



MOTOROLA

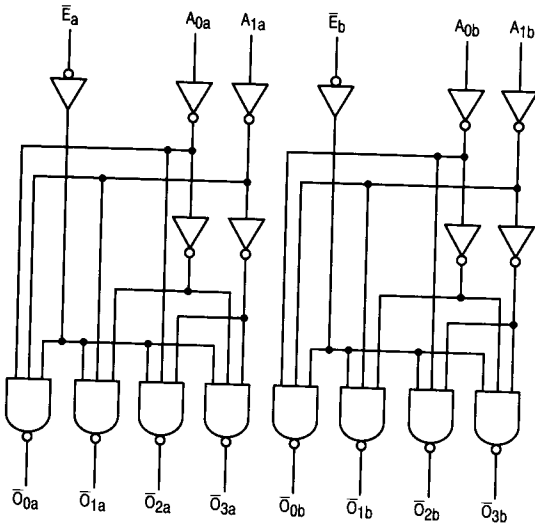
Dual 1-of-4 Decoder (Active Low Outputs With Enable)

**ELECTRICALLY TESTED PER:
MIL-M-38510/33702**

The 54F139 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 demultiplexer. Each half of the F139 can be used as a function generator providing all four minterms of two variables.

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

LOGIC DIAGRAM



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 accept two binary weighted inputs (A_0, A_1) and provide four mutually exclusive active LOW outputs (\bar{O}_0, \bar{O}_3). Each decoder has an active LOW Enable input (\bar{E}). When \bar{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 minterms of two variables. These four minterms are useful in some applications, replacing multiple gate functions, and thereby reducing the number of packages required in a logic network.

Military 54F139



AVAILABLE AS:

- 1) JAN: JM38510/33702BXA
- 2) SMD: N/A
- 3) 883: 54F139/BXAJC

**X = CASE OUTLINE AS FOLLOWS:
PACKAGE: CERDIP: E
CERFLAT: F
LCC: 2**

**THE LETTER "M" APPEARS
BEFORE THE / ON LCC.**

PIN ASSIGNMENTS

FUNCT.	DIL 620-09	FLATS 650-05	LCC 756A-02	BURN-IN (COND. A)
\bar{E}_a	1	1	2	VCC
A_{0a}	2	2	3	VCC
A_{1a}	3	3	4	VCC
\bar{O}_{0a}	4	4	5	OPEN
\bar{O}_{1a}	5	5	7	OPEN
\bar{O}_{2a}	6	6	8	OPEN
\bar{O}_{3a}	7	7	9	OPEN
GND	8	8	10	GND
\bar{O}_{3b}	9	9	12	OPEN
\bar{O}_{2b}	10	10	13	OPEN
\bar{O}_{1b}	11	11	14	OPEN
\bar{O}_{0b}	12	12	15	OPEN
A_{1b}	13	13	17	VCC
A_{0b}	14	14	18	VCC
\bar{E}_b	15	15	19	VCC
VCC	16	16	20	VCC

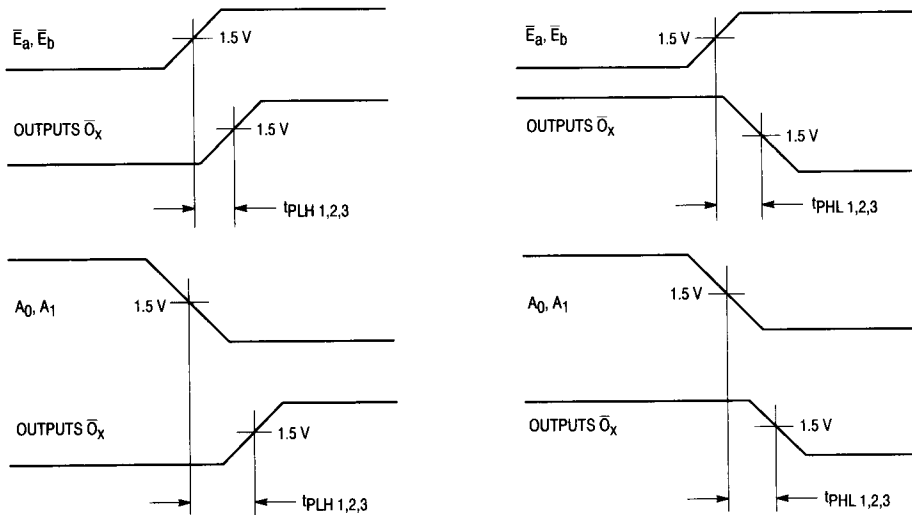
**BURN-IN CONDITIONS:
VCC = 5.0 V MIN/6.0 V MAX**

TRUTH TABLE

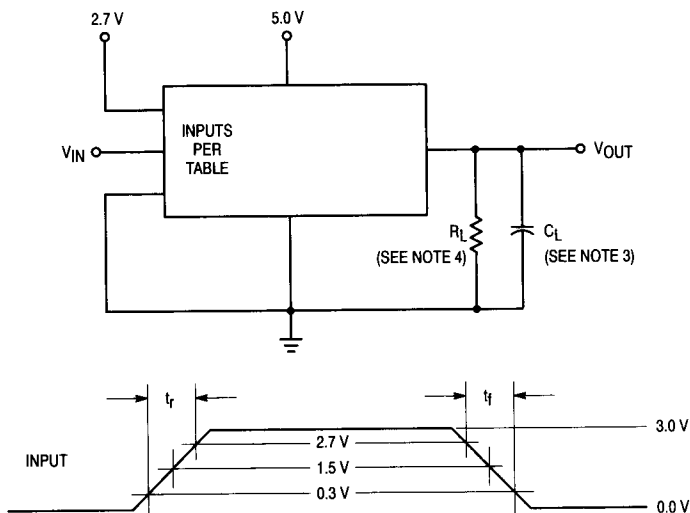
Inputs			Output			
\bar{E}	A_0	A_{12}	\bar{O}_0	\bar{O}_1	\bar{O}_2	\bar{O}_3
H	X	X	H	H	H	H
L	L	L	L	H	H	H
L	H	L	H	L	H	H
L	L	H	H	H	L	H
L	H	H	H	H	H	L

