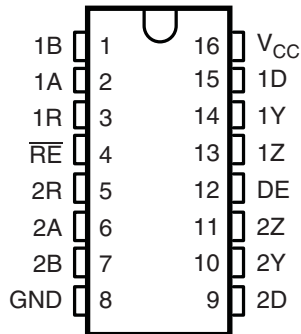
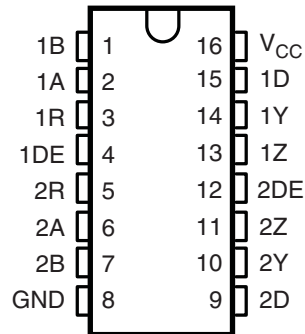


## DUAL DIFFERENTIAL DRIVERS AND RECEIVERS

Check for Samples: [SN7534050](#), [SN7534051](#)

### FEATURES

- Meet or Exceed Standards TIA/EIA-422-B and ITU Recommendation V.11
- Operate From Single 5-V Power Supply
- Driver Positive and Negative Current Limiting
- Receiver Input Sensitivity:  $\pm 200\text{mV}$
- Receiver Input Impedance: 12 k $\Omega$  Min
- Driver 3-State Outputs
- Receiver 3-State Outputs (SN7534050 Only)

**SN7534050...N OR NS PACKAGE  
(TOP VIEW)**

**SN7534051...N OR NS PACKAGE  
(TOP VIEW)**


### DESCRIPTION

The SN7534050 and SN7534051 dual differential drivers and receivers are monolithic integrated circuits designed to meet the requirements of ANSI standards TIA/EIA-422-B and ITU Recommendations V.11.

The driver outputs provide limiting for both positive and negative currents and thermal shutdown protection from line fault conditions on transmission bus line.

The SN7534050 combines dual 3-state differential drivers and dual 3-state differential input receivers. The drivers and receivers have active-high and active-low enables, respectively which can be externally connected together to function as direction control. SN7534051 drivers each have an individual active-high enable.

### ORDERING INFORMATION

$T_A$	PACKAGE <sup>(1)</sup> (2)	ORDERABLE PART NUMBER	TOP-SIDE MARKING
-20°C to 85°C	PDIP – N	Tube of 25	SN7534050N
	SOP – NS	Tube of 50	SN7534050NS
		Reel of 2000	SN7534050NSR
	PDIP – N	Tube of 25	SN7534051N
	SOP – NS	Tube of 50	SN7534051NS
		Reel of 2000	SN7534051NSR

- (1) Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at [www.ti.com/sc/package](http://www.ti.com/sc/package).
- (2) For the most current package and ordering information, see the Package Option Addendum at the end of this document, or see the TI website at [www.ti.com](http://www.ti.com).



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.

## FUNCTION TABLES

**Table 1. SN7534050,  
SN7534051  
Each Driver<sup>(1)</sup>**

INPUT D	ENABLE DE	OUTPUTS	
		Y	Z
H	H	H	L
L	H	L	H
X	L	Z	Z

- (1) H = high level, L = low level,  
X = irrelevant, Z = high impedance  
(off)

**Table 2. SN7534050  
Each Receiver<sup>(1)</sup>**

DIFFERENTIAL INPUTS, A–B	ENABLE RE	OUTPUT R
$V_{ID} \geq 0.2 \text{ V}$	L	H
$-0.2 \text{ V} < V_{ID} < 0.2 \text{ V}$	L	?
$V_{ID} \leq -0.2 \text{ V}$	L	L
X	H	Z

