AppleTalk© Transceiver

FEATURES

- Single Chip Provides Complete LocalTalk©/AppleTalk© Port
- Low Power: I_{CC} = 1.2mA Typ
- Shutdown Pin Reduces I_{CC} to 30µA Typ
- Drivers Maintain High Impedance in Three-State or with Power Off
- 30ns Driver Propagation Delay Typ
- 5ns Driver Skew Typ
- Thermal Shutdown Protection
- Drivers are Short-Circuit Protected

APPLICATIONS

- LocalTalk Peripherals
- Notebook/Palmtop Computers
- Battery-Powered Systems

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DESCRIPTION

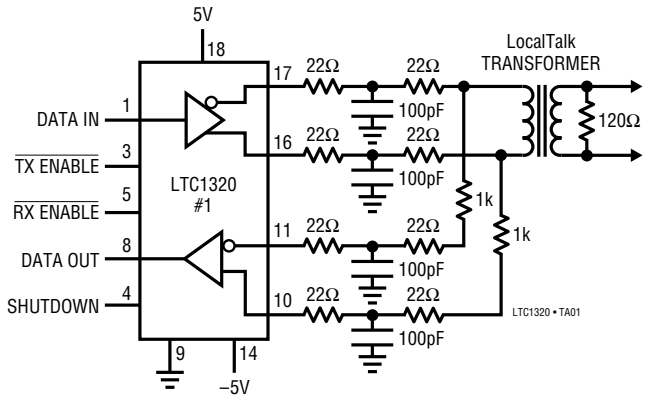
The LTC1320 is an RS422/RS562 line transceiver designed to operate on LocalTalk networks. It provides one differential RS422 driver, one single-ended RS562 driver, two single-ended RS562 receivers, and one differential RS422 receiver. The LTC1320 draws only 1.2mA quiescent current when active and 30µA in shutdown, making it ideal for use in battery-powered devices and other systems where power consumption is a primary concern.

The LTC1320 drivers are specified to drive ±2V into 100Ω. Additionally, the driver outputs three-state when disabled, during shutdown, or when the power is off; they maintain high impedance even with output common-mode voltages beyond the power supply rails. Both the driver outputs and receiver inputs are protected against ESD damage to beyond 5kV.

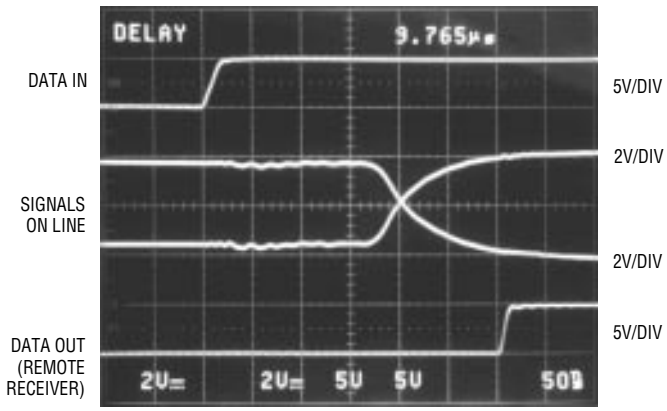
The LTC1320 is available in the 18-pin SOL package.

TYPICAL APPLICATION

Typical LocalTalk Connection



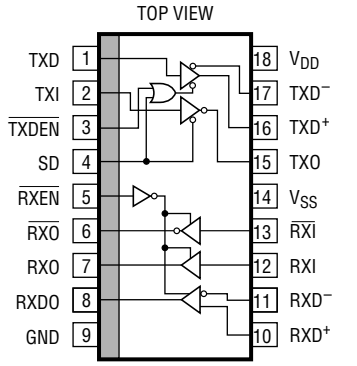
Output Waveforms



ABSOLUTE MAXIMUM RATINGS

Supply Voltage (V_{DD}) 7V
Supply Voltage (V_{SS}) ..... −7V
Input Voltage (Logic Inputs) ..... −0.3V to V_{DD} + 0.3V
Input Voltage (Receiver Inputs) ..... ±15V
Driver Output Voltage (Forced) ..... ±15V
Output Short-Circuit Duration ..... Indefinite
Operating Temperature Range ..... 0°C ot 70°C
Storage Temperature Range ..... −65°c to 150°C
Lead Temperature (Soldering, 10 sec)..... 300°C

PACKAGE/ORDER INFORMATION



ORDER PART NUMBER
LTC1320CS

Consult factory for Industrial and Military grade parts.

