

FAIRCHILD
SEMICONDUCTOR™

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MM74C14 Hex Schmitt Trigger

General Description

The MM74C14 Hex Schmitt Trigger is a monolithic complementary MOS (CMOS) integrated circuit constructed with N- and P-channel enhancement transistors. The positive and negative going threshold voltages V_{T+} and V_{T-} , show low variation with respect to temperature (typ. $0.0005V/^{\circ}C$ at $V_{CC} = 10V$), and hysteresis, $V_{T+} - V_{T-} \geq 0.2 V_{CC}$ is guaranteed.

All inputs are protected from damage due to static discharge by diode clamps to V_{CC} and GND.

Features

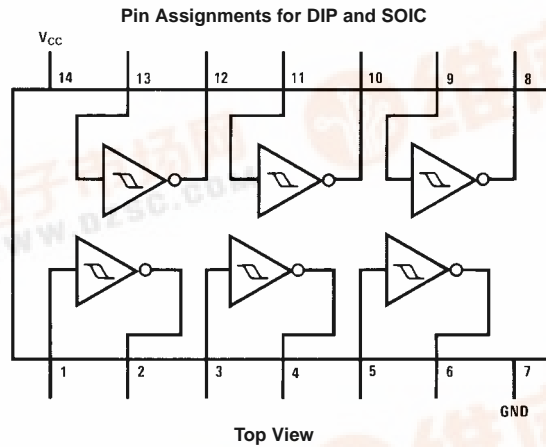
- Wide supply voltage range: 3.0V to 15V
- High noise immunity: $0.70 V_{CC}$ (typ.)
- Low power: TTL compatibility:
0.4 V_{CC} (typ.) 0.2 V_{CC} guaranteed
- Hysteresis: 0.4 V_{CC} (typ.): 0.2 V_{CC} guaranteed

Ordering Code:

| Order Number | Package Number | Package Description |
|--------------|----------------|--|
| MM74C14M | M14A | 14-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-120, 0.150" Narrow |
| MM74C14N | N14A | 14-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300" Wide |

Devices also available in Tape and Reel. Specify by appending suffix letter "X" to the ordering code.

