DTR-xxx-LC & DTR-xxx-LS

3.3 Volt 2x5 LC connector OC-3 & OC-12 LED Transceivers

Features

- ☑ *Designed for ATM/SONET/SDH OC-3 (156 Mb/s) & OC-12 (622 Mb/s)*
- ☑ *Multi-sourced 10-pin (2x5) SFF (Small Form Factor) package style*
- ☑ *Duplex LC optical connector interface*
- ☑ *Excellent EMI & ESD protection*
- ☑ *- 40°C to +85°C Operating Temperature ("A" option)*
- ☑ *Single +3.3 V supply & LV-PECL DATA interface*
- ☑ *Option for LV-TTL or LV-PECL SIGNAL DETECT output*

Description

The DTR-xxx-LC and DTR-xxx-LS fiber optic transceivers offer a simple, convenient way to interface PCBs to multimode fiber optic cables. They are designed for ATM/SONET/SDH applications at OC-3/STM-1 (156 Mb/s) and OC-12/STM-4 (622 Mb/s).

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 InGaAsP surface-emitting LED 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 for high sensitivity and wide dynamic range. The Receiver 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 0°C to +70°C or - 40°C to +85°C ("A" option). The package is made of either *conductive* plastic or metal for excellent EMI shielding

Absolute Maximum Ratings

Parameter		Symbol	Minimum	Maximum	Units
Storage Temperature		T_{st}	- 40	+ 85	C
Operating Temperature	"A" option	T_{op}	- 40	+ 85	C
	"blank" option		0	+ 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-3/STM-1 LC/LS LED Transceiver: DTR-156-LC/LS

Transmitter Performance Characteristics (over Operating Case Temperature)

Parameter	Symbol	Minimum	Typical	Maximum	Units
Data Rate	B	DC	156	266	Mb/s
Optical Output Power [1]	P_o	- 19.0	- 16.0	- 14.0	dBm
Center Wavelength	λ_c	1270	-	1380	nm
Spectral Width (FWHM)	$\Delta\lambda_{FWHM}$	-	-	200	nm
Optical Rise and Fall Time (10% to 90%)	t_r, t_f	-	2.0	3.0	ns
Extinction Ratio	P_{hi}/P_{lo}	10	-	-	dB
Transmitter OFF Power (continuous logic LOW input)	P_{OFF}	-	-	- 45.0	dBm
Random Jitter (peak-to-peak)	RJ	-	-	0.52	ns
Duty Cycle Distortion (peak-to-peak)	DCD	-	-	0.6	ns

[1] Measured average power coupled into 62.5/125 μm, 0.275 NA graded-index multimode fiber. The minimum power specified is at Beginning-of-Life (BOL).

Receiver Performance Characteristics (over Operating Case Temperature)

Parameter		Symbol	Minimum	Typical	Maximum	Units
Data Rate		B	50	156	266	Mb/s
Receiver Sensitivity (2.5 x 10^{-10} BER) [1]		P_{min}	- 30.0	- 33.0	-	dBm
Maximum Input Optical Power (2.5 x 10^{-10} BER) [1]		P_{max}	- 14.0	- 12.0	-	dBm
Signal Detect Thresholds	Increasing Light Input	P_{sd+}	-	-	- 30.0	dBm
	Decreasing Light Input	P_{sd-}	- 45.0	-	-	
Signal Detect Hysteresis			-	1.0	-	dB
Signal Detect Timing Delay	Increasing Light Input	t_{sd+}	-	-	100	μs
	Decreasing Light Input	t_{sd-}	-	-	350	
Wavelength of Operation		λ	1100	-	1600	nm

[1] Specified in Average Optical Input Power and measured at 156 Mb/s and 1300 nm wavelength with 2^{23}-1 PRBS.

Ordering Information for OC-3/STM-1 applications

MODULE NAME		SIGNAL DETECT	Package	
0 C to 70 C Operating	-40 C to 85 C Operating			
DTR-156-LC	DTR-156-LC-A	LV-TTL	Plastic	LC
DTR-156-LC-E	DTR-156-LC-A-E	LV-PECL	Plastic	
DTR-156-LC-M	DTR-156-LC-A-M	LV-TTL	Metal	
DTR-156-LC-ME	DTR-156-LC-A-ME	LV-PECL	Metal	
DTR-156-LS	DTR-156-LS-A	LV-TTL	Plastic	LS
DTR-156-LS-E	DTR-156-LS-A-E	LV-PECL	Plastic	
DTR-156-LS-M	DTR-156-LS-A-M	LV-TTL	Metal	
DTR-156-LS-ME	DTR-156-LS-A-ME	LV-PECL	Metal	

