

# COS/MOS INTEGRATED CIRCUIT

4508 B



## DUAL 4-BIT LATCH

- TWO INDEPENDENT 4-BIT LATCHES
- INDIVIDUAL MASTER RESET FOR EACH 4-BIT-LATCH
- 3-STATE OUTPUTS WITH HIGH-IMPEDANCE STATE FOR BUS LINE APPLICATION
- MEDIUM-SPEED OPERATION:  $t_{PHL} = t_{PLH} = 70 \text{ ns}$  (TYP.) AT  $V_{DD} = 10\text{V}$  AND  $C_L = 50 \text{ pF}$
- QUIESCENT CURRENT SPECIFIED TO 20V FOR HCC DEVICE
- 5V, 10V AND 15V PARAMETRIC RATINGS
- INPUT CURRENT OF 100 nA AT 18V AND 25°C FOR HCC DEVICE
- 100% TESTED FOR QUIESCENT CURRENT
- MEETS ALL REQUIREMENTS OF JEDEC TENTATIVE STANDARD No. 13A, "STANDARD SPECIFICATIONS FOR DESCRIPTION OF "B" SERIES CMOS DEVICES"

The **HCC 4508B** (extended temperature range) and the **HCF 4508B** (intermediate temperature range) are monolithic integrated circuits available in 24-lead dual in-line plastic or ceramic package and ceramic flat package. The **HCC/HCF 4508B** dual 4-bit latch contains two identical 4-bit latches with separate STROBE, RESET, and OUTPUT DISABLE controls. With the STROBE line in the high state, the data on the "D" inputs appear at the corresponding "Q" outputs provided the DISABLE line is in the low state. Changing the STROBE line to the low state locks the data into the latch. A high on the reset line forces the outputs to a low level regardless of the state of the STROBE input. The outputs are forced to the high-impedance state for bus line applications by a high level on the DISABLE input.

## ABSOLUTE MAXIMUM RATINGS

|            |   |                          |          |
|------------|---|--------------------------|----------|
| $V_{DD}^*$ | Supply voltage: <b>HCC</b> types<br><b>HCF</b> types  | -0.5 to 20<br>-0.5 to 18 | V<br>V   |
| $V_i$      | Input voltage   | -0.5 to $V_{DD} + 0.5$   | V        |
| $I_i$      | DC input current (any one input)  | $\pm 10$                 | mA       |
| $P_{tot}$  | Total power dissipation (per package)<br>Dissipation per output transistor<br>for $T_{op} =$ full package-temperature range | 200<br>100               | mW<br>mW |
| $T_{op}$   | Operating temperature: <b>HCC</b> types<br><b>HCF</b> types   | -55 to 125<br>-40 to 85  | °C<br>°C |
| $T_{stg}$  | Storage temperature   | -65 to 150               | °C       |

\* All voltage values are referred to  $V_{SS}$  pin voltage

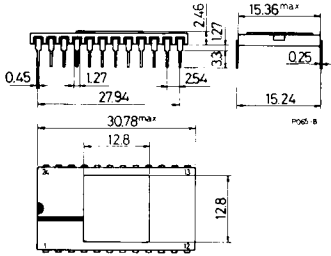
## ORDERING NUMBERS:

- HCC 4508 BD for dual in-line ceramic package
- HCC 4508 BF for dual in-line ceramic frit seal package
- HCC 4508 BK for ceramic flat package
- HCF 4508 BF for dual in-line ceramic frit seal package
- HCF 4508 BE for dual in-line plastic package

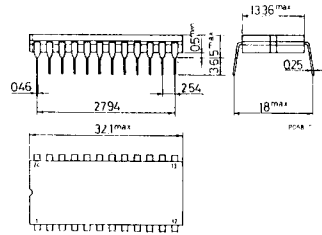
# HCC/HCF 4508 B

## MECHANICAL DATA (dimensions in mm)

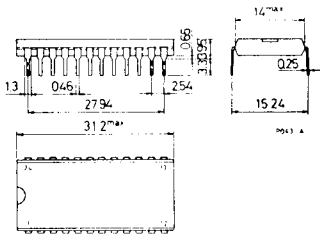
Dual in-line ceramic package for HCC 4508 BD



