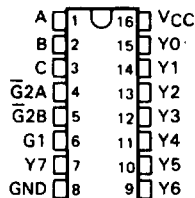


SN54HC138, SN74HC138 3-LINE TO 8-LINE DECODERS/DEMULTIPLEXERS

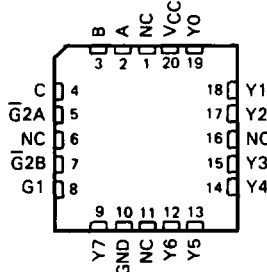
D2684, DECEMBER 1982—REVISED SEPTEMBER 1987

- Designed Specifically for High-Speed Memory Decoders and Data Transmission Systems
- Incorporates 3 Enable Inputs to Simplify Cascading and/or Data Reception
- Package Options: Plastic and Ceramic DIPs, Plastic Small-Outline Packages, and Ceramic Chip Carriers
- Dependable Texas Instruments Quality and Reliability

SN54HC138 . . . J PACKAGE
SN74HC138 . . . D OR N PACKAGE
(TOP VIEW)



SN54HC138 . . . FK PACKAGE
(TOP VIEW)



NC—No internal connection

description

The 'HC138 circuit is designed to be used in high-performance memory-decoding or data-routing applications requiring very short propagation delay times. In high-performance memory systems this decoder 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 this decoder 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 decoder is negligible.

The conditions at the binary select inputs at 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 SN54HC138 is characterized for operation over the full military temperature range of -55°C to 125°C . The SN74HC138 is characterized for operation from -40°C to 85°C .

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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.

TEXAS
INSTRUMENTS

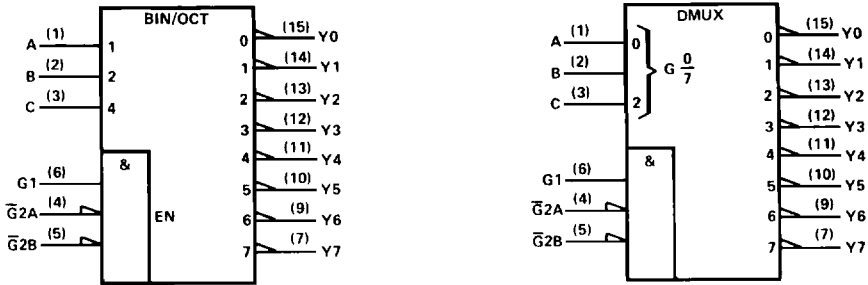
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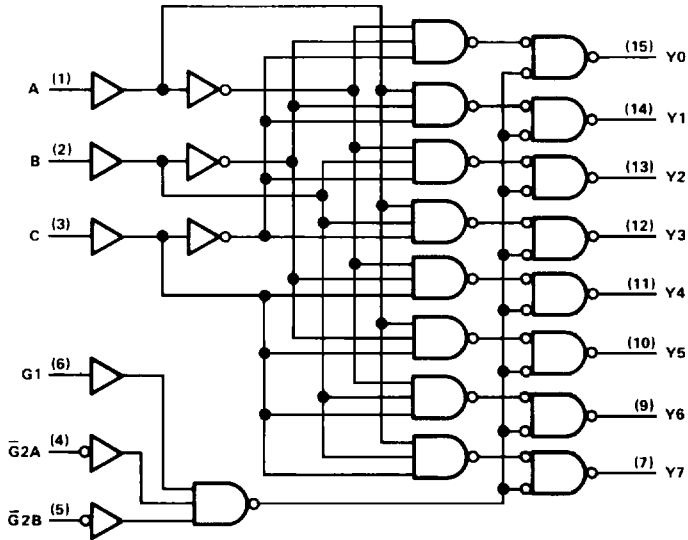
SN54HC138, SN74HC138
3-LINE TO 8-LINE DECODERS/DEMULTIPLEXERS

logic symbols (alternatives)[†]



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

logic diagram (positive logic)



Pin numbers shown are for D, J, and N packages.

