

## FEATURES

- Low Operating Voltage:  $\pm 5\text{V}$  to  $\pm 15\text{V}$
- $500\mu\text{A}$  Supply Current
- Zero Supply Current when Shut Down
- Outputs Can Be Driven  $\pm 30\text{V}$
- Thermal Limiting
- Output "Open" when Off (Three-State)
- $10\text{mA}$  Output Drive
- Pinout Similar to 1488

## APPLICATIONS

- RS232
- Power Supply Inverter
- Micropower Interface
- Level Translator

## DESCRIPTION

The LT<sup>®</sup>1032 is a RS232 and RS423 line driver that operates over a  $\pm 5\text{V}$  to  $\pm 15\text{V}$  range on low supply current and can be shut down to zero supply current. Outputs are fully protected from externally applied voltages of  $\pm 30\text{V}$  by both current and thermal limiting. Since the output swings to within  $200\text{mV}$  of the positive supply and  $600\text{mV}$  of the negative supply, power supply needs are minimized.

Also included is a strobe pin to force all outputs low independent of input or shutdown conditions. Further, slew rate can be adjusted with a resistor connected to the supply.

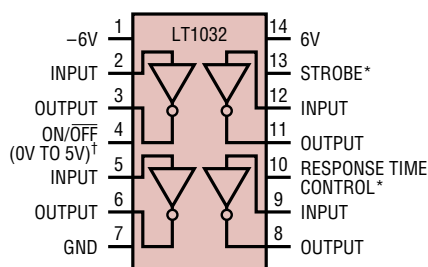
A major advantage of the LT1032 is the high impedance output state when off or powered down.

For applications requiring dual or triple RS232 driver/receiver devices, see the LT1180A (dual), LT1039A (triple) or the LT1130A data sheets.

**LT**, LTC and LT are registered trademarks of Linear Technology Corporation.

## TYPICAL APPLICATION

**RS232 Line Driver**

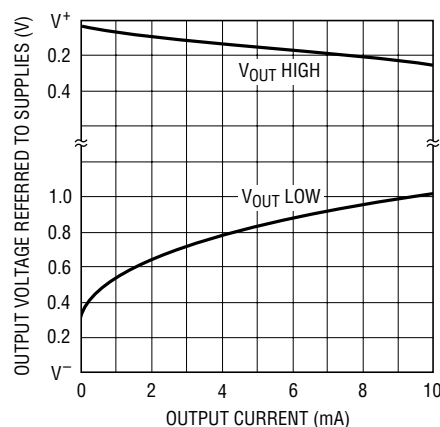


\*NO CONNECTION NEEDED WHEN NOT USED

†5V = ON

LT1032 • TA01

**Output Swing vs Output Current**



LT1032 • TA02

## ABSOLUTE MAXIMUM RATINGS (Note 1)

Supply Voltage .....	$\pm 15V$
Logic Input Pins .....	$V^-$ to $25V$
ON/OFF Pin .....	GND to $15V$
Output (Forced) .....	$V^- + 30V$ , $V^+ - 30V$
Response Pin .....	$\pm 6V$
Short-Circuit Duration (to $\pm 30V$ ) .....	Indefinite
Storage Temperature Range .....	$-65^\circ C$ to $150^\circ C$

Operating Temperature Range	
LT1032C .....	$0^\circ C$ to $70^\circ C$
LT1032I .....	$-40^\circ C$ to $85^\circ C$
LT1032M .....	$-55^\circ C$ to $125^\circ C$
C Grade Guaranteed	
Functional by Design .....	$-25^\circ C$ to $85^\circ C$
Lead Temperature (Soldering, 10 sec) .....	$300^\circ C$

## PACKAGE/ORDER INFORMATION

TOP VIEW	ORDER PART NUMBER	TOP VIEW	ORDER PART NUMBER
<p>J PACKAGE 14-LEAD CERDIP</p> <p>N PACKAGE 14-LEAD PDIP</p> <p><math>T_{JMAX} = 85^\circ C</math>, <math>\theta_{JA} = 100^\circ C/W</math>, <math>\theta_{JC} = 60^\circ C</math> (CJ)  <math>T_{JMAX} = 85^\circ C</math>, <math>\theta_{JA} = 100^\circ C/W</math>, <math>\theta_{JC} = 60^\circ C</math> (CN)  <math>T_{JMAX} = 150^\circ C</math>, <math>\theta_{JA} = 100^\circ C/W</math>, <math>\theta_{JC} = 60^\circ C</math> (MJ)</p>	LT1032CJ LT1032CN LT1032IN LT1032MJ	<p>SW PACKAGE 16-LEAD PLASTIC SO (WIDE)</p> <p><math>T_{JMAX} = 85^\circ C</math>, <math>\theta_{JA} = 80^\circ C/W</math></p>	LT1032CSW LT1032ISW