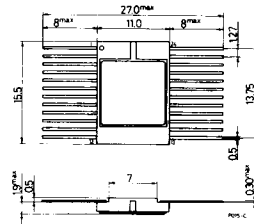
Dual in-line ceramic frit seal package for HCC/HCF 4508 BF



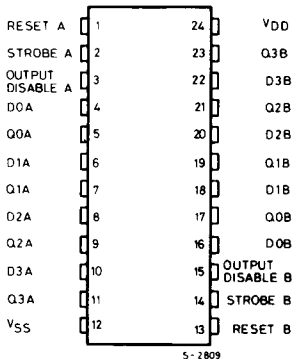
Dual in-line plastic package for HCF 4508 BE



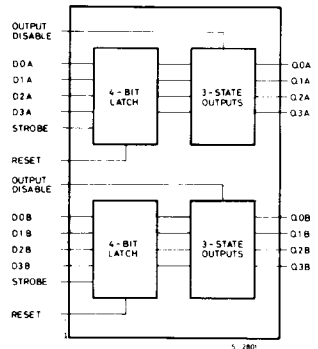
Ceramic flat package for HCC 4508 BK



## CONNECTION DIAGRAM



## FUNCTIONAL DIAGRAM

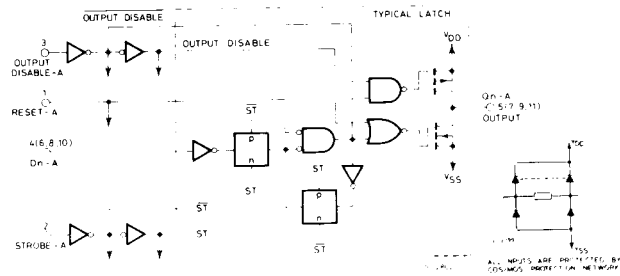


## RECOMMENDED OPERATING CONDITIONS

|          |   |                         |          |
|----------|---|-------------------------|----------|
| $V_{DD}$ | Supply voltage: HCC types<br>HCF types        | 3 to 18<br>3 to 15      | V<br>V   |
| $V_I$    | Input voltage                                 | 0 to $V_{DD}$           | V        |
| $T_{op}$ | Operating temperature: HCC types<br>HCF types | -55 to 125<br>-40 to 85 | °C<br>°C |

LOGIC DIAGRAM (A Section)

1 of 4 identical latches with common output disable, reset and strobe



TRUTH TABLE

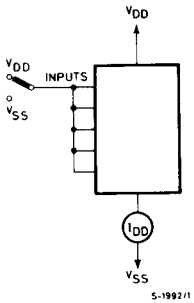
| RESET | DISAB | STROBE | D INPUT | Q INPUT |
|-------|-------|--------|---------|---------|
| 0     | 0     | 1      | 1       | 1       |
| 0     | 0     | 1      | 0       | 0       |
| 0     | 0     | 0      | X       | Latched |
| 1     | 0     | X      | X       | 0       |
| X     | 1     | X      | X       | Z       |

