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

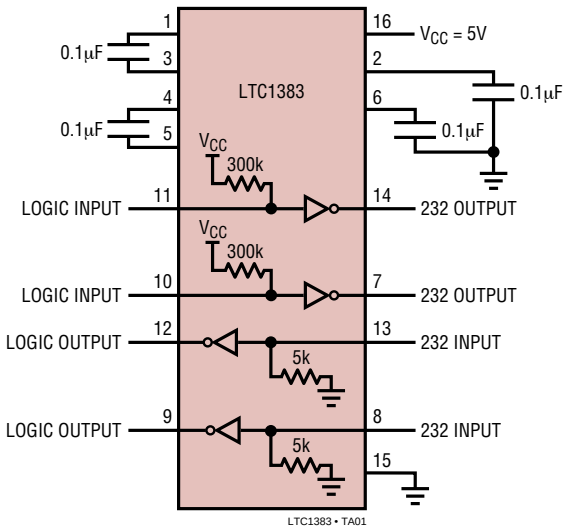
- Notebook Computers
- Palmtop Computers

DESCRIPTION

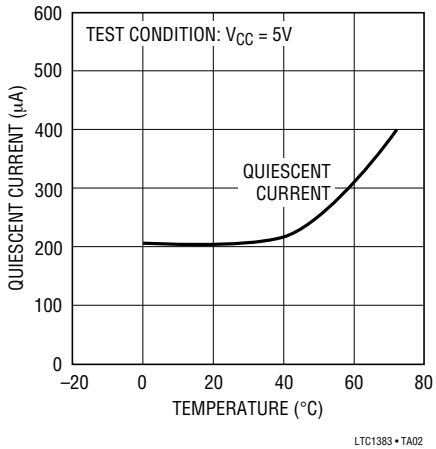
The LTC®1383 is an ultra-low power 2-driver/2-receiver RS232 transceiver that operates from a single 5V supply. The charge pump requires only four space-saving 0.1μF capacitors. The supply current (I_{CC}) of the transceiver is only 220μA with driver outputs unloaded.

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.

TYPICAL APPLICATION



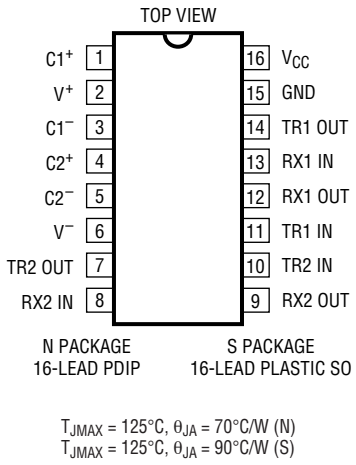
Quiescent Supply Current vs Temperature



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



N PACKAGE
16-LEAD PDIP

S PACKAGE
16-LEAD PLASTIC SO

$T_{JMAX} = 125°C$, $\theta_{JA} = 70°C/W$ (N)
$T_{JMAX} = 125°C$, $\theta_{JA} = 90°C/W$ (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	$-10V \le V_{IN} \le 10V$			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.

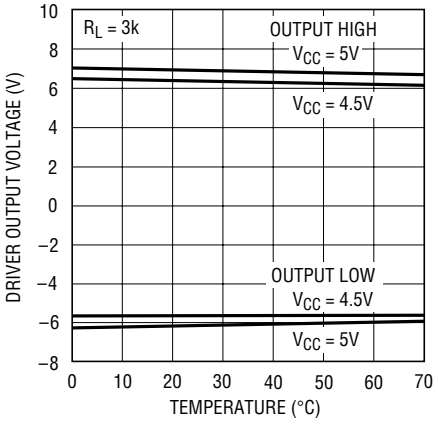
PARAMETER	CONDITIONS		MIN	TYP	MAX	UNITS
Slew Rate	R_L = 3k, C_L = 51pF			8	30	V/µs
	R_L = 3k, C_L = 2500pF		3	5		V/µs
Driver Propagation Delay (TTL to RS232)	t_{HLD} (Figure 1)	●		2	3.5	µs
	t_{LHD} (Figure 1)	●		2	3.5	µs
Receiver Propagation Delay (RS232 to TTL)	t_{HLR} (Figure 2)	●		0.3	0.8	µs
	t_{LHR}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

