GD54/74HC42, GD54/74HCT42
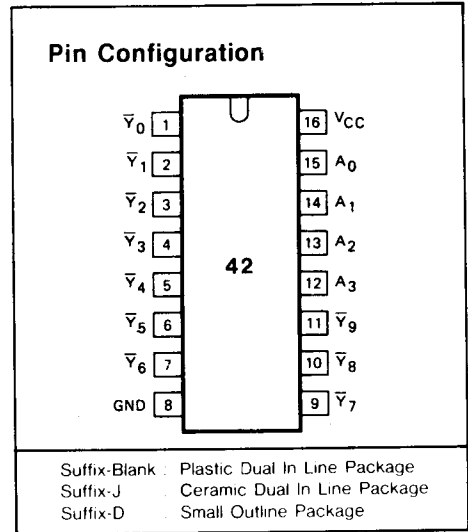
1-OF-10 DECODER

General Description

These devices are identical in pinout to the 54/74LS42. Data on the 4 input pins select one of the 10 outputs corresponding to the value of the BCD number on the inputs. An output will go low when selected, otherwise it remains high. If the input data is not a valid BCD number, i.e., a hexadecimal equivalent greater than 9, all outputs will remain high. These devices are characterized for operation over wide temperature ranges to meet industry and military specifications

Features

- Low Power consumption characteristic of CMOS devices
- Output drive capability: 10 LS TTL Loads Min.
- Operating speed superior to LS TTL
- Wide operating voltage range: for HC 2 to 6 volts
  for HCT 4.5 to 5.5 volts
- Low input current: $1\mu A$ Max.
- Low quiescent current: $80\mu A$ Max. (74HC)
- High noise immunity characteristic of CMOS
- Diode protection on all inputs

Pin Configuration

Pin			Pin
$\overline{Y}_0$	1	16	V_{CC}
$\overline{Y}_1$	2	15	A_0
$\overline{Y}_2$	3	14	A_1
$\overline{Y}_3$	4	13	A_2
$\overline{Y}_4$	5	12	A_3
$\overline{Y}_5$	6	11	$\overline{Y}_9$
$\overline{Y}_6$	7	10	$\overline{Y}_8$
GND	8	9	$\overline{Y}_7$

42

Suffix-Blank : Plastic Dual In Line Package
Suffix-J : Ceramic Dual In Line Package
Suffix-D : Small Outline Package

Function Table

INPUTS				OUTPUTS									
A_3	A_2	A_1	A_0	$\overline{Y}_0$	$\overline{Y}_1$	$\overline{Y}_2$	$\overline{Y}_3$	$\overline{Y}_4$	$\overline{Y}_5$	$\overline{Y}_6$	$\overline{Y}_7$	$\overline{Y}_8$	$\overline{Y}_9$
L	L	L	L	L	H	H	H	H	H	H	H	H	H
L	L	L	H	H	L	H	H	H	H	H	H	H	H
L	L	H	L	H	H	L	H	H	H	H	H	H	H
L	L	H	H	H	H	H	L	H	H	H	H	H	H
L	H	L	L	H	H	H	H	L	H	H	H	H	H
L	H	L	H	H	H	H	H	H	L	H	H	H	H
L	H	H	L	H	H	H	H	H	H	L	H	H	H
L	H	H	H	H	H	H	H	H	H	H	L	H	H
H	L	L	L	H	H	H	H	H	H	H	H	L	H
H	L	L	H	H	H	H	H	H	H	H	H	H	L
H	L	H	L	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	L	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	H	H	H	H	H	H	H	H	H	H	H	H

H = HIGH voltage level
L = LOW voltage level

Absolute Maximum Ratings

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{CC}	DC Supply voltage		−0.5	+7	V
I_{IK}, I_{OK}	DC input or output diode current	for $V_I < -0.5$ or $V_I > V_{CC} + 0.5V$		|20|	mA
I_O	DC output source or sink current	for $-0.5V < V_O < V_{CC} + 0.5V$		|35|	mA
I_{CC}	DC V_{CC} or GND current			|70|	mA
T_{stg}	Storage temperature range		−65	150	°C
P_D	Power dissipation per package	above +70°C: derate linearly with 8mW/K		500	mW
T_L	Lead temperature	At distance 1/16±1/32 in. from case for 60 sec(CERAMIC) 10 sec(PLASTIC)		300 260	°C

Recommended Operating Conditions

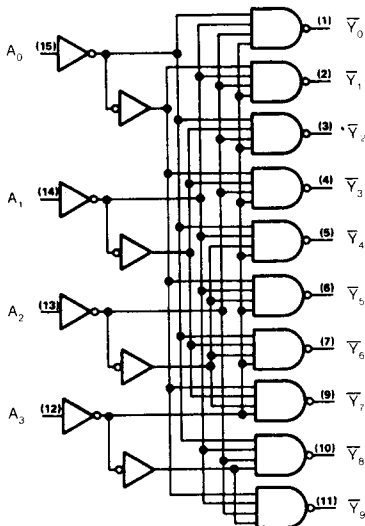| CHARACTERISTIC	LIMITS		UNITS
	MIN.	MAX.	
Supply-Voltage Range V_{CC}: GD54/74HC Types GD54/74HCT Types	2 4.5	6 5.5	V
DC Input or Output Voltage V_I, V_O	0	V_{CC}	V
Operating Temperature T_A: GD74 Types GD54 Types	−40 −55	+85 +125	°C
Input Rise and Fall times t_r, t_f: GD54/74HC Types at 2V at 4.5V at 6V GD54/74HCT Types at 4.5 V		1000 500 400 500	ns

