

## FEATURES

- Operates from a Single 5V Supply
- Low Supply Current:  $I_{CC} = 220\mu A$
- ESD Protection Over  $\pm 10kV$
- Available in 16-Pin SOIC Narrow Package
- Uses Small Capacitors:  $0.1\mu F$
- Operates to 120kbaud
- Output Overvoltage Does Not Force Current Back into Supplies
- RS232 I/O Lines Can Be Forced to  $\pm 25V$  Without Damage
- Pin Compatible with LT1181A and MAX232A


## APPLICATIONS

- Notebook Computers
- Palmtop Computers

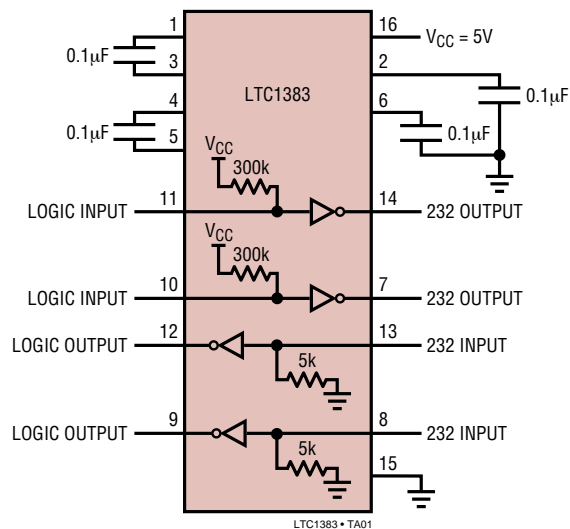
## DESCRIPTION

The LTC<sup>®</sup>1383 is an ultra-low power 2-driver/2-receiver RS232 transceiver that operates from a single 5V supply. The charge pump requires only four space-saving  $0.1\mu F$  capacitors. The supply current ( $I_{CC}$ ) of the transceiver is only  $220\mu A$  with driver outputs unloaded.

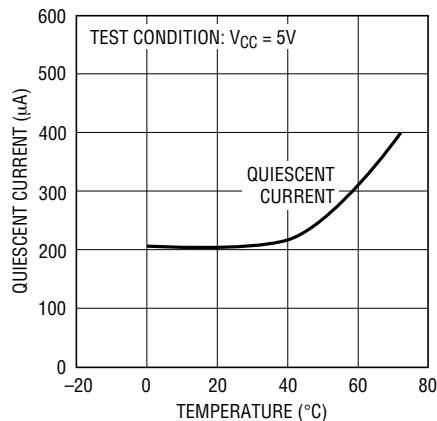
The LTC1383 is fully compliant with all data rate and overvoltage RS232 specifications. The transceiver can operate up to 120kbaud with a  $2500pF$ ,  $3k\Omega$  load. Both driver outputs and receiver inputs can be forced to  $\pm 25V$  without damage and can survive multiple  $\pm 10kV$  ESD strikes.

