



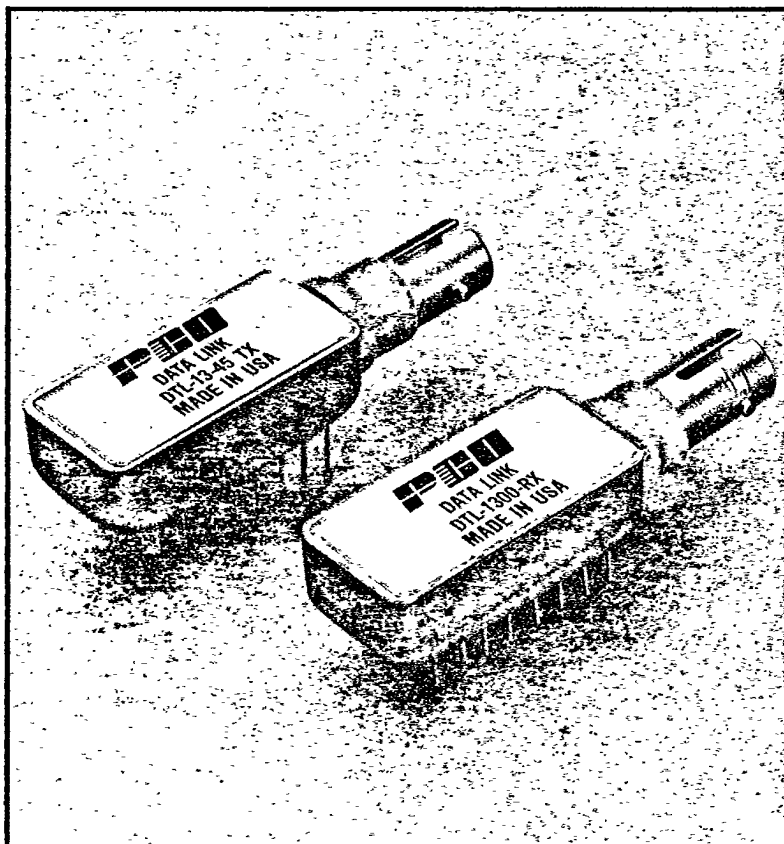
Digital Data Link

DTL-1300 SERIES: 45 Mbaud Version 1300 nm Transmitter/Receiver Modules

T-41-91

Features

- ☐ Long Wavelength — 1320 nm Operation
- ☐ High Speed — 1 to 45 Mb/s
- ☐ Standard +5 or -5.2 Volt Power Supply Operation
- ☐ Typical 17 dB Link Budget with 50/125 Micron Fiber
- ☐ Typical 22 dB Link Budget with 62.5/125 Micron Fiber
- ☐ Small 16-Pin Hermetic Metal Packages
- ☐ Wide Temperature Range — -40°C to +70°C
- ☐ High Power LED Optimized for 50/125 Micron Fiber
- ☐ Standard Logic Interface — 10 K and 100 K ECL



Description

The DTL-1300-45 Digital Transmission Links are high performance transmitter/receiver modules designed for use with multimode optical fiber. Data rates from 1 to 45 Mb/s and distances of 2 kilometers or more are supported. The extended operating temperature range and receiver sensitivity of these data links make them useful in rugged environments as well as in typical computer and data communications applications.

Although the DTL-1300-45 is a commercial product, its integrated circuit design and high

reliability packaging make it suitable for use in some military applications as well.

All electronic and optical functions are contained within the standard low profile PC-board mountable 16-pin hermetic dual-in-line (DIP) package transmitter and receiver modules. The modules incorporate custom bipolar integrated circuits and ST™ compatible receptacles for ease of handling and connection.