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SN54HC138, SN74HC138
3-LINE TO 8-LINE DECODERS/DEMULTIPLEXERS

FUNCTION TABLE

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

absolute maximum ratings over operating free-air temperature[†]

Supply voltage, V_{CC}	-0.5 V to 7 V
Input clamp current, I_{IK} ($V_I < 0$ or $V_I > V_{CC}$)	± 20 mA
Output clamp current, I_{OK} ($V_O < 0$ or $V_O > V_{CC}$)	± 20 mA
Continuous output current, I_O ($V_O = 0$ to V_{CC})	± 25 mA
Continuous current through V_{CC} or GND pins	± 50 mA
Lead temperature 1,6 mm (1/16 in) from case for 60 s: FK or J package	300°C
Lead temperature 1,6 mm (1/16 in) from case for 10 s: D or N package	260°C
Storage temperature range	-65°C to 150°C

[†] Stresses beyond those listed under "absolute maximum ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under "recommended operating conditions" is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

recommended operating conditions

		SN64HC138			SN74HC138			UNIT
		MIN	NOM	MAX	MIN	NOM	MAX	
V_{CC} Supply voltage		2	5	6	2	5	6	V
V_{IH} High-level input voltage	$V_{CC} = 2$ V	1.5			1.5			V
	$V_{CC} = 4.5$ V	3.15			3.15			
	$V_{CC} = 6$ V	4.2			4.2			
V_{IL} Low-level input voltage	$V_{CC} = 2$ V	0		0.3	0		0.3	V
	$V_{CC} = 4.5$ V	0		0.9	0		0.9	
	$V_{CC} = 6$ V	0		1.2	0		1.2	
V_I Input voltage		0		V_{CC}	0		V_{CC}	V
V_O Output voltage		0		V_{CC}	0		V_{CC}	V
t_t Input transition (rise and fall) times	$V_{CC} = 2$ V	0		1000	0		1000	ns
	$V_{CC} = 4.5$ V	0		500	0		500	
	$V_{CC} = 6$ V	0		400	0		400	
T_A Operating free-air temperature		-55		125	-40		85	°C

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SN54HC138, SN74HC138
3-LINE TO 8-LINE DECODERS/DEMULTIPLEXERS

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

PARAMETER	TEST CONDITIONS	V _{CC}	T _A = 25 °C			SN54HC138		SN74HC138		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
V _{OH}	V _I = V _{IH} or V _{IL} , I _{OH} = -20 μA	2 V	1.9	1.998		1.9		1.9	V	
		4.5 V	4.4	4.499		4.4		4.4		
		6 V	5.9	5.999		5.9		5.9		
	4.5 V	3.98	4.30		3.7		3.84			
V _{OL}	V _I = V _{IH} or V _{IL} , I _{OH} = -4 mA	2 V		0.002	0.1			0.1	V	
		4.5 V		0.001	0.1			0.1		
		6 V		0.001	0.1			0.1		
	4.5 V		0.17	0.26			0.4	0.33		
V _{OL}	V _I = V _{IH} or V _{IL} , I _{OL} = 5.2 mA	2 V							V	
		6 V		0.15	0.26			0.4		0.33
I _I	V _I = V _{CC} or 0	6 V		±0.1	±100		±1000	±1000	nA	
I _{CC}	V _I = V _{CC} or 0, I _O = 0	6 V			8		160	80	μA	
C _i		2 to 6 V		3	10		10	10	pF	

switching characteristics over recommended operating free-air temperature range (unless otherwise noted), C_L = 50 pF (see Note 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V _{CC}	T _A = 25 °C			SN54HC138		SN74HC138		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t _{pd}	A, B, or C	Any Y	2 V		67	180		270		225	ns
			4.5 V		18	36		54		45	
			6 V		15	31		46		38	
t _{pd}	Enable	Any Y	2 V		66	155		235		195	ns
			4.5 V		18	31		47		39	
			6 V		15	26		40		33	
t _t		Any	2 V		38	75		110		95	ns
			4.5 V		8	15		22		19	
			6 V		6	13		19		16	

C _{pd}	Power dissipation capacitance	No load, T _A = 25 °C	85 pF typ
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NOTE 1: Load circuit and voltage waveforms are shown in Section 1.

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