

## 74AC14, 74ACT14 Hex Inverter with Schmitt Trigger Input

### Features

- $I_{CC}$  reduced by 50%
- Outputs source/sink 24mA
- 74ACT14 has TTL-compatible inputs

### General Description

The 74AC14 and 74ACT14 contain six inverter gates each with a Schmitt trigger input. They are capable of transforming slowly changing input signals into sharply defined, jitter-free output signals. In addition, they have a greater noise margin than conventional inverters.

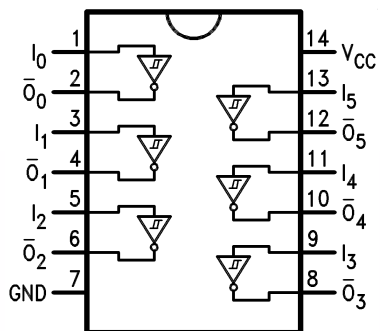
The 74AC14 and 74ACT14 have hysteresis between the positive-going and negative-going input thresholds (typically 1.0V) which is determined internally by transistor ratios and is essentially insensitive to temperature and supply voltage variations.

### Ordering Information

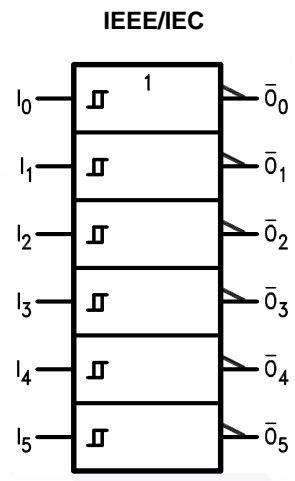
Order Number	Package Number	Package Description
74AC14SC	M14A	14-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow
74AC14SJ	M14D	14-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide
74AC14MTC	MTC14	14-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide
74ACT14SC	M14A	14-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow
74ACT14MTC	MTC14	14-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide

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

### Connection Diagram



### Logic Symbol



### Pin Description

Pin Names	Description
$I_n$	Inputs
$\bar{O}_n$	Outputs

### Function Table

Input	Output
<b>A</b>	<b>O</b>
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
$I_{IK}$	DC Input Diode Current $V_I = -0.5V$	-20mA
	$V_I = V_{CC} + 1.5$	+20mA
$V_I$	DC Input Voltage	-0.5V to $V_{CC} + 1.5V$
$I_{OK}$	DC Output Diode Current $V_O = -0.5V$	-20mA
	$V_O = V_{CC} + 0.5V$	+20mA
$V_O$	DC Output Voltage	-0.5V to $V_{CC} + 0.5V$
$I_O$	DC Output Source or Sink Current	$\pm 50mA$
$I_{CC}$ or $I_{GND}$	DC $V_{CC}$ or Ground Current per Output Pin	$\pm 50mA$
$T_{STG}$	Storage Temperature	-65°C to +150°C
$T_J$	Junction Temperature	140°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	Rating
$V_{CC}$	Supply Voltage AC	2.0V to 6.0V
	ACT	4.5V to 5.5V
$V_I$	Input Voltage	0V to $V_{CC}$
$V_O$	Output Voltage	0V to $V_{CC}$
$T_A$	Operating Temperature	-40°C to +85°C

