------|
| Optical Power | P _{op} | -2 | 0.5 | 3 | dBm |
| Average Launch Power of Off Tx | P _{off} | - | - | -30 | dBm |
| Extinction Ratio | ER | 8.2 | - | - | dB |
| Eye Mask | SONET/SDH compliant | | | | |
| Optical Jitter Generation | J _{gen} | - | - | 0.007 | UI |
| Optical Rise Time ^b | t _r | - | - | 160 | ps |
| Optical Fall Time ^b | t _f | - | - | 160 | ps |
| Mean Wavelength | λ | 1280 | 1310 | 1335 | nm |
| Spectral Width (20dB) | Δλ | - | - | 1 | nm |
| Dispersion Penalty (40Km) ^c | dp | - | - | 1 | dB |
| Relative Intensity Noise | RIN | - | - | -120 | dB/Hz |
| Reflectance Tolerance ^d | rp | -24 | - | - | dB |

b) 20%-80% values

c) Measured at BER of 1e-10, PRBS of 2²³-1, at eye center

d) 1dB degradation of receiver sensitivity

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Transmitter Specifications , Electrical

| Parameter | Symbol | Min | Typical | Max | Unit |
|------------------------------------|---------------|----------|---------|----------------|----------|
| Input Differential Impedence | R_{in} | 80 | 100 | 120 | Ω |
| PECL Single Ended data input swing | $V_{in, p-p}$ | 250 | - | 1200 | mV |
| TxFault_Fault | V_{fault} | 2 | - | V_{cc} | V |
| TxFault_Normal | V_{normal} | V_{ee} | - | $V_{ee} + 0.5$ | V |
| TxDisable_Disable | V_d | 2 | - | V_{cc} | V |
| TxDisable_Enable | V_{en} | V_{ee} | - | $V_{ee} + 0.8$ | V |

Receiver Specifications, Optical

| Parameter | Symbol | Min | Typical | Max | Unit |
|----------------------------------|------------------|------|---------|------|------|
| Receiver Power Low ^e | $R_{sens,low}$ | - | -29 | -27 | dBm |
| Receiver Power High ^e | $R_{sens,high}$ | -6 | - | - | dBm |
| Damage Threshold for Receiver | $P_{in, damage}$ | 4 | - | - | dBm |
| Wavelength ^f | λ | 1280 | 1310 | 1335 | nm |
| Maximum Reflectance of Receiver | RX_r | - | - | -27 | dB |
| LOS Assert | - | -42 | - | - | dBm |
| LOS De-assert | - | - | - | -27 | dBm |
| LOS Hysteresis | - | 0.5 | - | - | dB |

e) At 10^{-10} BER, PRBS 2²³-1

f) Operational over 1200-1625 nm range

Electrical Output

| Parameter | Symbol | Min | Typical | Max | Unit |
|-------------------------------------|---------------|-----|---------|-----|------|
| PECL Single Ended Data Output Swing | $V_{out,p-p}$ | 185 | - | 800 | mV |
| Data Output Rise Time | t_r | - | - | 175 | ps |
| Data Output Fall Time | t_f | - | - | 175 | ps |

Timing and Electrical

| Parameter | Symbol | Min | Typical | Max | Unit |
|---|---------------------|----------|---------|----------------|---------|
| Tx Disable Negate time | t_{on} | - | - | 1 | ms |
| Tx Disable assert time | t_{off} | - | - | 10 | μ s |
| Time to initialize, including reset of Tx fault | t_{init} | - | - | 300 | ms |
| Tx fault Assert time | t_{fault} | - | - | 100 | μ s |
| Tx Disable to reset | t_{reset} | 10 | - | - | μ s |
| LOS Assert time | $t_{loss,on}$ | - | - | 100 | μ s |
| LOS De-assert time | $t_{loss,off}$ | - | - | 100 | μ s |
| Serial ID Clock Rate | f_{serial_clock} | - | - | 100 | KHz |
| RX_LOS Voltage (high) | Rx_LOS_H | 2 | - | - | V |
| RX_LOS Voltage (low) | Rx_LOS_L | - | - | 0.8 | V |
| LOS output voltage-Fault | $V_{LOS\ fault}$ | 2 | - | V_{cc} | V |
| LOS output voltage-Normal | $V_{LOS\ normal}$ | V_{ee} | - | $V_{ee} + 0.5$ | V |
| MOD_DEF (0:2)-High | V_h | 2 | - | V_{cc} | V |
| MOD_DEF (0:2)-Low | V_l | V_{ee} | - | $V_{ee} + 0.5$ | V |

