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SEMICONDUCTOR®

January 2008

74LCX27
Low Voltage Triple 3-Input NOR Gate with 5V Tolerant Inputs

Features

■ 5V tolerant inputs
■ 2.3V–3.6V V_{CC} specifications provided
■ 4.9ns t_{PD} max. (V_{CC} = 3.3V), 10µA I_{CC} max.
■ Power down high impedance inputs and outputs
■ ±24mA output drive (V_{CC} = 3.0V)
■ Implements patented noise/EMI reduction circuitry
■ Latch-up performance exceeds JEDEC 78 conditions
■ ESD performance:
  – Human body model > 2000V
  – Machine model > 200V

General Description

The LCX27 contains three 3-input NOR gates. The inputs tolerate voltages up to 7V allowing the interface of 5V systems to 3V systems.

The 74LCX27 is fabricated with advanced CMOS technology to achieve high speed operation while maintaining CMOS low power dissipation.

Ordering Information

| Order Number	Package Number	Package Description
74LCX27M	M14A	14-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow
74LCX27SJ	M14D	14-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide
74LCX27MTC	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.

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

**74LCX27 — Low Voltage Triple 3-Input NOR Gate with 5V Tolerant Inputs**

Connection Diagram
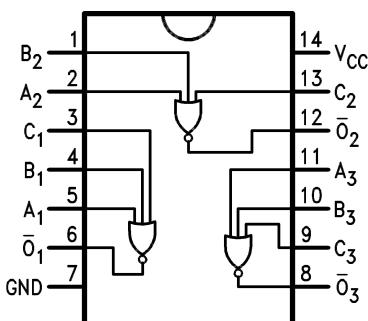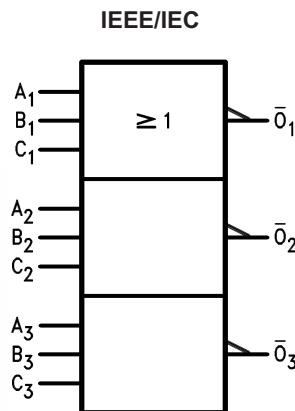
Pin Description

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

Logic Symbol

IEEE/IEC

Truth Table

$$\overline{O}_n = A_n + B_n + C_n$$

Inputs			Output
A_n	B_n	C_n	$\overline{O}_n$
H	X	X	L
X	H	X	L
X	X	H	L
L	L	L	H

H = HIGH Voltage Level

L = LOW Voltage Level

X = Immaterial

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_I	DC Input Voltage	−0.5V to +7.0V
V_O	DC Output Voltage, Output in HIGH or LOW State[1]	−0.5V to V_{CC} + 0.5V
I_{IK}	DC Input Diode Current, V_I < GND	−50mA
I_{OK}	DC Output Diode Current	
	V_O < GND	−50mA
	V_O > V_{CC}	+50mA
I_O	DC Output Source/Sink Current	±50mA
I_{CC}	DC Supply Current per Supply Pin	±100mA
I_{GND}	DC Ground Current per Ground Pin	±100mA
T_{STG}	Storage Temperature	−65°C to +150°C

Note:

1. I_O Absolute Maximum Rating must be observed.

Recommended Operating Conditions[2]

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.	Units
V_{CC}	Supply Voltage			
	Operating	2.0	3.6	V
	Data Retention	1.5	3.6	
V_I	Input Voltage	0	5.5	V
V_O	Output Voltage, HIGH or LOW State	0	V_{CC}	V
I_{OH} / I_{OL}	Output Current			
	V_{CC} = 3.0V–3.6V		±24	mA
	V_{CC} = 2.7V–3.0V		±12	
	V_{CC} = 2.3V–2.7V		±8	
T_A	Free-Air Operating Temperature	−40	85	°C
Δt / ΔV	Input Edge Rate, V_{IN} = 0.8V–2.0V, V_{CC} = 3.0V	0	10	ns / V

Note:

