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MOTOROLA

MC54/74F138

1-OF-8 DECODER/ DEMULTIPLEXER

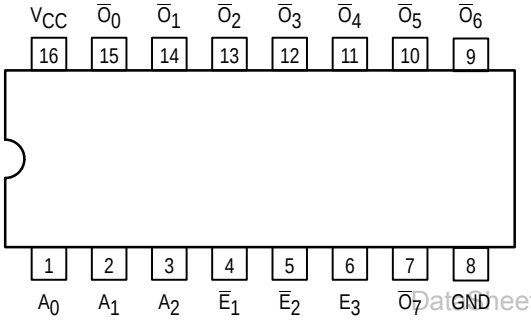
The MC54/74F138 is a high speed 1-of-8 Decoder/Demultiplexer. This device is ideally suited for high speed bipolar memory chip select address decoding. The multiple input enables allow parallel expansion to a 1-of-24 decoder using just three F138 devices or to a 1-of-32 decoder using four F138s and one inverter.

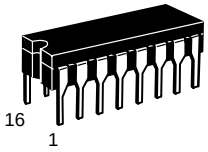
- Demultiplexing Capability
- Multiple Input Enable for Easy Expansion
- Active Low Mutually Exclusive Outputs
- Input Clamp Diodes Limit High-Speed Termination Effects

1-OF-8 DECODER/ DEMULTIPLEXER

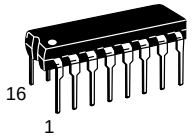
FAST™ SHOTTKY TTL

CONNECTION DIAGRAM DIP (TOP VIEW)

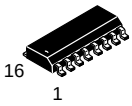




J SUFFIX
CERAMIC
CASE 620-09



N SUFFIX
PLASTIC
CASE 648-08

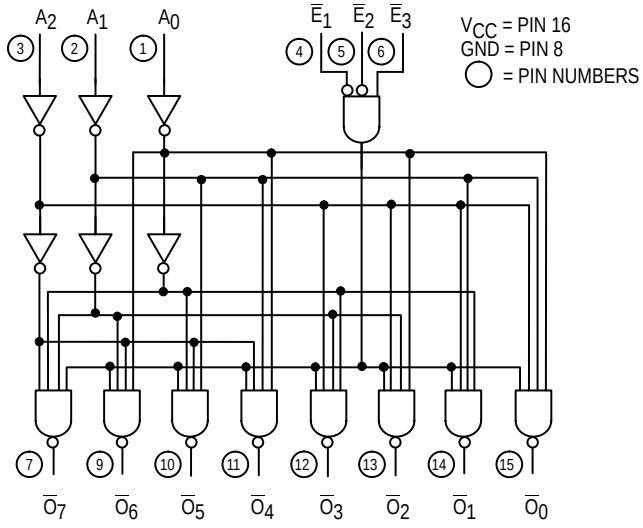


D SUFFIX
SOIC
CASE 751B-03

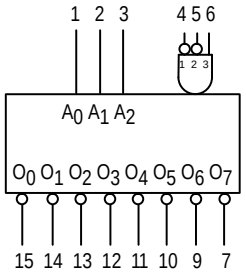
ORDERING INFORMATION

MC54FXXXJ	Ceramic
MC74FXXXN	Plastic
MC74FXXXD	SOIC

LOGIC DIAGRAM



LOGIC SYMBOL



VCC = PIN 16
GND = PIN 8

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GUARANTEED OPERATING RANGES

Symbol	Parameter		Min	Typ	Max	Unit
V_{CC}	Supply Voltage	54, 74	4.5	5.0	5.5	V
T_A	Operating Ambient Temperature Range	54	–55	25	125	°C
		74	0	25	70	
I_{OH}	Output Current — High	54, 74			–1.0	mA
I_{OL}	Output Current — Low	54, 74			20	mA

DC CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE (unless otherwise specified)

