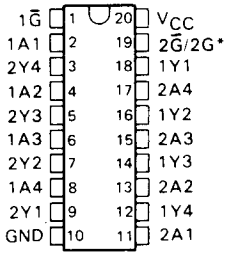
SN54ALS230, SN54ALS231, SN54AS230, SN54AS231
SN74ALS230, SN74ALS231, SN74AS230, SN74AS231
OCTAL BUFFERS AND LINE DRIVERS WITH 3-STATE OUTPUTS

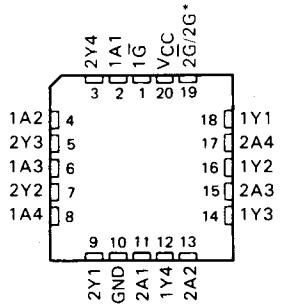
D2661, DECEMBER 1982—REVISED MAY 1986

- Package Options Include Plastic "Small Outline" Packages, Ceramic Chip Carriers, and Standard Plastic and Ceramic 300-mil DIPs
- 'ALS230 and 'AS230 have True and Complementary Outputs
- 'ALS231 and 'AS231 have Complementary G and $\overline{G}$ Inputs
- 3-State Outputs Drive Bus Lines or Buffer Memory Address Registers
- High Capacitive Drive Capability
- Current Sinking Capability Up to 64 mA
- Dependable Texas Instruments Quality and Reliability

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



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



*2$\overline{G}$ for 'AS230 or 2G for 'ALS231, 'AS231

description

These octal buffers and line drivers are designed specifically to improve the performance 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 $\overline{G}$ (active-low output control) inputs, and complementary G and $\overline{G}$ inputs.

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.

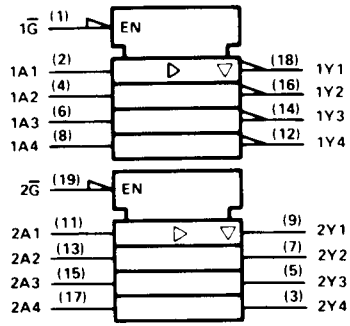
The SN54' family is characterized for operation over the full military temperature range of −55°C to 125°C. The SN74' family is characterized for operation from 0°C to 70°C.

This document contains information on products in more than one phase of development. The status of each device is indicated on the page(s) specifying its electrical characteristics.

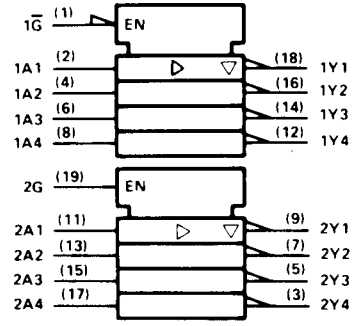
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logic symbols†

'ALS230, 'AS230

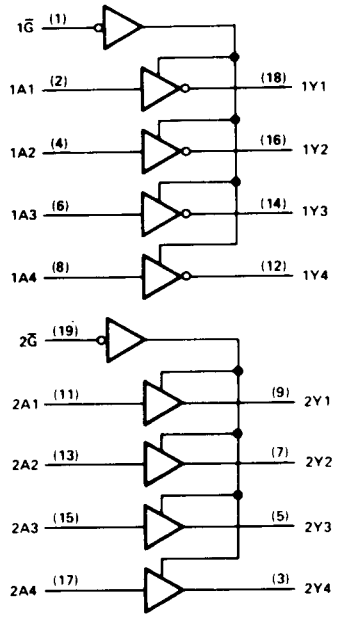


'ALS231, 'AS231

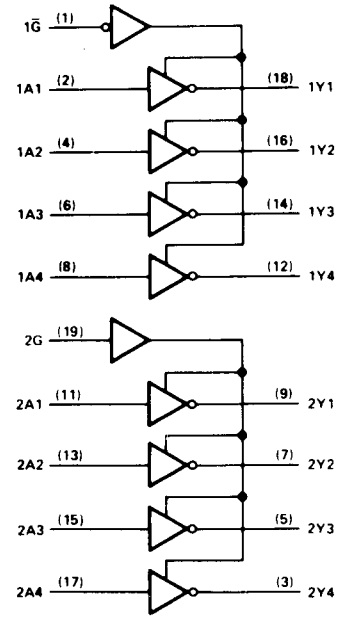


logic diagrams (positive logic)

'ALS230, 'AS230



'ALS231, 'AS231



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

TEXAS INSTRUMENTS
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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: SN54ALS230 . . . . . −55°C to 125°C
SN74ALS230 . . . . . 0°C to 70°C
Storage temperature range . . . . . −65°C to 150°C

recommended operating conditions

		SN54ALS230			SN74ALS230			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 versions and only if 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		SN54ALS230			SN74ALS230			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	
		V_{CC} = 4.75 V,	I_{OL} = 48 mA (−1 versions)					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_O§		V_{CC} = 5.5 V,	V_O = 2.25 V	−30		−112	−30		−112	mA
I_{CC}	'ALS230	V_{CC} = 5.5 V,	Outputs high		7			7		mA
			Outputs low		15			15		
			Outputs disabled		12			12		

‡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}.

PRODUCT PREVIEW documents contain information on products in the formative or design phase of development. Characteristic data and other specifications are design goals. Texas Instruments reserves the right to change or discontinue these products without notice.