1 = High level  
0 = Low level

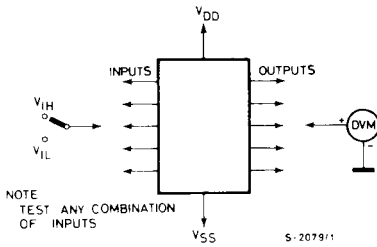
X = Dont' care  
Z = High impedance

TEST CIRCUITS

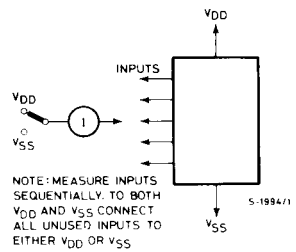
Quiescent device current test circuit



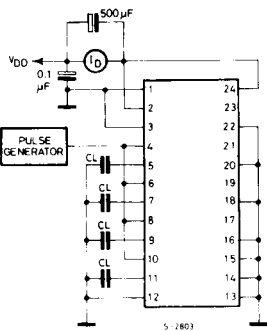
Input voltage test circuit



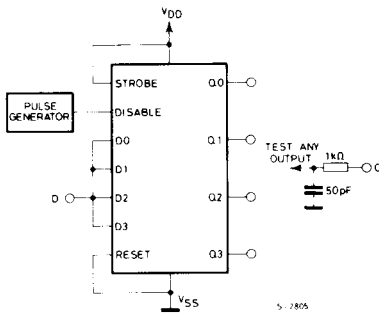
Input current test circuit



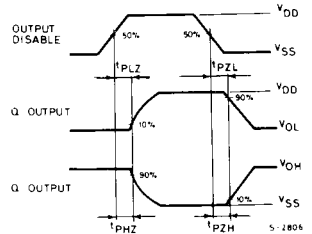
Power dissipation test circuit



Output disable



Waveform



| CHAR. | TEST. | VOLT. |
|-------|-------|-------|
|       | AT D  | AT Q  |
| tPHZ  | VDD   | VSS   |
| tPLZ  | VSS   | VDD   |
| tPZL  | VSS   | VDD   |
| tPZH  | VDD   | VSS   |

