



# DTR-1250-MM-LC-MR & DTR-1250-MM-LS-MR

## 3.3V LC connector SFF Multi-Rate Gigabit Ethernet 850 nm VCSEL Transceivers



### Features

- ☑ Data rate applications from 125 Mbps to 1300 Mbps
- ☑ Compliant with IEEE 802.3z Gigabit Ethernet 1000BASE-SX specifications
- ☑ 275 m distance with 62.5 μm multimode fiber
- ☑ 550 m distance with 50 μm multimode fiber
- ☑ 850 nm VCSEL technology
- ☑ Eye Safe (Class I Laser Safety)
- ☑ Excellent EMI & ESD protection (optional extra EMI shield also available)
- ☑ Multi-sourced 10-pin (2x5) SFF (Small Form Factor) package style
- ☑ Duplex LC optical connector interface
- ☑ Single +3.3 V supply & LV-PECL DATA interface (AC coupling option also available)
- ☑ LV-TTL TX DISABLE input & RX SIGNAL DETECT output

### Description

The DTR-1250-MM-LC-MR and DTR-1250-MM-LS-MR fiber optic multi-rate transceiver offer a simple and convenient way to interface 1000BASE-SX Gigabit Ethernet boards running at 1.25 Gbaud to multimode fiber optic cables. The multirate transceiver operates from Fast Ethernet data rate (125 Mbps) to Gigabit Ethernet data rate (1250 Mbps). A high reliability 850 nm wavelength Vertical Cavity Surface Emitting Laser (VCSEL) is used in the transmitter. All modules satisfy Class I Laser Safety requirements in accordance with the US FDA/CDRH and international IEC-825 standards.

The transmit and receive functions are contained in a narrow

width two-row, 10-pin (2x5) package with a Duplex LC connector interface. The receptacle fits into an RJ-45 form factor outline. The 10-pin configuration is in conformance to a Small Form Factor (SFF) multisource agreement.

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

The transceiver operates from a single +3.3V power supply over an operating temperature range of 0°C to +70°C. The package is made of metal for excellent EMI shielding.

### Absolute Maximum Ratings

Parameter	Symbol	Minimum	Maximum	Units
Storage Temperature	$T_{st}$	- 40	+ 85	°C
Operating Case Temperature	$T_{op}$	0	+ 70	°C
Supply Voltage	$V_{CC}$	- 0.5	+ 6.0	V
Input Voltage	$V_{in}$	- 0.5	$V_{CC}$	V
Output Current	$I_O$	-	50	mA
Lead Soldering Temperature & Time	-	-	260°C, 10 sec	

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## Transmitter Electrical Interface (over Operating Case Temperature Range)

Parameter	Symbol	Minimum	Typical	Maximum	Units
Input HIGH Voltage <sup>1</sup>	$V_{IH}$	$V_{CC} - 1.165$	-	$V_{CC} - 0.700$	V
Input LOW Voltage <sup>1</sup>	$V_{IL}$	$V_{CC} - 1.950$	-	$V_{CC} - 1.475$	V
Transmitter Disable Voltage	$V_{DIS}$	$V_{CC} - 1.3$	-	$V_{CC}$	V
Transmitter Enable Voltage	$V_{EN}$	0	-	0.8	V

<sup>1</sup> For AC-coupled modules, the input voltage swing is 0.25 V minimum and 1.2 V maximum single-ended.

## Receiver Electrical Interface (over Operating Case Temperature Range)

Parameter	Symbol	Minimum	Typical	Maximum	Units
Output HIGH Voltage (LV-PECL) <sup>1,2</sup>	$V_{OH}$	$V_{CC} - 1.10$	-	$V_{CC} - 0.90$	V
Output LOW Voltage (LV-PECL) <sup>1,2</sup>	$V_{OL}$	$V_{CC} - 1.84$	-	$V_{CC} - 1.60$	V
Output HIGH Voltage (LV-TTL)	$V_{OH}$	2.4	-	$V_{CC}$	
Output LOW Voltage (LV-TTL)	$V_{OL}$	0	-	0.8	
Output Current	$I_o$	-	-	25	mA

<sup>1</sup> With 50 ohm terminated to  $V_{CC} - 2$  volt (for DC-coupled modules).

<sup>2</sup> For AC-coupled modules, the output voltage swing into 50-ohm load is 0.3 V minimum and 1 V maximum single-ended.