OC-12/STM-4 LC/LS LED Transceiver: DTR-622-LC/LS

Transmitter Performance Characteristics (over Operating Case Temperature)

Parameter	Symbol	Minimum	Typical	Maximum	Units
Data Rate	B	DC	622	700	Mb/s
Optical Output Power [1]	P_o	- 20.0	- 18.0	- 14.0	dBm
Center Wavelength	λ_c	1270	-	1380	nm
Spectral Width (FWHM)	$\Delta\lambda_{FWHM}$	-	140	200	nm
Optical Rise and Fall Time (10% to 90%)	t_r, t_f	-	1.0	1.25	ns
Extinction Ratio	P_{hi}/P_{lo}	10	-	-	dB
Random Jitter (peak-to-peak)	RJ	-	-	0.13	ns
Duty Cycle Distortion (peak-to-peak)	DCD	-	-	0.4	ns

[1] Measured average power coupled into 62.5/125 μm, 0.275 NA graded-index multimode fiber. The minimum power specified is at Beginning-of-Life (BOL).

Receiver Performance Characteristics (over Operating Case Temperature)

Parameter		Symbol	Minimum	Typical	Maximum	Units
Data Rate		B	50	622	700	Mb/s
Receiver Sensitivity (10^{-10} BER) [1]		P_{min}	- 26.0	- 28.0	-	dBm
Maximum Input Optical Power (10^{-10} BER) [1]		P_{max}	- 14.0	- 12.0	-	dBm
Signal Detect Thresholds	Increasing Light Input	P_{sd+}	-	-	- 26.0	dBm
	Decreasing Light Input	P_{sd-}	- 40.0	-	-	
Signal Detect Hysteresis			-	1.0	-	dB
Signal Detect Timing Delay	Increasing Light Input	t_{sd+}	-	-	100	μs
	Decreasing Light Input	t_{sd-}	-	-	350	
Wavelength of Operation		λ	1100	-	1600	nm

[1] Specified in Average Optical Input Power and measured at 622 Mb/s and 1300 nm wavelength with 2^{23}-1 PRBS.

Ordering Information for OC-12/STM-4 applications

MODULE NAME		SIGNAL DETECT	Package	
0 C to 70 C Operating	-40 C to 85 C Operating			
DTR-622-LC	DTR-622-LC-A	LV-TTL	Plastic	LC
DTR-622-LC-E	DTR-622-LC-A-E	LV-PECL	Plastic	
DTR-622-LC-M	DTR-622-LC-A-M	LV-TTL	Metal	
DTR-622-LC-ME	DTR-622-LC-A-ME	LV-PECL	Metal	
DTR-622-LS	DTR-622-LS-A	LV-TTL	Plastic	LS
DTR-622-LS-E	DTR-622-LS-A-E	LV-PECL	Plastic	
DTR-622-LS-M	DTR-622-LS-A-M	LV-TTL	Metal	
DTR-622-LS-ME	DTR-622-LS-A-ME	LV-PECL	Metal	

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} - 0.70	V
Input LOW Voltage	V_{IL}	V_{CC} - 1.950	-	V_{CC} - 1.475	V
Data Input Current - HIGH	I_H	-	-	150	μA
Data Input Current - LOW	I_L	0.5	-	-	μA
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) [1]	V_{OH}	V_{CC} - 1.10	-	V_{CC} - 0.90	V
Output LOW Voltage (LV-PECL) [1]	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

[1] With 50 ohm 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 [1]	TX	$I_{CC,TX}$	-	110	130	mA
	RX	$I_{CC,RX}$	-	70	100	mA

[1] Supply current does not include termination resistor current.

Application Notes

Transmitter: When the DATA+ input is at logic HIGH and DATA- input is at logic LOW, the LED 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 LED is turned off independent of the input data.

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.

