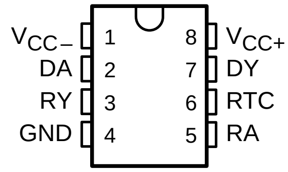
- **Meets or Exceeds the Requirements of ANSI TIA/EIA-232-C**
- **Wide Range of Supply Voltage $V_{CC} = \pm 4.5$ V to ± 15 V**
- **Low Power . . . 117 mW ($V_{CC} = \pm 9$ V)**
- **Receiver Output TTL Compatible**
- **Response Control Provides:**
  - **Input Threshold Shifting**
  - **Input Noise Filtering**

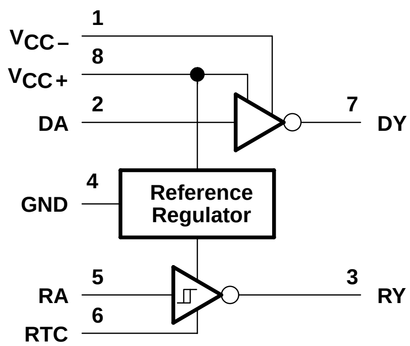
P OR PS PACKAGE
TOP VIEW



description

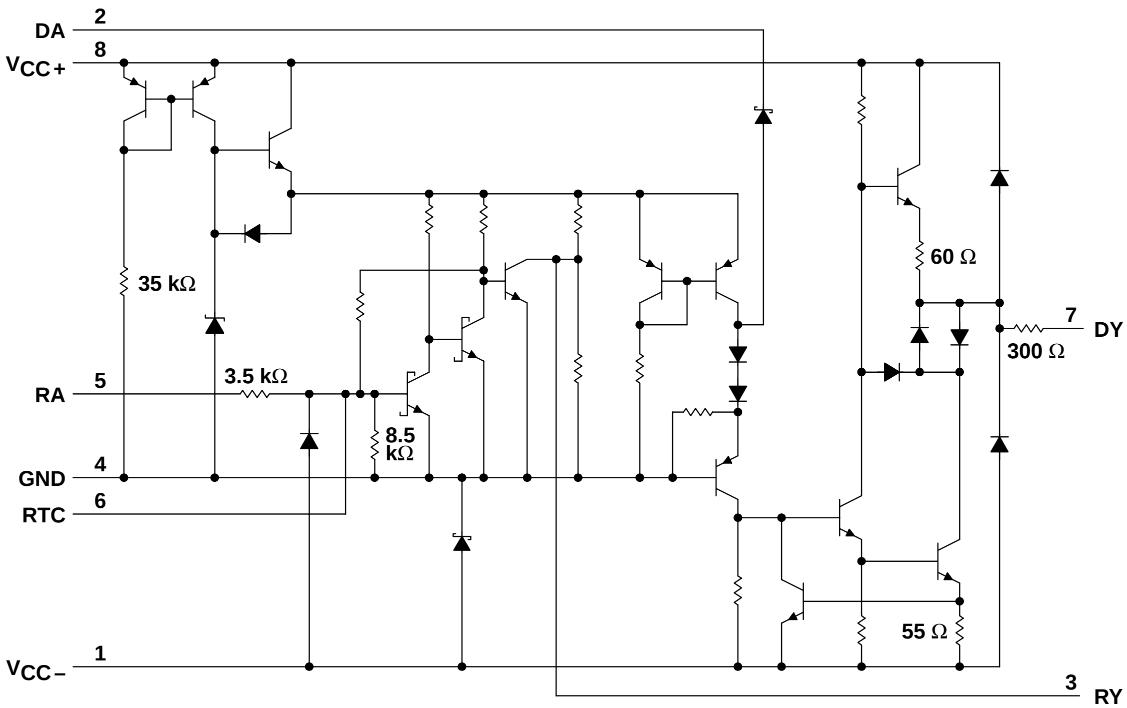
The SN751701 line driver and receiver is designed to satisfy the requirements of the standard interface between data terminal equipment and data communication equipment as defined by ANSI TIA/EIA-232-E. The driver used is similar to the SN75188. The receiver used is similar to the SN75189A. The device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

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.

electrical characteristics over recommended operating free-air temperature range, V_{CC+} = 12 V, V_{CC-} = –12 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 V, R_L = 3 kΩ	V_{CC} = ±5 V	3.2	3.7		V
			V_{CC} = ±9 V	6.5	7.2		
			V_{CC} = ±12 V	8.9	9.8		
V_{OL}	Low-level output voltage	$V_{I D)}$ = 2 V, R_L = 3 kΩ	V_{CC} = ±5 V		–3.6	–3.2	V
			V_{CC} = ±9 V		–7.1	–6.4	
			V_{CC} = ±12 V		–9.7	–8.8	
I_{IH}	High-level input current	$V_{I(D)}$ = 7 V				5	µA
I_{IL}	Low-level input current	$V_{I(D)}$ = 0 V			–0.73	–1.2	mA
$I_{OS(H)}$	High-level short-circuit output current	$V_{I(D)}$ = 0.8 V, $V_{O(D)}$= 0 V		–7	–12	–14.5	mA
$I_{OS(L)}$	Low-level short-circuit output current	$V_{I(D)}$ = 2 V, $V_{O(D)}$= 0 V		6.5	11.5	14	mA
r_O	Output resistance	V_{CC+} = 0 V, $V_{O(D)}$ = –2 V to 2 V		300			Ω

† All typical values are at T_A = 25°C.

switching characteristics, V_{CC+} = 12 V, V_{CC-} = –12 V, T_A = 25°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 kΩ, C_L = 50 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 kΩ, C_L = 50 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 kΩ to 7 kΩ (see Note 3), C_L = 2500 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 V, V_{CC-} = –12 V (unless otherwise noted)

