

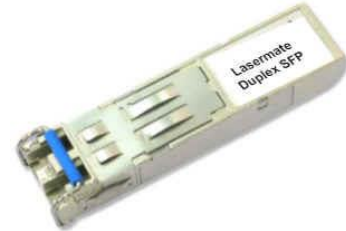


1.25Gbps 1310nm SMF 10km SFP Optical Transceiver with Duplex LC Connector

Model No. CS13F-24F-3S-Tx-LD

FEATURES

- RoHS compliant
- Compliant with IEEE802.3z Gigabit Ethernet
- Compliant with SFF8472 diagnostic monitoring interface
- Hot pluggable
- Single power supply 3.3V
- Duplex LC connector
- Differential LVPECL inputs and outputs
- TTL signal detect indicator
- Class 1 laser product compliant with EN 60825-1
- Input/Output: AC/AC



DIAGNOSTICS

| PARAMETER | RANGE | ACCURACY | UNIT | CALIBRATION |
|--------------|------------|----------|------|-------------|
| Temperature | -40 to 95 | ±3 | °C | External |
| Voltage | 3.0 to 3.6 | ±0.1 | V | |
| Bias Current | 0 to 100 | ±10% | mA | |
| TX Power | -9 to -3 | ±3 dB | dBm | |
| RX Power | -23 to -3 | ±3 dB | dBm | |

ABSOLUTE MAXIMUM RATINGS

| PARAMETER | SYMBOL | MIN | MAX | UNIT |
|---------------------|-----------------|------|-----------------|------|
| Storage Temperature | T _S | -40 | 85 | °C |
| Supply Voltage | V _{CC} | -0.5 | 4.0 | V |
| Input Voltage | V _{IN} | -0.5 | V _{CC} | V |

RECOMMENDED OPERATING CONDITIONS

| PARAMETER | SYMBOL | MIN | MAX | UNIT | NOTES |
|----------------------------|-----------------------------------|-----|-----|------|--------------------|
| Case Operating Temperature | T _C | 0 | 70 | °C | CS13F-24F-3S-TC-LD |
| | | -40 | 85 | | CS13F-24F-3S-TI-LD |
| Supply Voltage | V _{CC} | 3.1 | 3.5 | V | |
| Supply Current | I _{TX} + I _{RX} | - | 250 | mA | |

**TRANSMITTER ELECTRO-OPTICAL CHARACTERISTICS ($V_{CC} = 3.1V$ to $3.5V$, $T_C = 0^\circ C$ to $70^\circ C$, $-40^\circ C$ to $85^\circ C$)**

| PARAMETER | SYMBOL | MIN | TYP. | MAX | UNIT | NOTES |
|--|---------------------------|------|------|------|-------|---------|
| Output Optical Power 62.5/125, 50/125um fiber | P_{out} | -9 | - | -3 | dBm | Average |
| Extinction Ratio | ER | 9 | - | - | dB | |
| Center Wavelength | λ_C | 1270 | 1310 | 1355 | nm | |
| Spectral Width (RMS) | $\Delta\lambda$ | - | - | 2.5 | nm | |
| Relative Intensity Noise | RIN | - | - | -120 | dB/Hz | |
| Rise/Fall Time (20~80%) | $T_{r,f}$ | - | - | 260 | ps | |
| Total Jitter | TJ | - | - | 227 | ps | |
| Output Eye | Compliant with IEEE802.3z | | | | | |
| Max. P_{out} TX-DISABLE Asserted | P_{OFF} | - | - | -45 | dBm | |
| Differential Input Voltage | V_{DIFF} | 0.4 | - | 2.0 | V | |

RECEIVER ELECTRO-OPTICAL CHARACTERISTICS ($V_{CC} = 3.1V$ to $3.5V$, $T_C = 0^\circ C$ to $70^\circ C$, $-40^\circ C$ to $85^\circ C$)

| PARAMETER | SYMBOL | MIN | TYP. | MAX | UNIT | NOTES |
|---|-------------|------|------|----------|------|------------------|
| Optical Input Power-Maximum | P_{IN} | -3 | - | - | dBm | $BER < 10^{-12}$ |
| Optical Input Power-Minimum (Sensitivity) | P_{IN} | - | - | -21 | dBm | $BER < 10^{-12}$ |
| Operating Center Wavelength | λ_C | 1260 | - | 1610 | nm | |
| Optical Return Loss | ORL | 12 | - | - | dB | |
| Signal Detect-Asserted | P_A | - | - | -21 | dBm | |
| Signal Detect-Deasserted | P_D | -35 | - | - | dBm | |
| Data Output Rise, Fall time (20~80%) | $T_{r,f}$ | - | - | 0.35 | ns | |
| Differential Output Voltage | V_{DIFF} | 0.5 | - | 1.2 | V | |
| Receiver Loss of Signal Output Voltage-Low | RX_LOS_L | 0 | - | 0.5 | V | |
| Receiver Loss of Signal Output Voltage-High | RX_LOS_H | 2.4 | - | V_{CC} | V | |



