

**FAIRCHILD**  
SEMICONDUCTOR™

October 1987  
Revised January 1999

## 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

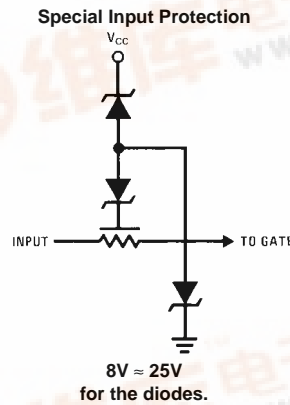
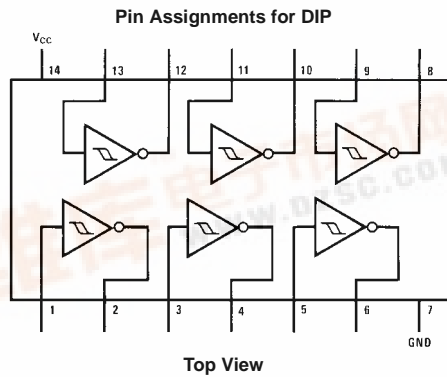
- Hysteresis:  $0.45 V_{CC}$  (typ.)  $0.2 V_{CC}$  guaranteed
- Special input protection: Extended Input Voltage Range
- Wide supply voltage range: 3V to 15V
- High noise immunity:  $0.7 V_{CC}$  (typ.)
- Low power TTL compatibility: Fan out of 2 driving 74L

### 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



MM74C914 Hex Schmitt Trigger with Extended Input Voltage



<b>Absolute Maximum Ratings</b> (Note 1)		Operating $V_{CC}$ Range	3V to 15V
Voltage at any Input Pin	$V_{CC} - 25V$ to $GND + 25V$	Absolute Maximum ( $V_{CC}$ )	18V
Voltage at any other Pin	$-0.3V$ to $V_{CC} + 0.3V$	Lead Temperature ( $T_L$ )	300°C
Operating Temperature Range ( $T_A$ )	$-40^\circ C$ to $+85^\circ C$	(Soldering, 10 seconds)	
Storage Temperature Range ( $T_S$ )	$-65^\circ C$ to $+150^\circ C$		
Power Dissipation		<b>Note 1:</b> "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.	
Dual-In-Line	700 mW		
Small Outline	500mW		

