

TC74VHCT74AF, TC74VHCT74AFN, TC74VHCT74AFT

DUAL D - TYPE FLIP - FLOP WITH PRESET AND CLEAR

The TC74VHCT74 is an advanced high speed CMOS D - FLIP FLOP fabricated with silicon gate C²MOS technology. It achieves the high speed operation similar to equivalent Bipolar Schottky TTL while maintaining the CMOS low power dissipation.

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

CLR and PR are independent of the CK and are accomplished by setting the appropriate input low.

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.

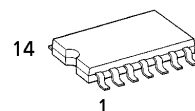
Input protection and output circuit ensure that 0 to 5.5V can be applied to the input and output*1 pins without regard to the supply voltage. These structure prevents device destruction due to mismatched supply and input / output voltages such as battery back up, hot board insertion, etc.

*1: $V_{CC}=0V$

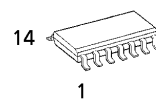
FEATURES:

- High Speed $f_{MAX} = 160MHz(typ.)$
at $V_{CC} = 5V$
- Low Power Dissipation $I_{CC} = 2\mu A(Max.)$ at $T_a = 25^{\circ}C$
- 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 $t_{PLH} \approx t_{PHL}$
- Pin and Function Compatible with the 74 series (74AC / HC / F / ALS / LS etc.) 74 type.

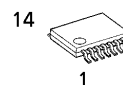
(Note) The JEDEC SOP (FN) is not available in Japan.



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

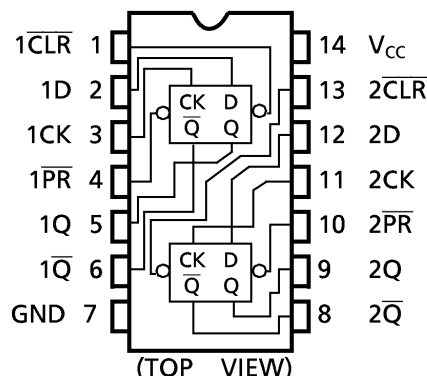


FN (SOL14-P-150-1.27)
Weight : 0.12g (Typ.)



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

PIN ASSIGNMENT

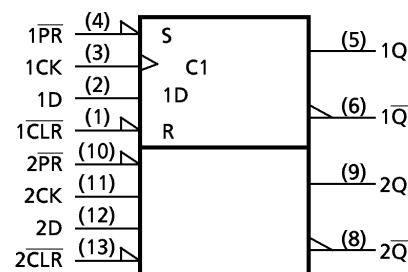


TRUTH TABLE

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 _n	Q̄ _n	NO CHANGE

X : Don't Care

IEC LOGIC SYMBOL



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ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	VALUE	UNIT
Supply Voltage Range	V_{CC}	$-0.5 \sim 7.0$	V
DC Input Voltage	V_{IN}	$-0.5 \sim 7.0$	V
DC Output Voltage	V_{OUT}	$-0.5 \sim 7.0$ (Note 1)	V
		$-0.5 \sim V_{CC} + 0.5$ (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 V_{CC} /Ground Current	I_{CC}	± 50	mA
Power Dissipation	P_D	180	mW
Storage Temperature	T_{stg}	$-65 \sim 150$	$^{\circ}\text{C}$

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

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~ V_{CC} (Note 5)	
Operating Temperature	T_{opr}	$-40 \sim 85$	$^{\circ}\text{C}$
Input Rise and Fall Time	dt/dV	0~20	ns/V

(Note 4) $V_{CC} = 0\text{V}$

(Note 5) High or Low State.

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DC ELECTRICAL CHARACTERISTICS

PARAMETER	SYMBOL	CONDITON		V _{CC} (V)	Ta = 25°C			Ta = -40~85°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} = -50μA	4.5	4.40	4.50	—	4.40	—	V
			I _{OH} = -8mA	4.5	3.94	—	—	3.80	—	
Low - Level Output Voltage	V _{OL}	V _{IN} = V _{IH} or V _{IL}	I _{OL} = 50μA	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	μA
Output Leakage Current	I _{OPD}	V _{OUT} = 5.5V		0	—	—	0.5	—	5.0	μA

TIMING REQUIREMENTS (Input $t_r = t_f = 3\text{ns}$)

