FAIRCHILD

SEMICONDUCTOR™

MM74HC139
Dual 2-To-4 Line Decoder

General Description

The MM74HC139 decoder utilizes advanced silicon-gate CMOS technology, and is well suited to memory address decoding or data routing applications. It possesses the high noise immunity and low power consumption usually associated with CMOS circuitry, yet has speeds comparable to low power Schottky TTL logic.

The MM74HC139 contain two independent one-of-four decoders each with a single active low enable input (G1, or G2). Data on the select inputs (A1, and B1 or A2, and B2) cause one of the four normally high outputs to go LOW.

The decoder's outputs can drive 10 low power Schottky TTL equivalent loads, and are functionally as well as pin equivalent to the 74LS139. All inputs are protected from damage due to static discharge by diodes to V_{CC} and ground.

Features

■ Typical propagation delays —
   Select to outputs (4 delays): 18 ns
   Select to output (5 delays): 28 ns
   Enable to output: 20 ns
■ Low power: 40 μW quiescent supply power
■ Fanout of 10 LS-TTL devices
■ Input current maximum 1 μA, typical 10 pA

Ordering Code:

Order Number	Package Number	Package Description
MM74HC139M (Note 1)	M16A	16-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow
MM74HC139SJ	M16D	16-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide
MM74HC139MTC (Note 1)	MTC16	16-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide
MM74HC139N	N16E	16-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300" Wide

Note 1: Devices also available in Tape and Reel. Specify by appending the suffix letter "X" to the ordering code.

Connection Diagram
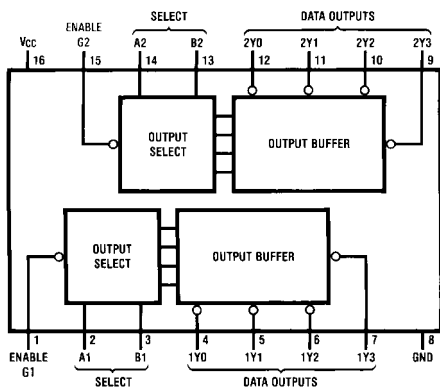
Truth Table

Inputs			Outputs			
Enable	Select					
G	B	A	Y0	Y1	Y2	Y3
H	X	X	H	H	H	H
L	L	L	L	H	H	H
L	L	H	H	L	H	H
L	H	L	H	H	L	H
L	H	H	H	H	H	L

H = HIGH Level
L = LOW Level
X = Don't Care

Logic Diagram
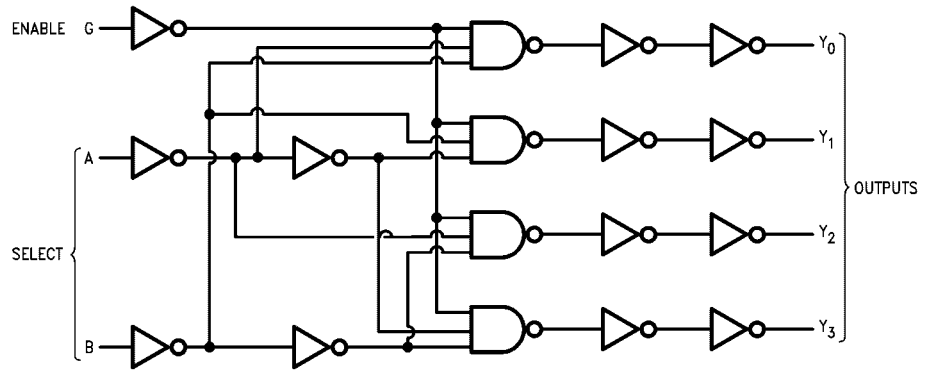
(1 of 2)

Absolute Maximum Ratings(Note 2)

(Note 3)