DC ELECTRICAL CHARACTERISTICS

V_S = ±5V ±5%, T_A = 0°C to 70°C (Notes 2, 3)

SYMBOL	PARAMETER	CONDITIONS		MIN	TYP	MAX	UNITS
V_{OD}	Differential Driver Output Voltage	No Load R_L = 100Ω (Figure 1)	● ●	8.0 2.0			V V
	Change in Magnitude of Driver Differential Output Voltage	R_L = 100Ω (Figure 1)			0.2		V
V_{OC}	Driver Common-Mode Output Voltage	R_L = 100Ω (Figure 1)			3		V
	Output Common-Mode Range	SD = 5V or Power Off	●			±10	V
	Single-Ended Driver Output Voltage	No Load R_L = 400Ω	● ●	±4.0 ±3.4			V V
	Input High Voltage	All Logic Input Pins	●	2.0			V
	Input Low Voltage	All Logic Input Pins	●			0.8	V
	Input Current	All Logic Input Pins	●		±1	±20	µA
	Three-State Output Current	SD = 5V or Power Off, −10V < V_O < 10V	●		±2	±100	µA
	Driver Short-Circuit Current	−5V < V_O < 5V	●	35	350	500	mA
	Receiver Input Resistance	−7V < V_{IN} < 7V	●	12			kΩ
V_{OH}	Receiver Output High Voltage	I_O = −4mA	●	3.5			V
V_{OL}	Receiver Output Low Voltage	I_O = 4mA	●			0.4	V
	Receiver Output Short-Circuit Current	0V < V_O < 5V	●	7		85	mA
	Receiver Output Three-State Current	0V < V_O < 5V	●		±2	±100	µA
	Differential Receiver Threshold Voltage	−7V < V_{CM} < 7V	●	−200		200	mV
	Differential Receiver Input Hysteresis	−7V < V_{CM} < 7V			70		mV
	Single-Ended Receiver Input Low Voltage		●			0.8	V
	Single-Ended Receiver Input High Voltage		●	2			V
I_{DD}	Supply Current	No Load, SD = 0V No Load, SD = 5V	● ●		1.2 30	3.0 350	mA µA
I_{SS}	Supply Current	No Load, SD = 5V	●		2	350	µA

SWITCHING CHARACTERISTICS $V_S = \pm5V \pm5\%$, $T_A = 0°C$ to $70°C$ (Notes 2, 3)

SYMBOL	PARAMETER	CONDITIONS		MIN	TYP	MAX	UNITS
$t_{PLH, HL}$	Differential Driver Propagation Delay	$R_L = 100\Omega$, $C_L = 100pF$ (Figures 2, 8)	●		40	120	ns
t_{SKEW}	Differential Driver Output to Output	$R_L = 100\Omega$, $C_L = 100pF$ (Figures 2, 8)	●		10	50	ns
$t_{r, f}$	Differential Driver Rise/Fall Time	$R_L = 100\Omega$, $C_L = 100pF$ (Figures 2, 8)	●		15	80	ns
$t_{ENH, L}$	Driver Enable to Output Active	$C_L = 100pF$ (Figures 3, 4, 10)	●		50	150	ns
$t_{H, Ldis}$	Driver Output Active to Disable	$C_L = 15pF$ (Figures 3, 4, 10)	●		50	150	ns
$t_{PLH, HL}$	Single-Ended Driver Propagation Delay	$R_L = 450\Omega$, $C_L = 100pF$ (Figures 5, 11)	●		40	120	ns
$t_{r, f}$	Single-Ended Driver Rise/Fall Time	$R_L = 450\Omega$, $C_L = 100pF$ (Figures 5, 12)	●		15	80	ns
$t_{PLH, HL}$	Receiver Propagation Delay	$C_L = 15pF$ (Figures 13, 14)	●		60	160	ns
$t_{ENH, L}$	Receiver Enable to Output Active	$C_L = 100pF$ (Figures 6, 7, 15)	●		30	100	ns
$t_{H, Ldis}$	Receiver Output Active to Disable	$C_L = 15pF$ (Figures 6, 7, 15)	●		30	100	ns

The ● denotes specifications which apply over the full operating temperature range.

