

TC74HC14AP, TC74HC14AF, TC74HC14AFN

Hex Schmitt Inverter

The TC74HC14A is a high speed CMOS SCHMITT INVERTER fabricated with silicon gate C²MOS technology.

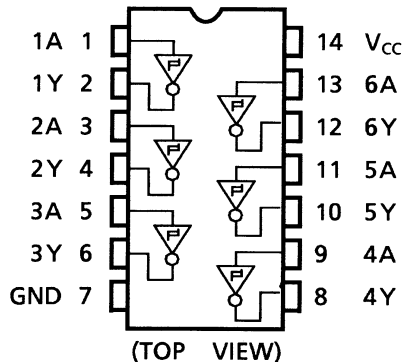
It achieves the high speed operation similar to equivalent LSTTL while maintaining the CMOS low power dissipation. Pin configuration and function are the same as the TC74HC04A but the inputs have 25% V_{CC} hysteresis and with its schmitt trigger function, the TC74HC14A can be used as a line receivers which will receive slow input signals.

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

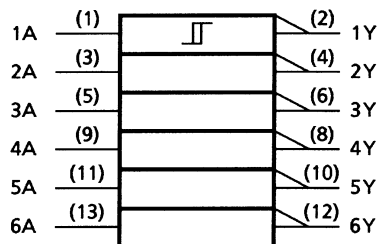
Features

- High speed: $t_{pd} = 11 \text{ ns}$ (typ.) at $V_{CC} = 5 \text{ V}$
- Low power dissipation: $I_{CC} = 1 \mu\text{A}$ (max) at $T_a = 25^\circ\text{C}$
- High noise immunity: $V_H = 1.1 \text{ V}$ at $V_{CC} = 5 \text{ V}$
- Output drive capability: 10 LSTTL loads
- Symmetrical output impedance: $|I_{OH}| = I_{OL} = 4 \text{ mA}$ (min)
- Balanced propagation delays: $t_{pLH} \approx t_{pHL}$
- Wide operating voltage range: $V_{CC} (\text{opr}) = 2 \sim 6 \text{ V}$
- Pin and function compatible with 74LS14

Pin Assignment

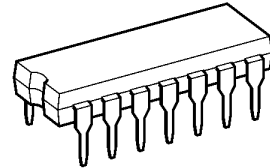


IEC Logic Symbol



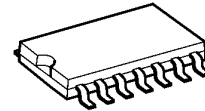
Note: xxxAFN (JEDEC SOP) is not available in Japan.

TC74HC14AP

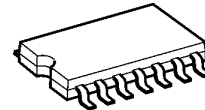


DIP14-P-300-2.54

TC74HC14AF

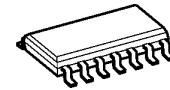


SOP14-P-300-1.27A



SOP14-P-300-1.27

TC74HC14AFN



SOL14-P-150-1.27

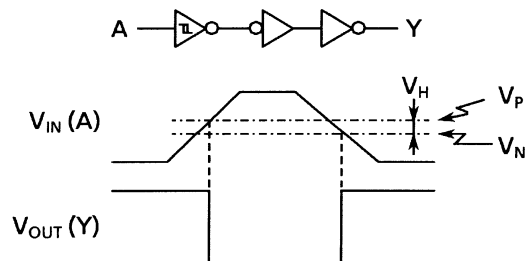
Weight

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.)

Truth Table

A	Y
L	H
H	L

System Diagram, Waveform



Absolute Maximum Ratings (Note 1)

Characteristics	Symbol	Rating	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) (Note 2)/180 (SOP)	mW
Storage temperature	T_{stg}	-65~150	°C

Note 1: Exceeding any of the absolute maximum ratings, even briefly, lead to deterioration in IC performance or even destruction.

Note 2: 500 mW 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 $-10 \text{ mW}/^{\circ}\text{C}$ shall be applied until 300 mW.

