



#### Features

- ☑ Designed for Multi-rate OC-3 (155Mb/s) & OC-12 (622Mb/s) data rates
- ☑ Long Reach 1310nm (40km distance) and 1550nm (80km) as well as Intermediate Reach (15km)
- ☑ Eye Safe (Class I Laser Safety)
- ☑ Multi-sourced 10-pin (2x5) SFF (Small Form Factor) package style
- ☑ Duplex LC optical connector interface
- ☑ Excellent EMI & ESD protection
- ☑ Single +3.3V power supply & LV-PECL DATA interface
- ☑ Option for LV-TTL or LV-PECL SIGNAL DETECT output

#### Description

The DTR-622-SM-LC-MR and DTR-622-SM-LS-MR fiber optic transceivers offer a simple, convenient way to interface PCBs to single mode fiber optic cables. These multi-rate transceivers are designed with performance versions that are fully compliant with SONET/SDH standards for OC-12/STM-4 data rate for Short Reach (12/2 km), Intermediate Reach (21/15 km) and Long Reach (42/40 km and 85/80 km) specifications. The modules also operate down to OC-3/STM-1 data rate. 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 transceiver agreement.

The transmitter incorporates a highly reliable 1300 nm or 1550 nm InGaAsP Laser and a driver circuit which converts LV-PECL data to light. A LV-TTL Transmitter Disable control input is also provided. The receiver features a transimpedance amplifier IC with internal AGC for high sensitivity and wide dynamic range. The Signal Detect status output can be either LV-TTL or LV-PECL.

The transceiver operates from a single +3.3V power supply over an operating temperature range of - 5°C to +70°C or - 40°C to +85°C ("A" option). 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	$T_{op}$	"A" option	+ 85	°C
		"B" option	+ 70	
Supply Voltage	$V_{CC}$	0	+ 6.0	V
Input Voltage	$V_{in}$	0	$V_{CC}$	V
Output Current	$I_O$	-	50	mA
Lead Soldering Temperature & Time	-	-	260°C, 10 sec	

# OC-12/STM-4 LC Single Mode Transceiver: DTR-622-SM-LC/LS-MR

## Transmitter Performance Characteristics (over Operating Case Temperature)

Parameter		Symbol	Minimum	Typical	Maximum	Units
Data Rate		$B$	155	622	700	Mb/s
Average Optical Output Power (coupled into single mode fiber), 50% duty cycle	HP <sup>1</sup>	$P_o$	- 3.0	- 1.0	+2.0	dBm
	L3		- 15.0	- 11.0	- 8.0	
Extinction Ratio	SR & IR	$P_{hi}/P_{lo}$	8.2	-	-	dB
	LR1 & LR2		10	-	-	
Center Wavelength <sup>2</sup>	SR (Short Reach)	$\lambda_c$	1261	1310	1360	nm
	IR (Intermediate Reach)		1274	1310	1356	
	LR1 (Long Reach 1310 nm)		1293	1310	1334	
	LR2 (Long Reach 1550 nm)		1480	1550	1580	
Spectral Width (RMS) <sup>2</sup>	SR (Short Reach)	$\Delta\lambda_{RMS}$	-	-	4.0	nm
	IR (Intermediate Reach)		-	-	2.5 or 4.0 <sup>1</sup>	
Spectral Width (-20 dB)	LR1 & LR2	$\Delta\lambda_{20}$	-	-	1.0	
Side Mode Suppression Ratio	LR1 & LR2	$SMSR$	30	-	-	dB
Optical Output Eye	Compliant with Telcordia GR-253-CORE and ITU-T Recommendation G.957					
<sup>1</sup> For Long Reach Version (LR1 & LR2) , the modules are not fully compliant with SONET OC-3/STM-1 specifications for output power. <sup>2</sup> For Intermediate Reach version, the Center Wavelength is either $1274\text{nm} \leq \lambda_c \leq 1356\text{nm}$ for $\Delta\lambda_{RMS} \leq 2.5\text{nm}$ or $1293\text{nm} \leq \lambda_c \leq 1334\text{nm}$ for $\Delta\lambda_{RMS} \leq 4.0\text{nm}$ .						

