

SN54ALS240A, SN54ALS241A, SN54AS240, SN54AS241 SN74ALS240A, SN74ALS241A, SN74AS240, SN74AS241 OCTAL BUFFERS AND LINE DRIVERS WITH 3-STATE OUTPUTS

D2661, DECEMBER 1982—REVISED MAY 1986

- 3-State Outputs Drive Bus Lines or Buffer Memory Address Registers
- P-N-P 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

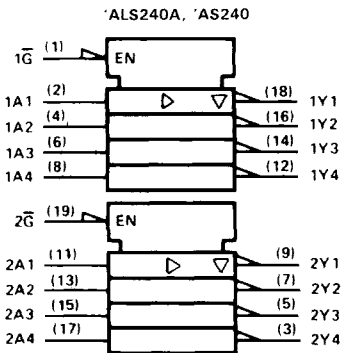
description

These octal buffers and line drivers are designed specifically to improve both the performance and density of three-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 \bar{G} (active-low output control) inputs, and complementary G and \bar{G} inputs. These devices feature high fan-out and improved fan-in.

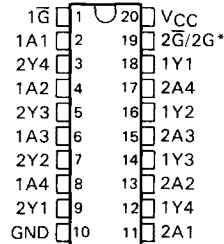
The -1 versions of the SN74ALS' parts are identical to their standard versions except that the recommended maximum I_{OL} is increased to 48 milliamperes. There are no -1 versions of the SN54ALS' parts.

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 .

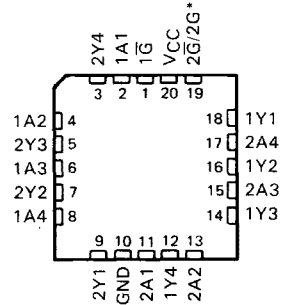
logic symbols†



SN54ALS', SN54AS' ... J PACKAGE
SN74ALS', SN74AS' ... DW or N PACKAGE
(TOP VIEW)



SN54ALS', SN54AS' ... FK PACKAGE
(TOP VIEW)

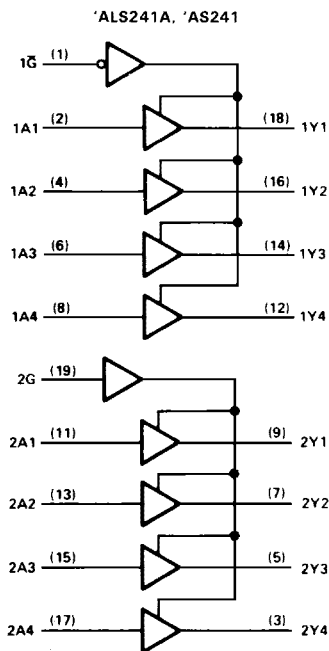
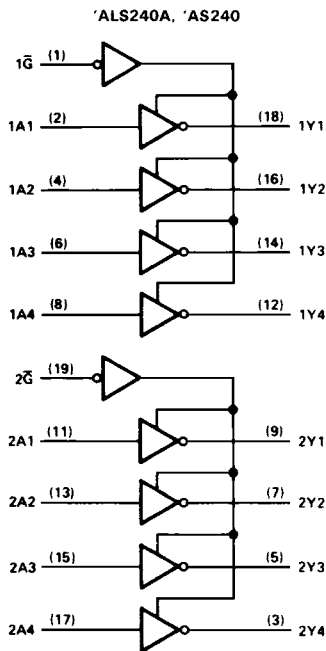


*2 \bar{G} for 'ALS240A, 'AS240 or 2G for 'ALS241A, 'AS241

†These symbols are in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12. Pin numbers are for DW, J, and N packages.

**SN54ALS240A, SN54ALS241A, SN54AS240, SN54AS241
 SN74ALS240A, SN74ALS241A, SN74AS240, SN74AS241
 OCTAL BUFFERS AND LINE DRIVERS WITH 3-STATE OUTPUTS**

logic diagrams (positive logic)



Pin numbers are for DW, J, and N packages.