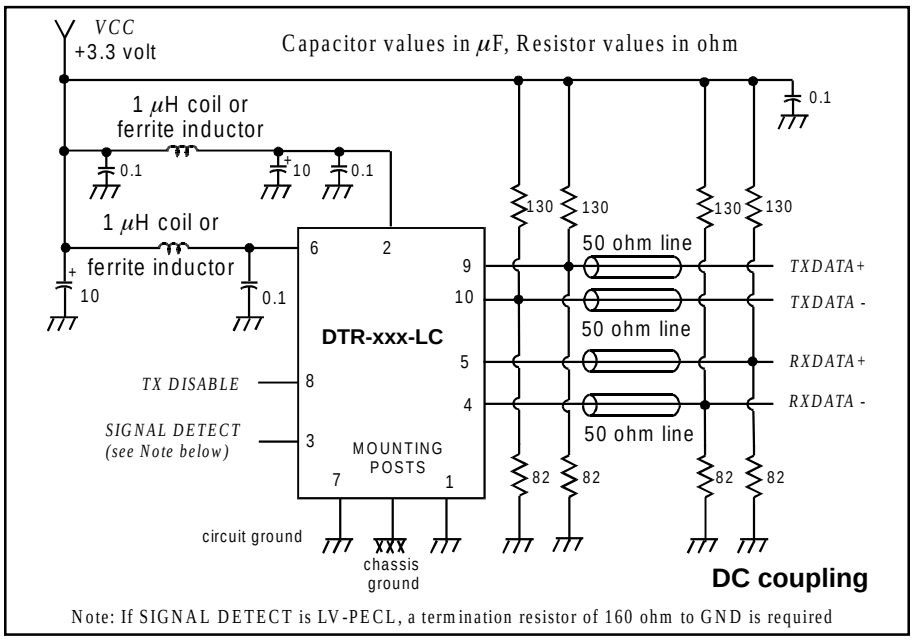
The Signal Detect circuit monitors the level of the incoming optical signal and generates a logic LOW signal when insufficient photocurrent is produced. If the SIGNAL DETECT output is LV-TTL level, no termination is required. If the SIGNAL DETECT output is LV-PECL level, a termination resistor of 160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