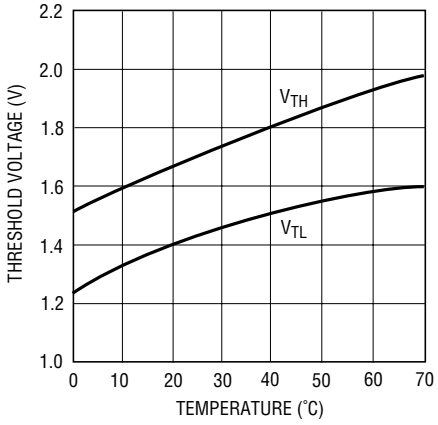
TYPICAL PERFORMANCE CHARACTERISTICS

Driver Output Voltage vs Temperature



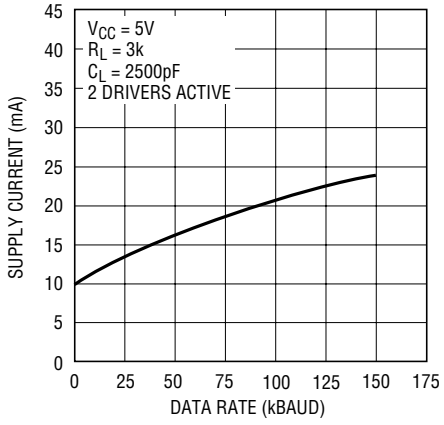
LTC1383 • TPC01

Receiver Input Thresholds vs Temperature



LTC1383 • TPC02

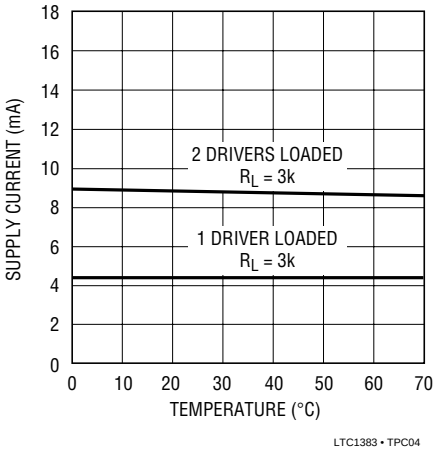
Supply Current vs Data Rate



LTC1383 • TPC03

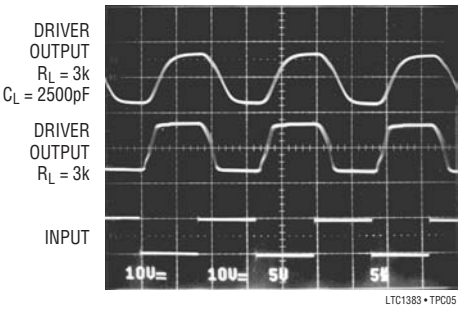
TYPICAL PERFORMANCE CHARACTERISTICS

V_{CC} Supply Current vs Temperature



LTC1383 • TPC04

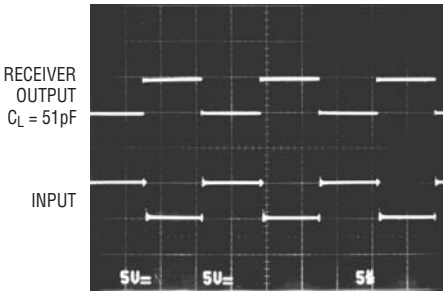
Driver Output Waveforms



LTC1383 • TPC05

5µs/DIV

Receiver Output Waveforms



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

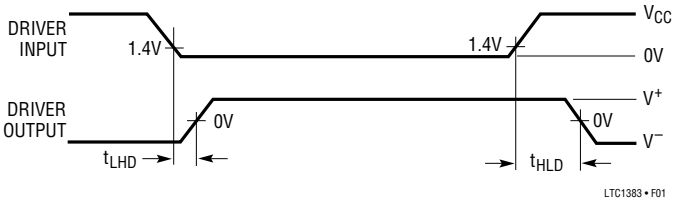


Figure 1. Driver Propagation Delay Timing

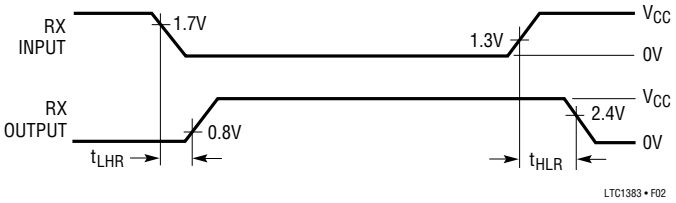
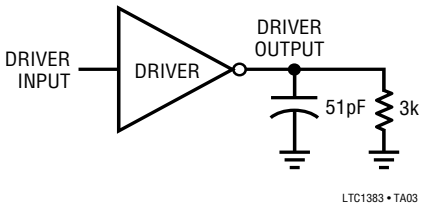


