

TOSHIBA CMOS DIGITAL INTEGRATED CIRCUIT SILICON MONOLITHIC

# TC74HC05AP, TC74HC05AF

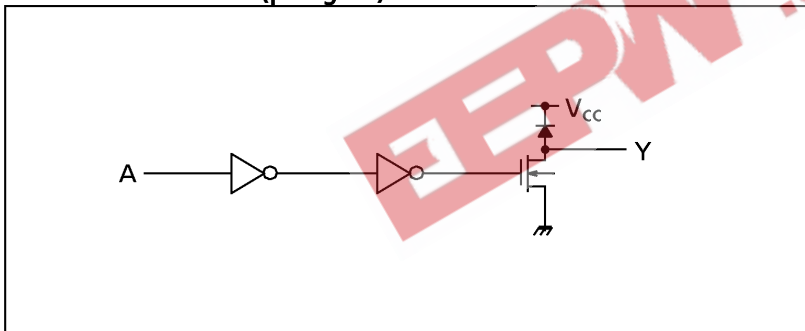
## HEX INVERTER (OPEN DRAIN)

The TC74HC05A is a high speed CMOS INVERTER fabricated with silicon gate C<sup>2</sup>MOS technology. It achieves the high speed operation similar to equivalent LSTTL while maintaining the CMOS low power dissipation. Pin configuration and function are the same as the TC74HC04A, but the TC74HC05A has high performance MOS N - channel transistor (OPEN - DRAIN) outputs. This device can, therefore, with a suitable pull - up resistors, be used in wired - AND, LED drive and other applications. All inputs are equipped with protection circuits against static discharge or transient excess voltage.

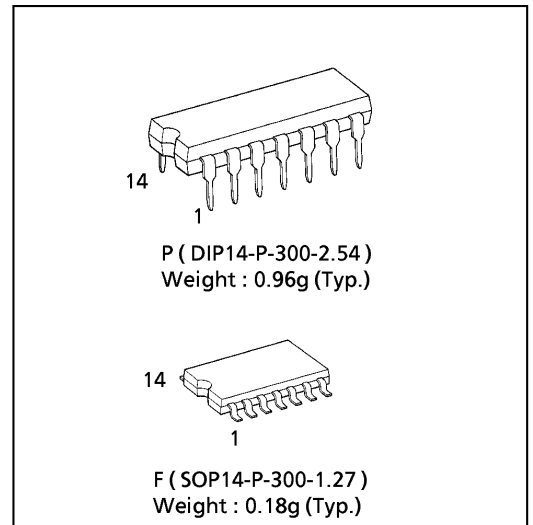
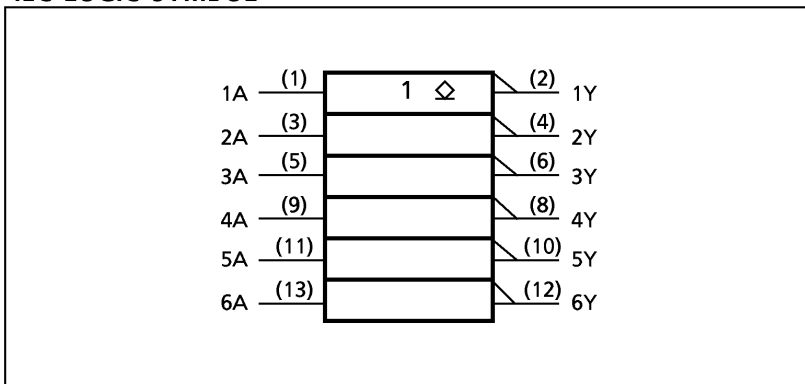
### FEATURES:

- High Speed..... $t_{pz} = 8\text{ns}(\text{typ.})$  at  $V_{CC} = 5\text{V}$
- Low Power Dissipation..... $I_{CC} = 1\mu\text{A}(\text{Max.})$  at  $T_a = 25^\circ\text{C}$
- High Noise Immunity..... $V_{NIH} = V_{NIL} = 28\% V_{CC} (\text{Min.})$
- Output Drive Capability..... 10 LSTTL Loads
- Wide Operating Voltage Range....  $V_{CC} (\text{opr.}) = 2\text{V} \sim 6\text{V}$
- Open Drain Structure.
- Pin and Function Compatible with 74LS05

