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SEMICONDUCTOR®

April 2007

74AC02, 74ACT02
Quad 2-Input NOR Gate

Features

■ I_{CC} reduced by 50% on 74AC02 only
■ Outputs source/sink 24mA
■ ACT02 has TTL-compatible inputs

General Description

The AC02/ACT02 contains four, 2-input NOR gates.

Ordering Information

| Order Number	Package Number	Package Description
74AC02SC	M14A	14-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow
74AC02SCX_NL[1]	M14A	14-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow
74AC02SJ	M14D	14-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide
74AC02MTC	MTC14	14-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide
74AC02PC	N14A	14-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300" Wide
74ACT02SC	M14A	14-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow
74ACT02MTC	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.
(PC not available in Tape and Reel.) Pb-Free package per JEDEC J-STD-020B.

Note:

1. Device available in Tape and Reel only.

Connection Diagram

Logic Symbol

IEEE/IEC
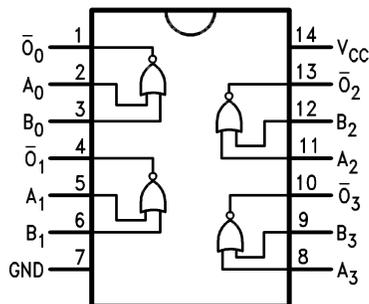
Pin Description

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

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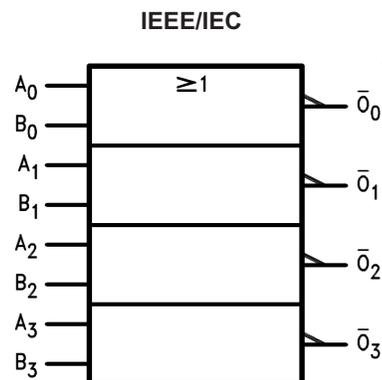
Absolute Maximum Ratings

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 $V_I = -0.5V$ $V_I = V_{CC} + 0.5V$	 –20mA +20mA
V_I	DC Input Voltage	–0.5V to V_{CC} + 0.5V
I_{OK}	DC Output Diode Current $V_O = -0.5V$ $V_O = V_{CC} + 0.5V$	 –20mA +20mA
V_O	DC Output Voltage	–0.5V to V_{CC} + 0.5V
I_O	DC Output Source or Sink Current	±50mA
I_{CC} or I_{GND}	DC V_{CC} or Ground Current per Output Pin	±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 ACT	 2.0V to 6.0V 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
$\Delta V / \Delta t$	Minimum Input Edge Rate, AC Devices: V_{IN} from 30% to 70% of V_{CC}, V_{CC} @ 3.3V, 4.5V, 5.5V	125mV/ns
$\Delta V / \Delta t$	Minimum Input Edge Rate, ACT Devices: V_{IN} from 0.8V to 2.0V, V_{CC} @ 4.5V, 5.5V	125mV/ns

DC Electrical Characteristics for AC

Symbol	Parameter	V_{CC} (V)	Conditions	T_A = +25°C Typ.	T_A = +25°C Guaranteed Limits	T_A = –40°C to +85°C Guaranteed Limits	Units
V_{IH}	Minimum HIGH Level Input Voltage	3.0	V_{OUT} = 0.1V or V_{CC} – 0.1V	1.5	2.1	2.1	V
		4.5		2.25	3.15	3.15	
		5.5		2.75	3.85	3.85	
V_{IL}	Maximum LOW Level Input Voltage	3.0	V_{OUT} = 0.1V or V_{CC} – 0.1V	1.5	0.9	0.9	V
		4.5		2.25	1.35	1.35	
		5.5		2.75	1.65	1.65	
V_{OH}	Minimum HIGH Level Output Voltage	3.0	I_{OUT} = –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	V_{IN} = V_{IL} or V_{IH}: I_{OH} = –12mA		2.56	2.46	
		4.5	I_{OH} = –24mA		3.86	3.76	
		5.5	I_{OH} = –24mA[2]		4.86	4.76	
V_{OL}	Maximum LOW Level Output Voltage	3.0	I_{OUT} = 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	V_{IN} = V_{IL} or V_{IH}: I_{OL} = 12mA		0.36	0.44	
		4.5	I_{OL} = 24mA		0.36	0.44	
		5.5	I_{OL} = 24mA[2]		0.36	0.44	
I_{IN}[4]	Maximum Input Leakage Current	5.5	V_I = V_{CC}, GND		±0.1	±1.0	µA
I_{OLD}	Minimum Dynamic Output Current[3]	5.5	V_{OLD} = 1.65V Max.			75	mA
I_{OHD}		5.5	V_{OHD} = 3.85V Min.			–75	mA
I_{CC}[4]	Maximum Quiescent Supply Current	5.5	V_{IN} = V_{CC} or GND		2.0	20.0	µA

Notes:

