TOSHIBA CMOS DIGITAL INTEGRATED CIRCUIT SILICON MONOLITHIC

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

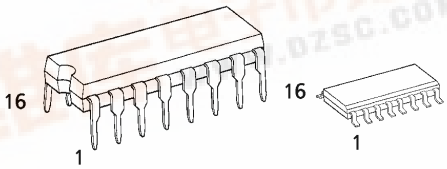
TC74HC4049AP/AF/AFN/AFT HEX BUFFER / CONVERTER (INVERTING)
TC74HC4050AP/AF/AFN/AFT HEX BUFFER / CONVERTER

The TC74HC4049A and TC74HC4050A are high speed CMOS HEX BUFFERs fabricated with silicon gate C^2MOS 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 invertaers, 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_{CC} 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_{CC}.

FEATURES :

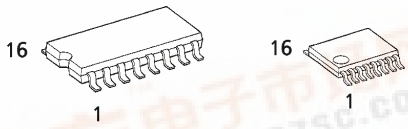
- High Speed ..... t_{pd} = 9ns(typ.) at V_{CC} = 5V
- Low Power Dissipation ..... I_{CC} = 1μA(Max.) at Ta = 25°C
- High Noise Immunity ..... $V_{NIH} = V_{NIL}$ = 28% V_{CC} (Min.)
- Output Drive Capability ..... 15 LSTTL Loads
- Symmetrical Output Impedance ... $|I_{OH}| = I_{OL}$ = 6mA (Min.)
- Balanced Propagation Delays ..... $t_{pLH} \simeq t_{pHL}$
- 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.



P (DIP16-P-300-2.54A)
Weight : 1.00g (Typ.)

FN (SOL16-P-150-1.27)
Weight : 0.13g (Typ.)



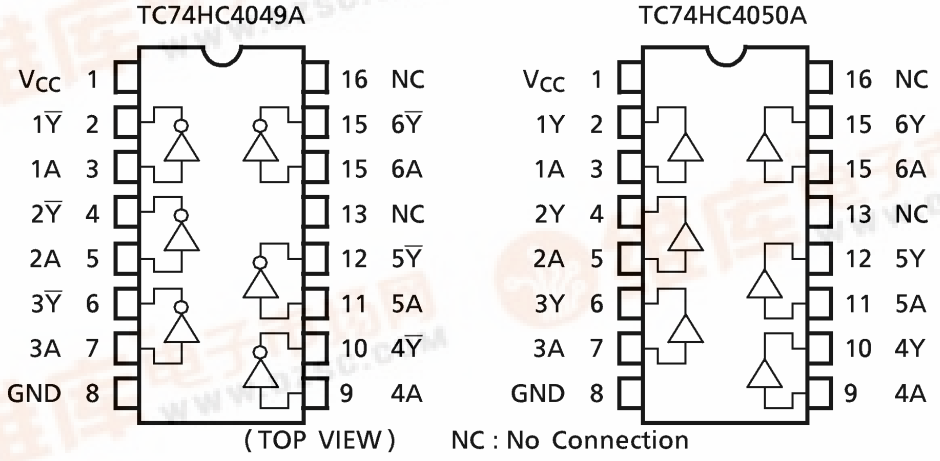
F (SOP16-P-300-1.27)
Weight : 0.18g (Typ.)

FT (TSSOP16-P-0044-0.65)
Weight : 0.06g (Typ.)

