

TC74AC04P, TC74AC04F, TC74AC04FN, TC74AC04FT

HEX INVERTER

The TC74AC04 is an advanced high speed CMOS INVERTER fabricated with silicon gate and double - layer metal wiring C<sup>2</sup>MOS technology.

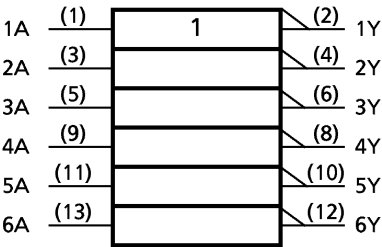
It achieves the high speed operation similar to equivalent Bipolar Schottky TTL while maintaining the CMOS low power dissipation.

The internal circuit is composed of 3 stages including buffer output, which provide high noise immunity and stable output. All inputs are equipped with protection circuits against static discharge or transient excess voltage.

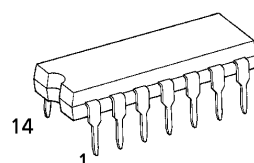
FEATURES :

- High Speed..... $t_{pd} = 3.2ns(typ.)$  at  $V_{CC} = 5V$
- Low Power Dissipation..... $I_{CC} = 4\mu A(Max.)$  at  $T_a = 25^{\circ}C$
- High Noise Immunity..... $V_{NIH} = V_{NIL} = 28\% V_{CC} (Min.)$
- Symmetrical Output Impedance... $|I_{OH}| = I_{OL} = 24mA(Min.)$   
Capability of driving  $50\Omega$  transmission lines.
- Balanced Propagation Delays..... $t_{pLH} \approx t_{pHL}$
- Wide Operating Voltage Range..... $V_{CC} (opr) = 2V \sim 5.5V$
- Pin and Function Compatible with 74F04

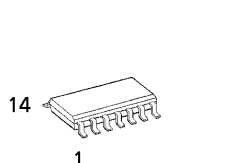
IEC LOGIC SYMBOL



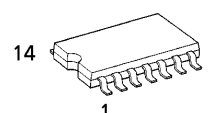
(Note) The JEDEC SOP (FN) is not available in Japan.



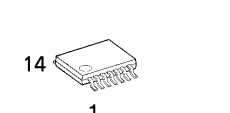
P (DIP14-P-300-2.54)  
Weight : 0.96g (Typ.)



FN (SOL14-P-150-1.27)  
Weight : 0.12g (Typ.)

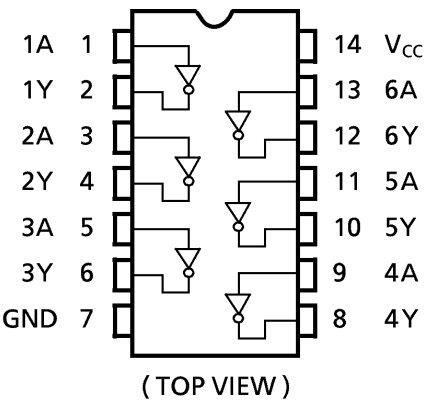


F (SOP14-P-300-1.27)  
Weight : 0.18g (Typ.)



FT (TSSOP14-P-0044-0.65)  
Weight : 0.06g (Typ.)

PIN ASSIGNMENT



TRUTH TABLE

A	Y
L	H
H	L

## 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	$I_{CC}$	$\pm 150$	mA
Power Dissipation	$P_D$	500 (DIP)* / 180 (SOP/TSSOP)	mW
Storage Temperature	$T_{stg}$	$-65 \sim 150$	°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  $-10\text{mW}/^\circ\text{C}$  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	$T_{opr}$	$-40 \sim 85$	°C
Input Rise and Fall Time	$dt/dV$	0~100 ( $V_{CC} = 3.3 \pm 0.3\text{V}$ ) 0~20 ( $V_{CC} = 5 \pm 0.5\text{V}$ )	ns/V

