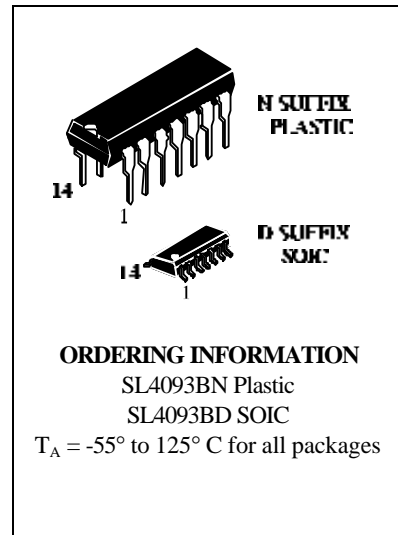


Quad 2-Input NAND Schmitt Triggers

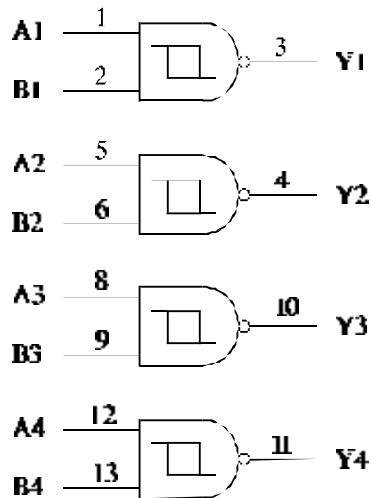
High-Voltage Silicon-Gate CMOS

The SL4093B consists of four Schmitt-trigger circuits. Each circuit functions as a two-input NAND gate with Schmitt-trigger action on both inputs. The gate switches at different points for positive- and negative-going signals. The difference between the positive voltage (V_P) and the negative voltage (V_N) is defined as hysteresis voltage (V_H) (see Fig.1).

- Operating Voltage Range: 3.0 to 18 V
- Maximum input current of 1 μ 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

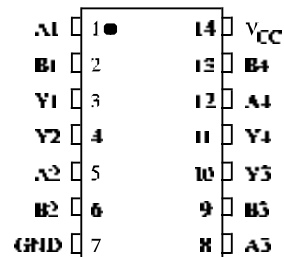


LOGIC DIAGRAM



PIN 14 = V_{CC}
PIN 7 = GND

PIN ASSIGNMENT



FUNCTION TABLE

| Inputs | | Output |
|--------|---|--------|
| A | B | Y |
| L | L | H |
| L | H | H |
| H | L | H |
| H | H | L |

MAXIMUM RATINGS*

| Symbol | Parameter | Value | Unit |
|-----------|--|------------------------|-------------|
| V_{CC} | DC Supply Voltage (Referenced to GND) | -0.5 to +20 | V |
| V_{IN} | DC Input Voltage (Referenced to GND) | -0.5 to $V_{CC} + 0.5$ | V |
| V_{OUT} | DC Output Voltage (Referenced to GND) | -0.5 to $V_{CC} + 0.5$ | V |
| I_{IN} | DC Input Current, per Pin | ± 10 | mA |
| P_D | Power Dissipation in Still Air, Plastic DIP+ SOIC Package+ | 750 | mW |
| | | 500 | |
| P_D | Power Dissipation per Output Transistor | 100 | mW |
| T_{stg} | Storage Temperature | -65 to +150 | $^{\circ}C$ |
| T_L | Lead Temperature, 1 mm from Case for 10 Seconds (Plastic DIP or SOIC Package) | 260 | $^{\circ}C$ |

*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/ $^{\circ}C$ from 65 $^{\circ}$ to 125 $^{\circ}C$

SOIC Package: - 7 mW/ $^{\circ}C$ from 65 $^{\circ}$ to 125 $^{\circ}C$

RECOMMENDED OPERATING CONDITIONS

| Symbol | Parameter | Min | Max | Unit |
|-------------------|--|-----|----------|-------------|
| V_{CC} | DC Supply Voltage (Referenced to GND) | 3.0 | 18 | V |
| V_{IN}, V_{OUT} | DC Input Voltage, Output Voltage (Referenced to GND) | 0 | V_{CC} | V |
| T_A | Operating Temperature, All Package Types | -55 | +125 | $^{\circ}C$ |

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_{IN} and V_{OUT} should be constrained to the range $GND \leq (V_{IN} \text{ or } V_{OUT}) \leq V_{CC}$.

Unused inputs must always be tied to an appropriate logic voltage level (e.g., either GND or V_{CC}). Unused outputs must be left open.