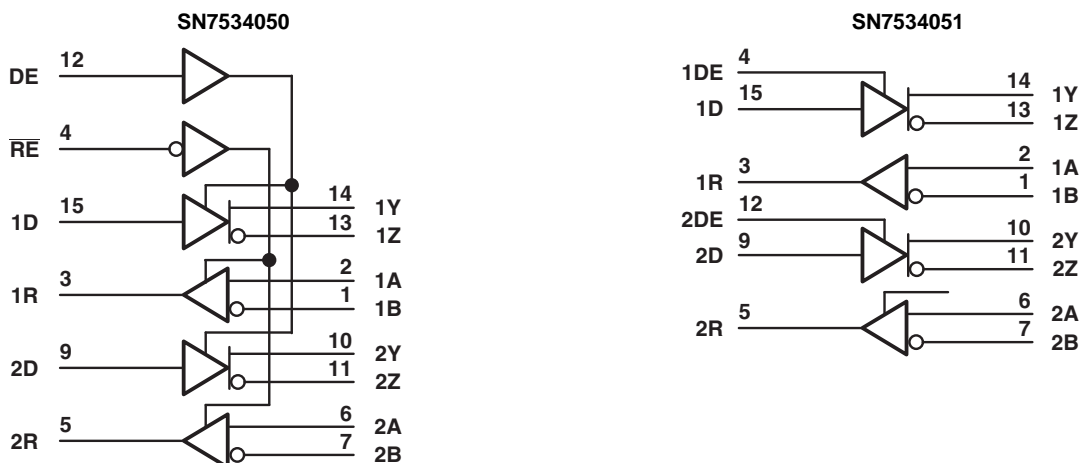
- (1) H = high level, L = low level, ? = indeterminate, X = irrelevant,  
Z = high impedance (off)

**Table 3. SN7534051  
Each Receiver<sup>(1)</sup>**

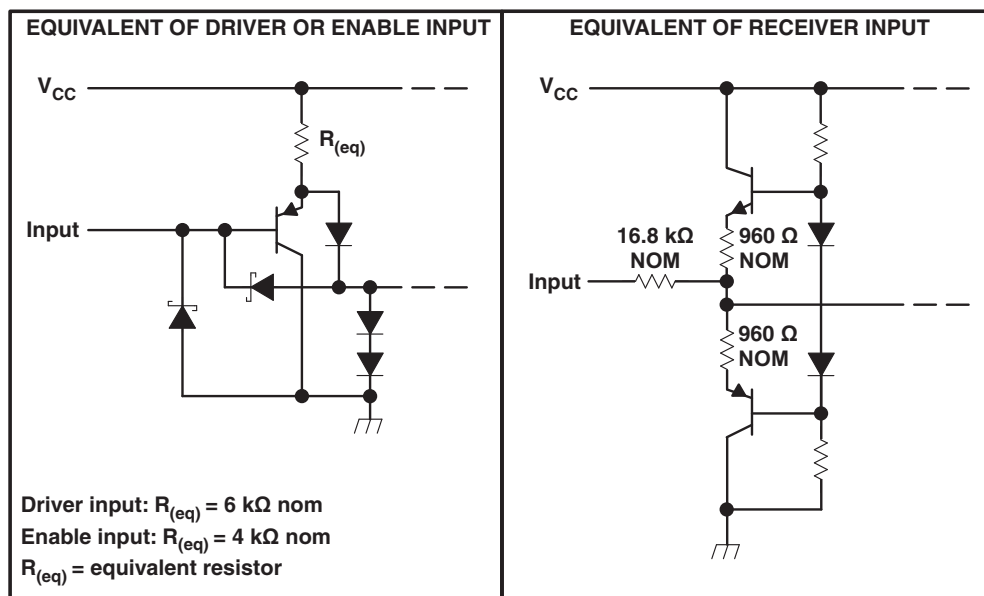
DIFFERENTIAL INPUTS, A–B	OUTPUT R
$V_{ID} \geq 0.2 \text{ V}$	H
$-0.2 \text{ V} < V_{ID} < 0.2 \text{ V}$	?
$V_{ID} \leq -0.2 \text{ V}$	L

