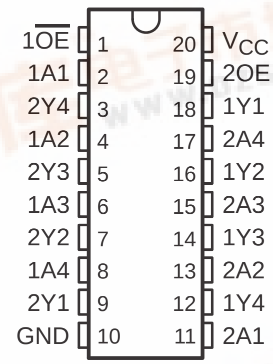
OCTAL BUFFERS/DRIVERS WITH 3-STATE OUTPUTS

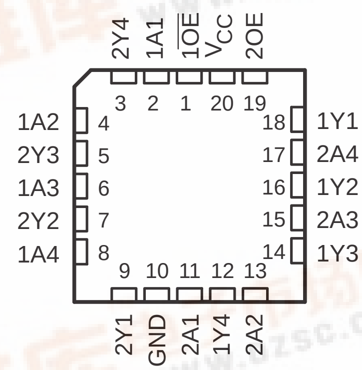
SDAS153C – DECEMBER 1982 – REVISED AUGUST 1994

- **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**

SN54ALS241B, SN54AS241 . . . J PACKAGE
SN74ALS241C, SN74AS241 . . . DW OR N PACKAGE
(TOP VIEW)



SN54ALS241B, SN54AS241 . . . FK PACKAGE
(TOP VIEW)



description

These octal buffers and line 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. The designer has a choice of selected combinations of inverting and noninverting outputs, symmetrical $\overline{OE}$ (active-low output control) inputs, and complementary OE and $\overline{OE}$ inputs. These devices feature high fan-out and improved fan-in.

The –1 version of the SN74ALS′ parts are identical to their standard versions except the recommended maximum I_{OL} is increased to 48 mA. There are no –1 versions of the SN54ALS241B.

The SN54ALS241B and SN54AS241 are characterized for operation over the full military temperature range of –55°C to 125°C. The SN74ALS241C and SN74AS241 are characterized for operation from 0°C to 70°C.

FUNCTION TABLES

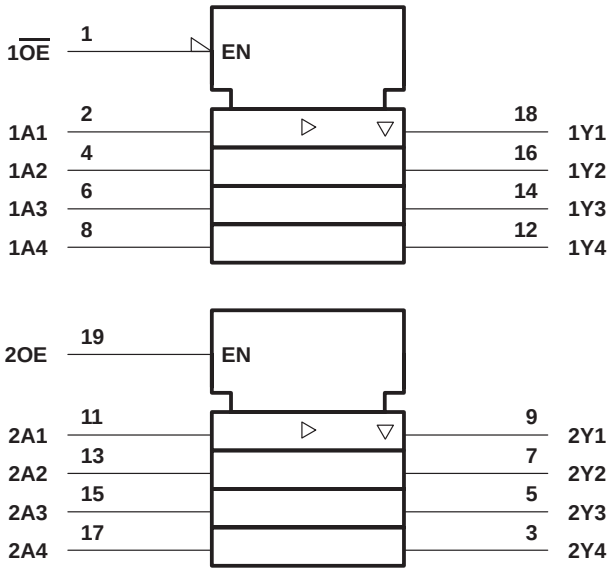
INPUTS		OUTPUT
$1\overline{OE}$	**1A**	**1Y**
L	H	H
L	L	L
H	X	Z

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

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.

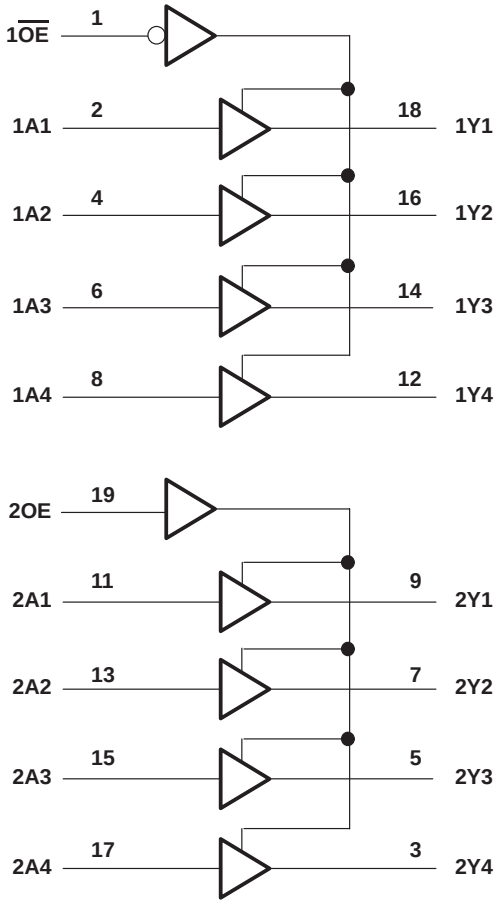
TEXAS INSTRUMENTS

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: SN54ALS241B, SN54AS241 . . . . . –55°C to 125°C
SN74ALS241C, SN74AS241 . . . . . 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