## DC Electrical Characteristics for AC

Symbol	Parameter	V <sub>CC</sub> (V)	Conditions	T <sub>A</sub> = +25°C		T <sub>A</sub> = -40°C to +85°C	Units	
				Typ	Guaranteed Limits			
V <sub>OH</sub>	Minimum HIGH Level Output Voltage	3.0	I <sub>OUT</sub> = -50μA	2.99	2.9	2.9	V	
		4.5		4.49	4.4	4.4		
		5.5		5.49	5.4	5.4		
		3.0	I <sub>OH</sub> = 12mA		2.56	2.46		
		4.5		I <sub>OH</sub> = 24mA		3.86		3.76
		5.5		I <sub>OH</sub> = 24mA <sup>(1)</sup>		4.86		4.76
V <sub>OL</sub>	Maximum LOW Level Output Voltage	3.0	I <sub>OUT</sub> = 50μA	0.002	0.1	0.1	V	
		4.5		0.001	0.1	0.1		
		5.5		0.001	0.1	0.1		
		3.0	I <sub>OL</sub> = 12mA		0.36	0.44		
		4.5		I <sub>OL</sub> = 24mA		0.36		0.44
		5.5		I <sub>OL</sub> = 24mA <sup>(1)</sup>		0.36		0.44
I <sub>IN</sub> <sup>(3)</sup>	Maximum Input Leakage Current	5.5	V <sub>I</sub> = V <sub>CC</sub> , GND		±0.1	±1.0	μA	
V <sub>t+</sub>	Maximum Positive Threshold	3.0	T <sub>A</sub> = Worst Case		2.2	2.2	V	
		4.5			3.2	3.2		
		5.5			3.9	3.9		
V <sub>t-</sub>	Minimum Negative Threshold	3.0	T <sub>A</sub> = Worst Case		0.5	0.5	V	
		4.5			0.9	0.9		
		5.5			1.1	1.1		
V <sub>H(MAX)</sub>	Maximum Hysteresis	3.0	T <sub>A</sub> = Worst Case		1.2	1.2	V	
		4.5			1.4	1.4		
		5.5			1.6	1.6		
V <sub>H(MIN)</sub>	Minimum Hysteresis	3.0	T <sub>A</sub> = Worst Case		0.3	0.3	V	
		4.5			0.4	0.4		
		5.5			0.5	0.5		
I <sub>OLD</sub>	Minimum Dynamic	5.5	V <sub>OLD</sub> = 1.65V Max.			75	mA	
I <sub>OHD</sub>	Output Current <sup>(2)</sup>	5.5	V <sub>OHD</sub> = 3.85V Min.			-75	mA	
I <sub>CC</sub> <sup>(3)</sup>	Maximum Quiescent Supply Current	5.5	V <sub>IN</sub> = V <sub>CC</sub> or GND		2.0	20.0	μA	

**Notes:**

1. All outputs loaded; thresholds on input associated with output under test.
2. Maximum test duration 2.0ms, one output loaded at a time.
3. I<sub>IN</sub> and I<sub>CC</sub> @ 3.0V are guaranteed to be less than or equal to the respective limit @ 5.5V V<sub>CC</sub>.

