

TC74HC164AP, TC74HC164AF, TC74HC164AFN

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

The TC74HC164A is a high speed CMOS 8 - BIT SERIAL - IN PARALLEL - OUT SHIFT REGISTER fabricated with silicon gate C²MOS technology.

It achieves the high speed operation similar to equivalent LSTTL while maintaining the CMOS low power dissipation. It consists of a serial - in, parallel - out 8 - bit shift register with a CK input and an overriding $\overline{\text{CLR}}$ input.

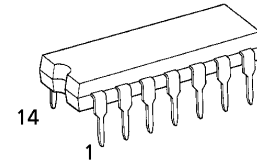
Two serial data inputs (A, B) are provided so that one may be used as a data enable.

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

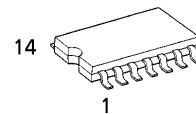
FEATURES :

- High Speed..... $f_{\text{MAX}} = 58\text{MHz}$ (typ.) at $V_{\text{CC}} = 5\text{V}$
- Low Power Dissipation..... $I_{\text{CC}} = 4\mu\text{A}$ (Max.) at $T_a = 25^\circ\text{C}$
- High Noise Immunity..... $V_{\text{NIH}} = V_{\text{NIL}} = 28\% V_{\text{CC}}$ (Min.)
- Output Drive Capability..... 10 LSTTL Loads
- Symmetrical Output Impedance... $|I_{\text{OH}}| = |I_{\text{OL}}| = 4\text{mA}$ (Min.)
- Balanced Propagation Delays..... $t_{\text{pLH}} \approx t_{\text{pHL}}$
- Wide Operating Voltage Range... V_{CC} (opr.) = 2V~6V
- Pin and Function Compatible with 74LS164

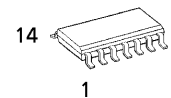
(Note) The JEDEC SOP (FN) is not available in Japan.



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

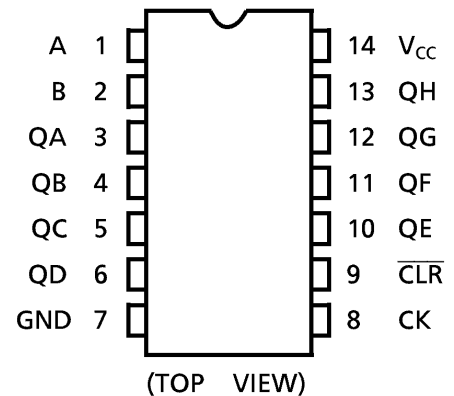


F (SOP14-P-300-1.27)
Weight : 0.18g (Typ.)



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

PIN ASSIGNMENT

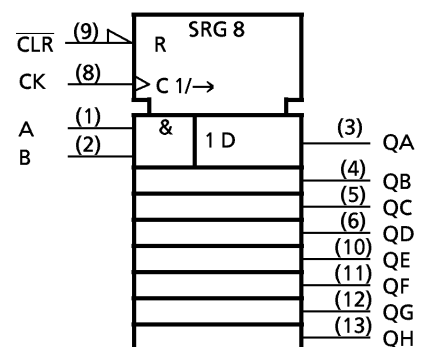


TRUTH TABLE

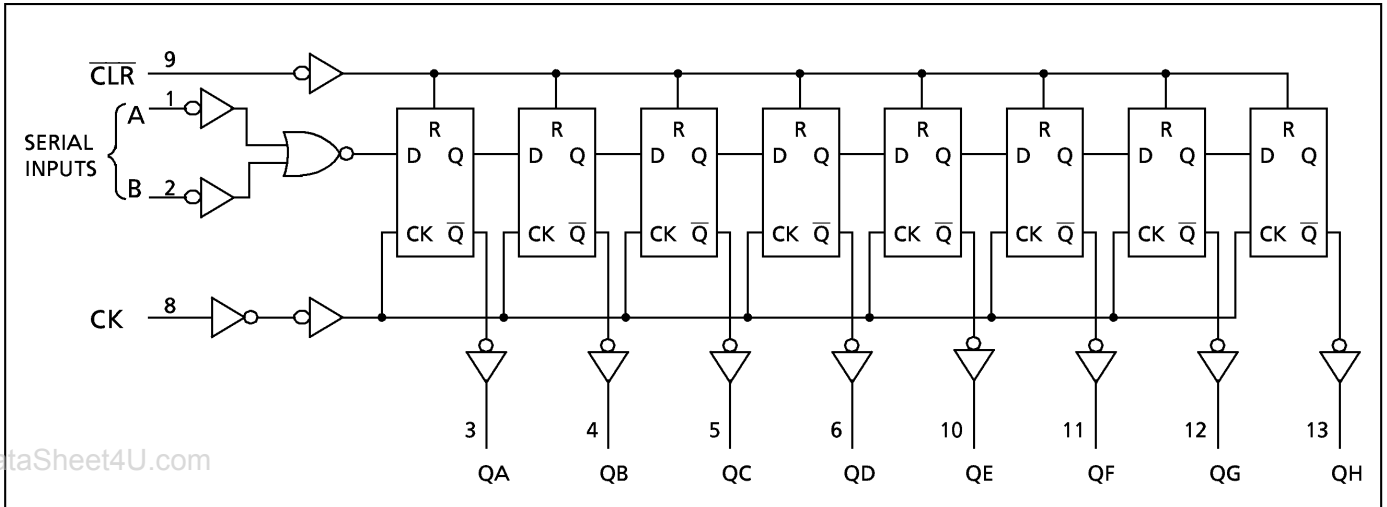
INPUTS				OUTPUTS			
$\overline{\text{CLR}}$	CK	SERIAL IN		QA	QB	...	QH
		A	B				
L	X	X	X	L	L	...	L
H		X	X	NO CHANGE			
H		L	X	L	QA _n	...	QG _n
H		X	L	L	QA _n	...	QG _n
H		H	H	H	QA _n	...	QG _n

