



MOTOROLA

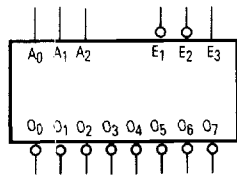
Product Preview

1-of-8 Decoder/Demultiplexer

The MC74AC138/74ACT138 is a high-speed 1-of-8 decoder/demultiplexer. This device is ideally suited for high-speed bipolar memory chip select address decoding. The multiple input enables allow parallel expansion to a 1-of-24 decoder using just three MC74AC138/74ACT138 devices or a 1-of-32 decoder using four MC74AC138/74ACT138 devices and one inverter.

- Demultiplexing Capability
- Multiple Input Enable for Easy Expansion
- Active LOW Mutually Exclusive Outputs
- Outputs Source/Sink 24 mA
- 'ACT138 Has TTL Compatible Inputs

LOGIC SYMBOL



PIN NAMES

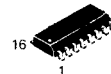
A₀-A₂ Address Inputs
 \bar{E}_1 - \bar{E}_2 Enable Inputs
 E₃ Enable Input
 O₀-O₇ Outputs

**MC74AC138
MC74ACT138**

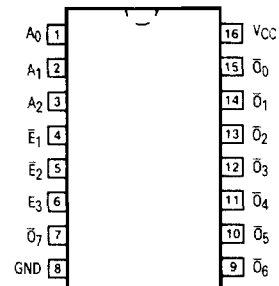
**1-OF-8 DECODER/
DEMULTIPLEXER**



**N SUFFIX
CASE 648-08
PLASTIC**



**D SUFFIX
CASE 751B-03
PLASTIC**



MC74AC138 • MC74ACT138

FUNCTIONAL DESCRIPTION

The MC74AC138/74ACT138 high-speed 1-of-8 decoder/demultiplexer accepts three binary weighted inputs (A_0 , A_1 , A_2) and, when enabled, provides eight mutually exclusive active-LOW outputs (\bar{O}_0 – \bar{O}_7). The MC74AC138/74ACT138 features three Enable inputs, two active-LOW (\bar{E}_1 , \bar{E}_2) and one active-HIGH (E_3). All outputs will be HIGH unless \bar{E}_1 and \bar{E}_2 are LOW and E_3 is HIGH. This multiple enabled function allows easy parallel expansion of the

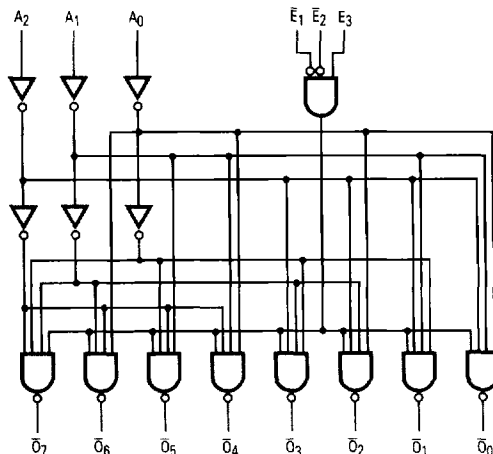
device to a 1-of-32 (5 lines to 32 lines) decoder with just four MC74AC138/74ACT138 devices and one inverter (See Figure a). The MC74AC138/74ACT138 can be used as an 8-output demultiplexer by using one of the active LOW Enable inputs as the data input and the other Enable inputs as strobes. The Enable inputs which are not used must be permanently tied to their appropriate active-HIGH or active-LOW state.

TRUTH TABLE

Inputs						Outputs							
\bar{E}_1	\bar{E}_2	E_3	A_0	A_1	A_2	\bar{O}_0	\bar{O}_1	\bar{O}_2	\bar{O}_3	\bar{O}_4	\bar{O}_5	\bar{O}_6	\bar{O}_7
H	X	X	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
X	X	L	X	X	X	H	H	H	H	H	H	H	H
L	L	H	L	L	L	L	H	H	H	H	H	H	H
L	L	H	H	L	L	H	L	H	H	H	H	H	H
L	L	H	L	H	L	H	H	L	H	H	H	H	H
L	L	H	H	H	L	H	H	H	L	H	H	H	H
L	L	H	L	L	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	L	H	H	H	H	H	H	H	H	L	H
L	L	H	H	H	H	H	H	H	H	H	H	H	L

