FAIRCHILD SEMICONDUCTOR®

February 2008

74VHC14
Hex Schmitt Inverter

Features

- High Speed: t_{PD} = 5.5ns (typ.) at V_{CC} = 5V
- Low power dissipation: I_{CC} = 2μA (max.) at T_A = 25°C
- High noise immunity: $V_{NIH} = V_{NIL}$ = 28% V_{CC} (min.)
- Power down protection is provided on all inputs
- Low noise: V_{OLP} = 0.8V (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

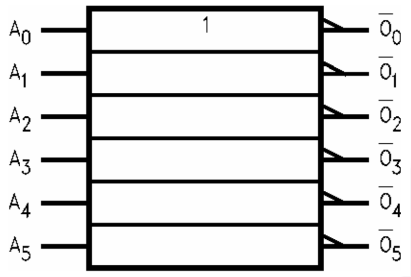
Order Number	Package Number	Package Description
74VHC14M	M14A	14-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow
74VHC14SJ	M14D	14-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide
74VHC14MTC	MTC14	14-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm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

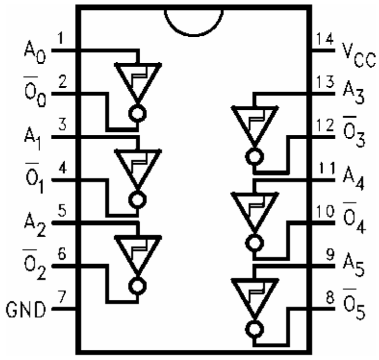
All packages are lead free per JEDEC: J-STD-020B standard.

Logic Symbol

IEEE/IEC



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	±20mA
I_{OUT}	DC Output Current	±25mA
I_{CC}	DC V_{CC} / GND Current	±50mA
T_{STG}	Storage Temperature	–65°C to +150°C
T_L	Lead Temperature (Soldering, 10 seconds)	260°C

Recommended Operating Conditions(1)

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:

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

DC Electrical Characteristics

Symbol	Parameter	V_{CC}	Conditions		$T_A = 25°C$			$T_A = -40°C$ to $+85°C$		Units
					Min.	Typ.	Max.	Min.	Max	
V_P	Positive Threshold Voltage	3.0					2.20		2.20	V
		4.5					3.15		3.15	
		5.5					3.85		3.85	
V_N	Negative Threshold Voltage	3.0			0.90			0.90		V
		4.5			1.35			1.35		
		5.5			1.65			1.65		
V_H	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_{OH}	HIGH Level Output Voltage	2.0	$V_{IN} = V_{IL}$	$I_{OH} = -50\mu A$	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		$I_{OH} = -4mA$	2.58			2.48		
		4.5		$I_{OH} = -8mA$	3.94			3.80		
V_{OL}	LOW Level Output Voltage	2.0	$V_{IN} = V_{IH}$	$I_{OL} = 50\mu A$		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		$I_{OL} = 4mA$			0.36		0.44	
		4.5		$I_{OL} = 8mA$			0.36		0.44	
I_{IN}	Input Leakage Current	0–5.5	$V_{IN} = 5.5V$ or GND				±0.1		±1.0	µA
I_{CC}	Quiescent Supply Current	5.5	$V_{IN} = V_{CC}$ or GND				2.0		20.0	µA

Noise Characteristics

Symbol	Parameter	V_{CC}	Conditions	$T_A = 25°C$		Units
				Typ.	Limits	
V_{OLP} (2)	Quiet Output Maximum Dynamic V_{OL}	5.0	$C_L = 50$ pF	0.4	0.8	V
V_{OLV} (2)	Quiet Output Minimum Dynamic V_{OL}	5.0	$C_L = 50$ pF	–0.4	–0.8	V
V_{IHD} (2)	Minimum HIGH Level Dynamic Input Voltage	5.0	$C_L = 50$ pF		3.5	V
V_{ILD} (2)	Maximum LOW Level Dynamic Input Voltage	5.0	$C_L = 50$ pF		1.5	V

Note:

2. Parameter guaranteed by design.

AC Electrical Characteristics

Symbol	Parameter	V_{CC} (V)	Conditions	T_A = 25°C			T_A = –40°C to +85°C		Units
				Min.	Typ.	Max.	Min.	Max.	
t_{PLH}, t_{PHL}	Propagation Delay	3.3 ± 0.3	C_L = 15pF		8.3	12.8	1.0	15.0	ns
			C_L = 50pF		10.8	16.3	1.0	18.5	
		5.0 ± 0.5	C_L = 15pF		5.5	8.6	1.0	10.0	ns
			C_L = 50pF		7.0	10.6	1.0	12.0	
C_{IN}	Input Capacitance		V_{CC} = Open		4	10		10	pF
C_{PD}	Power Dissipation Capacitance		(3)		21				pF

Note:

3. C_{PD} 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} (opr.) = C_{PD} • V_{CC} • f_{IN} + I_{CC} / 6 (per gate).

Physical Dimensions

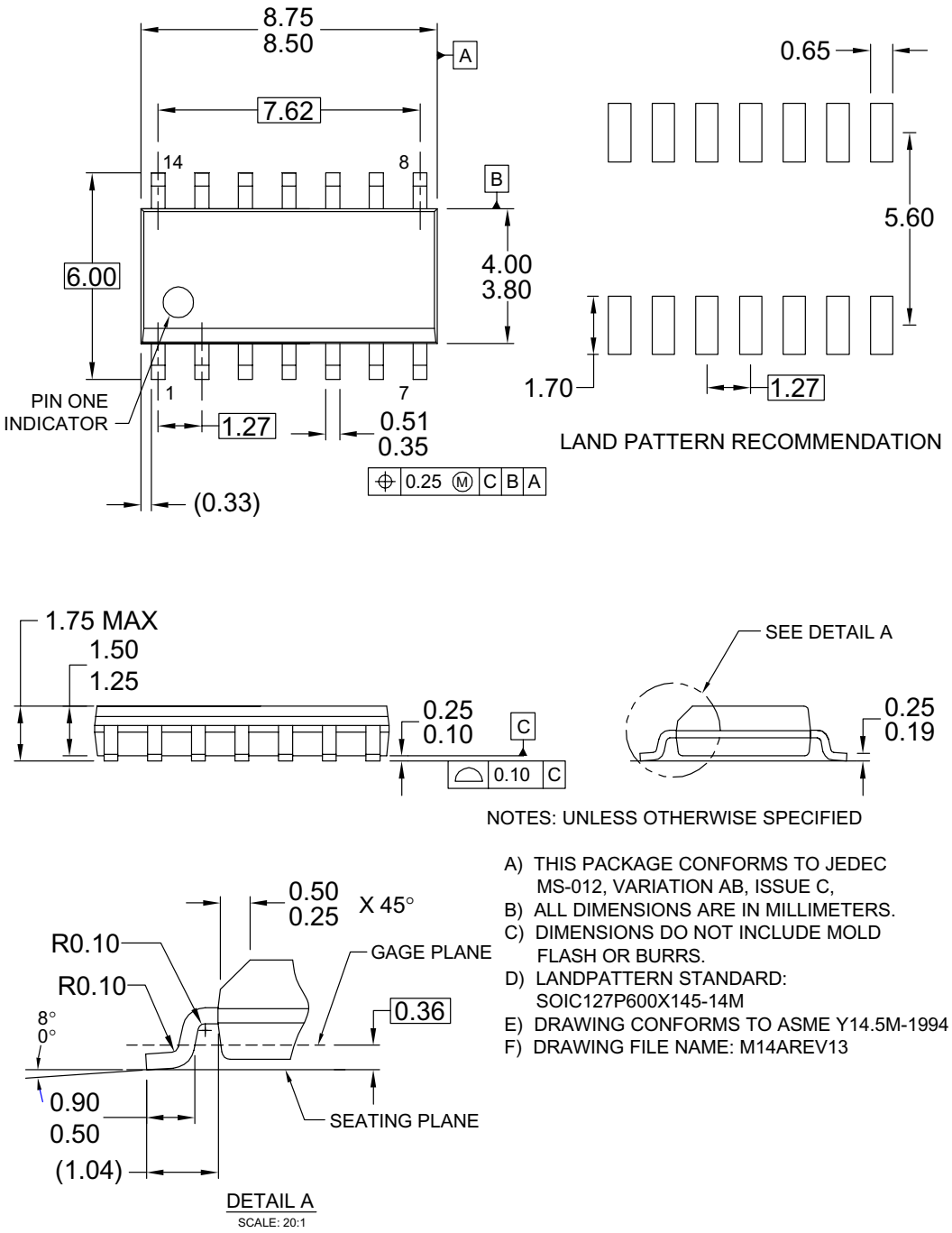