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

PARAMETER		TEST CONDITIONS		MIN	TYP†	MAX	UNIT
V_{IT+}	Positive-going input threshhold voltage			1.2	1.9	2.3	V
V_{IT-}	Negative-going input threshhold voltage			0.6	0.95	1.2	V
V_{hys}	Hystresis voltage (V_{IT+} – V_{IT-})			0.6			V
$V_{O(H)}$	High-level output voltage	$V_{I(R)} = V_{T-(min)}$, I_{OL} = –10 μA	V_{CC+} = 5 V	3.7	4.1	4.5	V
			V_{CC+} = 12 V	4.4	4.7	5.2	
		$V_{I(R)} = V_{T-(min)}$, I_{OH} = –0.4 mA	V_{CC+} = 5 V	3.1	3.4	3.8	
			V_{CC+} = 12 V	3.6	4	4.5	
$V_{O(L)}$	Low-level output voltage	$V_{I(R)} = V_{T+(max)}$,	I_{OL} = 24 mA		0.2	0.3	V
I_{IH}	High-level input current	$V_{I(R)}$ = 25 V		3.6	6.7	8.3	mA
		$V_{I(R)}$ = 3 V		0.43	0.67	1	mA
I_{IL}	Low-level input current	$V_{I(R)}$ = –25 V		–3.6	–6.7	–8.3	mA
		$V_{I(R)}$ = –3 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°C.
NOTE 4: Response Control pin is open.

switching characteristics, V_{CC+} = 12 V, V_{CC-} = –12 V, T_A = 25°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 kΩ, C_L = 50 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 kΩ, C_L = 50 pF		250	360	ns
t_{THL}	Transition time, high- to low-level output			18	35	

PARAMETER MEASUREMENT INFORMATION

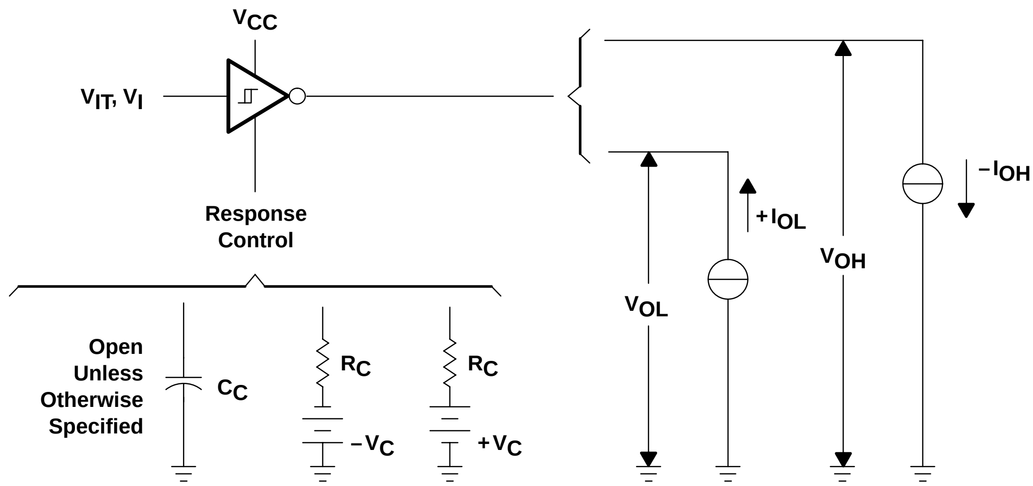
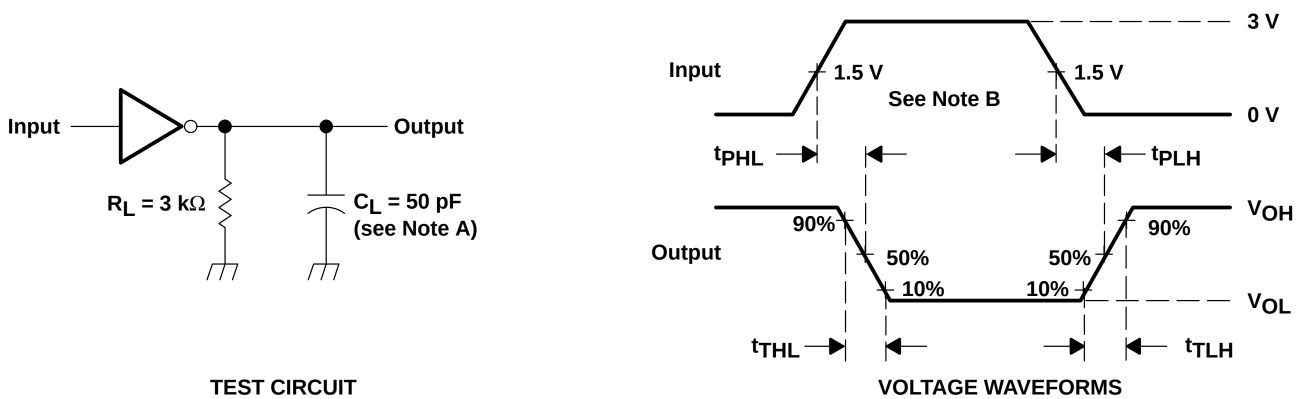


