

# DATA SHEET

For a complete data sheet, please also download:

- The IC06 74HC/HCT/HCU/HCMOS Logic Family Specifications
- The IC06 74HC/HCT/HCU/HCMOS Logic Package Information
- The IC06 74HC/HCT/HCU/HCMOS Logic Package Outlines

## **74HC/HCT137**

**3-to-8 line decoder/demultiplexer  
with address latches; inverting**

Product specification  
File under Integrated Circuits, IC06

December 1990

## 3-to-8 line decoder/demultiplexer with address latches; inverting

## 74HC/HCT137

### FEATURES

- Combines 3-to-8 decoder with 3-bit latch
- Multiple input enable for easy expansion or independent controls
- Active LOW mutually exclusive outputs
- Output capability: standard
- I<sub>CC</sub> category: MSI

### GENERAL DESCRIPTION

The 74HC/HCT137 are high-speed Si-gate CMOS devices and are pin compatible with low power Schottky TTL (LSTTL). They are specified in compliance with JEDEC standard no. 7A.

The 74HC/HCT137 are 3-to-8 line decoder/demultiplexers with latches at the three address inputs (A<sub>n</sub>). The "137" essentially combines the 3-to-8 decoder function with a 3-bit storage latch. When the latch is enabled ( $\overline{LE} = \text{LOW}$ ), the "137" acts as a 3-to-8 active LOW decoder. When the latch enable ( $\overline{LE}$ ) goes from LOW-to-HIGH, the last data present at the inputs before this transition, is stored in the latches. Further address changes are ignored as long as  $\overline{LE}$  remains HIGH.

The output enable input ( $\overline{E}_1$  and E<sub>2</sub>) controls the state of the outputs independent of the address inputs or latch operation. All outputs are HIGH unless  $\overline{E}_1$  is LOW and E<sub>2</sub> is HIGH.

The "137" is ideally suited for implementing non-overlapping decoders in 3-state systems and strobed (stored address) applications in bus oriented systems.

### QUICK REFERENCE DATA

GND = 0 V; T<sub>amb</sub> = 25 °C; t<sub>r</sub> = t<sub>f</sub> = 6 ns

SYMBOL	PARAMETER	CONDITIONS	TYPICAL		UNIT
			HC	HCT	
t <sub>PHL</sub> / t <sub>PLH</sub>	propagation delay	C <sub>L</sub> = 15 pF; V <sub>CC</sub> = 5 V			
	A <sub>n</sub> to $\overline{Y}_n$		18	19	ns
	$\overline{LE}$ to $\overline{Y}_n$		17	21	ns
	$\overline{E}_1$ to $\overline{Y}_n$		15	17	ns
	E <sub>2</sub> to $\overline{Y}_n$		15	15	ns
C <sub>I</sub>	input capacitance		3.5	3.5	pF
C <sub>PD</sub>	power dissipation capacitance per package	notes 1 and 2	57	59	pF

### Notes

1. C<sub>PD</sub> is used to determine the dynamic power dissipation (P<sub>D</sub> in μW):

$$P_D = C_{PD} \times V_{CC}^2 \times f_i + \sum (C_L \times V_{CC}^2 \times f_o) \text{ where:}$$

f<sub>i</sub> = input frequency in MHz

f<sub>o</sub> = output frequency in MHz

∑ (C<sub>L</sub> × V<sub>CC</sub><sup>2</sup> × f<sub>o</sub>) = sum of outputs

C<sub>L</sub> = output load capacitance in pF

V<sub>CC</sub> = supply voltage in V

2. For HC the condition is V<sub>1</sub> = GND to V<sub>CC</sub>  
For HCT the condition is V<sub>1</sub> = GND to V<sub>CC</sub> – 1.5 V

### ORDERING INFORMATION

See "74HC/HCT/HCU/HCMOS Logic Package Information".

