

TOSHIBA CMOS DIGITAL INTEGRATED CIRCUIT SILICON MONOLITHIC

TC74ACT164P, TC74ACT164F, TC74ACT164FN

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

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

The TC74ACT164 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.

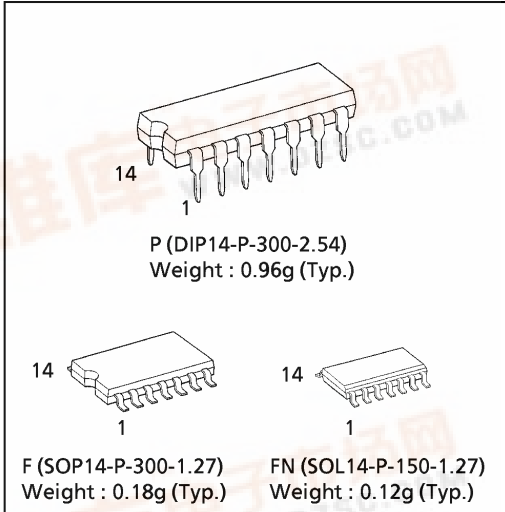
This device may be used as a level converter for interfacing TTL or NMOS to High Speed CMOS. The inputs are compatible with TTL, NMOS and CMOS output voltage levels. It consists of a serial - in, parallel - out 8 - bit shift register with a CLOCK input and an overriding CLEAR input.

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

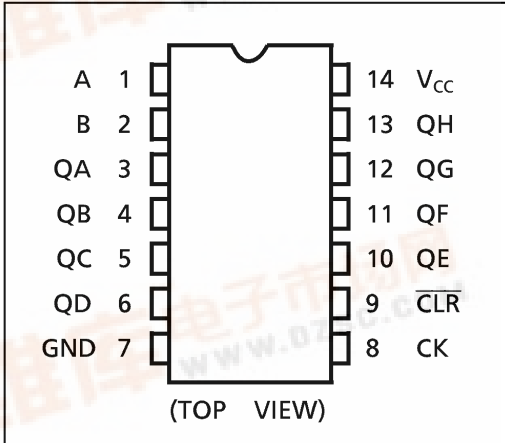
All inputs are equipped with protection circuits against static discharge or transient excess voltage.

FEATURES :

- High Speed..... $f_{MAX} = 200\text{MHz}$ (typ.) at $V_{CC} = 5\text{V}$
- Low Power Dissipation..... $I_{CC} = 8\mu\text{A}$ (Max.) at $T_a = 25^\circ\text{C}$
- Compatible with TTL outputs... $V_{IL} = 0.8\text{V}$ (Max.)
 $V_{IH} = 2.0\text{V}$ (Min.)
- Symmetrical Output Impedance... $|I_{OH}| = I_{OL} = 24\text{mA}$ (Min.)
Capability of driving 50Ω transmission lines.
- Balanced Propagation Delays... $t_{pLH} \approx t_{pHL}$
- Pin and Function Compatible with 74F164



