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# HD74LVC138

3-to-8-line Decoder / Demultiplexer

# HITACHI

ADE-205-068B(Z)

Rev.2

September 1995

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## Description

The HD74LVC138 has three binary select inputs in a 16 pin package. If the device is enabled these inputs determine which one of the eight normally high outputs will go low. Two active low and one active high enables are provided to ease the cascading of decoders. Low voltage and high speed operation is suitable at the battery drive product (note type personal computer) and low power consumption extends the life of a battery for long time operation.

## Features

- $V_{CC} = 2.0 \text{ V to } 5.5 \text{ V}$
- All inputs  $V_{IH} (\text{Max.}) = 5.5 \text{ V} (@V_{CC} = 0 \text{ V to } 5.5 \text{ V})$
- Typical  $V_{OL}$  ground bounce  $< 0.8 \text{ V} (@V_{CC} = 3.3 \text{ V}, T_a = 25^\circ\text{C})$
- Typical  $V_{OH}$  undershoot  $> 2.0 \text{ V} (@V_{CC} = 3.3 \text{ V}, T_a = 25^\circ\text{C})$
- High output current  $\pm 24 \text{ mA} (@V_{CC} = 3.0 \text{ V to } 5.5 \text{ V})$



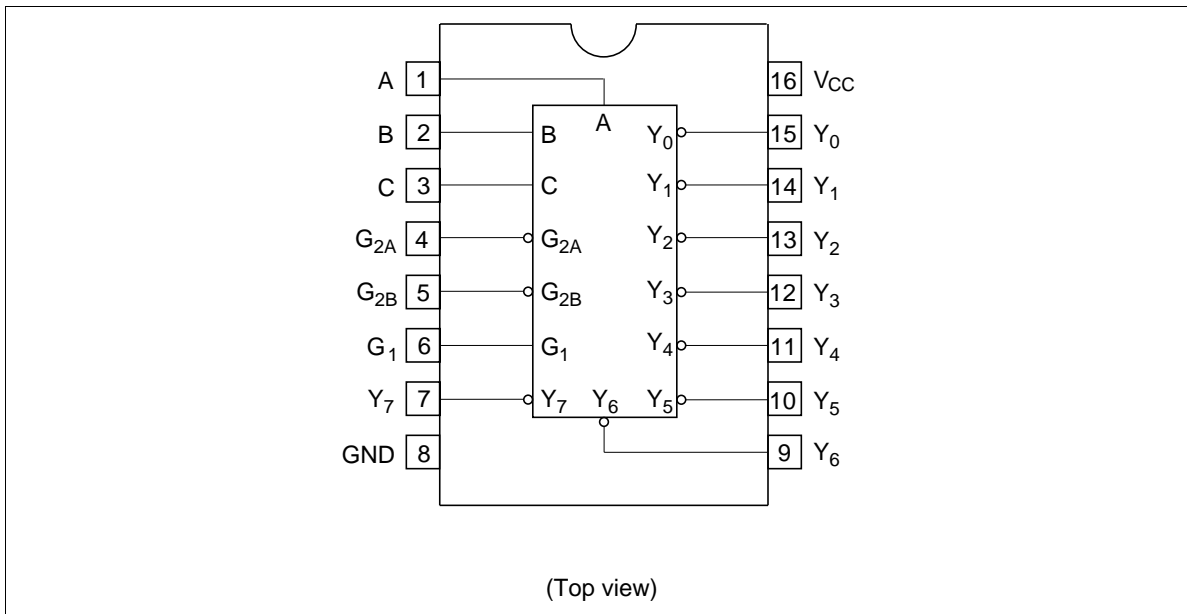
# HD74LVC138

## Function Table

Inputs						Outputs							
Enable			Select										
G <sub>1</sub>	G <sub>2A</sub>	G <sub>2B</sub>	C	B	A	Y <sub>0</sub>	Y <sub>1</sub>	Y <sub>2</sub>	Y <sub>3</sub>	Y <sub>4</sub>	Y <sub>5</sub>	Y <sub>6</sub>	Y <sub>7</sub>
X	X	H	X	X	X	H	H	H	H	H	H	H	H
X	H	X	X	X	X	H	H	H	H	H	H	H	H
L	X	X	X	X	X	H	H	H	H	H	H	H	H
H	L	L	L	L	L	L	H	H	H	H	H	H	H
H	L	L	L	L	H	H	L	H	H	H	H	H	H
