

## 74VHC14 Hex Schmitt Inverter

### Features

- High Speed:  $t_{PD} = 5.5\text{ns}$  (typ.) at  $V_{CC} = 5\text{V}$
- Low power dissipation:  $I_{CC} = 2\mu\text{A}$  (max.) at  $T_A = 25^\circ\text{C}$
- High noise immunity:  $V_{NIH} = V_{NIL} = 28\% V_{CC}$  (min.)
- Power down protection is provided on all inputs
- Low noise:  $V_{OLP} = 0.8\text{V}$  (max.)
- Pin and function compatible with 74HC14

### General Description


The VHC14 is an advanced high speed CMOS Hex Schmitt Inverter fabricated with silicon gate CMOS technology. It achieves the high speed operation similar to equivalent Bipolar Schottky TTL while maintaining the CMOS low power dissipation. Pin configuration and function are the same as the VHC04 but the inputs have hysteresis between the positive-going and negative-going input thresholds, which are capable of transforming slowly changing input signals into sharply defined, jitter-free output signals, thus providing greater noise margin than conventional inverters.

An input protection circuit ensures that 0V to 7V can be applied to the input pins without regard to the supply voltage. This device can be used to interface 5V to 3V systems and two supply systems such as battery back up. This circuit prevents device destruction due to mismatched supply and input voltages.

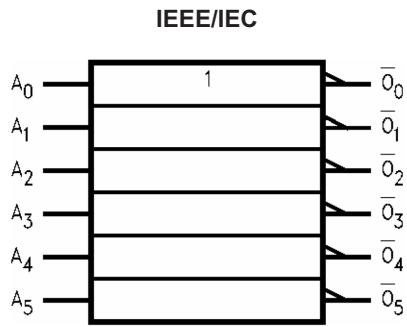
### Ordering Information

Order Number	Package Number	Package Description
74VHC14M	M14A	14-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow
74VHC14SJ	M14D	14-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide
74VHC14MTC	MTC14	14-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide
74VHC140N	N14A	14-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300" Wide

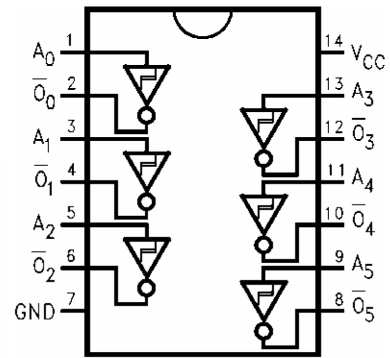
Device also available in Tape and Reel. Specify by appending suffix letter "X" to the ordering number.

 All packages are lead free per JEDEC: J-STD-020B standard.

### Logic Symbol



### Connection Diagram



### Pin Description

Pin Names	Description
$A_n$	Inputs
$\overline{O}_n$	Outputs

### Truth Table

A	O
L	H
H	L

## 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.

Symbol	Parameter	Rating
$V_{CC}$	Supply Voltage	-0.5V to +7.0V
$V_{IN}$	DC Input Voltage	-0.5V to +7.0V
$V_{OUT}$	DC Output Voltage	-0.5V to $V_{CC} + 0.5V$
$I_{IK}$	Input Diode Current	-20mA
$I_{OK}$	Output Diode Current	$\pm 20mA$
$I_{OUT}$	DC Output Current	$\pm 25mA$
$I_{CC}$	DC $V_{CC}$ /GND Current	$\pm 50mA$
$T_{STG}$	Storage Temperature	-65°C to +150°C
$T_L$	Lead Temperature (Soldering, 10 seconds)	260°C

## Recommended Operating Conditions<sup>(1)</sup>

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	Rating
$V_{CC}$	Supply Voltage	2.0V to +5.5V
$V_{IN}$	Input Voltage	0V to +5.5V
$V_{OUT}$	Output Voltage	0V to $V_{CC}$
$T_{OPR}$	Operating Temperature	-40°C to +85°C

### Note:

- Unused inputs must be held HIGH or LOW. They may not float.

