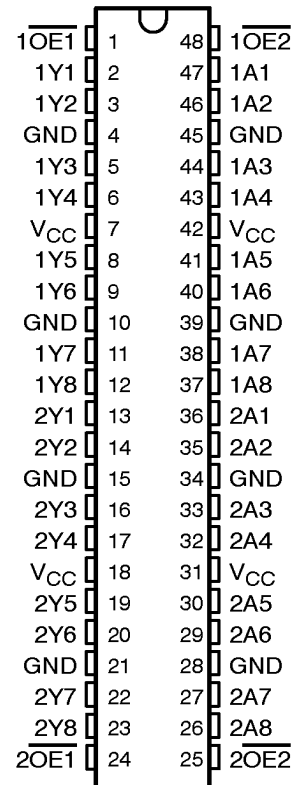


# 54ACT16540, 74ACT16540 16-BIT BUFFERS/DRIVERS WITH 3-STATE OUTPUTS

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- Members of the Texas Instruments *Widebus™* Family
- Inputs Are TTL-Voltage Compatible
- Provide Extra Data Width Necessary for Wider Address/Data Paths
- Provide Inverted Data
- 3-State Outputs Drive Bus Lines or Buffer Memory Address Registers
- Flow-Through Architecture Optimizes PCB Layout
- Distributed  $V_{CC}$  and GND Pin Configuration Minimizes High-Speed Switching Noise
- *EPIC™* (Enhanced-Performance Implanted CMOS) 1- $\mu$ m Process
- 500-mA Typical Latch-Up Immunity at 125°C
- Package Options Include Shrink Small-Outline 300-mil (DL) Package Using 25-mil Center-to-Center Pin Spacings and 380-mil Fine-Pitch Ceramic Flat (WD) Packages Using 25-mil Center-to-Center Pin Spacings

54ACT16540 . . . WD PACKAGE  
74ACT16540 . . . DL PACKAGE  
(TOP VIEW)



## description

These 16-bit buffers/bus drivers provide a high-performance bus interface for wide data paths.

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 74ACT16540 is packaged in TI's shrink small-outline package, which provides twice the I/O pin count and functionality of standard small-outline packages in the same printed-circuit-board area.

The 54ACT16540 is characterized for operation over the full military temperature range of -55°C to 125°C. The 74ACT16540 is characterized for operation from -40°C to 85°C.

FUNCTION TABLE  
(each 8-bit section)

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



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 **TEXAS  
INSTRUMENTS**

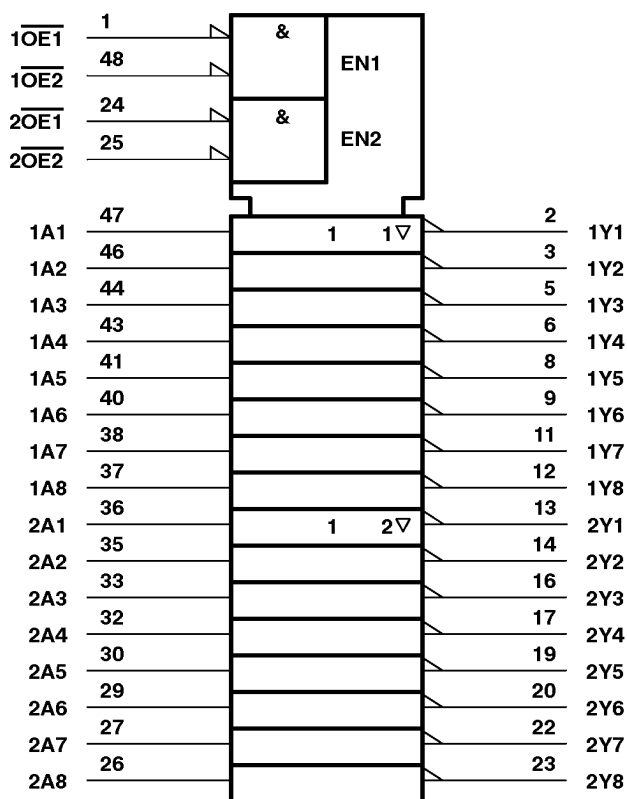
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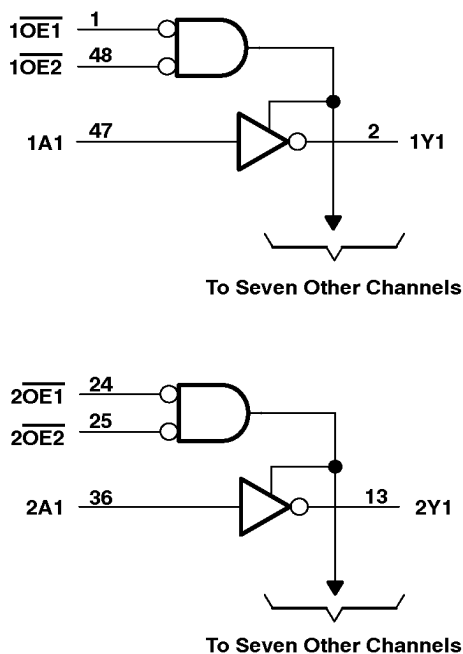
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## logic symbol†



