

# LT1080/LT1081

## ABSOLUTE MAXIMUM RATINGS (Note 1)

|                             |                                    |                                      |                |
|-----------------------------|------------------------------------|--------------------------------------|----------------|
| Supply Voltage ( $V_{CC}$ ) | 6V                                 | Short-Circuit Duration               |                |
| $V^+$                       | 12V                                | $V^+$                                | 30 sec         |
| $V^-$                       | -12V                               | $V^-$                                | 30 sec         |
| Input Voltage               |                                    | Driver Output                        | Indefinite     |
| Driver                      | $V^-$ to $V^+$                     | Receiver Output                      | Indefinite     |
| Receiver                    | -30V to 30V                        | Operating Temperature Range          |                |
| ON/OFF Pin                  | GND to 12V                         | LT1080C/LT1081C                      | 0°C to 70°C    |
| Output Voltage              |                                    | LT1080I/LT1081I                      | -40°C to 85°C  |
| Driver                      | ( $V^- + 30V$ ) to ( $V^+ - 30V$ ) | LT1080M/LT1081M (OBSOLETE) ...       | -55°C to 125°C |
| Receiver                    | -0.3V to ( $V_{CC} + 0.3V$ )       | Storage Temperature Range            | -65°C to 150°C |
|                             |                                    | Lead Temperature (Soldering, 10 sec) | 300°C          |

## PACKAGE/ORDER INFORMATION

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|
| <p>TOP VIEW</p> <p>LT1080</p> <p>N PACKAGE<br/>18-LEAD PDIP<br/><math>T_{JMAX} = 150^{\circ}C</math>, <math>\theta_{JA} = 120^{\circ}C/W</math>, <math>\theta_{JC} = 50^{\circ}C/W</math> (N)<br/><math>T_{JMAX} = 150^{\circ}C</math>, <math>\theta_{JA} = 90^{\circ}C/W</math>, <math>\theta_{JC} = 26^{\circ}C/W</math> (SW)</p> <p>SW PACKAGE<br/>18-LEAD PLASTIC SO WIDE<br/><math>T_{JMAX} = 150^{\circ}C</math>, <math>\theta_{JA} = 120^{\circ}C/W</math>, <math>\theta_{JC} = 50^{\circ}C/W</math> (N)<br/><math>T_{JMAX} = 150^{\circ}C</math>, <math>\theta_{JA} = 95^{\circ}C/W</math>, <math>\theta_{JC} = 27^{\circ}C/W</math> (SW)</p> <p>J PACKAGE<br/>18-LEAD Cerdip<br/><math>T_{JMAX} = 150^{\circ}C</math>, <math>\theta_{JA} = 100^{\circ}C/W</math>, <math>\theta_{JC} = 40^{\circ}C/W</math> (J)</p> <p><b>OBSOLETE PACKAGE</b><br/>Consider N Package for Alternate Source</p> | <p>ORDER PART NUMBER</p> <p>LT1080CN<br/>LT1080CSW<br/>LT1080IN<br/>LT1080ISW</p> <p>LT1080CJ<br/>LT1080MJ</p> | <p>TOP VIEW</p> <p>LT1081</p> <p>N PACKAGE<br/>16-LEAD PDIP<br/><math>T_{JMAX} = 150^{\circ}C</math>, <math>\theta_{JA} = 120^{\circ}C/W</math>, <math>\theta_{JC} = 50^{\circ}C/W</math> (N)<br/><math>T_{JMAX} = 150^{\circ}C</math>, <math>\theta_{JA} = 95^{\circ}C/W</math>, <math>\theta_{JC} = 27^{\circ}C/W</math> (SW)</p> <p>SW PACKAGE<br/>16-LEAD PLASTIC SO WIDE<br/><math>T_{JMAX} = 150^{\circ}C</math>, <math>\theta_{JA} = 120^{\circ}C/W</math>, <math>\theta_{JC} = 50^{\circ}C/W</math> (N)<br/><math>T_{JMAX} = 150^{\circ}C</math>, <math>\theta_{JA} = 95^{\circ}C/W</math>, <math>\theta_{JC} = 27^{\circ}C/W</math> (SW)</p> <p>J PACKAGE<br/>16-LEAD Cerdip<br/><math>T_{JMAX} = 150^{\circ}C</math>, <math>\theta_{JA} = 100^{\circ}C/W</math>, <math>\theta_{JC} = 40^{\circ}C/W</math> (J)</p> <p><b>OBSOLETE PACKAGE</b><br/>Consider N Package for Alternate Source</p> | <p>ORDER PART NUMBER</p> <p>LT1081CN<br/>LT1081CSW<br/>LT1081IN<br/>LT1081ISW</p> <p>LT1081CJ<br/>LT1081MJ</p> |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|

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

# ELECTRICAL CHARACTERISTICS

The ● denotes the specifications which apply over the full operating temperature range, otherwise specifications are at  $T_A = 25^\circ\text{C}$ . (Note 2)

