

# DATA SHEET

For a complete data sheet, please also download:

- The IC06 74HC/HCT/HCU/HCMOS Logic Family Specifications
- The IC06 74HC/HCT/HCU/HCMOS Logic Package Information
- The IC06 74HC/HCT/HCU/HCMOS Logic Package Outlines

## **74HC/HCT4094** 8-stage shift-and-store bus register

Product specification  
File under Integrated Circuits, IC06

December 1990

## 8-stage shift-and-store bus register

## 74HC/HCT4094

## FEATURES

- Output capability: standard
- I<sub>CC</sub> category: MSI

## GENERAL DESCRIPTION

The 74HC/HCT4094 are high-speed Si-gate CMOS devices and are pin compatible with the “4094” of the “4000B” series. They are specified in compliance with JEDEC standard no. 7A.

The 74HC/HCT4094 are 8-stage serial shift registers having a storage latch associated with each stage for strobing data from the serial input (D) to the parallel buffered 3-state outputs (QP<sub>0</sub> to QP<sub>7</sub>). The parallel outputs may be connected directly to common bus lines. Data is shifted on the positive-going clock (CP) transitions.

The data in each shift register stage is transferred to the storage register when the strobe input (STR) is HIGH. Data in the storage register appears at the outputs whenever the output enable input (OE) signal is HIGH.

Two serial outputs (QS<sub>1</sub> and QS<sub>2</sub>) are available for cascading a number of “4094” devices. Data is available at QS<sub>1</sub> on the positive-going clock edges to allow high-speed operation in cascaded systems in which the clock rise time is fast. The same serial information is available at QS<sub>2</sub> on the next negative-going clock edge and is for cascading “4094” devices when the clock rise time is slow.

## APPLICATIONS

- Serial-to-parallel data conversion
- Remote control holding register

## QUICK REFERENCE DATA

GND = 0 V; T<sub>amb</sub> = 25 °C; t<sub>r</sub> = t<sub>f</sub> = 6 ns

| SYMBOL                              | PARAMETER                                 | CONDITIONS                                    | TYPICAL |     | UNIT |
|-------------------------------------|-------------------------------------------|-----------------------------------------------|---------|-----|------|
|                                     |                                           |                                               | HC      | HCT |      |
| t <sub>PHL</sub> / t <sub>PLH</sub> | propagation delay                         | C <sub>L</sub> = 15 pF; V <sub>CC</sub> = 5 V |         |     |      |
|                                     | CP to QS <sub>1</sub>                     |                                               | 15      | 19  | ns   |
|                                     | CP to QS <sub>2</sub>                     |                                               | 13      | 18  | ns   |
|                                     | CP to QP <sub>n</sub>                     |                                               | 20      | 21  | ns   |
|                                     | STR to QP <sub>n</sub>                    |                                               | 18      | 19  | ns   |
| f <sub>max</sub>                    | maximum clock frequency                   |                                               | 95      | 86  | MHz  |
| C <sub>I</sub>                      | input capacitance                         |                                               | 3.5     | 3.5 | pF   |
| C <sub>PD</sub>                     | power dissipation capacitance per package | notes 1 and 2                                 | 83      | 92  | pF   |

## Notes

1. C<sub>PD</sub> is used to determine the dynamic power dissipation (P<sub>D</sub> in μW):

$$P_D = C_{PD} \times V_{CC}^2 \times f_i + \sum (C_L \times V_{CC}^2 \times f_o) \text{ where:}$$

f<sub>i</sub> = input frequency in MHz

f<sub>o</sub> = output frequency in MHz

∑ (C<sub>L</sub> × V<sub>CC</sub><sup>2</sup> × f<sub>o</sub>) = sum of outputs

C<sub>L</sub> = output load capacitance in pF

V<sub>CC</sub> = supply voltage in V

2. For HC the condition is V<sub>I</sub> = GND to V<sub>CC</sub>  
For HCT the condition is V<sub>I</sub> = GND to V<sub>CC</sub> – 1.5 V

