TOSHIBA CMOS Digital Integrated Circuit   Silicon Monolithic

TC74AC05P,TC74AC05F,TC74AC05FN

Hex Inverter (open drain)

Note: xxxFN (JEDEC SOP) is not available in Japan.

The TC74AC05 is an advanced high speed CMOS INVERTER fabricated with silicon gate and double-layer metal wiring C^{2}MOS technology.

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

Pin configuration and function are the same as the TC74AC04, but the TC74AC05 has high performance MOS N-channel transistor (open-drain) outputs.
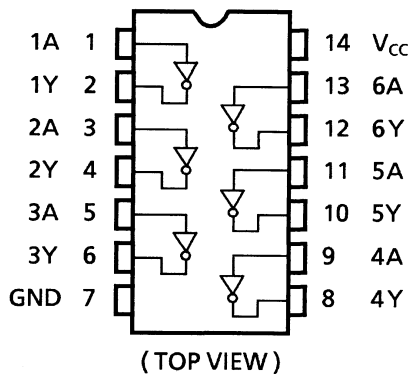
This device can, therefore, with a suitable pull-up resistors, be used in wired-OR, LED drive and other applications.

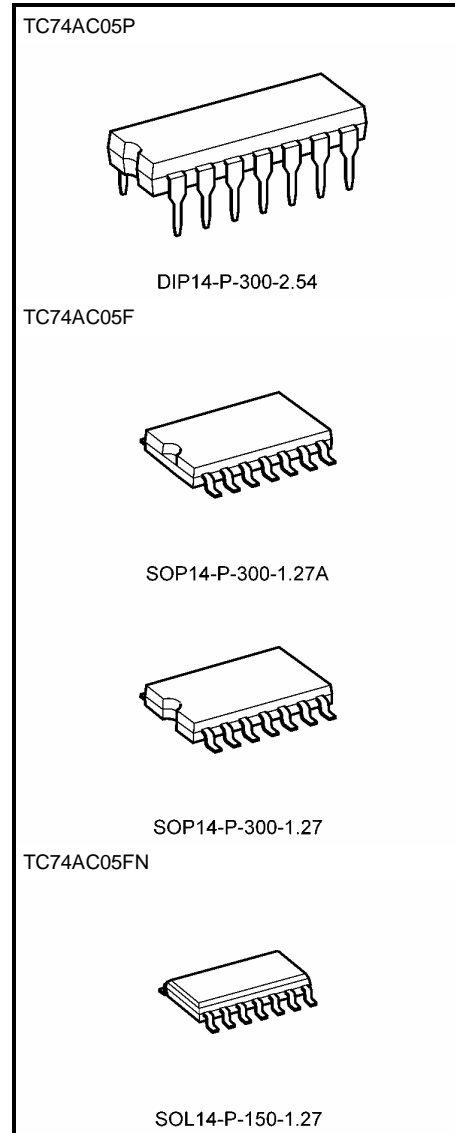All inputs are equipped with protection circuits against static discharge or transient excess voltage.

Features

- High speed: t_{pz} = 3.4 ns (typ.) at V_{CC} = 5 V
- Low power dissipation: I_{CC} = 4 µA (max) at Ta = 25°C
- High noise immunity: V_{NIH} = V_{NIL} = 28% V_{CC} (min)
- Symmetrical output impedance: I_{OL} = 24 mA (min)
  Capability of driving 50 Ω transmission lines.
- Wide operating voltage range: V_{CC} (opr) = 2 to 5.5 V
- Open drain structure.
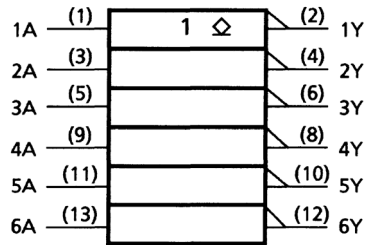- Pin and function compatible with 74F05

Pin Assignment

(TOP VIEW)

TC74AC05P

DIP14-P-300-2.54

TC74AC05F

SOP14-P-300-1.27A

SOP14-P-300-1.27

TC74AC05FN

SOL14-P-150-1.27

Weight
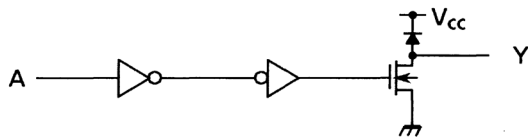|	
DIP14-P-300-2.54	: 0.96 g (typ.)
SOP14-P-300-1.27A	: 0.18 g (typ.)
SOP14-P-300-1.27	: 0.18 g (typ.)
SOL14-P-150-1.27	: 0.12 g (typ.)