## logic diagram (positive logic)



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

## 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 $V_{CC} + 0.5$ V
Output voltage range, $V_O$ (see Note 1) .....	-0.5 V to $V_{CC} + 0.5$ V
Input clamp current, $I_{IK}$ ( $V_I < 0$ or $V_I > V_{CC}$ ) .....	$\pm 20$ mA
Output clamp current, $I_{OK}$ ( $V_O < 0$ or $V_O > V_{CC}$ ) .....	$\pm 50$ mA
Continuous output current, $I_O$ ( $V_O = 0$ to $V_{CC}$ ) .....	$\pm 50$ mA
Continuous current through $V_{CC}$ or GND .....	$\pm 400$ mA
Maximum power package dissipation at $T_A = 55^\circ\text{C}$ (in still air) (see Note 2): DL package .....	1.2 W
Storage temperature range, $T_{stg}$ .....	$-65^\circ\text{C}$ to $150^\circ\text{C}$

‡ 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 maximum package power dissipation is calculated using a junction temperature of  $150^\circ\text{C}$  and a board trace length of 750 mils.



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# 54ACT16540, 74ACT16540 16-BIT BUFFERS/DRIVERS WITH 3-STATE OUTPUTS

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## recommended operating conditions (see Note 3)

		54ACT16540			74ACT16540			UNIT
		MIN	NOM	MAX	MIN	NOM	MAX	
$V_{CC}$	Supply voltage	4.5	5	5.5	4.5	5	5.5	V
$V_{IH}$	High-level input voltage	2			2			V
$V_{IL}$	Low-level input voltage				0.8			V
$V_I$	Input voltage	0			$V_{CC}$			V
$V_O$	Output voltage	0			$V_{CC}$			V
$I_{OH}$	High-level output current				-24			mA
$I_{OL}$	Low-level output current				24			mA
$\Delta t/\Delta v$	Input transition rise or fall rate	0			10			ns/V
$T_A$	Operating free-air temperature	-55			125			°C

NOTE 3: Unused inputs must be held high or low to prevent them from floating.

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

PARAMETER	TEST CONDITIONS	$V_{CC}$	$T_A = 25^\circ\text{C}$			54ACT16540		74ACT16540		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
$V_{OH}$	$I_{OH} = -50 \mu\text{A}$	4.5 V	4.4			4.4		4.4		V
		5.5 V	5.4			5.4		5.4		
	$I_{OH} = -24 \text{ mA}$	4.5 V	3.94			3.8		3.8		
		5.5 V	4.94			4.8		4.8		
	$I_{OH} = -75 \text{ mA}^\dagger$	5.5 V				3.85		3.85		
$V_{OL}$	$I_{OL} = 50 \mu\text{A}$	4.5 V	0.1			0.1		0.1		V
		5.5 V	0.1			0.1		0.1		
	$I_{OL} = 24 \text{ mA}$	4.5 V	0.36			0.44		0.44		
		5.5 V	0.36			0.44		0.44		
		$I_{OL} = 75 \text{ mA}^\dagger$	5.5 V				1.65		1.65	
$I_I$	$V_I = V_{CC}$ or GND	5.5 V	$\pm 0.1$			$\pm 1$		$\pm 1$		$\mu\text{A}$
$I_{OZ}$	$V_O = V_{CC}$ or GND	5.5 V	$\pm 0.5$			$\pm 5$		$\pm 5$		$\mu\text{A}$
$I_{CC}$	$V_I = V_{CC}$ or GND, $I_O = 0$	5.5 V	8			80		80		$\mu\text{A}$
$\Delta I_{CC}^\ddagger$	One input at 3.4 V, Other inputs at $V_{CC}$ or GND	5.5 V	0.9			1		1		mA
$C_i$	$V_I = V_{CC}$ or GND	5 V	4							pF
$C_o$	$V_O = V_{CC}$ or GND	5 V	13							pF

$^\dagger$  Not more than one output should be tested at a time, and the duration of the test should not exceed 10 ms.