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## PIN DESCRIPTION

PIN NO.	SYMBOL	NAME AND FUNCTION
1, 2, 3	A <sub>0</sub> to A <sub>2</sub>	data inputs
4	$\overline{LE}$	latch enable input (active LOW)
5	$\overline{E}_1$	data enable input (active LOW)
6	E <sub>2</sub>	data enable input (active HIGH)
8	GND	ground (0 V)
15, 14, 13, 12, 11, 10, 9, 7	$\overline{Y}_0$ to $\overline{Y}_7$	multiplexer outputs
16	V <sub>CC</sub>	positive supply voltage

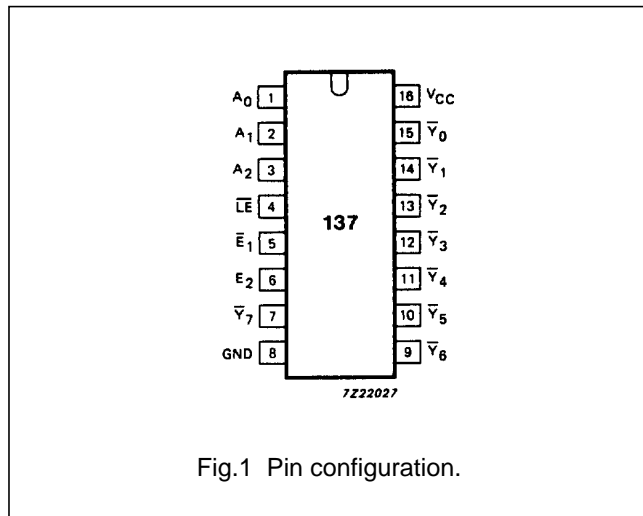


Fig.1 Pin configuration.

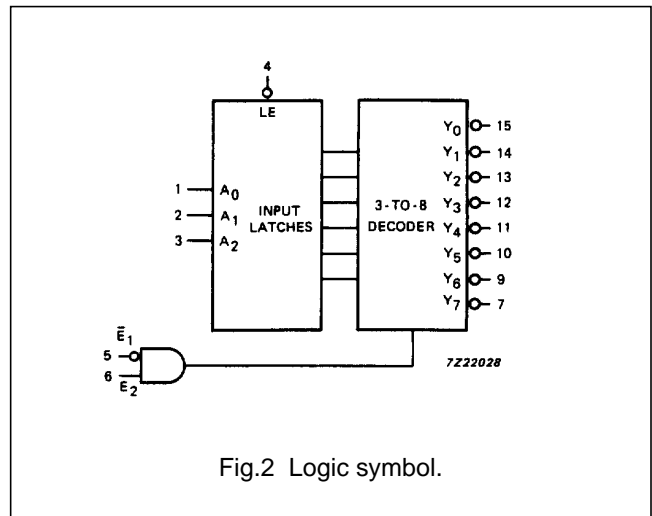


Fig.2 Logic symbol.

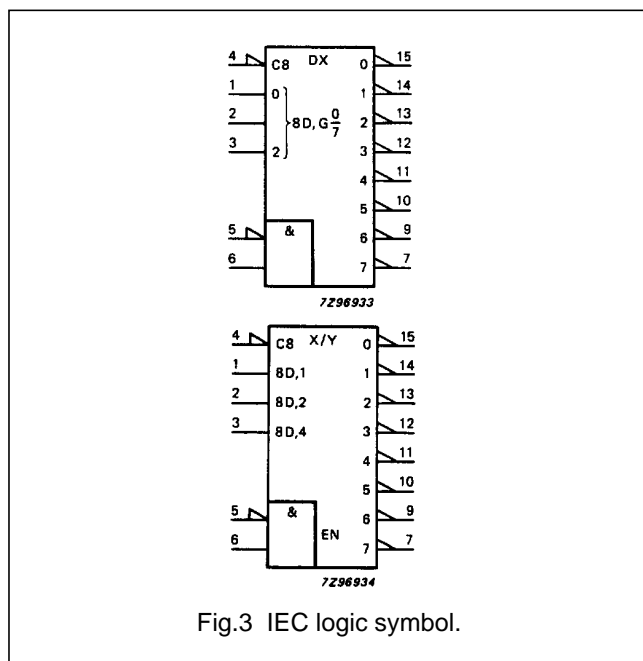


Fig.3 IEC logic symbol.

