

MC74HC4094A

8-Bit Shift and Store Register

High-Performance Silicon-Gate CMOS

The MC74HC4094A is a high speed CMOS 8-bit serial shift and storage register. This device consists of an 8-bit shift register and latch with 3-state output buffers. Data is shifted on positive clock (CP) transitions. The data in the shift register is transferred to the storage register when the Strobe (STR) input is high. The output buffers are enabled when the Output Enable (OE) input is set high. Two serial outputs (QS₁, QS₂) are available for cascading multiple devices.

Features

- Wide Operating Voltage Range: 2.0 to 6.0 V
- Low Power Dissipation: I_{CC} = < 10 μ A
- In Compliance with the Requirements Defined by JEDEC Standard No. 7A
- These are Pb-Free Devices

Typical Applications

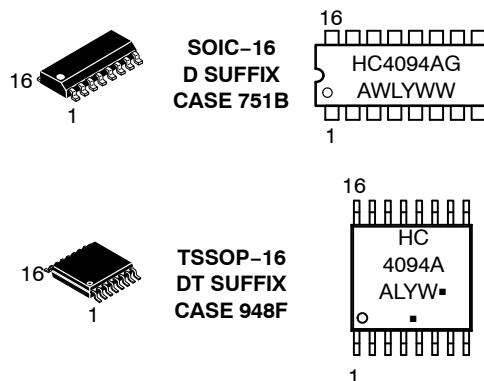
- Serial-to-Parallel Conversion
- Remote Control Storage Register



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MARKING DIAGRAMS



A = Assembly Location
WL, L = Wafer Lot
YY, Y = Year
WW, W = Work Week
G, ■ = Pb-Free Package

(Note: Microdot may be in either location)

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 10 of this data sheet.

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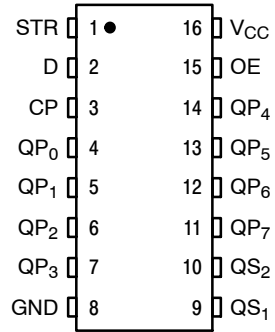


