

# MM74HCT14

## Hex Inverting Schmitt Trigger

### Features


- Typical Propagation Delay: 13ns
- Wide Power Supply Range: 4.5V–5.5V
- Low Quiescent Current: 10µA Maximum
- Low Input Current: 1µA Maximum
- Fanout of 10 LS-TTL Loads
- Typical Hysteresis Voltage: 0.6V at  $V_{CC} = 4.5V$
- TTL, LS Pin-out and Input Threshold Compatible

### Description

The MM74HCT14 utilizes advanced silicon-gate CMOS technology to achieve the low power dissipation and high noise immunity of standard CMOS, as well as the capability to drive 10 LS-TTL loads.

The 74HCT logic family is functionally and pinout-compatible with the standard 74LS logic family. Inputs are protected from damage due to static discharge by internal diode clamps to  $V_{CC}$  and ground.

### Ordering Information

Part Number	Operating Temperature Range	 Eco Status	Package	Packing Method
MM74HCT14M	-40°C to +85°C	RoHS	14-Lead, Small-Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150in Narrow	Tube
MM74HCT14MX	-40°C to +85°C	RoHS	14-Lead, Small-Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150in Narrow	Tape & Reel
MM74HCT14SJ	-40°C to +85°C	RoHS	14-Lead, Small-Outline Package (SOP), EIAJ Type II, 5.3mm Wide	Tube
MM74HCT14SJX	-40°C to +85°C	RoHS	14-Lead, Small-Outline Package (SOP), EIAJ Type II, 5.3mm Wide	Tape & Reel
MM74HCT14MTC	-40°C to +85°C	RoHS	14-Lead, Thin-Shrink Small-Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide	Tube
MM74HCT14MTCX	-40°C to +85°C	RoHS	14-Lead, Thin-Shrink Small-Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide	Tape & Reel
MM74HCT14SN	-40°C to +85°C	RoHS	14-Lead, Plastic Dual-Inline Package (PDIP), JEDEC MS-001, 0.300in Wide	Tube

 For Fairchild's definition of Eco Status, please visit: [http://www.fairchildsemi.com/company/green/rohs\\_green.html](http://www.fairchildsemi.com/company/green/rohs_green.html).