Recommended Operating Conditions (Note)

Characteristics	Symbol	Rating	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

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

Electrical Characteristics
DC Characteristics

Characteristics	Symbol	Test Condition		V _{CC} (V)	Ta = 25°C			Ta = −40~85°C		Unit
					Min	Typ.	Max	Min	Max	
Positive threshold voltage	V _P	—		2.0	1.0	1.25	1.50	1.0	1.50	V
				4.5	2.3	2.70	3.15	2.3	3.15	
				6.0	3.0	3.50	4.20	3.0	4.20	
Negative threshold voltage	V _N	—		2.0	0.30	0.65	0.9	0.30	0.9	V
				4.5	1.13	1.60	2.0	0.13	2.0	
				6.0	1.50	2.30	2.6	1.50	2.6	
Hysteresis voltage	V _H	—		2.0	0.3	0.6	1.0	0.3	1.0	V
				4.5	0.6	1.1	1.4	0.6	1.4	
				6.0	0.8	1.2	1.7	0.8	1.7	
High-level output voltage	V _{OH}	V _{IN} = V _{IL}	I _{OH} = −20 μA	2.0	1.9	2.0	—	1.9	—	V
				4.5	4.4	4.5	—	4.4	—	
			I _{OH} = −4 mA I _{OH} = −5.2 mA	6.0	5.9	6.0	—	5.9	—	
				4.5	4.18	4.31	—	4.13	—	
Low-level output voltage	V _{OL}	V _{IN} = V _{IH}	I _{OL} = 20 μA	2.0	—	0.0	0.1	—	0.1	V
				4.5	—	0.0	0.1	—	0.1	
			I _{OL} = 4 mA I _{OL} = 5.2 mA	6.0	—	0.0	0.1	—	0.1	
				4.5	—	0.17	0.26	—	0.33	
Quiescent supply current	I _{CC}	V _{IN} = V _{CC} or GND		6.0	—	—	1.0	—	10.0	μA
				6.0	—	—	1.0	—	10.0	
Input leakage current	I _{IN}	V _{IN} = V _{CC} or GND		6.0	—	—	±0.1	—	±1.0	μA

AC Characteristics (C_L = 15 pF, V_{CC} = 5 V, Ta = 25°C, input: t_r = t_f = 6 ns)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Output transition time	t _{TLH} t _{THL}	—	—	4	8	ns
Propagation delay time	t _{pLH} t _{pHL}	—	—	11	21	ns

AC Characteristics ($C_L = 50 \text{ pF}$, input: $t_r = t_f = 6 \text{ ns}$)

Characteristics	Symbol	Test Condition	$T_a = 25^\circ\text{C}$			$T_a = -40\sim 85^\circ\text{C}$		Unit
			V_{CC} (V)	Min	Typ.	Max	Min	Max
Output transition time	t_{TLH}	—	2.0	—	30	75	—	95
	t_{THL}		4.5	—	8	15	—	19
			6.0	—	7	13	—	16
Propagation delay time	t_{pLH}	—	2.0	—	42	125	—	155
	t_{pHL}		4.5	—	14	25	—	31
			6.0	—	12	21	—	26
Input capacitance	C_{IN}	—	—	—	5	10	—	10
Power dissipation capacitance	C_{PD} (Note)	—	—	—	28	—	—	—