## DC Electrical Characteristics

Symbol	Parameter	V <sub>CC</sub>	Conditions	T <sub>A</sub> = 25°C			T <sub>A</sub> = -40°C to +85°C		Units		
				Min.	Typ.	Max.	Min.	Max.			
V <sub>P</sub>	Positive Threshold Voltage	3.0				2.20		2.20	V		
		4.5				3.15		3.15			
		5.5				3.85		3.85			
V <sub>N</sub>	Negative Threshold Voltage	3.0		0.90			0.90		V		
		4.5		1.35			1.35				
		5.5		1.65			1.65				
V <sub>H</sub>	Hysteresis Voltage	3.0		0.30		1.20	0.30	1.20	V		
		4.5		0.40		1.40	0.40	1.40			
		5.5		0.50		1.60	0.50	1.60			
V <sub>OH</sub>	HIGH Level Output Voltage	2.0	V <sub>IN</sub> = V <sub>IL</sub>	I <sub>OH</sub> = -50μA	1.9	2.0		1.9	V		
		3.0			2.9	3.0		2.9			
		4.5			4.4	4.5		4.4			
		3.0			I <sub>OH</sub> = -4mA	2.58				2.48	
		4.5				I <sub>OH</sub> = -8mA	3.94				3.80
V <sub>OL</sub>	LOW Level Output Voltage	2.0	V <sub>IN</sub> = V <sub>IH</sub>	I <sub>OL</sub> = 50μA			0.0	0.1		0.1	V
		3.0				0.0	0.1		0.1		
		4.5				0.0	0.1		0.1		
		3.0			I <sub>OL</sub> = 4mA			0.36		0.44	
		4.5				I <sub>OL</sub> = 8mA			0.36		
I <sub>IN</sub>	Input Leakage Current	0-5.5	V <sub>IN</sub> = 5.5V or GND				±0.1		±1.0	μA	
I <sub>CC</sub>	Quiescent Supply Current	5.5	V <sub>IN</sub> = V <sub>CC</sub> or GND			2.0		20.0	μA		

## Noise Characteristics

Symbol	Parameter	V <sub>CC</sub>	Conditions	T <sub>A</sub> = 25°C		Units
				Typ.	Limits	
V <sub>OLP</sub> <sup>(2)</sup>	Quiet Output Maximum Dynamic V <sub>OL</sub>	5.0	C <sub>L</sub> = 50 pF	0.4	0.8	V
V <sub>OLV</sub> <sup>(2)</sup>	Quiet Output Minimum Dynamic V <sub>OL</sub>	5.0	C <sub>L</sub> = 50 pF	-0.4	-0.8	V
V <sub>IHD</sub> <sup>(2)</sup>	Minimum HIGH Level Dynamic Input Voltage	5.0	C <sub>L</sub> = 50 pF		3.5	V
V <sub>ILD</sub> <sup>(2)</sup>	Maximum LOW Level Dynamic Input Voltage	5.0	C <sub>L</sub> = 50 pF		1.5	V