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## TYPICAL APPLICATION



**Quiescent Supply Current vs Temperature**



LTC1383 • TA02

**ABSOLUTE MAXIMUM RATINGS**

Supply Voltage ( $V_{CC}$ ) ..... 6V

Input Voltage

Driver .....  $-0.3V$  to  $V_{CC} + 0.3V$

Receiver .....  $-25V$  to  $25V$

Digital Input .....  $-0.3V$  to  $V_{CC} + 0.3V$

Output Voltage

Driver .....  $-25V$  to  $25V$

Receiver .....  $-0.3V$  to  $V_{CC} + 0.3V$

Short-Circuit Duration

$V^+$  ..... 30 sec

$V^-$  ..... 30 sec

Driver Output ..... Indefinite

Receiver Output ..... Indefinite

Operating Temperature Range

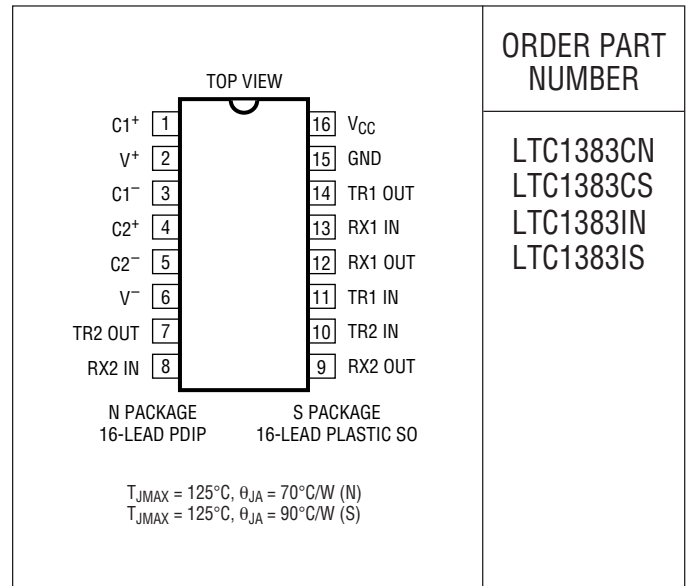
LTC1383C .....  $0^\circ C$  to  $70^\circ C$

LTC1383I .....  $-40^\circ C$  to  $85^\circ C$

Storage Temperature Range .....  $-65^\circ C$  to  $150^\circ C$

Lead Temperature (Soldering, 10 sec) .....  $300^\circ C$

**PACKAGE/ORDER INFORMATION**



ORDER PART NUMBER

LTC1383CN  
 LTC1383CS  
 LTC1383IN  
 LTC1383IS

Consult LTC Marketing for parts specified with wider operating temperature ranges.

**DC ELECTRICAL CHARACTERISTICS**

The ● denotes specifications which apply over the full operating temperature range, otherwise specifications are at  $T_A = 25^\circ C$ .  $V_{CC} = 5V$ ,  $C1 = C2 = C3 = C4 = 0.1\mu F$ , unless noted.

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
<b>Any Driver</b>					
Output Voltage Swing	3k to GND	Positive ● Negative ●	5.0 -5.0	7.0 -6.5	V V
Logic Input Voltage Level	Input Low Level ( $V_{OUT} = High$ ) Input High Level ( $V_{OUT} = Low$ )	● ●	1.4 2.0	0.8 1.4	V V
Logic Input Current	$V_{IN} = V_{CC}$ $V_{IN} = 0V$	● ●		5 -20	$\mu A$ $\mu A$
Output Short-Circuit Current	$V_{OUT} = 0V$		$\pm 9$	$\pm 12$	mA
<b>Any Receiver</b>					
Input Voltage Thresholds	Input Low Threshold Input High Threshold	● ●	0.8	1.3 1.7	2.4 V V
Hysteresis		●	0.1	0.4	1 V
Input Resistance	$-10V \leq V_{IN} \leq 10V$		3	5	7 k $\Omega$
Output Voltage	Output Low, $I_{OUT} = -1.6mA$ ( $V_{CC} = 5V$ ) Output High, $I_{OUT} = 160\mu A$ ( $V_{CC} = 5V$ )	● ●	0.2 3.0	0.4 3.2	V V
Output Short-Circuit Current	Sinking Current, $V_{OUT} = V_{CC}$ Sourcing Current $V_{OUT} = 0V$		-15 10	-40 20	mA mA
<b>Power Supply Generator</b>					
$V^+$ Output Voltage	$I_{OUT} = 0mA$ $I_{OUT} = 8mA$		8.0 7.5		V V
$V^-$ Output Voltage	$I_{OUT} = 0mA$ $I_{OUT} = -8mA$		-8.0 -7.0		V V

**DC ELECTRICAL CHARACTERISTICS** The ● denotes specifications which apply over the full operating temperature range, otherwise specifications are at  $T_A = 25^\circ\text{C}$ .  $V_{CC} = 5\text{V}$ ,  $C_1 = C_2 = C_3 = C_4 = 0.1\mu\text{F}$ , unless noted.

