

# TC7MH139FK

## Dual 2 - To - 4 Line Decoder

The TC7MH139 is an advanced high speed CMOS 2 to 4 LINE DECODER / DEMULTIPLEXER fabricated with silicon gate C<sup>2</sup>MOS technology.

It achieves the high speed operation similar to equivalent Bipolar Schottky TTL while maintaining the CMOS low power dissipation.

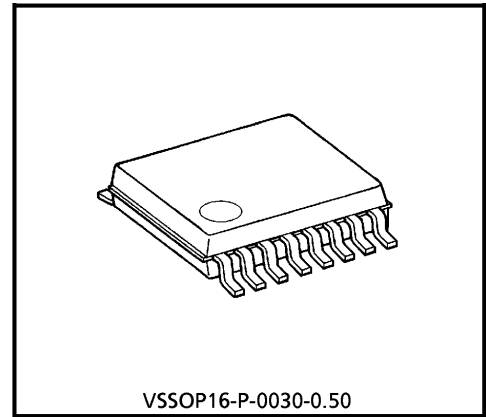
The active low enable input can be used for gating or it can be used as a data input for demultiplexing applications.

When the enable input is held High, all four outputs are fixed at a high logic level independent of the other inputs.

An input protection circuit ensures that 0 to 7V can be applied to the input pins without regard to the supply voltage. This device can be used to interface 5V to 3V systems and two supply systems such as battery back up. This circuit prevents device destruction due to mismatched supply and input voltages.

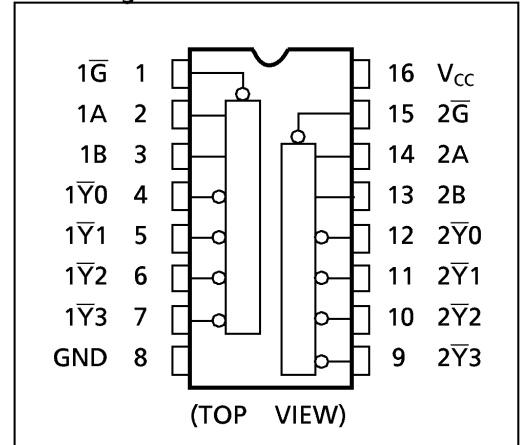
### Features:

- High Speed..... $t_{pd} = 5.0ns(\text{typ.})$  at  $V_{CC} = 5V$
- Low Power Dissipation..... $I_{CC} = 4\mu A(\text{max})$  at  $T_a = 25^\circ C$
- High Noise Immunity..... $V_{NIH} = V_{NIL} = 28\% V_{CC}$  (min)
- Power Down Protection is provided on all inputs.
- Balanced Propagation Delays..... $t_{pLH} \approx t_{pHL}$
- Wide Operating Voltage Range..... $V_{CC}(\text{opr}) = 2V \sim 5.5V$
- Pin and Function Compatible with 74ALS139

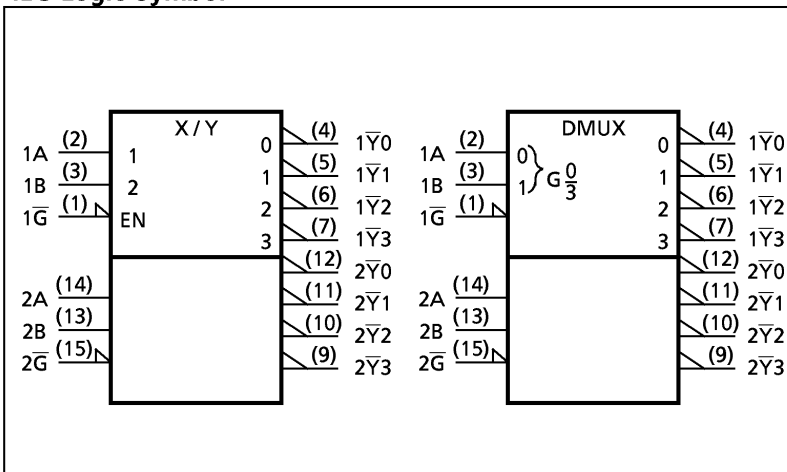


Weight: 0.02g (Typ.)