Connection Diagram



MM74C14 Hex Schmitt Trigger



| Absolute Maximum Ratings (Note 1) | | Absolute Maximum V_{CC} | 18V | | | |
|---|--------------------------------------|--|-------|--------|------|---------|
| Voltage at Any Pin | -0.3V to $V_{CC} + 0.3V$ | Lead Temperature (Soldering, 10 seconds) | 260°C | | | |
| Operating Temperature Range | -40°C to +85°C | Note 1: "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be guaranteed. Except for "Operating Temperature Range" they are not meant to imply that the devices should be operated at these limits. The Electrical Characteristics tables provide conditions for actual device operation. | | | | |
| Storage Temperature Range | -65°C to +150°C | | | | | |
| Power Dissipation | | | | | | |
| Dual-In-Line | 700 mW | | | | | |
| Small Outline | 500mW | | | | | |
| Operating V_{CC} Range | 3.0V to 15V | | | | | |
| DC Electrical Characteristics | | | | | | |
| Min/Max limits apply across the guaranteed temperature range unless otherwise noted | | | | | | |
| Symbol | Parameter | Conditions | Min | Typ | Max | Units |
| CMOS TO CMOS | | | | | | |
| V_{T+} | Positive Going Threshold Voltage | $V_{CC} = 5V$ | 3.0 | 3.6 | 4.3 | V |
| | | $V_{CC} = 10V$ | 6.0 | 6.8 | 8.6 | V |
| | | $V_{CC} = 15V$ | 9.0 | 10.0 | 12.9 | V |
| V_{T-} | Negative Going Threshold Voltage | $V_{CC} = 5V$ | 0.7 | 1.4 | 2.0 | V |
| | | $V_{CC} = 10V$ | 1.4 | 3.2 | 4.0 | V |
| | | $V_{CC} = 15V$ | 2.1 | 5.0 | 6.0 | V |
| $V_{T+} - V_{T-}$ | Hysteresis | $V_{CC} = 5V$ | 1.0 | 2.2 | 3.6 | V |
| | | $V_{CC} = 10V$ | 2.0 | 3.6 | 7.2 | V |
| | | $V_{CC} = 15V$ | 3.0 | 5.0 | 10.8 | V |
| $V_{OUT(1)}$ | Logical "1" Output Voltage | $V_{CC} = 5V, I_O = -10 \mu A$ | 4.5 | | | V |
| | | $V_{CC} = 10V, I_O = -10 \mu A$ | 9.0 | | | V |
| $V_{OUT(0)}$ | Logical "0" Output Voltage | $V_{CC} = 5V, I_O = 10 \mu A$ | | | 0.5 | V |
| | | $V_{CC} = 10V, I_O = 10 \mu A$ | | | 1.0 | V |
| $I_{IN(1)}$ | Logical "1" Input Current | $V_{CC} = 15V, V_{IN} = 15V$ | | 0.005 | 1.0 | μA |
| $I_{IN(0)}$ | Logical "0" Input Current | $V_{CC} = 15V, V_{IN} = 0V$ | -1.0 | -0.005 | | μA |
| I_{CC} | Supply Current | $V_{CC} = 15V, V_{IN} = 0V/15V$ | | 0.05 | 15 | μA |
| | | $V_{CC} = 5V, V_{IN} = 2.5V$ (Note 2) | | 20 | | μA |
| | | $V_{CC} = 10V, V_{IN} = 5V$ (Note 2) | | 200 | | μA |
| | | $V_{CC} = 15V, V_{IN} = 7.5V$ (Note 2) | | 600 | | μA |
| CMOS/LPTTL INTERFACE | | | | | | |
| $V_{IN(1)}$ | Logical "1" Input Voltage | $V_{CC} = 5V$ | 4.3 | | | V |
| $V_{IN(0)}$ | Logical "0" Input Voltage | $V_{CC} = 5V$ | | | 0.7 | V |
| $V_{OUT(1)}$ | Logical "1" Output Voltage | 74C, $V_{CC} = 4.75V, I_O = -360 \mu A$ | 2.4 | | | V |
| $V_{OUT(0)}$ | Logical "0" Output Voltage | 74C, $V_{CC} = 4.75V, I_O = 360 \mu A$ | | | 0.4 | V |
| OUTPUT DRIVE (see Family Characteristics Data Sheet) $T_A = 25^\circ C$ (Short Circuit Current) | | | | | | |
| I_{SOURCE} | Output Source Current (P-Channel) | $V_{CC} = 5V, V_{OUT} = 0V$ | -1.75 | -3.3 | | mA |
| I_{SOURCE} | Output Source Current (P-Channel) | $V_{CC} = 10V, V_{OUT} = 0V$ | -8.0 | -15 | | mA |
| I_{SINK} | Output Sink Current (N-Channel) | $V_{CC} = 5V, V_{OUT} = V_{CC}$ | 1.75 | 3.6 | | mA |
| I_{SINK} | Output Sink Current (N-Channel) | $V_{CC} = 10V, V_{OUT} = V_{CC}$ | 8.0 | 16 | | mA |
| Note 2: Only one of the six inputs is at $\frac{1}{2} V_{CC}$; the others are either at V_{CC} or GND. | | | | | | |

AC Electrical Characteristics (Note 3)

$T_A = 25^\circ\text{C}$, $C_L = 50\text{ pF}$, unless otherwise specified

| Symbol | Parameter | Conditions | Min | Typ | Max | Units |
|-----------|--|-----------------------|-----|-----|-----|-------|
| t_{PD0} | Propagation Delay from Input to Output | $V_{CC} = 5\text{V}$ | | 220 | 400 | n |
| t_{PD1} | | $V_{CC} = 10\text{V}$ | | 80 | 200 | ns |
| C_{IN} | Input Capacitance | Any Input (Note 4) | | 5.0 | | pF |
| C_{PD} | Power Dissipation Capacitance | Per Gate (Note 5) | | 20 | | pF |

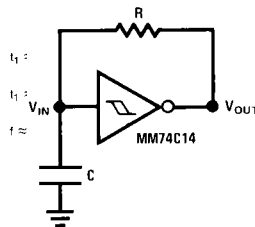
Note 3: AC Parameters are guaranteed by DC correlated testing.

