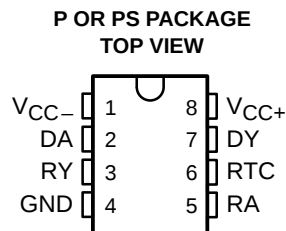


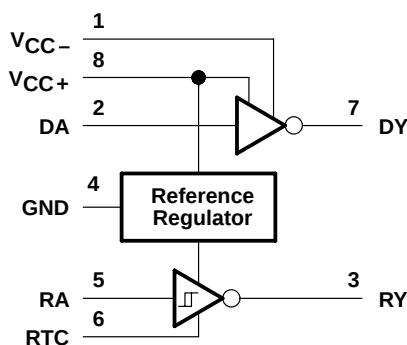
- Meets or Exceeds the Requirements of ANSI TIA/EIA-232-C
- Wide Range of Supply Voltage  
 $V_{CC} = \pm 4.5 \text{ V to } \pm 15 \text{ V}$
- Low Power . . . 117 mW ( $V_{CC} = \pm 9 \text{ V}$ )
- Receiver Output TTL Compatible
- Response Control Provides:
  - Input Threshold Shifting
  - Input Noise Filtering



## description

The SN751701 line driver and receiver is designed to satisfy the requirements of the standard interface between data terminal equipment and data communication equipment as defined by ANSI TIA/EIA-232-E. The driver used is similar to the SN75188. The receiver used is similar to the SN75189A. The device operates over a wide range of supply voltages ( $V_{CC} = \pm 4.5 \text{ V to } \pm 15 \text{ V}$ ) from the included reference regulator.

## logic diagram



Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

**TEXAS  
INSTRUMENTS**

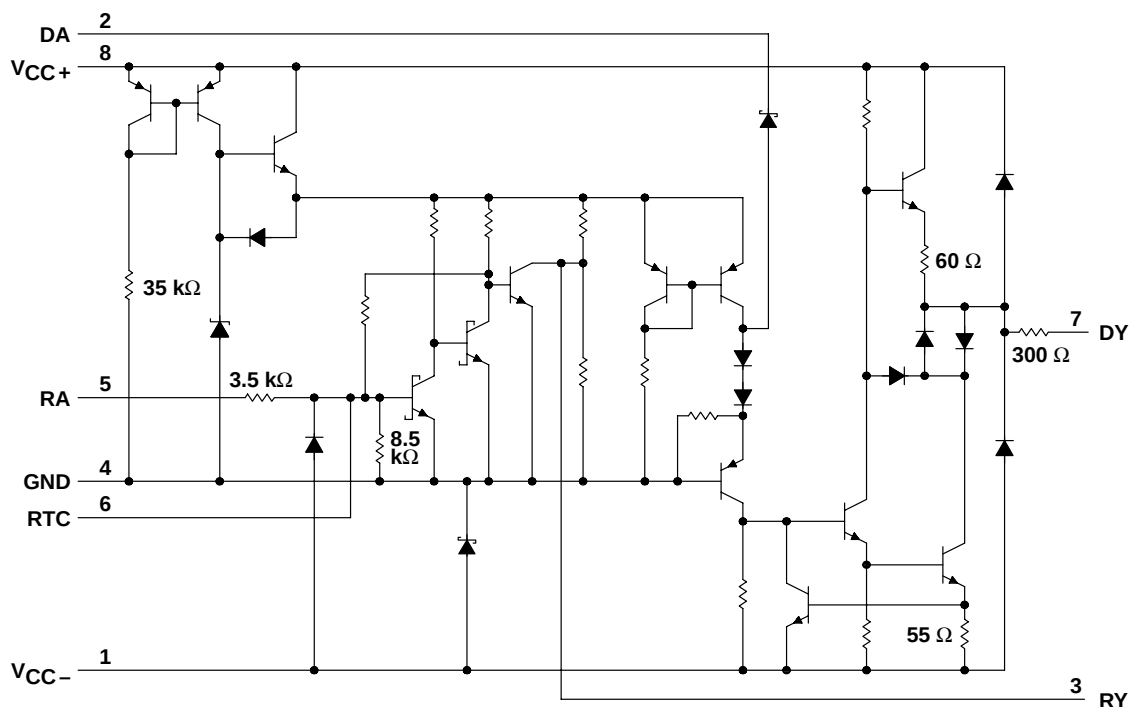
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# SN751701 LINE DRIVER AND RECEIVER

SLLS531 – MARCH 2002

## schematic



## absolute maximum ratings over operating free-air temperature range (unless otherwise noted)<sup>†</sup>

|                                                                  |                              |
|------------------------------------------------------------------|------------------------------|
| Supply voltage range, $V_{CC+}$ (see Note 1)                     | –0.4 V to 18 V               |
| Supply voltage range, $V_{CC-}$ (see Note 1)                     | 0.4 V to –18 V               |
| Input voltage range, $V_I$ : Driver                              | –5 V to 18 V                 |
| Receiver                                                         | –30 V to 30 V                |
| Output voltage range, $V_O$ : Driver                             | –25 V to 25 V                |
| Receiver                                                         | –0.4 V to 7 V                |
| Output current, $I_O$ (D) Driver                                 | 50 mA                        |
| Response control current range, $I_{RES}$                        | –10 mA to 10 mA              |
| Continuous total power dissipation                               | See Dissipation Rating Table |
| Package thermal impedance, $\theta_{JA}$ (see Note 2): P package | 85°C/W                       |
| PS package                                                       | 95°C/W                       |
| Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds     | 260°C                        |
| Storage temperature range, $T_{stg}$                             | –65°C to 150°C               |

<sup>†</sup> Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

NOTES: 1. All voltage values are with respect to the network ground terminal.  
2. The package thermal impedance is calculated in accordance with JESD 51-7.

**recommended operating conditions**

|            |                                | MIN        | MAX | UNIT |
|------------|--------------------------------|------------|-----|------|
| $V_{CC+}$  | Supply voltage                 | 4.5        | 15  | V    |
| $V_{CC-}$  | Supply voltage                 | -4.5       | -15 | V    |
| $V_{I(D)}$ | Input voltage, driver          |            | 15  | V    |
| $V_{I(R)}$ | Input voltage, receiver        | -25        | 25  | V    |
| $I_{RESP}$ | Response control current       | -5.5       | 5.5 | mA   |
| $I_{O(R)}$ | Output current, receiver       |            | 24  | mA   |
| $T_A$      | Operating free-air temperature | P package  | -20 | 85   |
|            |                                | PS package | -20 | 70   |
|            |                                |            |     | °C   |

**electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)**

**total device**

| PARAMETER                            | TEST CONDITIONS            |                                                                                            | MIN | TYP <sup>†</sup> | MAX   | UNIT |
|--------------------------------------|----------------------------|--------------------------------------------------------------------------------------------|-----|------------------|-------|------|
| $I_{CCH+}$ High-level supply current | $V_{CC} = \pm 5\text{ V}$  | $V_{I(D)} = 2\text{ V},$<br>$V_{I(R)} = V_{T+(max)},$<br>Output open                       |     | 6.3              | 8.1   | mA   |
|                                      | $V_{CC} = \pm 9\text{ V}$  |                                                                                            |     | 9.1              | 11.9  |      |
|                                      | $V_{CC} = \pm 12\text{ V}$ |                                                                                            |     | 10.4             | 14    |      |
| $I_{CCL+}$ Low-level supply current  | $V_{CC} = \pm 5\text{ V}$  | $V_{I(D)} = 0.8\text{ V},$<br>$V_{I(R)} = V_{T-(min)},$<br>Output open                     |     | 2.5              | 3.4   | mA   |
|                                      | $V_{CC} = \pm 9\text{ V}$  |                                                                                            |     | 3.7              | 5.1   |      |
|                                      | $V_{CC} = \pm 12\text{ V}$ |                                                                                            |     | 4.1              | 5.6   |      |
| $I_{CCH-}$ High-level supply current | $V_{CC} = \pm 5\text{ V}$  | $V_{I(D)} = 2\text{ V},$<br>$V_{I(R)} = V_{T+(max)},$<br>Output open                       |     | -2.4             | -3.1  | mA   |
|                                      | $V_{CC} = \pm 9\text{ V}$  |                                                                                            |     | -3.9             | -4.9  |      |
|                                      | $V_{CC} = \pm 12\text{ V}$ |                                                                                            |     | -4.8             | -6.1  |      |
| $I_{CCL-}$ Low-level supply current  | $V_{CC} = \pm 5\text{ V}$  | $V_{I(D)} = 0.8\text{ V},$<br>$V_{I(R)} = V_{T-(min)},$<br>Output open                     |     | -0.2             | -0.35 | mA   |
|                                      | $V_{CC} = \pm 9\text{ V}$  |                                                                                            |     | -0.25            | -0.4  |      |
|                                      | $V_{CC} = \pm 12\text{ V}$ |                                                                                            |     | -0.27            | -0.45 |      |
| $I_{CC+}$ Positive supply current    | $V_{CC} = \pm 5\text{ V}$  | $V_{I(R)} = V_{T+(max)}, V_{I(D)} = 0\text{ V},$<br>$V_{CC-} = 0\text{ V},$<br>Output open |     | 4.8              | 6.4   | mA   |
|                                      | $V_{CC} = \pm 12\text{ V}$ |                                                                                            |     | 6.7              | 9.1   |      |

<sup>†</sup> All typical values are at  $T_A = 25^\circ\text{C}$ .

# SN751701

## LINE DRIVER AND RECEIVER

SLLS531 – MARCH 2002

electrical characteristics over recommended operating free-air temperature range,  $V_{CC+} = 12\text{ V}$ ,  $V_{CC-} = -12\text{ V}$  (unless otherwise noted)

### driver section

| PARAMETER                                           | TEST CONDITIONS                                                   | MIN                        | TYP <sup>†</sup> | MAX   | UNIT          |
|-----------------------------------------------------|-------------------------------------------------------------------|----------------------------|------------------|-------|---------------|
| $V_{IH}$ High-level input voltage                   |                                                                   | 2                          |                  |       | V             |
| $V_{IL}$ Low-level input voltage                    |                                                                   |                            |                  | 0.8   | V             |
| $V_{OH}$ High-level output voltage                  | $V_{I(D)} = 0.8\text{ V}$ , $R_L = 3\text{ k}\Omega$              | $V_{CC} = \pm 5\text{ V}$  | 3.2              | 3.7   | V             |
|                                                     |                                                                   | $V_{CC} = \pm 9\text{ V}$  | 6.5              | 7.2   |               |
|                                                     |                                                                   | $V_{CC} = \pm 12\text{ V}$ | 8.9              | 9.8   |               |
| $V_{OL}$ Low-level output voltage                   | $V_{I(D)} = 2\text{ V}$ , $R_L = 3\text{ k}\Omega$                | $V_{CC} = \pm 5\text{ V}$  | -3.6             | -3.2  | V             |
|                                                     |                                                                   | $V_{CC} = \pm 9\text{ V}$  | -7.1             | -6.4  |               |
|                                                     |                                                                   | $V_{CC} = \pm 12\text{ V}$ | -9.7             | -8.8  |               |
| $I_{IH}$ High-level input current                   | $V_{I(D)} = 7\text{ V}$                                           |                            |                  | 5     | $\mu\text{A}$ |
| $I_{IL}$ Low-level input current                    | $V_{I(D)} = 0\text{ V}$                                           |                            | -0.73            | -1.2  | mA            |
| $I_{OS(H)}$ High-level short-circuit output current | $V_{I(D)} = 0.8\text{ V}$ , $V_{O(D)} = 0\text{ V}$               | -7                         | -12              | -14.5 | mA            |
| $I_{OS(L)}$ Low-level short-circuit output current  | $V_{I(D)} = 2\text{ V}$ , $V_{O(D)} = 0\text{ V}$                 | 6.5                        | 11.5             | 14    | mA            |
| $r_O$ Output resistance                             | $V_{CC+} = 0\text{ V}$ , $V_{O(D)} = -2\text{ V}$ to $2\text{ V}$ | 300                        |                  |       | $\Omega$      |

<sup>†</sup> All typical values are at  $T_A = 25^\circ\text{C}$ .

switching characteristics,  $V_{CC+} = 12\text{ V}$ ,  $V_{CC-} = -12\text{ V}$ ,  $T_A = 25^\circ\text{C}$  (unless otherwise noted)

### driver section (see Figure 2)

| PARAMETER                                                   | TEST CONDITIONS                                                                        | MIN | TYP | MAX | UNIT          |
|-------------------------------------------------------------|----------------------------------------------------------------------------------------|-----|-----|-----|---------------|
| $t_{PLH}$ Propagation delay time, low- to high-level output | $R_L = 3\text{ k}\Omega$ , $C_L = 50\text{ pF}$                                        |     | 340 | 480 | ns            |
| $t_{PHL}$ Propagation delay time, high- to low-level output |                                                                                        |     | 100 | 150 |               |
| $t_{TLH}$ Transition time, low- to high-level output        | $R_L = 3\text{ k}\Omega$ , $C_L = 50\text{ pF}$                                        |     | 120 | 180 | ns            |
| $t_{THL}$ Transition time, high- to low-level output        |                                                                                        |     | 105 | 160 |               |
| $t_{TLH}$ Transition time, low- to high-level output        | $R_L = 3\text{ k}\Omega$ to $7\text{ k}\Omega$ (see Note 3),<br>$C_L = 2500\text{ pF}$ |     | 2.1 | 3   | $\mu\text{s}$ |
| $t_{THL}$ Transition time, high- to low-level output        |                                                                                        |     | 2.1 | 3   |               |

NOTE 3: The time is measured between 3 V and -3 V on output waveform.

**electrical characteristics over recommended operating free-air temperature range,  $V_{CC+} = 12\text{ V}$ ,  $V_{CC-} = -12\text{ V}$  (unless otherwise noted)**

