MOTOROLA

# MC14584B

## CMOS SSI

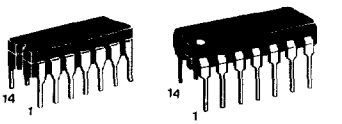
(LOW-POWER COMPLEMENTARY MOS)

## HEX SCHMITT TRIGGER

### HEX SCHMITT TRIGGER

The MC14584B Hex Schmitt Trigger is constructed with MOS P-channel and N-channel enhancement mode devices in a single monolithic structure. These devices find primary use where low power dissipation and/or high noise immunity is desired. The MC14584B may be used in place of the MC14069UB hex inverter for enhanced noise immunity to "square up" slowly changing waveforms.

- Supply Voltage Range = 3.0 Vdc to 18 Vdc
- Capable of Driving Two Low-power TTL Loads or One Low-power Schottky TTL Load over the Rated Temperature Range
- Double Diode Protection on All Inputs
- Can Be Used to Replace MC14069UB
- For Greater Hysterisis, Use MC14106B which is Pin-for-Pin Replacement for CD40106B and MM74C14




L SUFFIX
CERAMIC PACKAGE
CASE 632

P SUFFIX
PLASTIC PACKAGE
CASE 646

**ORDERING INFORMATION**

A Series: −55°C to +125°C
MC14XXXBAL (Ceramic Package Only)

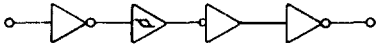
C Series: −40°C to +85°C
MC14XXXBCP (Plastic Package)
MC14XXXBCL (Ceramic Package)

**MAXIMUM RATINGS*** (Voltages Referenced to $V_{SS}$)

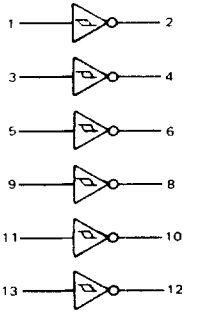
| Symbol | Parameter | Value | Unit |
|---|---|---|---|
| $V_{DD}$ | DC Supply Voltage | −0.5 to +18.0 | V |
| $V_{in}$, $V_{out}$ | Input or Output Voltage (DC or Transient) | −0.5 to $V_{DD}$ +0.5 | V |
| $I_{in}$, $I_{out}$ | Input or Output Current (DC or Transient), per Pin | ±10 | mA |
| $P_D$ | Power Dissipation, per Package† | 500 | mW |
| $T_{stg}$ | Storage Temperature | −65 to +150 | °C |
| $T_L$ | Lead Temperature (8-Second Soldering) | 260 | °C |

*Maximum Ratings are those values beyond which damage to the device may occur
†Temperature Derating: Plastic "P" Package: −12mW/°C from 65°C to 85°C
Ceramic "L" Package −12mW/°C from 100°C to 125°C

**EQUIVALENT CIRCUIT SCHEMATIC**
(1/6 OF CIRCUIT SHOWN)



**LOGIC DIAGRAM**




$V_{DD}$ = Pin 14
$V_{SS}$ = Pin 7

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 $V_{SS} \leq (V_{in}$ or $V_{out}) \leq V_{DD}$.

