

TC74VHC139F, TC74VHC139FN, TC74VHC139FS, TC74VHC139FT

DUAL 2-TO-4 LINE DECODER

The TC74VHC139 is an advanced high speed CMOS 2 to 4 LINE DECODER / DEMULTIPLEXER fabricated with silicon gate C²MOS technology.

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

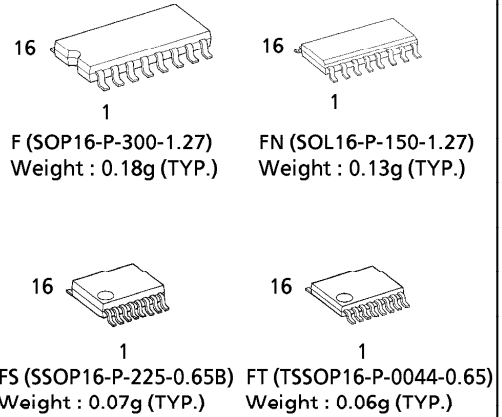
The active low enable input can be used for gating or it can be used as a data input for demultiplexing applications.

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

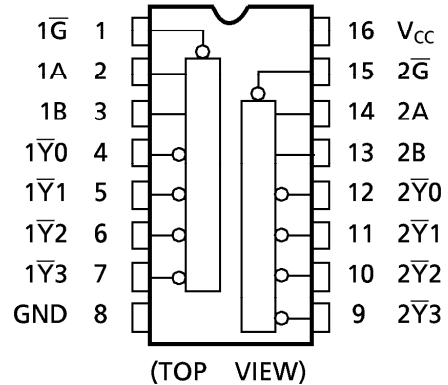
An input protection circuit ensures that 0 to 7V can be applied to the input pins without regard to the supply voltage. This device can be used to interface 5V to 3V systems and two supply systems such as battery back up. This circuit prevents device destruction due to mismatched supply and input voltages.

FEATURES :

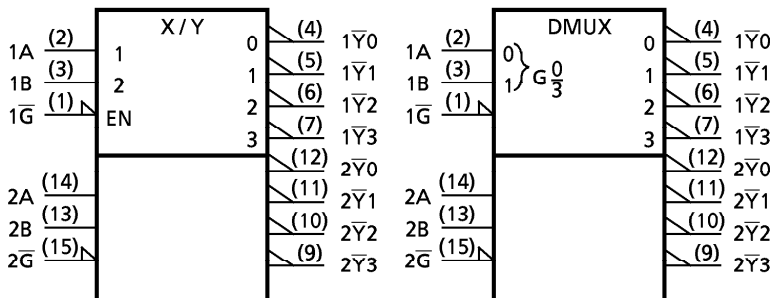
- High Speed..... $t_{pd} = 5.0ns(typ.)$ at $V_{CC} = 5V$
- Low Power Dissipation..... $I_{CC} = 4\mu A(Max.)$ at $T_a = 25^{\circ}C$
- High Noise Immunity..... $V_{NIH} = V_{NIL} = 28\% V_{CC} (Min.)$
- Power Down Protection is provided on all inputs.
- Balanced Propagation Delays..... $t_{pLH} \approx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



PIN ASSIGNMENT



IEC LOGIC SYMBOL



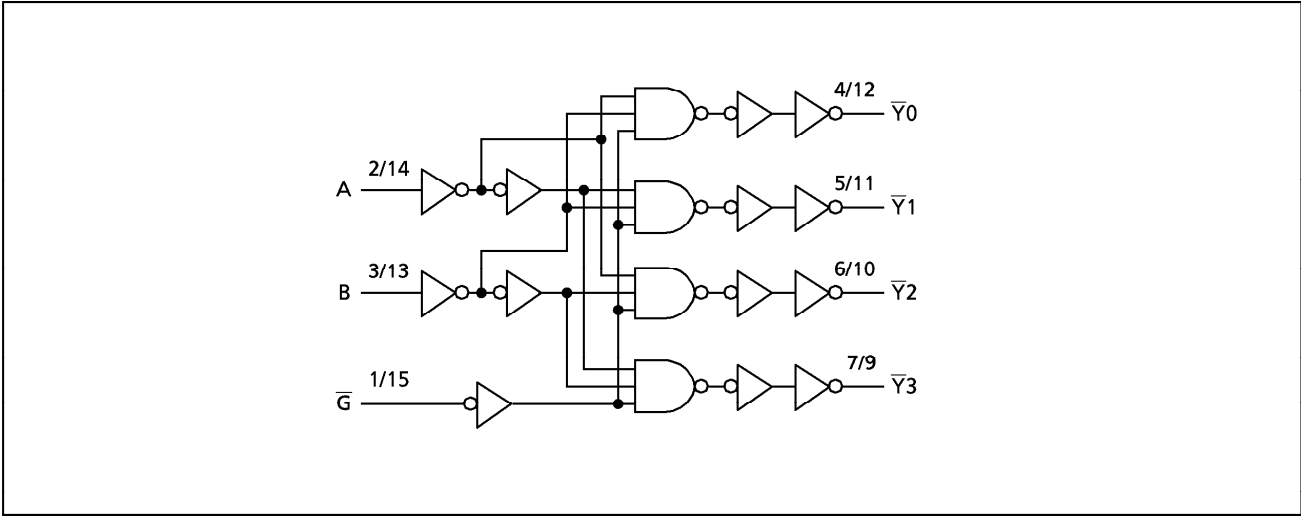
INPUTS			OUTPUTS				SELECTED OUTPUT
ENABLE	SELECT		Y0	Y1	Y2	Y3	
$\overline{G}$	B	A					
H	X	X	H	H	H	H	NONE
L	L	L	L	H	H	H	$\overline{Y0}$
L	L	H	H	L	H	H	$\overline{Y1}$
L	H	L	H	H	L	H	$\overline{Y2}$
L	H	H	H	H	H	L	$\overline{Y3}$

