

SN54AHCT541, SN74AHCT541 OCTAL BUFFERS/DRIVERS WITH 3-STATE OUTPUTS

SCLS269M – DECEMBER 1995 – REVISED JANUARY 2000

- **EPIC™** (Enhanced-Performance Implanted CMOS) Process
- Inputs Are TTL-Voltage Compatible
- Latch-Up Performance Exceeds 250 mA Per JESD 17
- ESD Protection Exceeds 2000 V Per MIL-STD-883, Method 3015; Exceeds 200 V Using Machine Model (C = 200 pF, R = 0)
- Package Options Include Plastic Small-Outline (DW), Shrink Small-Outline (DB), Thin Very Small-Outline (DGV), Thin Shrink Small-Outline (PW), and Ceramic Flat (W) Packages, Ceramic Chip Carriers (FK), and Standard Plastic (N) and Ceramic (J) DIPs

description

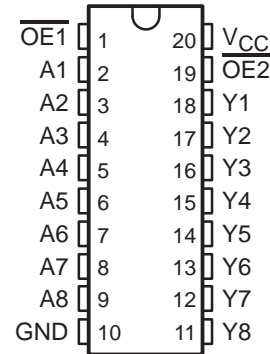
The 'AHCT541 octal buffers/drivers are ideal for driving bus lines or buffer memory address registers. These devices feature inputs and outputs on opposite sides of the package to facilitate printed circuit board layout.

The 3-state control gate is a 2-input AND gate with active-low inputs so that if either output-enable ($\overline{OE1}$ or $\overline{OE2}$) input is high, all corresponding outputs are in the high-impedance state. The outputs provide noninverted data when they are not in the high-impedance state.

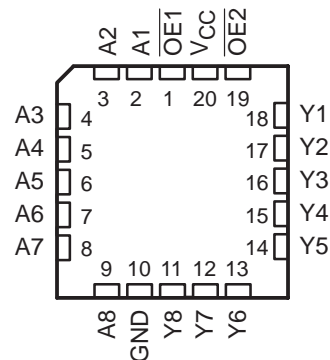
To ensure the high-impedance state during power up or power down, \overline{OE} should be tied to V_{CC} through a pullup resistor; the minimum value of the resistor is determined by the current-sinking capability of the driver.

The SN54AHCT541 is characterized for operation over the full military temperature range of -55°C to 125°C . The SN74AHCT541 is characterized for operation from -40°C to 85°C .

SN54AHCT541 . . . J OR W PACKAGE
SN74AHCT541 . . . DB, DGV, DW, N, OR PW PACKAGE
(TOP VIEW)



SN54AHCT541 . . . FK PACKAGE
(TOP VIEW)



FUNCTION TABLE
(each buffer/driver)

INPUTS			OUTPUT Y
$\overline{OE1}$	$\overline{OE2}$	A	
L	L	L	L
L	L	H	H
H	X	X	Z
X	H	X	Z



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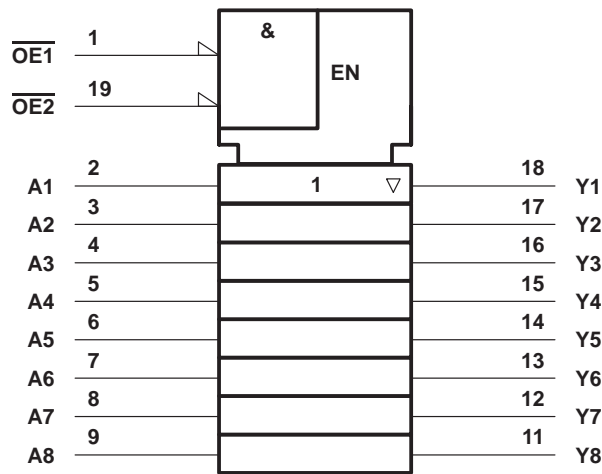
PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

**TEXAS
INSTRUMENTS**

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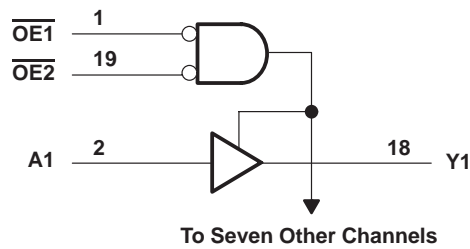
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logic symbol†



† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

logic diagram (positive logic)



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

Supply voltage range, V_{CC}	–0.5 V to 7 V
Input voltage range, V_I (see Note 1)	–0.5 V to 7 V
Output voltage range, V_O (see Note 1)	–0.5 V to $V_{CC} + 0.5$ V
Input clamp current, I_{IK} ($V_I < 0$)	–20 mA
Output clamp current, I_{OK} ($V_O < 0$ or $V_O > V_{CC}$)	±20 mA
Continuous output current, I_O ($V_O = 0$ to V_{CC})	±25 mA
Continuous current through V_{CC} or GND	±75 mA
Package thermal impedance, θ_{JA} (see Note 2): DB package	70°C/W
DGV package	92°C/W
DW package	58°C/W
N package	69°C/W
PW package	83°C/W
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. The input and output voltage ratings may be exceeded if the input and output current ratings are observed.
2. The package thermal impedance is calculated in accordance with JESD 51.

