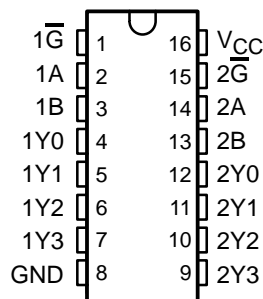


SN54AHC139, SN74AHC139 DUAL 2-LINE TO 4-LINE DECODERS/DEMULTIPLEXERS

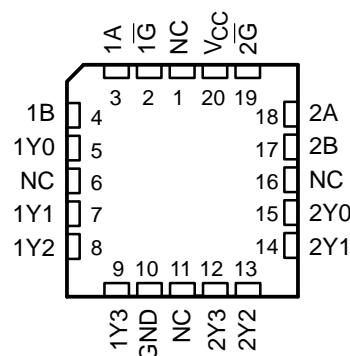
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- Operating Range 2-V to 5.5-V V_{CC}
- EPIC™ (Enhanced-Performance Implanted CMOS) Process
- Designed Specifically for High-Speed Memory Decoders and Data Transmission Systems
- Incorporate Two Enable Inputs to Simplify Cascading and/or Data Reception
- Package Options Include Plastic Small-Outline (D), Shrink Small-Outline (DB), Thin Shrink Small-Outline (PW), and Ceramic Flat (W) Packages, Ceramic Chip Carriers (FK), and Standard Plastic (N) and Ceramic (J) 300-mil DIPs

SN54AHC139 . . . J OR W PACKAGE
SN74AHC139 . . . D, DB, N, OR PW PACKAGE
(TOP VIEW)



SN54AHC139 . . . FK PACKAGE
(TOP VIEW)



NC – No internal connection

description

The 'AHC139 are dual 2-line to 4-line decoders/demultiplexers designed for 2-V to 5.5-V V_{CC} operation. These devices 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 used 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 decoders is negligible.

The active-low enable (\overline{G}) input can be used as a data line in demultiplexing applications. These decoders/demultiplexers feature fully buffered inputs, each of which represents only one normalized load to its driving circuit.

The SN54AHC139 is characterized for operation over the full military temperature range of -55°C to 125°C . The SN74AHC139 is characterized for operation from -40°C to 85°C .

FUNCTION TABLE

\overline{G}	INPUTS		OUTPUTS			
	SELECT		Y0	Y1	Y2	Y3
	B	A				
H	X	X	H	H	H	H
L	L	L	L	H	H	H
L	L	H	H	L	H	H
L	H	L	H	H	L	H
L	H	H	H	H	H	L