**receiver section (see Figure 1) (see Note 4)**

| PARAMETER                                            | TEST CONDITIONS                                              | MIN                     | TYP <sup>†</sup> | MAX  | UNIT |
|------------------------------------------------------|--------------------------------------------------------------|-------------------------|------------------|------|------|
| $V_{IT+}$ Positive-going input threshold voltage     |                                                              | 1.2                     | 1.9              | 2.3  | V    |
| $V_{IT-}$ Negative-going input threshold voltage     |                                                              | 0.6                     | 0.95             | 1.2  | V    |
| $V_{hys}$ Hysteresis voltage ( $V_{IT+} - V_{IT-}$ ) |                                                              | 0.6                     |                  |      | V    |
| $V_{O(H)}$ High-level output voltage                 | $V_{I(R)} = V_{T-(min)}$ , $I_{OL} = -10\text{ }\mu\text{A}$ | $V_{CC+} = 5\text{ V}$  | 3.7              | 4.1  | 4.5  |
|                                                      |                                                              | $V_{CC+} = 12\text{ V}$ | 4.4              | 4.7  | 5.2  |
|                                                      | $V_{I(R)} = V_{T-(min)}$ , $I_{OH} = -0.4\text{ mA}$         | $V_{CC+} = 5\text{ V}$  | 3.1              | 3.4  | 3.8  |
|                                                      |                                                              | $V_{CC+} = 12\text{ V}$ | 3.6              | 4    | 4.5  |
| $V_{O(L)}$ Low-level output voltage                  | $V_{I(R)} = V_{T+(max)}$ , $I_{OL} = 24\text{ mA}$           |                         | 0.2              | 0.3  | V    |
| $I_{IH}$ High-level input current                    | $V_{I(R)} = 25\text{ V}$                                     | 3.6                     | 6.7              | 8.3  | mA   |
|                                                      | $V_{I(R)} = 3\text{ V}$                                      | 0.43                    | 0.67             | 1    | mA   |
| $I_{IL}$ Low-level input current                     | $V_{I(R)} = -25\text{ V}$                                    | -3.6                    | -6.7             | -8.3 | mA   |
|                                                      | $V_{I(R)} = -3\text{ V}$                                     | -0.43                   | -0.74            | -1   | mA   |
| $I_{OS}$ Short-circuit output current                | $V_{I(R)} = V_{T-(min)}$                                     |                         | -2.8             | -3.7 | mA   |

<sup>†</sup> All typical values are at  $T_A = 25^\circ\text{C}$ .

NOTE 4: Response Control pin is open.

**switching characteristics,  $V_{CC+} = 12\text{ V}$ ,  $V_{CC-} = -12\text{ V}$ ,  $T_A = 25^\circ\text{C}$  (unless otherwise noted)**

**receiver section (see Figure 2)**

| PARAMETER                                                   | TEST CONDITIONS                                   | MIN | TYP | MAX | UNIT |
|-------------------------------------------------------------|---------------------------------------------------|-----|-----|-----|------|
| $t_{PLH}$ Propagation delay time, low- to high-level output | $R_L = 400\text{ k}\Omega$ , $C_L = 50\text{ pF}$ |     | 150 | 240 | ns   |
| $t_{PHL}$ Propagation delay time, high- to low-level output |                                                   |     | 50  | 100 |      |
| $t_{TLH}$ Transition time, low- to high-level output        | $R_L = 400\text{ k}\Omega$ , $C_L = 50\text{ pF}$ |     | 250 | 360 | ns   |
| $t_{THL}$ Transition time, high- to low-level output        |                                                   |     | 18  | 35  |      |

## PARAMETER MEASUREMENT INFORMATION

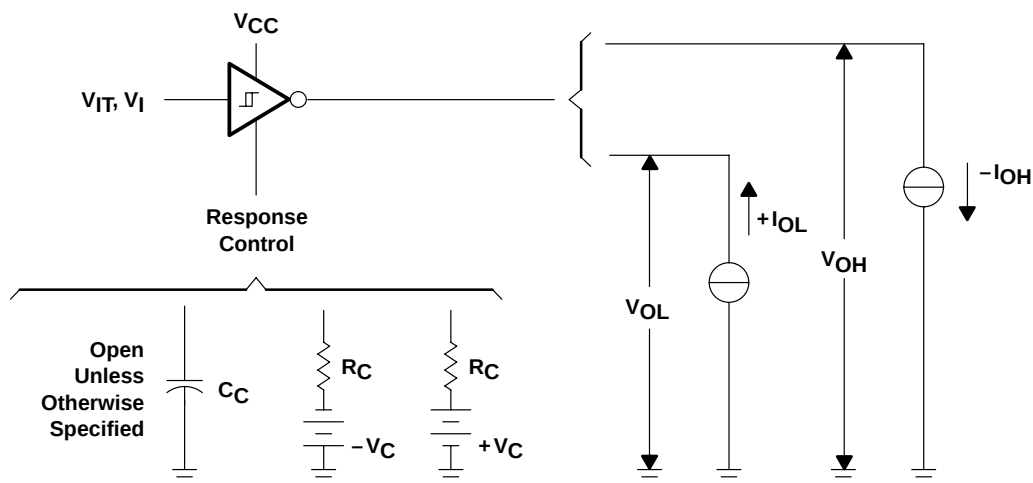
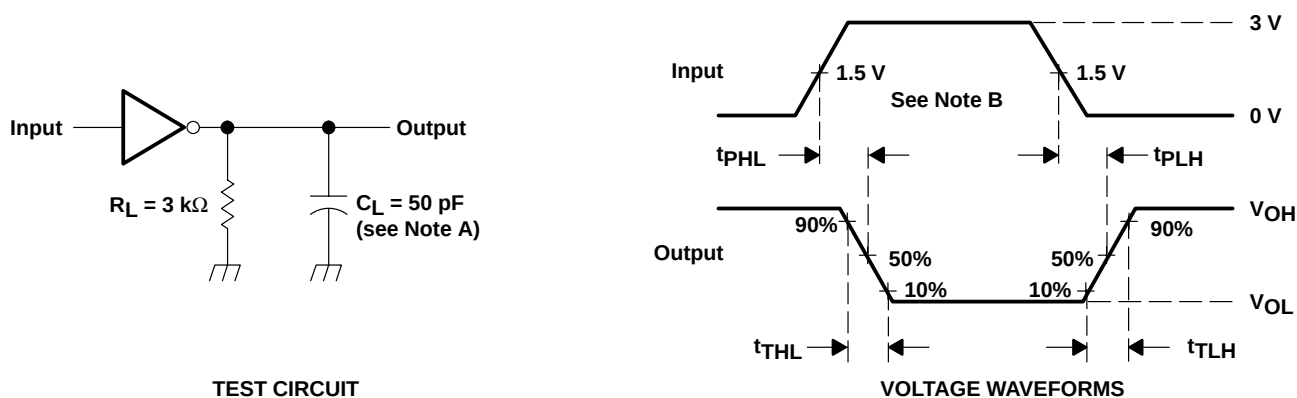


Figure 1. Receiver Section Test Circuit ( $V_{IT+}$ ,  $V_{IT-}$ ,  $V_{OH}$ ,  $V_{OL}$ )

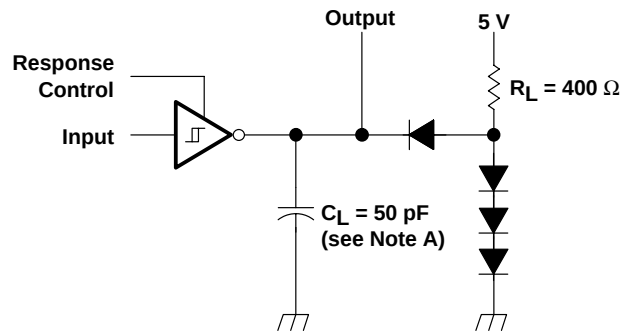


NOTES: A.  $C_L$  includes probe and jig capacitance.

B. The input waveform is supplied by a generator having the following characteristics:  $Z_O = 50 \Omega$ ,  $t_W = 500 \text{ ns}$ ,  $t_{TLH} \leq 5 \text{ ns}$ ,  $t_{THL} \leq 5 \text{ ns}$ .