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Diagnostics

| Parameter | Range | Accuracy | Unit | Calibration | Formula |
|--------------------|-----------|----------|------|-------------|---|
| Temperature (-CDA) | -5 to 70 | ±3 | °C | External | $T_c(C) = T_{slope} * T_{ad}(16 \text{ bit signed twos complement value}) + T_{offset}$ |
| Temperature (-RDA) | -20 to 85 | ±3 | °C | External | $T_c(C) = T_{slope} * T_{ad}(16 \text{ bit signed twos complement value}) + T_{offset}$ |
| Temperature (-TDA) | -40 to 85 | ±3 | °C | External | $T_c(C) = T_{slope} * T_{ad}(16 \text{ bit signed twos complement value}) + T_{offset}$ |
| Voltage | 0 to Vcc | 0.1 | V | External | $V(\text{Volts}) = V_{slope} * V_{ad}(16 \text{ bit unsigned integer}) + V_{offset}$ |
| Bias Current | 0 to 120 | 5 | mA | External | $I(\text{mA}) = I_{slope} * I_{ad}(16 \text{ bit unsigned integer}) + I_{offset}$ |
| Tx Power | -2 to 3 | ±3dB | dBm | External | $Tx_PWR(\mu W) = Tx_PWR_{slope} * Tx_PWR_{ad}(16 \text{ bit unsigned integer}) + Tx_PWR_{offset}$ |
| Rx Power | -31 to -6 | ±3dB | dBm | External | $Rx_PWR(\mu W) = A0 + A1 * x + A2 * x^2 + A3 * x^3 + A4 * x^4$ |

EEPROM Serial ID

| Name of Field | Description of Field | Address | Hex | ASCII |
|---------------|---|---------|-----|-------|
| Vendor Name | SFPVendor name (ASCII) | 20 | 4C | L |
| | | 21 | 55 | U |
| | | 22 | 4D | M |
| | | 23 | 49 | I |
| | | 24 | 4E | N |
| | | 25 | 45 | E |
| | | 26 | 4E | N |
| | | 27 | 54 | T |
| | | 28 | 4F | O |
| | | 29 | 49 | I |
| 30 | 43 | C | | |
| Vendor OUI | IEEE vendor OUI code for LuminentOIC Inc. | 37 | 00 | |
| | | 38 | 06 | |
| | | 39 | B5 | |
| Vendor PN | Part number in ASCII, e.g. SP-48-LR1-CDA | 40 | 53 | S |
| | | 41 | 50 | P |
| | | 42 | 34 | 4 |
| | | 43 | 38 | 8 |
| | | 44 | 4C | L |
| | | 45 | 52 | R |
| | | 46 | 31 | 1 |
| | | 47 | 43 | C |
| | | 48 | 44 | D |
| | | 49 | 41 | A |

