

**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 C<sup>2</sup>MOS 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.

$\overline{\text{CLR}}$  and  $\overline{\text{PR}}$  are independent of the CK and are accomplished by setting the appropriate input low.

The input voltage are compatible with TTL output voltage.

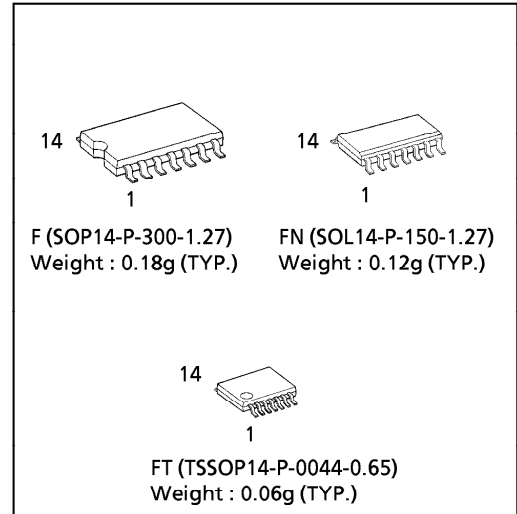
This device may be used as a level converter for interfacing 3.3V to 5V system.

Input protection and output circuit ensure that 0 to 5.5V can be applied to the input and output\*<sup>1</sup> 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.

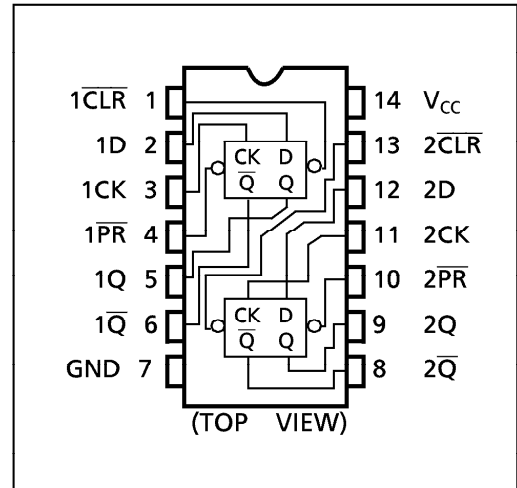
\*1: V<sub>CC</sub>=0V

**FEATURES:**

- High Speed ..... f<sub>MAX</sub> = 160MHz(typ.)  
at V<sub>CC</sub> = 5V
- Low Power Dissipation..... I<sub>CC</sub> = 2μA(Max.) at Ta = 25°C
- Compatible with TTL outputs ... V<sub>IL</sub> = 0.8V (Max.)  
V<sub>IH</sub> = 2.0V (Min.)
- Power Down Protection is provided on all inputs and outputs
- Balanced Propagation Delays..... t<sub>pLH</sub> ≈ t<sub>pHL</sub>
- Pin and Function Compatible with the 74 series (74AC / HC / F / ALS / LS etc.) 74 type.



**PIN ASSIGNMENT**

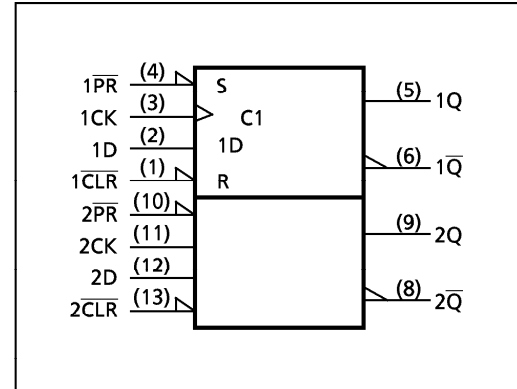


**TRUTH TABLE**

INPUTS				OUTPUTS		FUNCTION
$\overline{\text{CLR}}$	$\overline{\text{PR}}$	D	CK	Q	$\overline{\text{Q}}$	
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>	$\overline{\text{Q}}_n$	NO CHANGE

X : Don't Care

**IEC LOGIC SYMBOL**



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## ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	VALUE	UNIT
Supply Voltage Range	$V_{CC}$	-0.5~7.0	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~ $V_{CC} + 0.5$ (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	$T_{stg}$	-65~150	°C

(Note 1)  $V_{CC} = 0V$

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

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

(Note 5) High or Low State.