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

74LCX27 — Low Voltage Triple 3-Input NOR Gate with 5V Tolerant Inputs

DC Electrical Characteristics

Symbol	Parameter	V_{CC} (V)	Conditions	T_A = –40°C to +85°C Min.	T_A = –40°C to +85°C Max.	Units
V_{IH}	HIGH Level Input Voltage	2.3–2.7		1.7		V
		2.7–3.6		2.0		
V_{IL}	LOW Level Input Voltage	2.3–2.7			0.7	V
		2.7–3.6			0.8	
V_{OH}	HIGH Level Output Voltage	2.3–3.6	I_{OH} = –100µA	V_{CC} – 0.2		V
		2.3	I_{OH} = –8mA	1.8		
		2.7	I_{OH} = –12mA	2.2		
		3.0	I_{OH} = –18mA	2.4		
			I_{OH} = –24mA	2.2		
V_{OL}	LOW Level Output Voltage	2.3–3.6	I_{OL} = 100µA		0.2	V
		2.3	I_{OL} = 8mA		0.6	
		2.7	I_{OL} = 12mA		0.4	
		3.0	I_{OL} = 16mA		0.4	
			I_{OL} = 24mA		0.55	
I_I	Input Leakage Current	2.3–3.6	$0 \leq V_I \leq 5.5V$		±5.0	µA
I_{OFF}	Power-Off Leakage Current	0	V_I or V_O = 5.5V		10	µA
I_{CC}	Quiescent Supply Current	2.3–3.6	$V_I = V_{CC}$ or GND		10	µA
			$3.6V \leq V_I \leq 5.5V$		±10	
ΔI_{CC}	Increase in I_{CC} per Input	2.3–3.6	$V_{IH} = V_{CC}$ – 0.6V		500	µA

AC Electrical Characteristics

Symbol	Parameter	T_A = –40°C to +85°C, R_L = 500Ω V_{CC} = 3.3V ± 0.3V, C_L = 50pF Min.	Max.	V_{CC} = 2.7V, C_L = 50pF Min.	Max.	V_{CC} = 2.5V ± 0.2V, C_L = 30pF Min.	Max.	Units
t_{PHL}, t_{PLH}	Propagation Delay	1.5	4.9	1.5	5.8	1.5	5.9	ns
t_{OSHL}, t_{OSLH}	Output to Output Skew[3]		1.0					ns

Note:

3. Skew is defined as the absolute value of the difference between the actual propagation delay for any two separate outputs of the same device. The specification applies to any outputs switching in the same direction, either HIGH-to-LOW (t_{OSHL}) or LOW-to-HIGH (t_{OSLH}).

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Dynamic Switching Characteristics

Symbol	Parameter	V_{CC} (V)	Conditions	$T_A = 25°C$ Typical	Unit
V_{OLP}	Quiet Output Dynamic Peak V_{OL}	3.3	$C_L = 50pF$, $V_{IH} = 3.3V$, $V_{IL} = 0V$	0.8	V
		2.5	$C_L = 30pF$, $V_{IH} = 2.5V$, $V_{IL} = 0V$	0.6	
V_{OLV}	Quiet Output Dynamic Valley V_{OL}	3.3	$C_L = 50pF$, $V_{IH} = 3.3V$, $V_{IL} = 0V$	−0.8	V
		2.5	$C_L = 30pF$, $V_{IH} = 2.5V$, $V_{IL} = 0V$	−0.6	

Capacitance

Symbol	Parameter	Conditions	Typical	Units
C_{IN}	Input Capacitance	V_{CC} = Open, $V_I = 0V$ or V_{CC}	7	pF
C_{OUT}	Output Capacitance	$V_{CC} = 3.3V$, $V_I = 0V$ or V_{CC}	8	pF
C_{PD}	Power Dissipation Capacitance	$V_{CC} = 3.3V$, $V_I = 0V$ or V_{CC}, f = 10MHz	25	pF