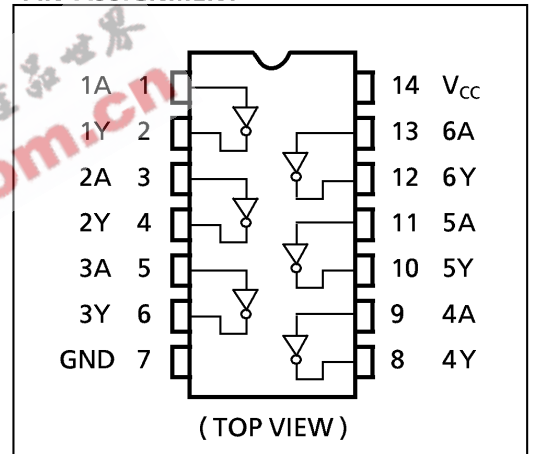
### SYSTEM DIAGRAM (per gate)



### IEC LOGIC SYMBOL



### PIN ASSIGNMENT



### TRUTH TABLE

A	Y
L	Z
H	L

Z : High Impedance

## ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	VALUE	UNIT
Supply Voltage Range	$V_{CC}$	-0.5~7	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	$I_{IK}$	±20	mA
Output Diode Current	$I_{OK}$	±20	mA
DC Output Current	$I_{OUT}$	+25	mA
DC $V_{CC}$ / Ground Current	$I_{CC}$	±50	mA
Power Dissipation	$P_D$	500 (DIP)* / 180 (SOP)	mW
Storage Temperature	$T_{stg}$	-65~150	°C

\*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  $-10\text{mW}/^{\circ}\text{C}$  shall be applied until 300mW.

## RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	VALUE	UNIT
Supply Voltage	$V_{CC}$	2~6	V
Input Voltage	$V_{IN}$	0~ $V_{CC}$	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		
Low - Level Output Voltage	$V_{OL}$	$V_{IN} = V_{IH}$	$I_{OL} = 20\mu\text{A}$	2.0	—	0.0	0.1	—	0.1	V
				4.5	—	0.0	0.1	—	0.1	
			$I_{OL} = 4\text{mA}$ $I_{OL} = 5.2\text{mA}$	4.5	—	0.17	0.26	—	0.33	
				6.0	—	0.18	0.26	—	0.33	
Output Off - State Current	$I_{OZ}$	$V_{IN} = V_{IH}$ or $V_{IL}$ $V_{OUT} = V_{CC}$	6.0	—	—	±0.5	—	±5.0	$\mu\text{A}$	
Input Leakage Current	$I_{IN}$	$V_{IN} = V_{CC}$ or GND	6.0	—	—	±0.1	—	±1.0		
Quiescent Supply Current	$I_{CC}$	$V_{IN} = V_{CC}$ or GND	6.0	—	—	1.0	—	10.0		

AC ELECTRICAL CHARACTERISTICS (  $C_L = 15\text{pF}$ ,  $V_{CC} = 5\text{V}$ ,  $T_a = 25^\circ\text{C}$ , Input  $t_r = t_f = 6\text{ns}$  )

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Output Transition Time	$t_{\text{THL}}$		—	4	8	ns
Propagation Delay Time	$t_{\text{pLZ}}$	$R_L = 1\text{k}\Omega$	—	8	15	
Propagation Delay Time	$t_{\text{pZL}}$	$R_L = 1\text{k}\Omega$	—	6	15	

AC ELECTRICAL CHARACTERISTICS (  $C_L = 50\text{pF}$ , Input  $t_r = t_f = 6\text{ns}$  )