X : Don't Care

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SYSTEM DIAGRAM



ABSOLUTE MAXIMUM RATINGS

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

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}	$-40 \sim 85$	$^{\circ}\text{C}$
Input Rise and Fall Time	dt/dv	0~100 ($V_{CC} = 3.3 \pm 0.3\text{V}$) 0~20 ($V_{CC} = 5 \pm 0.5\text{V}$)	ns/V

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DC ELECTRICAL CHARACTERISTICS

PARAMETER	SYMBOL	TEST CONDITION	V _{CC} (V)	Ta = 25°C			Ta = -40~85°C		UNIT
				MIN.	TYP.	MAX.	MIN.	MAX.	
High - Level Input Voltage	V _{IH}		2.0 3.0~5.5	1.50 V _{CC} × 0.7	— —	— —	1.50 V _{CC} × 0.7	— —	V
Low - Level Input Voltage	V _{IL}		2.0 3.0~5.5	— —	— —	0.50 V _{CC} × 0.3	— —	0.50 V _{CC} × 0.3	V
High - Level Output Voltage	V _{OH}	V _{IN} = V _{IH} or V _{IL}	I _{OH} = -50 μA	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 _{OH} = -4mA	3.0	2.58	—	—	2.48	
			I _{OH} = -8mA	4.5	3.94	—	—	3.80	
Low - Level Output Voltage	V _{OL}	V _{IN} = V _{IH} or V _{IL}	I _{OL} = 50 μA	2.0 3.0 4.5	— — —	0.0 0.0 0.0	— — —	0.1 0.1 0.1	V
			I _{OL} = 4mA	3.0	—	—	—	0.44	
			I _{OL} = 8mA	4.5	—	—	—	0.44	
Input Leakage Current	I _{IN}	V _{IN} = 5.5V or GND	0~5.5	—	—	± 0.1	—	± 1.0	μA
Quiescent Supply Current	I _{CC}	V _{IN} = V _{CC} or GND	5.5	—	—	4.0	—	40.0	

AC ELECTRICAL CHARACTERISTICS (Input t_r = t_f = 3ns)

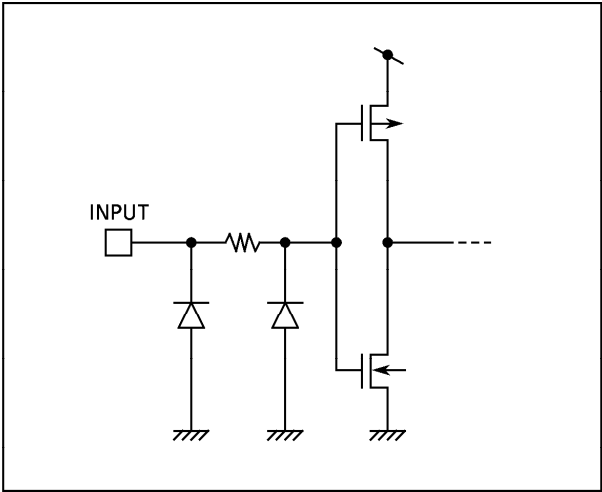
PARAMETER	SYMBOL	TEST CONDITION		Ta = 25°C			Ta = − 40~85°C		UNIT	
			V _{CC} (V)	CL (pF)	MIN.	TYP.	MAX.	MIN.		MAX.
Propagation Delay Time (A,B - $\bar{Y}$)	t_{pLH} t_{pHL}		3.3 ± 0.3	15	—	7.2	11.0	1.0	13.0	ns
				50	—	9.7	14.5	1.0	16.5	
			5.0 ± 0.5	15	—	5.0	7.2	1.0	8.5	
				50	—	6.5	9.2	1.0	10.5	
Propagation Delay Time ($\bar{G}$ - $\bar{Y}$)	t_{pLH} t_{pHL}		3.3 ± 0.3	15	—	6.4	9.2	1.0	11.0	
				50	—	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 _{I N}				—	4	10	—	10	pF
Power Dissipation Capacitance	C _{PD}	(Note 1)			—	26	—	—	—	