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AC Loading and Waveforms (Generic for LCX Family)
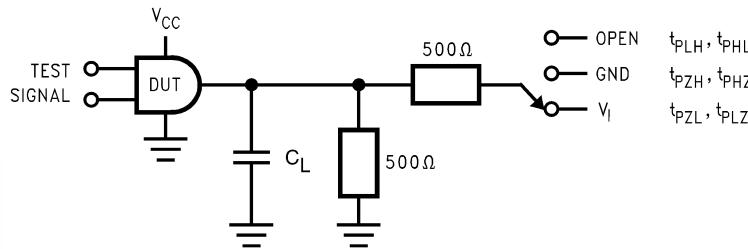
| Test	Switch
t_{PLH}, t_{PHL}	Open
t_{PZL}, t_{PLZ}	6V at $V_{CC} = 3.3 \pm 0.3$V V_{CC} x 2 at $V_{CC} = 2.5 \pm 0.2$V
t_{PZH}, t_{PHZ}	GND

**Figure 1. AC Test Circuit (C_L includes probe and jig capacitance)**
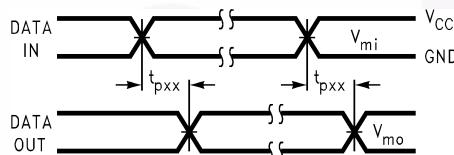

Waveform for Inverting and Non-Inverting Functions
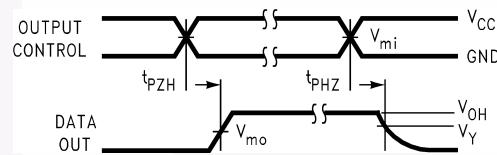
3-STATE Output High Enable and Disable Times for Logic
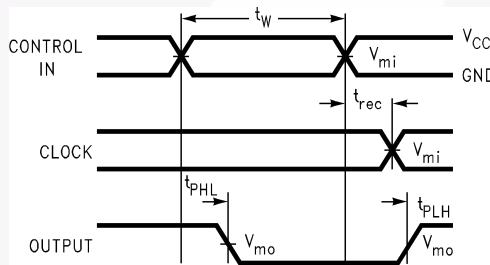
Propagation Delay. Pulse Width and t_{rec} Waveforms
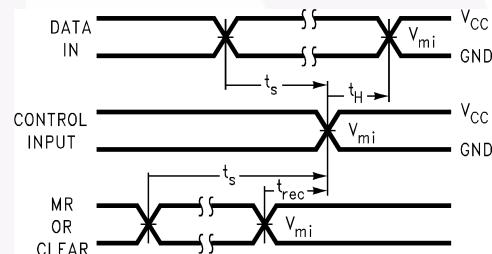
Setup Time, Hold Time and Recovery Time for Logic
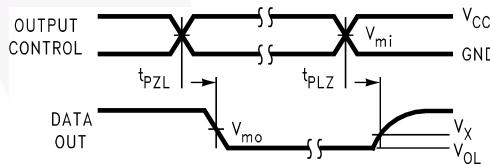
3-STATE Output Low Enable and Disable Times for Logic
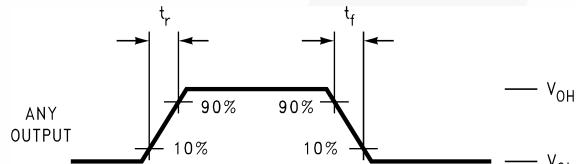
t_{rise} and t_{fall}

| Symbol	V_{CC}		
	3.3V ± 0.3V	2.7V	2.5V ± 0.2V
V_{mi}	1.5V	1.5V	V_{CC} / 2
V_{mo}	1.5V	1.5V	V_{CC} / 2
V_x	V_{OL} + 0.3V	V_{OL} + 0.3V	V_{OL} + 0.15V
V_y	V_{OH} − 0.3V	V_{OH} − 0.3V	V_{OH} − 0.15V

Figure 2. Waveforms (Input Characteristics; f = 1MHz, $t_r = t_f$ = 3ns)

Schematic Diagram (Generic for LCX Family)

74LCX27 — Low Voltage Triple 3-Input NOR Gate with 5V Tolerant Inputs

Physical Dimensions

8.75
8.50

A

7.62

0.65

14   8

B

5.60

6.00

4.00
3.80

1.70

1.27

PIN ONE
INDICATOR

1

7

1.27

0.51
0.35

LAND PATTERN RECOMMENDATION

⊕ | 0.25 Ⓜ | C | B | A

(0.33)