PARAMETER	SYMBOL	TEST CONDITION	$T_a = 25^\circ\text{C}$			$T_a = -40\text{--}85^\circ\text{C}$		UNIT	
			$V_{CC}(\text{V})$	MIN.	TYP.	MAX.	MIN.		MAX.
Output Transition Time	$t_{\text{THL}}$		2.0	—	30	75	—	95	ns
			4.5	—	8	15	—	19	
			6.0	—	7	13	—	16	
Propagation Delay Time	$t_{\text{pLZ}}$	$R_L = 1\text{k}\Omega$	2.0	—	20	90	—	115	
			4.5	—	11	18	—	23	
			6.0	—	10	15	—	20	
Propagation Delay Time	$t_{\text{pZL}}$	$R_L = 1\text{k}\Omega$	2.0	—	33	90	—	115	
			4.5	—	9	18	—	23	
			6.0	—	7	15	—	20	
Input Capacitance	$C_{\text{IN}}$		—	5	10	—	10	pF	
Output Capacitance	$C_{\text{OUT}}$		—	3	—	—	—		
Power Dissipation Capacitance	$C_{\text{PD}}(1)$		—	7	—	—	—		

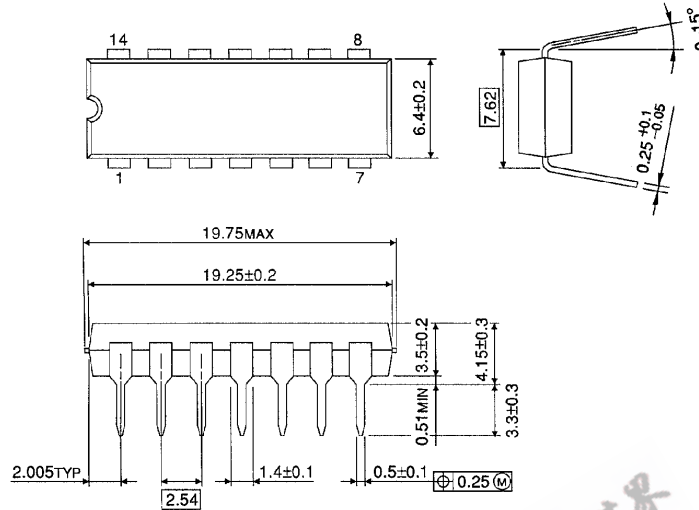
Note (1)  $C_{\text{PD}}$  is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

Average operating current can be obtained by the equation :

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

DIP 14PIN PACKAGE DIMENSIONS ( DIP14-P-300-2.54 )

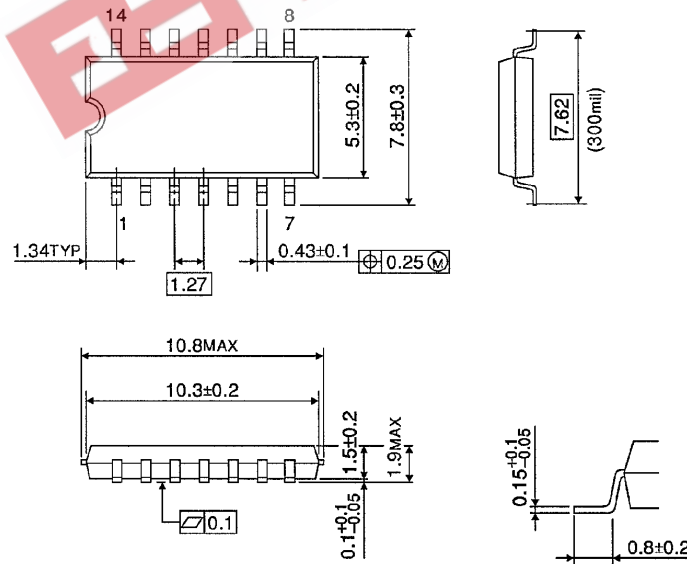
Unit in mm



Weight : 0.96g (Typ.)

SOP 14PIN ( 200mil BODY ) PACKAGE DIMENSIONS ( SOP14-P-300-1.27 )

Unit in mm



Weight : 0.18g (Typ.)

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