**Note:**

2. Parameter guaranteed by design.

## AC Electrical Characteristics

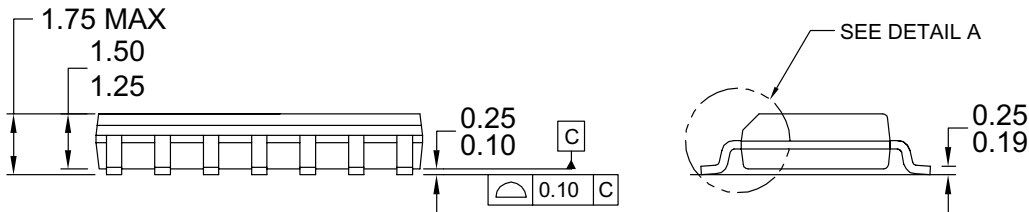
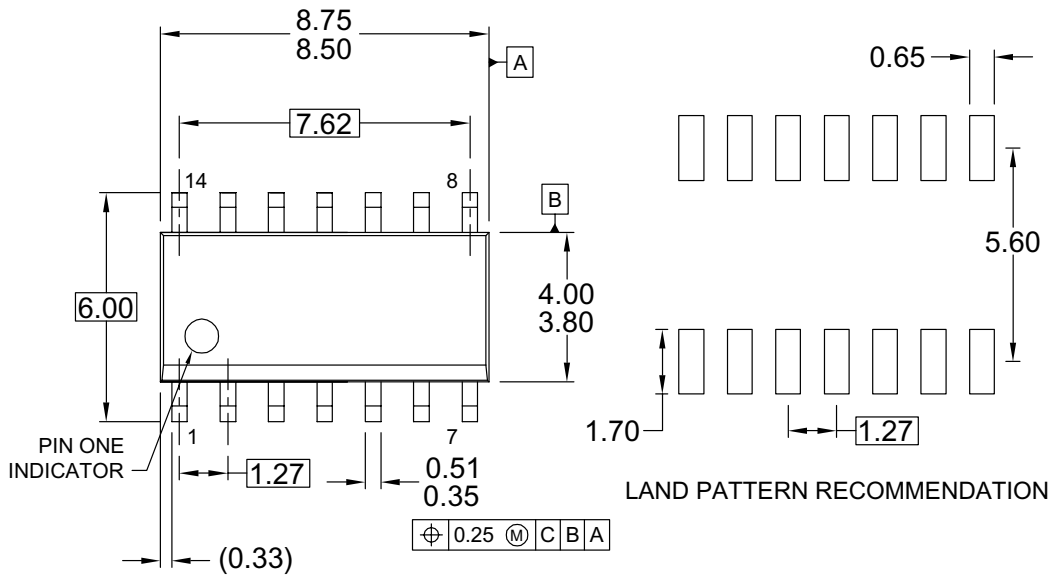
Symbol	Parameter	V <sub>CC</sub> (V)	Conditions	T <sub>A</sub> = 25°C			T <sub>A</sub> = -40°C to +85°C		Units
				Min.	Typ.	Max.	Min.	Max.	
t <sub>PLH</sub> , t <sub>PHL</sub>	Propagation Delay	3.3 ± 0.3	C <sub>L</sub> = 15pF		8.3	12.8	1.0	15.0	ns
			C <sub>L</sub> = 50pF		10.8	16.3	1.0	18.5	
		5.0 ± 0.5	C <sub>L</sub> = 15pF		5.5	8.6	1.0	10.0	ns
			C <sub>L</sub> = 50pF		7.0	10.6	1.0	12.0	
C <sub>IN</sub>	Input Capacitance		V <sub>CC</sub> = Open		4	10		10	pF
C <sub>PD</sub>	Power Dissipation Capacitance		<sup>(3)</sup>		21				pF

**Note:**

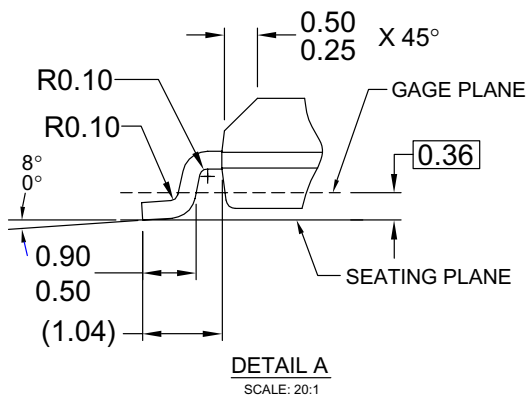
3. C<sub>PD</sub> is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load. Average operating current can be obtained by the equation:

$$I_{CC}(\text{opr.}) = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC} / 6 \text{ (per gate).}$$

Physical Dimensions



NOTES: UNLESS OTHERWISE SPECIFIED



- A) THIS PACKAGE 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) LANDPATTERN STANDARD: SOIC127P600X145-14M
- E) DRAWING CONFORMS TO ASME Y14.5M-1994
- F) DRAWING FILE NAME: M14AREV13