## ELECTRICAL CHARACTERISTICS

The ● denotes specifications which apply over the full operating temperature range, otherwise specifications are at  $T_A = 25^\circ C$ . Supply voltage =  $\pm 5V$  to  $\pm 15V$

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Supply Current	$V_{ON/OFF} \geq 2.4V$ , $I_{OUT} = 0$ , All Outputs Low ●		500	1000	$\mu A$
Power Supply Leakage Current	$V_{ON/OFF} \leq 0.4V$ $V_{ON/OFF} \leq 0.1V$ , $T_A = 125^\circ C$ ●		1 10	10 50	$\mu A$ $\mu A$
Output Voltage Swing	Load = 2mA Positive Negative	$V^+ - 0.3V$	$V^+ - 0.1V$ $V^- + 0.7V$	$V^- + 0.9V$	V V
Output Current (Active)	$V_{SUPPLY} = \pm 5V$ to $\pm 15V$	10	22		mA
Output Current (Shutdown)	$V_{SUPPLY} = 0V$ , $V_{OUT} = \pm 30V$ $V_{SUPPLY} = \pm 15V$ , $V_{OUT} = \pm 20V$		2 2	100 100	$\mu A$ $\mu A$
Output Overload Voltage (Forced)	Operating or Shutdown ●	$V^+ - 30V$		$V^- + 30V$	V
Input Overload Voltage (Forced)	Operating or Shutdown ●	$V^-$		30V	V
Logic Input Levels	Low Input ( $V_{OUT} = \text{High}$ ) High Input ( $V_{OUT} = \text{Low}$ ) ● ●		1.4 1.4	0.8	V V
Logic Input Current	$V_{IN} > 2.0V$ $V_{IN} < 0.8V$		2 10	20 20	$\mu A$ $\mu A$
ON/OFF Pin Current	$0 \leq V_{IN} \leq 5V$ ●	-10	3	50	$\mu A$
Slew Rate	$I_{RESPONSE} = 0$ , $R_L = 3k$	4	15	30	V/ $\mu s$
Change in Slew Rate (Note 3)	$I_{RESPONSE} = 50\mu A$ $I_{RESPONSE} = -50\mu A$		50 -50		% %
Response Pin Leakage	$V_{SUPPLY} = \pm 6V$ , $V_{ON/OFF} \leq 0.4V$ $V_{RESPONSE} = \pm 6V$		1		$\mu A$

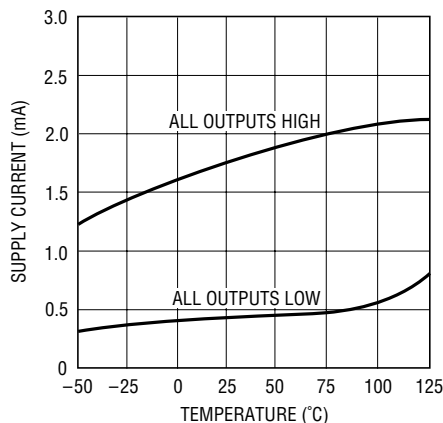
**Note 1:** Absolute Maximum Ratings are those values beyond which the life of a device may be impaired.

**Note 2:** 3V applied to the strobe pin will force all outputs low. Strobe pin input impedance is about 2k to ground. Leave open when not used.

**Note 3:** Response can be changed by connecting a resistor to the supply. For supplies less than  $\pm 6V$  this current is disconnected when shut down. Leave open when not used.