Figure 1. Pin Assignment

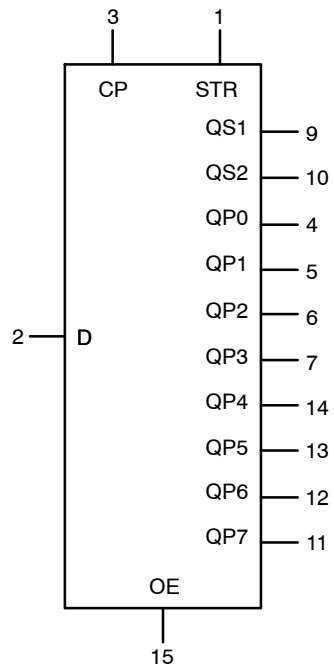


Figure 2. Logic Symbol

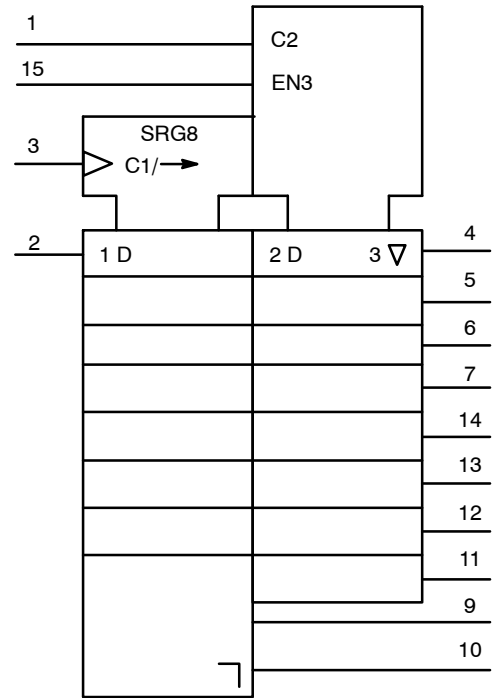


Figure 3. IEC Logic Symbol

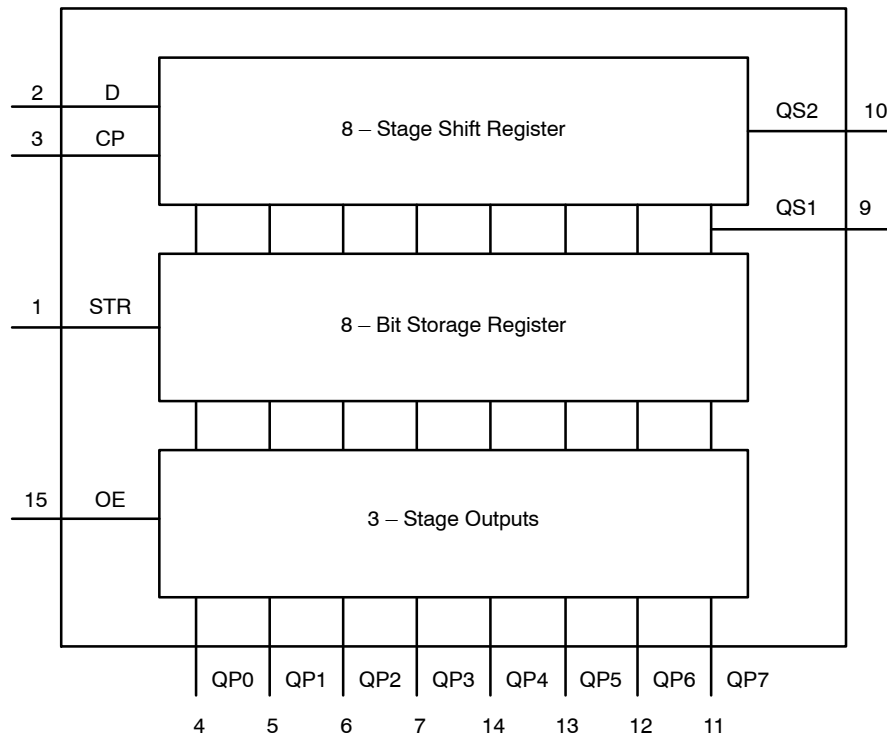


Figure 4. Functional Diagram

MC74HC4094A

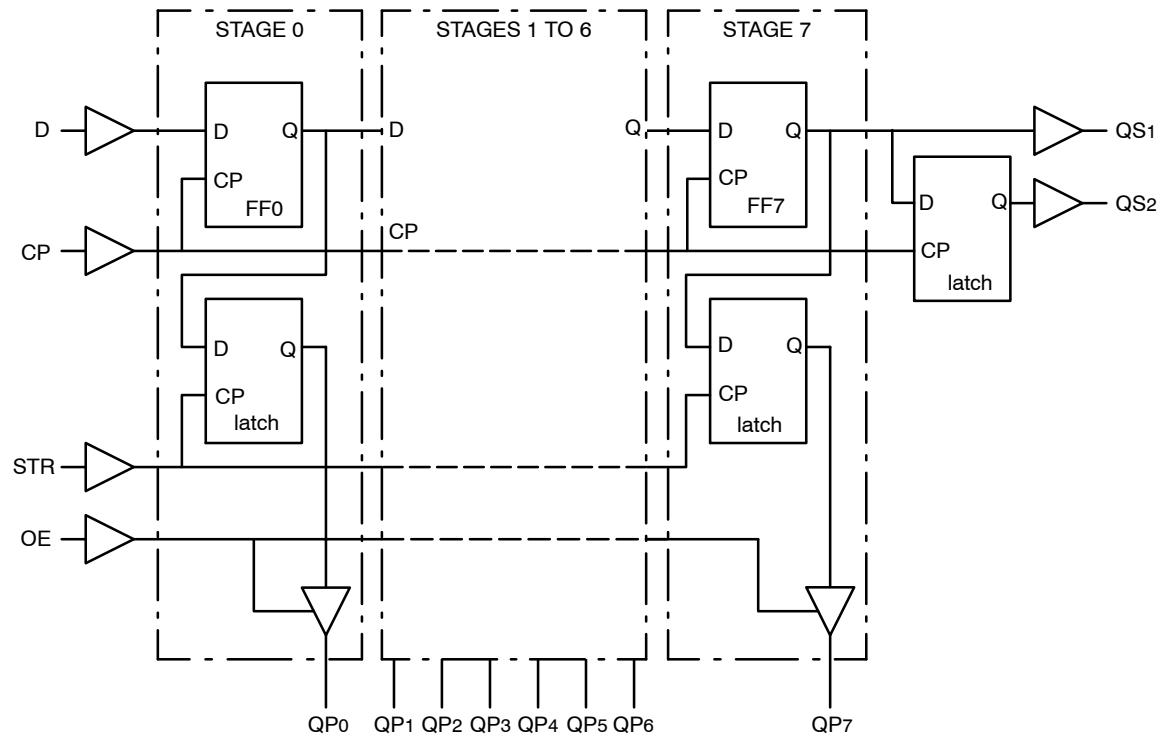


Figure 5. Logic Diagram

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MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{CC}	DC Supply Voltage (Referenced to GND)	– 0.5 to + 7.0	V
V_{in}	DC Input Voltage (Referenced to GND)	– 0.5 to $V_{CC} + 0.5$	V
V_{out}	DC Output Voltage (Referenced to GND)	– 0.5 to $V_{CC} + 0.5$	V
I_{in}	DC Input Current, per Pin	± 20	mA
I_{out}	DC Output Current, per Pin	± 35	mA
I_{CC}	DC Supply Current, V_{CC} and GND Pins	± 75	mA
P_D	Power Dissipation in Still Air, SOIC Package† TSSOP Package†	500 450	mW
T_{stg}	Storage Temperature	– 65 to + 150	°C

