

# TYPES SN54ALS131, SN54AS131, SN74ALS131, SN74AS131 3-LINE TO 8-LINE DECODERS/DEMULTIPLEXERS WITH ADDRESS REGISTERS

D2661, APRIL 1982—REVISED DECEMBER 1983

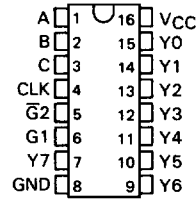
- Combines Decoder and 3-Bit Address Register
- Incorporates 2 Enable Inputs to Simplify Cascading
- Package Options Include Both Plastic and Ceramic Chip Carriers in Addition to Plastic and Ceramic DIPs
- Dependable Texas Instruments Quality and Reliability

## description

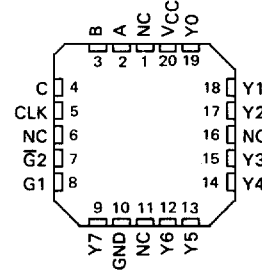
The 'ALS131 and 'AS131 are three-line to eight-line decoders/demultiplexers with registers on the three address inputs. When the clock input (CLK) goes from low to high, the 'ALS131 and 'AS131 act as decoders/demultiplexers and the address present at the select inputs (A, B, and C) is stored in the registers. Further address changes are ignored until the next transition of CLK. The output enable controls, G1 and  $\bar{G}2$ , control the state of the outputs independently of the select or CLK inputs. All of the outputs are high unless G1 is high and  $\bar{G}2$  is low. The 'ALS131 and 'AS131 are ideally suited for implementing glitch-free decoders in strobed (stored-address) applications in bus-oriented systems.

The SN54ALS131 and SN54AS131 are characterized for operation over the full military temperature range of  $-55^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ . The SN74ALS131 and SN74AS131 are characterized for operation from  $0^{\circ}\text{C}$  to  $70^{\circ}\text{C}$ .

SN54ALS131, SN54AS131 . . . J PACKAGE  
SN74ALS131, SN74AS131 . . . N PACKAGE  
(TOP VIEW)

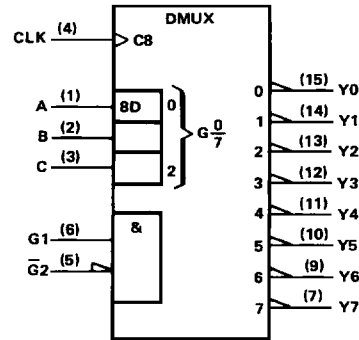
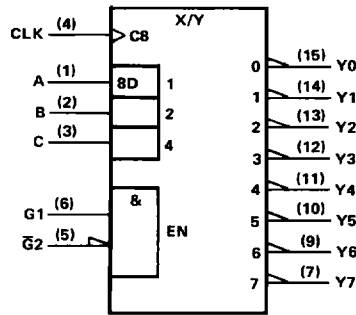


SN54ALS131, SN54AS131 . . . FH PACKAGE  
SN74ALS131, SN74AS131 . . . FN PACKAGE  
(TOP VIEW)



NC — No internal connection

## logic symbols (alternatives)

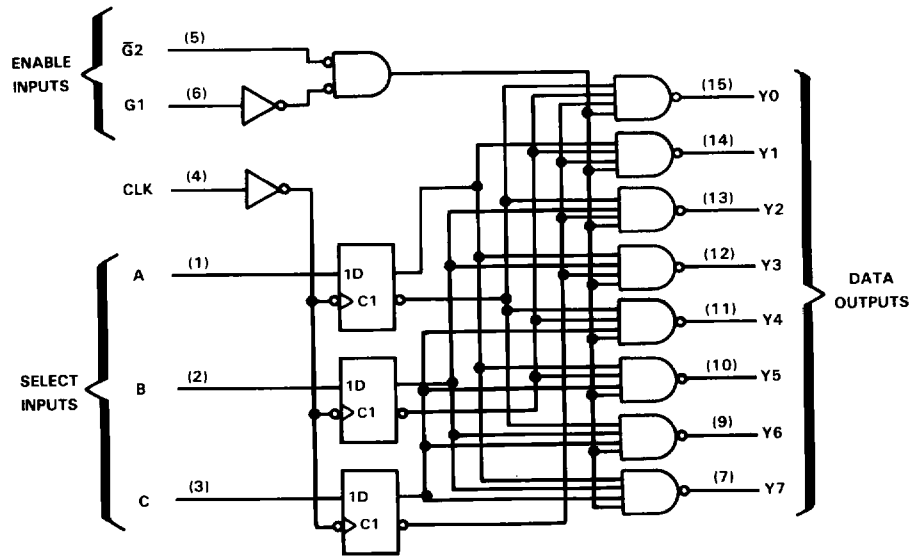


Pin numbers shown are for J and N packages.