H = HIGH Voltage Level
L = LOW Voltage Level
X = Immaterial

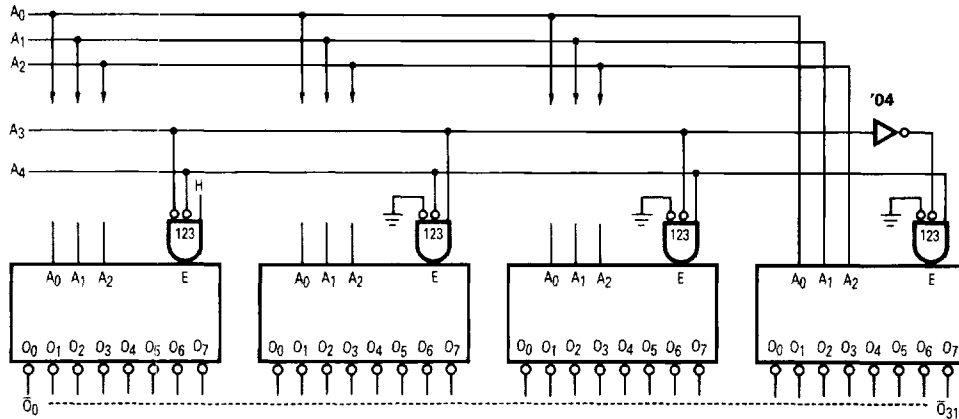
LOGIC DIAGRAM



Please note that this diagram is provided only for the understanding of logic operations and should not be used to estimate propagation delays.

MC74AC138 • MC74ACT138

Figure a: Expansion to 1-of-32 Decoding



DC CHARACTERISTICS (unless otherwise specified)

Symbol	Parameter	Value	Units	Test Conditions
I_{CC}	Maximum Quiescent Supply Current	80	μA	$V_{IN} = V_{CC}$ or Ground, $V_{CC} = 5.5 V, T_A = \text{Worst Case}$
I_{CC}	Maximum Quiescent Supply Current	8.0	μA	$V_{IN} = V_{CC}$ or Ground, $V_{CC} = 5.5 V, T_A = 25^\circ C$
I_{CCT}	Maximum Additional I_{CC} Input (ACT138)	1.5	mA	$V_{IN} = V_{CC} - 2.1 V$ $V_{CC} = 5.5 V, T_A = \text{Worst Case}$

MC74AC138 • MC74ACT138

AC CHARACTERISTICS (Figures and Waveforms — See Section 3)

Symbol	Parameter	V _{CC} * (V)	74AC			74AC		Units	Fig. No.
			T _A = +25°C C _L = 50 pF			T _A = -40°C to +85°C C _L = 50 pF			
			Min	Typ	Max	Min	Max		
t _{PLH}	Propagation Delay A _n to \bar{O}_n	3.3 5.0	1.0 1.0	8.5 6.5	13 9.5	1.0 1.0	15 10.5	ns	3-6
t _{PHL}	Propagation Delay A _n to \bar{O}_n	3.3 5.0	1.0 1.0	8.0 6.0	12.5 9.0	1.0 1.0	14 10.5	ns	3-6
t _{PLH}	Propagation Delay E ₁ or E ₂ to \bar{O}_n	3.3 5.0	1.0 1.0	11 8.0	15 11	1.0 1.0	16 12	ns	3-6
t _{PHL}	Propagation Delay E ₁ or E ₂ to \bar{O}_n	3.3 5.0	1.0 1.0	9.5 7.0	13.5 9.5	1.0 1.0	15 10.5	ns	3-6
t _{PLH}	Propagation Delay E ₃ to \bar{O}_n	3.3 5.0	1.0 1.0	11 8.0	15.5 11	1.0 1.0	16.5 12.5	ns	3-6
t _{PHL}	Propagation Delay E ₃ to \bar{O}_n	3.3 5.0	1.0 1.0	8.5 6.0	13 8.0	1.0 1.0	14 9.5	ns	3-6

*Voltage Range 3.3 is 3.3 V ± 0.3 V
Voltage Range 5.0 is 5.0 V ± 0.5 V

AC CHARACTERISTICS (Figures and Waveforms — See Section 3)

Symbol	Parameter	V _{CC} * (V)	74ACT			74ACT		Units	Fig. No.
			T _A = +25°C C _L = 50 pF			T _A = -40°C to +85°C C _L = 50 pF			
			Min	Typ	Max	Min	Max		
t _{PLH}	Propagation Delay A _n to \bar{O}_n	5.0	1.0	7.0	10.5	1.0	11.5	ns	3-6
t _{PHL}	Propagation Delay A _n to \bar{O}_n	5.0	1.0	6.5	10.5	1.0	11.5	ns	3-6
t _{PLH}	Propagation Delay E ₁ or E ₂ to \bar{O}_n	5.0	1.0	8.0	11.5	1.0	12.5	ns	3-6
t _{PHL}	Propagation Delay E ₁ or E ₂ to \bar{O}_n	5.0	1.0	7.5	11.5	1.0	12.5	ns	3-6
t _{PLH}	Propagation Delay E ₃ to \bar{O}_n	5.0	1.0	8.0	12	1.0	13	ns	3-6
t _{PHL}	Propagation Delay E ₃ to \bar{O}_n	5.0	1.0	6.5	10.5	1.0	11.5	ns	3-6

*Voltage Range 5.0 is 5.0 V ± 0.5 V

CAPACITANCE

Symbol	Parameter	Value Typ	Units	Test Conditions
C _{IN}	Input Capacitance	4.5	pF	V _{CC} = 5.0 V
C _{PD}	Power Dissipation Capacitance	60	pF	V _{CC} = 5.0 V