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

†Derating – SOIC Package: – 7 mW/°C from 65° to 125°C
TSSOP Package: – 6.1 mW/°C from 65° to 125°C

This device contains protection circuitry to guard against damage due to high static voltages or electric fields. However, precautions must be taken to avoid applications of any voltage higher than maximum rated voltages to this high-impedance circuit. For proper operation, V_{in} and V_{out} should be constrained to the range $GND \leq (V_{in} \text{ or } V_{out}) \leq V_{CC}$.
Unused inputs must always be tied to an appropriate logic voltage level (e.g., either GND or V_{CC}). Unused outputs must be left open.

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Min	Max	Unit
V _{CC}	DC Supply Voltage (Referenced to GND)	2.0	6.0	V
V _{in} , V _{out}	DC Input Voltage, Output Voltage (Referenced to GND)	0	V _{CC}	V
T _A	Operating Temperature, All Package Types	−55	+125	°C
t _r , t _f	Input Rise and Fall Time (Figure 1)	V _{CC} = 2.0 V V _{CC} = 4.5 V V _{CC} = 6.0 V	0 1000 500 400	ns

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FUNCTIONAL TABLE

INPUTS				PARALLEL OUTPUTS		SERIAL OUTPUTS	
CP	OE	STR	D	QP0	QPn	QS1	QS2
↑	L	X	X	Z	Z	Q'6	NC
↓	L	X	X	Z	Z	NC	QP7
↑	H	L	X	NC	NC	Q'6	NC
↑	H	H	L	L	QPn-1	Q'6	NC
↑	H	H	H	H	QPn-1	Q'6	NC
↓	H	H	H	NC	NC	NC	QP7

Notes

- H = HIGH voltage level
 L = LOW voltage level
 X = don't care
 Z = high impedance OFF-state
 NC = no change
 ↑ = LOW-to-HIGH CP transition
 ↓ = HIGH-to-LOW CP transition
 Q'6 = the information in the seventh register stage is transferred to the 8th register stage and QSn output at the positive clock edge

