

## FEATURES

- Generates + and – from Single Input
- Up to  $\pm 18V$  Output
- Only Needs Four  $1\mu F$  Capacitors
- No Inductors
- 10mA Output Current Minimum
- Operates Down to 4V
- No Latchup
- 8-Pin Minidip

## APPLICATIONS

- Line Drivers
- Op Amp Suppliers
- Battery Splitters
- RS232 Power

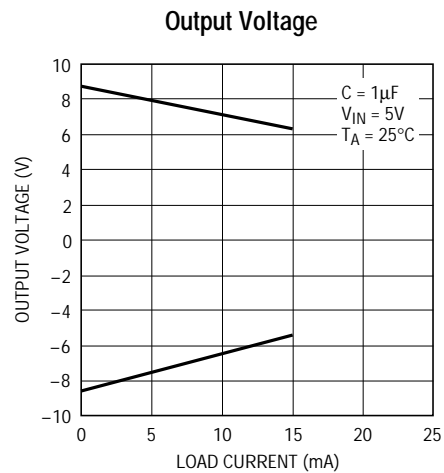
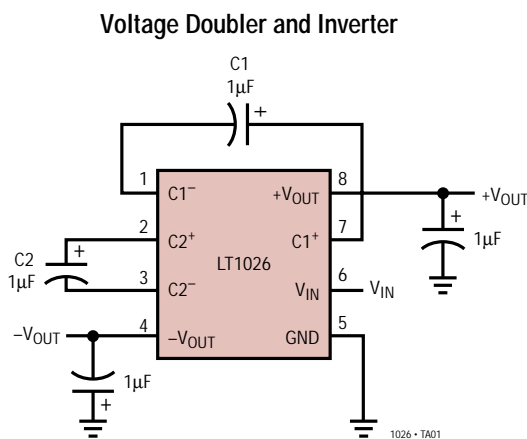
## DESCRIPTION

The LT<sup>®</sup>1026 is a switched capacitor voltage doubler and inverter on a single monolithic die. Capable of operating from a 4V to 10V input, it provides  $\pm 7V$  to  $\pm 18V$  output. Output currents of over 10mA are available. Two charge pumps first double the input voltage then invert the doubled voltage. Manufactured in bipolar technology, the LT1026 is not susceptible to latchup and generates up to 36V.

The LT1026 offers a convenient way of generating additional system voltages without using inductors. Powering interface circuits, op amps or data acquisition circuitry off logic supplies is simplified. Other Linear Technology voltage converters such as the low power LTC<sup>®</sup>1044 CMOS and 100mA bipolar LT1054 are available.

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## TYPICAL APPLICATION

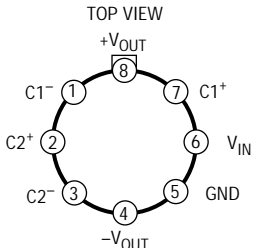
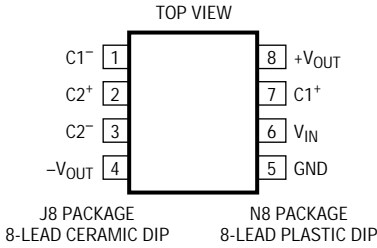


# LT1026

## ABSOLUTE MAXIMUM RATINGS

Supply Voltage .....	10V	Operating Temperature Range	
V <sup>+</sup> .....	20V	LT1026C .....	0°C to 70°C
V <sup>-</sup> .....	-20V	LT1026I .....	-40°C to 85°C
Short-Circuit Duration .....	10 sec	LT1026M .....	-55°C to 125°C
		Lead Temperature (Soldering, 10 sec) .....	300°C