DC ELECTRICAL CHARACTERISTICS (Voltages Referenced to GND)

| Symbol | Parameter | Test Conditions | V _{CC} V | Guaranteed Limit | | | Unit |
|---------------------------|--|--|----------------------|------------------|------|--------|------|
| | | | | ≥-55°C | 25°C | ≤125°C | |
| V _{T+min} | Minimum Positive-Going Input Threshold Voltage | Input on terminals A or B; other inputs to V _{CC} | 5.0 | 2.2 | 2.2 | 2.2 | V |
| | | | 10 | 4.6 | 4.6 | 4.6 | |
| | | | 15 | 6.8 | 6.8 | 6.8 | |
| | | Input on terminals A and B; other inputs to V _{CC} | 5.0 | 2.6 | 2.6 | 2.6 | |
| | | | 10 | 5.6 | 5.6 | 5.6 | |
| | | | 15 | 6.3 | 6.3 | 6.3 | |
| V _{T+max} | Maximum Positive-Going Input Threshold Voltage | Input on terminals A or B; other inputs to V _{CC} | 5.0 | 3.6 | 3.6 | 3.6 | V |
| | | | 10 | 7.1 | 7.1 | 7.1 | |
| | | | 15 | 10.8 | 10.8 | 10.8 | |
| | | Input on terminals A and B; other inputs to V _{CC} | 5.0 | 4 | 4 | 4 | |
| | | | 10 | 8.2 | 8.2 | 8.2 | |
| | | | 15 | 12.7 | 12.7 | 12.7 | |
| V _{T-min} | Minimum Negative-Going Input Threshold Voltage | Input on terminals A or B; other inputs to V _{CC} | 5.0 | 0.9 | 0.9 | 0.9 | V |
| | | | 10 | 2.5 | 2.5 | 2.5 | |
| | | | 15 | 4 | 4 | 4 | |
| | | Input on terminals A and B; other inputs to V _{CC} | 5.0 | 1.4 | 1.4 | 1.4 | |
| | | | 10 | 3.4 | 3.4 | 3.4 | |
| | | | 15 | 4.8 | 4.8 | 4.8 | |
| V _{T-max} | Maximum Negative-Going Input Threshold Voltage | Input on terminals A or B; other inputs to V _{CC} | 5.0 | 2.8 | 2.8 | 2.8 | V |
| | | | 10 | 5.2 | 5.2 | 5.2 | |
| | | | 15 | 7.4 | 7.4 | 7.4 | |
| | | Input on terminals A and B; other inputs to V _{CC} | 5.0 | 3.2 | 3.2 | 3.2 | |
| | | | 10 | 6.6 | 6.6 | 6.6 | |
| | | | 15 | 9.6 | 9.6 | 9.6 | |
| V _{Hmin} Note | Minimum Hysteresis Voltage | Input on terminals A or B; other inputs to V _{CC} | 5.0 | 0.3 | 0.3 | 0.3 | V |
| | | | 10 | 1.2 | 1.2 | 1.2 | |
| | | | 15 | 1.6 | 1.6 | 1.6 | |
| | | Input on terminals A and B; other inputs to V _{CC} | 5.0 | 0.3 | 0.3 | 0.3 | |
| | | | 10 | 1.2 | 1.2 | 1.2 | |
| | | | 15 | 1.6 | 1.6 | 1.6 | |
| V _{Hmax} Note | Maximum Hysteresis Voltage | Input on terminals A or B; other inputs to V _{CC} | 5.0 | 1.6 | 1.6 | 1.6 | V |
| | | | 10 | 3.4 | 3.4 | 3.4 | |
| | | | 15 | 5 | 5 | 5 | |
| | | Input on terminals A and B; other inputs to V _{CC} | 5.0 | 1.6 | 1.6 | 1.6 | |
| | | | 10 | 3.4 | 3.4 | 3.4 | |
| | | | 15 | 5 | 5 | 5 | |
| I _{IN} | Maximum Input Leakage Current | V _{IN} = GND or V _{CC} | 18 | ±0.1 | ±0.1 | ±1.0 | µA |



