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Renesas Technology Corp.
Customer Support Dept.
April 1, 2003

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HD74LVC138

3-to-8-line Decoder / Demultiplexer



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

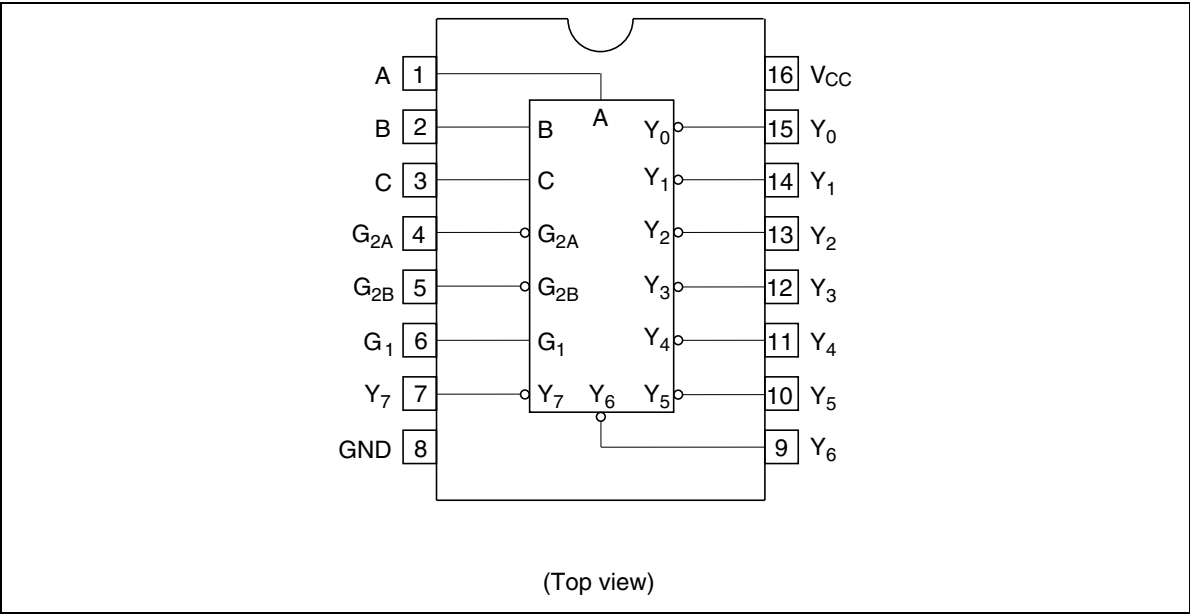
- $V_{CC} = 2.0\text{ V to }5.5\text{ V}$
- All inputs $V_{IH}(\text{Max.}) = 5.5\text{ V}$ ($@V_{CC} = 0\text{ V to }5.5\text{ V}$)
- Typical V_{OL} ground bounce $< 0.8\text{ V}$ ($@V_{CC} = 3.3\text{ V}$, $T_a = 25^\circ\text{C}$)
- Typical V_{OH} undershoot $> 2.0\text{ V}$ ($@V_{CC} = 3.3\text{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

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	$V_I = -0.5$ V
Input voltage	V_I	-0.5 to 6.0	V	
Output diode current	I_{OK}	-50	mA	$V_O = -0.5$ V
		50	mA	$V_O = V_{CC} + 0.5$ 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	$V_{CC} = 2.7$ V
		-24 ²	mA	$V_{CC} = 3.0$ V to 5.5 V
	I_{OL}	12	mA	$V_{CC} = 2.7$ V
		24 ²	mA	$V_{CC} = 3.0$ V to 5.5 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 $\leq 50\%$