2. All outputs loaded; thresholds on input associated with output under test.

3. Maximum test duration 2.0ms, one output loaded at a time.

4. I_{IN} and I_{CC} @ 3.0V are guaranteed to be less than or equal to the respective limit @ 5.5V V_{CC}.

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DC Electrical Characteristics for ACT

Symbol	Parameter	V_{CC} (V)	Conditions	T_A = +25°C Typ.	T_A = –40°C to +85°C Guaranteed Limits		Units
V_{IH}	Minimum HIGH Level Input Voltage	4.5	V_{OUT} = 0.1V or V_{CC} – 0.1V	1.5	2.0	2.0	V
		5.5		1.5	2.0	2.0	
V_{IL}	Maximum LOW Level Input Voltage	4.5	V_{OUT} = 0.1V or V_{CC} – 0.1V	1.5	0.8	0.8	V
		5.5		1.5	0.8	0.8	
V_{OH}	Minimum HIGH Level Output Voltage	4.5	I_{OUT} = –50µA	4.49	4.4	4.4	V
		5.5		5.49	5.4	5.4	
		4.5	$V_{IN} = V_{IL}$ or V_{IH}: I_{OH} = –24mA		3.86	3.76	
		5.5	I_{OH} = –24mA[5]		4.86	4.76	
V_{OL}	Maximum LOW Level Output Voltage	4.5	I_{OUT} = 50µA	0.001	0.1	0.1	V
		5.5		0.001	0.1	0.1	
		4.5	$V_{IN} = V_{IL}$ or V_{IH}: I_{OL} = 24mA		0.36	0.44	
		5.5	I_{OL}= 24mA[5]		0.36	0.44	
I_{IN}	Maximum Input Leakage Current	5.5	$V_I = V_{CC}$, GND		±0.1	±1.0	µA
I_{CCT}	Maximum I_{CC}/Input	5.5	$V_I = V_{CC}$ – 2.1V	0.6		1.5	mA
I_{OLD}	Minimum Dynamic Output Current[6]	5.5	V_{OLD} = 1.65V Max.			75	mA
I_{OHD}		5.5	V_{OHD} = 3.85V Min.			–75	mA
I_{CC}	Maximum Quiescent Supply Current	5.5	$V_{IN} = V_{CC}$ or GND		4.0	40.0	µA

Notes:

5. All outputs loaded; thresholds on input associated with output under test.

6. Maximum test duration 2.0ms, one output loaded at a time.

AC Electrical Characteristics for AC

Symbol	Parameter	V_{CC} (V)[7]	T_A = +25°C, C_L = 50pF			T_A = −40°C to +85°C, C_L = 50pF		Units
			Min.	Typ.	Max.	Min.	Max.	
t_{PLH}	Propagation Delay	3.3	1.5	5.0	7.5	1.0	8.0	ns
		5.0	1.5	4.0	6.0	1.0	6.5	
t_{PHL}	Propagation Delay	3.3	1.5	5.0	7.5	1.0	8.0	ns
		5.0	1.5	4.5	6.5	1.0	7.0	

Note:
7. Voltage range 3.3 is 3.3V ± 0.3V. Voltage range 5.0 is 5.0V ± 0.5V.

AC Electrical Characteristics for ACT

Symbol	Parameter	V_{CC} (V)[8]	T_A = +25°C, C_L = 50pF			T_A = −40°C to +85°C, C_L = 50pF		Units
			Min.	Typ.	Max.	Min.	Max.	
t_{PLH}	Propagation Delay	5.0	1.0	6.0	8.5	1.0	9.0	ns
t_{PHL}	Propagation Delay	5.0	1.0	6.5	9.5	1.0	10.0	ns

Note:
8. Voltage Range 5.0 is 5.0V ± 0.5V.

Capacitance

Symbol	Parameter	Conditions	Typ.	Units
C_{IN}	Input Capacitance	V_{CC} = OPEN	4.5	pF
C_{PD}	Power Dissipation Capacitance	V_{CC} = 5.0V	30.0	pF

Physical Dimensions
Dimensions are in inches (millimeters) unless otherwise noted.

8.60±0.10

7.62

14   8

6.00   3.90±0.10

1   7

PIN ONE
INDICATOR

(0.33)

1.27   0.51
            0.35

⊕ 0.25Ⓜ C B A

7.40

4.00

(1.70)

1.27   0.75

7.62

LAND PATTERN RECOMMENDATION

1.75 MAX

1.45 +0.05
     −0.20

0.15 +0.10
     −0.05

0.10 C

SEE DETAIL A

0.25
0.19

0.50   X 45°
0.25

(R0.10)

(R0.10)

GAGE PLANE

0.36

8°
0°

0.70±0.20

(1.04)

