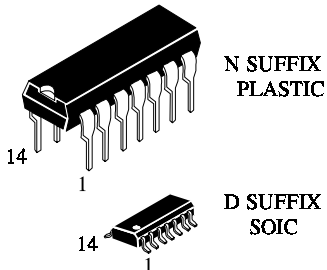


**IN74ALS164**

**8-Bit Serial-Input/Parallel-Output Shift Register**

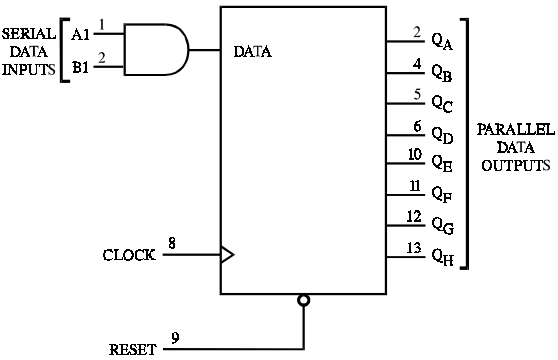
This device is a high speed 8-Bit Serial-In-Parallel-Out Shift Register. Serial data is entered through a 2-Input AND gate synchronous with the LOW to HIGH transition of the clock. This device features an asynchronous Master Reset which clears the register setting all outputs LOW independent of the clock. It utilizes the Schottky diode clamped process to achieved high speeds and is fully compatible with all TTL products.

- Switching specifications at 50 pF
- Switching specifications guaranteed over full temperature and  $V_{CC}$  range
- Functionally and pin-for-pin compatible with Schottky and LS TTL counterpart



**ORDERING INFORMATION**  
 IN74ALS164N Plastic  
 IN74ALS164D SOIC  
 $T_A = -10^\circ$  to  $70^\circ\text{C}$   
 for all packages

**LOGIC DIAGRAM**



PIN 14 =  $V_{CC}$   
 PIN 7 = GND

**PIN ASSIGNMENT**

|       |   |    |          |
|-------|---|----|----------|
| A1    | 1 | 14 | $V_{CC}$ |
| A2    | 2 | 13 | $Q_H$    |
| $Q_A$ | 3 | 12 | $Q_G$    |
| $Q_B$ | 4 | 11 | $Q_F$    |
| $Q_C$ | 5 | 10 | $Q_E$    |
| $Q_D$ | 6 | 9  | RESET    |
| GND   | 7 | 8  | CLOCK    |

**FUNCTION TABLE**

| Inputs |       |    |    | Outputs   |          |     |          |
|--------|-------|----|----|-----------|----------|-----|----------|
| Reset  | Clock | A1 | A2 | $Q_A$     | $Q_B$    | ... | $Q_H$    |
| L      | X     | X  | X  | L         | L        | ... | L        |
| H      |       | X  | X  | no change |          |     |          |
| H      |       | H  | D  | D         | $Q_{An}$ | ... | $Q_{Gn}$ |
| H      |       | D  | H  | D         | $Q_{An}$ | ... | $Q_{Gn}$ |

D = data input  
 X = don't care  
 $Q_{An} - Q_{Gn}$  = data shifted from the previous stage on a rising edge at the clock input.

## MAXIMUM RATINGS\*

| Symbol           | Parameter                 | Value       | Unit |
|------------------|---------------------------|-------------|------|
| V <sub>CC</sub>  | Supply Voltage            | 7.0         | V    |
| V <sub>IN</sub>  | Input Voltage             | 7.0         | V    |
| V <sub>OUT</sub> | Output Voltage            | 5.5         | V    |
| T <sub>stg</sub> | Storage Temperature Range | -65 to +150 | °C   |

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

## RECOMMENDED OPERATING CONDITIONS

| Symbol          | Parameter                 | Min | Max  | Unit |
|-----------------|---------------------------|-----|------|------|
| V <sub>CC</sub> | Supply Voltage            | 4.5 | 5.5  | V    |
| V <sub>IH</sub> | High Level Input Voltage  | 2.0 |      | V    |
| V <sub>IL</sub> | Low Level Input Voltage   |     | 0.8  | V    |
| I <sub>OH</sub> | High Level Output Current |     | -0.4 | mA   |
| I <sub>OL</sub> | Low Level Output Current  |     | 8.0  | mA   |
| T <sub>A</sub>  | Ambient Temperature Range | -10 | +70  | °C   |

