

TC74AC04P, TC74AC04F, TC74AC04FN, TC74AC04FT

HEX INVERTER

The TC74AC04 is an advanced high speed CMOS INVERTER fabricated with silicon gate and double-layer metal wiring C²MOS technology.

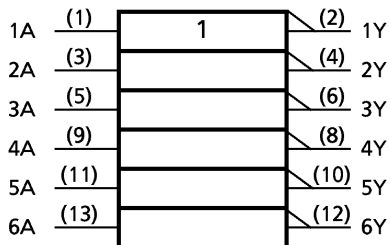
It achieves the high speed operation similar to equivalent Bipolar Schottky TTL while maintaining the CMOS low power dissipation.

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.

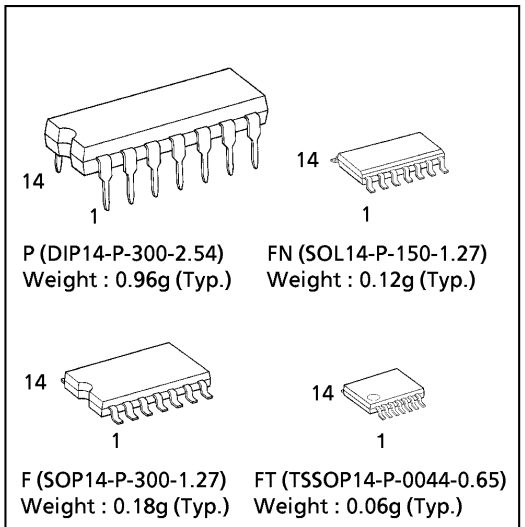
FEATURES :

- 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 50Ω 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

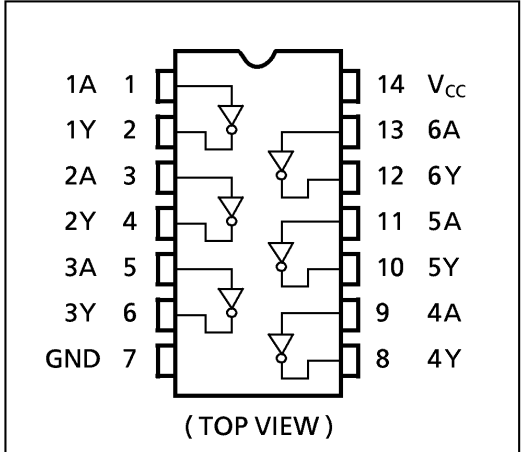
IEC LOGIC SYMBOL



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



PIN ASSIGNMENT



TRUTH TABLE

| | |
|---|---|
| A | Y |
| L | H |
| H | L |

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} | ± 20 | mA |
| Output Diode Current | I_{OK} | ± 50 | mA |
| DC Output Current | I_{OUT} | ± 50 | mA |
| DC V_{CC} /Ground Current | I_{CC} | ± 150 | mA |
| Power Dissipation | P_D | 500 (DIP)* / 180 (SOP/TSSOP) | 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°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} | 2.0~5.5 | V |
| Input Voltage | V_{IN} | 0~ V_{CC} | V |
| Output Voltage | V_{OUT} | 0~ V_{CC} | V |
| Operating Temperature | T_{opr} | -40~85 | °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 | — | |
| | | | | 3.0 | 2.58 | — | — | 2.48 | — | |
| Low - Level Output Voltage | V_{OL} | $V_{IN} = V_{IH}$ | $I_{OL} = 50\mu\text{A}$ | 2.0 | — | 0.0 | 0.1 | — | 0.1 | V |
| | | | | 3.0 | — | 0.0 | 0.1 | — | 0.1 | |
| | | | | 4.5 | — | 0.0 | 0.1 | — | 0.1 | |
| | | | | 3.0 | — | — | 0.36 | — | 0.44 | |
| Input Leakage Current | I_{IN} | $V_{IN} = V_{CC}$ or GND | 5.5 | — | — | ± 0.1 | — | ± 1.0 | μA | |
| | | | 3.0 | — | — | — | — | — | | |
| | | | 4.5 | — | — | — | — | — | | |
| Quiescent Supply Current | I_{CC} | $V_{IN} = V_{CC}$ or GND | 5.5 | — | — | 4.0 | — | 40.0 | μA | |

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

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

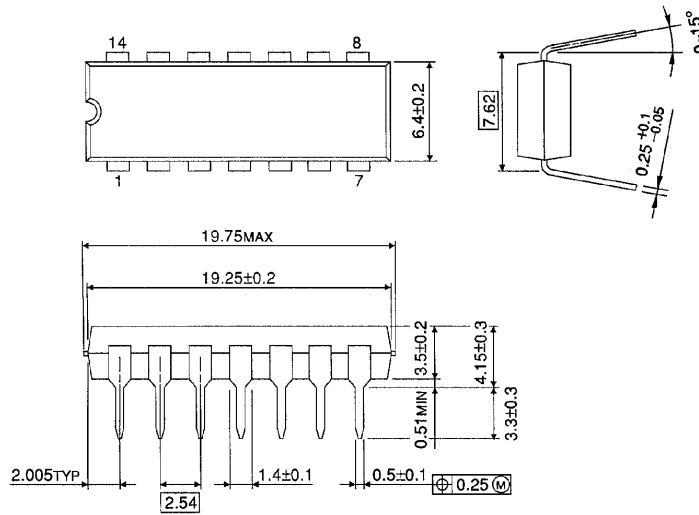
Note (1) C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