PIN ASSIGNMENT

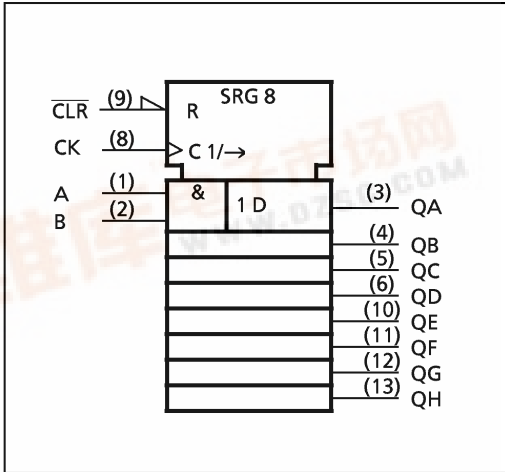


TRUTH TABLE

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

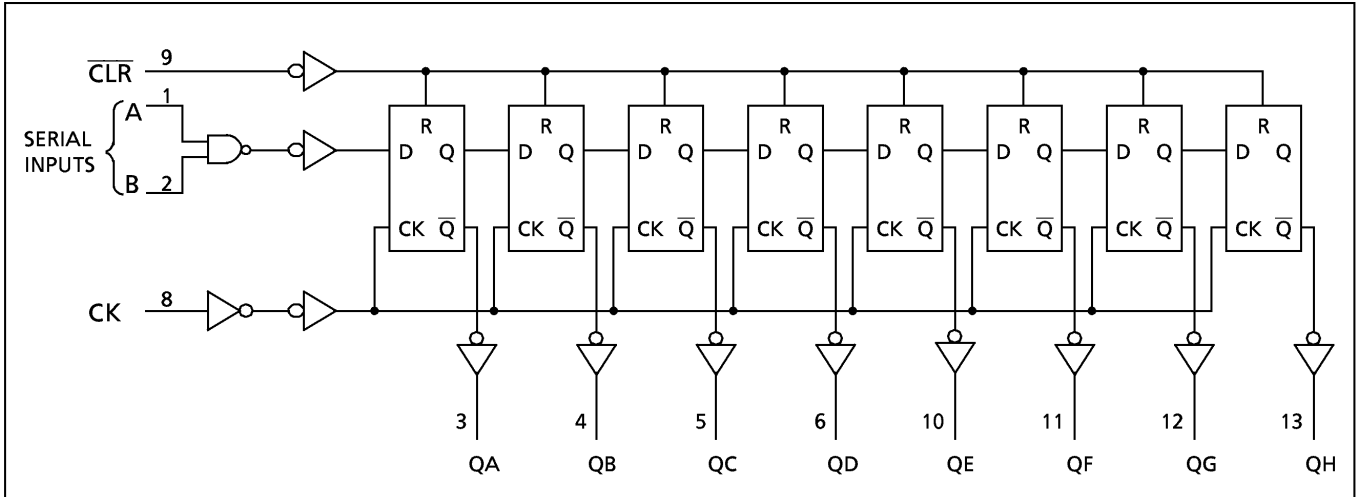


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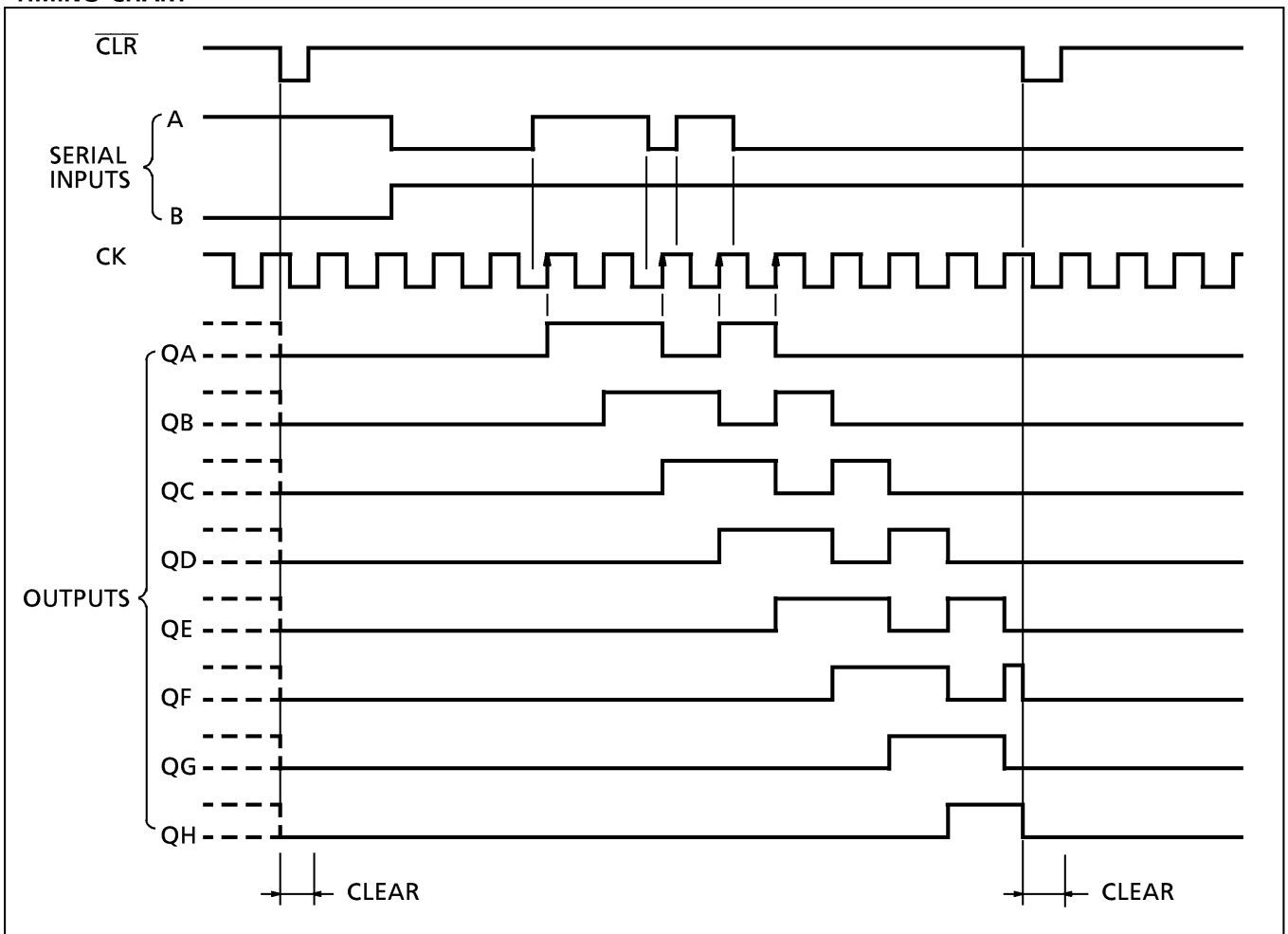
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SYSTEM DIAGRAM



