

CD40106B Types

CMOS Hex Schmitt Triggers

High-Voltage Types (20-Volt Rating)

■ CD40106B consists of six Schmitt-trigger circuits. Each circuit functions as an inverter with Schmitt-trigger action on the input. The trigger switches at different points for positive- and negative-going signals. The difference between the positive-going voltage (VP) and the negative-going voltage (VN) is defined as hysteresis voltage (VH) (see Fig.6). The CD40106B types are supplied in 14-lead hermetic dual-in-line ceramic packages (D and F suffixes), 14-lead dual-in-line plastic package (E suffix), and in chip form (H suffix).

Features:

- Schmitt-trigger action with no external components
- Hysteresis voltage (typ.) 0.9 V at VDD = 5 V, 2.3 V at VDD = 10 V, and 3.5 V at VDD = 15 V
- Noise immunity greater than 50%
- No limit on input rise and fall times
- Standardized, symmetrical output characteristics
- 100% tested for quiescent current at 20 V
- Maximum input current of 1 μA at 18 V over full package-temperature range; 100 nA at 18 V and 25°C
- Low VDD to VSS current during slow input ramp
- 5-V, 10-V, and 15-V parametric ratings
- Meets all requirements of JEDEC Tentative Standard No. 13B, "Standard Specifications for Description of 'B' Series CMOS Devices"

Applications:

- Wave and pulse shapers
- High-noise-environment systems
- Monostable multivibrators
- Astable multivibrators

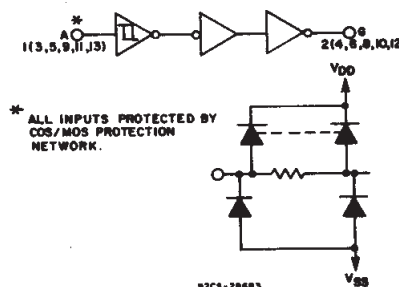
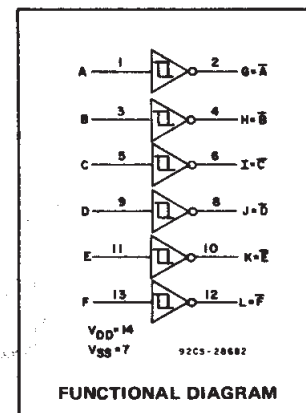


Fig.1 - Logic diagram (1 of 6 Schmitt triggers).

MAXIMUM RATINGS, Absolute-Maximum Values:

| | |
|--|--------------------------------------|
| DC SUPPLY-VOLTAGE RANGE, (VDD) | -0.5V to +20V |
| Voltages referenced to VSS Terminal) | |
| INPUT VOLTAGE RANGE, ALL INPUTS | -0.5V to VDD +0.5V |
| DC INPUT CURRENT, ANY ONE INPUT | ±10mA |
| POWER DISSIPATION PER PACKAGE (PD): | |
| For TA = -55°C to +100°C | 500mW |
| For TA = +100°C to +125°C | Derate Linearity at 12mW/°C to 200mW |
| DEVICE DISSIPATION PER OUTPUT TRANSISTOR | |
| FOR TA = FULL PACKAGE-TEMPERATURE RANGE (All Package Types) | 100mW |
| OPERATING-TEMPERATURE RANGE (TA) | -55°C to +125°C |
| STORAGE TEMPERATURE RANGE (Tstg) | -65°C to +150°C |
| LEAD TEMPERATURE (DURING SOLDERING): | |
| At distance 1/16 ± 1/32 inch (1.59 ± 0.79mm) from case for 10s max | +265°C |

RECOMMENDED OPERATING CONDITIONS

For maximum reliability, nominal operating conditions should be selected so that operation is always within the following ranges:

| CHARACTERISTIC | LIMITS | | UNITS |
|--|--------|------|-------|
| | MIN. | MAX. | |
| Supply-Voltage Range (For TA Full Package-Temperature Range) | 3 | 18 | V |

