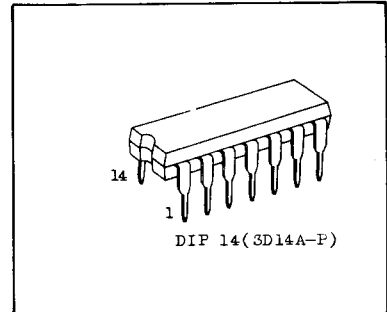


# TC4006BP

C<sup>2</sup>MOS DIGITAL INTEGRATED CIRCUIT  
SILICON MONOLITHIC

## TC4006BP 18-STAGE STATIC SHIFT REGISTER

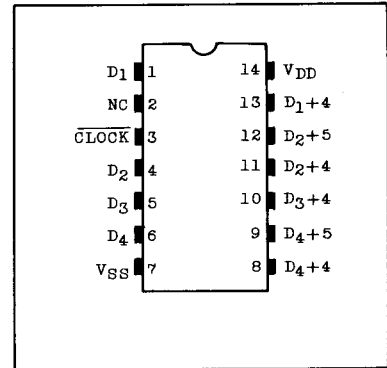
TC4006BP is static shift register of 18 bits maximum which consists of two 4 bit shift registers and two 5 bit shift registers, and the clock is supplied from the common CLOCK input for all the shift registers. Since 5 bit shift register is provided with 4 bit output  $D_{n+4}$  in addition to serial data output  $D_{n+5}$ , the shift register with arbitrary number of stages of 4, 5, 8, 9, 10, 12, 13, 14, 16, 17 and 18 can be obtained by the combination of inputs and outputs of 4 bit and 5 bit shift registers. Each register is shifted by the falling edge of CLOCK.



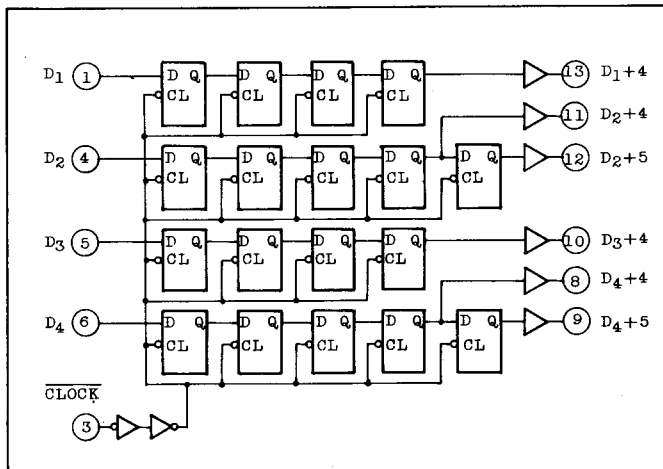
### MAXIMUM RATINGS

| CHARACTERISTIC                      | SYMBOL           | RATING                                      | UNIT |
|-------------------------------------|------------------|---|------|
| DC Supply Voltage                   | V <sub>DD</sub>  | V <sub>SS</sub> -0.5 ~ V <sub>SS</sub> +20  | V    |
| Input Voltage                       | V <sub>IN</sub>  | V <sub>SS</sub> -0.5 ~ V <sub>DD</sub> +0.5 | V    |
| Output Voltage                      | V <sub>OUT</sub> | V <sub>SS</sub> -0.5 ~ V <sub>DD</sub> +0.5 | V    |
| DC Input Current                    | I <sub>IN</sub>  | ±10   | mA   |
| Power Dissipation                   | P <sub>D</sub>   | 300   | mW   |
| Operating Ambient Temperature Range | T <sub>A</sub>   | -40 ~ 85                                    | °C   |
| Storage Temperature Range           | T <sub>stg</sub> | -65 ~ 150                                   | °C   |
| Lead Temp./Time                     | T <sub>sol</sub> | 260°C · 10sec                               |      |

### PIN ASSIGNMENT



### LOGIC DIAGRAM



### TRUTH TABLE (SINGLE STAGE)

| INPUTS         |       | OUTPUT           |
|----------------|-------|------------------|
| D <sub>n</sub> | CLOCK | D <sub>n+1</sub> |
| L              |       | L                |
| H              |       | H                |
| *              |       | D <sub>n</sub>   |