## ORDERING INFORMATION

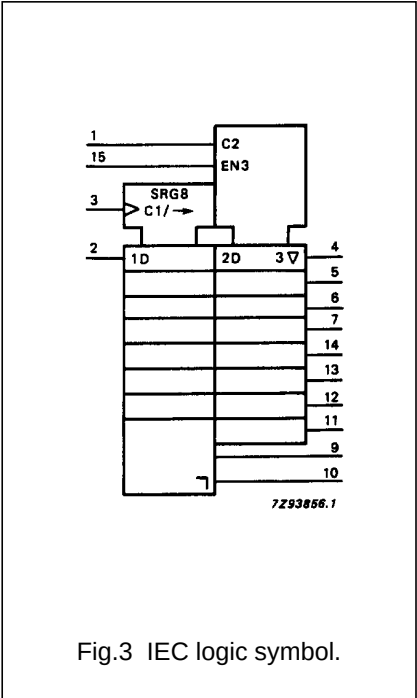
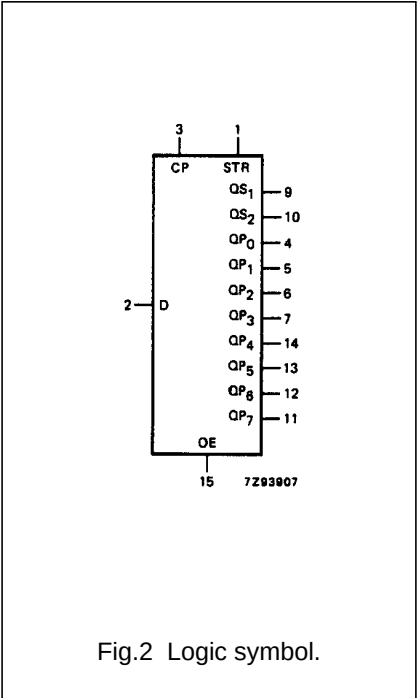
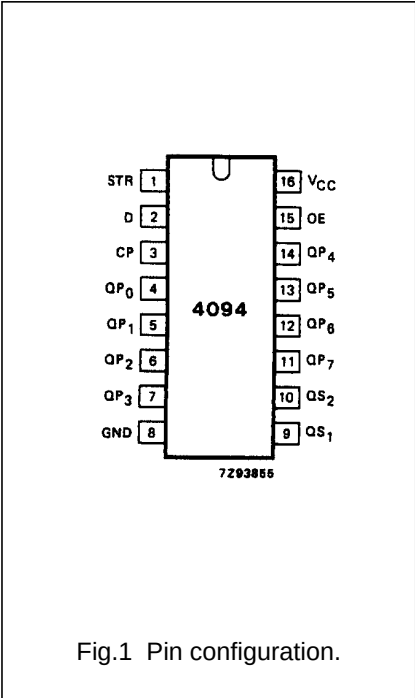
See “74HC/HCT/HCU/HCMOS Logic Package Information”.

8-stage shift-and-store bus register

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PIN DESCRIPTION

| PIN NO.                   | SYMBOL                             | NAME AND FUNCTION       |
|---------------------------|------------------------------------|-------------------------|
| 1                         | STR                                | strobe input            |
| 2                         | D                                  | serial input            |
| 3                         | CP                                 | clock input             |
| 4, 5, 6, 7,14, 13, 12, 11 | QP <sub>0</sub> to QP <sub>7</sub> | parallel outputs        |
| 8                         | GND                                | ground (0 V)            |
| 9, 10                     | QS <sub>1</sub> , QS <sub>2</sub>  | serial outputs          |
| 15                        | OE                                 | output enable input     |
| 16                        | V <sub>CC</sub>                    | positive supply voltage |



## 8-stage shift-and-store bus register

74HC/HCT4094

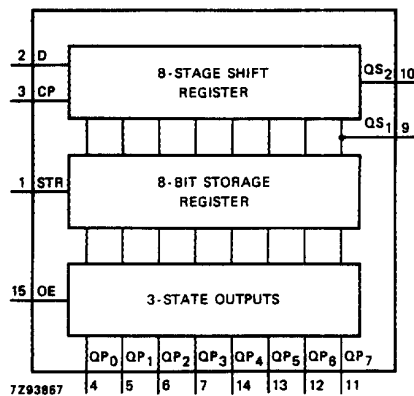


Fig.4 Functional diagram.