| PARAMETER                                 | CONDITIONS                                                                                            |                                                                                    |                      | MIN                  | TYP                  | MAX      | UNITS                |
|-------------------------------------------|-------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|----------------------|----------------------|----------------------|----------|----------------------|
| Driver                                    |                                                                                                       |                                                                                    |                      |                      |                      |          |                      |
| Output Voltage Swing                      | Load = 3k to GND Both Outputs                                                                         | Positive<br>Negative                                                               | ●<br>●               | 5<br>−5              | 7.3<br>−6.5          |          | V<br>V               |
| Logic Input Voltage Level                 | Input Low Level (V <sub>OUT</sub> = High)<br>Input High Level (V <sub>OUT</sub> = Low)                |                                                                                    | ●<br>●               | <br>2                | 1.4<br>1.4           | 0.8      | V<br>V               |
| Logic Input Current                       | V <sub>IN</sub> ≥ 2V<br>V <sub>IN</sub> ≤ 0.8V                                                        |                                                                                    | ●<br>●               |                      | 5<br>5               | 20<br>20 | μA<br>μA             |
| Output Short-Circuit Current              | Sourcing Current, V <sub>OUT</sub> = 0V<br>Sinking Current, V <sub>OUT</sub> = 0V                     |                                                                                    |                      | 9<br>−9              | 12<br>−12            |          | mA<br>mA             |
| Output Leakage Current                    | SHUTDOWN (Note 3), V <sub>OUT</sub> = ±30V                                                            |                                                                                    | ●                    |                      | 10                   | 100      | μA                   |
| Data Rate (Note 6)                        | R <sub>L</sub> = 3k, C <sub>L</sub> = 2500pF<br>R <sub>L</sub> = 3k, C <sub>L</sub> = 1000pF          |                                                                                    |                      | 120<br>250           |                      |          | kBd<br>kBd           |
| Slew Rate                                 | R <sub>L</sub> = 3k, C <sub>L</sub> = 51pF                                                            |                                                                                    |                      | 4                    | 15                   | 30       | V/μs                 |
| Receiver                                  |                                                                                                       |                                                                                    |                      |                      |                      |          |                      |
| Input Voltage Thresholds                  | Input Low Threshold<br><br>Input High Threshold                                                       | Commercial<br>Industrial and Military<br><br>Commercial<br>Industrial and Military | ●<br>●<br><br>●<br>● | 0.8<br>0.2           | 1.3<br>1.3           |          | V<br>V<br><br>V<br>V |
| Hysteresis                                |                                                                                                       |                                                                                    | ●                    | 0.1                  | 0.4                  | 1        | V                    |
| Input Resistance                          | V <sub>IN</sub> = ±10V                                                                                |                                                                                    |                      | 3                    | 5                    | 7        | kΩ                   |
| Output Voltage                            | Output Low, I <sub>OUT</sub> = −1.6mA<br>Output High, I <sub>OUT</sub> = 160μA (V <sub>CC</sub> = 5V) |                                                                                    | ●<br>●               | <br>3.5              | 0.2<br>4.8           | 0.4      | V<br>V               |
| Output Short-Circuit Current              | Sinking Current, V <sub>OUT</sub> = V <sub>CC</sub><br>Sourcing Current, V <sub>OUT</sub> = 0V        |                                                                                    |                      | −10<br>0.6           | −20<br>1             |          | mA<br>mA             |
| Output Leakage Current                    | SHUTDOWN (Note 3), 0V ≤ V <sub>OUT</sub> ≤ V <sub>CC</sub>                                            |                                                                                    | ●                    |                      | 1                    | 10       | μA                   |
| Power Supply Generator (Note 4)           |                                                                                                       |                                                                                    |                      |                      |                      |          |                      |
| V <sup>+</sup> Output Voltage             | I <sub>OUT</sub> = 0mA<br>I <sub>OUT</sub> = 10mA<br>I <sub>OUT</sub> = 15mA                          |                                                                                    |                      | 8.0<br>7.0<br>6.5    | 9.0<br>8.0<br>7.5    |          | V<br>V<br>V          |
| V <sup>−</sup> Output Voltage             | I <sub>OUT</sub> = 0mA<br>I <sub>OUT</sub> = −10mA<br>I <sub>OUT</sub> = −15mA                        |                                                                                    |                      | −7.5<br>−5.5<br>−5.0 | −8.5<br>−6.5<br>−6.0 |          | V<br>V<br>V          |
| Supply Current                            |                                                                                                       |                                                                                    | ●                    |                      | 12                   | 22       | mA                   |
| Supply Leakage Current (V <sub>CC</sub> ) | SHUTDOWN (Note 3), LT1080 Only                                                                        |                                                                                    | ●                    |                      | 1                    | 100      | μA                   |
| ON/OFF Pin Current                        | 0V ≤ V <sub>ON/OFF</sub> ≤ 5V, LT1080 Only                                                            |                                                                                    | ●                    | −15                  |                      | 80       | μA                   |
| Supply Rise Time                          | (Note 5), LT1080 Only                                                                                 |                                                                                    |                      |                      | 1                    |          | ms                   |

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

**Note 2:** These parameters apply for  $4.5V \leq V_{CC} \leq 5.5V$  and  $V_{ON/OFF} = 3V$ , unless otherwise specified.

**Note 3:**  $V_{ON/OFF} = 0.4V$  for  $-55^\circ\text{C} \leq T_A \leq 50^\circ\text{C}$ , and  $V_{ON/OFF} = 0.2V$  for  $50^\circ\text{C} \leq T_A \leq 125^\circ\text{C}$ . (LT1080 only)

**Note 4:** Unless otherwise specified,  $V_{CC} = 5V$ , external loading of  $V^+$  and  $V^-$  equals zero and the driver outputs are low (inputs high).

**Note 5:** Time from either SHUTDOWN high or power on until  $V^+ \geq 6V$  and  $V^- \leq -6V$ . All external capacitors are  $1\mu\text{F}$ .

**Note 6:** Data rate operation guaranteed by slew rate, short-circuit current and propagation delay tests.

## PIN FUNCTIONS (Pin numbers refer to LT1080)

**C1<sup>+</sup>; C1<sup>-</sup>; C2<sup>+</sup>; C2<sup>-</sup> (Pins 2, 4, 5, 6):** Requires an external capacitor ( $\geq 1\mu\text{F}$ ) from C1<sup>+</sup> to C1<sup>-</sup> and another from C2<sup>+</sup> to C2<sup>-</sup>. Pin 2 can be used for connecting a second positive supply. When a separate positive supply is used, C1 can be deleted.

**V<sup>+</sup> (Pin 3):** Positive Supply for RS232 Drivers.  
 $V^+ \approx 2V_{CC} - 1.5\text{V}$ . Requires an external capacitor ( $\geq 1\mu\text{F}$ ) for charge storage. May be loaded (up to 15mA) for external system use. Loading does reduce V<sup>+</sup> voltage (see graphs). Capacitor may be tied to ground or +5V input supply. With multiple transceivers, the V<sup>+</sup> and V<sup>-</sup> pins may be paralleled into common capacitors.

**V<sup>-</sup> (Pin 7):** Negative Supply for RS232 Drivers.  
 $V^- \approx -(2V_{CC} - 2.5\text{V})$ . Requires an external capacitor ( $\geq 1\mu\text{F}$ ) for charge storage. May be loaded (up to -15mA) for external system use. Loading does reduce V<sup>-</sup> voltage (see graphs). With multiple transceivers, the V<sup>+</sup> and V<sup>-</sup> pins may be paralleled into common capacitors.