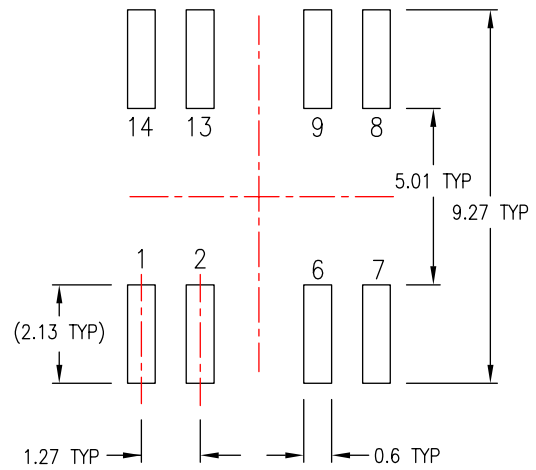
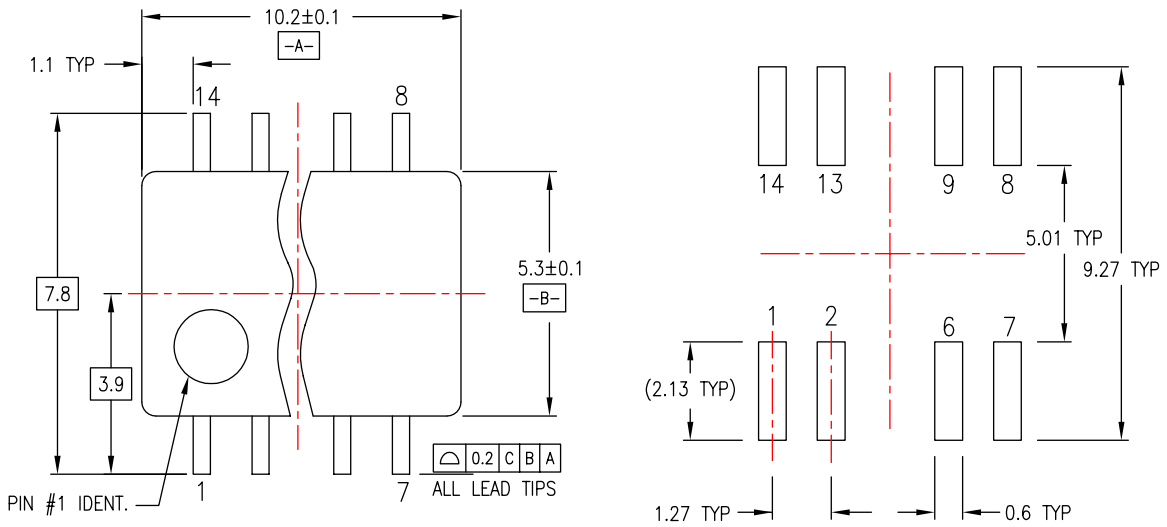
Figure 1. 14-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow

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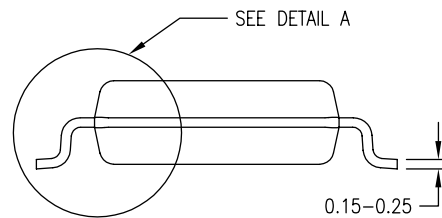
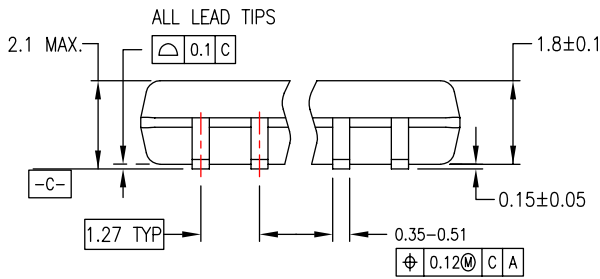
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Physical Dimensions (Continued)



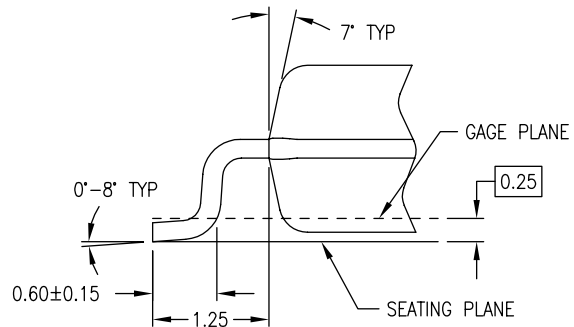
LAND PATTERN RECOMMENDATION



DIMENSIONS ARE IN MILLIMETERS

NOTES:

- A. CONFORMS TO EIAJ EDR-7320 REGISTRATION, ESTABLISHED IN DECEMBER, 1998.
- B. DIMENSIONS ARE IN MILLIMETERS.
- C. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.