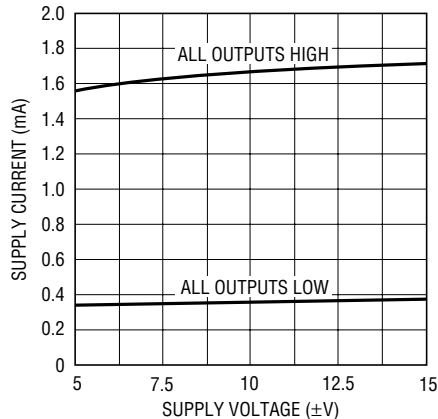
# TYPICAL PERFORMANCE CHARACTERISTICS

On Supply Current vs Temperature



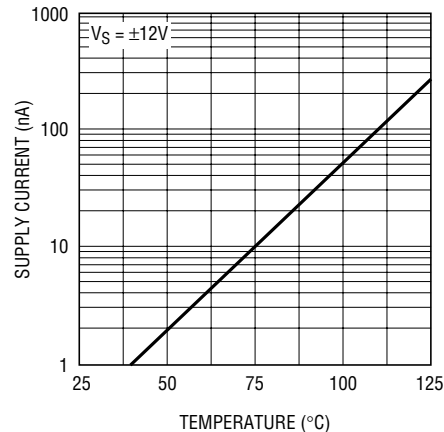
LT1032 • TPC01

Supply Current vs Supply Voltage



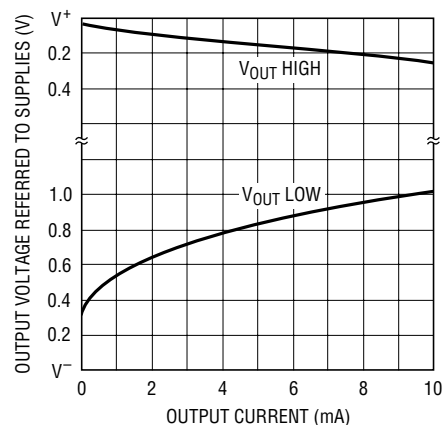
LT1032 • TPC02

Off Supply Current vs Temperature



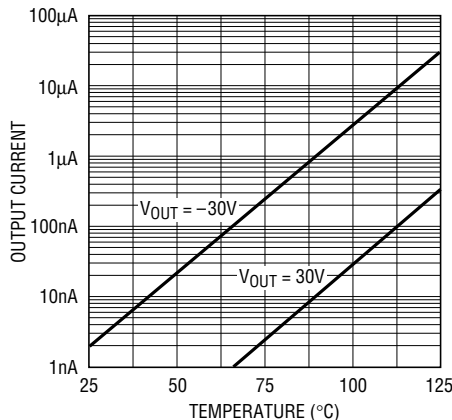
LT1032 • TPC03

Output Swing vs Output Current



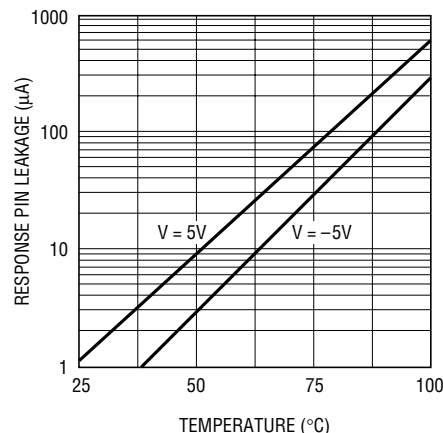
LT1032 • TA02

Output Leakage vs Temperature



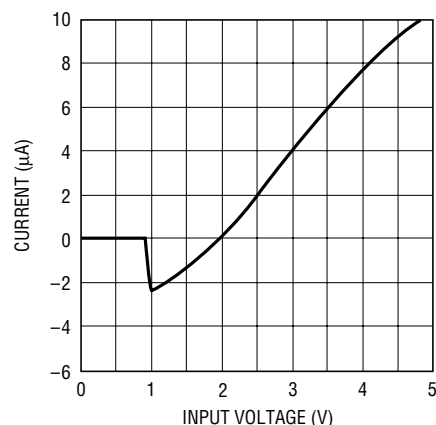
LT1032 • TPC05

Response Pin Leakage vs Temperature (Device Off)



