

SN54ALS240A, SN54AS240, SN74ALS240A, SN74AS240 OCTAL BUFFERS AND LINE DRIVERS WITH 3-STATE OUTPUTS

SDAS214 – D2661, DECEMBER 1982 – REVISED XXXXX 1988

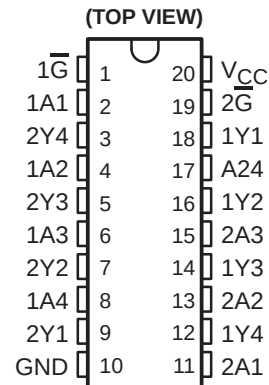
- 3-State Outputs Drive Bus Lines or Buffer Memory Address Registers
- PNP Inputs Reduce DC Loading
- Package Options include Plastic Small Outline Packages, Ceramic Chip Carriers, and Standard Plastic and Ceramic 300-mil DIPs
- Dependable Texas Instruments Quality and Reliability

description

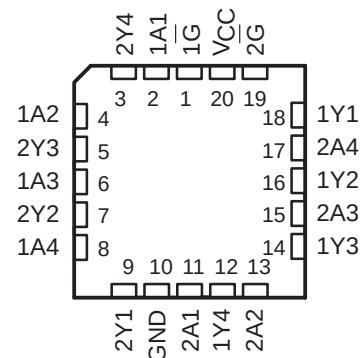
These octal buffers and line drivers are designed specifically to improve both the performance and density of 3-state memory address drivers, clock drivers, and bus-oriented receivers and transmitters. Taken together with the 'ALS241 and 'AS241, the designer has a choice of selected combinations of inverting and noninverting outputs, symmetrically $\overline{G}$ (active-low output control) inputs, and complementary G and $\overline{G}$ inputs. These devices feature high fan-out and improved fan-in.

The SN54' family is characterized for operation over the full military temperature range of -55°C to 125°C . The SN74' family is characterized for operation from 0°C to 70°C .

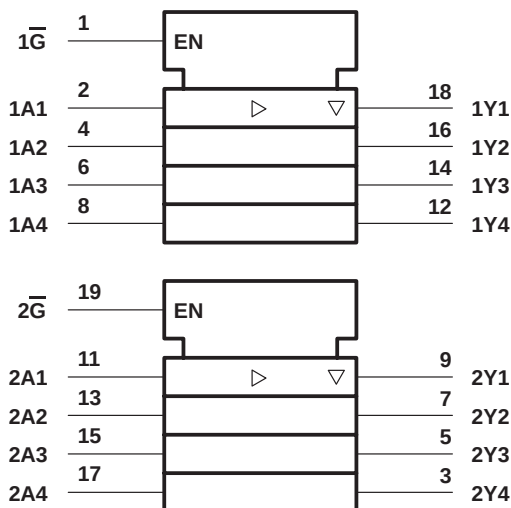
SN54ALS240A, SN54AS240 ... J PACKAGE
SN74ALS240A, SN74AS240 ... DW OR N PACKAGE



SN54ALS240A, SN54AS240 ... FK PACKAGE
(TOP VIEW)

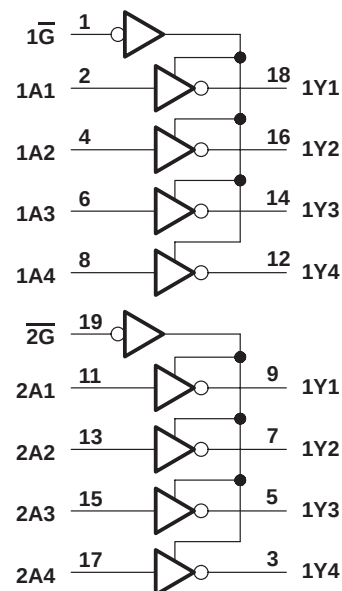


logic symbol†



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

logic diagram (positive logic)



SN54ALS240A, SN74ALS240A

OCTAL BUFFERS AND LINE DRIVERS WITH 3-STATE OUTPUTS

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

Supply voltage, V_{CC}	7 V
Input voltage	7 V
Voltage applied to a disabled 3-state output	5.5 V
Operating free-air temperature range: SN54ALS240A	–55°C to 125°C
SN74ALS240A	0°C to 70°C
Storage temperature range	–65°C to 150°C

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
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		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		
	$V_{CC} = 4.5$ V,	$I_{OH} = -12$ mA	2						
	$V_{CC} = 4.5$ V,	$I_{OH} = -15$ mA				2			
V_{OL}	$V_{CC} = 4.5$ V,	$I_{OL} = 12$ mA	0.25	0.4		0.25	0.4		V
	$V_{CC} = 4.5$ V,	$I_{OL} = 24$ 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	
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
$I_{O\ddagger}$	$V_{CC} = 5.5$ V,	$V_O = 2.25$ V	–30		–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		