DETAIL A

M14DREVC

Figure 2. 14-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide

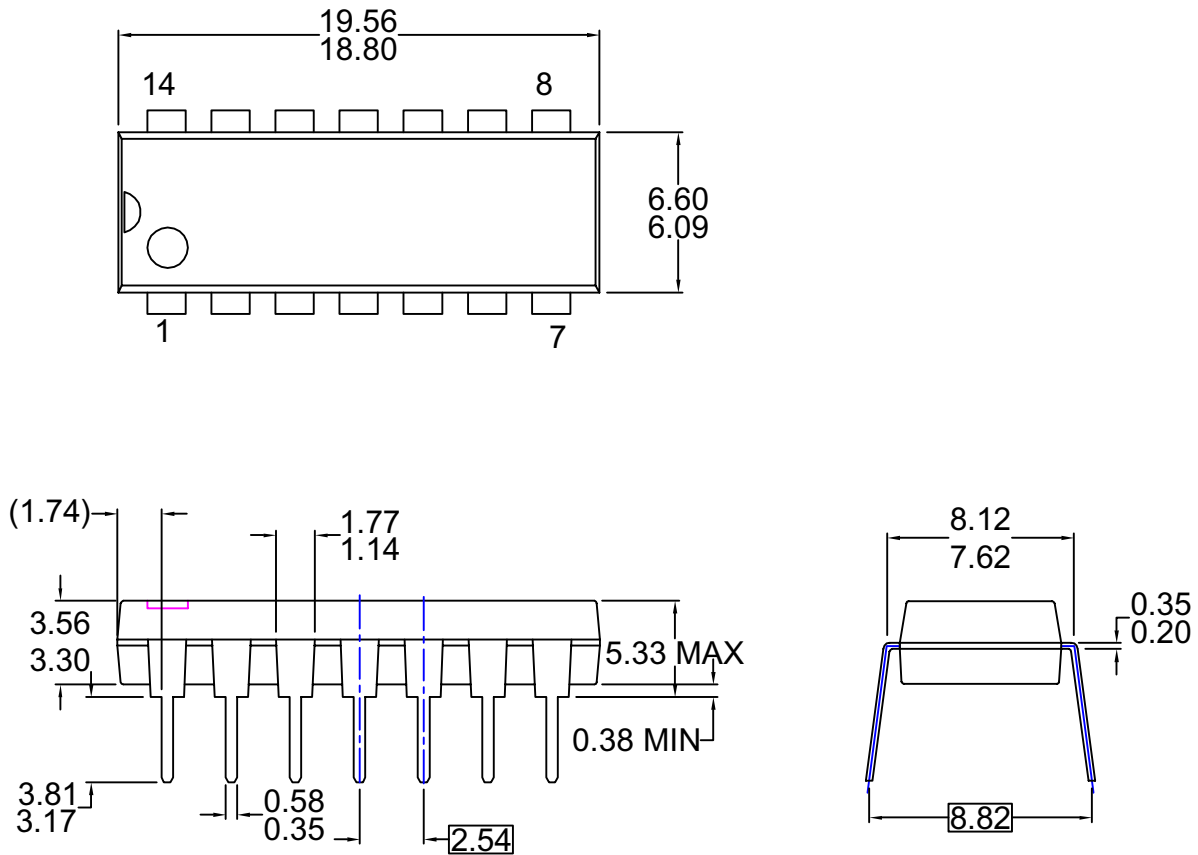
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**Physical Dimensions** (Continued)



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**C) DIMENSIONS ARE EXCLUSIVE OF BURRS,**  
**MOLD FLASH, AND TIE BAR EXTRUSIONS.**  
**D) DIMENSIONS AND TOLERANCES PER**  
**ASME Y14.5-1994**  
**E) DRAWING FILE NAME: MKT-N14AREV7**

**Figure 4. 14-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300" Wide**

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

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Rev. I32