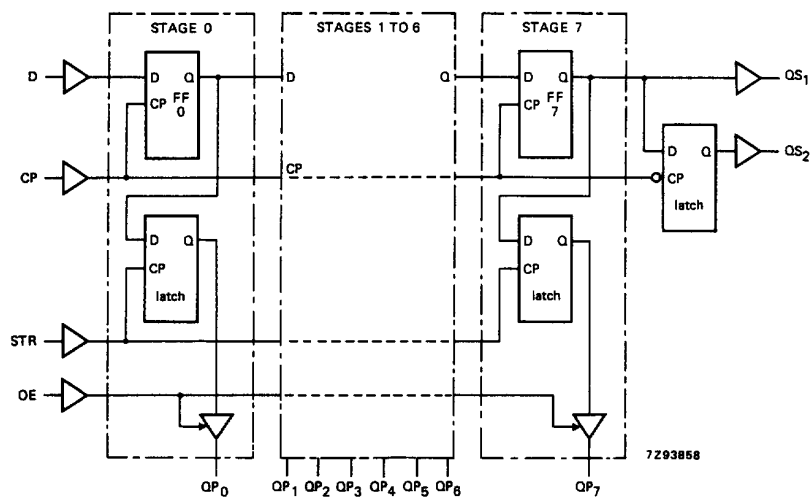


Fig.5 Logic diagram.

## 8-stage shift-and-store bus register

74HC/HCT4094

## FUNCTION TABLE

| INPUTS |    |     |   | PARALLEL OUTPUTS |                   | SERIAL OUTPUTS  |                 |
|--------|----|-----|---|------------------|-------------------|-----------------|-----------------|
| CP     | OE | STR | D | QP <sub>0</sub>  | QP <sub>n</sub>   | QS <sub>1</sub> | QS <sub>2</sub> |
| ↑      | L  | X   | X | Z                | Z                 | Q' <sub>6</sub> | NC              |
| ↓      | L  | X   | X | Z                | Z                 | NC              | QP <sub>7</sub> |
| ↑      | H  | L   | X | NC               | NC                | Q' <sub>6</sub> | NC              |
| ↑      | H  | H   | L | L                | QP <sub>n-1</sub> | Q' <sub>6</sub> | NC              |
| ↑      | H  | H   | H | H                | QP <sub>n-1</sub> | Q' <sub>6</sub> | NC              |
| ↓      | H  | H   | H | NC               | NC                | NC              | QP <sub>7</sub> |

## 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'<sub>6</sub> = the information in the seventh register stage is transferred to the 8th register stage and QS<sub>n</sub> output at the positive clock edge

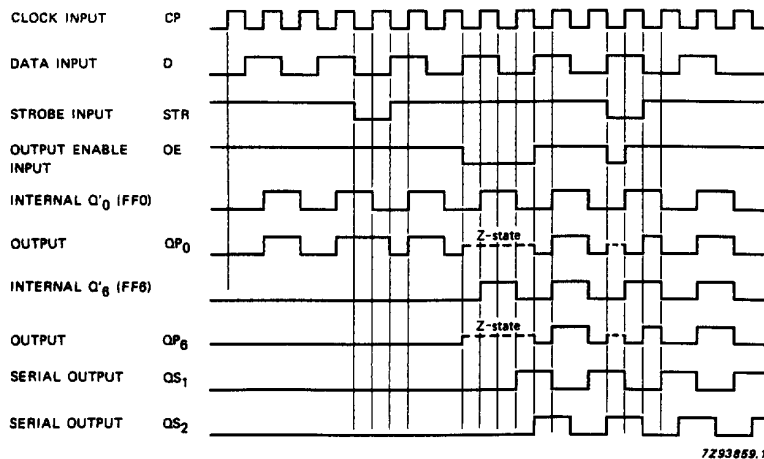


Fig.6 Timing diagram.

## 8-stage shift-and-store bus register

## 74HC/HCT4094

## DC CHARACTERISTICS FOR 74HC

For the DC characteristics see *"74HC/HCT/HCU/HCMOS Logic Family Specifications"*.

