

**TC74HCT74AP, TC74HCT74AF, TC74HCT74AFN**

**DUAL D-TYPE FLIP FLOP WITH PRESET AND CLEAR**

The TC74HCT74A is a high speed CMOS D FLIP FLOP fabricated with silicon gate C<sup>2</sup>MOS technology.

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

This device may be used as a level converter for interfacing TTL or NMOS to High Speed CMOS. The inputs are compatible with TTL, NMOS and CMOS output voltage levels.

The signal level applied to the D INPUT is transferred to Q OUTPUT during the positive going transition of the CLOCK pulse.

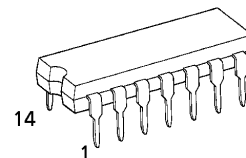
**CLEAR** and **PRESET** are independent of the CLOCK and are accomplished by setting the appropriate input to an "L" level.

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

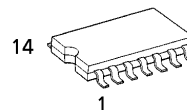
**FEATURES :**

- High Speed..... $f_{MAX} = 53\text{MHz}$  (typ.)  
at  $V_{CC} = 5\text{V}$
- Low Power Dissipation..... $I_{CC} = 2\mu\text{A}$ (Max.) at  $T_a = 25^\circ\text{C}$
- Compatible with TTL outputs...  $V_{IH} = 2\text{V}$  (Min.)  
 $V_{IL} = 0.8\text{V}$  (Max.)
- Wide Interfacing ability.....LSTTL, NMOS, CMOS
- Output Drive Capability.....10 LSTTL Loads
- Symmetrical Output Impedance...  $|I_{OH}| = I_{OL} = 4\text{mA}$  (Min.)
- Balanced Propagation Delays...  $t_{pLH} \approx t_{pHL}$
- Pin and Function Compatible with 74LS74

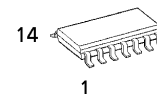
(Note) The JEDEC SOP (FN) is not available in Japan.



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

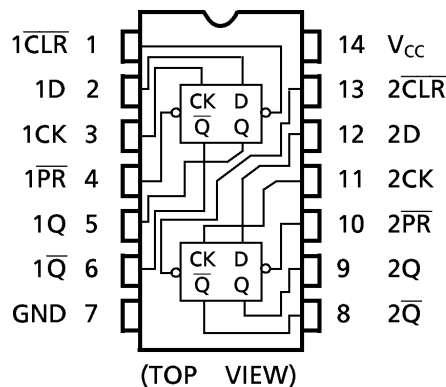


F (SOP14-P-300-1.27)  
Weight : 0.18g (Typ.)



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

**PIN ASSIGNMENT**

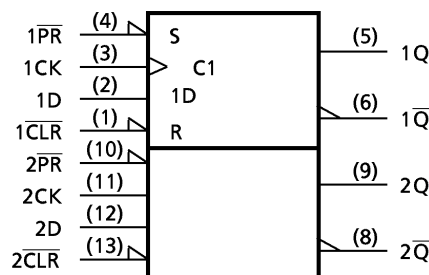


**TRUTH TABLE**

INPUTS				OUTPUTS		FUNCTION
CLR	PR	D	CK	Q	Q̄	
L	H	X	X	L	H	CLEAR
H	L	X	X	H	L	PRESET
L	L	X	X	H	H	—
H	H	L	┌	L	H	—
H	H	H	┌	H	L	—
H	H	X	└	Q <sub>n</sub>	Q̄ <sub>n</sub>	NO CHANGE