## Receiver Performance Characteristics (over Operating Case Temperature)

Parameter		Symbol	Minimum	Typical	Maximum	Units
Data Rate		$B$	155	622	700	Mb/s
Receiver Sensitivity ( $10^{-10}$ BER) <sup>1,2</sup>		$P_{min}$	- 28.0	- 31.0	-	dBm
Maximum Input Optical Power ( $10^{-10}$ BER) <sup>1</sup>		$P_{max}$	- 7.0	0	-	dBm
Signal Detect Thresholds	Increasing Light Input	$P_{sd+}$	-	-	- 28.0	dBm
	Decreasing Light Input	$P_{sd-}$	- 45.0	-	-	
Signal Detect Hysteresis		-	0.5	1.5	-	dB
Signal Detect Timing Delay	Increasing Light Input	$t_{sd+}$	-	-	100	$\mu\text{s}$
	Decreasing Light Input	$t_{sd-}$	-	-	100	
Wavelength of Operation		$\lambda$	1100	-	1600	nm
<sup>1</sup> Specified in Average Optical Input Power and measured at 155Mb/s & 622Mb/s and 1300nm (1550nm for LR2) wavelength with 2 <sup>23</sup> 1PRBS. <sup>2</sup> For Long Reach (LR1 & LR2), the modules are not fully compliant with SONET OC-3/STM-1 specifications for sensitivity.						

**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**

# OC-12/STM-4 LC Single Mode Transceiver: DTR-622-SM-LC/LS-MR

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

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

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

Parameter	Symbol	Minimum	Typical	Maximum	Units
Output HIGH Voltage (LV-PECL) <sup>1</sup>	$V_{OH}$	$V_{CC} - 1.10$	-	$V_{CC} - 0.90$	V
Output LOW Voltage (LV-PECL) <sup>1</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 50Ω terminated to  $V_{CC} - 2$  volts.