## PACKAGE/ORDER INFORMATION

 <p>TOP VIEW</p> <p>H PACKAGE 8-LEAD TO-5 METAL CAN</p> <p>T<sub>JMAX</sub> = 150°C, θ<sub>JA</sub> = 150°C/W (H8)</p>	ORDER PART NUMBER	 <p>TOP VIEW</p> <p>J8 PACKAGE 8-LEAD CERAMIC DIP</p> <p>N8 PACKAGE 8-LEAD PLASTIC DIP</p> <p>S8 PACKAGE 8-LEAD PLASTIC SO</p> <p>T<sub>JMAX</sub> = 150°C, θ<sub>JA</sub> = 150°C/W (J8) T<sub>JMAX</sub> = 150°C, θ<sub>JA</sub> = 100°C/W (N8) T<sub>JMAX</sub> = 150°C, θ<sub>JA</sub> = 150°C/W (S8)</p>	ORDER PART NUMBER
	LT1026CH LT1026MH		LT1026CJ8 LT1026CN8 LT1026CS8 LT1026IS8 LT1026MJ8
		S8 PART MARKING	
		1026 1026I	

## ELECTRICAL CHARACTERISTICS

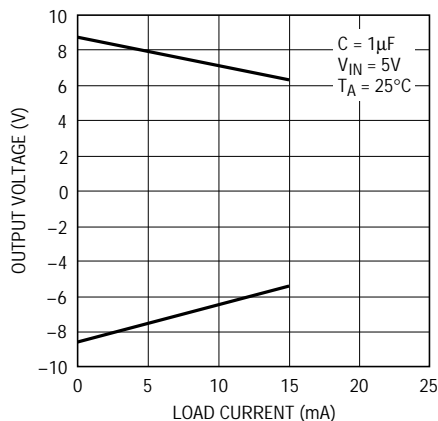
PARAMETERS	CONDITIONS			MIN	TYP	MAX	UNITS
Output Voltage	V <sub>IN</sub> = 4V (Note 1)	I <sub>L</sub> = 0mA	Positive	● 6.5	7		V
		I <sub>L</sub> = 0mA	Negative	● -6	-6.7		V
		I <sub>L</sub> = 10mA	Positive	● 5.25	5.7		V
		I <sub>L</sub> = -10mA	Negative	● -4.5	-5		V
	V <sub>IN</sub> = 5V	I <sub>L</sub> = 15mA	Positive	● 6.25	7		V
		I <sub>L</sub> = -15mA	Negative	● -5.5	-6.2		V
	V <sub>IN</sub> = 10V	I <sub>L</sub> = 0mA	Positive	● 18	18.5		V
		I <sub>L</sub> = 0mA	Negative	● -17.7	-18		V
		I <sub>L</sub> = 10mA	Positive	● 16	17.6		V
		I <sub>L</sub> = -10mA	Negative	● -15.3	-17		V
		I <sub>L</sub> = 15mA	Positive	● 15.25	17		V
		I <sub>L</sub> = -15mA	Negative	● -14.5	-16.5		V
V <sub>IN</sub> = 5V	I <sub>L</sub> = 10mA, -10mA	Positive	● 6.25	7.2		V	
		Negative	● -5.5	-6.5		V	
V <sub>IN</sub> = 10V	I <sub>L</sub> = 10mA, -10mA	Positive	● 15	16.8		V	
		Negative	● -14.25	-15.75		V	
Supply Current	V <sub>IN</sub> = 4V	I <sub>L</sub> = 0mA	●		7	12.5	mA
	V <sub>IN</sub> = 10V	I <sub>L</sub> = 0mA	●		15	30	mA

The ● denotes specifications which apply over the specified operating temperature range. Loads are applied to individual outputs unless otherwise marked.

