LT LINEAR TECHNOLOGY

LTC1383

5V Low Power
RS232 Transceiver

FEATURES

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

## APPLICATIONS

- Notebook Computers
- Palmtop Computers

DESCRIPTION

The LTC®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 0.1μF capacitors. The supply current (I_{CC}) of the transceiver is only 220μA 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, 3kΩ load. Both driver outputs and receiver inputs can be forced to ±25V without damage and can survive multiple ±10kV ESD strikes.

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TYPICAL APPLICATION
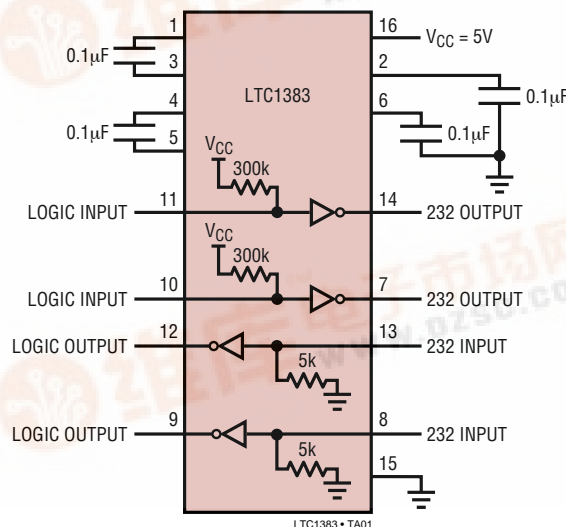
LTC1383 • TA01
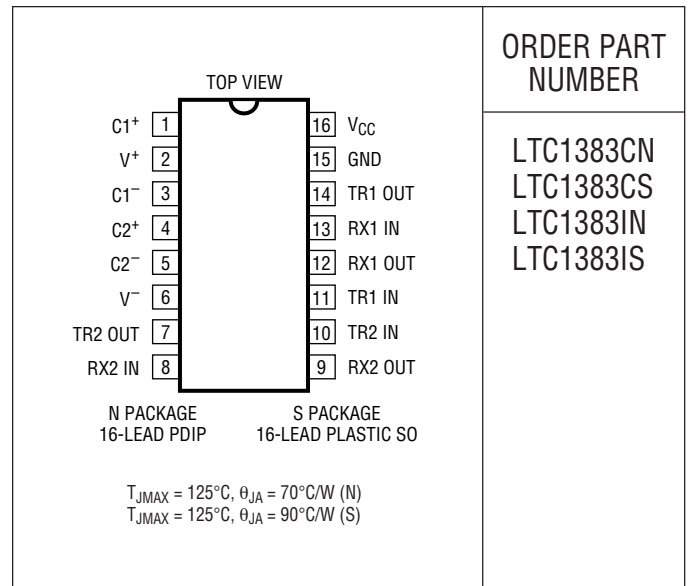
Quiescent Supply Current vs Temperature

LTC1383 • TA02

1383fa
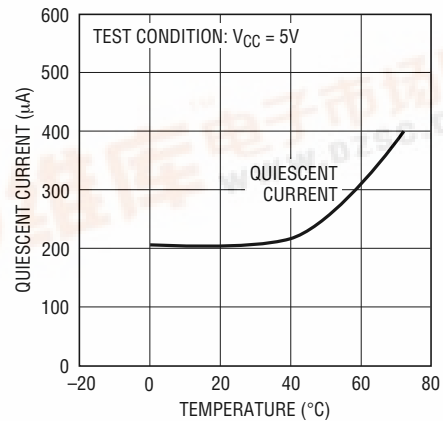
LTC1383

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°C to 70°C
    LTC1383I...................................... −40°C to 85°C
Storage Temperature Range .... −65°C to 150°C
Lead Temperature (Soldering, 10 sec)................. 300°C

PACKAGE/ORDER INFORMATION

TOP VIEW

C1$^+$	1	16	V_{CC}
V$^+$	2	15	GND
C1$^-$	3	14	TR1 OUT
C2$^+$	4	13	RX1 IN
C2$^-$	5	12	RX1 OUT
V$^-$	6	11	TR1 IN
TR2 OUT	7	10	TR2 IN
RX2 IN	8	9	RX2 OUT

N PACKAGE
16-LEAD PDIP

S PACKAGE
16-LEAD PLASTIC SO

T_{JMAX} = 125°C, $θ_{JA}$ = 70°C/W (N)
T_{JMAX} = 125°C, $θ_{JA}$ = 90°C/W (S)

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°C. V_{CC} = 5V, C1 = C2 = C3 = C4 = 0.1μF, unless noted.

