

TOSHIBA CMOS DIGITAL INTEGRATED CIRCUIT SILICON MONOLITHIC

**TC74HC4049AP, TC74HC4049AF, TC74HC4049AFN, TC74HC4049AFT**  
**TC74HC4050AP, TC74HC4050AF, TC74HC4050AFN, TC74HC4050AFT**

**TC74HC4049AP/AF/AFN/AFT HEX BUFFER / CONVERTER ( INVERTING )**  
**TC74HC4050AP/AF/AFN/AFT HEX BUFFER / CONVERTER**

The TC74HC4049A and TC74HC4050A are high speed CMOS HEX BUFFERS fabricated with silicon gate CMOS technology.

They achieve the high speed operation similar to equivalent LSTTL while maintaining the CMOS low power dissipation.

The TC74HC4049A is an inverting buffer, while the TC74HC4050A is a non - inverting buffer. The internal circuits are composed of 3 - stages ( HC4049A ) or 2 - stages ( HC4050A ) of inverters, which provided high noise immunity and stable output.

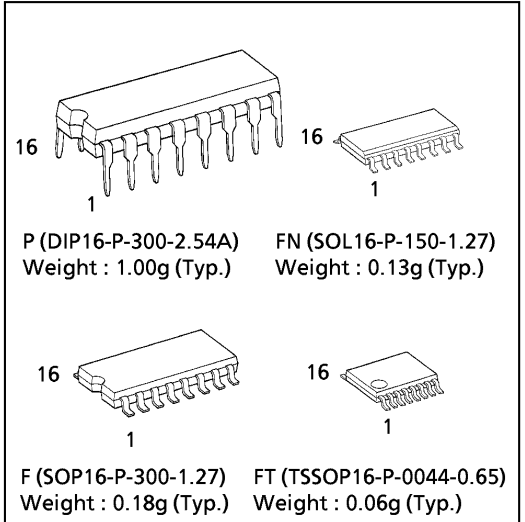
Input protection circuits are different from those of other high speed CMOS IC's. They eliminate the diodes on the V<sub>CC</sub> side thus providing of logic - level conversion from high - level volages up to 15V to low - level voltages.

They are useful for battery back up circuits, because input voltage can be applied on IC's which are not biased by V<sub>CC</sub>.

**FEATURES :**

- High Speed..... $t_{pd} = 9ns$ (typ.) at  $V_{CC} = 5V$
- Low Power Dissipation..... $I_{CC} = 1\mu A$ (Max.) at  $T_a = 25^\circ C$
- High Noise Immunity..... $V_{NIH} = V_{NIL} = 28\% V_{CC}$  (Min.)
- Output Drive Capability.....15 LSTTL Loads
- Symmetrical Output Impedance...  $|I_{OH}| = I_{OL} = 6mA$  (Min.)
- Balanced Propagation Delays..... $t_{pLH} \approx t_{pHL}$
- Wide Operating Voltage Range.... $V_{CC}$  (opr.) = 2V~6V
- Pin and Function Compatible with 4049B / 4050B