Note 1: V<sub>IN</sub> min = -4.5 for T<sub>A</sub> ≤ 40°C

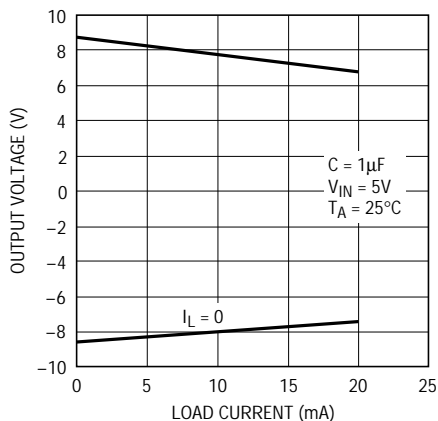
# TYPICAL PERFORMANCE CHARACTERISTICS

**Load Regulation (Both Outputs Loaded)**



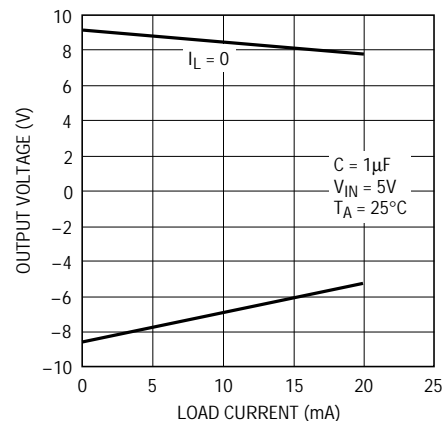
LT1026 • TPC01

**Load Regulation for Positive Loading**



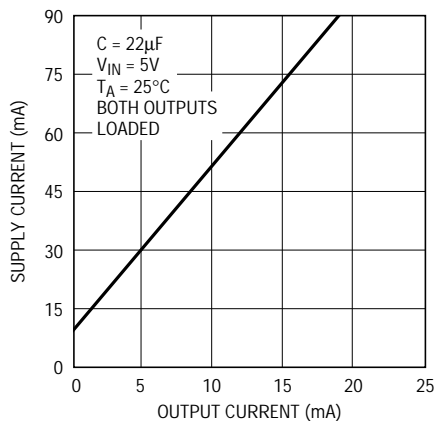
LT1026 • TPC02

**Load Regulation for Negative Loading**



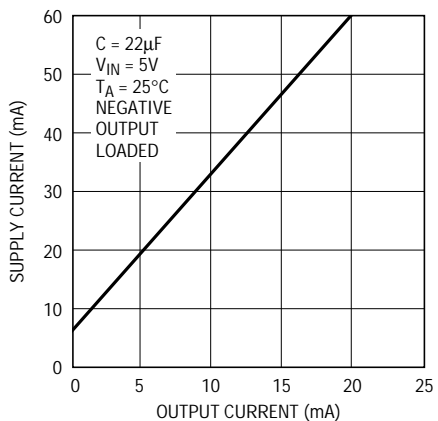
LT1026 • TPC03

**Supply Current**



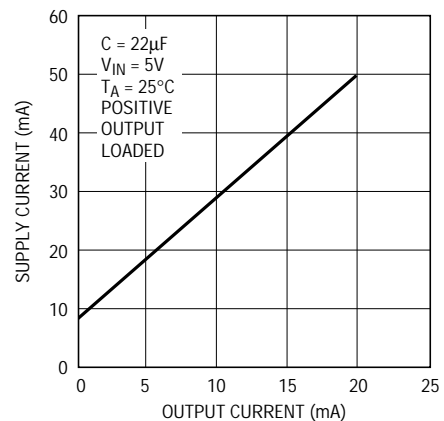
LT1026 • TPC04

**Supply Current**



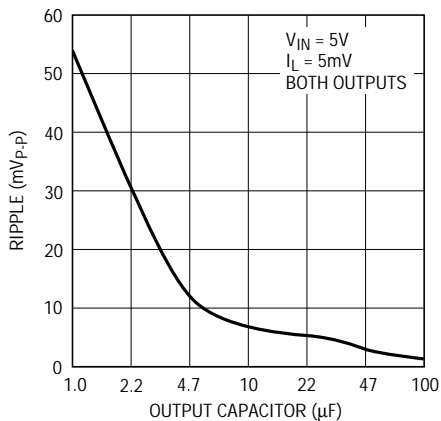
LT1026 • TPC05

**Supply Current**



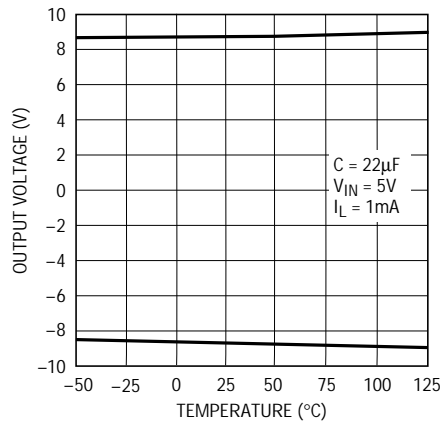
LT1026 • TPC06

**Ripple**



1026 • TPC07

**Output Voltage vs Temperature**



LT1026 • TPC08

## APPLICATIONS INFORMATION

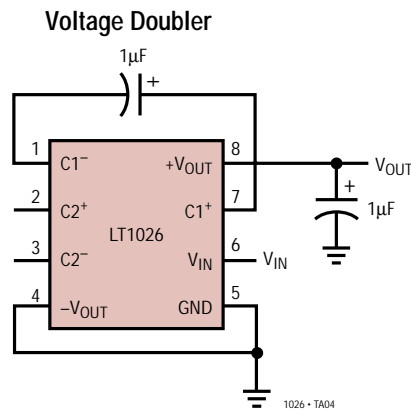
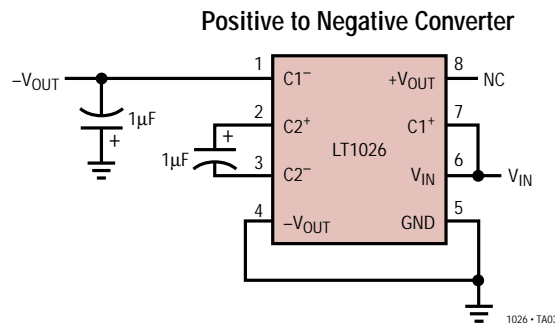
The LT1026 is a nonregulating voltage converter that converts a single input voltage into both a positive and negative output at up to 15mA. A positive input voltage is first doubled and then the doubled voltage is inverted. The voltage output level is dependent on both the input voltage and the output loading. The total output current available depends on the individual loading of the outputs since loading on one output affects the load and the voltage of the other.