Output capability: standard

I<sub>CC</sub> category: MSI

## AC CHARACTERISTICS FOR 74HC

GND = 0 V; t<sub>r</sub> = t<sub>f</sub> = 6 ns; C<sub>L</sub> = 50 pF

| SYMBOL                              | PARAMETER                                            | T <sub>amb</sub> (°C) |                |                 |                 |                 |                 |                 | UNIT | TEST CONDITIONS        |           |
|-------------------------------------|------------------------------------------------------|-----------------------|----------------|-----------------|-----------------|-----------------|-----------------|-----------------|------|------------------------|-----------|
|                                     |                                                      | 74HC                  |                |                 |                 |                 |                 |                 |      | V <sub>CC</sub><br>(V) | WAVEFORMS |
|                                     |                                                      | +25                   |                |                 | −40 to +85      |                 | −40 to +125     |                 |      |                        |           |
|                                     |                                                      | min.                  | typ.           | max.            | min.            | max.            | min.            | max.            |      |                        |           |
| t <sub>PHL</sub> / t <sub>PLH</sub> | propagation delay<br>CP to QS <sub>1</sub>           |                       | 50<br>18<br>14 | 150<br>30<br>26 |                 | 190<br>38<br>33 |                 | 225<br>45<br>38 | ns   | 2.0<br>4.5<br>6.0      | Fig.7     |
| t <sub>PHL</sub> / t <sub>PLH</sub> | propagation delay<br>CP to QS <sub>2</sub>           |                       | 44<br>16<br>13 | 135<br>27<br>23 |                 | 170<br>34<br>29 |                 | 205<br>41<br>35 | ns   | 2.0<br>4.5<br>6.0      | Fig.7     |
| t <sub>PHL</sub> / t <sub>PLH</sub> | propagation delay<br>CP to QP <sub>n</sub>           |                       | 63<br>23<br>18 | 195<br>39<br>33 |                 | 245<br>49<br>42 |                 | 295<br>59<br>50 | ns   | 2.0<br>4.5<br>6.0      | Fig.7     |
| t <sub>PHL</sub> / t <sub>PLH</sub> | propagation delay<br>STR to QP <sub>n</sub>          |                       | 58<br>21<br>17 | 180<br>36<br>31 |                 | 225<br>45<br>38 |                 | 270<br>54<br>46 | ns   | 2.0<br>4.5<br>6.0      | Fig.8     |
| t <sub>PZH</sub> / t <sub>PZL</sub> | 3-state output enable time<br>OE to QP <sub>n</sub>  |                       | 55<br>20<br>16 | 175<br>35<br>30 |                 | 220<br>44<br>37 |                 | 265<br>53<br>45 | ns   | 2.0<br>4.5<br>6.0      | Fig.9     |
| t <sub>PHZ</sub> / t <sub>PLZ</sub> | 3-state output disable<br>time OE to QP <sub>n</sub> |                       | 41<br>15<br>12 | 125<br>25<br>21 |                 | 155<br>31<br>26 |                 | 190<br>38<br>32 | ns   | 2.0<br>4.5<br>6.0      | Fig.9     |
| t <sub>THL</sub> / t <sub>TLH</sub> | output transition time                               |                       | 19<br>7<br>6   | 75<br>15<br>13  |                 | 95<br>19<br>16  |                 | 110<br>22<br>19 | ns   | 2.0<br>4.5             | Fig.7     |
| t <sub>w</sub>                      | clock pulse width<br>HIGH or LOW                     | 80<br>16<br>14        | 14<br>5<br>4   |                 | 100<br>20<br>17 |                 | 120<br>24<br>20 |                 | ns   | 2.0<br>4.5<br>6.0      | Fig.7     |
| t <sub>w</sub>                      | strobe pulse width<br>HIGH                           | 80<br>16<br>14        | 14<br>5<br>4   |                 | 100<br>20<br>17 |                 | 120<br>24<br>20 |                 | ns   | 2.0<br>4.5<br>6.0      | Fig.8     |
| t <sub>su</sub>                     | set-up time<br>D to CP                               | 50<br>10<br>9         | 14<br>5<br>4   |                 | 65<br>13<br>11  |                 | 75<br>15<br>13  |                 | ns   | 2.0<br>4.5<br>6.0      | Fig.10    |
| t <sub>su</sub>                     | set-up time<br>CP to STR                             | 100<br>20<br>17       | 28<br>10<br>8  |                 | 125<br>25<br>21 |                 | 150<br>30<br>26 |                 | ns   | 2.0<br>4.5<br>6.0      | Fig.8     |

