

TOSHIBA CMOS DIGITAL INTEGRATED CIRCUIT SILICON MONOLITHIC

**TC74ACT139P, TC74ACT139F, TC74ACT139FN, TC74ACT139FT**

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

The TC74ACT139 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.

This device may be used as a level converter for interfacing TTL or NMOS to High Speed CMOS. The inputs are compatible with TTL, NMOS and CMOS output voltage levels.

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

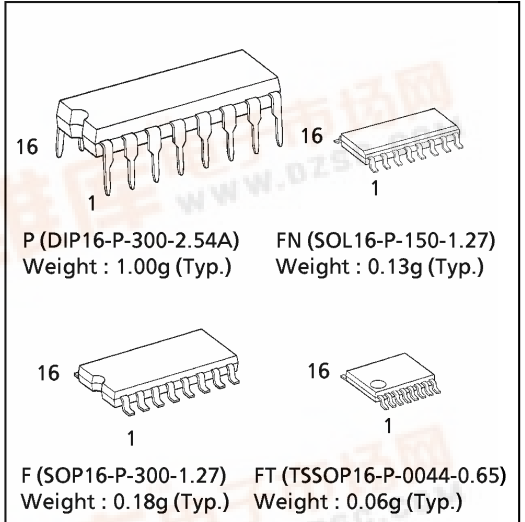
When the enable input is held "H", all four outputs are fixed at a high logic level independent of the other inputs.

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

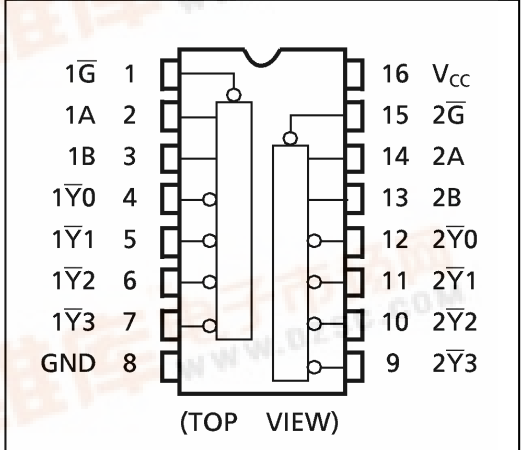
**FEATURES:**

- High Speed..... $t_{pd} = 5.5ns$ (typ.) at  $V_{CC} = 5V$
- Low Power Dissipation..... $I_{CC} = 8\mu A$ (Max.) at  $T_a = 25^\circ C$
- Compatible with TTL outputs ...  $V_{IL} = 0.8V$  (Max.)  
 $V_{IH} = 2.0V$  (Min.)
- Symmetrical Output Impedance...  $|I_{OH}| = I_{OL} = 24mA$ (Min.)  
Capability of driving  $50\Omega$  transmission lines.
- Balanced Propagation Delays..... $t_{pLH} \approx t_{pHL}$
- Pin and Function Compatible with 74F139

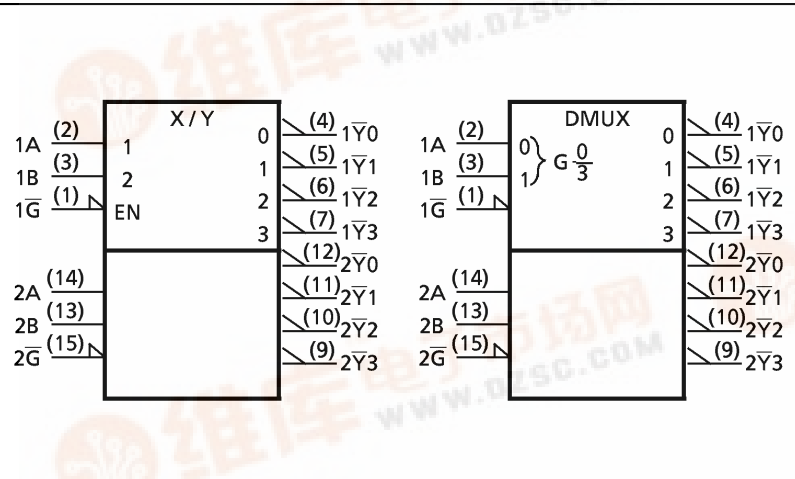
(Note) The JEDEC SOP (FN) is not available in Japan.