## 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>	TX	$I_{CC,TX}$	-	80	mA
	RX	$I_{CC,RX}$	-	70	

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

## Pin Assignments

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

# OC-12/STM-4 LC Single Mode Transceiver: DTR-622-SM-LC/LS-MR

## Application Notes

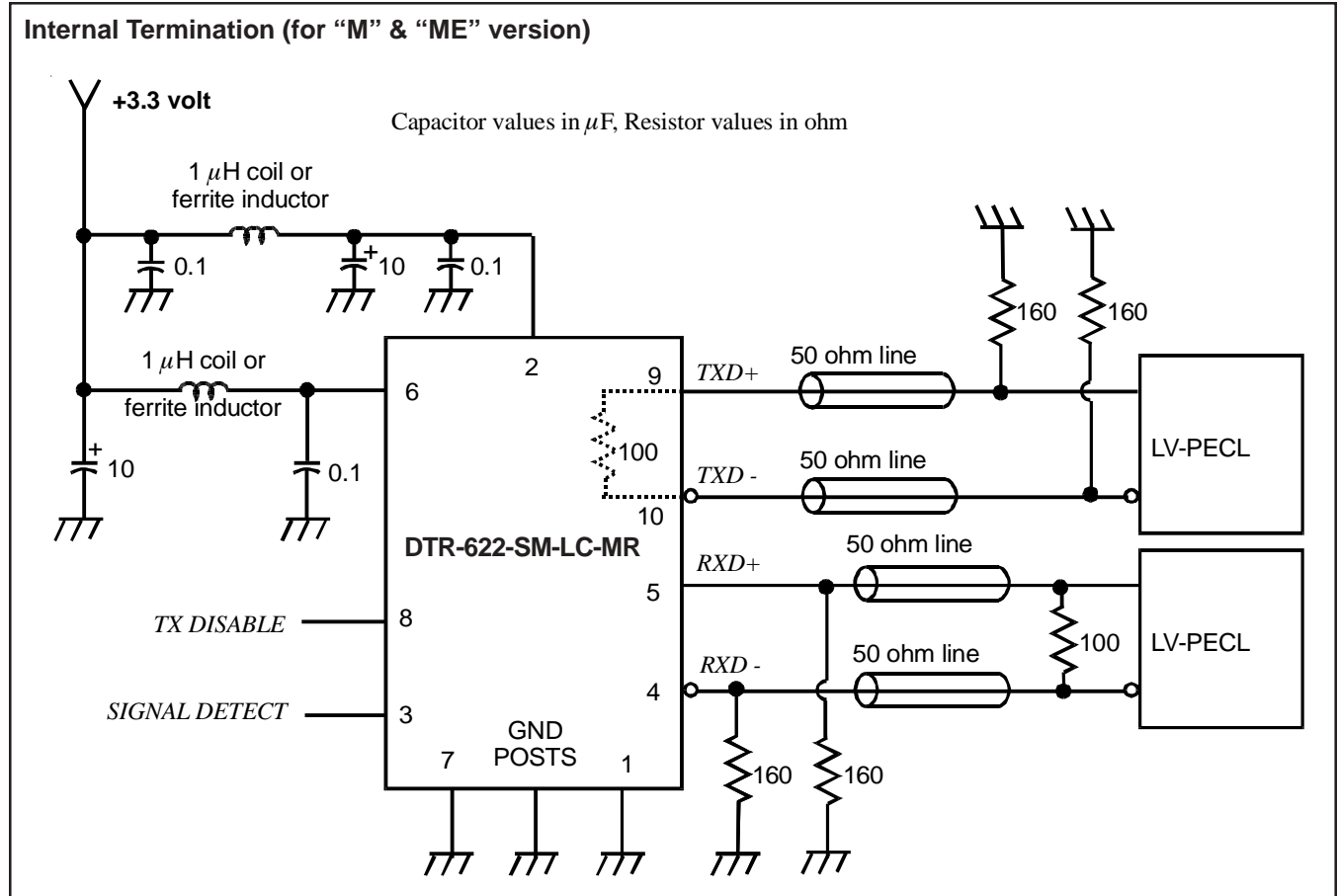
**Transmitter:** When the DATA+ input is at logic HIGH and DATA- input is at logic LOW, the Laser Diode is ON; and vice versa. The transmitter is normally enabled (i.e. when the TX DISABLE control input is not connected). When the TX DISABLE control input voltage is higher than  $V_{CC} - 1.3$  V, the laser is turned off independent of the input data. The transmitter has two options for input termination. With “MS” and “MSE” versions, the transmitter input interface is standard LV-PECL (i.e. normal resistor termination needs to be provided by the end user). With the “M” and “ME” version, an internal differential 100 ohm resistor termination is provided at the transmitter input interface for convenience (see circuit diagrams below.)

The transmitter incorporates an Average Power Control (APC) loop to stabilize the transmitter average optical output power against temperature variation. The APC loop always acts to keep the transmitter average optical output power at a constant value. Therefore, when the input data is all continuous “zeroes” or all continuous “ones”, the transmitter optical output power is a constant level equal to the nominal average optical output power (not at the “OFF” level or at the “ON” level).

**Receiver:** Both differential DATA+ and DATA- outputs are LV-PECL levels requiring proper termination (see recommended interface circuits). For optimum performance, both outputs should be terminated in the same manner, even if only one is used.