IEC Logic Symbol

1A	(1)	1 ◇ (2) 1Y
2A	(3)	(4) 2Y
3A	(5)	(6) 3Y
4A	(9)	(8) 4Y
5A	(11)	(10) 5Y
6A	(13)	(12) 6Y

Truth Table

A	Y
L	Z
H	L

Z: High impedance

System Diagram (per gate)

A ──▷○──○▷── V_{CC} ── Y

Absolute Maximum Ratings (Note 1)

Characteristics	Symbol	Rating	Unit
Supply voltage range	V_{CC}	−0.5 to 7.0	V
DC input voltage	V_{IN}	−0.5 to V_{CC} + 0.5	V
DC output voltage	V_{OUT}	−0.5 to 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) (Note 2)/180 (SOP)	mW
Storage temperature	T_{stg}	−65 to 150	°C

Note1: Exceeding any of the absolute maximum ratings, even briefly, lead to deterioration in IC performance or even destruction.

Note2: 500 mW in the range of Ta = −40 to 65°C. From Ta = 65 to 85°C a derating factor of −10 mW/°C should be applied up to 300 mW.

Recommended Operating Conditions (Note)

Characteristics	Symbol	Rating	Unit
Supply voltage	V_{CC}	2.0 to 5.5	V
Input voltage	V_{IN}	0 to V_{CC}	V
Output voltage	V_{OUT}	0 to V_{CC}	V
Operating temperature	T_{opr}	−40 to 85	°C
Input rise and fall time	dt/dV	0 to 100 (V_{CC} = 3.3 ± 0.3 V) 0 to 20 (V_{CC} = 5 ± 0.5 V)	ns/V

Note: The recommended operating conditions are required to ensure the normal operation of the device. Unused inputs must be tied to either VCC or GND.

Electrical Characteristics

DC Characteristics

Characteristics	Symbol	Test Condition		V_{CC} (V)	Ta = 25°C			Ta = −40 to 85°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	
Low-level output voltage	V_{OL}	V_{IN} = V_{IH}	I_{OL} = 50 μA	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	
			I_{OL} = 12 mA	3.0	—	—	0.36	—	0.44	
			I_{OL} = 24 mA	4.5	—	—	0.36	—	0.44	
			I_{OL} = 75 mA (Note)	5.5	—	—	—	—	1.65	
3-state output off-state current	I_{OZ}	V_{IN} = V_{IL} V_{OUT} = V_{CC}		5.5	—	—	±0.5	—	±5.0	μA
Input leakage current	I_{IN}	V_{IN} = V_{CC} or GND		5.5	—	—	±0.1	—	±1.0	μA
Quiescent supply current	I_{CC}	V_{IN} = V_{CC} or GND		5.5	—	—	4.0	—	40.0	μA

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

AC Characteristics (C_L = 50 pF, R_L = 500 Ω, input: t_r = t_f = 3 ns)

Characteristics	Symbol	Test Condition		Ta = 25°C			Ta = −40 to 85°C		Unit
			V_{CC} (V)	Min	Typ.	Max	Min	Max	
Propagation delay time	t_{pLZ}	—	3.3 ± 0.3	—	4.1	7.0	1.0	8.0	ns
			5.0 ± 0.5	—	3.5	5.3	1.0	6.0	
Propagation delay time	t_{pZL}	—	3.3 ± 0.3	—	5.9	9.1	1.0	10.4	ns
			5.0 ± 0.5	—	4.1	6.6	1.0	7.5	
Input capacitance	C_{IN}	—		—	5	10	—	10	pF
Output capacitance	C_{OUT}	—		—	10	—	—	—	pF
Power dissipation capacitance	C_{PD} (Note)	—		—	8	—	—	—	pF

