

TC74AC164P, TC74AC164F, TC74AC164FN, TC74AC164FT

8 - BIT SHIFT REGISTER (S - IN, P - OUT)

The TC74AC164 is an advanced high speed CMOS 8 - BIT SERIAL - IN PARALLEL - OUT SHIFT REGISTER 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.

It consists of a serial - in, parallel - out 8 - bit shift register with a CLOCK input and an overriding CLEAR input.

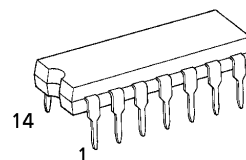
Two serial data inputs (A, B) are provided so that one may be used as a data enable.

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

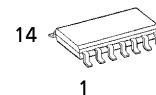
FEATURES:

- High Speed..... $f_{MAX} = 170\text{MHz (typ.)}$ at $V_{CC} = 5\text{V}$
- Low Power Dissipation..... $I_{CC} = 8\mu\text{A(Max.)}$ at $T_a = 25^\circ\text{C}$
- High Noise Immunity..... $V_{NIH} = V_{NIL} = 28\% V_{CC} \text{ (Min.)}$
- Symmetrical Output Impedance... $|I_{OH}| = |I_{OL}| = 24\text{mA(Min.)}$
Capability of driving 50Ω transmission lines.
- Balanced Propagation Delays..... $t_{PLH} \approx t_{PHL}$
- Wide Operating Voltage Range... $V_{CC} \text{ (opr)} = 2\text{V} \sim 5.5\text{V}$
- Pin and Function Compatible with 74F164

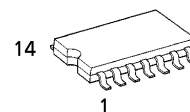
(Note) The JEDEC SOP (FN) is not available in Japan.



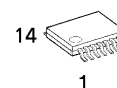
P (DIP14-P-300-2.54)
Weight : 0.96g (Typ.)



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

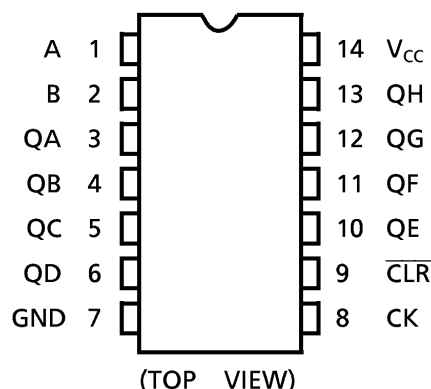


F (SOP14-P-300-1.27)
Weight : 0.18g (Typ.)



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

PIN ASSIGNMENT



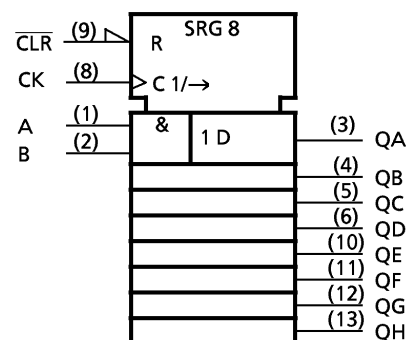
TRUTH TABLE

INPUTS				OUTPUTS			
CLR	CK	SERIAL IN		QA	QB	...	QH
		A	B				
L	X	X	X	L	L	...	L
H		X	X	NO CHANGE			
H		L	X	L	QA _n	...	QG _n
H		X	L	L	QA _n	...	QG _n
H		H	H	H	QA _n	...	QG _n

X : Don't Care

QA_n ~ QG_n: The level of QA ~ QG, respectively, before the most recent positive edge of the clock.