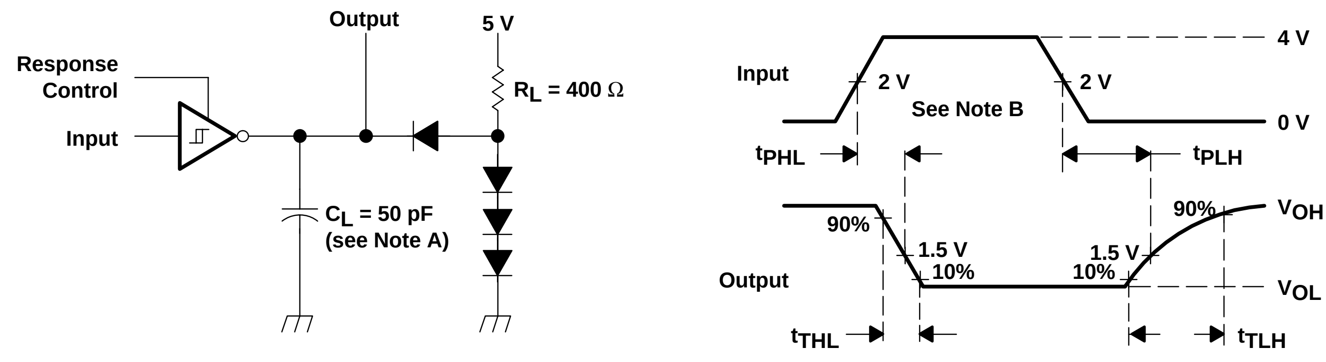
Figure 1. Receiver Section Test Circuit (V_{IT+}, V_{IT-}, V_{OH}, V_{OL})



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 Ω, t_W = 500 ns, t_{TLH} ≤ 5 ns, t_{THL} ≤ 5 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 Ω, t_W = 500 ns, $t_{THL} \leq 5$ ns, $t_{TLH} \leq 5$ ns.