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

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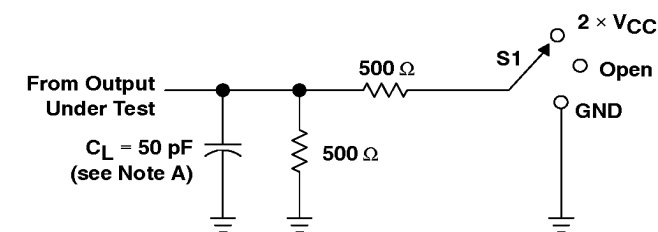
switching characteristics over recommended operating free-air temperature range,  
 $V_{CC} = 5\text{ V} \pm 0.5\text{ V}$  (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$T_A = 25^\circ\text{C}$			54ACT16540		74ACT16540		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
$t_{PLH}$	A	Y	2.1	5.1	6.8	2.1	7.5	2.1	7.5	ns
$t_{PHL}$			3.9	6.8	8.5	3.9	9.5	3.9	9.5	
$t_{PZH}$	$\overline{\text{OE}}$	Y	2.7	6.2	8	2.7	8.9	2.7	8.9	ns
$t_{PZL}$			3.6	7.5	9.5	3.6	10.5	3.6	10.5	
$t_{PHZ}$	$\overline{\text{OE}}$	Y	5.4	9.2	10.9	5.4	11.9	5.4	11.9	ns
$t_{PLZ}$			5.4	8.6	10.3	5.4	11.1	5.4	11.1	

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

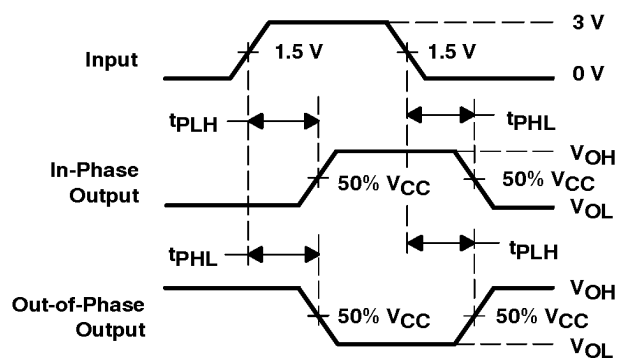
PARAMETER		TEST CONDITIONS		TYP	UNIT
$C_{pd}$	Power dissipation capacitance per buffer	Outputs enabled	$C_L = 50\text{ pF}$ , $f = 1\text{ MHz}$	42	$\mu\text{F}$
		Outputs disabled		8.5	

## PARAMETER MEASUREMENT INFORMATION

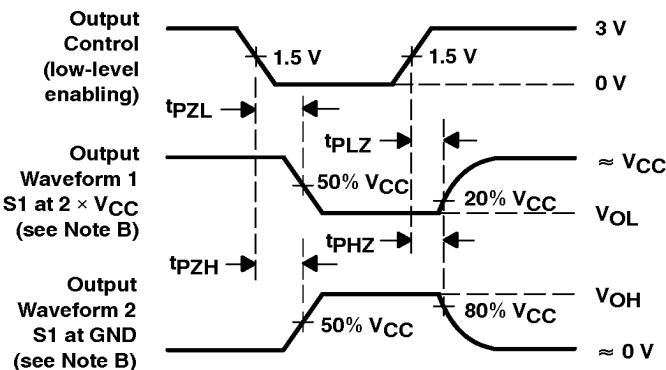


LOAD CIRCUIT

TEST	S1
$t_{PLH}/t_{PHL}$	Open
$t_{PLZ}/t_{PZL}$	$2 \times V_{CC}$
$t_{PHZ}/t_{PZH}$	GND



VOLTAGE WAVEFORMS



VOLTAGE WAVEFORMS

- 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:  $PRR \leq 1\text{ MHz}$ ,  $Z_O = 50\ \Omega$ ,  $t_r = 3\text{ ns}$ ,  $t_f = 3\text{ ns}$ .  
 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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