## DC Electrical Characteristics for ACT

Symbol	Parameter	V <sub>CC</sub> (V)	Conditions	T <sub>A</sub> = +25°C		T <sub>A</sub> = -40°C to +85°C		Units
				Typ.	Guaranteed Limits			
V <sub>IH</sub>	Minimum HIGH Level Input Voltage	4.5	V <sub>OUT</sub> = 0.1V or V <sub>CC</sub> - 0.1V	1.5	2.0	2.0		V
		5.5		1.5	2.0	2.0		
V <sub>IL</sub>	Maximum LOW Level Input Voltage	4.5	V <sub>OUT</sub> = 0.1V or V <sub>CC</sub> - 0.1V	1.5	0.8	0.8		V
		5.5		1.5	0.8	0.8		
V <sub>OH</sub>	Minimum HIGH Level Output Voltage	4.5	I <sub>OUT</sub> = -50μA	4.49	4.34	4.4		V
		5.5		5.49	5.4	5.4		
		4.5	V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub> , I <sub>OH</sub> = -24mA		3.86	3.76		
		5.5		V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub> , I <sub>OH</sub> = -24mA <sup>(4)</sup>		4.86	4.76	
V <sub>OL</sub>	Maximum LOW Level Output Voltage	4.5	I <sub>OUT</sub> = 50μA	0.001	0.1	0.1		V
		5.5		0.001	0.1	0.1		
		4.5	V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub> , I <sub>OL</sub> = 24mA		0.36	0.44		
		5.5		V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub> , I <sub>OL</sub> = 24mA <sup>(4)</sup>		0.36	0.44	
I <sub>IN</sub>	Maximum Input Leakage Current	5.5	V <sub>I</sub> = V <sub>CC</sub> , GND		±0.1	±1.0		μA
V <sub>H(MAX)</sub>	Maximum Hysteresis	4.5	T <sub>A</sub> = Worst Case		1.4	1.4		V
		5.5			1.6	1.6		
V <sub>H(MIN)</sub>	Minimum Hysteresis	4.5	T <sub>A</sub> = Worst Case		0.4	0.4		V
		5.5			0.5	0.5		
V <sub>t+</sub>	Maximum Positive Threshold	4.5	T <sub>A</sub> = Worst Case		2.0	2.0		V
		5.5			2.0	2.0		
V <sub>t-</sub>	Minimum Negative Threshold	4.5	T <sub>A</sub> = Worst Case		0.8	0.8		V
		5.5			0.8	0.8		
I <sub>CCT</sub>	Maximum I <sub>CC</sub> /Input	5.5	V <sub>I</sub> = V <sub>CC</sub> - 2.1V	0.6		1.5		mA
I <sub>OLD</sub>	Minimum Dynamic Output Current <sup>(5)</sup>	5.5	V <sub>OLD</sub> = 1.65V Max.			75		mA
I <sub>OHD</sub>		5.5	V <sub>OHD</sub> = 3.85V Min.			-75		mA
I <sub>CC</sub>	Maximum Quiescent Supply Current	5.5	V <sub>IN</sub> = V <sub>CC</sub> or GND		2.0	20.0		μA

**Notes:**

- All outputs loaded; thresholds on input associated with output under test.
- Maximum test duration 2.0ms, one output loaded at a time.

**AC Electrical Characteristics for AC**

Symbol	Parameter	$V_{CC}$ (V) <sup>(6)</sup>	$T_A = +25^\circ\text{C}$ , $C_L = 50\text{pF}$			$T_A = -40^\circ\text{C to } +85^\circ\text{C}$ , $C_L = 50\text{pF}$		Units
			Min.	Typ.	Max.	Min.	Max.	
$t_{PLH}$	Propagation Delay	3.3	1.5	9.5	13.5	1.5	15.0	ns
		5.0	1.5	7.0	10.0	1.5	11.0	
$t_{PHL}$	Propagation Delay	3.3	1.5	7.5	11.5	1.5	13.0	ns
		5.0	1.5	6.0	8.5	1.5	9.5	

**Note:**

6. Voltage range 3.3 is  $3.3\text{V} \pm 0.3\text{V}$ . Voltage range 5.0 is  $5.0\text{V} \pm 0.5\text{V}$ .

**AC Electrical Characteristics for ACT**

Symbol	Parameter	$V_{CC}$ (V) <sup>(7)</sup>	$T_A = +25^\circ\text{C}$ , $C_L = 50\text{pF}$			$T_A = -40^\circ\text{C to } +85^\circ\text{C}$ , $C_L = 50\text{pF}$		Units
			Min.	Typ.	Max.	Min.	Max.	
$t_{PLH}$	Propagation Delay	5.0	3.0	8.0	10.0	3.0	11.0	ns
$t_{PHL}$	Propagation Delay	5.0	3.0	8.0	10.0	3.0	11.0	ns

