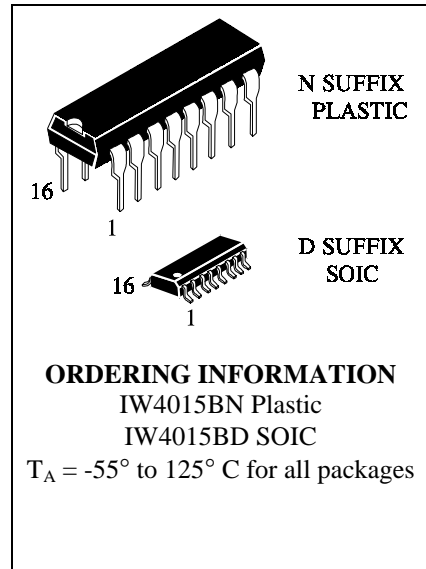


**IW4015B**

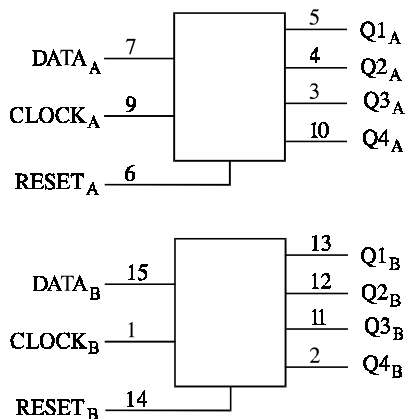
**Dual 4-Stage Static Shift Register**  
**High-Voltage Silicon-Gate CMOS**

The IW4015B consists of two identical, independent, 4-stage serial-input/parallel-output registers. Each register has independent CLOCK and RESET inputs as well as a single serial DATA input. "Q" outputs are available from each of the four stages on both registers. All register stages are D-type, master-slave flip-flops. The logic level present at the DATA input is transferred into the first register stage and shifted over one stage at each positive-going clock transition. Resetting of all stages is accomplished by a high level on the reset line. Register expansion to 8 stages using one IW4015B package, or to more than 8 stages using additional IW4015B's is possible.

- Operating Voltage Range: 3.0 to 18 V
- Maximum input current of 1  $\mu$ A at 18 V over full package-temperature range; 100 nA at 18 V and 25°C
- Noise margin (over full package temperature range):
  - 1.0 V min @ 5.0 V supply
  - 2.0 V min @ 10.0 V supply
  - 2.5 V min @ 15.0 V supply

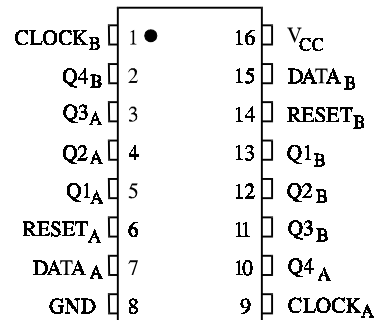


**LOGIC DIAGRAM**



PIN 16 = V<sub>CC</sub>  
 PIN 8 = GND

**PIN ASSIGNMENT**



**FUNCTION TABLE**

| Inputs |      |       | Outputs   |                  |
|--------|------|-------|-----------|------------------|
| Clock  | Data | Reset | Q1        | Q <sub>n</sub>   |
|        | L    | L     | L         | Q <sub>n-1</sub> |
|        | H    | L     | H         | Q <sub>n-1</sub> |
|        | X    | L     | No change |                  |
| X      | X    | H     | L         | L                |