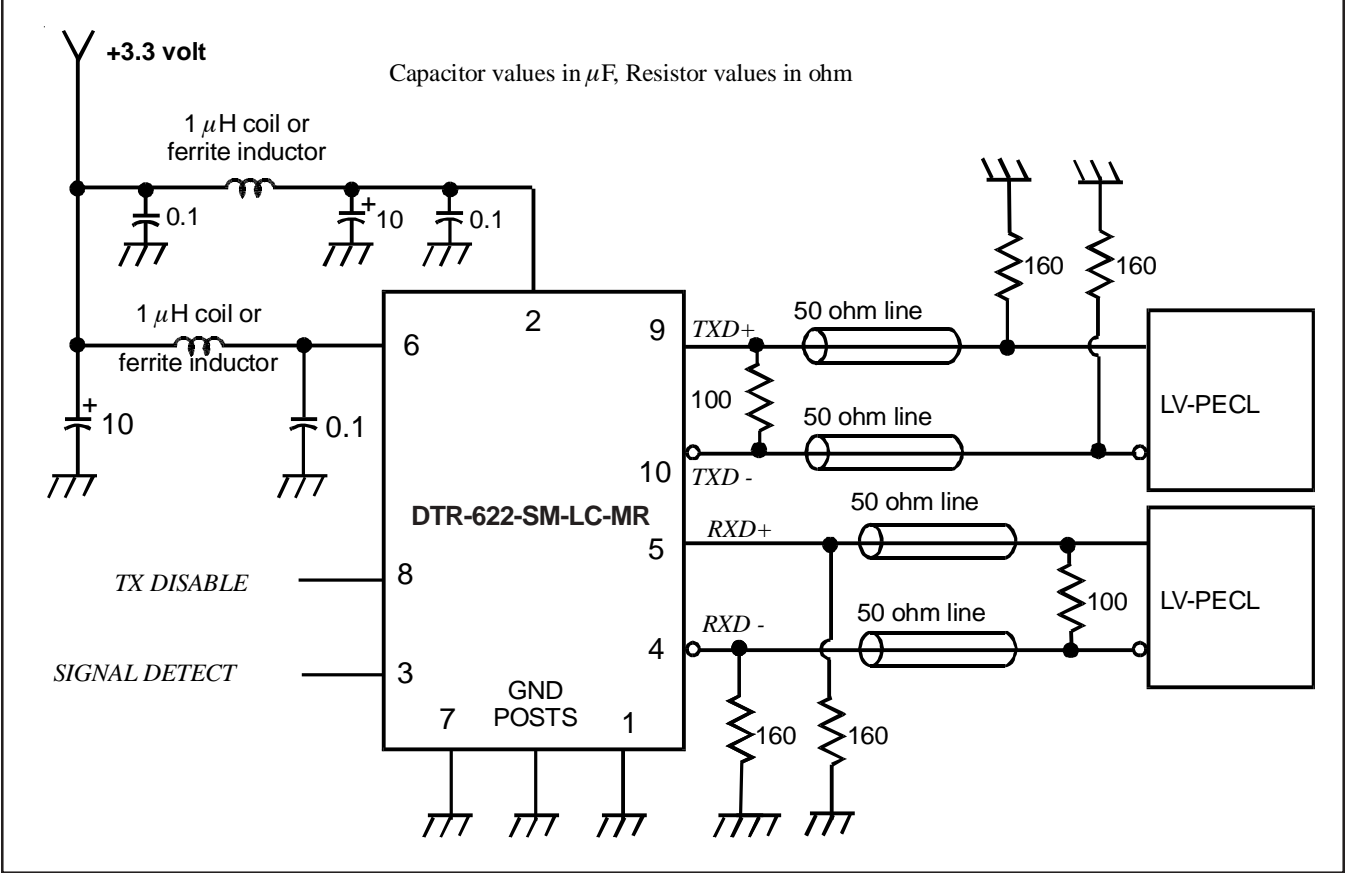
The Signal Detect circuit monitors the level of the incoming optical signal and generates a logic LOW signal when insufficient photocurrent is produced. If the SIGNAL DETECT output is LV-TTL level, no termination is required. If the SIGNAL DETECT output is LV-PECL level, a termination resistor of 160 ohms to GND is required.

**Interface circuit:** 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 Circuit Ground or Chassis Ground. The Transmitter has internal 50 ohm termination (see interface circuits).