EEPROM Serial ID Memory Contents (2-Wire Address A0h)

| Address | Description | Hex | Real Value |
|---------|-----------------------------|--|--|
| 0 | Identifier | 03 | SFP or SFP+ |
| 1 | Ext. Identifier | 04 | GBIC/SFP function is defined by two-wire interface ID only |
| 2 | Connector | 07 | LC |
| 3 | Specification Compliance | 00 | Unallocated |
| 4 | | 00 | Unallocated |
| 5 | | 00 | Unallocated |
| 6 | | 02 | 1000BASE-LX; |
| 7 | | 12 | Longwave laser(LC);long distance(L); |
| 8 | | 00 | Unallocated |
| 9 | | 01 | Single Mode(SM); |
| 10 | | 01 | 100MBytes/sec; |
| 11 | Encoding | 01 | 8B/10B |
| 12 | BR, nominal | 0D | 1300Mbps |
| 13 | Rate Identifier | 0D | |
| 14 | Length(SMFm)-km | 00 | 10(units of km) |
| 15 | Length(SMF) | 00 | 100(units of 100m) |
| 16 | Length(50 μ m) | 00 | |
| 17 | Length(62.5 μ m) | 37 | |
| 18 | Length(cable) | 1E | |
| 19 | Length(OM3) | 00 | |
| 20-35 | Vendor name | 41, 50, 41, 43, 20, 4F, 70, 74, 6F, 20, 20, 20, 20, 20, 20, 20 | APAC Opto |
| 36 | Extended Module | 00 | |
| 37-39 | Vendor OUI | 00, 0F, 99 | |
| 40-55 | Vendor PN | 4C, 53, 33, 38, 2D, 43, 33, 53, 2D, 54, 49, 2D, 4E, 2D, 44, 44 | LS38-C3S-TI-N-DD |



| | | | |
|--------|----------------------------|-------------|--|
| 56-59 | Vendor rev | 00,00,00,00 | Unspecified |
| 60-61 | Wave length | 05, 1E | 1310nm |
| 62 | Unallocated | 00 | |
| 63 | CC_BASE. | DC | Check sum of byte 0 ~ 62 |
| 64-65 | Options | 00,1A | Loss of Signal;Tx_Fault;Tx_Disable; |
| 66-67 | BR | 00, 00 | |
| 68-83 | Vendor SN | | |
| 84-91 | Date Code | | |
| 92 | Diagnostic Monitoring Type | 58 | Received Power Measurement Type;Externally Calibrated;Digital diagnostic monitoring implemented; |
| 93 | Enhanced Options | B0 | Rx_Loss Monitoring;Tx_Fault Monitoring;Alarm/warning Flags; |
| 94 | SFF-8472 Compliance | 01 | includes functionality described in Rev 9.3 of SFF-8472 |
| 95 | CC_EXT | 2E | Check sum of byte 64 ~ 94 |
| 96-127 | Vendor Specific | | |

EEPROM Serial ID Memory Contents (A2h)