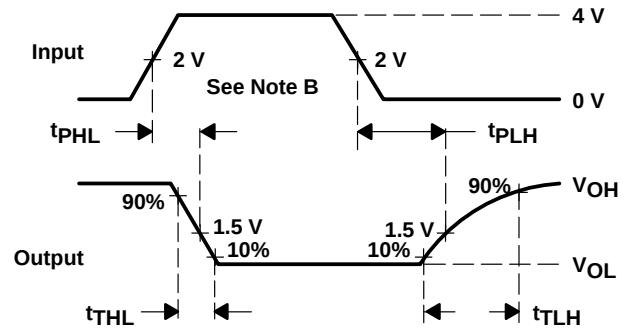
Figure 2. Driver Section Switching Test Circuit and Voltage Waveforms

## PARAMETER MEASUREMENT INFORMATION



TEST CIRCUIT

- NOTES: A.  $C_L$  includes probe and jig capacitance.  
B. The input waveform is supplied by a generator having the following characteristics:  $Z_O = 50 \Omega$ ,  $t_w = 500 \text{ ns}$ ,  $t_{THL} \leq 5 \text{ ns}$ ,  $t_{TLH} \leq 5 \text{ ns}$ .



VOLTAGE WAVEFORMS

Figure 3. Receiver Section Switching Test Circuit and Voltage Waveforms

TYPICAL CHARACTERISTICS

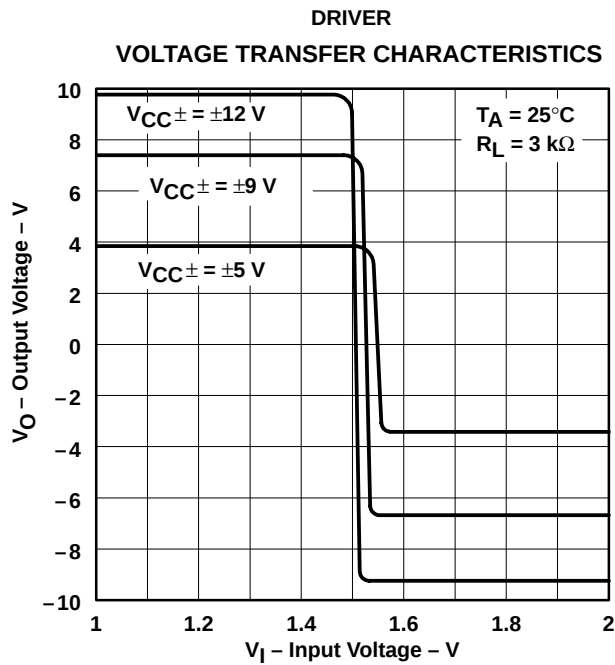


Figure 4

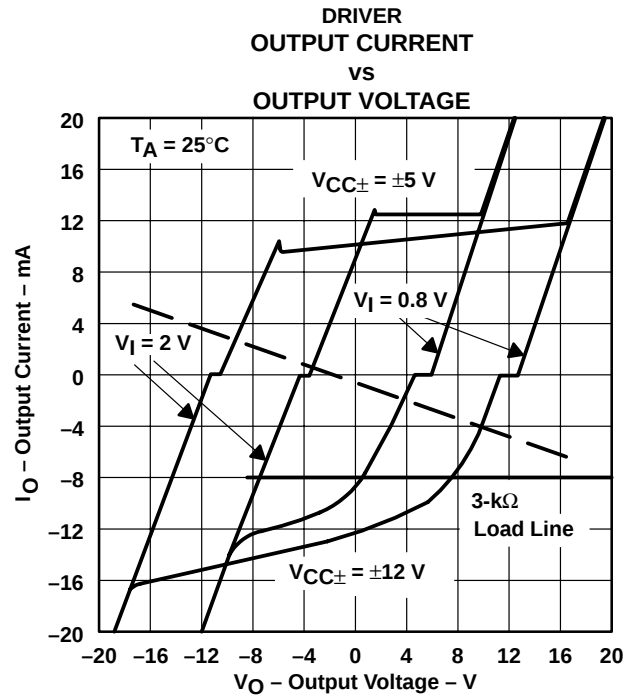


Figure 5

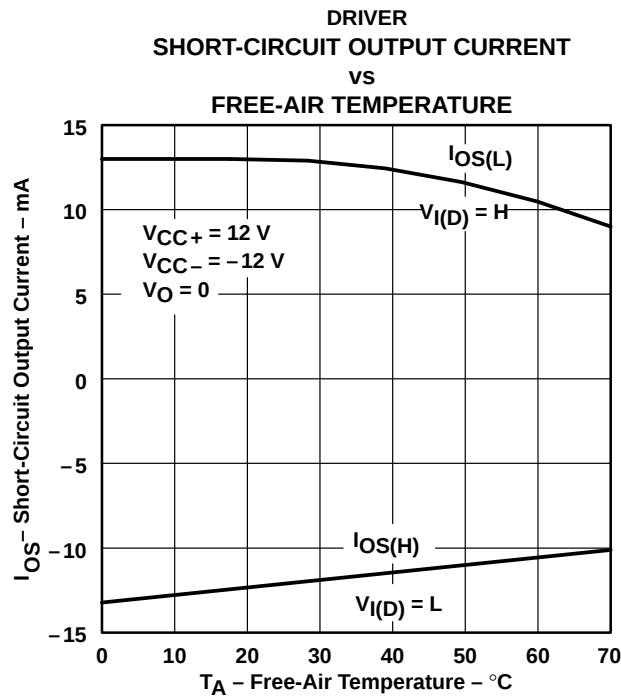


Figure 6

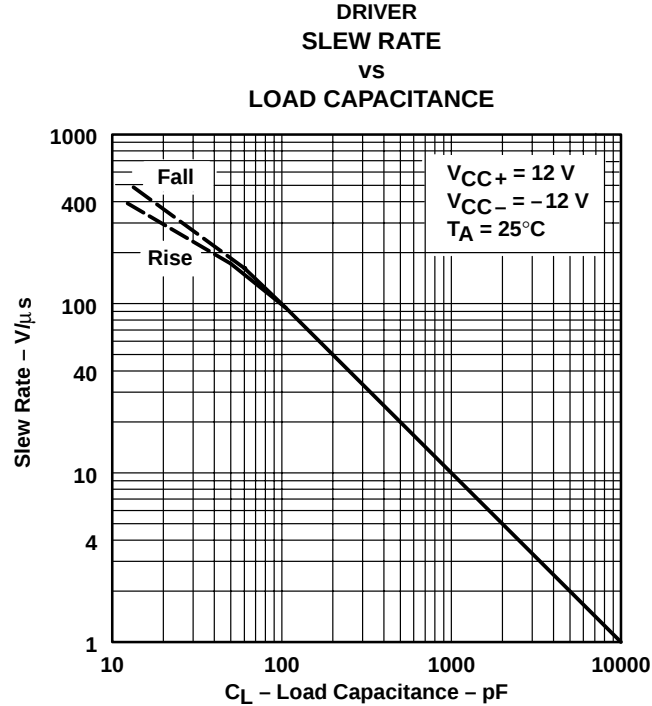


Figure 7

TYPICAL CHARACTERISTICS

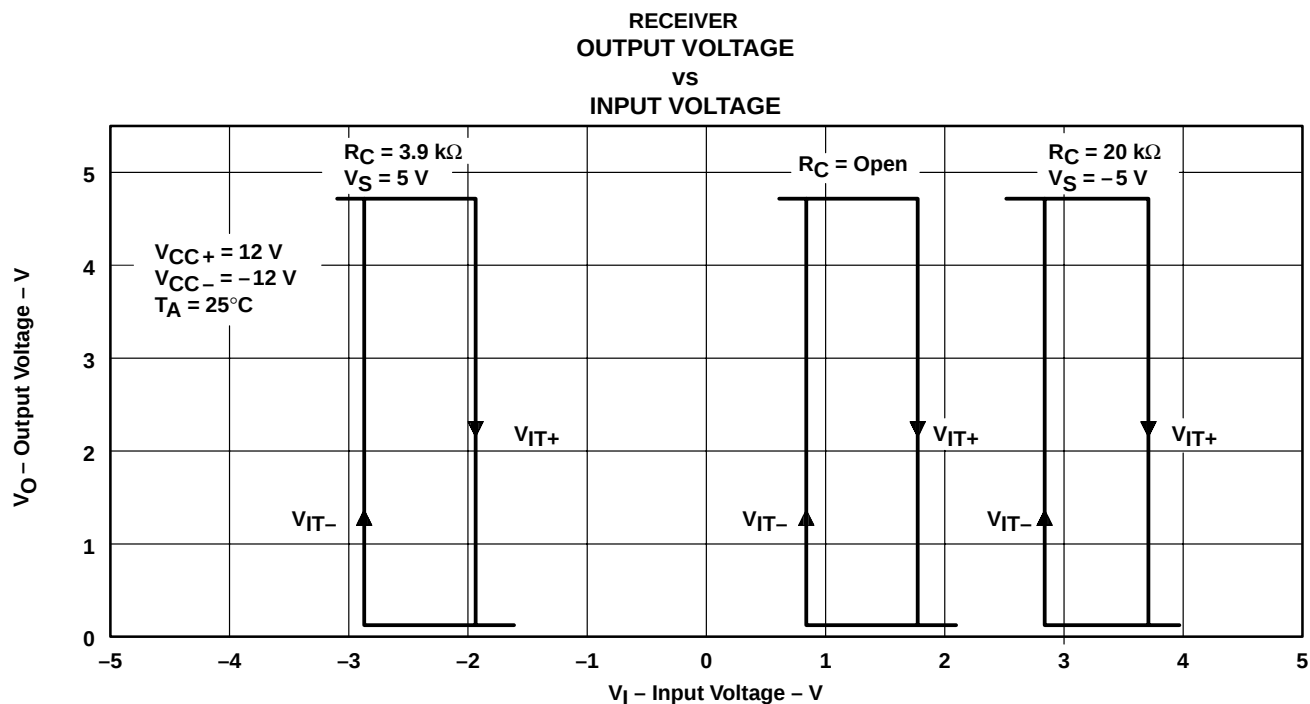


Figure 8

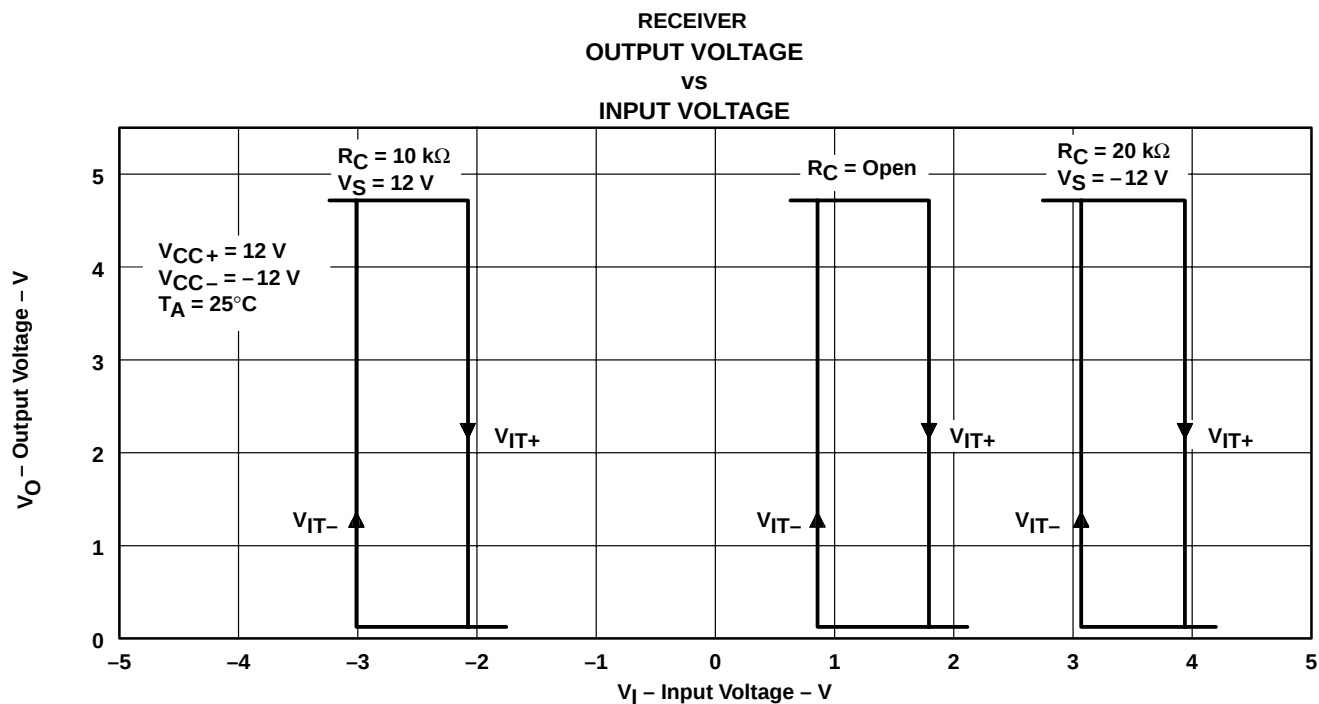


Figure 9

TYPICAL CHARACTERISTICS

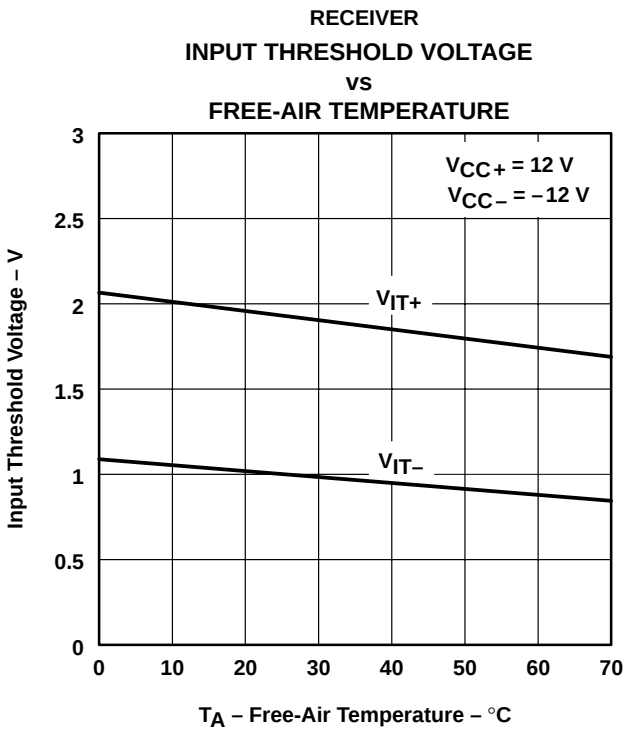