Figure 3. Receiver Section Switching Test Circuit and Voltage Waveforms

TYPICAL CHARACTERISTICS

DRIVER
VOLTAGE TRANSFER CHARACTERISTICS

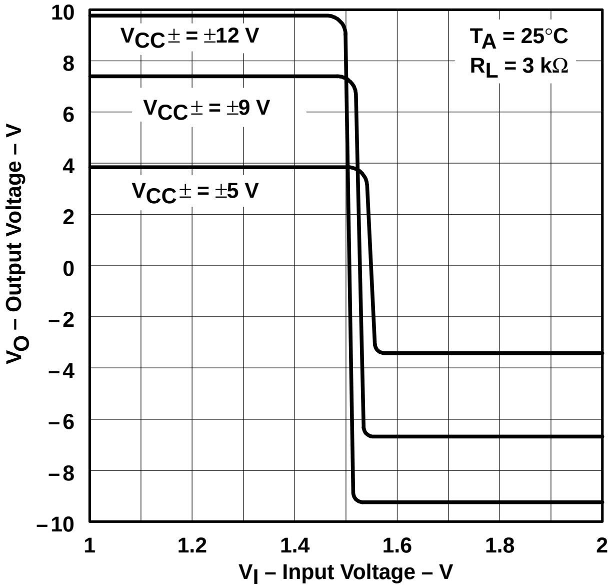


Figure 4

DRIVER
OUTPUT CURRENT
vs
OUTPUT VOLTAGE

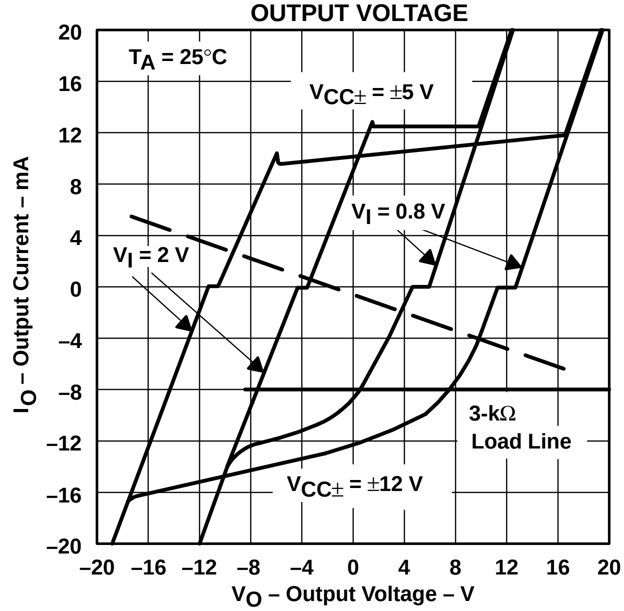


Figure 5

DRIVER
SHORT-CIRCUIT OUTPUT CURRENT
vs
FREE-AIR TEMPERATURE

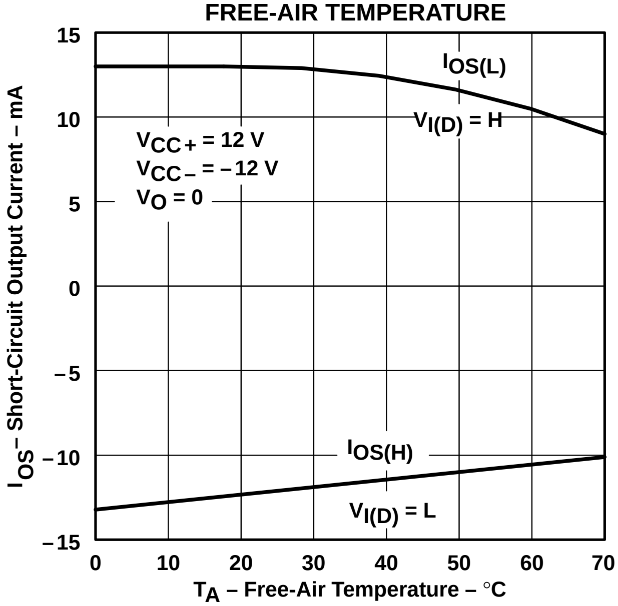


Figure 6

DRIVER
SLEW RATE
vs
LOAD CAPACITANCE

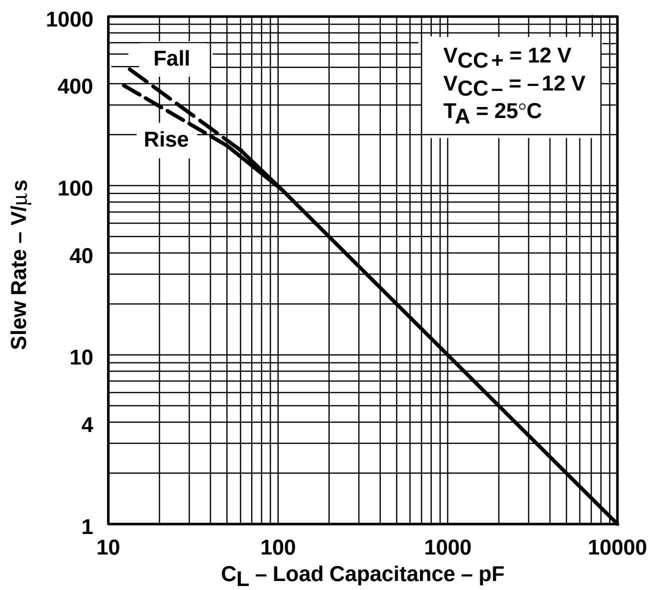


Figure 7

