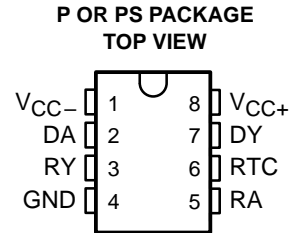


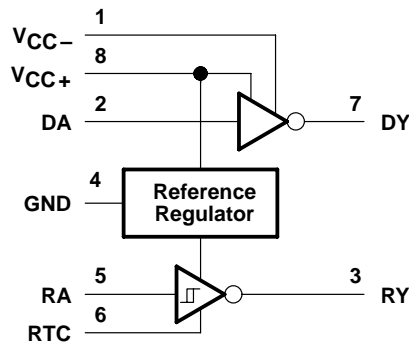
- Meets or Exceeds the Requirements of ANSI TIA/EIA-232-C
- Wide Range of Supply Voltage  
 $V_{CC} = \pm 4.5 \text{ V to } \pm 15 \text{ V}$
- Low Power . . . 117 mW ( $V_{CC} = \pm 9 \text{ V}$ )
- Receiver Output TTL Compatible
- Response Control Provides:
  - Input Threshold Shifting
  - Input Noise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

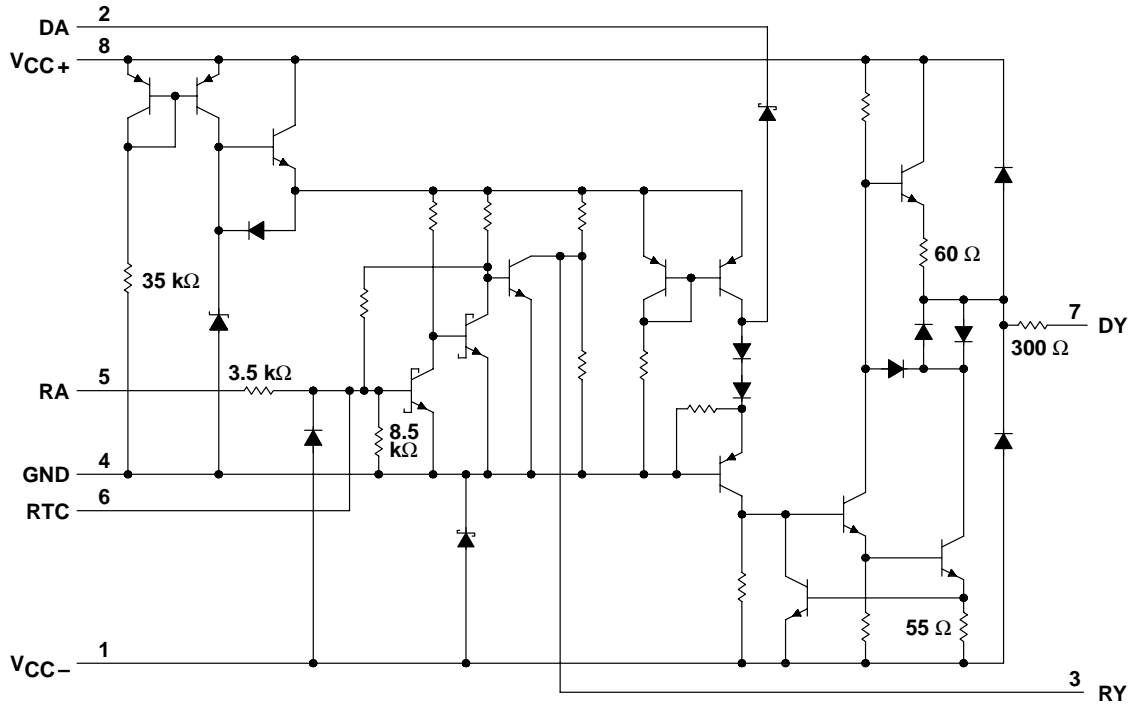


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# SN751701 LINE DRIVER AND RECEIVER