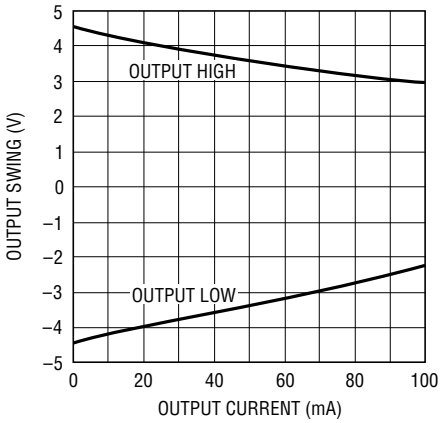
Note 1: Absolute Maximum Ratings are those values beyond which the life of a device may be impaired.

Note 2: All currents into device pins are positive; all currents out of device pins are negative. All voltages are referenced to ground unless otherwise specified.

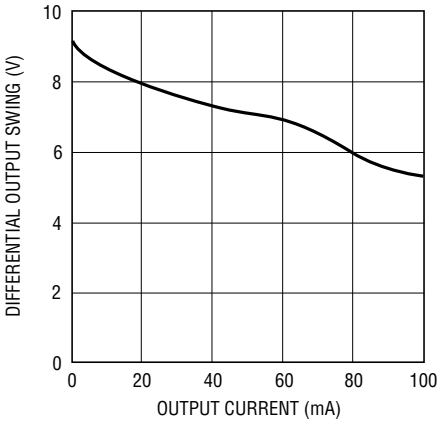
Note 3: All typicals are given at $V_S = \pm5V$, $T_A = 25°C$.

TYPICAL PERFORMANCE CHARACTERISTICS

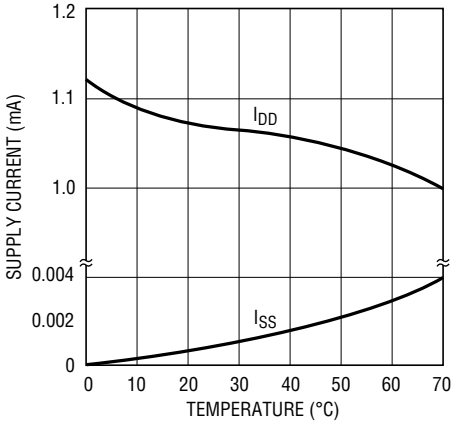
Output Swing vs Load Current



Differential Output Swing vs Load Current



Supply Current vs Temperature



PIN FUNCTIONS

TXD (Pin 1): RS422 Differential Driver Input (TTL Compatible).

TXI (Pin 2): RS562 Single-Ended Driver Input (TTL compatible.

$\overline{\text{TXDEN}}$ (Pin 3): RS422 Differential Driver Output Enable (TTL Compatible). A high level on this pin forces the RS422 driver into three-state; a low level enables the driver. This input does not affect the RS562 single-ended driver.

SD (Pin 4): Shutdown Input (TTL Compatible). When this pin is high, the chip is shut down: all driver outputs three-state and the supply current drops to 30μA. A low on this pin allows normal operation.

PIN FUNCTIONS

$\overline{\text{RXEN}}$ (Pin 5): Receiver Enable (TTL Compatible). A high level on this pin disables the receivers and three-states the logic outputs; a low level allows normal operation. To prevent erratic behavior at the receiver outputs during shutdown, $\overline{\text{RXEN}}$ should be pulled high along with SD.

$\overline{\text{RXO}}$ (Pin 6): Inverting RS562 Single-Ended Receiver Output.