- (1) H = high level, L = low level,  
? = indeterminate

LOGIC DIAGRAMS

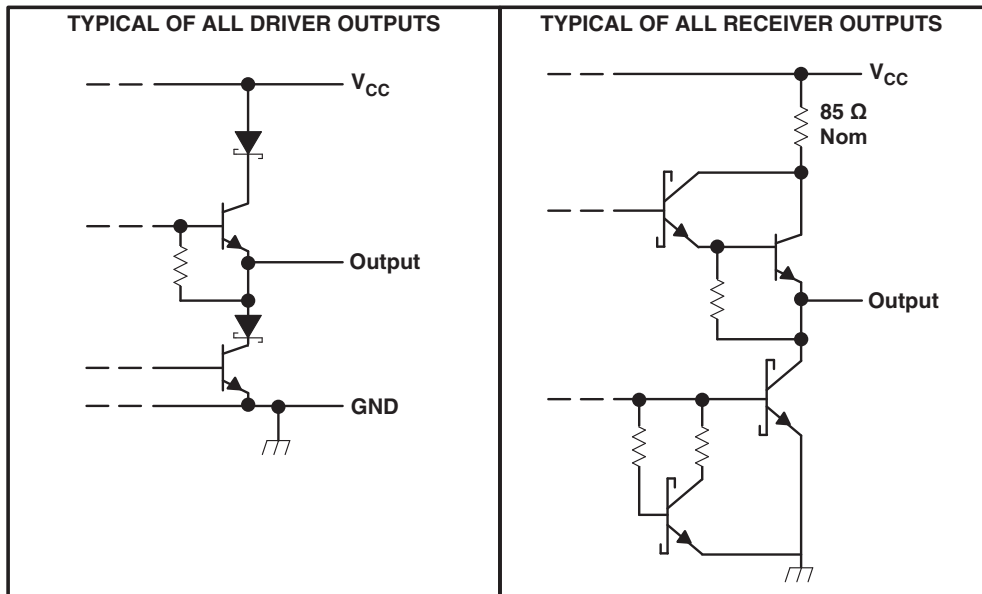


SCHEMATIC OF INPUTS



All resistor values are nominal.

**SCHEMATIC OF OUTPUTS**



All resistor values are nominal.

**Absolute Maximum Ratings<sup>(1)</sup>**

over operating free-air temperature range (unless otherwise noted)

		MIN	MAX	UNIT
$V_{CC}$	Supply voltage <sup>(2)</sup>		7	V
$V_I$	Input voltage	DE, $\overline{RE}$ , D inputs		7 V
$V_i$	Receiver input voltage	A or B inputs		$\pm 25$ V
$V_{ID}$	Receiver differential output voltage <sup>(3)</sup>		$\pm 25$	V
$V_O$	Driver output voltage range	-10	15	V
$I_{OL}$	Receiver low-level output current		50	mA
$\theta_{JA}$	Package thermal impedance <sup>(4)</sup>	N package		66
		NS package		68
Operating free-air temperature range		-20	85	$^{\circ}C$
$T_{stg}$	Storage temperature range	-65	150	$^{\circ}C$
	Lead temperature, 1.6 mm (1/16 in) from case for 10 s		260	$^{\circ}C$

- (1) 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.
- (2) All voltages, except differential input voltage, are with respect to the network GND.
- (3) Differential input voltage is measured at the noninverting terminal, with respect to the inverting terminal.
- (4) The package thermal impedance is calculated in accordance with JESD 51, except for through-hole packages, which use a trace length of zero.

## Recommended Operating Conditions

		MIN	NOM	MAX	UNIT
V <sub>CC</sub>	Supply voltage	4.75	5	5.25	V
V <sub>IH</sub>	High-level input voltage	2			V
V <sub>IL</sub>	Low-level input voltage				0.8
V <sub>IC</sub>	Common-mode input voltage <sup>(1)</sup>	Receiver		±7	V
V <sub>ID</sub>	Differential input voltage	Receiver		±12	V
I <sub>OH</sub>	High-level output current	Driver		40	mA
		Receiver		-400	µA
I <sub>OL</sub>	Low-level output current	Driver		-40	mA
		Receiver		16	
T <sub>A</sub>	Operating free-air temperature	-20		85	°C

(1) Refer to TIA/EIA-422-B for exact conditions.