1100-25  
1100-17

**STATIC ELECTRICAL CHARACTERISTICS** (over recommended operating conditions)

| Parameter                         |                       |           | Test conditions       |                       |                          |                        | Values             |      |       |                   |      |                     | Unit |      |
|-----------------------------------|-----------------------|-----------|-----------------------|-----------------------|--------------------------|------------------------|--------------------|------|-------|-------------------|------|---------------------|------|------|
|                                   |                       |           | V <sub>I</sub><br>(V) | V <sub>O</sub><br>(V) | I <sub>O</sub>  <br>(μA) | V <sub>DD</sub><br>(V) | T <sub>Low</sub> * |      | 25°C  |                   |      | T <sub>High</sub> * |      |      |
|                                   |                       |           |                       |                       |                          |                        | Min.               | Max. | Min.  | Typ.              | Max. | Min.                |      | Max. |
| I <sub>L</sub>                    | Quiescent current     | HCC types | 0/ 5                  |                       |                          | 5                      |                    | 5    | 0.04  | 5                 |      | 150                 | μA   |      |
|                                   |                       |           | 0/10                  |                       |                          | 10                     |                    | 10   | 0.04  | 10                |      | 300                 |      |      |
|                                   |                       | 0/15      |                       |                       | 15                       |                        | 20                 | 0.04 | 20    |                   | 600  |                     |      |      |
|                                   |                       | 0/20      |                       |                       | 20                       |                        | 100                | 0.08 | 100   |                   | 3000 |                     |      |      |
|                                   | HCF types             | 0/ 5      |                       |                       | 5                        |                        | 20                 | 0.04 | 20    |                   | 150  |                     |      |      |
|                                   |                       | 0/10      |                       |                       | 10                       |                        | 40                 | 0.04 | 40    |                   | 300  |                     |      |      |
|                                   |                       |           | 0/15                  |                       |                          | 15                     |                    | 80   | 0.04  | 80                |      | 600                 |      |      |
| V <sub>OH</sub>                   | Output high voltage   |           | 0/ 5                  |                       | < 1                      | 5                      | 4.95               |      | 4.95  |                   |      | 4.95                | V    |      |
|                                   |                       |           | 0/10                  |                       | < 1                      | 10                     |                    | 9.95 |       | 9.95              |      | 9.95                |      |      |
|                                   |                       |           | 0/15                  |                       | < 1                      | 15                     | 14.95              |      | 14.95 |                   |      | 14.95               |      |      |
| V <sub>OL</sub>                   | Output low voltage    |           | 5/0                   |                       | < 1                      | 5                      |                    | 0.05 |       | 0.05              |      | 0.05                | V    |      |
|                                   |                       |           | 10/0                  |                       | < 1                      | 10                     |                    | 0.05 |       | 0.05              |      | 0.05                |      |      |
|                                   |                       |           | 15/0                  |                       | < 1                      | 15                     |                    | 0.05 |       | 0.05              |      | 0.05                |      |      |
| V <sub>IH</sub>                   | Input high voltage    |           |                       | 0.5/4.5               | < 1                      | 5                      | 3.5                |      | 3.5   |                   |      | 3.5                 | V    |      |
|                                   |                       |           |                       | 1/9                   | < 1                      | 10                     | 7                  |      | 7     |                   |      | 7                   |      |      |
|                                   |                       |           |                       | 1.5/13.5              | < 1                      | 15                     | 11                 |      | 11    |                   |      | 11                  |      |      |
| V <sub>IL</sub>                   | Input low voltage     |           |                       | 4.5/0.5               | < 1                      | 5                      |                    | 1.5  |       | 1.5               |      | 1.5                 | V    |      |