X : Don't Care

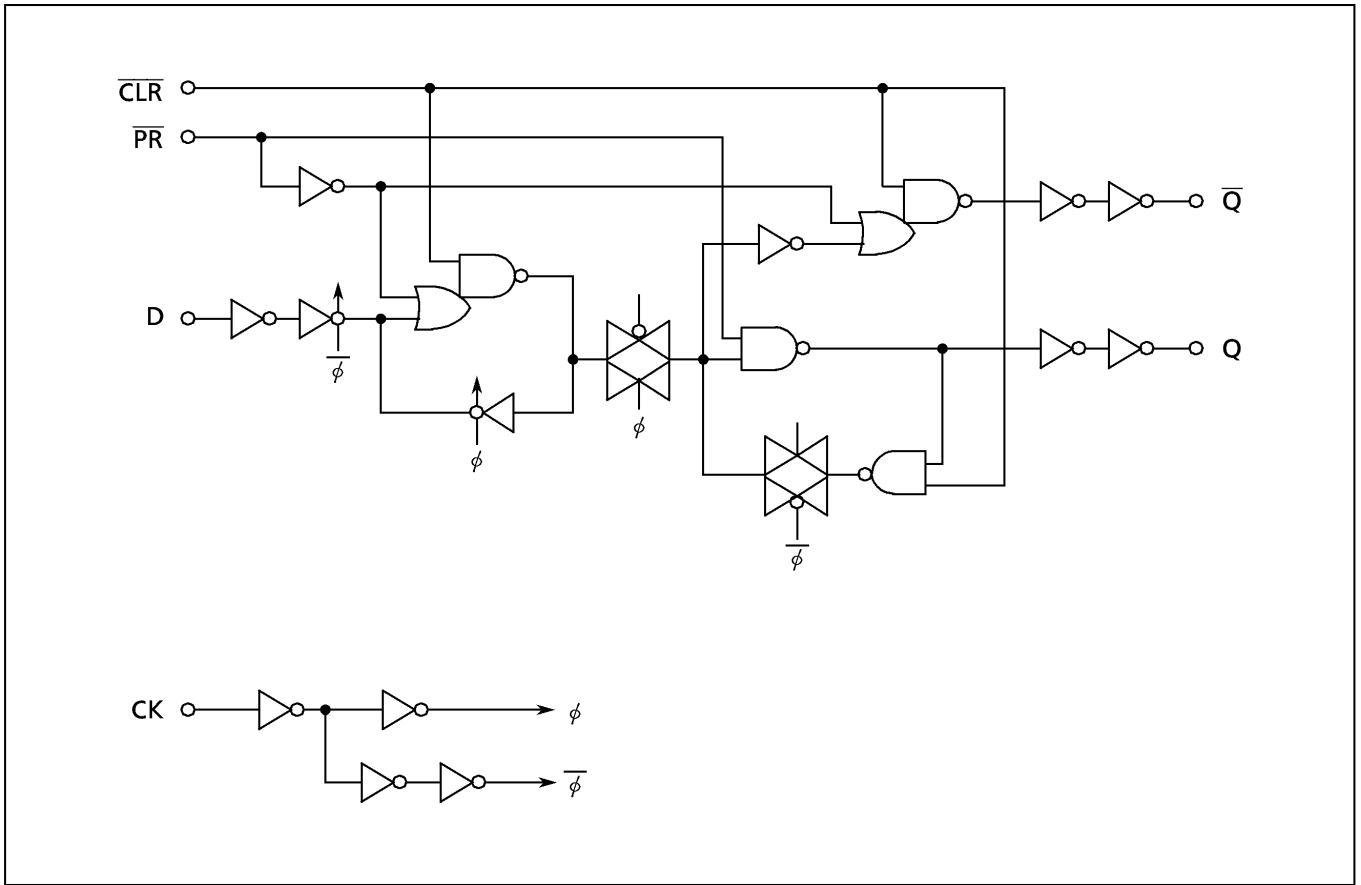
**IEC LOGIC SYMBOL**



980508EBA2

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SYSTEM DIAGRAM



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## ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	VALUE	UNIT
Supply Voltage Range	$V_{CC}$	$-0.5 \sim 7$	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	$I_{OK}$	$\pm 20$	mA
DC Output Current	$I_{OUT}$	$\pm 25$	mA
DC $V_{CC}$ / Ground Current	$I_{CC}$	$\pm 50$	mA
Power Dissipation	$P_D$	500 (DIP)* / 180 (SOP)	mW
Storage Temperature	$T_{stg}$	$-65 \sim 150$	$^{\circ}\text{C}$

\*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  $-10\text{mW}/^{\circ}\text{C}$  shall be applied until 300mW.

## RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	VALUE	UNIT
Supply Voltage	$V_{CC}$	$4.5 \sim 5.5$	V
Input Voltage	$V_{IN}$	$0 \sim V_{CC}$	V
Output Voltage	$V_{OUT}$	$0 \sim V_{CC}$	V
Operating Temperature	$T_{opr}$	$-40 \sim 85$	$^{\circ}\text{C}$
Input Rise and Fall Time	$t_r, t_f$	$0 \sim 500$	ns

## 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	$V_{IH}$		4.5 ┆ 5.5	2.0	—	—	2.0	—	V	
Low - Level Input Voltage	$V_{IL}$		4.5 ┆ 5.5	—	—	0.8	—	0.8	V	
High - Level Output Voltage	$V_{OH}$	$V_{IN} = V_{IH}$ or $V_{IL}$	$I_{OH} = -20 \mu\text{A}$	4.5	4.4	4.5	—	4.4	—	V
			$I_{OH} = -4 \text{ mA}$	4.5	4.18	4.31	—	4.13	—	
Low - Level Output Voltage	$V_{OL}$	$V_{IN} = V_{IH}$ or $V_{IL}$	$I_{OL} = 20 \mu\text{A}$	4.5	—	0.0	0.1	—	0.1	V
			$I_{OL} = 4 \text{ mA}$	4.5	—	0.17	0.26	—	0.33	
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	—	—	2.0	—	20.0		
		$I_C$	PER INPUT: $V_{IN} = 0.5\text{V}$ or $2.4\text{V}$ OTHER INPUT: $V_{CC}$ or GND	5.5	—	—	2.0	—	2.9	mA

TIMING REQUIREMENTS (Input  $t_r = t_f = 6\text{ns}$ )

PARAMETER	SYMBOL	TEST CONDITION	$V_{CC}$ (V)	Ta = 25°C		Ta = -40~85°C	UNIT
				TYP.	LIMIT	LIMIT	
Minimum Pulse Width (CK)	$t_{W(L)}$ $t_{W(H)}$		4.5	—	15	19	ns
			5.5	—	14	17	
Minimum Pulse Width ( $\overline{\text{CLR}}$ , $\overline{\text{PR}}$ )	$t_{W(L)}$		4.5	—	15	19	
			5.5	—	14	17	
Minimum Set-up Time	$t_s$		4.5	—	15	19	
			5.5	—	14	17	
Minimum Hold Time	$t_h$		4.5	—	0	0	
			5.5	—	0	0	
Minimum Removal Time ( $\overline{\text{CLR}}$ , $\overline{\text{PR}}$ )	$t_{rem}$		4.5	—	5	5	
			5.5	—	5	5	
Clock Frequency	f		4.5	—	27	22	MHz
			5.5	—	30	24	

AC ELECTRICAL CHARACTERISTICS ( $C_L = 15\text{pF}$ ,  $V_{CC} = 5\text{V}$ , Ta = 25°C, Input  $t_r = t_f = 6\text{ns}$ )

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Output Transition Time	$t_{TLH}$ $t_{THL}$		—	6	12	ns
Propagation Delay Time (CK-Q, $\overline{\text{Q}}$ )	$t_{pLH}$ $t_{pHL}$		—	17	28	
Propagation Delay Time ( $\overline{\text{CLR}}$ , $\overline{\text{PR}}$ -Q, $\overline{\text{Q}}$ )	$t_{pLH}$ $t_{pHL}$		—	15	25	
Maximum Clock Frequency	$f_{MAX}$		29	53	—	MHz

AC ELECTRICAL CHARACTERISTICS ( $C_L = 50\text{pF}$ , Input  $t_r = t_f = 6\text{ns}$ )

PARAMETER	SYMBOL	TEST CONDITION	$V_{CC}$ (V)	Ta = 25°C			Ta = -40~85°C		UNIT
				MIN.	TYP.	MAX.	MIN.	MAX.	
Output Transition Time	$t_{TLH}$ $t_{THL}$		4.5	—	8	15	—	19	ns
			5.5	—	7	13	—	16	
Propagation Delay Time (CK-Q, Q)	$t_{pLH}$ $t_{pHL}$		4.5	—	21	33	—	41	
			5.5	—	19	30	—	37	
Propagation Delay Time ( $\overline{\text{CLR}}$ , $\overline{\text{PR}}$ -Q, Q)	$t_{pLH}$ $t_{pHL}$		4.5	—	18	30	—	38	
			5.5	—	15	27	—	35	
Maximum Clock Frequency	$f_{MAX}$		4.5	27	48	—	22	—	MHz
			5.5	30	53	—	24	—	
Input Capacitance	$C_{IN}$			—	5	10	—	10	pF
Power Dissipation Capacitance	$C_{PD}$	(1)		—	32	—	—	—	