TIMING CHART



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ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	VALUE	UNIT
Supply Voltage Range	V _{CC}	-0.5~7.0	V
DC Input Voltage	V _{IN}	-0.5~V _{CC} +0.5	V
DC Output Voltage	V _{OUT}	-0.5~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)	mW
Storage Temperature	T _{stg}	-65~150	°C

*500mW in the range of Ta = -40°C~65°C. From Ta = 65°C to 85°C a derating factor of -10mW/°C should be applied up to 300mW.

RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	VALUE	UNIT
Supply Voltage	V _{CC}	4.5~5.5	V
Input Voltage	V _{IN}	0~V _{CC}	V
Output Voltage	V _{OUT}	0~V _{CC}	V
Operating Temperature	T _{opr}	-40~85	°C
Input Rise and Fall Time	dt / dV	0~10	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}		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	4.4	4.5	—	4.4	—	V
			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	4.5	—	0.0	0.1	—	0.1	V
			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	—	—	8.0	—	80.0		
		I _C	PER INPUT : V _{IN} = 3.4V OTHER INPUT : V _{CC} or GND	5.5	—	—	1.35	—	1.5	mA

* : 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
			V _{CC} (V)	LIMIT	LIMIT	LIMIT	
Minimum Pulse Width (CK)	t _W (L) t _W (H)		5.0 ± 0.5	5.0	5.0	5.0	ns
Minimum Pulse Width (CLR)	t _W (L)		5.0 ± 0.5	5.0	5.0	5.0	
Minimum Set-up Time	t _s		5.0 ± 0.5	3.0	3.0	3.0	
Minimum Hold Time	t _h		5.0 ± 0.5	2.6	2.6	2.6	
Minimum Removal Time (CLR)	t _{rem}		5.0 ± 0.5	2.0	2.0	2.0	

AC ELECTRICAL CHARACTERISTICS (C_L = 50pF, R_L = 500Ω, Input $t_r = t_f = 3ns$)

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}		5.0 ± 0.5	—	6.6	11.0	1.0	12.5	ns
Propagation Delay Time (CLR-Q)	t _{pHL}		5.0 ± 0.5	—	6.9	11.0	1.0	12.5	
Maximum Clock Frequency	f _{MAX}		5.0 ± 0.5	80	150	—	80	—	MHz
Input Capacitance	C _{IN}			—	5	10	—	10	pF
Power Dissipation Capacitance	C _{PD} (1)			—	101	—	—	—	