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Transmitter Performance Characteristics

Transmitter ($T_a = +25^\circ\text{C}$)

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Parameter	Symbol	Minimum	Typical	Maximum	Units
Electrical Interface					
Supply Voltage ¹	V _{EE}	-5.7	-5.2	-4.7	V
Supply Current	I _{EE}	-	105	130	mA
Power Dissipation	P	-	550	750	mW
Optical Interface					
Optical Output Power ^{2,3} (50/125 Fiber)	$\bar{P}_o$	-22.0	-20.0	-	dBm
Rise/Fall Time ⁴	t_r/t_f	-	4.0	5.0	ns
Data Rate	B	DC	-	45	Mb/s
ON:OFF Ratio	-	20:1	-	-	-
Output Power Temperature Coefficient ⁵	-	-	-0.7	-1.0	%/°C
Center Wavelength ⁶	λ_c	1280	1320	1355	nm
Temperature Coefficient of λ_c	-	-	+0.3	-	nm/°C
Spectral Width (FWHM) ⁶	$\Delta\lambda$	-	150	-	nm
Temperature Coefficient of $\Delta\lambda$	-	-	+0.4	-	nm/°C

Notes:

1. Can also operate on a DC +5 V power supply. Tolerance is $\pm 5\%$.
2. Average coupled power into 50/125 micron graded index fiber.
3. Approximately 5 dB more power coupled into 62.5/125 micron graded index fiber.
4. Measured from 10-90% points.
5. At -40°C , the average optical output power is approximately 2 dB above that at 25°C . At 70°C the average optical output power is approximately 2 dB below that at 25°C .
6. Measured with 50% duty cycle drive signal.

Transmitter Signal Interface

Parameter	Symbol	Minimum	Maximum	Units
Input HIGH Voltage	V _{IHS}	V _{CC} - 1.165	V _{CC} - 0.88	V
Input LOW Voltage	V _{ILS}	V _{CC} - 1.81	V _{CC} - 1.475	V
Differential Input Voltage	V _{DIF}	0.3	1.1	V
Input Common Mode Range ¹	V _{ICM}	-	1.0	V

¹ Permissible $\pm V_{ICM}$ with respect to V_{BB}.

Transmitter Operation

The transmitter behaves logically as a differential input gate which controls a 1300 nanometer light emitting diode. When the DATA input voltage is greater than the $\overline{\text{DATA}}$ input voltage, the LED is

ON. When the $\overline{\text{DATA}}$ signal is greater than the DATA input voltage, the LED is OFF. When used in a single-ended application, the unused input pin should be biased to V_{BB} (V_{CC} - 1.32 volts).

Receiver Performance Characteristics

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Receiver ($T_a = +25^\circ\text{C}$)

Parameter	Symbol	Minimum	Typical	Maximum	Units
Electrical Interface					
Supply Voltage ¹	V_{EE}	-5.7	-5.2	-4.7	V
Supply Current ^{1, 2}	I_{EE}	-	60	80	mA
Power Dissipation	P	-	250	450	mW
Optical Interface					
Data Rate	B	1	-	45	Mb/s
Sensitivity (10^{-12} BER) ³	$\bar{P}_{IN}$	-35	-37	-	dBm
Dynamic Range	$\bar{P}_{MAX}$	-18	-20	-	dB
Temperature Derating (-40°C to $+70^\circ\text{C}$) ⁴		-1	0	+1	dBm
Wavelength of Operation	λ	1100	1320	1600	nm
Carrier Detection Level ⁵	$\bar{P}_{CD}$	-39	-37	-35	dBm

Notes:

1. Can also operate on a DC +5 V power supply. Tolerance is $\pm 5\%$.
2. Measured with open circuited outputs.
3. Average incident power for all fiber sizes up to 85/125 micron measured at the input connector with balanced code optical input with 2.5 ns rise/fall time.
4. Measured under conditions of maximum data rate 50% duty cycle input signal over temperature range of -40°C to $+70^\circ\text{C}$. Minimum average sensitivity over temperature range is -34 dBm.
5. Carrier detection output threshold is an ECL level signal which switches from high to low level when the average input optical signal is below this nominal power level.

