FAIRCHILD SEMICONDUCTOR™

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# MM74C914
# Hex Schmitt Trigger with Extended Input Voltage

## General Description

The MM74C914 is a monolithic CMOS Hex Schmitt trigger with special input protection scheme. This scheme allows the input voltage levels to exceed $V_{CC}$ or ground by at least 10V ($V_{CC}$ −25V to GND + 25V), and is valuable for applications involving voltage level shifting or mismatched power supplies.

The positive and negative-going threshold voltages, $V_{T+}$ and $V_{T-}$, show low variation with respect to temperature (typ 0.0005V/°C at $V_{CC}$ = 10V). And the hysteresis, $V_{T+} - V_{T-} \geq 0.2\ V_{CC}$ is guaranteed.

## Features

- Hysteresis: 0.45 $V_{CC}$ (typ.) 0.2 $V_{CC}$guaranteed
- Special input protection: Extended Input Voltage Range
- Wide supply voltage range: 3V to 15V
- High noise immunity: 0.7 $V_{CC}$ (typ.)
- Low power TTL compatibility: Fan out of 2 driving 74L

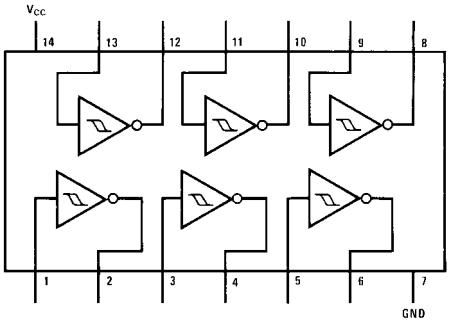
## Ordering Code:

| Order Number | Package Number | Package Description |
|---|---|---|
| MM74C914M | M14A | 14-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-120, 0.150" Narrow |
| MM74C914N | N14A | 14-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300" Wide |

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

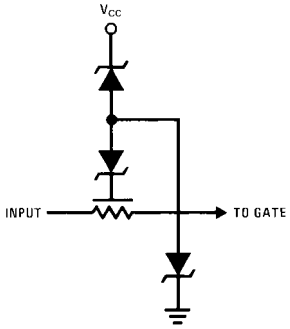
## Connection Diagrams

**Pin Assignments for DIP**




**Top View**

**Special Input Protection**




**8V ≈ 25V**
**for the diodes.**

## Absolute Maximum Ratings (Note 1)

| | |
|---|---|
| Voltage at any Input Pin | $V_{CC}$ − 25V to GND + 25V |
| Voltage at any other Pin | −0.3Vto $V_{CC}$ + 0.3V |
| Operating Temperature Range ($T_A$) | −40°C to +85°C |
| Storage Temperature Range ($T_S$) | −65°C to +150°C |
| Power Dissipation | |
| Dual-In-Line | 700 mW |
| Small Outline | 500mW |
| Operating $V_{CC}$ Range | 3V to 15V |
| Absolute Maximum ($V_{CC}$) | 18V |
| Lead Temperature ($T_L$) | |
| (Soldering, 10 seconds) | 300°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.