1.75 MAX
1.50
1.25

SEE DETAIL A

0.25
0.10

C

0.25
0.19

▱ | 0.10 | C
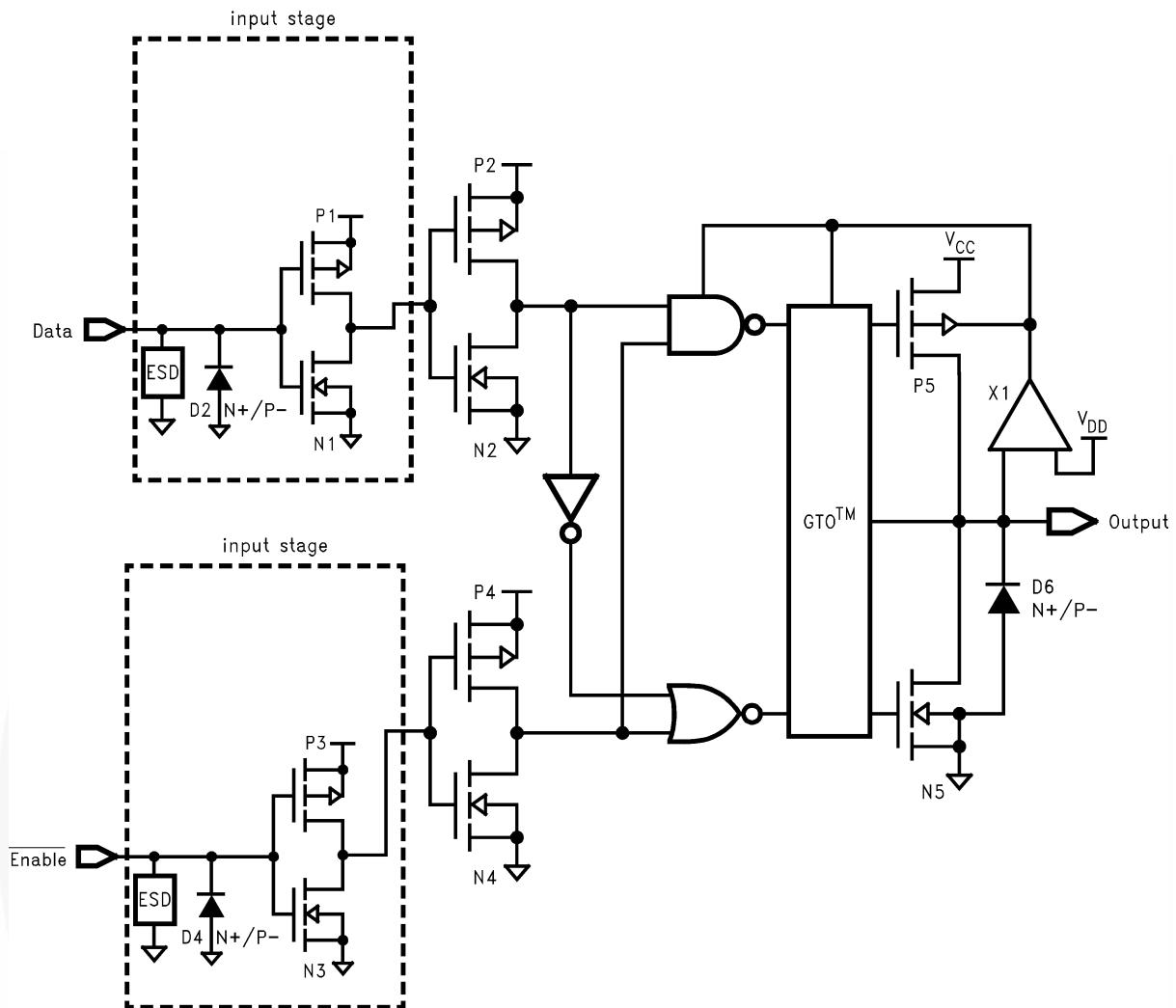