PARAMETER	SYMBOL	TEST CONDITION	Ta = 25°C		Ta = -40~85°C		UNIT
			V _{CC} (V)	LIMIT	LIMIT	LIMIT	
Minimum Pulse Width (CK)	$t_{W(L)}$ $t_{W(H)}$		5.0 ± 0.5	5.0	5.0		ns
Minimum Pulse Width (CLR, PR)	$t_{W(L)}$		5.0 ± 0.5	5.0	5.0		
Minimum Set-up Time	t_s		5.0 ± 0.5	5.0	5.0		
Minimum Hold Time	t_h		5.0 ± 0.5	0.0	0.0		
Minimum Removal Time (CLR, PR)	t_{rem}		5.0 ± 0.5	3.5	3.5		

AC ELECTRICAL CHARACTERISTICS (Input $t_r = t_f = 3\text{ns}$)

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 (CK - Q, $\bar{Q}$)	t_{pLH} t_{pHL}	5.0 ± 0.5	15	—	5.8	7.8	1.0	9.0	ns
			50	—	6.3	8.8	1.0	10.0	
Propagation Delay Time (CLR, PR - Q, $\bar{Q}$)	t_{pLH} t_{pHL}	5.0 ± 0.5	15	—	7.6	10.4	1.0	12.0	
			50	—	8.1	11.4	1.0	13.0	
Maximum Clock Frequency	f_{MAX}	5.0 ± 0.5	15	100	160	—	80	—	MHz
			50	80	140	—	65	—	
Input Capacitance	C_{IN}			—	4	10	—	10	pF
Power Dissipation Capacitance	C_{PD}	(Note 1)		—	24	—	—	—	

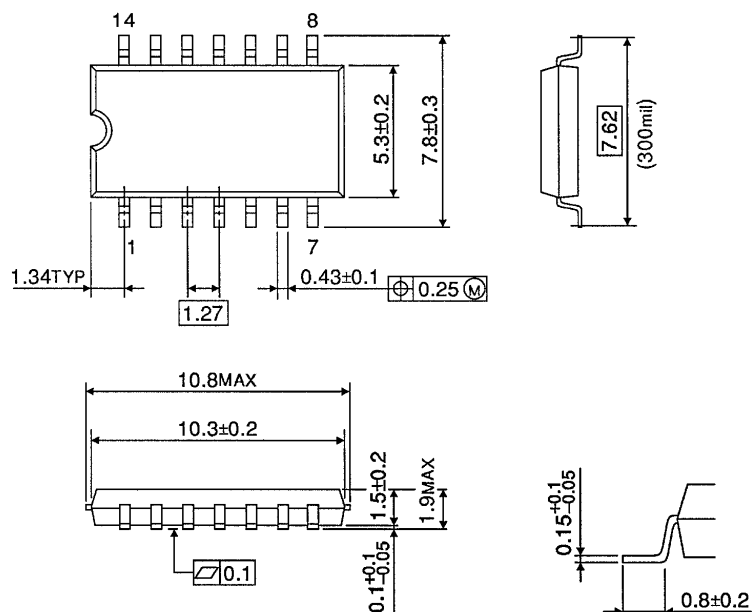
Note(1) C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

Average operating current can be obtained by the equation :

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

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

Unit in mm

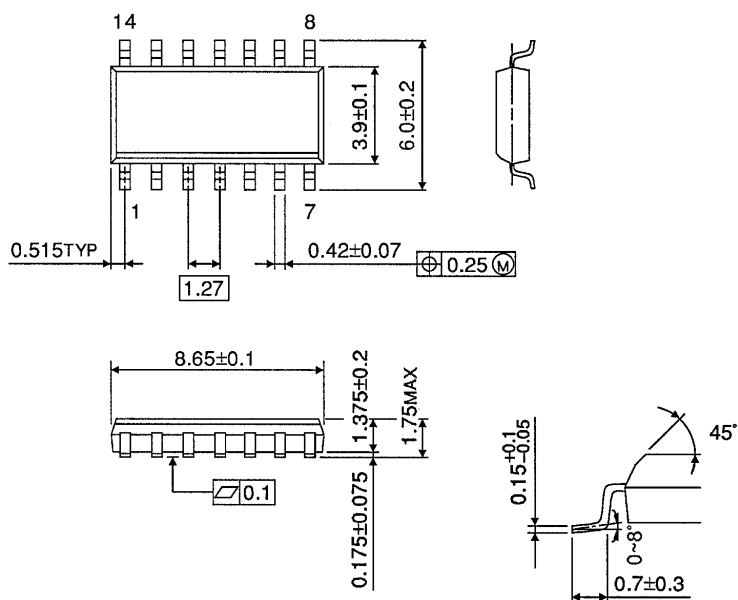


Weight : 0.18g (Typ.)

SOP 14PIN (150mil BODY) OUTLINE DRAWING (SOP14-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