Only four external components are needed for operation. Two charge pump capacitors and two output storage capacitors. Nominal value for these capacitors is 1 $\mu$ F, but the LT1026 will operate (with reduced performance) down to 0.1 $\mu$ F. Higher value capacitors (22 $\mu$ F) will reduce ripple and slightly lower output impedance. For higher output currents the outputs of several converters may be paralleled with common output capacitors.

The substrate diodes are an inherent part of the IC, and must always be reversed biased to isolate the individual transistors. In the LT1026 the substrate is tied to the negative output. If the negative output is not used, such as when only the voltage doubler output is needed,  $-V_{OUT}$  must be tied to ground so the substrate diodes are properly biased. The substrate diodes must never become forward biased even during overload conditions. For example, pulling  $-V_{OUT}$  positive with respect to ground can forward bias the substrate diodes. Clamping the substrate to ground with an external diode would be needed to ensure proper operation and prevent the substrate from carrying any current.

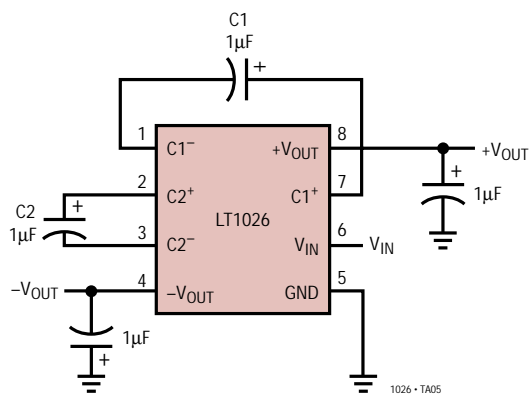
No overload protection is included on the LT1026. Neither output is damaged by momentary shorts, but during sustained shorts the resulting high current flow will overheat the IC.