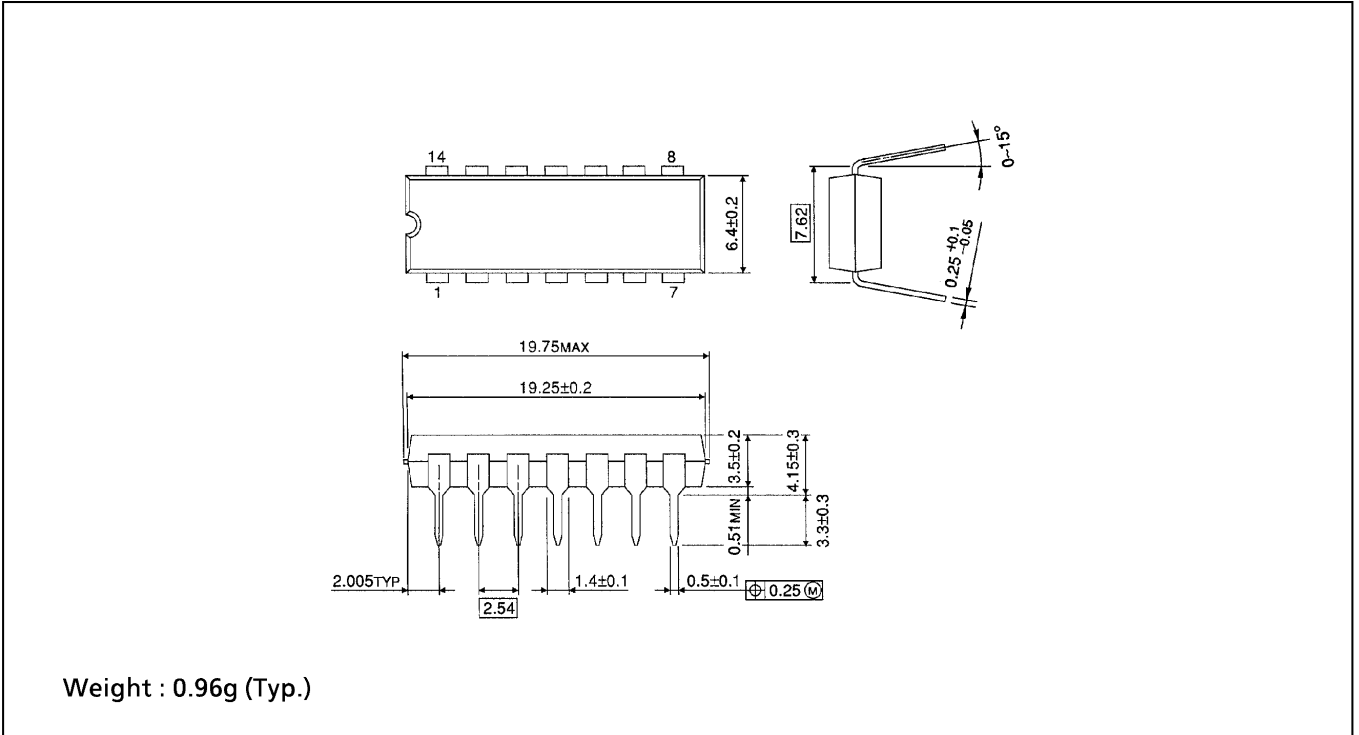
Note (1)  $C_{PD}$  is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

Average operating current can be obtained by the equation:

$$I_{CC}(\text{opr}) = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}/2 \text{ (per F/F)}$$

