

TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

TC74ACT164FN

8-Bit Shift Register (S-IN, P-OUT)

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.

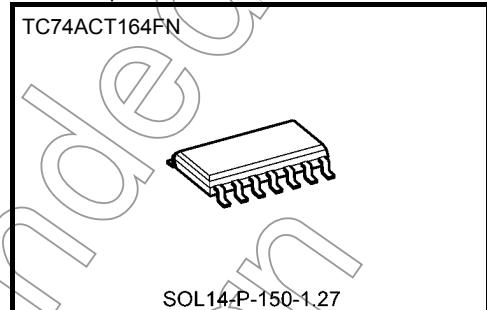
Two serial data inputs (A, B) are provided so that one may be used as a data enable.

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

Features

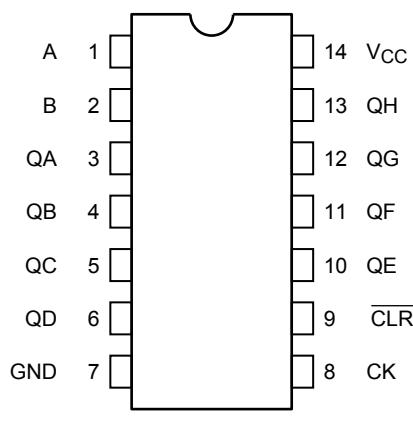
- High speed: $f_{max} = 200$ MHz (typ.) at $V_{CC} = 5$ V
- Low power dissipation: $I_{CC} = 8 \mu A$ (max) at $T_a = 25^\circ C$
- Compatible with TTL outputs: $V_{IL} = 0.8$ V (max)
 $V_{IH} = 2.0$ V (max)
- Symmetrical output impedance: $|I_{OH}| = I_{OL} = 24$ mA (min)
Capability of driving 50 Ω transmission lines.
- Balanced propagation delays: $t_{pLH} \approx t_{pHL}$
- Pin and function compatible with 74F164

Note: xxxFN (JEDEC SOP) is not available in Japan.



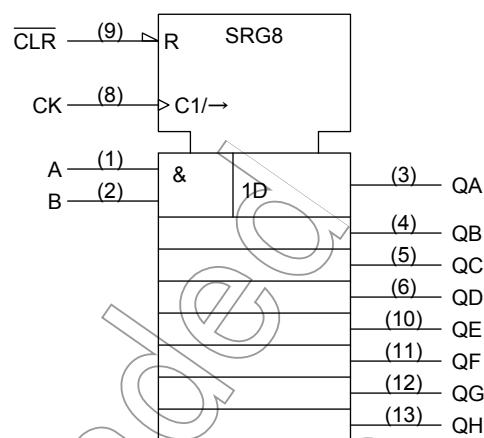
Weight
SOL14-P-150-1.27 : 0.12 g (typ.)

Pin Assignment



(top view)

