

TC74AC74P, TC74AC74F, TC74AC74FN, TC74AC74FT

DUAL D-TYPE FLIP FLOP WITH PRESET AND CLEAR

The TC74AC74 is an advanced high speed CMOS D - FLIP FLOP fabricated with silicon gate and double - layer metal wiring 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.

$\overline{\text{CLR}}$ and $\overline{\text{PR}}$ are independent of the CK 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 :

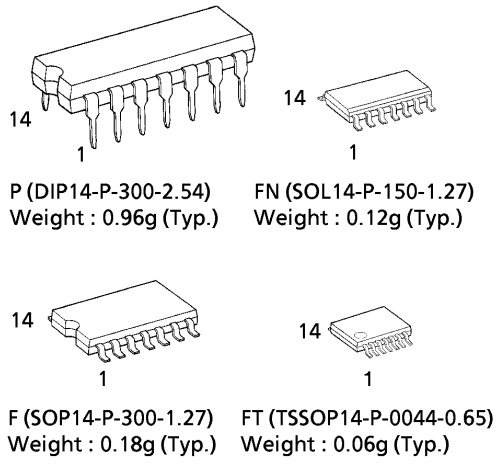
- High Speed..... $f_{\text{MAX}} = 200\text{MHz}$ (typ.)
at $V_{\text{CC}} = 5\text{V}$
- Low Power Dissipation..... $I_{\text{CC}} = 4\mu\text{A}(\text{Max.})$ at $T_a = 25^{\circ}\text{C}$
- High Noise Immunity..... $V_{\text{NIH}} = V_{\text{NIL}} = 28\% V_{\text{CC}}$ (Min.)
- Symmetrical Output Impedance... $|I_{\text{OH}}| = I_{\text{OL}} = 24\text{mA}(\text{Min.})$
Capability of driving 50Ω transmission lines.
- Balanced Propagation Delays..... $t_{\text{PLH}} \approx t_{\text{PHL}}$
- Wide Operating Voltage Range... $V_{\text{CC}}(\text{opr}) = 2\text{V} \sim 5.5\text{V}$
- Pin and Function Compatible with 74F74

TRUTH TABLE

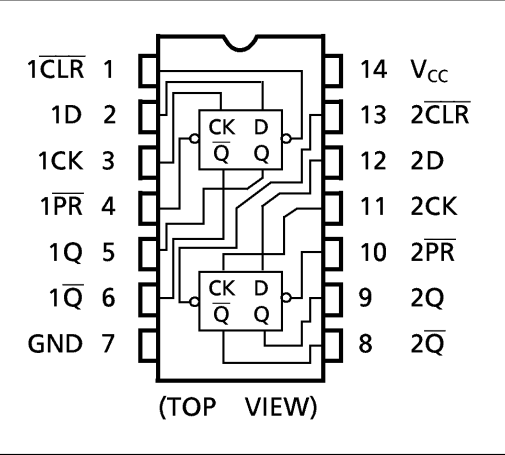
INPUTS				OUTPUTS		FUNCTION
$\overline{\text{CLR}}$	$\overline{\text{PR}}$	D	CK	Q	$\overline{\text{Q}}$	
L	H	X	X	L	H	CLEAR
H	L	X	X	H	L	PRESET
L	L	X	X	H	H	—
H	H	L	$\uparrow$	L	H	—
H	H	H	$\uparrow$	H	L	—
H	H	X	$\downarrow$	Q_n	$\overline{\text{Q}}_n$	NO CHANGE

X : Don't Care

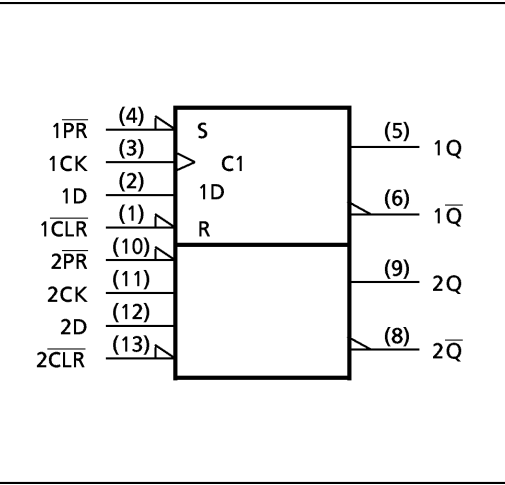
(Note) The JEDEC SOP (FN) is not available in Japan.



