

GD54/74HC147, GD54/74HCT147

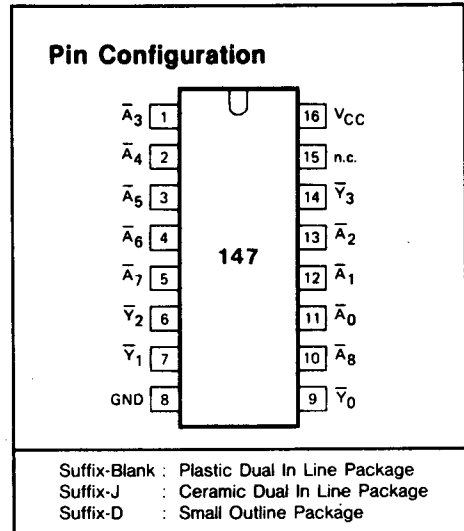
10-TO-4 LINE (DECIMAL-TO-BCD) PRIORITY ENCODER

General Description

These devices are identical in pinout to the 54/74LS147. This encoder features priority encoding of the inputs to ensure that only the highest input lines are encoded to a four active-low BCD coded when all nine data inputs are at a high logic level. The implied decimal zero condition is encoded when all nine data inputs are at a high logic level (inactive). 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 μ A Max.
- Low quiescent current: 80 μ Max. (74HC)
- High noise immunity characteristic of CMOS
- Diode protectin on all inputs



Function Table

INPUTS								OUTPUTS				
\bar{A}_0	\bar{A}_1	\bar{A}_2	\bar{A}_3	\bar{A}_4	\bar{A}_5	\bar{A}_6	\bar{A}_7	\bar{A}_8	\bar{Y}_3	\bar{Y}_2	\bar{Y}_1	\bar{Y}_0
H	H	H	H	H	H	H	H	H	H	H	H	H
X	X	X	X	X	X	X	X	L	L	H	H	L
X	X	X	X	X	X	X	L	H	L	H	H	H
X	X	X	X	X	X	L	H	H	H	L	L	L
X	X	X	X	X	L	H	H	H	H	L	L	H
X	X	X	X	L	H	H	H	H	H	L	H	L
X	X	X	L	H	H	H	H	H	H	L	H	H
X	X	L	H	H	H	H	H	H	H	L	L	L
X	L	H	H	H	H	H	H	H	H	L	L	H
L	H	H	H	H	H	H	H	H	H	H	H	L

H = HIGH voltage level
 L = LOW voltage level
 X = don't care

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 $-0.5V < V_O < V_{CC} + 0.5V$		25	mA
I_{CC}	DC V_{CC} or GND current			50	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 4.5V		1000 500 400 500	ns

Logic Diagram

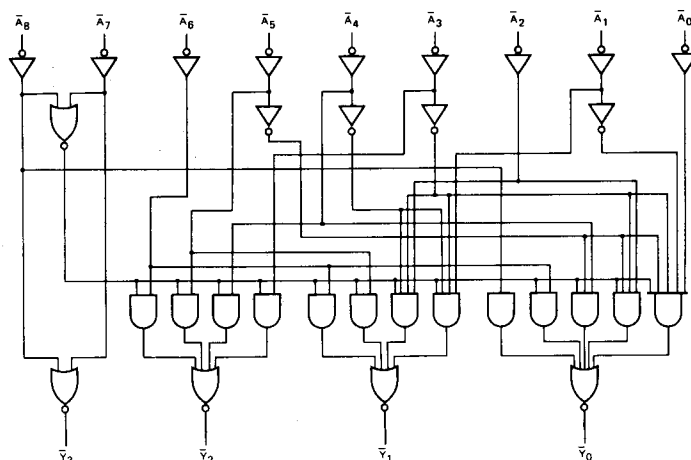


Fig. 1 Logic diagram

DC Electrical Characteristics for HC

SYMBOL	PARAMETER	TEST CONDITION	V _{CC} (V)	T _A =25°C			GD74HC147		GD54HC147		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			
			6.0			1.2		1.2			
V _{OH}	HIGH level output voltage	V _{IN} =V _{IH} or V _{IL}	I _{OH} =-20μA	2.0	1.9	2.0		1.9		1.9	V
				4.5	4.4	4.5		4.4		4.4	
		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} =20μA	2.0			0.1		0.1	0.1	V
				4.5			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} =0μA	6.0			8		80		160	μA

DC Electrical Characteristics for HCT

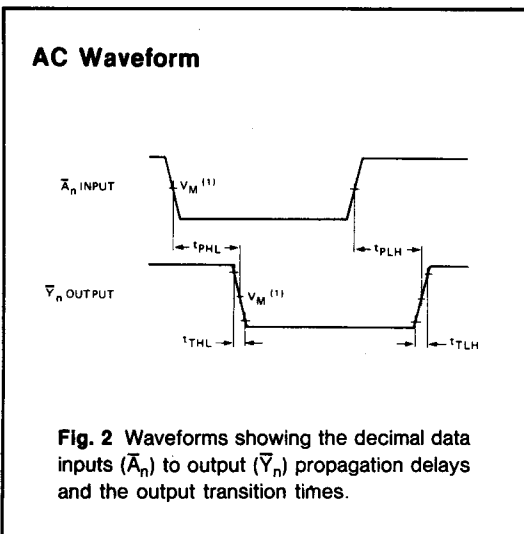
SYMBOL	PARAMETER	TEST CONDITION	V _{CC} (V)	T _A =25°C			GD74HCT147		GD54HCT147		UNIT
				MIN.	TYP.	MAX.	MIN.	MAX.	MIN.	MAX.	
V _{IH}	HIGH level input Voltage		4.5 to 5.0	2.0			2.0		2.0		V
V _{IL}	LOW level input voltage		4.5 to 5.5			0.8		0.8		0.8	V
V _{OH}	HIGH level output voltage	V _{IN} =V _{IH} or V _{IL}	I _{OH} =-20μA	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} =20μA	4.5			0.1		0.1		V
			I _{OL} =4mA	4.5		0.17	0.26		0.33		
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} =0μA	5.5			8		80		160	μA

AC Characteristics for HC: $t_r=t_f=6\text{ns}$ $C_L=50\text{ pF}$

SYMBOL	PARAMETER	V_{CC} (V)	$T_A=25^\circ\text{C}$			GD74HC147		GD54HC147		UNIT
			MIN.	TYP.	MAX.	MIN.	MAX.	MIN.	MAX.	
$t_{PLH}/$ t_{PHL}	Propagation delay time \bar{A}_n to \bar{Y}_n	2.0 4.5 6.0		50 18 14	160 32 27		200 40 34		240 48 41	ns
$t_{TLH}/$ t_{THL}	Output transition time	2.0 4.5 6.0		19 7 6	75 15 13		95 19 16		110 22 19	

AC Characteristics for HCT: $t_r=t_f=6\text{ns}$ $C_L=50\text{ pF}$

SYMBOL	PARAMETER	V_{CC} (V)	$T_A=25^\circ\text{C}$			GD74HCT147		GD54HCT147		UNIT
			MIN.	TYP.	MAX.	MIN.	MAX.	MIN.	MAX.	
$t_{PLH}/$ t_{PHL}	Propagation delay time \bar{A}_n to \bar{Y}_n	4.5		20	35		44		53	ns
$t_{TLH}/$ t_{THL}	Output transition time	4.5		7	15		19		22	



Note to AC waveform

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