Note: 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:

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

Package Dimensions

DIP14-P-300-2.54   Unit : mm
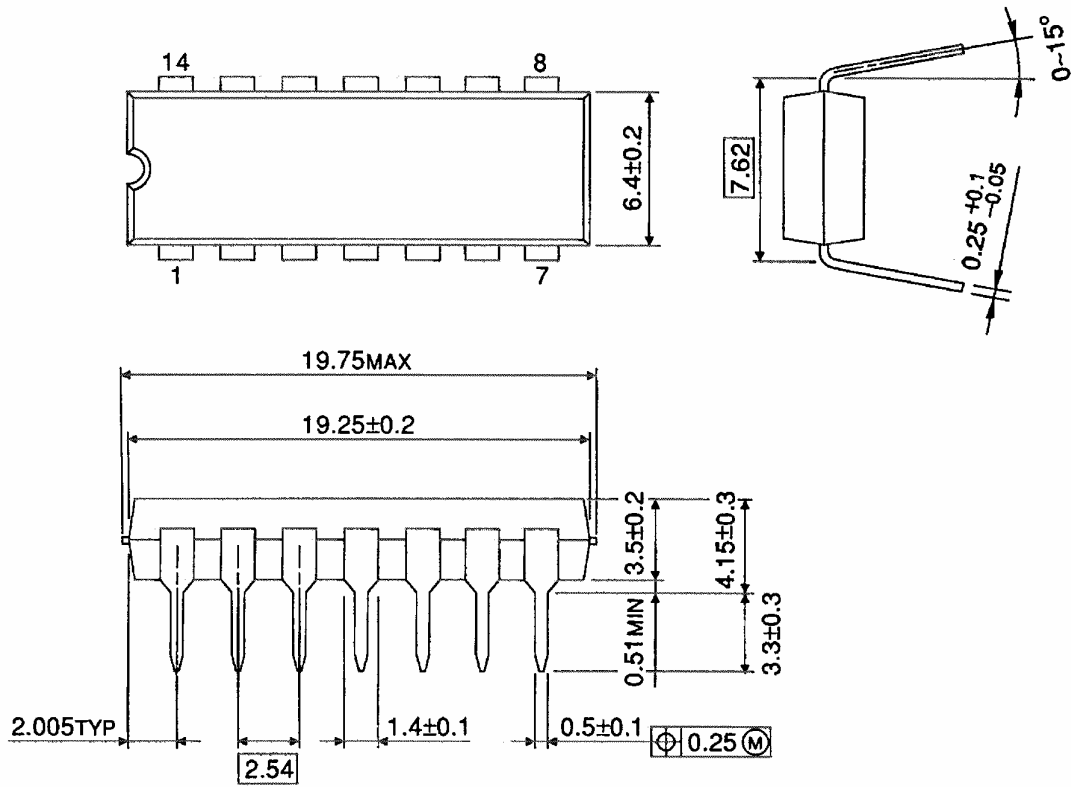
Weight: 0.96 g (typ.)

