



Features

- ☑ Compliant with IEEE 802.3z Draft D5.0 1000BASE-LX specifications for Gigabit Ethernet
- ☑ Distance options of 10 km, 25 km, 40 km and 70 km using DFB lasers also available
- ☑ Eye Safe (Class I Laser Safety)
- ☑ Excellent EMI & ESD protection (optional extra EMI shield also available)
- ☑ Multi-sourced 1x9 package with Duplex SC interface (ST or FC connector also available)
- ☑ PCI-mezzanine-compliant package (9.8 mm maximum height)
- ☑ Single +3.3 V supply & LV-PECL interface (AC coupling option also available)
- ☑ Conductive Plastic or Metal package
- ☑ Wave Solder Process Compatible

Description

The DTR-1250-3.3-SM fiber optic transceiver is the 3.3 volt supply version of the DTR-1250-SM 5 volt transceiver. It offers a simple and convenient way to interface 1000BASE-LX Gigabit Ethernet boards running at 1.25 Gbaud to single mode and multimode fiber optic cables. In addition to option “L2” for the 5 km distance specified in IEEE 802.3z Draft D5.0, five other options with longer distance capability with single mode fibers are offered. In option “L1”, a 1300 nm Fabry Perot laser with higher power and narrower spectral width and center wavelength range is used to increase the distance to at least 10 km. In option “L0”, an even higher power 1300 nm Fabry Perot laser is used to offer more optical power budget. In option “H3”, a 1300 nm DFB laser and a high sensitivity receiver are used to increase the distance to over 25 km or 30 km (assuming worst case fiber loss of 0.4 dB/km and 0.35 dB/km respectively). In option “H5”, a 1550 nm DFB laser and a high sensitivity receiver are used to increase the distance to over 35 km or 40 km (assuming worst case fiber loss of 0.3 and 0.25 dB/km respectively). Finally, in option “H7”, a high power 1550 nm DFB laser and an ultra

high sensitivity receiver are used to increase the distance to 70 km (assuming fiber loss of 0.2 to 0.25 dB/km). All modules satisfy Class I Laser Safety requirements in accordance with the US FDA/CDRH and international IEC-825 standards.

All transceiver modules are housed in a PCI-mezzanine-compliant (9.8 mm maximum height) one-row, 9-pin (1x9) package with Duplex SC connector interface. The transceiver package is made of *conductive* plastic to obtain excellent EMI shielding. An optional EMI shield for making direct contact from the SC connector to the equipment chassis opening is also available. The transceiver is also offered in a metal package with ST or FC connector interface.

The transmitter and receiver DATA interface are differential direct-coupled LV-PECL. An alternate version with AC coupling interface is also available. The receiver Signal Detect output interface is direct-coupled LV-PECL.

The transceiver operates from a single +3.3V power supply over an operating temperature range of 0°C to +70°C. Please refer to the DTR-1250-SM data sheet for the 5 v supply version.

Absolute Maximum Ratings

| Parameter | Symbol | Minimum | Maximum | Units |
|-----------------------------------|----------|---------|----------|---------------|
| Storage Temperature | T_{st} | - 40 | + 85 | °C |
| Operating Temperature | T_{op} | 0 | + 70 | °C |
| Supply Voltage | V_{CC} | 0 | + 5.0 | V |
| Input Voltage | V_{in} | 0 | V_{CC} | V |
| Output Current | I_o | - | 50 | mA |
| Lead Soldering Temperature & Time | - | - | - | 260°C, 10 sec |

DTR-1250-3.3-SM

Transmitter Electrical Interface (over Operating Temperature Range)

| Parameter | Symbol | Minimum | Typical | Maximum | Units |
|---------------------------------|----------|------------------|---------|------------------|---------|
| Input HIGH Voltage ¹ | V_{IH} | $V_{CC} - 1.165$ | - | $V_{CC} - 0.700$ | V |
| Input LOW Voltage ¹ | V_{IL} | $V_{CC} - 1.890$ | - | $V_{CC} - 1.475$ | V |
| Data Input Current - HIGH | I_H | - | - | 350 | μA |
| Data Input Current - LOW | I_L | - | - | 250 | μA |

¹ For AC-coupled modules, the input voltage swing is 0.3 V minimum and 1.2 V maximum.