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

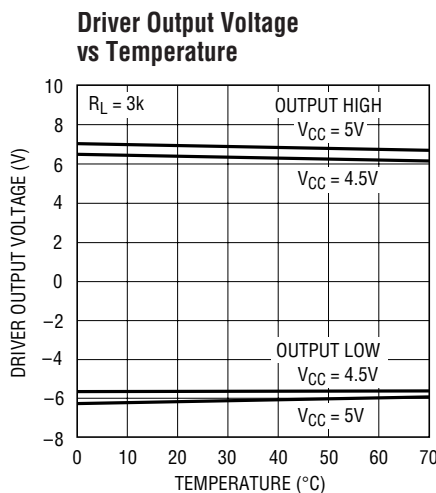# DC ELECTRICAL CHARACTERISTICS

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

PARAMETER	CONDITIONS		MIN	TYP	MAX	UNITS
Power Supply						
V_{CC} Supply Current	No Load (Note 2), 0°C to 70°C	●		0.22	0.5	mA
	No Load (Note 2), – 40°C to 85°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 $T_A = 25°C$. $V_{CC} = 5V$, C1 = C2 = C3 = C4 = 0.1μF, unless noted.

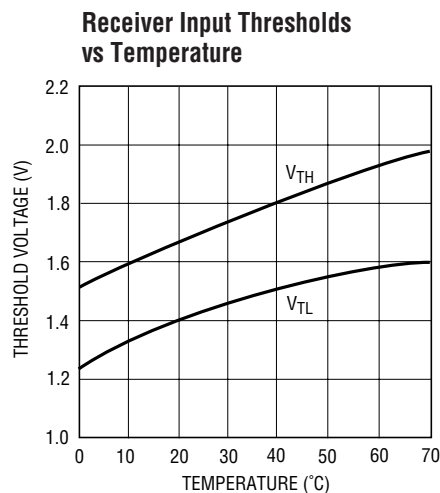| PARAMETER	CONDITIONS		MIN	TYP	MAX	UNITS
Slew Rate	$R_L = 3k$, $C_L = 51pF$			8	30	V/μs
	$R_L = 3k$, $C_L = 2500pF$		3	5		V/μs
Driver Propagation Delay	t_{HLD} (Figure 1)	●		2	3.5	μs
(TTL to RS232)	t_{LHD} (Figure 1)	●		2	3.5	μs
Receiver Propagation Delay	t_{HLR} (Figure 2)	●		0.3	0.8	μs
(RS232 to TTL)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

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

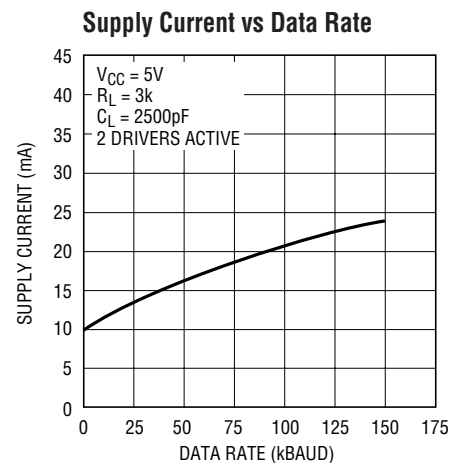**Note 2:** Supply current is measured with driver and receiver outputs unloaded.
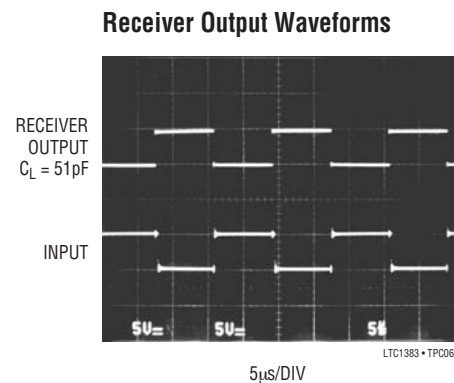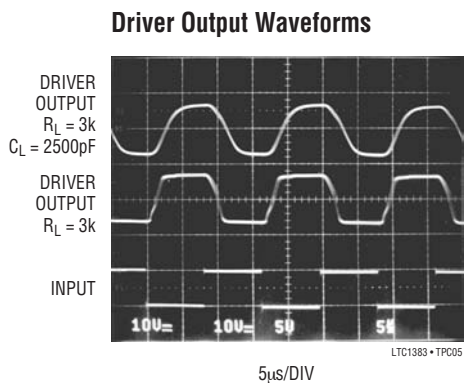
TYPICAL PERFORMANCE CHARACTERISTICS