Symbol	Parameter		Limits Min	Typ	Max	Unit	Test Conditions	
V_{IH}	Input HIGH Voltage		2.0			V	Guaranteed Input HIGH Voltage	
V_{IL}	Input LOW Voltage				0.8	V	Guaranteed Input LOW Voltage	
V_{IK}	Input Clamp Diode Voltage				–1.2	V	V_{CC} = MIN, I_{IN} = –18 mA	
V_{OH}	Output HIGH Voltage	54, 74	2.5			V	I_{OH} = –1.0 mA	V_{CC} = 4.50 V
		74	2.7			V	I_{OH} = –1.0 mA	V_{CC} = 4.75 V
V_{OL}	Output LOW Voltage				0.5	V	I_{OL} = 20 mA	V_{CC} = MIN
I_{IH}	Input HIGH Current				20	µA	V_{CC} = MAX, V_{IN} = 2.7 V	
					0.1	mA	V_{CC} = MAX, V_{IN} = 7.0 V	
I_{IL}	Input LOW Current				–0.6	mA	V_{CC} = MAX, V_{IN} = 0.5 V	
I_{OS}	Output Short Circuit Current (Note 2)		–60		–150	mA	V_{CC} = MAX, V_{OUT} = 0 V	
I_{CC}	Power Supply Current				20	mA	V_{CC} = MAX	

NOTES:
1. For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions for the applicable device type.
2. Not more than one output should be shorted at a time, nor for more than 1 second.

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AC CHARACTERISTICS

Symbol	Parameter	Levels of Delay	54/74F T_A = +25 °C, V_{CC} = +5.0 V, C_L = 50 pF Min	Max	54F T_A = +25°C to +125°C, V_{CC} = 5.0 V ±10%, C_L = 50 pF Min	Max	74F T_A = 0°C to 70°C, V_{CC} = 5.0 V ±10%, C_L = 50 pF Min	Max	Unit
t_{PLH}	Propagation Delay,	3	3.0	7.5	3.0	12	3.0	8.5	ns
t_{PHL}	Address to Output		3.0	8.0	3.0	9.5	3.0	9.0	
t_{PLH}	Enable to Output	2	3.5	7.0	3.5	11	3.5	8.0	ns
t_{PHL}	$\overline{E}_1$ or $\overline{E}_2$		3.0	7.0	3.0	8.0	3.0	7.5	
t_{PLH}	Enable to Output	3	4.0	8.0	4.0	12.5	4.0	9.0	ns
t_{PHL}	E3		3.5	7.5	3.5	8.5	3.5	8.5	

FUNCTIONAL DESCRIPTION

The decoder accepts three binary weighted inputs (A_O, A_1, A_2) and when enabled provides eight mutually exclusive active LOW outputs ($\overline{O}_0$–$\overline{O}_7$). The F138 features three Enable inputs, two active LOW ($\overline{E}_1$, $\overline{E}_2$) and one active HIGH (E_3). All outputs will be HIGH unless $\overline{E}_1$ and $\overline{E}_2$ are LOW and E_3 is HIGH. This multiple enable function allows easy parallel expansion of the device to a 1-of-32 (5 lines to 32 lines) decoder with just four F138s and one inverter.

The F138 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 states.

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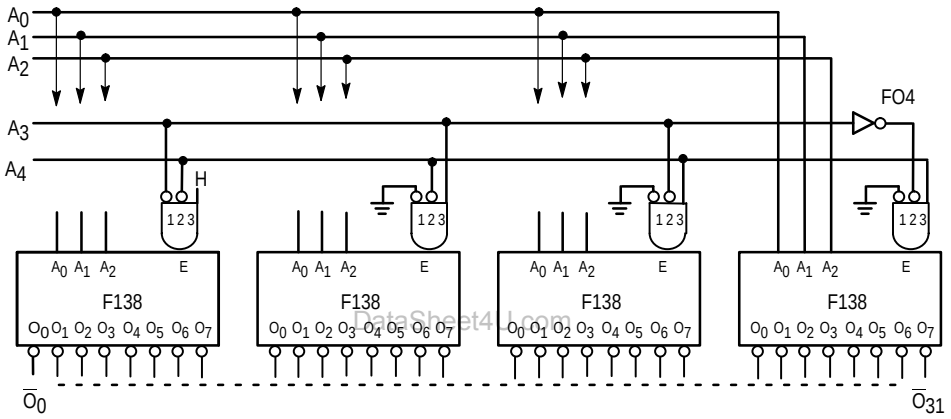
FUNCTION TABLE

Inputs						Outputs							
$\overline{E}_1$	$\overline{E}_2$	E_3	A_0	A_1	A_2	$\overline{O}_0$	$\overline{O}_1$	$\overline{O}_2$	$\overline{O}_3$	$\overline{O}_4$	$\overline{O}_5$	$\overline{O}_6$	$\overline{O}_7$
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 = Don't Care



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