Receiver Signal Interface

Parameter	Symbol	Minimum	Maximum	Units
Output HIGH Voltage	V_{OH}	$V_{CC} - 1.025$	$V_{CC} - 0.88$	V
Output LOW Voltage	V_{OL}	$V_{CC} - 1.81$	$V_{CC} - 1.62$	V

Receiver Operation

The receiver converts optical energy to a photocurrent using a high performance PIN diode. The photocurrent is converted to a proportional analog voltage by a transimpedance amplifier. This low level analog signal is amplified by additional gain stages and processed through a shaping filter and a comparator to generate the differential emitter coupled logic (ECL) output signals. Both outputs (DATA and $\overline{\text{DATA}}$) are open emitters requiring termination to $V_{CC} - 2$ volts with 50 ohms or to V_{EE} with 510 ohms.

The threshold detection circuit monitors the level of the incoming optical signal and outputs a logic LOW signal when insufficient photocurrent is produced. The threshold signal can be used to control an external squelch circuit to gate off spurious outputs generated by the receiver when no optical input is available. The outputs are open emitter ECL requiring termination (510 ohms to V_{EE} is recommended).

Absolute Maximum Ratings

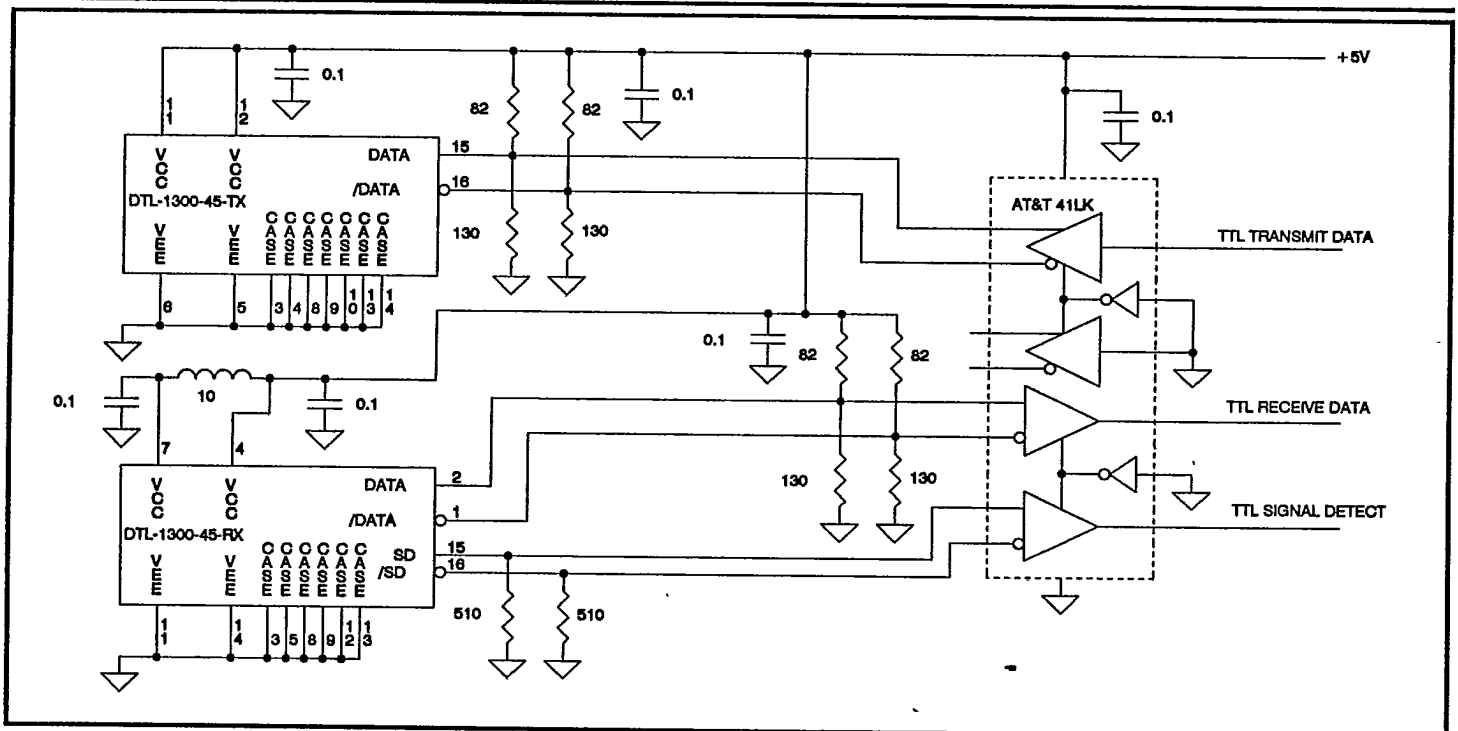
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Characteristic		Minimum	Maximum	Units
Storage Temperature		-55	+85	°C
Operating Temperature		-40	+70	°C
Supply Voltage ¹		-	+6.0	V
Input Voltage ²		-	+6.0	V
Lead Soldering	Temperature	-	240	°C
	Time	-	10	sec