Figure 10

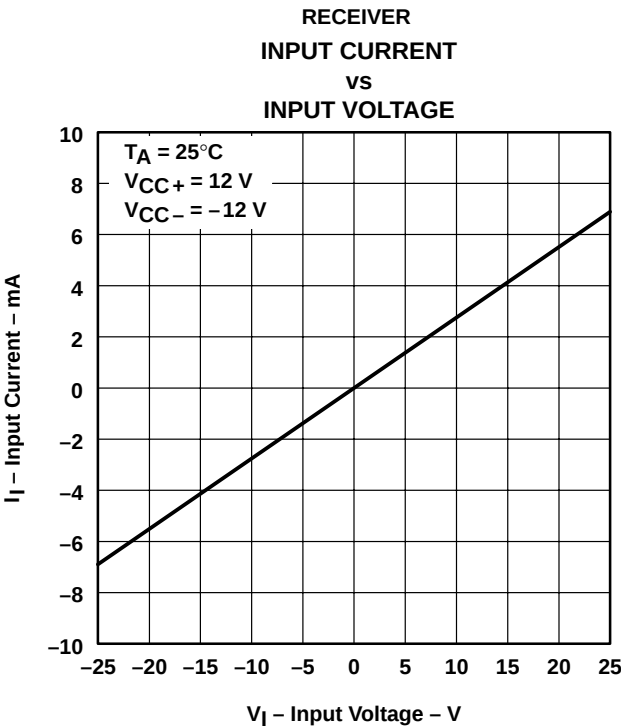


Figure 11

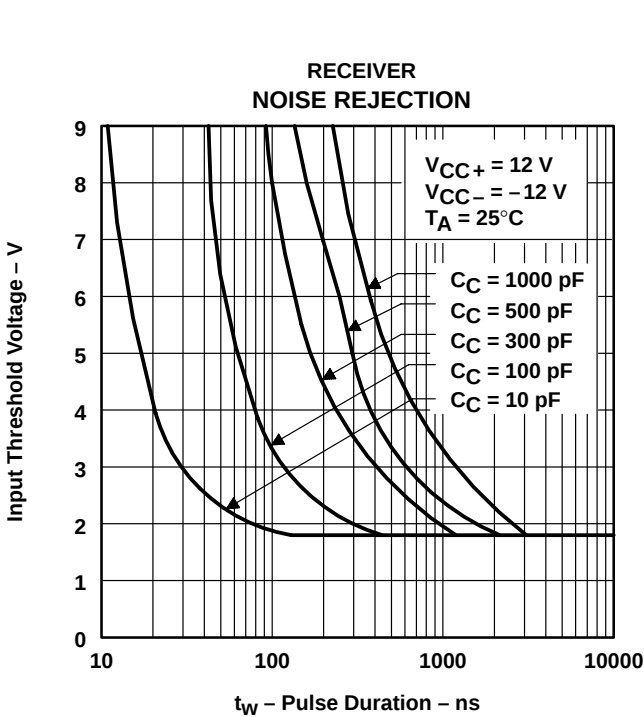


Figure 12

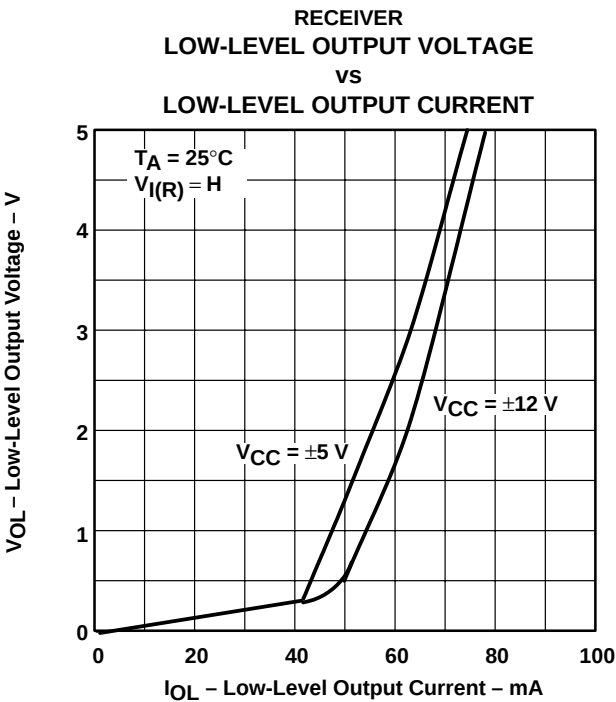


Figure 13

TYPICAL CHARACTERISTICS

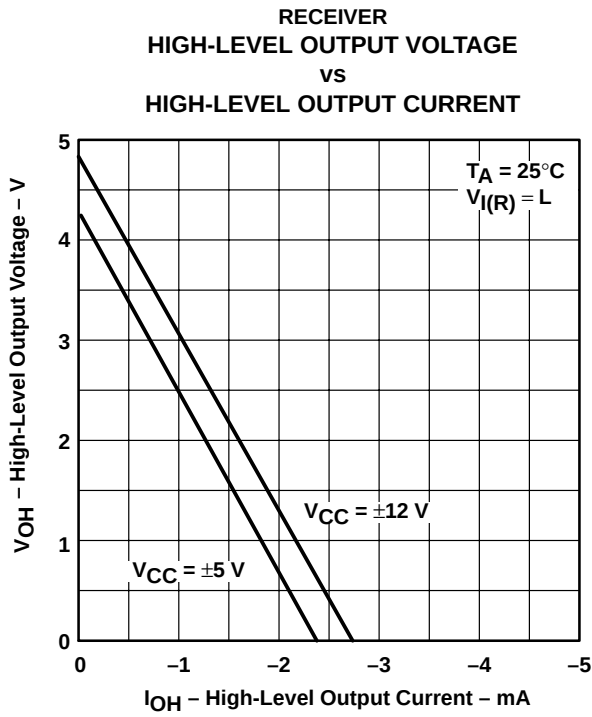


Figure 14

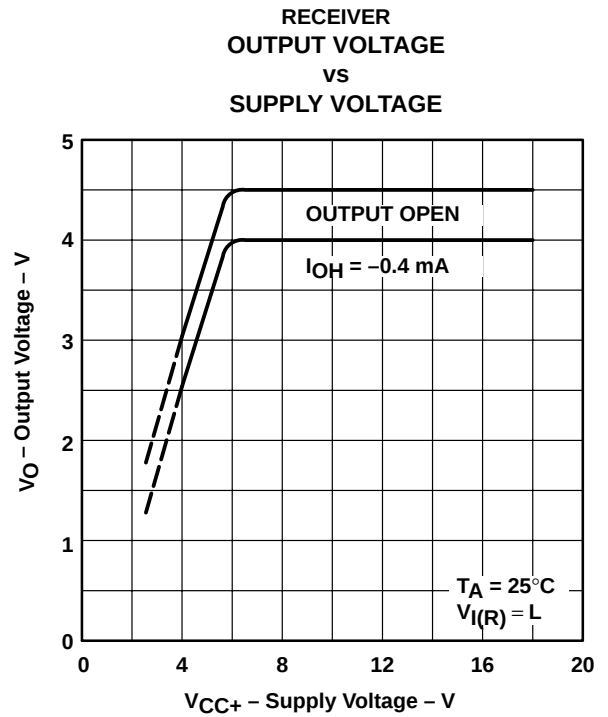


Figure 15

## PACKAGING INFORMATION

| Orderable Device | Status<br>(1) | Package Type | Package<br>Drawing | Pins | Package<br>Qty | Eco Plan<br>(2) | Lead finish/<br>Ball material<br>(6) | MSL Peak Temp<br>(3) | Op Temp (°C) | Device Marking<br>(4/5) | Samples                 |
|------------------|---------------|--------------|--------------------|------|----------------|-----------------|--------------------------------------|----------------------|--------------|-------------------------|-------------------------|
| SN751701PSR      | ACTIVE        | SO           | PS                 | 8    | 2000           | RoHS & Green    | NIPDAU                               | Level-1-260C-UNLIM   | -20 to 70    | A1701                   | <a href="#">Samples</a> |

(1) The marketing status values are defined as follows:

**ACTIVE:** Product device recommended for new designs.

**LIFEBUY:** TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

**NRND:** Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

**PREVIEW:** Device has been announced but is not in production. Samples may or may not be available.

**OBSOLETE:** TI has discontinued the production of the device.

(2) **RoHS:** TI defines "RoHS" to mean semiconductor products that are compliant with the current EU RoHS requirements for all 10 RoHS substances, including the requirement that RoHS substance do not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, "RoHS" products are suitable for use in specified lead-free processes. TI may reference these types of products as "Pb-Free".