IEC Logic Symbol

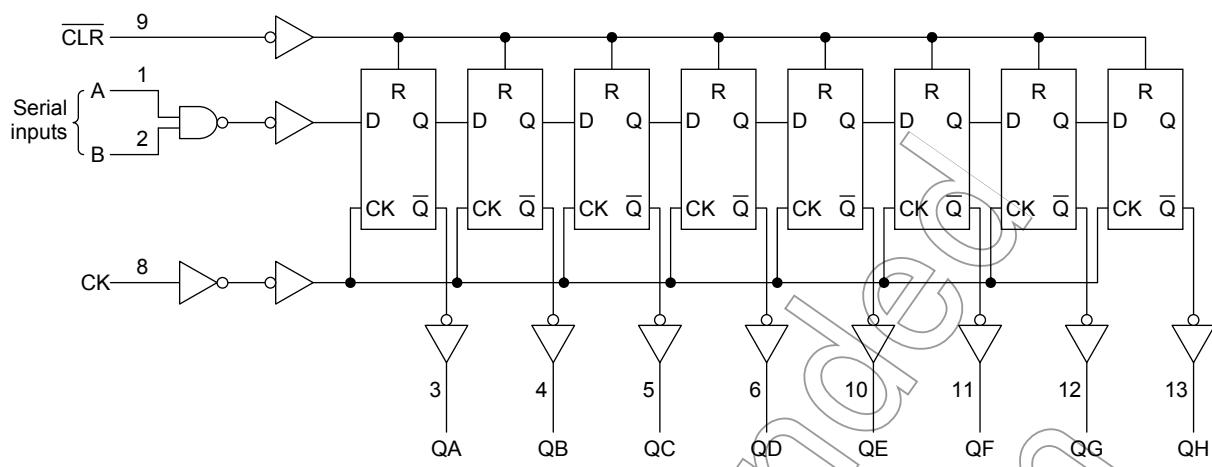
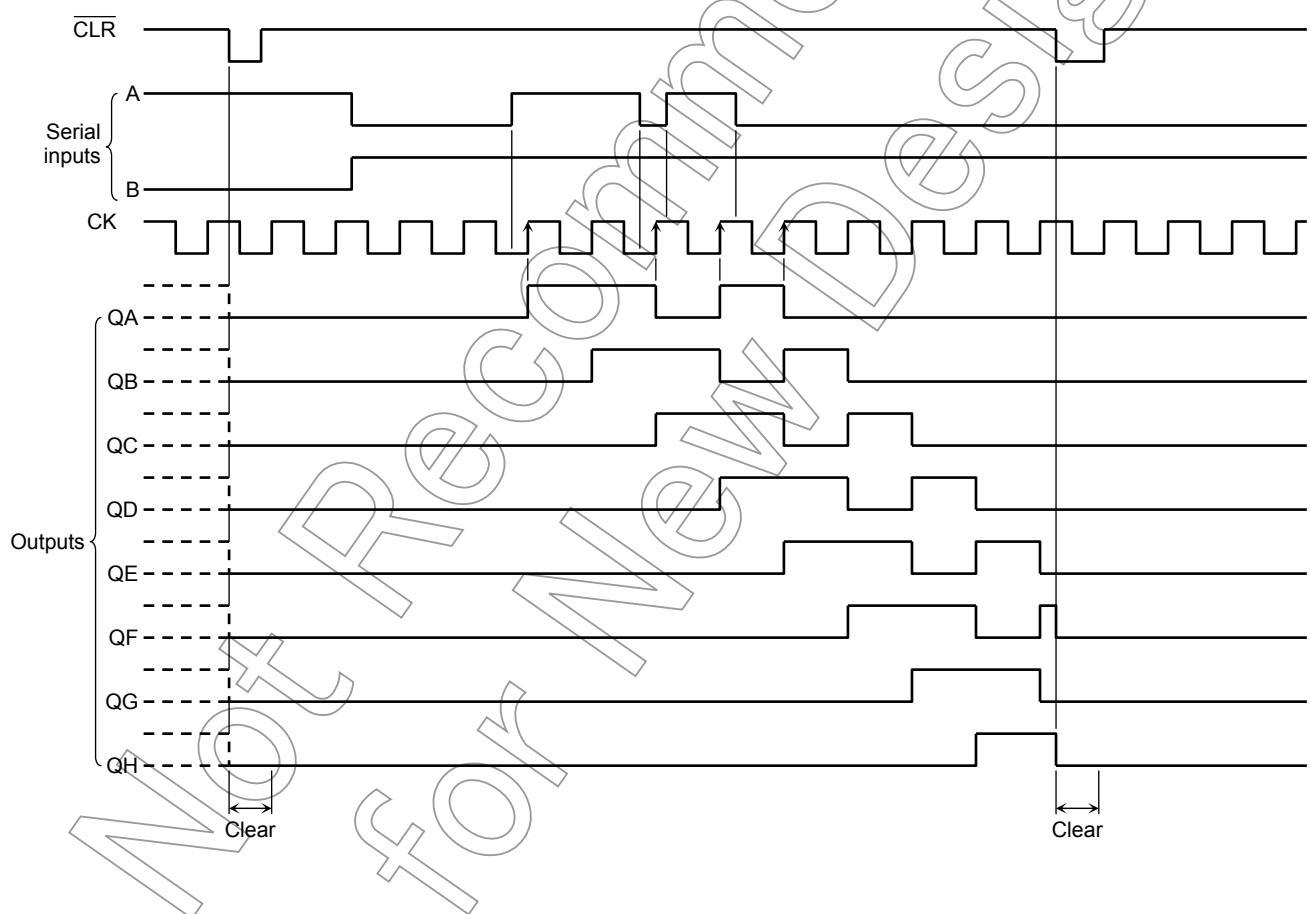