## 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
			3.0	2.10	—	—	2.10	—	
			5.5	3.85	—	—	3.85	—	
Low - Level Input Voltage	$V_{IL}$		2.0	—	—	0.50	—	0.50	V
			3.0	—	—	0.90	—	0.90	
			5.5	—	—	1.65	—	1.65	
High - Level Output Voltage	$V_{OH}$	$V_{IN} = V_{IL}$	$I_{OH} = -50\mu\text{A}$	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	
			$I_{OH} = -4\text{mA}$ $I_{OH} = -24\text{mA}$ $I_{OH} = -75\text{mA}^*$	3.0	2.58	—	—	2.48	
				4.5	3.94	—	—	3.80	
				5.5	—	—	—	3.85	
Low - Level Output Voltage	$V_{OL}$	$V_{IN} = V_{IH}$	$I_{OL} = 50\mu\text{A}$	2.0	—	0.0	0.1	—	V
				3.0	—	0.0	0.1	—	
				4.5	—	0.0	0.1	—	
			$I_{OL} = 12\text{mA}$ $I_{OL} = 24\text{mA}$ $I_{OL} = 75\text{mA}^*$	3.0	—	—	0.36	—	
				4.5	—	—	0.36	—	
				5.5	—	—	—	1.65	
Input Leakage Current	$I_{IN}$	$V_{IN} = V_{CC}$ or GND	5.5	—	—	$\pm 0.1$	—	$\pm 1.0$	$\mu\text{A}$
Quiescent Supply Current	$I_{CC}$	$V_{IN} = V_{CC}$ or GND	5.5	—	—	4.0	—	40.0	

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

**AC ELECTRICAL CHARACTERISTICS (  $C_L = 50\text{pF}$  ,  $R_L = 500\ \Omega$  , Input  $t_r = t_f = 3\text{ns}$  )**

PARAMETER	SYMBOL	TEST CONDITION		Ta = 25°C			Ta = − 40~85°C		UNIT
			V <sub>CC</sub> (V)	MIN.	TYP.	MAX.	MIN.	MAX.	
Propagation Delay Time	t <sub>pLH</sub>		3.3 ± 0.3	—	5.7	9.8	1.0	11.2	ns
	t <sub>pHL</sub>		5.0 ± 0.5	—	4.3	6.6	1.0	7.5	
Input Capacitance	C <sub>IN</sub>			—	5	10	—	10	pF
Power Dissipation Capacitance	C <sub>PD</sub> (1)			—	20	—	—	—	

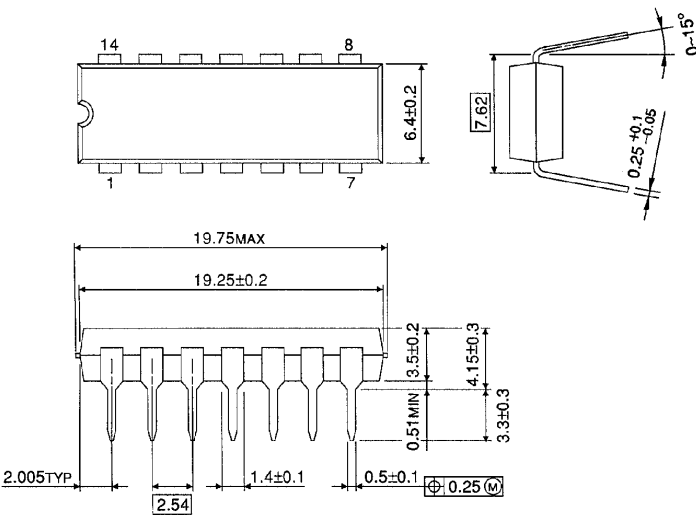
Note (1) C<sub>PD</sub> is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

Average operating current can be obtained by the equation :

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

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

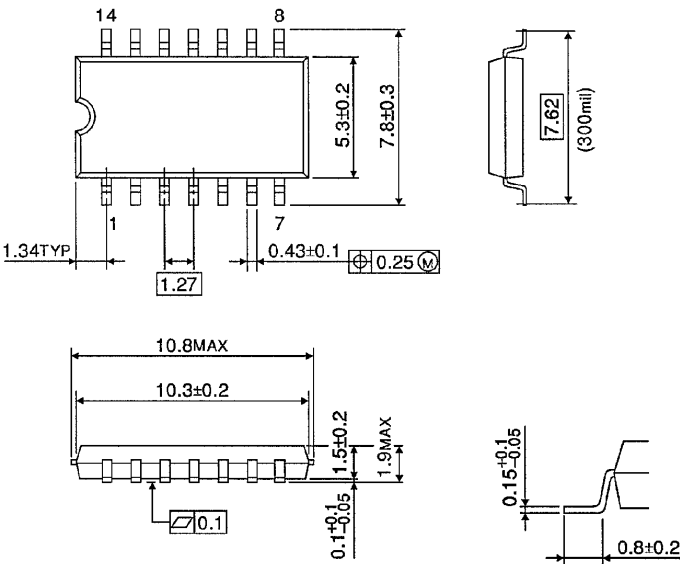
Unit in mm



Weight : 0.96g (Typ.)