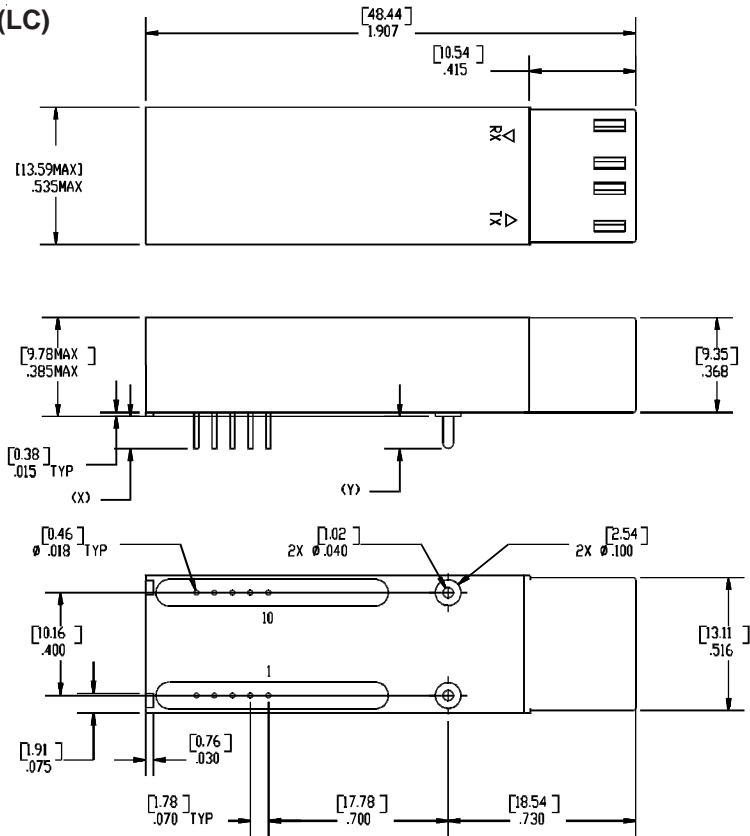


# OC-12/STM-4 LC Single Mode Transceiver: DTR-622-SM-LC/LS-MR

## External Termination (for "MS" & "MSE" version)



## Package without EMI shield (LC)

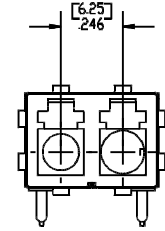
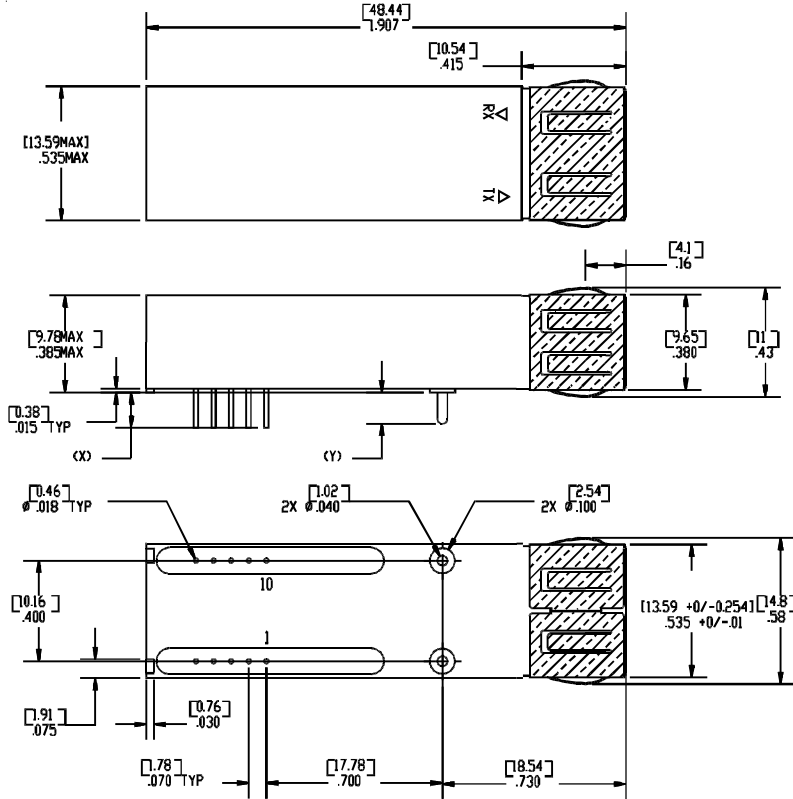


### Notes:

1. Default tolerance for all dimensions given in inches [mm]  
.xxx =  $\pm 0.005$ "  
.xx =  $\pm 0.01$ "
2. x, y: see Pin length option table in ordering information