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## DC ELECTRICAL CHARACTERISTICS

PARAMETER	SYMBOL	CONDITON		V <sub>CC</sub> (V)	Ta = 25°C			Ta = -40~85°C		UNIT
					MIN.	TYP.	MAX.	MIN.	MAX.	
High - Level Input Voltage	V <sub>IH</sub>			4.5~5.5	2.0	—	—	2.0	—	V
Low - Level Input Voltage	V <sub>IL</sub>			4.5~5.5	—	—	0.8	—	0.8	V
High - Level Output Voltage	V <sub>OH</sub>	V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub>	I <sub>OH</sub> = -50μA	4.5	4.40	4.50	—	4.40	—	V
			I <sub>OH</sub> = -8mA	4.5	3.94	—	—	3.80	—	
Low - Level Output Voltage	V <sub>OL</sub>	V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub>	I <sub>OL</sub> = 50μA	4.5	—	0.0	0.1	—	0.1	V
			I <sub>OL</sub> = 8mA	4.5	—	—	0.36	—	0.44	
Input Leakage Current	I <sub>IN</sub>	V <sub>IN</sub> = 5.5V or GND		0~5.5	—	—	±0.1	—	±1.0	μA
Quiescent Supply Current	I <sub>CC</sub>	V <sub>IN</sub> = V <sub>CC</sub> or GND		5.5	—	—	2.0	—	20.0	
		I <sub>CCT</sub>	PER INPUT : V <sub>IN</sub> = 3.4V OTHER INPUT : V <sub>CC</sub> or GND		5.5	—	—	1.35	—	1.50
Output Leakage Current	I <sub>OPD</sub>	V <sub>OUT</sub> = 5.5V		0	—	—	0.5	—	5.0	μA

TIMING REQUIREMENTS (Input  $t_r = t_f = 3ns$ )

PARAMETER	SYMBOL	TEST CONDITION	Ta = 25°C		Ta = -40~85°C		UNIT
			V <sub>CC</sub> (V)	LIMIT	LIMIT	LIMIT	
Minimum Pulse Width (CK)	t <sub>W(L)</sub>		5.0 ± 0.5	5.0	5.0		ns
	t <sub>W(H)</sub>						
Minimum Pulse Width (CLR, PR)	t <sub>W(L)</sub>		5.0 ± 0.5	5.0	5.0		
Minimum Set-up Time			5.0 ± 0.5	5.0	5.0		
Minimum Hold Time	t <sub>h</sub>		5.0 ± 0.5	0.0	0.0		
Minimum Removal Time (CLR, PR)	t <sub>rem</sub>		5.0 ± 0.5	3.5	3.5		

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

PARAMETER	SYMBOL	TEST CONDITION		Ta = 25°C			Ta = -40~85°C		UNIT
		V <sub>CC</sub> (V)	CL (pF)	MIN.	TYP.	MAX.	MIN.	MAX.	
Propagation Delay Time (CK - Q, Q)	t <sub>pLH</sub> t <sub>pHL</sub>	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, Q)	t <sub>pLH</sub> t <sub>pHL</sub>	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 <sub>MAX</sub>	5.0 ± 0.5	15	80	100	—	80	—	MHZ
			50	80	140	—	65	—	
Input Capacitance	C <sub>IN</sub>			—	4	10	—	10	pF
Power Dissipation Capacitance	C <sub>PD</sub>	(Note 1)		—	24	—	—	—	

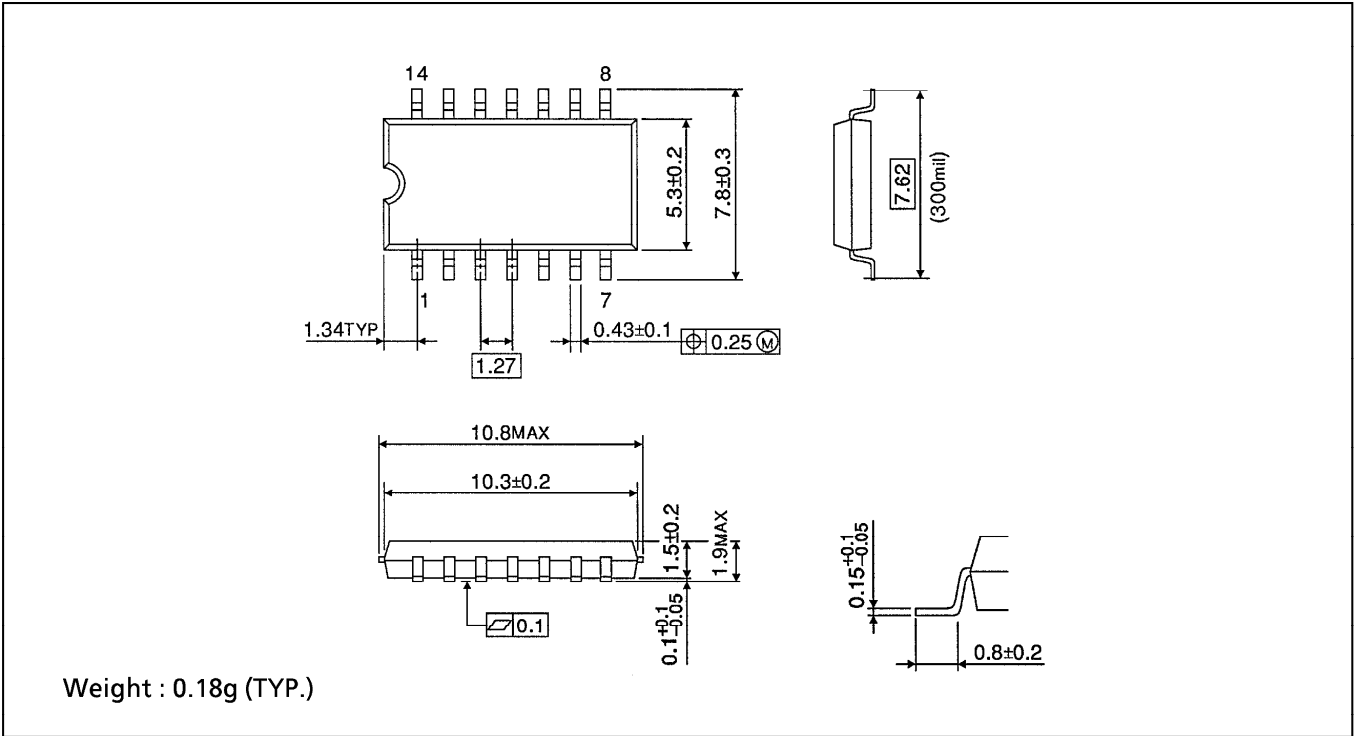
Note (1) C<sub>PD</sub> is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