## 8-stage shift-and-store bus register

## 74HC/HCT4094

| SYMBOL           | PARAMETER                        | T <sub>amb</sub> (°C) |      |      |            |      |             |      | UNIT | TEST CONDITIONS        |           |
|------------------|----------------------------------|-----------------------|------|------|------------|------|-------------|------|------|------------------------|-----------|
|                  |                                  | 74HC                  |      |      |            |      |             |      |      | V <sub>CC</sub><br>(V) | WAVEFORMS |
|                  |                                  | +25                   |      |      | −40 to +85 |      | −40 to +125 |      |      |                        |           |
|                  |                                  | min.                  | typ. | max. | min.       | max. | min.        | max. |      |                        |           |
| t <sub>h</sub>   | hold time<br>D to CP             | 3                     | −6   |      | 3          |      | 3           |      | ns   | 2.0                    | Fig.10    |
|                  |                                  | 3                     | −2   |      | 3          |      | 3           |      |      | 4.5                    |           |
|                  |                                  | 3                     | −2   |      | 3          |      | 3           |      |      | 6.0                    |           |
| t <sub>h</sub>   | hold time<br>CP to STR           | 0                     | −14  |      | 0          |      | 0           |      | ns   | 2.0                    | Fig.8     |
|                  |                                  | 0                     | −5   |      | 0          |      | 0           |      |      | 4.5                    |           |
|                  |                                  | 0                     | −4   |      | 0          |      | 0           |      |      | 6.0                    |           |
| f <sub>max</sub> | maximum clock pulse<br>frequency | 6.0                   | 28   |      | 4.8        |      | 4.0         |      | MHz  | 2.0                    | Fig.7     |
|                  |                                  | 30                    | 87   |      | 24         |      | 20          |      |      | 4.5                    |           |
|                  |                                  | 35                    | 103  |      | 28         |      | 24          |      |      | 6.0                    |           |

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8-stage shift-and-store bus register74HC/HCT4094

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**DC CHARACTERISTICS FOR 74HCT**

For the DC characteristics see *"74HC/HCT/HCU/HCMOS Logic Family Specifications"*.

Output capability: standard

I<sub>CC</sub> category: MSI

**Note to HCT types**

The value of additional quiescent supply current ( $\Delta I_{CC}$ ) for a unit load of 1 is given in the family specifications. To determine  $\Delta I_{CC}$  per input, multiply this value by the unit load coefficient shown in the table below.

| INPUT  | UNIT LOAD COEFFICIENT |
|--------|-----------------------|
| OE, CP | 1.50                  |
| D      | 0.40                  |
| STR    | 1.00                  |



