

**DUAL 2-TO-4 LINE DECODER**

The TC74AC139 is an advanced high speed CMOS 2-to-4 LINE DECODER fabricated with silicon gate and double-layer metal wiring 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.

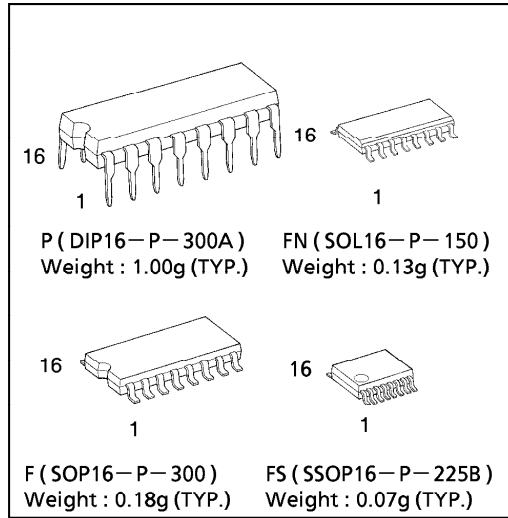
The active low enable input can be used for gating or it can be used as a data input for demultiplexing applications.

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

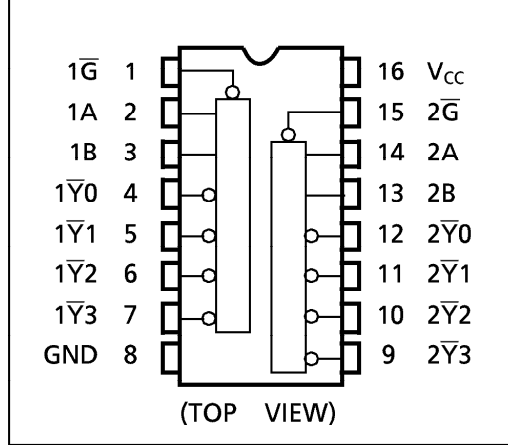
All inputs are equipped with protection circuits against static discharge or transient excess voltage.

**FEATURES:**

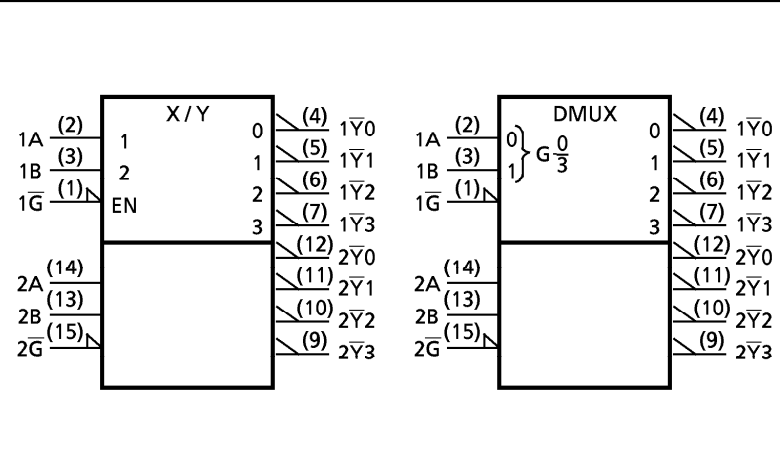
- High Speed..... $t_{pd} = 5.9\text{ns}(\text{typ.})$  at  $V_{CC} = 5\text{V}$
- Low Power Dissipation..... $I_{CC} = 8\mu\text{A}(\text{Max.})$  at  $T_a = 25^\circ\text{C}$
- High Noise Immunity..... $V_{NIH} = V_{NIL} = 28\% V_{CC}(\text{Min.})$
- Symmetrical Output Impedance...  $|I_{OH}| = I_{OL} = 24\text{mA}(\text{Min.})$   
Capability of driving 50Ω transmission lines.
- Balanced Propagation Delays..... $t_{pLH} \approx t_{pHL}$
- Wide Operating Voltage Range....  $V_{CC}(\text{opr}) = 2\text{V} \sim 5.5\text{V}$
- Pin and Function Compatible with 74F139



