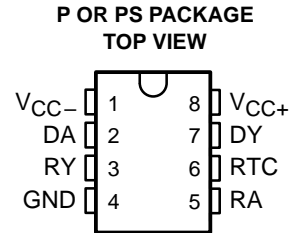


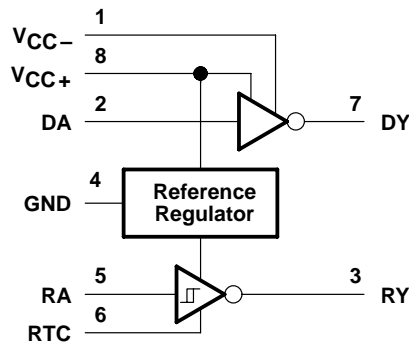
- Meets or Exceeds the Requirements of ANSI TIA/EIA-232-C
- Wide Range of Supply Voltage
 $V_{CC} = \pm 4.5 \text{ V to } \pm 15 \text{ V}$
- Low Power . . . 117 mW ($V_{CC} = \pm 9 \text{ V}$)
- Receiver Output TTL Compatible
- Response Control Provides:
 - Input Threshold Shifting
 - Input Noise Filtering



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

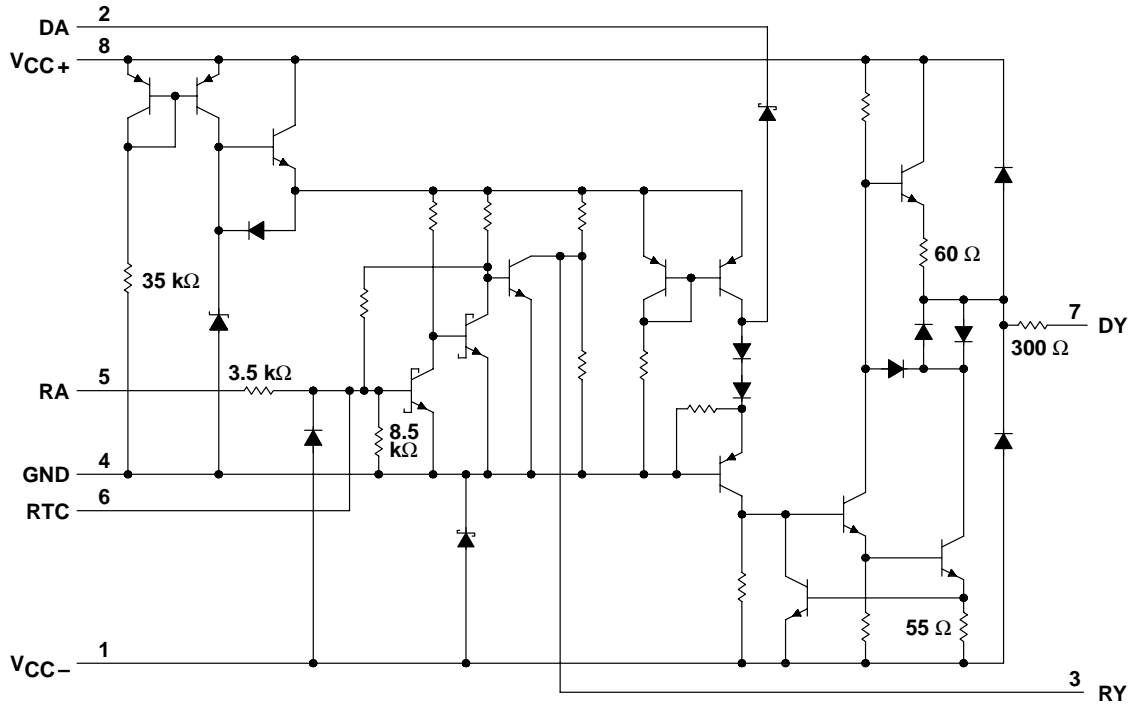


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SN751701 LINE DRIVER AND RECEIVER