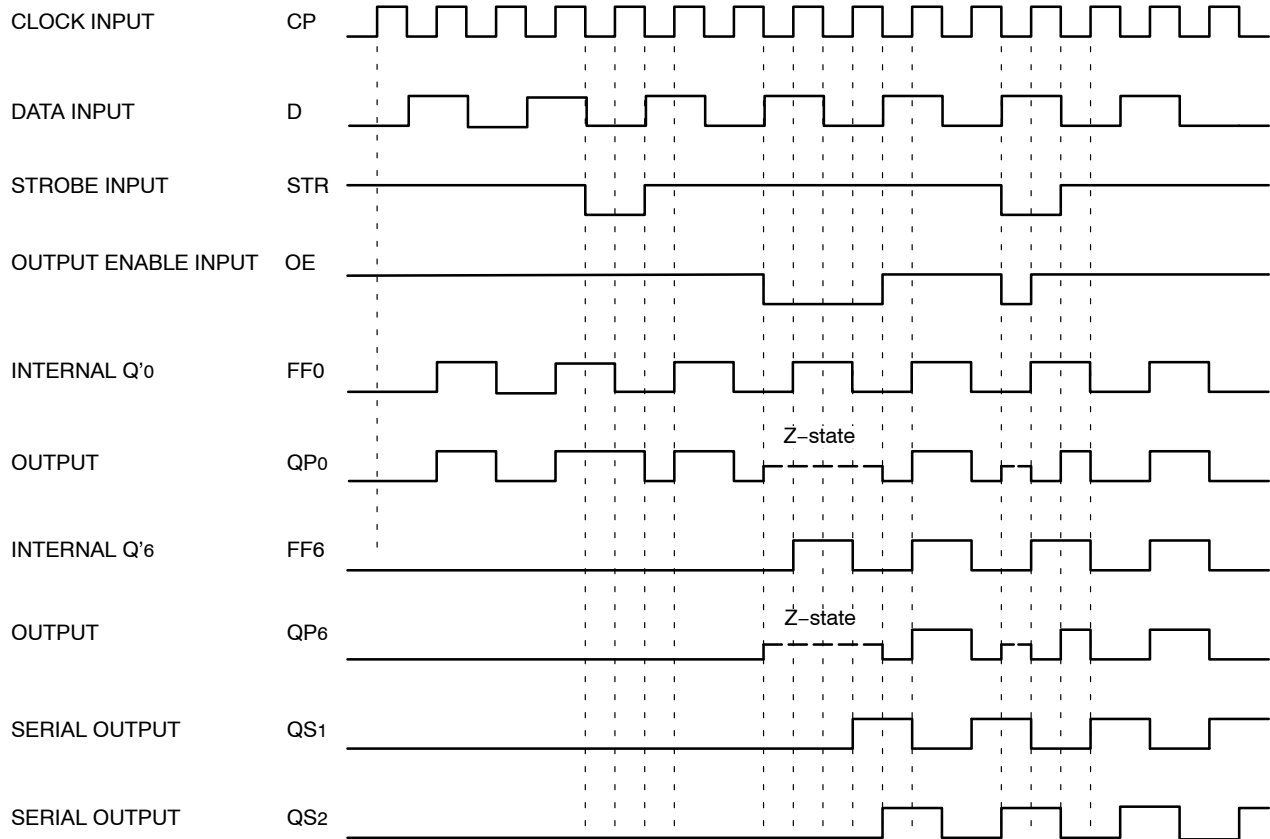


Figure 6. Timing Diagram

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DC CHARACTERISTICS

Symbol	Parameter	Test Conditions	V _{CC} (V)	Guaranteed Limits			Unit
				-55°C to 25°C	≤ 85°C	≤ 125°C	
V _{IH}	Minimum High-Level Input Voltage	V _{OUT} = 0.1 V or V _{CC} - 0.1 V I _{OUT} ≤ 20 μA	2.0	1.5	1.5	1.5	V
			3.0	2.1	2.1	2.1	
			4.5	3.15	3.15	3.15	
			6.0	4.2	4.2	4.2	
V _{IL}	Maximum Low-Level Input Voltage	V _{OUT} = 0.1 V or V _{CC} - 0.1 V I _{OUT} ≤ 20 μA	2.0	0.5	0.5	0.5	V
			3.0	0.9	0.9	0.9	
			4.5	1.35	1.35	1.35	
			6.0	1.8	1.8	1.8	
V _{OH}	Minimum High-Level Output Voltage	V _{IN} = V _{IH} or V _{IL} I _{OUT} ≤ 20 μA	2.0	1.9	1.9	1.9	V
			3.0	2.9	2.9	2.9	
			4.5	4.4	4.4	4.4	
			6.0	5.9	5.9	5.9	
		V _{IN} = V _{IH} or V _{IL} , I _{OUT} = 2.4 mA	3.0	2.75	2.7	2.6	
		V _{IN} = V _{IH} or V _{IL} , I _{OUT} = 4 mA	4.5	4.25	4.2	4.1	
		V _{IN} = V _{IH} or V _{IL} , I _{OUT} = 5.2 mA	6.0	5.75	5.7	5.6	
V _{OL}	Maximum Low-Level Output Voltage	V _{IN} = V _{IH} or V _{IL} , I _{OUT} ≤ 20 μA	2.0	0.1	0.1	0.1	V
			3.0	0.1	0.1	0.1	
			4.5	0.1	0.1	0.1	
			6.0	0.1	0.1	0.1	
		V _{IN} = V _{IH} or V _{IL} , I _{OUT} = 2.4 mA	3.0	0.25	0.3	0.4	
		V _{IN} = V _{IH} or V _{IL} , I _{OUT} = 4 mA	4.5	0.25	0.3	0.4	
		V _{IN} = V _{IH} or V _{IL} , I _{OUT} = 5.2 mA	6.0	0.25	0.3	0.4	
I _{IN}	Maximum Input Leakage Current	V _{IN} = V _{CC} or GND	6.0	±0.1	±1	±1	μA
I _{OZ}	Maximum Tri-State Output Leakage Current	V _{IN} = V _{CC} or GND V _{OUT} = V _{CC} or GND	6.0	±0.5	±5	±10	μA
I _{CC}	Maximum Quiescent Supply Current	V _{IN} = V _{CC} or GND	6.0	4.0	40	80	μA

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AC CHARACTERISTICS ($t_f = t_r = 6 \text{ ns}$, $C_L = 50 \text{ pF}$)