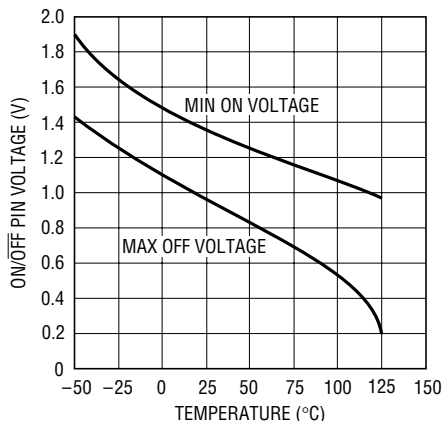
LT1032 • G06

ON/OFF Pin Current vs Voltage



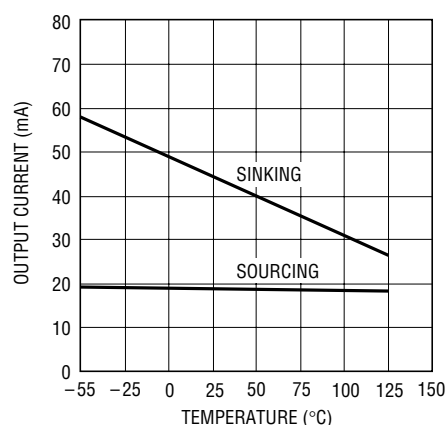
LT1032 • TPC07

Shutdown Pin Voltage vs Temperature



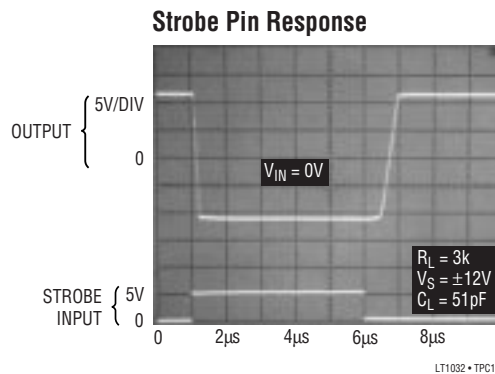
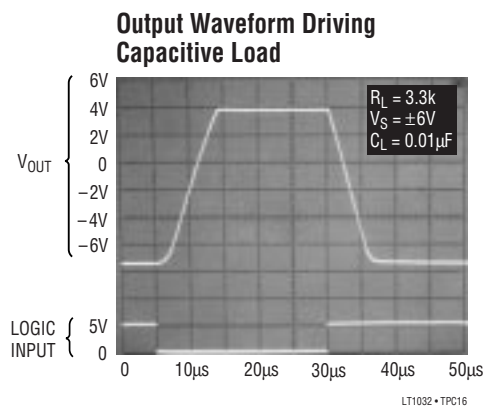
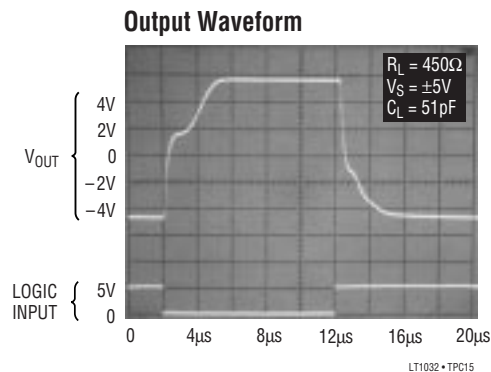
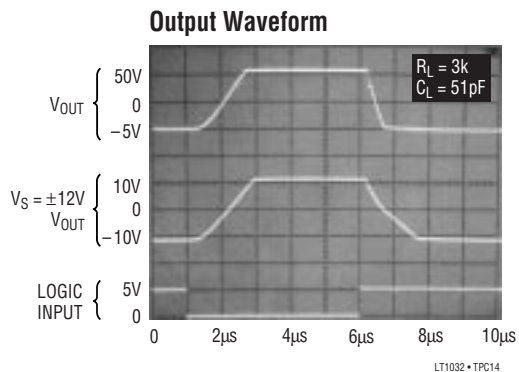
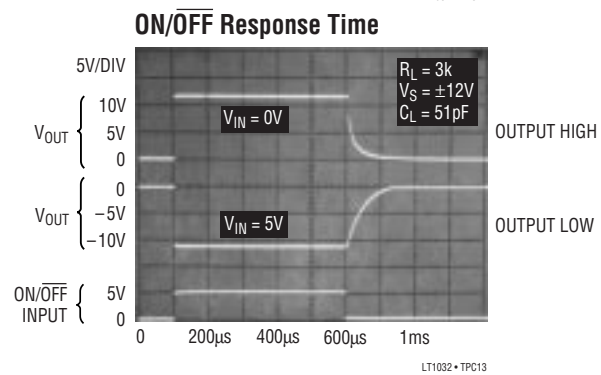
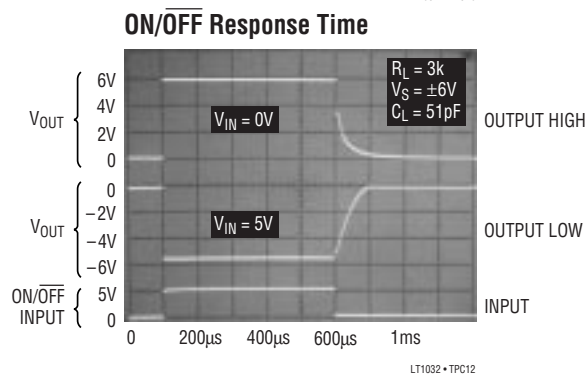
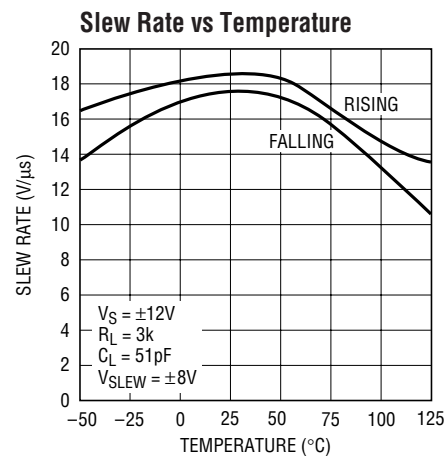
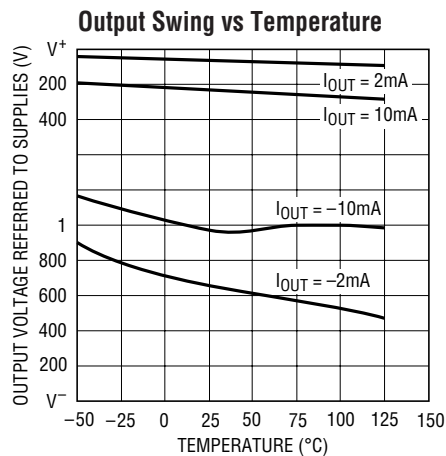
LT1032 • TPC08

