

# 8-bit compatible shift / store register

## BU4094BC / BU4094BCF / BU4094BCFV

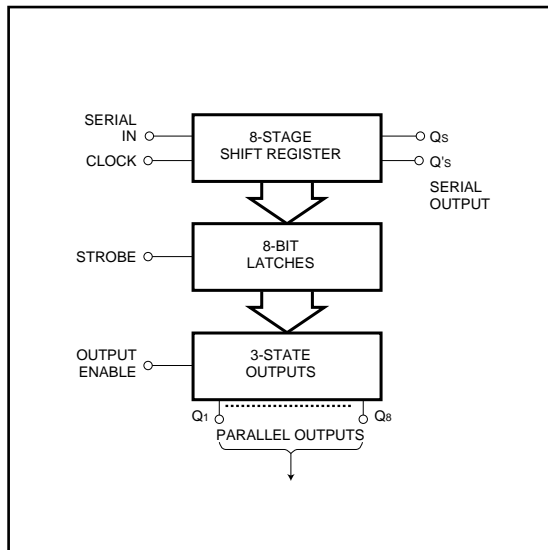
The BU4094BC, BU4094BCF, and BU4094BCFV are shift / store registers, each consisting of an 8-bit register and an 8-bit latch.

As the data in the shift register can be latched by an asynchronous strobe input, it is possible to hold the output in the data transfer mode.

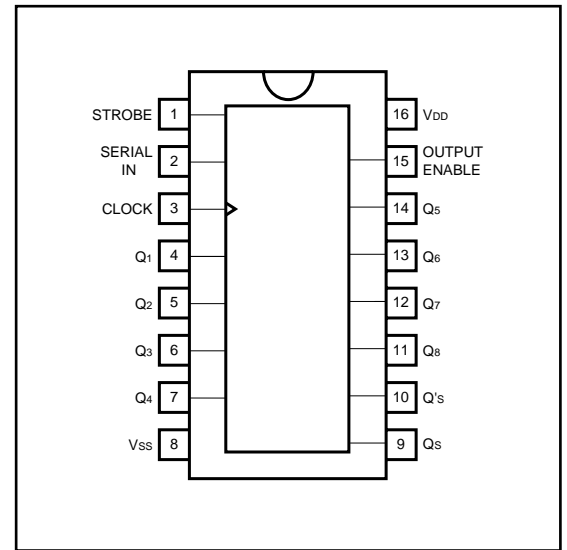
The tri-state parallel output can be connected directly with an 8-bit bus line.

These registers are suitable for in-line / parallel data conversion, data receivers and other similar applications.

●Logic circuit diagram



●Block diagram



●Truth table

| CLOCK        | OUTPUT ENABLE | STROBE | SERIAL IN | Parallel output |                  | Serial output  |                 |
|--------------|---------------|--------|-----------|-----------------|------------------|----------------|-----------------|
|              |               |        |           | Q <sub>1</sub>  | Q <sub>n</sub>   | Q <sub>s</sub> | Q' <sub>s</sub> |
| $\downarrow$ | H             | H      | L         | L               | Q <sub>n-1</sub> | Q <sub>7</sub> | NC              |
| $\downarrow$ | H             | H      | H         | H               | Q <sub>n-1</sub> | Q <sub>7</sub> | NC              |
| $\downarrow$ | H             | L      | X         | NC              | NC               | Q <sub>7</sub> | NC              |
| $\downarrow$ | L             | X      | X         | Z               | Z                | Q <sub>7</sub> | NC              |
| $\uparrow$   | H             | X      | X         | NC              | NC               | NC             | Q <sub>s</sub>  |
| $\uparrow$   | L             | X      | X         | Z               | Z                | NC             | Q <sub>s</sub>  |

NC: No Change Z: High Impedance X: Irrelevant

## ●Absolute maximum ratings (Ta = 25°C)

| Parameter             | Symbol           | Limits                              | Unit |
|-----------------------|------------------|-------------------------------------|------|
| Power supply voltage  | V <sub>DD</sub>  | - 0.5 ~ + 20                        | V    |
| Power dissipation     | P <sub>d</sub>   | 1000 (DIP), 500 (SOP)<br>400 (SSOP) | mW   |
| Operating temperature | T <sub>opr</sub> | - 40 ~ + 85                         | °C   |
| Storage temperature   | T <sub>stg</sub> | - 55 ~ + 150                        | °C   |
| Input voltage         | V <sub>IN</sub>  | - 0.5 ~ V <sub>DD</sub> + 0.5       | V    |