Truth Table

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	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.

System Diagram**Timing Chart**

Absolute Maximum Ratings (Note 1)

Characteristics	Symbol	Rating	Unit
Supply voltage range	V_{CC}	-0.5 to 7.0	V
DC input voltage	V_{IN}	-0.5 to $V_{CC} + 0.5$	V
DC output voltage	V_{OUT}	-0.5 to $V_{CC} + 0.5$	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	180	mW
Storage temperature	T_{STG}	-65 to 150	°C

Note 1: Exceeding any of the absolute maximum ratings, even briefly, lead to deterioration in IC performance or even destruction.

Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings and the operating ranges.

Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/"Derating Concept and Methods") and individual reliability data (i.e. reliability test report and estimated failure rate, etc.).

Operating Ranges (Note)

Characteristics	Symbol	Rating	Unit
Supply voltage	V_{CC}	4.5 to 5.5	V
Input voltage	V_{IN}	0 to V_{CC}	V
Output voltage	V_{OUT}	0 to V_{CC}	V
Operating temperature	T_{OPR}	-40 to 85	°C
Input rise and fall time	dt/dV	0 to 10	ns/V

Note: The operating ranges must be maintained to ensure the normal operation of the device.
Unused inputs must be tied to either VCC or GND.

Electrical Characteristics

DC Characteristics

Characteristics	Symbol	Test Condition		Ta = 25°C			Ta = -40 to 85°C		Unit
			V _{CC} (V)	Min	Typ.	Max	Min	Max	
High-level input voltage	V _{IH}		4.5 to 5.5	2.0	—	—	2.0	—	V
Low-level input voltage	V _{IL}		4.5 to 5.5	—	—	0.8	—	0.8	V
High-level output voltage	V _{OH}	V _{IN} = V _{IH} or V _{IL}	I _{OH} = -50 µA I _{OH} = -24 mA I _{OH} = -75 mA (Note)	4.5 4.5 5.5	4.4 — —	4.5 — —	4.4 3.80 3.85	— — —	V
Low-level output voltage	V _{OL}	V _{IN} = V _{IH} or V _{IL}	I _{OL} = 50 µA I _{OL} = 24 mA I _{OL} = 75 mA (Note)	4.5 4.5 5.5	— — —	0.0 0.36 —	0.1 0.44 1.65	— 0.1 1.65	V
Input leakage current	I _{IN}	V _{IN} = V _{CC} or GND		5.5	—	—	±0.1	—	±1.0
Quiescent supply current	I _{CC}	V _{IN} = V _{CC} or GND		5.5	—	—	8.0	—	80.0
	I _C	PER Input: V _{IN} = 3.4 V Other input: V _{CC} or GND		5.5	—	—	1.35	—	1.5

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

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

Timing Requirements (input: t_r = t_f = 3 ns)

Characteristics	Symbol	Test Condition		Ta = 25°C		Ta = -40 to 85°C		Unit
			V _{CC} (V)	Typ.	Limit	Limit	Limit	
Minimum pulse width (CK)	t _W (L) t _W (H)		5.0 ± 0.5	—	5.0	5.0	ns	
Minimum pulse width (CLR)	t _W (L)		5.0 ± 0.5	—	5.0	5.0		
Minimum set-up time	t _s		5.0 ± 0.5	—	3.0	3.0		
Minimum hold time	t _h		5.0 ± 0.5	—	2.6	2.6		
Minimum removal time (CLR)	t _{rem}		5.0 ± 0.5	—	2.0	2.0		