|                                   |                       |           |                       | 9/1                   | < 1                      | 10                     |                    | 3    |       | 3                 |      | 3                   |      |      |
|                                   |                       |           |                       | 13.5/1.5              | < 1                      | 15                     |                    | 4    |       | 4                 |      | 4                   |      |      |
| I <sub>OH</sub>                   | Output drive current  | HCC types | 0/ 5                  | 2.5                   |                          | 5                      | -2                 |      | -1.6  | -3.2              |      | -1.15               | mA   |      |
|                                   |                       |           | 0/ 5                  | 4.6                   |                          | 5                      | -0.64              |      | -0.51 | -1                |      | -0.36               |      |      |
|                                   |                       |           | 0/10                  | 9.5                   |                          | 10                     | -1.6               |      | -1.3  | -2.6              |      | -0.9                |      |      |
|                                   |                       | 0/15      | 13.5                  |                       | 15                       | -4.2                   |                    | -3.4 | -6.8  |                   | -2.4 |                     |      |      |
|                                   |                       | HCF types | 0/ 5                  | 2.5                   |                          | 5                      | -1.53              |      | -1.36 | -3.2              |      | -1.1                |      |      |
|                                   |                       |           | 0/ 5                  | 4.6                   |                          | 5                      | -0.52              |      | -0.44 | -1                |      | -0.36               |      |      |
| 0/10                              | 9.5                   |           |                       | 10                    | -1.3                     |                        | -1.1               | -2.6 |       | -0.9              |      |                     |      |      |
|                                   |                       | 0/15      | 13.5                  |                       | 15                       | -3.6                   |                    | -3.0 | -6.8  |                   | -2.4 |                     |      |      |
| I <sub>OL</sub>                   | Output sink current   | HCC types | 0/ 5                  | 0.4                   |                          | 5                      | 0.64               |      | 0.51  | 1                 |      | 0.36                | mA   |      |
|                                   |                       |           | 0/10                  | 0.5                   |                          | 10                     | 1.6                |      | 1.3   | 2.6               |      | 0.9                 |      |      |
|                                   |                       |           | 0/15                  | 1.5                   |                          | 15                     | 4.2                |      | 3.4   | 6.8               |      | 2.4                 |      |      |
|                                   |                       | HCF types | 0/ 5                  | 0.4                   |                          | 5                      | 0.52               |      | 0.44  | 1                 |      | 0.36                |      |      |
|                                   |                       |           | 0/10                  | 0.5                   |                          | 10                     | 1.3                |      | 1.1   | 2.6               |      | 0.9                 |      |      |
|                                   |                       |           | 0/15                  | 1.5                   |                          | 15                     | 3.6                |      | 3.0   | 6.8               |      | 2.4                 |      |      |
| I <sub>IH</sub> , I <sub>IL</sub> | Input leakage current | HCC types | 0/18                  |                       | Any input                | 18                     |                    | ±0.1 |       | ±10 <sup>-5</sup> | ±0.1 |                     | ± 1  | μA   |
|                                   |                       | HCF types | 0/15                  |                       |                          | 15                     |                    | ±0.3 |       | ±10 <sup>-5</sup> | ±0.3 |                     | ± 1  |      |
| I <sub>O</sub>                    | 3-state output        | HCC types | 0/18                  |                       |                          | 18                     |                    | ±0.4 |       | ±10 <sup>-4</sup> | ±0.4 |                     | ±12  | μA   |
|                                   |                       | HCF types | 0/15                  |                       |                          | 15                     |                    | ±1.0 |       | ±10 <sup>-4</sup> | ±1.0 |                     | ±7.5 |      |
| C <sub>I</sub>                    | Input capacitance     |           |                       | Any input             |                          |                        |                    |      | 5     | 7.5               |      |                     | pF   |      |