## ●Electrical characteristics

DC characteristics (unless otherwise noted, V<sub>SS</sub> = 0V, Ta = 25°C)

| Parameter                         | Symbol          | Min.   | Typ. | Max.  | Unit | V <sub>DD</sub> (V) | Conditions                                |
|-----------------------------------|-----------------|--------|------|-------|------|---------------------|---|
|                                   |                 |        |      |       |      |                     |   |
| Input high level voltage          | V <sub>IH</sub> | 3.5    | —    | —     | V    | 5                   | —   |
|                                   |                 | 7.0    | —    | —     |      | 10                  |   |
|                                   |                 | 11.0   | —    | —     |      | 15                  |   |
| Input low level voltage           | V <sub>IL</sub> | —      | —    | 1.5   | V    | 5                   | —   |
|                                   |                 | —      | —    | 3.0   |      | 10                  |   |
|                                   |                 | —      | —    | 4.0   |      | 15                  |   |
| Input high level current          | I <sub>IH</sub> | —      | —    | 0.3   | μA   | 15                  | V <sub>IH</sub> = 15V                     |
| Input low level current           | I <sub>IL</sub> | —      | —    | - 0.3 | μA   | 15                  | V <sub>IL</sub> = 0V                      |
| Output high level voltage         | V <sub>OH</sub> | 4.95   | —    | —     | V    | 5                   | I <sub>o</sub> = 0mA                      |
|                                   |                 | 9.95   | —    | —     |      | 10                  |   |
|                                   |                 | 14.95  | —    | —     |      | 15                  |   |
| Output low level voltage          | V <sub>OL</sub> | —      | —    | 0.05  | V    | 5                   | I <sub>o</sub> = 0mA                      |
|                                   |                 | —      | —    | 0.05  |      | 10                  |   |
|                                   |                 | —      | —    | 0.05  |      | 15                  |   |
| Output high level current         | I <sub>OH</sub> | - 0.44 | —    | —     | mA   | 5                   | V <sub>OH</sub> = 4.6V                    |
|                                   |                 | - 1.1  | —    | —     |      | 10                  | V <sub>OH</sub> = 9.5V                    |
|                                   |                 | - 3.0  | —    | —     |      | 15                  | V <sub>OH</sub> = 13.5V                   |
| Output low level current          | I <sub>OL</sub> | 0.44   | —    | —     | mA   | 5                   | V <sub>OL</sub> = 0.4V                    |
|                                   |                 | 1.1    | —    | —     |      | 10                  | V <sub>OL</sub> = 0.5V                    |
|                                   |                 | 3.0    | —    | —     |      | 15                  | V <sub>OL</sub> = 1.5V                    |
| Output high level disable current | I <sub>DH</sub> | —      | —    | 1.0   | μA   | 15                  | V <sub>OUT</sub> = 15V                    |
| Output low level disable current  | I <sub>DL</sub> | —      | —    | - 1.0 | μA   | 15                  | V <sub>OUT</sub> = 0V                     |
| Static current dissipation        | I <sub>DD</sub> | —      | —    | 20    | μA   | 5                   | V <sub>I</sub> = V <sub>DD</sub> , or GND |
|                                   |                 | —      | —    | 40    |      | 10                  |   |
|                                   |                 | —      | —    | 80    |      | 15                  |   |