## DC ELECTRICAL CHARACTERISTICS over full operating conditions

| Symbol          | Parameter                    | Test Conditions                                  | Guaranteed Limit |      | Unit |
|-----------------|------------------------------|--|------------------|------|------|
|                 |                              |  | Min              | Max  |      |
| V <sub>IK</sub> | Input Clamp Voltage          | V <sub>CC</sub> = min, I <sub>IN</sub> = -18 mA  |                  | -1.5 | V    |
| V <sub>OH</sub> | High Level Output Voltage    | V <sub>CC</sub> = min, I <sub>OH</sub> = -0.4 mA | 2.5              |      | V    |
| V <sub>OL</sub> | Low Level Output Voltage     | V <sub>CC</sub> = min, I <sub>OL</sub> = 4 mA    |                  | 0.4  | V    |
|                 |                              | V <sub>CC</sub> = min, I <sub>OL</sub> = 8 mA    |                  | 0.5  |      |
| I <sub>IH</sub> | High Level Input Current     | V <sub>CC</sub> = max, V <sub>IN</sub> = 2.7 V   |                  | 20   | μA   |
|                 |                              | V <sub>CC</sub> = max, V <sub>IN</sub> = 7.0 V   |                  | 0.1  | mA   |
| I <sub>IL</sub> | Low Level Input Current      | V <sub>CC</sub> = max, V <sub>IN</sub> = 0.4 V   |                  | -0.1 | mA   |
| I <sub>O</sub>  | Output Short Circuit Current | V <sub>CC</sub> = max, V <sub>O</sub> = 2.25 V   | -30              | -112 | mA   |
| I <sub>CC</sub> | Supply Current               | V <sub>CC</sub> = max                            |                  | 24   | mA   |

**AC ELECTRICAL CHARACTERISTICS** over full operating conditions ( $V_{CC} = 5.0\text{ V} \pm 10\%$ ,  $C_L = 50\text{ pF}$ ,  $R_L = 500\ \Omega$ , Input  $t_r = t_f = 2.0\text{ ns}$ )

| Symbol    | Parameter                              | Min | Max | Unit |
|-----------|--|-----|-----|------|
| $f_{max}$ | Maximum Clock Frequency                |     | 50  | MHz  |
| $t_{PLH}$ | Propagation Delay Time, Clock to Q     |     | 16  | ns   |
| $t_{PHL}$ | Propagation Delay Time, Clock to Q     |     | 17  | ns   |
| $t_{PHL}$ | Propagation Delay Time, Reset to Q     |     | 20  | ns   |
| $t_{su}$  | Setup Time, A1 or A2 to Clock          | 8   |     | ns   |
| $t_h$     | Hold Time, Clock to A1 or A2           | 2   |     | ns   |
| $t_{rec}$ | Recovery Time, Reset Inactive to Clock | 8   |     | ns   |
| $t_w$     | Pulse Width, Clock                     | 10  |     | ns   |
| $t_w$     | Pulse Width, Reset                     | 16  |     | ns   |

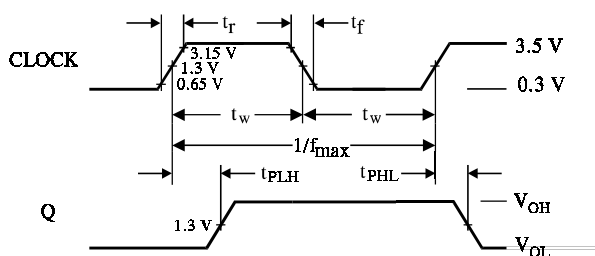


Figure 1. Switching Waveforms

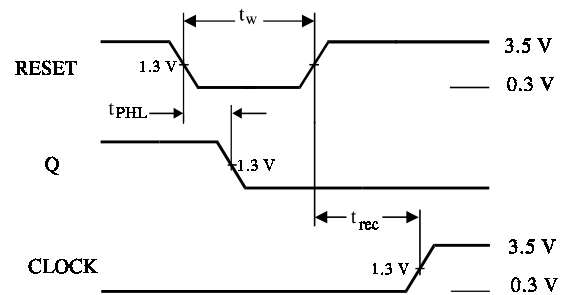


Figure 2. Switching Waveforms

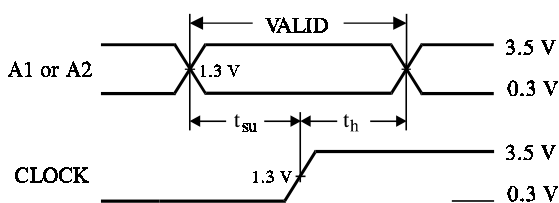
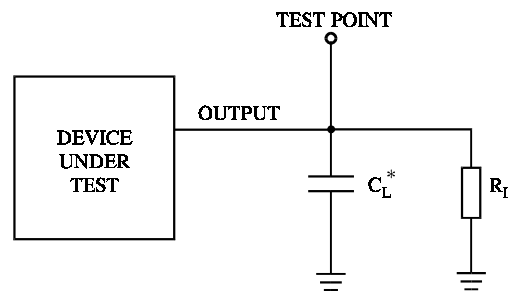


Figure 3. Switching Waveforms



\* Includes all probe and jig capacitance

Figure 4. Test Circuit