## DRIVER SECTION

### Electrical Characteristics

over recommended supply voltage and operating free-air temperature range (unless otherwise noted)

PARAMETER		TEST CONDITIONS		MIN	TYP <sup>(1)</sup>	MAX	UNIT
V <sub>OH</sub>	High-level output voltage	V <sub>IH</sub> = 2 V, V <sub>IL</sub> = 0.8 V, I <sub>OH</sub> = -20 mA			3.7		V
V <sub>OL</sub>	Low-level output voltage	V <sub>IH</sub> = 2 V, V <sub>IL</sub> = 0.8 V, I <sub>OL</sub> = 20 mA			1.1		V
V <sub>OD1</sub>	Differential output voltage	I <sub>O</sub> = 0 mA		1.5		6	V
V <sub>OD2</sub>	Differential output voltage <sup>(2)</sup>	R <sub>L</sub> = 100 Ω,	See Figure 1	2			V
ΔV <sub>OD</sub>	Change in magnitude of differential output voltage <sup>(2)</sup>	R <sub>L</sub> = 100 Ω,	See Figure 1			±0.4	V
V <sub>OC</sub>	Common-mode output voltage <sup>(2)</sup>	R <sub>L</sub> = 100 Ω,	See Figure 1			±3	V
ΔV <sub>OC</sub>	Change in magnitude of differential common-mode voltage <sup>(2)</sup>	R <sub>L</sub> = 100 Ω,	See Figure 1			±0.4	V
I <sub>off</sub>	Output current with power off <sup>(2)</sup>	V <sub>CC</sub> = 0 V	V <sub>O</sub> = 6 V			100	µA
			V <sub>O</sub> = -0.25 V			-100	
I <sub>OZ</sub>	High-impedance-state output current	V <sub>O</sub> = -0.25 V to 6 V				±100	µA
I <sub>IH</sub>	High-level input current	V <sub>I</sub> = 2.7 V				20	µA
I <sub>IL</sub>	Low-level input current	V <sub>I</sub> = 0.4 V				-100	µA
I <sub>OS</sub>	Short-circuit output current <sup>(2)</sup> (3)	V <sub>O</sub> = V <sub>CC</sub> or GND		-30		-150	mA
I <sub>CC</sub>	Supply current (total package)	No load	Output enabled		80	110	mA
			Output disabled		50	80	

(1) All typical values are at V<sub>CC</sub> = 5 V and T<sub>A</sub> = 25°C.

(2) Refer to TIA-EIA-422-B for exact conditions.

(3) Not more than one output should be shorted at a time, and the duration of the short circuit should not exceed one second.

## Switching Characteristics

 $V_{CC} = 5\text{ V}$ ,  $C_L = 50\text{ pF}$ ,  $T_A = 25^\circ\text{C}$ 

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
$t_{d(OD)}$	Differential output delay time	$R_L = 100\ \Omega$ , $C_L = 50\text{ pF}$ , See <a href="#">Figure 3</a>		20	25	ns
$t_{t(OD)}$	Differential output transition time	$R_L = 100\ \Omega$ , $C_L = 50\text{ pF}$ , See <a href="#">Figure 3</a>		27	35	ns
$t_{PLH}$	Propagation delay time, low- to high-level output	$R_L = 27\ \Omega$ , See <a href="#">Figure 4</a>		20	25	ns
$t_{PHL}$	Propagation delay time, high- to low-level output	$R_L = 27\ \Omega$ , See <a href="#">Figure 4</a>		20	25	ns
$t_{PZH}$	Output enable time to high level	$R_L = 110\ \Omega$ , See <a href="#">Figure 5</a>		80	120	ns
$t_{PZL}$	Output enable time to low level	$R_L = 110\ \Omega$ , See <a href="#">Figure 6</a>		40	60	ns
$t_{PHZ}$	Output disable time from high level	$R_L = 110\ \Omega$ , See <a href="#">Figure 5</a>		90	120	ns
$t_{PLZ}$	Output disable time from low level	$R_L = 110\ \Omega$ , See <a href="#">Figure 6</a>		30	45	ns

## RECEIVER SECTION

### Electrical Characteristics

over operating free-air temperature range (unless otherwise noted)

