

# SN54HCT238, SN74HCT238 3-LINE TO 8-LINE DECODERS/DEMULTIPLEXERS

D2804, MARCH 1984 - REVISED JUNE 1989

- Inputs are TTL-Voltage Compatible
- 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 Plastic "Small Outline" Packages, Ceramic Chip Carriers, and Standard Plastic and Ceramic 300-mil DIPs
- Dependable Texas Instruments Quality and Reliability

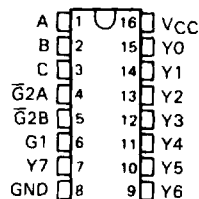
## description

The 'HCT238 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 systems 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.

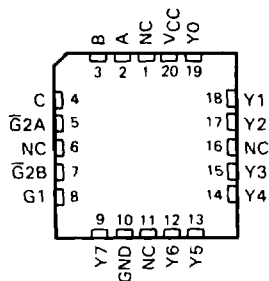
The conditions at the binary select inputs and the three enable inputs select one of eight input lines. Two active-low and one active-high enable inputs reduce the need for external gates or inverters when expanding. A 24-line decoder can be implemented without external inverters and a 32-line decoder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

The SN54HCT238 is characterized for operation over the full military temperature range of  $-55^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ . The SN74HCT238 is characterized for operation from  $-40^{\circ}\text{C}$  to  $85^{\circ}\text{C}$ .

SN54HCT238 . . . J PACKAGE  
SN74HCT238 . . . D† OR N PACKAGE  
(TOP VIEW)



SN54HCT238 . . . FK PACKAGE  
(TOP VIEW)



NC - No internal connection

† Contact the factory for D availability.

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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

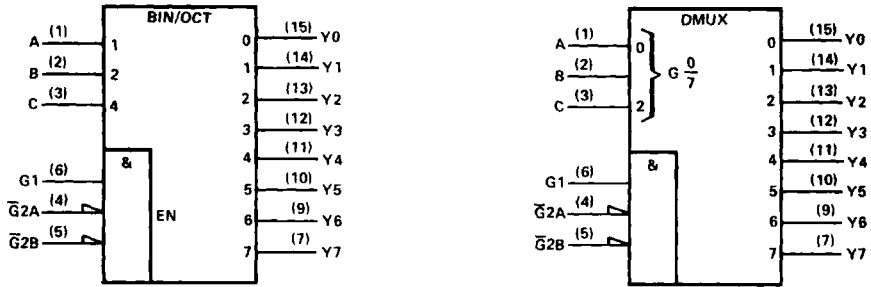
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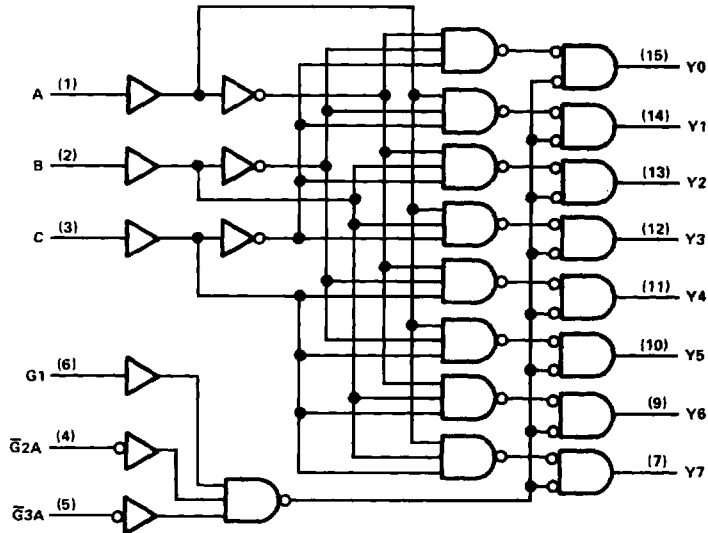
**SN54HCT238, SN74HCT238**  
**3-LINE TO 8-LINE DECODERS/DEMULTIPLEXERS**

logic symbols (alternatives)<sup>†</sup>



<sup>†</sup> 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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FUNCTION TABLE