TRUTH TABLE

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

PIN ASSIGNMENT

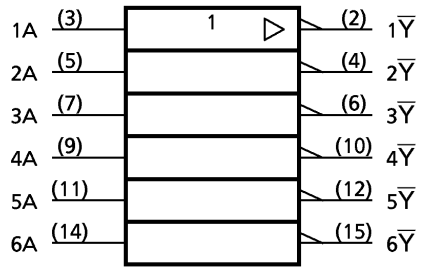


(TOP VIEW) NC : No Connection

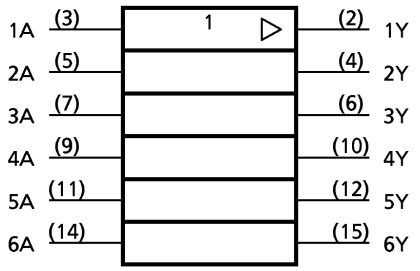
961001EBA2

IEC LOGIC SYMBOL

TC74HC4049A

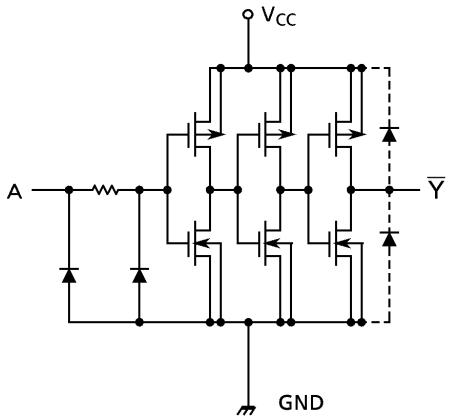


TC74HC4050A

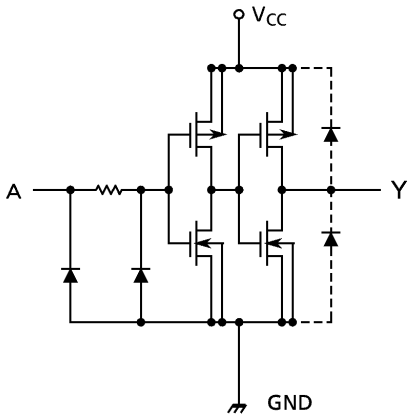


INPUT and OUTPUT EQUIVALENT CIRCUIT

TC74HC4049A



TC74HC4050A



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 Ta = −40°C~65°C. From Ta = 65°C to 85 °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} = 2.0V) 0~ 500 (V_{CC} = 4.5V) 0~ 400 (V_{CC} = 6.0V)	ns

DC ELECTRICAL CHARACTERISTICS

PARAMETER	SYMBOL	TEST CONDITION		V_{CC} (V)	Ta = 25°C MIN.	Ta = 25°C TYP.	Ta = 25°C MAX.	Ta = −40~85°C MIN.	Ta = −40~85°C MAX.	UNIT
High - Level Input Voltage	V_{IH}			2.0 4.5 6.0	1.50 3.15 4.20	— — —	— — —	1.50 3.15 4.20	— — —	V
Low - Level Input Voltage	V_{IL}			2.0 4.5 6.0	— — —	— — —	0.50 1.35 1.80	— — —	0.50 1.35 1.80	V
High - Level Output Voltage	V_{OH}	V_{IN} = V_{IH} or V_{IL}	I_{OH} = −20μA	2.0 4.5 6.0	1.9 4.4 5.9	2.0 4.5 6.0	— — —	1.9 4.4 5.9	— — —	V
			I_{OH} = −6 mA I_{OH} = −7.8mA	4.5 6.0	4.18 5.68	4.31 5.80	— —	4.13 5.63	— —	
Low - Level Output Voltage	V_{OL}	V_{IN} = V_{IH} or V_{IL}	I_{OL} = 20μA	2.0 4.5 6.0	— — —	0.0 0.0 0.0	0.1 0.1 0.1	— — —	0.1 0.1 0.1	V
			I_{OL} = 6 mA I_{OL} = 7.8mA	4.5 6.0	— —	0.17 0.18	0.26 0.26	— —	0.33 0.33	
Input Leakage Current	I_{IN}	V_{IN} = V_{CC} or GND		6.0	—	—	±0.1	—	±1.0	μA
		V_{IN} = 15V		6.0	—	—	±0.5	—	±5.0	
Quiescent Supply Current	I_{CC}	V_{IN} = V_{CC} or GND		6.0	—	—	1.0	—	10.0	

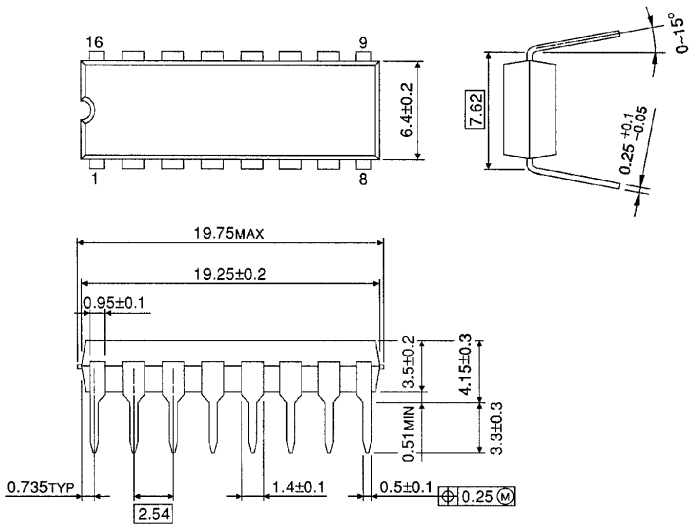
AC ELECTRICAL CHARACTERISTICS (Input $t_r = t_f = 6ns$)

PARAMETER	SYMBOL	TEST CONDITION	CL (pF)	V_{CC} (V)	Ta = 25°C MIN.	Ta = 25°C TYP.	Ta = 25°C MAX.	Ta = −40~85°C MIN.	Ta = −40~85°C MAX.	UNIT
Output Transition Time	t_{TLH} t_{THL}		50	2.0	—	25	60	—	75	ns
				4.5	—	6	12	—	15	
				6.0	—	5	10	—	13	
Propagation Delay Time	t_{pLH} t_{pHL}		50	2.0	—	30	75	—	95	
				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_{IN}				—	5	10	—	10	pF
Power Dissipation Capacitance	C_{PD} (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:

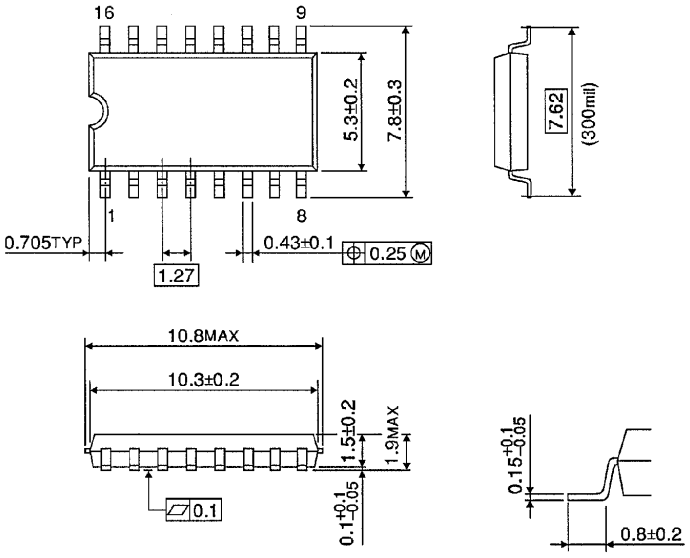
$$I_{CC}(opr) = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC} / 6 \text{ (per Gate)}$$

DIP 16PIN OUTLINE DRAWING (DIP16-P-300-2.54A) Unit in mm



Weight : 1.00g (Typ.)

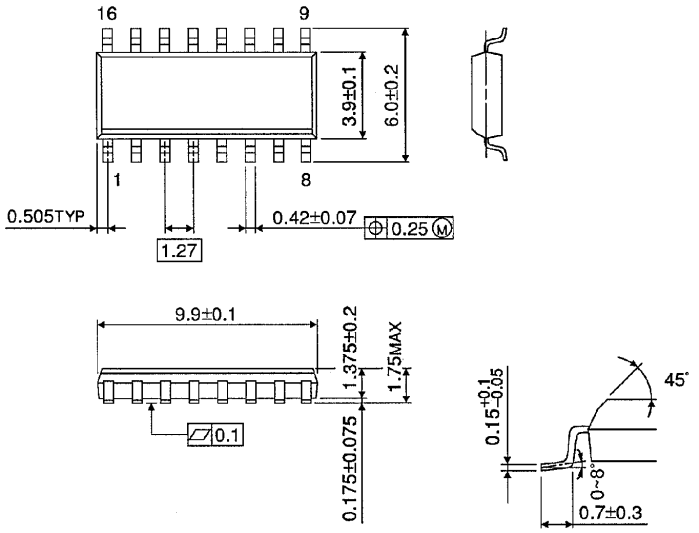
SOP 16PIN (200mil BODY) OUTLINE DRAWING (SOP16-P-300-1.27) Unit in mm



Weight : 0.18g (Typ.)

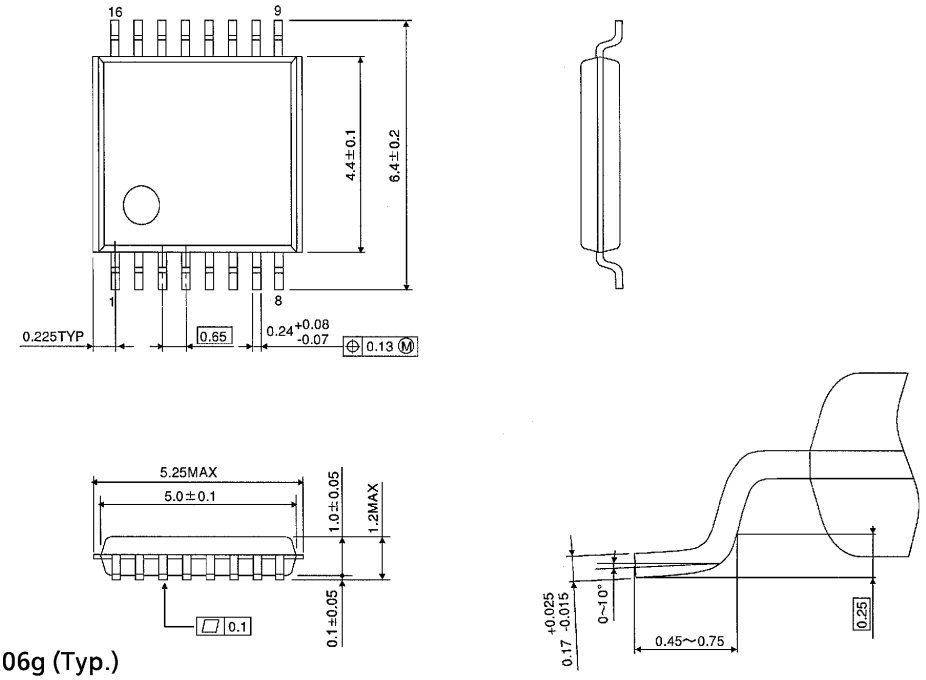
SOP 16PIN (150mil BODY) OUTLINE DRAWING (SOL16-P-150 -1.27) Unit in mm

(Note) This package is not available in Japan.



Weight : 0.13g (Typ.)

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



Weight : 0.06g (Typ.)