Figure 1. 14-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow

Package drawings are provided as a service to customers considering Fairchild components. Drawings may change in any manner without notice. Please note the revision and/or date on the drawing and contact a Fairchild Semiconductor representative to verify or obtain the most recent revision. Package specifications do not expand the terms of Fairchild's worldwide terms and conditions, specifically the warranty therein, which covers Fairchild products.

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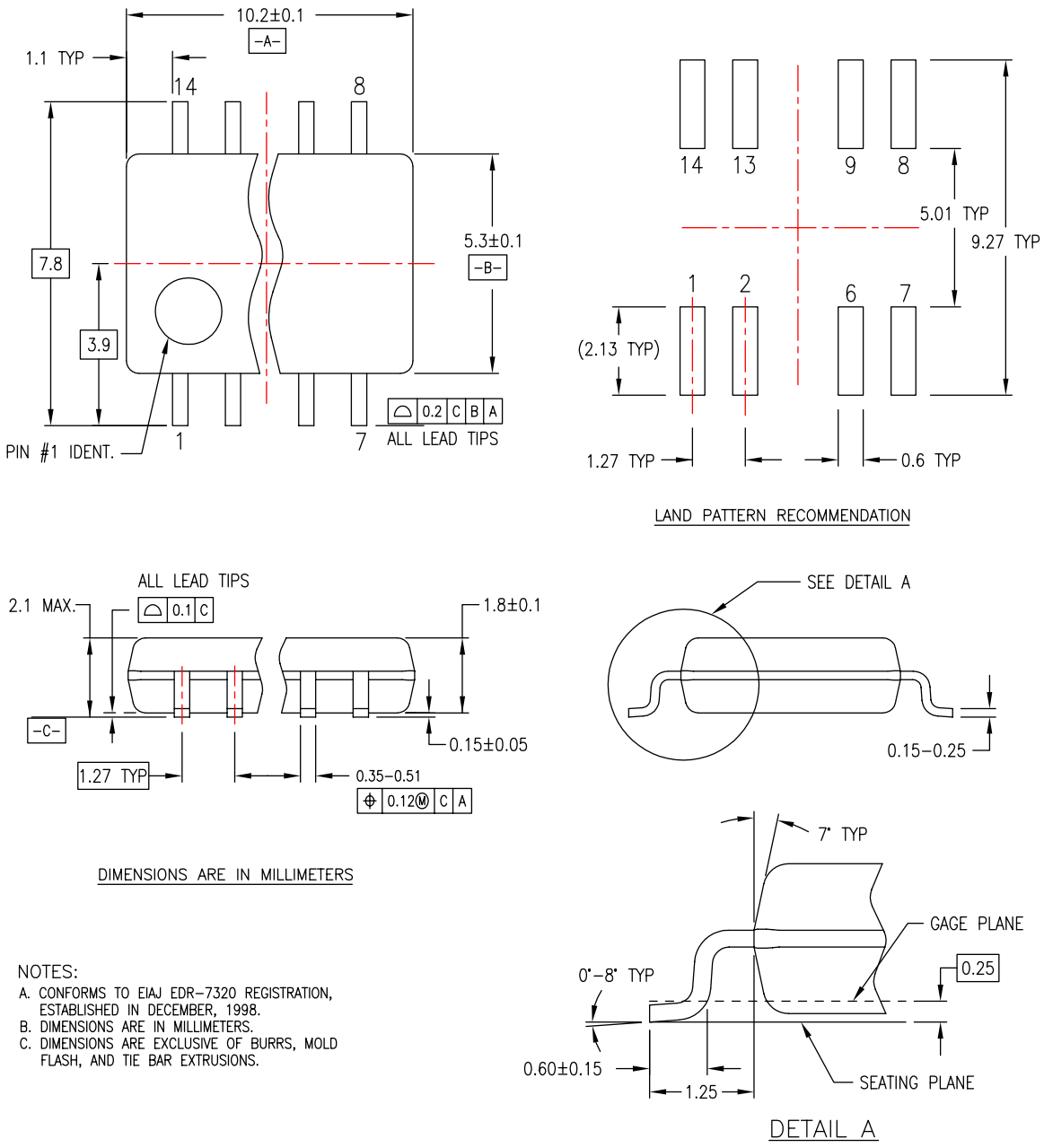
Physical Dimensions (Continued)



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.