SLLS531 – MARCH 2002

## schematic



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

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

† 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 <sub>CC+</sub>	Supply voltage	4.5	15	V	
V <sub>CC-</sub>	Supply voltage	-4.5	-15	V	
V <sub>I(D)</sub>	Input voltage, driver		15	V	
V <sub>I(R)</sub>	Input voltage, receiver	-25	25	V	
I <sub>RESP</sub>	Response control current	-5.5	5.5	mA	
I <sub>O(R)</sub>	Output current, receiver		24	mA	
T <sub>A</sub>	Operating free-air temperature	P package	-20	85	°C
		PS package	-20	70	

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

**total device**

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

† All typical values are at T<sub>A</sub> = 25°C.

# SN751701 LINE DRIVER AND RECEIVER

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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†	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			$\Omega$

† 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), $C_L = 2500\text{ pF}$		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†	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	$V_{I(R)} = V_{T-(min)}$ , $I_{OL} = -10\ \mu\text{A}$	$V_{CC+} = 5\text{ V}$	3.7	4.1	4.5	V
			$V_{CC+} = 12\text{ V}$	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	

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

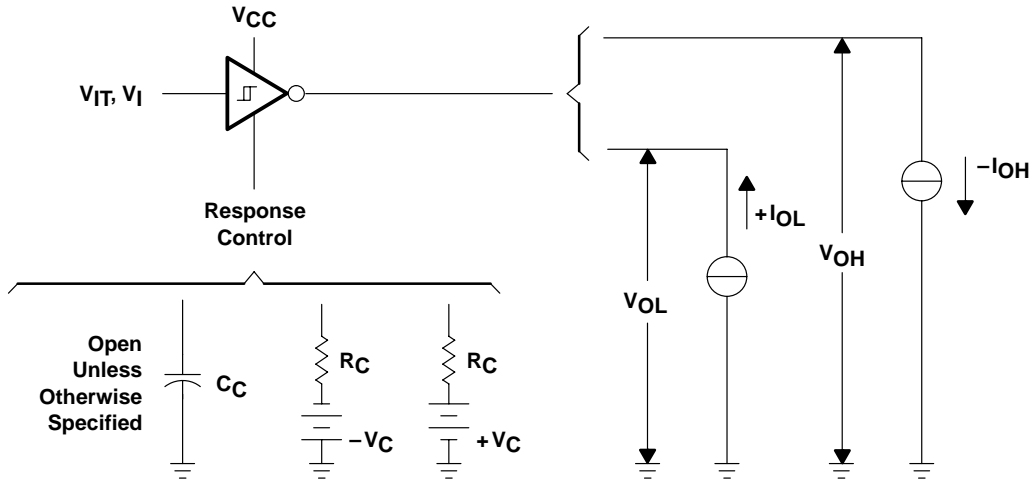
NOTE 4: Response Control pin is open.