**PIN ASSIGNMENT**



**IEC LOGIC SYMBOL**



**TRUTH TABLE**

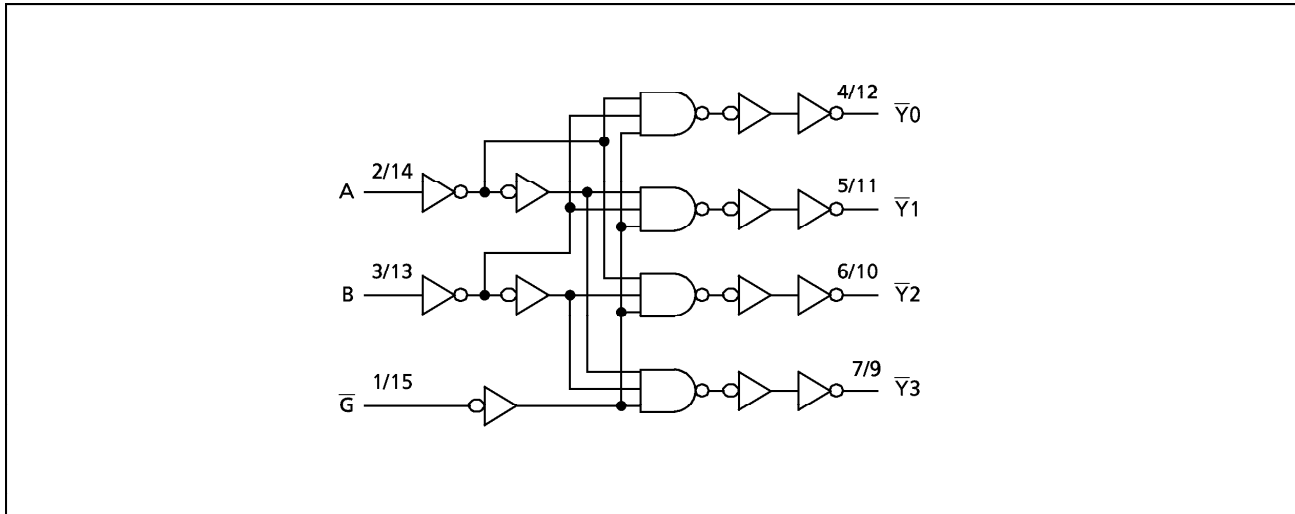
INPUTS		OUTPUTS				SELECTED OUTPUT
ENABLE	SELECT	$\bar{Y}_0$	$\bar{Y}_1$	$\bar{Y}_2$	$\bar{Y}_3$	
$\bar{G}$	B A					
H	X X	H	H	H	H	NONE
L	L L	L	H	H	H	$\bar{Y}_0$
L	L H	H	L	H	H	$\bar{Y}_1$
L	H L	H	H	L	H	$\bar{Y}_2$
L	H H	H	H	H	L	$\bar{Y}_3$

X : Don't Care

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**SYSTEM DIAGRAM**



**ABSOLUTE MAXIMUM RATINGS**

PARAMETER	SYMBOL	VALUE	UNIT
Supply Voltage Range	$V_{CC}$	$-0.5 \sim 7.0$	V
DC Input Voltage	$V_{IN}$	$-0.5 \sim V_{CC} + 0.5$	V
DC Output Voltage	$V_{OUT}$	$-0.5 \sim V_{CC} + 0.5$	V
Input Diode Current	$I_{IK}$	$\pm 20$	mA
Output Diode Current	$I_{OK}$	$\pm 50$	mA
DC Output Current	$I_{OUT}$	$\pm 50$	mA
DC $V_{CC}$ /Ground Current	$I_{CC}$	$\pm 200$	mA
Power Dissipation	$P_D$	500 (DIP)* / 180 (SOP/SSOP)	mW
Storage Temperature	$T_{stg}$	$-65 \sim 150$	$^{\circ}C$

\*500mW in the range of  $T_a = -40^{\circ}C \sim 65^{\circ}C$ . From  $T_a = 65^{\circ}C$  to  $85^{\circ}C$  a derating factor of  $-10mW/^{\circ}C$  should be applied up to 300mW.