DC ELECTRICAL CHARACTERISTICS(Voltages Referenced to GND) - continued

| Symbol | Parameter | Test Conditions | V _{CC} V | Guaranteed Limit | | | Unit |
|-----------------|--|---|----------------------|------------------|-------|--------|------|
| | | | | ≥-55°C | 25°C | ≤125°C | |
| I _{CC} | Maximum Quiescent Supply Current (per Package) | V _{IN} = GND or V _{CC} | 5.0 | 1 | 1 | 30 | μA |
| | | | 10 | 2 | 2 | 60 | |
| | | | 15 | 4 | 4 | 120 | |
| | | | 20 | 20 | 20 | 600 | |
| I _{OL} | Minimum Output Low (Sink) Current | V _{IN} = GND or V _{CC} U _{OL} =0.4 V U _{OL} =0.5 V U _{OL} =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 _{OH} | Minimum Output High (Source) Current | V _{IN} = GND or V _{CC} U _{OH} =2.5 V U _{OH} =4.6 V U _{OH} =9.5 V U _{OH} =13.5 V | 5.0 | -2.0 | -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 | |
| V _{OH} | Minimum High-Level Output Voltage | V _{IN} =GND or V _{CC} | 5.0 | 4.95 | 4.95 | 4.95 | V |
| | | | 10 | 9.95 | 9.95 | 9.95 | |
| | | | 15 | 14.95 | 14.95 | 14.95 | |
| V _{OL} | Maximum Low-Level Output Voltage | V _{IN} = V _{CC} | 5.0 | 0.05 | 0.05 | 0.05 | V |
| | | | 10 | 0.05 | 0.05 | 0.05 | |
| | | | 15 | 0.05 | 0.05 | 0.05 | |

Note. V_{Hmin}>(V_{T+}.min)-(V_T.max); V_{Hmax}=(V_{T+}.max)+(V_T.min).

AC ELECTRICAL CHARACTERISTICS(C_L=50pF, R_L=200kΩ, Input t_r=t_f=20 ns)

| Symbol | Parameter | V _{CC} V | Guaranteed Limit | | | Unit |
|-------------------------------------|--|----------------------|------------------|------|--------|------|
| | | | ≥-55°C | 25°C | ≤125°C | |
| t _{PLH} , t _{PHL} | Maximum Propagation Delay, Input A or B to Output Y (Figure 2) | 5.0 | 380 | 380 | 760 | ns |
| | | 10 | 180 | 180 | 360 | |
| | | 15 | 130 | 130 | 260 | |
| t _{TLH} , t _{THL} | Maximum Output Transition Time, Any Output (Figure 2) | 5.0 | 200 | 200 | 400 | ns |
| | | 10 | 100 | 100 | 200 | |
| | | 15 | 80 | 80 | 160 | |
| C _{IN} | Maximum Input Capacitance | - | | 7.5 | | pF |

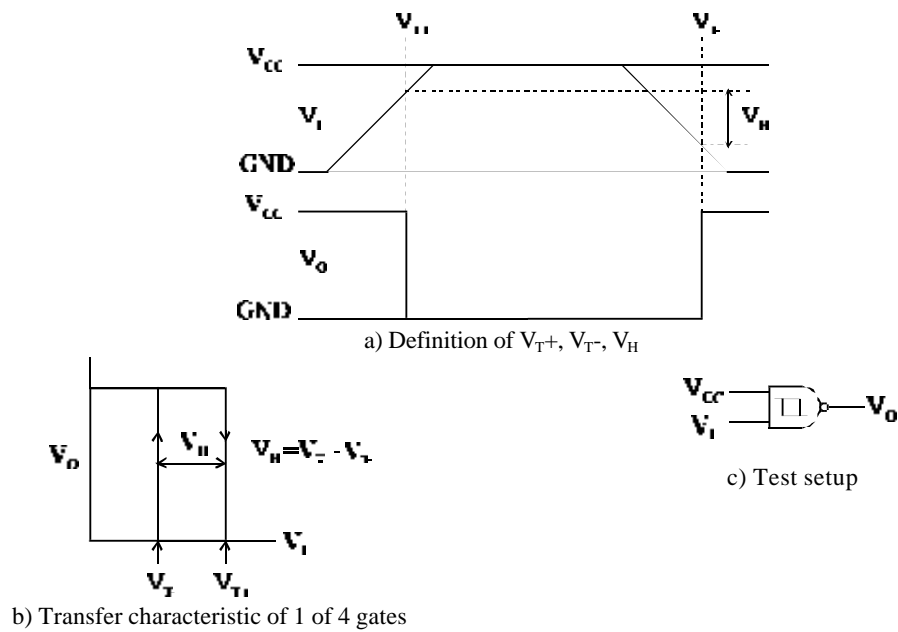


Figure 1. Hysteresis definition, characteristic, and test setup

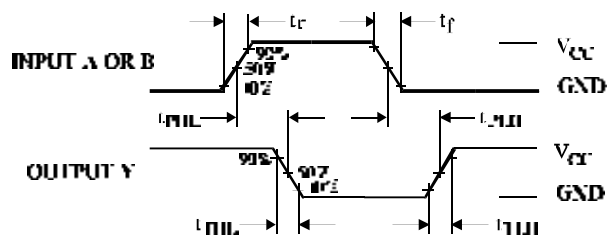


Figure 2. Switching Waveforms

**EXPANDED LOGIC DIAGRAM
(1/4 of the Device)**