TYPICAL CHARACTERISTICS

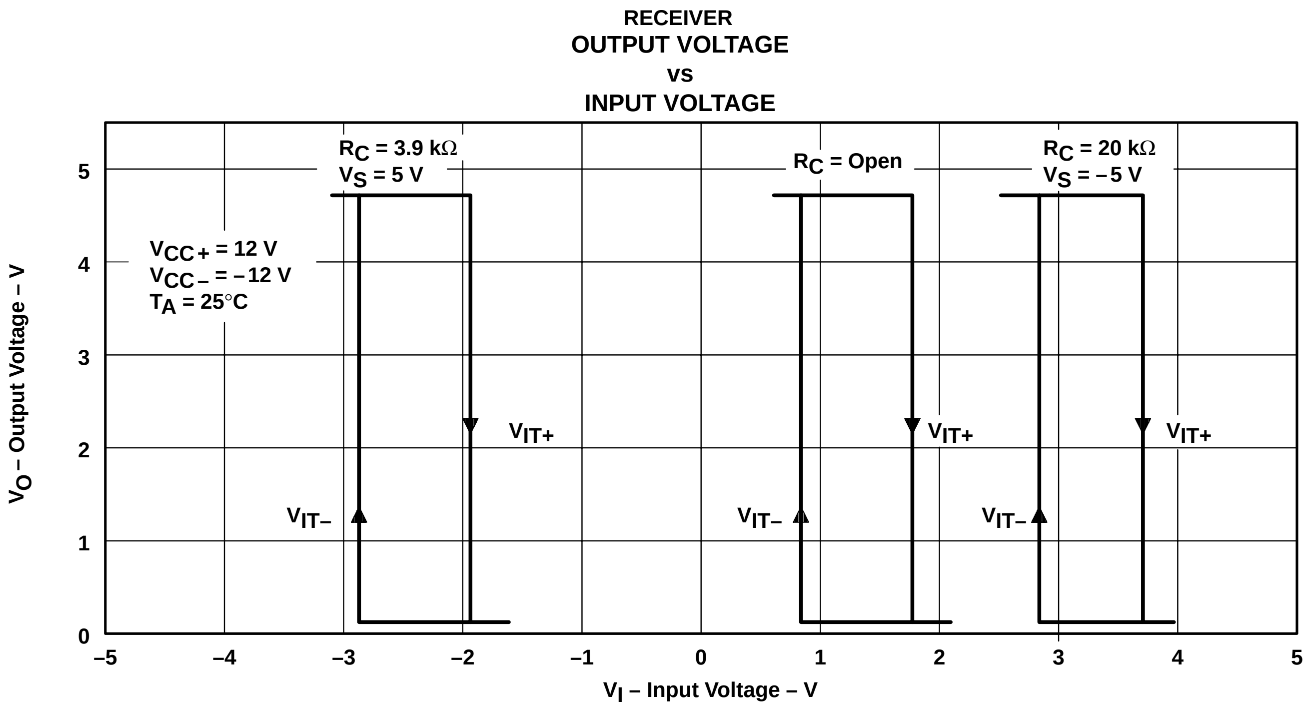


Figure 8

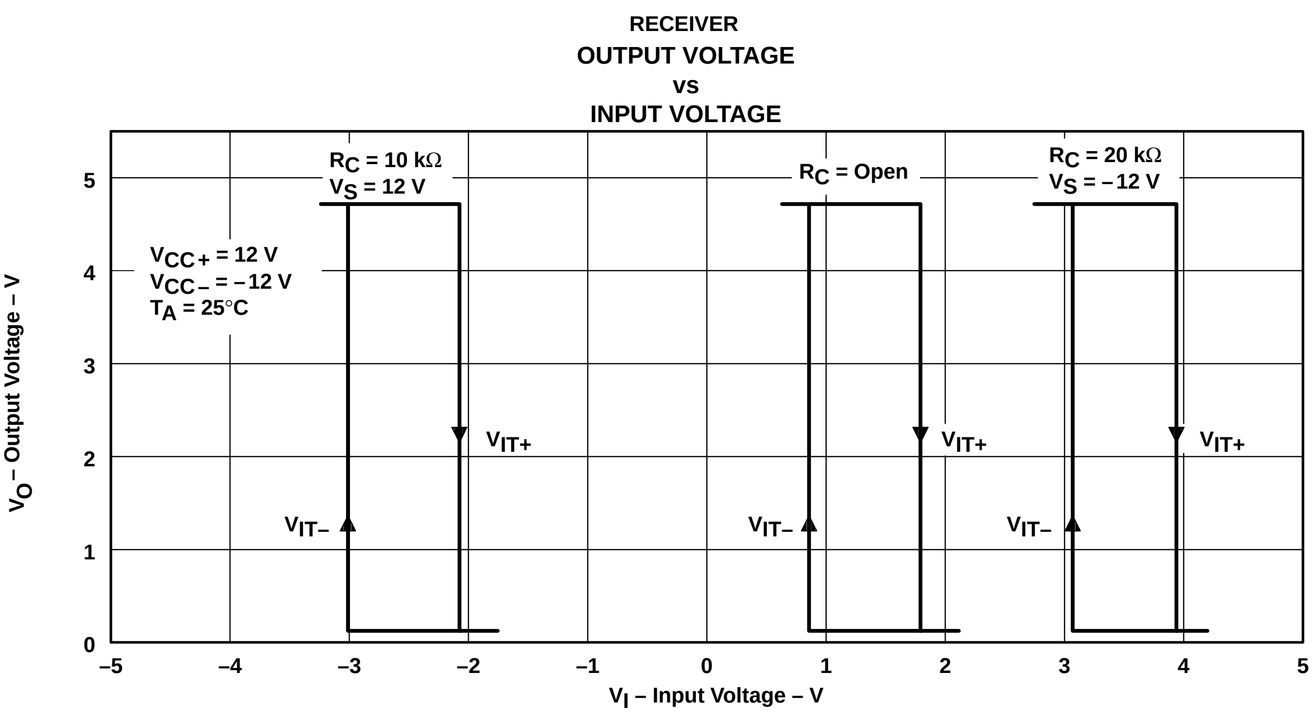


Figure 9

TYPICAL CHARACTERISTICS

RECEIVER
INPUT THRESHOLD VOLTAGE
vs
FREE-AIR TEMPERATURE

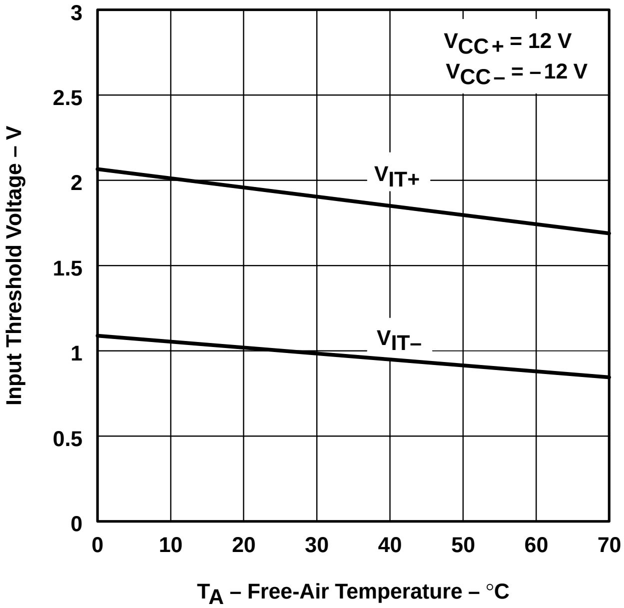


Figure 10

RECEIVER
INPUT CURRENT
vs
INPUT VOLTAGE

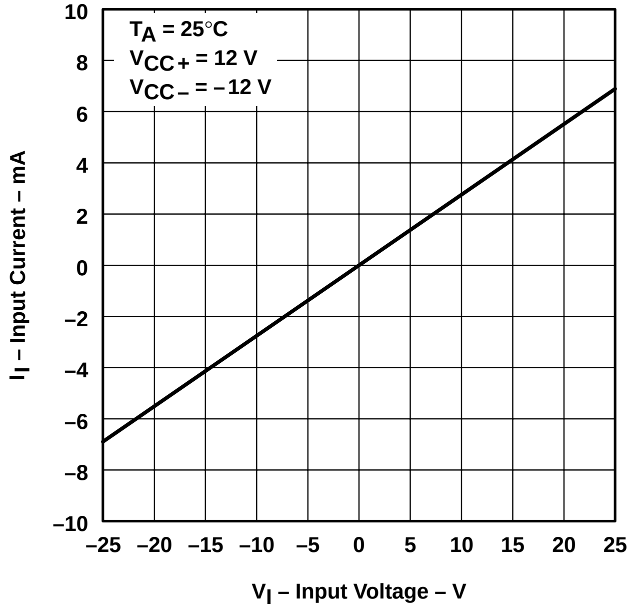


Figure 11

RECEIVER
NOISE REJECTION

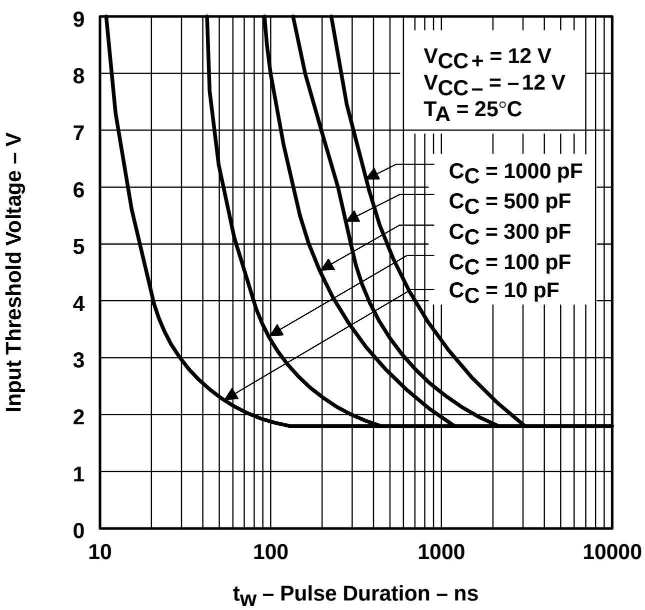


Figure 12

RECEIVER
LOW-LEVEL OUTPUT VOLTAGE
vs