## 8-stage shift-and-store bus register

## 74HC/HCT4094

## AC CHARACTERISTICS FOR 74HCT

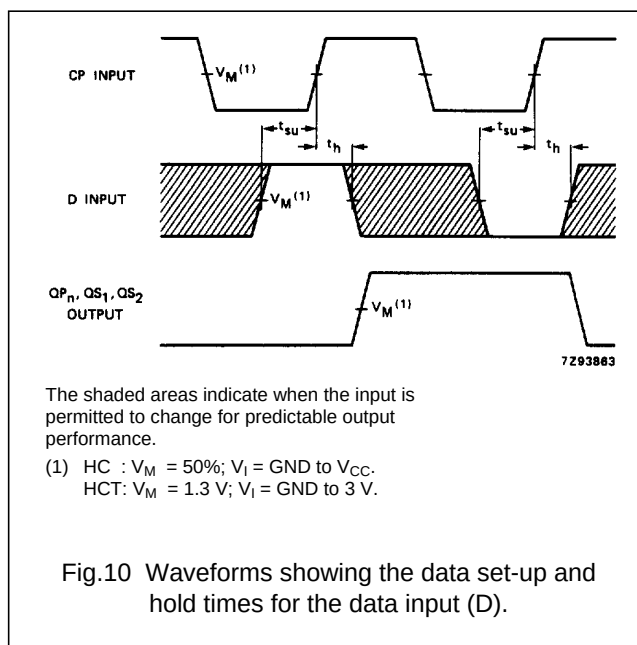
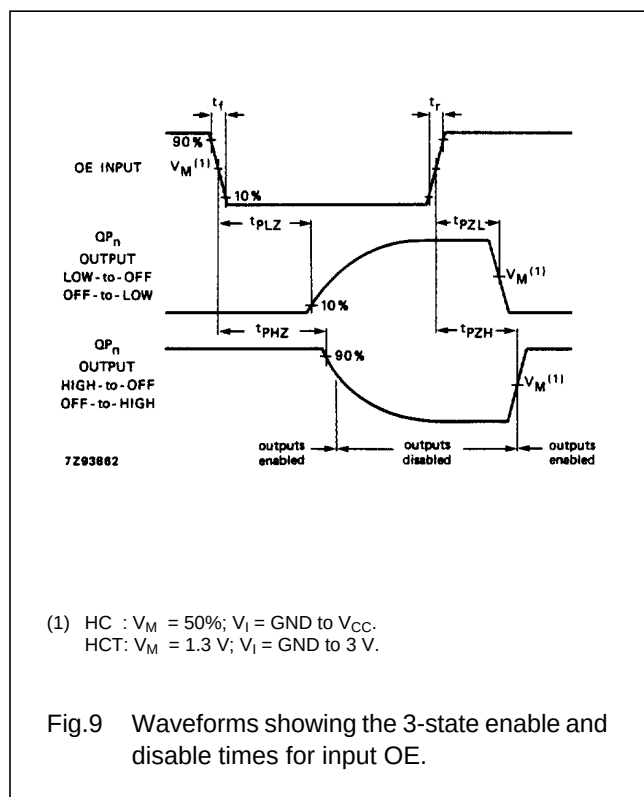
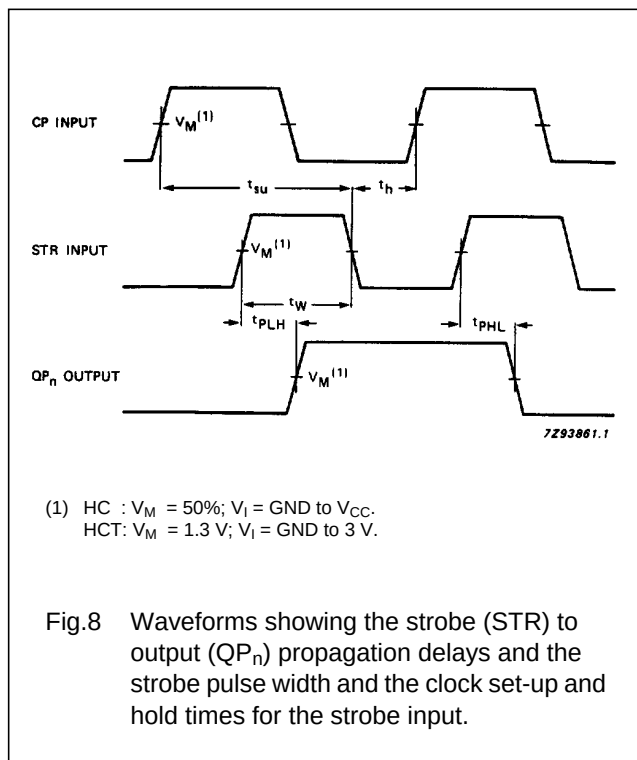
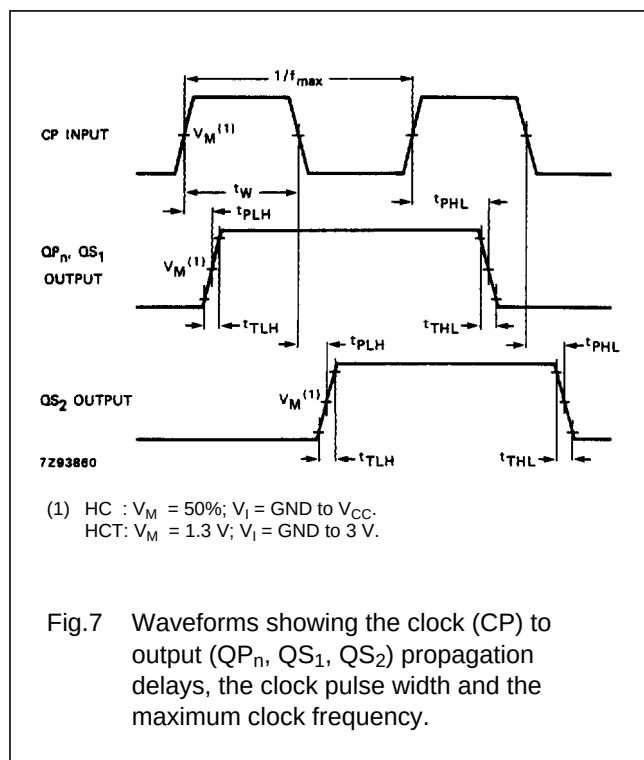
GND = 0 V;  $t_r = t_f = 6$  ns;  $C_L = 50$  pF