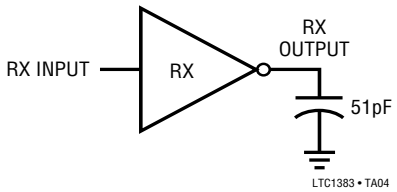
Figure 2. Receiver Propagation Delay Timing

TEST CIRCUITS

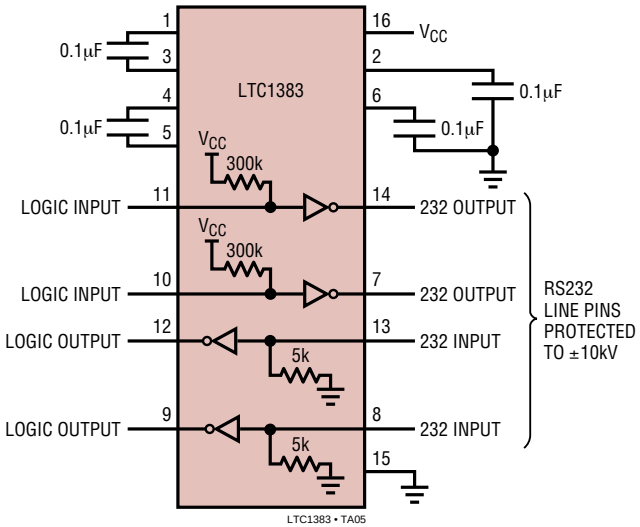
Driver Timing Test Load



Receiver Timing Test Load

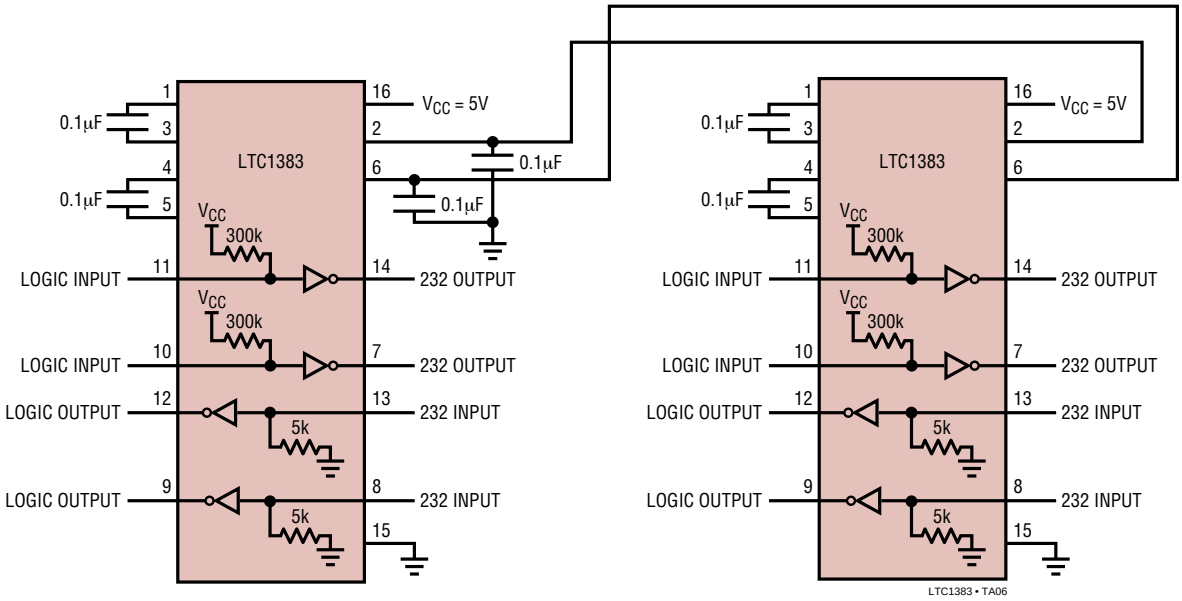


ESD Test Circuit



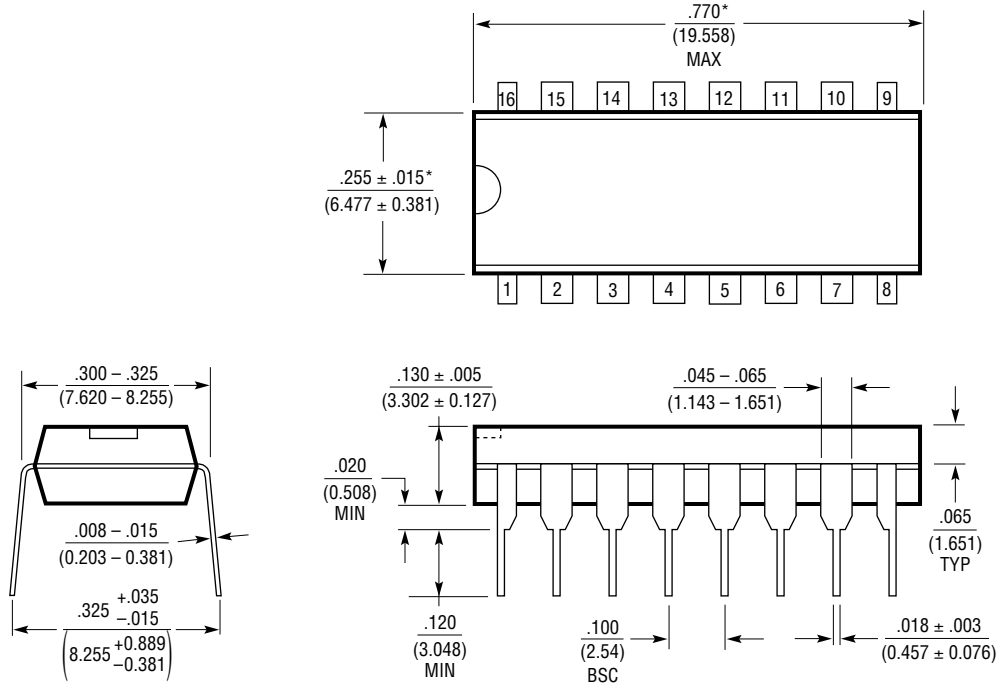
TYPICAL APPLICATIONS

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 INCHES / MILLIMETERS