## Electrical Power Supply Characteristics (over Operating Case Temperature Range)

Parameter	Symbol	Minimum	Typical	Maximum	Units
Supply Voltage	$V_{CC}$	3.13	3.3	3.47	V
Supply Current <sup>1</sup>	DC-coupled module	$I_{CC}$	-	160	mA
	AC-coupled module	$I_{CC}$	-	185	mA

<sup>1</sup> Supply current does not include termination.

## Application Notes

### DATA interface (DC-coupled modules):

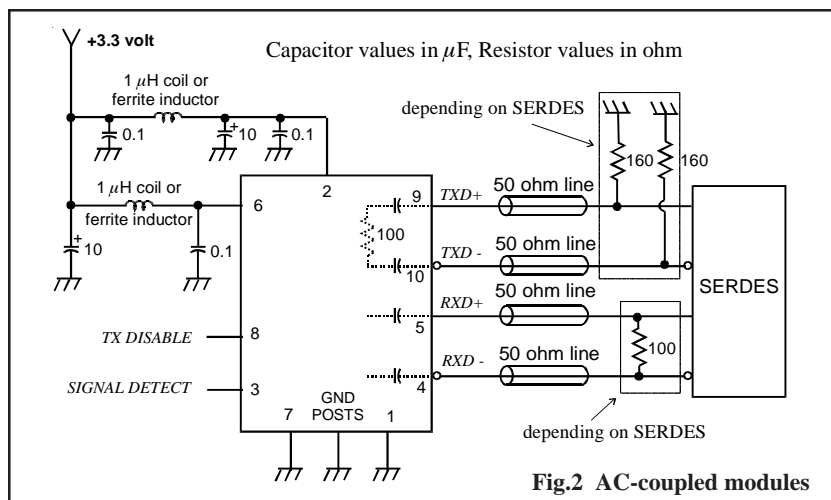
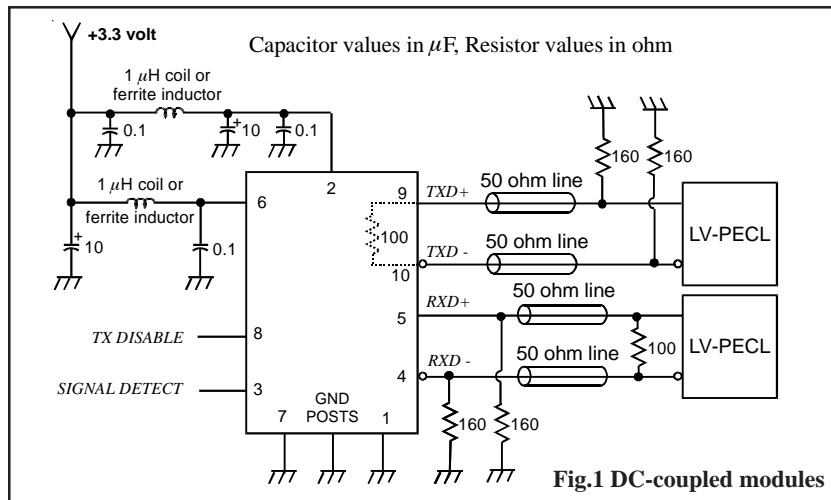
The interface circuit for standard DC-coupled modules with direct-coupled LV-PECL interface is shown in Fig. 1. The Transmitter input has internal 50 ohm termination.

### DATA interface (AC-coupled modules):

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 as shown in Fig. 2. The receiver can be connected directly to the external 50 ohm loads (termination resistor of the SERDES). For best performance, both DATA+ & DATA- should be used.

**TX DISABLE:** The transmitter is normally enabled (i.e. when the TX DISABLE control input is not connected or at LV-TTL logic LOW). When the TX DISABLE voltage is higher than  $V_{CC} - 1.3$  V, the laser is turned off independent of the input data.

