

TC74HC4094AP, TC74HC4094AF

8-Bit Shift and Store Register (3-state)

The TC74HC4094A is a high speed CMOS 8-BIT SHIFT AND STROBE REGISTER fabricated with silicon gate C²MOS technology.

It achieves the high speed operation similar to equivalent LSTTL while maintaining the CMOS low power dissipation.

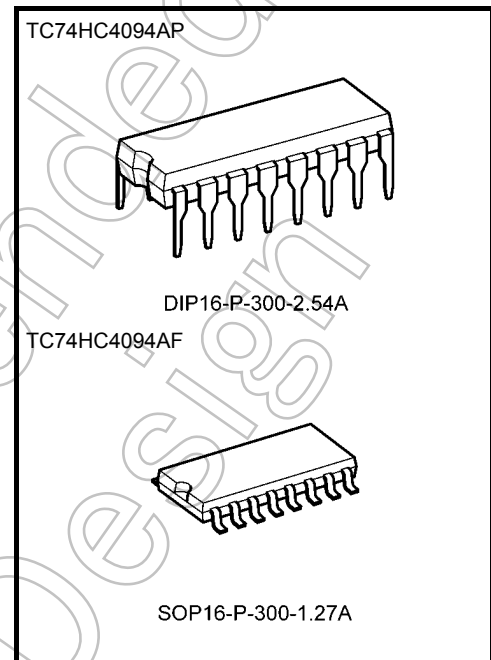
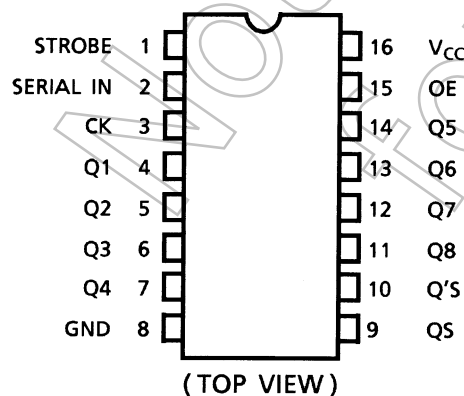
It consists of an 8-bit shift register and an 8-bit latch with 3-state output buffers. Data is shifted serially through the shift register on the positive going transition of the CK input. The output of the last stage (Qs) can be used to cascade several devices. Data on the Qs output is transferred to a second output (Q's) on the following negative transition of the CK input. The data in each stage of the shift register is provided to a corresponding latch, on the negative going transition of the STROBE input. When STROBE is held high, data propagates through the latch to a 3-state output buffer. This buffer is enabled when OUTPUT ENABLE input is set high.

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

Features

- High speed: $f_{max} = 73 \text{ MHz (typ.)}$ at $V_{CC} = 5 \text{ V}$
- Low power dissipation: $I_{CC} = 4 \mu\text{A (max)}$ at $T_a = 25^\circ\text{C}$
- High noise immunity: $V_{NIH} = V_{NIL} = 28\% V_{CC} \text{ (min)}$
- Output drive capability: 10 LSTTL loads
- Symmetrical output impedance: $|I_{OH}| = I_{OL} = 4 \text{ mA (min)}$
- Balanced propagation delays: $t_{PLH} \approx t_{PHL}$
- Wide operating voltage range: $V_{CC} \text{ (opr)} = 2 \text{ to } 6 \text{ V}$
- Pin and function compatible with 4094B

Pin Assignment

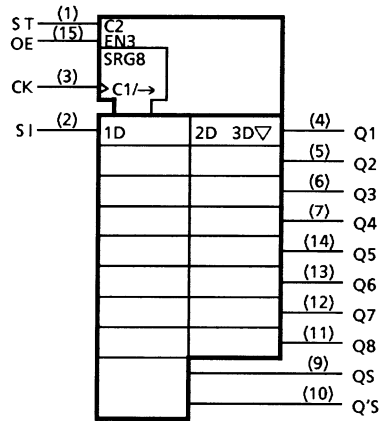


Weight

DIP16-P-300-2.54A	: 1.00 g (typ.)
SOP16-P-300-1.27A	: 0.18 g (typ.)

