

GD54/74HC137, GD54/74HCT137

3-TO-8 LINE DECODER/DEMULTIPLEXER WITH ADDRESS LATCH

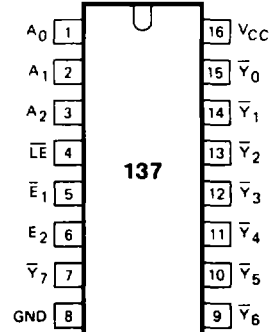
General Description

These devices are identical in pinout to the 54/74LS137. Each device decodes a 3-bit address to 1-of-3 active-low outputs. It has a transparent latch for storage of the address. Two chip selects, one active-low and one active-high, are provided to facilitate the demultiplexing, cascading, and chip-selecting functions. 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 A Max. (74HC)
- High noise immunity characteristic of CMOS
- Diode protection on all inputs

Pin Configuration



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

Function Table

INPUTS						OUTPUTS							
$\overline{LE}$	$\overline{E_1}$	E ₂	A ₀	A ₁	A ₂	$\overline{Y_0}$	$\overline{Y_1}$	$\overline{Y_2}$	$\overline{Y_3}$	$\overline{Y_4}$	$\overline{Y_5}$	$\overline{Y_6}$	$\overline{Y_7}$
H	L	H	X	X	X	stable							
X	H	X	X	X	X	H	H	H	H	H	H	H	H
X	X	L	X	X	X	H	H	H	H	H	H	H	H
L	L	H	L	L	L	L	H	H	H	H	H	H	H
L	L	H	H	L	L	H	L	H	H	H	H	H	H
L	L	H	L	H	L	H	H	L	H	H	H	H	H
L	L	H	H	H	L	H	H	H	L	H	H	H	H
L	L	H	L	L	H	H	H	H	H	L	H	H	H
L	L	H	L	H	H	H	H	H	H	H	L	H	H
L	L	H	L	H	H	H	H	H	H	H	H	L	H
L	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 $V_I > V_{CC} + 0.5$ V		20	mA
I_O	DC output source or sink current	for -0.5 V $< V_O < V_{CC} + 0.5$ V		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

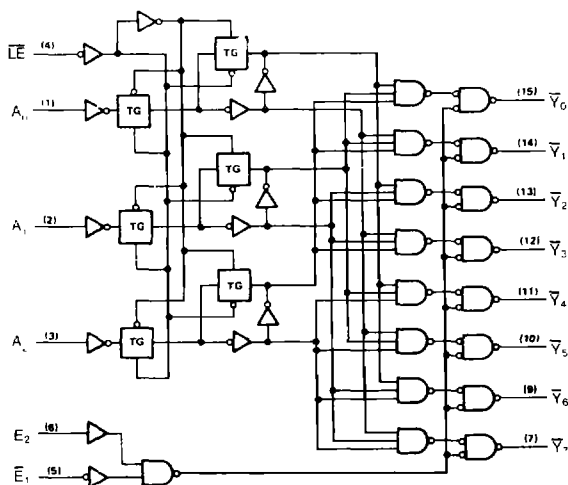


Fig. 1 Logic diagram

DC Electrical Characteristics for HC

SYMBOL	PARAMETER	TEST CONDITION	V _{CC} (V)	T _A =25°C			GD74HC137		GD54HC137		UNIT
				MIN.	TYP.	MAX.	MIN.	MAX.	MIN.	MAX.	
V _{IH}	HIGH level input Voltage		2.0 4.5 6.0	1.5 3.15 4.2			1.5 3.15 4.2		1.5 3.15 4.2		V
V _{IL}	LOW level input voltage		2.0 4.5 6.0			0.3 0.9 1.2		0.3 0.9 1.2		0.3 0.9 1.2	V
V _{OH}	HIGH level output voltage	V _{IN} =V _{IH}	I _{OH} =-20μA	2.0 4.5 6.0	1.9 4.4 5.9	2.0 4.5 6.0	1.9 4.4 5.9		1.9 4.4 5.9		V
		or V _{IL}	I _{OH} =-4mA I _{OH} =-5.2mA	4.5 6.0	3.98 5.48	4.3 5.2	3.84 5.34		3.7 5.2		
V _{OL}	LOW level output voltage	V _{IN} =V _{IH}	I _{OL} =20μA	2.0 4.5 6.0			0.1 0.1 0.1	0.1 0.1 0.1		0.1 0.1 0.1	V
		or V _{IL}	I _{OL} =4mA I _{OL} =5.2mA	4.5 6.0	0.17 0.15	0.27 0.26		0.33 0.33		0.4 0.	
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			GD74HCT137		GD54HCT137		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}	I _{OH} =-20μA	4.5	4.4	4.5	4.4		4.4		V
		or V _{IL}	I _{OH} =-4mA	4.5	3.98	4.3	3.84		3.7		
V _{OL}	LOW level output voltage	V _{IN} =V _{IH}	I _{OL} =20μA	4.5			0.1	0.1		0.1	V
		or V _{IL}	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} =0μA	5.5			8		80		160	μA