Average operating current can be obtained by the equation :

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

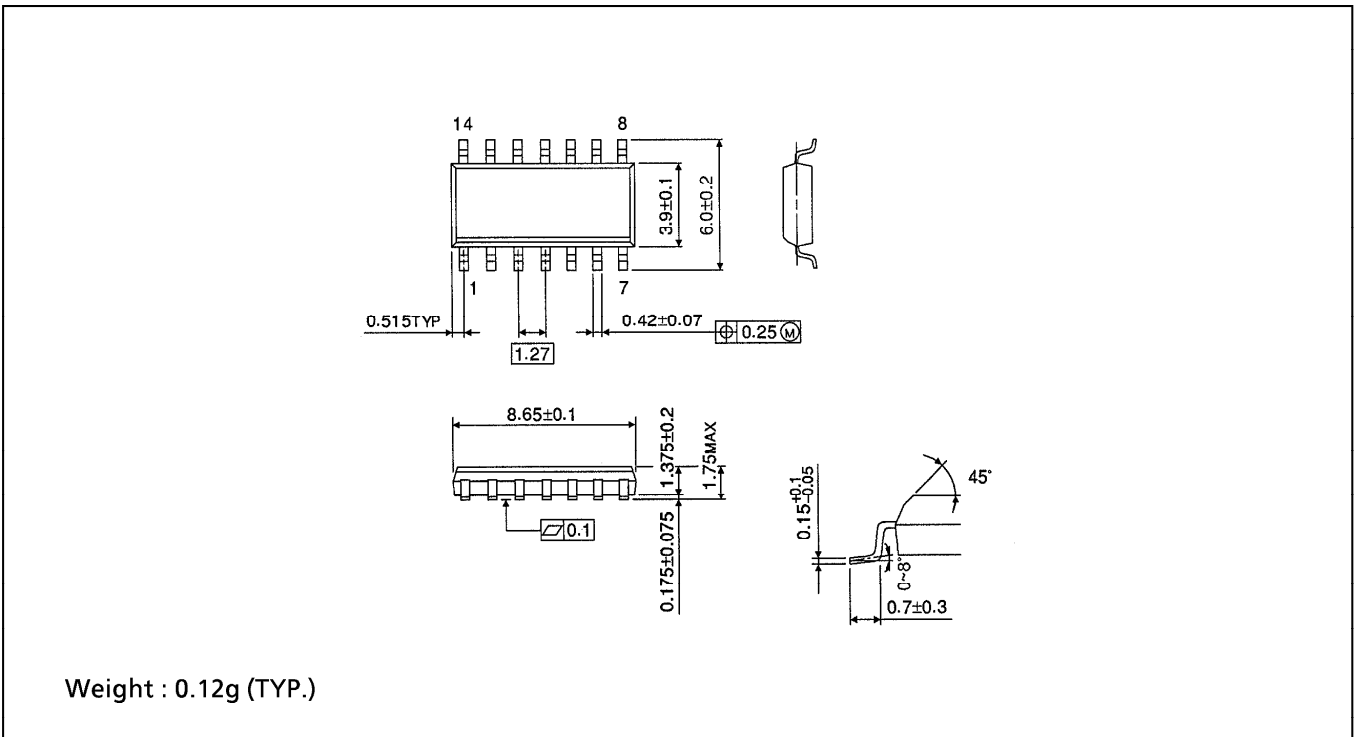
**SOP 14PIN (200mil BODY) OUTLINE DRAWING (SOP14-P-300-1.27)**

Unit in mm



**SOP 14PIN (150mil BODY) OUTLINE DRAWING (SOP14-P-150-1.27)**

Unit in mm



**TSSOP 14PIN OUTLINE DRAWING (TSSOP14-P-0044-0.65)**

Unit in mm