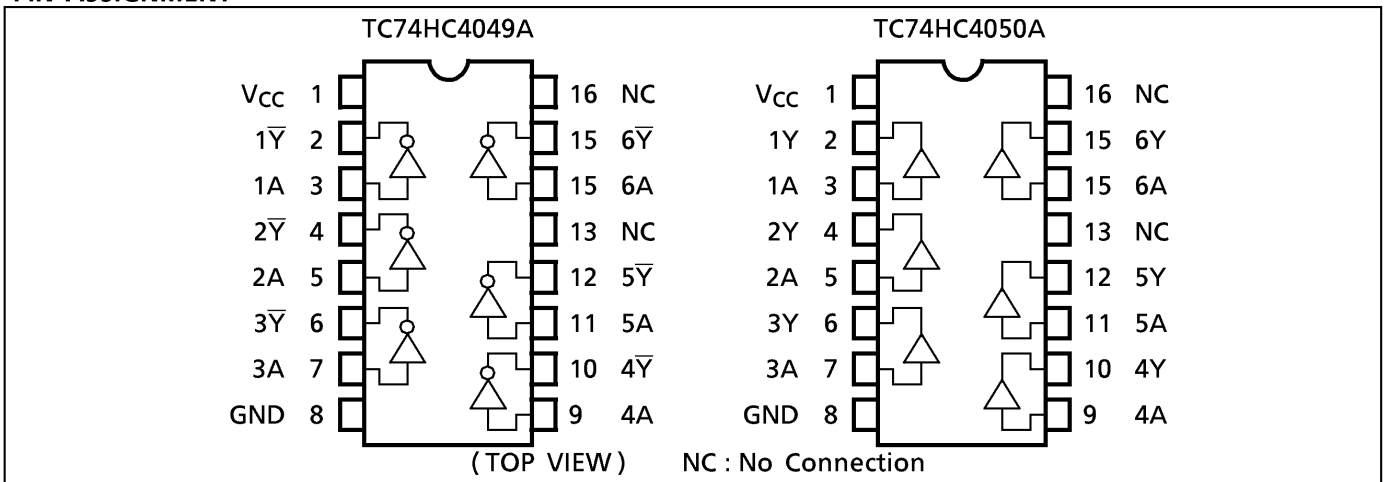
(Note) The JEDEC SOP (FN) is not available in Japan.