Receiver Electrical Interface (over Operating Temperature Range)

| Parameter | Symbol | Minimum | Typical | Maximum | Units |
|----------------------------------|----------|-----------------|---------|-----------------|-------|
| Output HIGH Voltage ¹ | V_{OH} | $V_{CC} - 1.06$ | - | $V_{CC} - 0.70$ | V |
| Output LOW Voltage ¹ | V_{OL} | $V_{CC} - 1.95$ | - | $V_{CC} - 1.55$ | V |
| Output Current | I_O | - | - | 25 | mA |

¹ For AC-coupled modules, the output voltage swing into 50-ohm load is 0.3 V minimum and 1 V maximum.

Electrical Power Supply Characteristics (over Operating Temperature Range)

| Parameter | Symbol | Minimum | Typical | Maximum | Units |
|----------------|-------------------|----------|---------|---------|-------|
| Supply Voltage | V_{CC} | 3.13 | 3.3 | 3.47 | V |
| Supply Current | DC-coupled module | I_{CC} | - | 150 | mA |
| | AC-coupled module | I_{CC} | - | 170 | mA |

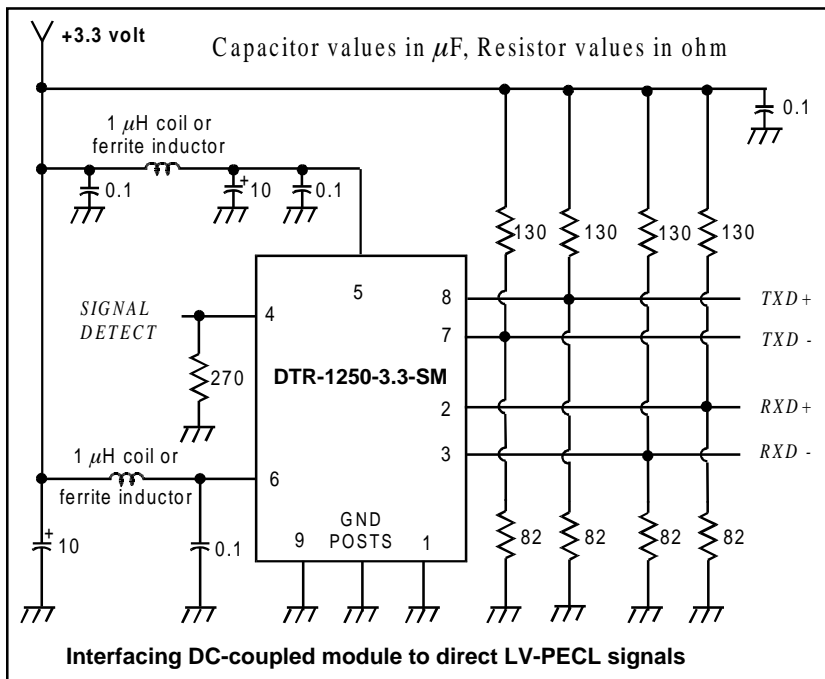
Application Notes

DATA interface (DC-coupled module):

The interface circuit for the standard DC-coupled module with direct-coupled LV-PECL interface is shown. The termination resistors for the transmitter should be close to the DTR transceiver module. The termination resistors for the receiver (50 ohms to $V_{CC} - 2$ volts or the Thevenin equivalent resistors shown) should be close to the PHY or SERDES IC (which receives the DATA outputs from the receiver).

DATA interface (AC-coupled module):

For modules with AC coupling option, both transmitter and receiver interface has internal bias, termination and AC coupling capacitor. The transmitter can be connected directly to the driving SERDES. The receiver can be connected directly to the external 50 ohm load (termination resistor of the SERDES).



SIGNAL DETECT: The Signal Detect circuit monitors the level of the incoming optical signal and generates a logic LOW signal when insufficient photocurrent is produced. The SIGNAL DETECT output is LV-PECL level requiring termination (270 ohms to GND is recommended).

Power supply and grounding: The power supply line should be well-filtered. All 0.1 μF power supply bypass capacitors should be as close to the DTR transceiver module as possible. The two front GND posts should be

grounded to Circuit Ground or Chassis Ground.

Laser Safety: All transceivers are Class I Laser products per FDA/CDRH and IEC-825 standards. They must be operated under specified operating conditions.

Optical Communication Products, Inc.