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

Unit in mm

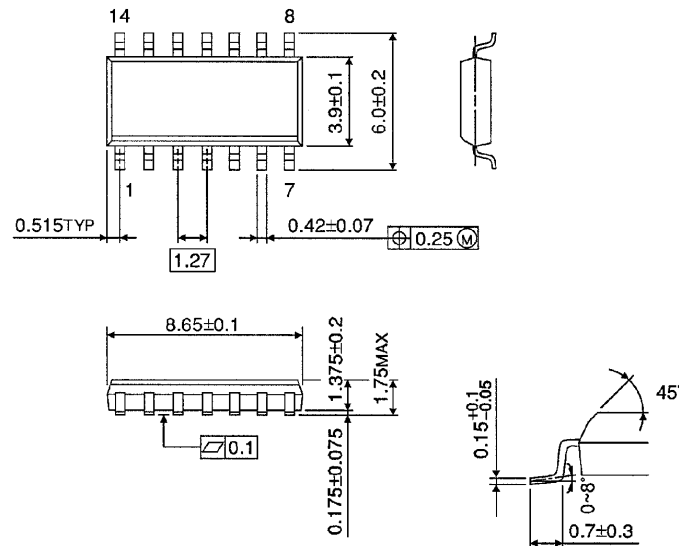


Weight : 0.18g (Typ.)

## SOP 14PIN (150mil BODY) PACKAGE DIMENSIONS (SOL14-P-150 -1.27)

Unit in mm

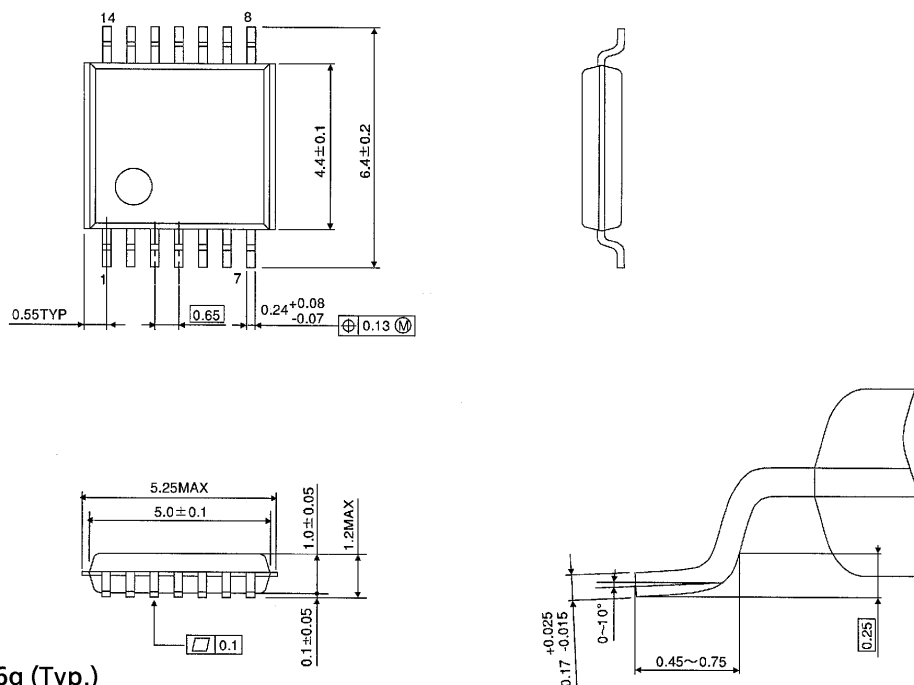
(Note) This package is not available in Japan.



Weight : 0.12g (Typ.)

## TSSOP 14PIN (170mil BODY) PACKAGE DIMENSIONS (TSSOP14-P-0044-0.65)

Unit in mm



Weight : 0.06g (Typ.)

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