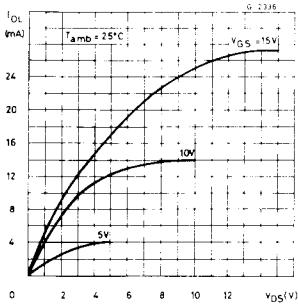
\* T<sub>Low</sub> = - 55°C for **HCC** device; -40°C for **HCF** device.  
 \* T<sub>High</sub> = +125°C for **HCC** device; +85°C for **HCF** device.  
 The Noise Margin for both "1" and "0" level is: 1V min. with V<sub>DD</sub>= 5V  
 2V min. with V<sub>DD</sub>= 10V  
 2.5V min. with V<sub>DD</sub>= 15V

**DYNAMIC ELECTRICAL CHARACTERISTICS** ( $T_{amb} = 25^{\circ}C$ , input  $t_r, t_f = 20$  ns,  $C_L = 50$  pF,  $R_L = 200$  k $\Omega$ , unless otherwise specified)

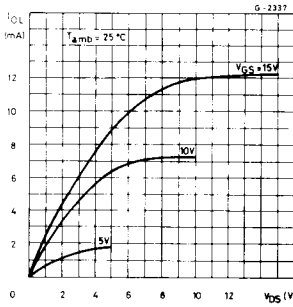
| Parameter                              |  |                    | Test conditions     | Values              |      |      | Unit |      |    |
|--|--|--------------------|---------------------|---------------------|------|------|------|------|----|
|  |  |                    |                     | V <sub>DD</sub> (V) | Min. | Typ. |      | Max. |    |
| t <sub>THL</sub> ,<br>t <sub>TLH</sub> | Transition time  |                    |                     | 5                   |      | 100  | 200  | ns   |    |
|  |  |                    |                     | 10                  |      | 50   | 100  |      |    |
|  |  |                    |                     | 15                  |      | 40   | 80   |      |    |
| t <sub>W(R)</sub>                      | Reset pulse width  |                    |                     | 5                   | 200  | 100  |      | ns   |    |
|  |  |                    |                     | 10                  | 140  | 70   |      |      |    |
|  |  |                    |                     | 15                  | 100  | 50   |      |      |    |
| t <sub>W(st)</sub>                     | Strobe pulse width   |                    |                     | 5                   | 140  | 70   |      | ns   |    |
|  |  |                    |                     | 10                  | 80   | 40   |      |      |    |
|  |  |                    |                     | 15                  | 70   | 35   |      |      |    |
| t <sub>setup</sub>                     | Setup time   |                    |                     | 5                   | 50   | 25   |      | ns   |    |
|  |  |                    |                     | 10                  | 30   | 15   |      |      |    |
|  |  |                    |                     | 15                  | 20   | 10   |      |      |    |
| t <sub>H</sub>                         | Hold time  |                    |                     | 5                   | 0    | 0    |      | ns   |    |
|  |  |                    |                     | 10                  | 0    | 0    |      |      |    |
|  |  |                    |                     | 15                  | 0    | 0    |      |      |    |
| t <sub>PHL</sub> ,<br>t <sub>PLH</sub> | Propagation delay times:                                       | Strobe to data out |                     | 5                   |      | 130  | 260  | ns   |    |
|  |  |                    |                     | 10                  |      | 70   | 140  |      |    |
|  |  |                    |                     | 15                  |      | 50   | 100  |      |    |
|  |  |                    | Data in to data out |                     | 5    |      | 105  | 210  | ns |
|  |  |                    |                     |                     | 10   |      | 60   | 120  |    |
|  |  |                    |                     |                     | 15   |      | 45   | 90   |    |
|  |  |                    | Reset to data out   |                     | 5    |      | 90   | 180  | ns |
|  |  |                    |                     |                     | 10   |      | 50   | 100  |    |
|  |  |                    |                     |                     | 15   |      | 40   | 80   |    |
| t <sub>PHZ</sub>                       | 3-state propagation delay times: output high to high impedance |                    |                     | 5                   |      | 90   | 180  | ns   |    |
|  |  |                    |                     | 10                  |      | 50   | 100  |      |    |
|  |  |                    |                     | 15                  |      | 35   | 70   |      |    |
| t <sub>PZH</sub>                       | High impedance to output high                                  |                    |                     | 5                   |      | 90   | 180  | ns   |    |
|  |  |                    |                     | 10                  |      | 50   | 100  |      |    |
|  |  |                    |                     | 15                  |      | 35   | 70   |      |    |
| t <sub>PLZ</sub>                       | Output low to high impedance                                   |                    |                     | 5                   |      | 90   | 180  | ns   |    |
|  |  |                    |                     | 10                  |      | 50   | 100  |      |    |
|  |  |                    |                     | 15                  |      | 35   | 70   |      |    |
| t <sub>PZL</sub>                       | High impedance to output low                                   |                    |                     | 5                   |      | 90   | 180  | ns   |    |
|  |  |                    |                     | 10                  |      | 50   | 100  |      |    |
|  |  |                    |                     | 15                  |      | 35   | 70   |      |    |

# HCC/HCF 4508 B

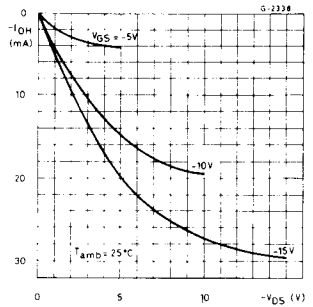
Typical output low (sink) current characteristics



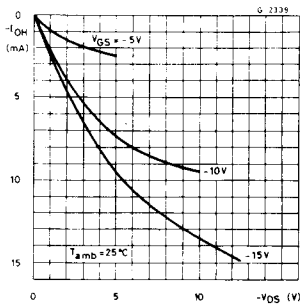
Minimum output low (sink) current characteristics



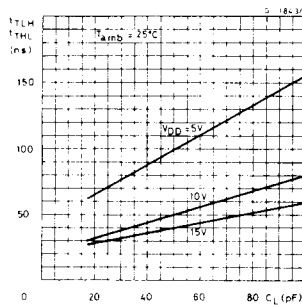
Typical output high (source) current characteristics



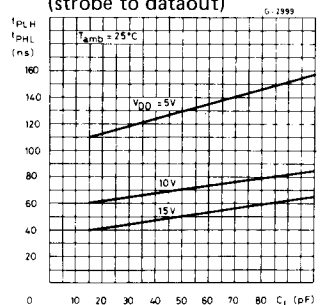
Minimum output high (source) current characteristics