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

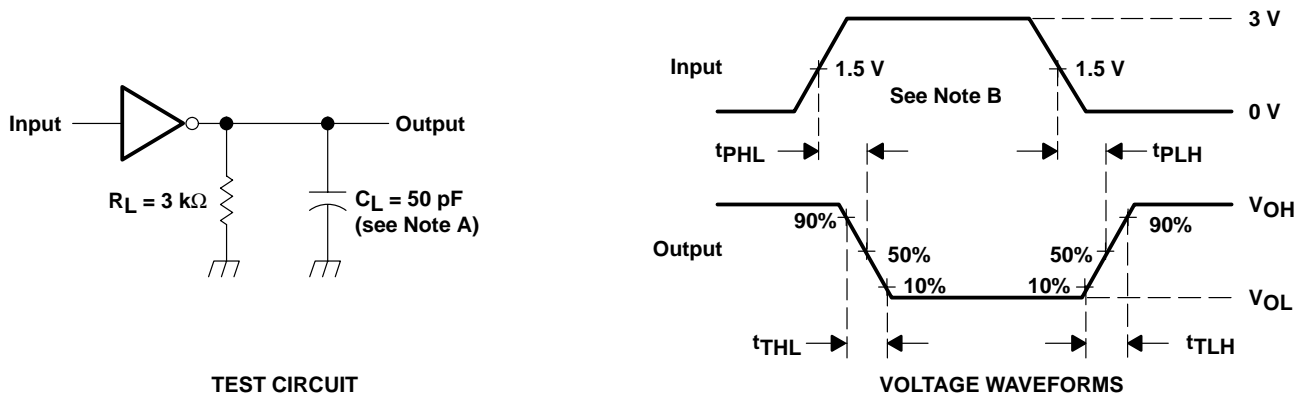
**receiver section (see Figure 2)**

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**



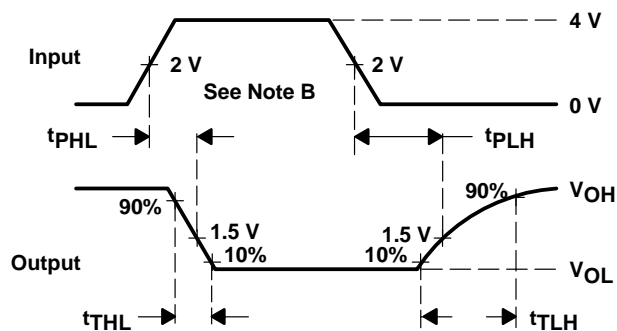
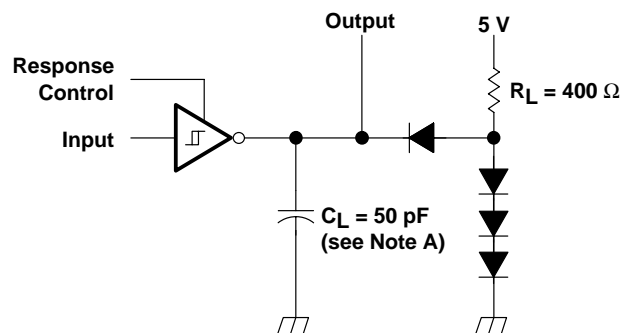
**Figure 1. Receiver Section Test Circuit ( $V_{IT+}$ ,  $V_{IT-}$ ,  $V_{OH}$ ,  $V_{OL}$ )**