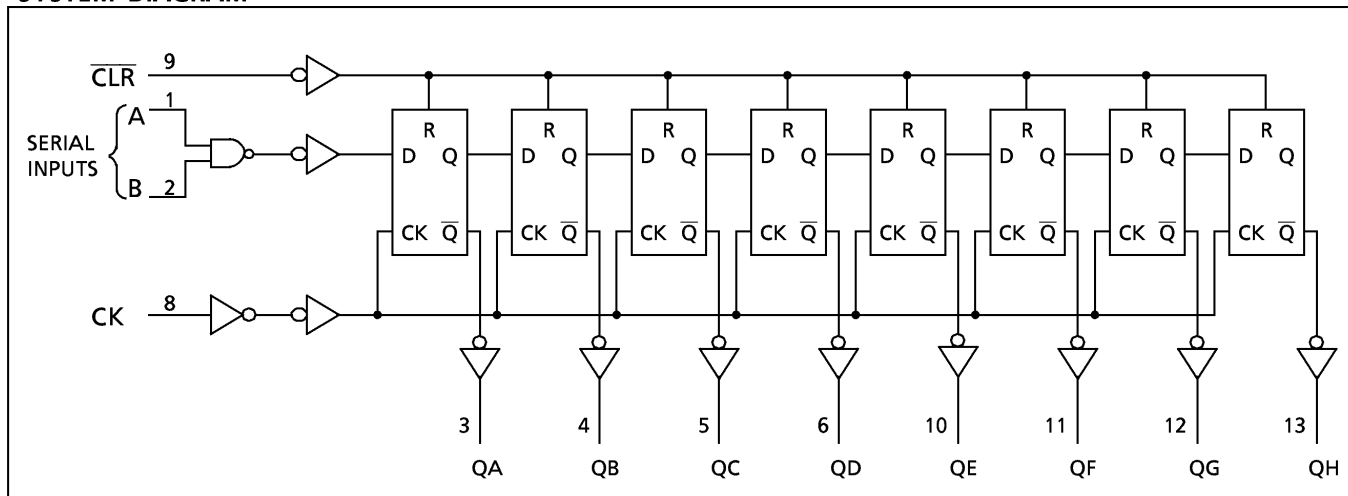
IEC LOGIC SYMBOL



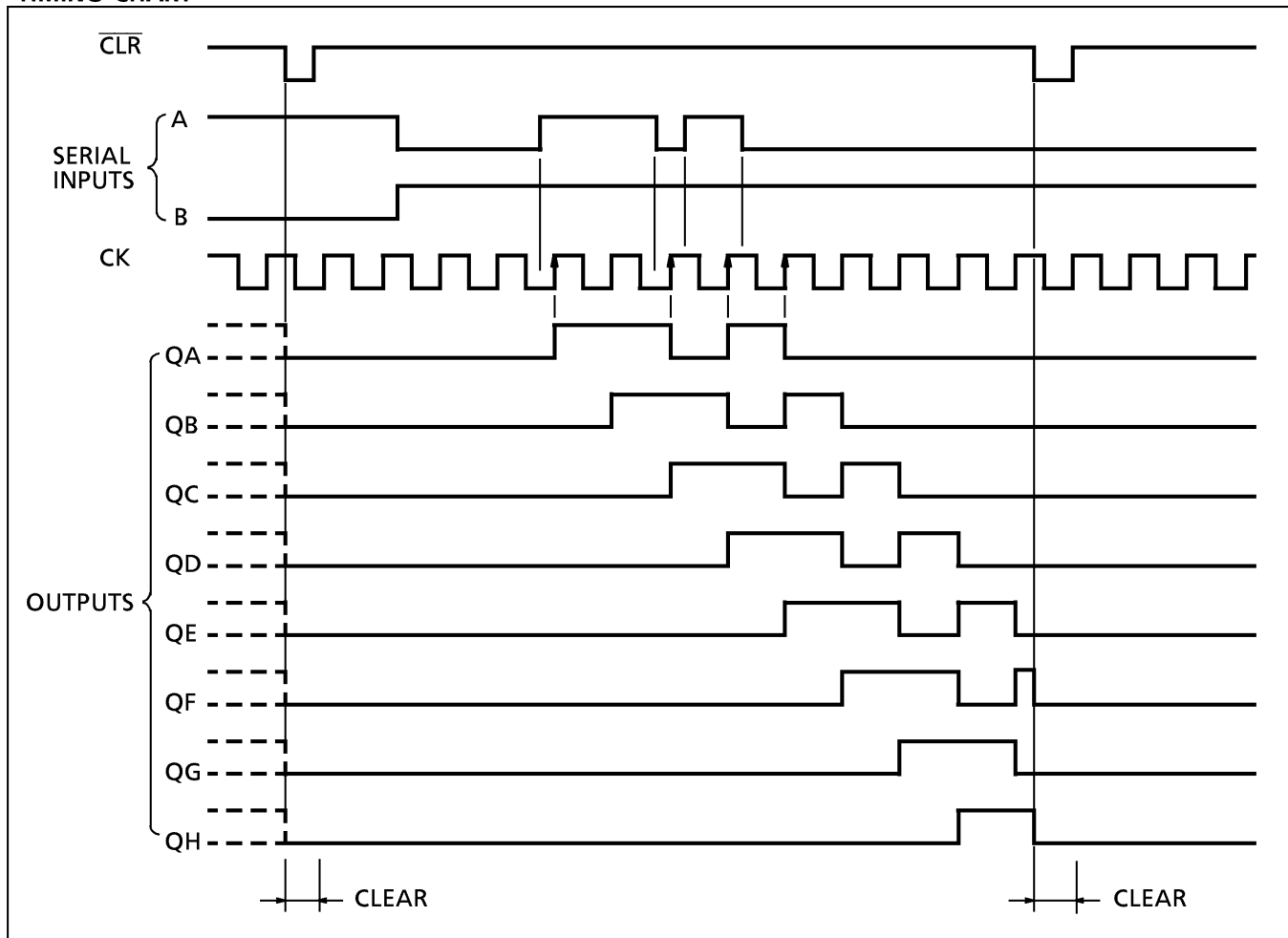
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SYSTEM DIAGRAM



