

MN74HC42/MN74HC42S

BCD-to-Decimal Decoder

Outline

The MN74HC42/MN74HC42S is a decoder to convert BCD signals into decimal signals. Of the ten outputs $Y_0 \sim Y_9$, the outputs corresponding to the input codes A~D become the "L" level and all the other outputs become the "H" level. When the decimal number of the input exceeded 9, the levels of all the outputs becomes "H".

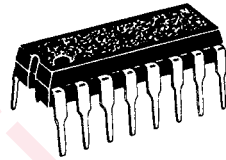
Owing to the silicon gate CMOS process, this decoder has realized low power consumption and high noise immunity equivalent to those of a standard CMOS and the operation speed as high as of an LS TTL. The MN74HC42/MN74HC42S can directly drive ten LS TTL inputs.

To protect the input and output against electrostatic breakdown, a resistor and a diode are used for the V_{CC} and the GND. The pin configuration and the function are the same as those of the standard 54LS/74LS logic family.

Truth Table

No.	Input				Output										
	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	H	L	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	H	L	H	H	H
8	H	L	L	L	H	H	H	H	H	H	H	H	L	H	H
9	H	L	L	H	H	H	H	H	H	H	H	H	H	L	H
All outputs are of "H" level	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

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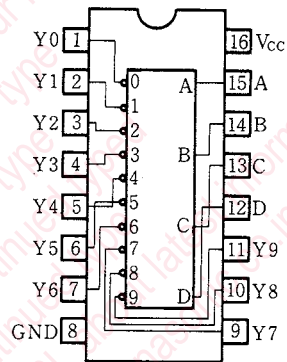
16-pin plastic DIL package

P-4

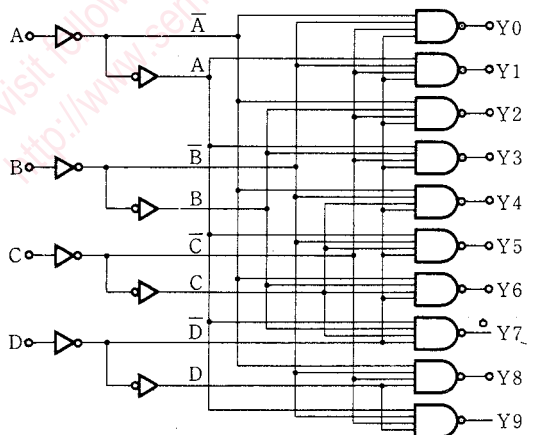


16-pin PANAFLAT package (SO-16D)

Pin Configuration



Logic Diagram



■ Absolute Maximum Ratings

Item		Symbol	Rating	Unit	
Supply voltage		V_{CC}	-0.5~+7.0	V	
Input output voltage		V_I, V_O	-0.5~ $V_{CC}+0.5$	V	
Input protective diode current		I_{IK}	±20	mA	
Output parasitic diode current		I_{OK}	±20	mA	
Output current		I_O	±25	mA	
Supply current		I_{CC}, I_{GND}	±50	mA	
Storage temperature		T_{stg}	-65~+150	°C	
Power dissipation	MN74HC42	$T_a = -40 \sim +60^\circ\text{C}$	P_D	400	mW
		$T_a = +60 \sim +85^\circ\text{C}$		Decrease to 200mW at the rate of 8mW/°C	
	MN74HC42S	$T_a = -40 \sim +60^\circ\text{C}$	P_D	275	mW
		$T_a = +60 \sim +85^\circ\text{C}$		Decrease to 200mW at the rate of 3.8mW/°C	

■ Recommended Operating Conditions

Item	Symbol	$V_{CC}(V)$	Rating	Unit
Operating power supply voltage	V_{CC}		1.4~6.0	V
Input output voltage	V_I, V_O		0~ V_{CC}	V
Operating temperature	T_A		-40~+85	°C
Input rise, fall time	t_r, t_f	2.0	0~1000	ns
		4.5	0~500	ns
		6.0	0~400	ns

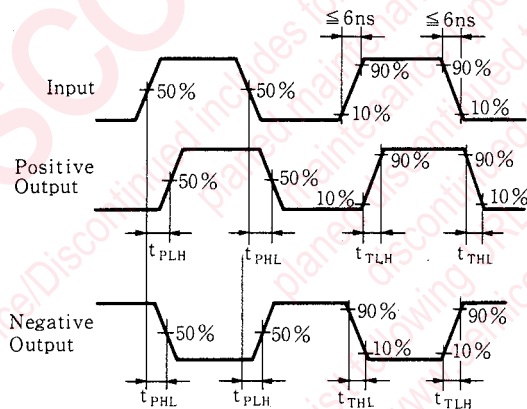
■ DC Characteristics (GND=0V)

Item	Symbol	V_{CC} (V)	Test Condition			Temperature					Unit
			V_I	V_O	Unit	$T_a = 25^\circ\text{C}$			$T_a = -40 \sim +85^\circ\text{C}$		
						min.	typ.	max.	min.	max.	
Input voltage high level	V_{IH}	2.0				1.5			1.5		V
		4.5				3.15			3.15		
		6.0				4.2			4.2		
Input voltage low level	V_{IL}	2.0						0.3		0.3	V
		4.5						0.9		0.9	
		6.0						1.2		1.2	
Output voltage high level	V_{OH}	2.0		-20.0	μA	1.9	2.0		1.9		V
		4.5	V_{IH}	-20.0	μA	4.4	4.5		4.4		
		6.0	or	-20.0	μA	5.9	6.0		5.9		
		4.5	V_{IL}	-4.0	mA	3.92			3.84		
		6.0		-5.2	mA	5.48			5.34		
Output voltage low level	V_{OL}	2.0		20.0	μA		0.0	0.1		0.1	V
		4.5	V_{IH}	20.0	μA		0.0	0.1		0.1	
		6.0	or	20.0	μA		0.0	0.1		0.1	
		4.5	V_{IL}	4.0	mA			0.26		0.33	
		6.0		5.2	mA			0.26		0.33	
Input leakage current	I_I	6.0	$V_I = V_{CC}$ or GND					±0.1		±1.0	μA
Static supply current	I_{CC}	6.0	$V_I = V_{CC}$ or GND, $I_O = 0$					8.0		80.0	μA

■ AC Characteristics (GND=0V, Input transition time ≤ 6ns, C_L=50pF)

Item	Symbol	V _{CC} (V)	Test Condition	Temperature					Unit
				T _a =25°C			T _a =-40~+85°C		
				min.	typ.	max.	min.	max.	
Output rise time	t _{TLH}	2.0			25	75		95	ns
		4.5		8	15	19			
		6.0		7	13	16			
Output fall time	t _{THL}	2.0			20	75		95	ns
		4.5		7	15	19			
		6.0		6	13	16			
Propagation time A, B, C, D → Y (L → H)	t _{PLH}	2.0			38	125		155	ns
		4.5		17	25	31			
		6.0		12	21	26			
Propagation time A, B, C, D → Y (H → L)	t _{PHL}	2.0			36	125		155	ns
		4.5		15	25	31			
		6.0		10	21	26			

● AC characteristics measuring waveforms



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