X : Don't Care
QA_n ~ QG_n: The level of QA ~ QG, respectively, before the most recent positive edge of clock.

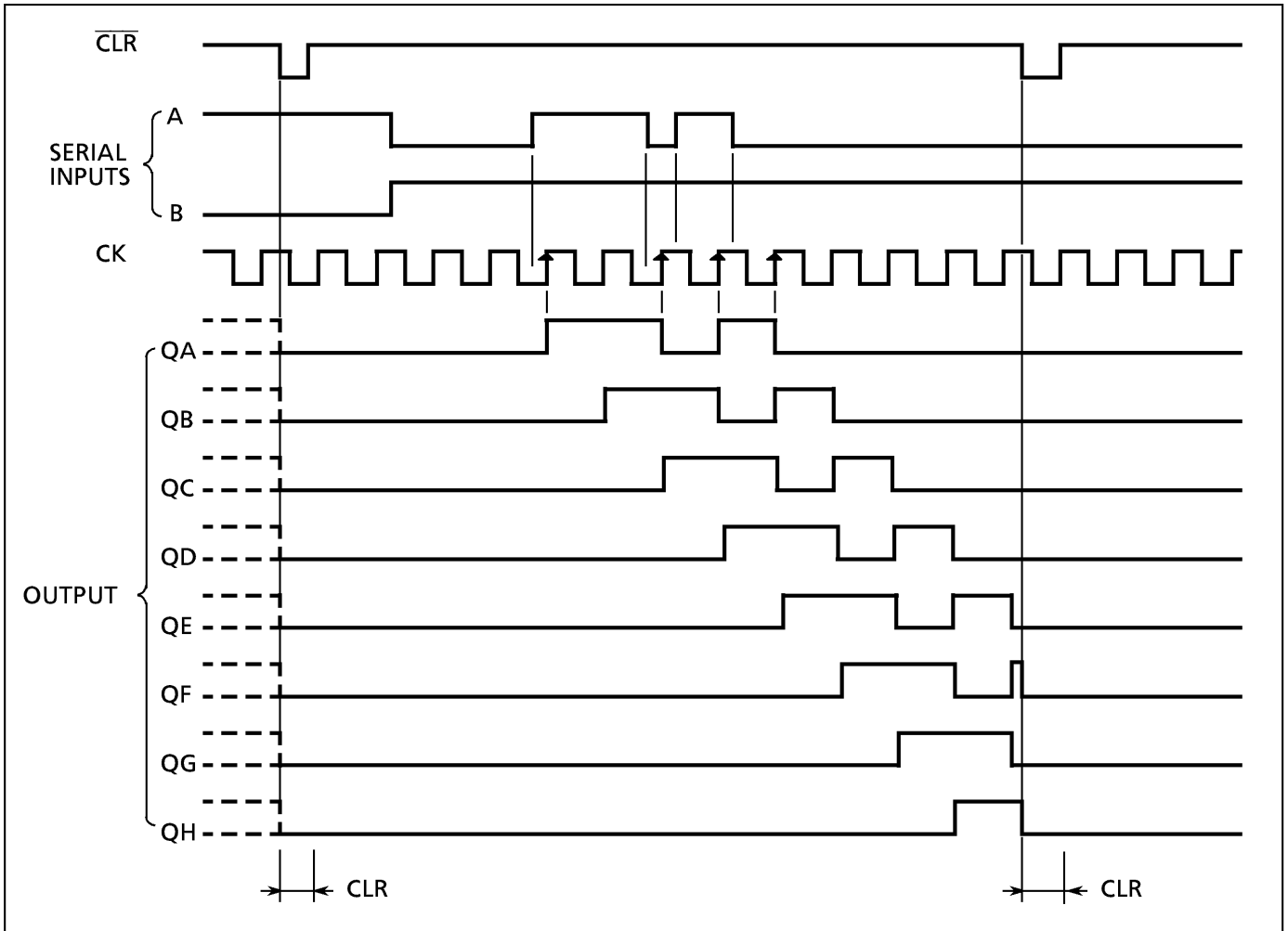
IEC LOGIC SYMBOL



SYSTEM DIAGRAM



TIMING CHART



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}	± 20	mA
Output Diode Current	I_{OK}	± 20	mA
DC Output Current	I_{OUT}	± 25	mA
DC V_{CC} / Ground Current	I_{CC}	± 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°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}	$2 \sim 6$	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	$0 \sim 1000 (V_{CC} = 2.0\text{V})$ $0 \sim 500 (V_{CC} = 4.5\text{V})$ $0 \sim 400 (V_{CC} = 6.0\text{V})$	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}		2.0	1.50	—	—	1.50	—	V	
			4.5	3.15	—	—	3.15	—		
			6.0	4.20	—	—	4.20	—		
Low - Level Input Voltage	V_{IL}		2.0	—	—	0.50	—	0.50	V	
			4.5	—	—	1.35	—	1.35		
			6.0	—	—	1.80	—	1.80		
High - Level Output Voltage	V_{OH}	$V_{IN} = V_{IH}$ or V_{IL}	$I_{OH} = -20\mu\text{A}$	2.0	1.9	2.0	—	1.9	—	V
				4.5	4.4	4.5	—	4.4	—	
			$I_{OH} = -4\text{ mA}$ $I_{OH} = -5.2\text{ mA}$	4.5	4.18	4.31	—	4.13	—	
				6.0	5.68	5.80	—	5.63	—	
Low - Level Output Voltage	V_{OL}	$V_{IN} = V_{IH}$ or V_{IL}	$I_{OL} = 20\mu\text{A}$	2.0	—	0.0	0.1	—	0.1	V