DATE OF MANUFACTURE:

MANUFACTURED IN THE USA

This product complies with
21 CFR 1040.10 and 1040.11

Meets Class I Laser Safety Requirements

DTR-1250-3.3-SM

Transmitter Performance Characteristics (over Operating Temperature, $V_{CC} = 3.13$ to 3.47 V)

| Parameter | Symbol | Minimum | Typical | Maximum | Units |
|-----------------------------------|---|---------|---------|---------|-------|
| Data Rate | B | 50 | 1250 | 1300 | Mb/s |
| Optical Output Power ¹ | L2 | - 11.0 | - | - 3.0 | dBm |
| | L1 | - 9.0 | - | - 3.0 | |
| | L0 | - 5.0 | - | 0 | |
| | H3, H5 | - 4.0 | - | 1.0 | |
| | H7 | - 3.0 | - | 2.0 | |
| Center Wavelength | L2 | 1270 | 1310 | 1355 | nm |
| | L1, L0 | 1285 | 1310 | 1345 | |
| | H3 | 1280 | 1310 | 1335 | |
| | H5, H7 | 1480 | 1550 | 1580 | |
| Spectral Width (RMS) ¹ | L2 | - | - | 4.0 | nm |
| | L1, L0 | - | - | 2.5 | |
| Spectral Width (-20 dB) | H3, H5, H7 | - | - | 1.0 | |
| Extinction Ratio | P_{hi}/P_{lo} | 9 | - | - | dB |
| Deterministic Jitter | DJ | - | - | 80 | ps |
| Random Jitter | RJ | - | - | 147 | ps |
| Relative Intensity Noise | RIN | - | - | - 120 | dB/Hz |
| Transmitter Output Eye | compliant with Eye Mask Defined in IEEE 802.3z standard | | | | |

¹ Measured average power coupled into single mode fiber (SMF). For 50 μ m or 62.5 μ m multimode fiber (MMF) operation, the output power is 0.5 dB less and is measured after a single mode fiber offset-launch mode-conditioning patch cord as specified in IEEE 802.3z Draft 5.0.

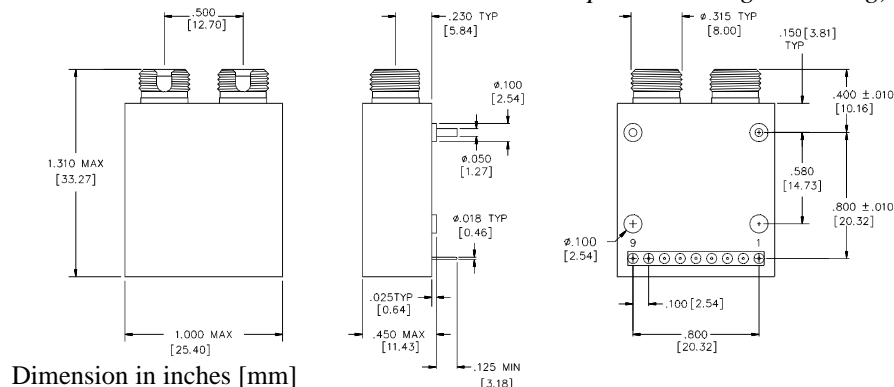
Receiver Performance Characteristics (over Operating Temperature, $V_{CC} = 3.13$ to 3.47 V)

| Parameter | Symbol | Minimum | Typical | Maximum | Units |
|--|-------------------------------------|------------|---------|---------|-------|
| Data Rate | B | 1000 | 1250 | 1300 | Mb/s |
| Minimum Input Optical Power (10 ⁻¹² BER) ¹ | L2, L1, L0 | - 20.0 | - | - | dBm |
| | H3, H5 | - 21.0 | - | - | |
| | H7 | - 23.0 | - | - | |
| Maximum Input Optical Power (10 ⁻¹² BER) ¹ | P_{max} | - 3.0 | - | - | dBm |
| Signal Detect Thresholds | Increasing Light Input | L2, L1, L0 | - | - 20.0 | dBm |
| | | H3, H5 | - | - 21.0 | |
| | H7 | - | - 23.0 | | |
| Decreasing Light Input | P_{sd-} | - 30.0 | - | - | dBm |
| Signal Detect Hysteresis | - | 0.5 | - | - | dB |
| Deterministic Jitter | DJ | - | - | 170 | ps |
| Random Jitter | RJ | - | - | 96 | ps |
| Wavelength of Operation | λ | 1100 | - | 1600 | nm |
| Return Loss | - | 12 | - | - | dB |
| Electrical 3 dB upper cutoff frequency | - | - | - | 1500 | MHz |
| Stressed Receiver Sensitivity | compliant with IEEE 802.3z standard | | | | |

¹ Measured with 2⁷-1 PRBS at 1250 Mb/s at 1300 nm wavelength.