Switching characteristics (unless otherwise noted,  $V_{SS} = 0V$ ,  $T_a = 25^\circ C$ ,  $C_L = 50pF$ )

| Parameter   | Symbol                                   | Min.     | Typ. | Max. | Unit    | V <sub>DD</sub> (V) | Conditions                   | Measurement circuit |
|---|--|----------|------|------|---------|---------------------|------------------------------|---------------------|
|   |  |          |      |      |         |                     |                              |                     |
| Output rise time                                    | t <sub>RLH</sub>                         | —        | 100  | —    | ns      | 5                   | —                            | Fig.1               |
|   |  | —        | 50   | —    | ns      | 10                  |                              |                     |
|   |  | —        | 40   | —    | ns      | 15                  |                              |                     |
| Output fall time                                    | t <sub>RHL</sub>                         | —        | 100  | —    | ns      | 5                   | —                            | Fig.1               |
|   |  | —        | 50   | —    | ns      | 10                  |                              |                     |
|   |  | —        | 40   | —    | ns      | 15                  |                              |                     |
| Propagation delay time, CLOCK to Qs                 | t <sub>PLH</sub><br>t <sub>PHL</sub>     | —        | 350  | 600  | ns      | 5                   | —                            | Fig.1               |
|   |  | —        | 125  | 250  | ns      | 10                  |                              |                     |
|   |  | —        | 95   | 190  | ns      | 15                  |                              |                     |
| Propagation delay time, CLOCK to Qs                 | t <sub>PLH</sub><br>t <sub>PHL</sub>     | —        | 230  | 460  | ns      | 5                   | —                            | Fig.1               |
|   |  | —        | 110  | 220  | ns      | 10                  |                              |                     |
|   |  | —        | 75   | 150  | ns      | 15                  |                              |                     |
| Propagation delay time, CLOCK to Qn                 | t <sub>PLH</sub><br>t <sub>PHL</sub>     | —        | 420  | 840  | ns      | 5                   | —                            | Fig.1               |
|   |  | —        | 195  | 390  | ns      | 10                  |                              |                     |
|   |  | —        | 135  | 270  | ns      | 15                  |                              |                     |
| Propagation delay time, STROBE to Qn                | t <sub>PLH</sub><br>t <sub>PHL</sub>     | —        | 290  | 580  | ns      | 5                   | —                            | Fig.1               |
|   |  | —        | 145  | 290  | ns      | 10                  |                              |                     |
|   |  | —        | 100  | 200  | ns      | 15                  |                              |                     |
| 3-state propagation delay time, Output Enable to Qn | t <sub>PHZ</sub><br>t <sub>PZH</sub>     | —        | 140  | 280  | ns      | 5                   | R <sub>L</sub> = 1k $\Omega$ | Fig.2               |
|   |  | —        | 75   | 150  | ns      | 10                  |                              |                     |
|   |  | —        | 55   | 110  | ns      | 15                  |                              |                     |
| 3-state propagation delay time, Output Enable to Qn | t <sub>PLZ</sub><br>t <sub>PZL</sub>     | —        | 140  | 280  | ns      | 5                   | R <sub>L</sub> = 1k $\Omega$ | Fig.2               |
|   |  | —        | 75   | 150  | ns      | 10                  |                              |                     |
|   |  | —        | 55   | 110  | ns      | 15                  |                              |                     |
| Minimum setup time, DATA to CLOCK                   | t <sub>su</sub>                          | —        | 20   | 125  | ns      | 5                   | —                            | Fig.1               |
|   |  | —        | 8    | 55   | ns      | 10                  |                              |                     |
|   |  | —        | 6    | 35   | ns      | 15                  |                              |                     |
| Minimum hold time, CLOCK to DATA                    | t <sub>h</sub>                           | —        | 10   | 40   | ns      | 5                   | —                            | Fig.1               |
|   |  | —        | 10   | 20   | ns      | 10                  |                              |                     |
|   |  | —        | 5    | 15   | ns      | 15                  |                              |                     |
| Minimum clock pulse width                           | t <sub>w</sub>                           | —        | 100  | 200  | ns      | 5                   | —                            | Fig.1               |
|   |  | —        | 50   | 100  | ns      | 10                  |                              |                     |
|   |  | —        | 40   | 80   | ns      | 15                  |                              |                     |
| Maximum clock rise time and fall time               | t <sub>r(CL)</sub><br>t <sub>f(CL)</sub> | NO Limit |      |      | $\mu$ s | 5                   | —                            | Fig.1               |
|   |  |          |      |      | $\mu$ s | 10                  |                              |                     |
|   |  |          |      |      | $\mu$ s | 15                  |                              |                     |
| Maximum clock frequency                             | f <sub>CL</sub>                          | 1.25     | 5    | —    | MHz     | 5                   | —                            | Fig.1               |
|   |  | 2.5      | 10   | —    | MHz     | 10                  |                              |                     |
|   |  | 3.0      | 12.5 | —    | MHz     | 15                  |                              |                     |
| Minimum strobe pulse width                          | t <sub>WH</sub>                          | —        | 100  | 200  | ns      | 5                   | —                            | Fig.1               |
|   |  | —        | 40   | 80   | ns      | 10                  |                              |                     |
|   |  | —        | 35   | 70   | ns      | 15                  |                              |                     |
| Input capacitance                                   | C <sub>IN</sub>                          | —        | 5    | —    | pF      | —                   | —                            | —                   |