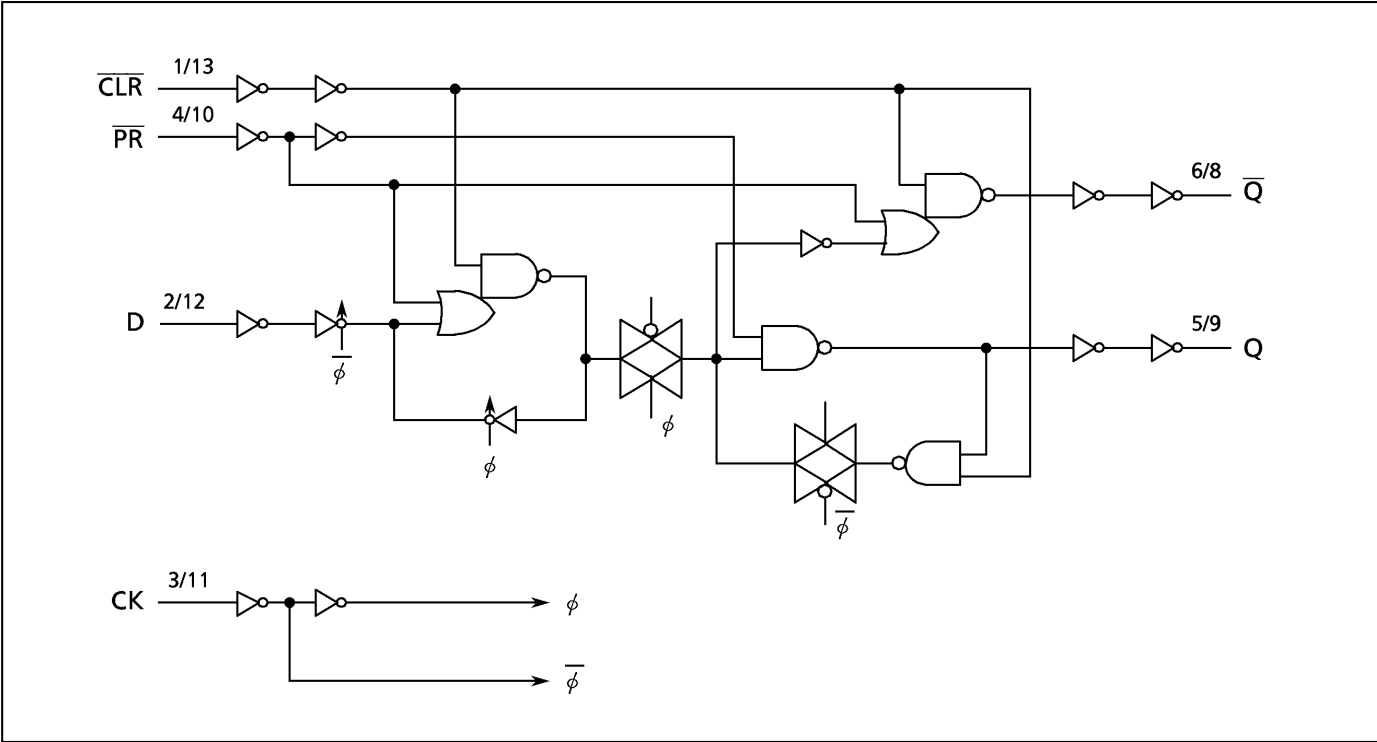
PIN ASSIGNMENT



IEC LOGIC SYMBOL



SYSTEM DIAGRAM



ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	VALUE	UNIT
Supply Voltage Range	V_{CC}	$-0.5 \sim 7.0$	V
DC Input Voltage	V_{IN}	$-0.5 \sim V_{CC} + 0.5$	V
DC Output Voltage	V_{OUT}	$-0.5 \sim V_{CC} + 0.5$	V
Input Diode Current	I_{IK}	± 20	mA
Output Diode Current	I_{OK}	± 50	mA
DC Output Current	I_{OUT}	± 50	mA
DC V_{CC} /Ground Current	I_{CC}	± 100	mA
Power Dissipation	P_D	500 (DIP)* / 180 (SOP/TSSOP)	mW
Storage Temperature	T_{stg}	$-65 \sim 150$	$^{\circ}C$