**TR2 OUT; TR1 OUT (Pins 8, 15):** Driver Outputs with RS232 Voltage Levels. Outputs are in a high impedance state when in the SHUTDOWN mode or when power is off ( $V_{CC} = 0\text{V}$ ) to allow data line sharing. Outputs are fully short-circuit protected from ( $V^- + 30\text{V}$ ) to ( $V^+ - 30\text{V}$ ) with power on, off or in the SHUTDOWN mode. Typical output breakdowns are greater than  $\pm 45\text{V}$  and higher applied

voltages will not damage the device if moderately current limited. Shorting one output will affect output from the other.

**REC2 IN; REC1 IN (Pins 9, 14):** Receiver Inputs. Accepts RS232 voltage levels ( $\pm 30\text{V}$ ) and has 0.4V of hysteresis to provide noise immunity. Input impedance is nominally 5k $\Omega$ .

**REC2 OUT; REC1 OUT (Pins 10, 13):** Receiver Outputs with TTL/CMOS Voltage Levels. Outputs are in a high impedance state when in the SHUTDOWN mode to allow data line sharing. Outputs are fully short-circuit protected to ground or  $V_{CC}$  with power on, off or in the SHUTDOWN mode.

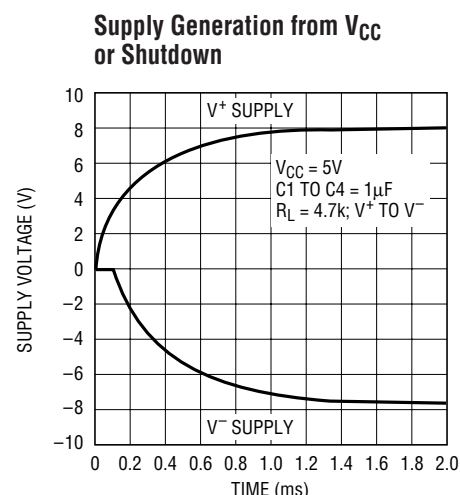
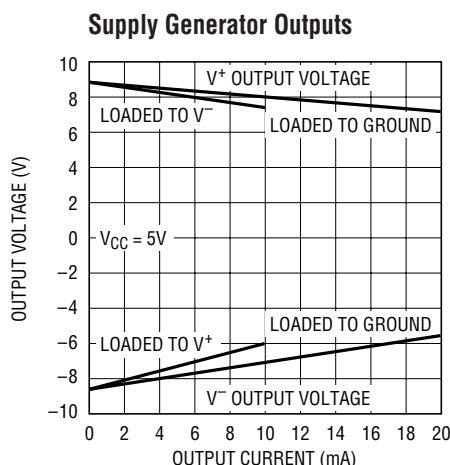
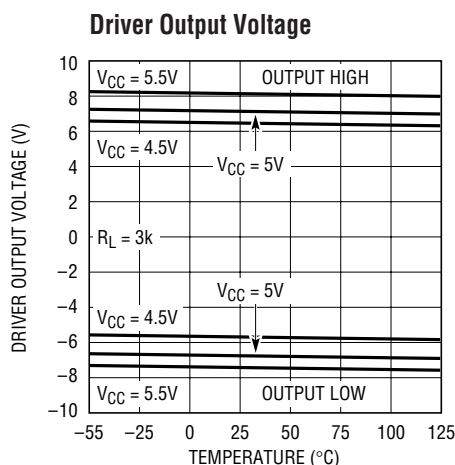
**TR2 IN; TR1 IN (Pins 11, 12):** RS232 Driver Input Pins. Inputs are TTL/CMOS compatible. Inputs should not be allowed to float. Tie unused inputs to  $V_{CC}$ .

**GND (Pin 16):** Ground Pin.

**V<sub>CC</sub> (Pin 17):** Input Supply Pin. Supply current drops to zero in the SHUTDOWN mode.

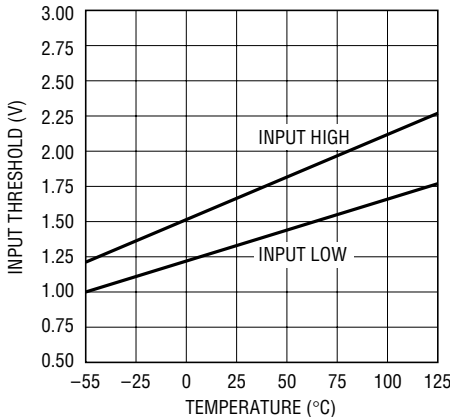
**ON/OFF (Pin 18):** Controls the operation mode of the LT1080 and is TTL/CMOS compatible. A logic low puts the device in the SHUTDOWN mode which reduces input supply current to zero and places both driver and receiver outputs in a high impedance state. A logic high fully enables the device.