		SN54ALS241B			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

† The 48-mA limit applies only to the –1 version and only if the V_{CC} is maintained between 4.75 V and 5.25 V.

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

PARAMETER	TEST CONDITIONS		SN54ALS241B			SN74ALS241C			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	
	V_{CC} = 4.75 V	I_{OL} = 48 mA (–1 version)							
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_O§	V_{CC} = 5.5 V,	V_O = 2.25 V	–20		–112	–30		–112	mA
I_{CC}	V_{CC} = 5.5 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 V, T_A = 25°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 V to 5.5 V, C_L = 50 pF, R_1 = 500 Ω, R_2 = 500 Ω, T_A = MIN to MAX†				UNIT
			SN54ALS241B		SN74ALS241C		
			MIN	MAX	MIN	MAX	
t_{PLH}	A	Y	3	31	2	11	ns
t_{PHL}			1	17	3	10	
t_{PZH}	$1\overline{OE}$	Y	3	33	3	21	ns
t_{PZL}			3	27	4	21	
t_{PHZ}	$1\overline{OE}$	Y	2	17	1	10	ns
t_{PLZ}			2	32	2	15	
t_{PZH}	2OE	Y	3	38	4	21	ns
t_{PZL}			3	30	5	21	
t_{PHZ}	2OE	Y	2	17	2	10	ns
t_{PLZ}			3	35	3	15	

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

recommended operating conditions

		SN54AS241			SN74AS241			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			0.8	V
I_{OH}	High-level output current			–12			–15	mA
I_{OL}	Low-level output current			48			64	mA
T_A	Operating free-air temperature	–55		125	0		70	°C

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

PARAMETER	TEST CONDITIONS		SN54AS241			SN74AS241			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} = – 2 mA	V_{CC}–2			V_{CC}–2			V
		I_{OH} = – 3 mA	2.4	3.4		2.4	3.4		
	V_{CC} = 4.5 V	I_{OH} = –12 mA	2.4						
		I_{OH} = –15 mA				2.4			
V_{OL}	V_{CC} = 4.5 V,	I_{OL} = 48 mA		0.27	0.55				V
	V_{CC} = 4.75 V,	I_{OL} = 64 mA					0.31	0.55	
I_{OZH}	V_{CC} = 5.5 V,	V_O = 2.7 V			50			50	µA
I_{OZL}	V_{CC} = 5.5 V,	V_O = 0.4 V			–50			–50	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			–1			–1	mA
I_O‡	V_{CC} = 5.5 V,	V_O = 2.25 V	–50		–150	–50		–150	mA
I_{CC}	V_{CC} = 5.5 V	Outputs high		22	35		22	35	mA
		Outputs low		61	90		61	90	
		Outputs disabled		35	56		35	56	

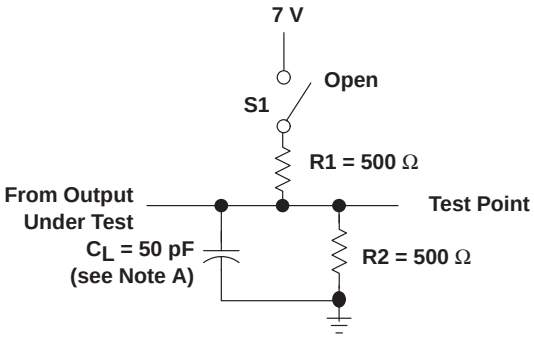
† All typical values are at V_{CC} = 5 V, T_A = 25°C.
‡ The output conditions have been chosen to produce a current that closely approximates one half of the true short-circuit output current, I_{OS}.