Note (1) C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

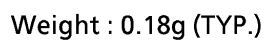
Average operating current can be obtained by the equation :

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

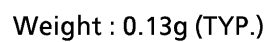
INPUT EQUIVALENT CIRCUIT



Unit in mm

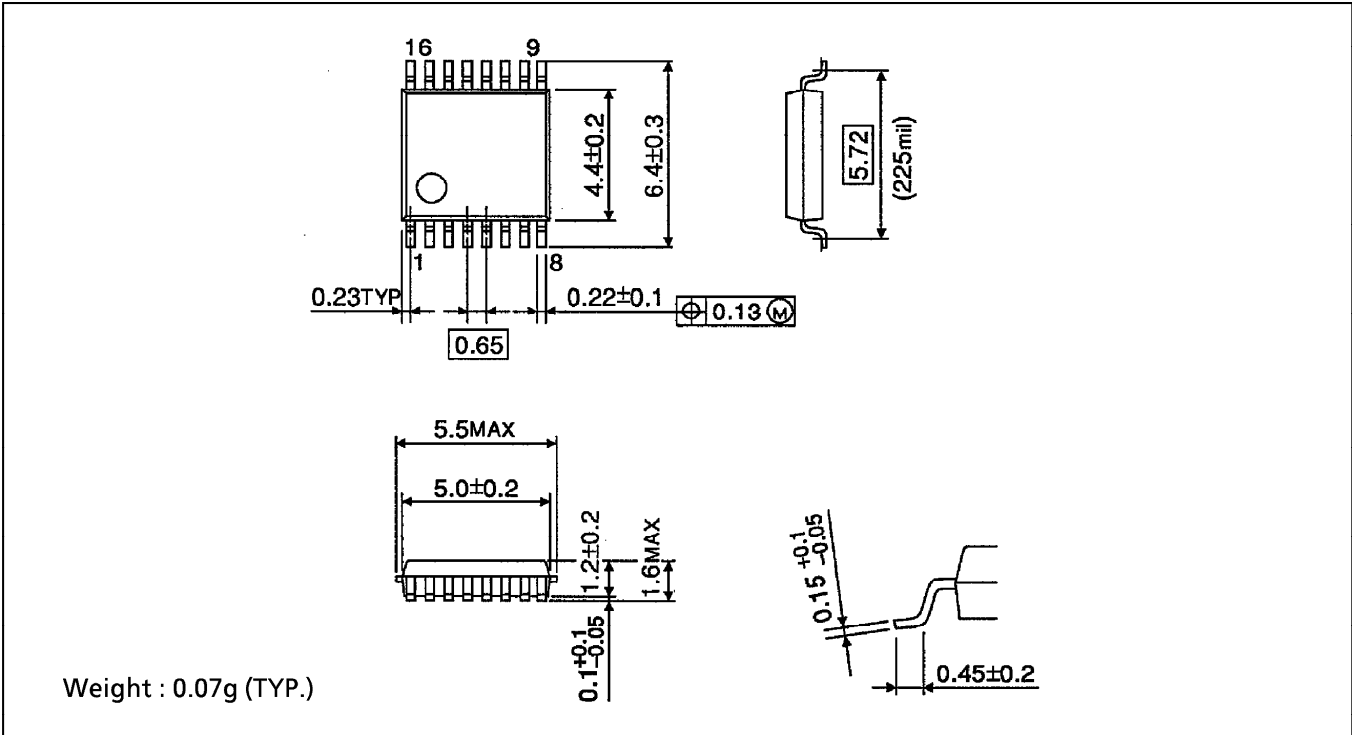


Unit in mm



SSOP 16PIN OUTLINE DRAWING (SSOP16-P-225-0.65B)

Unit in mm



TSSOP 16PIN OUTLINE DRAWING (TSSOP16-P-0044-0.65)

Unit in mm