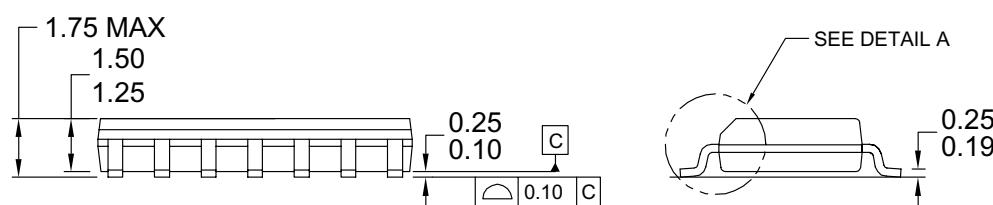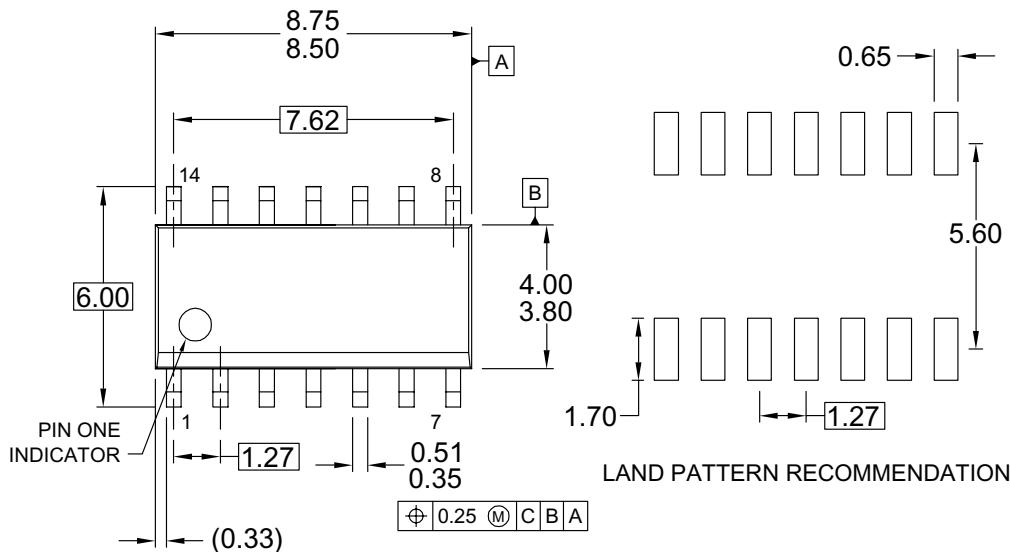
NOTES: UNLESS OTHERWISE SPECIFIED