- 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

VOLTAGE WAVEFORMS

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

Figure 3. Receiver Section Switching Test Circuit and Voltage Waveforms

TYPICAL CHARACTERISTICS

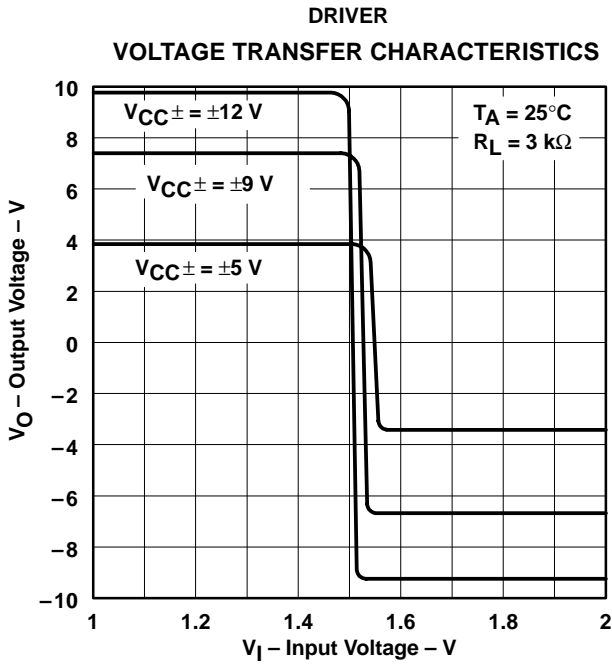


Figure 4

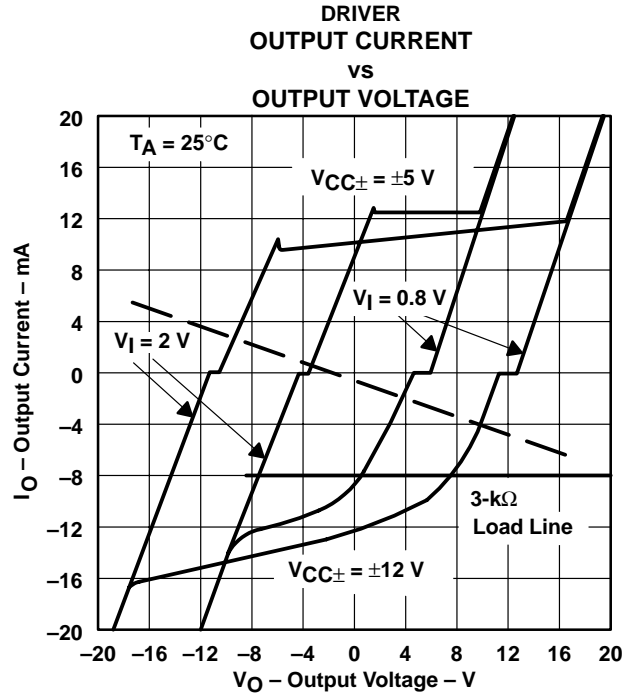


Figure 5