<b>DC Electrical Characteristics</b>						
Min/Max limits apply across temperature range unless otherwise noted						
Symbol	Parameter	Conditions	Min	Typ	Max	Units
<b>CMOS TO CMOS</b>						
$V_{T+}$	Positive Going Threshold Voltage	$V_{CC} = 5V$ $V_{CC} = 10V$ $V_{CC} = 15V$	3.0 6.0 9.0	3.6 6.8 10	4.3 8.6 12.9	V
$V_{T-}$	Negative Going Threshold Voltage	$V_{CC} = 5V$ $V_{CC} = 10V$ $V_{CC} = 15V$	0.7 1.4 2.1	1.4 3.2 5	2.0 4.0 6.0	V
$V_{T+} - V_{T-}$	Hysteresis	$V_{CC} = 5V$ $V_{CC} = 10V$ $V_{CC} = 15V$	1.0 2.0 3.0	2.2 3.6 5	3.6 7.2 10.8	V
$V_{OUT(1)}$	Logical "1" Output Voltage	$V_{CC} = 5V, I_O = -10 \mu A$ $V_{CC} = 10V, I_O = -10 \mu A$	4.5 9.0			V
$V_{OUT(0)}$	Logical "0" Output Voltage	$V_{CC} = 5V, I_O = +10 \mu A$ $V_{CC} = 10V, I_O = +10 \mu A$			0.5 1.0	V
$I_{IN(1)}$	Logical "1" Input Current	$V_{CC} = 15V, V_{IN} = 25V$		0.005	5.0	$\mu A$
$I_{IN(0)}$	Logical "0" Input Current	$V_{CC} = 15V, V_{IN} = -10V$	-100	-0.005		$\mu A$
$I_{CC}$	Supply Current	$V_{CC} = 15V, V_{IN} = -10V/25V$ $V_{CC} = 5V, V_{IN} = -2.5V$ (Note 2) $V_{CC} = 10V, V_{IN} = 5V$ (Note 2) $V_{CC} = 15V, V_{IN} = 7.5V$ (Note 2)		0.05 20 200 600	300	$\mu A$
<b>CMOS/LPTTL INTERFACE</b>						
$V_{IN(1)}$	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	$V_{CC} = 4.75V, I_O = -360 \mu A$	2.4			V
$V_{OUT(0)}$	Logical "0" Output Voltage	$V_{CC} = 4.75V, I_O = 360 \mu A$			0.4	V
<b>OUTPUT DRIVE (See Family Characteristics Data Sheet) (Short Circuit Current)</b>						
$I_{SOURCE}$	Output Source Current (P-Channel)	$V_{CC} = 5V, V_{OUT} = 0V, T_A = 25^\circ C$	-1.75	-3.3		mA
$I_{SOURCE}$	Output Source Current (P-Channel)	$V_{CC} = 10V, V_{OUT} = 0V, T_A = 25^\circ C$	-8.0	-15		mA
$I_{SINK}$	Output Sink Current (N-Channel)	$V_{CC} = 5V, V_{OUT} = V_{CC}, T_A = 25^\circ C$	1.75	3.6		mA
$I_{SINK}$	Output Sink Current (N-Channel)	$V_{CC} = 10V, V_{OUT} = V_{CC}, T_A = 25^\circ C$	8.0	16		mA
<b>Note 2:</b> Only one input 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
$t_{PHL}$	Propagation Delay from Input to Output	$V_{CC} = 5\text{V}$		220	400	ns
$t_{PLH}$		$V_{CC} = 10\text{V}$		80	200	ns
$C_{IN}$	Input Capacitance	Any Input (Note 4)		5		pF
$C_{PD}$	Power Dissipation Capacitance	Per Gate (Note 5)		20		pF

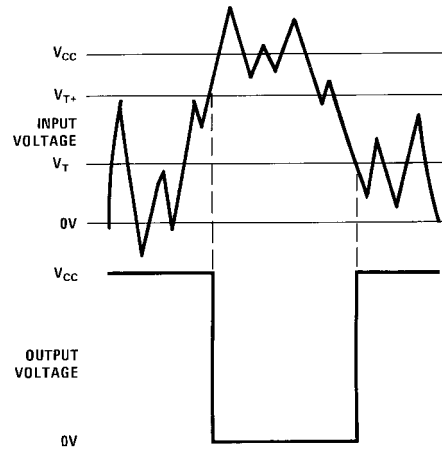
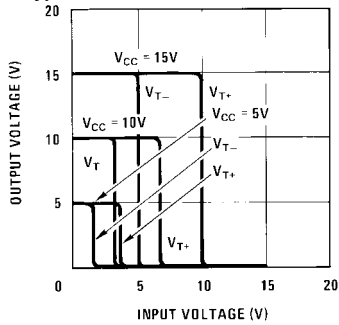
**Note 3:** AC Parameters are guaranteed by DC correlated testing.

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

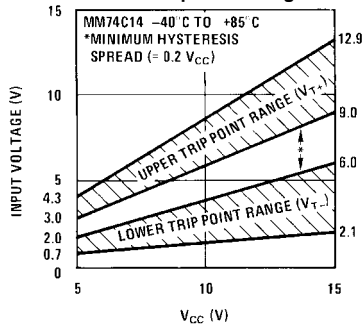
**Note 5:**  $C_{PD}$  determines the no load AC power consumption of any CMOS device. For complete explanation see Family Characteristics Application Note, AN-90.