0.50
0.25   X 45°

R0.10

R0.10

GAGE PLANE

0.36

8°
0°

0.90
0.50

SEATING PLANE

(1.04)

DETAIL A
SCALE: 20:1

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
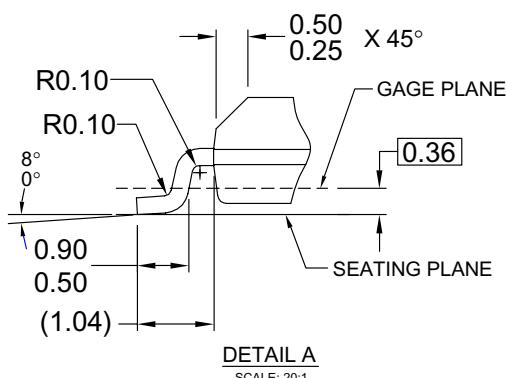
Figure 3. 14-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow

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Physical Dimensions (Continued)

DIMENSIONS ARE IN MILLIMETERS
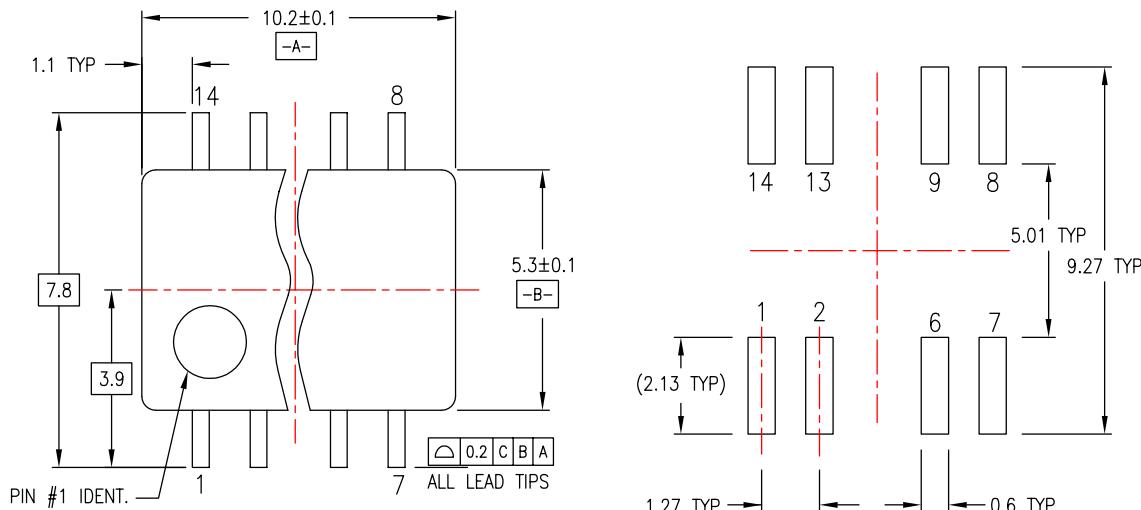
LAND PATTERN RECOMMENDATION

DETAIL A
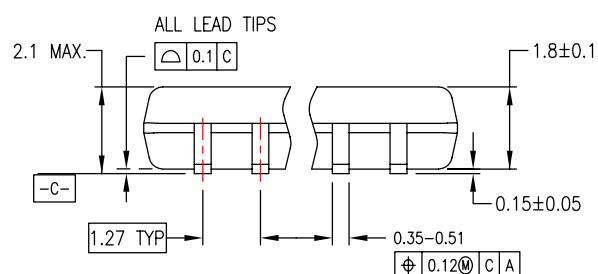
NOTES:
A. CONFORMS TO EIAJ EDR-7320 REGISTRATION,
   ESTABLISHED IN DECEMBER, 1998.
B. DIMENSIONS ARE IN MILLIMETERS.
C. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD
   FLASH, AND TIE BAR EXTRUSIONS.
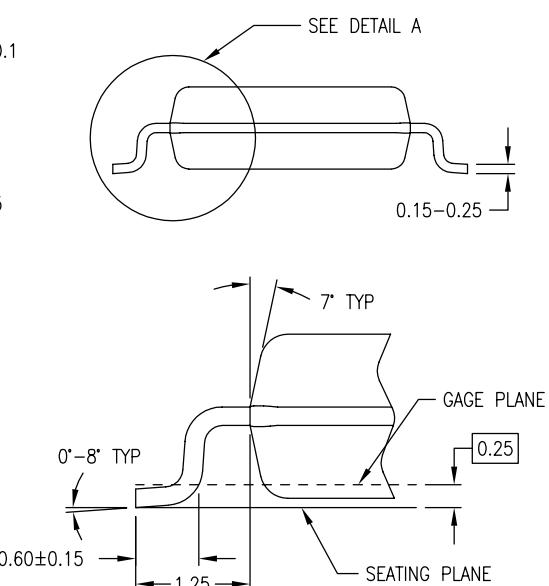
M14DREVC

Figure 4. 14-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide

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Physical Dimensions (Continued)

5.0±0.1
-A-

0.43 TYP

14   8

6.4

3.2

4.4±0.1
-B-

PIN #1 IDENT.