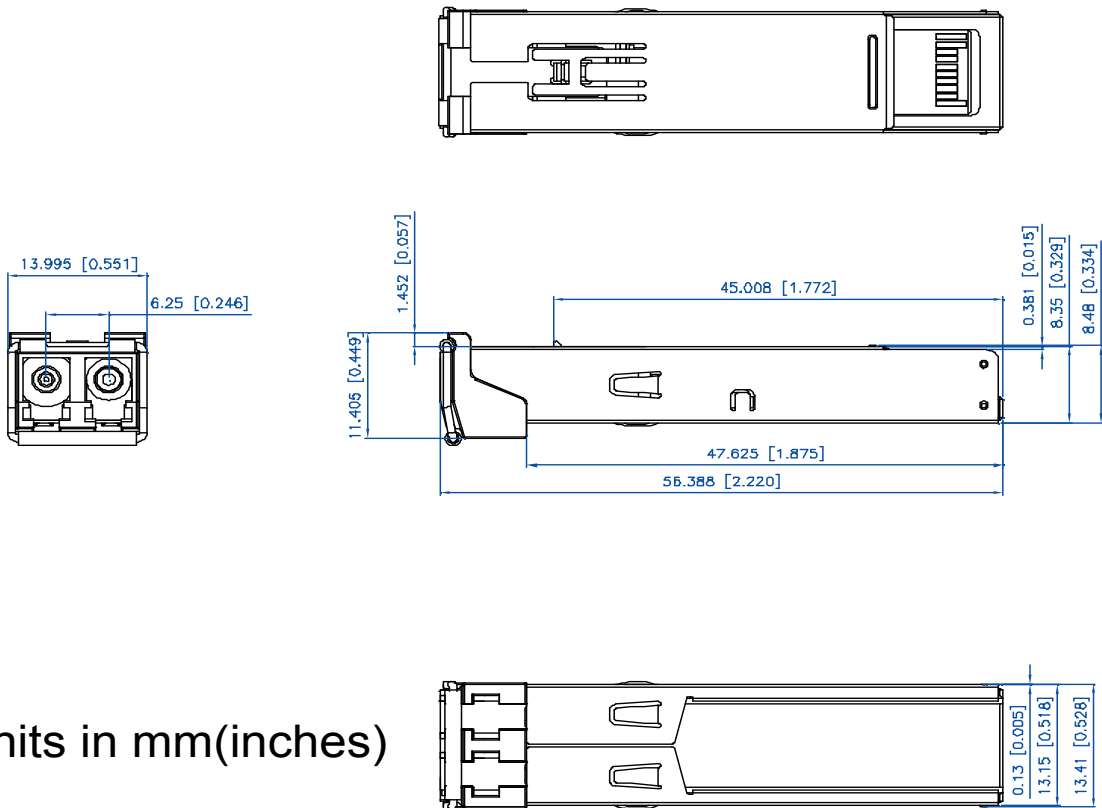
SP-48-LR1

Pinout Definitions

| Pin | Function | Notes |
|-----|-------------------|------------------------|
| 1 | V _{ee} T | TX GND |
| 2 | TX_FAULT | Open Collector |
| 3 | TX_DISABLE | Internally Pulled High |
| 4 | MOD_DEF2 | Serial Data Input |
| 5 | MOD_DEF1 | Serial Clock Input |
| 6 | MOD_DEF0 | Internally Grounded |
| 7 | NC | Not Connected |
| 8 | LOS | Open Collector |
| 9 | V _{ee} R | RX Ground |
| 10 | V _{ee} R | RX Ground |
| 11 | V _{ee} R | RX Ground |
| 12 | RXD- | RX Data Negative |
| 13 | RXD+ | RX Data Positive |
| 14 | V _{ee} R | RX GND |
| 15 | V _{CC} R | RX Power |
| 16 | V _{CC} T | TX Power |
| 17 | V _{ee} T | TX GND |
| 18 | TXD+ | TX Data Positive |
| 19 | TXD- | TX Data Negative |
| 20 | V _{ee} T | TX GND |