## DC Electrical Characteristics

Min/Max limits apply across 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 | 12.9 | |
| $V_{T-}$ | 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 | 6.0 | |
| $V_{T+} - V_{T-}$ | 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 | 10.8 | V |
| $V_{OUT(1)}$ | Logical"1" Output Voltage | $V_{CC}$ = 5V, $I_O$ = −10 µA | 4.5 | | | V |
| | | $V_{CC}$ = 10V, $I_O$ = −10 µA | 9.0 | | | V |
| $V_{OUT(0)}$ | Logical "0" Output Voltage | $V_{CC}$ = 5V, $I_O$ = +10 µA | | | 0.5 | V |
| | | $V_{CC}$ = 10V, $I_O$ = +10 µA | | | 1.0 | V |
| $I_{IN(1)}$ | Logical "1" Input Current | $V_{CC}$ = 15V, $V_{IN}$ = 25V | | 0.005 | 5.0 | µA |
| $I_{IN(0)}$ | Logical "0" Input Current | $V_{CC}$ = 15V, $V_{IN}$ = −10V | −100 | −0.005 | | µA |
| $I_{CC}$ | Supply Current | $V_{CC}$ = 15V, $V_{IN}$ = − 10V/25V | | 0.05 | 300 | 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 | $V_{CC}$ = 4.75V, $I_O$ = −360 µA | 2.4 | | | V |
| $V_{OUT(0)}$ | Logical "0" Output Voltage | $V_{CC}$ = 4.75V, $I_O$ = 360 µA | | | 0.4 | V |
| **OUTPUT DRIVE (See Family Characteristics Data Sheet) (Short Circuit Current)** | | | | | | |
| $I_{SOURCE}$ | Output Source Current (P-Channel) | $V_{CC}$ = 5V, $V_{OUT}$ = 0V, $T_A$ = 25°C | −1.75 | −3.3 | | mA |
| $I_{SOURCE}$ | Output Source Current (P-Channel) | $V_{CC}$ = 10V, $V_{OUT}$ = 0V, $T_A$ = 25°C | −8.0 | −15 | | mA |
| $I_{SINK}$ | Output Sink Current (N-Channel) | $V_{CC}$ = 5V, $V_{OUT}$ = $V_{CC}$, $T_A$ = 25°C | 1.75 | 3.6 | | mA |
| $I_{SINK}$ | Output Sink Current (N-Channel) | $V_{CC}$ = 10V, $V_{OUT}$ = $V_{CC}$, $T_A$ = 25°C | 8.0 | 16 | | mA |

**Note 2:** Only one input is at ½ $V_{CC}$, the others are either at $V_{CC}$ or GND.

## AC Electrical Characteristics (Note 3)

$T_A$ = 25°C, $C_L$ = 50 pF, unless otherwise specified

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

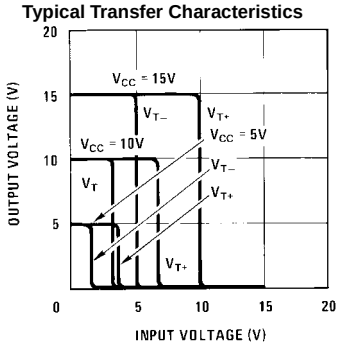
**Note 3:** AC Parameters are guaranteed by DC correlated testing.

**Note 4:** Capacitance is guaranteed by periodic testing.

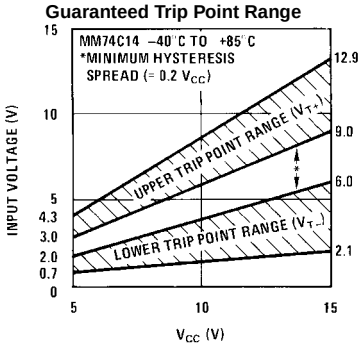
**Note 5:** $C_{PD}$ determines the no load AC power consumption of any CMOS device. For complete explanation see Family Characteristics Application Note, AN-90.