Package Dimensions

SOP14-P-300-1.27A   Unit: mm

Weight: 0.18 g (typ.)
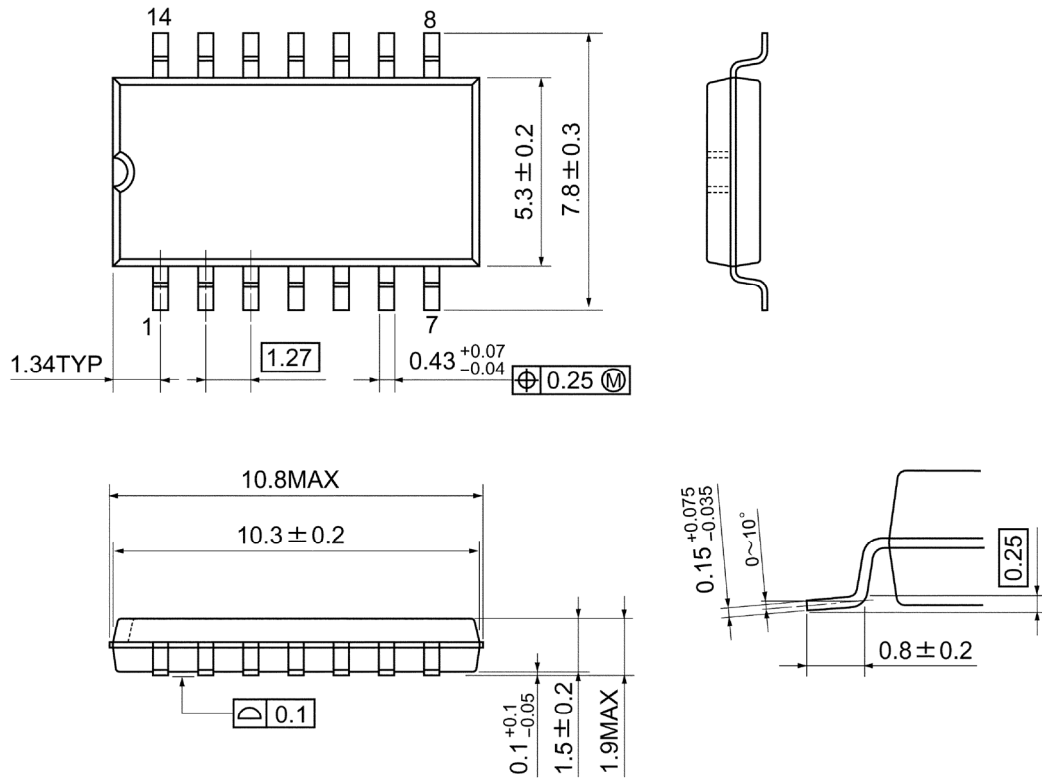
Package Dimensions

SOP14-P-300-1.27   Unit : mm
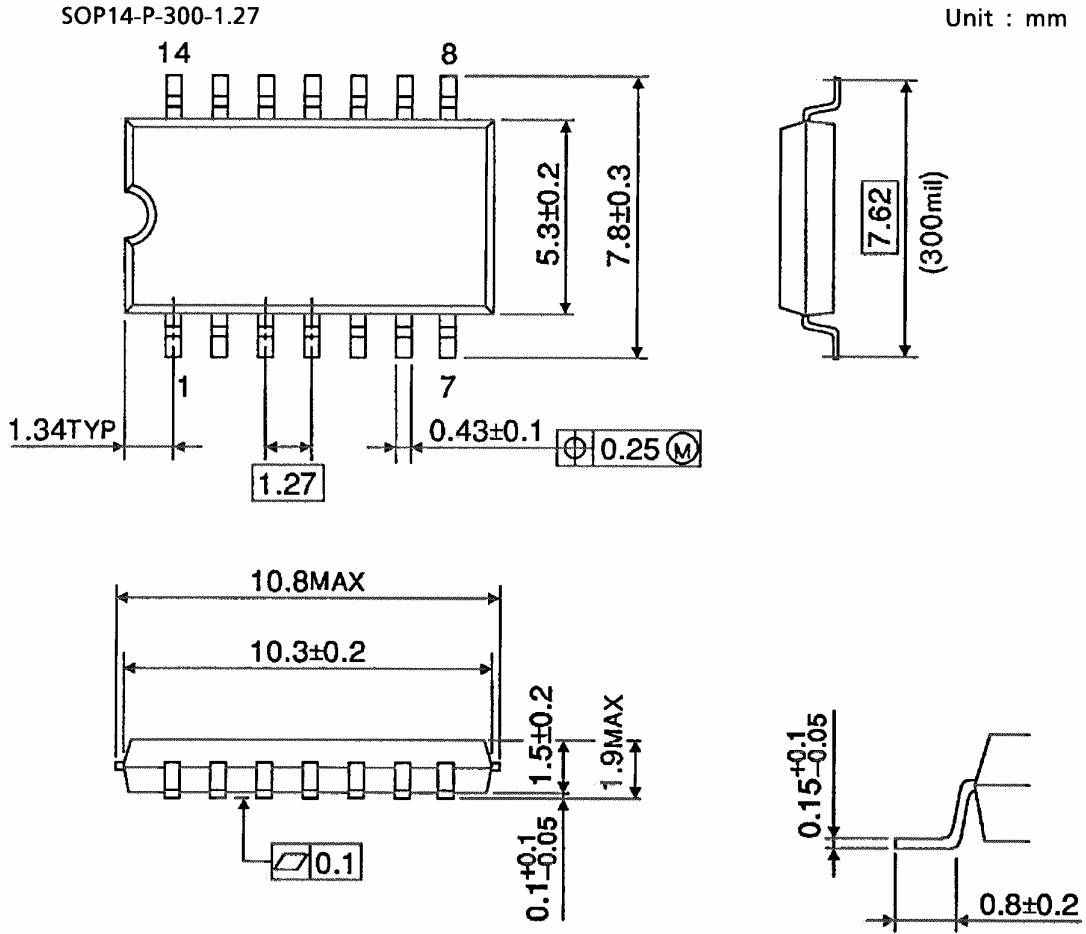
Weight: 0.18 g (typ.)