## TYPICAL PERFORMANCE CHARACTERISTICS

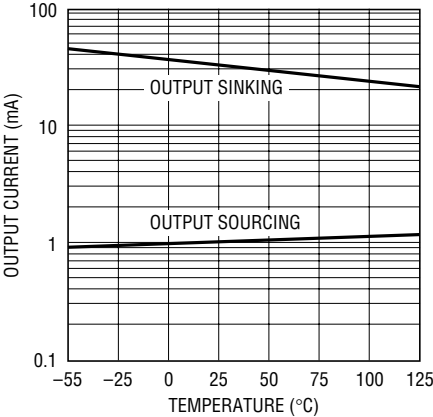


TYPICAL PERFORMANCE CHARACTERISTICS

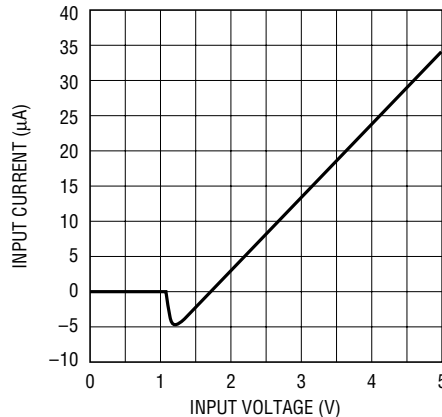
Receiver Input Thresholds



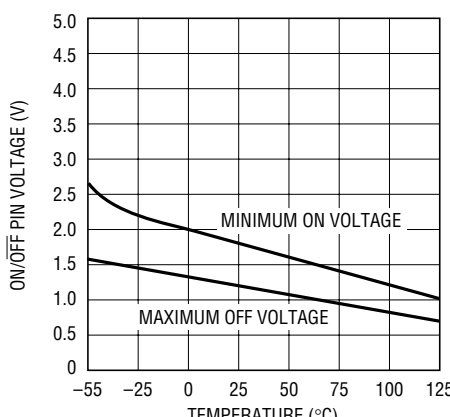
Receiver Output Short-Circuit Current



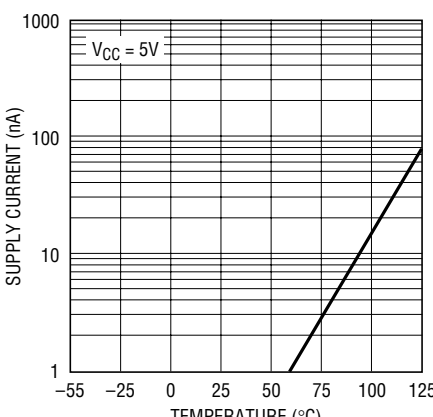
ON/OFF Pin Current vs Voltage



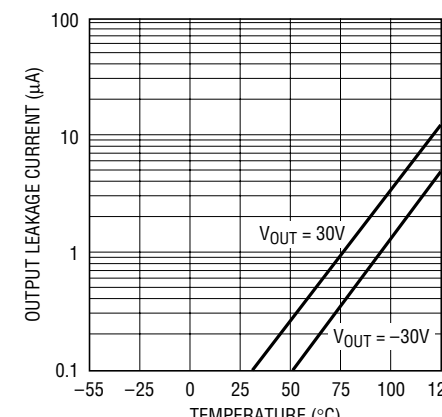
ON/OFF Pin Thresholds



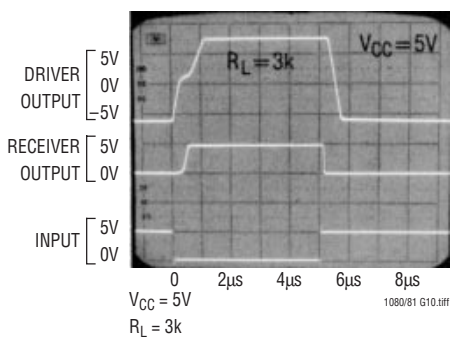
Supply Current in Shutdown



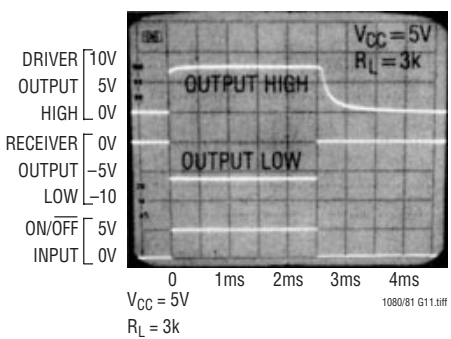
Driver Output Leakage in Shutdown



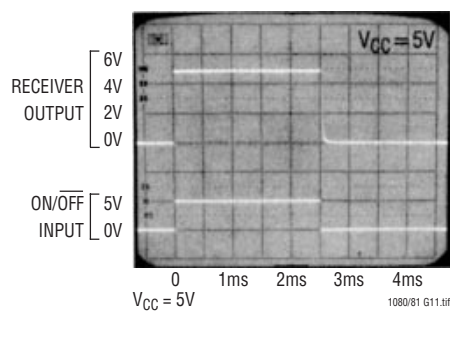
Output Waveforms



Shutdown to Driver Output



Shutdown to Receiver Output



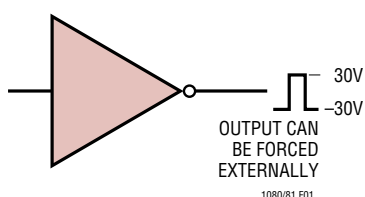
## APPLICATIONS INFORMATION

The driver output stage of the LT1080 offers significantly improved protection over older bipolar and CMOS designs. In addition to current limiting, the driver output can be externally forced to  $\pm 30V$  with no damage or excessive current flow, and will not disrupt the supplies. Some drivers have diodes connected between the outputs and the supplies, so externally applied voltages can cause excessive supply voltage to develop.

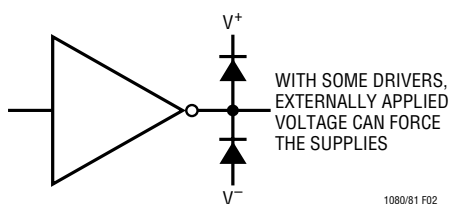
Placing the LT1080 in the SHUTDOWN mode (Pin 18 low) puts both the driver and receiver outputs in a high impedance state. This allows data line sharing and transceiver applications.

The SHUTDOWN mode also drops input supply current ( $V_{CC}$ ; Pin 17) to zero for power-conscious systems.