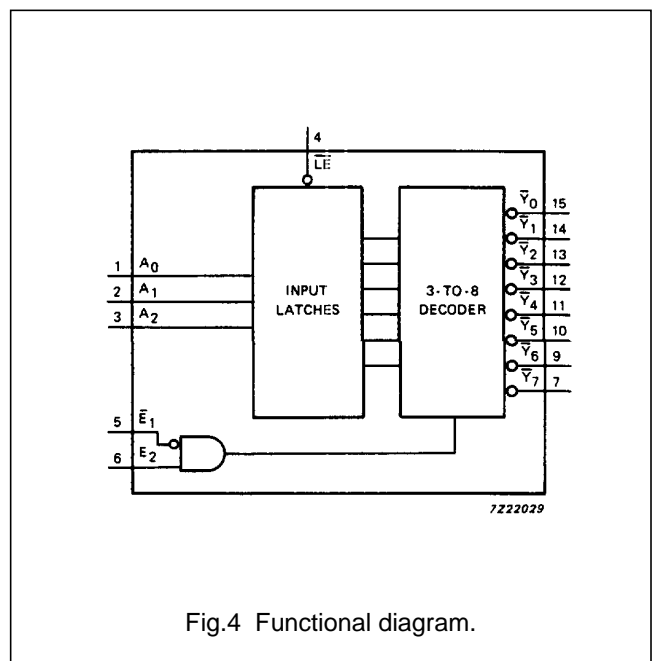


Fig.4 Functional diagram.

# 3-to-8 line decoder/demultiplexer with address latches; inverting

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**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	H	L	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

**Notes**

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

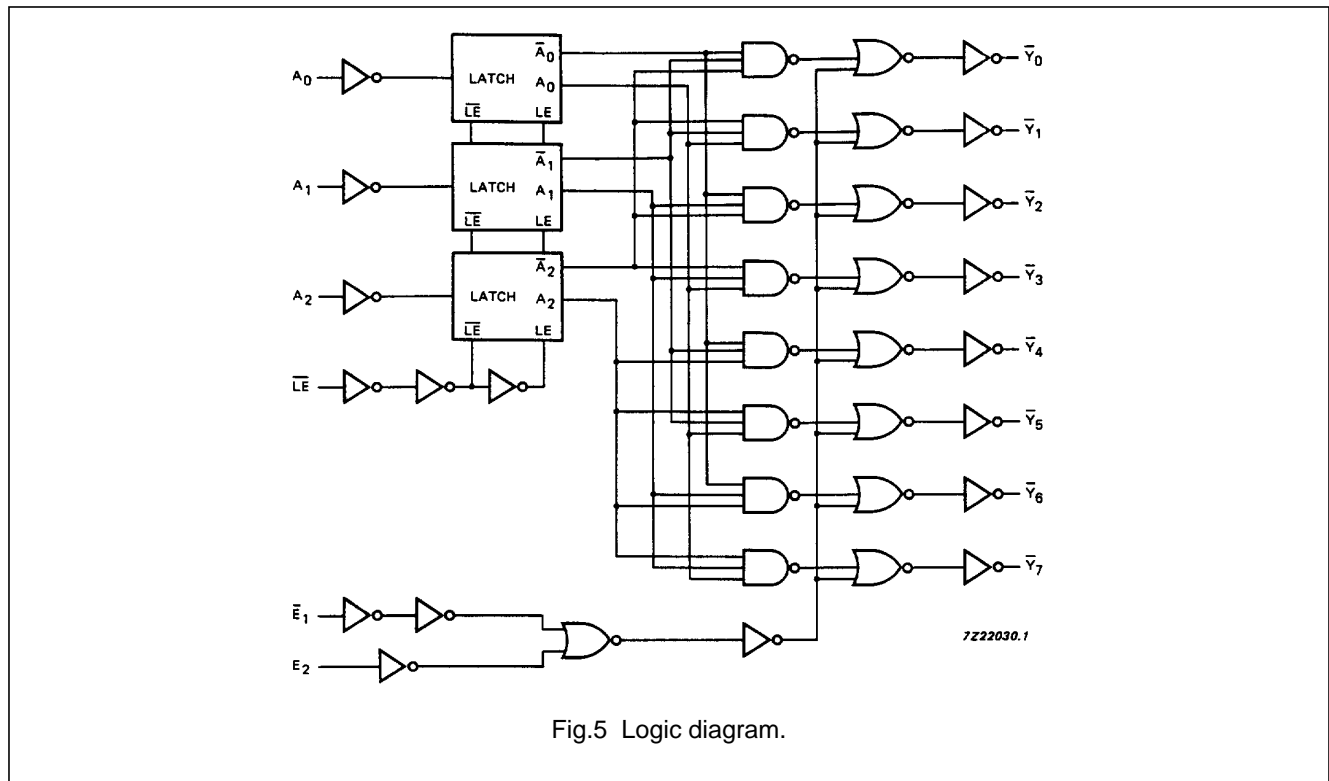


Fig.5 Logic diagram.