Start of commercial production
1986-05

IEC Logic Symbol

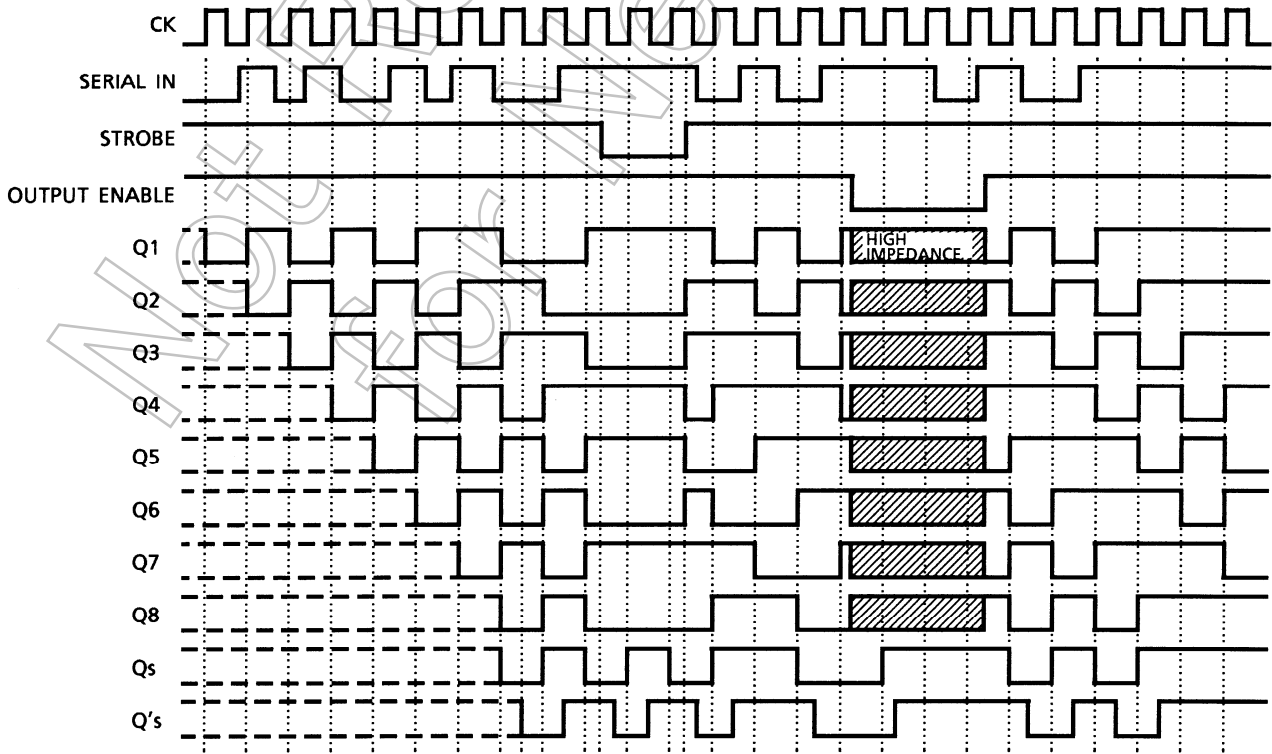


Truth Table

CK	OE	ST	SI	Para. Out		Seri. Out	
				Q1	Qn	Qs	Q's
	H	H	L	L	Qn - 1	Q7	NC
	H	H	H	H	Qn - 1	Q7	NC
	H	L	*	NC	NC	Q7	NC
	L	*	*	Z	Z	Q7	NC
	H	*	*	NC	NC	NC	Qs
	L	*	*	Z	Z	NC	Qs

X: Don't care
NC: No change
Z: High impedance

Timing Chart



Characteristics	Symbol	Rating	Unit
Supply voltage range	V _{CC}	−0.5 to 7	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}	±20	mA
DC output current	I _{OUT}	±25	mA
DC V _{CC} /ground current	I _{CC}	±50	mA
Power dissipation	P _D	500 (DIP) (Note 2)/180 (SOP)	mW
Storage temperature	T _{stg}	−65 to 150	°C

Note 2: 500 mW in the range of $T_a = -40$ to 65°C . From $T_a = 65$ to 85°C a derating factor of $-10\text{ mW}/^\circ\text{C}$ shall be applied until 300 mW.