Symbol	Parameter	Test Conditions	$V_{CC} \text{ (V)}$	Guaranteed Limits			Unit
				$-55^{\circ}\text{C to } 25^{\circ}\text{C}$	$\leq 85^{\circ}\text{C}$	$\leq 125^{\circ}\text{C}$	
t_{PHL}, t_{PLH}	Maximum Propagation Delay CP to QS_1	Figure 7	2.0	120	150	170	ns
			3.0	90	100	110	
			4.5	30	38	45	
			6.0	26	33	38	
t_{PHL}, t_{PLH}	Maximum Propagation Delay CP to QS_2	Figure 7	2.0	120	150	170	ns
			3.0	90	100	110	
			4.5	27	34	41	
			6.0	23	29	35	
t_{PHL}, t_{PLH}	Maximum Propagation Delay CP to QP_n	Figure 7	2.0	120	150	170	ns
			3.0	90	100	110	
			4.5	39	49	59	
			6.0	33	42	50	
t_{PHL}, t_{PLH}	Maximum Propagation Delay STR to QP_n	Figure 8	2.0	120	150	170	ns
			3.0	90	100	110	
			4.5	36	45	54	
			6.0	31	38	46	
t_{PZH}, t_{PZL}	Maximum 3-State Output Enable Time OE to QP_n	Figure 9	2.0	120	140	160	ns
			3.0	80	100	120	
			4.5	35	44	53	
			6.0	30	37	45	
t_{PHZ}, t_{PLZ}	Maximum 3-State Output Enable Time OE to QP_n	Figure 9	2.0	100	120	140	ns
			3.0	70	90	110	
			4.5	25	31	38	
			6.0	21	26	32	
t_{THL}, t_{TLH}	Maximum Output Transition Time	Figure 7	2.0	70	90	110	ns
			3.0	40	60	80	
			4.5	18	22	25	
			6.0	16	19	22	
t_W	Minimum Clock Pulse Width High or Low	Figure 7	2.0	80	100	120	ns
			3.0	50	60	80	
			4.5	16	20	24	
			6.0	14	17	20	
t_W	Minimum Strobe Pulse Width High	Figure 8	2.0	80	100	120	ns
			3.0	50	60	80	
			4.5	16	20	24	
			6.0	14	17	20	
t_{SU}	Minimum Set-up Time D to CP	Figure 10	2.0	50	65	75	ns
			3.0	30	35	45	
			4.5	10	13	15	
			6.0	9	11	13	

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AC CHARACTERISTICS ($t_f = t_r = 6 \text{ ns}$, $C_L = 50 \text{ pF}$)

Symbol	Parameter	Test Conditions	$V_{CC} \text{ (V)}$	Guaranteed Limits			Unit
				$-55^{\circ}\text{C to } 25^{\circ}\text{C}$	$\leq 85^{\circ}\text{C}$	$\leq 125^{\circ}\text{C}$	
t_{SU}	Minimum Set-up Time CP to STR	Figure 8	2.0	100	125	150	ns
			3.0	60	75	90	
			4.5	20	25	30	
			6.0	17	21	26	
t_h	Minimum Hold Time D to CP	Figure 10	2.0	3	3	3	ns
			3.0	3	3	3	
			4.5	3	3	3	
			6.0	3	3	3	
t_h	Minimum Hold Time CP to STR	Figure 8	2.0	0	0	0	ns
			3.0	0	0	0	
			4.5	0	0	0	
			6.0	0	0	0	
f_{MAX}	Minimum Clock Pulse Frequency	Figure 7	2.0	6	5	4	MHz
			3.0	18	14	12	
			4.5	30	24	20	
			6.0	35	28	24	
C_{in}	Maximum Input Capacitance		–	10	10	10	pF
C_{out}	Maximum Output Capacitance		–	15	15	15	pF
C_{PD}	Power Dissipation Capacitance (Note 2)		–	140	140	140	pF

2. C_{PD} is defined as the value of the IC's equivalent capacitance from which the operating current can be calculated from:
 $I_{CC}(\text{operating}) \approx C_{PD} \times V_{CC} \times f_{IN} \times N_{SW}$ where N_{SW} = total number of outputs switching and f_{IN} = switching frequency.

AC WAVEFORMS

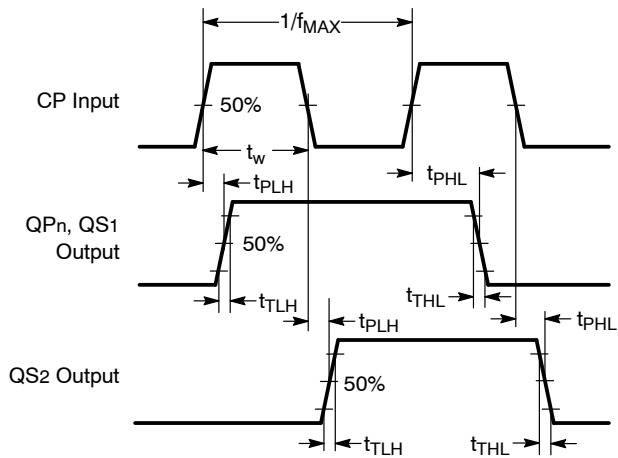


Figure 7. Waveforms showing the clock (CP) to output (QPn, QS1, QS2) propagation delays, the clock pulse width and the maximum clock frequency.