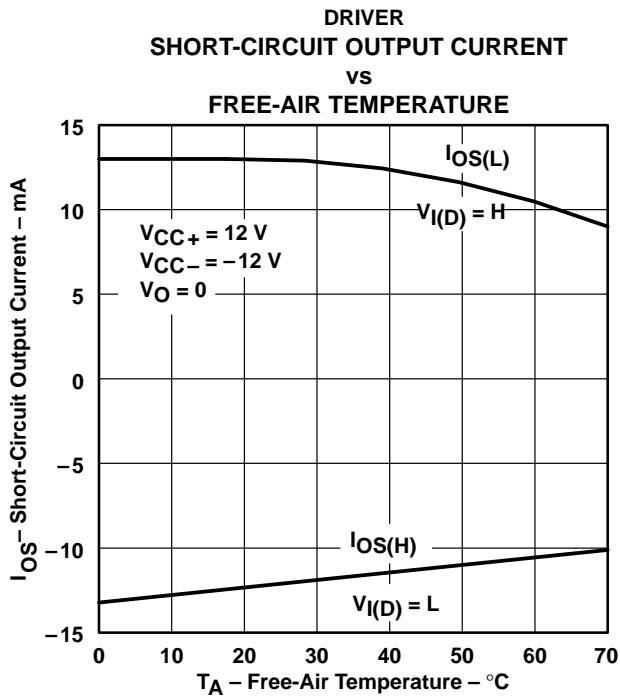


Figure 6

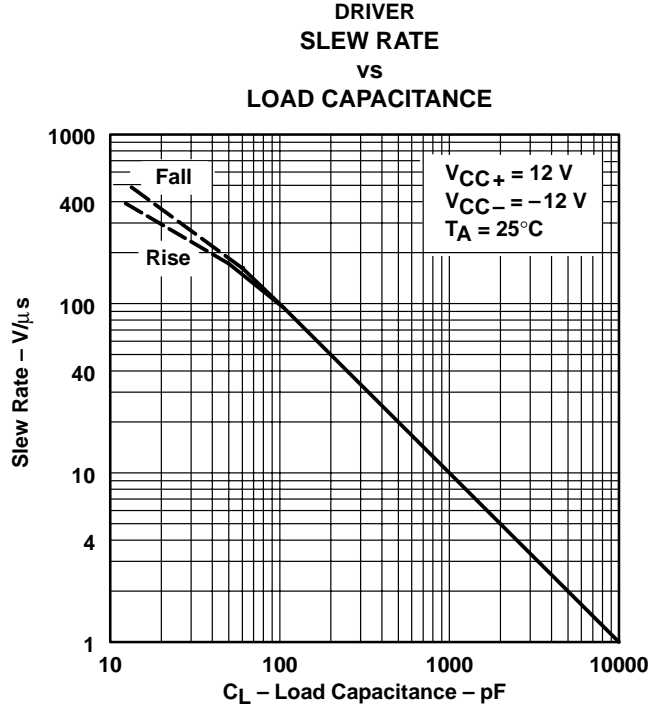
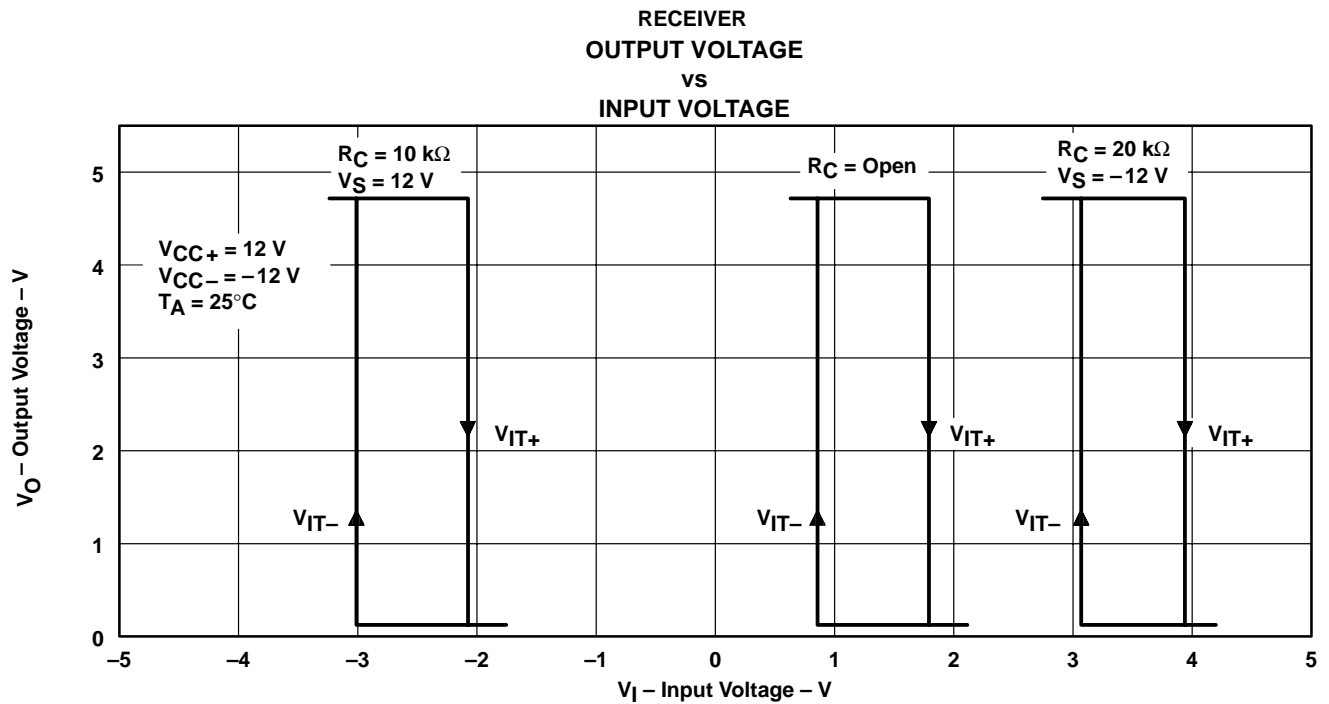
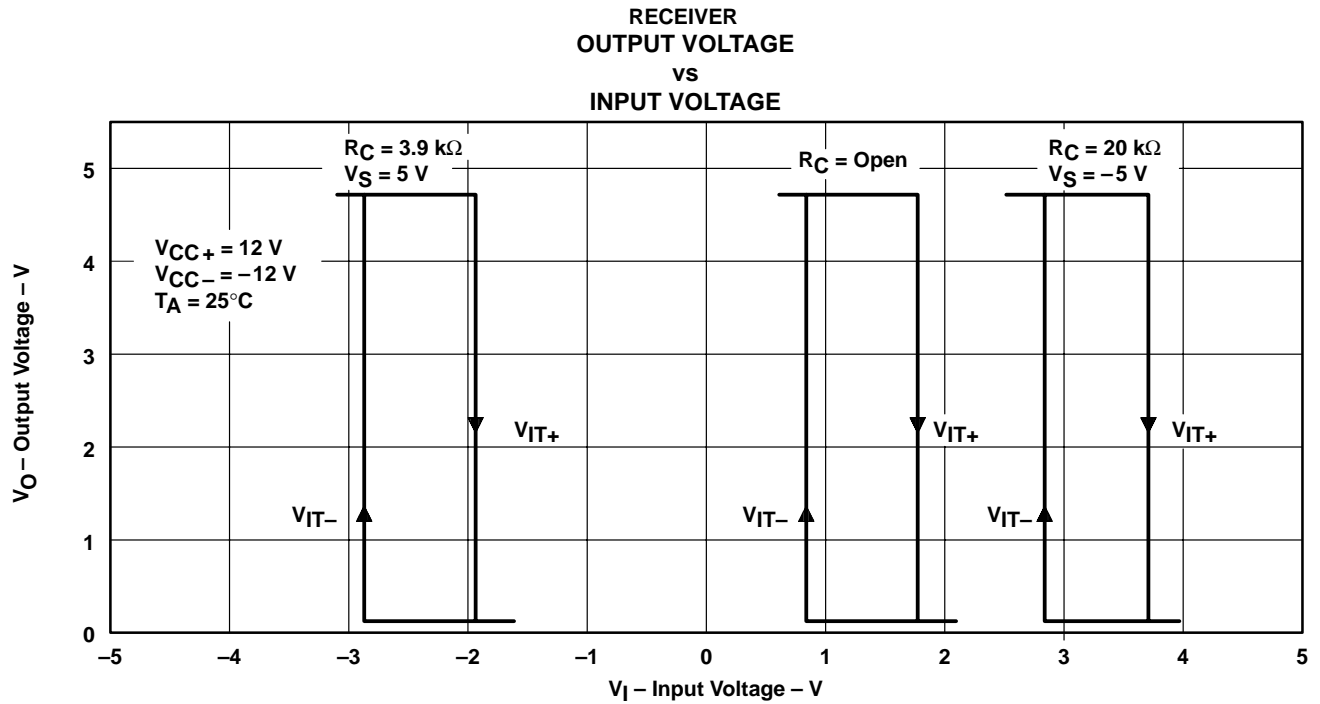