*500mW in the range of $T_a = -40^{\circ}C \sim 65^{\circ}C$. From $T_a = 65^{\circ}C$ to $85^{\circ}C$ a derating factor of $-10mW/^{\circ}C$ should be applied up to 300mW.

RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	VALUE	UNIT
Supply Voltage	V_{CC}	2.0~5.5	V
Input Voltage	V_{IN}	0~ V_{CC}	V
Output Voltage	V_{OUT}	0~ V_{CC}	V
Operating Temperature	T_{opr}	$-40 \sim 85$	$^{\circ}C$
Input Rise and Fall Time	dt/dV	0~100 ($V_{CC} = 3.3 \pm 0.3V$) 0~20 ($V_{CC} = 5 \pm 0.5V$)	ns / V

DC ELECTRICAL CHARACTERISTICS

PARAMETER	SYMBOL	TEST CONDITION		V _{CC} (V)	Ta = 25°C			Ta = -40~85°C		UNIT
					MIN.	TYP.	MAX.	MIN.	MAX.	
High - Level Input Voltage	V _{IH}			2.0 3.0 5.5	1.50 2.10 3.85	— — —	— — —	1.50 2.10 3.85	— — —	V
Low - Level Input Voltage	V _{IL}			2.0 3.0 5.5	— — —	— — —	0.50 0.90 1.65	— — —	0.50 0.90 1.65	V
High - Level Output Voltage	V _{OH}	V _{IN} = V _{IH} or V _{IL}	I _{OH} = -50μA	2.0 3.0 4.5	1.9 2.9 4.4	2.0 3.0 4.5	— — —	1.9 2.9 4.4	— — —	V
			I _{OH} = -4mA	3.0	2.58	—	—	2.48	—	
			I _{OH} = -24mA	4.5	3.94	—	—	3.80	—	
			I _{OH} = -75mA*	5.5	—	—	—	3.85	—	
Low - Level Output Voltage	V _{OL}	V _{IN} = V _{IH} or V _{IL}	I _{OL} = 50μA	2.0 3.0 4.5	— — —	0.0 0.0 0.0	0.1 0.1 0.1	— — —	0.1 0.1 0.1	V
			I _{OL} = 12mA	3.0	—	—	0.36	—	0.44	
			I _{OL} = 24mA	4.5	—	—	0.36	—	0.44	
			I _{OL} = 75mA*	5.5	—	—	—	—	1.65	
Input Leakage Current	I _{IN}	V _{IN} = V _{CC} or GND		5.5	—	—	±0.1	—	±1.0	μA
Quiescent Supply Current	I _{CC}	V _{IN} = V _{CC} or GND		5.5	—	—	4.0	—	40.0	

* : This spec indicates the capability of driving 50Ω transmission lines.

One output should be tested at a time for a 10ms maximum duration.

TIMING REQUIREMENTS (Input t_r = t_f = 3ns)

PARAMETER	SYMBOL	TEST CONDITION		Ta = 25°C	Ta = -40~85°C	UNIT
				LIMIT	LIMIT	
Minimum Pulse Width (CK)	t _W (L)		3.3 ± 0.3	7.0	7.0	ns
	t _W (H)		5.0 ± 0.5	5.0	5.0	
Minimum Pulse Width (CLR, PR)	t _W (L)		3.3 ± 0.3	7.0	7.0	
			5.0 ± 0.5	5.0	5.0	
Minimum Set - up Time	t _s		3.3 ± 0.3	6.0	6.0	
			5.0 ± 0.5	3.5	3.5	
Minimum Hold Time	t _h		3.3 ± 0.3	1.0	1.0	
			5.0 ± 0.5	1.0	1.0	
Minimum Removal Time (CLR, PR)	t _{rem}		3.3 ± 0.3	4.0	4.0	
			5.0 ± 0.5	2.0	2.0	