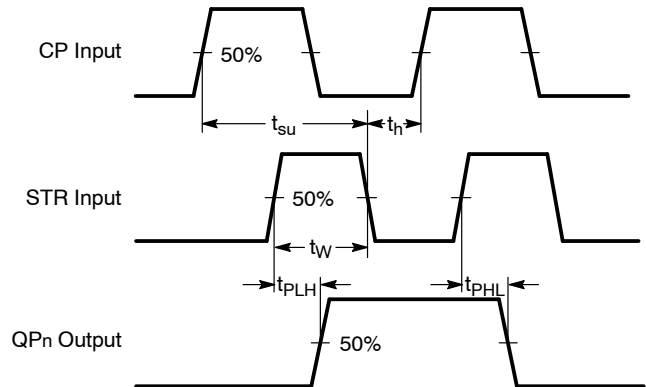


Figure 8. Waveforms showing the strobe (STR) to output (QPn) propagation delays, the strobe pulse width, the clock set-up and hold times for the strobe input.

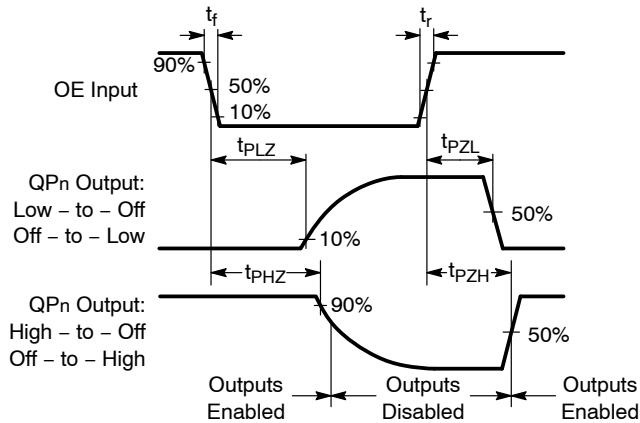
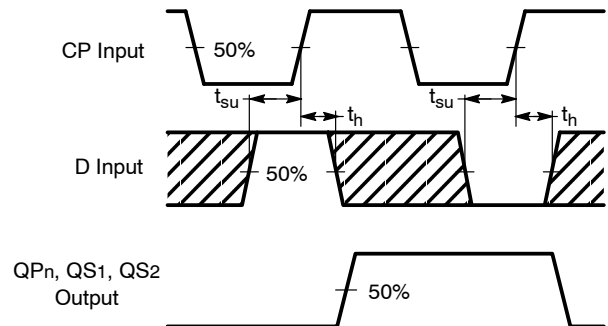


Figure 9. Waveforms showing the 3-state enable and disable times for input OE.



The shaded areas indicate when the input is permitted to change for predictable output performance.

Figure 10. Waveforms showing the data set-up and hold times for the data input.

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TEST CIRCUITS

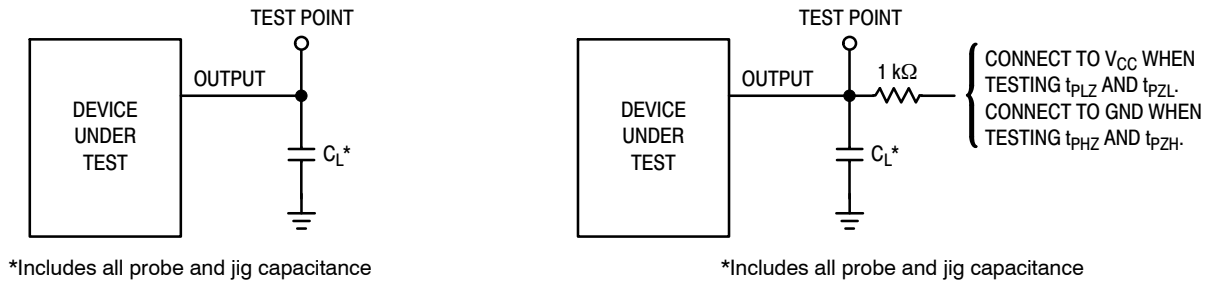


Figure 11. AC Characteristics Load Circuits

ORDERING INFORMATION

Device	Package	Shipping [†]
MC74HC4094ADG	SOIC-16 (Pb-Free)	48 Units / Rail
MC74HC4094ADR2G	SOIC-16 (Pb-Free)	2500 Tape & Reel
MC74HC4094ADT	TSSOP-16*	96 Units / Rail
MC74HC4094ADTR2G	TSSOP-16* (Pb-Free)	2500 Tape & Reel