**PIN ASSIGNMENT**



**IEC LOGIC SYMBOL**

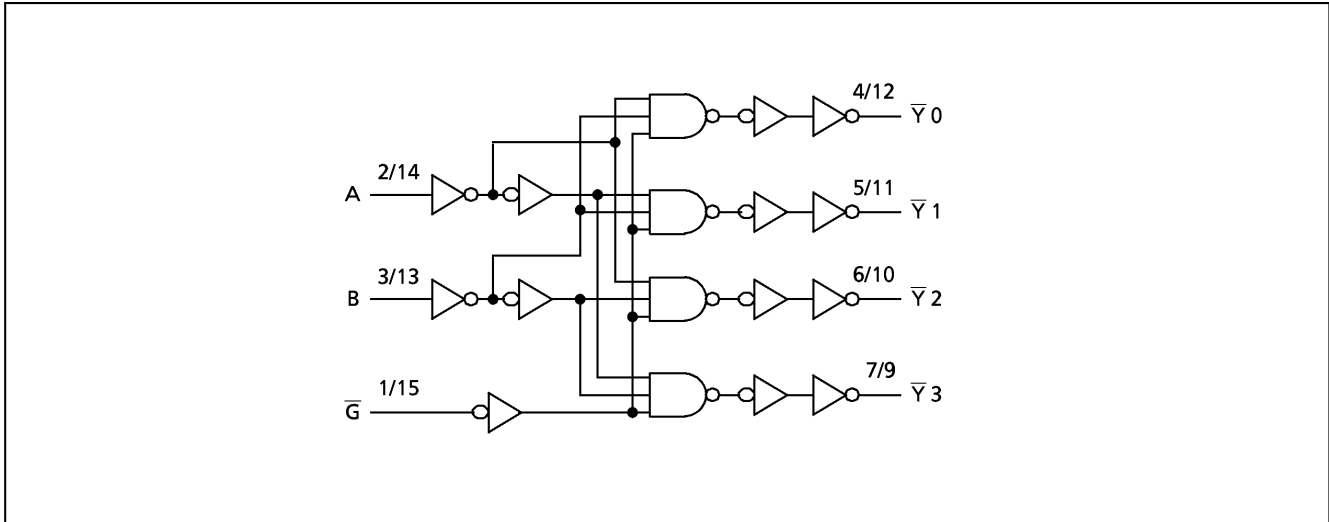


**TRUTH TABLE**

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

**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~ $V_{CC} + 0.5$	V
DC Output Voltage	$V_{OUT}$	- 0.5~ $V_{CC} + 0.5$	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/TSSOP)	mW
Storage Temperature	$T_{stg}$	- 65~150	$^{\circ}C$

\*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	$V_{CC}$	4.5~5.5	V
Input Voltage	$V_{IN}$	0~ $V_{CC}$	V
Output Voltage	$V_{OUT}$	0~ $V_{CC}$	V
Operating Temperature	$T_{opr}$	- 40~85	$^{\circ}C$
Input Rise and Fall Time	dt / dV	0~10	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>		4.5 } 5.5	2.0	—	—	2.0	—	V	
Low - Level Input Voltage	V <sub>IL</sub>		4.5 } 5.5	—	—	0.8	—	0.8	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	4.5	4.4	4.5	—	4.4	—	V
			I <sub>OH</sub> = -24mA	4.5	3.94	—	—	3.80	—	
			I <sub>OH</sub> = -75mA*	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	4.5	—	0.0	0.1	—	0.1	V
			I <sub>OL</sub> = 24mA	4.5	—	—	0.36	—	0.44	
			I <sub>OL</sub> = 75mA*	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		
		I <sub>C</sub>	PER INPUT : V <sub>IN</sub> = 3.4V OTHER INPUT : V <sub>CC</sub> or GND	5.5	—	—	1.35	—	1.5	mA