PARAMETER		TEST CONDITIONS	MIN	TYP <sup>(1)</sup>	MAX	UNIT
$V_{IT+}$	Positive-going input threshold voltage, differential input				0.2	V
$V_{IT-}$	Negative-going input threshold voltage, differential input		-0.2 <sup>(2)</sup>			V
$V_{hys}$	Input hysteresis ( $V_{IT+} - V_{IT-}$ )			50		mV
$V_{IK}$	Input clamp voltage, $\overline{RE}$	SN7534050 $I_I = -18\text{ mA}$			-1.5	V
$V_{OH}$	High-level output voltage	$V_{ID} = 200\text{ mV}$ , $I_{OH} = -400\ \mu\text{A}$ , See <a href="#">Figure 2</a>		2.7		V
$V_{OL}$	Low-level output voltage	$V_{ID} = -200\text{ mV}$ , See <a href="#">Figure 2</a>			0.45 0.5	V
$I_{OZ}$	High-impedance-state output current	SN7534050 $V_O = 0.4\text{ V to } 2.4\text{ V}$			$\pm 20$	$\mu\text{A}$
$I_I$	Line input current	Other input at 0 V			1.5 -2.5	mA
$I_{IH}$	High-level enable input current, $\overline{RE}$	SN7534050 $V_{IH} = 2.7\text{ V}$			20	$\mu\text{A}$
$I_{IL}$	Low-level enable input current, $\overline{RE}$	SN7534050 $V_{IL} = 0.4\text{ V}$			-100	$\mu\text{A}$
$r_i$	Input resistance			12		k $\Omega$
$I_{OS}$	Short circuit output current			-15	-85	mA
$I_{CC}$	Supply current (total package)	No load, enabled		80	110	mA

 (1) All typical values are at  $V_{CC} = 5\text{ V}$  and  $T_A = 25^\circ\text{C}$ .

(2) The algebraic convention, where the less positive (more negative) limit is designated as minimum, is used in this data sheet for common-mode input voltage and threshold voltage levels.

### Switching Characteristics

over operating free-air temperature range (unless otherwise noted)

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
$t_{PLH}$	Propagation delay time, low- to high-level output	$V_{ID} = 1.5\text{ V}$ , $C_L = 15\text{ pF}$ , See <a href="#">Figure 7</a>		20	35	ns
$t_{PHL}$	Propagation delay time, high- to low-level output	$V_{ID} = 1.5\text{ V}$ , $C_L = 15\text{ pF}$ , See <a href="#">Figure 7</a>		22	35	ns
$t_{PZH}$	Output enable time to high level	SN7534050 $C_L = 15\text{ pF}$ , see <a href="#">Figure 8</a>		17	25	ns
$t_{PZL}$	Output enable time to low level	SN7534050 $C_L = 15\text{ pF}$ , See <a href="#">Figure 8</a>		20	27	ns
$t_{PHZ}$	Output disable time from high level	SN7534050 $C_L = 15\text{ pF}$ , See <a href="#">Figure 8</a>		25	40	ns
$t_{PLZ}$	Output disable time from low level	SN7534050 $C_L = 15\text{ pF}$ , See <a href="#">Figure 8</a>		30	40	ns

PARAMETER MEASUREMENT INFORMATION

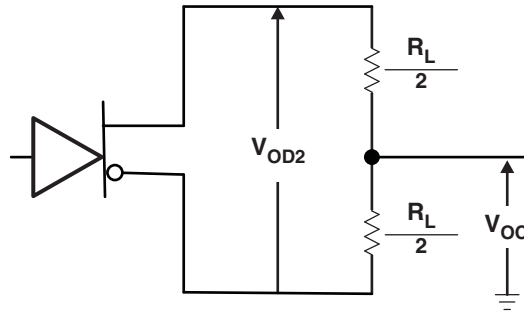


Figure 1. Driver Test Circuit,  $V_{OD}$  and  $V_{OC}$

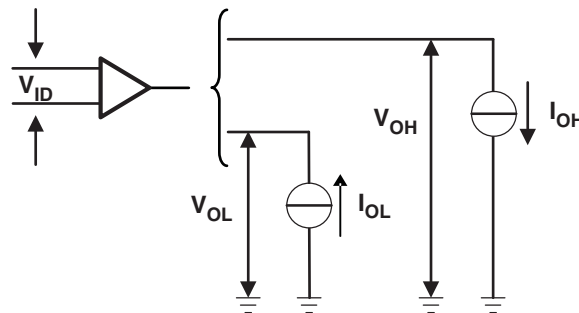
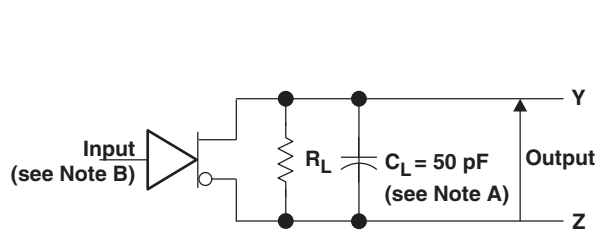


Figure 2. Receiver Test Circuit,  $V_{OH}$  and  $V_{OL}$

- A.  $C_L$  includes probe and jig capacitance.
- B. The pulse generator has the following characteristics:  $PRR \leq 1$  MHz, duty cycle = 50%,  $t_r = t_f \leq 6$  ns.