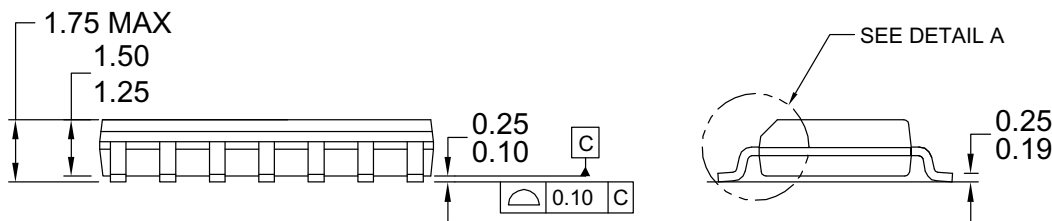
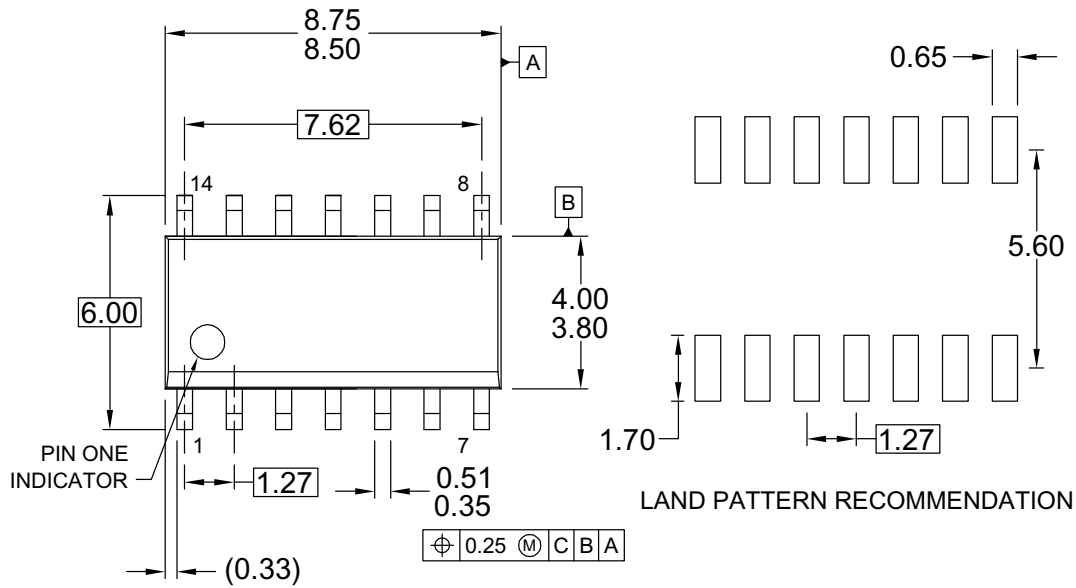
**Note:**

7. Voltage Range 5.0 is  $5.0\text{V} \pm 0.5\text{V}$ .

**Capacitance**

Symbol	Parameter	Conditions	Typ	Units
$C_{IN}$	Input Capacitance	$V_{CC} = \text{OPEN}$	4.5	pF
$C_{PD}$	Power Dissipation Capacitance	$V_{CC} = 5.0\text{V}$	25.0	pF
	AC			
	ACT		80	