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

SYMBOL	PARAMETER		V_{CC} (V)	$T_A=25^\circ\text{C}$			GD74HC137		GD54HC137		UNIT
				MIN.	TYP.	MAX.	MIN.	MAX.	MIN.	MAX.	
t_w	Pulse width	$\overline{LE}$ to CLK	2.0	75			100		120		ns
			4.5	15			20		24		
			6.0	13			17		20		
t_{su}	Setup time	A_n before $\overline{LE}$	2.0	75			95		115		ns
			4.5	15			19		23		
			6.0	13			16		20		
t_h	Hold time	A_n after $\overline{LE}$	2.0	5			5		5		ns
			4.5	5			5		5		
			6.0	5			5		5		

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

SYMBOL	PARAMETER		V_{CC} (V)	$T_A=25^\circ\text{C}$			GD74HC137		GD54HC137		UNIT
				MIN.	TYP.	MAX.	MIN.	MAX.	MIN.	MAX.	
$t_{PLH}/$ t_{PHL}	Propagation Delay Time A,B,C to $\overline{Y}_n$		2.0		82	190		230		280	ns
			4.5		22	36		45		55	
			6.0		19	31		40		46	
$t_{PLH}/$ t_{PHL}	Propagation Delay Time $\overline{E}_1$ to $\overline{Y}_n$		2.0		55	140		180		220	ns
			4.5		17	28		35		42	
			6.0		14	24		30		35	
$t_{PLH}/$ t_{PHL}	Propagation Delay Time E_2 to $\overline{Y}_n$		2.0		55	140		180		220	ns
			4.5		17	28		35		42	
			6.0		14	24		30		35	
$t_{PLH}/$ t_{PHL}	Propagation Delay Time $\overline{LE}$ to $\overline{Y}_n$		2.0		75	180		225		280	ns
			4.5		22	36		45		55	
			6.0		19	31		40		46	
$t_{TLH}/$ t_{THL}	Output Transition Time		2.0		38	75		95		110	ns
			4.5		7	15		19		22	
			6.0		6	13		16		19	

Timing Requirements HCT: $t_r=t_f=6\text{ns}$ $C_L=50\text{ pF}$

SYMBOL	PARAMETER	V_{CC} (V)	$T_A=25^\circ\text{C}$			GD74HCT137		GD54HCT137		UNIT
			MIN.	TYP.	MAX.	MIN.	MAX.	MIN.	MAX.	
t_w	Pulse width	$\overline{LE}$ to CLK	4.5	26		33		39		ns
t_{su}	Setup time	A_n before $\overline{LE}$	4.5	15		19		23		ns
t_h	Hold time	A_n after $\overline{LE}$	4.5	5		5		5		ns

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

SYMBOL	PARAMETER	V_{CC} (V)	$T_A=25^\circ\text{C}$			GD74HCT137		GD54HCT137		UNIT
			MIN.	TYP.	MAX.	MIN.	MAX.	MIN.	MAX.	
$t_{PLH}/$ t_{PHL}	Propagation Delay Time A,B,C to $\overline{Y}_n$	4.5		25	36		45		55	ns
$t_{PLH}/$ t_{PHL}	Propagation Delay Time E_1 to $\overline{Y}_n$	4.5		20	29		36		42	ns
$t_{PLH}/$ t_{PHL}	Propagation Delay Time E_2 to $\overline{Y}_n$	4.5		20	29		36		42	ns
$t_{PLH}/$ t_{PHL}	Propagation Delay Time $\overline{LE}$ to $\overline{Y}_n$	4.5		30	40		50		61	ns
$t_{TLH}/$ t_{THL}	Output Transition Time	4.5		8	15		19		22	ns