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

6

**ELECTRICAL CHARACTERISTICS** (Voltages Referenced to $V_{SS}$)

| Characteristic | Symbol | $V_{DD}$ Vdc | $T_{low}$* Min | $T_{low}$* Max | 25°C Min | 25°C Typ # | 25°C Max | $T_{high}$* Min | $T_{high}$* Max | Unit |
|---|---|---|---|---|---|---|---|---|---|---|
| Output Voltage "0" Level | $V_{OL}$ | 5.0 | – | 0.05 | – | 0 | 0.05 | – | 0.05 | Vdc |
| $V_{in} = V_{DD}$ | | 10 | – | 0.05 | – | 0 | 0.05 | – | 0.05 | |
| | | 15 | – | 0.05 | – | 0 | 0.05 | – | 0.05 | |
| "1" Level | $V_{OH}$ | 5.0 | 4.95 | – | 4.95 | 5.0 | – | 4.95 | – | Vdc |
| $V_{in} = 0$ | | 10 | 9.95 | – | 9.95 | 10 | – | 9.95 | – | |
| | | 15 | 14.95 | – | 14.95 | 15 | – | 14.95 | – | |
| Output Drive Current (AL Device) | $I_{OH}$ | | | | | | | | | mAdc |
| ($V_{OH}$ = 2.5 Vdc) Source | | 5.0 | –3.0 | – | –2.4 | –4.2 | – | –1.7 | – | |
| ($V_{OH}$ = 4.6 Vdc) | | 5.0 | –0.64 | – | –0.51 | –0.88 | – | –0.36 | – | |
| ($V_{OH}$ = 9.5 Vdc) | | 10 | –1.6 | – | –1.3 | –2.25 | – | –0.9 | – | |
| ($V_{OH}$ = 13.5 Vdc) | | 15 | –4.2 | – | –3.4 | –8.8 | – | –2.4 | – | |
| ($V_{OL}$ = 0.4 Vdc) Sink | $I_{OL}$ | 5.0 | 0.64 | – | 0.51 | 0.88 | – | 0.36 | – | mAdc |
| ($V_{OL}$ = 0.5 Vdc) | | 10 | 1.6 | – | 1.3 | 2.25 | – | 0.9 | – | |
| ($V_{OL}$ = 1.5 Vdc) | | 15 | 4.2 | – | 3.4 | 8.8 | – | 2.4 | – | |
| Output Drive Current (CL/CP Device) | $I_{OH}$ | | | | | | | | | mAdc |
| ($V_{OH}$ = 2.5 Vdc) Source | | 5.0 | –2.5 | – | –2.1 | –4.2 | – | –1.7 | – | |
| ($V_{OH}$ = 4.6 Vdc) | | 5.0 | –0.52 | – | –0.44 | –0.88 | – | –0.36 | – | |
| ($V_{OH}$ = 9.5 Vdc) | | 10 | –1.3 | – | –1.1 | –2.25 | – | –0.9 | – | |
| ($V_{OH}$ = 13.5 Vdc) | | 15 | –3.6 | – | –3.0 | –8.8 | – | –2.4 | – | |
| ($V_{OL}$ = 0.4 Vdc) Sink | $I_{OL}$ | 5.0 | 0.52 | – | 0.44 | 0.88 | – | 0.36 | – | mAdc |
| ($V_{OL}$ = 0.5 Vdc) | | 10 | 1.3 | – | 1.1 | 2.25 | – | 0.9 | – | |
| ($V_{OL}$ = 1.5 Vdc) | | 15 | 3.6 | – | 3.0 | 8.8 | – | 2.4 | – | |
| Input Current (AL Device) | $I_{in}$ | 15 | – | ±0.1 | – | ±0.00001 | ±0.1 | – | ±1.0 | µAdc |
| Input Current (CL/CP Device) | $I_{in}$ | 15 | – | ±0.3 | – | ±0.00001 | ±0.3 | – | ±1.0 | µAdc |
| Input Capacitance ($V_{in}$ = 0) | $C_{in}$ | – | – | – | – | 5.0 | 7.5 | – | – | pF |
| Quiescent Current (AL Device) | $I_{DD}$ | 5.0 | – | 0.25 | – | 0.0005 | 0.25 | – | 7.5 | µAdc |
| (Per Package) | | 10 | – | 0.50 | – | 0.0010 | 0.50 | – | 15 | |
| | | 15 | – | 1.00 | – | 0.0015 | 1.00 | – | 30 | |
| Quiescent Current (CL/CP Device) | $I_{DD}$ | 5.0 | – | 1.0 | – | 0.0005 | 1.0 | – | 7.5 | µAdc |
| (Per Package) | | 10 | – | 2.0 | – | 0.0010 | 2.0 | – | 15 | |
| | | 15 | – | 4.0 | – | 0.0015 | 4.0 | – | 34 | |
| Total Supply Current**† (Dynamic plus Quiescent, Per Package) ($C_L$ = 50 pF on all outputs, all buffers switching) | $I_T$ | 5.0 | $I_T = (1.8\ \mu A/kHz)\ f + I_{DD}$ | | | | | | | µAdc |
| | | 10 | $I_T = (3.6\ \mu A/kHz)\ f + I_{DD}$ | | | | | | | |
| | | 15 | $I_T = (5.4\ \mu A/kHz)\ f + I_{DD}$ | | | | | | | |
| **Hysteresis Voltage** | $V_H$‡ | 5.0 | 0.27 | 1.0 | 0.25 | 0.6 | 1.0 | 0.21 | 1.0 | Vdc |
| | | 10 | 0.36 | 1.3 | 0.30 | 0.70 | 1.2 | 0.25 | 1.2 | |
| | | 15 | 0.77 | 1.7 | 0.60 | 1.1 | 1.5 | 0.50 | 1.4 | |
| **Threshold Voltage** | | | | | | | | | | |
| **Positive-Going** | $V_{T+}$ | 5.0 | 1.9 | 3.5 | 1.8 | 2.7 | 3.4 | 1.7 | 3.4 | Vdc |
| | | 10 | 3.4 | 7.0 | 3.3 | 5.3 | 6.9 | 3.2 | 6.9 | |
| | | 15 | 5.2 | 10.6 | 5.2 | 8.0 | 10.5 | 5.2 | 10.5 | |
| **Negative-Going** | $V_{T-}$ | 5.0 | 1.6 | 3.3 | 1.6 | 2.1 | 3.2 | 1.5 | 3.2 | Vdc |
| | | 10 | 3.0 | 6.7 | 3.0 | 4.6 | 6.7 | 3.0 | 6.7 | |
| | | 15 | 4.5 | 9.7 | 4.6 | 6.9 | 9.8 | 4.7 | 9.9 | |