X = don't care

**MAXIMUM RATINGS\***

| Symbol           | Parameter  | Value                        | Unit |
|------------------|--|------------------------------|------|
| V <sub>CC</sub>  | DC Supply Voltage (Referenced to GND)  | -0.5 to +20                  | V    |
| V <sub>IN</sub>  | DC Input Voltage (Referenced to GND)   | -0.5 to V <sub>CC</sub> +0.5 | V    |
| V <sub>OUT</sub> | DC Output Voltage (Referenced to GND)  | -0.5 to V <sub>CC</sub> +0.5 | V    |
| I <sub>IN</sub>  | DC Input Current, per Pin  | ±10                          | mA   |
| P <sub>D</sub>   | Power Dissipation in Still Air, Plastic DIP+<br>SOIC Package+                    | 750<br>500                   | mW   |
| P <sub>D</sub>   | Power Dissipation per Output Transistor  | 100                          | mW   |
| T <sub>stg</sub> | Storage Temperature  | -65 to +150                  | °C   |
| T <sub>L</sub>   | Lead Temperature, 1 mm from Case for 10 Seconds<br>(Plastic DIP or SOIC Package) | 260                          | °C   |

\*Maximum Ratings are those values beyond which damage to the device may occur.  
Functional operation should be restricted to the Recommended Operating Conditions.

+Derating - Plastic DIP: - 10 mW/°C from 65° to 125°C  
SOIC Package: : - 7 mW/°C from 65° to 125°C

**RECOMMENDED OPERATING CONDITIONS**

| Symbol                             | Parameter  | Min | Max             | Unit |
|------------------------------------|--|-----|-----------------|------|
| V <sub>CC</sub>                    | DC Supply Voltage (Referenced to GND)                | 3.0 | 18              | V    |
| V <sub>IN</sub> , V <sub>OUT</sub> | DC Input Voltage, Output Voltage (Referenced to GND) | 0   | V <sub>CC</sub> | V    |
| T <sub>A</sub>                     | Operating Temperature, All Package Types             | -55 | +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<sub>IN</sub> and V<sub>OUT</sub> should be constrained to the range GND ≤ (V<sub>IN</sub> or V<sub>OUT</sub>) ≤ V<sub>CC</sub>.

Unused inputs must always be tied to an appropriate logic voltage level (e.g., either GND or V<sub>CC</sub>). Unused outputs must be left open.