Operating Ranges (Note)

Characteristics	Symbol	Rating	Unit
Supply voltage	V_{CC}	2 to 6	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	t_r, t_f	0 to 1000 ($V_{CC} = 2.0$ V) 0 to 500 ($V_{CC} = 4.5$ V) 0 to 400 ($V_{CC} = 6.0$ V)	ns

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

Electrical Characteristics

DC Characteristics

Characteristics	Symbol	Test Condition		Ta = 25°C			Ta = -40 to 85°C		Unit	
				VCC (V)	Min	Typ.	Max	Min		Max
High-level input voltage	VIH	—		2.0 4.5 6.0	1.50 3.15 4.20	— — —	— — —	1.50 3.15 4.20	V	
Low-level input voltage	VIL	—		2.0 4.5 6.0	— — —	— — —	0.50 1.35 1.80	— — —	0.50 1.35 1.80	V
High-level output voltage	VOH	VIN = VIH or VIL	IOH = -20 μA	2.0 4.5 6.0	1.9 4.4 5.9	2.0 4.5 6.0	— — —	1.9 4.4 5.9	— — —	V
			IOH = -4 mA	4.5	4.18	4.31	—	4.13	—	
			IOH = -5.2 mA	6.0	5.68	5.80	—	5.63	—	
Low-level output voltage	VOL	VIN = VIH or VIL	IOL = 20 μA	2.0 4.5 6.0	— — —	0.0 0.0 0.0	0.1 0.1 0.1	— — —	0.1 0.1 0.1	V
			IOL = 4 mA	4.5	—	0.17	0.26	—	0.33	
				6.0	—	0.18	0.26	—	0.33	
			IOL = 5.2 mA	4.5	—	—	—	—	—	
3-state output off-state current	IOZ	VIN = VIH or VIL VOUT = VCC or GND		6.0	—	—	±0.5	—	±5.0	μA
Input leakage current	IIN	VIN = VCC or GND		6.0	—	—	±0.1	—	±1.0	μA
Quiescent supply current	ICC	VIN = VCC or GND		6.0	—	—	4.0	—	40.0	μA

Timing Requirements (input: $t_r = t_f = 6 \text{ ns}$)

Characteristics	Symbol	Test Condition	Ta = 25°C		Ta = -40 to 85°C	Unit
			V _{CC} (V)	Typ.	Limit	
Minimum pulse width (CK)	t_W (H) t_W (L)	—	2.0	—	75	ns
			4.5	—	15	
			6.0	—	13	
Minimum pulse width (STROBE)	t_W (H)	—	2.0	—	75	ns
			4.5	—	15	
			6.0	—	13	
Minimum set-up time (SERIAL)	t_s	—	2.0	—	75	ns
			4.5	—	15	
			6.0	—	13	
Minimum set-up time (STROBE)	t_s	—	2.0	—	100	ns
			4.5	—	20	
			6.0	—	17	
Minimum hold time (SERIAL)	t_h	—	2.0	—	0	ns
			4.5	—	0	
			6.0	—	0	
Minimum hold time (STROBE)	t_h	—	2.0	—	0	ns
			4.5	—	0	
			6.0	—	0	
Clock frequency	f	—	2.0	—	6	MHz
			4.5	—	30	
			6.0	—	35	

AC Characteristics ($C_L = 15 \text{ pF}$, $V_{CC} = 5 \text{ V}$, Ta = 25°C, input: $t_r = t_f = 6 \text{ ns}$)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Output transition time	t_{TLH}	—	—	4	8	ns
	t_{THL}					
Propagation delay time (CK-Qn)	t_{pLH}	—	—	22	35	ns
	t_{pHL}					
Propagation delay time (CK-QS, Q'S)	t_{pLH}	—	—	16	25	ns
	t_{pHL}					
Propagation delay time (STROBE-Qn)	t_{pLH}	—	—	16	27	ns
	t_{pHL}					
3-state output enable time	t_{pZL}	$R_L = 1 \text{ k}\Omega$	—	13	25	ns
	t_{pZH}					
Maximum clock frequency	f_{max}	—	33	73	—	MHz