switching characteristics (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V_{CC} = 4.5 V to 5.5 V, C_L = 50 pF, R_1 = 500 Ω, R_2 = 500 Ω, T_A = MIN to MAX†				UNIT
			SN54AS241		SN74AS241		
			MIN	MAX	MIN	MAX	
t_{PLH}	A	Y	2	9	2	6.2	ns
t_{PHL}			2	7	2	6.2	
t_{PZH}	$1\overline{OE}$	Y	2	10	2	9	ns
t_{PZL}			2	8	2	7.5	
t_{PHZ}	$1\overline{OE}$	Y	2	6.5	2	6	ns
t_{PLZ}			2	10.5	2	9	
t_{PZH}	2OE	Y	2	11	3	10.5	ns
t_{PZL}			3	9.5	3	8.5	
t_{PHZ}	2OE	Y	3	7	3	7	ns
t_{PLZ}			3	12	3	12	

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

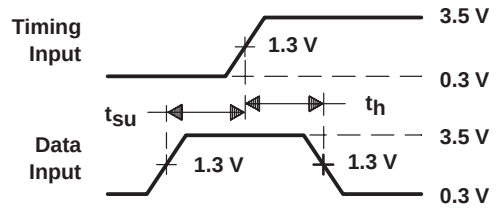
PARAMETER MEASUREMENT INFORMATION



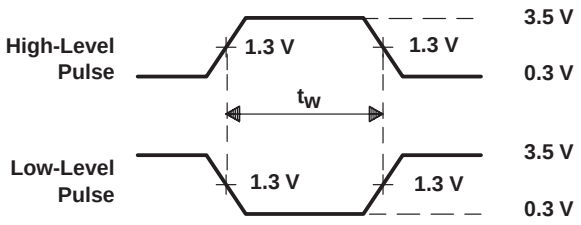
LOAD CIRCUIT FOR 3-STATE OUTPUTS

SWITCH POSITION TABLE

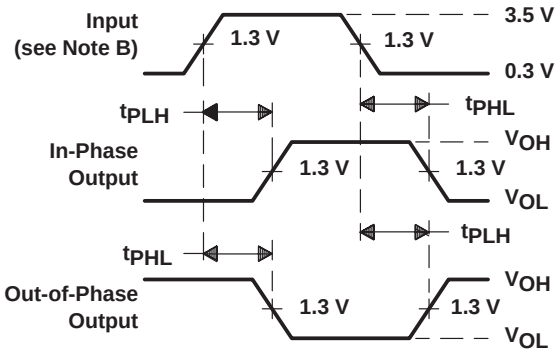
TEST	S1
t_{PLH}	Open
t_{PHL}	Open
t_{PZH}	Open
t_{PZL}	Closed
t_{PHZ}	Open
t_{PLZ}	Closed



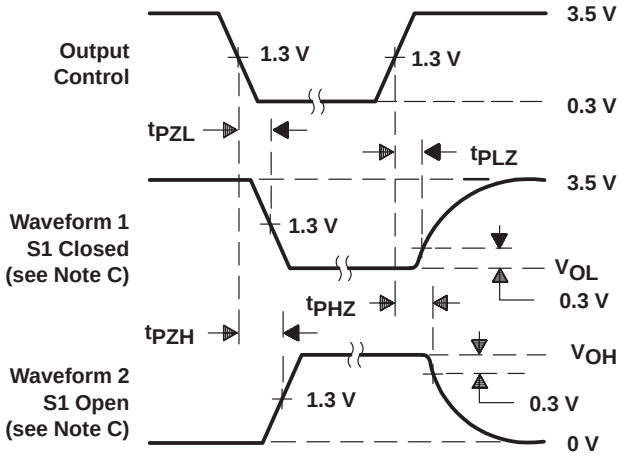
VOLTAGE WAVEFORMS
SETUP AND HOLD TIMES



VOLTAGE WAVEFORMS
PULSE DURATION



VOLTAGE WAVEFORMS
PROPAGATION DELAY TIMES



VOLTAGE WAVEFORMS
ENABLE AND DISABLE TIMES, 3-STATE OUTPUTS

NOTES: A. C_L includes probe and jig capacitance.
B. All input pulses are supplied by generators having the following characteristics: PRR ≤ 1 MHz, Z_O = 50 Ω, t_r ≤ 2 ns, t_f ≤ 2 ns.
C. 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.
D. The outputs are measured one at a time with one transition per measurement.

Figure 1. Load Circuit and Voltage Waveforms

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