FC Receptacle Package

(Refer to DTR-1250-3.3 MM data sheet for ST Receptacle Package Drawing)

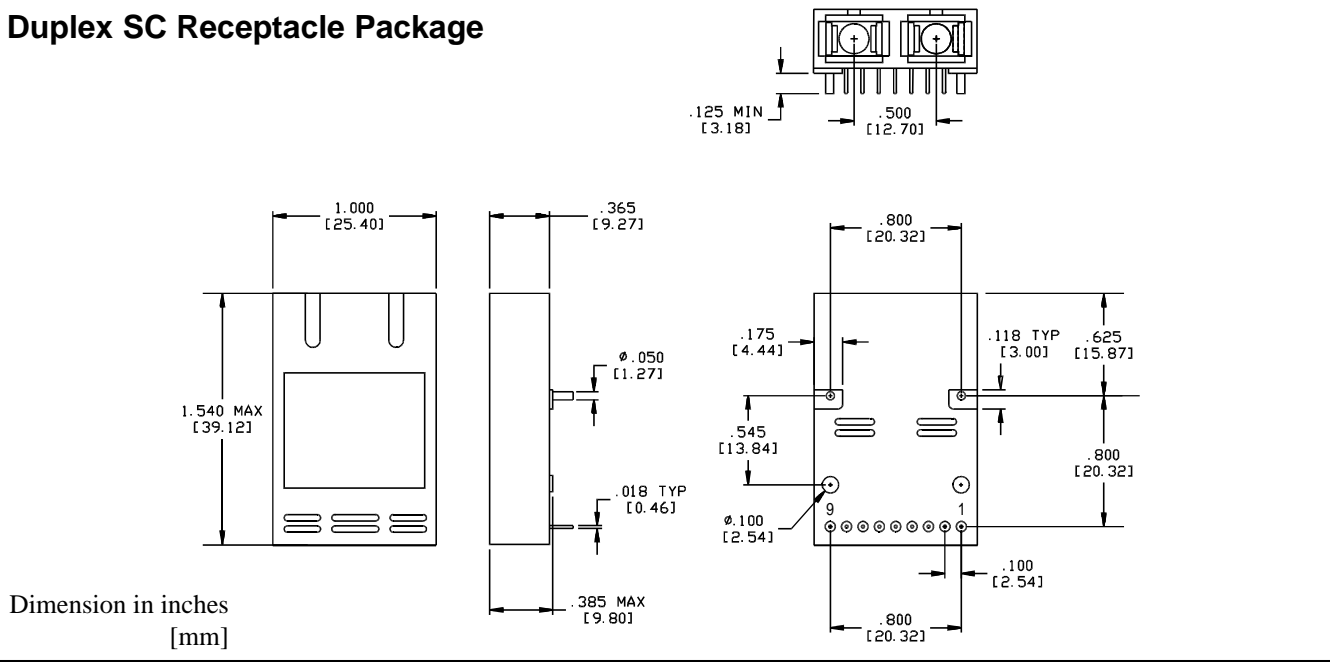


Pin Assignments

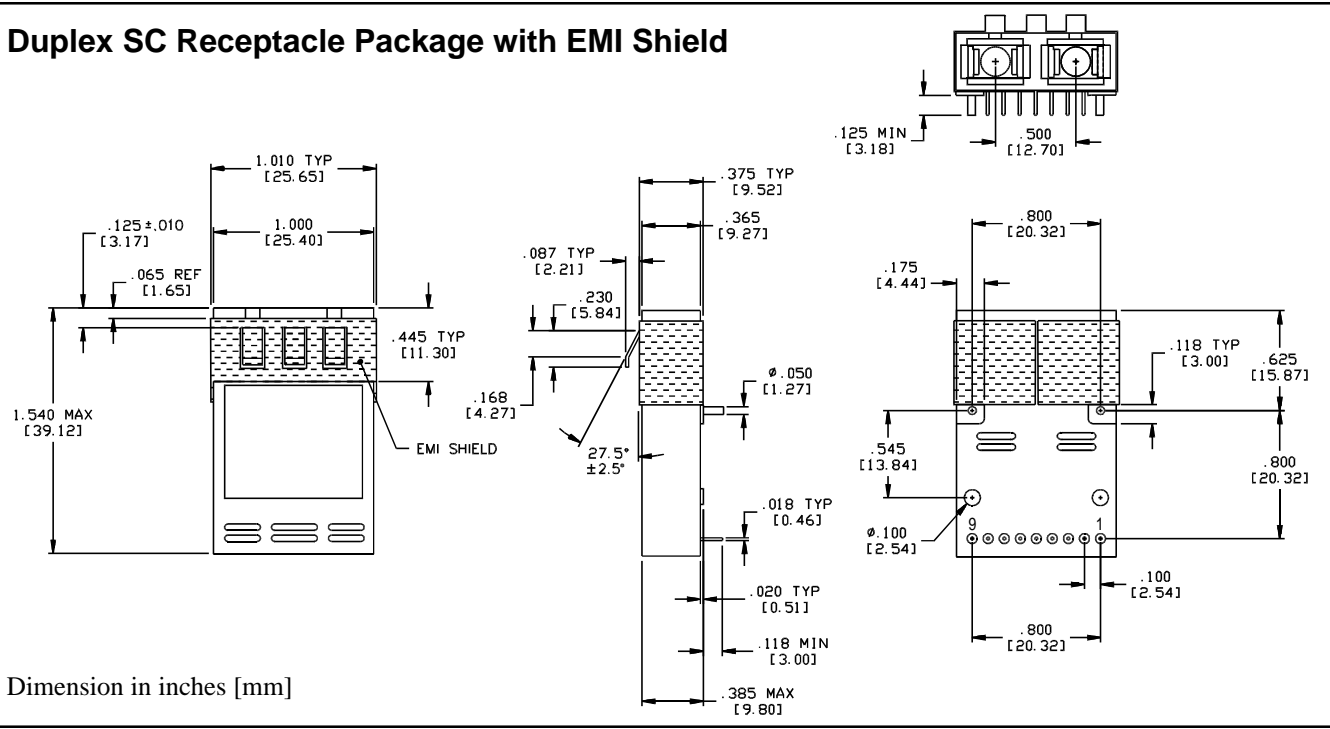
| PIN | FUNCTION |
|-----|-----------------------|
| 1 | RX GND |
| 2 | RD+ (RX DATA OUT +) |
| 3 | RD- (RX DATA OUT -) |
| 4 | SD (RX SIGNAL DETECT) |
| 5 | V_{CCRX} |
| 6 | V_{CCTX} |
| 7 | TD- (TX DATA IN -) |
| 8 | TD+ (TX DATA IN +) |
| 9 | TX GND |

DTR-1250-3.3-SM

Duplex SC Receptacle Package



Duplex SC Receptacle Package with EMI Shield



Ordering Information

| Module Name | Connector | EMI Shield | Coupling |
|-------------------------------|-----------|------------|----------|
| DTR-1250-3.3-SM | SC | NO | DC |
| DTR-1250-3.3-SM-ES- <i>Yn</i> | SC | YES | DC |
| DTR-1250-3.3-SM-AC- <i>Yn</i> | SC | NO | AC |
| DTR-1250-3.3-SM-AE- <i>Yn</i> | SC | YES | AC |

| Module Name | Connector | EMI Shield | Coupling |
|-------------------------------|-----------|------------|----------|
| DTR-1250-3.3-SM-ST- <i>Yn</i> | ST | NO | DC |
| DTR-1250-3.3-SM-SA- <i>Yn</i> | ST | NO | AC |
| DTR-1250-3.3-SM-FC- <i>Yn</i> | FC | NO | DC |
| DTR-1250-3.3-SM-FA- <i>Yn</i> | FC | NO | AC |

Options for *Yn*: L2 (1000BASE-LX compliant), L1 (10 km), L0 (higher power Fabry Perot lasers), H3 (25 to 30 km with 1300 nm DFB laser), H5 (40 km with 1550 nm DFB laser), H7 (70 km with 1550 nm DFB laser)

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Contents

| | |
|---|----------|
| Description | 1 |
| Absolute Maximum Ratings | 1 |
| Transmitter Electrical Interface | 2 |
| Receiver Electrical Interface | 2 |
| Electrical Power Supply Characteristics | 2 |
| Application Notes | 2 |
| Transmitter Performance Characteristics | 3 |
| Receiver Performance Characteristics | 3 |
| FC Receptacle Package | 3 |
| Duplex SC Receptacle Package | 4 |
| Duplex SC Receptacle Package with EMI Shield | 4 |
| Ordering Information | 4 |