AC Characteristics ($C_L = 50 \text{ pF}$, $R_L = 500 \Omega$, input: $t_r = t_f = 3 \text{ ns}$)

Characteristics	Symbol	Test Condition		Ta = 25°C			Ta = -40 to 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} (Note)			—	101	—	—	—	

Note: 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:

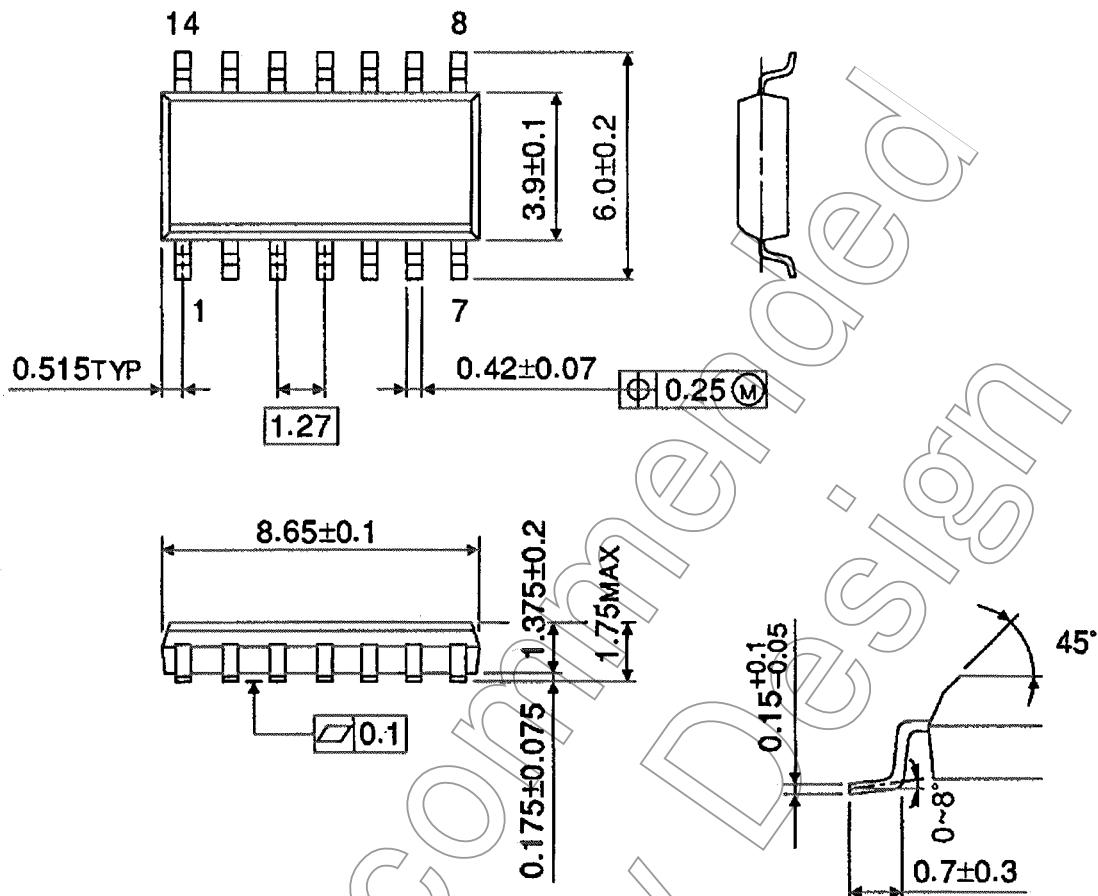
$$I_{CC} (\text{opr}) = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}$$

Not Recommended for New Design

Package Dimensions (Note)

SOL14-P-150-1.27

Unit : mm



Note: This package is not available in Japan.

Weight: 0.12 g (typ.)

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