

# SN54ALS241C, SN54AS241A, SN74ALS241C, SN74AS241A OCTAL BUFFERS/DRIVERS WITH 3-STATE OUTPUTS

SDAS153E – 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

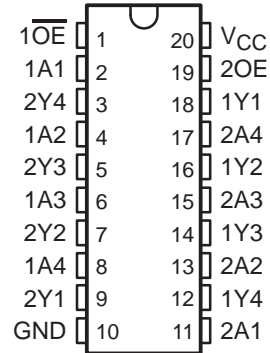
## description

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

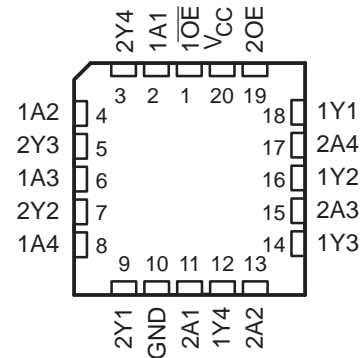
The -1 version of SN74ALS241C is identical to the standard version, except that the recommended maximum  $I_{OL}$  of the -1 version is 48 mA. There is no -1 version of the SN54ALS241C.

The SN54ALS241C and SN54AS241A are characterized for operation over the full military temperature range of  $-55^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ . The SN74ALS241C and SN74AS241A are characterized for operation from  $0^{\circ}\text{C}$  to  $70^{\circ}\text{C}$ .

SN54ALS241C, SN54AS241A . . . J PACKAGE  
SN74ALS241C, SN74AS241A . . . DW OR N PACKAGE  
(TOP VIEW)



SN54ALS241C, SN54AS241A . . . FK PACKAGE  
(TOP VIEW)



## FUNCTION TABLES

INPUTS		OUTPUT
$\overline{1OE}$	1A	1Y
L	H	H
L	L	L
H	X	Z

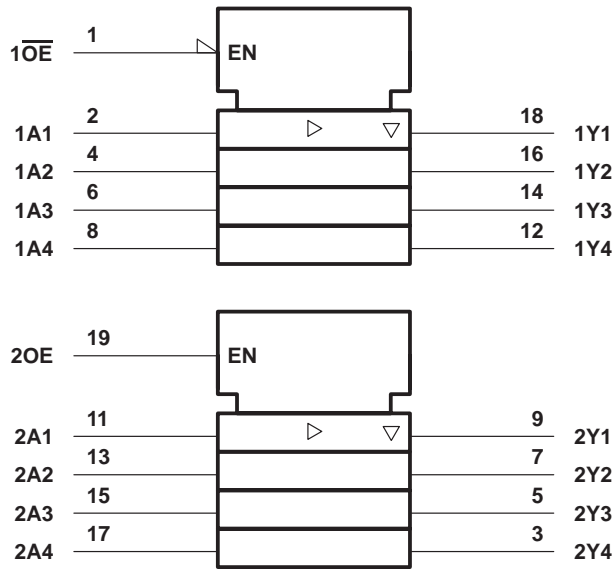
INPUTS		OUTPUT
2OE	2A	2Y
H	H	H
H	L	L
L	X	Z

# SN54ALS241C, SN54AS241A, SN74ALS241C, SN74AS241A

## OCTAL BUFFERS/DRIVERS WITH 3-STATE OUTPUTS

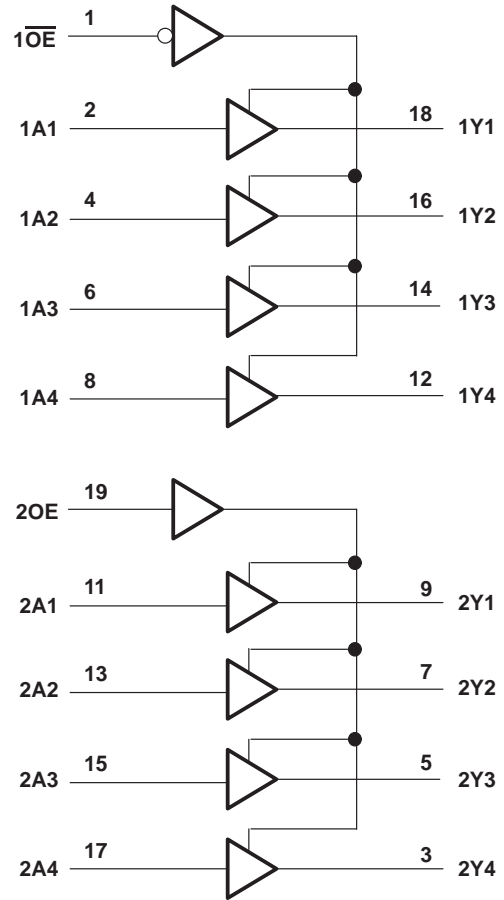
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### logic symbol†



† 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, $T_A$ : SN54ALS241C	-55°C to 125°C
SN74ALS241C	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.