Package Dimensions (Note 1)

SOL14-P-150-1.27   Unit : mm
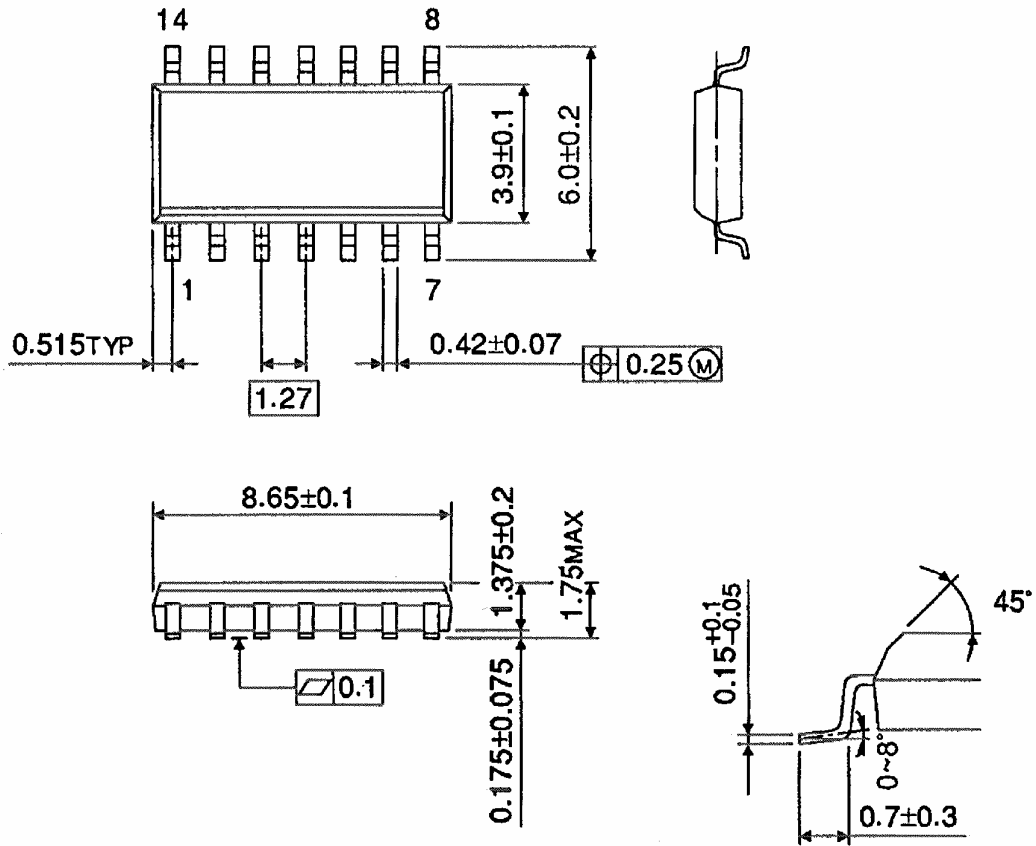
Note: This package is not available in Japan.

Weight: 0.12 g (typ.)

Note: Lead (Pb)-Free Packages

DIP14-P-300-2.54   SOP14-P-300-1.27A   SOL14-P-150-1.27

RESTRICTIONS ON PRODUCT USE