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
<b>Power Supply</b>					
$V_{CC}$ Supply Current	No Load (Note 2), $0^\circ\text{C}$ to $70^\circ\text{C}$	●	0.22	0.5	mA
	No Load (Note 2), $-40^\circ\text{C}$ to $85^\circ\text{C}$	●	0.35	1.0	mA
Digital Input Threshold Low		●	1.4	0.8	V
Digital Input Threshold High		●	2.0	1.4	V

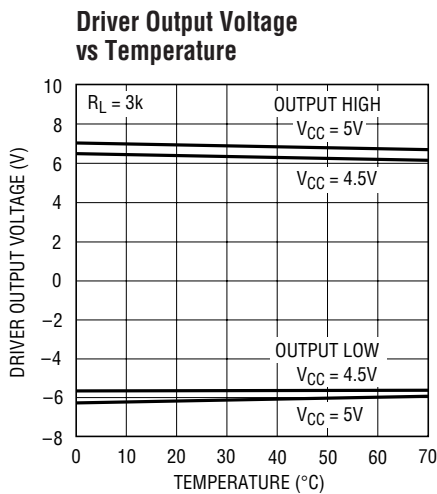
**AC CHARACTERISTICS** The ● denotes specifications which apply over the full operating temperature range, otherwise specifications are at  $T_A = 25^\circ\text{C}$ .  $V_{CC} = 5\text{V}$ ,  $C_1 = C_2 = C_3 = C_4 = 0.1\mu\text{F}$ , unless noted.

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Slew Rate	$R_L = 3\text{k}$ , $C_L = 51\text{pF}$		8	30	$\text{V}/\mu\text{s}$
	$R_L = 3\text{k}$ , $C_L = 2500\text{pF}$	3	5		$\text{V}/\mu\text{s}$
Driver Propagation Delay (TTL to RS232)	$t_{\text{HLD}}$ (Figure 1)	●	2	3.5	$\mu\text{s}$
	$t_{\text{LHD}}$ (Figure 1)	●	2	3.5	$\mu\text{s}$
Receiver Propagation Delay (RS232 to TTL)	$t_{\text{HLR}}$ (Figure 2)	●	0.3	0.8	$\mu\text{s}$
	$t_{\text{LHR}}$ (Figure 2)	●	0.3	0.8	$\mu\text{s}$

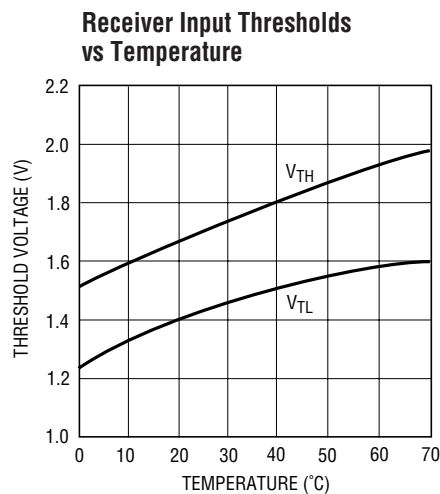
**Note 1:** Absolute Maximum Ratings are those values beyond which the life of the device may be impaired.