**RECOMMENDED OPERATING CONDITIONS**

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

**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	1.50	—	—	1.50	—	V	
			3.0	2.10	—	—	2.10	—		
			5.5	3.85	—	—	3.85	—		
Low - Level Input Voltage	V <sub>IL</sub>		2.0	—	—	0.50	—	0.50	V	
			3.0	—	—	0.90	—	0.90		
			5.5	—	—	1.65	—	1.65		
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	1.9	2.0	—	1.9	—	V
				3.0	2.9	3.0	—	2.9	—	
				4.5	4.4	4.5	—	4.4	—	
				3.0	2.58	—	—	2.48	—	
				4.5	3.94	—	—	3.80	—	
5.5	—	—	—	3.85	—					
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	—	0.0	0.1	—	0.1	V
				3.0	—	0.0	0.1	—	0.1	
				4.5	—	0.0	0.1	—	0.1	
				3.0	—	—	0.36	—	0.44	
				4.5	—	—	0.36	—	0.44	
5.5	—	—	—	—	1.65					
Input Leakage Current	I <sub>IN</sub>	V <sub>IN</sub> = V <sub>CC</sub> or GND	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	—	—	8.0	—	80.0		

\* : This spec indicates the capability of driving 50Ω transmission lines.  
One output should be tested at a time for a 10ms maximum duration.

**AC ELECTRICAL CHARACTERISTICS (C<sub>L</sub> = 50pF, R<sub>L</sub> = 500Ω, Input t<sub>r</sub> = t<sub>f</sub> = 3ns)**

PARAMETER	SYMBOL	TEST CONDITION	V <sub>CC</sub> (V)	Ta = 25°C			Ta = -40~85°C		UNIT
				MIN.	TYP.	MAX.	MIN.	MAX.	
Propagation Delay Time (A, B-ȳ)	t <sub>pLH</sub> t <sub>pHL</sub>		3.3 ± 0.3	—	8.2	13.9	1.0	16.0	ns
			5.0 ± 0.5	—	6.2	9.0	1.0	10.3	
Propagation Delay Time (ȳ-ȳ)	t <sub>pLH</sub> t <sub>pHL</sub>		3.3 ± 0.3	—	7.6	12.9	1.0	14.8	ns
			5.0 ± 0.5	—	5.8	8.5	1.0	9.6	
Input Capacitance	C <sub>IN</sub>			—	5	10	—	10	pF
Power Dissipation Capacitance	C <sub>PD</sub> (1)			—	110	—	—	—	

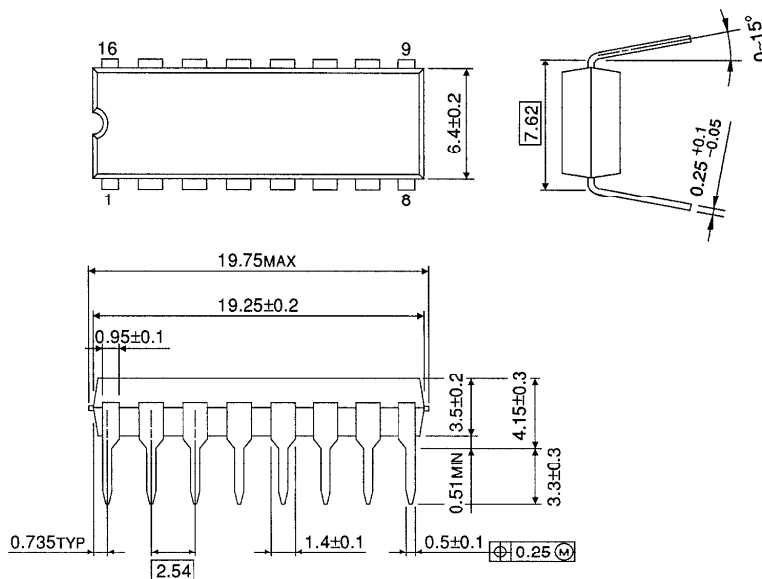
Note (1) C<sub>PD</sub> is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

Average operating current can be obtained by the equation :