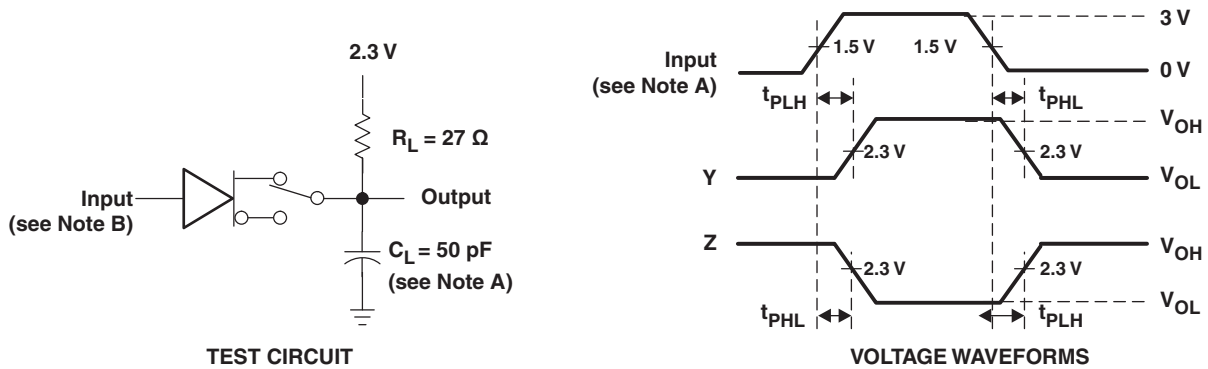
TEST CIRCUIT

VOLTAGE WAVEFORMS

Figure 3. Driver Test Circuit and Voltage Waveforms,  $t_{d(OD)}$  and  $t_{t(OD)}$

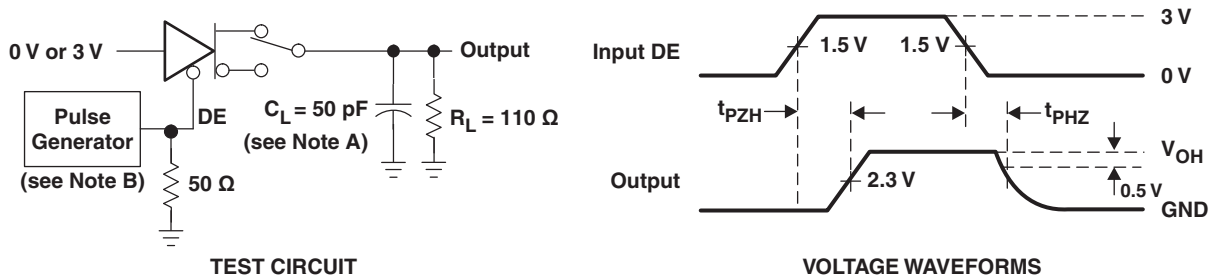
- A.  $C_L$  includes probe and jig capacitance.
- B. The pulse generator has the following characteristics:  $PRR \leq 1$  MHz, duty cycle = 50%,  $t_r = t_f \leq 6$  ns.