## TYPICAL APPLICATIONS

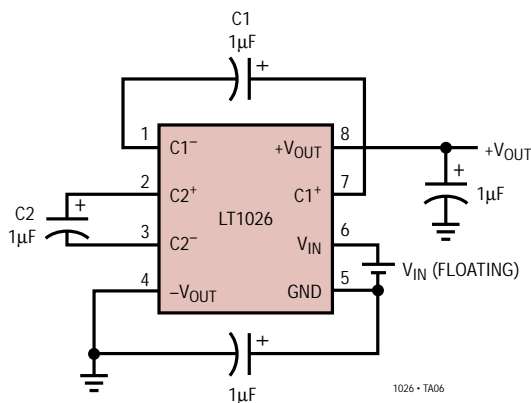


# TYPICAL APPLICATIONS

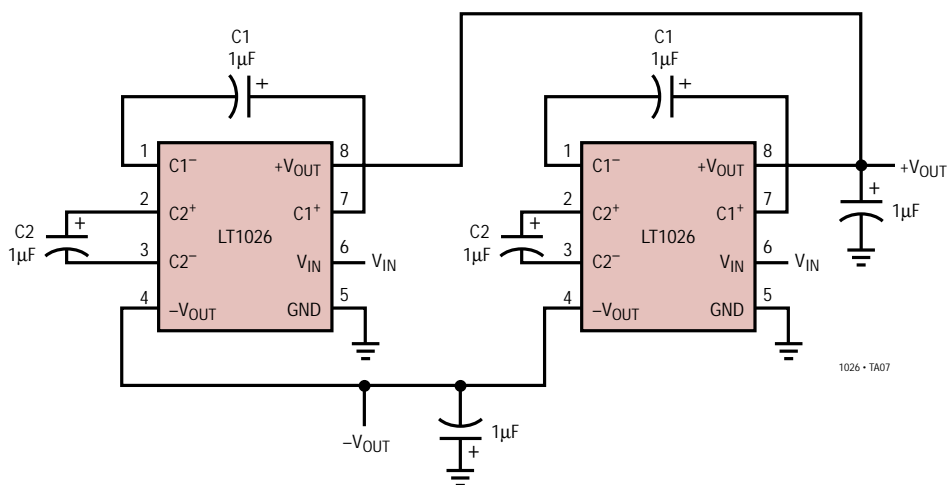
Standard Configuration Voltage Doubler and Inverter