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, θ_{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 _{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	°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 _{CCH+} High-level supply current	V _{CC} = ±5 V	V _{I(D)} = 2 V, V _{I(R)} = V _{T+(max)} , Output open		6.3	8.1	mA
	V _{CC} = ±9 V			9.1	11.9	
	V _{CC} = ±12 V			10.4	14	
I _{CCL+} Low-level supply current	V _{CC} = ±5 V	V _{I(D)} = 0.8 V, V _{I(R)} = V _{T-(min)} , Output open		2.5	3.4	mA
	V _{CC} = ±9 V			3.7	5.1	
	V _{CC} = ±12 V			4.1	5.6	
I _{CCH-} High-level supply current	V _{CC} = ±5 V	V _{I(D)} = 2 V, V _{I(R)} = V _{T+(max)} , Output open		-2.4	-3.1	mA
	V _{CC} = ±9 V			-3.9	-4.9	
	V _{CC} = ±12 V			-4.8	-6.1	
I _{CCL-} Low-level supply current	V _{CC} = ±5 V	V _{I(D)} = 0.8 V, V _{I(R)} = V _{T-(min)} , Output open		-0.2	-0.35	mA
	V _{CC} = ±9 V			-0.25	-0.4	
	V _{CC} = ±12 V			-0.27	-0.45	
I _{CC+} Positive supply current	V _{CC} = ±5 V	V _{I(R)} = V _{T+(max)} , V _{I(D)} = 0 V, V _{CC-} = 0 V, Output open		4.8	6.4	mA
	V _{CC} = ±12 V			6.7	9.1	

† All typical values are at T_A = 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	μA
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 V	300			Ω

† 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	μs
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

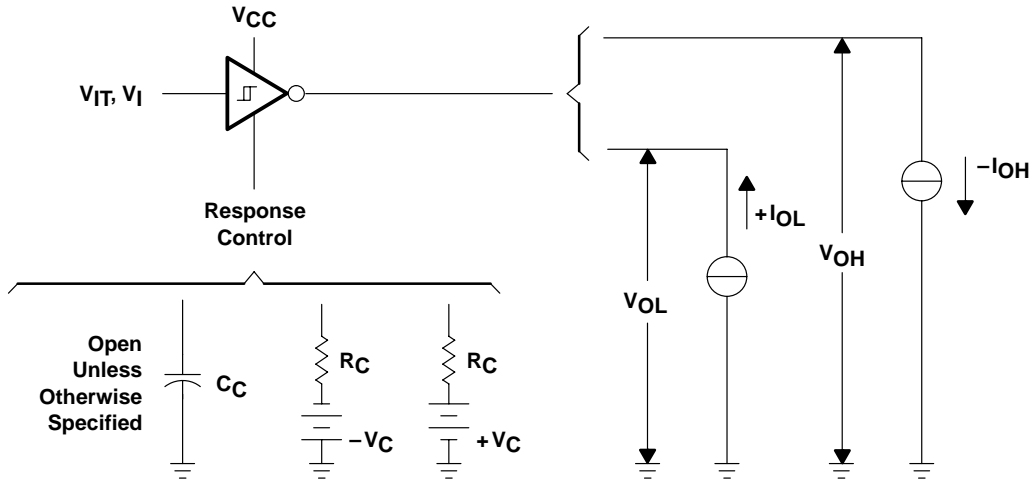
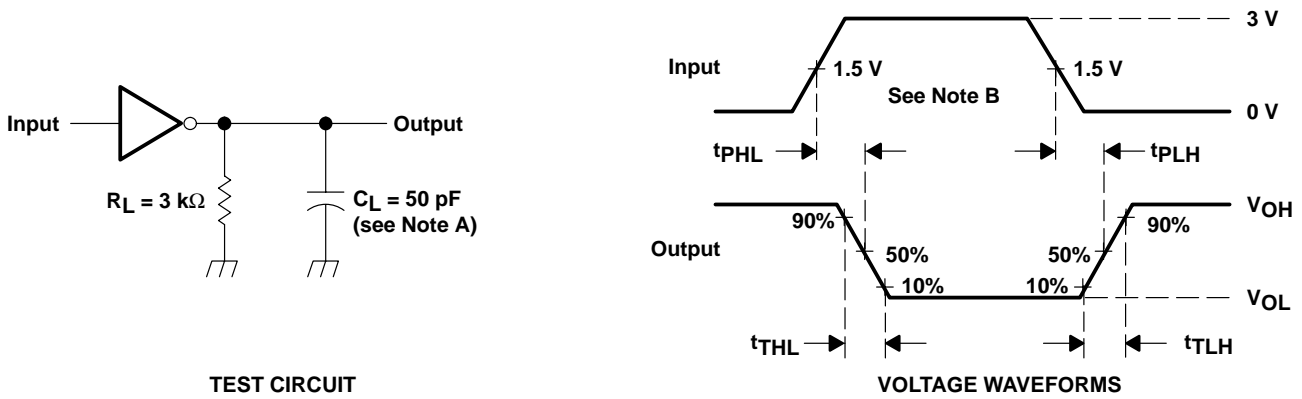


