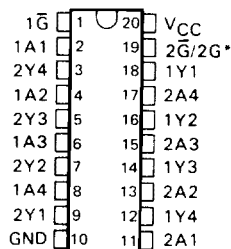


SN54ALS230, SN54ALS231, SN54AS230, SN54AS231 SN74ALS230, SN74ALS231, SN74AS230, SN74AS231 OCTAL BUFFERS AND LINE DRIVERS WITH 3-STATE OUTPUTS

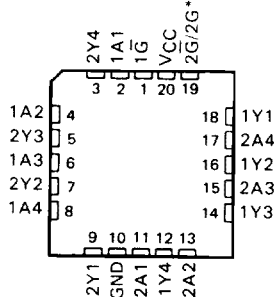
D2661, DECEMBER 1982—REVISED MAY 1986

- 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

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

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.

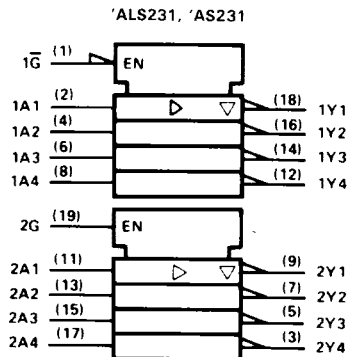
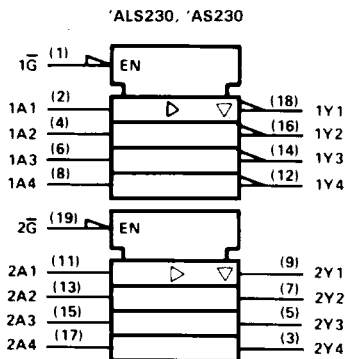
The SN54' family is characterized for operation over the full military temperature range of -55°C to 125°C . The SN74' family is characterized for operation from 0°C to 70°C .

2

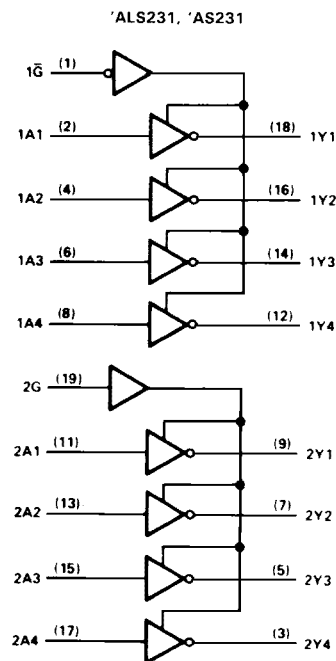
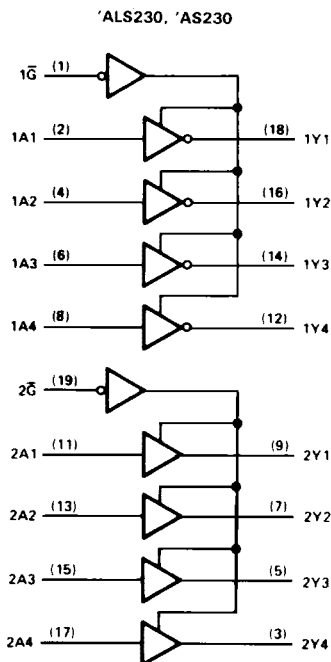
ALS and AS Circuits

**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.

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}		$V_{CC} = 4.5 \text{ V}$, $I_I = -18 \text{ mA}$				–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		0.5	
		$V_{CC} = 4.75 \text{ V}$, $I_{OL} = 48 \text{ mA}$ (–1 versions)					0.35		0.5	
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
$I_O^{\S}$		$V_{CC} = 5.5 \text{ V}$, $V_O = 2.25 \text{ V}$		–30		–112	–30		–112	mA
I_{CC}	ALS230	$V_{CC} = 5.5 \text{ V}$,	Outputs high	7			7			mA
			Outputs low	15			15			
			Outputs disabled	12			12			

†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} .

ALS230 switching characteristics (see Note 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	VCC = 5 V, CL = 50 pF, R1 = 500 Ω, R2 = 500 Ω, TA = 25 °C			VCC = 4.5 V to 5.5 V, CL = 50 pF, R1 = 500 Ω, R2 = 500 Ω, TA = MIN to MAX			UNIT	
			ALS230			SN54ALS230		SN74ALS230		
			MIN	TYP	MAX	MIN	MAX	MIN		MAX
tPLH	A	Y	5							ns
tPHL			5							
tPZH	G	Y	9							ns
tPZL			10							
tPHZ	G	Y	5							ns
tPLZ			6							

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

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			0.7			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}		$V_{CC} = 4.5 \text{ V}$, $I_I = -18 \text{ mA}$				–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	0.5		
		$V_{CC} = 4.75 \text{ V}$, $I_{OL} = 48 \text{ mA}$ (–1 versions)					0.35	0.5		
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
$I_O^{\S}$		$V_{CC} = 5.5 \text{ V}$, $V_O = 2.25 \text{ V}$		–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 $V_{CC} = 5 \text{ V}$, $T_A = 25^\circ\text{C}$.

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

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}	1G	Y	9	4	17	4	14	ns	
t _{PZL}			10	5	21	5	18		
t _{PHZ}	1G	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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ALS and AS Circuits

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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 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}	'AS230 2A			-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}	'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 V to 5.5 V, C _L = 50 pF, R ₁ = 500 Ω, R ₂ = 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}	1G	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}	2G	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, R ₁ = 500 Ω, R ₂ = 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.