Notes:

1. Measured from VCC to VEE.
2. Measured with respect to VEE.

Interfacing with TTL Circuits



EMI Susceptibility

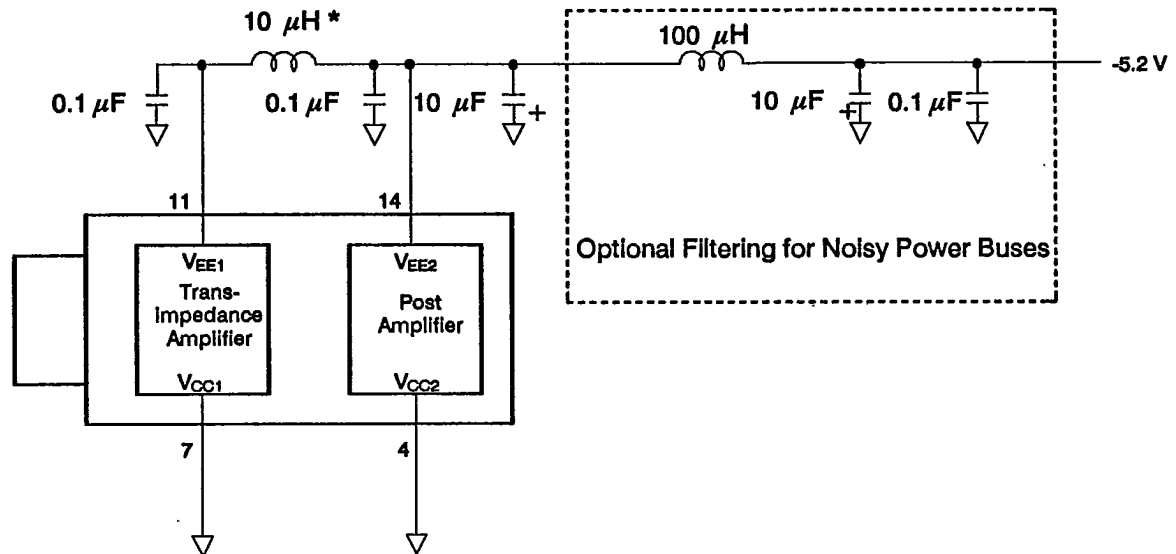
The cases of both the transmitter and receiver RF quality capacitors (0.1microfarad) close to the should be grounded to shield the internal circuitry. package. On a noisy power supply bus the receiver The power supply leads should be bypassed with may be further isolated by a PI filter.