# OC-12/STM-4 LC Single Mode Transceiver: DTR-622-SM-LC/LS-MR

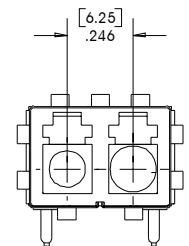
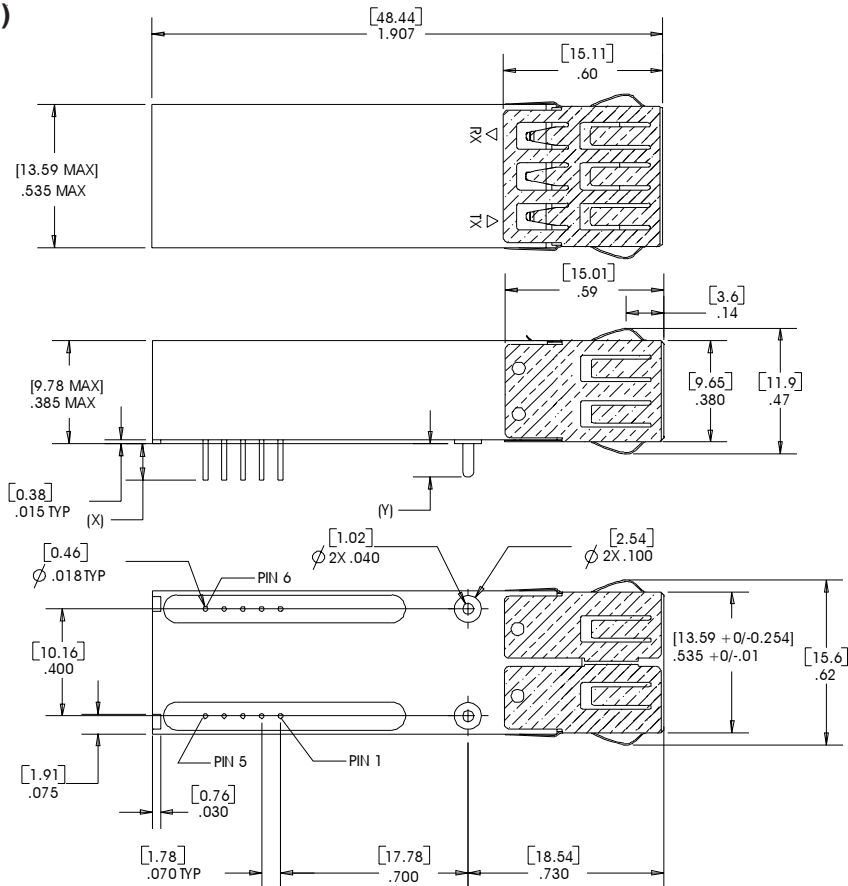
## Package with EMI Shield (LS)



### Notes:

1. Default tolerance for all dimensions given in inches [mm]  
 .xxx =  $\pm 0.005''$   
 .xx =  $\pm 0.01''$
2. x, y: see Pin length option table in ordering information