Supply Voltage (V_{CC})	−0.5 to +7.0V
DC Input Voltage (V_{IN})	−1.5 to V_{CC} +1.5V
DC Output Voltage (V_{OUT})	−0.5 to V_{CC} +0.5V
Clamp Diode Current (I_{IK}, I_{OK})	±20 mA
DC Output Current, per pin (I_{OUT})	±25 mA
DC V_{CC} or GND Current, per pin (I_{CC})	±50 mA
Storage Temperature Range (T_{STG})	−65°C to +150°C
Power Dissipation (P_D)	
(Note 4)	600 mW
S.O. Package only	500 mW
Lead Temperature (T_L)	
(Soldering 10 seconds)	260°C

Recommended Operating Conditions

	Min	Max	Units
Supply Voltage (V_{CC})	2	6	V
DC Input or Output Voltage (V_{IN}, V_{OUT})	0	V_{CC}	V
Operating Temperature Range (T_A)	−40	+85	°C
Input Rise or Fall Times			
(t_r, t_f) V_{CC} = 2.0V		1000	ns
V_{CC} = 4.5V		500	ns
V_{CC} = 6.0V		400	ns

Note 2: Absolute Maximum Ratings are those values beyond which damage to the device may occur.

Note 3: Unless otherwise specified all voltages are referenced to ground.

Note 4: Power Dissipation temperature derating — plastic "N" package: − 12 mW/°C from 65°C to 85°C.

DC Electrical Characteristics (Note 5)

Symbol	Parameter	Conditions	V_{CC}	T_A = 25°C Typ	T_A = 25°C Guaranteed Limits	T_A = −40 to 85°C	T_A = −55 to 125°C	Units
V_{IH}	Minimum HIGH Level Input Voltage		2.0V		1.5	1.5	1.5	
			4.5V		3.15	3.15	3.15	V
			6.0V		4.2	4.2	4.2	
V_{IL}	Maximum LOW Level Input Voltage		2.0V		0.5	0.5	0.5	
			4.5V		1.35	1.35	1.35	V
			6.0V		1.8	1.8	1.8	
V_{OH}	Minimum HIGH Level Output Voltage	$V_{IN} = V_{IH}$ or V_{IL} $|I_{OUT}| \leq 20\ \mu A$	2.0V	2.0	1.9	1.9	1.9	
			4.5V	4.5	4.4	4.4	4.4	
			6.0V	6.0	5.9	5.9	5.9	V
		$V_{IN} = V_{IH}$ or V_{IL} $|I_{OUT}| \leq 4.0$ mA	4.5V	4.2	3.98	3.84	3.7	
		$|I_{OUT}| \leq 5.2$ mA	6.0V	5.7	5.48	5.34	5.2	
V_{OL}	Maximum LOW Level Output Voltage	$V_{IN} = V_{IH}$ or V_{IL} $|I_{OUT}| \leq 20\ \mu A$	2.0V	0	0.1	0.1	0.1	
			4.5V	0	0.1	0.1	0.1	
			6.0V	0	0.1	0.1	0.1	V
		$V_{IN} = V_{IH}$ or V_{IL} $|I_{OUT}| \leq 4.0$ mA	4.5V	0.2	0.26	0.33	0.4	
		$|I_{OUT}| \leq 5.2$ mA	6.0V	0.2	0.26	0.33	0.4	
I_{IN}	Maximum Input Current	$V_{IN} = V_{CC}$ or GND	6.0V		±0.1	±1.0	±1.0	μA
I_{CC}	Maximum Quiescent Supply Current	$V_{IN} = V_{CC}$ or GND $I_{OUT} = 0\ \mu A$	6.0V		8.0	80	160	μA

Note 5: For a power supply of 5V ±10% the worst case output voltages (V_{OH}, and V_{OL}) occur for HC at 4.5V. Thus the 4.5V values should be used when designing with this supply. Worst case V_{IH} and V_{IL} occur at V_{CC} = 5.5V and 4.5V respectively. (The V_{IH} value at 5.5V is 3.85V.) The worst case leakage current (I_{IN}, I_{CC}, and I_{OZ}) occur for CMOS at the higher voltage and so the 6.0V values should be used.