Average operating current can be obtained by the equation :

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

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

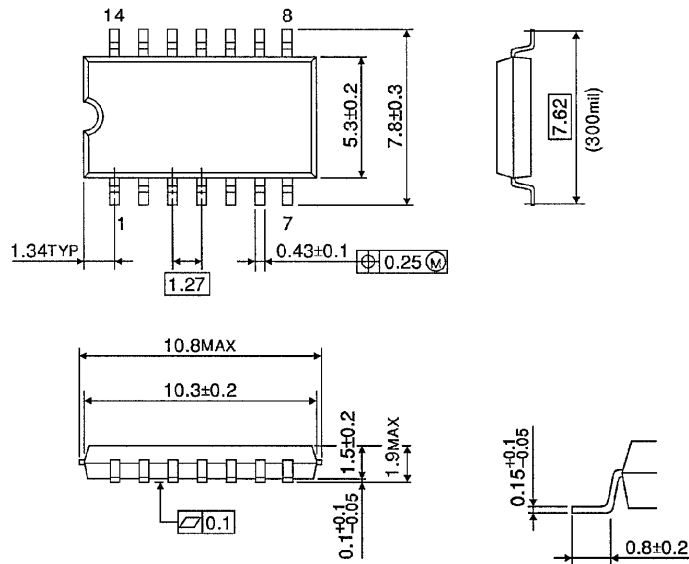
Unit in mm



Weight : 0.96g (Typ.)

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

Unit in mm

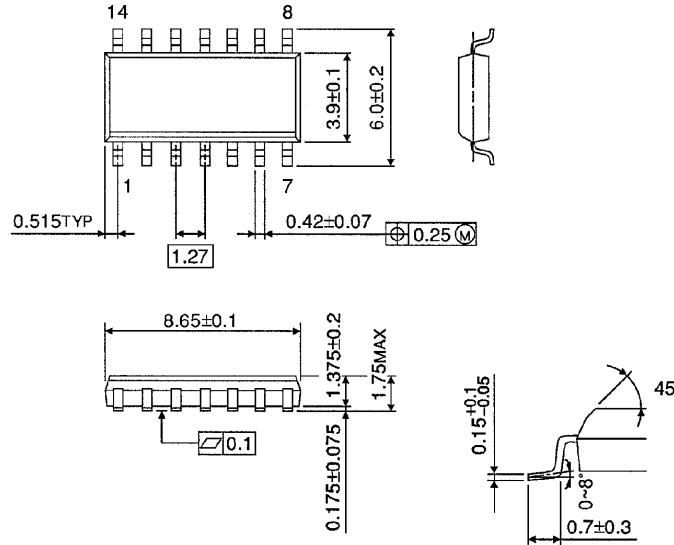


Weight : 0.18g (Typ.)

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

Unit in mm

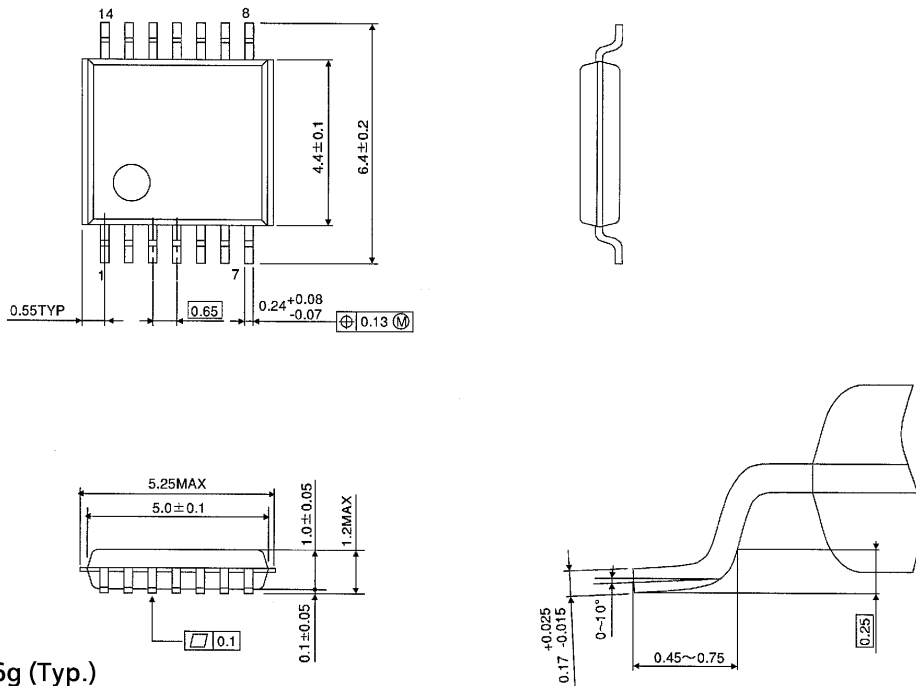
(Note) This package is not available in Japan.



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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