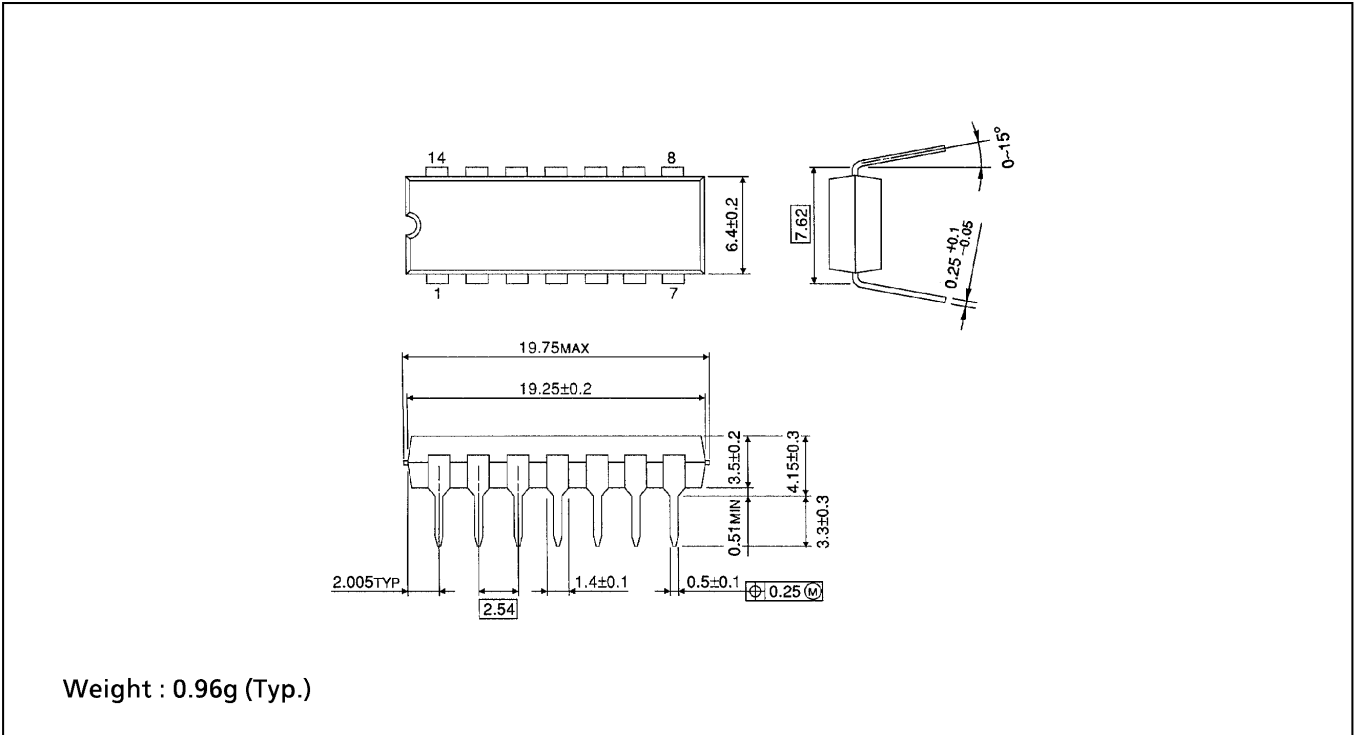
Note (1) C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

Average operating current can be obtained by the equation :

