

6249827 MITSUBISHI (DGTL LOGIC)

91D 12192 D

MITSUBISHI ASTTLs

**M74AS138P**

T-66-21-55

**PRELIMINARY**  
 Notice This is not a final specification.  
 Some parametric limits are subject to change.

**3-LINE TO 8-LINE DECODER/DEMULTIPLEXER**

**DESCRIPTION**

The M74AS138P is a semiconductor integrated circuit of a 3-line-to-8-line decoder/demultiplexer with enable inputs.

**FEATURES**

- Three types of enable inputs
- 4 to 16 decoder/demultiplexer capability without adding external components
- Wide operating temperature range ( $T_a = -20 \sim +75^\circ\text{C}$ )

**APPLICATION**

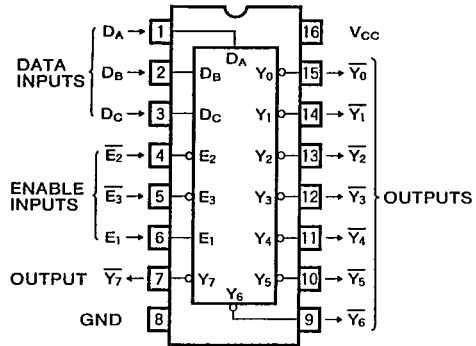
General purpose, for use in industrial and consumer digital equipment.

**FUNCTIONAL DESCRIPTION**

Using as a decoder, give the address in 3-bit binary code on inputs  $D_A \sim D_C$ , and one output among outputs  $\bar{Y}_0 \sim \bar{Y}_7$  corresponding to the address become low while the other seven outputs are all high. In this case, set enable input  $E_1$  high and enable inputs  $\bar{E}_2$  and  $\bar{E}_3$  low. When  $E_1$ ,  $E_2$  and  $\bar{E}_3$  are in any other condition, the outputs are high irrespective of the status of  $D_A \sim D_C$ .

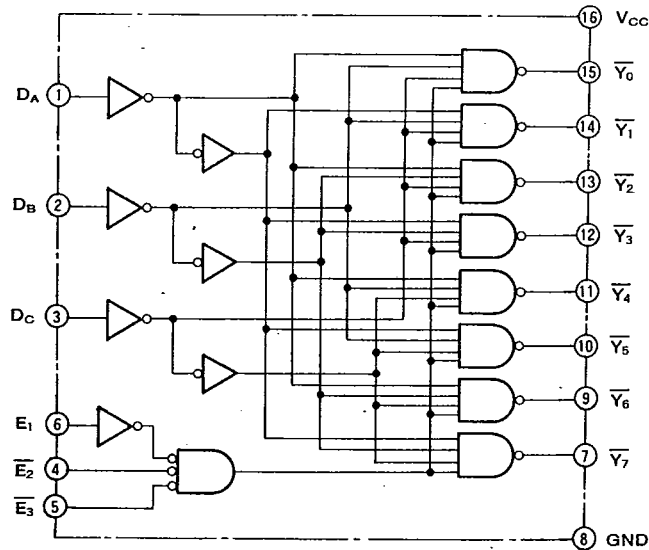
When the device is used as a demultiplexer, it functions as a 1-line-to-8-line demultiplexer by making  $E_1$ ,  $E_2$  or  $\bar{E}_3$  the data input and  $D_A \sim D_C$  the selection inputs.

**PIN CONFIGURATION (TOP VIEW)**



Outline 16P4

**LOGIC DIAGRAM**



**3-LINE TO 8-LINE DECODER/DEMULTIPLEXER**

**FUNCTION TABLE (Note 1)**

Inputs					Outputs							
E <sub>1</sub>	$\overline{E}_x$	D <sub>C</sub>	D <sub>B</sub>	D <sub>A</sub>	$\overline{Y}_0$	$\overline{Y}_1$	$\overline{Y}_2$	$\overline{Y}_3$	$\overline{Y}_4$	$\overline{Y}_5$	$\overline{Y}_6$	$\overline{Y}_7$
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

Note 1 :  $\overline{E}_x = \overline{E}_2 + \overline{E}_3$

X : Irrelevant

**ABSOLUTE MAXIMUM RATINGS (T<sub>a</sub> = -20~+75°C, unless otherwise noted)**

Symbol	Parameter	Conditions	Ratings	Unit
V <sub>CC</sub>	Supply voltage		-0.5~+7	V
V <sub>I</sub>	Input voltage		-0.5~+7	V
V <sub>O</sub>	Output voltage	High-level state	-0.5~V <sub>CC</sub>	V
T <sub>opr</sub>	Operating free-air ambient temperature range		-20~+75	°C
T <sub>stg</sub>	Storage temperature range		-65~+150	°C