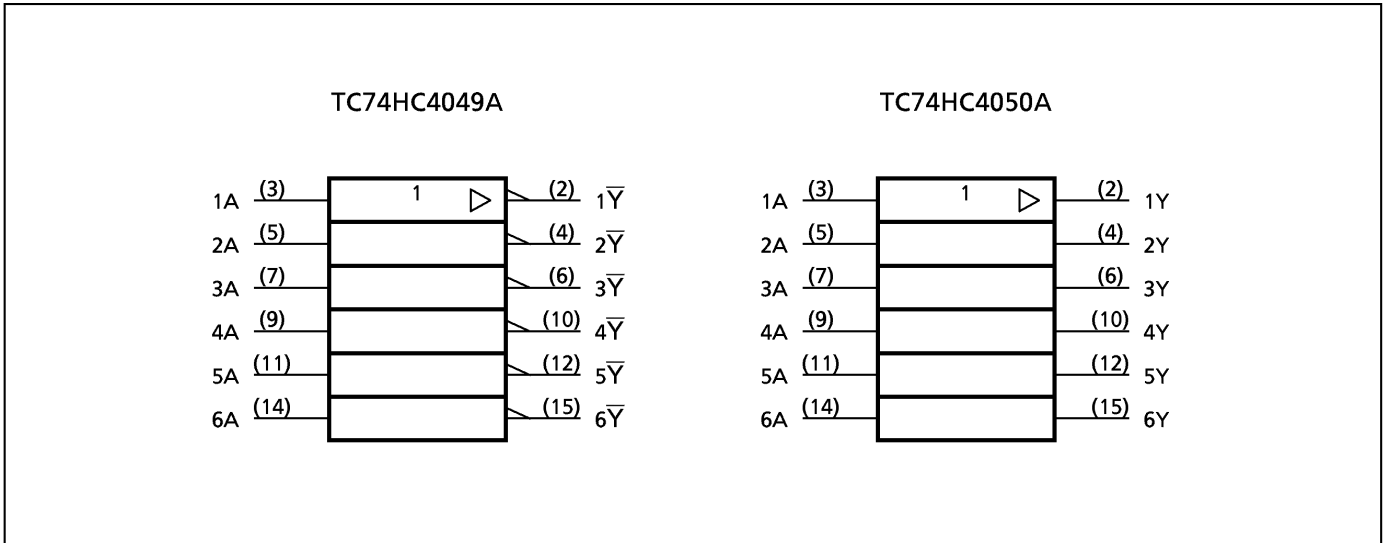
**TRUTH TABLE**

A	$\bar{Y}$ ( 4049A )	Y ( 4050A )
L	H	L
H	L	H

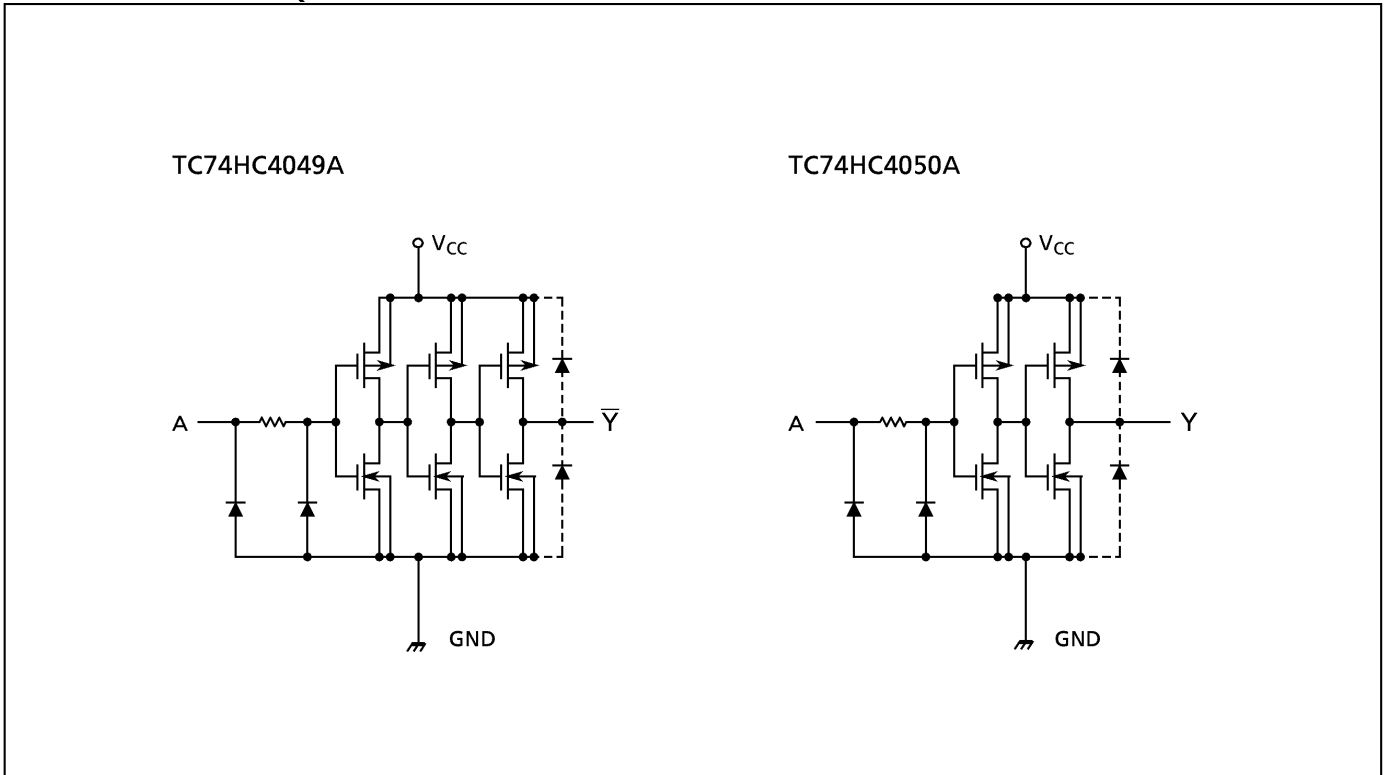
**PIN ASSIGNMENT**



**IEC LOGIC SYMBOL**



**INPUT and OUTPUT EQUIVALENT CIRCUIT**



## ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	VALUE	UNIT
Supply Voltage Range	$V_{CC}$	-0.5~7	V
DC Input Voltage	$V_{IN}$	-0.5~18*	V
DC Output Voltage	$V_{OUT}$	-0.5~ $V_{CC} + 0.5$	V
Input Diode Current	$I_{IK}$	-20	mA
Output Diode Current	$I_{OK}$	±20	mA
DC Output Current	$I_{OUT}$	±35	mA
DC $V_{CC}$ /Ground Current	$I_{CC}$	±75	mA
Power Dissipation	$P_D$	500(DIP)**/180(SOP,TSSOP)	mW
Storage Temperature	$T_{stg}$	-65~150	°C

Note) \* DC input voltage ( $V_{IN}$ ) specified is measured to GND and is not related to  $V_{CC}$ .  
Recommended operating range is 0V to 15V and it is possible to convert logic-levels from 15V to 5V or 5V to 2V.

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

## RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	VALUE	UNIT
Supply Voltage	$V_{CC}$	2~6	V
Input Voltage	$V_{IN}$	0~15	V
Output Voltage	$V_{OUT}$	0~ $V_{CC}$	V
Operating Temperature	$T_{opr}$	-40~85	°C
Input Rise and Fall Time	$t_r, t_f$	0~1000 ( $V_{CC} = 2.0\text{V}$ ) 0~500 ( $V_{CC} = 4.5\text{V}$ ) 0~400 ( $V_{CC} = 6.0\text{V}$ )	ns