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

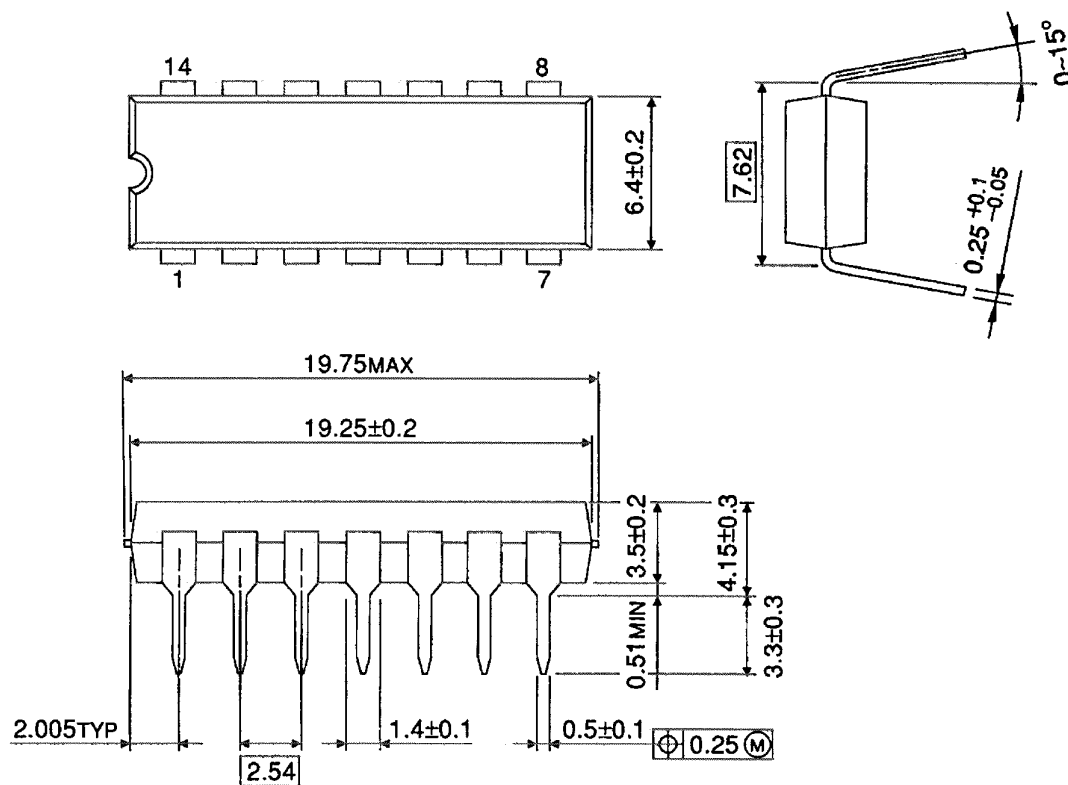
Average operating current can be obtained by the equation:

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

Package Dimensions

DIP14-P-300-2.54

Unit : mm

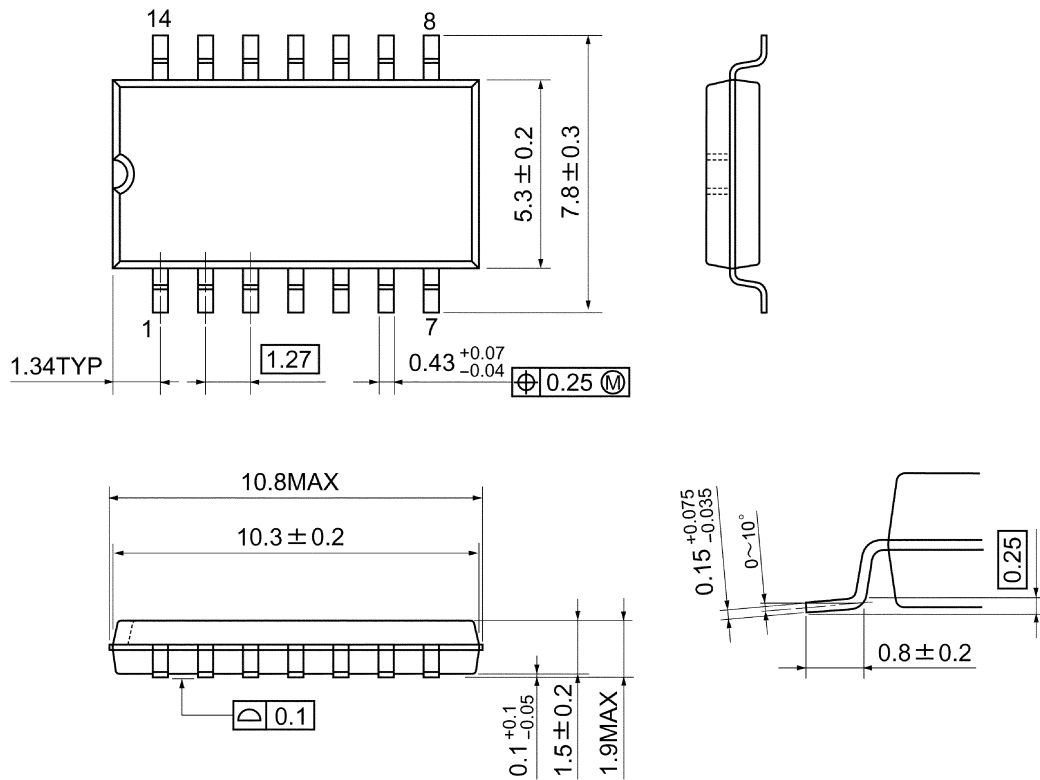


Weight: 0.96 g (typ.)