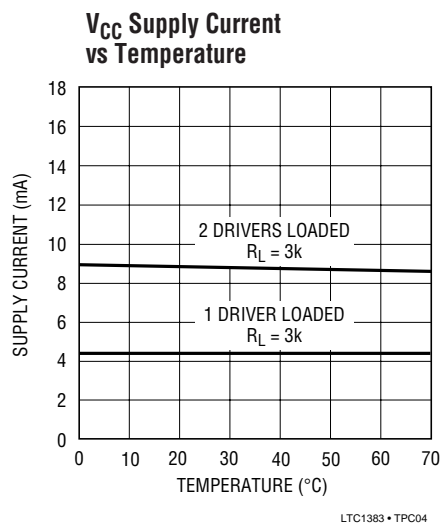### Driver Output Voltage vs Temperature

LTC1383 • TPC01

Receiver Input Thresholds vs Temperature

LTC1383 • TPC02

Supply Current vs Data Rate

LTC1383 • TPC03

TYPICAL PERFORMANCE CHARACTERISTICS

V_{CC} Supply Current vs Temperature

LTC1383 • TPC04

Driver Output Waveforms

DRIVER OUTPUT $R_L = 3k$ $C_L = 2500pF$

DRIVER OUTPUT $R_L = 3k$

INPUT

10V= 10V= 5U 5U

LTC1383 • TPC05

5µs/DIV

Receiver Output Waveforms

RECEIVER OUTPUT $C_L = 51pF$

INPUT

5U= 5U= 5U

LTC1383 • TPC06

5µs/DIV

PIN FUNCTIONS

V_{CC}: 5V Input Supply Pin. This pin should be decoupled with a 0.1µF ceramic capacitor.

GND: Ground Pin.

V^+: Positive Supply Output (RS232 Drivers). $V^+ \cong 2V_{CC} - 2V$. This pin requires an external capacitor C = 0.1µF 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^-: Negative Supply Output (RS232 Drivers). $V^- \cong -(2V_{CC} - 2V)$. This pin requires an external capacitor C = 0.1µF for charge storage.

$C1^+$, $C1^-$, $C2^+$, $C2^-$: Commutating Capacitor Inputs. These pins require two external capacitors C = 0.1µF: one from $C1^+$ to $C1^-$ and another from $C2^+$ to $C2^-$. 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.

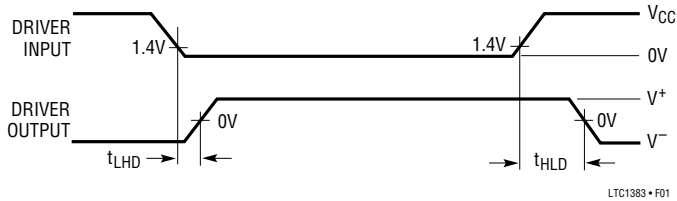**RX OUT:** Receiver Outputs with TTL/CMOS Voltage Levels.

SWITCHING TIME WAVEFORMS
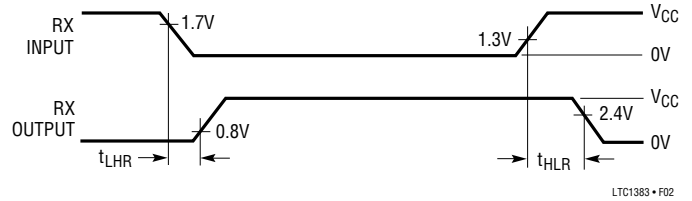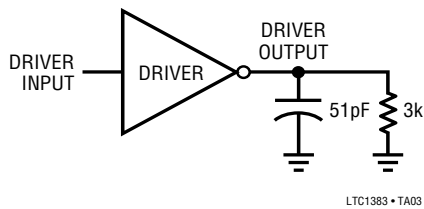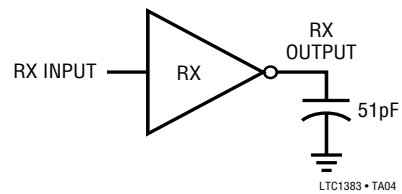
Figure 1. Driver Propagation Delay Timing
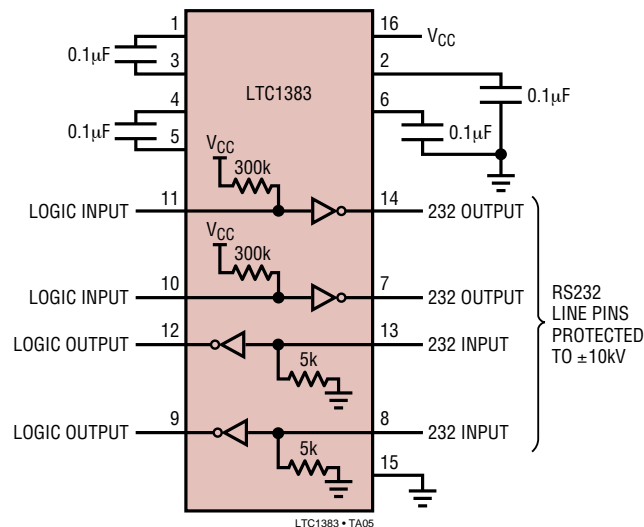
Figure 2. Receiver Propagation Delay Timing