## DC ELECTRICAL CHARACTERISTICS

PARAMETER	SYMBOL	TEST CONDITION	$V_{CC}$ (V)	$T_a = 25^{\circ}\text{C}$			$T_a = -40 \sim 85^{\circ}\text{C}$		UNIT	
				MIN.	TYP.	MAX.	MIN.	MAX.		
High - Level Input Voltage	$V_{IH}$		2.0	1.50	—	—	1.50	—	V	
			4.5	3.15	—	—	3.15	—		
			6.0	4.20	—	—	4.20	—		
Low - Level Input Voltage	$V_{IL}$		2.0	—	—	0.50	—	0.50	V	
			4.5	—	—	1.35	—	1.35		
			6.0	—	—	1.80	—	1.80		
High - Level Output Voltage	$V_{OH}$	$V_{IN} = V_{IH}$ or $V_{IL}$	$I_{OH} = -20\mu\text{A}$	2.0	1.9	2.0	—	1.9	—	V
				4.5	4.4	4.5	—	4.4	—	
			$I_{OH} = -6\text{ mA}$ $I_{OH} = -7.8\text{ mA}$	4.5	4.18	4.31	—	4.13	—	
				6.0	5.68	5.80	—	5.63	—	
Low - Level Output Voltage	$V_{OL}$	$V_{IN} = V_{IH}$ or $V_{IL}$	$I_{OL} = 20\mu\text{A}$	2.0	—	0.0	0.1	—	0.1	V
				4.5	—	0.0	0.1	—	0.1	
			$I_{OL} = 6\text{ mA}$ $I_{OL} = 7.8\text{ mA}$	4.5	—	0.17	0.26	—	0.33	
				6.0	—	0.18	0.26	—	0.33	
Input Leakage Current	$I_{IN}$	$V_{IN} = V_{CC}$ or GND	6.0	—	—	±0.1	—	±1.0	$\mu\text{A}$	
		$V_{IN} = 15\text{V}$	6.0	—	—	±0.5	—	±5.0		
Quiescent Supply Current	$I_{CC}$	$V_{IN} = V_{CC}$ or GND	6.0	—	—	1.0	—	10.0		

AC ELECTRICAL CHARACTERISTICS ( Input  $t_r = t_f = 6\text{ns}$  )

