

# SN54ALS240A, SN54AS240A, SN74ALS240A, SN74AS240A

## OCTAL BUFFERS/DRIVERS WITH 3-STATE OUTPUTS

SDAS214C – DECEMBER 1982 – REVISED AUGUST 1995

- 3-State Outputs Drive Bus Lines or Buffer Memory Address Registers
- pnp Inputs Reduce dc Loading
- Package Options Include Plastic Small-Outline (DW) Packages, Ceramic Chip Carriers (FK), and Standard Plastic (N) and Ceramic (J) 300-mil DIPs

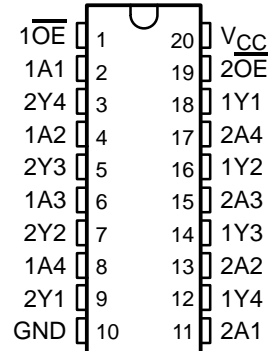
### description

These octal buffers/drivers are designed specifically to improve both the performance and density of 3-state memory address drivers, clock drivers, and bus-oriented receivers and transmitters. When these devices are used with the 'ALS241, 'AS241A, 'ALS244, and 'AS244A, the circuit designer has a choice of selected combinations of inverting and noninverting outputs, symmetrical active-low output-enable ( $\overline{\text{OE}}$ ) inputs, and complementary OE and  $\overline{\text{OE}}$  inputs. These devices feature high fan-out and improved fan-in.

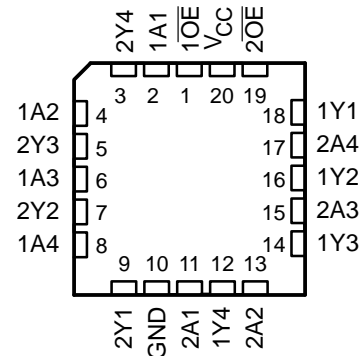
The -1 version of SN74ALS240A is identical to the standard version, except that the recommended maximum  $I_{OL}$  for the -1 version is 48 mA. There is no -1 version of the SN54ALS240A.

The SN54ALS240A and SN54AS240A are characterized for operation over the full military temperature range of  $-55^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ . The SN74ALS240A and SN74AS240A are characterized for operation from  $0^{\circ}\text{C}$  to  $70^{\circ}\text{C}$ .

SN54ALS240A, SN54AS240A . . . J PACKAGE  
SN74ALS240A, SN74AS240A . . . DW OR N PACKAGE  
(TOP VIEW)



SN54ALS240A, SN54AS240A . . . FK PACKAGE  
(TOP VIEW)



FUNCTION TABLE  
(each buffer)

INPUTS		OUTPUT Y
$\overline{\text{OE}}$	A	
L	H	L
L	L	H
H	X	Z

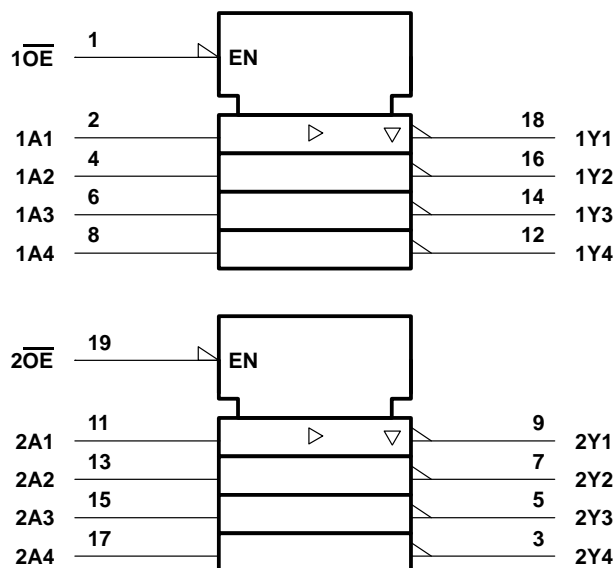
# SN54ALS240A, SN54AS240A, SN74ALS240A, SN74AS240A