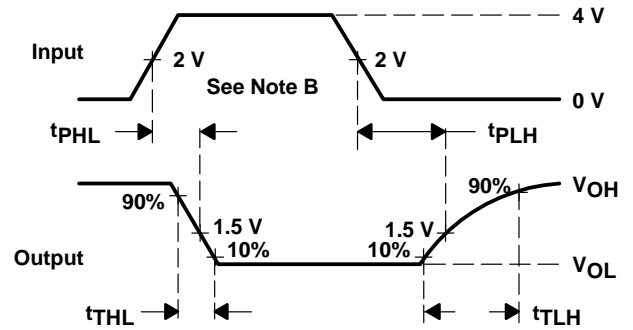
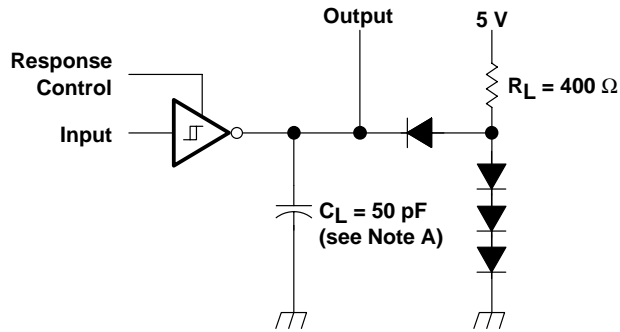
Figure 1. Receiver Section Test Circuit (V_{IT+} , V_{IT-} , V_{OH} , V_{OL})