**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. Its output is LV-TTL with no termination required.



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

Parameter	Symbol	Minimum	Typical	Maximum	Units
Data Rate	$B$	125	1250	1300	Mb/s
Optical Output Power <sup>1</sup>	$P_o$	- 9.5	- 7	- 4	dBm
Center Wavelength	$\lambda_c$	820	-	860	nm
Spectral Width (RMS)	$\Delta\lambda_{RMS}$	-	-	0.85	nm
Extinction Ratio	$P_{hi}/P_{lo}$	9	-	-	dB
Deterministic Jitter	$DJ$	-	-	80	ps
Random Jitter	$RJ$	-	-	147	ps
Relative Intensity Noise	$RIN$	-	-	- 117	dB/Hz
Coupled Power Ratio	$CPR$	9	-	-	dB
Transmitter Output Eye	compliant with Eye Mask Defined in 802.3z standard				

<sup>1</sup> Measured average power coupled into either 50  $\mu$ m or 62.5  $\mu$ m multimode fiber (MMF).

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

Parameter	Symbol	Minimum	Typical	Maximum	Units
Data Rate	$B$	125	1250	1300	Mb/s
Minimum Input Optical Power ( $10^{-12}$ BER) <sup>1</sup>	$P_{min}$	- 17.0	-	-	dBm
Maximum Input Optical Power ( $10^{-12}$ BER) <sup>1</sup>	$P_{max}$	- 3.0	-	-	dBm
Signal Detect Thresholds	Increasing Light Input	$P_{sd+}$	-	- 17.0	dBm
	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	$\lambda$	770	-	860	nm
Return Loss	-	12	-	-	dB
Electrical 3 dB upper cutoff frequency	-	-	-	1500	MHz
Stressed Receiver Sensitivity	compliant with 802.3z standard				

<sup>1</sup> Measured with  $2^7-1$  PRBS at 1250 Mb/s and 125 Mb/s at 850 nm wavelength.

**Power supply and grounding:** The power supply line should be well-filtered. All 0.1  $\mu$ F power supply bypass capacitors should be as close to the DTR transceiver module as possible. The two front GND posts (mounting studs) should be grounded to Chassis Ground for best EMI and ESD protection. If Chassis Ground is not available, they should be tied to Circuit Ground.

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

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DATE OF MANUFACTURE:

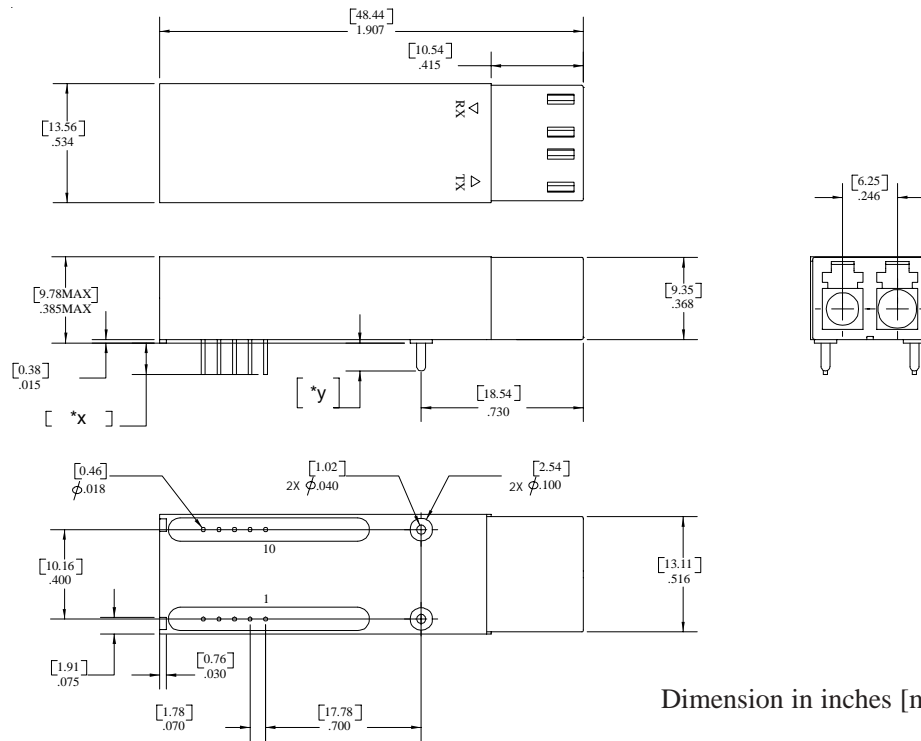
MANUFACTURED IN THE USA  
This product complies with  
21 CFR 1040.10 and 1040.11  
**Meets Class I Laser Safety Requirements**