PARAMETER	SYMBOL	TEST CONDITION	CL (pF)	V <sub>CC</sub> (V)	Ta = 25°C			Ta = -40~85°C		UNIT
					MIN.	TYP.	MAX.	MIN.	MAX.	
Output Transition Time	$t_{TLH}$ $t_{THL}$		50	2.0	—	25	60	—	75	
				4.5	—	6	12	—	15	
				6.0	—	5	10	—	13	
Propagation Delay Time	$t_{pLH}$ $t_{pHL}$		50	2.0	—	30	75	—	95	ns
				4.5	—	9	15	—	19	
				6.0	—	8	13	—	16	
			150	2.0	—	45	100	—	145	
				4.5	—	14	20	—	29	
				6.0	—	12	17	—	25	
Input Capacitance	C <sub>IN</sub>			—	5	10	—	10	pF	
Power Dissipation Capacitance	C <sub>PD</sub> (1)			—	26	—	—	—		

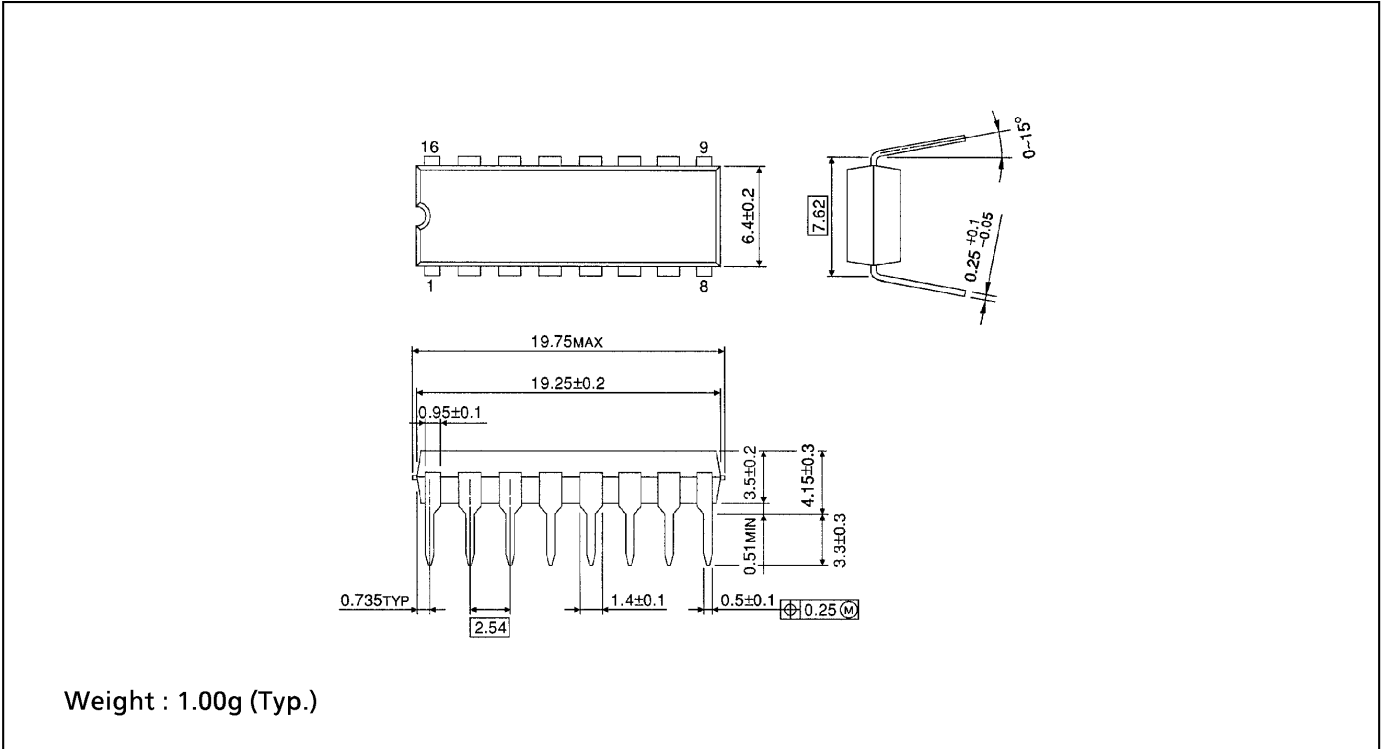
Note (1) C<sub>PD</sub> is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