AC ELECTRICAL CHARACTERISTICS ($C_L = 50\text{pF}$, $R_L = 500\ \Omega$, Input $t_r = t_f = 3\text{ns}$)

PARAMETER	SYMBOL	TEST CONDITION		Ta = 25°C			Ta = − 40~85°C		UNIT
			V _{CC} (V)	MIN.	TYP.	MAX.	MIN.	MAX.	
Propagation Delay Time (CK−Q, $\overline{Q}$)	t _{pLH} t _{pHL}		3.3 ± 0.3	—	8.2	13.9	1.0	16.0	ns
			5.0 ± 0.5	—	6.1	8.7	1.0	10.0	
Propagation Delay Time ($\overline{\text{CLR}}$, $\overline{\text{PR}}$ −Q, $\overline{Q}$)	t _{pLH} t _{pHL}		3.3 ± 0.3	—	8.0	13.1	1.0	15.0	ns
			5.0 ± 0.5	—	5.7	8.2	1.0	9.4	
Maximum Clock Frequency	f _{MAX}		3.3 ± 0.3	60	120	—	60	—	MHz
			5.0 ± 0.5	100	160	—	100	—	
Input Capacitance	C _{IN}			—	5	10	—	10	pF
Power Dissipation Capacitance	C _{PD} (1)			—	77	—	—	—	

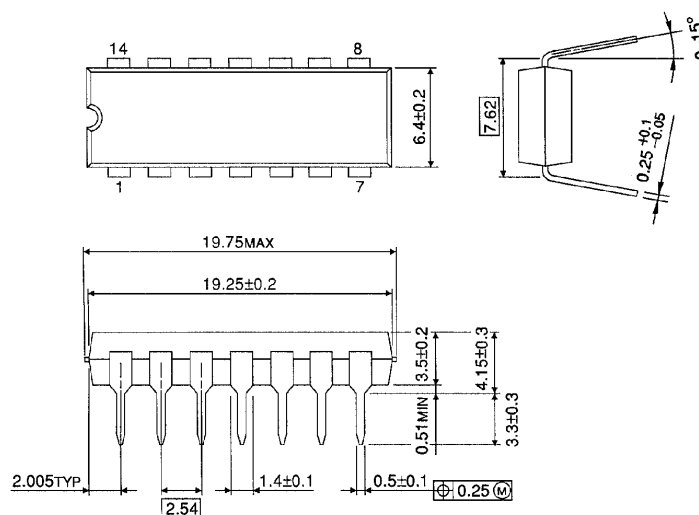
Note (1) C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

Average operating current can be obtained by the equation :

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

DIP 14PIN PACKAGE DIMENSIONS (DIP14-P-300-2.54)

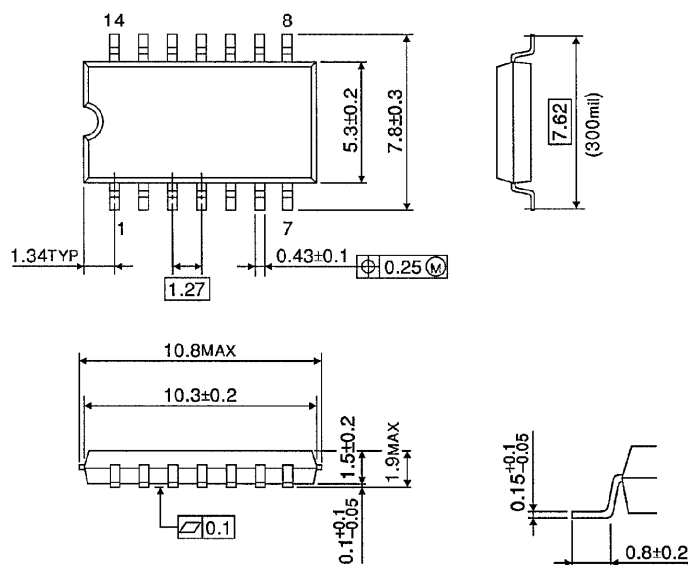
Unit in mm



Weight : 0.96g (Typ.)

