



### Features

- ☑ Eight wavelengths (8) CWDM transceivers
- ☑ Compliant with IEEE 802.3z Gigabit Ethernet 1000BASE-LX PMD specifications
- ☑ 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-SM-LC-CWDM and DTR-1250-SM-LS-CWDM fiber optic transceivers offer a simple and convenient way to interface 1000BASE-LX Gigabit Ethernet boards running at 1.25 Gbaud to single mode fiber optic cables in Coarse Wavelength Division Multiplexing (CWDM) applications. There are eight center wavelengths available 1470 nm, 1490 nm, 1510 nm, 1530 nm, 1550 nm, 1570 nm, 1590 nm, and 1610 nm. Two performance options are available. In option “H5”, a guaranteed minimum optical link budget of 17 dB is offered which can correspond to a link distance of over 35 km or 40 km (assuming worst case fiber loss of 0.3 and 0.25 dB/km respectively). In option “H7”, a guaranteed minimum optical link budget of 20 dB is offered which can correspond to a link distance of over 70 km (assuming fiber loss of 0.2 to 0.25 dB/km).

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.

All modules satisfy Class I Laser Safety requirements in accordance with the US FDA/CDRH and international IEC-825 standards.

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 module is housed in a metal package for excellent EMI shielding.

### 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-SM-LC/LS-CWDM

## 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 Current	$I_O$	-	-	25	mA
Output HIGH Voltage (LV-TTL)	$V_{OH}$	2.4	-	$V_{CC}$	
Output LOW Voltage (LV-TTL)	$V_{OL}$	0	-	0.8	

<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. (Option for LVPECL is also available.)