M14DREVC

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

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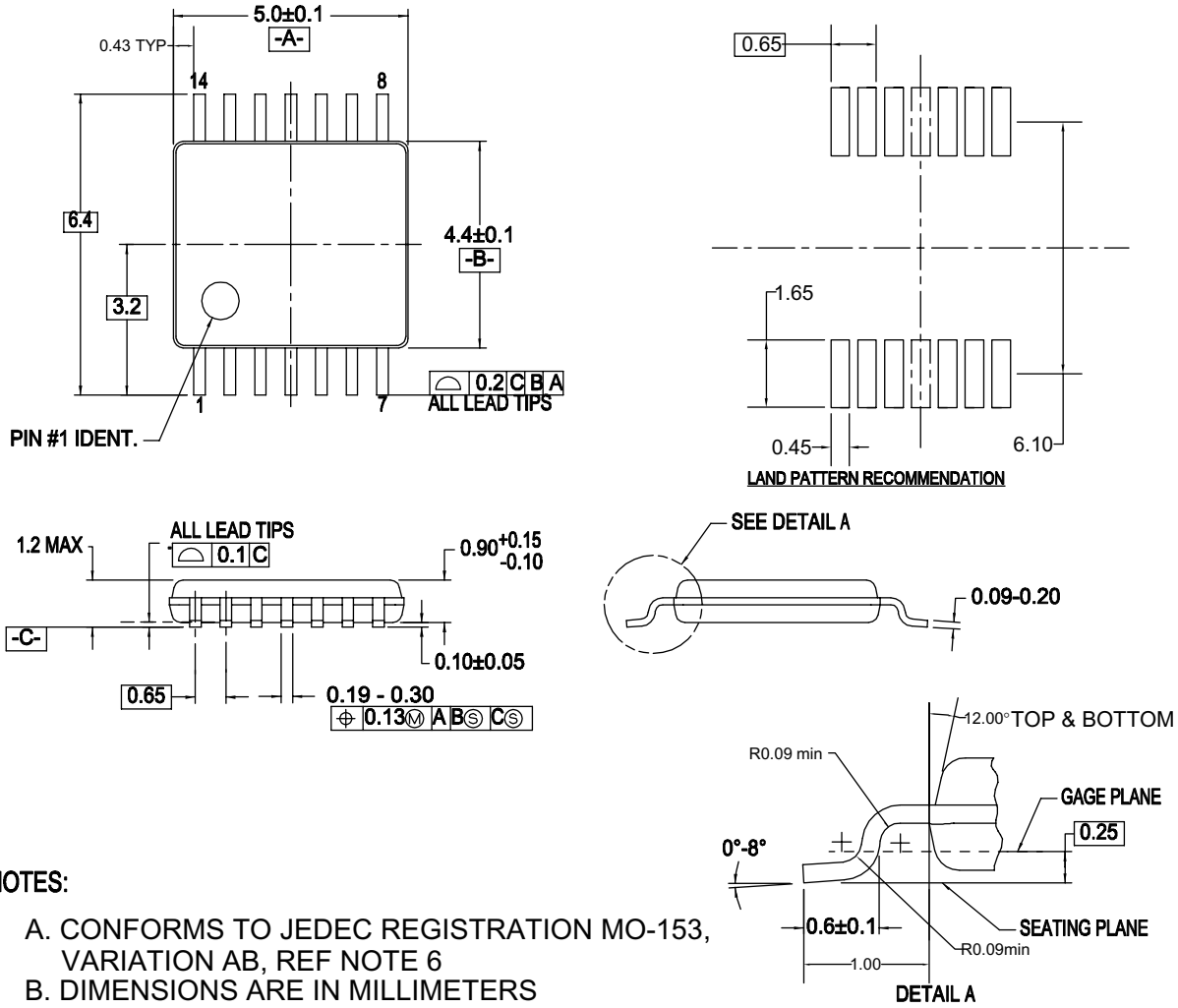
Physical Dimensions (Continued)