RXO (Pin 7): Noninverting RS562 Single-Ended Receiver Output.

RXDO (Pin 8): RS422 Differential Receiver Output.

GND (Pin 9): Ground Pin.

RXD$^+$ (Pin 10): RS422 Differential Receiver Noninverting Input. When this pin is ≥200mV above RXD$^-$, RXDO will be high; when this pin is ≥200mV below RXD$^-$, RXDO will be low.

RXD$^-$ (Pin 11): RS422 Differential Receiver Inverting Input.

RXI (Pin 12): Noninverting RS562 Receiver Input. This input controls the RXO output; it has no effect on the $\overline{\text{RXO}}$ output.

$\overline{\text{RXI}}$ (Pin 13): Inverting RS562 Receiver Input. This input controls the $\overline{\text{RXO}}$ output; it has no effect on the RXO output.

V_{SS} (Pin 14): Negative Supply. $-4.75 \geq V_{SS} \geq -5.25V$. The voltage on this pin must never exceed ground on power up or power-down.

TXO (Pin 15): RS562 Single-Ended Driver Output.

TXD$^+$ (Pin 16): RS422 Differential Driver Noninverting Output.

TXD$^-$ (Pin 17): RS422 Differential Driver Inverting Output.

V_{DD} (Pin 18): Positive Supply. $4.75V \leq V_{DD} \leq 5.25V$.