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ALS and AS Circuits

SN54ALS240A, SN54ALS241A, SN74ALS240A, SN74ALS241A OCTAL BUFFERS AND LINE DRIVERS WITH 3-STATE OUTPUTS

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, SN54ALS241A	-55°C to 125°C
SN74ALS240A, SN74ALS241A	0°C to 70°C
Storage temperature range	-65°C to 150°C

recommended operating conditions

		SN54ALS240A SN54ALS241A			SN74ALS240A SN74ALS241A			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
I_{OH}	High-level output current				-15			mA
I_{OL}	Low-level output current				24			mA
					48 [†]			
T_A	Operating free-air temperature	-55			125			°C

[†] The 48 mA limit applies only to the -1 versions 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	SN54ALS240A SN54ALS241A		SN74ALS240A SN74ALS241A		UNIT		
		MIN	TYP [‡]	MAX	MIN		TYP [‡]	MAX
V_{IK}	$V_{CC} = 4.5$ V, $I_I = -18$ mA			-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			
	$V_{CC} = 4.75$ V, $I_{OL} = 48$ mA (-1 versions)							
I_{OZH}	$V_{CC} = 5.5$ V, $V_O = 2.7$ V	20		20		μ A		
I_{OZL}	$V_{CC} = 5.5$ V, $V_O = 0.4$ V	-20		-20		μ A		
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		μ A		
I_{IL}	$V_{CC} = 5.5$ V, $V_I = 0.4$ V	-0.1		-0.1		mA		
I_O^{\S}	$V_{CC} = 5.5$ V, $V_O = 2.25$ V	-30	-112	-30	-112	mA		
I_{CC}	$V_{CC} = 5.5$ V	'ALS240A	Outputs high	4	11	4	11	mA
			Outputs low	13	23	13	23	
		'ALS241A	Outputs disabled	14	25	14	25	
			Outputs high	9	17	9	15	
			Outputs low	15	28	15	26	
			Outputs disabled	17	32	17	30	

[‡] All typical values are at $V_{CC} = 5$ V, $T_A = 25^\circ$ 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, SN54ALS241A, SN74ALS240A, SN74ALS241A

OCTAL BUFFERS AND LINE DRIVERS WITH 3-STATE OUTPUTS

'ALS240A switching characteristics (see Note 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC} = 5\text{ V}$, $C_L = 50\text{ pF}$, $R_1 = 500\ \Omega$, $R_2 = 500\ \Omega$, $T_A = 25^\circ\text{C}$	$V_{CC} = 4.5\text{ V to }5.5\text{ V}$, $C_L = 50\text{ pF}$, $R_1 = 500\ \Omega$, $R_2 = 500\ \Omega$, $T_A = \text{MIN to MAX}$				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}	\bar{G}	Y	9	4	34	5	13	ns	
t_{PZL}			10	5	26	5	18		
t_{PHZ}	\bar{G}	Y	6	1	15	2	10	ns	
t_{PLZ}			7	3	24	3	12		

'ALS241A switching characteristics (see Note 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC} = 4.5\text{ V to }5.5\text{ V}$, $C_L = 50\text{ pF}$, $R_1 = 500\ \Omega$, $T_A = \text{MIN to MAX}$				UNIT
			SN54ALS241A		SN74ALS241A		
			MIN	MAX	MIN	MAX	
t_{PLH}	A	Y	3	31	3	11	ns
t_{PHL}			1	14	3	10	
t_{PZH}	$1\bar{G}$	Y	5	33	7	21	ns
t_{PZL}			7	27	7	21	
t_{PHZ}	$1\bar{G}$	Y	2	13	2	10	ns
t_{PLZ}			2	32	3	15	
t_{PZH}	2G	Y	7	38	7	21	ns
t_{PZL}			7	30	7	21	
t_{PHZ}	2G	Y	2	17	2	10	ns
t_{PLZ}			3	35	3	15	

NOTE 1: Load circuit and voltage waveforms are shown in Section 1.