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

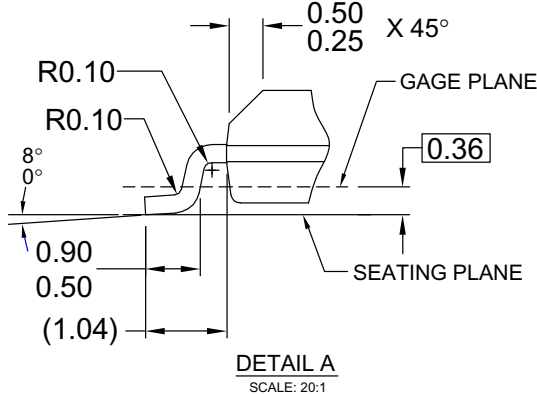


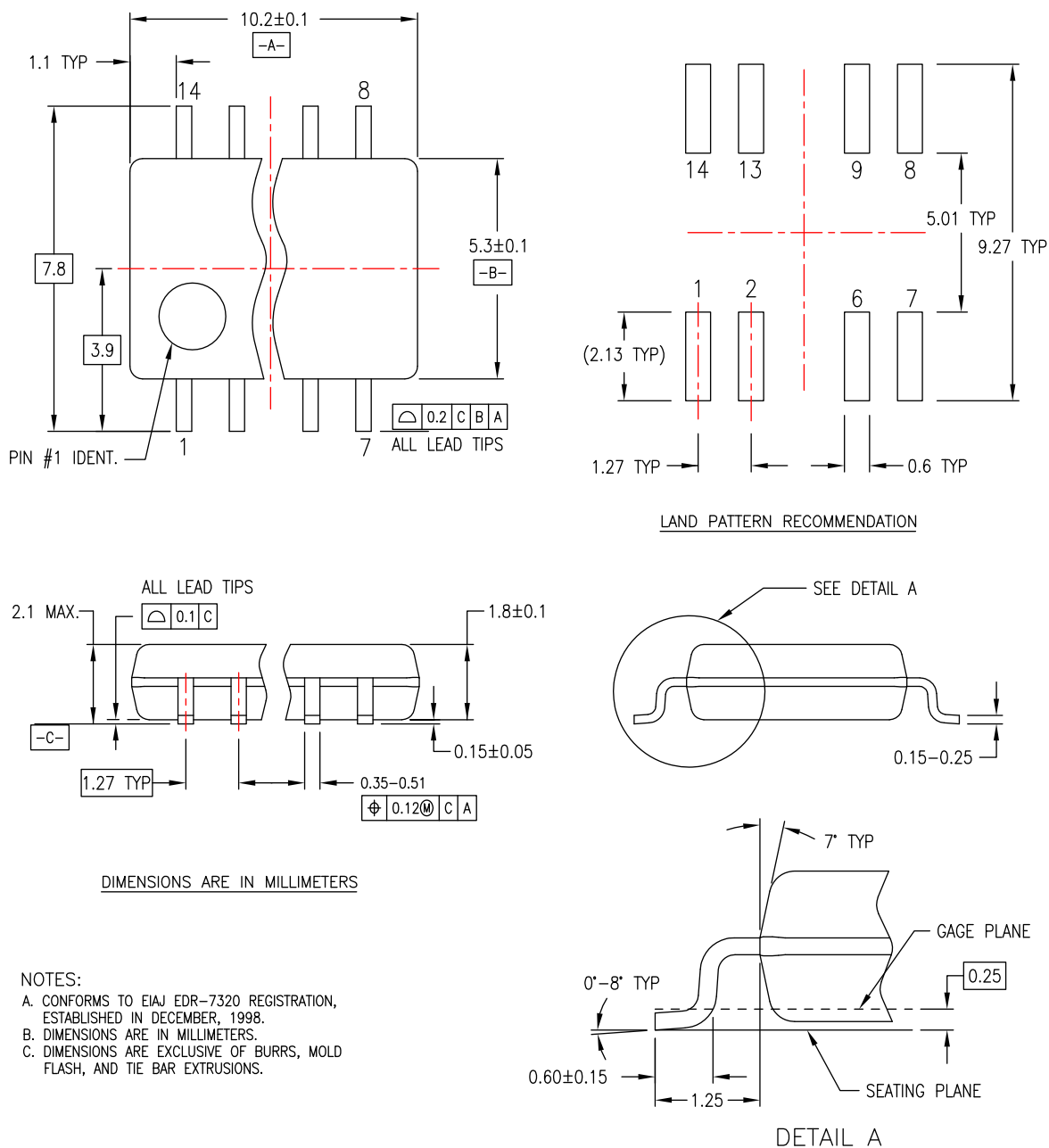
Figure 1. 14-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow

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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