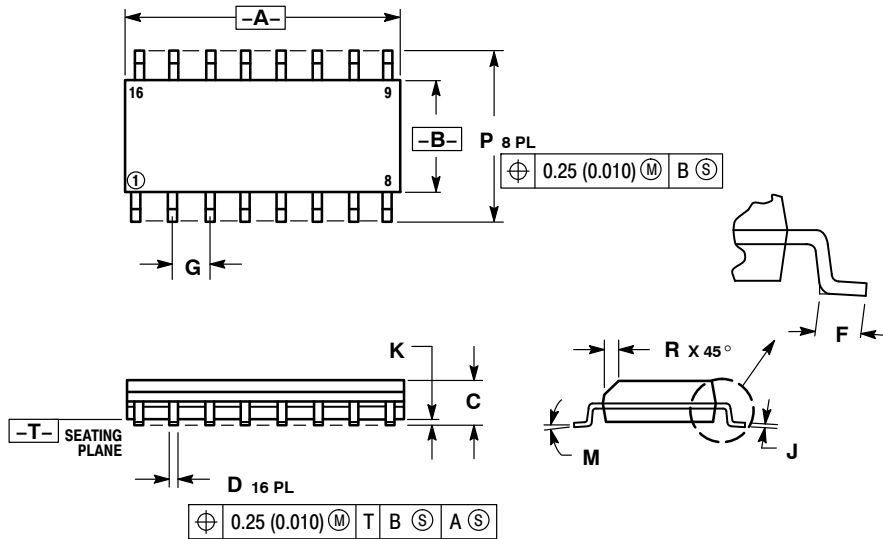
[†]For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

*This package is inherently Pb-Free.

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PACKAGE DIMENSIONS

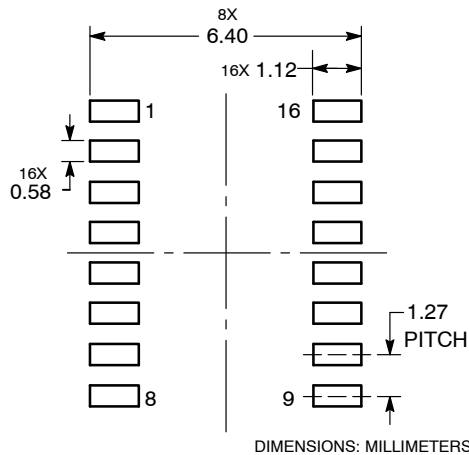
SOIC-16
CASE 751B-05
ISSUE K



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: MILLIMETER.
 3. DIMENSIONS A AND B DO NOT INCLUDE MOLD PROTRUSION.
 4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
 5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 (0.005) TOTAL IN EXCESS OF THE D DIMENSION AT MAXIMUM MATERIAL CONDITION.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	9.80	10.00	0.386	0.393
B	3.80	4.00	0.150	0.157
C	1.35	1.75	0.054	0.068
D	0.35	0.49	0.014	0.019
F	0.40	1.25	0.016	0.049
G	1.27 BSC		0.050 BSC	
J	0.19	0.25	0.008	0.009
K	0.10	0.25	0.004	0.009
M	0°	7°	0°	7°
P	5.80	6.20	0.229	0.244
R	0.25	0.50	0.010	0.019