*$T_{low}$ = –55°C for AL Device, –40°C for CL/CP Device.
$T_{high}$ = +125°C for AL Device, +85°C for CL/CP Device.

#Data labelled "Typ" is not to be used for design purposes but is intended as an indication of the IC's potential performance.

**The formulas given are for the typical characteristics only at 25°C.

†To calculate total supply current at loads other than 50 pF:

$$I_T(C_L) = I_T(50\ pF) + (C_L - 50)\ Vfk$$

where: $I_T$ is in µA (per package), $C_L$ in pF, V = ($V_{DD}$ – $V_{SS}$) in volts, f in kHz is input frequency, and k = 0.001.

‡$V_H = V_{T+} - V_{T-}$ (But maximum variation of $V_H$ is specified as less than $V_{T+\,max} - V_{T-\,min}$).

6

**SWITCHING CHARACTERISTICS** ($C_L$ = 50 pF, $T_A$ = 25°C)

| Characteristic | Symbol | $V_{DD}$ Vdc | Min | Typ # | Max | Unit |
|---|---|---|---|---|---|---|
| Output Rise Time | $t_{TLH}$ | 5.0 | – | 100 | 200 | ns |
| | | 10 | – | 50 | 100 | |
| | | 15 | – | 40 | 80 | |
| Output Fall Time | $t_{THL}$ | 5.0 | – | 100 | 200 | ns |
| | | 10 | – | 50 | 100 | |
| | | 15 | – | 40 | 80 | |
| Propagation Delay Time | $t_{PLH}$, $t_{PHL}$ | 5.0 | – | 125 | 250 | ns |
| | | 10 | – | 50 | 100 | |
| | | 15 | – | 40 | 80 | |

#Data labelled "Typ" is not to be used for design purposes but is intended as an indication of the IC's potential performance.

FIGURE 1 – SWITCHING TIME TEST CIRCUIT AND WAVEFORMS

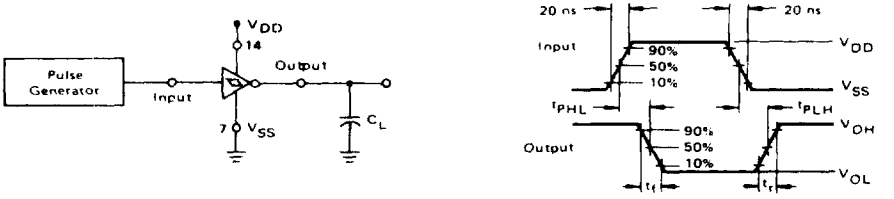



FIGURE 2 – TYPICAL SCHMITT TRIGGER APPLICATIONS

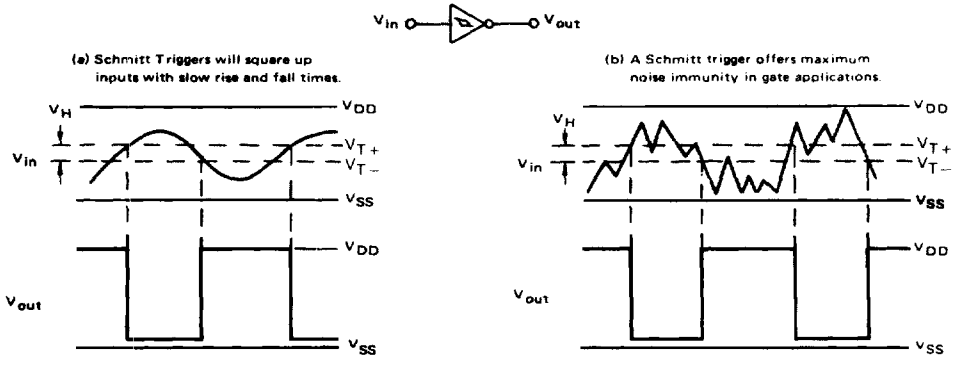



FIGURE 3 – TYPICAL TRANSFER CHARACTERISTICS