Average operating current can be obtained by the equation :

$$I_{CC}(\text{opr}) = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}/6 \text{ ( per Gate )}$$

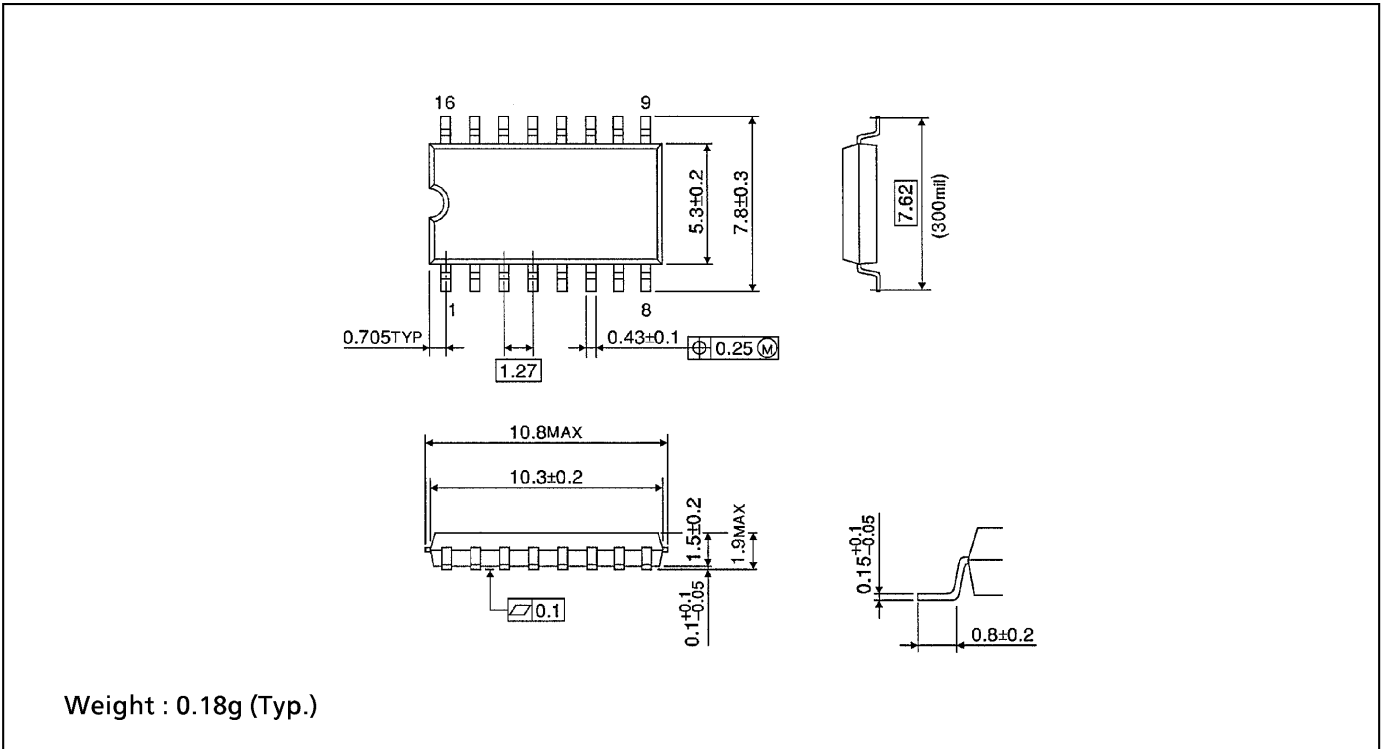
**DIP 16PIN PACKAGE DIMENSIONS (DIP16-P-300-2.54A)**