# SN54ALS241C, SN54AS241A, SN74ALS241C, SN74AS241A OCTAL BUFFERS/DRIVERS WITH 3-STATE OUTPUTS

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## recommended operating conditions

		SN54ALS241C			SN74ALS241C			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	SN54ALS241C			SN74ALS241C			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
$V_{OH}$	$V_{CC} = 4.5\text{ V to } 5.5\text{ V}$ , $I_{OH} = -0.4\text{ mA}$	$V_{CC} - 2$			$V_{CC} - 2$			V
	$V_{CC} = 4.5\text{ V}$	$I_{OH} = -3\text{ mA}$	2.4	3.2	2.4	3.2		
		$I_{OH} = -12\text{ mA}$	2					
$V_{OL}$	$V_{CC} = 4.5\text{ V}$	$I_{OH} = -15\text{ mA}$				2		
		$I_{OL} = 12\text{ mA}$	0.25		0.4	0.25		0.4
		$I_{OL} = 24\text{ mA}$				0.35		0.5
		$I_{OL} = 48\text{ mA (-1 version)}$				0.35		0.5
$I_{OZH}$	$V_{CC} = 5.5\text{ V}$ , $V_O = 2.7\text{ V}$				20		20	μA
$I_{OZL}$	$V_{CC} = 5.5\text{ V}$ , $V_O = 0.4\text{ V}$				-20		-20	μA
$I_I$	$V_{CC} = 5.5\text{ V}$ , $V_I = 7\text{ V}$				0.1		0.1	mA
$I_{IH}$	$V_{CC} = 5.5\text{ V}$ , $V_I = 2.7\text{ V}$				20		20	μA
$I_{IL}$	$V_{CC} = 5.5\text{ V}$ , $V_I = 0.4\text{ V}$				-0.1		-0.1	mA
$I_{O}^{\S}$	$V_{CC} = 5.5\text{ V}$ , $V_O = 2.25\text{ V}$	-20		-112	-30		-112	mA
$I_{CC}$	$V_{CC} = 5.5\text{ V}$	Outputs high	9	17	9	18	mA	
		Outputs low	15	28	15	26		
		Outputs disabled	17	32	17	30		

‡ 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,  $I_{OS}$ .

# SN54ALS241C, SN54AS241A, SN74ALS241C, SN74AS241A

## 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
			SN54ALS241C		SN74ALS241C		
			MIN	MAX	MIN	MAX	
t <sub>PLH</sub>	A	Y	3	31	2	11	ns
t <sub>PHL</sub>			1	17	3	10	
t <sub>PZH</sub>	$\overline{1OE}$	Y	3	33	3	21	ns
t <sub>PZL</sub>			3	27	4	21	
t <sub>PHZ</sub>	$\overline{1OE}$	Y	2	17	1	10	ns
t <sub>PLZ</sub>			2	32	2	15	
t <sub>PZH</sub>	2OE	Y	3	38	4	21	ns
t <sub>PZL</sub>			3	30	5	21	
t <sub>PHZ</sub>	2OE	Y	2	17	2	10	ns
t <sub>PLZ</sub>			3	35	3	15	

† 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> : SN54AS241A	–55°C to 125°C
SN74AS241A	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

		SN54AS241A			SN74AS241A			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

# SN54ALS241C, SN54AS241A, SN74ALS241C, SN74AS241A 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		SN54AS241A		SN74AS241A		UNIT	
			MIN	TYP†	MAX	MIN		TYP†
$V_{IK}$	$V_{CC} = 4.5\text{ V}$ ,	$I_I = -18\text{ mA}$			-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	
	$V_{CC} = 4.5\text{ V}$	$I_{OH} = -3\text{ mA}$	2.4	3.4	2.4	3.4		
		$I_{OH} = -12\text{ mA}$	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	$\mu\text{A}$
$I_{IL}$	$V_{CC} = 5.5\text{ V}$ ,	$V_I = 0.4\text{ V}$			-1		-1	mA
$I_{O}^\ddagger$	$V_{CC} = 5.5\text{ V}$ ,	$V_O = 2.25\text{ V}$	-50		-150	-50	-150	mA
$I_{CC}$	$V_{CC} = 5.5\text{ V}$	Outputs high	22	35	22	35	mA	
		Outputs low	61	90	61	90		
		Outputs disabled	35	56	35	56		

