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

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Remember to give due consideration to safety when making your circuit designs, with appropriate measures such as (i) placement of substitutive, auxiliary circuits, (ii) use of nonflammable material or (iii) prevention against any malfunction or mishap.

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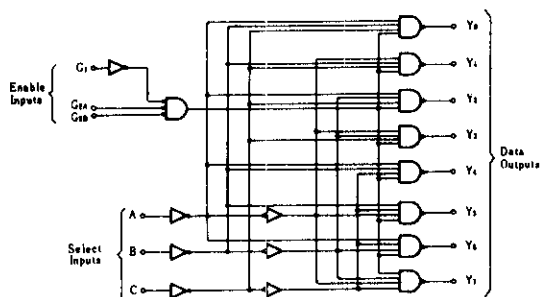
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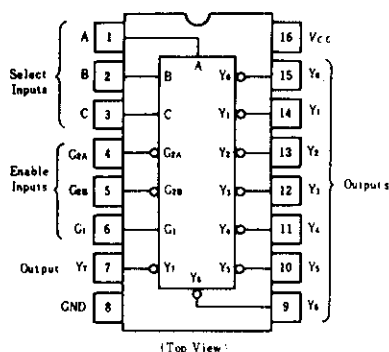
HD74LS138 3-Line-to-8-Line Decoders/Demultiplexers

The HD74LS138 decodes one-of-eight line dependent on the conditions at the three binary select inputs and the three enable inputs. Two active-low and one active-high enable inputs reduce the need for external gates or inverters when expanding. A 24-line decoder can be implemented without external inverters and a 32-line decoder requires only one inverter. An enable input can be used as a data input for demultiplexing applications.

BLOCK DIAGRAM



PIN ARRANGEMENT



FUNCTION TABLE

Inputs					Outputs							
Enable	Select				Y ₀	Y ₁	Y ₂	Y ₃	Y ₄	Y ₅	Y ₆	Y ₇
G ₁	G ₂ *	C	B	A	×	H	×	×	×	H	H	H
×	H	×	×	×	H	H	H	H	H	H	H	H
L	×	×	×	×	H	H	H	H	H	H	H	H
H	L	L	L	L	L	H	H	H	H	H	H	H
H	L	L	L	H	H	L	H	H	H	H	H	H
H	L	L	H	L	H	H	L	H	H	H	H	H
H	L	L	H	H	H	H	H	L	H	H	H	H
H	L	H	L	L	H	H	H	H	L	H	H	H
H	L	H	L	H	H	H	H	H	H	L	H	H
H	L	H	H	L	H	H	H	H	H	H	L	H
H	L	H	H	H	H	H	H	H	H	H	H	L

H; high level, L; low level, X; irrelevant

*; $G_2 = G_{2A} + G_{2B}$

ELECTRICAL CHARACTERISTICS ($T_a = -20 \sim +75^\circ\text{C}$)

Item	Symbol	Test Conditions	min	typ*	max	Unit
Input voltage	V_{IH}		2.0	—	—	V
	V_{IL}		—	—	0.8	V
Output voltage	V_{OH}	$V_{CC} = 4.75\text{V}$, $V_{IH} = 2\text{V}$, $V_{IL} = 0.8\text{V}$, $I_{OH} = -400\mu\text{A}$	2.7	—	—	V
	V_{OL}	$V_{CC} = 4.75\text{V}$, $V_{IH} = 2\text{V}$, $V_{IL} = 0.8\text{V}$, $I_{OL} = 4\text{mA}$	—	—	0.4	V
		$I_{OL} = 8\text{mA}$	—	—	0.5	
Input current	I_{IH}	$V_{CC} = 5.25\text{V}$, $V_I = 2.7\text{V}$	—	—	20	μA
	I_{IL}	$V_{CC} = 5.25\text{V}$, $V_I = 0.4\text{V}$	—	—	-0.4	mA
	I_I	$V_{CC} = 5.25\text{V}$, $V_I = 7\text{V}$	—	—	0.1	mA
Short-circuit output current	I_{OS}	$V_{CC} = 5.25\text{V}$	-20	—	-100	mA
Supply current	I_{CC}	$V_{CC} = 5.25\text{V}$, Outputs enabled and open	—	6.3	10	mA
Input clamp voltage	V_{IK}	$V_{CC} = 4.75\text{V}$, $I_{IN} = -18\text{mA}$	—	—	-1.5	V

* $V_{CC} = 5\text{V}$, $T_a = 25^\circ\text{C}$

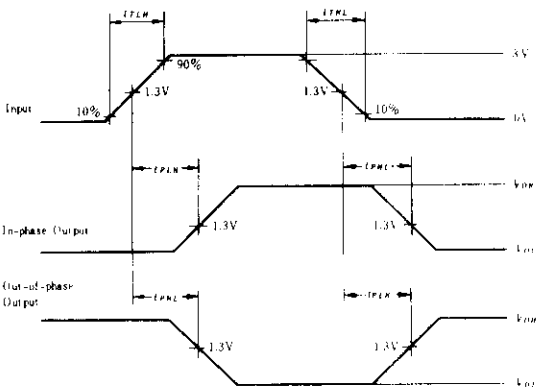
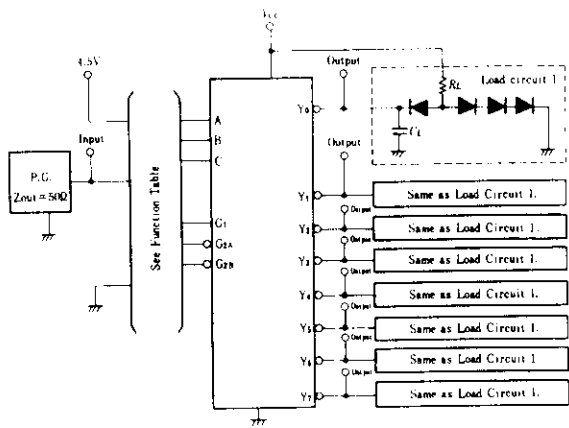
SWITCHING CHARACTERISTICS (VCC=5V, Ta=25°C)

