

# SN54HC239, SN74HC239 DUAL 2-LINE TO 4-LINE DECODERS/DEMULTIPLEXERS

D2804, MARCH 1984—REVISED JUNE 1989

- Designed Specifically for High-Speed Memory Decoders and Data Transmission Systems
- Incorporates 2 Enable Inputs to Simplify Cascading and/or Data Reception
- Package Options Include Plastic "Small Outline" Packages, Ceramic Chip Carriers, and Standard Plastic and Ceramic 300-mil DIPs
- Dependable Texas Instruments Quality and Reliability

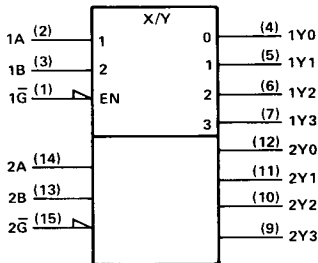
### description

The 'HC239 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.

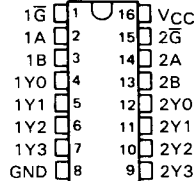
The 'HC239 is comprised of two individual two-line to four-line decoders in a single package. The active-low enable input can be used as a data line in demultiplexing applications. These decoders/demultiplexers feature fully buffered inputs, each of which represents only one normalized load to its driving circuit.

The SN54HC239 is characterized for operation over the full military temperature range of  $-55^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ . The SN74HC239 is characterized for operation from  $-40^{\circ}\text{C}$  to  $85^{\circ}\text{C}$ .

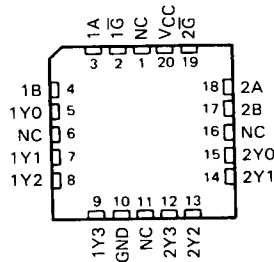
### logic symbols (alternatives) †



SN54HC239 . . . J PACKAGE  
SN74HC239 . . . D† OR N PACKAGE  
(TOP VIEW)



SN54HC239 . . . FK PACKAGE  
(TOP VIEW)



NC—No internal connection

†Contact the factory for D availability

†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.

**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.

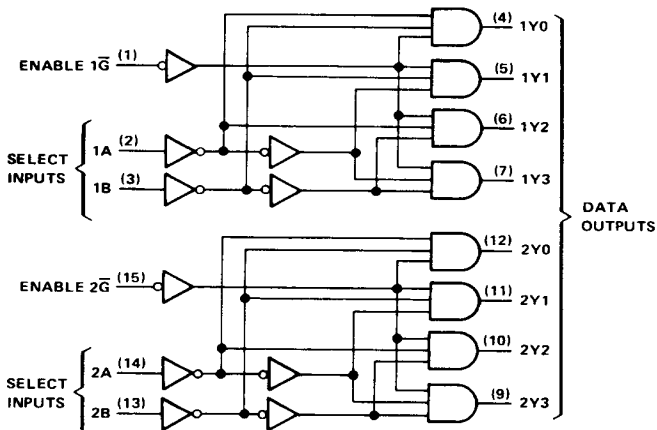


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logic diagram (positive logic)



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

FUNCTION TABLE

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

### absolute maximum ratings over operating free-air temperature range†

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.

# SN54HC239, SN74HC239 DUAL 2-LINE TO 4-LINE DECODERS/DEMULTIPLEXERS

## recommended operating conditions

		SN54HC239			SN74HC239			UNIT		
		MIN	NOM	MAX	MIN	NOM	MAX			
$V_{CC}$	Supply voltage	2	5	6	2	5	6	V		
$V_{IH}$	High-level input voltage	$V_{CC} = 2\text{ V}$		1.5	$V_{CC} = 4.5\text{ V}$		1.5	V		
		$V_{CC} = 4.5\text{ V}$		3.15	$V_{CC} = 6\text{ V}$		3.15			
		$V_{CC} = 6\text{ V}$		4.2			4.2			
$V_{IL}$	Low-level input voltage	$V_{CC} = 2\text{ V}$		0	0.3	$V_{CC} = 4.5\text{ V}$		0	0.3	
		$V_{CC} = 4.5\text{ V}$		0	0.9	$V_{CC} = 6\text{ V}$		0	0.9	
		$V_{CC} = 6\text{ V}$		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	$V_{CC} = 2\text{ V}$		0	1000	$V_{CC} = 4.5\text{ V}$		0	1000	
		$V_{CC} = 4.5\text{ V}$		0	500	$V_{CC} = 6\text{ V}$		0	500	
		$V_{CC} = 6\text{ V}$		0	400			0	400	
$T_A$	Operating free-air temperature	-55			125	-40			85	°C

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

PARAMETER	TEST CONDITIONS	$V_{CC}$	$T_A = 25^\circ\text{C}$			SN54HC239		SN74HC239		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
$V_{OH}$	$V_I = V_{IH}$ or $V_{IL}$ , $I_{OH} = -20\ \mu\text{A}$	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 $V_{IL}$ , $I_{OH} = -5.2\text{ mA}$	2 V	5.48	5.80		5.2		5.34	V	
		4.5 V	0.002	0.1		0.1		0.1		
		6 V	0.001	0.1		0.1		0.1		
	4.5 V	0.17	0.26		0.4		0.33			
	6 V	0.15	0.26		0.4		0.33			
$I_I$	$V_I = V_{CC}$ or 0	6 V	$\pm 0.1$	$\pm 100$		$\pm 1000$		$\pm 1000$	nA	
$I_{CC}$	$V_I = V_{CC}$ or 0, $I_O = 0$	6 V		8		160		80	$\mu\text{A}$	
$C_i$		2 to 6 V		3	10		10	10	pF	

## switching characteristics over recommended operating free-air temperature range (unless otherwise noted), $C_L = 50\text{ pF}$ (see Note 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC}$	$T_A = 25^\circ\text{C}$			SN54HC239		SN74HC239		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
$t_{pd}$	A or B	Y	2 V	62	150		225		190	ns	
			4.5 V	18	30		45		38		
			6 V	14	26		38		32		
$t_{pd}$	$\bar{G}$	Y	2 V	53	120		180		150	ns	
			4.5 V	14	24		36		30		
			6 V	11	20		31		26		
$t_{pd}$		Y	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 per decoder	No load, $T_A = 25^\circ\text{C}$	25 pF typ
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NOTE 1: Load circuit and voltage waveforms are shown in Section 1.



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