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 **TEXAS
INSTRUMENTS**

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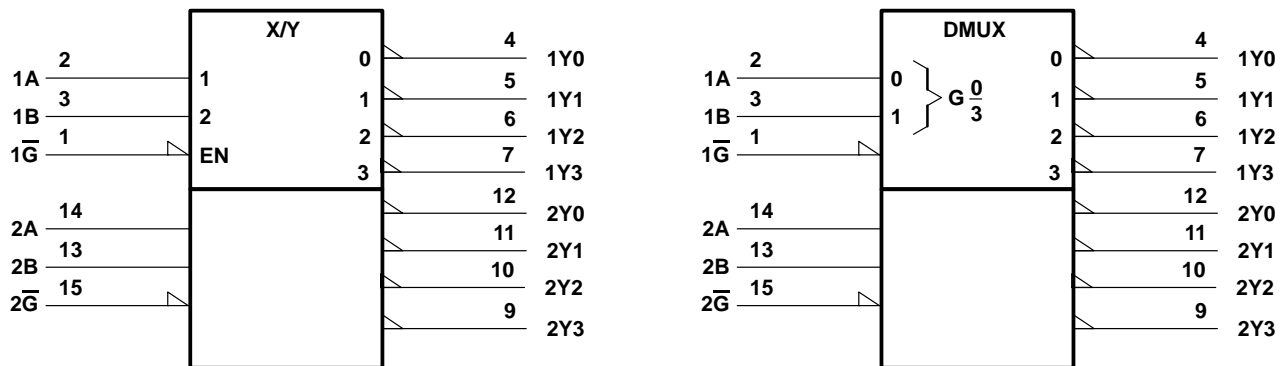
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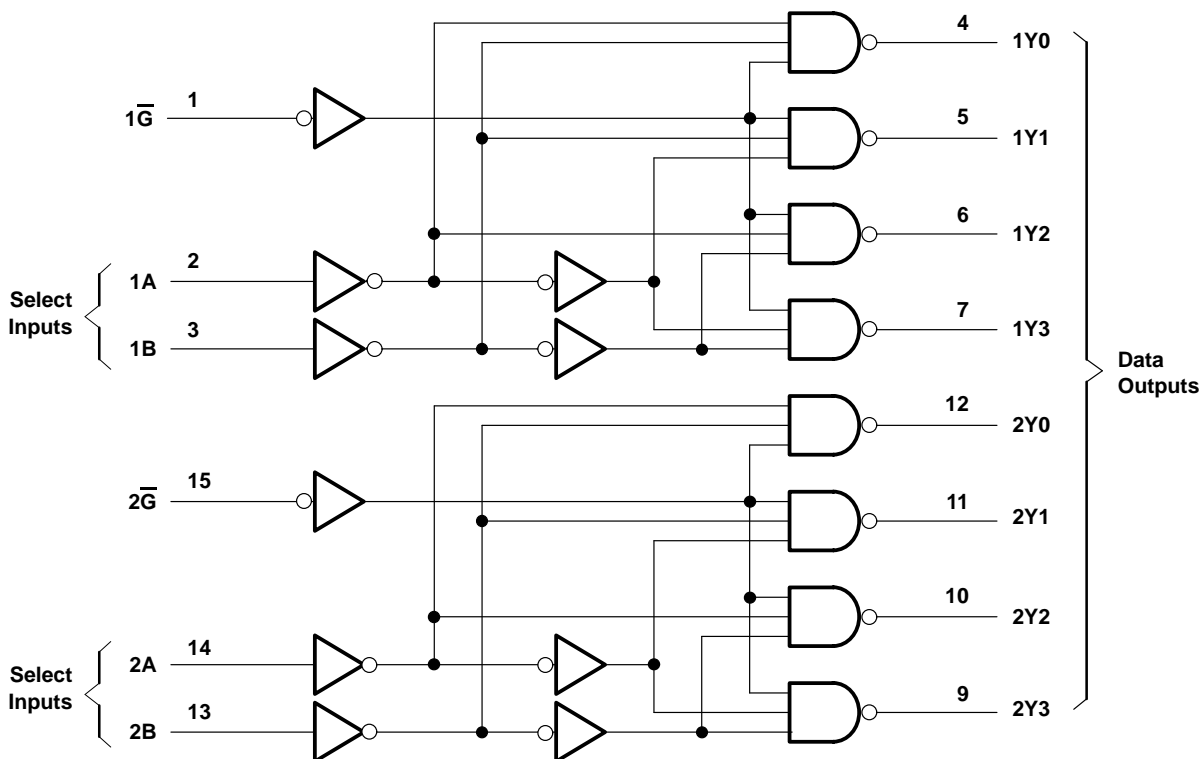
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logic symbols (alternatives)†



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

logic diagram (positive logic)



Pin numbers shown are for the D, DB, J, N, PW, and W packages.

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

Supply voltage range, V_{CC}	–0.5 V to 7 V
Input voltage range, V_I (see Note 1)	–0.5 V to 7 V
Output voltage range, V_O (see Note 1)	–0.5 V to $V_{CC} + 0.5$ V
Input clamp current, I_{IK} ($V_I < 0$)	–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	±75 mA
Maximum power dissipation at $T_A = 55^\circ\text{C}$ (in still air) (see Note 2):	
D package	1.3 W
DB package	0.55 W
N package	1.1 W
PW package	0.5 W
Storage temperature range, T_{stg}	–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.

- NOTES: 1. The input and output voltage ratings may be exceeded if the input and output current ratings are observed.
 2. The maximum package power dissipation is calculated using a junction temperature of 150°C and a board trace length of 750 mils, except for the N package, which has a trace length of zero.

recommended operating conditions (see Note 3)