Voltage Quadrupler

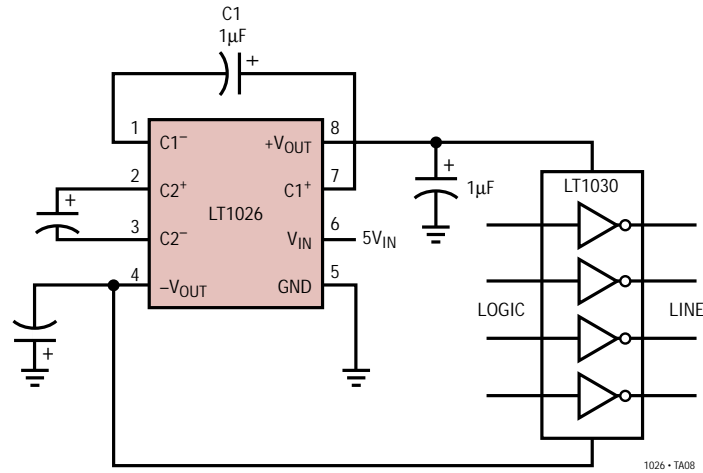


Parallel Converters for Higher Output Current and Lower Output Impedance



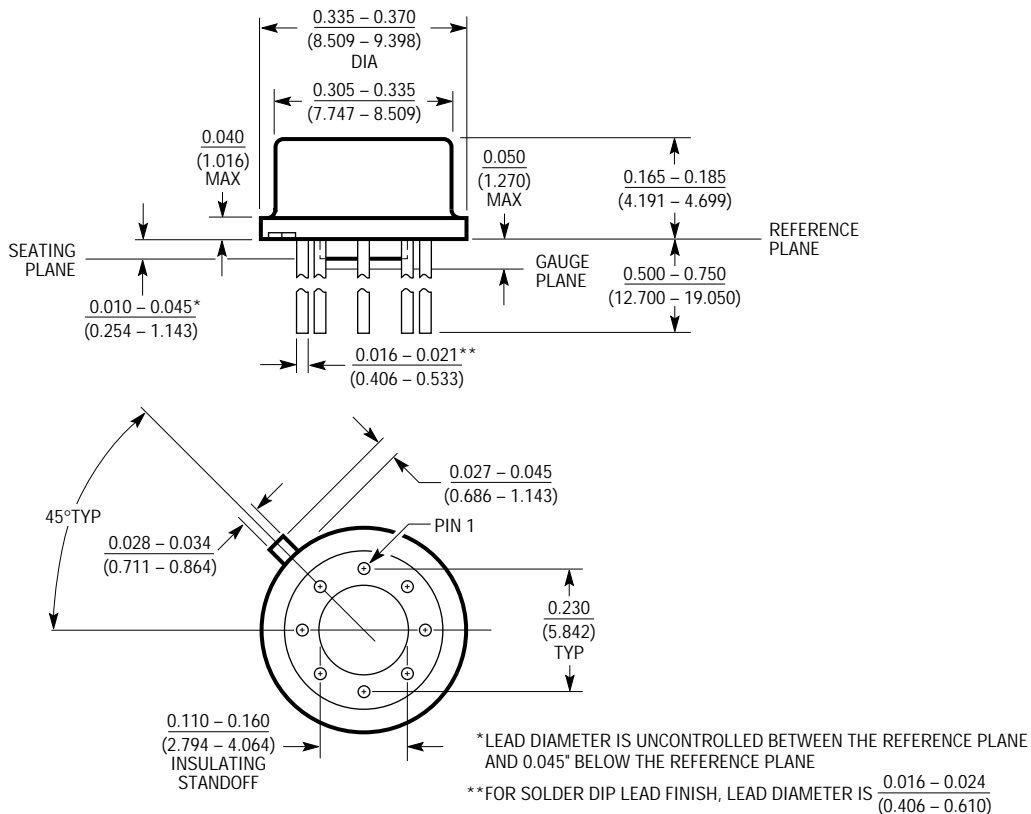
TYPICAL APPLICATIONS

5V Powered RS232 Line Driver



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

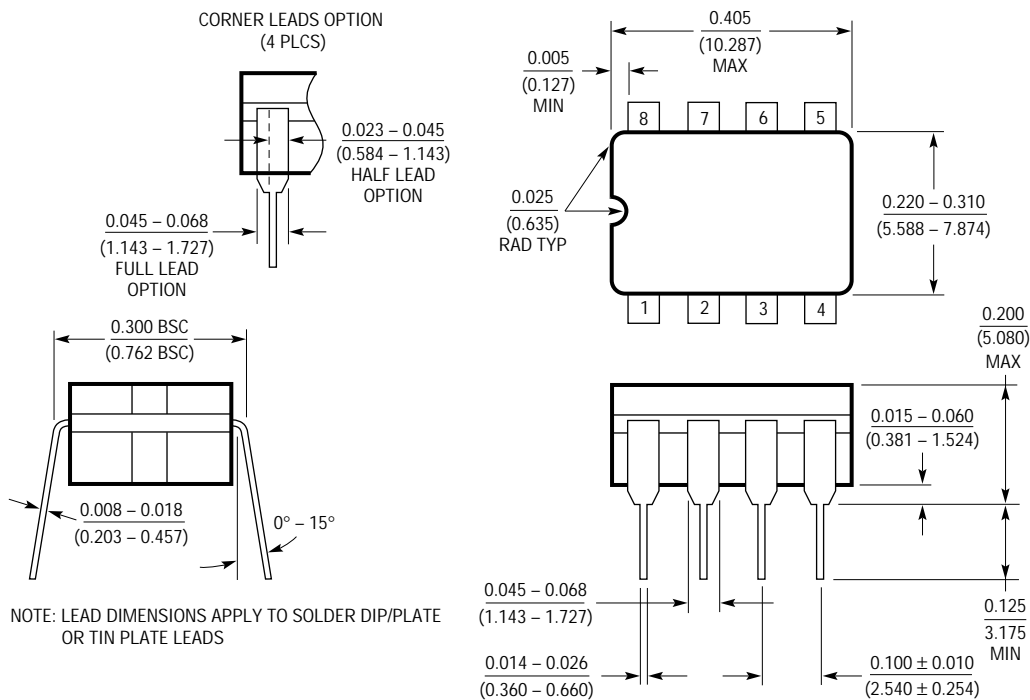
H Package  
8-Lead TO-5 Metal Can (0.230 PCD)  
(LTC DWG # 05-08-1321)