- 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

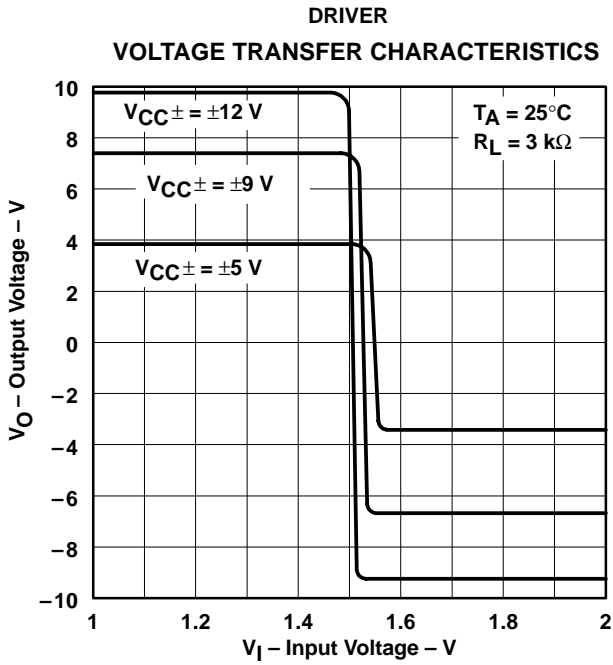


Figure 4