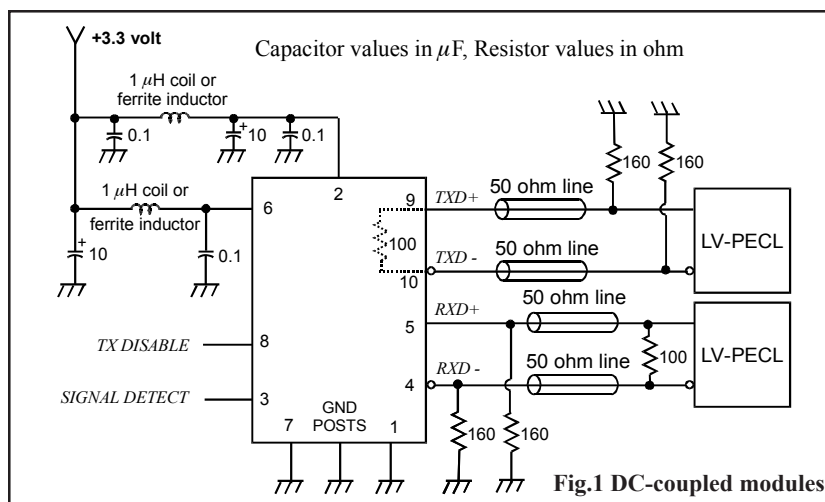


Fig.1 DC-coupled modules

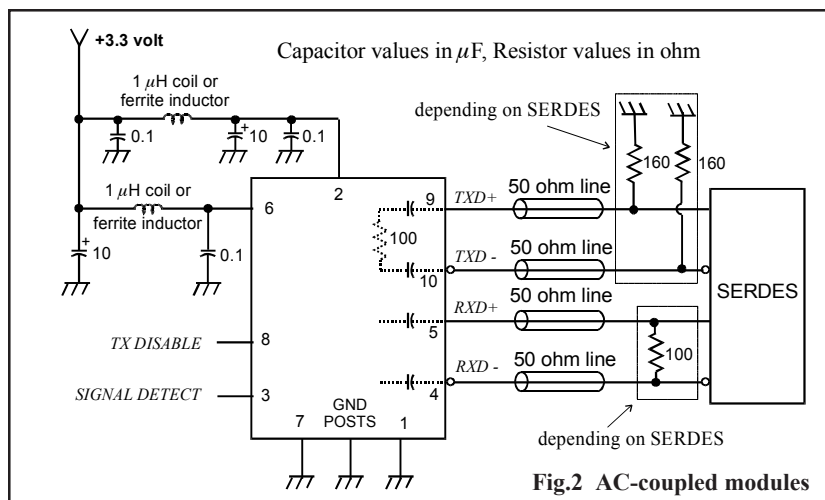


Fig.2 AC-coupled modules

# DTR-1250-SM-LC/LS-CWDM

## Transmitter Performance Characteristics (over Operating Case 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 <sup>1</sup>	H5	$P_o$	- 4.0	- 2.0	1.0	dBm
	H7		-3.0	- 1.0	2.0	
Center Wavelength	1470	$\lambda_c$	1464	1470	1477.5	nm
	1490		1484	1490	1497.5	
	1510		1504	1510	1517.5	
	1530		1524	1530	1537.5	
	1550		1544	1550	1557.5	
	1570		1564	1570	1577.5	
	1590		1584	1590	1597.5	
	1610		1604	1610	1617.5	
Spectral Width (-20 dB)	H5, H7	$\Delta\lambda_{20}$	-	-	1.0	nm
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				

<sup>1</sup> Measured average power coupled into single mode fiber (SMF).

## 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 <sup>-12</sup> BER) <sup>1</sup>	H5	$P_{min}$	- 21.0	-	-	dBm
	H7		- 23.0	-	-	
Maximum Input Optical Power (10 <sup>-12</sup> BER) <sup>1</sup>		$P_{max}$	- 3.0	-	-	dBm
Signal Detect Thresholds	Increasing Light Input	H5	-	-	- 21.0	dBm
		H7	-	-	- 23.0	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		$\lambda$	1100	-	1620	nm
Optical Return Loss		-	12	-	-	dB
Electrical 3 dB upper cutoff frequency		-	-	-	1500	MHz
Stressed Receiver Sensitivity		compliant with IEEE 802.3z standard				

<sup>1</sup> Measured with 2<sup>7</sup>-1 PRBS at 1250 Mb/s.

**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.

### Optical Communication Products, Inc.

DATE OF MANUFACTURE:

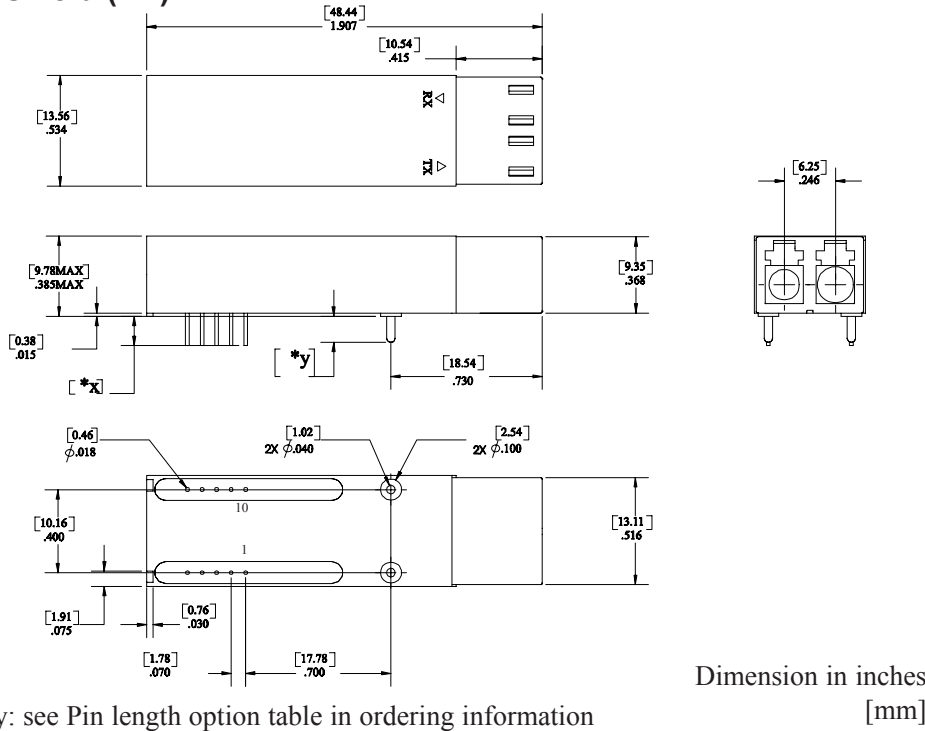
MANUFACTURED IN THE USA

This product complies with  
21 CFR 1040.10 and 1040.11

**Meets Class I Laser Safety Requirements**

# DTR-1250-SM-LC/LS-CWDM

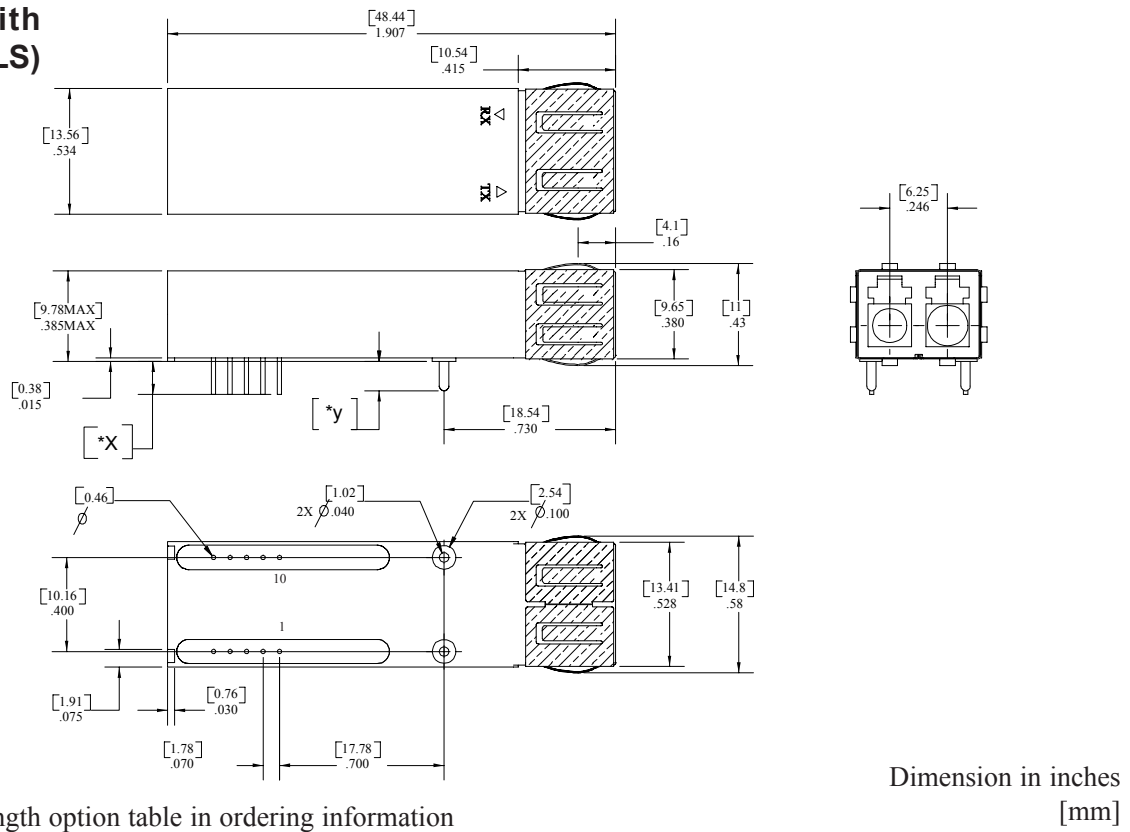
## Package without EMI shield (LC)



## Pin Assignments

PIN	FUNCTION
1	RX GND
2	V <sub>CC</sub> RX
3	SD (RX SIGNAL DETECT)
4	RD- (RX DATA OUT -)
5	RD+ (RX DATA OUT +)
6	V <sub>CC</sub> TX
7	TX GND
8	TX DISABLE
9	TD+ (TX DATA IN +)
10	TD- (TX DATA IN -)

## Package with EMI Shield (LS)



# DTR-1250-SM-LC/LS-CWDM

## Ordering Information

DTR-1250-SM-*WW*-*Xn*-*Czzz*-*YY*-*Mp*

*see Pin Length  
option table*

<i>Package Types</i>	<i>Light Output Power</i>	<i>Center Wavelength</i>	<i>Coupling option</i>
LC: Package without Shield LS: Package With Shield	H5: -2dBm (typ.) H7: -1dBm (typ.)	C470: 1470 nm C490: 1490 nm C510: 1510 nm C530: 1530 nm C550: 1550 nm C570: 1570 nm C590: 1590 nm C610: 1610 nm	“Blank”: DC coupling AC : AC coupling

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

## Optical Communication Products, Inc.

20961 Knapp Street, Chatsworth, CA 91311, Tel.: 818-701-0164, FAX: 818-701-1468, <http://www.ocp-inc.com>

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