**PARAMETER MEASUREMENT INFORMATION (continued)**



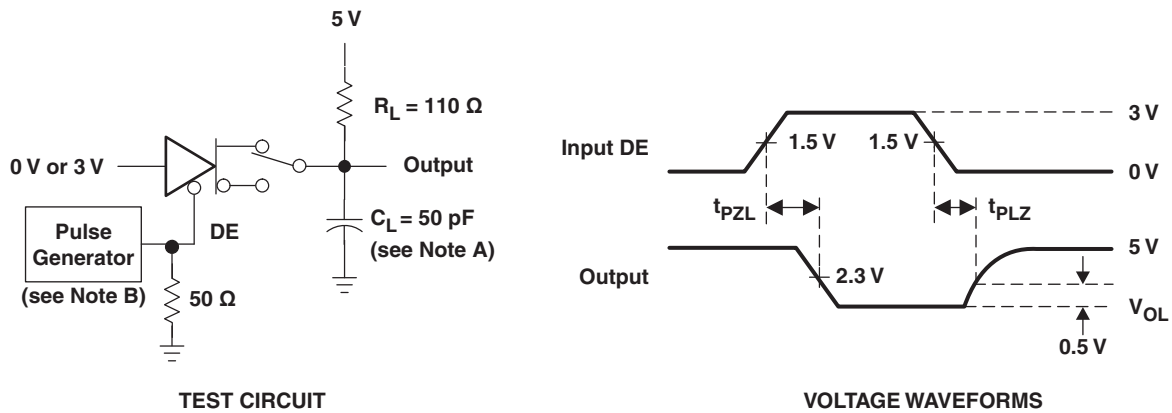
**Figure 4. Driver Test Circuit and Voltage Waveforms,  $t_{PLH}$  and  $t_{PHL}$**

- A.  $C_L$  includes probe and jig capacitance.
- B. The pulse generator has the following characteristics:  $PRR \leq 1$  MHz, duty cycle = 50%,  $t_r = t_f \leq 6$  ns.



**Figure 5. Driver Test Circuit and Voltage Waveforms,  $t_{PZH}$  and  $t_{PHZ}$**

- A.  $C_L$  includes probe and jig capacitance.
- B. The pulse generator has the following characteristics:  $PRR \leq 1$  MHz, duty cycle = 50%,  $t_r = t_f \leq 6$  ns.



**Figure 6. Driver Test Circuit and Voltage Waveforms,  $t_{PZL}$  and  $t_{PLZ}$**

- A.  $C_L$  includes probe and jig capacitance.
- B. The pulse generator has the following characteristics:  $PRR \leq 1$  MHz, duty cycle = 50%,  $t_r = t_f \leq 6$  ns.



PARAMETER MEASUREMENT INFORMATION (continued)

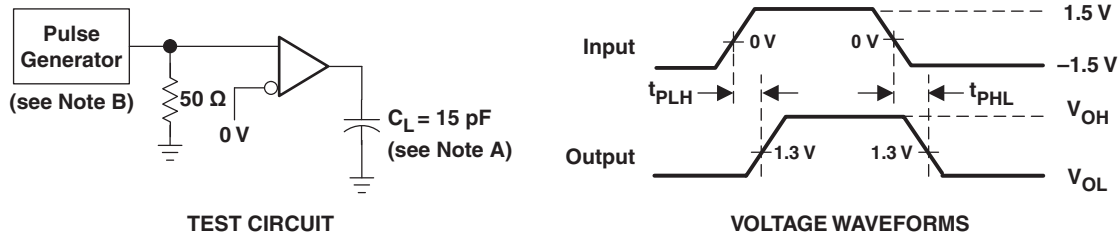


Figure 7. Receiver Test Circuit and Voltage Waveforms,  $t_{PLH}$  and  $t_{PHL}$

- A.  $C_L$  includes probe and jig capacitance.
- B. The pulse generator has the following characteristics: PRR  $\leq$  1 MHz, duty cycle = 50%,  $t_r = t_f \leq$  6 ns.