### Pin Assignments

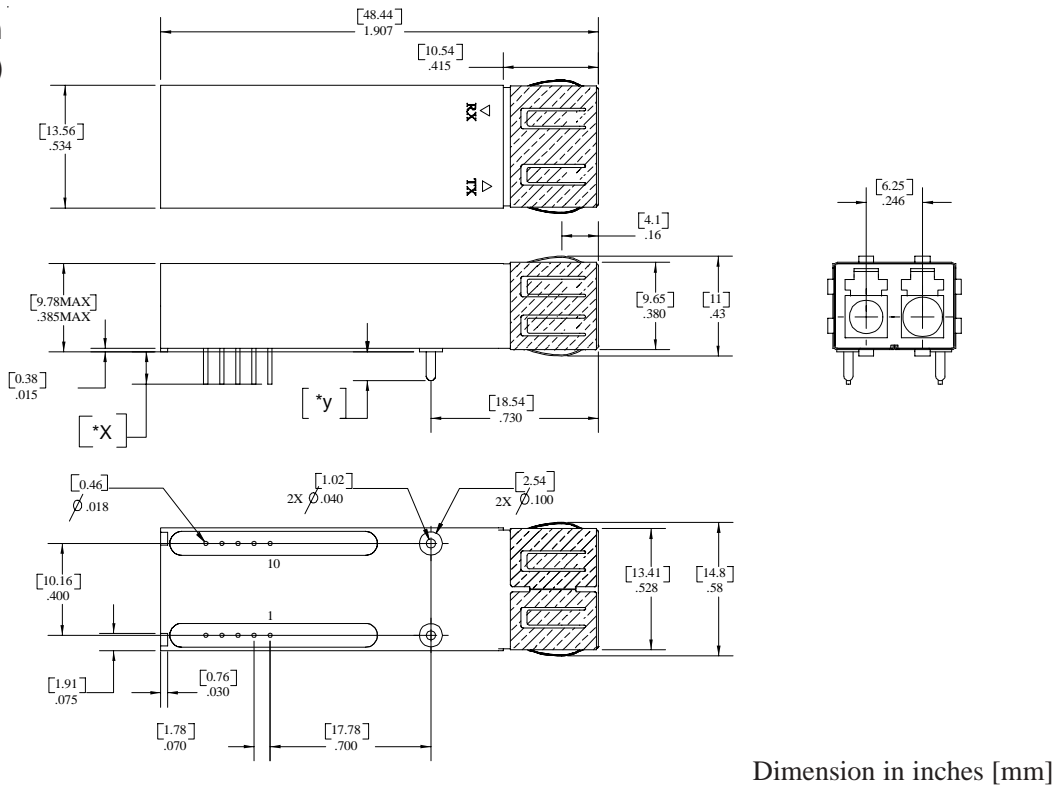
PIN	FUNCTION
1	RX GND
2	$V_{CC}$ RX
3	SD (RX SIGNAL DETECT)
4	RD- (RX DATA OUT -)
5	RD+ (RX DATA OUT +)
6	$V_{CC}$ TX
7	TX GND
8	TX DISABLE
9	TD+ (TX DATA IN +)
10	TD- (TX DATA IN -)

# DTR-1250-MM-LC-MR & DTR-1250-MM-LS-MR

## Package without EMI shield (LC)



## Package with EMI Shield (LS)



### Notes:

- Default tolerance for all dimensions given in inches (Unless otherwise noted)  
 .xxx =  $\pm 0.005$   
 .xx =  $\pm 0.01$
- \*x, \*y: see Pin length option table in ordering information

# DTR-1250-MM-LC-MR & DTR-1250-MM-LS-MR

## Ordering Information

DTR-1250 - MM - Lx - YY - Mp - MR

*Pin Length Option Table*

Options (P)	Pin Length (x)		Post Length (y)	
	Inches	Millimeters	Inches	Millimeters
M	0.140 ± 0.010	3.56 ± 0.250	0.125 + 0.010 - 0.005	3.17 + 0.250 - 0.125
M5	0.155 ± 0.010	3.94 ± 0.250	0.155 + 0.010 - 0.005	3.94 + 0.250 - 0.125
M8	0.180 ± 0.010	4.57 ± 0.250	0.180 ± 0.010	4.57 ± 0.250

see Pin Length  
option table

Coupling option

“Blank” : DC coupling  
AC : AC coupling

Package Types

LC: Package without Shield  
LS: Package With Shield

## Optical Communication Products, Inc.

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