Data Encoding

The receiver circuit utilizes capacitive interstage circuit is optimal for this type of data link. coupling which limits the permissible duty cycle Unrestricted NRZ or bursty transmissions will variations in the serial data. A DC balanced optical require special precautions. signal generated by a scrambling or encoding

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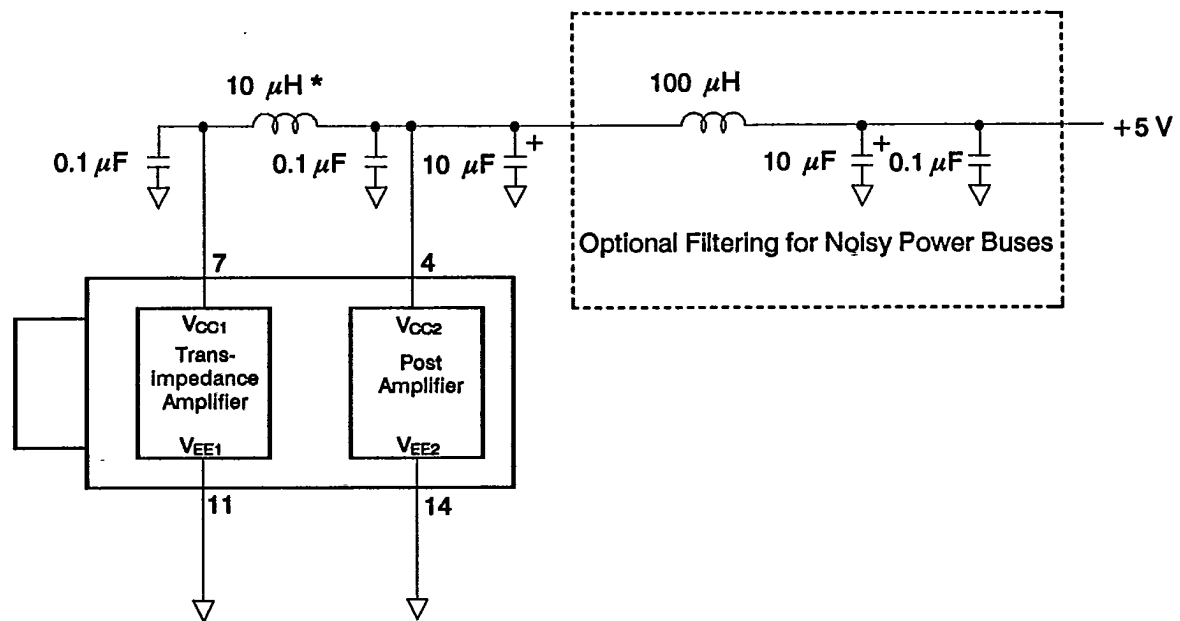
DTL-1300-RX Recommended De-Coupling Circuit for -5.2 V Operation



Case Is Isolated from VEE and VCC. Case grounding is required.

* I_{EE1} is 20 mA typical, 30 mA maximum. Series resistance of inductor should be 2 ohms or less.