		SN54AHC139		SN74AHC139		UNIT
		MIN	MAX	MIN	MAX	
V_{CC}	Supply voltage	2	5.5	2	5.5	V
V_{IH}	High-level input voltage	$V_{CC} = 2$ V		1.5		V
		$V_{CC} = 3$ V		2.1		
		$V_{CC} = 5.5$ V		3.85		
V_{IL}	Low-level input voltage	$V_{CC} = 2$ V		0.5		V
		$V_{CC} = 3$ V		0.9		
		$V_{CC} = 5.5$ V		1.65		
V_I	Input voltage	0	5.5	0	5.5	V
V_O	Output voltage	0	V_{CC}	0	V_{CC}	V
I_{OH}	High-level output current	$V_{CC} = 2$ V		–50		μA
		$V_{CC} = 3.3$ V ± 0.3 V		–4		
		$V_{CC} = 5$ V ± 0.5 V		–8		
I_{OL}	Low-level output current	$V_{CC} = 2$ V		50		μA
		$V_{CC} = 3.3$ V ± 0.3 V		4		
		$V_{CC} = 5$ V ± 0.5 V		8		
$\Delta t/\Delta v$	Input transition rise or fall rate	$V_{CC} = 3.3$ V ± 0.3 V		100		ns/V
		$V_{CC} = 5$ V ± 0.5 V		20		
T_A	Operating free-air temperature	–55	125	–40	85	°C

NOTE 3: Unused inputs must be held high or low to prevent them from floating.

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

PARAMETER	TEST CONDITIONS	V _{CC}	T _A = 25°C			SN54AHC139		SN74AHC139		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
V _{OH}	I _{OH} = -50 μA	2 V	1.9	2		1.9		1.9	V	
		3 V	2.9	3		2.9		2.9		
		4.5 V	4.4	4.5		4.4		4.4		
	I _{OH} = -4 mA	3 V	2.58			2.48		2.48		
	I _{OH} = -8 mA	4.5 V	3.94			3.8		3.8		
V _{OL}	I _{OL} = 50 μA	2 V			0.1		0.1	0.1	V	
		3 V			0.1		0.1	0.1		
		4.5 V			0.1		0.1	0.1		
	I _{OL} = 4 mA	3 V			0.36		0.5	0.44		
	I _{OL} = 8 mA	4.5 V			0.36		0.5	0.44		
I _I	V _I = V _{CC} or GND	5.5 V			±0.1		±1	±1	μA	
I _{CC}	V _I = V _{CC} or GND, I _O = 0	5.5 V			4		40	40	μA	
C _i	V _I = V _{CC} or GND	5 V		4	10			10	pF	

switching characteristics over recommended operating free-air temperature range, V_{CC} = 3.3 V ± 0.3 V (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	OUTPUT CAPACITANCE	SN54AHC139				UNIT	
				T _A = 25°C			MIN		MAX
				MIN	TYP	MAX			
t _{PLH} *	A or B	Y	C _L = 15 pF	7.2	11	1	13	ns	
t _{PHL} *				7.2	11	1	13		
t _{PLH} *	G̅	Y	C _L = 15 pF	6.4	9.2	1	11	ns	
t _{PHL} *				6.4	9.2	1	11		
t _{PLH}	A or B	Y	C _L = 50 pF	9.7	14.5	1	16.5	ns	
t _{PHL}				9.7	14.5	1	16.5		
t _{PLH}	G̅	Y	C _L = 50 pF	8.9	12.7	1	14.5	ns	
t _{PHL}				8.9	12.7	1	14.5		

* On products compliant to MIL-PRF-38535, this parameter is ensured but not production tested.

switching characteristics over recommended operating free-air temperature range, V_{CC} = 3.3 V ± 0.3 V (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	OUTPUT CAPACITANCE	SN74AHC139				UNIT	
				T _A = 25°C			MIN		MAX
				MIN	TYP	MAX			
t _{PLH}	A or B	Y	C _L = 15 pF	7.2	11	1	13	ns	
t _{PHL}				7.2	11	1	13		
t _{PLH}	G̅	Y	C _L = 15 pF	6.4	9.2	1	11	ns	
t _{PHL}				6.4	9.2	1	11		
t _{PLH}	A or B	Y	C _L = 50 pF	9.7	14.5	1	16.5	ns	
t _{PHL}				9.7	14.5	1	16.5		
t _{PLH}	G̅	Y	C _L = 50 pF	8.9	12.7	1	14.5	ns	
t _{PHL}				8.9	12.7	1	14.5		



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**switching characteristics over recommended operating free-air temperature range,
V_{CC} = 5 V ± 0.5 V (unless otherwise noted) (see Figure 1)**