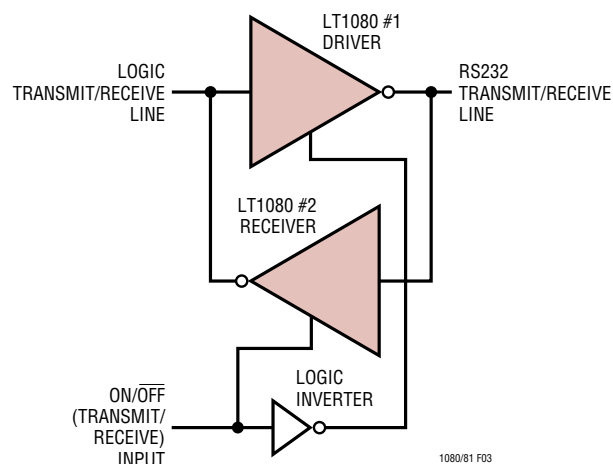
LT1080/LT1081 Driver



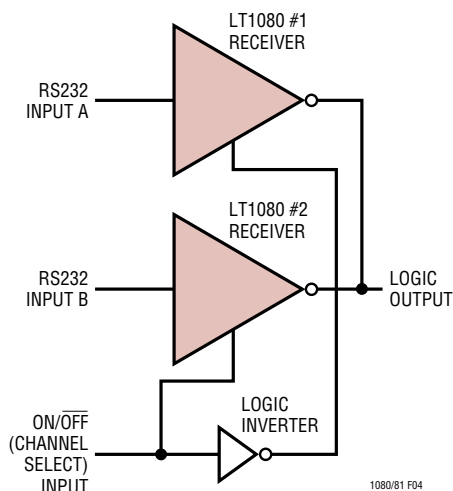
Older RS232 Drivers and CMOS Drivers



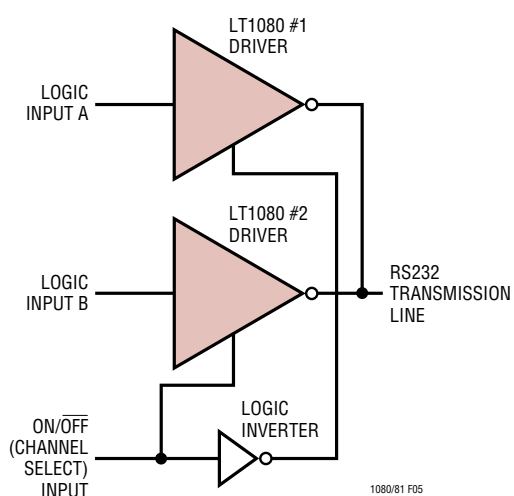
Transceiver



Sharing a Receiver Line

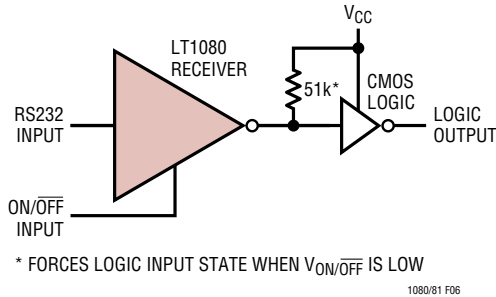


Sharing a Transmitter Line

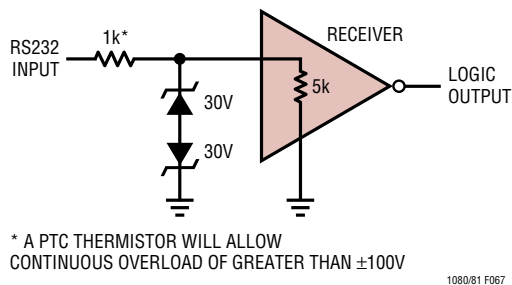


## APPLICATIONS INFORMATION

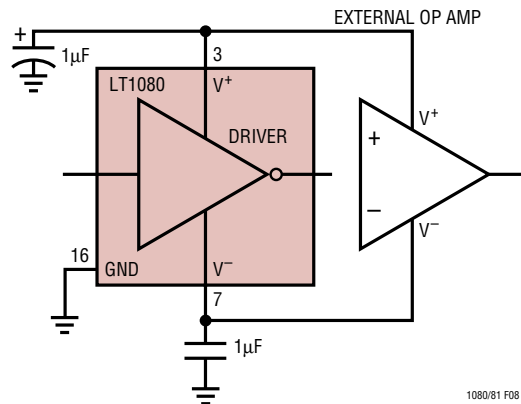
When driving CMOS logic from a receiver that will be used in the SHUTDOWN mode and there is no other active receiver on the line, a 51k resistor can be placed from the logic input to  $V_{CC}$  to force a definite logic level when the receiver output is in a high impedance state.



To protect against receiver input overloads in excess of  $\pm 30V$ , a voltage clamp can be placed on the data line and still maintain RS232 compatibility.

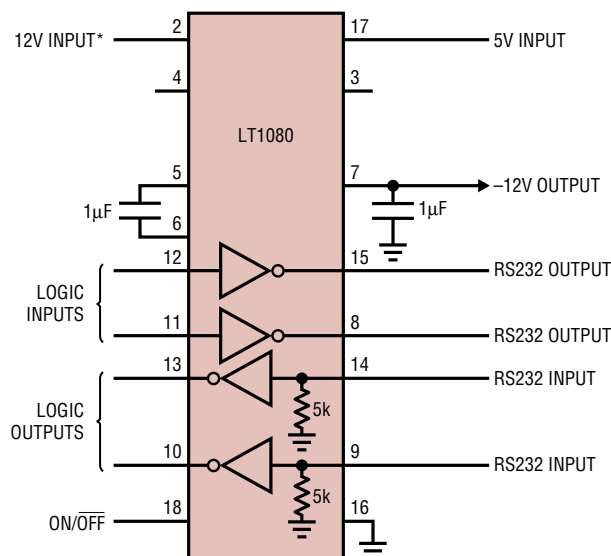


The generated driver supplies ( $V^+$  and  $V^-$ ) may be used to power external circuitry such as other RS232 drivers or op amps. They should be loaded with care, since excessive loading can cause the generated supply voltages to drop, causing the RS232 driver output voltages to fall below RS232 requirements. See the graph "Supply Generator Outputs" for a comparison of generated supply voltage versus supply current.



## TYPICAL APPLICATION

Operating with 5V and 12V



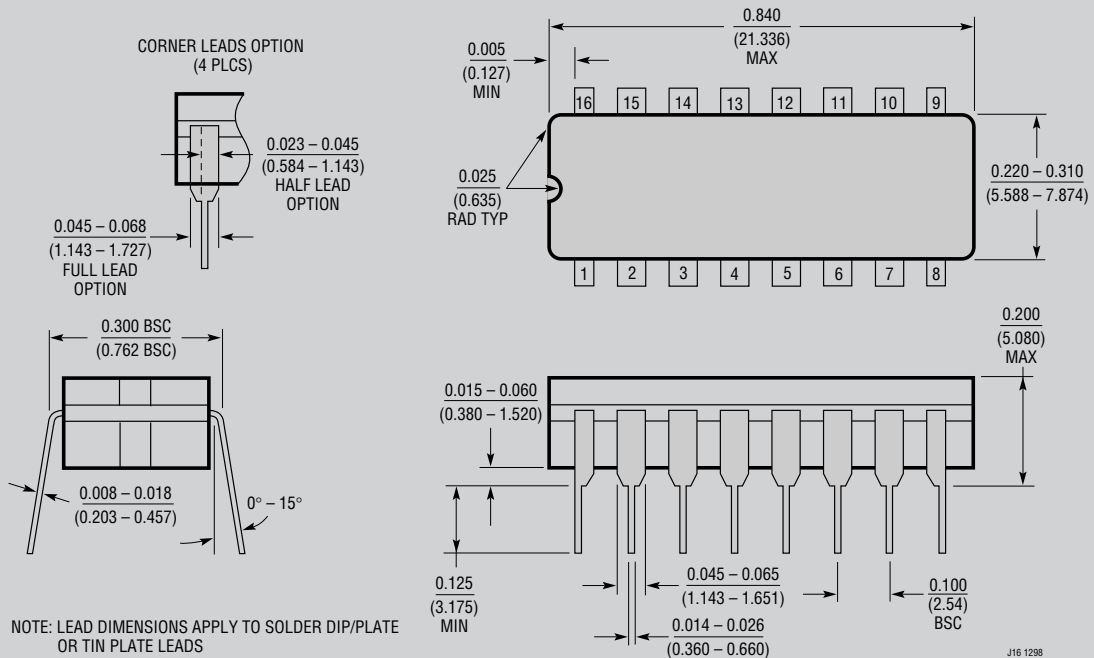
\* PIN 1 USED ON LT1081.