**RECOMMENDED OPERATING CONDITIONS**

Symbol	Parameter	Limits			Unit
		Min	Typ	Max	
V <sub>CC</sub>	Supply voltage	4.5	5	5.5	V
V <sub>IH</sub>	High-level input voltage	2			V
V <sub>IL</sub>	Low-level input voltage			0.8	V
I <sub>OH</sub>	High-level output current	0		-2	mA
I <sub>OL</sub>	Low-level output current	0		20	mA
T <sub>opr</sub>	Operating free-air ambient temperature range	-20		+75	°C

**ELECTRICAL CHARACTERISTICS (T<sub>a</sub> = -20~+75°C, unless otherwise noted)**

Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ*	Max	
V <sub>IC</sub>	Input clamp voltage	V <sub>CC</sub> =4.5V, I <sub>IC</sub> =-18mA			-1.2	V
V <sub>OH</sub>	High-level output voltage	V <sub>CC</sub> =4.5V~5.5V, I <sub>OH</sub> =-2mA	V <sub>CC</sub> -2			V
V <sub>OL</sub>	Low-level output voltage	V <sub>CC</sub> =4.5V, I <sub>OL</sub> =20mA			0.5	V
I <sub>I</sub>	Input current at maximum voltage	V <sub>CC</sub> =5.5V, V <sub>I</sub> =7V			0.1	mA
I <sub>IH</sub>	High-level input current	V <sub>CC</sub> =5.5V, V <sub>I</sub> =2.7V			20	μA
I <sub>IL</sub>	Low-level input current	V <sub>CC</sub> =5.5V, V <sub>I</sub> =0.4V			-0.5	mA
I <sub>O</sub>	Output current	V <sub>CC</sub> =5.5V, V <sub>O</sub> =2.25V	-30		-112	mA
I <sub>CC</sub>	Supply current	V <sub>CC</sub> =5.5V		14	20	mA

\*: All typical values are at V<sub>CC</sub>=5V, T<sub>a</sub>=25°C.

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**M74AS138P**

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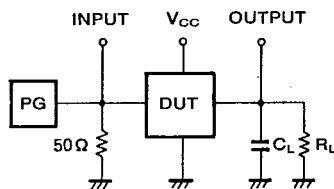
**3-LINE TO 8-LINE DECODER/DEMULTIPLEXER**

**SWITCHING CHARACTERISTICS**

Symbol	Parameter	Test conditions/Limits							Unit	
		V <sub>CC</sub> =4.5~5.5V (Note 2)								
		C <sub>L</sub> =50pF								
		R <sub>L</sub> =500Ω								
		T <sub>a</sub> =0~70°C			T <sub>a</sub> =-20~+75°C					
		Inputs	Output	Min	Typ*	Max	Min	Typ*	Max	
t <sub>PLH</sub>	Propagation time	D <sub>A</sub> , D <sub>B</sub>	$\bar{Y}$	2		10	2		11	ns
t <sub>PHL</sub>		D <sub>C</sub>	$\bar{Y}$	2		9.5	2		10.5	
t <sub>PLH</sub>		E <sub>1</sub> , $\bar{E}_2$	$\bar{Y}$	2		10	2		11	
t <sub>PHL</sub>	$\bar{E}_3$			2		10	2		11	

\*: All typical values are at V<sub>CC</sub>=5V, T<sub>a</sub>=25°C.

Note 2: Measurement circuit

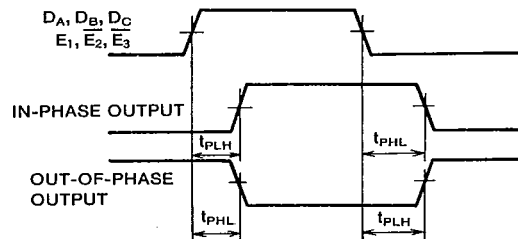


(1) The pulse generator (PG) has the following characteristics:

- PRR ≤ 1MHz
- t<sub>r</sub> = 2ns, t<sub>f</sub> = 2ns
- V<sub>IH</sub> = 3.5V, V<sub>IL</sub> = 0.3V
- duty cycle = 50%
- Z<sub>o</sub> = 50Ω

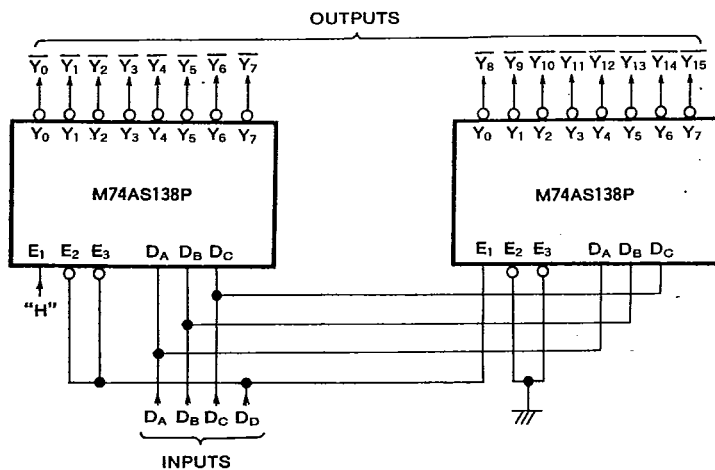
(2) C<sub>L</sub> includes probe and jig capacitance.