**Note 2:** Supply current is measured with driver and receiver outputs unloaded.

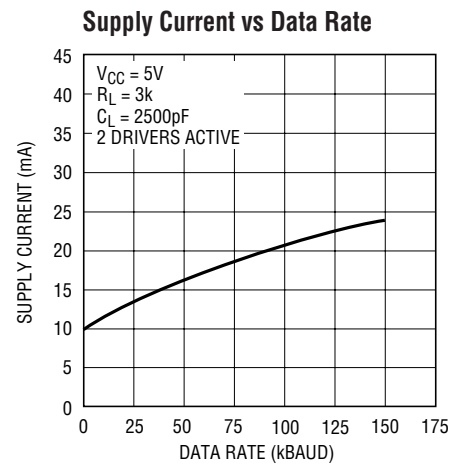
**TYPICAL PERFORMANCE CHARACTERISTICS**



LTC1383 • TPC01

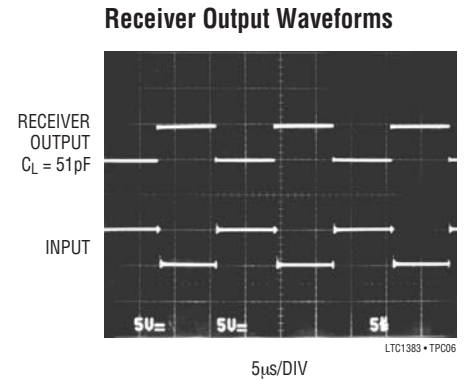
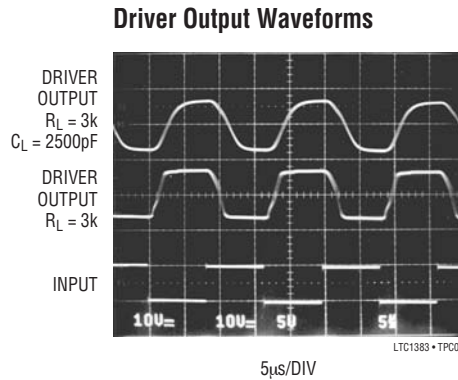
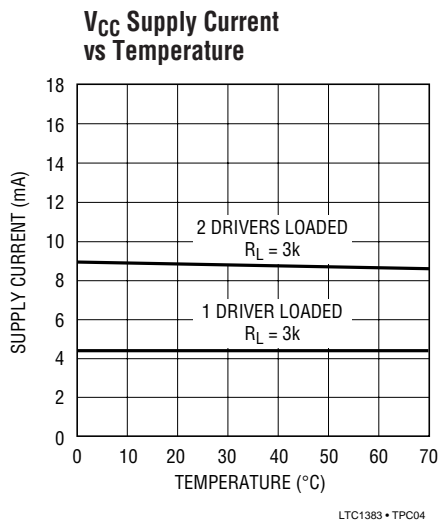


LTC1383 • TPC02



LTC1383 • TPC03

## TYPICAL PERFORMANCE CHARACTERISTICS



## PIN FUNCTIONS

**V<sub>CC</sub>**: 5V Input Supply Pin. This pin should be decoupled with a 0.1µF ceramic capacitor.

**GND**: Ground Pin.

**V<sup>+</sup>**: Positive Supply Output (RS232 Drivers).  $V^+ \cong 2V_{CC} - 2V$ . This pin requires an external capacitor  $C = 0.1\mu F$  for charge storage. The capacitor may be tied to ground or  $V_{CC}$ . With multiple devices, the  $V^+$  and  $V^-$  pins may share a common capacitor. For large numbers of devices, increasing the size of the shared common storage capacitors is recommended to reduce ripple.

**V<sup>-</sup>**: Negative Supply Output (RS232 Drivers).  $V^- \cong -(2V_{CC} - 2V)$ . This pin requires an external capacitor  $C = 0.1\mu F$  for charge storage.

**C1<sup>+</sup>, C1<sup>-</sup>, C2<sup>+</sup>, C2<sup>-</sup>**: Commutating Capacitor Inputs. These pins require two external capacitors  $C = 0.1\mu F$ : one from C1<sup>+</sup> to C1<sup>-</sup> and another from C2<sup>+</sup> to C2<sup>-</sup>. To maintain

charge pump efficiency, the capacitor's effective series resistance should be less than 2Ω.

**TR IN**: RS232 Driver Input Pins. Inputs are TTL/CMOS compatible. The inputs of unused drivers can be left unconnected since 300k input pull-up resistors to  $V_{CC}$  are included on chip.

**TR OUT**: Driver Outputs at RS232 Voltage Levels. The driver outputs are protected against ESD to ±10kV for human body model discharges.

**RX IN**: Receiver Inputs. These pins can be forced to ±25V without damage. The receiver inputs are protected against ESD to ±10kV for human body model discharges. Each receiver provides 0.4V of hysteresis for noise immunity.

