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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 \bar{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

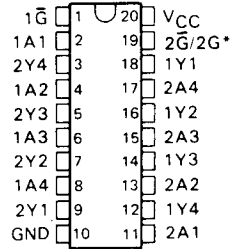
description

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 \bar{G} (active-low output control) inputs, and complementary G and \bar{G} inputs.

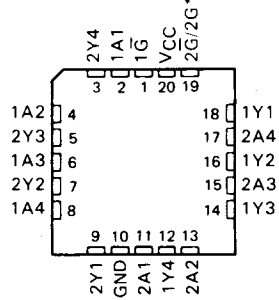
The -1 versions of the SN74ALS' parts are identical to their standard versions except that the recommended maximum I_{OL} is increased to 48 milliamperes. There are no -1 versions of the SN54ALS' parts.

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 .

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



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



*2G for 'AS230 or 2G for 'ALS231, 'AS231

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.

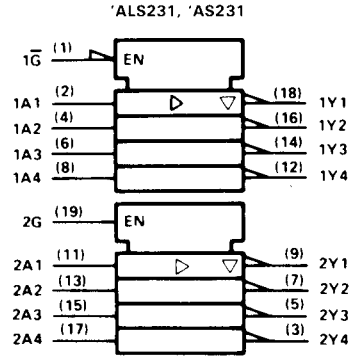
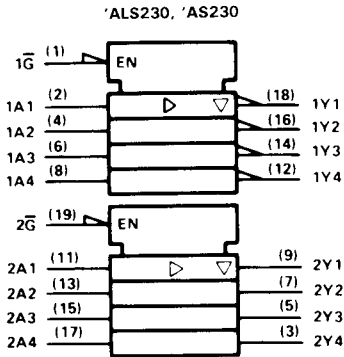
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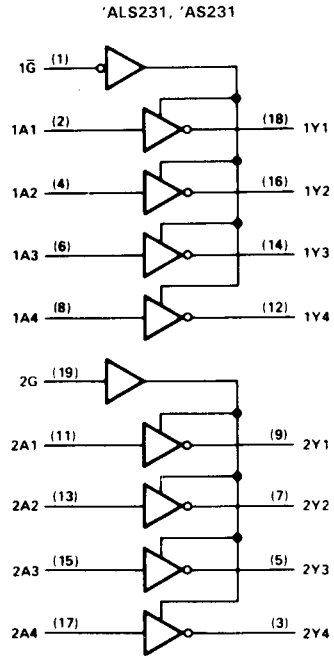
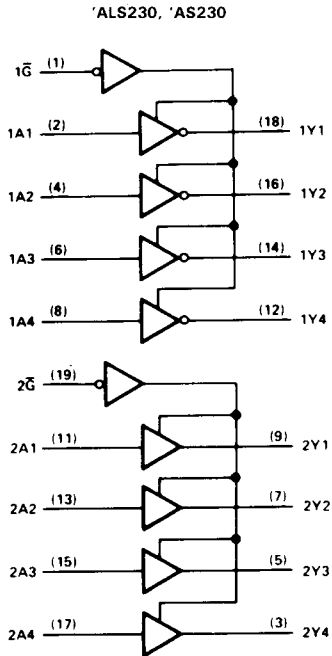
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**SN54ALS230, SN54ALS231, SN54AS230, SN54AS231
SN74ALS230, SN74ALS231, SN74AS230, SN74AS231
OCTAL BUFFERS AND LINE DRIVERS WITH 3-STATE OUTPUTS**

logic symbols†



logic diagrams (positive logic)



†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.

2

ALS and AS Circuits

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^{\S}	$V_{CC} = 5.5$ 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, $T_A = 25^\circ\text{C}$.

[§]The output conditions have been chosen to produce a current that closely approximates one half of the true short-circuit output current, I_{OS} .