TEST CIRCUITS

Driver Timing Test Load

Receiver Timing Test Load

ESD Test Circuit

LTC1383
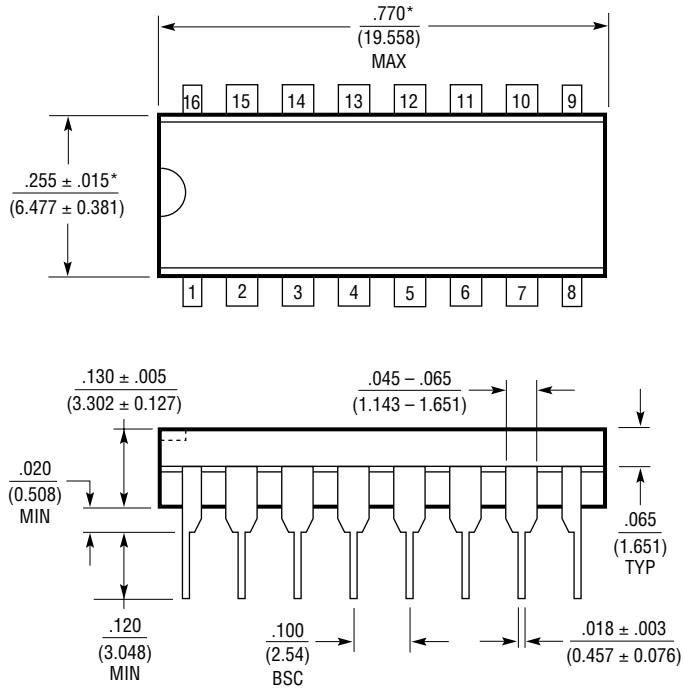
TYPICAL APPLICATIONS

Paralleling Power Supply Generator
with Common Storage Capacitors

LTC1383 • TA06
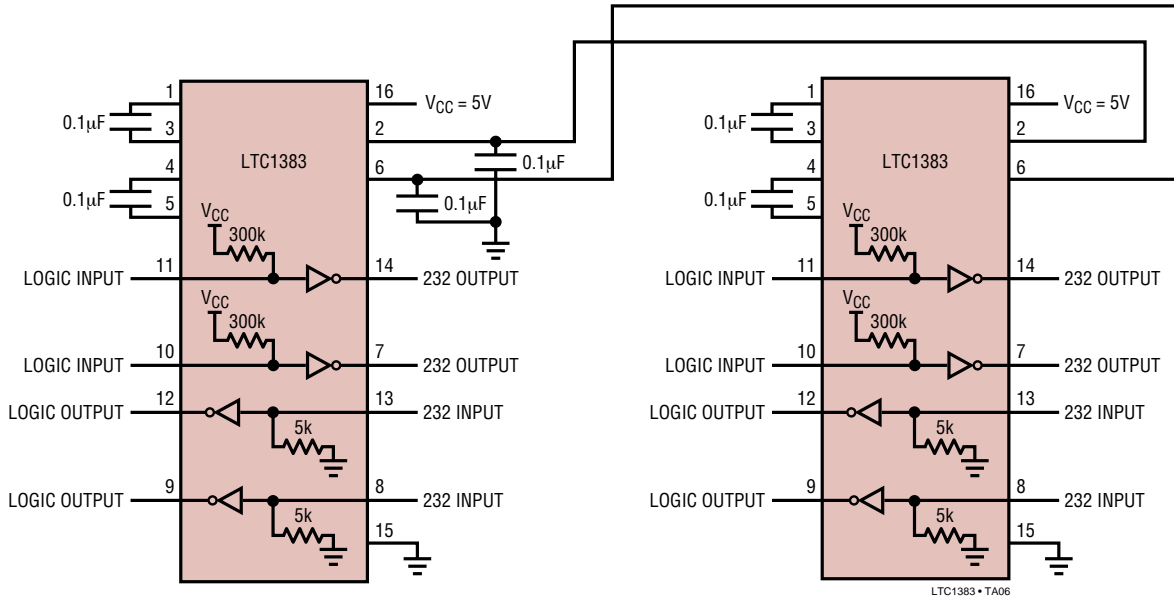
PACKAGE DESCRIPTION

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

.770*
(19.558)
MAX

.255 ± .015*
(6.477 ± 0.381)