INPUTS						OUTPUTS							
ENABLE			SELECT										
G1	$\bar{G}2A$	$\bar{G}2B$	C	B	A	Y0	Y1	Y2	Y3	Y4	Y5	Y6	Y7
X	H	X	X	X	X	L	L	L	L	L	L	L	L
X	X	H	X	X	X	L	L	L	L	L	L	L	L
L	X	X	X	X	X	L	L	L	L	L	L	L	L
H	L	L	L	L	L	H	L	L	L	L	L	L	L
H	L	L	L	L	H	L	H	L	L	L	L	L	L
H	L	L	L	H	L	L	L	H	L	L	L	L	L
H	L	L	L	H	H	L	L	L	L	H	L	L	L
H	L	L	H	L	H	L	L	L	L	L	H	L	L
H	L	L	H	H	L	L	L	L	L	L	L	H	L
H	L	L	H	H	H	L	L	L	L	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 $V_I > V_{CC}$ ) .....	$\pm 20$ mA
Output clamp current, $I_{OK}$ ( $V_O < 0$ or $V_O > V_{CC}$ ) .....	$\pm 20$ mA
Continuous output current, $I_O$ ( $V_O = 0$ to $V_{CC}$ ) .....	$\pm 25$ mA
Continuous current through $V_{CC}$ or GND pins .....	$\pm 50$ 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**

	SN54HCT238			SN74HCT238			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	$V_{CC} = 4.5$ V to $5.5$ V			2			V
$V_{IL}$ Low-level input voltage	$V_{CC} = 4.5$ V to $5.5$ V			0			V
$V_I$ Input voltage	0			$V_{CC}$			V
$V_O$ Output voltage	0			$V_{CC}$			V
$t_t$ Input transition (rise and fall) times	0			500			ns
$T_A$ Operating free-air temperature	-55			125			°C



**SN54HCT238, SN74HCT238**  
**3-LINE TO 8-LINE DECODERS/DEMULTIPLEXERS**

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

PARAMETER	TEST CONDITIONS	V <sub>CC</sub>	T <sub>A</sub> = 25°C			SN54HCT238		SN74HCT238		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
V <sub>OH</sub>	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> , I <sub>OH</sub> = -20 μA	4.5 V	4.4	4.499		4.4		4.4	V	
	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> , I <sub>OH</sub> = -4 mA	4.5 V	3.98	4.30		3.7		3.84		
V <sub>OL</sub>	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> , I <sub>OL</sub> = 20 μA	4.5 V		0.001	0.1			0.1	V	
	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> , I <sub>OL</sub> = 4 mA	4.5 V		0.17	0.26			0.4		
I <sub>I</sub>	V <sub>I</sub> = V <sub>CC</sub> or 0	5.5 V		±0.1	±100			±1000	nA	
I <sub>CC</sub>	V <sub>I</sub> = V <sub>CC</sub> or 0, I <sub>O</sub> = 0	5.5 V			8			160	μA	
ΔI <sub>CC</sub> <sup>†</sup>	One input at 0.5 V or 2.4 V, Other inputs at 0 V or V <sub>CC</sub>	5.5 V		1.4	2.4			3	2.9	mA
C <sub>i</sub>		4.5 to 5.5 V		3	10			10	10	pF

<sup>†</sup>This is the increase in supply current for each input that is at one of the specified TTL voltage levels rather than 0 V or V<sub>CC</sub>.

**switching characteristics over recommended operating free-air temperature range (unless otherwise noted), C<sub>L</sub> = 50 pF (see Note 1)**

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V <sub>CC</sub>	T <sub>A</sub> = 25°C			SN54HCT238		SN74HCT238		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t <sub>pd</sub>	A, B, or C	Any	4.5 V		21	36		54		45	ns
			5.5 V		18	32		49		41	
t <sub>pd</sub>	Enable	Any	4.5 V		21	33		50		42	ns
			5.5 V		17	30		45		38	
t <sub>t</sub>		Any	4.5 V		11	15		22		19	ns
			5.5 V		9	14		20		17	

C <sub>pd</sub>	Power dissipation capacitance	No load, T <sub>A</sub> = 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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