## Package with Extended EMI Shield (S1)



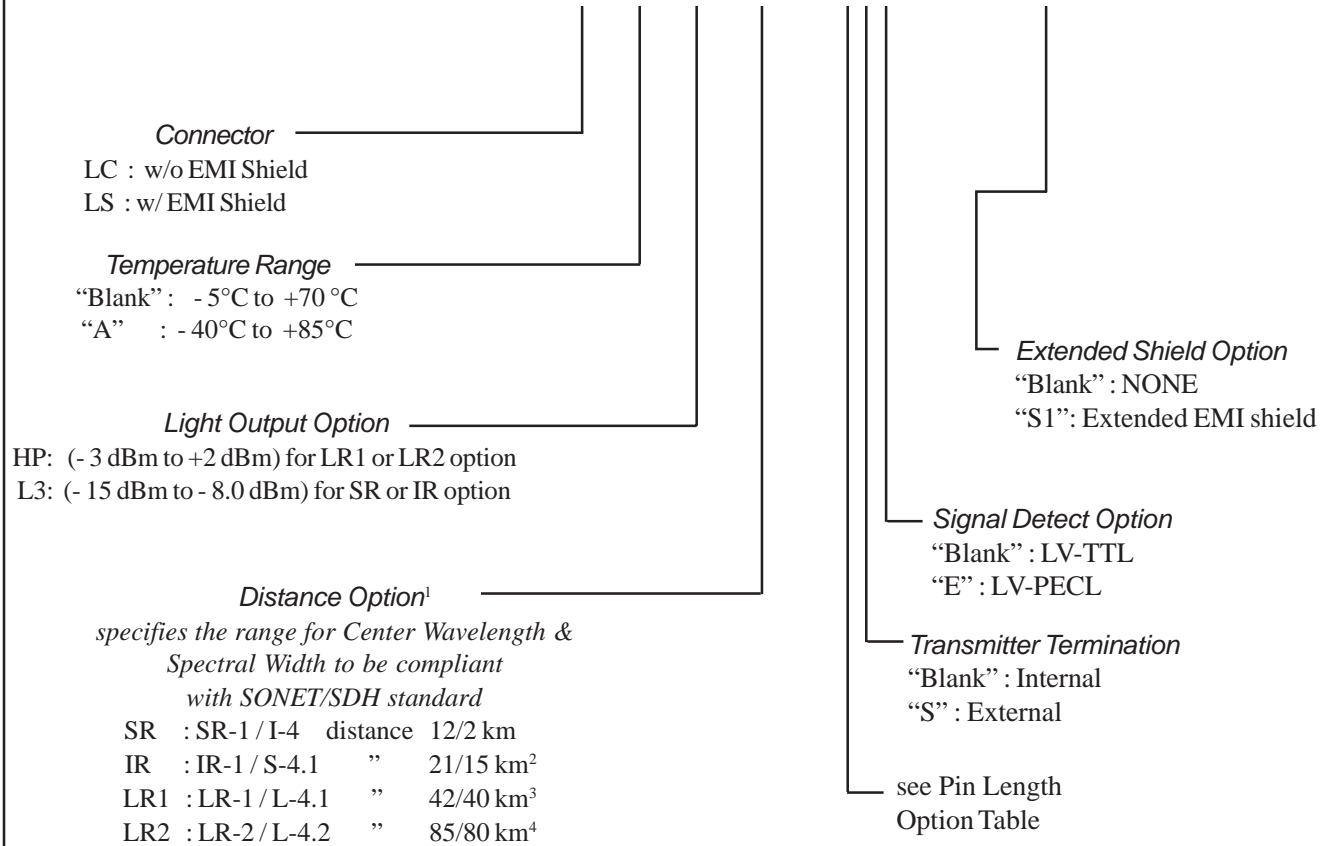
### Notes:

1. Default tolerance for all dimensions given in inches [mm]  
 .xxx =  $\pm 0.005''$   
 .xx =  $\pm 0.01''$
2. x, y: see Pin length option table in ordering information

# OC-12/STM-4 LC Single Mode Transceiver: DTR-622-SM-LC/LS-MR

## Ordering Information

DTR - 622 - SM - Lx -T- Ln - D - Mpxy - MR - S1



### 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

<sup>1</sup>These are target distances to be used for classification and not for specification, per Telcordia GR-253-CORE/ITU-T Recommendation G.957

<sup>2</sup>The DTR-622-SM-Lx-T-L3-IR-Mpxy-MR modules are fully compliant with OC-12/STM-4 Intermediate Reach IR-1/S-4.1 SONET/SDH standard for distance of 21/15 km.

<sup>3</sup>The DTR-622-SM-Lx-T-HP-LR1-Mpxy-MR are fully compliant with OC-12/STM-4 Long Reach 1310 nm LR1/L-4.1 SONET/SDH standard. They use DFB lasers to satisfy the requirement for Center Wavelength & Spectral Width.

<sup>4</sup>The DTR-622-SM-Lx-T-HP-LR2-Mpxy-MR are fully compliant with OC-12/STM-4 Long Reach 1550 nm LR-2/L-4.2 SONET/SDH standard. Both modules use DFB lasers. However, the DTR-622-SM-Lx-A-HP-LR2-Mpxy-MR is specified only over -25°C to +70°C.

## Optical Communication Products, Inc.

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