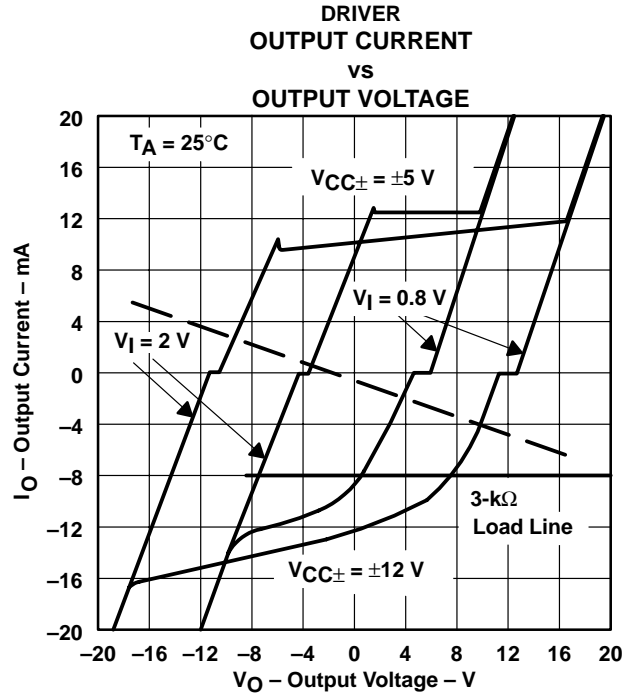


Figure 5

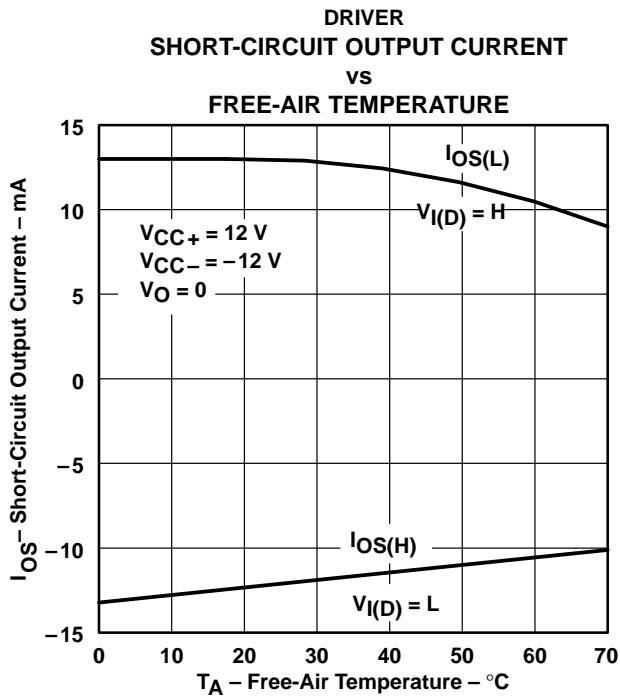


Figure 6

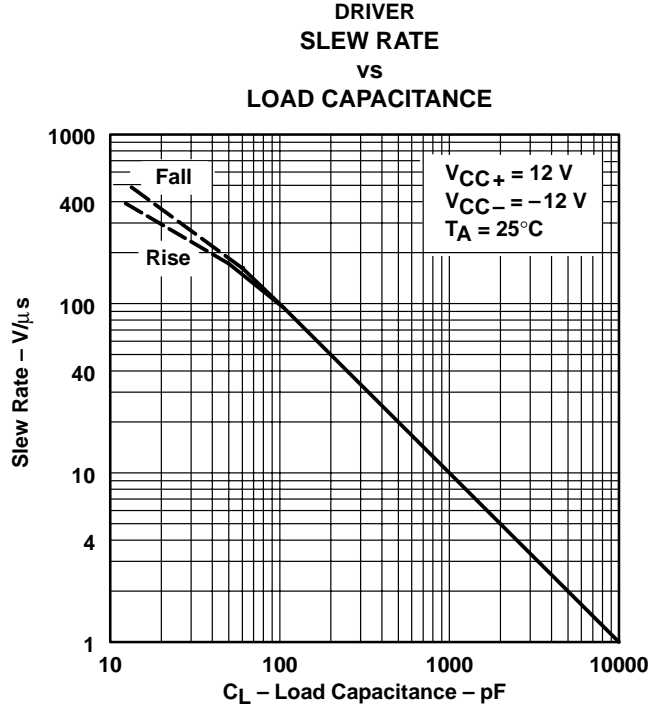