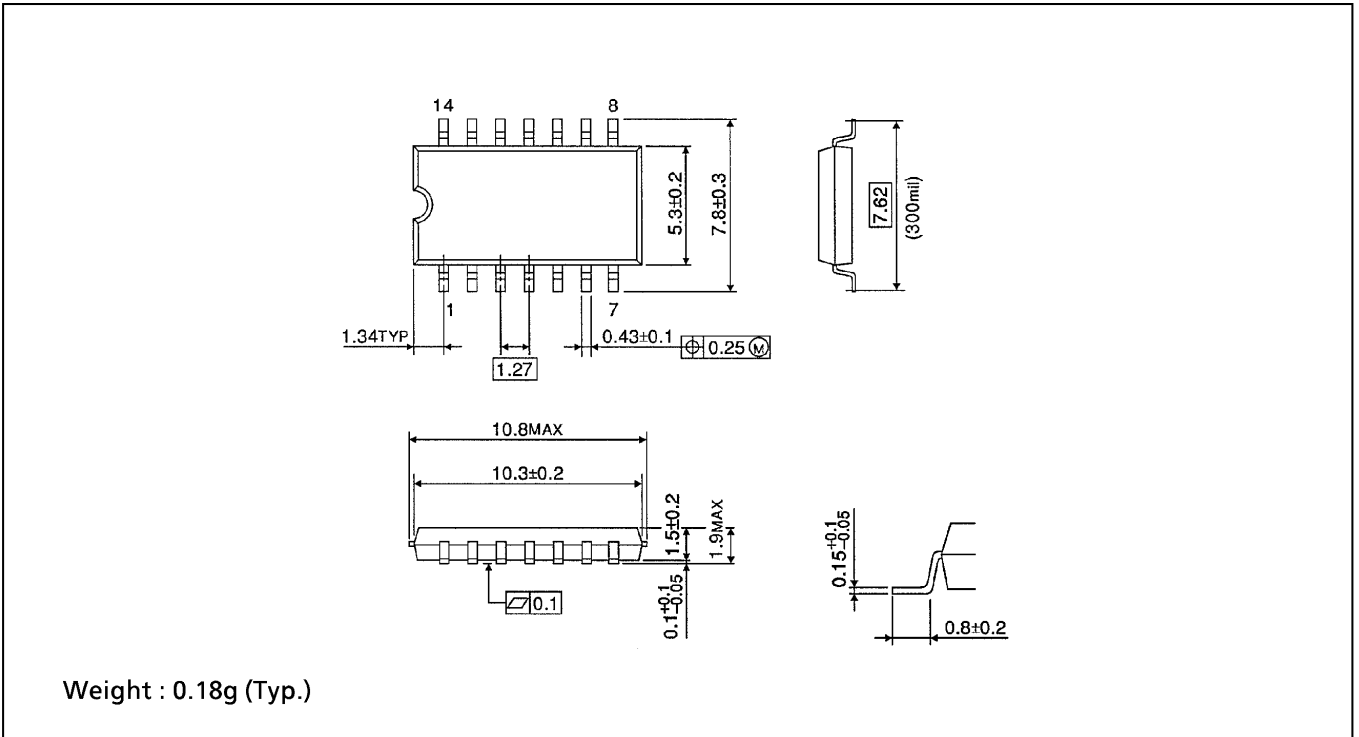
DIP 14PIN OUTLINE DRAWING (DIP14-P-300-2.54)

Unit in mm



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

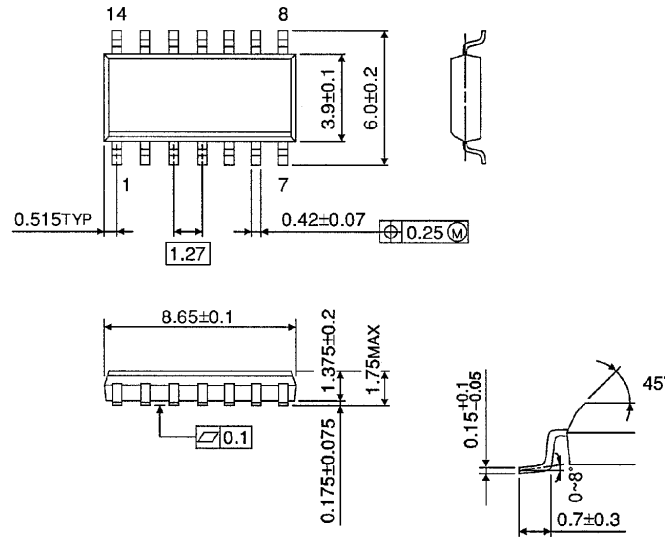
Unit in mm



**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.)