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ALS AND AS CIRCUITS

**TYPES SN54ALS131, SN54AS131, SN74ALS131, SN74AS131**  
**3-LINE TO 8-LINE DECODERS/DEMULTIPLEXERS WITH ADDRESS REGISTERS**

logic diagram (positive logic)



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**ALS AND AS CIRCUITS**

Pin numbers shown are for J and N packages.

FUNCTION TABLE

CLK	ENABLE		SELECT			OUTPUTS							
	G1	G2	C	B	A	Y0	Y1	Y2	Y3	Y4	Y5	Y6	Y7
X	X	H	X	X	X	H	H	H	H	H	H	H	H
X	L	X	X	X	X	H	H	H	H	H	H	H	H
↑	H	L	L	L	L	L	H	H	H	H	H	H	H
↑	H	L	L	L	H	H	L	H	H	H	H	H	H
↑	H	L	L	H	L	H	H	L	H	H	H	H	H
↑	H	L	L	H	H	H	H	L	H	H	H	H	H
↑	H	L	H	L	H	H	H	H	H	L	H	H	H
↑	H	L	H	H	L	H	H	H	H	H	L	H	H
↑	H	L	H	H	H	H	H	H	H	H	H	L	H
L or H	H	L	X	X	X	OUTPUTS CORRESPONDING TO STORED ADDRESS, L; ALL OTHERS, H							

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

Supply voltage, VCC	7 V
Input voltage	7 V
Operating free-air temperature range: SN54ALS131, SN54AS131	-55°C to 125°C
SN74ALS131, SN74AS131	0°C to 70°C
Storage temperature	-65°C to 150°C

**TYPES SN54ALS131, SN74ALS131**  
**3-LINE TO 8-LINE DECODERS/DEMULTIPLEXERS WITH ADDRESS REGISTERS**

**recommended operating conditions**

	SN54ALS131			SN74ALS131			UNIT
	MIN	NOM	MAX	MIN	NOM	MAX	
V <sub>CC</sub> Supply voltage	4.5	5	5.5	4.5	5	5.5	V
V <sub>IH</sub> High-level input voltage	2			2			V
V <sub>IL</sub> Low-level input voltage	0.8			0.8			V
I <sub>OH</sub> High-level output current	-0.4			-0.4			mA
I <sub>OL</sub> Low-level output current	4			8			mA
f <sub>clock</sub> Clock frequency	0			50			MHz
t <sub>w</sub> Pulse duration	CLK high			10			ns
	CLK low			10			
t <sub>su</sub> Setup time at A, B, and C before CLK †	15			10			ns
t <sub>h</sub> Hold time at A, B, and C after CLK †	0			0			ns
T <sub>A</sub> Operating free-air temperature	-55			125			°C

**electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)**

PARAMETER	TEST CONDITIONS	SN54ALS131			SN74ALS131			UNIT
		MIN	TYP†	MAX	MIN	TYP†	MAX	
V <sub>IK</sub>	V <sub>CC</sub> = 4.5 V, I <sub>I</sub> = -18 mA	-1.5			-1.5			V
V <sub>OH</sub>	V <sub>CC</sub> = 4.5 V to 5.5 V, I <sub>OH</sub> = -0.4 mA	V <sub>CC</sub> - 2			V <sub>CC</sub> - 2			V
V <sub>OL</sub>	V <sub>CC</sub> = 4.5 V, I <sub>OL</sub> = 4 mA	0.25	0.4		0.25	0.4	V	
	V <sub>CC</sub> = 4.5 V, I <sub>OL</sub> = 8 mA				0.35	0.5		
I <sub>I</sub>	V <sub>CC</sub> = 5.5 V, V <sub>I</sub> = 7 V	0.1			0.1			mA
I <sub>IH</sub>	V <sub>CC</sub> = 5.5 V, V <sub>I</sub> = 2.7 V	20			20			µA
I <sub>IL</sub>	V <sub>CC</sub> = 5.5 V, V <sub>I</sub> = 0.4 V	-0.1			-0.1			mA
I <sub>O</sub> ‡	V <sub>CC</sub> = 5.5 V, V <sub>O</sub> = 2.25 V	-30	-112		-30	-112	mA	
I <sub>CC</sub>	V <sub>CC</sub> = 5.5 V	5			11			mA

†All typical values are at V<sub>CC</sub> = 5 V, T<sub>A</sub> = 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<sub>OS</sub>.