				4.5	—	0.0	0.1	—	0.1	
			$I_{OL} = 4\text{ mA}$ $I_{OL} = 5.2\text{ mA}$	4.5	—	0.17	0.26	—	0.33	
				6.0	—	0.18	0.26	—	0.33	
Input Leakage Current	I_{IN}	$V_{IN} = V_{CC}$ or GND	6.0	—	—	± 0.1	—	± 1.0	μA	
Quiescent Supply Current	I_{CC}	$V_{IN} = V_{CC}$ or GND	6.0	—	—	4.0	—	40.0		

TIMING REQUIREMENTS (Input $t_r = t_f = 6ns$)

PARAMETER	SYMBOL	TEST CONDITION	Ta = 25°C			Ta = -40~85°C	UNIT
			V _{CC} (V)	TYP.	LIMIT	LIMIT	
Minimum Pulse Width (CK)	$t_{W(L)}$ $t_{W(H)}$		2.0	—	75	95	ns
			4.5	—	15	19	
			6.0	—	13	16	
Minimum Pulse Width (\overline{CLR})	$t_{W(L)}$		2.0	—	80	100	
			4.5	—	16	20	
			6.0	—	14	17	
Minimum Set-up Time (A, B)	t_s		2.0	—	50	65	
			4.5	—	10	13	
			6.0	—	9	11	
Minimum Hold Time (A, B)	t_h		2.0	—	5	5	
			4.5	—	5	5	
			6.0	—	5	5	
Minimum Removal Time (\overline{CLR})	t_{rem}		2.0	—	5	5	
			4.5	—	5	5	
			6.0	—	5	5	
Clock Frequency	f		2.0	—	6	5	MHz
			4.5	—	31	25	
			6.0	—	36	29	

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

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Output Transition Time	t_{TLH} t_{THL}		—	4	8	ns
Propagation Delay Time (CK-Qn)	t_{pLH} t_{pHL}		—	15	27	
Propagation Delay Time (\overline{CLR} -Qn)	t_{pHL}		—	16	30	
Maximum Clock Frequency	f _{MAX}		33	58	—	MHz