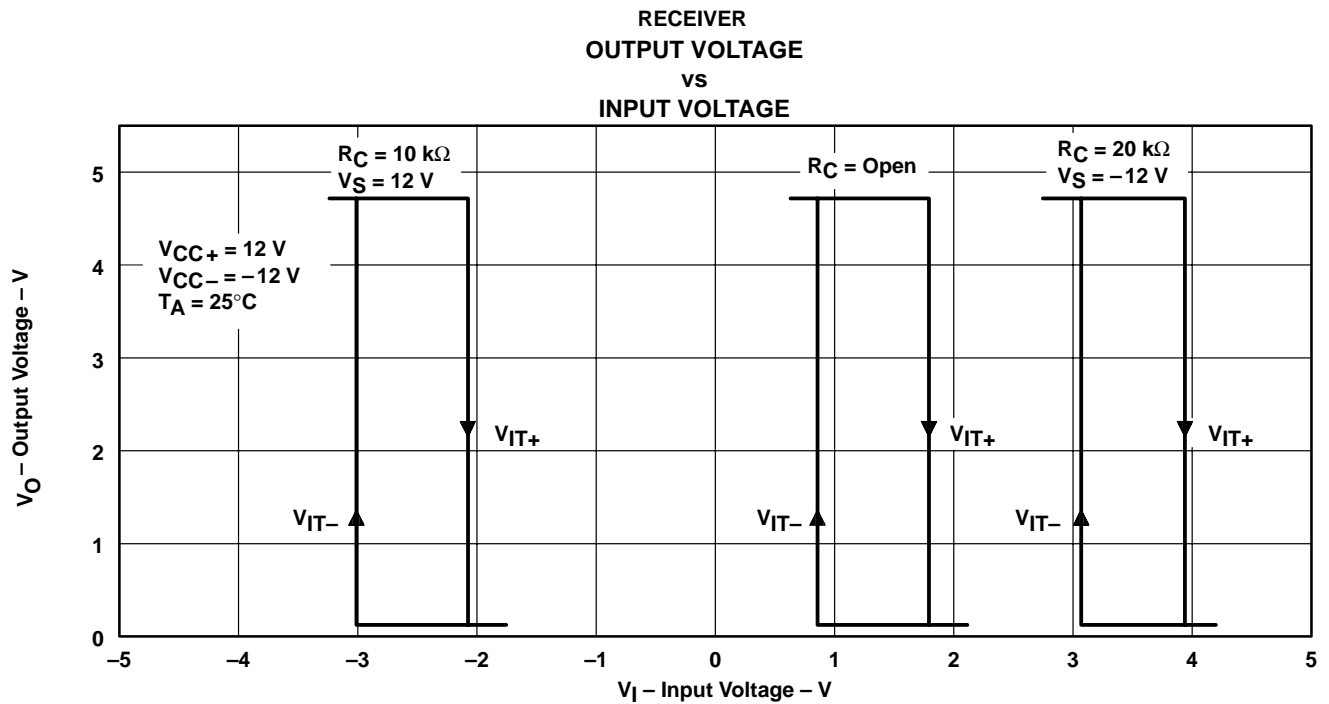
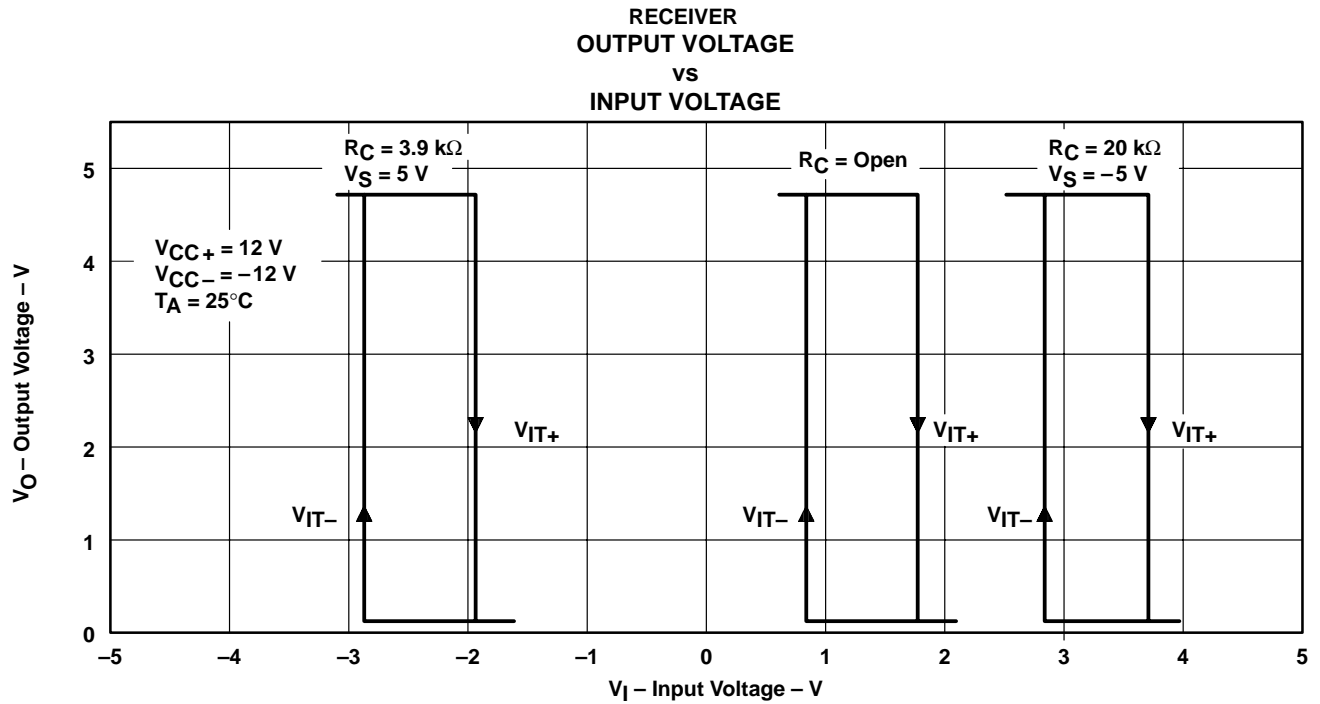
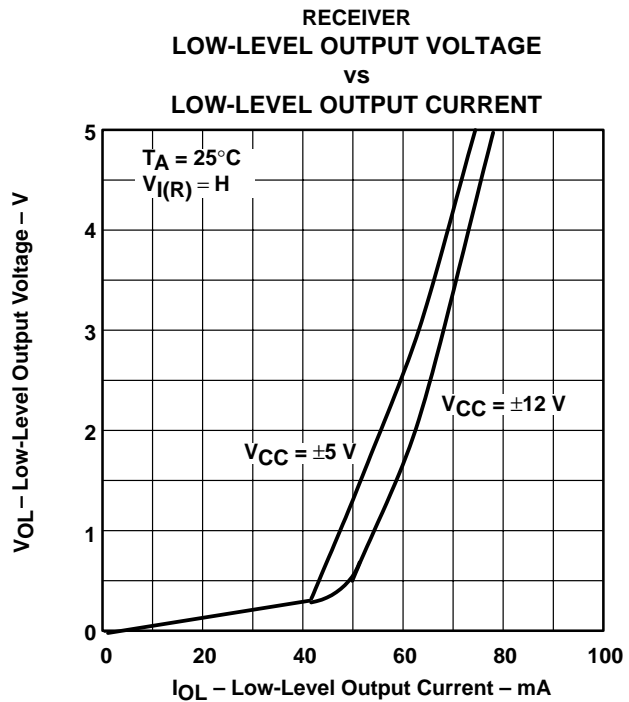