DYNAMIC ELECTRICAL CHARACTERISTICS

At TA = 25°C, Input tr, tf = 20 ns, CL = 50 pF, RL = 200 kΩ

| CHARACTERISTIC | TEST CONDITIONS | LIMITS | | UNITS | |
|-------------------------|-----------------|---------|------|-------|------|
| | | VDD (V) | TYP. | | MAX. |
| Propagation Delay Time: | tPHL | 5 | 140 | 280 | ns |
| | tPLH | 10 | 70 | 140 | |
| | | 15 | 60 | 120 | |
| Transition Time: | tTHL | 5 | 100 | 200 | ns |
| | tTLH | 10 | 50 | 100 | |
| | | 15 | 40 | 80 | |
| Input Capacitance, CIN | Any Input | | 5 | 7.5 | pF |

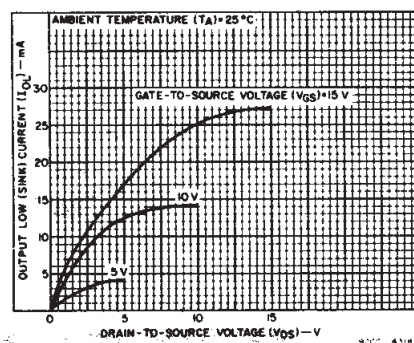


Fig.2 - Typical output low (sink) current characteristics.

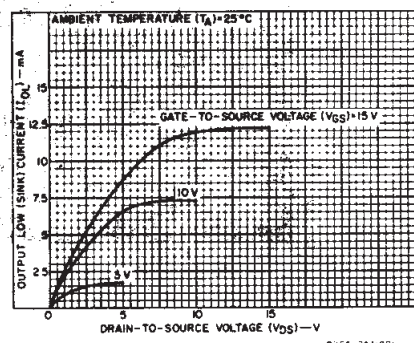
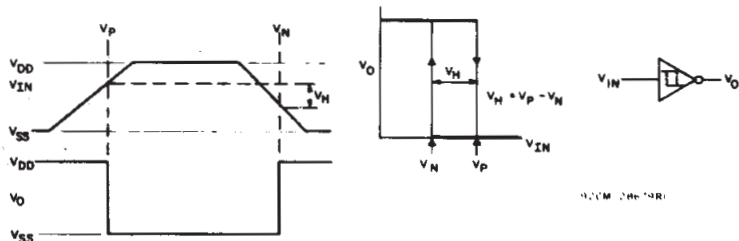


Fig.3 - Minimum output low (sink) current characteristics.

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STATIC ELECTRICAL CHARACTERISTICS