LOW-LEVEL OUTPUT CURRENT

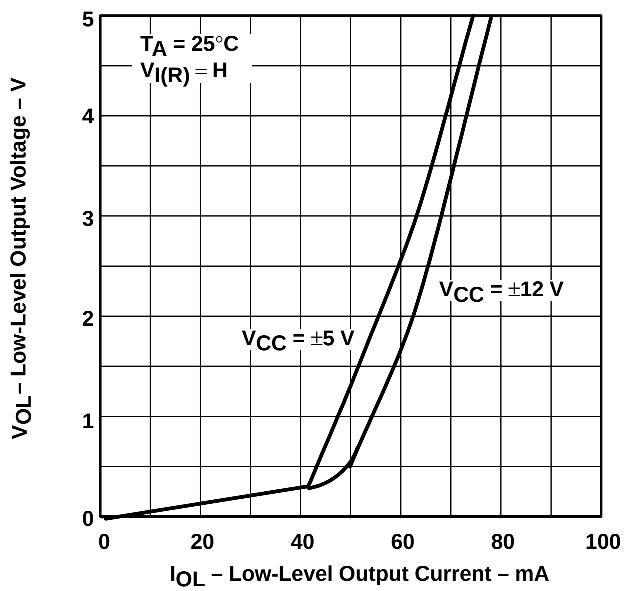


Figure 13

TYPICAL CHARACTERISTICS

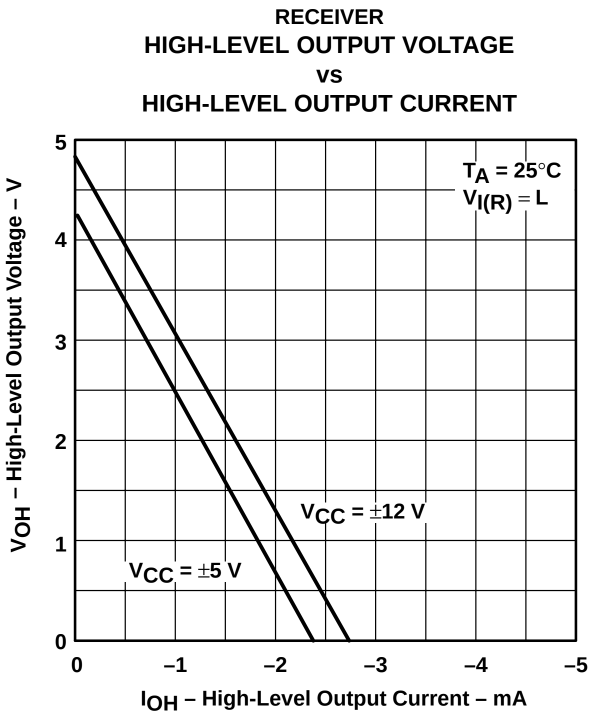


Figure 14

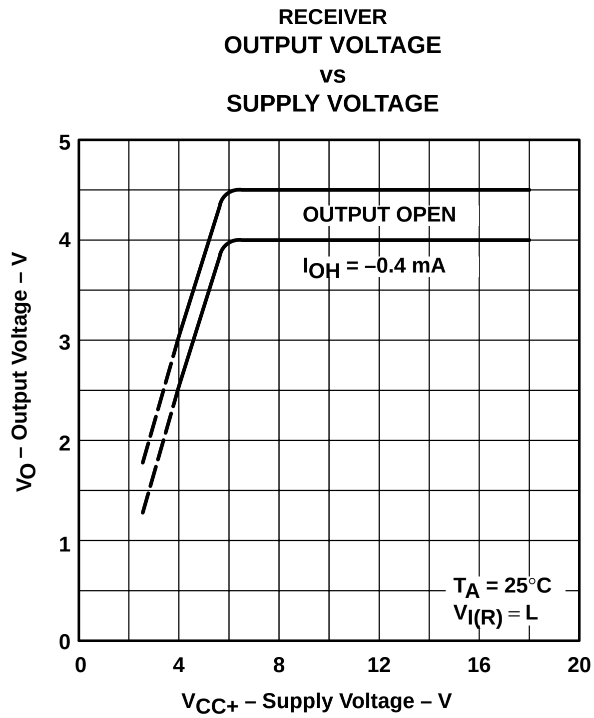


Figure 15

PACKAGING INFORMATION

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

(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.

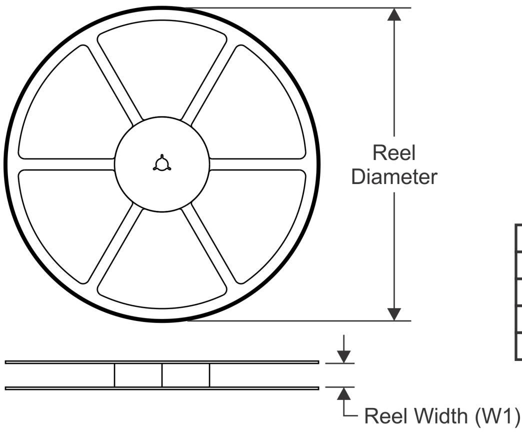
(4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

(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.

