TOSHIBA CMOS DIGITAL INTEGRATED CIRCUIT SILICON MONOLITHIC

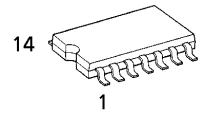
TC74VHCT14AF, TC74VHCT14AFN, TC74VHCT14AFT

HEX SCHMITT INVERTER

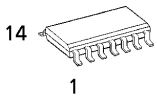
The TC74VHCT14A is an advanced high speed CMOS SCHMITT INVERTER fabricated with silicon gate C^{2}MOS technology.
It achieves the high speed operation similar to equivalent Bipolar Schottky TTL while maintaining the CMOS low power dissipation.
Pin configuration and function are the same as the TC74VHC04 but the inputs have hysteresis and with its schmitt trigger function, the TC74VHC14 can be used as a line receivers which will receive slow input signals.
The input voltage are compatible with TTL output voltage.
This device may be used as a level converter for interfacing 3.3V to 5V system.
Input protection and output circuit ensure that 0 to 5.5V can be applied to the input and output*1 pins without regard to the supply voltage. These structure prevents device destruction due to mismatched supply and input / output voltages such as battery back up, hot board insertion, etc.
*1: Vcc = 0V

FEATURES:
- High Speed ..... t_{pd} = 5.0ns (typ.) at V_{CC} = 5V
- Low Power Dissipation ..... I_{CC} = 2μA(Max.) at Ta = 25°C
- Compatible with TTL outputs .... V_{IL} = 0.8V (Max.), V_{IH} = 2.0V (Min.)
- Power Down Protection is provided on all inputs and outputs.
- Balanced Propagation Delays ..... $t_{pLH} \simeq t_{pHL}$
- Low Noise ..... V_{OLP} = 0.8V (Max.)
- Pin and Function Compatible with the 74 series (74AC / HC / F / ALS / LS etc.) 14 type.

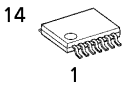
(Note) The JEDEC SOP (FN) is not available in Japan.



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

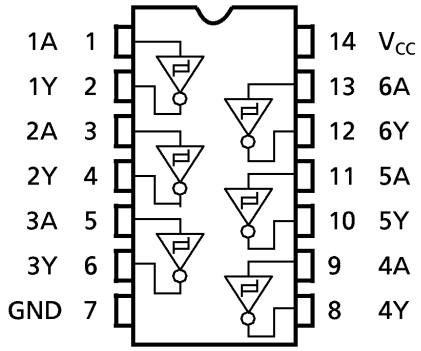


FN (SOL14-P-150-1.27)
Weight : 0.12g (Typ.)



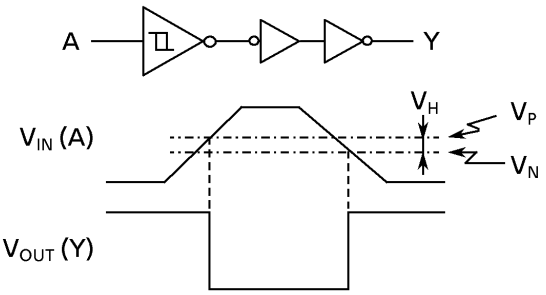
FT (TSSOP14-P-0044-0.65)
Weight : 0.06g (Typ.)

PIN ASSIGNMENT

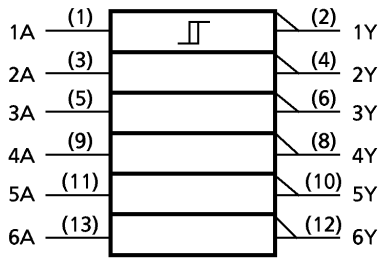


(TOP VIEW)

SYSTEM DIAGRAM, WAVEFORM



IEC LOGIC SYMBOL



TRUTH TABLE

A	Y
L	H
H	L

980910EBA2

● TOSHIBA is continually working to improve the quality and the reliability of its products. Nevertheless, semiconductor devices in general can malfunction or fail due to their inherent electrical sensitivity and vulnerability to physical stress. It is the responsibility of the buyer, when utilizing TOSHIBA products, to observe standards of safety, and to avoid situations in which a malfunction or failure of a TOSHIBA product could cause loss of human life, bodily injury or damage to property. In developing your designs, please ensure that TOSHIBA products are used within specified operating ranges as set forth in the most recent products specifications. Also, please keep in mind the precautions and conditions set forth in the TOSHIBA Semiconductor Reliability Handbook.

ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	VALUE	UNIT
Supply Voltage Range	V_{CC}	−0.5~7.0	V
DC Input Voltage	V_{IN}	−0.5~7.0	V
DC Output Voltage	V_{OUT}	−0.5~7.0 (Note 1)	V
		−0.5~VCC+0.5 (Note 2)	
Input Diode Current	I_{IK}	−20	mA
Output Diode Current	I_{OK}	±20 (Note 3)	mA
DC Output Current	I_{OUT}	±25	mA
DC Vcc/Ground Current	I_{CC}	±50	mA
Power Dissipation	P_D	180	mW
Storage Temperature	T_{stg}	−65~150	°C

(Note 1) Vcc = 0V
(Note 2) High or Low State. I_{OUT} absolute maximum rating must be observed.
(Note 3) $V_{OUT}<GND$, $V_{OUT}>V_{CC}$

RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	VALUE	UNIT
Supply Voltage	V_{CC}	4.5~5.5	V
Input Voltage	V_{IN}	0~5.5	V
Output Voltage	V_{OUT}	0~5.5 (Note 4)	V
		0~VCC (Note 5)	
Operating Temperature	T_{opr}	−40~85	°C
Input Rise and Fall Time	dt / dV	0~20	ns / V

(Note 4) Vcc = 0V
(Note 5) High or Low State

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- The information contained herein is presented only as a guide for the applications of our products. No responsibility is assumed by TOSHIBA CORPORATION for any infringements of intellectual property or other rights of the third parties which may result from its use. No license is granted by implication or otherwise under any intellectual property or other rights of TOSHIBA CORPORATION or others.
- The information contained herein is subject to change without notice.

DC ELECTRICAL CHARACTERISTICS

PARAMETER	SYMBOL	TEST CONDITION		V_{CC} (V)	Ta = 25°C			Ta = −40~85°C		UNIT
					MIN.	TYP.	MAX.	MIN.	MAX.	
Positive Threshold Voltage	V_P			4.5 5.5	— —	— —	1.90 2.10	— —	1.90 2.10	V
Negative Threshold Voltage	V_N			4.5 6.0	0.50 0.60	— —	— —	0.50 0.60	— —	V
Hysteresis Voltage	V_H			4.5 5.5	0.40 0.40	— —	1.40 1.50	0.40 0.40	1.40 1.50	V
High - Level Output Voltage	V_{OH}	$V_{IN} = V_{IL}$	$I_{OH} = -50\mu A$	4.5	4.4	4.5	—	4.4	—	V
			$I_{OH} = -8mA$	4.5	3.94	—	—	3.80	—	
Low - Level Output Voltage	V_{OL}	$V_{IN} = V_{IH}$	$I_{OL} = 50\mu A$	4.5	—	0.0	0.1	—	0.1	V
			$I_{OL} = 8mA$	4.5	—	—	0.36	—	0.44	
Input Leakage Current	I_{IN}	$V_{IN} = 5.5V$ or GND		0~ 5.5	—	—	±0.1	—	±1.0	μA
Quiescent Supply Current	I_{CC}	$V_{IN} = V_{CC}$ or GND		5.5	—	—	2.0	—	20.0	
	I_{CCT}	PER INPUT : $V_{IN} = 3.4V$ OTHER INPUT : V_{CC} or GND		5.5	—	—	1.35	—	1.50	mA
Output Leakage Current	I_{OPD}	$V_{OUT} = 5.5V$		0	—	—	0.5	—	5.0	μA

AC ELECTRICAL CHARACTERISTICS (Input $t_r = t_f = 3ns$)

PARAMETER	SYMBOL	TEST CONDITION			Ta = 25°C			Ta = −40~85°C		UNIT
			V_{CC} (V)	CL (pF)	MIN.	TYP.	MAX.	MIN.	MAX.	
Propagation Delay Time	t_{pLH} t_{pHL}		5.0 ± 0.5	15	—	5.0	7.6	1.0	9.0	ns
				50	—	6.5	9.6	1.0	11.0	
Input Capacitance	C_{IN}				—	4	10	—	10	pF
Power Dissipation Capacitance	C_{PD}	(Note 6)			—	18	—	—	—	

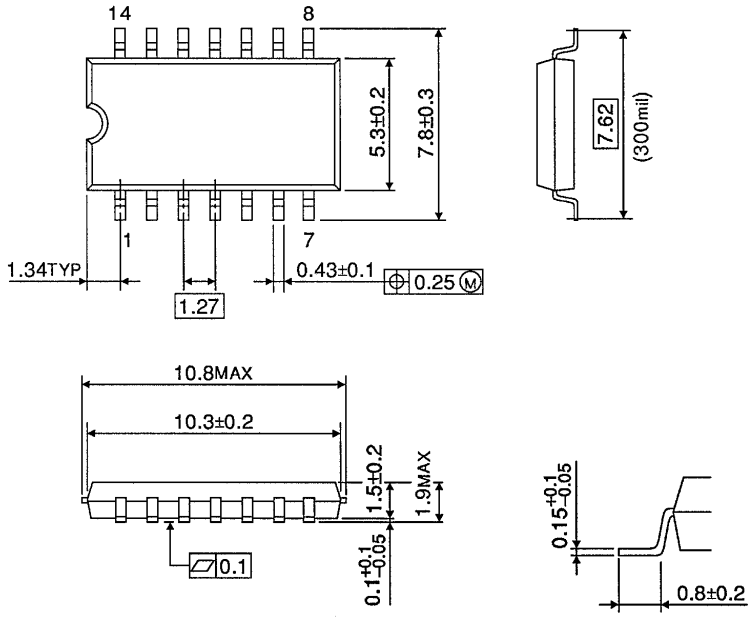
(Note 6) C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.
Average operating current can be obtained by the equation :