TIMING CHART



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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}	$-0.5 \sim V_{CC} + 0.5$	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}	± 200	mA
Power Dissipation	P_D	500 (DIP)* / 180 (SOP/TSSOP)	mW
Storage Temperature	T_{stg}	$-65 \sim 150$	°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°C a derating factor of $-10\text{mW}/^\circ\text{C}$ should be applied up to 300mW.

RECOMMENDED OPERATING CONDITIONS

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

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}		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}	$V_{IN} = V_{IH} \text{ or } V_{IL}$	$I_{OH} = -50\mu\text{A}$	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
			$I_{OH} = -4\text{mA}$	3.0	2.58	—	—	2.48	
			$I_{OH} = -24\text{mA}$	4.5	3.94	—	—	3.80	
			$I_{OH} = -75\text{mA}^*$	5.5	—	—	—	3.85	
Low - Level Output Voltage	V_{OL}	$V_{IN} = V_{IH} \text{ or } V_{IL}$	$I_{OL} = 50\mu\text{A}$	2.0 3.0 4.5	— — —	0.0 0.0 0.0	0.1 0.1 0.1	— — —	V
			$I_{OL} = 12\text{mA}$	3.0	—	—	0.36	—	
			$I_{OL} = 24\text{mA}$	4.5	—	—	0.36	—	
			$I_{OL} = 75\text{mA}^*$	5.5	—	—	—	1.65	
Input Leakage Current	I_{IN}	$V_{IN} = V_{CC} \text{ or GND}$	5.5	—	—	± 0.1	—	± 1.0	μA
Quiescent Supply Current	I_{CC}	$V_{IN} = V_{CC} \text{ or GND}$	5.5	—	—	8.0	—	80.0	

* : 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 $t_r = t_f = 3\text{ns}$)