Note 4: Capacitance is guaranteed by periodic testing.

Note 5: C_{PD} determines the no load AC power consumption of any CMOS device. For complete explanation see Family Characteristics Application Note—AN-90.

Typical Applications

Low Power Oscillator

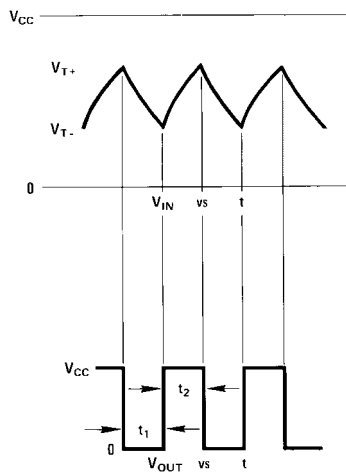


$$t_1 \approx RC \ln \frac{V_{T+}}{V_T}$$

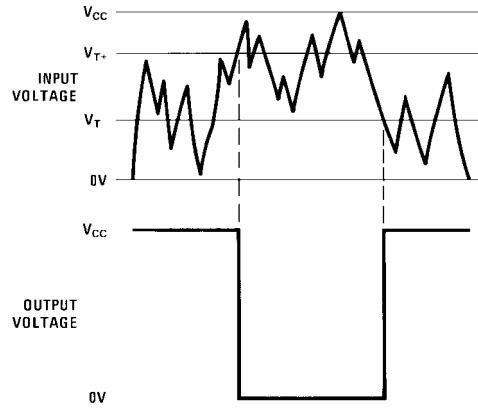
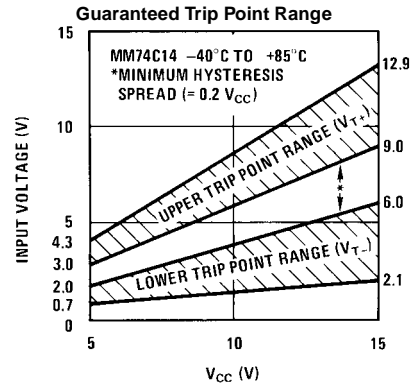
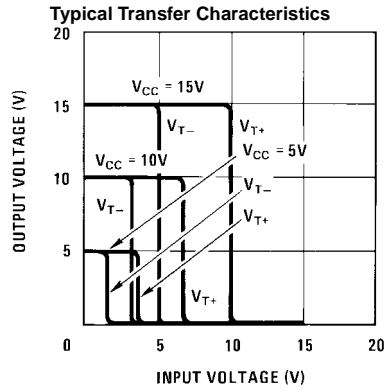
$$t_2 \approx RC \ln \frac{V_{CC} - V_{T-}}{V_{CC} - V_{T+}}$$

$$f \approx \frac{1}{RC \ln \frac{V_{T+}(V_{CC} - V_{T-})}{V_{T-}(V_{CC} - V_{T+})}} \approx \frac{1}{1.7 RC}$$