1080/81 • TA03

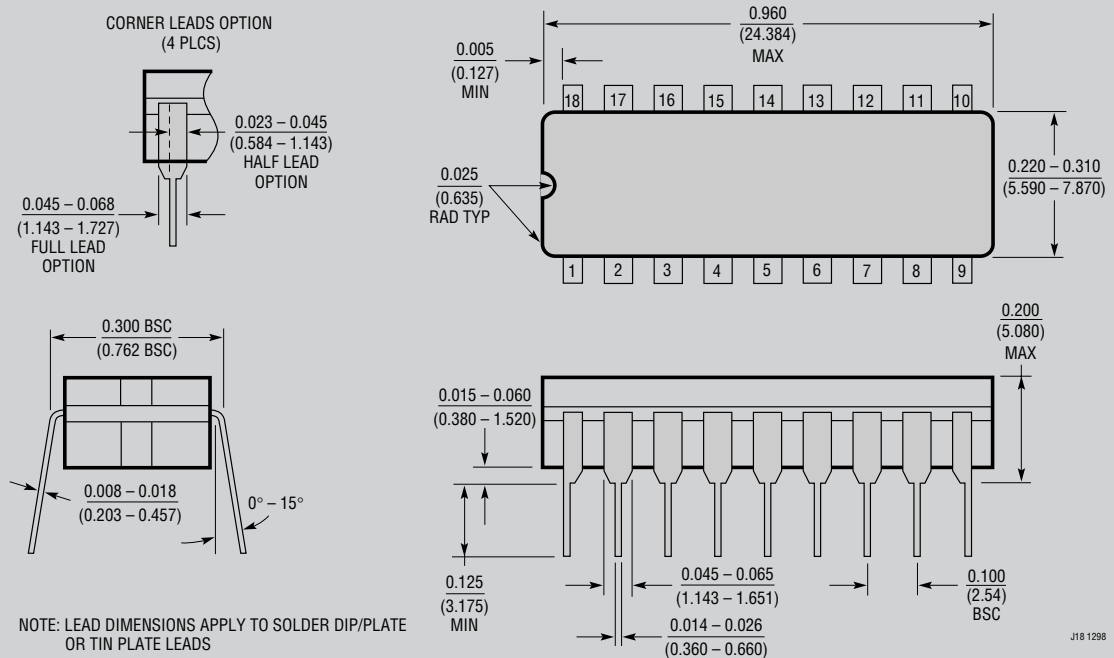
10801fe

## PACKAGE DESCRIPTION

### J Package 16-Lead Cerdip (Narrow .300 Inch, Hermetic) (Reference LTC DWG # 05-08-1110)



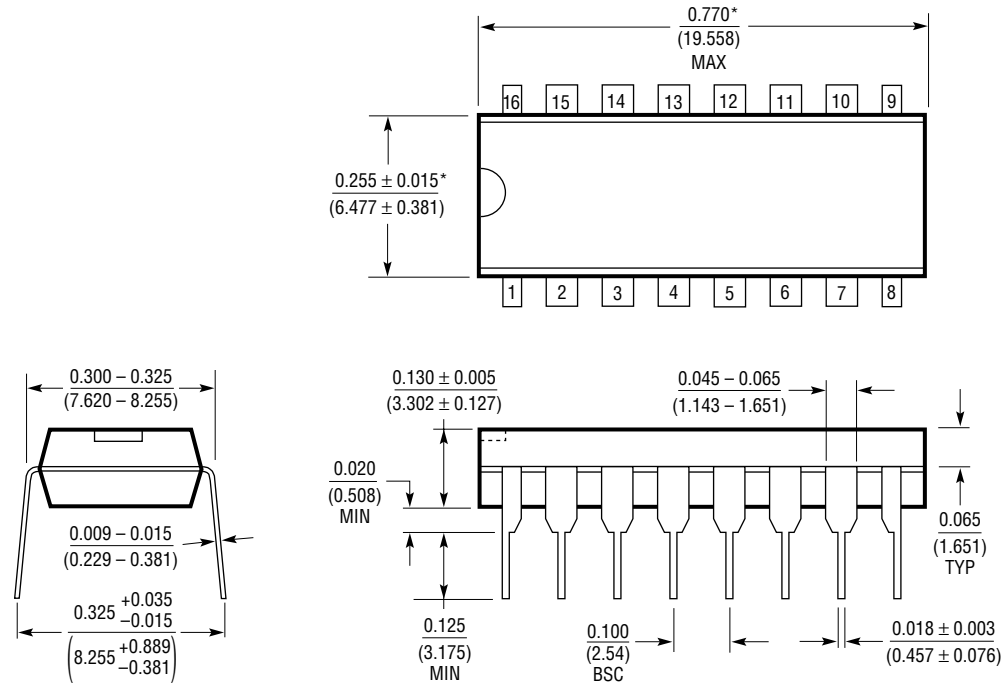
### J Package 18-Lead Cerdip (Narrow .300 Inch, Hermetic) (Reference LTC DWG # 05-08-1110)



