

TYPES SN54ALS138, SN54AS138, SN74ALS138, SN74AS138 3-LINE TO 8-LINE DECODERS/DEMULPLEXERS

D2661, APRIL 1982—REVISED DECEMBER 1983

- Designed Specifically for High-Speed Memory Decoders and Data Transmission Systems
- Incorporates 3 Enable Inputs to Simplify Cascading and/or Data Reception
- Package Options Include Both Plastic and Ceramic Chip Carriers in Addition to Plastic and Ceramic DIPs
- Dependable Texas Instruments Quality and Reliability

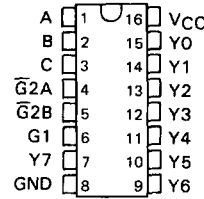
description

The 'ALS138 and 'AS138 circuits are designed to be used in high-performance memory-decoding or data-routing applications requiring very short propagation delay times. In high-performance memory systems these decoders can be used to minimize the effects of system decoding. When employed with high-speed memories utilizing a fast enable circuit, the delay times of these decoders and the enable time of the memory are usually less than the typical access time of the memory. This means that the effective system delay introduced by the Schottky-clamped system decoder is negligible.

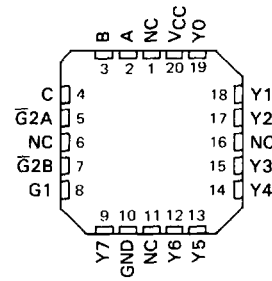
The conditions at the binary select inputs and the three enable inputs select one of eight input lines. Two active-low and one active-high enable inputs reduce the need for external gates or inverters when expanding. A 24-line decoder can be implemented without external inverters and a 32-line decoder requires only one inverter. An enable input can be used as a data input for demultiplexing applications.

The SN54ALS138 and SN54AS138 are characterized for operation over the full military temperature range of -55°C to 125°C . The SN74ALS138 and SN74AS138 are characterized for operation from 0°C to 70°C .

SN54ALS138, SN54AS138 . . . J PACKAGE
SN74ALS138, SN74AS138 . . . N PACKAGE
(TOP VIEW)

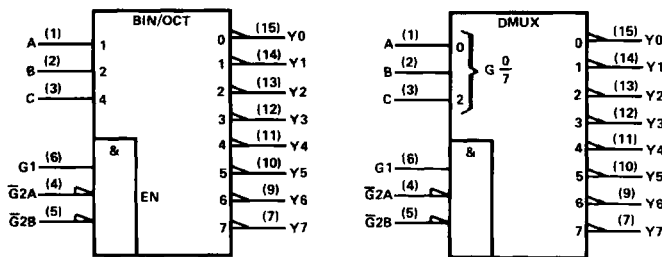


SN54ALS138, SN54AS138 . . . FH PACKAGE
SN74ALS138, SN74AS138 . . . FN PACKAGE
(TOP VIEW)



NC—No internal connection

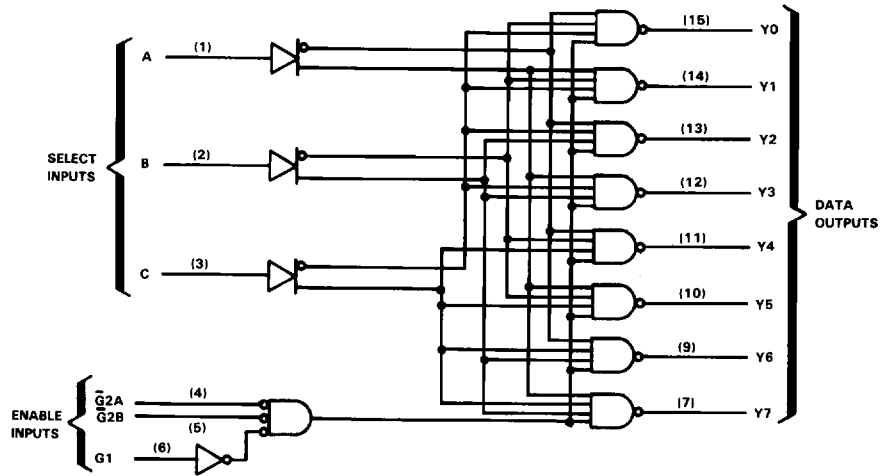
logic symbols (alternatives)



Pin numbers shown are for J and N packages.

TYPES SN54ALS138, SN54AS138, SN74ALS138, SN74AS138
3-LINE TO 8-LINE DECODERS/DEMULTIPLEXERS

logic diagram (positive logic)



Pin numbers shown are for J and N packages.

