
HD74LVC138

3-to-8-line Decoder / Demultiplexer

HITACHI

ADE-205-068B(Z)

Rev.2

September 1995

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 $\pm 24\text{ mA}$ ($@V_{CC} = 3.0\text{ V to }5.5\text{ V}$)

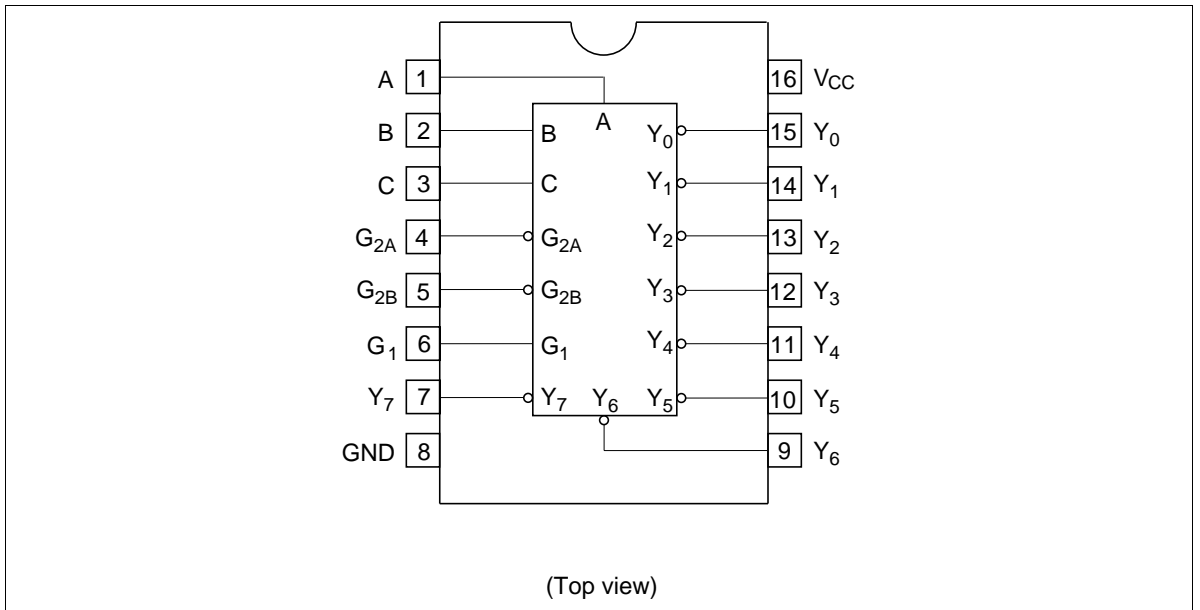
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Function Table

Inputs						Outputs							
Enable			Select										
G_1	G_{2A}	G_{2B}	C	B	A	Y_0	Y_1	Y_2	Y_3	Y_4	Y_5	Y_6	Y_7
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	± 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	Ta	-40 to 85	°C	
Output current	I_{OH}	-12	mA	$V_{CC} = 2.7\text{ V}$
		-24 ²	mA	$V_{CC} = 3.0\text{ V to } 5.5\text{ V}$
	I_{OL}	12	mA	$V_{CC} = 2.7\text{ V}$
		24 ²	mA	$V_{CC} = 3.0\text{ V to } 5.5\text{ V}$
Input rise / fall time ¹	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 $\leq 50\%$

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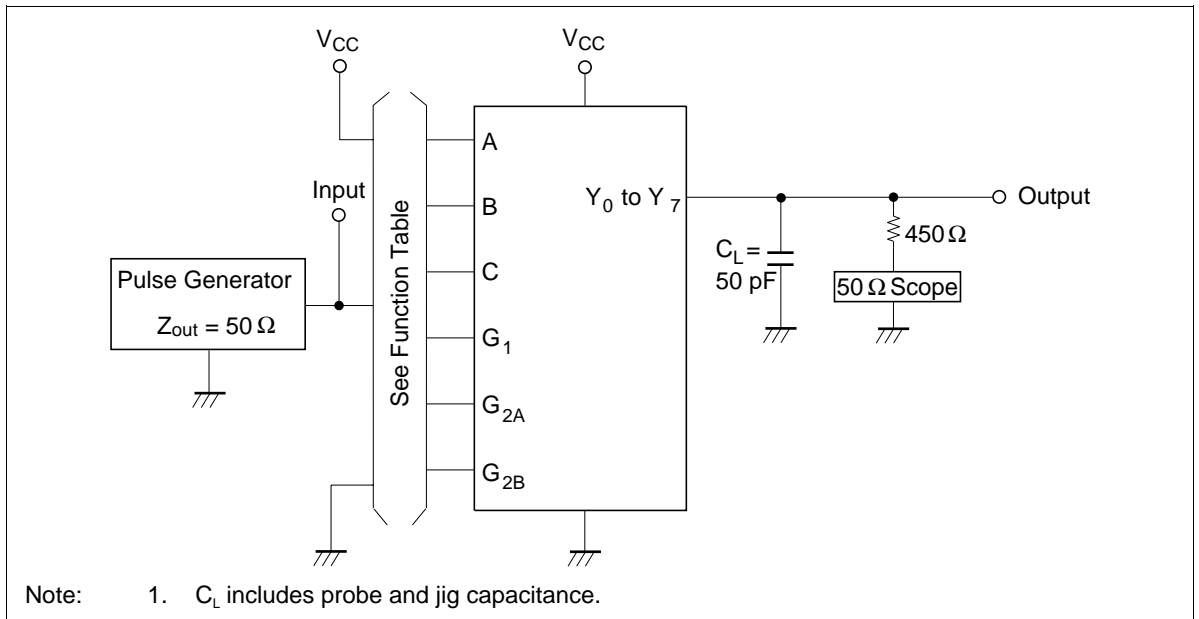
Electrical Characteristics