| CHARACTERISTIC | CONDITIONS | | | LIMITS AT INDICATED TEMPERATURES (°C) | | | | | | | UNITS |
|--|-----------------------|------------------------|------------------------|---------------------------------------|-------|-------|-------|-------|-------------------|------|-------|
| | V _O (V) | V _{IN} (V) | V _{DD} (V) | -55 | -40 | +85 | +125 | +25 | | | |
| | | | | | | | | Min. | Typ. | Max. | |
| Quiescent Device Current, I _{DD} Max. | - | 0,5 | 5 | 1 | 1 | 30 | 30 | - | 0,02 | 1 | μA |
| | - | 0,10 | 10 | 2 | 2 | 60 | 60 | - | 0,02 | 2 | |
| | - | 0,15 | 15 | 4 | 4 | 120 | 120 | - | 0,02 | 4 | |
| | - | 0,20 | 20 | 20 | 20 | 600 | 600 | - | 0,04 | 20 | |
| Positive Trigger Threshold Voltage V _P Min. | - | - | 5 | 2,2 | 2,2 | 2,2 | 2,2 | 2,2 | 2,9 | - | V |
| | - | - | 10 | 4,6 | 4,6 | 4,6 | 4,6 | 4,6 | 5,9 | - | |
| | - | - | 15 | 6,8 | 6,8 | 6,8 | 6,8 | 6,8 | 8,8 | - | |
| | - | - | 5 | 3,6 | 3,6 | 3,6 | 3,6 | - | 2,9 | 3,6 | |
| | - | - | 10 | 7,1 | 7,1 | 7,1 | 7,1 | - | 5,9 | 7,1 | |
| | - | - | 15 | 10,8 | 10,8 | 10,8 | 10,8 | - | 8,8 | 10,8 | |
| Negative Trigger Threshold Voltage V _N Min. | - | - | 5 | 0,9 | 0,9 | 0,9 | 0,9 | 0,9 | 1,9 | - | V |
| | - | - | 10 | 2,5 | 2,5 | 2,5 | 2,5 | 2,5 | 3,9 | - | |
| | - | - | 15 | 4 | 4 | 4 | 4 | 4 | 5,8 | - | |
| | - | - | 5 | 2,8 | 2,8 | 2,8 | 2,8 | - | 1,9 | 2,8 | |
| | - | - | 10 | 5,2 | 5,2 | 5,2 | 5,2 | - | 3,9 | 5,2 | |
| | - | - | 15 | 7,4 | 7,4 | 7,4 | 7,4 | - | 5,8 | 7,4 | |
| Hysteresis Voltage V _H Min. | - | - | 5 | 0,3 | 0,3 | 0,3 | 0,3 | 0,3 | 0,9 | - | V |
| | - | - | 10 | 1,2 | 1,2 | 1,2 | 1,2 | 1,2 | 2,3 | - | |
| | - | - | 15 | 1,6 | 1,6 | 1,6 | 1,6 | 1,6 | 3,5 | - | |
| | - | - | 5 | 1,6 | 1,6 | 1,6 | 1,6 | - | 0,9 | 1,6 | |
| | - | - | 10 | 3,4 | 3,4 | 3,4 | 3,4 | - | 2,3 | 3,4 | |
| | - | - | 15 | 5 | 5 | 5 | 5 | - | 3,5 | 5 | |
| Output Low (Sink) Current, I _{OL} Min. | 0,4 | 0,5 | 5 | 0,64 | 0,61 | 0,42 | 0,36 | 0,51 | 1 | - | mA |
| | 0,5 | 0,10 | 10 | 1,6 | 1,5 | 1,1 | 0,9 | 1,3 | 2,6 | - | |
| | 1,5 | 0,15 | 15 | 4,2 | 4 | 2,8 | 2,4 | 3,4 | 6,8 | - | |
| Output High (Source) Current, I _{OH} Min. | 4,6 | 0,5 | 5 | -0,64 | -0,61 | -0,42 | -0,36 | -0,51 | -1 | - | mA |
| | 2,5 | 0,5 | 5 | -2 | -1,8 | -1,3 | -1,15 | -1,6 | -3,2 | - | |
| | 9,5 | 0,10 | 10 | -1,6 | -1,5 | -1,1 | -0,9 | -1,3 | -2,6 | - | |
| | 13,5 | 0,15 | 15 | -4,2 | -4 | -2,8 | -2,4 | -3,4 | -6,8 | - | |
| Output Voltage Low-Level, V _{OL} Max. | - | 5 | 5 | | | 0,05 | | | 0 | 0,05 | V |
| | - | 10 | 10 | | | 0,05 | | | 0 | 0,05 | |
| | - | 15 | 15 | | | 0,05 | | | 0 | 0,05 | |
| Output Voltage High Level, V _{OH} Min. | - | 0 | 5 | | | 4,95 | | 4,95 | 5 | - | V |
| | - | 0 | 10 | | | 9,95 | | 9,95 | 10 | - | |
| | - | 0 | 15 | | | 14,95 | | 14,95 | 15 | - | |
| Input Current, I _{IN} Max. | - | 0,18 | 18 | ±0,1 | ±0,1 | ±1 | ±1 | - | ±10 ⁻⁵ | ±0,1 | μA |



a) Definition of V_P, V_N, V_H
b) Transfer characteristics of 1 of 6 gates
Fig. 6 - Hysteresis definition, characteristics, and test set-up.