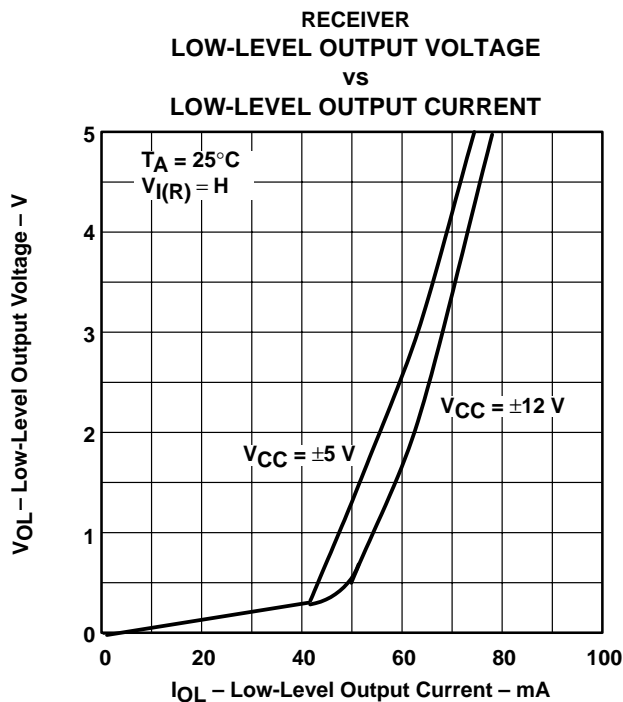
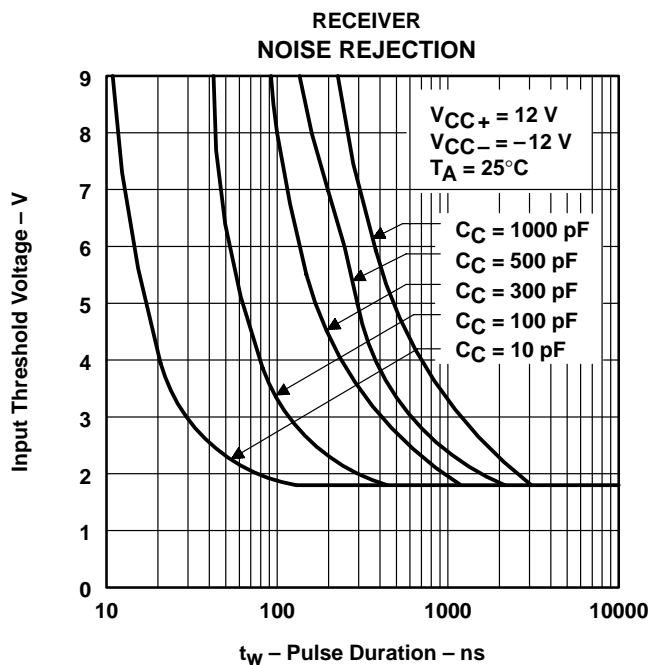
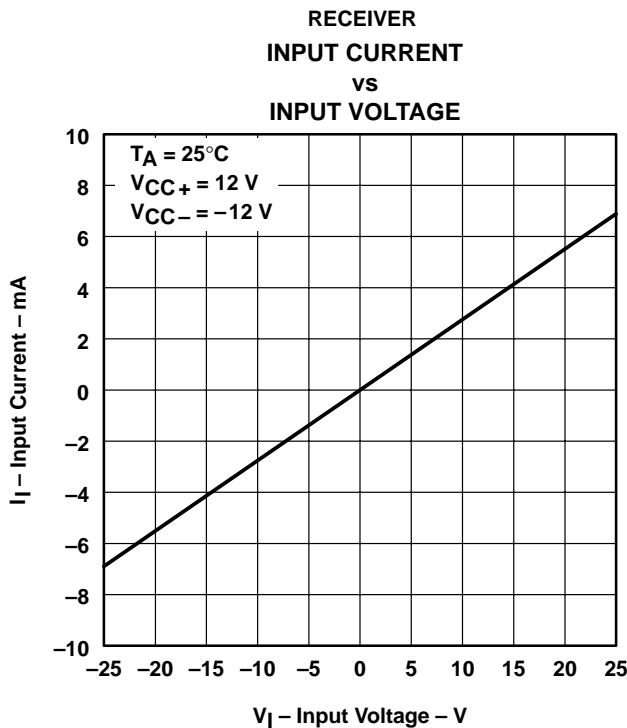
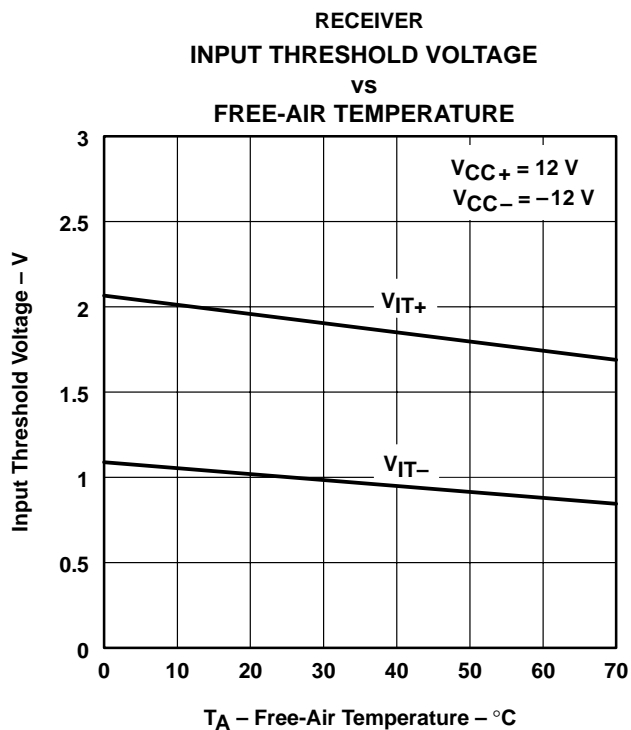
Figure 7