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AC Electrical Characteristics

$V_{CC} = 5V$, $T_A = 25°C$, $C_L = 15$ pF, $t_r = t_f = 6$ ns

Symbol	Parameter	Conditions	Typ	Guaranteed Limit	Units
t_{PHL}, t_{PLH}	Maximum Propagation Delay, Binary Select to any Output 4 levels of delay		18	30	ns
t_{PHL}, t_{PLH}	Maximum Propagation Delay, Binary Select to any Output 5 levels of delay		28	38	ns
t_{PHL}, t_{PLH}	Maximum Propagation Delay, Enable to any Output		19	30	ns

AC Electrical Characteristics

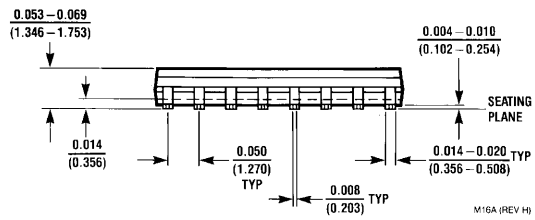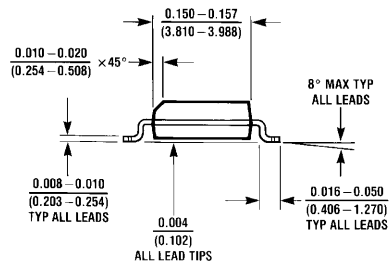$C_L = 50$ pF, $t_r = t_f = 6$ ns (unless otherwise specified)

Symbol	Parameter	Conditions	V_{CC}	$T_A = 25°C$ Typ	$T_A = 25°C$ Guaranteed Limits	$T_A = -40$ to $85°C$ Guaranteed Limits	$T_A = -55$ to $125°C$ Guaranteed Limits	Units
t_{PHL}, t_{PLH}	Maximum Propagation Delay Binary Select to any Output 4 levels of delay	(Note 6)	2.0V	110	175	219	254	
			4.5V	22	35	44	51	ns
			6.0V	18	30	38	44	
t_{PHL}, t_{PLH}	Maximum Propagation Delay Binary Select to any Output 5 levels of delay	(Note 7)	2.0V	165	220	275	320	
			4.5V	33	44	55	64	ns
			6.0V	28	38	47	54	
t_{PHL}, t_{PLH}	Maximum Propagation Delay Enable to any Output		2.0V	115	175	219	254	
			4.5V	23	35	44	51	ns
			6.0V	19	30	38	44	
t_{TLH}, t_{TLH}	Maximum Output Rise and Fall Time		2.0V	30	75	95	110	
			4.5V	8	15	19	22	ns
			6.0V	7	13	16	19	
C_{IN}	Maximum Input Capacitance			3	10	10	10	pF
C_{PD}	Power Dissipation Capacitance (Note 8)	(Note 8)		75				pF

Note 6: 4 levels of delay are A to Y1, Y3 and B to Y2, Y3.

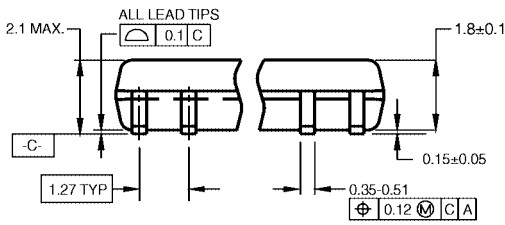**Note 7:** 5 levels of delay are A to Y0, Y2 and B to Y0, Y1.

Note 8: C_{PD} determines the no load dynamic power consumption, $P_D = C_{PD} V_{CC}^2 f + I_{CC} V_{CC}$, and the no load dynamic current consumption, $I_S = C_{PD} V_{CC} f + I_{CC}$.