'ALS230 switching characteristics (see Note 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V_{CC} = 5 V, C_L = 50 pF, R1 = 500 Ω, R2 = 500 Ω, T_A = 25°C			V_{CC} = 4.5 V to 5.5 V, C_L = 50 pF, R1 = 500 Ω, R2 = 500 Ω, T_A = MIN to MAX				UNIT
			'ALS230			SN54ALS230		SN74ALS230		
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t_{PLH}	A	Y		5		2	7			ns
t_{PHL}				5		2	7			
t_{PZH}	$\overline{G}$	Y		9		5.4	12.6			ns
t_{PZL}				10		6	14			
t_{PHZ}	$\overline{G}$	Y		5		2	7			ns
t_{PLZ}				6		3.6	8.4			

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

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TEXAS INSTRUMENTS
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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: SN54ALS231 . . . . . −55°C to 125°C
SN74ALS231 . . . . . 0°C to 70°C
Storage temperature range . . . . . −65°C to 150°C

recommended operating conditions

		SN54ALS231			SN74ALS231			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 versions and only if 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		SN54ALS231			SN74ALS231			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	
		V_{CC} = 4.75 V,	I_{OL} = 48 mA (−1 versions)					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_O§		V_{CC} = 5.5 V,	V_O = 2.25 V	−30		−112	−30		−112	mA
I_{CC}	'ALS231	V_{CC} = 5.5 V,	Outputs high		7	11		7	11	mA
			Outputs low		15	22		15	22	
			Outputs disabled		12	19		12	19	

‡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}.

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'ALS231 switching characteristics (see Note 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V_{CC} = 5 V, C_L = 50 pF, R1 = 500 Ω, R2 = 500 Ω, T_A = 25°C	V_{CC} = 4.5 V to 5.5 V, C_L = 50 pF, R1 = 500 Ω, R2 = 500 Ω, T_A = MIN to MAX				UNIT
			'ALS231	SN54ALS231		SN74ALS231		
			TYP	MIN	MAX	MIN	MAX	
t_{PLH}	A	Y	5	2	12	2	9	ns
t_{PHL}			5	2	11	2	9	
t_{PZH}	$1\overline{G}$	Y	9	4	17	4	14	ns
t_{PZL}			10	5	21	5	18	
t_{PHZ}	$1\overline{G}$	Y	5	2	12	2	10	ns
t_{PLZ}			6	3	18	3	12	
t_{PZH}	2G	Y	11	5	18	5	16	ns
t_{PZL}			12	5	22	5	19	
t_{PHZ}	2G	Y	6	2	12	2	10	ns
t_{PLZ}			7	3	19	3	13	

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

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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: SN54AS230, SN54AS231 . . . . . −55°C to 125°C
SN74AS230, SN74AS231 . . . . . 0°C to 70°C
Storage temperature range . . . . . −65°C to 150°C

recommended operating conditions

		SN54AS230 SN54AS231			SN74AS230 SN74AS231			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		SN54AS230 SN54AS231			SN74AS230 SN74AS231			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,	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} = 4.5 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}	'AS230 2A	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}	'AS230	V_{CC} = 5.5 V	Outputs high		16	25		16	25	mA
			Outputs low		55	87		55	87	
			Outputs disabled		29	46		29	46	
	'AS231	V_{CC} = 5.5 V	Outputs high		12	18		12	18	mA
			Outputs low		52	82		52	82	
			Outputs disabled		25	39		25	39	

†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}.

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'AS230 switching characteristics (see Note 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V_{CC} = 4.5 V to 5.5 V, C_L = 50 pF, R1 = 500 Ω, R2 = 500 Ω, T_A = MIN to MAX				UNIT
			SN54AS230		SN74AS230		
			MIN	MAX	MIN	MAX	
t_{PLH}	1A	1Y	2.5	7	2.5	6.5	ns
t_{PHL}			2	6	2	5.7	
t_{PLH}	2A	2Y	2.5	9	2.5	6.2	ns
t_{PHL}			2	7	2	6.2	
t_{PZH}	$1\overline{G}$	1Y	2	7	2	6.4	ns
t_{PZL}			2	9	2	8.5	
t_{PHZ}			2	5.5	2	5	
t_{PLZ}			2	12.5	2	9.5	
t_{PZH}	$2\overline{G}$	2Y	2	10	2	9	ns
t_{PZL}			2	8	2	7.5	
t_{PHZ}			2	6.5	2	6	
t_{PLZ}			2	10.5	2	9	

'AS231 switching characteristics (see Note 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V_{CC} = 4.5 V to 5.5 V, C_L = 50 pF, R1 = 500 Ω, R2 = 500 Ω, T_A = MIN to MAX				UNIT
			SN54AS231		SN74AS231		
			MIN	MAX	MIN	MAX	
t_{PLH}	A	Y	2	7	2	6.5	ns
t_{PHL}			2	6	2	5.7	
t_{PZH}	$\overline{G}$	Y	2	7	2	6.4	ns
t_{PZL}			2	9	2	8.5	
t_{PHZ}			2	5.5	2	5	
t_{PLZ}			2	12.5	2	9.5	
t_{PZH}	G	Y	3	7	3	6	ns
t_{PZL}			3	10	3	9	
t_{PHZ}			3	6.5	3	6	
t_{PLZ}			3	13.5	3	7	

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

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