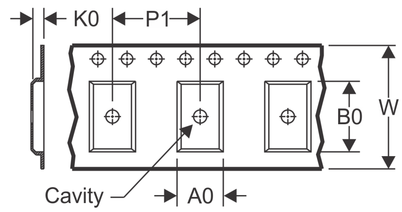
(6) Lead finish/Ball material - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

TAPE AND REEL INFORMATION

REEL DIMENSIONS

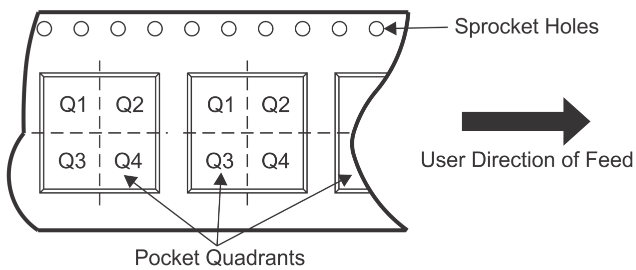


TAPE DIMENSIONS



A0	Dimension designed to accommodate the component width
B0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

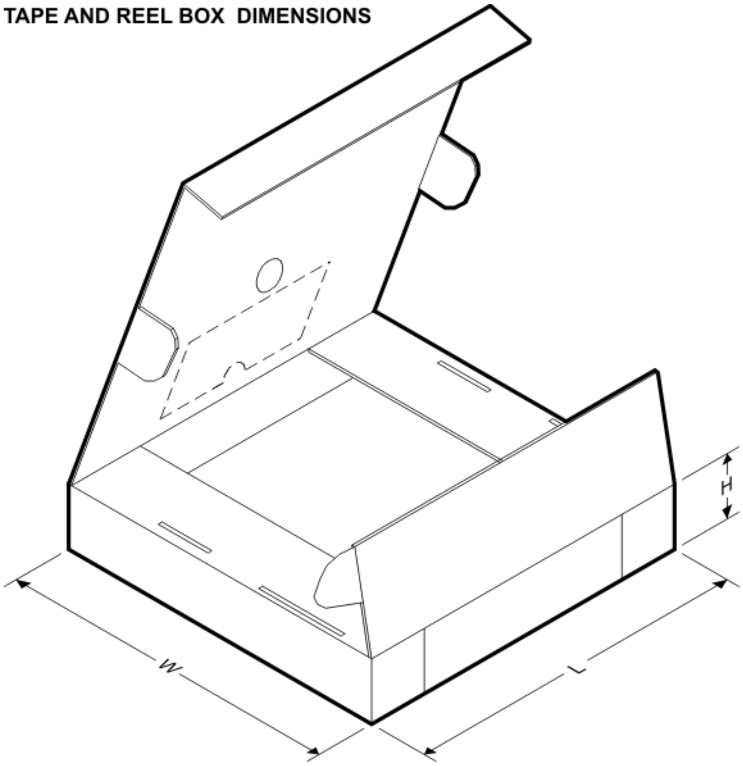
QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*All dimensions are nominal

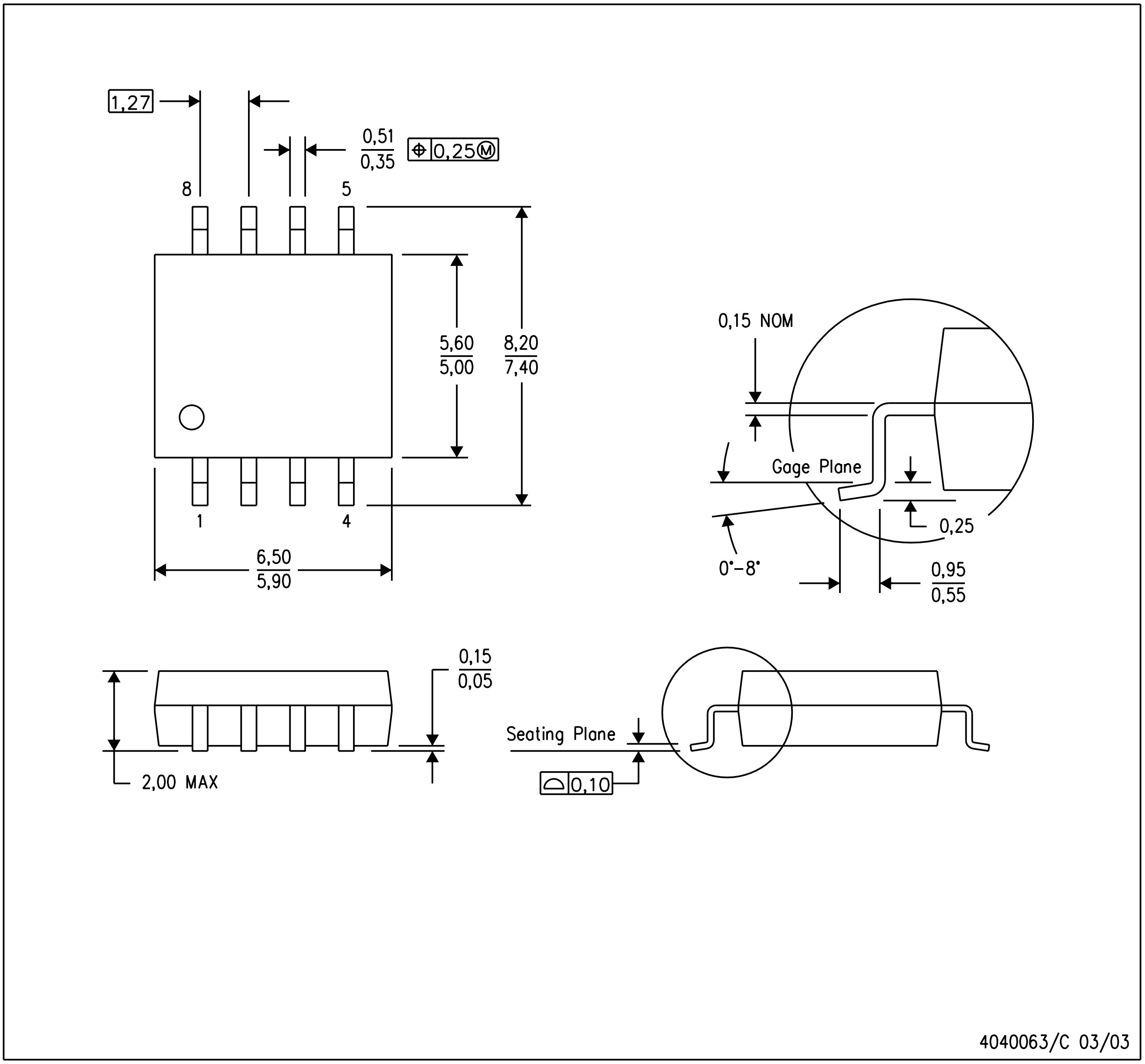
Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
SN751701PSR	SO	PS	8	2000	330.0	16.4	8.35	6.6	2.4	12.0	16.0	Q1