**RoHS Exempt:** TI defines "RoHS Exempt" to mean products that contain lead but are compliant with EU RoHS pursuant to a specific EU RoHS exemption.

**Green:** TI defines "Green" to mean the content of Chlorine (Cl) and Bromine (Br) based flame retardants meet JS709B low halogen requirements of <=1000ppm threshold. Antimony trioxide based flame retardants must also meet the <=1000ppm threshold requirement.

(3) MSL, Peak Temp. - The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

(4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

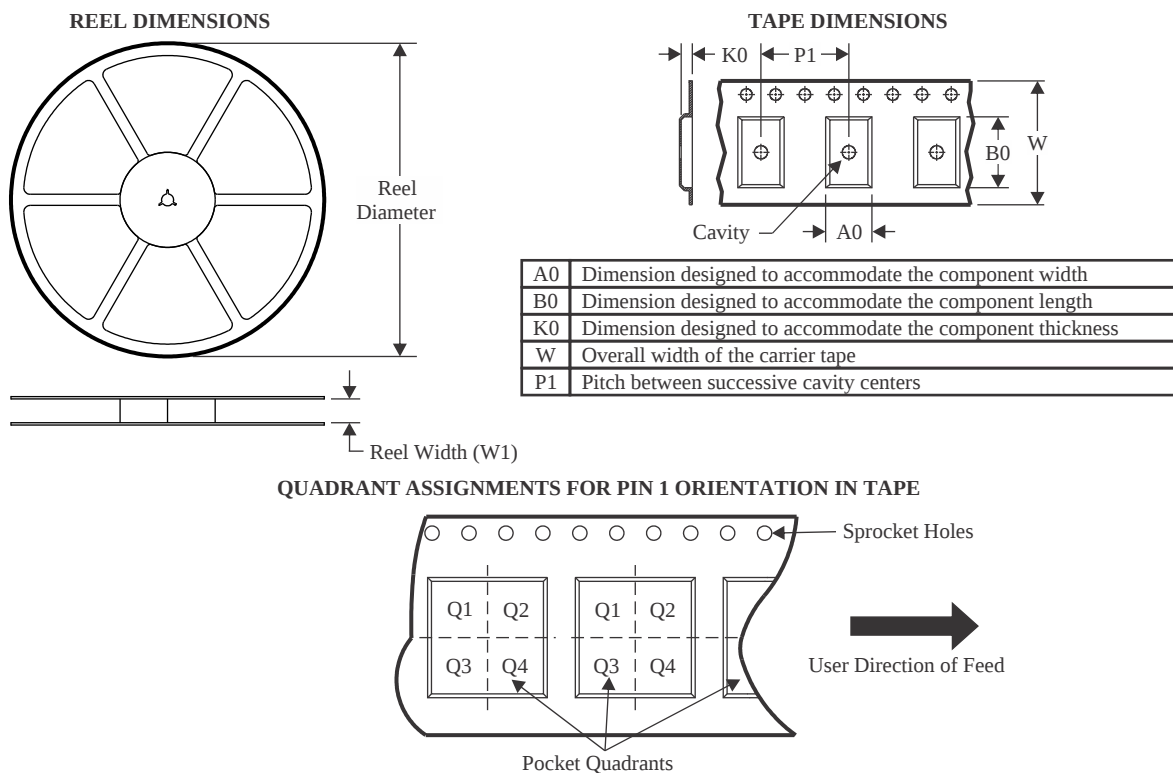
(5) Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "-" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

(6) Lead finish/Ball material - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

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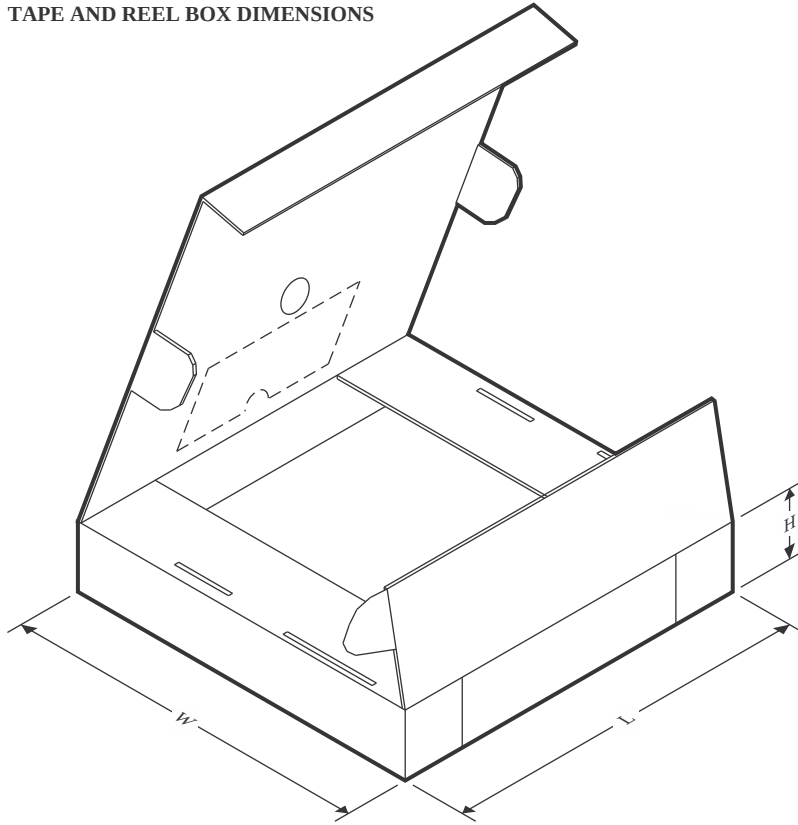
## TAPE AND REEL INFORMATION



\*All dimensions are nominal

| Device      | Package Type | Package Drawing | Pins | SPQ  | Reel Diameter (mm) | Reel Width W1 (mm) | A0 (mm) | B0 (mm) | K0 (mm) | P1 (mm) | W (mm) | Pin1 Quadrant |
|-------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| SN751701PSR | SO           | PS              | 8    | 2000 | 330.0              | 16.4               | 8.35    | 6.6     | 2.4     | 12.0    | 16.0   | Q1            |