OBsolete PACKAGES

# PACKAGE DESCRIPTION

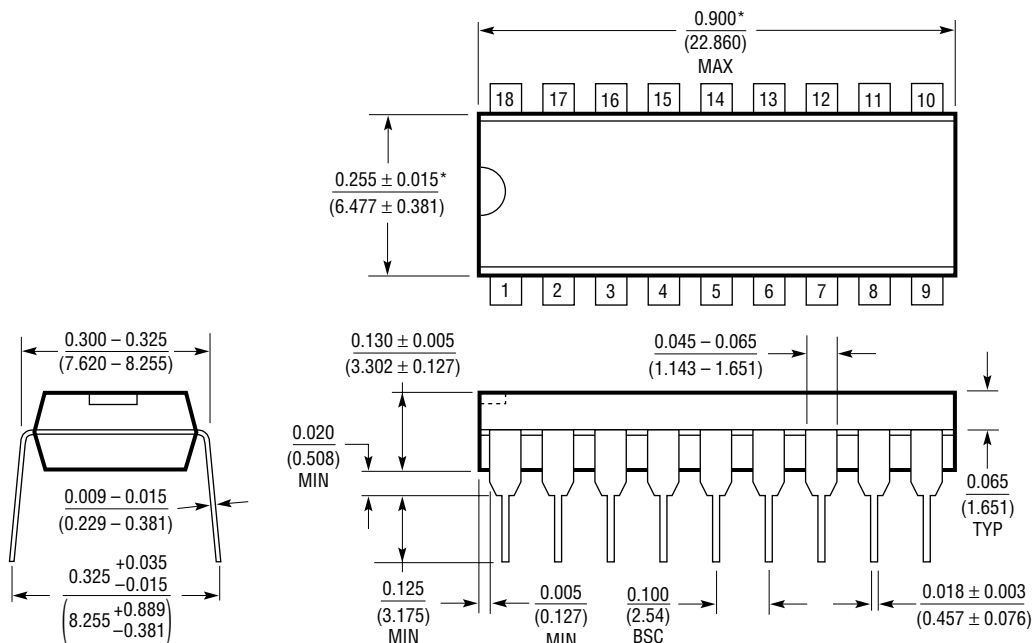
## N Package 16-Lead PDIP (Narrow .300 Inch) (Reference LTC DWG # 05-08-1510)



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

N16 1098

## N Package 18-Lead PDIP (Narrow .300 Inch) (Reference 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)

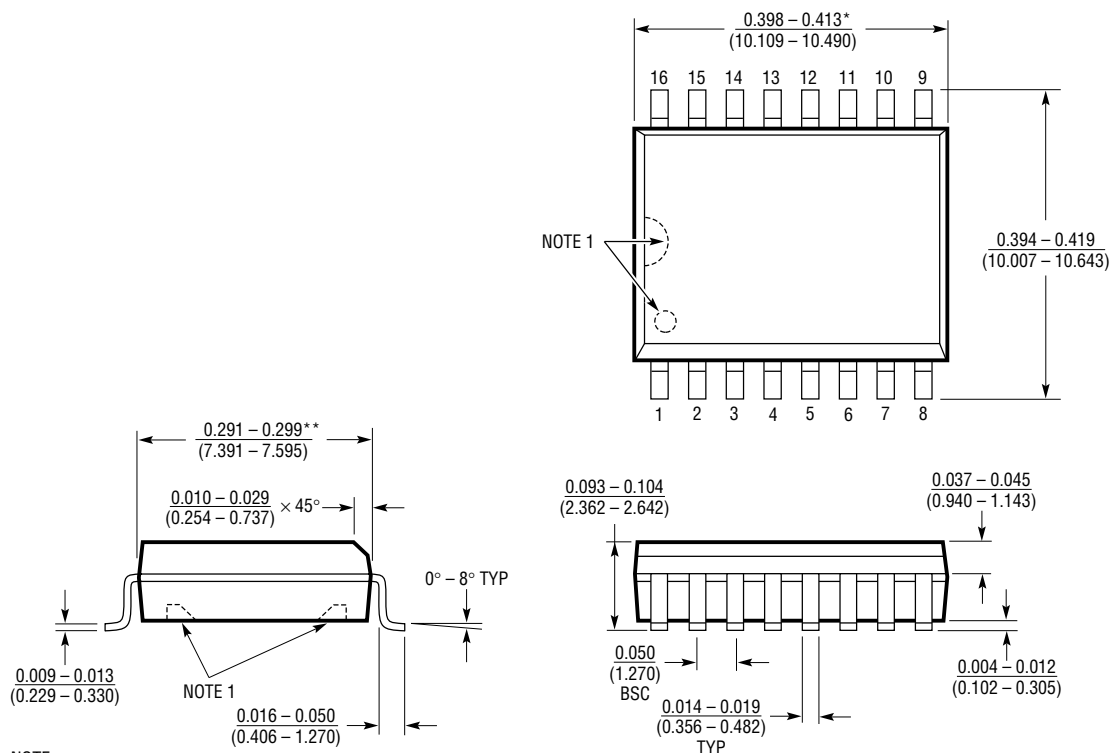
N18 1098

10801fe



## PACKAGE DESCRIPTION

### SW Package 16-Lead Plastic Small Outline (Wide .300 Inch) (Reference LTC DWG # 05-08-1620)



#### NOTE:

1. PIN 1 IDENT, NOTCH ON TOP AND CAVITIES ON THE BOTTOM OF PACKAGES ARE THE MANUFACTURING OPTIONS. THE PART MAY BE SUPPLIED WITH OR WITHOUT ANY OF THE OPTIONS