SOP 14PIN (200mil BODY) PACKAGE DIMENSIONS (SOP14-P-300-1.27)

Unit in mm

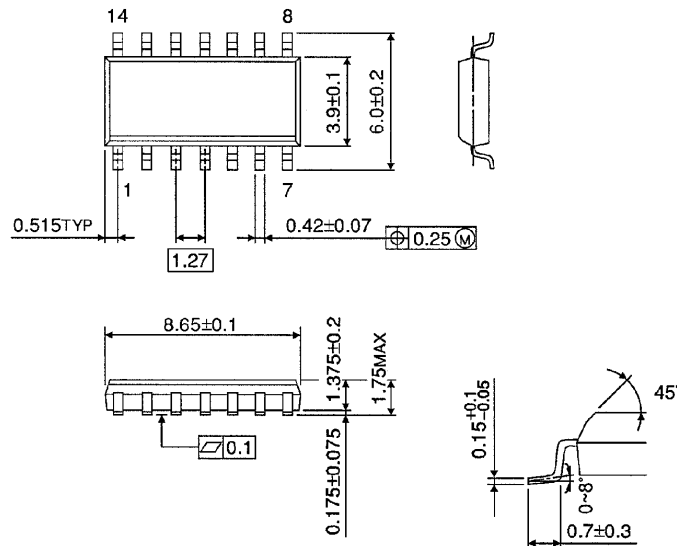


Weight : 0.18g (Typ.)

SOP 14PIN (150mil BODY) PACKAGE DIMENSIONS (SOL14-P-150 -1.27)

Unit in mm

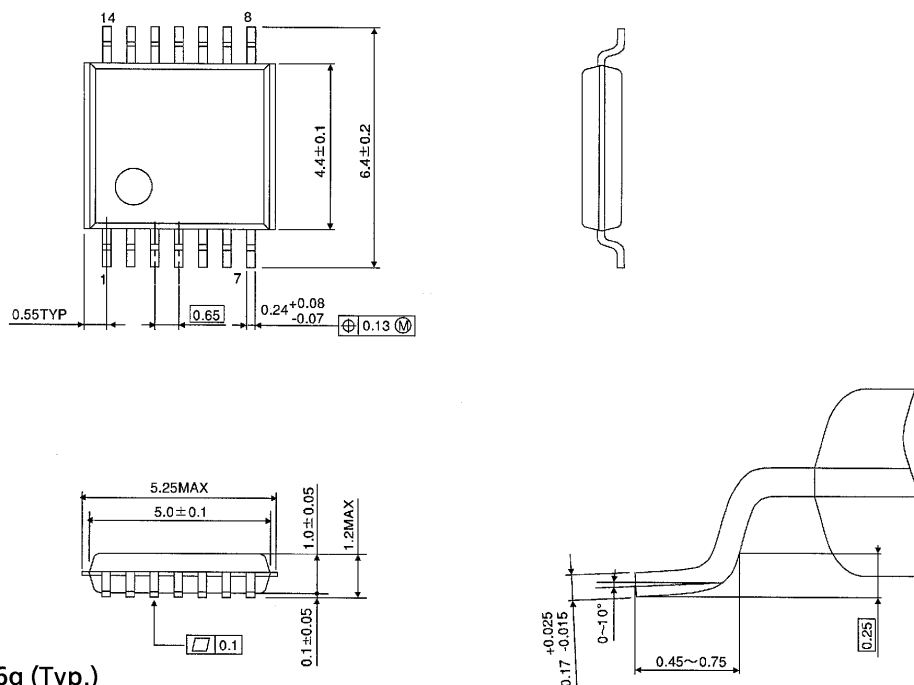
(Note) This package is not available in Japan.



Weight : 0.12g (Typ.)

TSSOP 14PIN (170mil BODY) PACKAGE DIMENSIONS (TSSOP14-P-0044-0.65)

Unit in mm



Weight : 0.06g (Typ.)

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000707EBA

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