# 3-to-8 line decoder/demultiplexer with address latches; inverting

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## DC CHARACTERISTICS FOR 74HC

For the DC characteristics see *"74HC/HCT/HCU/HCMOS Logic Family Specifications"*.

Output capability: standard

I<sub>CC</sub> category: MSI

## AC CHARACTERISTICS FOR 74HC

GND = 0 V; t<sub>r</sub> = t<sub>f</sub> = 6 ns; C<sub>L</sub> = 50 pF

SYMBOL	PARAMETER	T <sub>amb</sub> (°C)								UNIT	TEST CONDITIONS	
		74HC									V <sub>CC</sub> (V)	WAVEFORMS
		+25			-40 to +85		-40 to +125					
		min.	typ.	max.	min.	max.	min.	max.				
t <sub>PHL</sub> / t <sub>PLH</sub>	propagation delay A <sub>n</sub> to $\bar{Y}_n$		58 21 17	180 36 31		225 45 38		270 54 46	ns	2.0 4.5 6.0	Fig.6	
t <sub>PHL</sub> / t <sub>PLH</sub>	propagation delay $\bar{LE}$ to $\bar{Y}_n$		55 20 16	190 38 32		240 48 41		285 57 48	ns	2.0 4.5 6.0	Fig.7	
t <sub>PHL</sub> / t <sub>PLH</sub>	propagation delay $\bar{E}_1$ to $\bar{Y}_n$		50 18 14	145 29 25		180 36 31		220 44 38	ns	2.0 4.5 6.0	Fig.7	
t <sub>PHL</sub> / t <sub>PLH</sub>	propagation delay E <sub>2</sub> to $\bar{Y}_n$		50 18 14	145 29 25		180 36 31		220 44 38	ns	2.0 4.5 6.0	Fig.6	
t <sub>THL</sub> / t <sub>TLH</sub>	output transition time		19 7 6	75 15 13		95 19 16		110 22 19	ns	2.0 4.5 6.0	Fig.6	
t <sub>w</sub>	$\bar{LE}$ pulse width HIGH	50 10 9	11 4 3		65 13 11		75 15 13		ns	2.0 4.5 6.0	Fig.8	
t <sub>su</sub>	set-up time A <sub>n</sub> to $\bar{LE}$	50 10 9	3 1 1		65 13 11		75 15 13		ns	2.0 4.5 6.0	Fig.8	
t <sub>h</sub>	hold time A <sub>n</sub> to $\bar{LE}$	30 6 5	3 1 1		40 8 7		45 9 8		ns	2.0 4.5 6.0	Fig.8	

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## DC CHARACTERISTICS FOR 74HCT

For the DC characteristics see *"74HC/HCT/HCU/HCMOS Logic Family Specifications"*.

Output capability: standard

I<sub>CC</sub> category: MSI

### Note to HCT types

The value of additional quiescent supply current ( $\Delta I_{CC}$ ) for a unit load of 1 is given in the family specifications. To determine  $\Delta I_{CC}$  per input, multiply this value by the unit load coefficient shown in the table below.