H	L	L	L	H	L	H	H	L	H	H	H	H	H
H	L	L	L	H	H	H	H	H	L	H	H	H	H
H	L	L	H	L	L	H	H	H	H	L	H	H	H
H	L	L	H	L	H	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	H	H	H	H	H	H	H	H	H	L

H: High level  
 L: Low level  
 X: Immaterial

## Pin Arrangement



**Absolute Maximum Ratings**

Item	Symbol	Ratings	Unit	Conditions
Supply voltage	$V_{CC}$	-0.5 to 6.0	V	
Input diode current	$I_{IK}$	-50	mA	$V_I = -0.5\text{ V}$
Input voltage	$V_I$	-0.5 to 6.0	V	
Output diode current	$I_{OK}$	-50	mA	$V_O = -0.5\text{ V}$
		50	mA	$V_O = V_{CC} + 0.5\text{ V}$
Output voltage	$V_O$	-0.5 to $V_{CC} + 0.5$	V	
Output current	$I_O$	$\pm 50$	mA	
$V_{CC}$ , GND current / pin	$I_{CC}$ or $I_{GND}$	100	mA	
Storage temperature	Tstg	-65 to +150	°C	

Note: The absolute maximum ratings are values which must not individually be exceeded, and furthermore, no two of which may be realized at the same time.

**Recommended Operating Conditions**

Item	Symbol	Ratings	Unit	Conditions
Supply voltage	$V_{CC}$	1.5 to 5.5	V	Data retention
		2.0 to 5.5	V	At operation
Input / output voltage	$V_I$	0 to 5.5	V	G, A, B, C
	$V_O$	0 to $V_{CC}$	V	$Y_0$ to $Y_7$
Operating temperature	$T_a$	-40 to 85	°C	
Output current	$I_{OH}$	-12	mA	$V_{CC} = 2.7\text{ V}$
		-24 <sup>2</sup>	mA	$V_{CC} = 3.0\text{ V to } 5.5\text{ V}$
	$I_{OL}$	12	mA	$V_{CC} = 2.7\text{ V}$
		24 <sup>2</sup>	mA	$V_{CC} = 3.0\text{ V to } 5.5\text{ V}$
Input rise / fall time <sup>1</sup>	$t_r, t_f$	10	ns/V	

Notes: 1. This item guarantees maximum limit when one input switches.

Waveform : Refer to test circuit of switching characteristics.