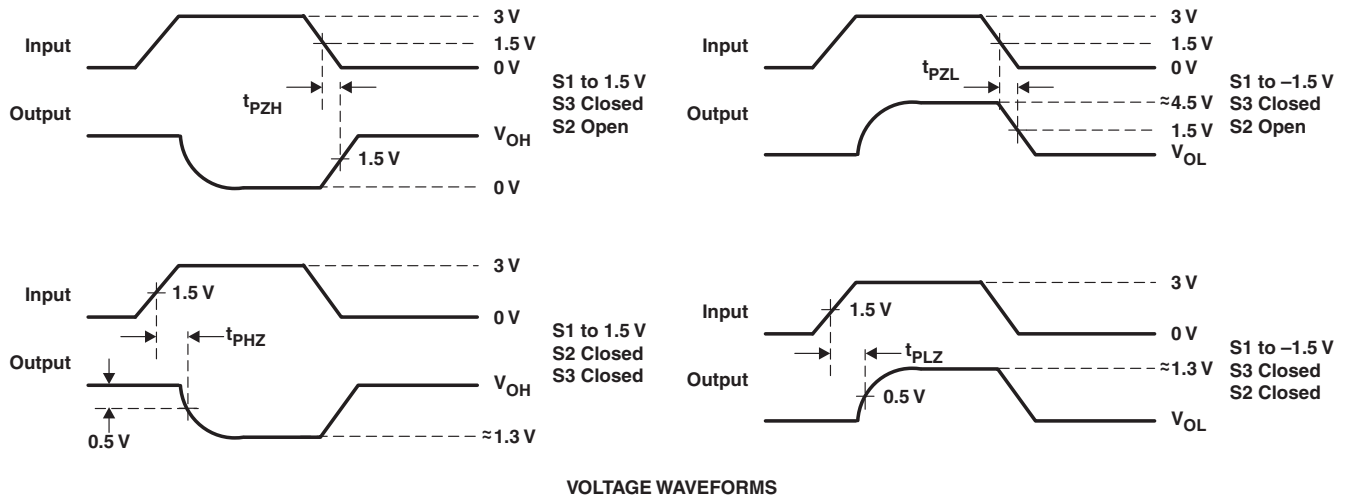
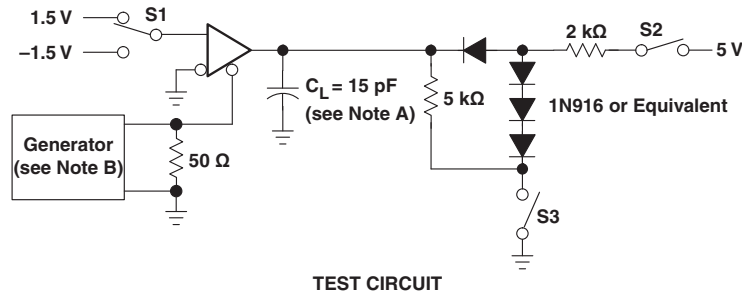


Figure 8. Receiver Test Circuit and Voltage Waveforms,  $t_{PZH}$ ,  $t_{PZL}$ ,  $t_{PHZ}$ ,  $t_{PLZ}$  (SN7534050)

## REVISION HISTORY

Changes from Original (May 2007) to Revision A	Page
• Updated document format from QS to DocZone. ....	1
• Updated ORDERING INFORMATION table. ....	1

**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
SN7534051NSR	LIFEBUY	SO	NS	16	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-20 to 85	SN7534051	

(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.

**OBSELETE:** 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**

**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
SN7534051NSR	SO	NS	16	2000	330.0	16.4	8.2	10.5	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)
SN7534051NSR	SO	NS	16	2000	356.0	356.0	35.0



# PACKAGE OUTLINE

## NS0016A

### SOP - 2.00 mm max height

SOP



4220735/A 12/2021

#### NOTES:

1. All linear dimensions are in millimeters. Dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.15 mm, per side.
4. This dimension does not include interlead flash. Interlead flash shall not exceed 0.25 mm, per side.

# EXAMPLE BOARD LAYOUT

NS0016A

SOP - 2.00 mm max height

SOP



SOLDER MASK DETAILS

4220735/A 12/2021

NOTES: (continued)

5. Publication IPC-7351 may have alternate designs.

6. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

# EXAMPLE STENCIL DESIGN

NS0016A

SOP - 2.00 mm max height

SOP



SOLDER PASTE EXAMPLE  
BASED ON 0.125 mm THICK STENCIL  
SCALE:7X

4220735/A 12/2021

NOTES: (continued)

7. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
8. Board assembly site may have different recommendations for stencil design.



# MECHANICAL DATA

NS (R-PDSO-G\*\*)

PLASTIC SMALL-OUTLINE PACKAGE

14-PINS SHOWN



- 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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