Note: The equations assume $t_1 + t_2 \gg t_{pd0} + t_{pd1}$

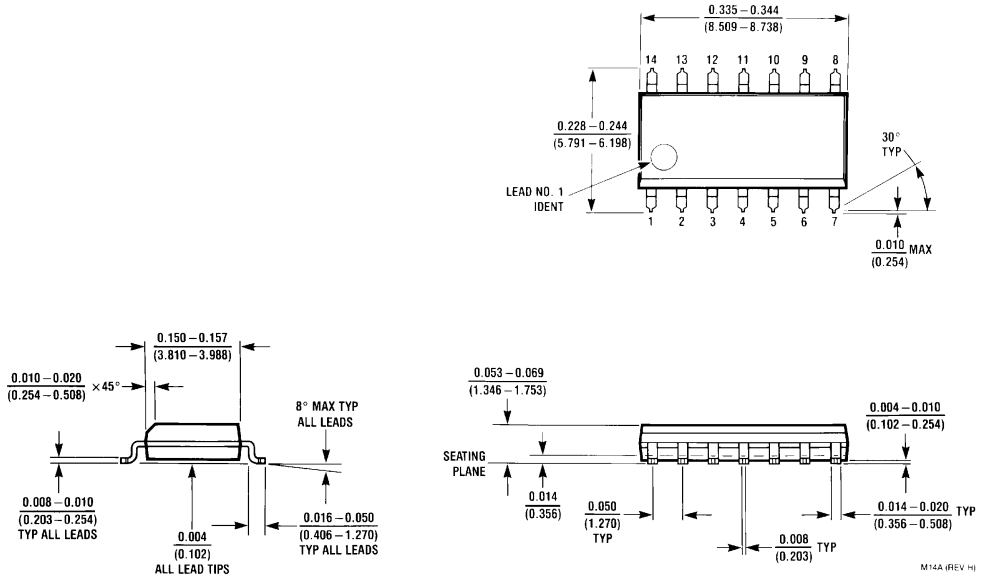


Typical Performance Characteristics



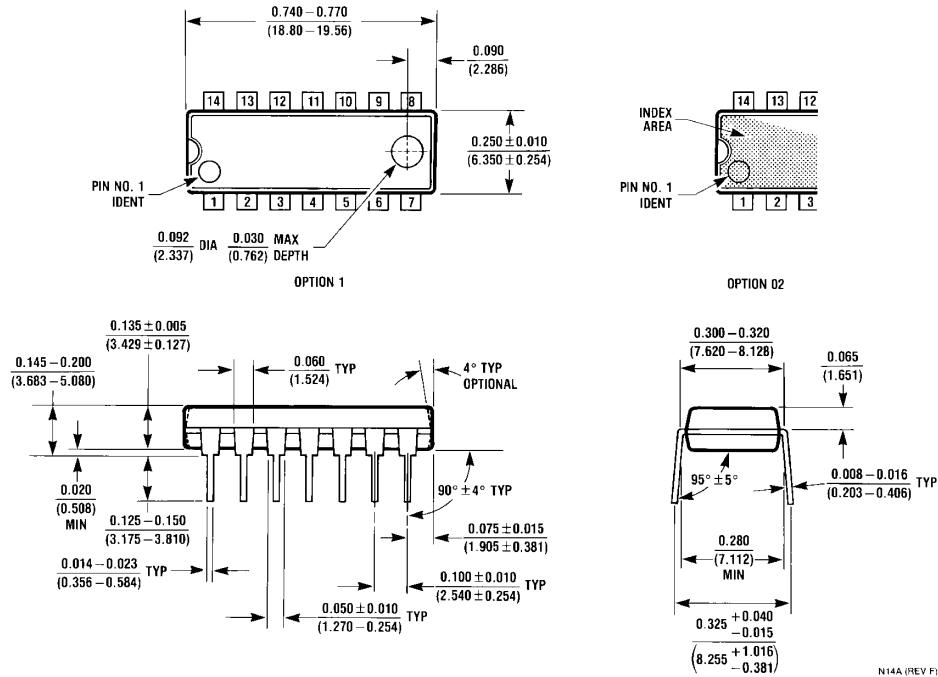
Note: For more information on output drive characteristics, power dissipation, and propagation delays, see AN-90.

Physical Dimensions inches (millimeters) unless otherwise noted



14-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-120, 0.150" Narrow Package Number M14A

Physical Dimensions inches (millimeters) unless otherwise noted (Continued)



N14A (REV F)

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