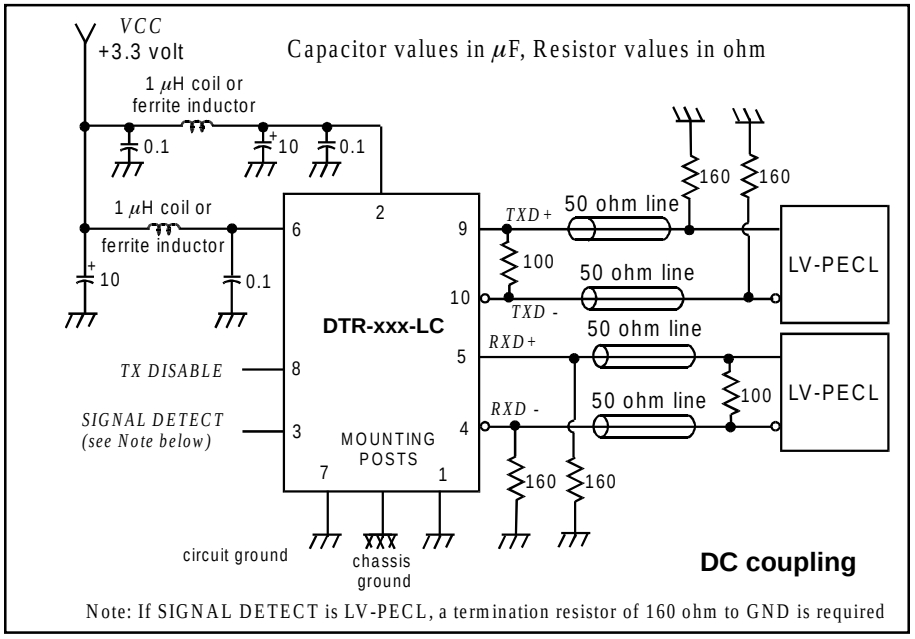
Pin Assignments

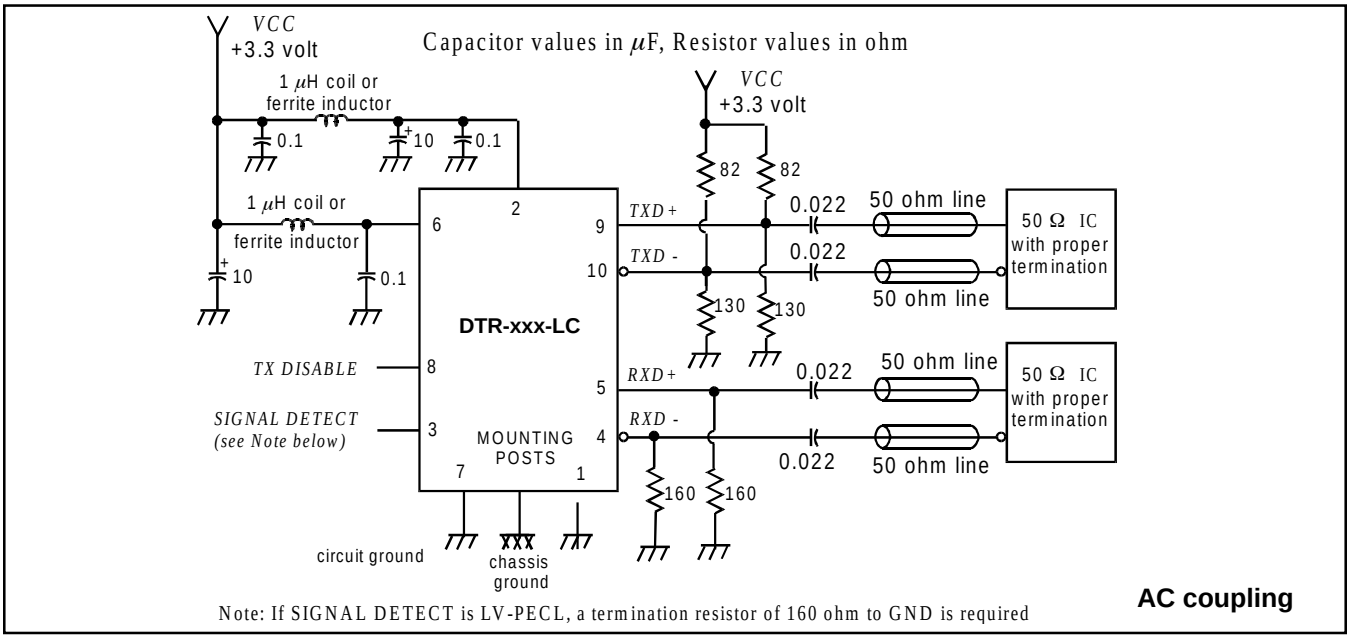
PIN	FUNCTION	LOGIC FAMILY
1	RX GND	-
2	V_{CC}RX	-
3	SD (RX SIGNAL DETECT)	LV-TTL (standard) or LV-PECL ("E" option)
4	RD- (RX DATA OUT -)	LV-PECL
5	RD+ (RX DATA OUT +)	LV-PECL
6	V_{CC}TX	-
7	TX GND	-
8	TX DISABLE	LV-TTL
9	TD+ (TX DATA IN +)	LV-PECL
10	TD- (TX DATA IN -)	LV-PECL

Interface circuit: Three options for interface circuit are shown here: two with DC coupling and one with AC coupling.

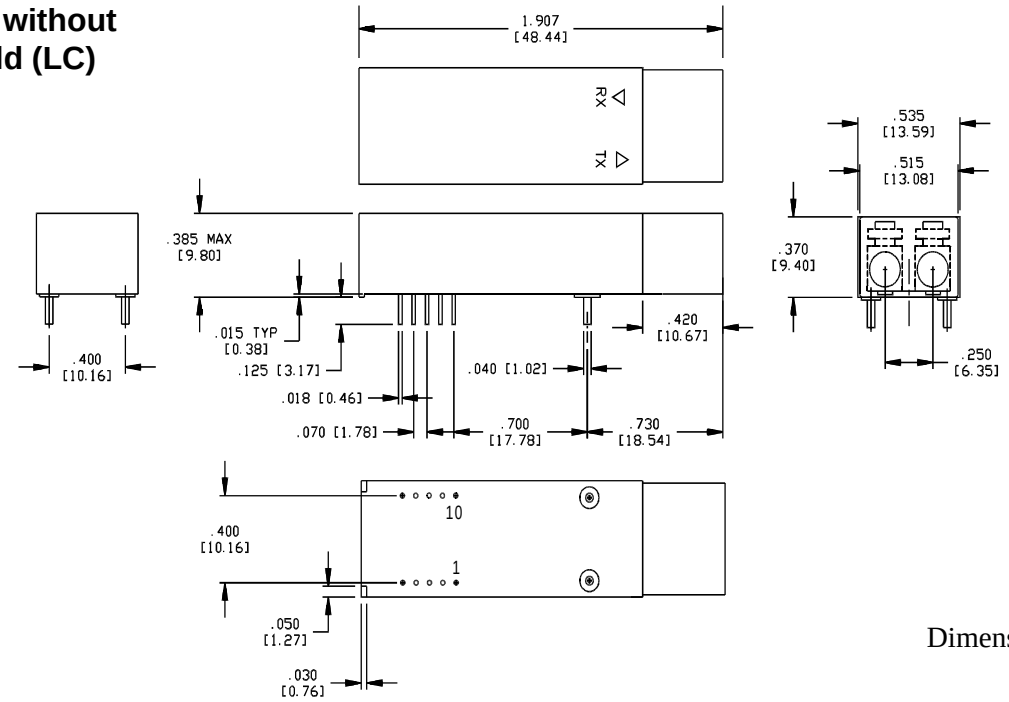
The power supply line should be well-filtered. All 0.1 μF power supply bypass capacitors should be as close to the DTR transceiver module as possible. The two front GND posts (mounting studs) should be grounded to Chassis Ground. If Chassis Ground is not available, they should be connected to Circuit Ground.