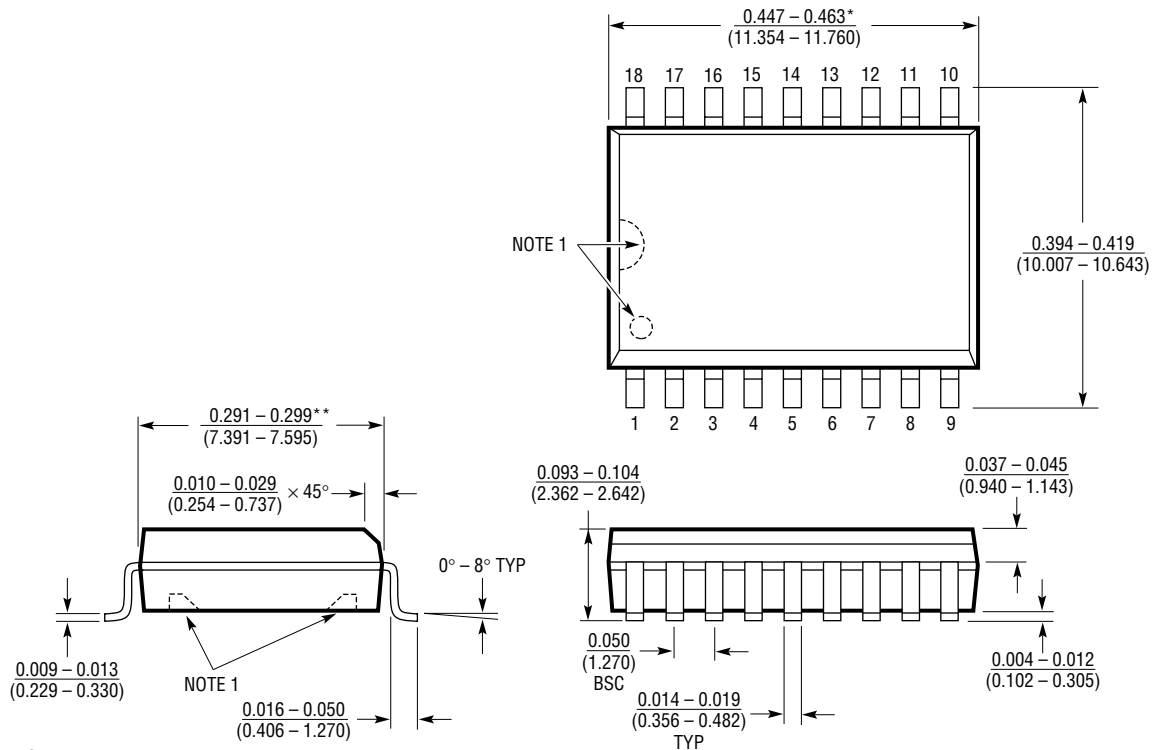
\*DIMENSION DOES NOT INCLUDE MOLD FLASH. MOLD FLASH SHALL NOT EXCEED 0.006" (0.152mm) PER SIDE

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

S16 (WIDE) 1098

# PACKAGE DESCRIPTION

## SW Package 18-Lead Plastic Small Outline (Wide .300 Inch) (Reference LTC DWG # 05-08-1620)



### NOTE:

1. PIN 1 IDENT. NOTCH ON TOP AND CAVITIES ON THE BOTTOM OF PACKAGES ARE THE MANUFACTURING OPTIONS. THE PART MAY BE SUPPLIED WITH OR WITHOUT ANY OF THE OPTIONS

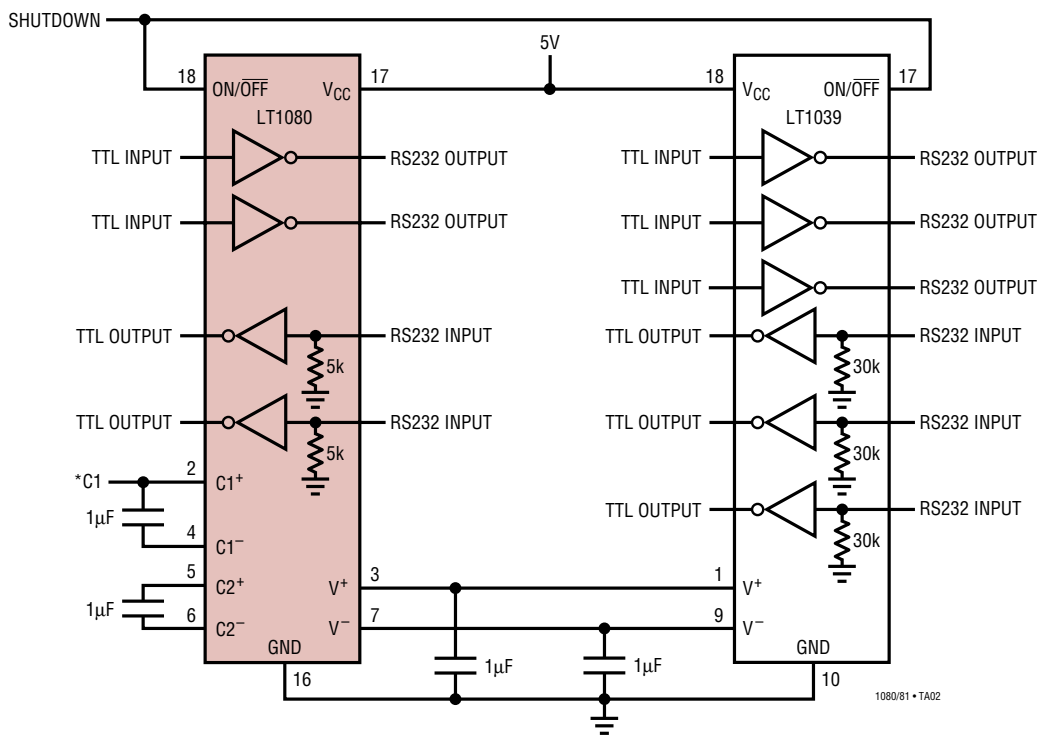
\*DIMENSION DOES NOT INCLUDE MOLD FLASH. MOLD FLASH SHALL NOT EXCEED 0.006" (0.152mm) PER SIDE

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

S18 (WIDE) 1098

TYPICAL APPLICATION

Supporting an LT1039 (Triple Driver/Receiver)



\*IN APPLICATIONS WHERE A SEPARATE SECOND POSITIVE SUPPLY IS AVAILABLE (SUCH AS 5V AND 12V), THE 12V SUPPLY MAY BE CONNECTED TO PIN 2 AND C1 DELETED. THE POWER SUPPLY CIRCUITRY WILL THEN INVERT THE 12V SUPPLY. THE 5V SUPPLY IS STILL NEEDED TO POWER THE BIASING CIRCUITRY AND RECEIVERS.

RELATED PARTS

| PART NUMBER     | DESCRIPTION                            | COMMENTS                                   |
|-----------------|----------------------------------------|--------------------------------------------|
| LT1180A/LT1181A | 5V Low Power 2DR/2TX RS232 Transceiver | 0.1μF Capacitors, 10kV ESD                 |
| LT1780/LT1781   | 5V Low Power 2DR/2TX RS232 Transceiver | 15kV ESD                                   |
| LT1381          | 5V Low Power 2DR/2TX RS232 Transceiver | 16-Pin Narrow SO Package                   |
| LT1130A/LT1140A | 5V RS232 Transceivers                  | Up to 5DR/5RX                              |
| LTC1383         | 5V Low Power 2DR/2RX RS232 Transceiver | Low Supply Current I <sub>CC</sub> = 220μA |
| LTC1386         | 3.3V Low Power EIA/TIA562 Transceiver  | Low Supply Current I <sub>CC</sub> = 200μA |