TEST CIRCUITS

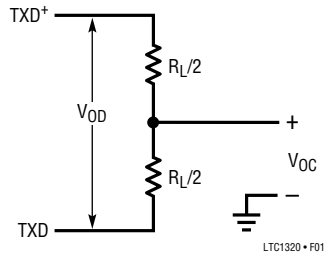


Figure 1

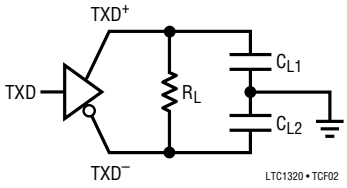


Figure 2

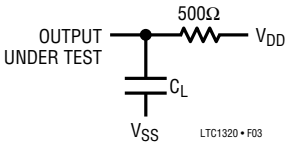


Figure 3

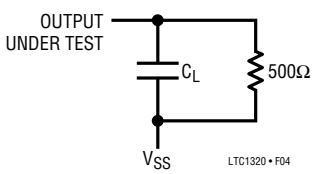


Figure 4

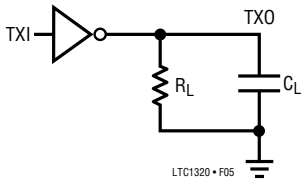


Figure 5

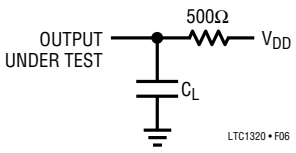


Figure 6

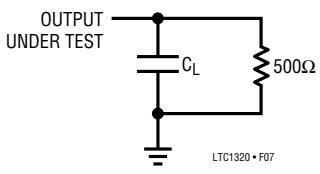


Figure 7

SWITCHING WAVEFORMS

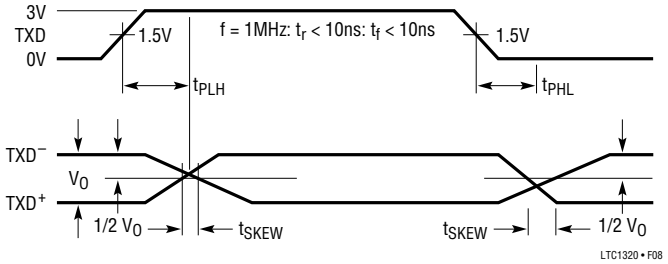


Figure 8

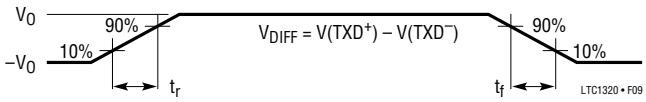


Figure 9

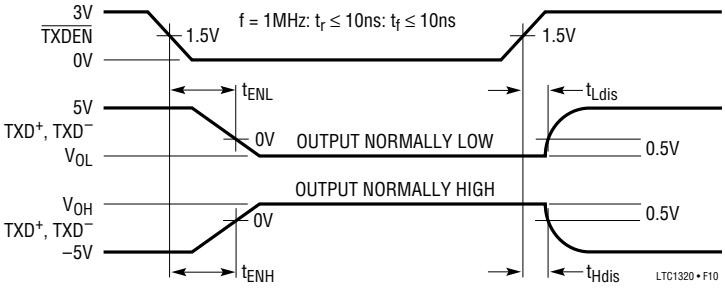


Figure 10

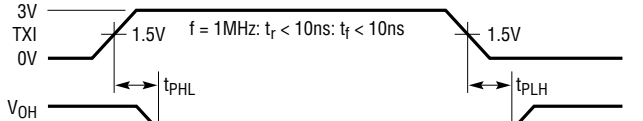


Figure 11

Figure 12

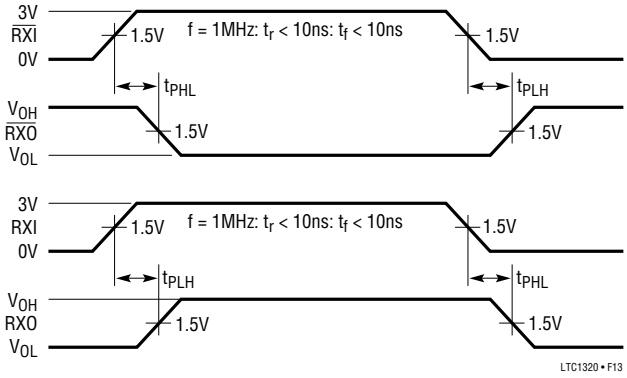


Figure 13

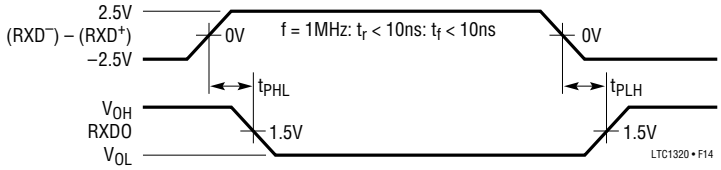


Figure 14

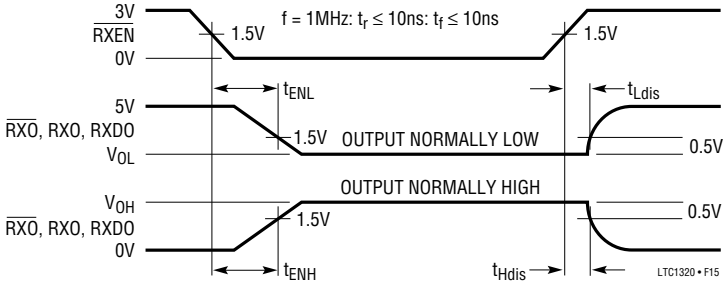


Figure 15

APPLICATIONS INFORMATION

Thermal Shutdown Protection

The LTC1320 includes a thermal shutdown circuit which protects the part against prolonged shorts at the driver outputs. If any driver output is shorted to another output or to the power supply, the current will be initially limited to 450mA max. The die temperature will rise to about 150°C, at which point the thermal shutdown circuit turns off the driver outputs. When the die cools to about 130°C, the outputs re-enable. If the shorted condition still exists, the part will heat again and the cycle will repeat. When the short is removed, the part will return to normal operation. This oscillation occurs at about 10Hz and prevents the part from being damaged by excessive power dissipation.