TYPICAL CHARACTERISTICS



**TYPICAL CHARACTERISTICS**



TYPICAL CHARACTERISTICS

RECEIVER  
HIGH-LEVEL OUTPUT VOLTAGE  
vs  
HIGH-LEVEL OUTPUT CURRENT

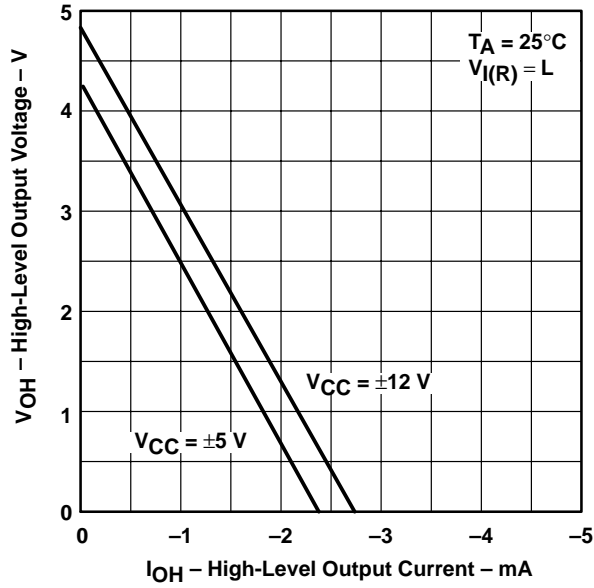


Figure 14

RECEIVER  
OUTPUT VOLTAGE  
vs  
SUPPLY VOLTAGE

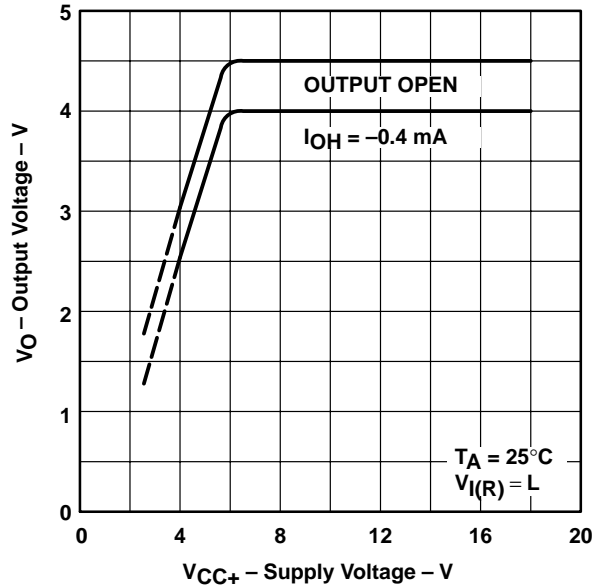


Figure 15

**PACKAGING INFORMATION**

Orderable Device	Status <sup>(1)</sup>	Package Type	Package Drawing	Pins	Package Qty	Eco Plan <sup>(2)</sup>	Lead/Ball Finish	MSL Peak Temp <sup>(3)</sup>
SN751701PSR	ACTIVE	SO	PS	8	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN751701PSRG4	ACTIVE	SO	PS	8	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM

<sup>(1)</sup> 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.

<sup>(2)</sup> Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS) or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

**TBD:** The Pb-Free/Green conversion plan has not been defined.

**Pb-Free (RoHS):** TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

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

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**TAPE AND REEL INFORMATION**



**QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE**



\*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	8.2	6.6	2.5	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	346.0	346.0	33.0

# MECHANICAL DATA

PS (R-PDSO-G8)

PLASTIC SMALL-OUTLINE PACKAGE



- 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.

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