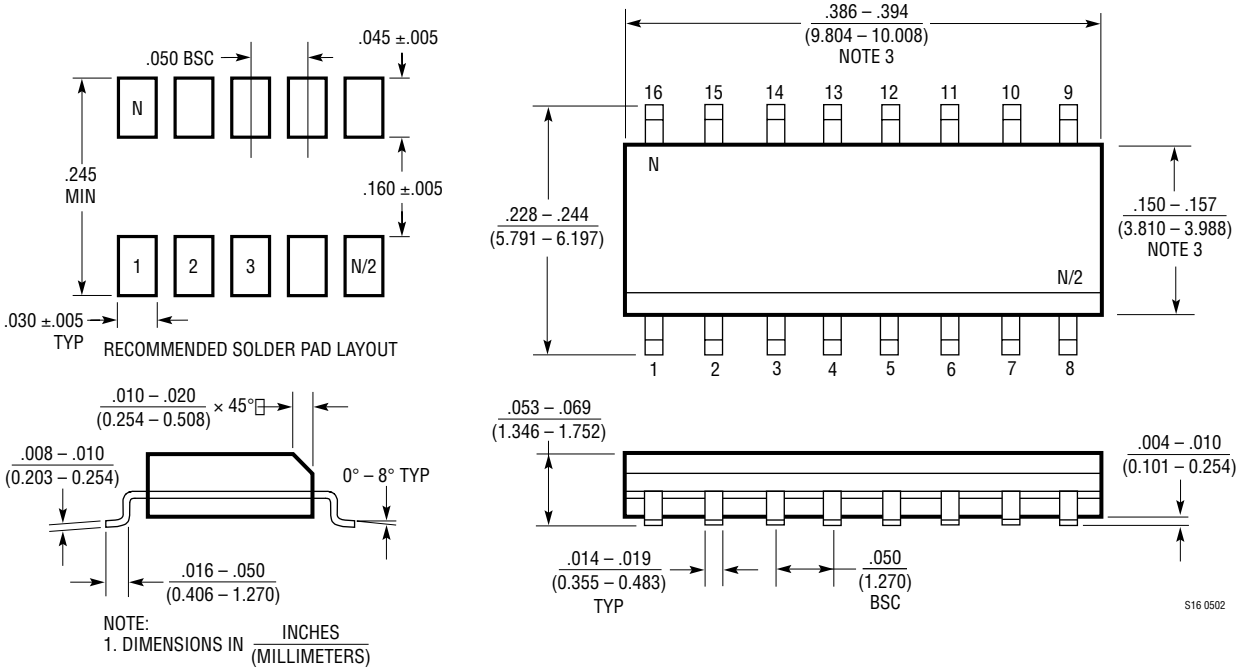
*THESE DIMENSIONS DO NOT INCLUDE MOLD FLASH OR PROTRUSIONS.
MOLD FLASH OR PROTRUSIONS SHALL NOT EXCEED .010 INCH (0.254mm)

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)

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

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