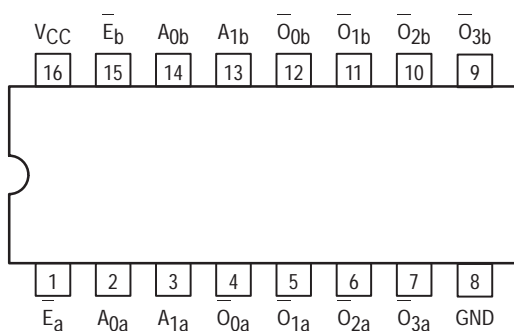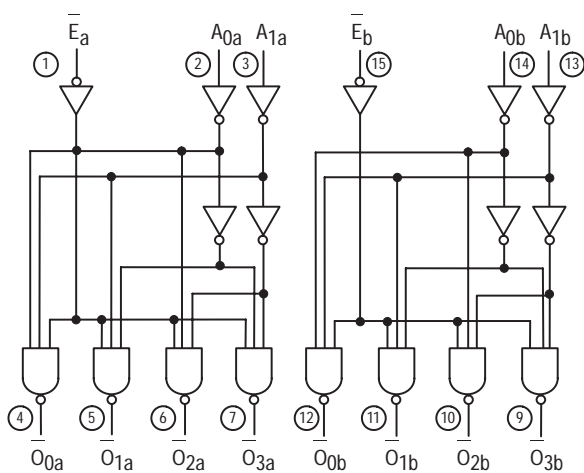**MOTOROLA**

DUAL 1-OF-4 DECODER

The MC54/74F139 is a high speed Dual 1-of-4 Decoder/Demultiplexer. The device has two independent decoders, each accepting two inputs and providing four mutually exclusive active LOW outputs. Each decoder has an active LOW Enable input which can be used as a data input for a 4-output de-multiplexer. Each half of the F139 can be used as a function generator providing all four miniterms of two variables.

- Multifunction Capability
- Two Completely Independent 1-of-4 Decoders
- Active Low Mutually Exclusive Outputs
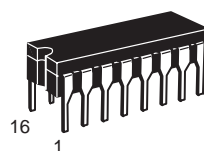- Input Clamp Diodes Limit High-Speed Termination Effects

CONNECTION DIAGRAM

V_{CC}	$\overline{E}_b$	A_{0b}	A_{1b}	$\overline{O}_{0b}$	$\overline{O}_{1b}$	$\overline{O}_{2b}$	$\overline{O}_{3b}$
16	15	14	13	12	11	10	9

1	2	3	4	5	6	7	8
$\overline{E}_a$	A_{0a}	A_{1a}	$\overline{O}_{0a}$	$\overline{O}_{1a}$	$\overline{O}_{2a}$	$\overline{O}_{3a}$	GND

LOGIC DIAGRAM

V_{CC} = PIN 16
GND = PIN 8
◯ = PIN NUMBERS

MC54/74F139

DUAL 1-OF-4 DECODER
FAST™ SHOTTKY TTL

J SUFFIX
CERAMIC
CASE 620-09

16   1
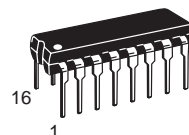
N SUFFIX
PLASTIC
CASE 648-08

16
1
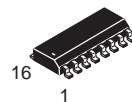
D SUFFIX
SOIC
CASE 751B-03

16   1

ORDERING INFORMATION

MC54FXXXJ	Ceramic
MC74FXXXN	Plastic
MC74FXXXD	SOIC

LOGIC SYMBOL
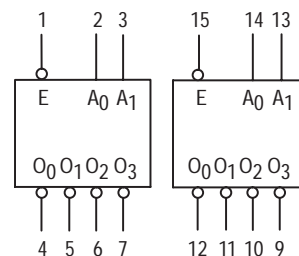
V_{CC} = Pin 16
GND = Pin 8

MC54/74F139

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	Limits Typ	Limits 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	

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.

AC CHARACTERISTICS

Symbol	Parameter	54/74F T_A = +25°C V_{CC} = +5.0 V C_L = 50 pF Min	Max	54F T_A = -55°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,	3.5	7.0	2.5	12.0	3.0	8.5	ns
t_{PHL}	Address to Output	3.5	8.0	3.5	9.5	3.5	9.0	
t_{PLH}	Enable to Output	3.5	7.0	3.0	9.0	3.5	8.0	ns
t_{PHL}		2.5	6.5	2.5	8.0	2.5	7.5	

FUNCTIONAL DESCRIPTION

The F139 is a high speed dual 1-of-4 decoder/demultiplexer fabricated with the Schottky barrier diode process. The device has two independent decoders, each of which accepts two binary weighted inputs (A_O, A_1) and provide four mutually exclusive active LOW outputs (O_0-O_3). Each decoder has an active LOW Enable ($\overline{E}$). When $\overline{E}$ is HIGH all outputs are forced HIGH. The enable can be used as the data input for a 4-output demultiplexer application.

Each half of the F139 generates all four miniterms of two variables. These four miniterms are useful in some applications, replacing multiple gate functions as shown in Figure 1, and thereby reducing the number of packages required in a logic network.

MC54/74F139

LIFETIME BUY

FUNCTION TABLE

Inputs			Outputs			
$\overline{E}$	A_0	A_1	$\overline{O_0}$	$\overline{O_1}$	$\overline{O_2}$	$\overline{O_3}$
H	X	X	H	H	H	H
L	L	L	L	H	H	H
L	H	L	H	L	H	H
L	L	H	H	H	L	H
L	H	H	H	H	H	L

H = HIGH Voltage Level
L = LOW Voltage Level
X = Don't Care
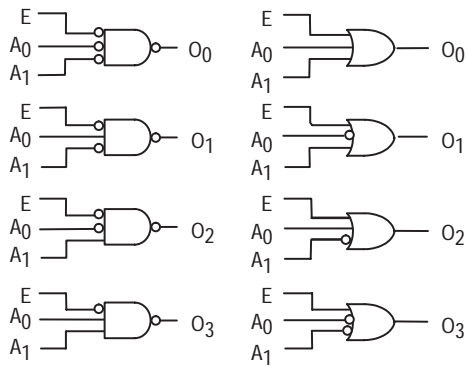
Figure 1.

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