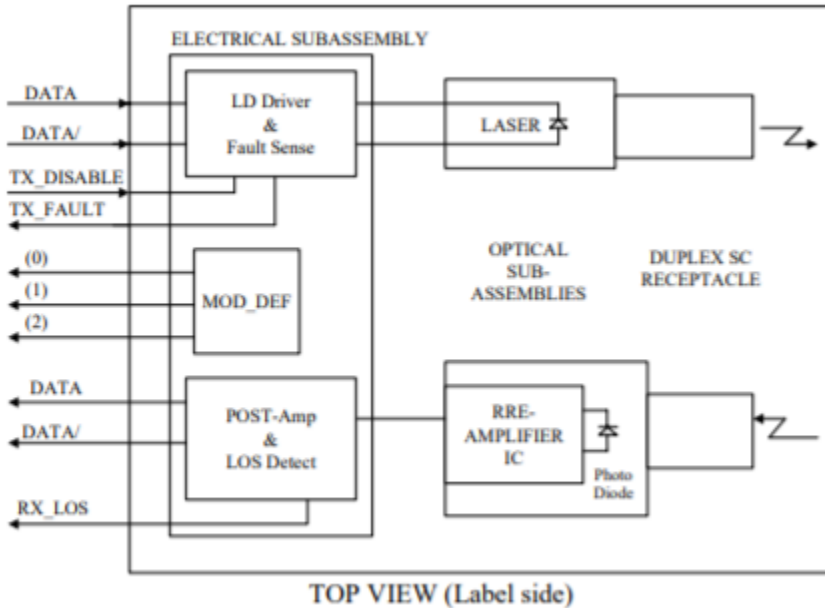
| Address | Description | Value |
|---------|--|--------------|
| 00-01 | Temp High Alarm | 85 Degree C |
| 02-03 | Temp Low Alarm | -15 Degree C |
| 04-05 | Temp High Warning | 80 Degree C |
| 06-07 | Temp Low Warning | -10 Degree C |
| 08-09 | Voltage High Alarm | 3.8 V |
| 10-11 | Voltage Low Alarm | 2.8 V |
| 12-13 | Voltage High Warning | 3.6 V |
| 14-15 | Voltage Low Warning | 2.97 V |
| 16-17 | Bias High Alarm | 80 mA |
| 18-19 | Bias Low Alarm | 0.1 mA |
| 20-21 | Bias High Warning | 70 mA |
| 22-23 | Bias Low Warning | 0.5 mA |
| 24-25 | TX Power High Alarm | -1 dBm |
| 26-27 | TX Power Low Alarm | -11.5 dBm |
| 28-29 | TX Power High Warning | -2 dBm |
| 30-31 | TX Power Low Warning | -10.5 dBm |
| 32-33 | RX Power High Alarm | -2 dBm |
| 34-35 | RX Power Low Alarm | -22 dBm |
| 36-37 | RX Power High Warning | -3 dBm |
| 38-39 | RX Power Low Warning | -19 dBm |
| 40-55 | Reserved for future monitored quantities | |
| 56-91 | Calibration constant | |



| | | |
|-------------|--|--|
| 92-94 | Reserved | |
| 95 | Check sum | |
| 96-97 | Real Time temperature | |
| 98-99 | Real Time supply voltage | |
| 100-101 | Real Time TX bias current | |
| 102-103 | Real Time TX optical power | |
| 104-105 | Real Time RX received power | |
| 106-109 | Reserved | |
| 110(bit7) | NA | |
| 110(bit6) | NA | |
| 110(bit5) | Reserved | |
| 110(bit4) | NA | |
| 110(bit3) | NA | |
| 110(bit2) | Digital state of TX fault output pin | |
| 110(bit1) | Digital state of LOS output pin | |
| 110(bit0) | NA | |
| 111 | Reserved | |
| 112(bit7) | Set when internal temperature exceeds high alarm level | |
| 112(bit6) | Set when internal temperature exceeds is below alarm level | |
| 112(bit5) | Set when internal supply voltage exceeds high alarm level | |
| 112(bit4) | Set when internal supply voltage is below alarm level | |
| 112(bit3) | Set when TX bias exceeds high alarm level | |
| 112(bit2) | Set when TX bias voltage is below alarm level | |
| 112(bit1) | Set when TX output power exceeds high alarm level | |
| 112(bit0) | Set when TX output power voltage is below alarm level | |
| 113(bit7) | Set when RX received power exceeds high alarm level | |
| 113(bit6) | Set when RX received power is below alarm level | |
| 113(bit5-0) | Reserved | |
| 114-115 | Reserved | |
| 116(bit7) | Set when internal temperature exceeds high warning level | |
| 116(bit6) | Set when internal temperature exceeds is below warning level | |
| 116(bit5) | Set when internal supply voltage exceeds high warning level | |
| 116(bit4) | Set when internal supply voltage is below warning level | |
| 116(bit3) | Set when TX bias exceeds high warning level | |
| 116(bit2) | Set when TX bias voltage is below warning level | |
| 116(bit1) | Set when TX output power exceeds high warning level | |
| 116(bit0) | Set when TX output power voltage is below warning level | |
| 117(bit7) | Set when RX received power exceeds high warning level | |
| 117(bit6) | Set when RX received power is below warning level | |
| 117(bit5-0) | Reserved | |
| 118-119 | Reserved | |
| 120-127 | Vendor specific | |