16 15 14 13 12 11 10 9

1 2 3 4 5 6 7 8

.300 – .325
(7.620 – 8.255)

.008 – .015
(0.203 – 0.381)

.325 +.035 −.015

(8.255 +0.889 −0.381)

.130 ± .005
(3.302 ± 0.127)

.020
(0.508)
MIN

.120
(3.048)
MIN

.100
(2.54)
BSC

.045 – .065
(1.143 – 1.651)

.065
(1.651)
TYP

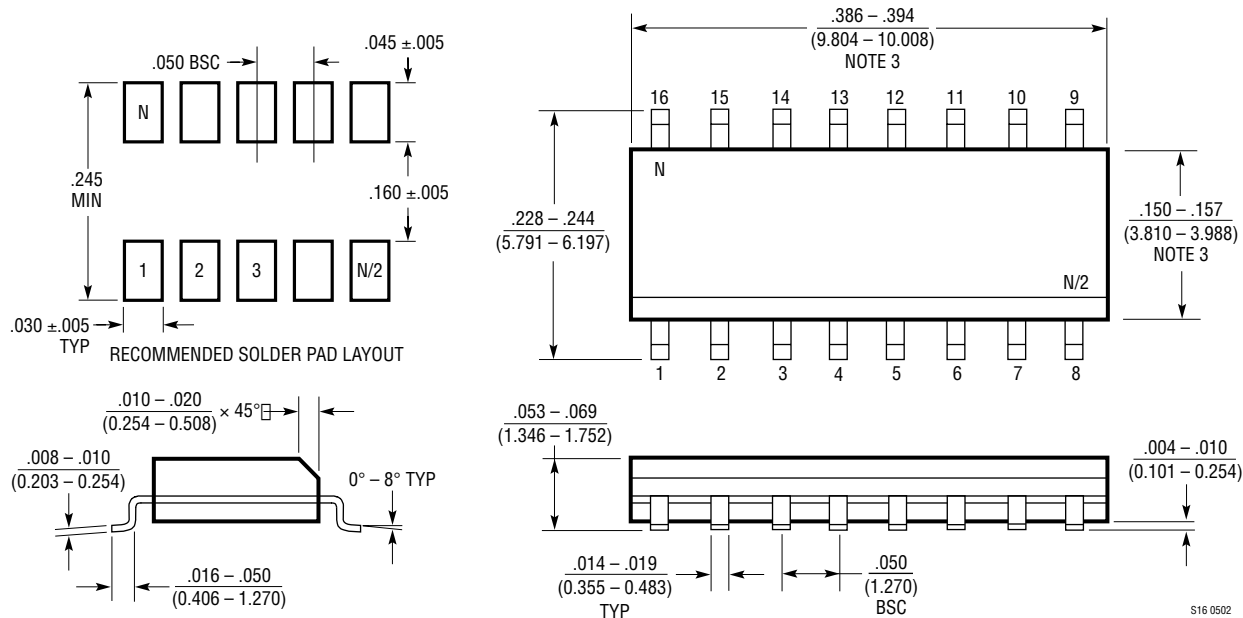.018 ± .003
(0.457 ± 0.076)

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)

NOTE:
1. DIMENSIONS IN $\frac{\text{INCHES}}{\text{(MILLIMETERS)}}$
2. DRAWING NOT TO SCALE
3. THESE DIMENSIONS DO NOT INCLUDE MOLD FLASH OR PROTRUSIONS.
   MOLD FLASH OR PROTRUSIONS SHALL NOT EXCEED .006" (0.15mm)

S16 0502

RELATED PARTS

PART NUMBER	DESCRIPTION	COMMENTS
LT1780/LT1781	5V, 2 Driver, 2 Receiver RS232 Transeivers	±15kV ESD per IEC 1000-4
LTC1382	5V, 2 Driver, 2 Receiver RS232 Transceiver	220µA Supply Current, 0.2µA in Shutdown
LTC1384	5V, 2 Driver, 2 Receiver RS232 Transceiver	220µA Supply Current, 2 Receivers Active in Shutdown
LTC1385	3.3V, 2 Driver, 2 Receiver RS562 Transceiver	220µA Supply Current, 2 Receivers Active in Shutdown
LTC1386	3.3V, 2 Driver, 2 Receiver RS562 Transceiver	220µA Supply Current, Narrow 16-pin SO