2. duty cycle  $\leq 50\%$

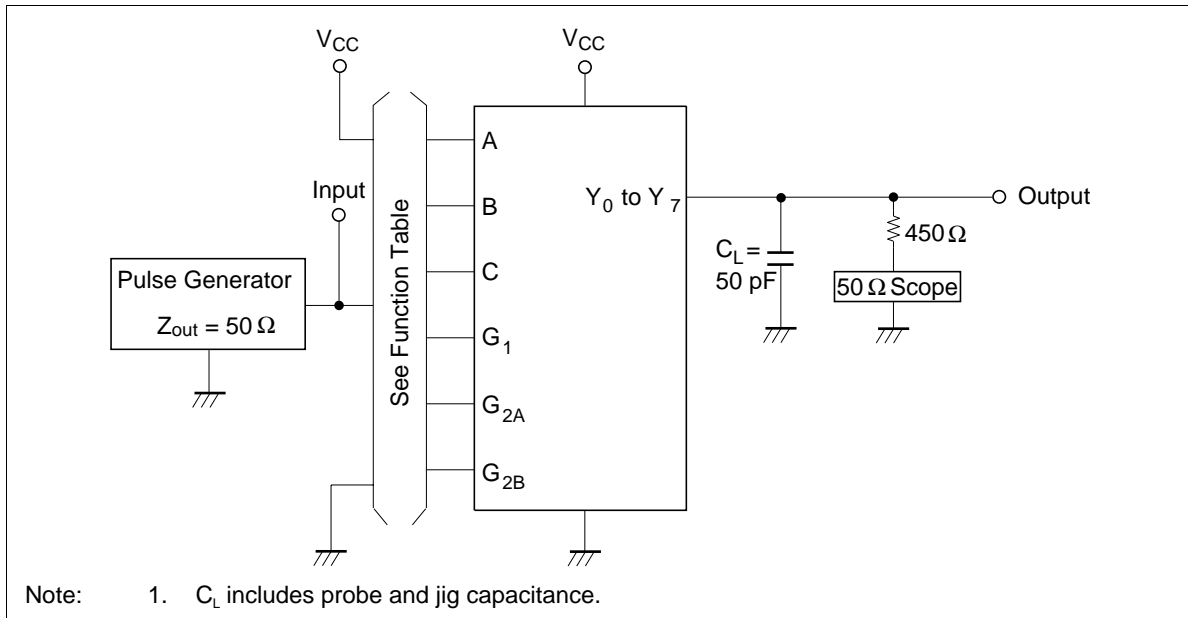
# HD74LVC138

## Electrical Characteristics

Item	Symbol	V <sub>CC</sub> (V)	Ta = -40 to 85°C			Unit	Test Conditions
			Min	Max	Unit		
Input voltage	V <sub>IH</sub>	2.7 to 3.6	2.0	—	V		
		4.5 to 5.5	V <sub>CC</sub> ×0.7	—	V		
	V <sub>IL</sub>	2.7 to 3.6	—	0.8	V		
		4.5 to 5.5	—	V <sub>CC</sub> ×0.3	V		
Output voltage	V <sub>OH</sub>	2.7 to 5.5	V <sub>CC</sub> - 0.2	—	V	I <sub>OH</sub> = -100 μA	
		2.7	2.2	—	V	I <sub>OH</sub> = -12 mA	
		3.0	2.4	—	V		
		3.0	2.0	—	V	I <sub>OH</sub> = -24 mA	
		4.5	3.8	—	V		
	V <sub>OL</sub>	2.7 to 5.5	—	0.2	V	I <sub>OL</sub> = 100 μA	
		2.7	—	0.4	V	I <sub>OL</sub> = 12 mA	
		3.0	—	0.55	V	I <sub>OL</sub> = 24 mA	
		4.5	—	0.55	V		
Input current	I <sub>IN</sub>	0 to 5.5	—	±5.0	μA	V <sub>IN</sub> = 5.5 V or GND	
Quiescent supply current	I <sub>CC</sub>	5.5	—	20	μA	V <sub>IN</sub> = V <sub>CC</sub> or GND	
	ΔI <sub>CC</sub>	3.0 to 3.6	—	500	μA	V <sub>IN</sub> = one input at (V <sub>CC</sub> - 0.6)V, other inputs at V <sub>CC</sub> or GND	