DTL-1300-RX Recommended De-Coupling Circuit for +5.0 V Operation

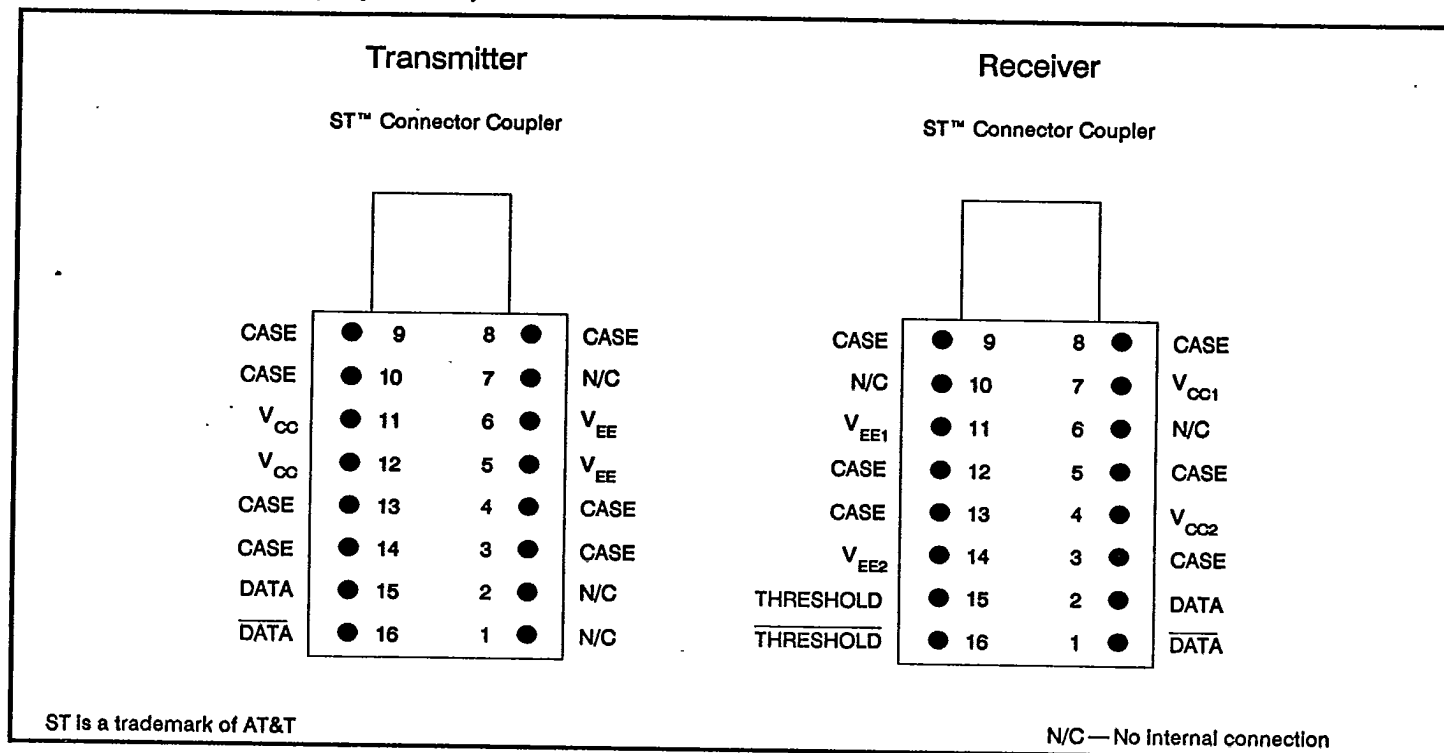


Case Is Isolated from VEE and V

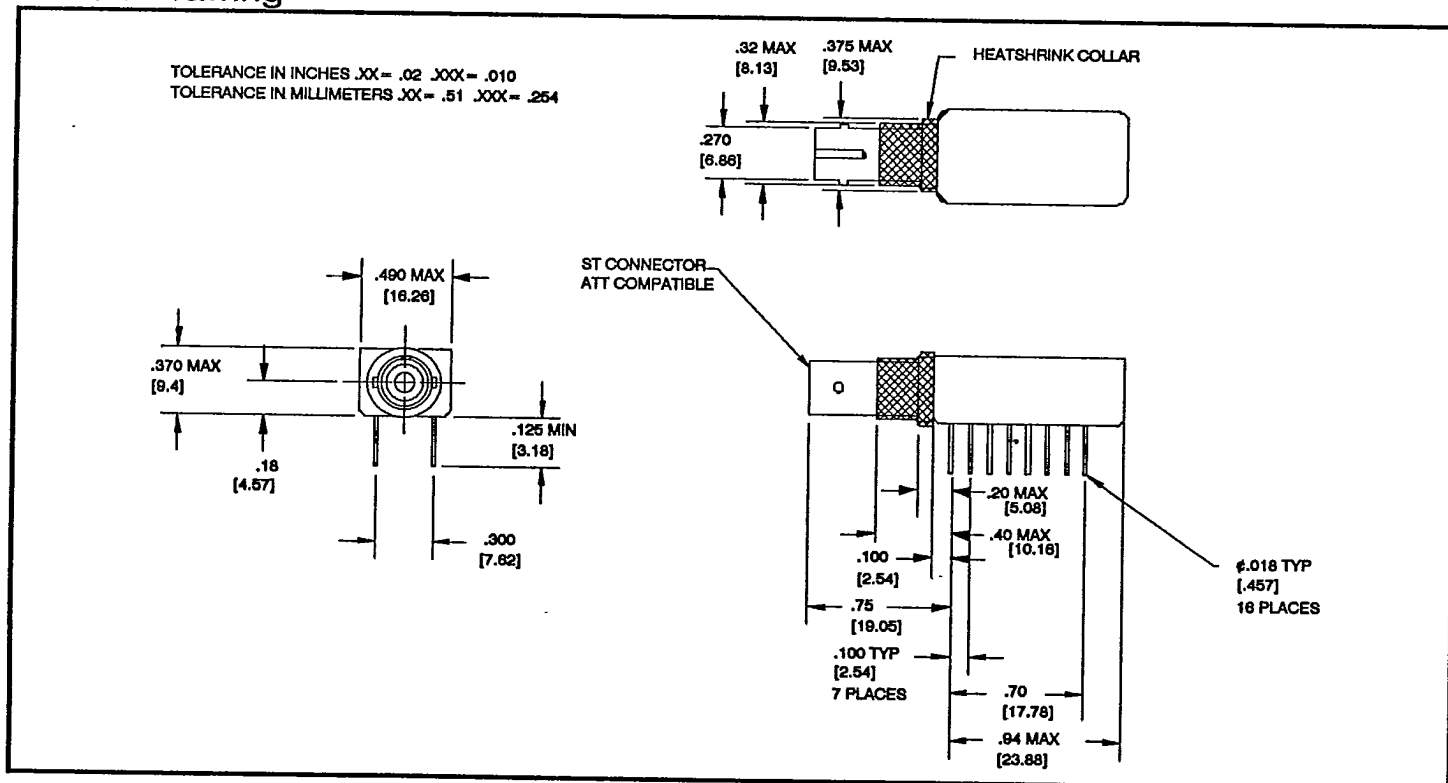
* I_{CC1} is 20 mA typical, 30 mA maximum. Series resistance of inductor should be 2 ohms or less.