BLOCK DIAGRAM OF TRANSCEIVER



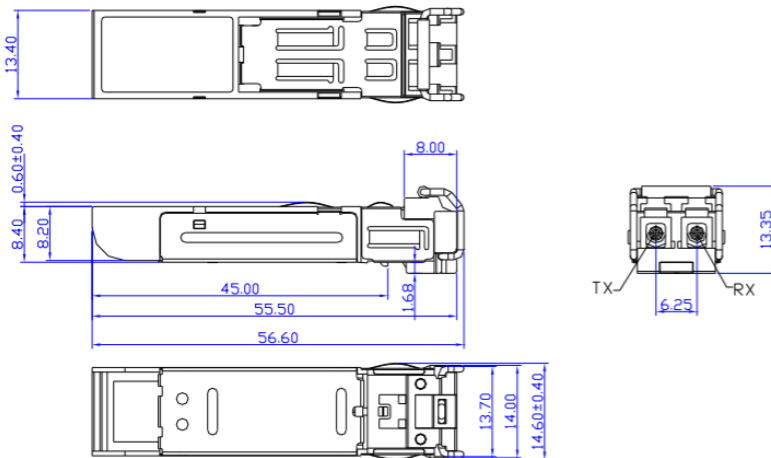
Transmitter Section - The transmitter section consists of a 1310 nm InGaAsP laser in an eye safe optical subassembly (OSA) which mates to the fiber cable. The laser OSA is driven by a LD driver IC which converts differential input LVPECL logic signals into an analog laser driving current.

TX_DISABLE - The TX_DISABLE signal is high (TTL logic "1") to turn off the laser output. The laser will turn on when TX_DISABLE is low (TTL logic "0").

Receiver Section - The receiver utilizes an InGaAs PIN photodiode mounted together with a trans-impedance preamplifier IC in an OSA. This OSA is connected to a circuit providing post-amplification quantization, and optical signal detection.

Receive Loss (RX_LOS) - The RX_LOS is high (logic "1") when there is no incoming light from the companion transceiver. This signal is normally used by the system for the diagnostic purpose. The signal is operated in LVTTTL level.

DIMENSIONS



DIMENSIONS ARE IN MILLIMETERS

ALL DIMENSIONS ARE ± 0.2mm UNLESS OTHERWISE SPECIFIED

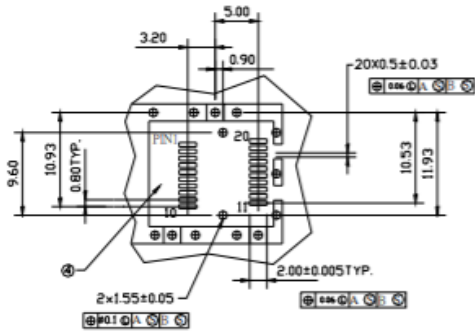
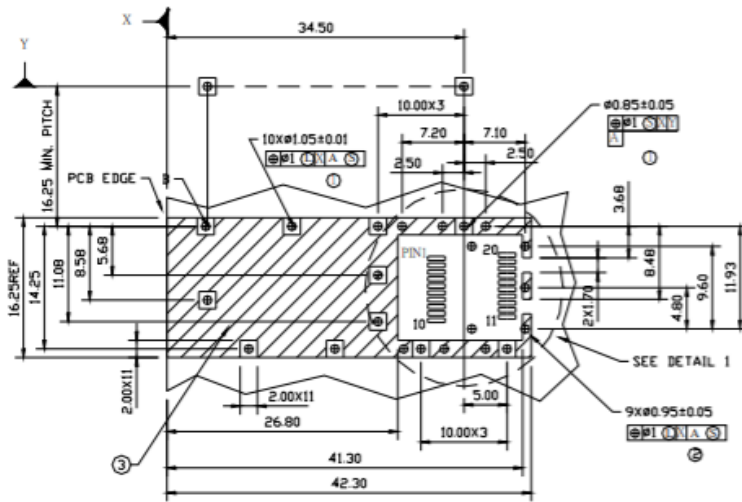
Lasermate Group, Inc.

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SFP HOST BOARD MECHANICAL LAYOUT