\* : 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 - $\bar{Y}$ )	t <sub>pLH</sub> t <sub>pHL</sub>		5.0 ± 0.5	—	6.2	9.2	1.0	10.5	ns
				—	6.3	9.6	1.0	11.0	
Propagation Delay Time ( $\bar{G}$ - $\bar{Y}$ )	t <sub>pLH</sub> t <sub>pHL</sub>		5.0 ± 0.5	—	6.3	9.6	1.0	11.0	pF
Input Capacitance	C <sub>IN</sub>			—	5	10	—	10	
Power Dissipation Capacitance	C <sub>PD</sub> (1)			—	51	—	—	—	

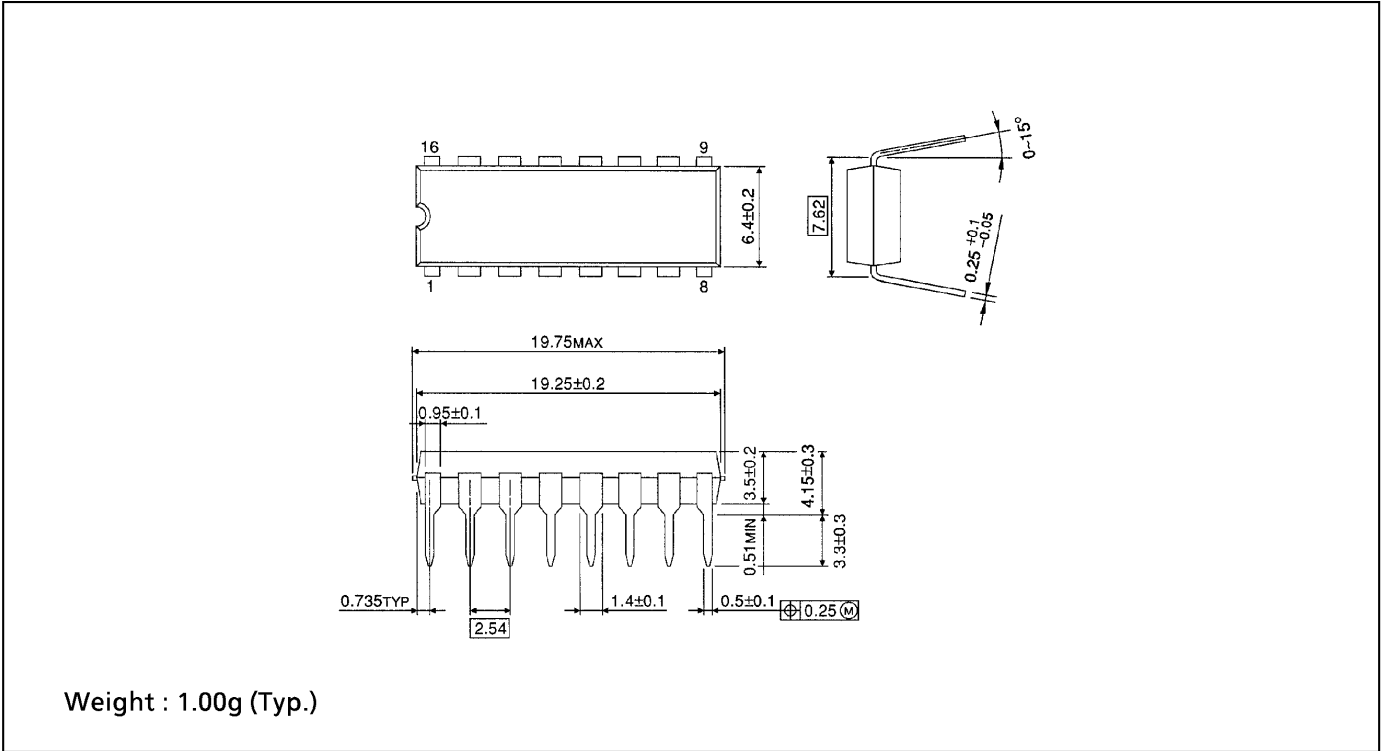
Note (1) C<sub>PD</sub> is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