INPUT	UNIT LOAD COEFFICIENT
A <sub>n</sub>	1.50
$\overline{E}_1$	1.50
E <sub>2</sub>	1.50
$\overline{LE}$	1.50

## AC CHARACTERISTICS FOR 74HCT

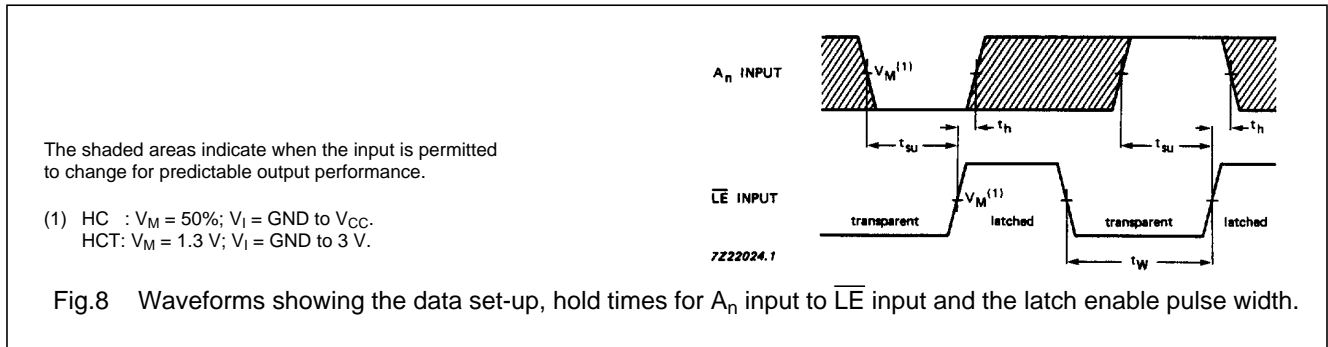
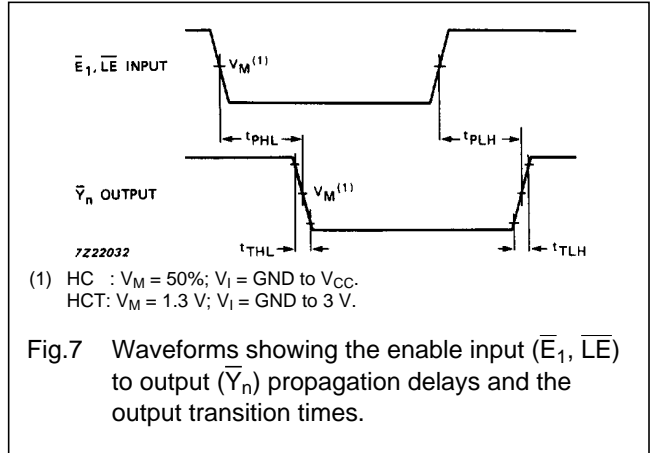
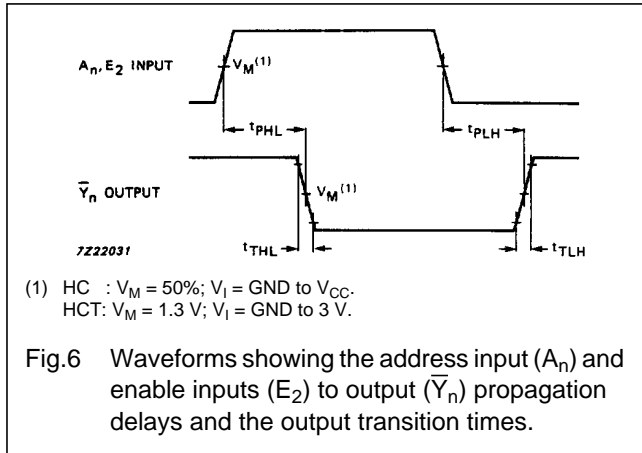
GND = 0 V; t<sub>r</sub> = t<sub>f</sub> = 6 ns; C<sub>L</sub> = 50 pF