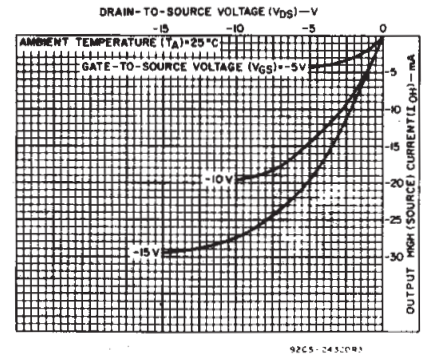


Fig. 4 - Typical output high (source) current characteristics.

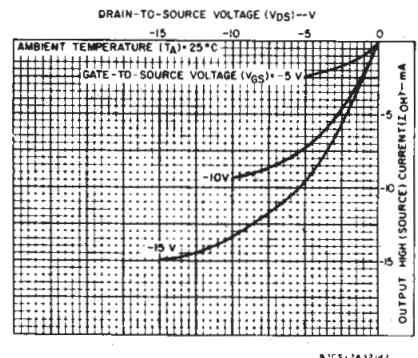


Fig. 5 - Minimum output high (source) current characteristics.

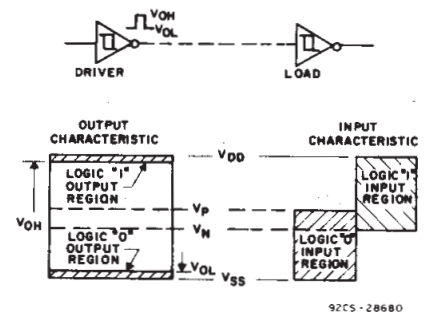


Fig. 7 - Input and output characteristics.

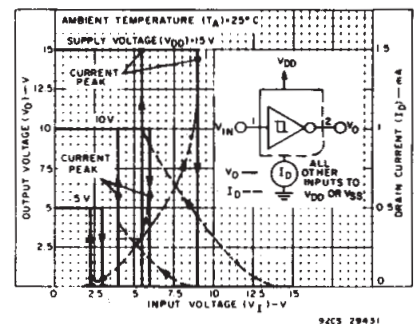


Fig. 8 - Typical current and voltage transfer characteristics.

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Fig. 9 - Typical voltage transfer characteristics as a function of temperature.

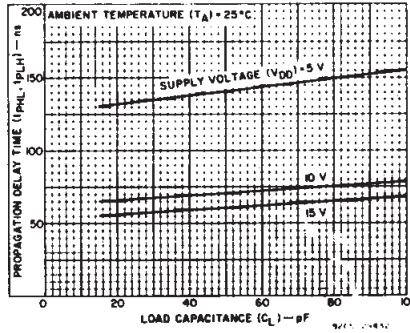


Fig. 10 - Typical propagation delay time as a function of load capacitance.



Fig. 11 - Typical transition time as a function of load capacitance.



Fig. 12 - Typical power dissipation per trigger as a function of input frequency.



Fig. 13 - Typical trigger threshold voltage as a function of supply voltage.

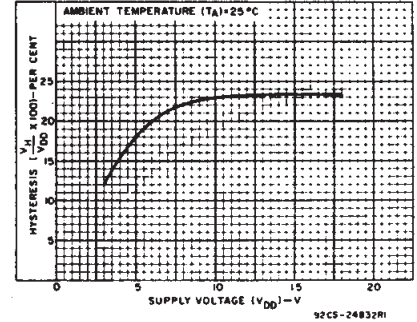


Fig. 14 - Typical per cent hysteresis as a function of supply voltage.