\* Don't care

RECOMMENDED OPERATING CONDITIONS (VSS=0V)

| CHARACTERISTIC    | SYMBOL | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|-------------------|--------|----------------|------|------|------|------|
| DC Supply Voltage | VDD    |                | 3    | -    | 18   | V    |
| Input Voltage     | VIN    |                | 0    | -    | VDD  | V    |

STATIC ELECTRICAL CHARACTERISTICS (VSS=0V)

| CHARACTERISTIC            | SYM-BOL   | TEST CONDITION  | VDD (V) | -40°C |      | 25°C  |       |                   | 85°C  |      | UNIT |    |
|---------------------------|-----------|---|---------|-------|------|-------|-------|-------------------|-------|------|------|----|
|                           |           |   |         | MIN.  | MAX. | MIN.  | TYP.  | MAX.              | MIN.  | MAX. |      |    |
| High-Level Output Voltage | VOH       | IOUT  < 1μA<br>VIN=VSS,VDD  | 5       | 4.95  | -    | 4.95  | 5.00  | -                 | 4.95  | -    | V    |    |
|                           |           |   | 10      | 9.95  | -    | 9.95  | 10.00 | -                 | 9.95  | -    |      |    |
|                           |           |   | 15      | 14.95 | -    | 14.95 | 15.00 | -                 | 14.95 | -    |      |    |
| Low-Level Output Voltage  | VOL       | IOUT  < 1μA<br>VIN=VSS,VDD  | 5       | -     | 0.05 | -     | 0.00  | 0.05              | -     | 0.05 | V    |    |
|                           |           |   | 10      | -     | 0.05 | -     | 0.00  | 0.05              | -     | 0.05 |      |    |
|                           |           |   | 15      | -     | 0.05 | -     | 0.00  | 0.05              | -     | 0.05 |      |    |
| Output High Current       | IOH       | VOH=4.6V<br>VOH=2.5V<br>VOH=9.5V<br>VOH=13.5V<br>VIN=VSS,VDD        | 5       | -0.61 | -    | -0.51 | -1.0  | -                 | -0.42 | -    | mA   |    |
|                           |           |   | 5       | -2.5  | -    | -2.1  | -4.0  | -                 | -1.7  | -    |      |    |
|                           |           |   | 10      | -1.5  | -    | -1.3  | -2.2  | -                 | -1.1  | -    |      |    |
|                           |           |   | 15      | -4.0  | -    | -3.4  | -9.0  | -                 | -2.8  | -    |      |    |
|                           |           |   |         |       |      |       |       |                   |       |      |      |    |
| Output Low Current        | IOL       | VOL=0.4V<br>VOL=0.5V<br>VOL=1.5V<br>VIN=VSS,VDD                     | 5       | 0.61  | -    | 0.51  | 1.5   | -                 | 0.42  | -    | mA   |    |
|                           |           |   | 10      | 1.5   | -    | 1.3   | 3.8   | -                 | 1.1   | -    |      |    |
|                           |           |   | 15      | 4.0   | -    | 3.4   | 15.0  | -                 | 2.8   | -    |      |    |
|                           |           |   |         |       |      |       |       |                   |       |      |      |    |
| Input High Voltage        | VIH       | VOUT=0.5V,4.5V<br>VOUT=1.0V,9.0V<br>VOUT=1.5V,13.5V<br> IOUT  < 1μA | 5       | 3.5   | -    | 3.5   | 2.75  | -                 | 3.5   | -    | V    |    |
|                           |           |   | 10      | 7.0   | -    | 7.0   | 5.5   | -                 | 7.0   | -    |      |    |
|                           |           |   | 15      | 11.0  | -    | 11.0  | 8.25  | -                 | 11.0  | -    |      |    |
|                           |           |   |         |       |      |       |       |                   |       |      |      |    |
| Input Low Voltage         | VIL       | VOUT=0.5V,4.5V<br>VOUT=1.0V,9.0V<br>VOUT=1.5V,13.5V<br> IOUT  < 1μA | 5       | -     | 1.5  | -     | 2.25  | 1.5               | -     | 1.5  | V    |    |
|                           |           |   | 10      | -     | 3.0  | -     | 4.5   | 3.0               | -     | 3.0  |      |    |
|                           |           |   | 15      | -     | 4.0  | -     | 6.75  | 4.0               | -     | 4.0  |      |    |
|                           |           |   |         |       |      |       |       |                   |       |      |      |    |
| Input Current             | "H" Level | IIH   | VIH=18V | 18    | -    | 0.1   | -     | 10 <sup>-5</sup>  | 0.1   | -    | 1.0  | μA |
|                           | "L" Level | IIL   | VIL=0V  | 18    | -    | -0.1  | -     | -10 <sup>-5</sup> | -0.1  | -    | -1.0 |    |
| Quiescent Device Current  | IDD       | VIN=VSS,VDD<br>*  | 5       | -     | 5    | -     | 0.005 | 5                 | -     | 150  | μA   |    |
|                           |           |   | 10      | -     | 10   | -     | 0.010 | 10                | -     | 300  |      |    |
|                           |           |   | 15      | -     | 20   | -     | 0.015 | 20                | -     | 600  |      |    |