Pin Assignments (Top View)

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Outline Drawing



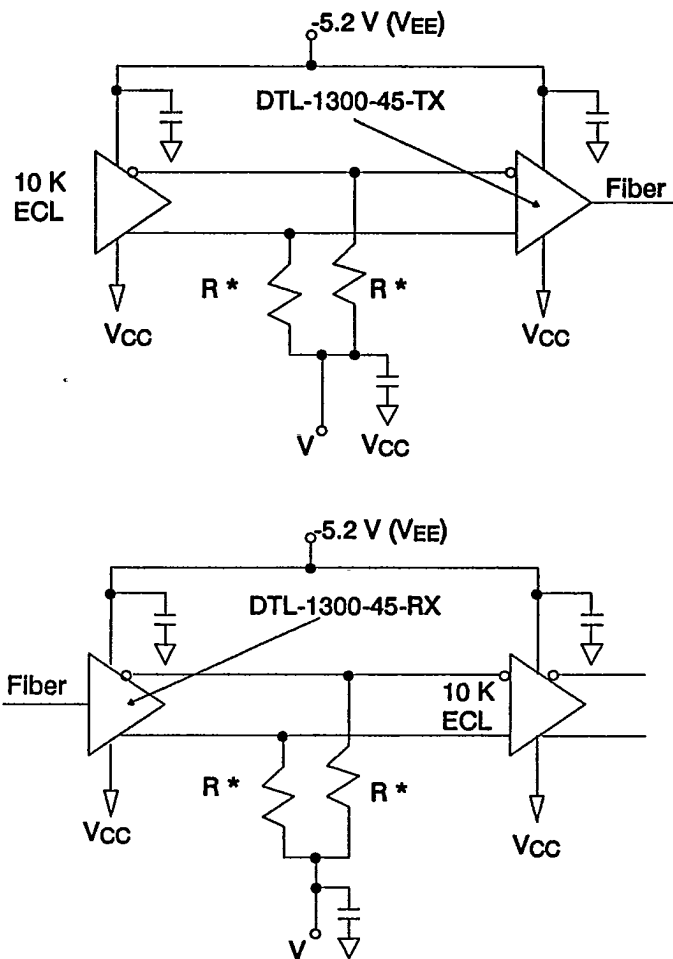
The metal housing is conductive and should be prevented from contacting circuit board traces or the sleeves of low profile screw machine sockets.