Package Dimensions

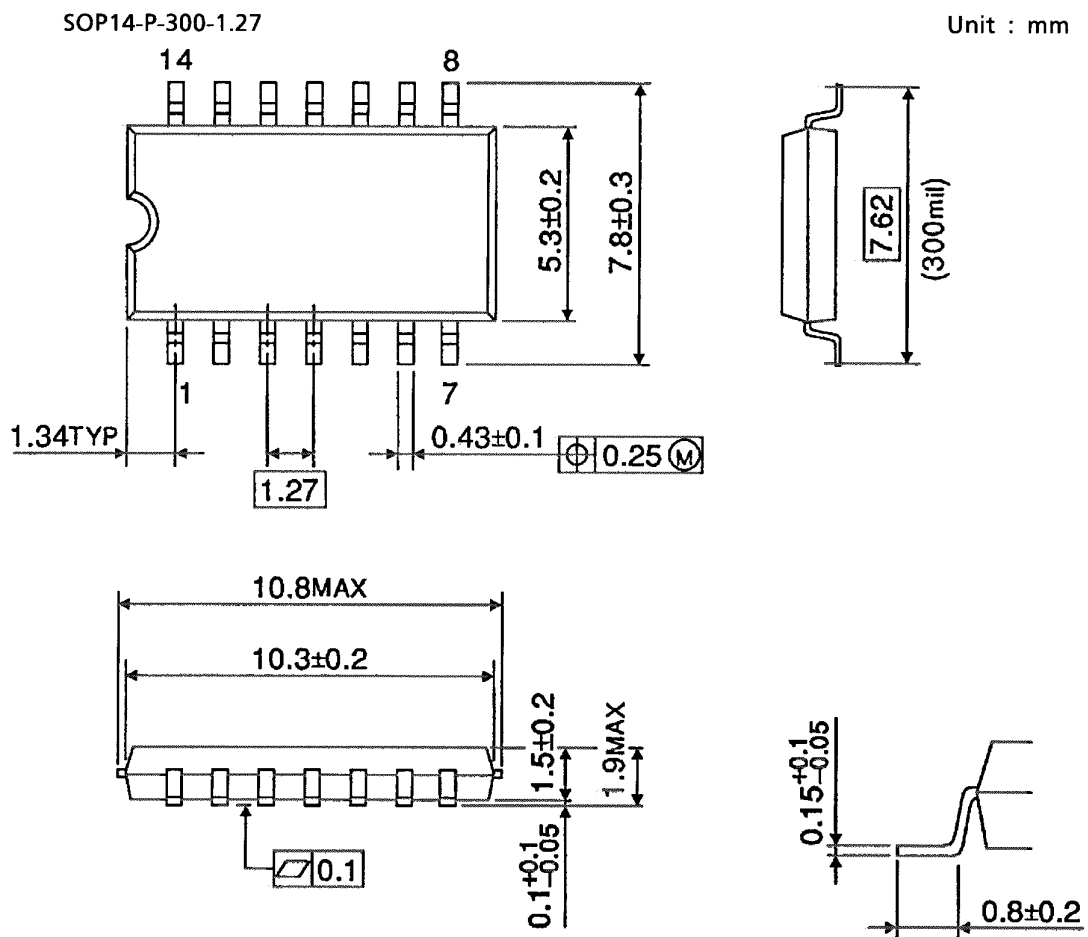
SOP14-P-300-1.27A

Unit: mm



Weight: 0.18 g (typ.)

Package Dimensions

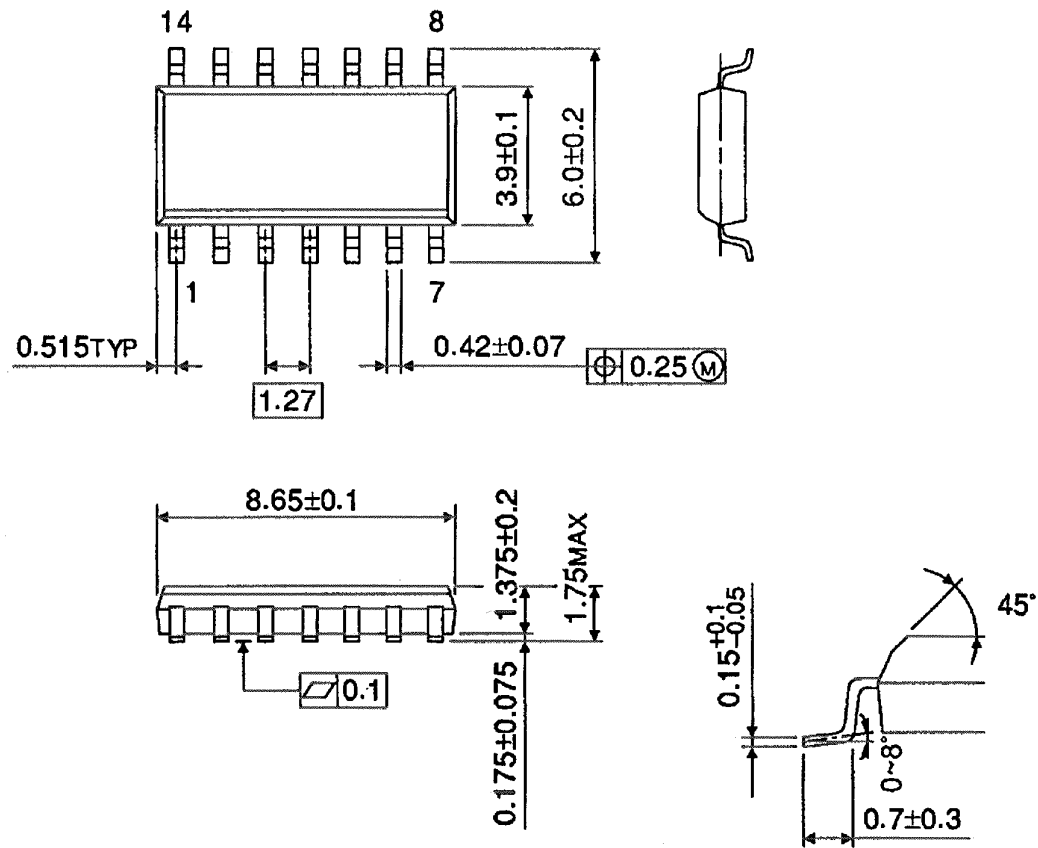


Weight: 0.18 g (typ.)

Package Dimensions (Note)

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

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