### Pin Assignment



### IEC Logic Symbol



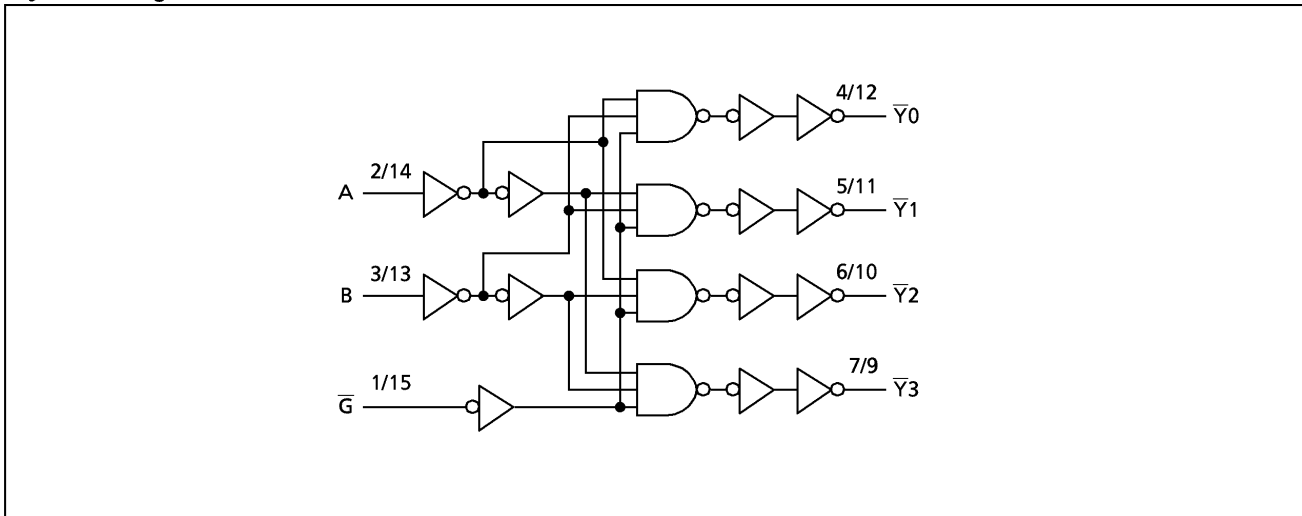
INPUTS		OUTPUTS				SELECTED OUTPUT
ENABLE	SELECT	$\bar{Y}0$	$\bar{Y}1$	$\bar{Y}2$	$\bar{Y}3$	
$\bar{G}$	B A					
H	X X	H	H	H	H	NONE
L	L L	L	H	H	H	$\bar{Y}0$
L	L H	H	L	H	H	$\bar{Y}1$
L	H L	H	H	L	H	$\bar{Y}2$
L	H H	H	H	H	L	$\bar{Y}3$

X: Don't Care

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System Diagram



Absolute Maximum Ratings

PARAMETER	SYMBOL	VALUE	UNIT
Supply Voltage Range	$V_{CC}$	- 0.5~7.0	V
DC Input Voltage	$V_{IN}$	- 0.5~7.0	V
DC Output Voltage	$V_{OUT}$	- 0.5~ $V_{CC} + 0.5$	V
Input Diode Current	$I_{IK}$	- 20	mA
Output Diode Current	$I_{OK}$	$\pm 20$	mA
DC Output Current	$I_{OUT}$	$\pm 25$	mA
DC $V_{CC}$ /Ground Current	$I_{CC}$	$\pm 75$	mA
Power Dissipation	$P_D$	180	mW
Storage Temperature	$T_{stg}$	- 65~150	$^{\circ}C$