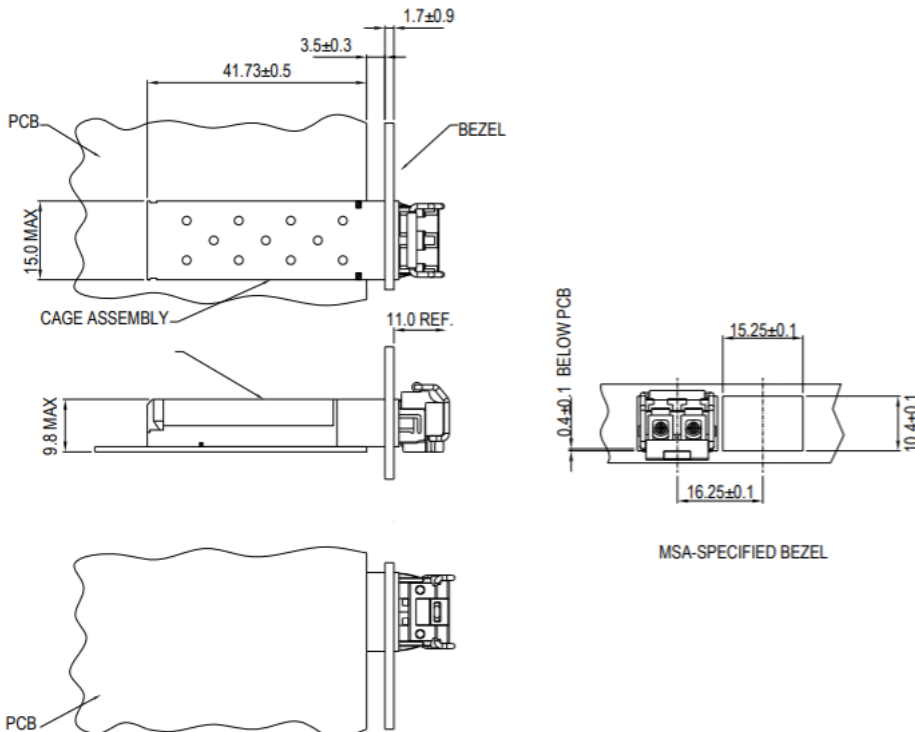


LEGEND

1. PADS AND VIAS ARE CHASSIS GROUND
2. THROUGH HOLES, PLATING OPTIONAL
3. HATCHED AREA DENOTES COMPONENT AND TRACE KEEPOUT (EXCEPT CHASSIS GROUND)
4. AREA DENOTES COMPONENT KEEPOUT (TRACES ALLOWED)

DIMENSIONS ARE IN MILLIMETERS

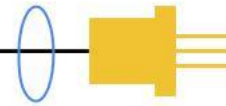
ASSEMBLY DRAWING (unit: mm)



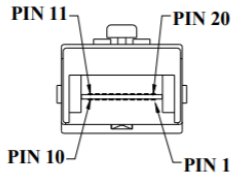
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PIN ASSIGNMENT



| PIN | SIGNAL NAME | DESCRIPTION | PIN | SIGNAL NAME | DESCRIPTION |
|-----|------------------|---|-----|------------------|--|
| 1 | T _{GND} | Transmit Ground | 11 | R _{GND} | Receiver Ground |
| 2 | TX_FAULT | Transmit Fault | 12 | RX- | Receive Data Bar, Differential PECL, ac coupled |
| 3 | TX_DISABLE | Transmit Disable | 13 | RX+ | Receive Data, Differential PECL, ac coupled |
| 4 | MOD_DEF (2) | SDA Serial Data Signal | 14 | R _{GND} | Receiver Ground |
| 5 | MOD_DEF (1) | SCL Serial Clock Signal | 15 | V _{CCR} | Receiver Power Supply |
| 6 | MOD_DEF (0) | TTL Low | 16 | V _{CCT} | Transmitter Power Supply |
| 7 | RATE SELECT | Open Circuit | 17 | T _{GND} | Transmitter Ground |
| 8 | RX_LOS | Receiver Loss of Signal, TTL High, open collector | 18 | TX+ | Transmit Data, Differential PECL, ac coupled |
| 9 | R _{GND} | Receiver Ground | 19 | TX- | Transmit Data Bar, Differential PECL, ac coupled |
| 10 | R _{GND} | Receiver Ground | 20 | T _{GND} | Transmitter Ground |

EYE SAFETY MARK

The single-mode transceiver is a class 1 laser product. It complies with EN 60825-1 and FDA 21 CFR 1040.10 and 1040.11. In order to meet laser safety requirements, the transceiver shall be operated within the Absolute Maximum Ratings.

Required Mark

**Class 1 Laser Product
Complies with
21 CFR 1040.10 and 1040.11**

[Caution] All adjustments have been done at the factory before the shipment of the devices. No maintenance and user serviceable part is required. Tampering with and modifying the performance of the device will result in voided product warranty.

ORDERING INFORMATION

| PART NUMBER | OPERATING TEMPERATURE |
|--------------------|-----------------------|
| CS13F-24F-3S-TC-LD | 0°C to 70°C |
| CS13F-24F-3S-TI-LD | -40°C to 85°C |

Note: The specifications subject to change without notice.

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