## OCTAL BUFFERS/DRIVERS

### WITH 3-STATE OUTPUTS

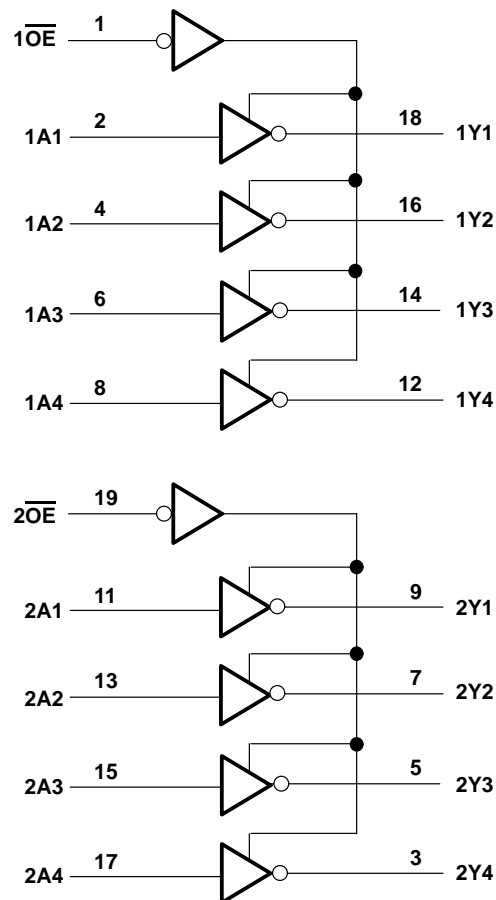
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#### logic symbol†



† 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, $V_{CC}$	7 V
Input voltage, $V_I$	7 V
Voltage applied to a disabled 3-state output	5.5 V
Operating free-air temperature range, $T_A$ : SN54ALS240A	–55°C to 125°C
SN74ALS240A	0°C to 70°C
Storage temperature range	–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.

# SN54ALS240A, SN54AS240A, SN74ALS240A, SN74AS240A

## OCTAL BUFFERS/DRIVERS WITH 3-STATE OUTPUTS

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### recommended operating conditions

		SN54ALS240A			SN74ALS240A			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			0.7			0.8	V
$I_{OH}$	High-level output current			-12			-15	mA
$I_{OL}$	Low-level output current			12			24	mA
							48†	
$T_A$	Operating free-air temperature	-55		125	0		70	°C

† Applies only to the -1 version and only if  $V_{CC}$  is between 4.75 V and 5.25 V

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

PARAMETER	TEST CONDITIONS		SN54ALS240A			SN74ALS240A			UNIT
			MIN	TYP‡	MAX	MIN	TYP‡	MAX	
$V_{IK}$	$V_{CC} = 4.5$ V,	$I_I = -18$ mA			-1.2			-1.2	V
$V_{OH}$	$V_{CC} = 4.5$ V to 5.5 V,	$I_{OH} = -0.4$ mA	$V_{CC} - 2$			$V_{CC} - 2$			V
	$V_{CC} = 4.5$ V	$I_{OH} = -3$ mA	2.4	3.2		2.4	3.2		
		$I_{OH} = -12$ mA	2						
		$I_{OH} = -15$ mA				2			
$V_{OL}$	$V_{CC} = 4.5$ V	$I_{OL} = 12$ mA	0.25	0.4		0.25	0.4		V
		$I_{OL} = 24$ mA				0.35	0.5		
		$I_{OL} = 48$ mA†				0.35	0.5		
$I_{OZH}$	$V_{CC} = 5.5$ V,	$V_O = 2.7$ V			20			20	μA
$I_{OZL}$	$V_{CC} = 5.5$ V,	$V_O = 0.4$ V			-20			-20	μA
$I_I$	$V_{CC} = 5.5$ V,	$V_I = 7$ V			0.1			0.1	mA
$I_{IH}$	$V_{CC} = 5.5$ V,	$V_I = 2.7$ V			20			20	μA
$I_{IL}$	$V_{CC} = 5.5$ V,	$V_I = 0.4$ V			-0.1			-0.1	mA
$I_{OS}§$	$V_{CC} = 5.5$ V,	$V_O = 2.25$ V	-20		-112	-30		-112	mA
$I_{CC}$	$V_{CC} = 5.5$ V	Outputs high	4	11		4	11		mA
		Outputs low	13	23		13	23		
		Outputs disabled	14	25		14	25		

† Applies only to the -1 version and only if  $V_{CC}$  is between 4.75 V and 5.25 V

‡ All typical values are at  $V_{CC} = 5$  V,  $T_A = 25^\circ\text{C}$ .

§ The output conditions have been chosen to produce a current that closely approximates one half of the true short-circuit output current,  $I_{OS}$ .

# SN54ALS240A, SN54AS240A, SN74ALS240A, SN74AS240A

## OCTAL BUFFERS/DRIVERS

### WITH 3-STATE OUTPUTS

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#### switching characteristics (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V <sub>CC</sub> = 4.5 V to 5.5 V, C <sub>L</sub> = 50 pF, R <sub>1</sub> = 500 Ω, R <sub>2</sub> = 500 Ω, T <sub>A</sub> = MIN to MAX†				UNIT
			SN54ALS240A		SN74ALS240A		
			MIN	MAX	MIN	MAX	
t <sub>PLH</sub>	A	Y	2	22	2	9	ns
t <sub>PHL</sub>			2	11	2	9	
t <sub>PZH</sub>	$\overline{\text{OE}}$	Y	4	34	5	13	ns
t <sub>PZL</sub>			5	26	5	18	
t <sub>PHZ</sub>	$\overline{\text{OE}}$	Y	1	15	2	10	ns
t <sub>PLZ</sub>			3	24	3	12	

† For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

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

Supply voltage, V <sub>CC</sub>	7 V
Input voltage, V <sub>I</sub>	7 V
Voltage applied to a disabled 3-state output	5.5 V
Operating free-air temperature range, T <sub>A</sub> : SN54AS240A	–55°C to 125°C
SN74AS240A	0°C to 70°C
Storage temperature range	–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.