AC Characteristics (C_L = 50 pF, input: t_r = t_f = 6 ns)

Characteristics	Symbol	Test Condition	Ta = 25°C			Ta = -40 to 85°C		Unit
			V _{CC} (V)	Min	Typ.	Max	Min	Max
Output transition time	t _{TLH} t _{THL}	—	2.0	—	30	75	—	95
			4.5	—	8	15	—	19
			6.0	—	7	13	—	16
Propagation delay time (CK-Qn)	t _{pLH} t _{pHL}	—	2.0	—	92	200	—	250
			4.5	—	26	40	—	50
			6.0	—	20	34	—	43
Propagation delay time (CK-QS, Q'S)	t _{pLH} t _{pHL}	—	2.0	—	65	150	—	190
			4.5	—	19	30	—	38
			6.0	—	15	26	—	32
Propagation delay time (STROBE-Qn)	t _{pLH} t _{pHL}	—	2.0	—	75	160	—	200
			4.5	—	20	32	—	40
			6.0	—	16	27	—	34
3-state output enable time	t _{pZL} t _{pZH}	R _L = 1 kΩ	2.0	—	58	150	—	190
			4.5	—	16	30	—	38
			6.0	—	13	26	—	32
3-state output disable time	t _{pLZ} t _{pHZ}	R _L = 1 kΩ	2.0	—	35	150	—	190
			4.5	—	16	30	—	38
			6.0	—	13	26	—	32
Maximum clock frequency	f _{max}	—	2.0	6	16	—	5	—
			4.5	30	66	—	24	—
			6.0	35	80	—	28	—
Input capacitance	C _{IN}	—	—	—	5	10	—	10
Bus input capacitance	C _{OUT}	—	—	—	10	—	—	—
Power dissipation capacitance	C _{PD} (Note)	—	—	—	140	—	—	—

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

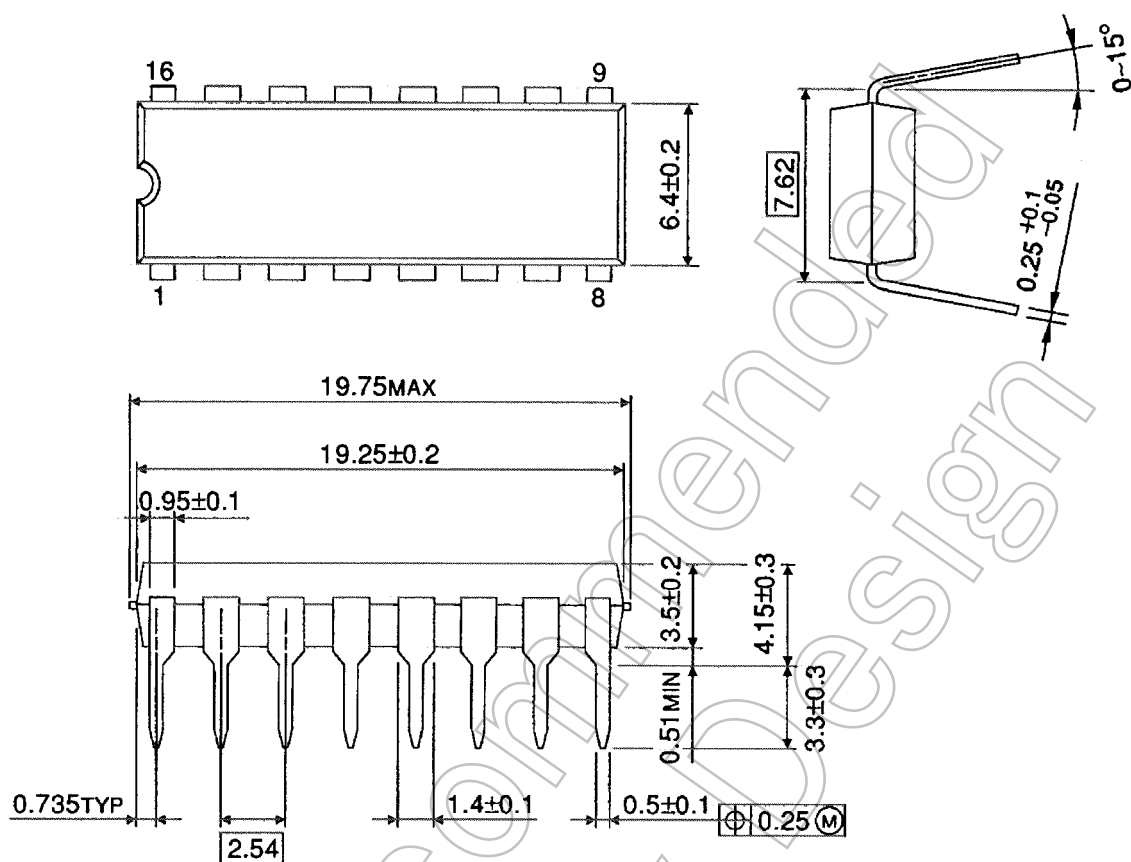
Average operating current can be obtained by the equation:

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

Package Dimensions

DIP16-P-300-2.54A

Unit : mm

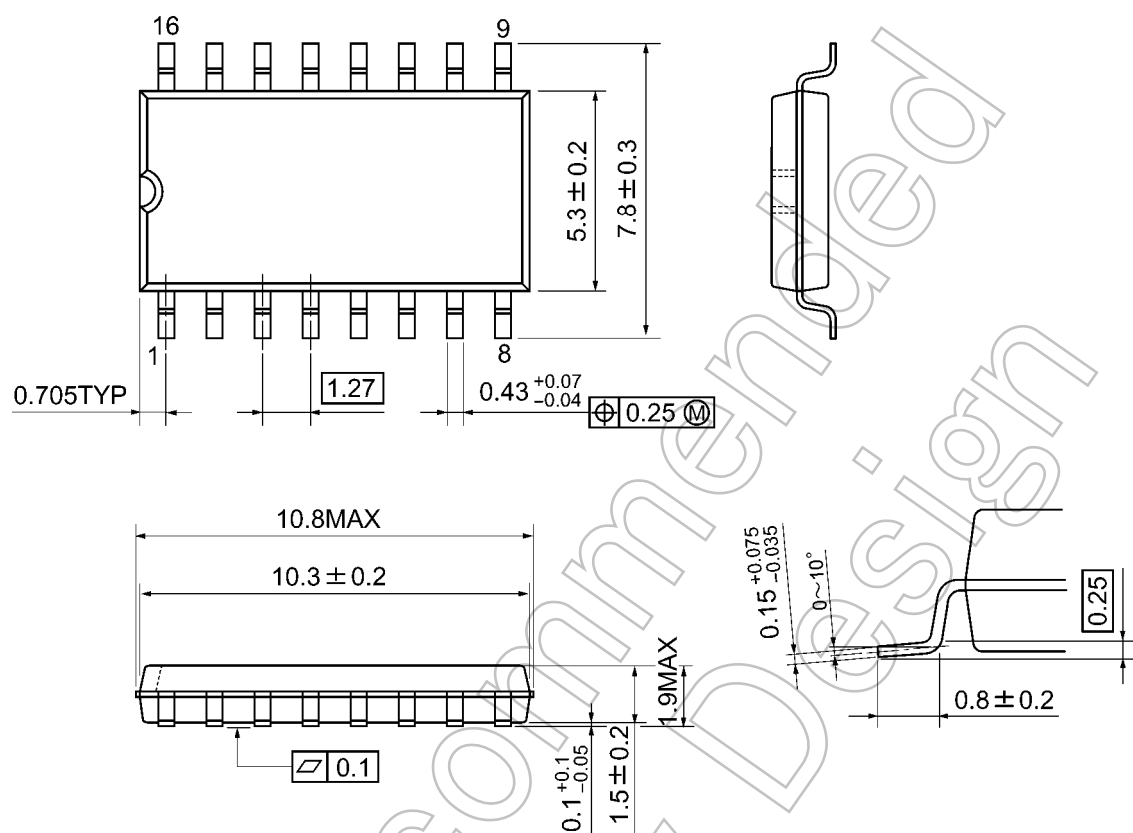


Weight: 1.00 g (typ.)

Package Dimensions

SOP16-P-300-1.27A

Unit: mm



Weight: 0.18 g (typ.)

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