## Connection Diagram

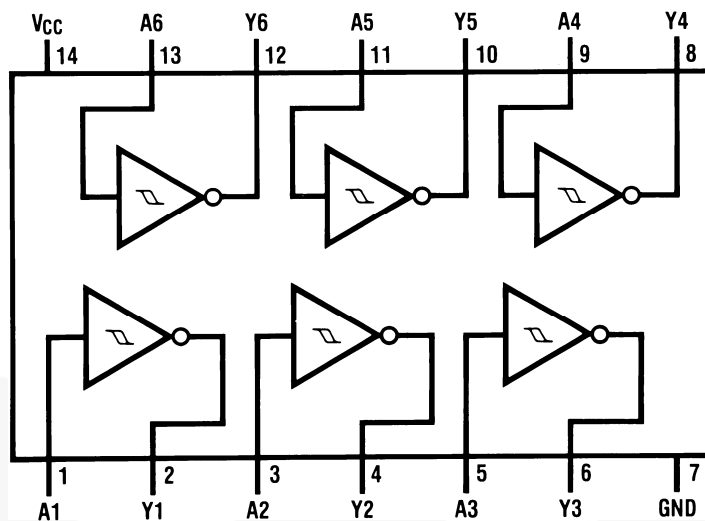


Figure 1. Pin Assignments

## Schematic Diagram

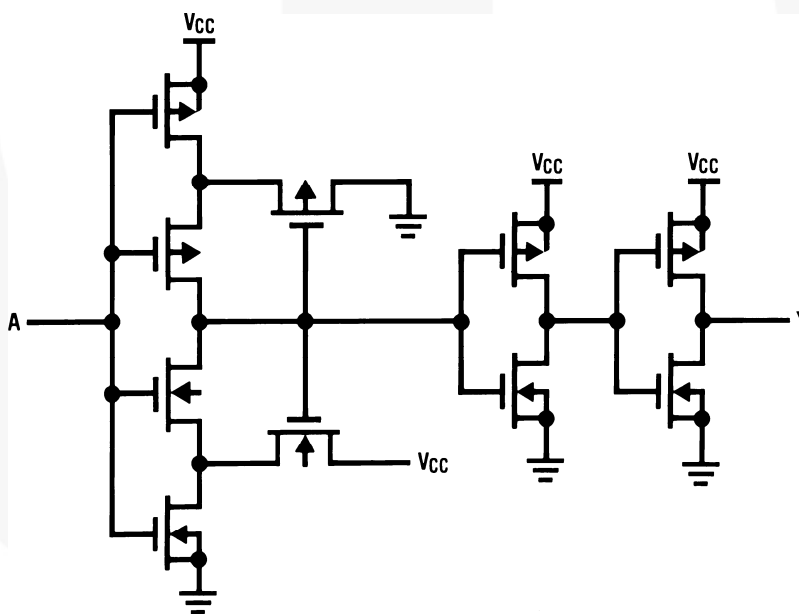


Figure 2. Schematic

## Absolute Maximum Ratings

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only. Unless otherwise specified, all voltages are referenced to ground.

Symbol	Parameter	Min.	Max.	Unit
$V_{CC}$	Supply Voltage	-0.5	+7.0	V
$V_{IN}$	DC Input Voltage	-1.5	$V_{CC} + 1.5$	V
$V_{OUT}$	DC Output Voltage	-0.5	$V_{CC} + 0.5$	V
$I_K, I_{OK}$	Clamp Diode Current		$\pm 20$	mA
$I_{OUT}$	DC Output Current, Per Pin		$\pm 25$	mA
$I_{CC}$	DC $V_{CC}$ or GND Current, Per Pin		$\pm 50$	mA
$T_{STG}$	Storage Temperature Range	-65	+150	°C
$T_L$	Lead Temperature (Soldering 10 Seconds)		+260	°C

## Recommended Operating Conditions

The Recommended Operating Conditions table defines the conditions for actual device operation. Recommended operating conditions are specified to ensure optimal performance to the datasheet specifications. Fairchild does not recommend exceeding them or designing to Absolute Maximum Ratings.

Symbol	Parameter	Min.	Max.	Unit
$V_{CC}$	Supply Voltage	4.5	5.5	V
$V_{IN}, V_{OUT}$	DC Input or Output Voltage	0	$V_{CC}$	V
$T_A$	Operating Temperature Range	-40	+85	°C

## DC Electrical Characteristics

Symbol	Parameter	Conditions	V <sub>CC</sub>	T <sub>A</sub> =+25°C		T <sub>A</sub> =-40°C to +85°C	Units
				Typ.	Guaranteed Limits		
V <sub>T+</sub>	Positive-Going Threshold Voltage	Minimum	4.5	1.5	1.2	1.2	V
			5.5	1.7	1.4	1.4	
		Maximum	4.5	1.5	1.9	1.9	
			5.5	1.7	2.1	2.1	
V <sub>T-</sub>	Negative-Going Threshold Voltage	Minimum	4.5	0.9	0.5	0.5	V
			5.5	1.0	0.6	0.6	
		Maximum	4.5	0.9	1.2	1.2	
			5.5	1.0	1.4	1.4	
V <sub>H</sub>	Hysteresis Voltage	Minimum	4.5	0.6	0.4	0.4	V
			5.5	0.7	0.4	0.4	
		Maximum	4.5	0.6	1.4	1.4	
			5.5	0.7	1.5	1.5	
V <sub>OH</sub>	Minimum HIGH Level Output Voltage	V <sub>IN</sub> =V <sub>IL</sub> ,   I <sub>OUT</sub>   = 20μA	4.5	V <sub>CC</sub>	V <sub>CC</sub> – 0.1	V <sub>CC</sub> – 0.1	V
		V <sub>IN</sub> =V <sub>IL</sub> ,   I <sub>OUT</sub>   = 4.0mA	4.5	4.20	3.98	3.84	
		V <sub>IN</sub> =V <sub>IL</sub> ,   I <sub>OUT</sub>   = 4.8mA	5.5	5.20	4.98	4.98	
V <sub>OL</sub>	Maximum LOW Level Voltage	V <sub>IN</sub> =V <sub>IL</sub> ,   I <sub>OUT</sub>   = 20μA	4.5	0	0.1	0.1	V
		V <sub>IN</sub> =V <sub>IL</sub> ,   I <sub>OUT</sub>   = 4.0mA	4.5	0.2	0.26	0.33	
		V <sub>IN</sub> =V <sub>IL</sub> ,   I <sub>OUT</sub>   = 4.8mA	5.5	0.2	0.26	0.33	
I <sub>IN</sub>	Maximum Input Current	V <sub>IN</sub> = V <sub>CC</sub> or GND, V <sub>IH</sub> or V <sub>IL</sub>	5.5		±0.1	±1.0	μA
I <sub>CC</sub>	Maximum Quiescent Supply Current	V <sub>IN</sub> = V <sub>CC</sub> or GND, I <sub>OUT</sub> = 0μA	5.5		1.0	10.0	μA
		V <sub>IN</sub> = 2.4V or 0.5V			2.4	2.4	mA

**AC Electrical Characteristics**

$V_{CC} = 5V$ ,  $T_A = 25^\circ C$ ,  $C_L = 15pF$ ,  $t_r = t_f = 6ns$ .