Physical Dimensions inches (millimeters) unless otherwise noted

0.386 − 0.394
(9.804 − 10.00)

0.228 − 0.244
(5.791 − 6.198)

30°
TYP

LEAD NO.1
IDENT

0.010 MAX
(0.254)

0.150 − 0.157
(3.810 − 3.988)

0.010 − 0.020
(0.254 − 0.508)   × 45°

8° MAX TYP
ALL LEADS

0.008 − 0.010
(0.203 − 0.254)
TYP ALL LEADS

0.004
(0.102)
ALL LEAD TIPS

0.016 − 0.050
(0.406 − 1.270)
TYP ALL LEADS

0.053 − 0.069
(1.346 − 1.753)

0.004 − 0.010
(0.102 − 0.254)

SEATING
PLANE

0.014
(0.356)

0.050
(1.270)
TYP

0.008
(0.203)   TYP

0.014 − 0.020
(0.356 − 0.508)   TYP

M16A (REV H)

16-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow
Package Number M16A

Physical Dimensions inches (millimeters) unless otherwise noted (Continued)

10.2±0.1
-A-

0.47 TYP

16   9

7.8

3.9

5.3±0.1
-B-

0.2 C B A
ALL LEAD TIPS

PIN #1 IDENT.   1   8

LAND PATTERN RECOMMENDATION

16   15   10   9

5.01 TYP

9.27 TYP

(2.13 TYP)