**RX OUT**: Receiver Outputs with TTL/CMOS Voltage Levels.

# SWITCHING TIME WAVEFORMS

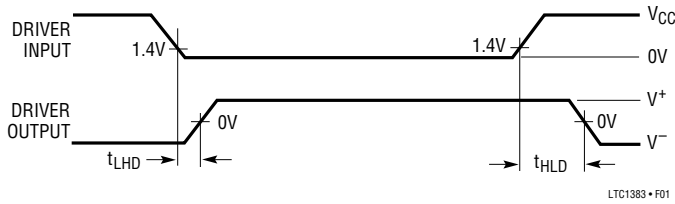


Figure 1. Driver Propagation Delay Timing

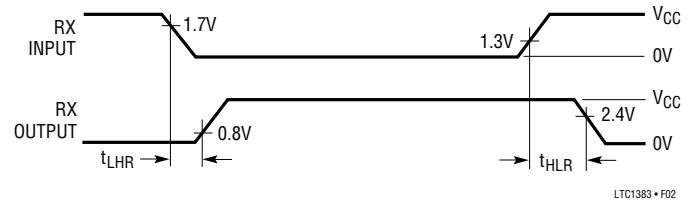
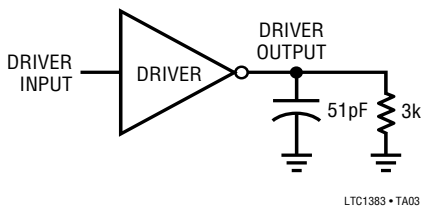


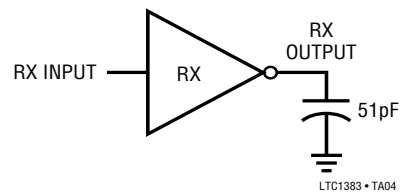
Figure 2. Receiver Propagation Delay Timing