Symbol	Parameter	Typ.	Guaranteed Limit	Unit
$t_{PHL}$ , $t_{PLH}$	Maximum Propagation Delay	10	18	ns

**AC Electrical Characteristics**

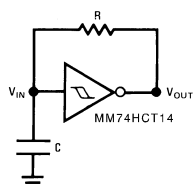
Unless otherwise specified,  $V_{CC} = 5V \pm 10\%$ ,  $C_L = 50pF$ ,  $t_r = t_f = 6ns$ .

Symbol	Parameter	Conditions	T <sub>A</sub> =+25°C		T <sub>A</sub> =-40°C to +85°C	Units
			Typ.	Guaranteed Limits		
t <sub>PHL</sub> , t <sub>PLH</sub>	Maximum Propagation Delay			20	25	ns
t <sub>TLH</sub> , t <sub>THL</sub>	Maximum Output Rise and Fall Time		9	15	19	ns
C <sub>PD</sub>	Power Dissipation Capacitance <sup>(1)</sup>	Per Gate		25		pF
C <sub>IN</sub>	Maximum Input Capacitance		5	10	10	pF

**Note:**

1.  $C_{PD}$  determines the no-load dynamic power consumption,  $P_D = C_{PD} V_{CC}^2 f + I_{CC} V_{CC}$ , and the no-load dynamic current consumption,  $I_S = C_{PD} V_{CC} f + I_{CC}$ .