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ALS and AS Circuits

SN54AS240, SN54AS241, SN74AS240, SN74AS241

OCTAL BUFFERS AND LINE DRIVERS WITH 3-STATE OUTPUTS

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, SN54AS241	-55°C to 125°C
SN74AS240, SN74AS241	0°C to 70°C
Storage temperature range	-65°C to 150°C

recommended operating conditions

		SN54AS240 SN54AS241			SN74AS240 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			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 SN54AS241			SN74AS240 SN74AS241			UNIT
		MIN	TYP ¹	MAX	MIN	TYP ¹	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
	$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$, $I_{OH} = -3 \text{ mA}$	2.4	3.4		2.4	3.4		
	$V_{CC} = 4.5 \text{ V}$, $I_{OH} = -12 \text{ mA}$	2.4						
	$V_{CC} = 4.5 \text{ V}$, $I_{OH} = -15 \text{ mA}$				2.4			
V_{OL}	$V_{CC} = 4.5 \text{ V}$, $I_{OL} = 48 \text{ mA}$	0.27 0.55						V
	$V_{CC} = 4.75 \text{ V}$, $I_{OL} = 64 \text{ mA}$				0.31	0.55		
I_{OZH}	$V_{CC} = 5.5 \text{ V}$, $V_O = 2.7 \text{ V}$	50			50			μA
I_{OZL}	$V_{CC} = 5.5 \text{ V}$, $V_O = 0.4 \text{ V}$	-50			-50			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}	'AS241A inputs	-1			-1			mA
	All others	-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}	'AS240	$V_{CC} = 5.5 \text{ V}$	Outputs high	11	17	11	17	mA
			Outputs low	51	75	51	75	
			Outputs disabled	24	38	24	38	
			Outputs high	22	35	22	35	
			Outputs low	61	90	61	90	
			Outputs disabled	35	56	35	56	
I_{CC}	'AS241	$V_{CC} = 5.5 \text{ V}$	Outputs high	11	17	11	17	mA
			Outputs low	51	75	51	75	
			Outputs disabled	24	38	24	38	
			Outputs high	22	35	22	35	
			Outputs low	61	90	61	90	
			Outputs disabled	35	56	35	56	

¹All typical values are at $V_{CC} = 5 \text{ V}$, $T_A = 25^\circ\text{C}$.

²The 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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ALS and AS Circuits

SN54AS240, SN54AS241, SN74AS240, SN74AS241
OCTAL BUFFERS AND LINE DRIVERS WITH 3-STATE OUTPUTS

***AS240 switching characteristics (see Note 1)**

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V,}$ $C_L = 50 \text{ pF,}$ $R_1 = 500 \Omega,$ $R_2 = 500 \Omega,$ $T_A = \text{MIN to MAX}$				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}	$1\bar{G}$	Y	2	7	2	6.4	ns
t_{PZL}			2	9.5	2	9	
t_{PHZ}	\bar{G}	Y	2	5.5	2	5	ns
t_{PLZ}			2	12.5	2	9.5	

***AS241 switching characteristics (see Note 1)**

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V,}$ $C_L = 50 \text{ pF,}$ $R_1 = 500 \Omega,$ $R_2 = 500 \Omega,$ $T_A = \text{MIN to MAX}$				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}	$1\bar{G}$	Y	2	10	2	9	ns
t_{PZL}			2	8	2	7.5	
t_{PHZ}	$1\bar{G}$	Y	2	6.5	2	6	ns
t_{PLZ}			2	10.5	2	9	
t_{PZH}	2G	Y	2	11	3	10.5	ns
t_{PZL}			3	9.5	3	8.5	
t_{PHZ}	2G	Y	3	7	3	7	ns
t_{PLZ}			3	12	3	12	

NOTE 1: Load circuit and voltage waveforms are shown in Section 1.

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ALS and AS Circuits