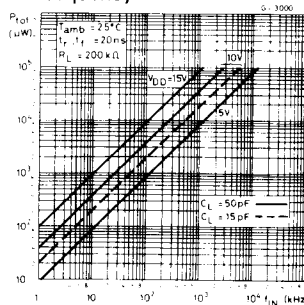
Typical transition time vs. load capacitance



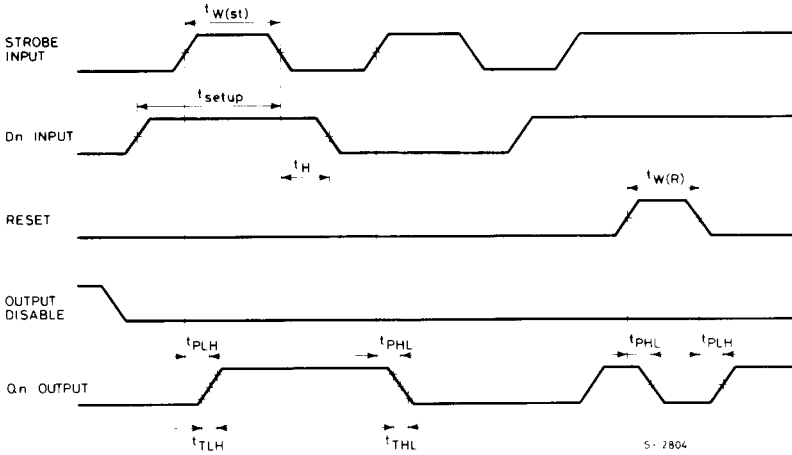
Typical propagation delay time vs. load capacitance (strobe to dataout)