## Typical Applications

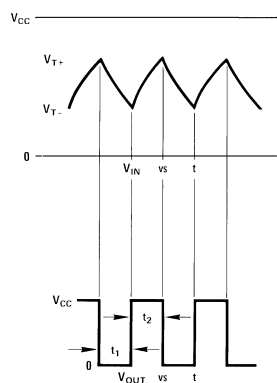


**Figure 3. Low Power Oscillator**

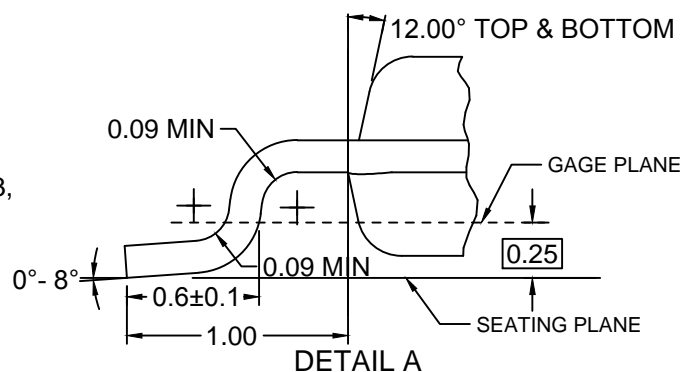
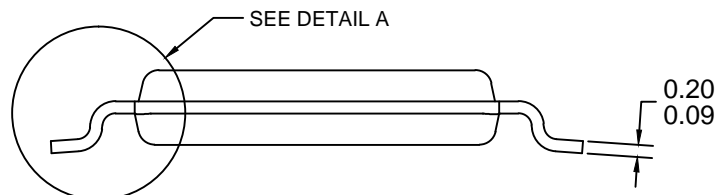
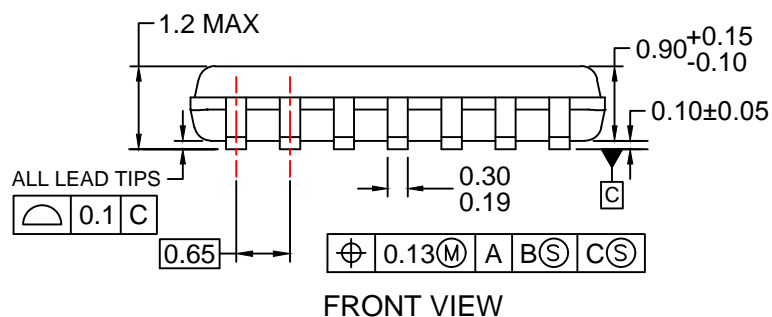
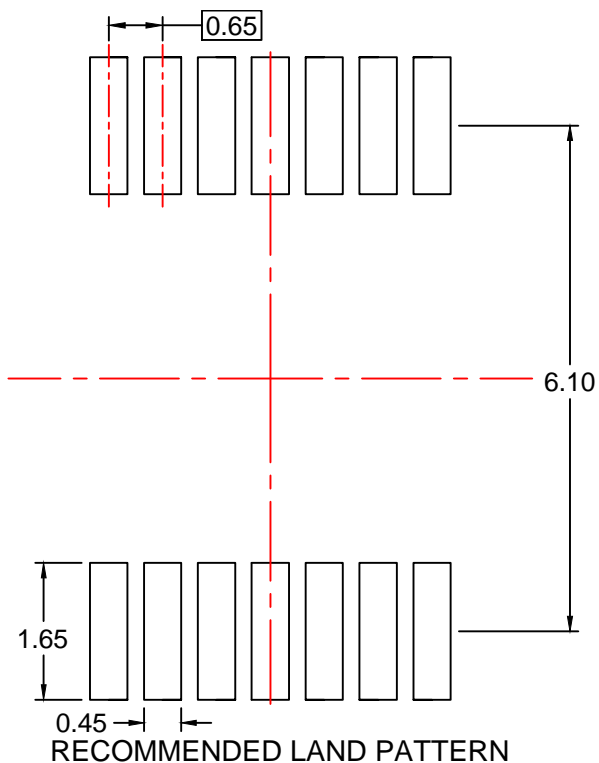
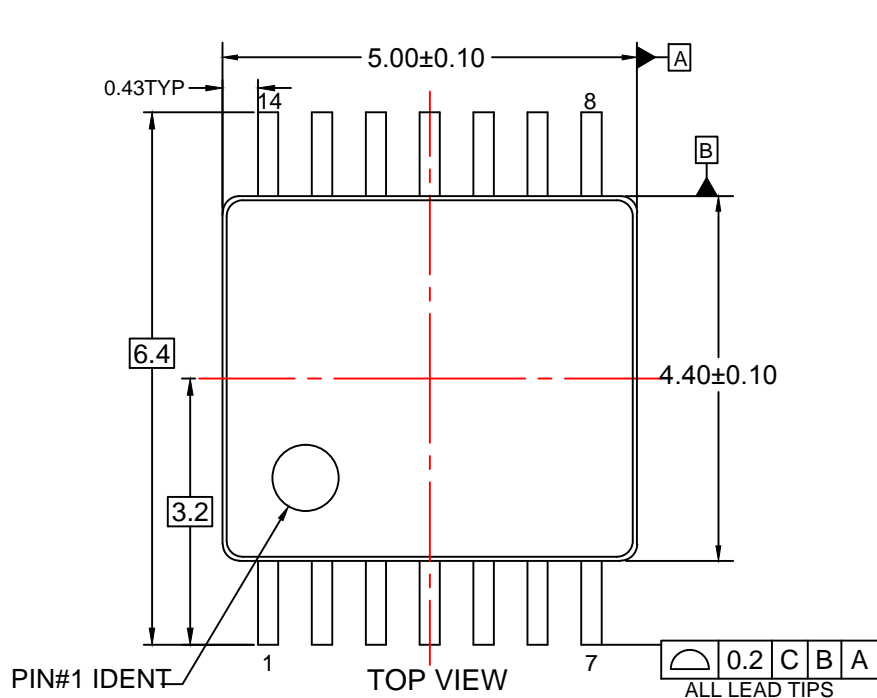
The following equations assume  $t_1 + t_2 \gg t_{pd0} + t_{pd1}$ :

$$t_2 \approx RC \ln \frac{V_{CC} - V_{T-}}{V_{CC} - V_{T+}} \quad (1)$$

$$f \approx \frac{1}{RC \ln \frac{V_{T+}(V_{CC} - V_{T-})}{V_{T-}(V_{CC} - V_{T+})}} \quad (2)$$