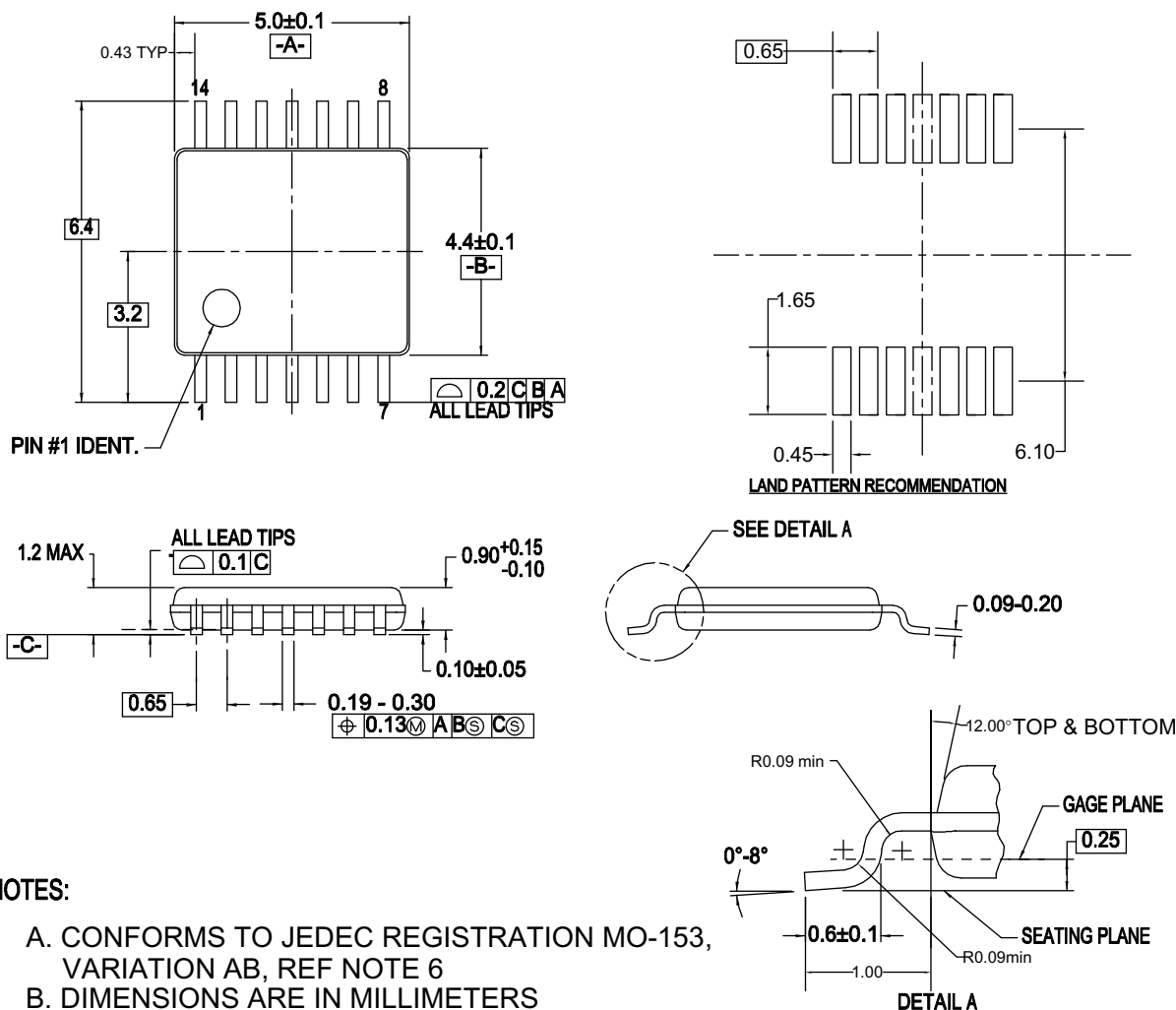
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### Physical Dimensions (Continued)



**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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**Definition of Terms**

Datasheet Identification	Product Status	Definition
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Preliminary	First Production	Datasheet contains preliminary data; supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve design.
No Identification Needed	Full Production	Datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve the design.
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