1   2   7   8

1.27 TYP   0.6 TYP

ALL LEAD TIPS
2.1 MAX.   0.1 C

-C-

1.27 TYP

1.8±0.1

0.15±0.05

0.35-0.51
0.12 M C A

DIMENSIONS ARE IN MILLIMETERS

SEE DETAIL A

0.15-0.25

7° TYP

GAGE PLANE
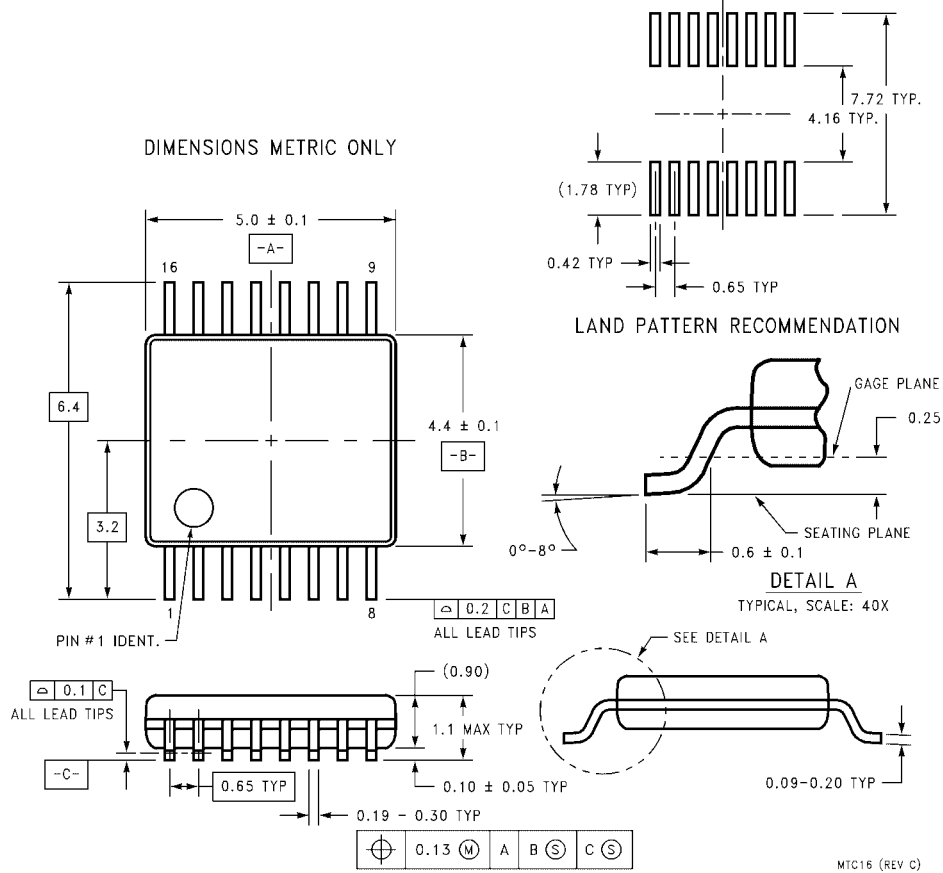
0°-8° TYP

0.25

0.60±0.15

1.25

SEATING PLANE

DETAIL A

NOTES:
A. CONFORMS TO EIAJ EDR-7320 REGISTRATION, ESTABLISHED IN DECEMBER, 1998.
B. DIMENSIONS ARE IN MILLIMETERS.
C. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.

M16DRevB1

16-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide
Package Number M16D

Physical Dimensions inches (millimeters) unless otherwise noted (Continued)

DIMENSIONS METRIC ONLY

LAND PATTERN RECOMMENDATION

7.72 TYP.

4.16 TYP.

(1.78 TYP)

0.42 TYP

0.65 TYP

5.0 ± 0.1

-A-

16   9

6.4

4.4 ± 0.1

-B-

3.2

1   8

◬ 0.2 C B A
ALL LEAD TIPS

PIN #1 IDENT.

◬ 0.1 C
ALL LEAD TIPS

-C-

0.65 TYP

0.19 – 0.30 TYP

(0.90)

1.1 MAX TYP

0.10 ± 0.05 TYP

⊕ 0.13 Ⓜ A B Ⓢ C Ⓢ

GAGE PLANE

0.25

0°–8°

SEATING PLANE

0.6 ± 0.1

DETAIL A
TYPICAL, SCALE: 40X

SEE DETAIL A

0.09–0.20 TYP

MTC16 (REV C)

16-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide
Package Number MTC16

Physical Dimensions inches (millimeters) unless otherwise noted (Continued)
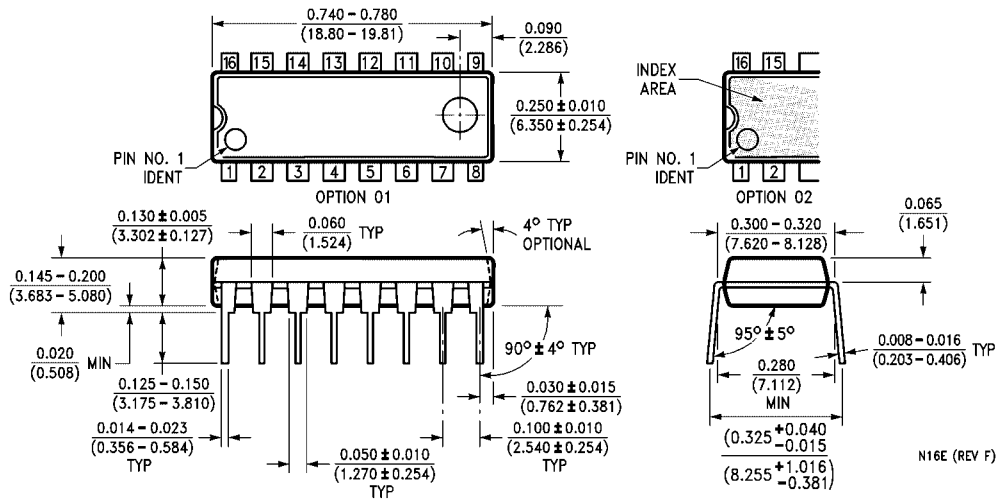
16-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300" Wide
Package Number N16E

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2. A critical component in any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

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