2
ALS AND AS CIRCUITS

FUNCTION TABLE

ENABLE INPUTS		SELECT INPUTS			OUTPUTS							
G1	$\bar{G}2^*$	C	B	A	Y0	Y1	Y2	Y3	Y4	Y5	Y6	Y7
X	H	X	X	X	H	H	H	H	H	H	H	H
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	H	L	H	H	H	H
H	L	H	L	L	H	H	H	H	L	H	H	H
H	L	H	L	H	H	H	H	H	H	L	H	H
H	L	H	H	L	H	H	H	H	H	H	L	H
H	L	H	H	H	H	H	H	H	H	H	H	L
H	L	H	H	H	H	H	H	H	H	H	H	H

* $\bar{G}2 = \bar{G}2A + \bar{G}2B$

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

Supply voltage, V_{CC}	7 V
Input voltage	7 V
Operating free-air temperature range: SN54ALS138, SN54AS138	-55°C to 125°C
SN74ALS138, SN74AS138	0°C to 70°C
Storage temperature range	-65°C to 150°C

**TYPES SN54ALS138, SN74ALS138
3-LINE TO 8-LINE DECODERS/DEMULTIPLEXERS**

recommended operating conditions

		SN54ALS138			SN74ALS138			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				-0.4			mA
I _{OL}	Low-level output current				4			mA
T _A	Operating free-air temperature	-55			125			°C

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

PARAMETER	TEST CONDITIONS	SN54ALS138			SN74ALS138			UNIT
		MIN	TYP†	MAX	MIN	TYP†	MAX	
V _{IK}	V _{CC} = 4.5 V, I _I = -18 mA	-1.5			-1.5			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 _{OL}	V _{CC} = 4.5 V, I _{OL} = 4 mA	0.25			0.25			V
	V _{CC} = 4.5 V, I _{OL} = 8 mA				0.35			
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			mA
I _{CC}	V _{CC} = 5.5 V	5			10			mA

†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}.

switching characteristics (see Note 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V _{CC} = 4.5 V to 5.5 V, C _L = 50 pF, R _L = 500 Ω, T _A = MIN to MAX				UNIT
			SN54ALS138		SN74ALS138		
			MIN	MAX	MIN	MAX	
t _{PLH}	A, B, C	Any Y	6	27	6	22	ns
t _{PHL}			6	22	6	18	
t _{PLH}	Enable	Any Y	4	20	4	17	ns
t _{PHL}			5	20	5	17	

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

2

ALS AND AS CIRCUITS

TYPES SN54AS138, SN74AS138
3-LINE TO 8-LINE DECODERS/DEMULTIPLEXERS

recommended operating conditions

		SN54AS138			SN74AS138			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	-2			-2			mA
I _{OL}	Low-level output current	20			20			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	SN54AS138			SN74AS138			UNIT
		MIN	TYP†	MAX	MIN	TYP†	MAX	
V _{IK}	V _{CC} = 4.5 V, I _I = -18 mA							V
V _{OH}	V _{CC} = 4.5 V to 5.5 V, I _{OH} = -2 mA	V _{CC} - 2			V _{CC} - 2			V
V _{OL}	V _{CC} = 4.5 V, I _{OL} = 20 mA	0.35 0.5			0.35 0.5			V
I _I	V _{CC} = 5.5 V, V _I = 7 V							mA
I _{IH}	V _{CC} = 5.5 V, V _I = 2.7 V							μA
I _{IL}	V _{CC} = 5.5 V, V _I = 0.4 V							mA
I _O ‡	V _{CC} = 5.5 V, V _O = 2.25 V	-30 -112			-30 -112			mA
I _{CC}	V _{CC} = 5.5 V	13			13			mA

†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}.

2 ALS AND AS CIRCUITS

switching characteristics (see Note 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V _{CC} = 4.5 V to 5.5 V, C _L = 50 pF, R _L = 500 Ω, T _A = MIN to MAX						UNIT
			SN54AS138			SN74AS138			
			MIN	TYP†	MAX	MIN	TYP†	MAX	
t _{PLH}	A, B, C	Any Y	5.6			5.6			ns
t _{PHL}			6.1			6.1			
t _{PLH}	Enable	Any Y	5.8			5.8			ns
t _{PHL}			5.5			5.5			

†All typical values are at V_{CC} = 5 V, T_A = 25°C.

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

PRODUCT PREVIEW

2:116 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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