Typical power dissipation vs. frequency

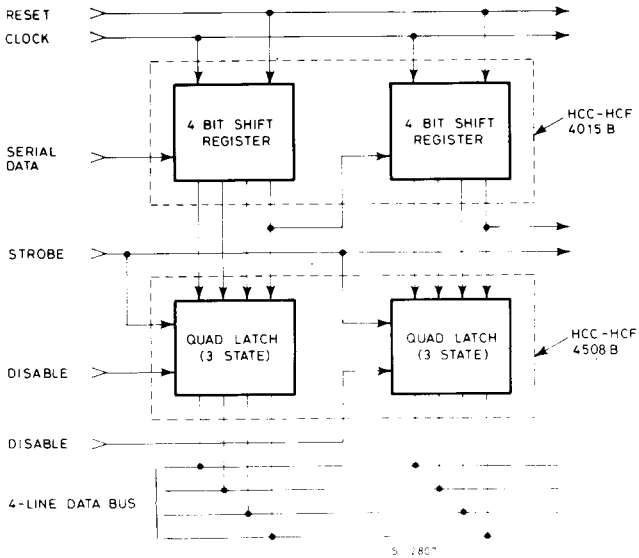


TEST WAVEFORM



TYPICAL APPLICATIONS

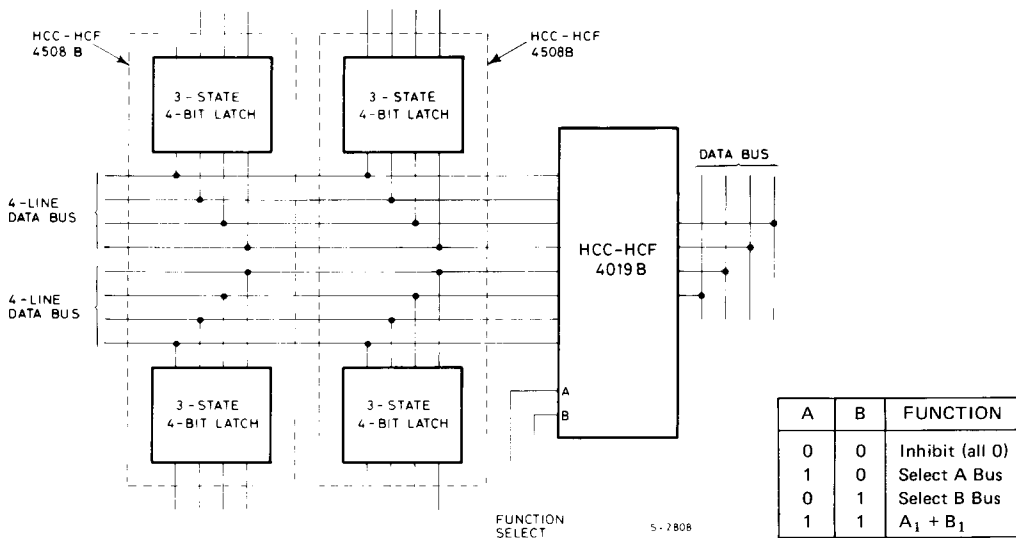
A) Fig. 15 - Bus register



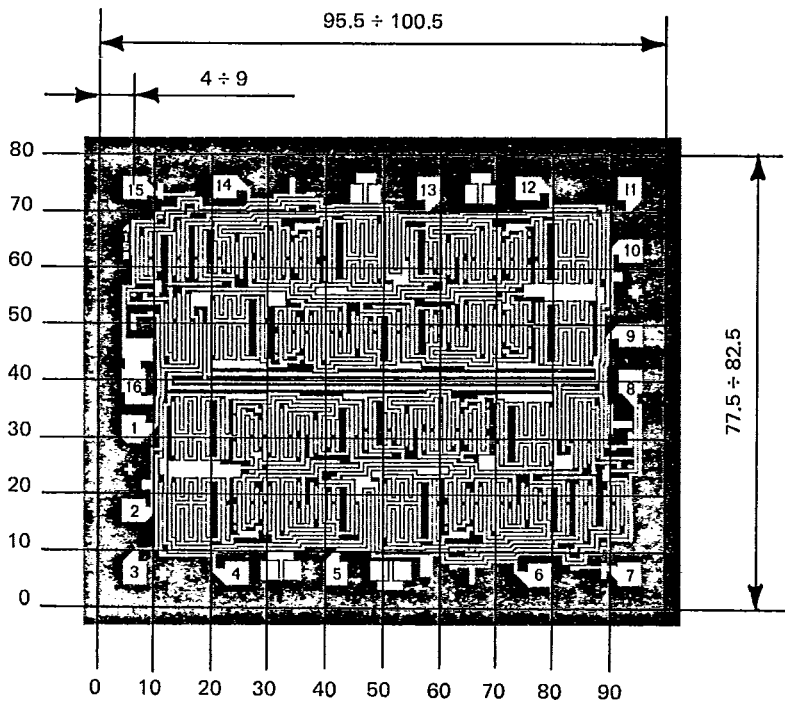
# HCC/HCF 4508 B

## TYPICAL APPLICATIONS (continued)

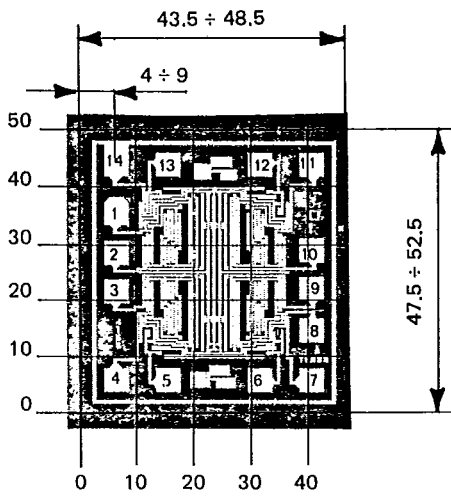
B) Fig. 16 - Dual multiplexed bus register with function select







4015B



4016B