SOLDERING FOOTPRINT*



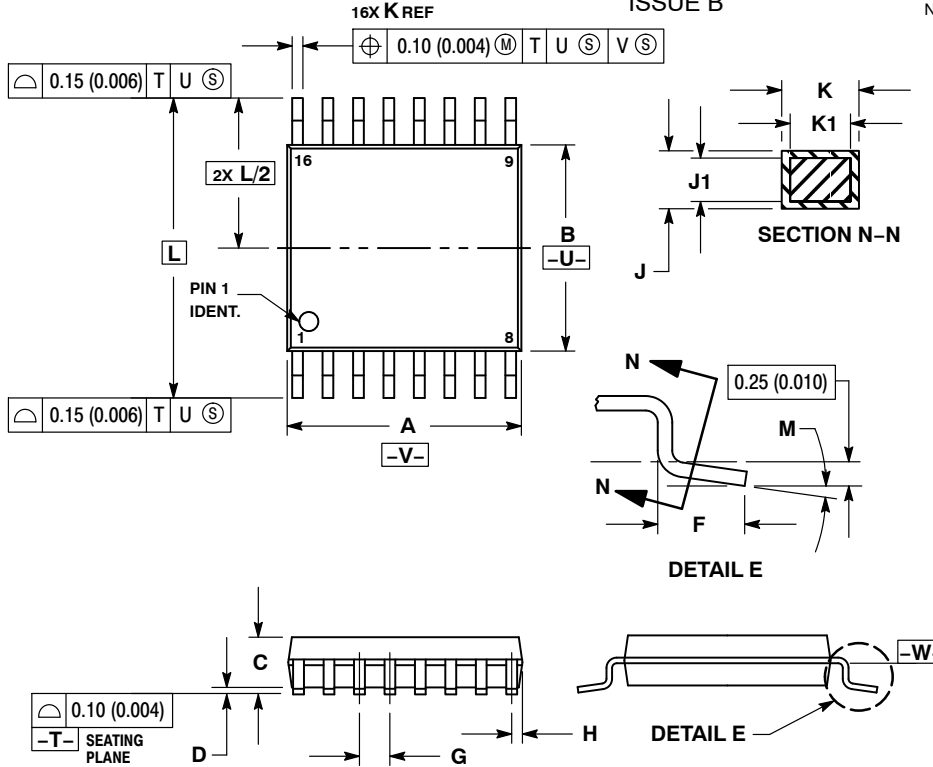
DIMENSIONS: MILLIMETERS

*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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PACKAGE DIMENSIONS

TSSOP-16
DT SUFFIX
CASE 948F-01
ISSUE B

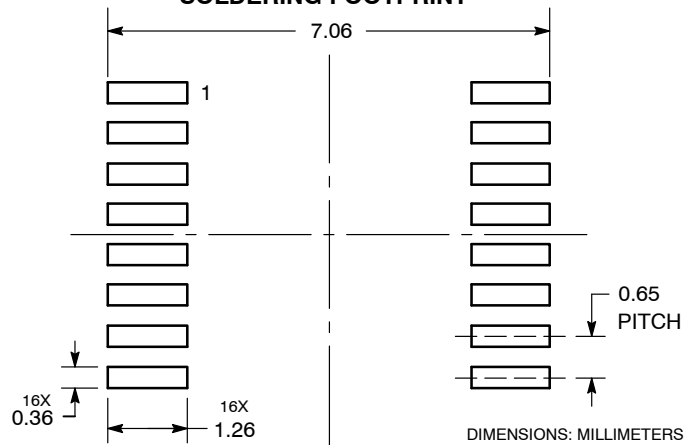


NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION A DOES NOT INCLUDE MOLD FLASH. PROTRUSIONS OR GATE BURRS. MOLD FLASH OR GATE BURRS SHALL NOT EXCEED 0.15 (0.006) PER SIDE.
4. DIMENSION B DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. INTERLEAD FLASH OR PROTRUSION SHALL NOT EXCEED 0.25 (0.010) PER SIDE.
5. DIMENSION K DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 (0.003) TOTAL IN EXCESS OF THE K DIMENSION AT MAXIMUM MATERIAL CONDITION.
6. TERMINAL NUMBERS ARE SHOWN FOR REFERENCE ONLY.
7. DIMENSION A AND B ARE TO BE DETERMINED AT DATUM PLANE -W-.

	MILLIMETERS		INCHES	
DIM	MIN	MAX	MIN	MAX
A	4.90	5.10	0.193	0.200
B	4.30	4.50	0.169	0.177
C	---	1.20	---	0.047
D	0.05	0.15	0.002	0.006
F	0.50	0.75	0.020	0.030
G	0.65 BSC		0.026 BSC	
H	0.18	0.28	0.007	0.011
J	0.09	0.20	0.004	0.008
J1	0.09	0.16	0.004	0.006
K	0.19	0.30	0.007	0.012
K1	0.19	0.25	0.007	0.010
L	6.40 BSC		0.252 BSC	
M	0°	8°	0°	8°

SOLDERING FOOTPRINT*



*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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Наши преимущества:

- Поставка оригинальных импортных электронных компонентов напрямую с производств Америки, Европы и Азии, а так же с крупнейших складов мира;
- Широкая линейка поставок активных и пассивных импортных электронных компонентов (более 30 млн. наименований);
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Помощь Конструкторского Отдела и консультации квалифицированных инженеров;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Поставка электронных компонентов под контролем ВП;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- При необходимости вся продукция военного и аэрокосмического назначения проходит испытания и сертификацию в лаборатории (по согласованию с заказчиком);
- Поставка специализированных компонентов военного и аэрокосмического уровня качества (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Actel, Aeroflex, Peregrine, VPT, Syfer, Eurofarad, Texas Instruments, MS Kennedy, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

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JONHON

«JONHON» (основан в 1970 г.)

Разъемы специального, военного и аэрокосмического назначения:

(Применяются в военной, авиационной, аэрокосмической, морской, железнодорожной, горно- и нефтедобывающей отраслях промышленности)

«FORSTAR» (основан в 1998 г.)

ВЧ соединители, коаксиальные кабели,
кабельные сборки и микроволновые компоненты:

(Применяются в телекоммуникациях гражданского и специального назначения, в средствах связи, РЛС, а так же военной, авиационной и аэрокосмической отраслях промышленности).



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