Average operating current can be obtained by the equation :

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

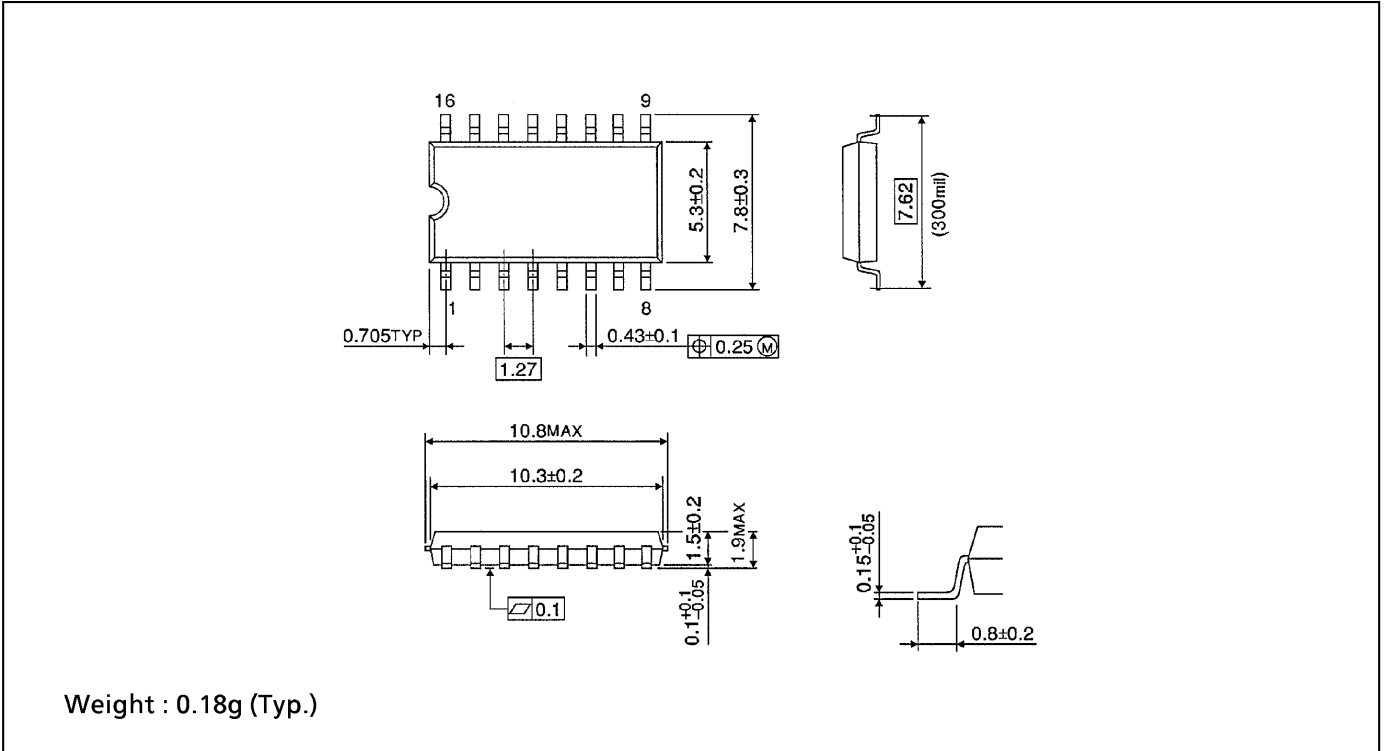
**DIP 16PIN PACKAGE DIMENSIONS (DIP16-P-300-2.54A)**