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

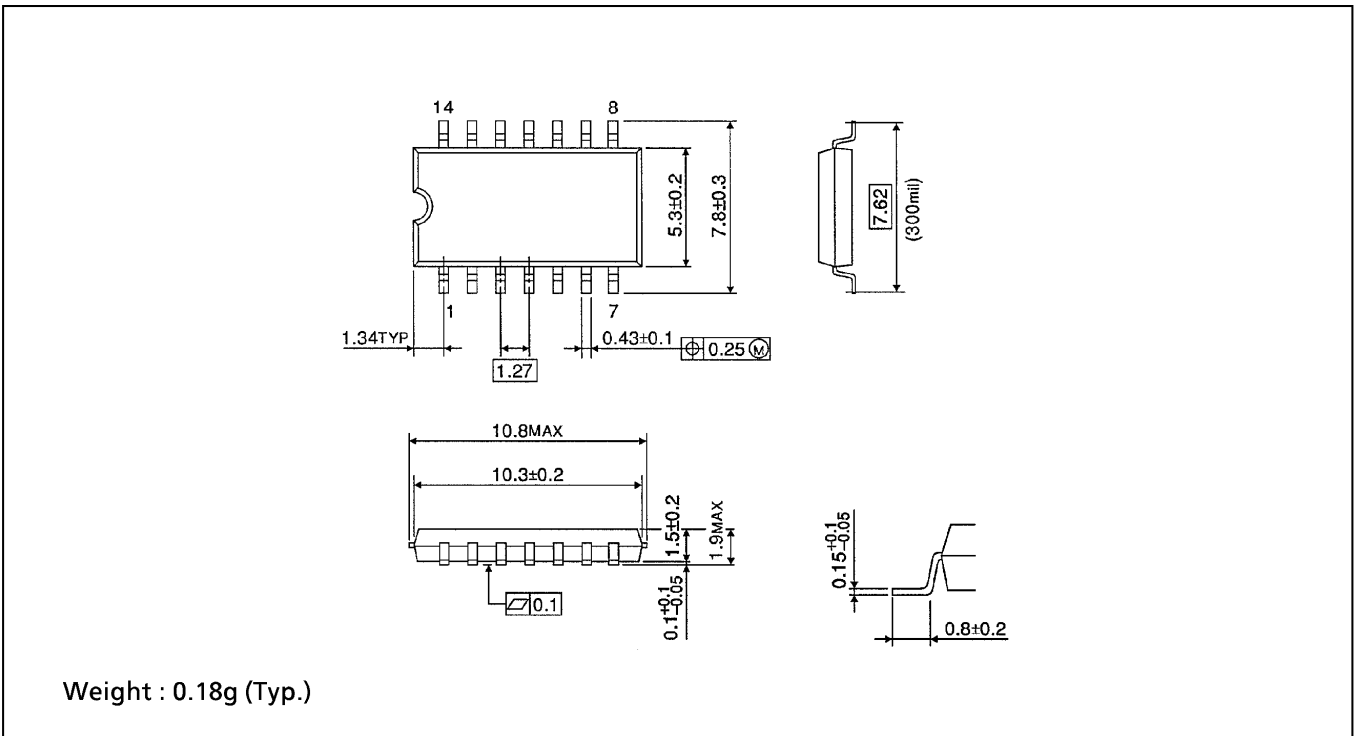
DIP 14PIN OUTLINE DRAWING (DIP14-P-300-2.54)

Unit in mm



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

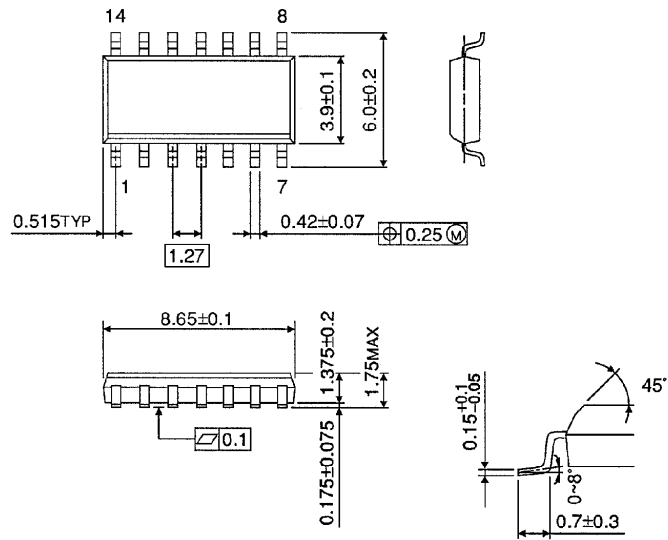
Unit in mm



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.)