† 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)	$V_{CC} = 4.5\text{ V to }5.5\text{ V}$ , $C_L = 50\text{ pF}$ , $R_1 = 500\ \Omega$ , $R_2 = 500\ \Omega$ , $T_A = \text{MIN to MAX}^\S$				UNIT
			SN54AS241A		SN74AS241A		
			MIN	MAX	MIN	MAX	
$t_{PLH}$	A	Y	2	9	2	6.2	ns
$t_{PHL}$			1	7	1	6.2	
$t_{PZH}$	$\overline{1OE}$	Y	1	10	1	9	ns
$t_{PZL}$			2	8	2	7.5	
$t_{PHZ}$	$\overline{1OE}$	Y	1	6.5	1	6	ns
$t_{PLZ}$			1	10.5	1	9	
$t_{PZH}$	2OE	Y	2	11	2	10.5	ns
$t_{PZL}$			3	9.5	3	8.5	
$t_{PHZ}$	2OE	Y	1	7	1	7	ns
$t_{PLZ}$			2	12	2	12	

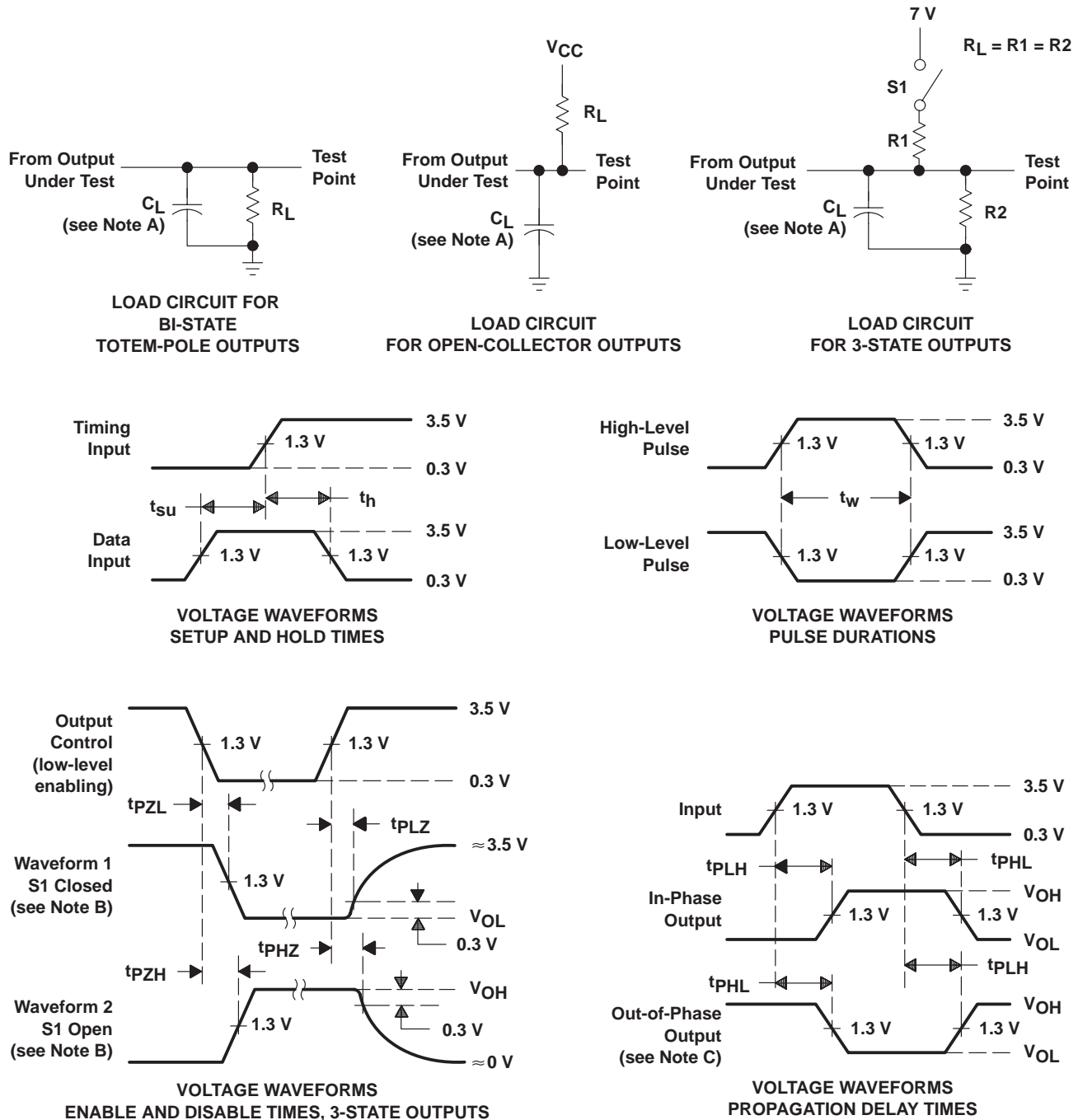
§ For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.



**SN54ALS241C, SN54AS241A, SN74ALS241C, SN74AS241A**  
**OCTAL BUFFERS/DRIVERS**  
**WITH 3-STATE OUTPUTS**

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**PARAMETER MEASUREMENT INFORMATION**  
**SERIES 54ALS/74ALS AND 54AS/74AS DEVICES**



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

**Figure 1. Load Circuits and Voltage Waveforms**

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