PARAMETER	SYMBOL	TEST CONDITION	Ta = 25°C		Ta = -40~85°C	UNIT
			V _{CC} (V)	LIMIT		
Minimum Pulse Width (CK)	t_W (L) t_W (H)		3.3 ± 0.3	9.0	10.0	ns
			5.0 ± 0.5	5.0	6.0	
Minimum Pulse Width ($\overline{\text{CLR}}$)	t_W (L)		3.3 ± 0.3 5.0 ± 0.5	9.0 5.0	10.0 6.0	
Minimum Set - up Time	t_s		3.3 ± 0.3 5.0 ± 0.5	7.0 4.0	7.0 4.0	
Minimum Hold Time	t_h		3.3 ± 0.3 5.0 ± 0.5	1.0 1.0	1.0 1.0	
Minimum Removal Time ($\overline{\text{CLR}}$)	t_{rem}		3.3 ± 0.3 5.0 ± 0.5	8.5 5.0	8.5 5.0	

AC ELECTRICAL CHARACTERISTICS (C_L = 50pF, R_L = 500 Ω , 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)	t _{pLH} t _{pHL}		3.3 ± 0.3	—	9.6	16.3	1.0	18.6	ns
			5.0 ± 0.5	—	6.6	9.8	1.0	11.2	
Propagation Delay Time ($\overline{\text{CLR}}$ —Q)	t _{pHL}		3.3 ± 0.3	—	8.0	15.4	1.0	17.5	
			5.0 ± 0.5	—	6.0	11.0	1.0	12.5	
Maximum Clock Frequency	f _{MAX}		3.3 ± 0.3 5.0 ± 0.5	45 80	100 150	— —	45 80	— —	MHz
Input Capacitance	C _{IN}			—	5	10	—	10	pF
Power Dissipation Capacitance	C _{PD} (1)			—	110	—	—	—	

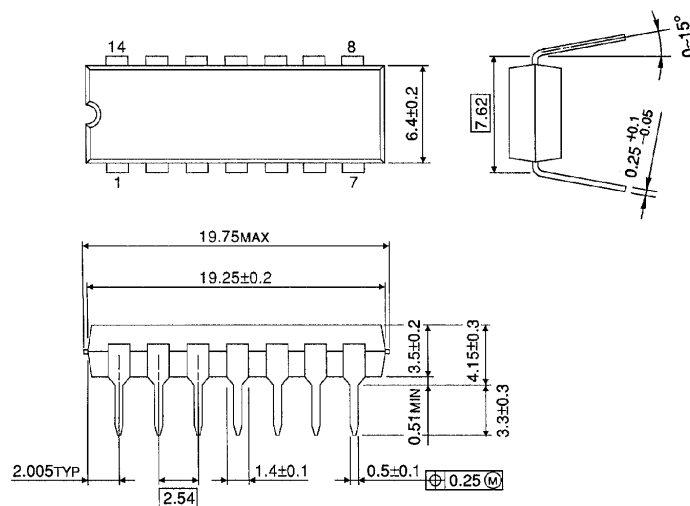
Note (1) C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

Average operating current can be obtained by the equation :

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

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

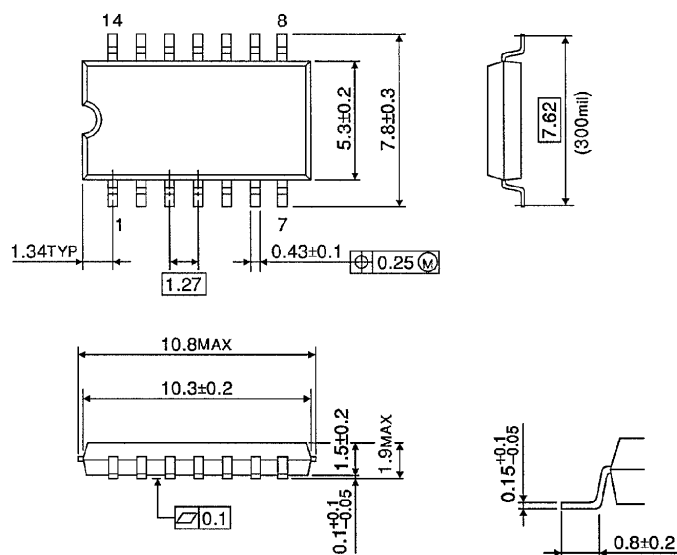
Unit in mm



Weight : 0.96g (Typ.)