NOTES:

A. CONFORMS TO JEDEC REGISTRATION MO-153, VARIATION AB, REF NOTE 6

B. DIMENSIONS ARE IN MILLIMETERS

C. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS

D. DIMENSIONING AND TOLERANCES PER ANSI Y14.5M, 1982

E. LANDPATTERN STANDARD: SOP65P640X110-14M

F. DRAWING FILE NAME: MTC14REV6

Figure 3. 14-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide

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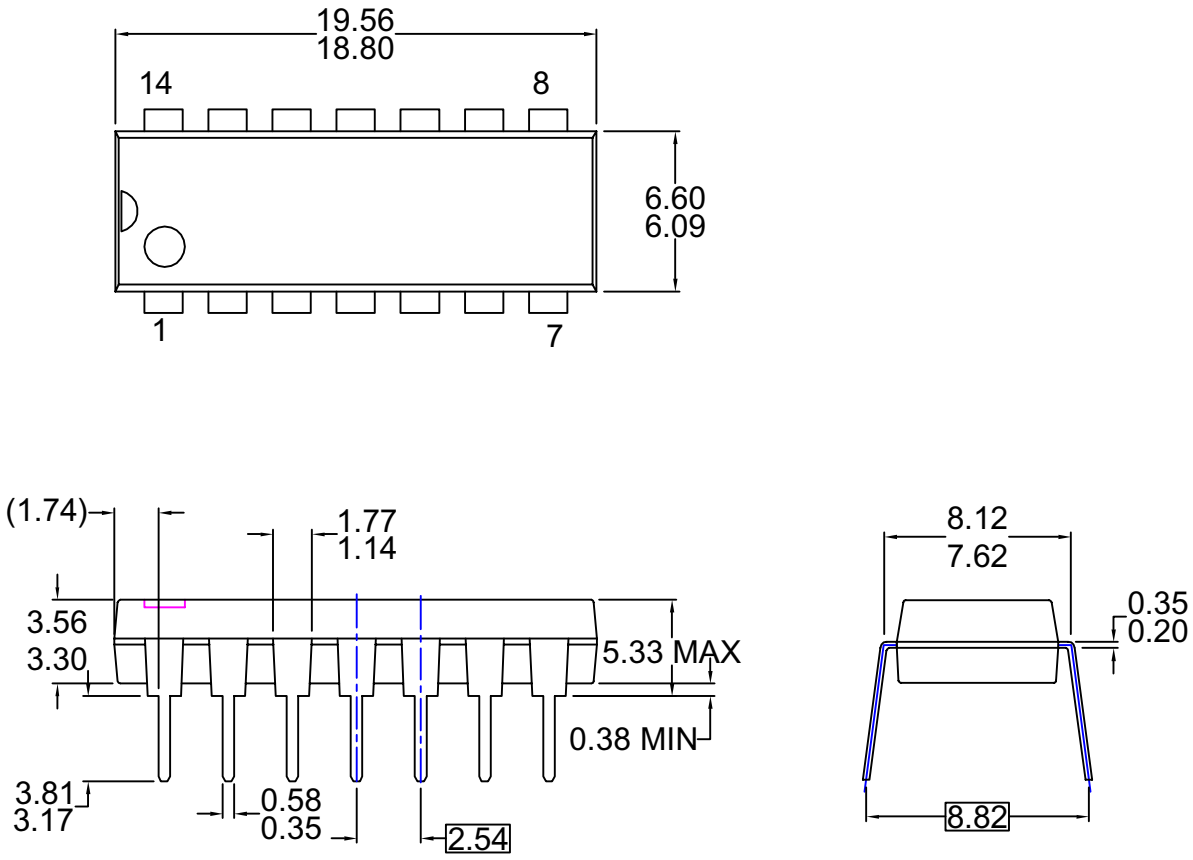
Physical Dimensions (Continued)



NOTES: UNLESS OTHERWISE SPECIFIED

THIS PACKAGE CONFORMS TO

A) JEDEC MS-001 VARIATION BA

B) ALL DIMENSIONS ARE IN MILLIMETERS.

DIMENSIONS ARE EXCLUSIVE OF BURRS,

C) 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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