† 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, SN74ALS240A

OCTAL BUFFERS AND LINE DRIVERS WITH 3-STATE OUTPUTS

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switching characteristics (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC} = 5\text{ V},$ $C_L = 50\text{ pF},$ $R_1 = 500\ \Omega,$ $R_2 = 500\ \Omega,$ $T_A = 25^\circ\text{C}$	$V_{CC} = 4.5\text{ V to }5.5\text{ V},$ $C_L = 50\text{ pF},$ $R_1 = 500\ \Omega,$ $R_2 = 500\ \Omega,$ $T_A = \text{MIN to MAX}^\dagger$				UNIT
			'ALS240A	SN54ALS240A		SN74ALS240A		
			TYP	MIN	MAX	MIN	MAX	
t _{PLH}	A	Y	6	2	22	2	9	ns
t _{PHL}			5	2	11	2	9	
t _{PZH}	$\overline{G}$	Y	9	4	34	5	13	ns
t _{PZL}			10	5	26	5	18	
t _{PHZ}	$\overline{G}$	Y	6	1	15	2	10	ns
t _{PLZ}			7	3	24	3	12	

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

SN54ALS240A, SN74ALS240A

OCTAL BUFFERS AND LINE DRIVERS WITH 3-STATE OUTPUTS

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

Supply voltage, V_{CC}	7 V
Input voltage	7 V
Voltage applied to a disabled 3-state output	5.5 V
Operating free-air temperature range: SN54AS240	–55°C to 125°C
SN74AS240	0°C to 70°C
Storage temperature range	–65°C to 150°C

recommended operating conditions

		SN54AS240			SN74AS240			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	SN54AS240			SN74AS240			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	
	V _{CC} = 4.5 V to 5.5 V, I _{OH} = −3 mA		2.4	3.4		2.4	3.4			
	V _{CC} = 4.5 V, I _{OH} = −12 mA		2.4							
	V _{CC} = 4.5 V, 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}	'AS241A inputs	V _{CC} = 5.5 V, V _I = 0.4 V	−1			−1			mA	
	All others		−0.5			−0.5				
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		11	17	11		17	mA
			Outputs low		51	75	51		75	
			Outputs disabled		24	38	24		38	

[†] All typical values are at $V_{CC} = 5$ 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} .



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SN54ALS240A, SN74ALS240A

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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
			SN54AS240		SN74AS240		
			MIN	MAX	MIN	MAX	
t _{PLH}	A	Y	2	7	2	6.5	NS
t _{PHL}			2	6	2	5.7	
t _{PZH}	1G	Y	2	7	2	6.4	NS
t _{PZL}			2	9.5	2	9	
t _{PHZ}	G	Y	2	5.5	2	5	NS
t _{PLZ}			2	12.5	2	9.5	

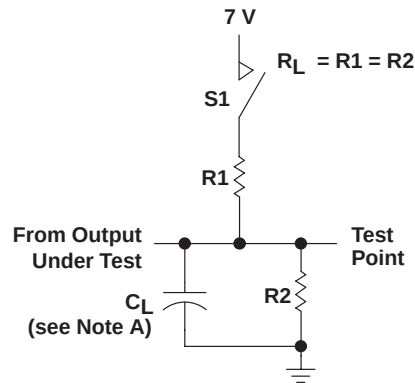
[†] For conditions shown MIN or MAX, use the appropriate value specified under recommended operating conditions.

SN54ALS240A, SN74ALS240A

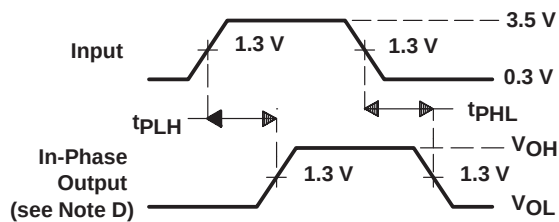
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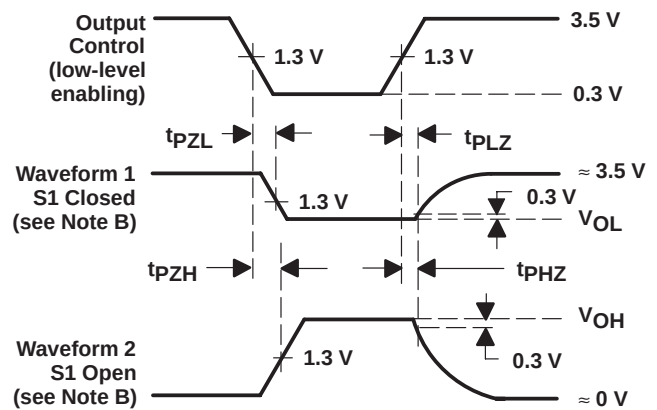
PARAMETER MEASUREMENT INFORMATION



LOAD CIRCUIT FOR
3-STATE OUTPUTS



VOLTAGE WAVEFORMS
PROPAGATION DELAY TIMES



VOLTAGE WAVEFORMS
ENABLE AND DISABLE TIMES. 3-STATE OUTPUTS

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 have the following characteristics: $PRR \leq 1$ MHz, $t_r = t_f = 2$ ns, duty cycle = 50%.

D. When measuring propagation delay items of 3-state outputs, switch S1 is open.

E. The outputs are measured one at a time with one input transition per measurement.

Figure 1

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