# TEST CIRCUITS

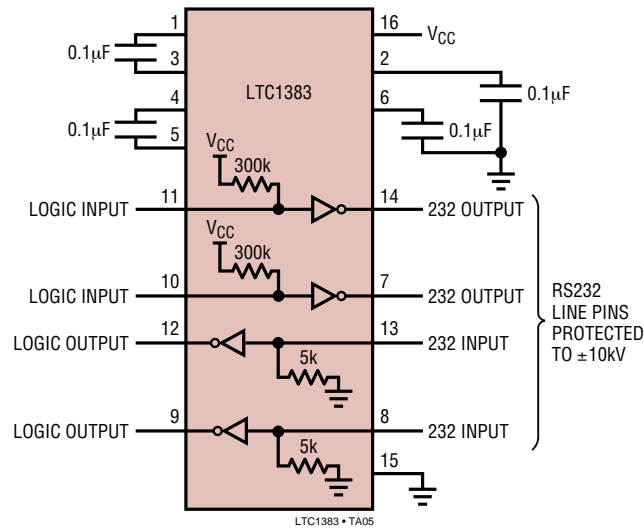
Driver Timing Test Load



Receiver Timing Test Load

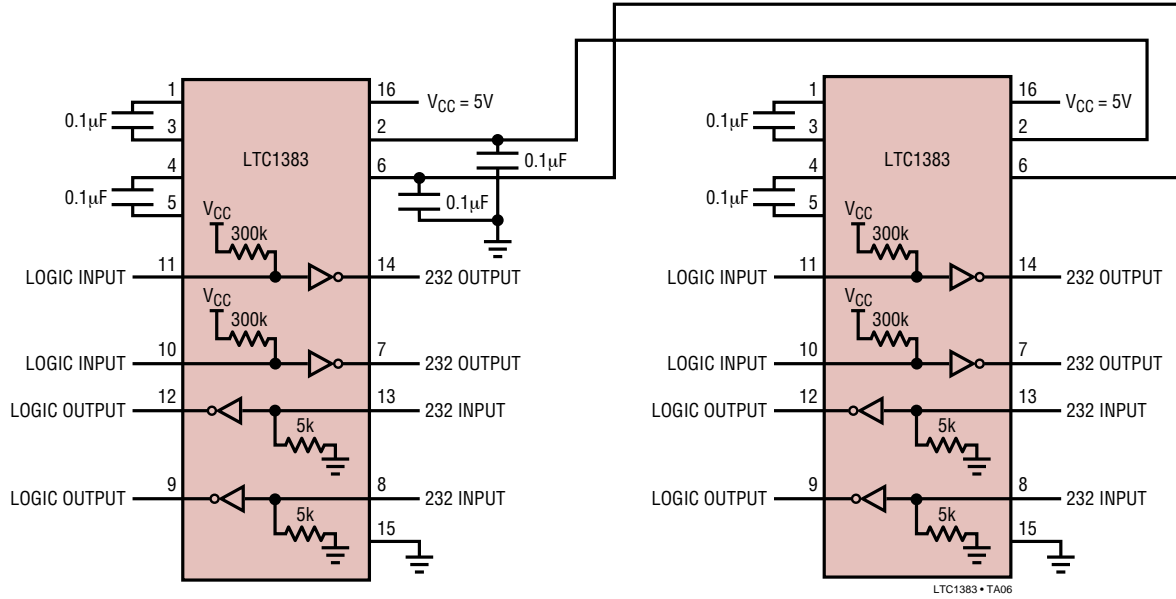


ESD Test Circuit



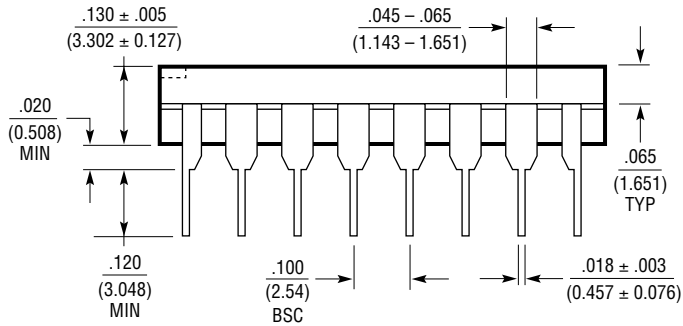
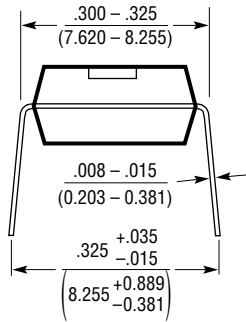
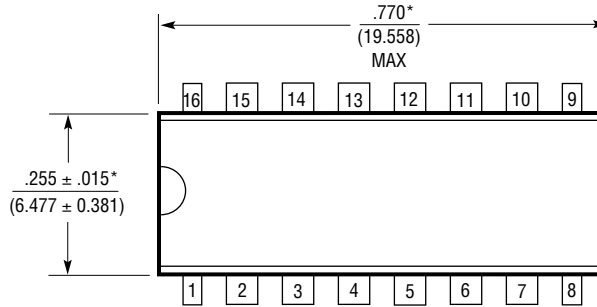
**TYPICAL APPLICATIONS**

**Paralleling Power Supply Generator  
with Common Storage Capacitors**



# PACKAGE DESCRIPTION

**N Package**  
**16-Lead PDIP (Narrow .300 Inch)**  
 (Reference LTC DWG # 05-08-1510)



NOTE:  
 1. DIMENSIONS ARE  $\frac{\text{INCHES}}{\text{MILLIMETERS}}$

\*THESE DIMENSIONS DO NOT INCLUDE MOLD FLASH OR PROTRUSIONS.  
 MOLD FLASH OR PROTRUSIONS SHALL NOT EXCEED .010 INCH (0.254mm)