Recommended Operating Conditions

PARAMETER	SYMBOL	VALUE	UNIT
Supply Voltage	$V_{CC}$	2.0~5.5	V
Input Voltage	$V_{IN}$	0~5.5	V
Output Voltage	$V_{OUT}$	0~ $V_{CC}$	V
Operating Temperature	$T_{opr}$	- 40~85	$^{\circ}C$
Input Rise and Fall Time	dt / dv	0~100 ( $V_{CC} = 3.3 \pm 0.3V$ ) 0~20 ( $V_{CC} = 5 \pm 0.5V$ )	ns / V

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## DC Electrical Characteristics

PARAMETER	SYMBOL	TEST CONDITION		V <sub>CC</sub> (V)	Ta = 25°C			Ta = -40~85°C		UNIT
					Min	Typ.	Max	Min	Max	
High - Level Input Voltage	V <sub>IH</sub>			2.0 3.0~ 5.5	1.50 V <sub>CC</sub> × 0.7	— —	— —	1.50 V <sub>CC</sub> × 0.7	— —	V
Low - Level Input Voltage	V <sub>IL</sub>			2.0 3.0~ 5.5	— —	— —	0.50 V <sub>CC</sub> × 0.3	— —	0.50 V <sub>CC</sub> × 0.3	V
High - Level Output Voltage	V <sub>OH</sub>	V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub>	I <sub>OH</sub> = -50μA	2.0 3.0 4.5	1.9 2.9 4.4	2.0 3.0 4.5	— — —	1.9 2.9 4.4	— — —	V
			I <sub>OH</sub> = -4mA I <sub>OH</sub> = -8mA	3.0 4.5	2.58 3.94	— —	— —	2.48 3.80	— —	
Low - Level Output Voltage	V <sub>OL</sub>	V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub>	I <sub>OL</sub> = 50μA	2.0 3.0 4.5	— — —	0.0 0.0 0.0	0.1 0.1 0.1	— — —	0.1 0.1 0.1	V
			I <sub>OL</sub> = 4mA I <sub>OL</sub> = 8mA	3.0 4.5	— —	— —	0.36 0.36	— —	0.44 0.44	
Input Leakage Current	I <sub>IN</sub>	V <sub>IN</sub> = 5.5V or GND		0~5.5	—	—	±0.1	—	±1.0	μA
Quiescent Supply Current	I <sub>CC</sub>	V <sub>IN</sub> = V <sub>CC</sub> or GND		5.5	—	—	4.0	—	40.0	

AC Electrical Characteristics (Input t<sub>r</sub> = t<sub>f</sub> = 3ns)

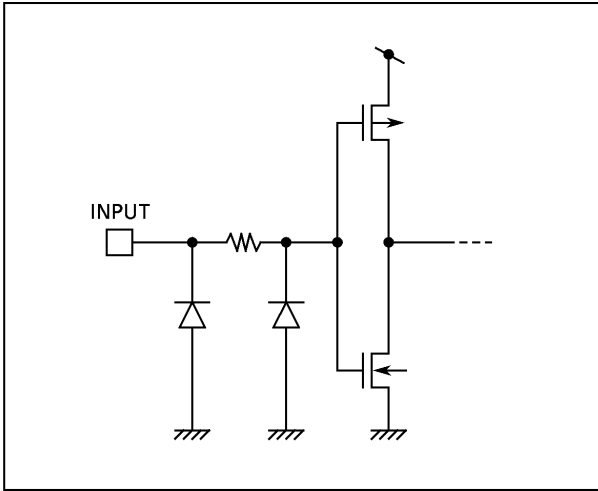
PARAMETER	SYMBOL	TEST CONDITION		V <sub>CC</sub> (V)	CL (pF)	Ta = 25°C			Ta = -40~85°C		UNIT		
						Min	Typ.	Max	Min	Max			
Propagation Delay Time (A, B - $\bar{Y}$ )	t <sub>pLH</sub> t <sub>pHL</sub>			3.3 ± 0.3	15	—	7.2	11.0	1.0	13.0	ns		
						—	9.7	14.5	1.0	16.5			
						5.0 ± 0.5	15	—	5.0	7.2		1.0	8.5
							50	—	6.5	9.2		1.0	10.5
Propagation Delay Time ( $\bar{G}$ - $\bar{Y}$ )	t <sub>pLH</sub> t <sub>pHL</sub>			3.3 ± 0.3	15	—	6.4	9.2	1.0	11.0	ns		
						—	8.9	12.7	1.0	14.5			
						5.0 ± 0.5	15	—	4.4	6.3		1.0	7.5
							50	—	5.9	8.3		1.0	9.5
Input Capacitance	C <sub>IN</sub>					—	4	10	—	10	pF		
Power Dissipation Capacitance	C <sub>PD</sub>	(Note 1)				—	26	—	—	—			