*ALS230 switching characteristics (see Note 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V _{CC} = 5 V, C _L = 50 pF, R ₁ = 500 Ω, R ₂ = 500 Ω, T _A = 25°C			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	
			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}	\bar{G}	Y	9			5.4	12.6		ns	
t _{PZL}			10			5	10			
t _{PHZ}	\bar{G}	Y	5			3	7		ns	
t _{PLZ}			6			2.5	8.4			

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

2
 ALS and AS Circuits

SN54ALS231, SN74ALS231

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: 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				0.8			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	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}	$V_{CC} = 4.5 \text{ V}$, $I_I = -18 \text{ mA}$	-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		
	$V_{CC} = 4.5 \text{ V}$, $I_{OH} = -12 \text{ mA}$	2						
	$V_{CC} = 4.5 \text{ V}$, $I_{OH} = -15 \text{ mA}$				2			
V_{OL}	$V_{CC} = 4.5 \text{ V}$, $I_{OL} = 12 \text{ mA}$	0.25			0.4	0.25	0.4	V
	$V_{CC} = 4.5 \text{ V}$, $I_{OL} = 24 \text{ mA}$				0.35			
	$V_{CC} = 4.75 \text{ V}$, $I_{OL} = 48 \text{ mA}$ (-1 versions)				0.35			
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 [§]	$V_{CC} = 5.5 \text{ V}$, $V_O = 2.25 \text{ V}$	-30		-112	-30		-112	mA
I_{CC}	'ALS231	$V_{CC} = 5.5 \text{ V}$,	Outputs high	7	11	7	11	mA
			Outputs low	15	22	15	22	
			Outputs disabled	12	19	12	19	

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

[§]The output conditions have been chosen to produce a current that closely approximates one half of the true short-circuit output current, I_{OS} .

PRODUCTION DATA documents contain information 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.


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SN54ALS231, SN74ALS231 OCTAL BUFFERS AND LINE DRIVERS WITH 3-STATE OUTPUTS

'ALS231 switching characteristics (see Note 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V _{CC} = 5 V, C _L = 50 pF, R ₁ = 500 Ω, R ₂ = 500 Ω, T _A = 25°C		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		
			'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 \bar{G}	Y	9	4	17	4	14	ns	
t _{PZL}			10	5	21	5	18		
t _{PHZ}	1 \bar{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.

2

ALS and AS Circuits

SN54AS230, SN54AS231, SN74AS230, SN74AS231 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: 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}	$V_{CC} = 4.5\text{ V}$, $I_I = -18\text{ mA}$			-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			
	$V_{CC} = 4.5\text{ V}$, $I_{OH} = -12\text{ mA}$	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	
	$V_{CC} = 4.5\text{ V}$, $I_{OL} = 64\text{ mA}$			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}	$V_{CC} = 5.5\text{ V}$, $V_I = 0.4\text{ V}$	-1		-1		mA		
		-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}	'AS230	$V_{CC} = 5.5\text{ V}$	Outputs high	16	25	16	25	mA
			Outputs low	55	87	55	87	
			Outputs disabled	29	46	29	46	
	'AS231	$V_{CC} = 5.5\text{ V}$	Outputs high	12	18	12	18	mA
			Outputs low	52	82	52	82	
			Outputs disabled	25	39	25	39	

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

[‡]The output conditions have been chosen to produce a current that closely approximates one half of the true short-circuit output current, I_{OS} .

SN54AS230, SN54AS231, SN74AS230, SN74AS231

OCTAL BUFFERS AND LINE DRIVERS WITH 3-STATE OUTPUTS

'AS230 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
			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}	$\bar{1}G$	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	10	2	9	
t_{PZL}	$\bar{2}G$	2Y	2	8	2	7.5	ns
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)	$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V,}$ $C_L = 50 \text{ pF,}$ $R_1 = 500 \Omega,$ $R_2 = 500 \Omega,$ $T_A = \text{MIN to MAX}$				UNIT
			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}	$\bar{1}G$	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}			3	7	3	6	
t_{PZL}	G	Y	3	10	3	9	ns
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.