1   7

⌒ 0.2 C B A
ALL LEAD TIPS

1.2 MAX

ALL LEAD TIPS
⌒ 0.1 C

0.90 +0.15 -0.10

-C-

0.10±0.05

0.65

0.19 - 0.30

⊕ 0.13 Ⓜ A BⓈ CⓈ

0.65

1.65

0.45   6.10

LAND PATTERN RECOMMENDATION

SEE DETAIL A

0.09-0.20

12.00° TOP & BOTTOM

R0.09 min

GAGE PLANE

0.25

0°-8°

0.6±0.1

SEATING PLANE

R0.09min

1.00

DETAIL A
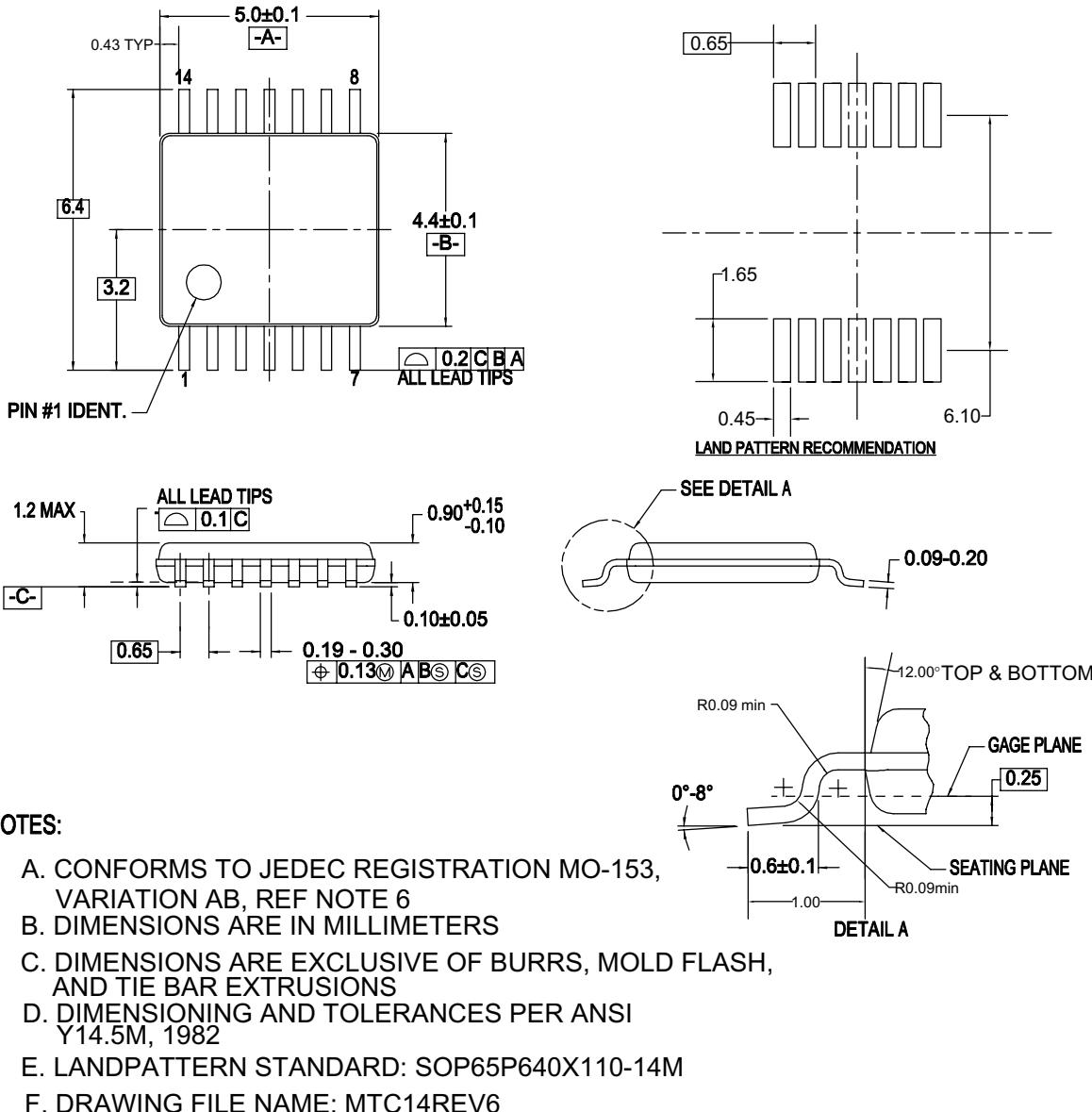
NOTES:

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 5. 14-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide

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		SuperSOT™ 8	

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