H8 (TO-5) 0.230 PCD 1197

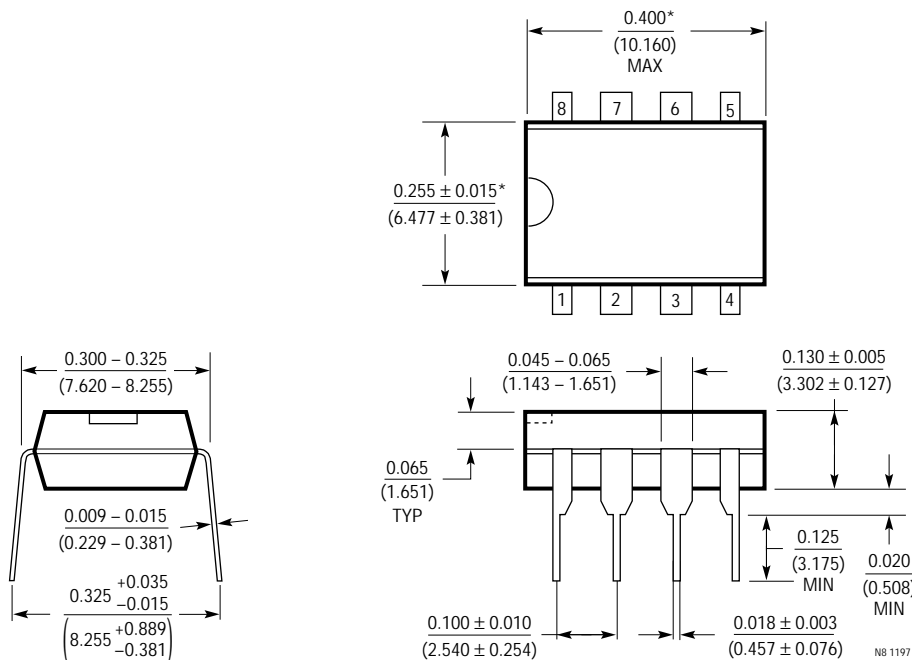
**PACKAGE DESCRIPTION** Dimensions in inches (millimeters) unless otherwise noted.