\* All valid input combinations.

# TC4006BP

## DYNAMIC ELECTRICAL CHARACTERISTICS (Ta=25°C, VSS=0V, CL=50pF)

| CHARACTERISTIC                               | SYMBOL                               | TEST CONDITION | VDD (V) | MIN. | TYP. | MAX. | UNIT |
|--|--------------------------------------|----------------|---------|------|------|------|------|
|  |                                      |                |         |      |      |      |      |
| Output Transition Time<br>(Low to High)      | t <sub>TLH</sub>                     |                | 5       | -    | 80   | 200  | ns   |
|  |                                      |                | 10      | -    | 50   | 100  |      |
|  |                                      |                | 15      | -    | 40   | 80   |      |
| Output Transition Time<br>(High to Low)      | t <sub>THL</sub>                     |                | 5       | -    | 80   | 200  | ns   |
|  |                                      |                | 10      | -    | 50   | 100  |      |
|  |                                      |                | 15      | -    | 40   | 80   |      |
| Propagation Delay Time                       | t <sub>pLH</sub><br>t <sub>pHL</sub> |                | 5       | -    | 170  | 400  | ns   |
|  |                                      |                | 10      | -    | 75   | 200  |      |
|  |                                      |                | 15      | -    | 65   | 160  |      |
| Max. Clock Frequency                         | f <sub>CL</sub>                      |                | 5       | 2.5  | 8    | -    | MHz  |
|  |                                      |                | 10      | 5    | 17   | -    |      |
|  |                                      |                | 15      | 7    | 20   | -    |      |
| Min. Clock Pulse Width                       | t <sub>w</sub>                       |                | 5       | -    | 60   | 180  | ns   |
|  |                                      |                | 10      | -    | 30   | 80   |      |
|  |                                      |                | 15      | -    | 25   | 50   |      |
| Max. Clock Rise Time<br>Max. Clock Fall Time | t <sub>rCL</sub><br>t <sub>fCL</sub> |                | 5       | 20   | -    | -    | μs   |
|  |                                      |                | 10      | 2.5  | -    | -    |      |
|  |                                      |                | 15      | 1.0  | -    | -    |      |
| Min. Set-up Time<br>(DATA - CLOCK)           | t <sub>SU</sub>                      |                | 5       | -    | 20   | 100  | ns   |
|  |                                      |                | 10      | -    | 8    | 50   |      |
|  |                                      |                | 15      | -    | 5    | 40   |      |
| Min. Hold Time<br>(DATA - CLOCK)             | t <sub>H</sub>                       |                | 5       | -    | -2   | 60   | ns   |
|  |                                      |                | 10      | -    | 4    | 40   |      |
|  |                                      |                | 15      | -    | 5    | 30   |      |
| Input Capacitance                            | C <sub>IN</sub>                      |                |         | -    | 5    | 7.5  | pF   |

WAVEFORM FOR MEASUREMENT OF DYNAMIC CHARACTERISTICS