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recommended operating conditions (see Note 3)

		SN54AHCT541		SN74AHCT541		UNIT
		MIN	MAX	MIN	MAX	
V_{CC}	Supply voltage	4.5	5.5	4.5	5.5	V
V_{IH}	High-level input voltage	2		2		V
V_{IL}	Low-level input voltage		0.8		0.8	V
V_I	Input voltage	0	5.5	0	5.5	V
V_O	Output voltage	0	V_{CC}	0	V_{CC}	V
I_{OH}	High-level output current		–8		–8	mA
I_{OL}	Low-level output current		8		8	mA
$\Delta t/\Delta v$	Input transition rise or fall rate		20		20	ns/V
T_A	Operating free-air temperature	–55	125	–40	85	°C

NOTE 3: All unused inputs of the device must be held at V_{CC} or GND to ensure proper device operation. Refer to the TI application report, *Implications of Slow or Floating CMOS Inputs*, literature number SCBA004.

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

PARAMETER	TEST CONDITIONS	V_{CC}	$T_A = 25^\circ\text{C}$			SN54AHCT541		SN74AHCT541		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
V_{OH}	$I_{OH} = -50\ \mu\text{A}$	4.5 V	4.4	4.5		4.4		4.4		V
	$I_{OH} = -8\ \text{mA}$		3.94			3.8		3.8		
V_{OL}	$I_{OL} = 50\ \mu\text{A}$	4.5 V			0.1	0.1		0.1		V
	$I_{OL} = 8\ \text{mA}$				0.36	0.44		0.44		
I_I	$V_I = V_{CC}$ or GND	0 V to 5.5 V			± 0.1	$\pm 1^*$		± 1		μA
I_{OZ}	$V_O = V_{CC}$ or GND	5.5 V			± 0.25	± 2.5		± 2.5		μA
I_{CC}	$V_I = V_{CC}$ or GND, $I_O = 0$	5.5 V			4	40		40		μA
ΔI_{CC}^\dagger	One input at 3.4 V, Other inputs at V_{CC} or GND	5.5 V			1.35	1.5		1.5		mA
C_i	$V_I = V_{CC}$ or GND	5 V		2	10				10	pF
C_o	$V_O = V_{CC}$ or GND	5 V		4						pF

* On products compliant to MIL-PRF-38535, this parameter is not production tested at $V_{CC} = 0\ \text{V}$.

† This is the increase in supply current for each input at one of the specified TTL voltage levels rather than 0 V or V_{CC} .

SN54AHCT541, SN74AHCT541

OCTAL BUFFERS/DRIVERS

WITH 3-STATE OUTPUTS

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switching characteristics over recommended operating free-air temperature range,
 $V_{CC} = 5\text{ V} \pm 0.5\text{ V}$ (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	LOAD CAPACITANCE	$T_A = 25^\circ\text{C}$			SN54AHCT541		SN74AHCT541		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t_{PLH}	A	Y	$C_L = 15\text{ pF}$	4.1*	6*		1*	6.5*	1	6.5	ns
t_{PHL}				3.7*	5.5*		1*	6.5*	1	6.5	
t_{PZH}	\overline{OE}	Y	$C_L = 15\text{ pF}$	5*	7*		1*	8*	1	8	ns
t_{PZL}				5*	7*		1*	8*	1	8	
t_{PHZ}	\overline{OE}	Y	$C_L = 15\text{ pF}$	4.5*	7*		1*	8*	1	8	ns
t_{PLZ}				4.5*	7*		1*	8*	1	8	
t_{PLH}	A	Y	$C_L = 50\text{ pF}$	6.2	8.5		1	9.5	1	9.5	ns
t_{PHL}				6	8.5		1	9.5	1	9.5	
t_{PZH}	\overline{OE}	Y	$C_L = 50\text{ pF}$	7.5	10		1	12	1	12	ns
t_{PZL}				7.5	10		1	12	1	12	
t_{PHZ}	\overline{OE}	Y	$C_L = 50\text{ pF}$	7	10		1	12	1	12	ns
t_{PLZ}				7	10		1	12	1	12	
$t_{sk(o)}$			$C_L = 50\text{ pF}$		1**					1	ns

* On products compliant to MIL-PRF-38535, this parameter is not production tested.