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

**DIP 16PIN OUTLINE DRAWING (DIP16-P-300A)**

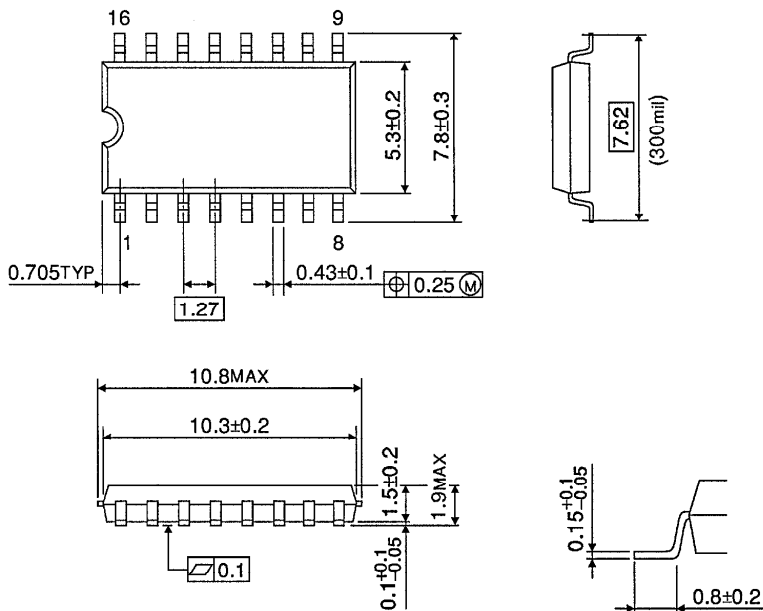
Unit in mm



Weight : 1.00g (TYP.)

**SOP 16PIN (200mil BODY) OUTLINE DRAWING (SOP16-P-300)**

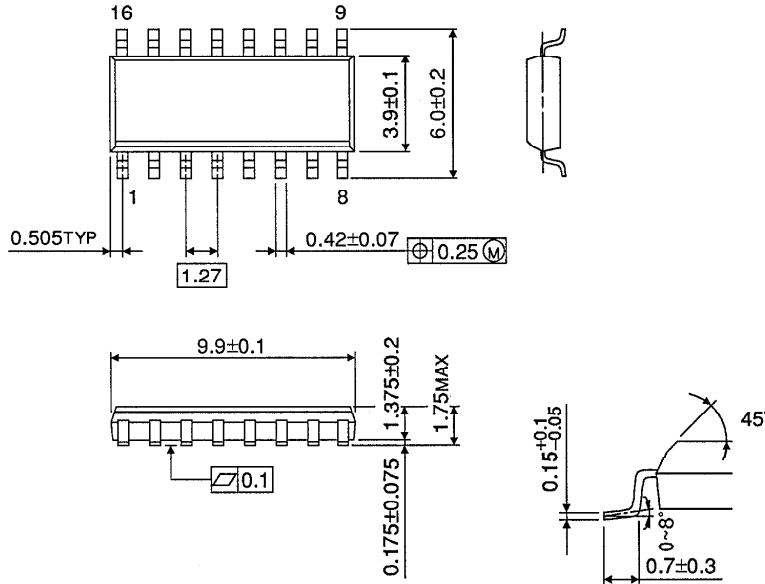
Unit in mm



Weight : 0.18g (TYP.)

**SOP 16PIN (150mil BODY) OUTLINE DRAWING (SOL16-P-150)**

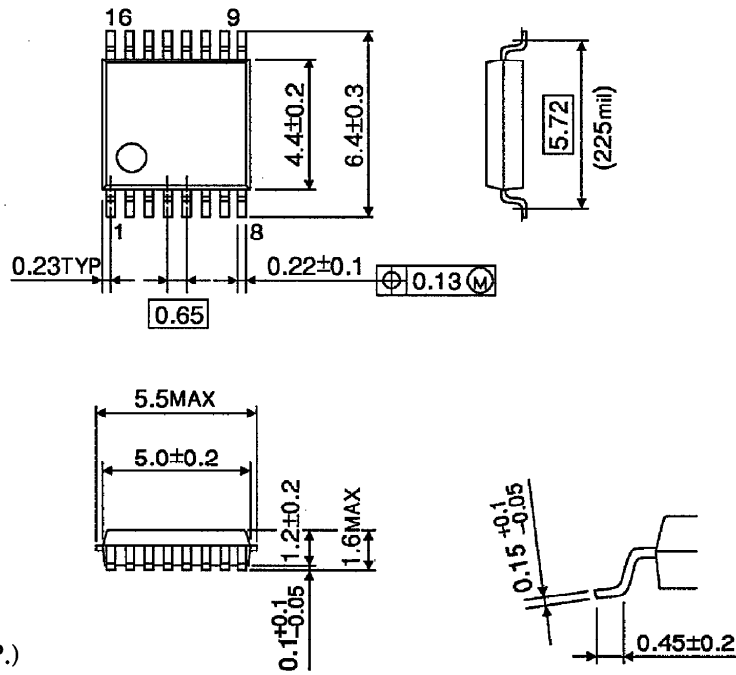
Unit in mm



Weight : 0.13g (TYP.)

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

Unit in mm



Weight : 0.07g (TYP.)