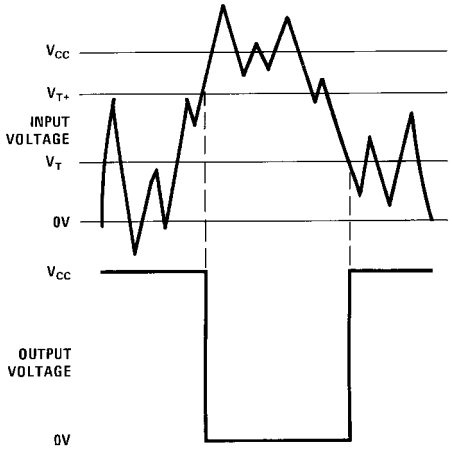
## Typical Performance Characteristics

**Typical Transfer Characteristics**

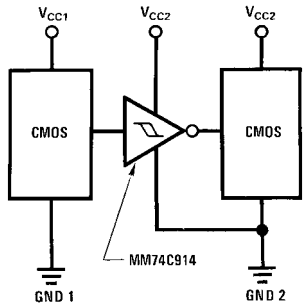



**Guaranteed Trip Point Range**



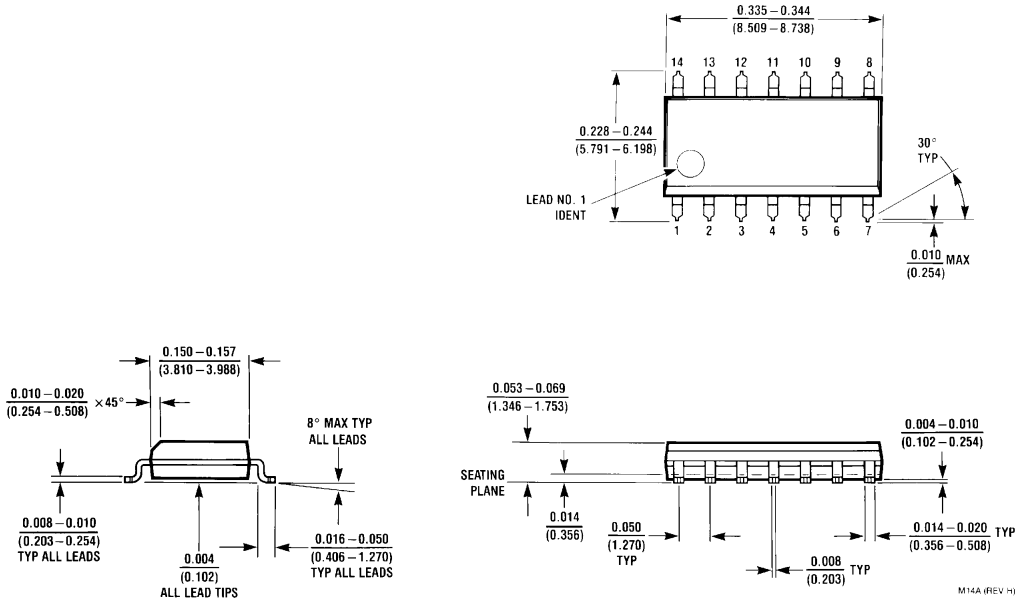

## Typical Application




**Note:** $V_{CC1} = V_{CC2}$

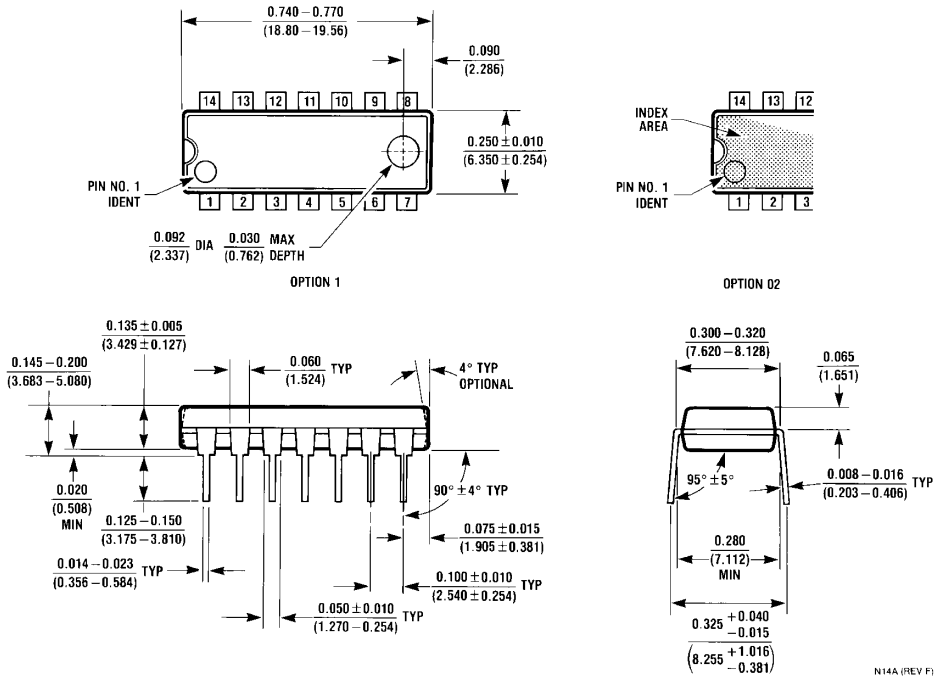
GND1 = GND2

## 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)




**14-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300" Wide**
**Package Number N14A**

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