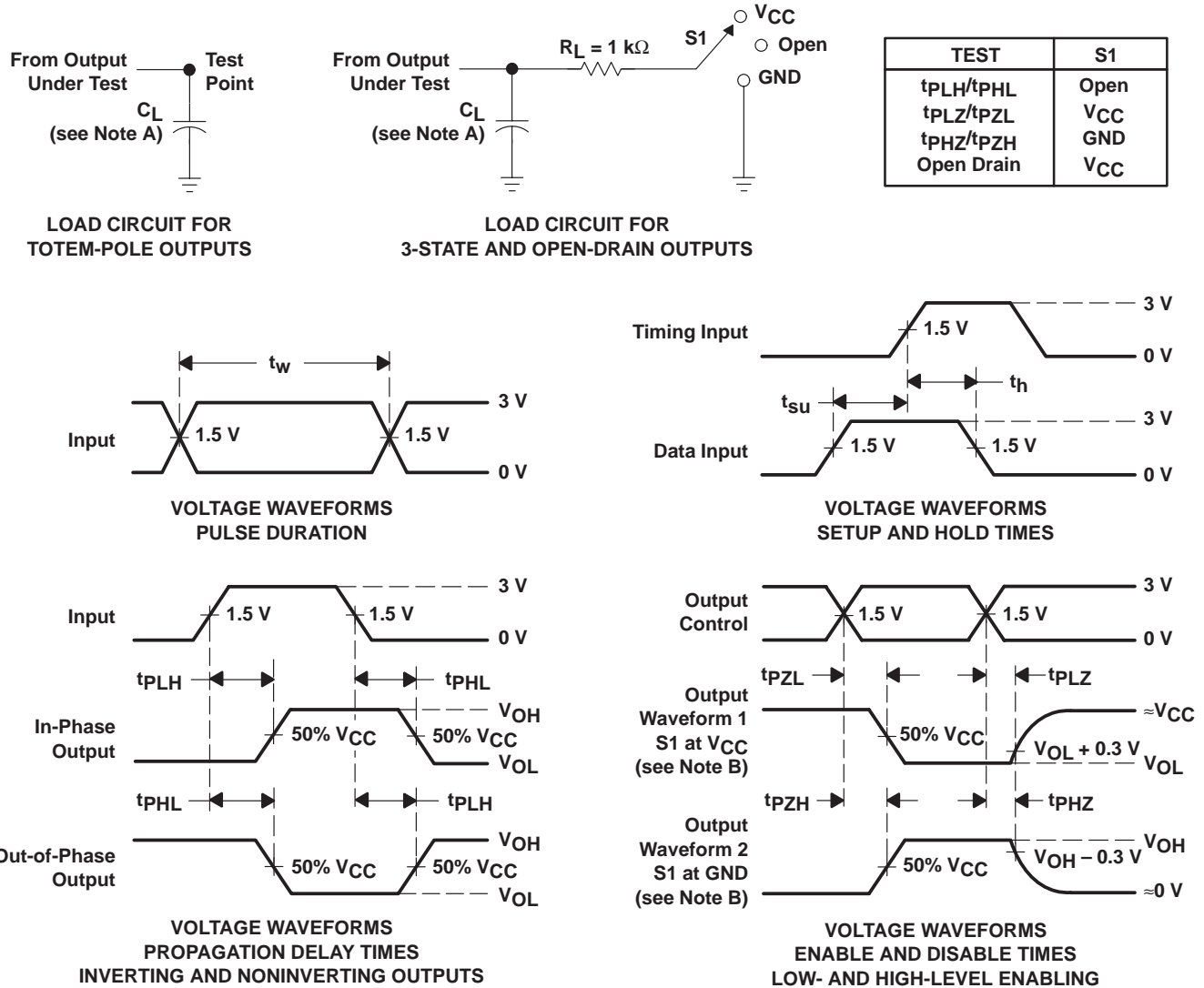
** On products compliant to MIL-PRF-38535, this parameter does not apply.

operating characteristics, $V_{CC} = 5\text{ V}$, $T_A = 25^\circ\text{C}$

PARAMETER	TEST CONDITIONS	TYP	UNIT
C_{pd} Power dissipation capacitance	No load, $f = 1\text{ MHz}$	12	pF



PARAMETER MEASUREMENT INFORMATION



- NOTES: A. C_L includes probe and jig capacitance.
- B. Waveform 1 is for an output with internal conditions such that the output is low except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high except when disabled by the output control.
- C. All input pulses are supplied by generators having the following characteristics: $PRR \leq 1\text{ MHz}$, $Z_O = 50\ \Omega$, $t_r \leq 3\text{ ns}$, $t_f \leq 3\text{ ns}$.
- D. The outputs are measured one at a time with one input transition per measurement.

Figure 1. Load Circuit and Voltage Waveforms

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