### Typical Performance Characteristics

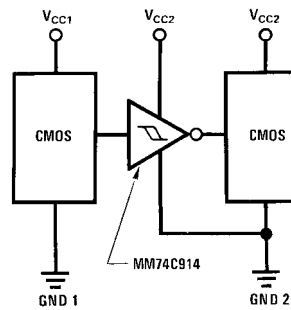
Typical Transfer Characteristics



Guaranteed Trip Point Range



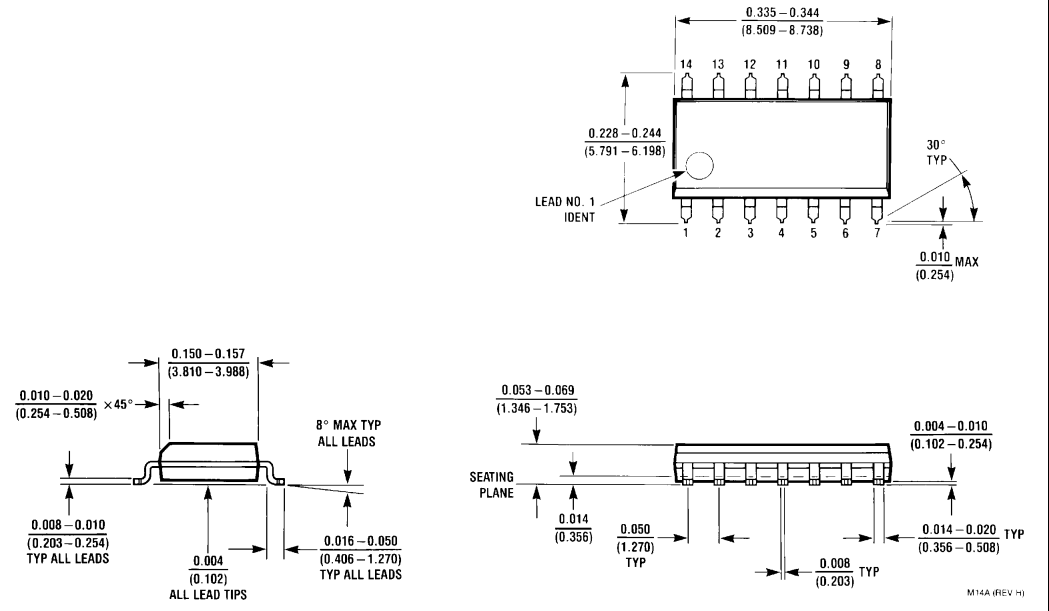
### Typical Application



**Note:**  $V_{CC1} = V_{CC2}$   
 $GND1 = GND2$

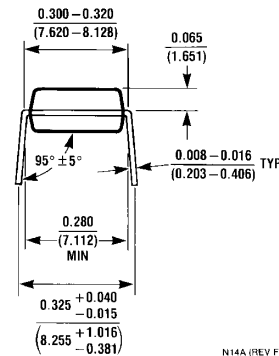
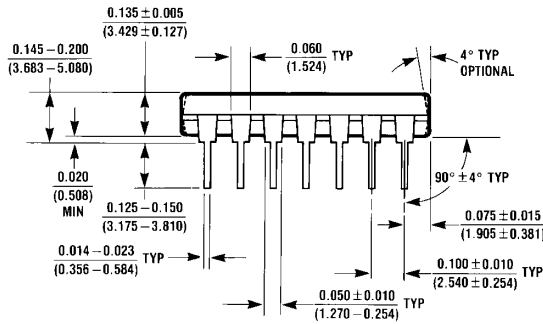
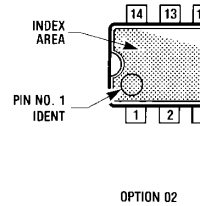
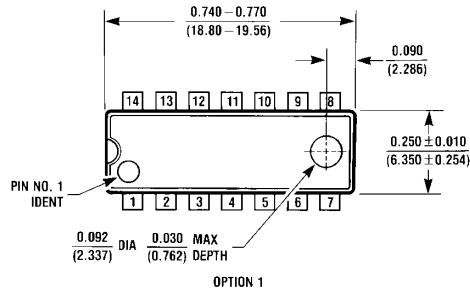
MM74C914

**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 P)

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

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