**DC ELECTRICAL CHARACTERISTICS**(Voltages Referenced to GND)

| Symbol          | Parameter                                      | Test Conditions   | V <sub>CC</sub><br>V | Guaranteed Limit |       |        | Unit |
|-----------------|--|---|----------------------|------------------|-------|--------|------|
|                 |  |   |                      | ≥-55°C           | 25°C  | ≤125°C |      |
| V <sub>IH</sub> | Minimum High-Level Input Voltage               | V <sub>OUT</sub> = 0.5 V or V <sub>CC</sub> - 0.5V  | 5.0                  | 3.5              | 3.5   | 3.5    | V    |
|                 |  | V <sub>OUT</sub> = 1.0 V or V <sub>CC</sub> - 1.0 V   | 10                   | 7                | 7     | 7      |      |
|                 |  | V <sub>OUT</sub> = 1.5 V or V <sub>CC</sub> - 1.5V  | 15                   | 11               | 11    | 11     |      |
| V <sub>IL</sub> | Maximum Low-Level Input Voltage                | V <sub>OUT</sub> = 0.5 V or V <sub>CC</sub> - 0.5V  | 5.0                  | 1.5              | 1.5   | 1.5    | V    |
|                 |  | V <sub>OUT</sub> = 1.0 V or V <sub>CC</sub> - 1.0 V   | 10                   | 3                | 3     | 3      |      |
|                 |  | V <sub>OUT</sub> = 1.5 V or V <sub>CC</sub> - 1.5V  | 15                   | 4                | 4     | 4      |      |
| V <sub>OH</sub> | Minimum High-Level Output Voltage              | V <sub>IN</sub> =GND or V <sub>CC</sub>   | 5.0                  | 4.95             | 4.95  | 4.95   | V    |
|                 |  |   | 10                   | 9.95             | 9.95  | 9.95   |      |
|                 |  |   | 15                   | 14.95            | 14.95 | 14.95  |      |
| V <sub>OL</sub> | Maximum Low-Level Output Voltage               | V <sub>IN</sub> =GND or V <sub>CC</sub>   | 5.0                  | 0.05             | 0.05  | 0.05   | V    |
|                 |  |   | 10                   | 0.05             | 0.05  | 0.05   |      |
|                 |  |   | 15                   | 0.05             | 0.05  | 0.05   |      |
| I <sub>IN</sub> | Maximum Input Leakage Current                  | V <sub>IN</sub> = GND or V <sub>CC</sub>  | 18                   | ±0.1             | ±0.1  | ±1.0   | μA   |
| I <sub>CC</sub> | Maximum Quiescent Supply Current (per Package) | V <sub>IN</sub> = GND or V <sub>CC</sub>  | 5.0                  | 5                | 5     | 150    | μA   |
|                 |  |   | 10                   | 10               | 10    | 300    |      |
|                 |  |   | 15                   | 20               | 20    | 600    |      |
|                 |  |   | 20                   | 100              | 100   | 3000   |      |
| I <sub>OL</sub> | Minimum Output Low (Sink) Current              | V <sub>IN</sub> = GND or V <sub>CC</sub><br>U <sub>OL</sub> =0.4 V<br>U <sub>OL</sub> =0.5 V<br>U <sub>OL</sub> =1.5 V                            | 5.0                  | 0.64             | 0.51  | 0.36   | mA   |
|                 |  |   | 10                   | 1.6              | 1.3   | 0.9    |      |
|                 |  |   | 15                   | 4.2              | 3.4   | 2.4    |      |
| I <sub>OH</sub> | Minimum Output High (Source) Current           | V <sub>IN</sub> = GND or V <sub>CC</sub><br>U <sub>OH</sub> =2.5 V<br>U <sub>OH</sub> =4.6 V<br>U <sub>OH</sub> =9.5 V<br>U <sub>OH</sub> =13.5 V | 5.0                  | -2               | -1.6  | -1.15  | mA   |
|                 |  |   | 5.0                  | -0.64            | -0.51 | -0.36  |      |
|                 |  |   | 10                   | -1.6             | -1.3  | -0.9   |      |
|                 |  |   | 15                   | -4.2             | -3.4  | -2.4   |      |

**AC ELECTRICAL CHARACTERISTICS**( $C_L=50\text{pF}$ ,  $R_L=200\text{k}\Omega$ , Input  $t_r=t_f=20\text{ ns}$ )

| Symbol                              | Parameter   | V <sub>CC</sub><br>V | Guaranteed Limit |      |        | Unit |
|-------------------------------------|---|----------------------|------------------|------|--------|------|
|                                     |   |                      | ≥-55°C           | 25°C | ≤125°C |      |
| t <sub>max</sub>                    | Maximum Clock Frequency (Figure 1)                    | 5.0                  | 3                | 3    | 1.5    | MHz  |
|                                     |   | 10                   | 6                | 6    | 3      |      |
|                                     |   | 15                   | 8.5              | 8.5  | 4.25   |      |
| t <sub>PHL</sub> , t <sub>PLH</sub> | Maximum Propagation Delay, Clock to Q (Figure 1)      | 5.0                  | 320              | 320  | 640    | ns   |
|                                     |   | 10                   | 160              | 160  | 320    |      |
|                                     |   | 15                   | 120              | 120  | 240    |      |
| t <sub>PHL</sub>                    | Maximum Propagation Delay, Reset to Q (Figure 2)      | 5.0                  | 400              | 400  | 800    | ns   |
|                                     |   | 10                   | 200              | 200  | 400    |      |
|                                     |   | 15                   | 160              | 160  | 320    |      |
| t <sub>THL</sub> , t <sub>TLH</sub> | Maximum Output Transition Time, Any Output (Figure 1) | 5.0                  | 200              | 200  | 400    | ns   |
|                                     |   | 10                   | 100              | 100  | 200    |      |
|                                     |   | 15                   | 80               | 80   | 160    |      |
| C <sub>IN</sub>                     | Maximum Input Capacitance                             | -                    |                  | 7.5  |        | pF   |