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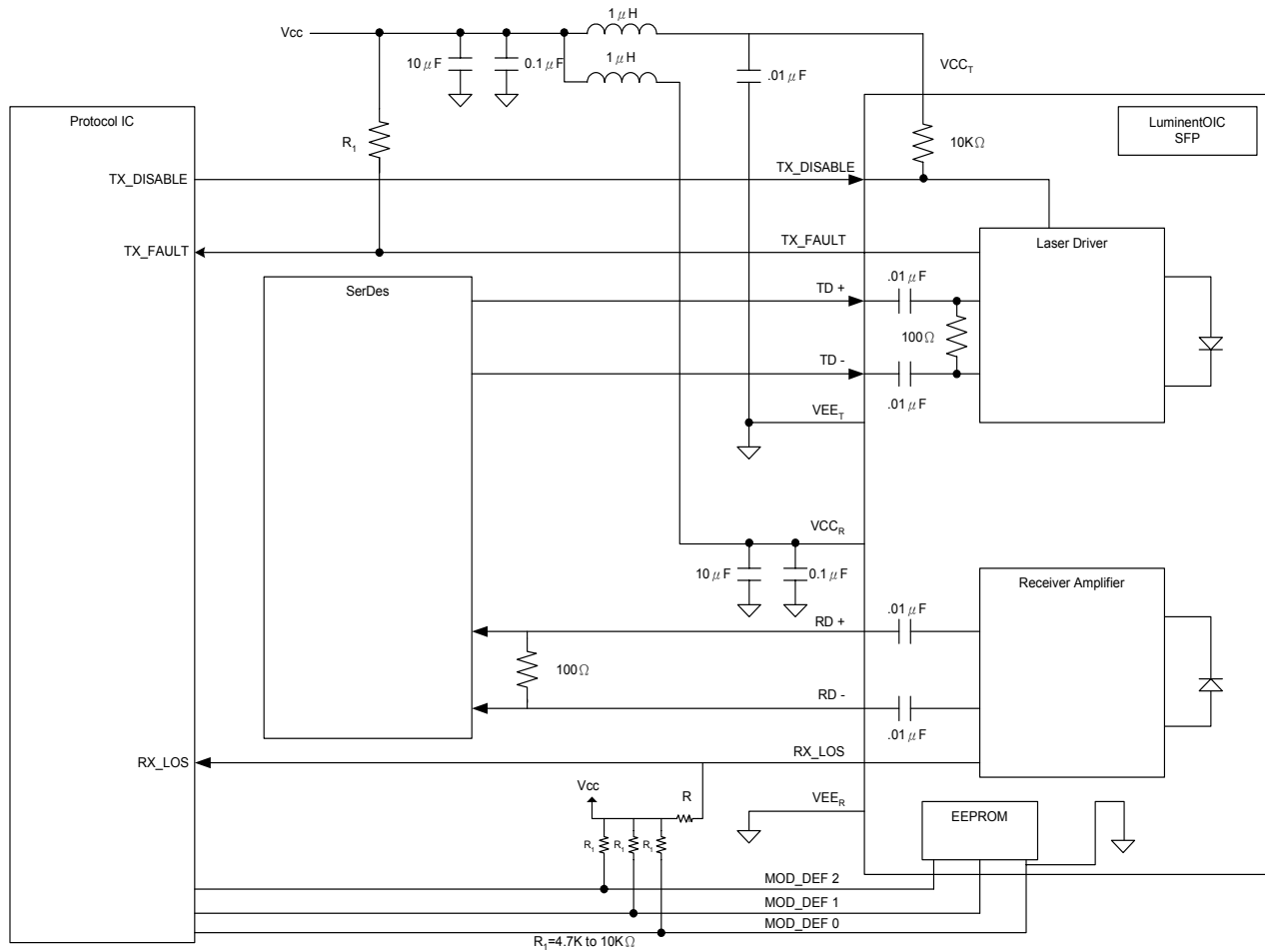
Outline Drawing



Units in mm(inches)

SP-48-LR1

Suggested Transceiver Interface



SP-48-LR1

Ordering Information

Available Options:

| | |
|---------------|---------------|
| SP-48-LR1-CDA | SP-48-LR1-CNA |
| SP-48-LR1-TDA | SP-48-LR1-TNA |
| SP-48-LR1-RDA | SP-48-LR1-RNA |

Part Numbering Definition:

SP - 03 - LR1 - Temperature Diagnostic Revision

- SP = Small Form Pluggable
- 48 = OC48
- LR1 = Long Reach 40 km
- Operatating Temperature
 - C= Commercial temperature (-5 to 70°C)
 - T= Industrial temperature (-40 to 85°C)
 - R = Reduced Industrial (-20 to 85°C)
- Diagnostic
 - D = Digital Diagnostic (SFF-8472)
 - N = No Diagnostic
- Design Revision
 - A = RoHS compliant

Warnings:

Handling Precautions: This device is susceptible to damage as a result of electrostatic discharge (ESD). A static free environment is highly recommended. Follow guidelines according to proper ESD procedures.

Laser Safety: Radiation emitted by laser devices can be dangerous to human eyes. Avoid eye exposure to direct or indirect radiation.

Legal Notes:

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