PARAMETER	FROM (INPUT)	TO (OUTPUT)	OUTPUT CAPACITANCE	SN54AHC139				UNIT	
				T _A = 25°C			MIN		MAX
				MIN	TYP	MAX			
t _{PLH} *	A or B	Y	C _L = 15 pF	5	7.2	1	8.5	ns	
t _{PHL} *				5	7.2	1	8.5		
t _{PLH} *	\bar{G}	Y	C _L = 15 pF	4.4	6.3	1	7.5	ns	
t _{PHL} *				4.4	6.3	1	7.5		
t _{PLH}	A or B	Y	C _L = 50 pF	6.5	9.2	1	10.5	ns	
t _{PHL}				6.5	9.2	1	10.5		
t _{PLH}	\bar{G}	Y	C _L = 50 pF	5.9	8.3	1	9.5	ns	
t _{PHL}				5.9	8.3	1	9.5		

* On products compliant to MIL-PRF-38535, this parameter is ensured but not production tested.

**switching characteristics over recommended operating free-air temperature range,
V_{CC} = 5 V ± 0.5 V (unless otherwise noted) (see Figure 1)**

PARAMETER	FROM (INPUT)	TO (OUTPUT)	OUTPUT CAPACITANCE	SN74AHC139				UNIT	
				T _A = 25°C			MIN		MAX
				MIN	TYP	MAX			
t _{PLH}	A or B	Y	C _L = 15 pF	5	7.2	1	8.5	ns	
t _{PHL}				5	7.2	1	8.5		
t _{PLH}	\bar{G}	Y	C _L = 15 pF	4.4	6.3	1	7.5	ns	
t _{PHL}				4.4	6.3	1	7.5		
t _{PLH}	A or B	Y	C _L = 50 pF	6.5	9.2	1	10.5	ns	
t _{PHL}				6.5	9.2	1	10.5		
t _{PLH}	\bar{G}	Y	C _L = 50 pF	5.9	8.3	1	9.5	ns	
t _{PHL}				5.9	8.3	1	9.5		

operating characteristics, V_{CC} = 5 V, T_A = 25°C

PARAMETER	TEST CONDITIONS	TYP	UNIT
C _{pd} Power dissipation capacitance per gate	No load, f = 1 MHz	26	pF

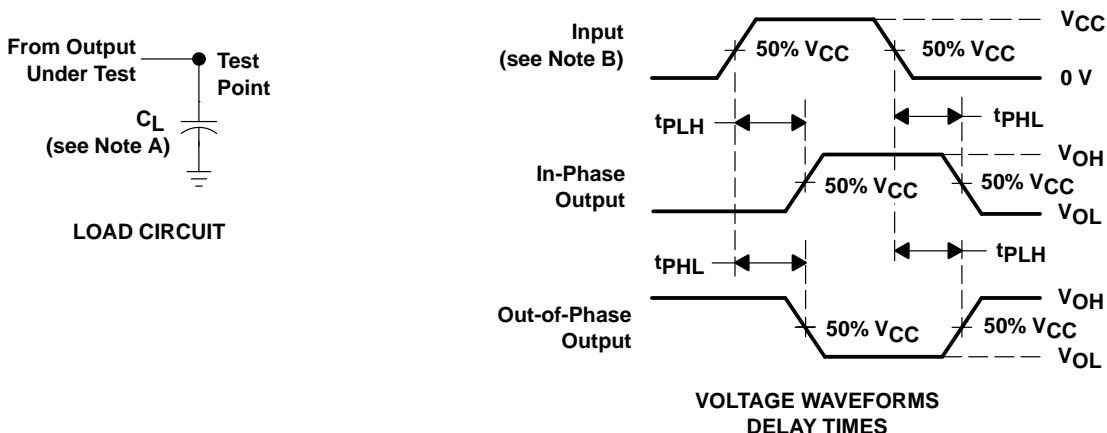
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PARAMETER MEASUREMENT INFORMATION



- NOTES: A. C_L includes probe and jig capacitance.
 B. All input pulses are supplied by generators having the following characteristics: $PRR \leq 1$ MHz, $Z_O = 50 \Omega$, $t_r = 3$ ns, $t_f = 3$ ns.
 C. The outputs are measured one at a time with one input transition per measurement.

Figure 1. Load Circuit and Voltage Waveforms

PRODUCT PREVIEW

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