H = HIGH Voltage Levels
L = LOW Voltage Levels
X = Don't Care

SWITCHING TIME WAVEFORMS



TEST CIRCUIT AND WAVEFORM



NOTES:

1. Input pulse has the following characteristics:
 $t_r = t_f \leq 2.5$ ns, PRR ≤ 1.0 MHz and $Z_{OUT} \approx 50 \Omega$.
2. Terminal conditions (pins not designated may be high ≥ 2.0 V, low ≤ 0.8 V, or open).
3. $C_L = 50$ pF $\pm 10\%$ including scope probe, wiring and stray capacitance, without package in test fixture.
4. $R_L = 499 \Omega \pm 5.0\%$.
5. Voltage measurements are to be made with respect to network ground.

54F139

Symbol	Parameter	Limits						Unit	Test Condition (Unless Otherwise Specified)
		+ 25°C		+ 125°C		- 55°C			
		Subgroup 1		Subgroup 2		Subgroup 3			
		Min	Max	Min	Max	Min	Max		
V _{OH}	Logical "1" Output Voltage	2.5		2.5		2.5		V	V _{CC} = 4.5 V, I _{OH} = -1.0 mA, E _x = 2.0 V or 0.8 V, V _{IL} = 0.8 V, V _{IH} = 2.0 V.
V _{OL}	Logical "0" Output Voltage		0.5		0.5		0.5	V	V _{CC} = 4.5 V, I _{OL} = 20 mA, E _x = 0.8 V, V _{IL} = 0.8 V, V _{IH} = 2.0 V.
V _{IC}	Input Clamping Voltage		-1.2					V	V _{CC} = 4.5 V, I _{IN} = -18 mA, other inputs are open.
I _{IH}	Logical "1" Input Current		20		20		20	μA	V _{CC} = 5.5 V, V _{IH} = 2.7 V (other inputs are open).
I _{IHH}	Logical "1" Input Current		100		100		100	μA	V _{CC} = 5.5 V, V _{IHH} = 7.0 V (other inputs are open).
I _{OS}	Output Short Circuit Current	-60	-150	-60	-150	-60	-150	mA	V _{CC} = 5.5 V, V _{IN} = 0 V (all inputs), E _x = 5.5 V, V _{OUT} = 0 V.
I _{IL}	Logical "0" Input Current	0	-0.6	0	-0.6	0	-0.6	mA	V _{CC} = 5.5 V, V _{IN} = 0.5 V, other inputs are open.
I _{OD}	Diode Current	60		60		60		mA	V _{CC} = 4.5 V, V _{IN} = 0 V, 0.5 V or 5.5 V, E _x = 0 V, V _{OUT} = 2.5 V.
I _{CC}	Power Supply Current		20		20		20	mA	V _{CC} = 5.5 V, V _{IN} = 5.5 (both inputs), E _x = 0 V.
V _{IH}	Logical "1" Input Voltage	2.0		2.0		2.0		V	V _{CC} = 4.5 V.
V _{IL}	Logical "0" Input Voltage		0.8		0.8		0.8	V	V _{CC} = 4.5 V.
	Functional Tests	Subgroup 7		Subgroup 8A		Subgroup 8B			per Truth Table with V _{CC} = 4.5 V, (Repeat at), V _{CC} = 5.5 V, V _{INL} = 0.5 V, and V _{INH} = 2.5 V.

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Symbol	Parameter	Limits						Unit	Test Condition (Unless Otherwise Specified)
		+ 25°C		+ 125°C		- 55°C			
		Subgroup 9		Subgroup 10		Subgroup 11			
		Min	Max	Min	Max	Min	Max		
t _{PHL1}	Propagation Delay /Data-Output E _a or E _b to O _x	1.5	6.5	1.5	8.0	1.5	8.0	ns	V _{CC} = 5.0 V, C _L = 50 pF, R _L = 499 Ω.
t _{PLH1}	Propagation Delay /Data-Output E _a or E _b to O _x	1.5	7.0	1.5	9.0	1.5	9.0	ns	V _{CC} = 5.0 V, C _L = 50 pF, R _L = 499 Ω.
t _{PHL3}	Propagation Delay A _{0a} , A _{0b} , A _{1a} or A _{1b} to O _x	1.5	8.0	1.5	9.5	1.5	9.5	ns	V _{CC} = 5.0 V, C _L = 50 pF, R _L = 499 Ω.
t _{PLH3}	Propagation Delay A _{0a} , A _{0b} , A _{1a} or A _{1b} to O _x	1.5	7.0	1.5	12.5	1.5	12.5	ns	V _{CC} = 5.0 V, C _L = 50 pF, R _L = 499 Ω.