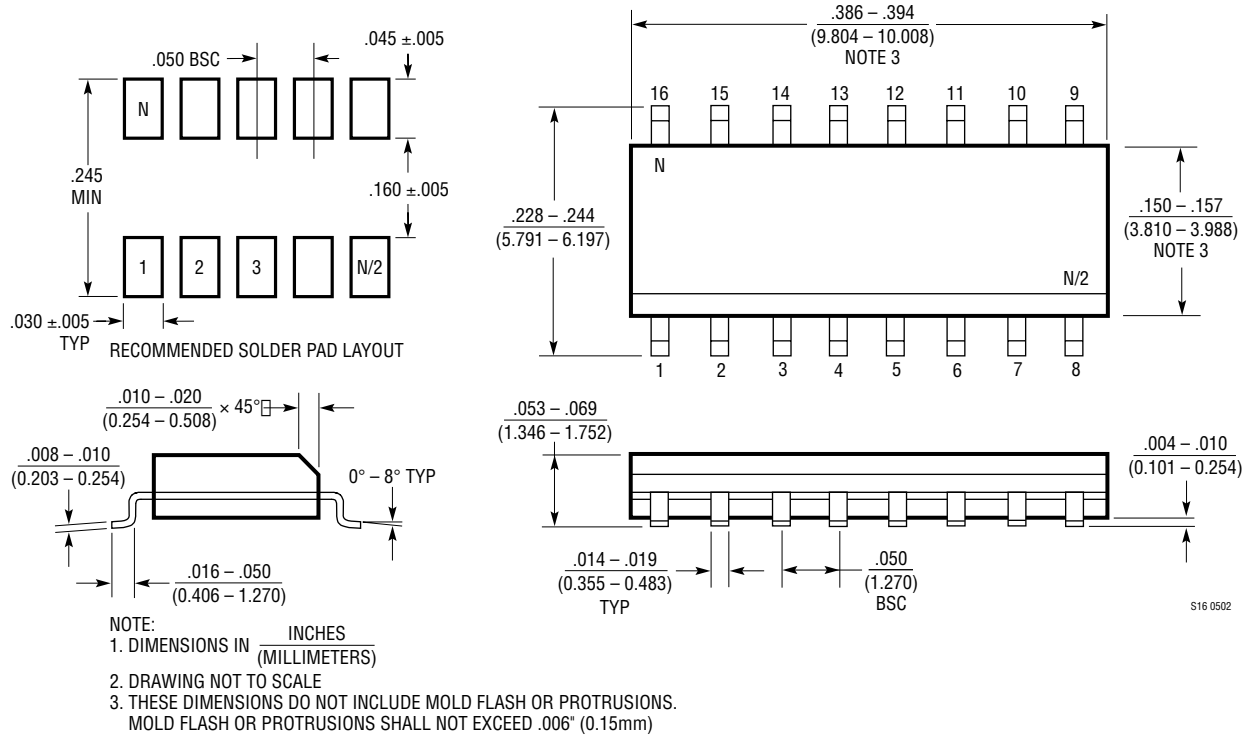
N16 1002

# PACKAGE DESCRIPTION

## S Package

### 16-Lead Plastic Small Outline (Narrow .150 Inch)

(Reference LTC DWG # 05-08-1610)



## RELATED PARTS

PART NUMBER	DESCRIPTION	COMMENTS
LT1780/LT1781	5V, 2 Driver, 2 Receiver RS232 Transceivers	$\pm 15\text{kV}$ ESD per IEC 1000-4
LTC1382	5V, 2 Driver, 2 Receiver RS232 Transceiver	220 $\mu\text{A}$ Supply Current, 0.2 $\mu\text{A}$ in Shutdown
LTC1384	5V, 2 Driver, 2 Receiver RS232 Transceiver	220 $\mu\text{A}$ Supply Current, 2 Receivers Active in Shutdown
LTC1385	3.3V, 2 Driver, 2 Receiver RS562 Transceiver	220 $\mu\text{A}$ Supply Current, 2 Receivers Active in Shutdown
LTC1386	3.3V, 2 Driver, 2 Receiver RS562 Transceiver	220 $\mu\text{A}$ Supply Current, Narrow 16-pin SO