A thin plastic DIP insulator (such as BIVAR, Inc. Part Number 816-030 or equivalent) is recommended.

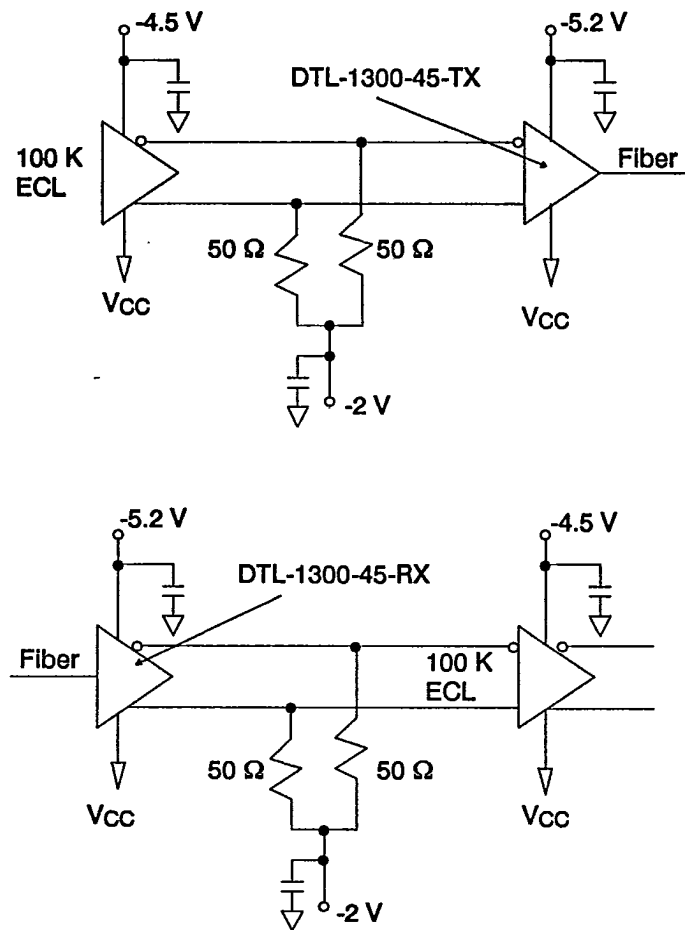
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Application Examples

10 K ECL Typical Interface Configuration



100 K ECL Typical Interface Configuration



* If $V = -5.2 \text{ V}$, then $R = 510 \Omega$

If $V = -2 \text{ V}$, then $R = 50 \Omega$

Note: If positive supply voltage is used for both a DTL-1300-45-RX/TX and an ECL 10 K gate ($V_{CC} = 5.0 \text{ V}$, $V_{EE} = 0 \text{ V}$), they are still logically fully compatible and can have the common power supply voltage.

Ordering Information

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Complete Optical Data Link DTL-1300-45	Transmitter Module DTL-1300-45-TX	Receiver Module DTL-1300-45-RX
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HANDLING PRECAUTIONS:
Normal handling precautions for
electrostatic-sensitive devices should be taken.



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