Current Limit vs Temperature



LT1032 • TPC09

TYPICAL PERFORMANCE CHARACTERISTICS



## PIN FUNCTIONS

**V<sub>EE</sub> (J, N & S: Pin 1):** Minus Supply. Operates -2V to -15V.  
**(J & N: Pins 2, 5, 9, 12/S: Pins 2, 5, 11, 14):** Logic Input. Operates properly on TTL or CMOS levels. Output valid from  $(V^- + 2V) \leq V_{IN} \leq 15V$ . Connect to ground when not used.

**(J & N: Pins 3, 6, 8, 11/S: Pins 3, 6, 10, 13):** Output. Line drive output.

**ON/OFF (J, N & S: Pin 4):** Shuts down entire circuit. Cannot be left open. For “normally on” operation, connect to V<sup>+</sup>.

**GND (J, N & S: Pin 7):** Ground. Ground must be more positive than V<sup>-</sup>.

**Response Control (J & N: Pin 10/S: Pin 12):** Allows limited change of slew rate. Leave open when not used.

**Strobe (J & N: Pin 13/S: Pin 15):** Forces all outputs low. Drive with 3V.

**V<sub>CC</sub> (J & N: Pin 14/S: Pin 15):** Positive Supply. Operates 5V to 15V.

## APPLICATIONS INFORMATION

### Application Hints

The LT1032 is exceptionally easy to use when compared to older drivers. Operating supply voltage can be as low as  $\pm 3V$  or as high as  $\pm 15V$ . Input levels are referred to ground.

The logic inputs are internally set at TTL levels. Outputs are valid for input voltages from 1V above V<sup>-</sup> to 25V. Driving the logic inputs to V<sup>-</sup> turns off the output stage. The ON/OFF control completely turns off all supply current of the LT1032. The levels required to drive the device on or off are set by internal emitter-based voltages. Since the current into the ON/OFF pin is so low, TTL or CMOS drivers have no problem controlling the device.

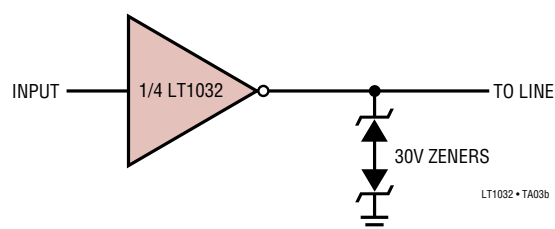
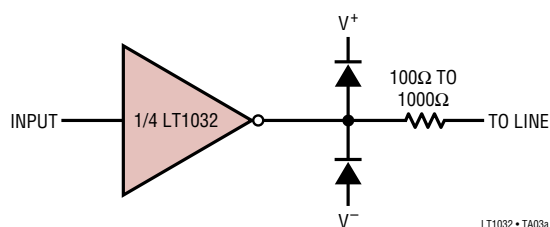
The strobe pin is not fully logic compatible. The impedance of the strobe pin is about 2k $\Omega$  to ground. Driving the strobe pin positive forces the output stages low—even if the device is shut off. Under worst case conditions, 3V minimum at 2mA are needed driving the strobe pin to insure strobing.

The response pin can be used to make some adjustment in slew rate. A resistor can be connected between the response pin and the power supplies to drive 50 $\mu A$  to 100 $\mu A$  into the pin. The response pin is a low impedance point operating at about 0.75V above ground. For supply voltage up to  $\pm 6V$ , current is turned off when the device is turned off. For higher supply voltages, a Zener should be connected in series with the resistor to limit the voltage applied to the response pin to 6V. Also, for temperatures above 100°C, using the response pin is not recommended. The leakage current into the response pin at high temperatures is excessive.

Outputs are well protected against shorts or externally applied voltage. Tested limits are  $\pm 30V$ , but the device can withstand external voltages up to breakdown of the transistors (typically about 50V). The LT1032 is usually immune to ESD up to 2500V on the outputs with no damage.