Item	Symbol	Inputs	Output	Levels of delay	Test Conditions	min	typ	max	Unit	
Propagation delay time	t_{PLH}	Binary Select A, B, C	Y	2	$C_L = 15\text{pF}$ $R_L = 2\text{k}\Omega$	—	13	20	ns	
	t_{PHL}					—	27	41	ns	
	t_{PLH}			3		—	18	27	ns	
	t_{PHL}					—	26	39	ns	
	t_{PLH}	Enable G_{2A}, G_{2B}	Y	2		—	12	18	ns	
	t_{PHL}					—	21	32	ns	
	t_{PLH}	Enable G_1		3		—	17	26	ns	
	t_{PHL}					—	25	38	ns	

TESTING METHOD

1) Test Circuit

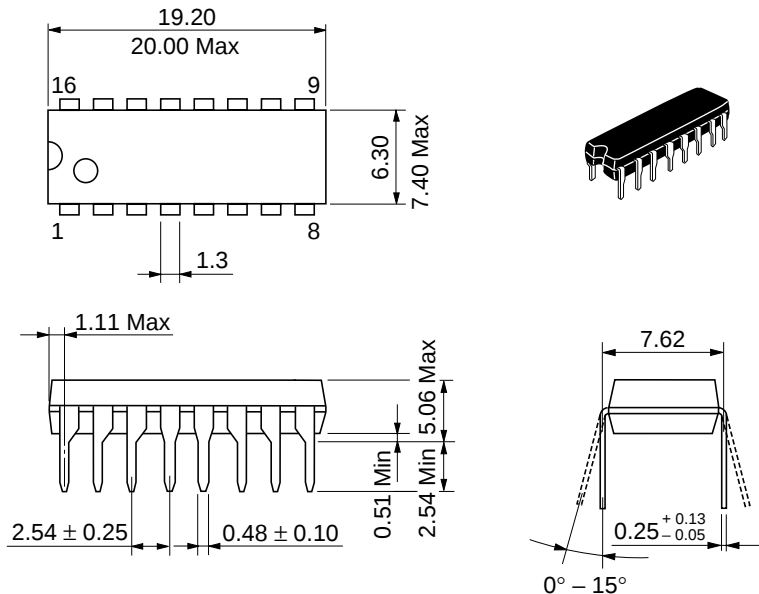
Waveform



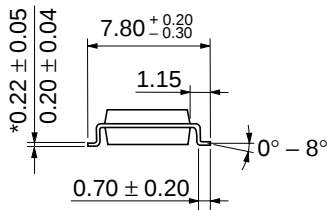
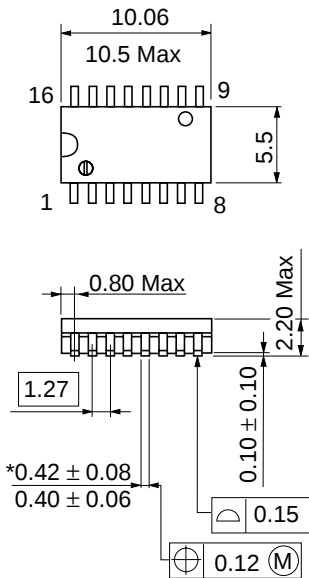
- Notes) 1. C_L includes probe and jig capacitance.
2. All diodes are 1S2074 (H).
3. Input pulse: $t_{TLH} \leq 15\text{ns}$, $t_{THL} \leq 6\text{ns}$,
 $PRR = 1\text{MHz}$, duty cycle 50%.

RELATION BETWEEN INPUT AND OUTPUT TO LEVELS OF DELAY

Inputs	Outputs							
	2 levels of delay				3 levels of delay			
A	Y0	Y2	Y4	Y6	Y1	Y3	Y5	Y7
B	Y0	Y1	Y4	Y5	Y2	Y3	Y6	Y7
C	Y0	Y1	Y2	Y3	Y4	Y5	Y6	Y7
G1					Y0 ~ Y7			
G2A, G2B	Y0 ~ Y7							

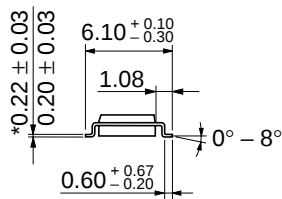
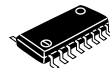
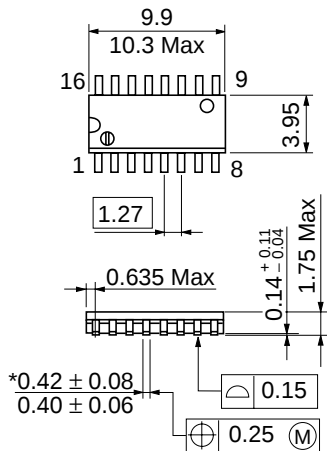


Hitachi Code	DP-16
JEDEC	Conforms
EIAJ	Conforms
Weight (reference value)	1.07 g



*Dimension including the plating thickness
Base material dimension

Hitachi Code	FP-16DA
JEDEC	—
EIAJ	Conforms
Weight (reference value)	0.24 g



*Dimension including the plating thickness
Base material dimension

Hitachi Code	FP-16DN
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EIAJ	Conforms
Weight (reference value)	0.15 g

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