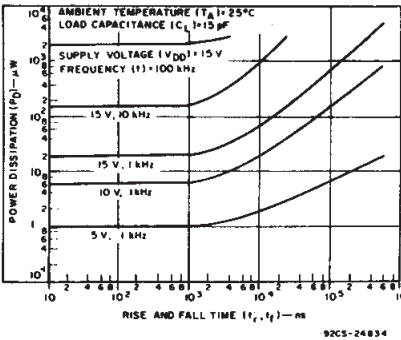


Fig. 15 - Typical power dissipation as a function of rise and fall times.

APPLICATIONS



Fig. 16 - Wave shaper.

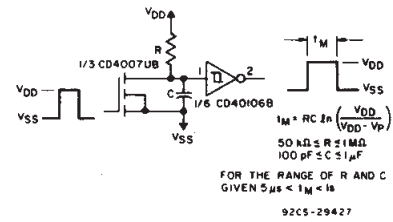


Fig. 17 - Monostable multivibrator.

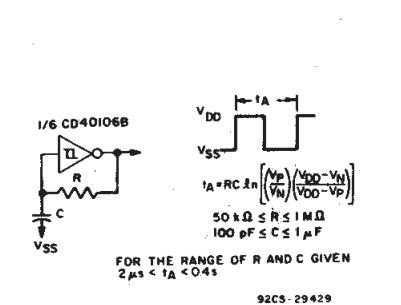


Fig. 18 - Astable multivibrator.

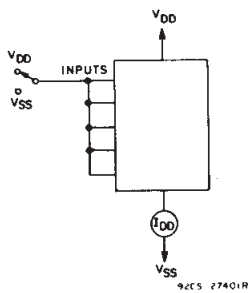


Fig. 19 - Quiescent device current test circuit.

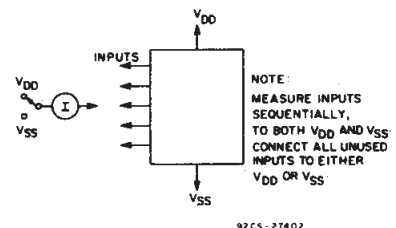


Fig. 20 - Input current test circuit.

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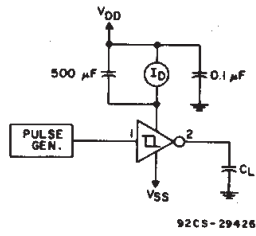
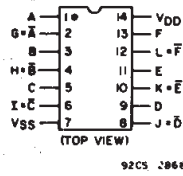
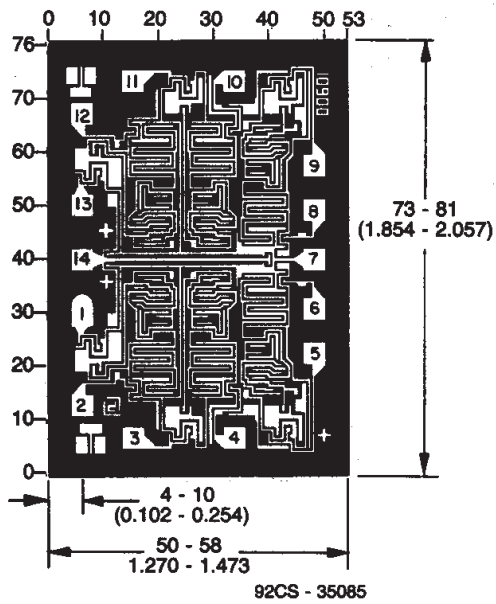


Fig.21 - Dynamic power dissipation test circuit.



TERMINAL ASSIGNMENT



Dimensions and Pad Layout for CD40106BH

Dimensions in parentheses are in millimeters and are derived from the basic inch dimensions as indicated. Grid graduations are in mils (10^{-3} inch).

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