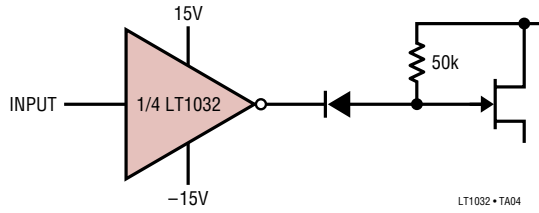
## TYPICAL APPLICATIONS

Protecting Against More Than  $\pm 30V$  Output Overload

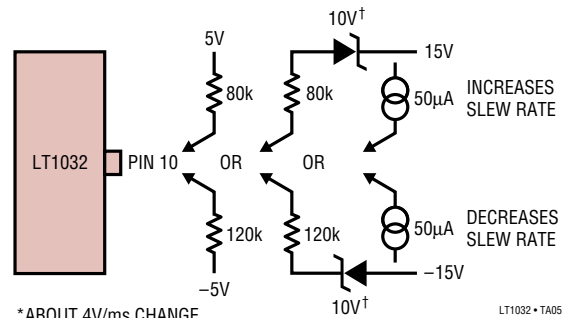


## TYPICAL APPLICATIONS

### FET Driver



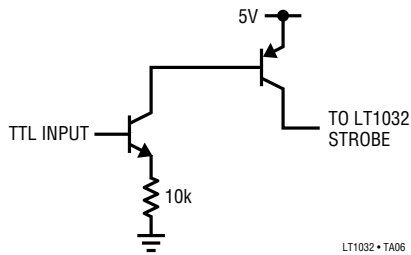
### Slew Rate Adjustment\*



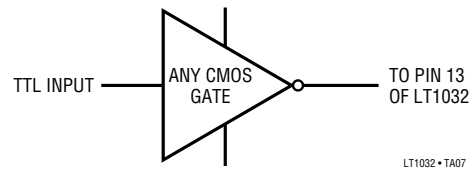
\* ABOUT 4V/ms CHANGE

† ZENERS PREVENT LEAKAGE DURING SHUTDOWN

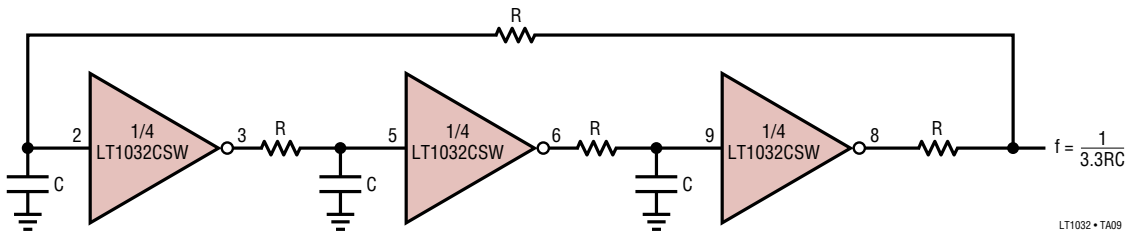