| SYMBOL                              | PARAMETER                                            | T <sub>amb</sub> (°C) |      |      |            |      |             |      | UNIT | TEST CONDITIONS        |           |
|-------------------------------------|------------------------------------------------------|-----------------------|------|------|------------|------|-------------|------|------|------------------------|-----------|
|                                     |                                                      | 74HCT                 |      |      |            |      |             |      |      | V <sub>CC</sub><br>(V) | WAVEFORMS |
|                                     |                                                      | +25                   |      |      | −40 to +85 |      | −40 to +125 |      |      |                        |           |
|                                     |                                                      | min.                  | typ. | max. | min.       | max. | min.        | max. |      |                        |           |
| t <sub>PHL</sub> / t <sub>PLH</sub> | propagation delay<br>CP to QS <sub>1</sub>           |                       | 23   | 39   |            | 49   |             | 59   | ns   | 4.5                    | Fig.7     |
| t <sub>PHL</sub> / t <sub>PLH</sub> | propagation delay<br>CP to QS <sub>2</sub>           |                       | 21   | 36   |            | 45   |             | 54   | ns   | 4.5                    | Fig.7     |
| t <sub>PHL</sub> / t <sub>PLH</sub> | propagation delay<br>CP to QP <sub>n</sub>           |                       | 25   | 43   |            | 54   |             | 65   | ns   | 4.5                    | Fig.7     |
| t <sub>PHL</sub> / t <sub>PLH</sub> | propagation delay<br>STR to QP <sub>n</sub>          |                       | 22   | 39   |            | 49   |             | 59   | ns   | 4.5                    | Fig.8     |
| t <sub>PZH</sub> / t <sub>PZL</sub> | 3-state output enable time<br>OE to QP <sub>n</sub>  |                       | 20   | 35   |            | 44   |             | 53   | ns   | 4.5                    | Fig.9     |
| t <sub>PHZ</sub> / t <sub>PLZ</sub> | 3-state output disable time<br>OE to QP <sub>n</sub> |                       | 21   | 35   |            | 44   |             | 53   | ns   | 4.5                    | Fig.9     |
| t <sub>THL</sub> / t <sub>TLH</sub> | output transition time                               |                       | 7    | 15   |            | 19   |             | 22   | ns   | 4.5                    | Fig.7     |
| t <sub>W</sub>                      | clock pulse width<br>HIGH or LOW                     | 16                    | 7    |      | 20         |      | 24          |      | ns   | 4.5                    | Fig.7     |
| t <sub>W</sub>                      | strobe pulse width<br>HIGH                           | 16                    | 5    |      | 20         |      | 24          |      | ns   | 4.5                    | Fig.8     |
| t <sub>su</sub>                     | set-up time<br>D to CP                               | 10                    | 4    |      | 13         |      | 15          |      | ns   | 4.5                    | Fig.10    |
| t <sub>su</sub>                     | set-up time<br>CP to STR                             | 20                    | 9    |      | 25         |      | 30          |      | ns   | 4.5                    | Fig.8     |
| t <sub>h</sub>                      | hold time<br>D to CP                                 | 4                     | 0    |      | 4          |      | 4           |      | ns   | 4.5                    | Fig.10    |
| t <sub>h</sub>                      | hold time<br>CP to STR                               | 0                     | −4   |      | 0          |      | 0           |      | ns   | 4.5                    | Fig.8     |
| f <sub>max</sub>                    | maximum clock pulse<br>frequency                     | 30                    | 80   |      | 24         |      | 20          |      | MHz  | 4.5                    | Fig.7     |

## 8-stage shift-and-store bus register

74HC/HCT4094

## AC WAVEFORMS



## PACKAGE OUTLINES

See "74HC/HCT/HCU/HCMOS Logic Package Outlines".

Компания «Океан Электроники» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

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.);

Компания «Океан Электроники» является официальным дистрибьютором и эксклюзивным представителем в России одного из крупнейших производителей разъемов военного и аэрокосмического назначения «JONHON», а так же официальным дистрибьютором и эксклюзивным представителем в России производителя высокотехнологичных и надежных решений для передачи СВЧ сигналов «FORSTAR».



## 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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