#### recommended operating conditions

		SN54AS240A			SN74AS240A			UNIT
		MIN	NOM	MAX	MIN	NOM	MAX	
V <sub>CC</sub>	Supply voltage	4.5	5	5.5	4.5	5	5.5	V
V <sub>IH</sub>	High-level input voltage	2			2			V
V <sub>IL</sub>	Low-level input voltage			0.8			0.8	V
I <sub>OH</sub>	High-level output current			–12			–15	mA
I <sub>OL</sub>	Low-level output current			48			64	mA
T <sub>A</sub>	Operating free-air temperature	–55		125	0		70	°C



# SN54ALS240A, SN54AS240A, SN74ALS240A, SN74AS240A

## OCTAL BUFFERS/DRIVERS

### WITH 3-STATE OUTPUTS

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

PARAMETER	TEST CONDITIONS		SN54AS240A			SN74AS240A			UNIT
			MIN	TYP†	MAX	MIN	TYP†	MAX	
$V_{IK}$	$V_{CC} = 4.5\text{ V}$ , $I_I = -18\text{ mA}$				-1.2			-1.2	V
$V_{OH}$	$V_{CC} = 4.5\text{ V to } 5.5\text{ V}$	$I_{OH} = -2\text{ mA}$	$V_{CC} - 2$			$V_{CC} - 2$			V
		$I_{OH} = -3\text{ mA}$	2.4	3.4		2.4	3.4		
	$V_{CC} = 4.5\text{ V}$	$I_{OH} = -12\text{ mA}$	2.4						
		$I_{OH} = -15\text{ mA}$				2.4			
$V_{OL}$	$V_{CC} = 4.5\text{ V}$	$I_{OL} = 48\text{ mA}$	0.27	0.55					V
		$I_{OL} = 64\text{ mA}$				0.31	0.55		
$I_{OZH}$	$V_{CC} = 5.5\text{ V}$ , $V_O = 2.7\text{ V}$				50			50	$\mu\text{A}$
$I_{OZL}$	$V_{CC} = 5.5\text{ V}$ , $V_O = 0.4\text{ V}$				-50			-50	$\mu\text{A}$
$I_I$	$V_{CC} = 5.5\text{ V}$ , $V_I = 7\text{ V}$				0.1			0.1	mA
$I_{IH}$	$V_{CC} = 5.5\text{ V}$ , $V_I = 2.7\text{ V}$				20			20	$\mu\text{A}$
$I_{IL}$	A inputs	$V_{CC} = 5.5\text{ V}$ , $V_I = 2.7\text{ V}$			-1			-1	mA
	$\overline{OE}$ inputs				-0.5			-0.5	
$I_{O\ddagger}$	$V_{CC} = 5.5\text{ V}$ , $V_O = 2.25\text{ V}$		-50		-150	-50		-150	mA
$I_{CC}$	$V_{CC} = 5.5\text{ V}$	Outputs high	11	17		11	17		mA
		Outputs low	51	75		51	75		
		Outputs disabled	24	38		24	38		

† All typical values are at  $V_{CC} = 5\text{ V}$ ,  $T_A = 25^\circ\text{C}$ .

‡ The output conditions have been chosen to produce a current that closely approximates one half of the true short-circuit output current,  $I_{OS}$ .

### switching characteristics (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V <sub>CC</sub> = 4.5 V to 5.5 V, C <sub>L</sub> = 50 pF, R <sub>1</sub> = 500 Ω, R <sub>2</sub> = 500 Ω, T <sub>A</sub> = MIN to MAX§				UNIT
			SN54AS240A		SN74AS240A		
			MIN	MAX	MIN	MAX	
t <sub>PLH</sub>	A	Y	1	7	1	6.5	ns
t <sub>PHL</sub>			1.2	6.5	1.2	6.5	
t <sub>PZH</sub>	$\overline{OE}$	Y	1	7	1	6.4	ns
t <sub>PZL</sub>			1.1	9.5	1.1	9	
t <sub>PHZ</sub>	$\overline{OE}$	Y	1.2	5.5	1.2	5	ns
t <sub>PLZ</sub>			1.5	12.5	1.5	9.5	