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

Unit in mm

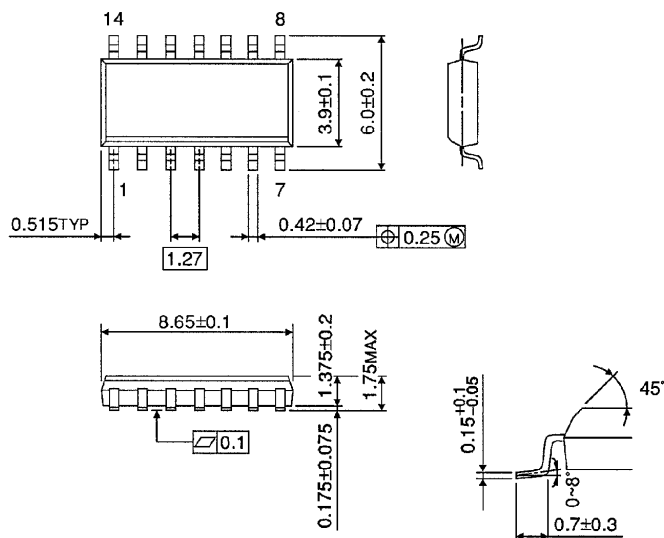


Weight : 0.18g (Typ.)

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

Unit in mm

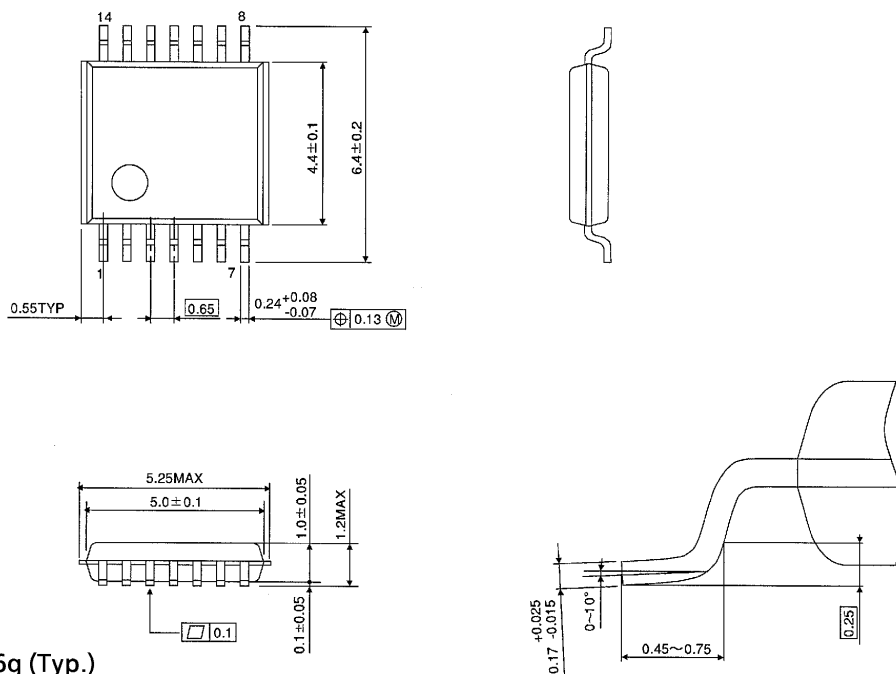
(Note) This package is not available in Japan.



Weight : 0.12g (Typ.)

TSSOP 14PIN (170mil BODY) OUTLINE DRAWING (TSSOP14-P-0044-0.65)

Unit in mm



Weight : 0.06g (Typ.)