SYMBOL	PARAMETER	T <sub>amb</sub> (°C)							UNIT	TEST CONDITIONS	
		74HCT								V <sub>CC</sub> (V)	WAVEFORMS
		+25			-40 to +85		-40 to +125				
		min.	typ.	max.	min.	max.	min.	max.			
t <sub>PHL</sub> / t <sub>PLH</sub>	propagation delay A <sub>n</sub> to $\overline{Y}_n$		22	38		48		57	ns	4.5	Fig.6
t <sub>PHL</sub> / t <sub>PLH</sub>	propagation delay $\overline{LE}$ to $\overline{Y}_n$		25	44		55		66	ns	4.5	Fig.7
t <sub>PHL</sub> / t <sub>PLH</sub>	propagation delay $\overline{E}_1$ to $\overline{Y}_n$		20	37		46		56	ns	4.5	Fig.7
t <sub>PHL</sub> / t <sub>PLH</sub>	propagation delay E <sub>2</sub> to $\overline{Y}_n$		18	35		44		53	ns	4.5	Fig.6
t <sub>THL</sub> / t <sub>TLH</sub>	output transition time		7	15		19		22	ns	4.5	Fig.6
t <sub>w</sub>	$\overline{LE}$ pulse width HIGH	10	5		13		15		ns	4.5	Fig.8
t <sub>su</sub>	set-up time A <sub>n</sub> to $\overline{LE}$	10	2		13		15		ns	4.5	Fig.8
t <sub>h</sub>	hold time A <sub>n</sub> to $\overline{LE}$	7	2		9		11		ns	4.5	Fig.8

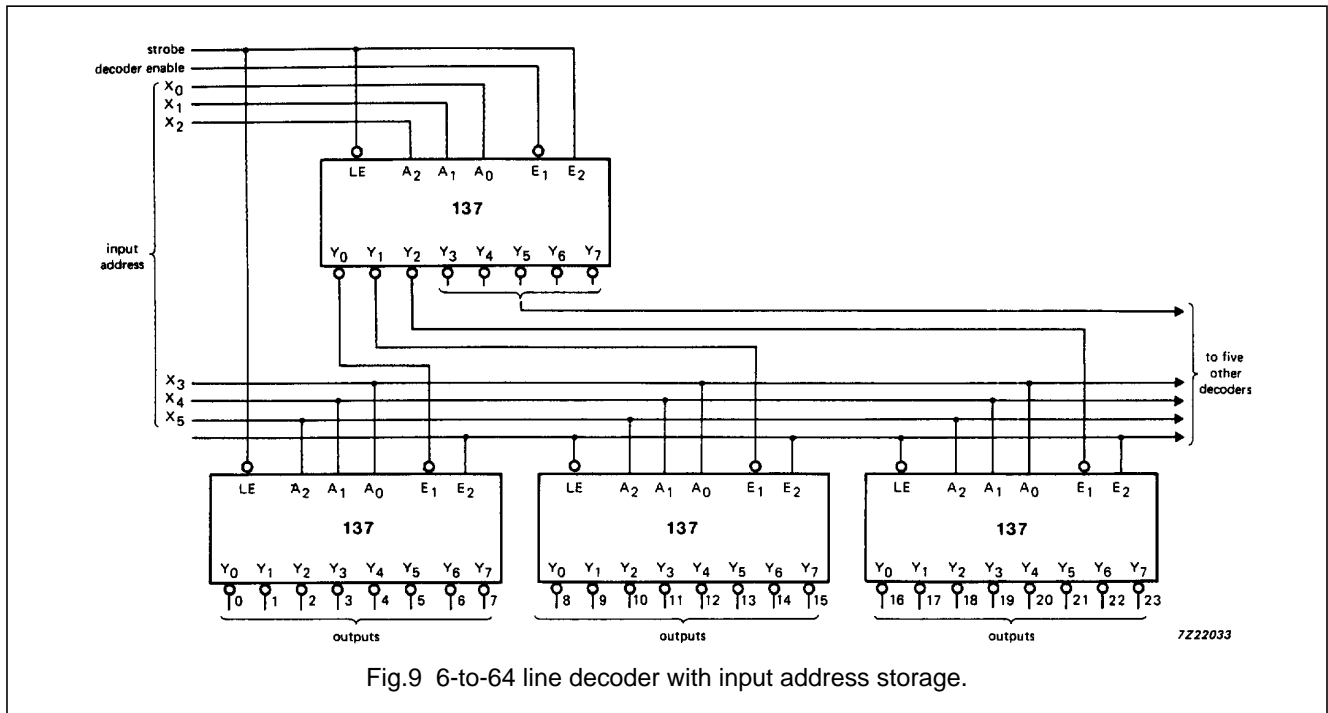
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## AC WAVEFORMS



## APPLICATION INFORMATION



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**PACKAGE OUTLINES**

See *"74HC/HCT/HCU/HCMOS Logic Package Outlines"*.