TAPE AND REEL BOX DIMENSIONS



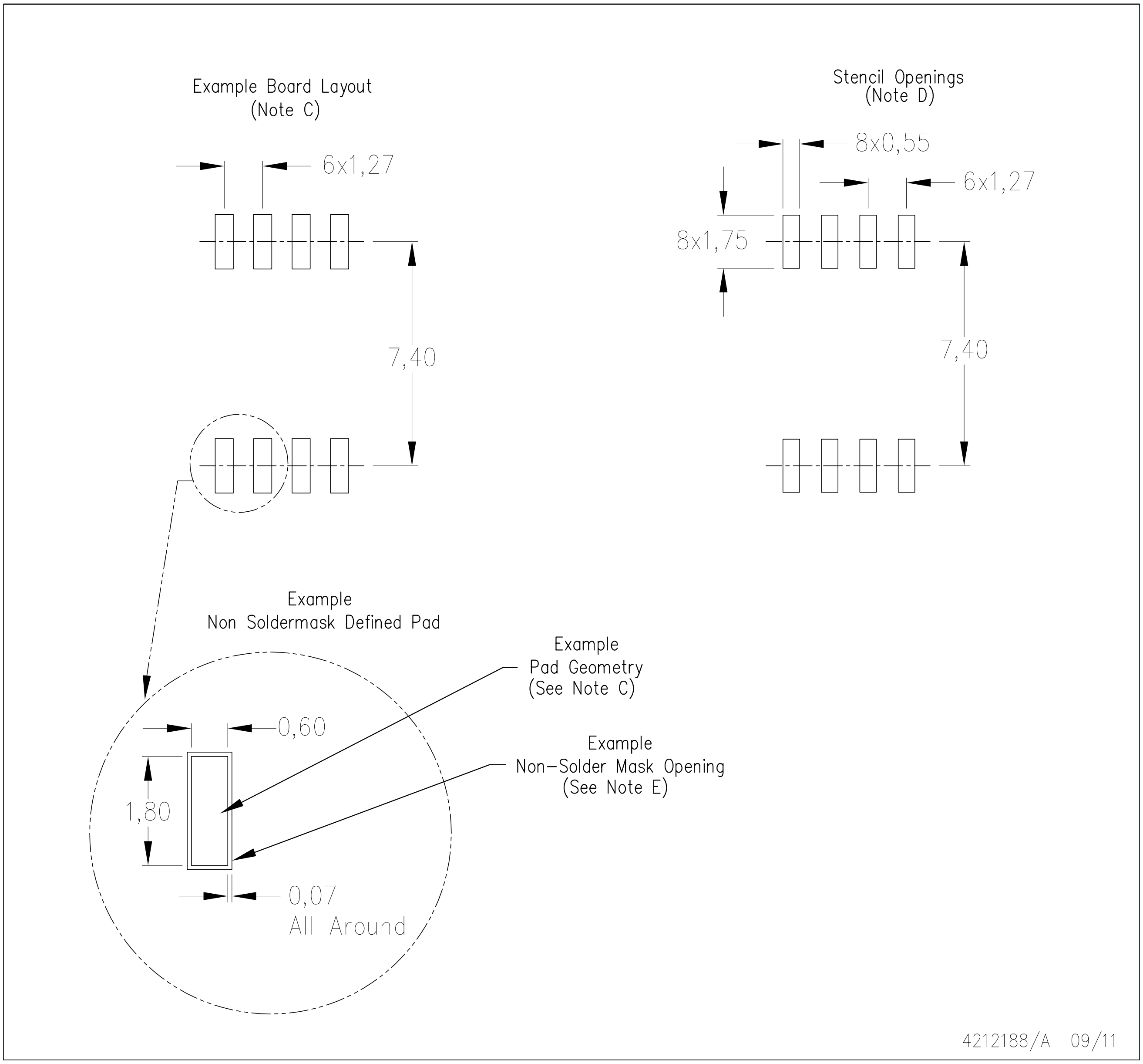
*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN751701PSR	SO	PS	8	2000	853.0	449.0	35.0



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.

IMPORTANT NOTICE AND DISCLAIMER