Power Shutdown

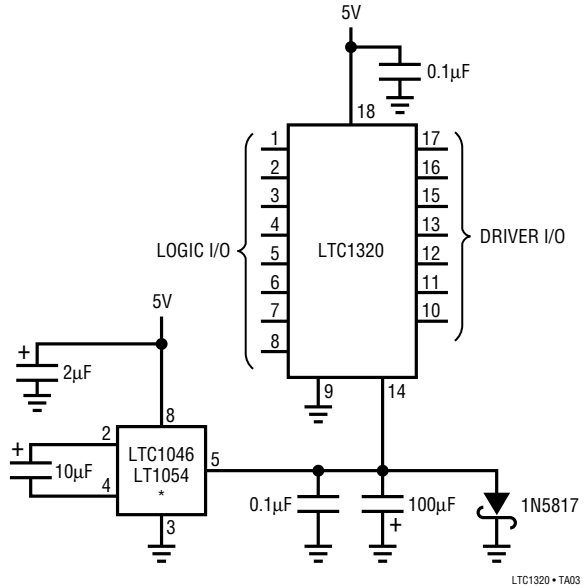
The power shutdown feature of the LTC1320 is designed primarily for battery-powered systems. When SD (pin 4) is forced high, the part enters shutdown mode. In shutdown, the supply current drops from 1.2mA to 30μA typ. The driver outputs are three-stated and the power to the receivers is removed. The receiver outputs are not automatically three-stated in shutdown, and can toggle erroneously due to feedthrough from the inputs. This can be prevented by pulling $\overline{RXEN}$ high along with SD; this will three-state the receiver outputs and prevent the generation of spurious data.

Supply Bypassing

The LTC1320 requires that both V_{DD} and V_{SS} are well bypassed; data errors can result from inadequate bypassing. Bypass capacitor values of 0.1μF to 1μF from V_{DD} to ground and from V_{SS} to ground are adequate. Lead lengths and trace lengths between the capacitors and the chip should be short to minimize lead inductance.

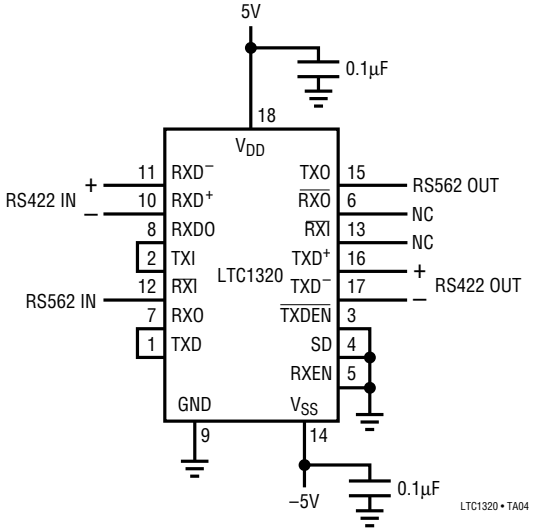
TYPICAL APPLICATIONS

Single 5V Supply



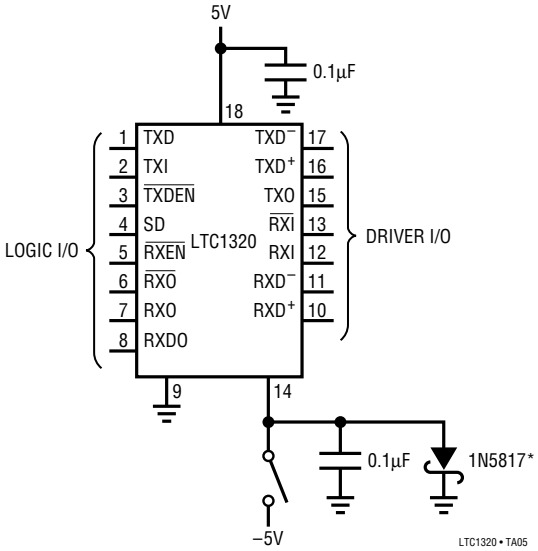
*LTC1046 GIVES 300μA QUIESCENT CURRENT WHEN LTC1320 IS SHUT DOWN
LT1054 PROVIDES HIGHER OUTPUT DRIVE