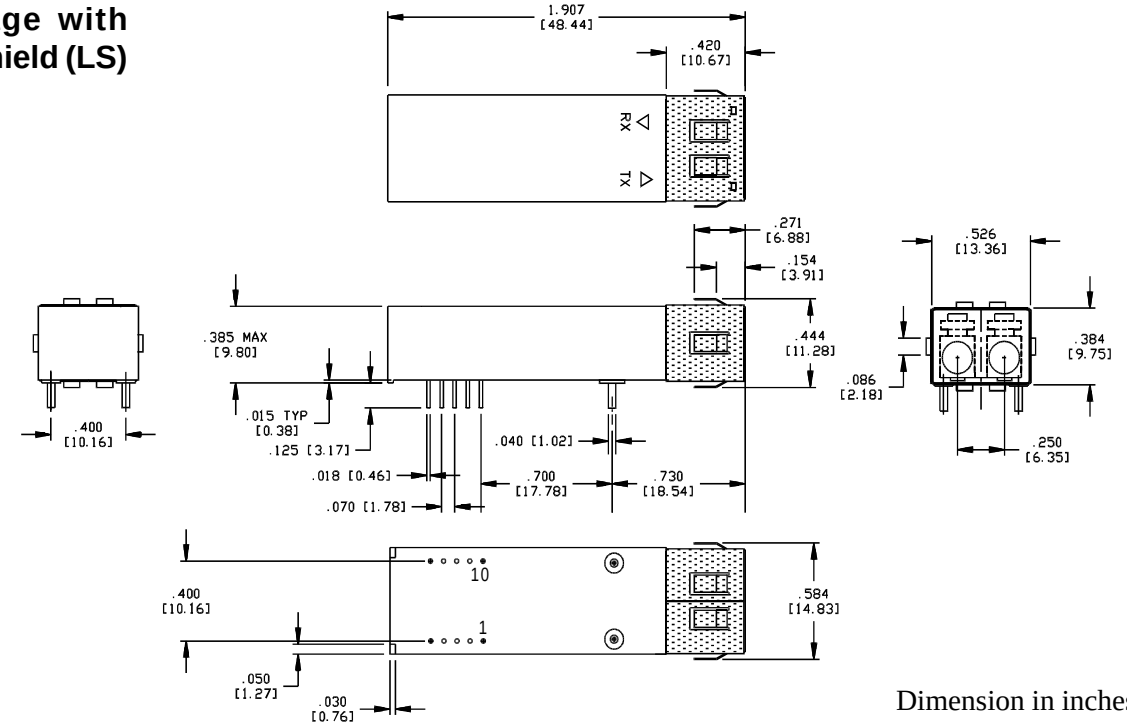


Package without EMI shield (LC)



Dimension in inches [mm]

Package with EMI Shield (LS)



Dimension in inches [mm]

Ordering Information

Module Family	EMI Shield	SONET / SDH / Bit rate
DTR-156-LC	NO	OC-3 / STM-1 / 156 Mbps
DTR-622-LC	NO	OC-12 / STM-4 / 622 Mbps
DTR-156-LS	YES	OC-3 / STM-1 / 156 Mbps
DTR-622-LS	YES	OC-12 / STM-4 / 622 Mbps

See Ordering Information for each particular module (Operating Temperature Range, Plastic or Metal Package, LVTTL or LVPECL SIGNAL DETECT from Tables on page 2 and 3.

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