Unit in mm



**SOP 16PIN (200mil BODY) PACKAGE DIMENSIONS (SOP16-P-300-1.27)**

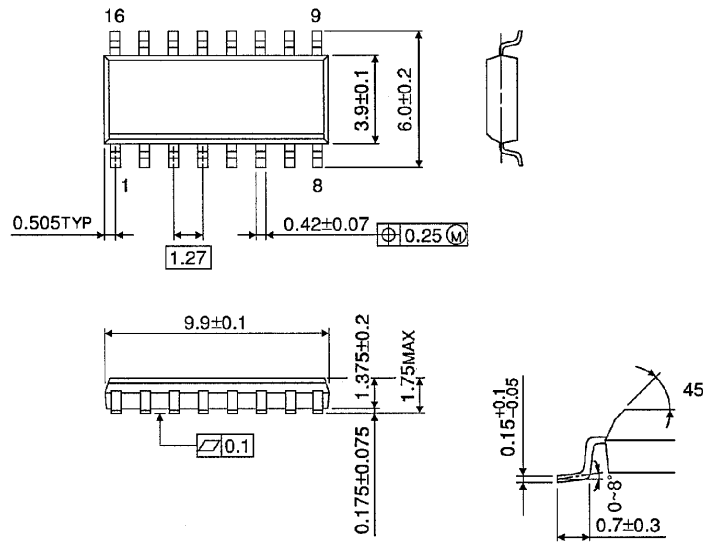
Unit in mm



**SOP 16PIN (150mil BODY) PACKAGE DIMENSIONS (SOL16-P-150 -1.27)**

Unit in mm

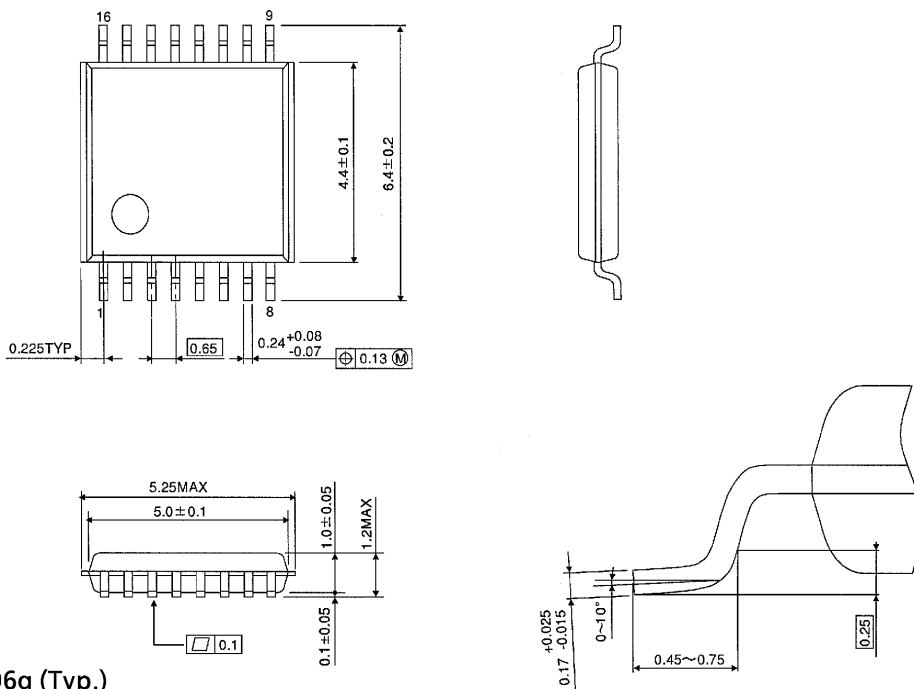
(Note) This package is not available in Japan.



Weight : 0.13g (Typ.)

**TSSOP 16PIN PACKAGE DIMENSIONS (TSSOP16-P-0044-0.65)**

Unit in mm



Weight : 0.06g (Typ.)

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