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

Switching Characteristics

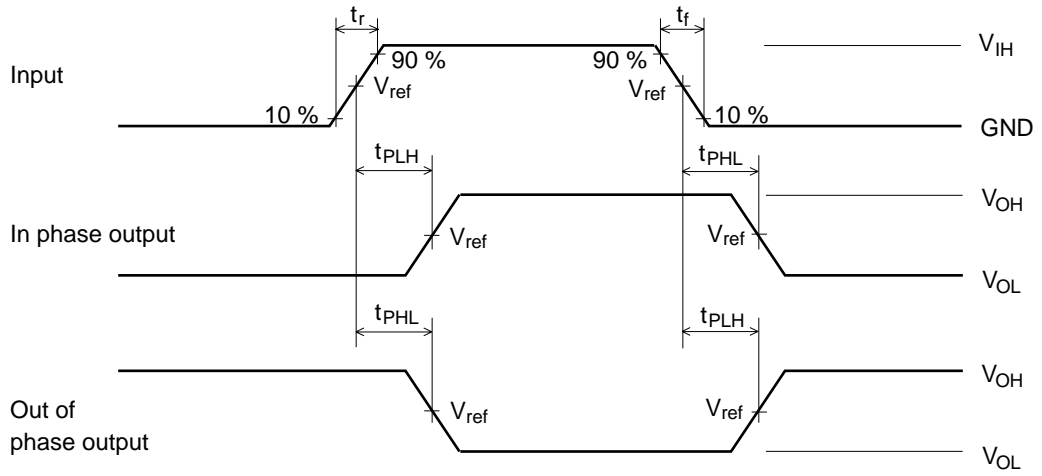
Item	Symbol	V _{CC} (V)	Ta = -40 to 85°C			Unit	From (Input)	To (Output)
			Min	Typ	Max			
Propagation delay time	t _{PLH}	2.7	—	7.0	10.0	ns	G, A, B, C	Y ₀ to Y ₇
	t _{PHL}	3.3±0.3	1.5	5.0	9.0	ns		
		5.0±0.5	—	3.5	7.5	ns		
Input capacitance	C _{IN}	2.7	—	3.0	—	pF		
Output capacitance	C _O	2.7	—	15.0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

Test Circuit



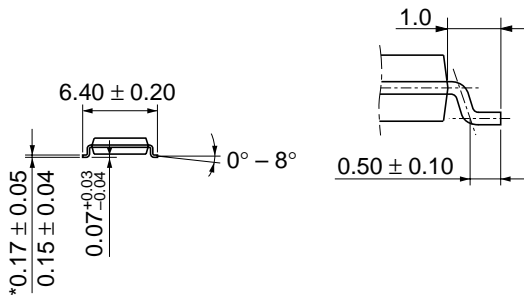
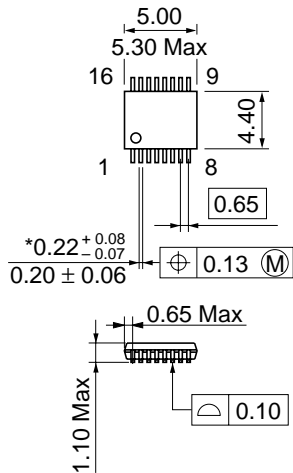
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Waveforms



Symbol	$V_{CC} = 2.7\text{ V},$ $3.3 \pm 0.3\text{ V}$	$V_{CC} = 5.0 \pm 0.5\text{ V}$
V_{IH}	2.7 V	V_{CC}
V_{ref}	1.5 V	$50\%V_{CC}$

- Notes:
1. $t_r = 2.5\text{ ns}, t_f = 2.5\text{ ns}$
 2. Input waveform : PRR = 10 MHz, duty cycle 50%



*Dimension including the plating thickness
 Base material dimension

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

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Hitachi, Ltd.

Semiconductor & Integrated Circuits.
Nippon Bldg., 2-6-2, Ohte-machi, Chiyoda-ku, Tokyo 100-0004, Japan
Tel: Tokyo (03) 3270-2111 Fax: (03) 3270-5109

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For further information write to:

Hitachi Semiconductor
(America) Inc.
179 East Tasman Drive,
San Jose, CA 95134
Tel: <1> (408) 433-1990
Fax: <1> (408) 433-0223

Hitachi Europe GmbH
Electronic components Group
Dornacher Straße 3
D-85622 Feldkirchen, Munich
Germany
Tel: <49> (89) 9 9180-0
Fax: <49> (89) 9 29 30 00

Hitachi Europe Ltd.
Electronic Components Group.
Whitebrook Park
Lower Cookham Road
Maidenhead
Berkshire SL6 8YA, United Kingdom
Tel: <44> (1628) 585000
Fax: <44> (1628) 778322

Hitachi Asia Pte. Ltd.
16 Collyer Quay #20-00
Hitachi Tower
Singapore 049318
Tel: 535-2100
Fax: 535-1533

Hitachi Asia Ltd.
Taipei Branch Office
3F, Hung Kuo Building, No.167,
Tun-Hwa North Road, Taipei (105)
Tel: <886> (2) 2718-3666
Fax: <886> (2) 2718-8180

Hitachi Asia (Hong Kong) Ltd.
Group III (Electronic Components)
7/F., North Tower, World Finance Centre,
Harbour City, Canton Road, Tsim Sha Tsui,
Kowloon, Hong Kong
Tel: <852> (2) 735 9218
Fax: <852> (2) 730 0281
Telex: 40815 HITEC HX

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