### TTL/CMOS Compatible Strobe



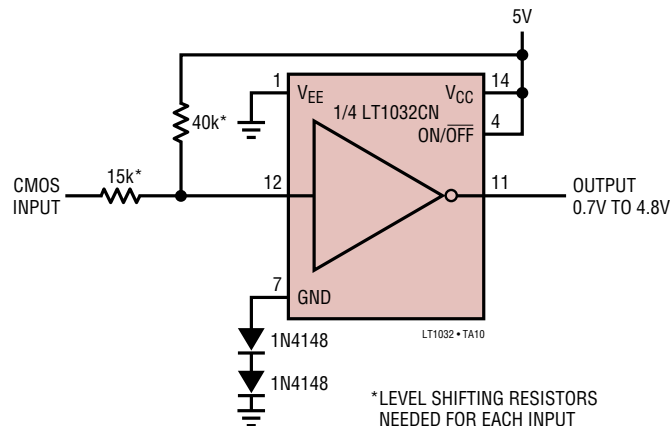
### Strobing with CMOS



### Phase Shift Oscillator

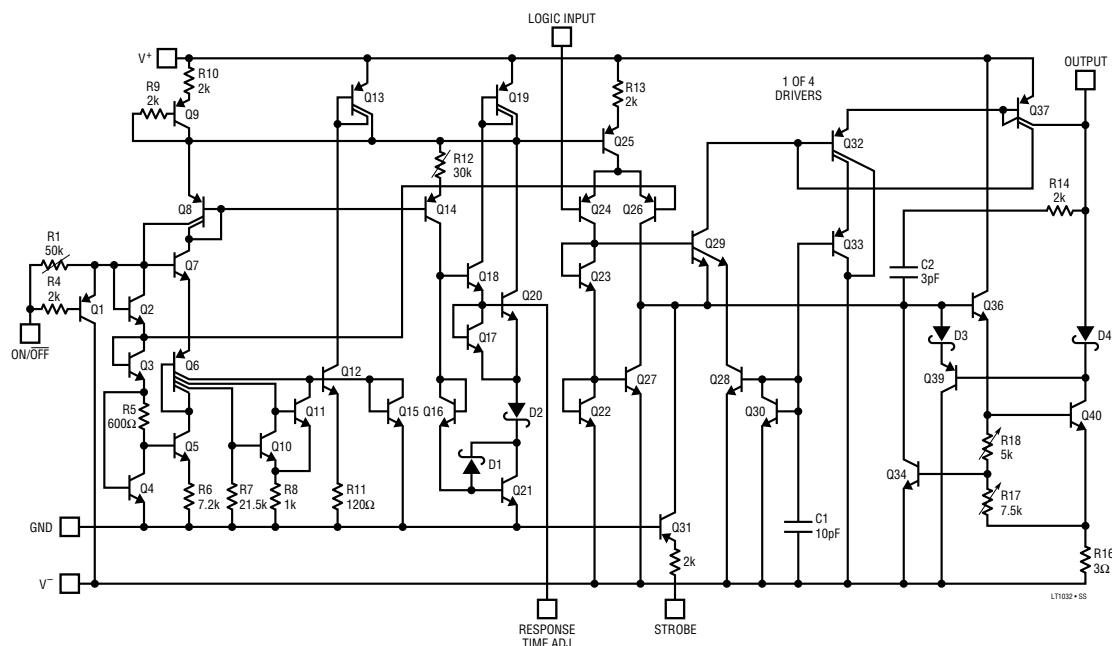


### Operating from a Single 5V Supply



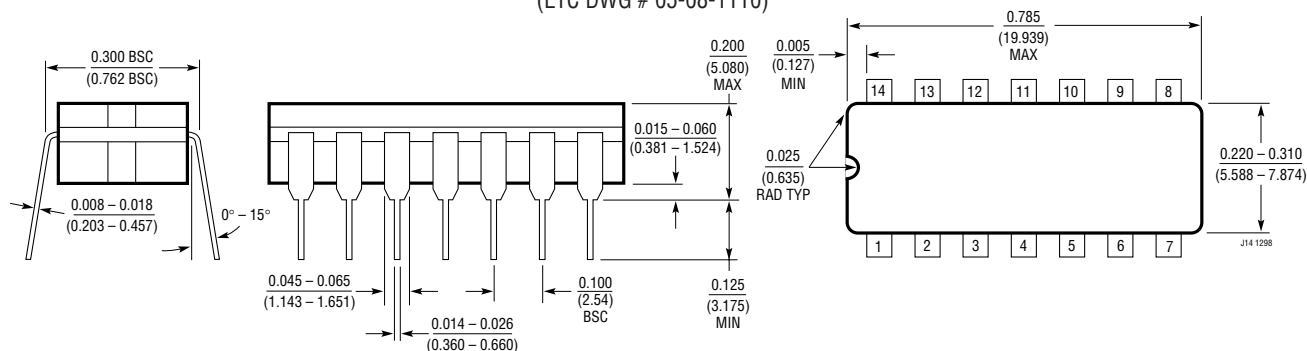
\* LEVEL SHIFTING RESISTORS  
NEEDED FOR EACH INPUT

# SIMPLIFIED SCHEMATIC



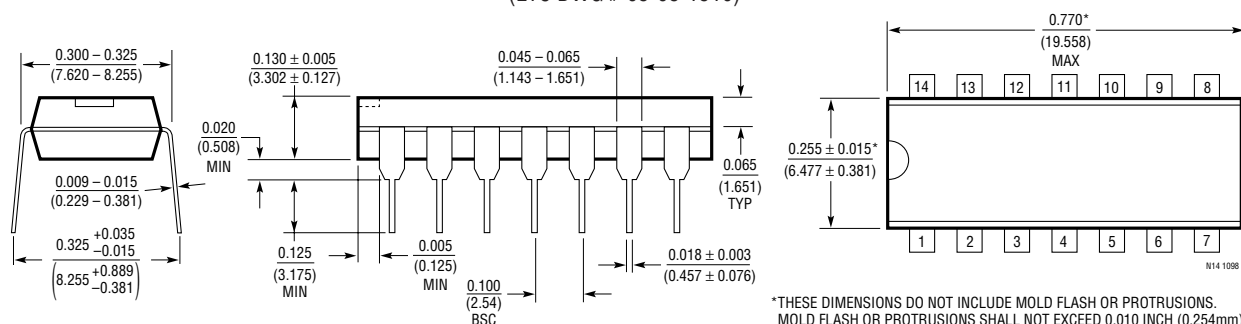
## PACKAGE DESCRIPTION Dimensions in inches (millimeters) unless otherwise noted.