§ For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

# SN54ALS240A, SN54AS240A, SN74ALS240A, SN74AS240A

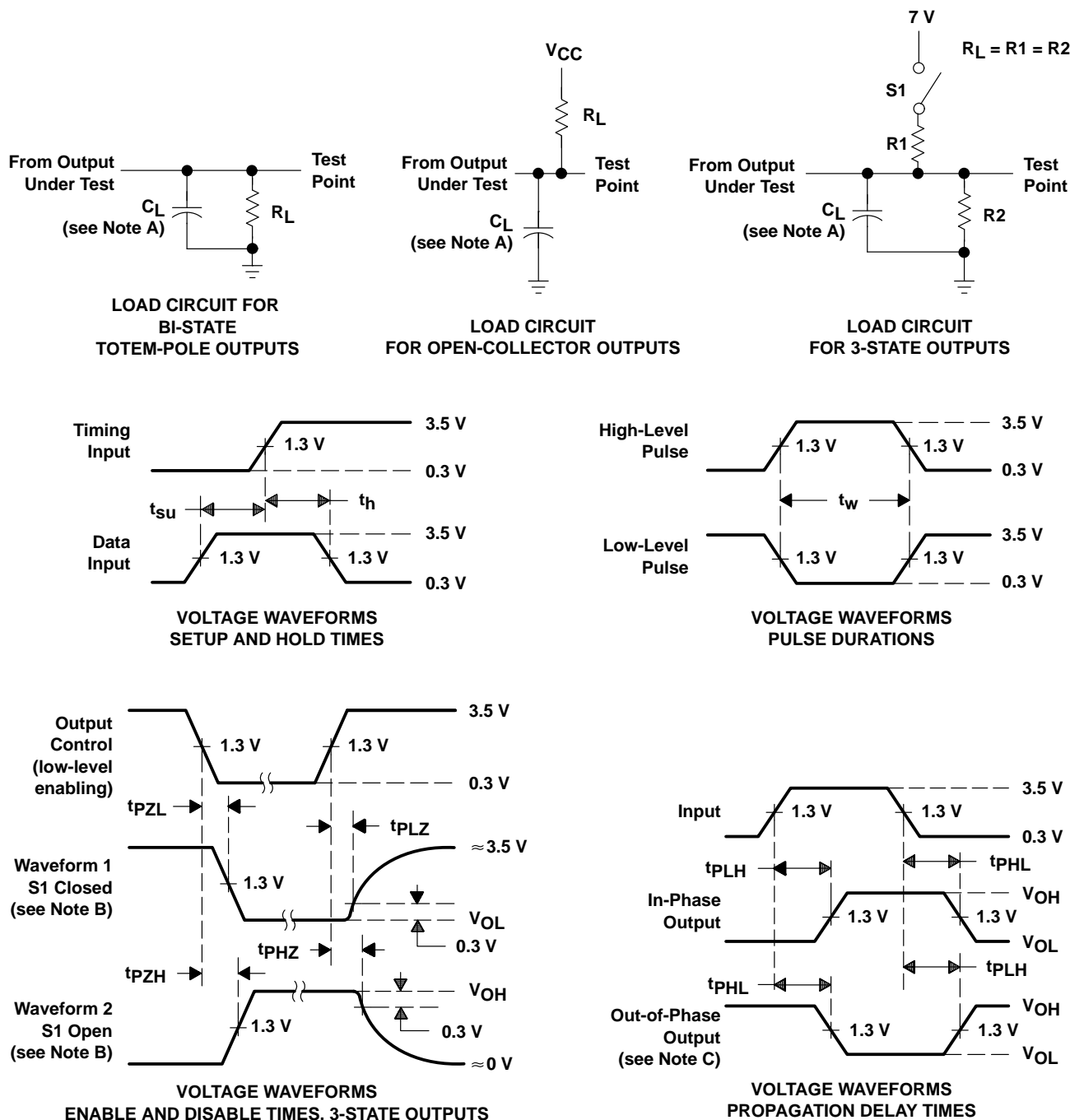
## OCTAL BUFFERS/DRIVERS

### WITH 3-STATE OUTPUTS

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#### PARAMETER MEASUREMENT INFORMATION

##### SERIES 54ALS/74ALS AND 54AS/74AS DEVICES



- NOTES:
- $C_L$  includes probe and jig capacitance.
  - 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.
  - When measuring propagation delay items of 3-state outputs, switch S1 is open.
  - All input pulses have the following characteristics:  $PRR \leq 1$  MHz,  $t_r = t_f = 2$  ns, duty cycle = 50%.
  - The outputs are measured one at a time with one transition per measurement.

Figure 1. Load Circuits and Voltage Waveforms

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