**switching characteristics (see Note 1)**

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V <sub>CC</sub> = 4.5 V to 5.5 V, C <sub>L</sub> = 50 pF, R <sub>L</sub> = 500 Ω, T <sub>A</sub> = MIN to MAX				UNIT
			SN54ALS131		SN74ALS131		
			MIN	MAX	MIN	MAX	
f <sub>max</sub>			40		50	MHz	
t <sub>PLH</sub>	CLK	Y	8	28	8	25	ns
t <sub>PHL</sub>			7	24	7	20	
t <sub>PLH</sub>	G1	Y	7	24	7	20	ns
t <sub>PHL</sub>			6	20	6	17	
t <sub>PLH</sub>	Ḡ2	Y	5	18	5	15	ns
t <sub>PHL</sub>			5	18	5	15	

NOTE 1: For load circuit and voltage waveforms, see page 1-12.

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**TYPES SN54AS131, SN74AS131**  
**3-LINE TO 8-LINE DECODERS/DEMULTIPLEXERS WITH ADDRESS REGISTERS**

**recommended operating conditions**

	SN54AS131			SN74AS131			UNIT
	MIN	NOM	MAX	MIN	NOM	MAX	
V <sub>CC</sub> Supply voltage	4.5	5	5.5	4.5	5	5.5	V
V <sub>IH</sub> High-level input voltage	2			2			V
V <sub>IL</sub> Low-level input voltage			0.8			0.8	V
I <sub>OH</sub> High-level output current			-2			-2	mA
I <sub>OL</sub> Low-level output current			20			20	mA
f <sub>clock</sub> Clock frequency							MHz
t <sub>w</sub> Pulse duration	CLK high			CLK low			ns
	CLK low			CLK high			
t <sub>su</sub> Setup time at A, B, and C before CLK ↑							ns
t <sub>h</sub> Hold time at A, B, and C after CLK ↑							ns
T <sub>A</sub> Operating free-air temperature	-55		125	0		70	°C

**electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)**

PARAMETER	TEST CONDITIONS	SN54AS131			SN74AS131			UNIT
		MIN	TYP <sup>†</sup>	MAX	MIN	TYP <sup>†</sup>	MAX	
V <sub>IK</sub>	V <sub>CC</sub> = 4.5 V, I <sub>I</sub> = -18 mA			-1.2			-1.2	V
V <sub>OH</sub>	V <sub>CC</sub> = 4.5 V to 5.5 V, I <sub>OH</sub> = -2 mA	V <sub>CC</sub> -2			V <sub>CC</sub> -2			V
V <sub>OL</sub>	V <sub>CC</sub> = 4.5 V, I <sub>OL</sub> = 20 mA		0.35	0.5		0.35	0.5	V
I <sub>I</sub>	V <sub>CC</sub> = 5.5 V, V <sub>I</sub> = 7 V							mA
I <sub>IH</sub>	V <sub>CC</sub> = 5.5 V, V <sub>I</sub> = 2.7 V							μA
I <sub>IL</sub>	V <sub>CC</sub> = 5.5 V, V <sub>I</sub> = 0.4 V							mA
I <sub>O</sub> <sup>‡</sup>	V <sub>CC</sub> = 5.5 V, V <sub>O</sub> = 2.25 V	-30		-112	-30		-112	mA
I <sub>CC</sub>	V <sub>CC</sub> = 5.5 V		16			16		mA

<sup>†</sup>All typical values are at V<sub>CC</sub> = 5 V, T<sub>A</sub> = 25°C.

<sup>‡</sup>The output conditions have been chosen to produce a current that closely approximates one half of the true short-circuit output current, I<sub>OS</sub>.

**switching characteristics (see Note 1)**

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V <sub>CC</sub> = 4.5 V to 5.5 V, C <sub>L</sub> = 50 pF, R <sub>L</sub> = 500 Ω, T <sub>A</sub> = MIN to MAX						UNIT
			SN54AS131			SN74AS131			
			MIN	TYP <sup>†</sup>	MAX	MIN	TYP <sup>†</sup>	MAX	
f <sub>max</sub>								MHz	
t <sub>PLH</sub>	CLK	Y	5.4			5.4			ns
t <sub>PHL</sub>			5.3			5.3			
t <sub>PLH</sub>	G1	Y	6.2			6.2			ns
t <sub>PHL</sub>			5.6			5.6			
t <sub>PLH</sub>	G <sub>2</sub>	Y	5.4			5.4			ns
t <sub>PHL</sub>			5.3			5.3			

<sup>†</sup>All typical values are at V<sub>CC</sub> = 5 V, T<sub>A</sub> = 25°C.

NOTE 1: For load circuit and voltage waveforms, see page 1-12.

**2 ALS AND AS CIRCUITS**

**PRODUCT PREVIEW**

2-106 This page contains information on a product under development. Texas Instruments reserves the right to change or discontinue this product without notice.

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