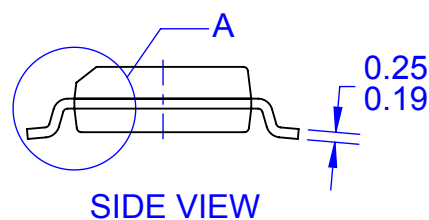
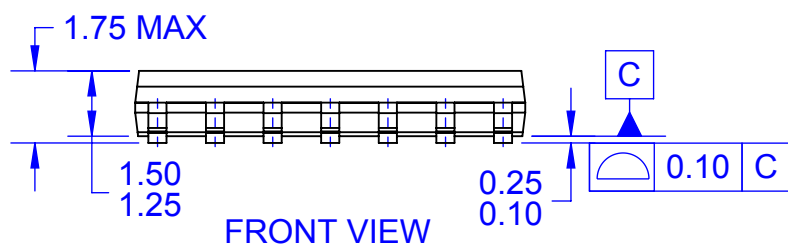
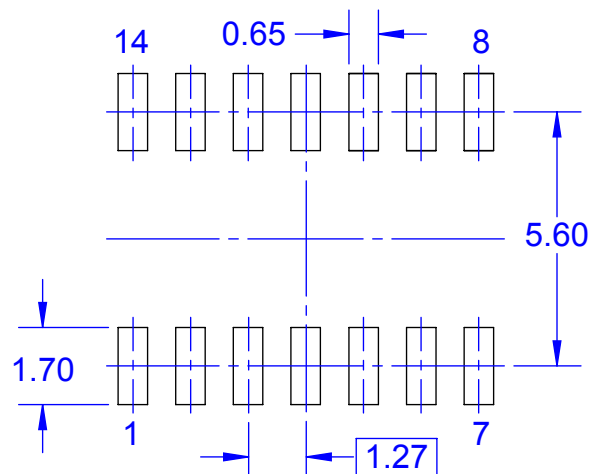
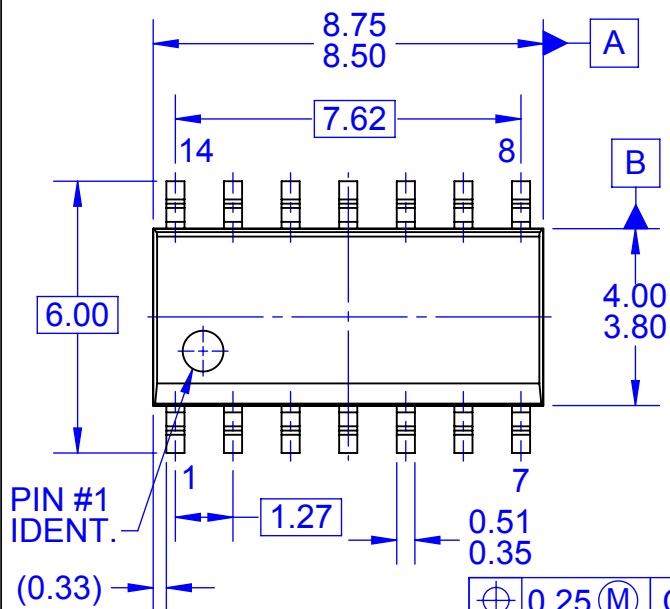
**Figure 4. Oscillator Input and Output Waveforms**



#### NOTES:

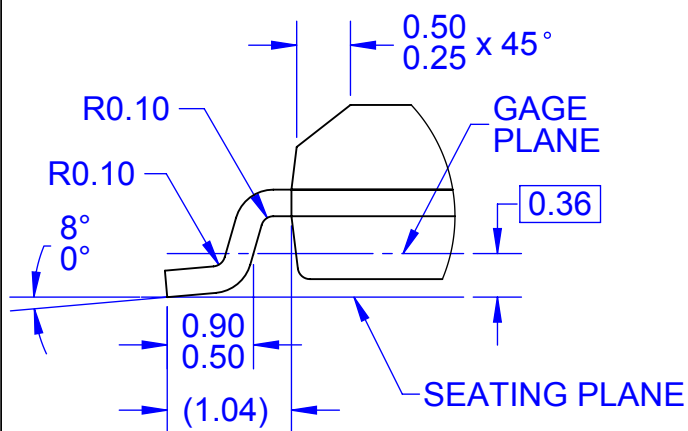
- CONFORMS TO JEDEC REGISTRATION MO-153, VARIATION AB, REF NOTE 6
- DIMENSIONS ARE IN MILLIMETERS.
- DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS
- DIMENSIONING AND TOLERANCES PER ANSI Y14.5M, 2009.
- LANDPATTERN STANDARD: SOP65P640X110-14M.
- DRAWING FILE NAME: MKT-MTC14rev7.






#### NOTES:

- A. CONFORMS TO JEDEC MS-012, VARIATION AB, ISSUE C
- B. ALL DIMENSIONS ARE IN MILLIMETERS
- C. DIMENSIONS DO NOT INCLUDE MOLD FLASH OR BURRS
- D. LAND PATTERN STANDARD: SOIC127P600X145-14M
- E. CONFORMS TO ASME Y14.5M, 2009
- D. DRAWING FILENAME: MKT-M14Arev14



DETAIL A  
SCALE 16 : 1



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