● Measurement circuits

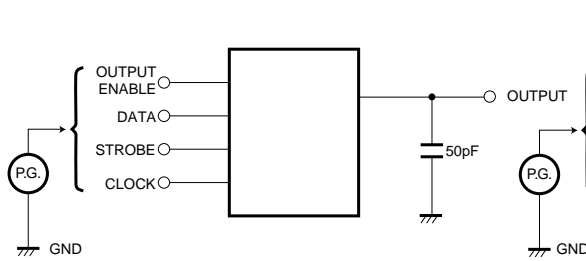


Fig. 1 Switching waveform

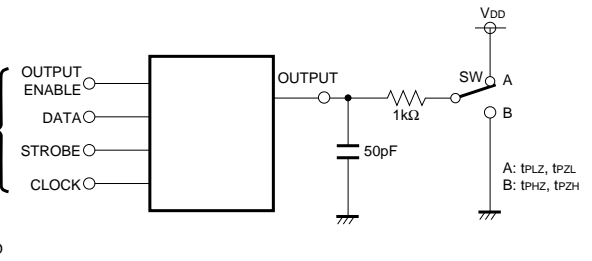


Fig. 2 3-state delay time

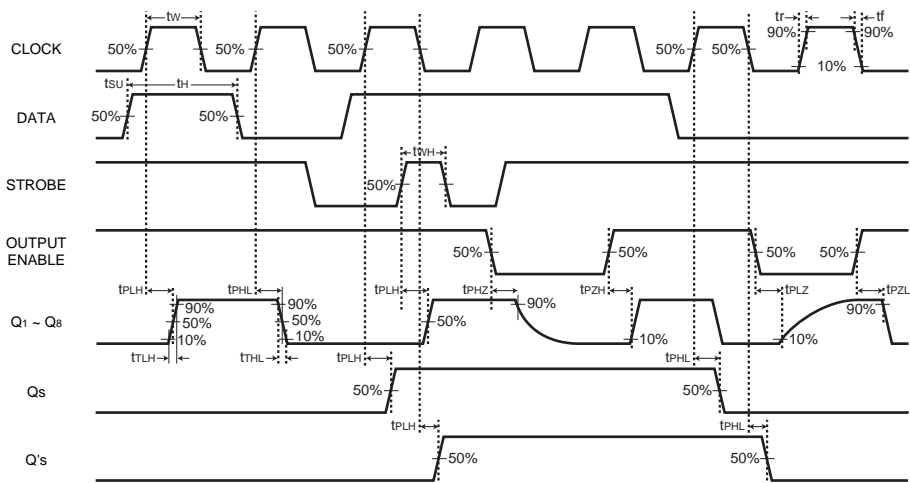


Fig. 3 Switching time test waveform

● Electrical characteristic curve

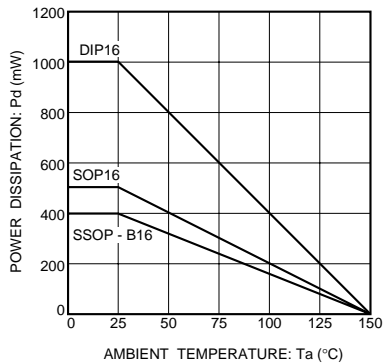


Fig. 4 Power dissipation vs. ambient temperature

●External dimensions (Units: mm)