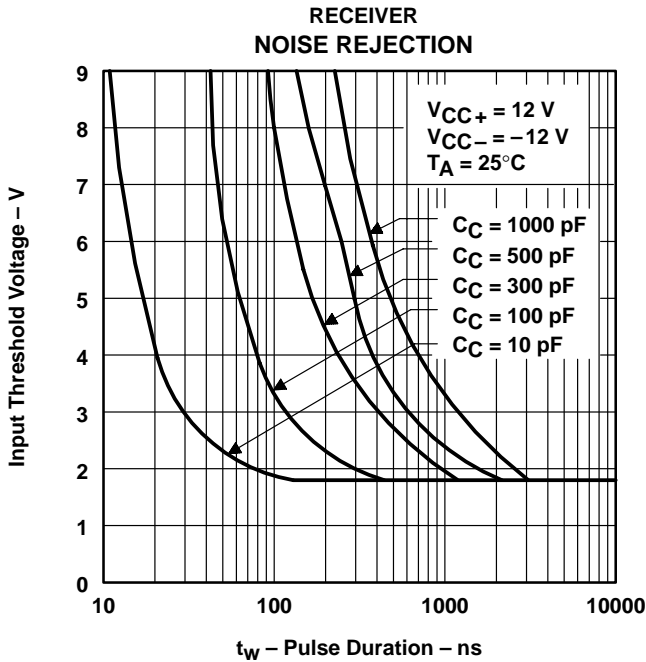
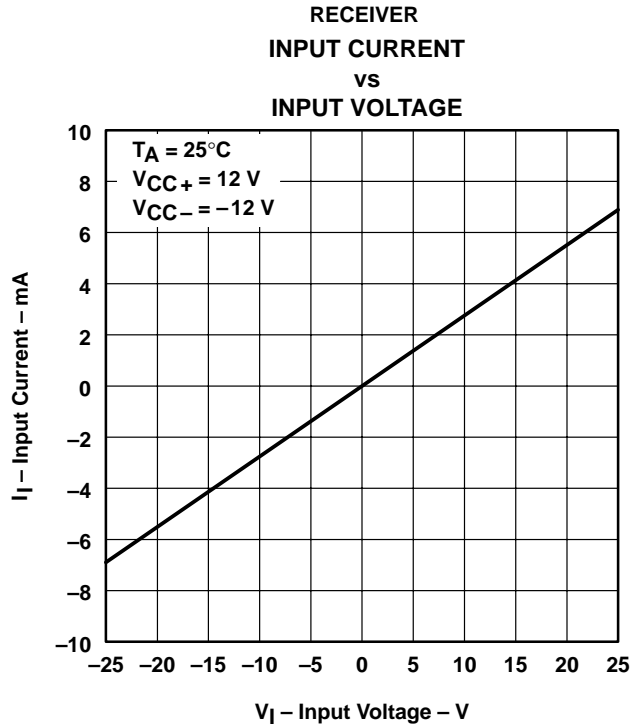
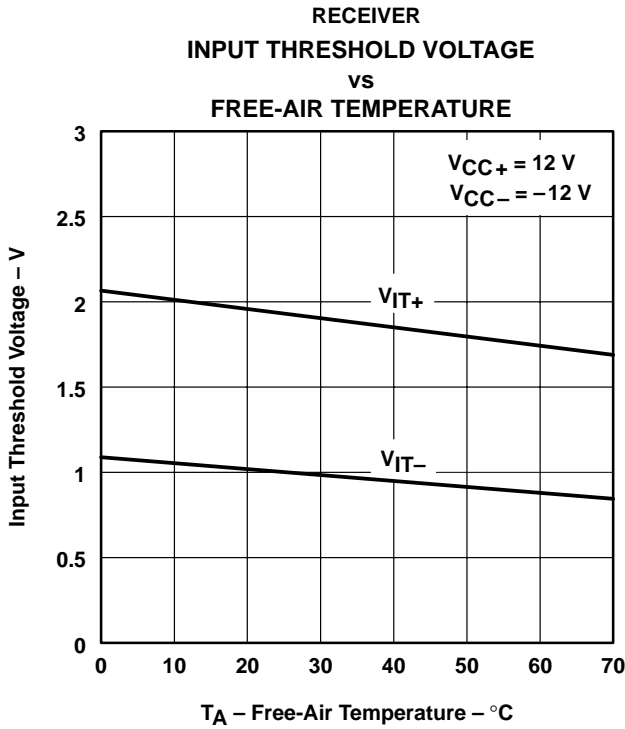