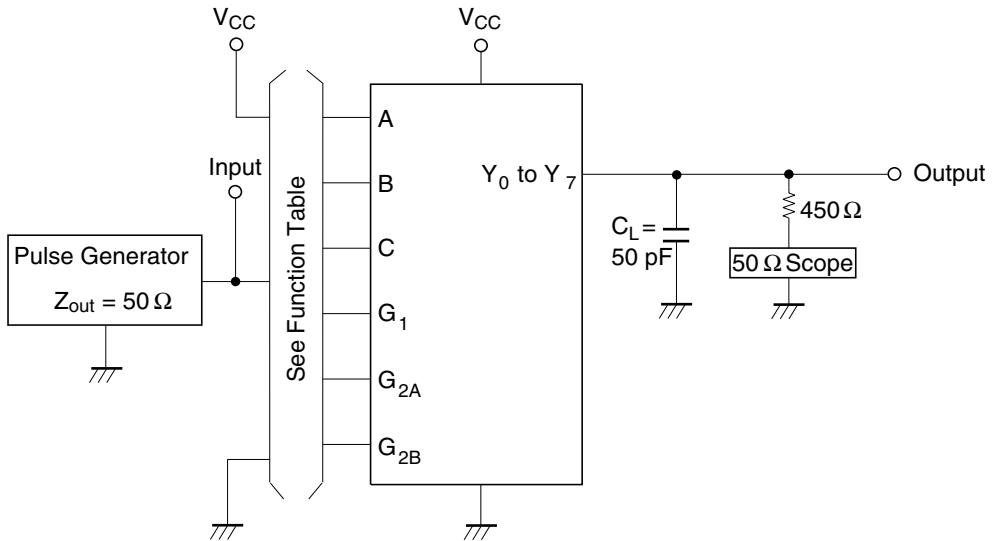
Electrical Characteristics

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

Switching Characteristics

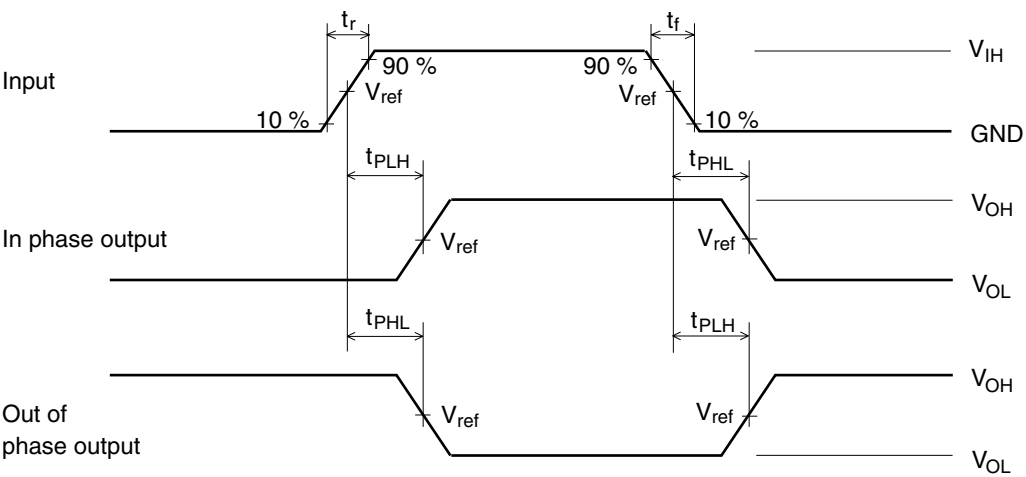
Item	Symbol	V_{CC} (V)	Ta = -40 to 85°C			Unit	From (Input)	To (Output)
			Min	Typ	Max			
Propagation delay time	t_{PLH}	2.7	—	7.0	10.0	ns	G, A, B, C	Y_0 to Y_7
	t_{PHL}	3.3 $\pm$ 0.3	1.5	5.0	9.0	ns		
		5.0 $\pm$ 0.5	—	3.5	7.5	ns		
Input capacitance	C_{IN}	2.7	—	3.0	—	pF		
Output capacitance	C_O	2.7	—	15.0	—	pF		

Test Circuit



Note: 1. C_L includes probe and jig capacitance.

Waveforms

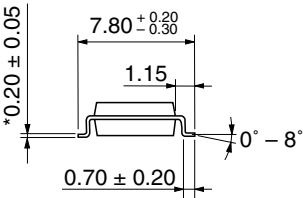
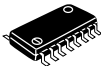
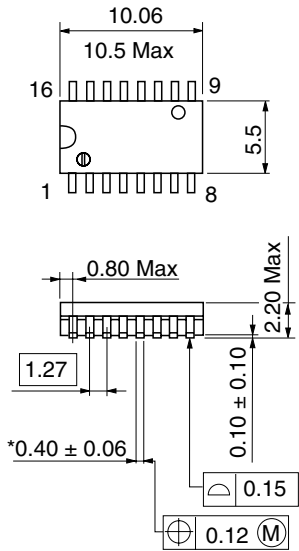


Symbol	$V_{CC} = 2.7\text{ V}, 3.3 \pm 0.3\text{ V}$	$V_{CC} = 5.0 \pm 0.5\text{ V}$
V_{IH}	2.7 V	V_{CC}
V_{ref}	1.5 V	50% V_{CC}

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

Package Dimensions

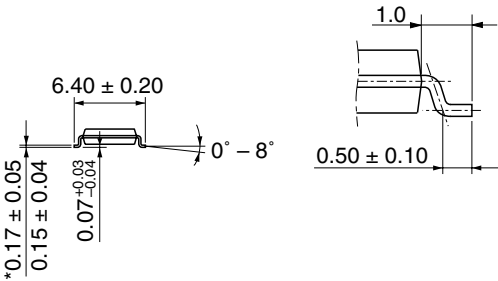
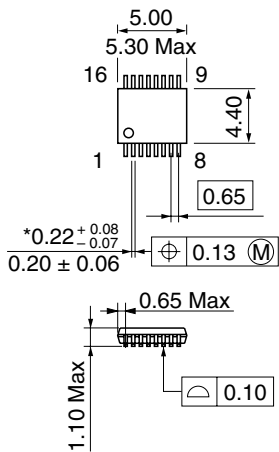
As of July, 2001
Unit: mm



*Pd plating

Hitachi Code	FP-16DAV
JEDEC	—
JEITA	Conforms
Mass (reference value)	0.24 g

As of July, 2001
Unit: mm



*Dimension including the plating thickness
Base material dimension

Hitachi Code	TTP-16DA
JEDEC	—
JEITA	—
Mass (reference value)	0.05 g

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