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

NOISE CHARACTERISTICS (Input $t_r = t_f = 3ns$)

PARAMETER	SYMBOL	TEST CONDITION		Ta = 25°C		UNIT
			V_{CC} (V)	TYP.	LIMIT	
Quiet Output Maximum Dynamic V_{OL}	V_{OLP}	$C_L = 50pF$	5.0	0.5	0.8	V
Quiet Output Minimum Dynamic V_{OL}	V_{OLV}	$C_L = 50pF$	5.0	−0.5	−0.8	V
Minimum High Level Dynamic Input Voltage	V_{IHD}	$C_L = 50pF$	5.0	—	2.0	V
Maximum Low Level Dynamic Input Voltage	V_{ILD}	$C_L = 50pF$	5.0	—	0.8	V

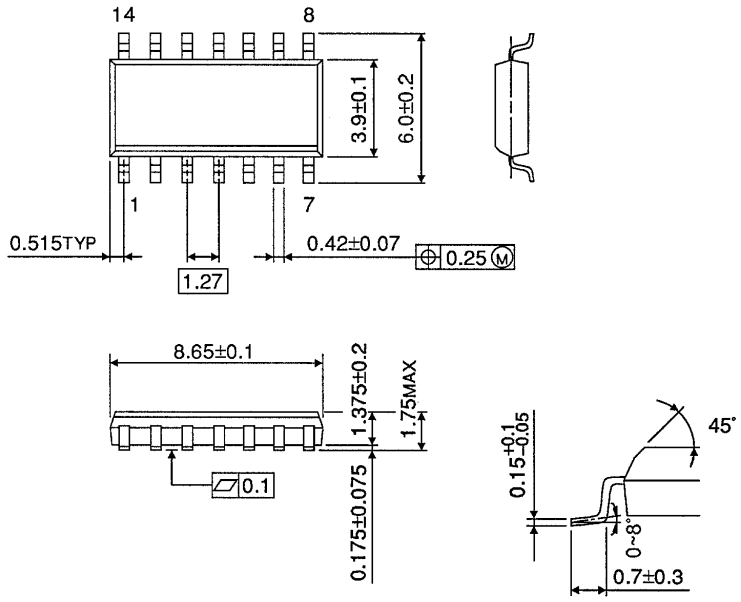
SOP 14PIN (200mil BODY) OUTLINE DRAWING (SOP14-P-300-1.27) Unit in mm



Weight : 0.18g (Typ.)

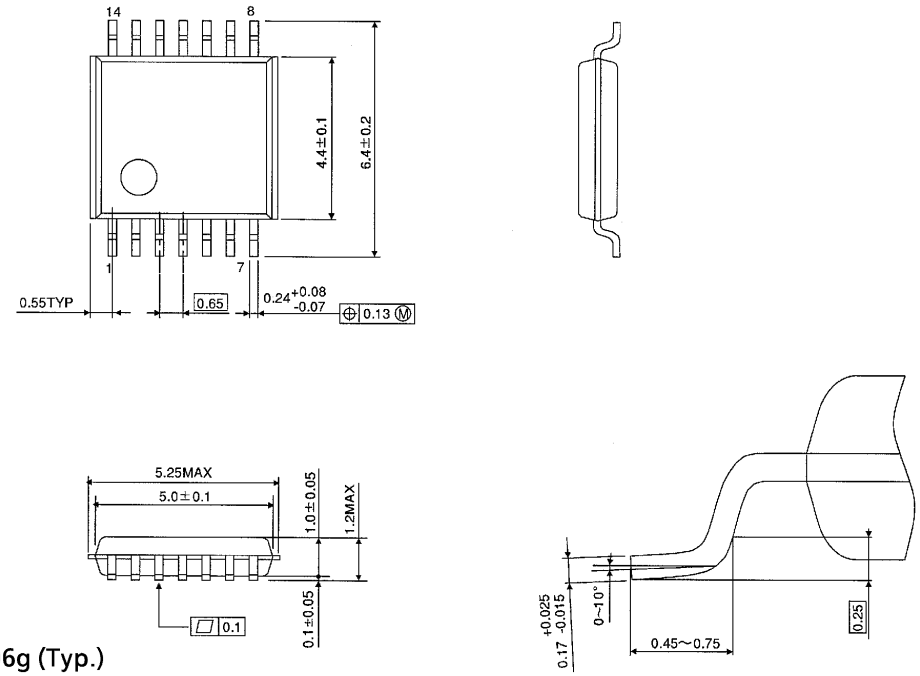
SOP 14PIN (150mil BODY) OUTLINE DRAWING (SOL14-P-150-1.27) Unit in mm

(Note) This package is not available in Japan.



Weight : 0.12g (Typ.)

TSSOP 14PIN OUTLINE DRAWING (TSSOP14-P-0044-0.65) Unit in mm



Weight : 0.06g (Typ.)