

# SN54HC42, SN74HC42 4-LINE TO 10-LINE DECODERS (1-of-10)

D2684, DECEMBER 1982 - REVISED JUNE 1989

- Full Decoding of Input Logic
- All Outputs are High for Invalid BCD Conditions
- Also for Application as 3-Line to 8-Line Decoders
- 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

These monolithic decimal decoders consist of eight inverters and ten four-input NAND gates. The inverters are connected in pairs to make BCD input data available for decoding by the NAND gates. Full decoding of valid input logic ensures that all inputs remain off for all invalid input conditions.

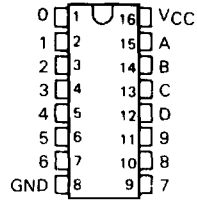
The SN54HC42 is characterized for operation over the full military temperature range of  $-55^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ . The SN74HC42 is characterized for operation from  $-40^{\circ}\text{C}$  to  $85^{\circ}\text{C}$ .

FUNCTION TABLE

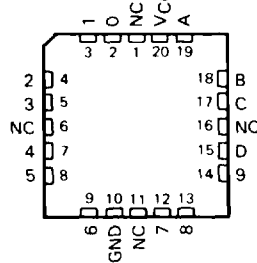
NO.	INPUTS				OUTPUTS										
	D	C	B	A	0	1	2	3	4	5	6	7	8	9	
0	L	L	L	L	L	H	H	H	H	H	H	H	H	H	H
1	L	L	L	H	H	L	H	H	H	H	H	H	H	H	H
2	L	L	H	L	H	H	L	H	H	H	H	H	H	H	H
3	L	L	H	H	H	H	L	H	H	H	H	H	H	H	H
4	L	H	L	L	H	H	H	H	L	H	H	H	H	H	H
5	L	H	L	H	H	H	H	H	H	L	H	H	H	H	H
6	L	H	H	L	H	H	H	H	H	H	L	H	H	H	H
7	L	H	H	H	H	H	H	H	H	H	L	H	H	H	H
8	H	L	L	L	H	H	H	H	H	H	H	L	H	H	H
9	H	L	L	H	H	H	H	H	H	H	H	H	L	H	H
INVALID	H	L	H	L	H	H	H	H	H	H	H	H	H	H	H
	H	L	H	H	H	H	H	H	H	H	H	H	H	H	H
	H	H	L	L	H	H	H	H	H	H	H	H	H	H	H
	H	H	L	H	H	H	H	H	H	H	H	H	H	H	H
	H	H	H	L	H	H	H	H	H	H	H	H	H	H	H

H = high level, L = low level

SN54HC42 . . . J PACKAGE  
SN74HC42 . . . D<sup>1</sup> OR N PACKAGE  
(TOP VIEW)



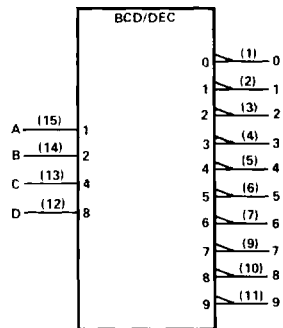
SN54HC42 . . . FK PACKAGE  
(TOP VIEW)



NC - No internal connection

<sup>1</sup>Contact the factory for D availability

## logic symbol<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.

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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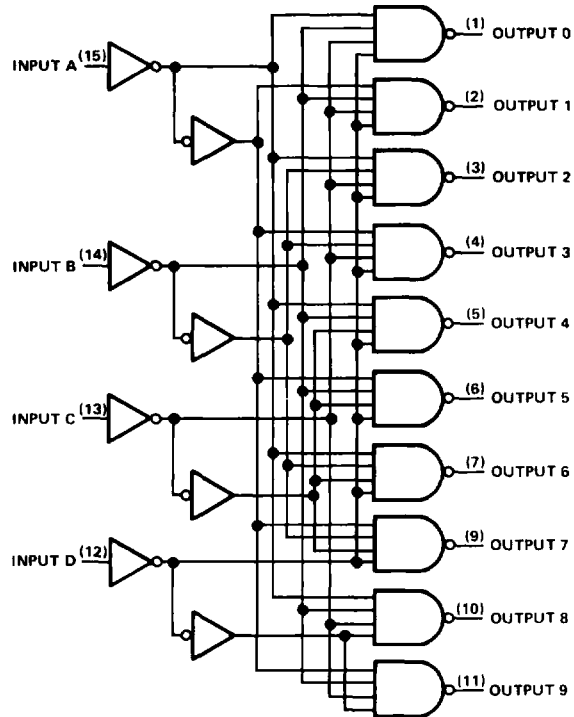
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HCMOS Devices

**SN54HC42, SN74HC42**  
**4-LINE TO 10-LINE DECODERS (1-of-10)**

logic diagram (positive logic)



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

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**SN54HC42, SN74HC42**  
**4-LINE TO 10-LINE DECODERS (1-of-10)**

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

Supply voltage, $V_{CC}$ .....	-0.5 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**

		SN54HC42			SN74HC42			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

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

PARAMETER	TEST CONDITIONS	$V_{CC}$	$T_A = 25^\circ\text{C}$			SN54HC42		SN74HC42		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 $V_{IL}$ , $I_{OH} = -4 \text{ mA}$	6 V	5.48	5.80		5.2	5.34		V	
		2 V			0.002	0.1		0.1		
	4.5 V			0.001	0.1		0.1			
	6 V			0.001	0.1		0.1			
$V_{OL}$	$V_I = V_{IH}$ or $V_{IL}$ , $I_{OL} = 20 \mu\text{A}$	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			$\pm 0.1$	$\pm 100$		$\pm 1000$	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	

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**HC MOS Devices**

**SN54HC42, SN74HC42**  
**4-LINE TO 10-LINE DECODERS (1-of-10)**

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

PARAMETER	FROM (INPUT)	TO (OUTPUT)	VCC	T <sub>A</sub> = 25 °C			SN54HC42		SN74HC42		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t <sub>pd</sub>	A, B, C, or D	0 thru 9	2 V		65	150		225		190	ns
			4.5 V		18	30		45		38	
			6 V		14	26		38		32	
t <sub>t</sub>		Any	2 V		28	75		110		95	ns
			4.5 V		8	15		22		19	
			6 V		7	13		19		16	

C <sub>pd</sub>	Power dissipation capacitance	No load, T <sub>A</sub> = 25 °C	39 pF typ
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NOTE 1: Load circuit and voltage waveforms are shown in Section 1.

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**HCMOS Devices**