Logic Diagram

Fig. 1 Logic diagram

DC Electrical Characteristics for HC

SYMBOL	PARAMETER	TEST CONDITION		V_CC (V)	$T_A=25°C$			GD74HC42		GD54HC42		UNIT
					MIN.	TYP.	MAX.	MIN.	MAX.	MIN.	MAX.	
V_{IH}	HIGH level input Voltage			2.0	1.5			1.5		1.5		V
				4.5	3.15			3.15		3.15		
				6.0	4.2			4.2		4.2		
V_{IL}	LOW level input voltage			2.0			0.3		0.3		0.3	V
				4.5			0.9		0.9		0.9	
				6.0			1.2		1.2		1.2	
V_{OH}	HIGH level output voltage	$V_{IN}=V_{IH}$ or V_{IL}	$I_{OH}=-20\mu A$	2.0	1.9	2.0		1.9		1.9		V
				4.5	4.4	4.5		4.4		4.4		
				6.0	5.9	6.0		5.9		5.9		
			$I_{OH}=-4mA$	4.5	3.98	4.3		3.84		3.7		
			$I_{OH}=-5.2mA$	6.0	5.48	5.2		5.34		5.2		
V_{OL}	LOW level output voltage	$V_{IN}=V_{IH}$ or V_{IL}	$I_{OL}=20\mu A$	2.0			0.1		0.1		0.1	V
				4.5			0.1		0.1		0.1	
				6.0			0.1		0.1		0.1	
			$I_{OL}=4mA$	4.5		0.17	0.26		0.33		0.4	
			$I_{OL}=5.2mA$	6.0		0.15	0.26		0.33		0.4	
$|I_{IN}|$	Input leakage Current	$V_{IN}=V_{CC}$ or GND		6.0			0.1		1.0		1.0	μA
I_{CC}	Quiescent Supply Current	$V_{IN}=V_{CC}$ or GND $I_{out}=0\mu A$		6.0			8		80		160	μA

DC Electrical Characteristics for HCT

SYMBOL	PARAMETER	TEST CONDITION		V_CC (V)	$T_A=25°C$			GD74HCT42		GD54HCT42		UNIT
					MIN.	TYP.	MAX.	MIN.	MAX.	MIN.	MAX.	
V_{IH}	HIGH level input Voltage			4.5 to 5.5	2.0			2.0		2.0		V
V_{IL}	LOW level input voltage			4.5 to 5.5			0.8		0.8		0.8	V
V_{OH}	HIGH level output voltage	$V_{IN}=V_{IH}$ or V_{IL}	$I_{OH}=-20\mu A$	4.5	4.4	4.5		4.4		4.4		V
			$I_{OH}=-4mA$	4.5	3.98	4.3		3.84		3.7		
V_{OL}	LOW level output voltage	$V_{IN}=V_{IH}$ or V_{IL}	$I_{OL}=20\mu A$	4.5			0.1		0.1		0.1	V
			$I_{OL}=4mA$	4.5		0.17	0.26		0.33		0.4	
$|I_{IN}|$	Input leakage Current	$V_{IN}=V_{CC}$ or GND		5.5			0.1		1.0		1.0	μA
I_{CC}	Quiescent Supply Current	$V_{IN}=V_{CC}$ or GND $I_{out}=0\mu A$		5.5			8		80		160	μA

AC Characteristics for HC: $t_r = t_f = 6ns$ CL=50pF

SYMBOL	PARAMETER	V_{CC} (V)	$T_A = 25°C$			GD74HC42		GD54HC42		UNIT
			MIN.	TYP.	MAX.	MIN.	MAX.	MIN.	MAX.	
$t_{PLH}/$ t_{PHL}	Propagation delay time An to $\overline{Y}n$	2.0		65	150		190		225	ns
		4.5		17	30		38		45	
		6.0		14	26		32		38	
$t_{TLH}/$ t_{THL}	Output transition time	2.0		28	75		95		110	ns
		4.5		7	15		19		22	
		6.0		6	13		16		19	

AC Characteristics for HCT: $t_r = t_f = 6ns$ CL=50pF

SYMBOL	PARAMETER	V_{CC} (V)	$T_A = 25°C$			GD74HCT42		GD54HCT42		UNIT
			MIN.	TYP.	MAX.	MIN.	MAX.	MIN.	MAX.	
$t_{PLH}/$ t_{PHL}	Propagation delay time An to $\overline{Y}n$	4.5		19	35		44		53	ns
$t_{TLH}/$ t_{THL}	Output transition time	4.5		7	15		19		22	ns

AC Waveforms

An INPUT

$V_M^{(1)}$

t_{PHL} t_{PLH}

$\overline{Y}n$ OUTPUT

$V_M^{(1)}$

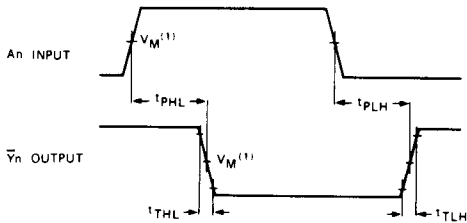t_{THL} t_{TLH}

Fig. 3 Waveforms showing the input (An) to output ($\overline{Y}n$) propagation delays and the output transition times.

Note to AC waveforms
(1) HC : $V_M = 50\%$, $V_I = $ GND to V_{CC}
     HCT: $V_M = 1.3V$; $V_I = $ GND to 3V.