Figure 7

TYPICAL CHARACTERISTICS



TYPICAL CHARACTERISTICS



TYPICAL CHARACTERISTICS

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

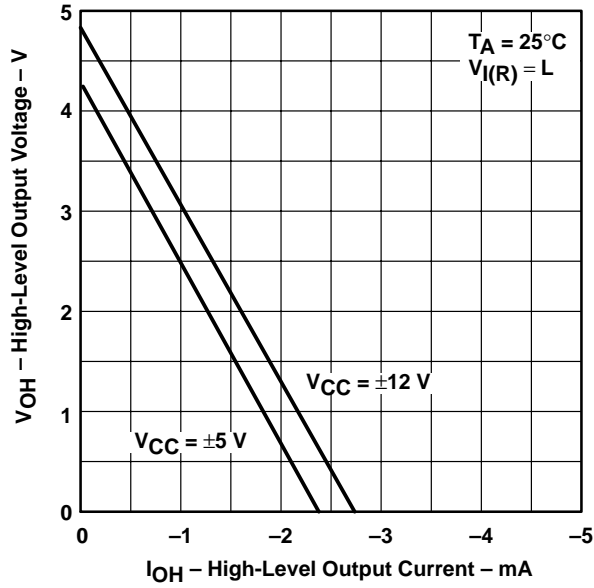


Figure 14

RECEIVER
OUTPUT VOLTAGE
vs
SUPPLY VOLTAGE

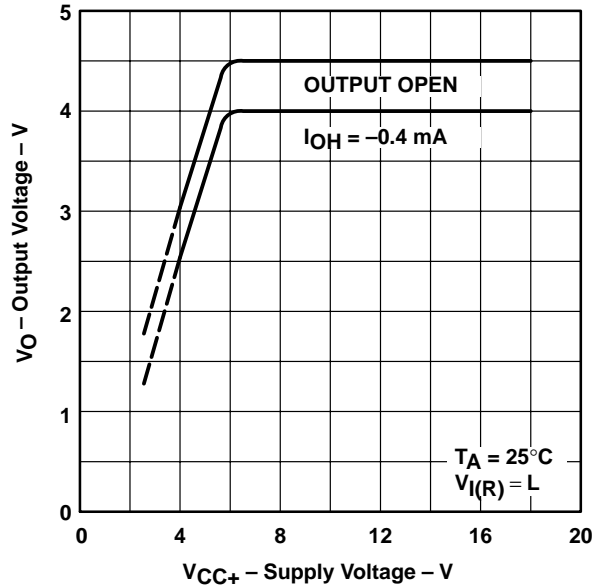


Figure 15

PACKAGING INFORMATION

Orderable part number	Status (1)	Material type (2)	Package Pins	Package qty Carrier	RoHS (3)	Lead finish/ Ball material (4)	MSL rating/ Peak reflow (5)	Op temp (°C)	Part marking (6)
SN751701P	Active	Production	PDIP (P) 8	50 TUBE	Yes	NIPDAU	N/A for Pkg Type	-20 to 85	SN751701P
SN751701P.A	Active	Production	PDIP (P) 8	50 TUBE	Yes	NIPDAU	N/A for Pkg Type	-20 to 85	SN751701P
SN751701PSR	Active	Production	SO (PS) 8	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-20 to 70	A1701
SN751701PSR.A	Active	Production	SO (PS) 8	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-20 to 70	A1701

(1) **Status:** For more details on status, see our [product life cycle](#).

(2) **Material type:** When designated, preproduction parts are prototypes/experimental devices, and are not yet approved or released for full production. Testing and final process, including without limitation quality assurance, reliability performance testing, and/or process qualification, may not yet be complete, and this item is subject to further changes or possible discontinuation. If available for ordering, purchases will be subject to an additional waiver at checkout, and are intended for early internal evaluation purposes only. These items are sold without warranties of any kind.

(3) **RoHS values:** Yes, No, RoHS Exempt. See the [TI RoHS Statement](#) for additional information and value definition.

(4) **Lead finish/Ball material:** Parts 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.

(5) **MSL rating/Peak reflow:** The moisture sensitivity level ratings and peak solder (reflow) temperatures. In the event that a part has multiple moisture sensitivity ratings, only the lowest level per JEDEC standards is shown. Refer to the shipping label for the actual reflow temperature that will be used to mount the part to the printed circuit board.

(6) **Part marking:** There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.

Multiple part markings will be inside parentheses. Only one part marking contained in parentheses and separated by a "~" will appear on a part. If a line is indented then it is a continuation of the previous line and the two combined represent the entire part marking for that device.

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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	8.35	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	353.0	353.0	32.0

TUBE


*All dimensions are nominal

Device	Package Name	Package Type	Pins	SPQ	L (mm)	W (mm)	T (μm)	B (mm)
SN751701P	P	PDIP	8	50	506	13.97	11230	4.32
SN751701P.A	P	PDIP	8	50	506	13.97	11230	4.32

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.

PS (R-PDSO-G8)

PLASTIC SMALL OUTLINE



- NOTES:
- A. All linear dimensions are in millimeters.
 - B. This drawing is subject to change without notice.
 - C. Publication IPC-7351 is recommended for alternate designs.
 - D. 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.
 - E. Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.

P (R-PDIP-T8)

PLASTIC DUAL-IN-LINE PACKAGE



- NOTES:
- A. All linear dimensions are in inches (millimeters).
 - B. This drawing is subject to change without notice.
 - C. Falls within JEDEC MS-001 variation BA.

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