(Note 1): C<sub>PD</sub> is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

Average operating current can be obtained by the equation:

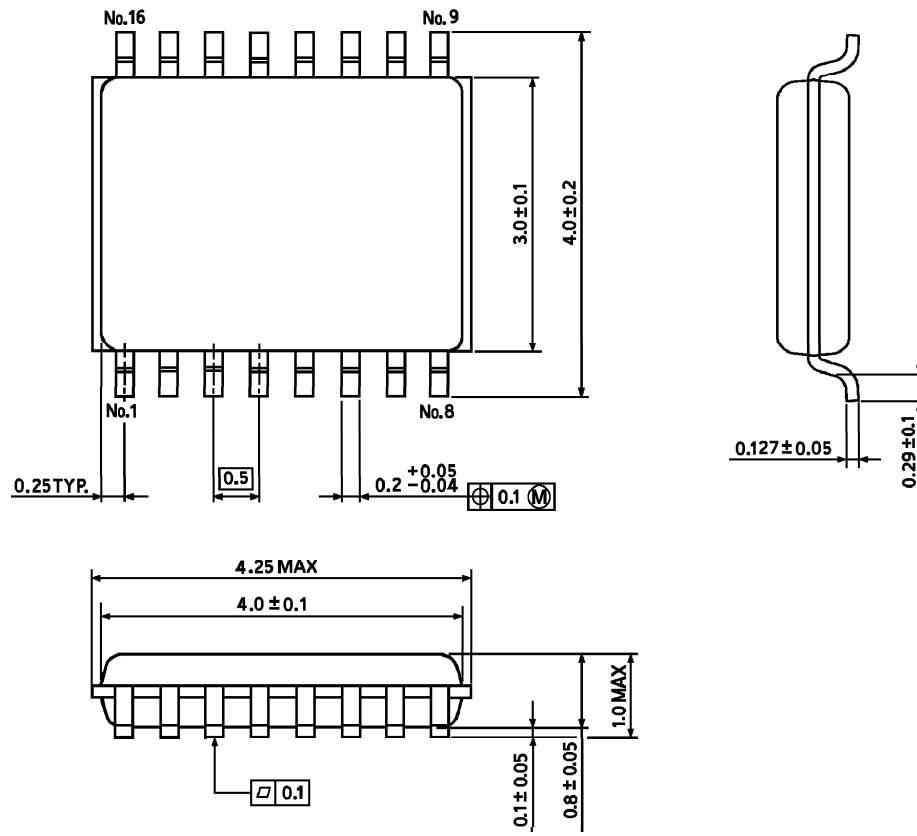
$$I_{CC(\text{opr.})} = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC} / 2 \text{ (per decoder)}$$

Input Equivalent Circuit



Outline Drawing  
VSSOP16-P-0030-0.50

Unit: mm



Weight: 0.02g (Typ.)