**TIMING DIAGRAM (Reference level=1.3V)**



**APPLICATION EXAMPLES**

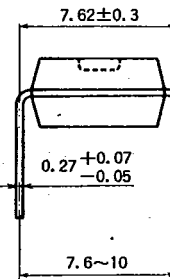
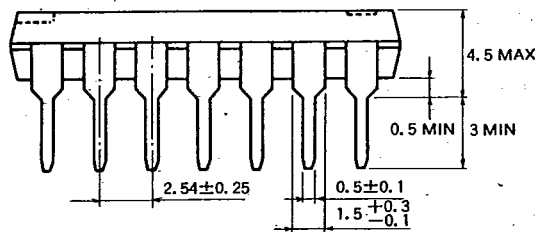
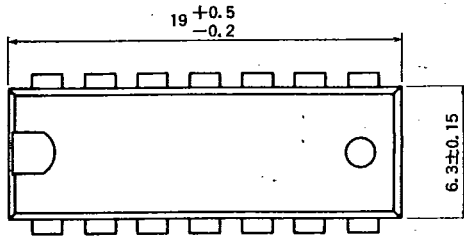
4-line to 16-line decoder/demultiplexer



T-90-20

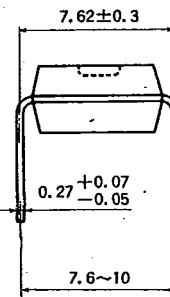
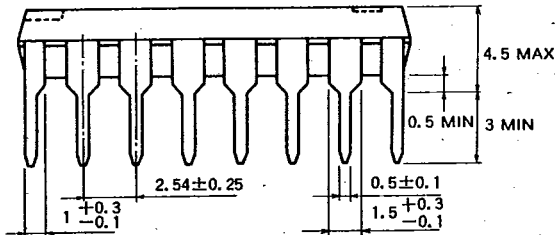
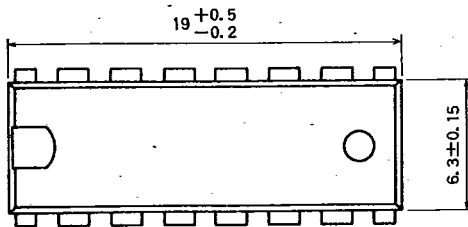
TYPE 14P4 14-PIN MOLDED PLASTIC DIP

Dimension in mm



TYPE 16P4 16-PIN MOLDED PLASTIC DIP

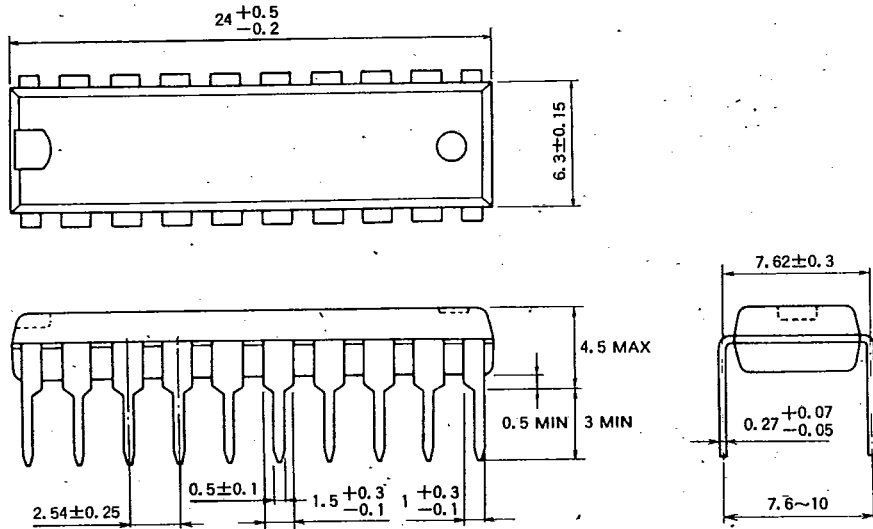
Dimension in mm



T-90-20

TYPE 20P4 20-PIN MOLDED PLASTIC DIP

Dimension in mm



TYPE 24P4D 24-PIN MOLDED PLASTIC DIP

Dimension in mm