### J Package 14-Lead Cerdip (Narrow 0.300, Hermetic) (LTC DWG # 05-08-1110)



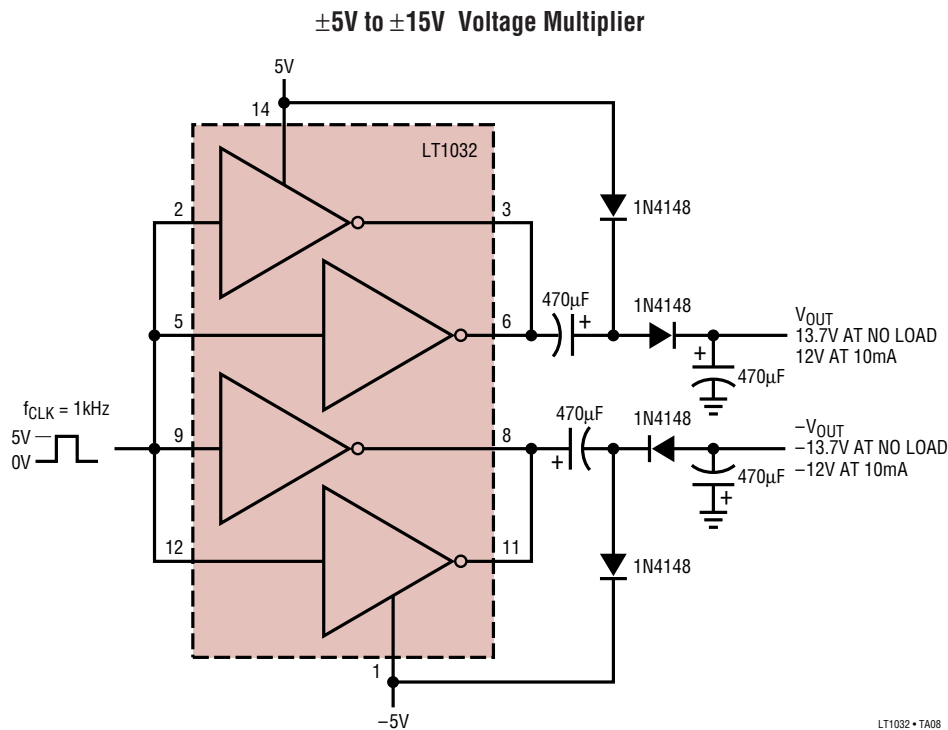
NOTE: LEAD DIMENSIONS APPLY TO SOLDER DIP/PLATE OR TIN PLATE LEADS

### N Package 14-Lead PDIP (Narrow 0.300) (LTC DWG # 05-08-1510)



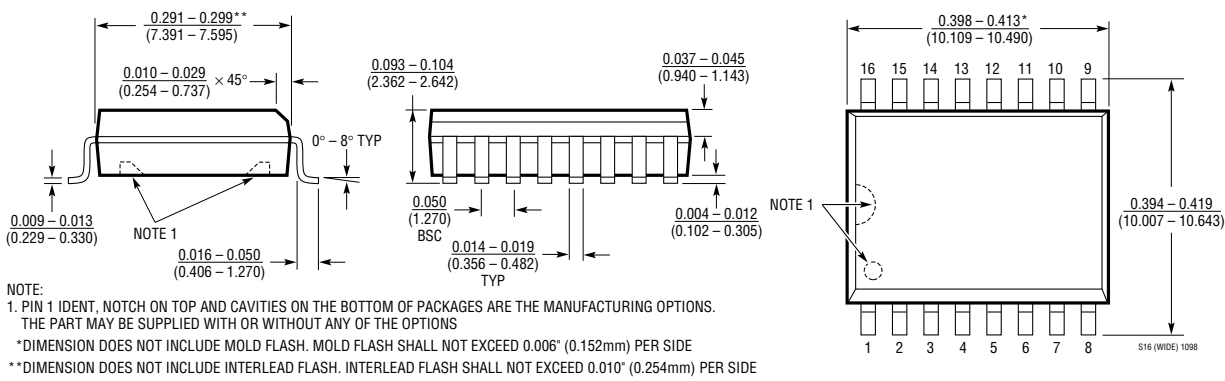
\*THESE DIMENSIONS DO NOT INCLUDE MOLD FLASH OR PROTRUSIONS. MOLD FLASH OR PROTRUSIONS SHALL NOT EXCEED 0.010 INCH (0.254mm)

TYPICAL APPLICATION



PACKAGE DESCRIPTION Dimensions in inches (millimeters) unless otherwise noted.

SW Package  
16-Lead Plastic Small Outline (Wide 0.300)  
(LTC DWG # 05-08-1620)



RELATED PARTS

PART NUMBER	DESCRIPTION	COMMENTS
LT1039A	Triple RS232 Driver/Receiver with Shutdown	±15kV ESD Protection
LT1130A/LT1140A	5V Supply, Multiple RS232 Driver/Receiver	±15kV 3 Driver/5 Receiver (LT1137A)
LT1780/LT1781A	5V Supply, 2 Driver/2 Receiver RS232	±15kV Pin Compatible Upgrade to LT1080/LT1081 and LT1180A/LT1181A