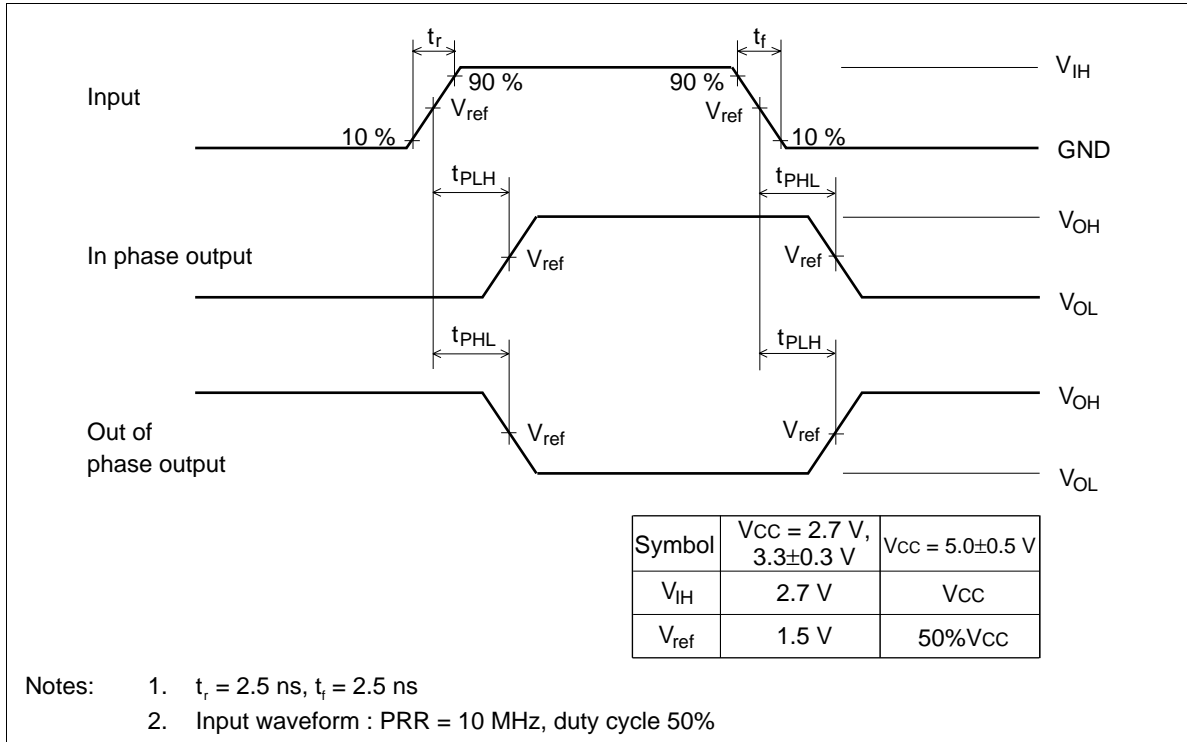
## Switching Characteristics

Item	Symbol	V <sub>CC</sub> (V)	Ta = -40 to 85°C			Unit	From (Input)	To (Output)
			Min	Typ	Max			
Propagation delay time	t <sub>PLH</sub>	2.7	—	7.0	10.0	ns	G, A, B, C	Y <sub>0</sub> to Y <sub>7</sub>
	t <sub>PHL</sub>	3.3±0.3	1.5	5.0	9.0	ns		
		5.0±0.5	—	3.5	7.5	ns		
Input capacitance	C <sub>IN</sub>	2.7	—	3.0	—	pF		
Output capacitance	C <sub>O</sub>	2.7	—	15.0	—	pF		

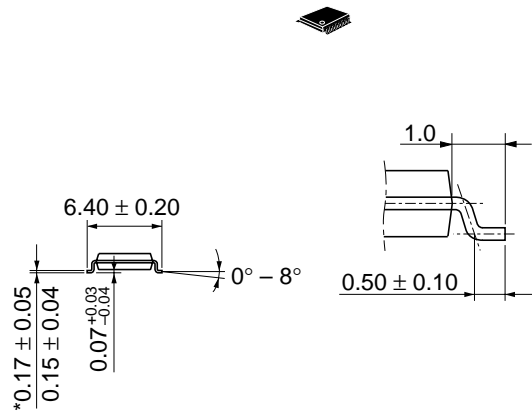
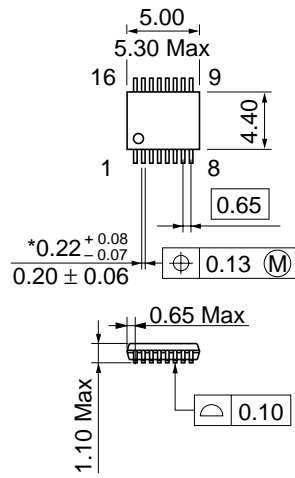
**Test Circuit**

# HD74LVC138

## Waveforms



Unit: mm



\*Dimension including the plating thickness  
Base material dimension

Hitachi Code	TTP-16DA
JEDEC	—
EIAJ	—
Weight (reference value)	0.05 g

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