

DN74LS138

3-line to 8-line Decoders / Demultiplexers

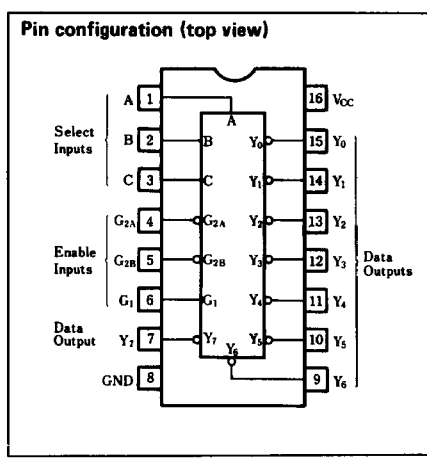
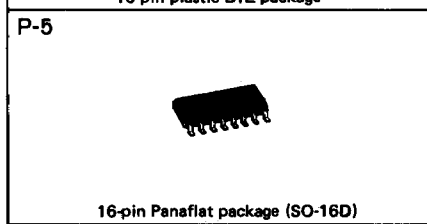
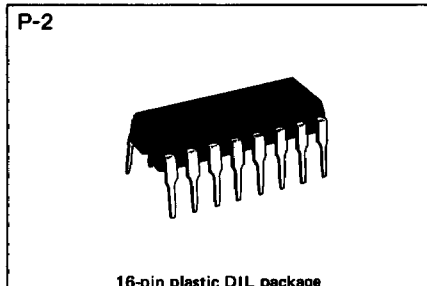
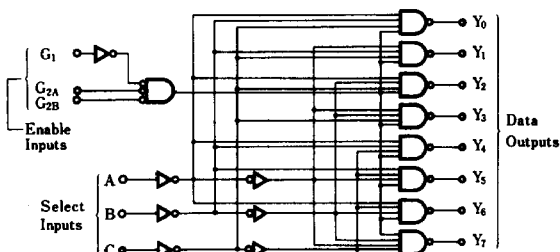
■ Description

DN74LS138 is a 3-bit decimal to octal decoder/demultiplexer with enable inputs.

■ Features

- Three types of enable inputs
- Quaternary to hexadecimal decoder/demultiplexer capability with no externally connected parts
- Wide operating temperature range ($T_a = -20$ to $+75^\circ\text{C}$)

■ Logic diagram



■ Recommended operating conditions

Parameter	Sym	Min	Typ	Max	Unit
Supply voltage	V_{CC}	4.75	5.00	5.25	V
Output current	I_{OH}			-400	μA
	I_{OL}			8	mA
Operating temperature range	T_{opr}	-20	25	75	$^\circ\text{C}$

■ DC characteristics (Ta = -20 ~ +75°C)

Parameter	Sym	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 V, V _{IH} = 2 V V _{IL} = 0.8 V, I _{OH} = -400 μA	2.7	3.4		V
	V _{OL1}	V _{CC} = 4.75 V V _{IH} = 2 V, I _{OL} = 4 mA		0.25	0.4	V
	V _{OL2}	V _{CC} = 4.75 V V _{IH} = 2 V, I _{OL} = 8 mA		0.35	0.5	V
Input current	I _{IH}	V _{CC} = 5.25 V V _I = 2.7 V			20	μA
	I _{IL}	V _{CC} = 5.25 V V _I = 0.4 V			-0.4	mA
	I _I	V _{CC} = 5.25 V V _I = 7 V			0.1	mA
Output short circuit current**	I _{OS}	V _{CC} = 5.25 V, V _O = 0 V	-15		-100	mA
Input clamp voltage	V _{IK}	V _{CC} = 4.75 V I _I = -18 mA			-1.5	V
Supply current***	I _{CC}	I _{CC} = 5.25 V		6.3	10	mA

* When constant at V_{CC} = 5 V, Ta = 25°C.

** Only one output at a time short circuited to GND. Also, short circuit time to GND within 1 second.

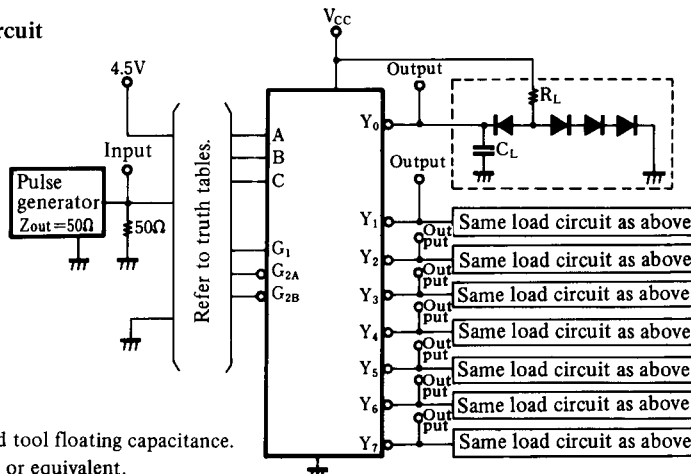
*** Measured with all outputs open and in enable condition.

■ Switching characteristics (V_{CC} = 5 V, Ta = 25°C)

Parameter	Sym	Inputs	Outputs	Delay level	Test conditions	Min	Typ	Max	Unit	
Propagation delay time	t _{PLH}	Binary Select A, B, C	Y	2	C _L = 15 pF R _L = 2 kΩ		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

※ Switching parameter measurement information

1. Measurement circuit



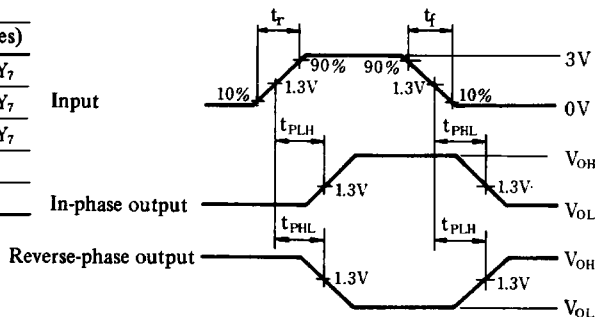
Notes

1. C_L includes probe and tool floating capacitance.
2. Diodes are all MA161 or equivalent.

2. Relationships of inputs/outputs to delay level

Input	Output							
	Delay level (2-stages)				Delay level (3-stages)			
A	Y ₀	Y ₂	Y ₄	Y ₆	Y ₁	Y ₃	Y ₅	Y ₇
B	Y ₀	Y ₁	Y ₄	Y ₅	Y ₂	Y ₃	Y ₆	Y ₇
C	Y ₀	Y ₁	Y ₂	Y ₃	Y ₄	Y ₅	Y ₆	Y ₇
G ₁					Y ₀ ~ Y ₇			
G _{2A} , G _{2B}	Y ₀ ~ Y ₇							

3. Waveforms



Notes

1. Input waveform: $t_r \leq 15\text{ns}$, $t_f \leq 6\text{ns}$, PRR = 1MHz, duty cycle = 50%.

■ Truth tables

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								
X	H	X	X	X	H	H	H	H	H	H	H	H
L	X	X	X	X	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

Notes

1. * $G_2 = G_{2A} + G_{2B}$
2. H: HIGH voltage level.
L: LOW voltage level.
X: Either HIGH or LOW; doesn't matter.