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

PARAMETER	SYMBOL	TEST CONDITION	Ta = 25°C			Ta = -40~85°C		UNIT	
			V _{CC} (V)	MIN.	TYP.	MAX.	MIN.		MAX.
Output Transition Time	t_{TLH} t_{THL}		2.0	—	25	75	—	95	ns
			4.5	—	7	15	—	19	
			6.0	—	6	13	—	16	
Propagation Delay Time (CK-Qn)	t_{pLH} t_{pHL}		2.0	—	57	160	—	200	
			4.5	—	19	32	—	40	
			6.0	—	16	27	—	34	
Propagation Delay Time (\overline{CLR} -Qn)	t_{pHL}		2.0	—	60	175	—	220	
			4.5	—	20	35	—	44	
			6.0	—	17	30	—	37	
Maximum Clock Frequency Frequency	f _{MAX}		2.0	6	18	—	5	—	
			4.5	31	53	—	25	—	
			6.0	36	62	—	29	—	
Input Capacitance	C _{IN}		—	5	10	—	10	pF	
Power Dissipation Capacitance	C _{PD} (1)		—	107	—	—	—		

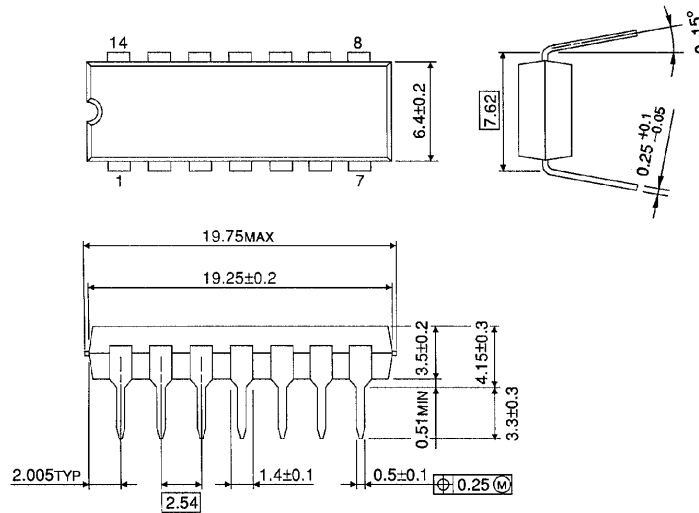
Note (1) C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

Average operating current can be obtained by the equation :

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

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

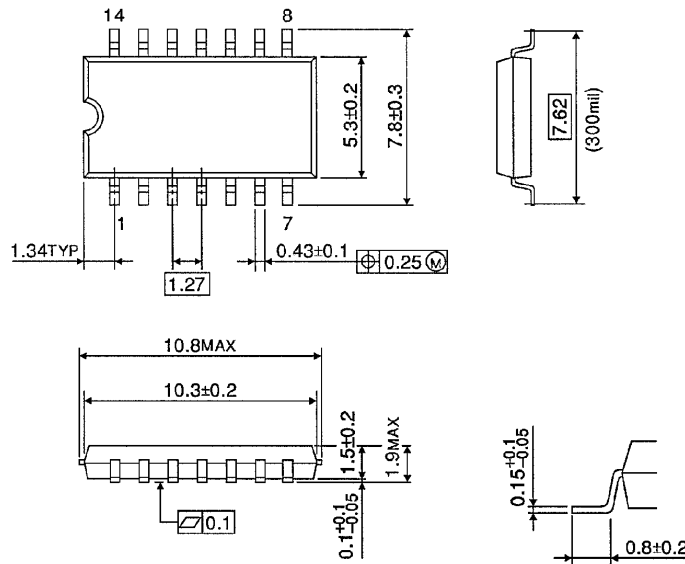
Unit in mm



Weight : 0.96g (Typ.)

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

Unit in mm

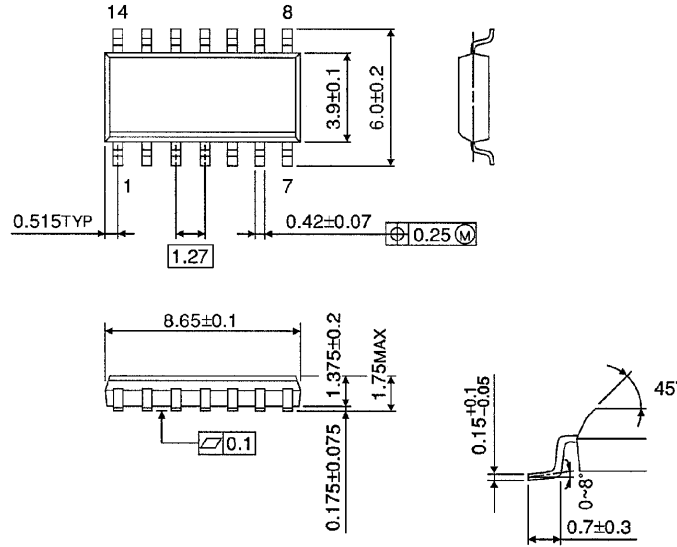


Weight : 0.18g (Typ.)

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.)

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