**J8 Package**  
**8-Lead CERDIP (Narrow 0.300, Hermetic)**  
 (LTC DWG # 05-08-1110)



J8 1197

**N8 Package**  
**8-Lead PDIP (Narrow 0.300)**  
 (LTC DWG # 05-08-1510)



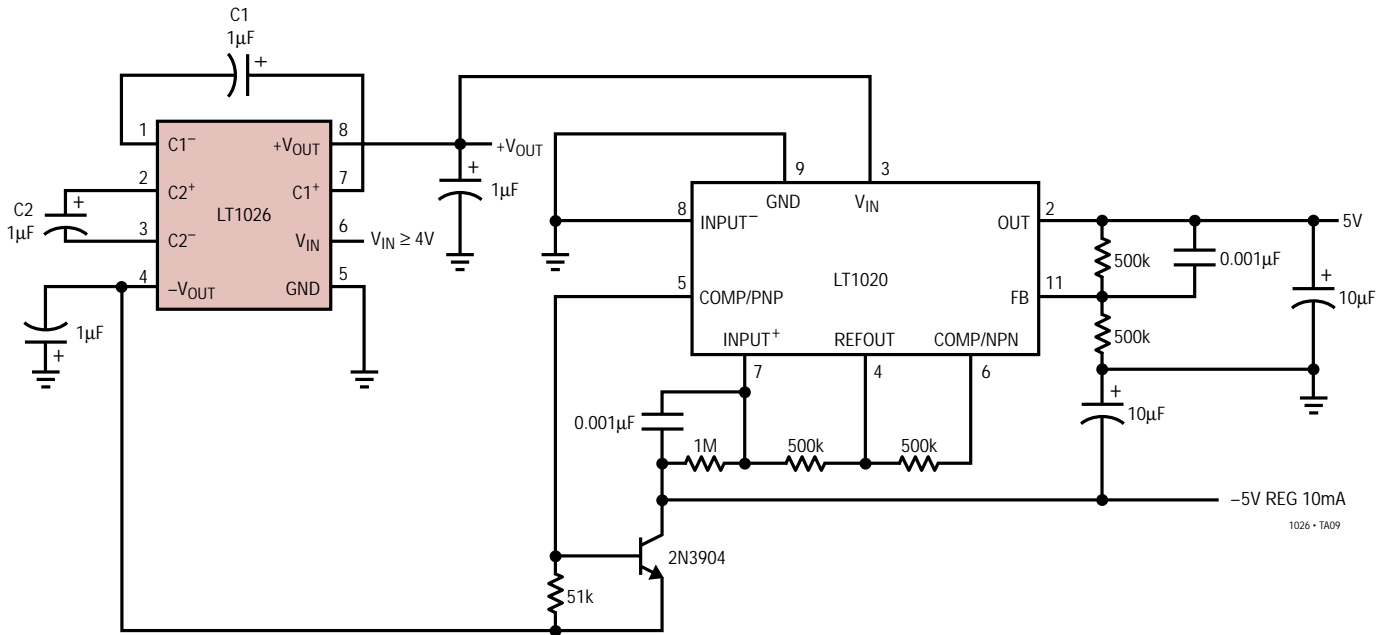
N8 1197

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

# LT1026

## TYPICAL APPLICATION

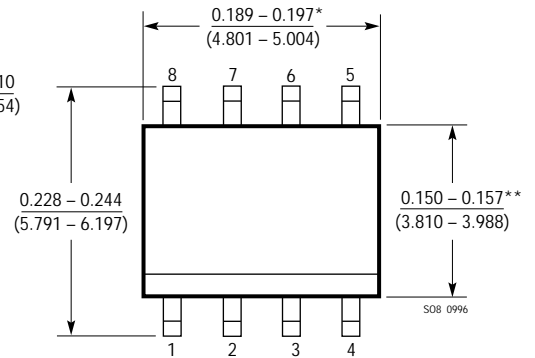
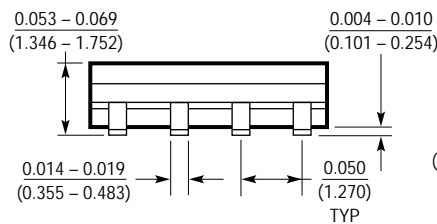
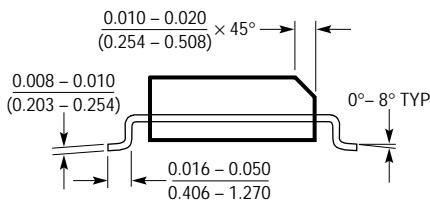
Regulated Converter



## PACKAGE DESCRIPTION

Dimensions in inches (millimeters) unless otherwise noted.

S8 Package  
8-Lead Plastic Small Outline (Narrow 0.150)  
(LTC DWG # 05-08-1610)



\* DIMENSION DOES NOT INCLUDE MOLD FLASH. MOLD FLASH SHALL NOT EXCEED 0.006\* (0.152mm) PER SIDE

\*\* DIMENSION DOES NOT INCLUDE INTERLEAD FLASH. INTERLEAD FLASH SHALL NOT EXCEED 0.010\* (0.254mm) PER SIDE

## RELATED PARTS

PART NUMBER	DESCRIPTION	COMMENTS
LTC1517-5	Micropower, Regulated 5V In SOT-23	Ultralow Power: $I_{CC} = 6\mu A$ Typical, Small 5-Pin SOT-23
LTC1550/LTC1551	Low Noise, Switched Capacitor Regulator Voltage Inverter	< 1mVp-p Typical Output Ripple, 900kHz, $I_{OUT} = 10mA$
LTC1555/LTC1556	SIM Power Supply and Level Translator	Step-Up/Step-Down Generates 5V, Input Voltage Range: 2.7V to 10V, > 10kV ESD, Short-Circuit and Overtemp Protection