**TIMING REQUIREMENTS**( $C_L=50\text{pF}$ ,  $R_L=200\text{ k}\Omega$ , Input  $t_r=t_f=20\text{ ns}$ )

| Symbol                          | Parameter                                    | V <sub>CC</sub><br>V | Guaranteed Limit |      |        | Unit |
|---------------------------------|--|----------------------|------------------|------|--------|------|
|                                 |  |                      | ≥-55°C           | 25°C | ≤125°C |      |
| t <sub>w</sub>                  | Minimum Pulse Width, Clock (Figure 1)        | 5.0                  | 180              | 180  | 360    | ns   |
|                                 |  | 10                   | 80               | 80   | 160    |      |
|                                 |  | 15                   | 50               | 50   | 100    |      |
| t <sub>w</sub>                  | Minimum Pulse Width, Reset (Figure 2)        | 5.0                  | 200              | 200  | 400    | ns   |
|                                 |  | 10                   | 80               | 80   | 160    |      |
|                                 |  | 15                   | 60               | 60   | 120    |      |
| t <sub>su</sub>                 | Minimum Setup Time, Data to Clock (Figure 3) | 5.0                  | 70               | 70   | 140    | ns   |
|                                 |  | 10                   | 40               | 40   | 80     |      |
|                                 |  | 15                   | 30               | 30   | 60     |      |
| t <sub>h</sub>                  | Minimum Hold Time, Clock to Data (Figure 3)  | 5.0                  | 0                | 0    | 0      | ns   |
|                                 |  | 10                   | 0                | 0    | 0      |      |
|                                 |  | 15                   | 0                | 0    | 0      |      |
| t <sub>r</sub> , t <sub>f</sub> | Maximum Input Rise and Fall Time (Figure 1)  | 5.0                  | 15               | 15   | 30     | μs   |
|                                 |  | 10                   | 6                | 6    | 12     |      |
|                                 |  | 15                   | 2                | 2    | 4      |      |

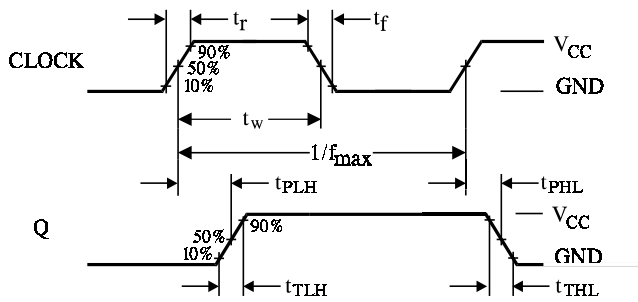


Figure 1. Switching Waveforms

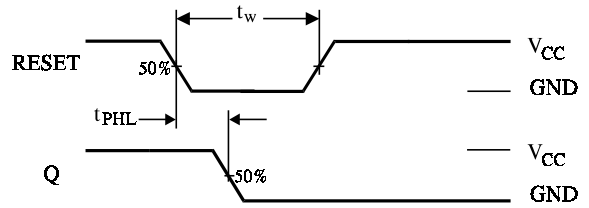


Figure 2. Switching Waveforms

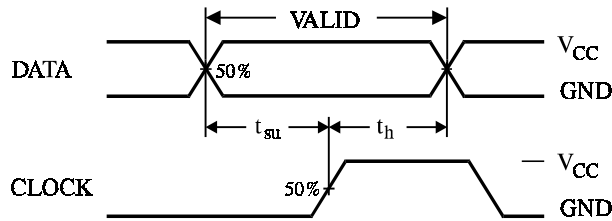


Figure 3. Switching Waveforms

**EXPANDED LOGIC DIAGRAM  
( 1/2 of the Device )**