## TAPE AND REEL BOX DIMENSIONS



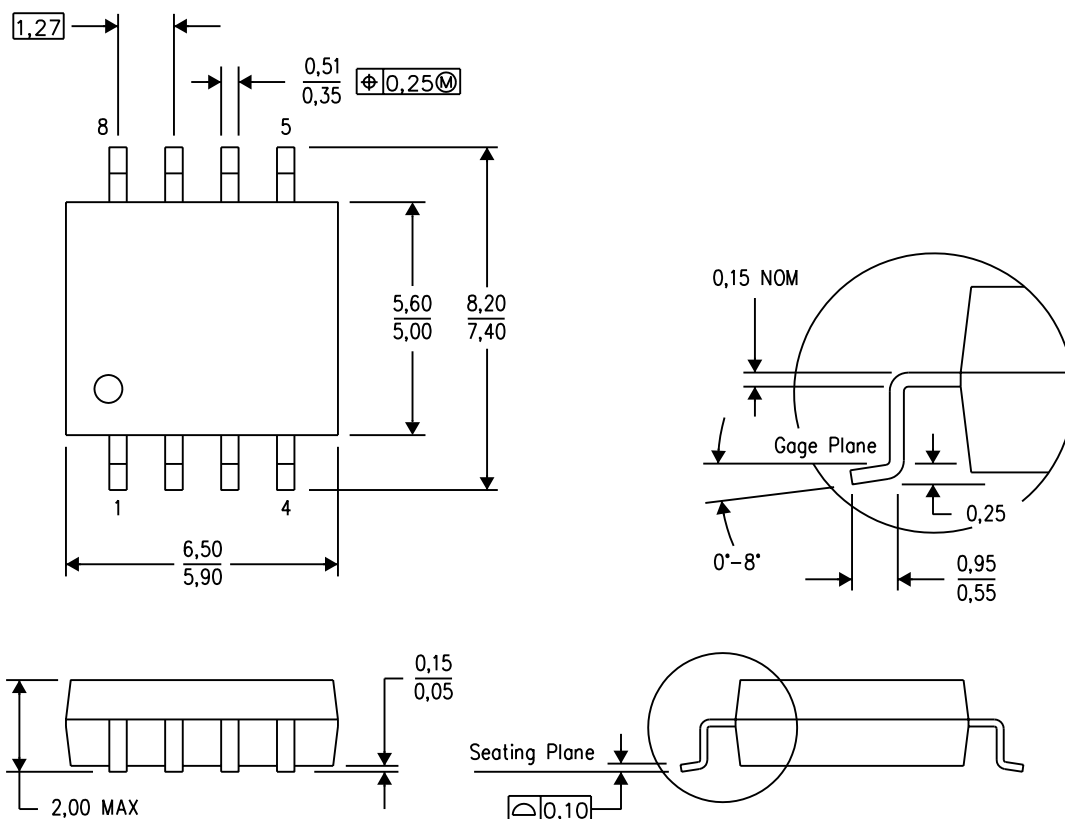
\*All dimensions are nominal

| Device      | Package Type | Package Drawing | Pins | SPQ  | Length (mm) | Width (mm) | Height (mm) |
|-------------|--------------|-----------------|------|------|-------------|------------|-------------|
| SN751701PSR | SO           | PS              | 8    | 2000 | 356.0       | 356.0      | 35.0        |

## MECHANICAL DATA

PS (R-PDSO-G8)

PLASTIC SMALL-OUTLINE PACKAGE

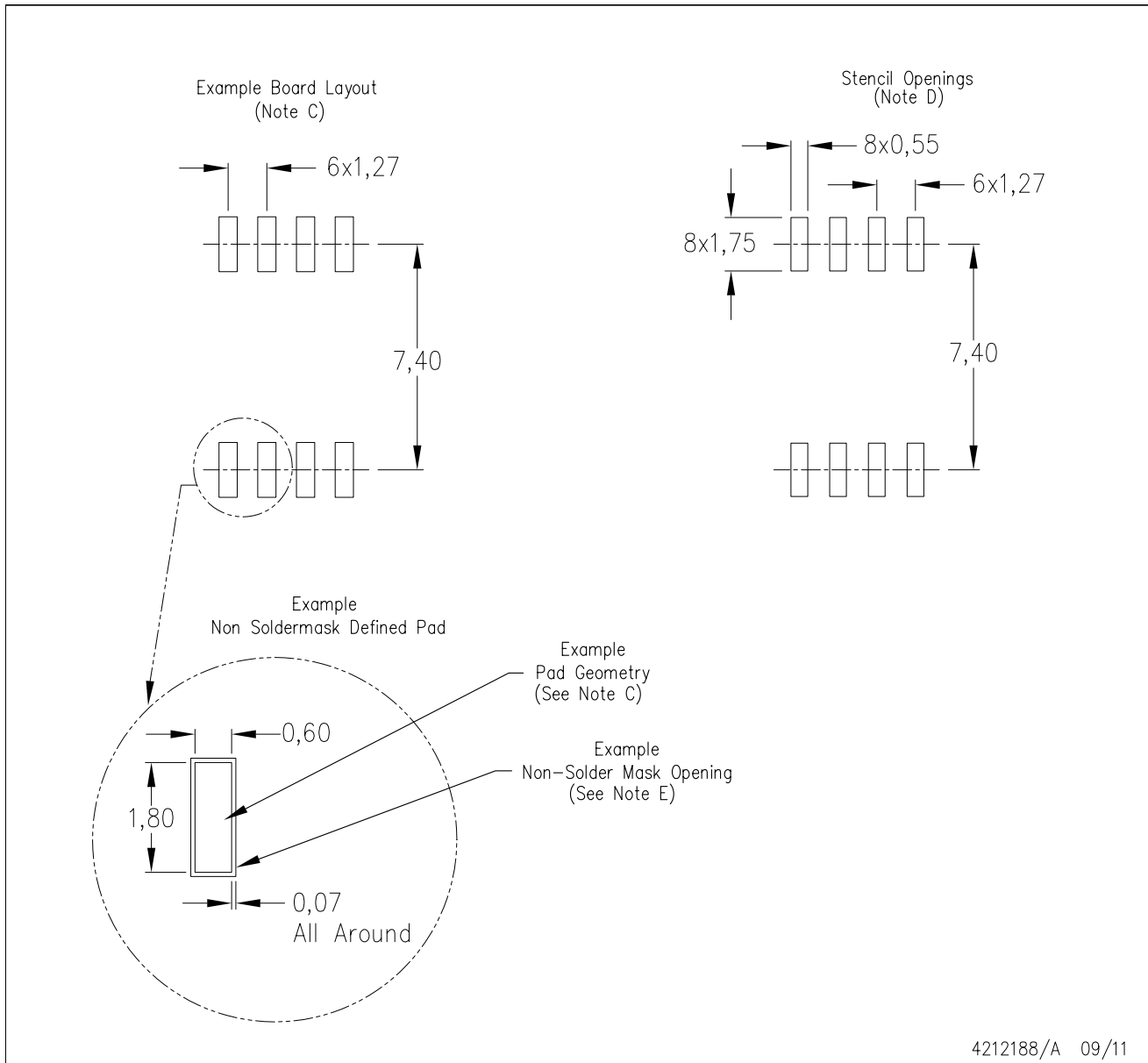


4040063/C 03/03

- NOTES:
- A. All linear dimensions are in millimeters.
  - B. This drawing is subject to change without notice.
  - C. Body dimensions do not include mold flash or protrusion, not to exceed 0,15.

## PS (R-PDSO-G8)

## PLASTIC SMALL OUTLINE



- NOTES:
- All linear dimensions are in millimeters.
  - This drawing is subject to change without notice.
  - Publication IPC-7351 is recommended for alternate designs.
  - Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC-7525 for other stencil recommendations.
  - Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.

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