Unit in mm



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

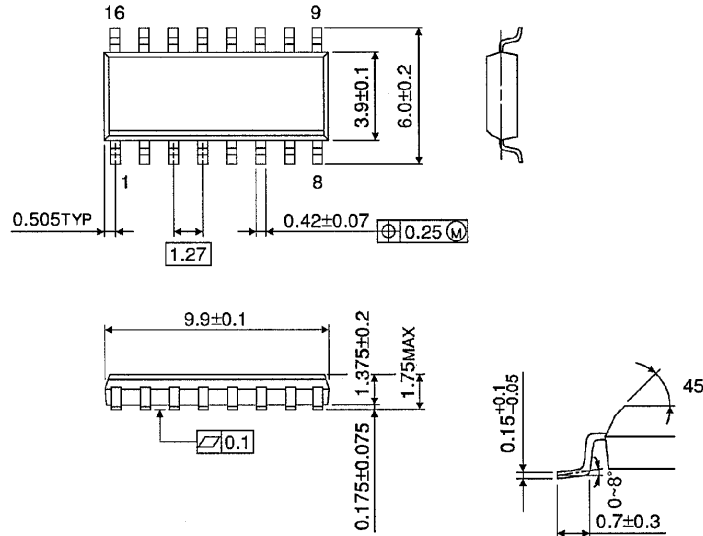
Unit in mm



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

Unit in mm

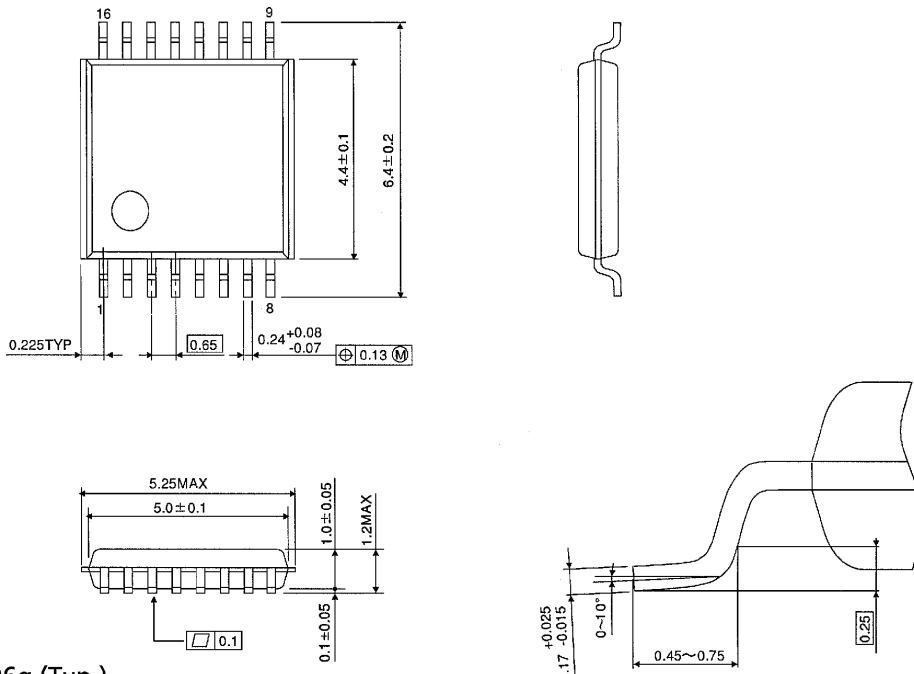
(Note) This package is not available in Japan.



Weight : 0.13g (Typ.)

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

Unit in mm



Weight : 0.06g (Typ.)

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