RS422 to RS562/RS562 to RS422 Converter



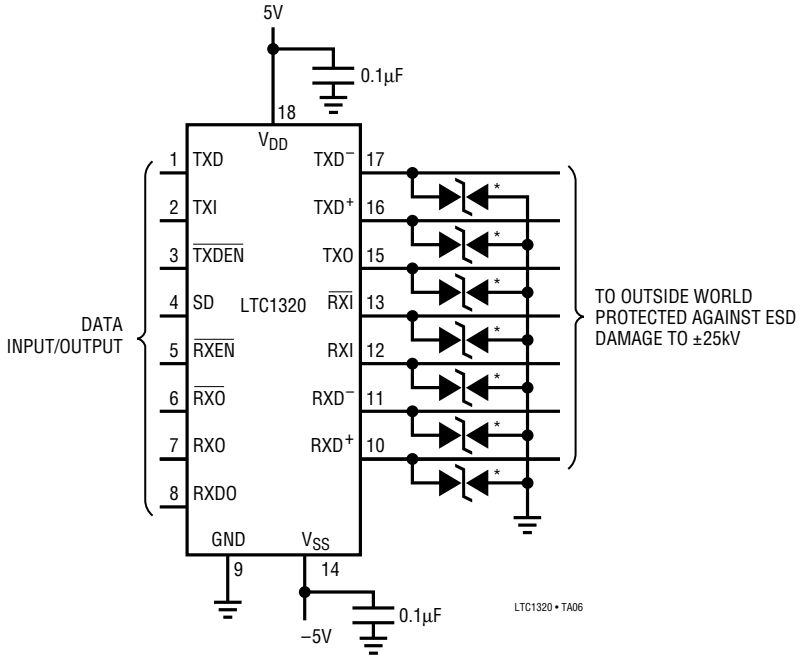
TYPICAL APPLICATIONS

Switched Negative Supply



*SCHOTTKY DIODE PREVENTS V_{SS} FROM EXCEEDING GND ON POWER-UP OR POWER-DOWN

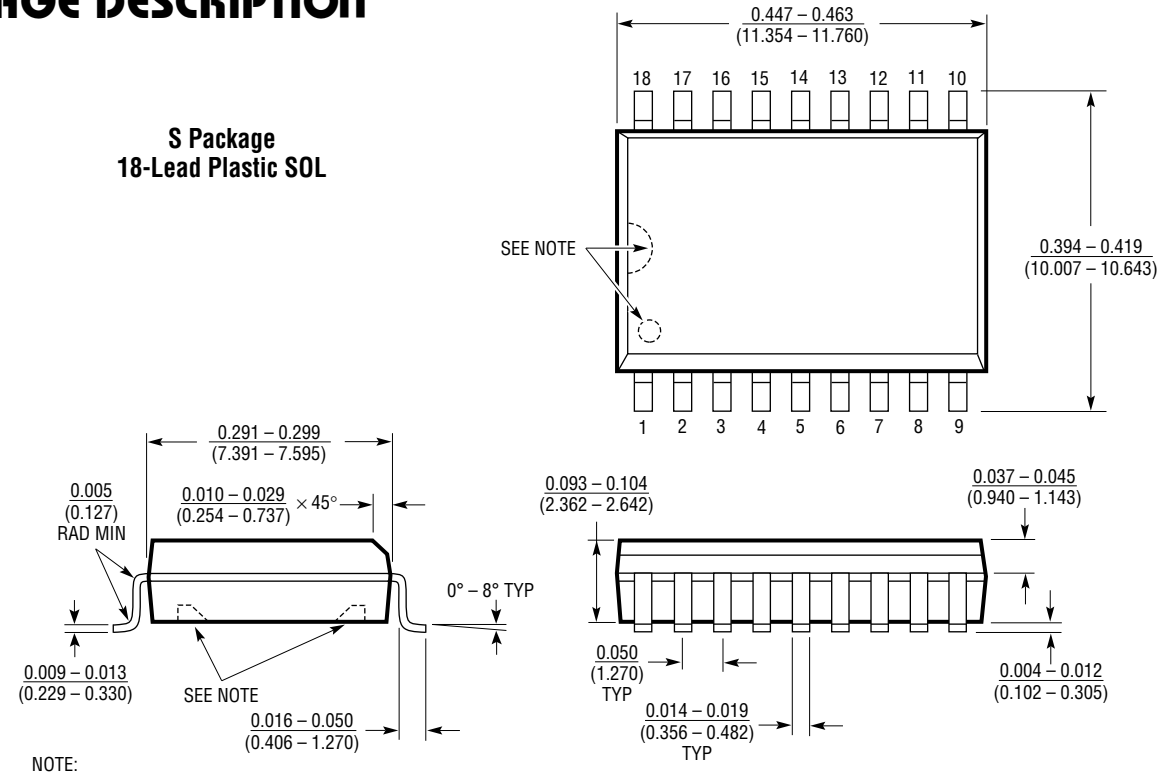
≥25k ESD Protection



*GENERAL SEMICONDUCTOR ICTE-22C OR EQUIVALENT

PACKAGE DESCRIPTION

S Package
18-Lead Plastic SOL



NOTE:
PIN 1 IDENT, NOTCH ON TOP AND CAVITIES ON THE BOTTOM OF PACKAGES ARE THE MANUFACTURING OPTIONS.
THE PART MAY BE SUPPLIED WITH OR WITHOUT ANY OF THE OPTIONS.

SOL18 0392

Information furnished by Linear Technology Corporation is believed to be accurate and reliable. However, no responsibility is assumed for its use. Linear Technology Corporation makes no representation that the interconnection of circuits as described herein will not infringe on existing patent rights.

U.S. Area Sales Offices

NORTHEAST REGION
Linear Technology Corporation
One Oxford Valley
2300 E. Lincoln Hwy.,Suite 306
Langhorne, PA 19047
Phone: (215) 757-8578
FAX: (215) 757-5631

CENTRAL REGION
Linear Technology Corporation
Chesapeake Square
229 Mitchell Court, Suite A-25
Addison, IL 60101
Phone: (708) 620-6910
FAX: (708) 620-6977

NORTHWEST REGION
Linear Technology Corporation
782 Sycamore Dr.
Milpitas, CA 95035
Phone: (408) 428-2050
FAX: (408) 432-6331

SOUTHEAST REGION
Linear Technology Corporation
17060 Dallas Parkway
Suite 208
Dallas, TX 75248
Phone: (214) 733-3071
FAX: (214) 380-5138

SOUTHWEST REGION
Linear Technology Corporation
22141 Ventura Blvd.
Suite 206
Woodland Hills, CA 91364
Phone: (818) 703-0835
FAX: (818) 703-0517

International Sales Offices

FRANCE
Linear Technology S.A.R.L.
Immeuble "Le Quartz"
58 Chemin de la Justice
92290 Chatenay Mallabry
France
Phone: 33-1-46316161
FAX: 33-1-46314613

KOREA
Linear Technology Korea Branch
Namsong Building, #505
Itaewon-Dong 260-199
Yongsan-Ku, Seoul
Korea
Phone: 82-2-792-1617
FAX: 82-2-792-1619

TAIWAN
Linear Technology Corporation
Rm. 801, No. 46, Sec. 2
Chung Shan N. Rd.
Taipei, Taiwan, R.O.C.
Phone: 886-2-521-7575
FAX: 886-2-562-2285

GERMANY
Linear Techonolgy GMBH
Untere Hauptstr. 9
D-8057 Eching
Germany
Phone: 49-89-319741-0
FAX: 49-89-3194821

SINGAPORE
Linear Technology Pte. Ltd.
101 Boon Keng Road
#02-15 Kallang Ind. Estates
Singapore 1233
Phone: 65-293-5322
FAX: 65-292-0398

UNITED KINGDOM
Linear Technology (UK) Ltd.
The Coliseum, Riverside Way
Camberley, Surrey GU15 3YL
United Kingdom
Phone: 44-276-677676
FAX: 44-276-64851

JAPAN
Linear Technology KK
5F YZ Building
4-4-12 Iidabashi Chiyoda-Ku
Tokyo, 102 Japan
Phone: 81-3-3237-7891
FAX: 81-3-3237-8010

World Headquarters

Linear Technology Corporation
1630 McCarthy Blvd.
Milpitas, CA 95035-7487
Phone: (408) 432-1900
FAX: (408) 434-0507

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