SEATING PLANE

M14AREVL

DETAIL A
SCALE: 20:1
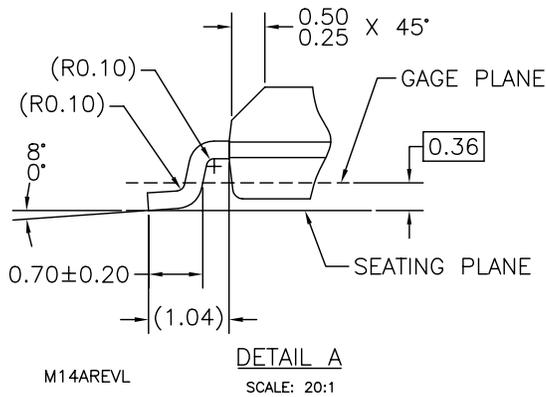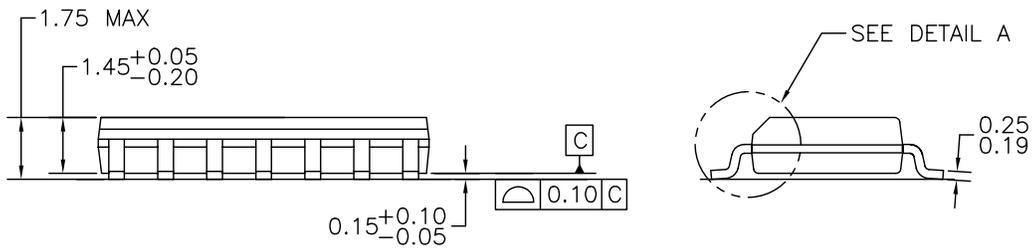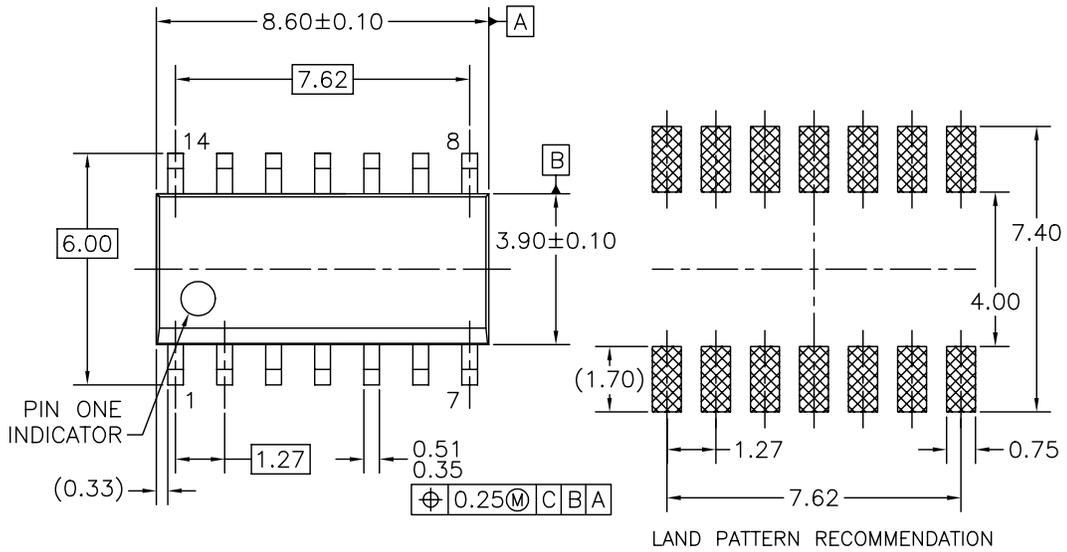
NOTES: UNLESS OTHERWISE SPECIFIED

A) THIS PACKAGE CONFORMS TO JEDEC
    MS−012, VARIATION AB, ISSUE C,
    DATED MAY 1990.
B) ALL DIMENSIONS ARE IN MILLIMETERS.
C) DIMENSIONS DO NOT INCLUDE MOLD
    FLASH OR BURRS.

**Figure 1. 14-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow
Package Number M14A**

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Physical Dimensions (Continued)
Dimensions are in millimeters unless otherwise noted.

10.2±0.1
-A-
1.1 TYP
14   8
7.8
-B-
5.3±0.1
3.9
PIN #1 IDENT.   1   7
0.2 C B A
ALL LEAD TIPS

LAND PATTERN RECOMMENDATION
14 13   9   8
5.01 TYP
9.27 TYP
(2.13 TYP)
1   2   6   7
1.27 TYP   0.6 TYP

ALL LEAD TIPS
2.1 MAX.   0.1 C
1.8±0.1
-C-
1.27 TYP   0.35−0.51
0.15±0.05
0.12 M C A
DIMENSIONS ARE IN MILLIMETERS

SEE DETAIL A
0.15−0.25

7° TYP
GAGE PLANE
0.25
0°−8° TYP
0.60±0.15   1.25
SEATING PLANE
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 2. 14-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide
Package Number M14D

Physical Dimensions (Continued)
Dimensions are in millimeters unless otherwise noted.

LAND PATTERN RECOMMENDATION

ALL LEAD TIPS

SEE DETAIL A

DETAIL A
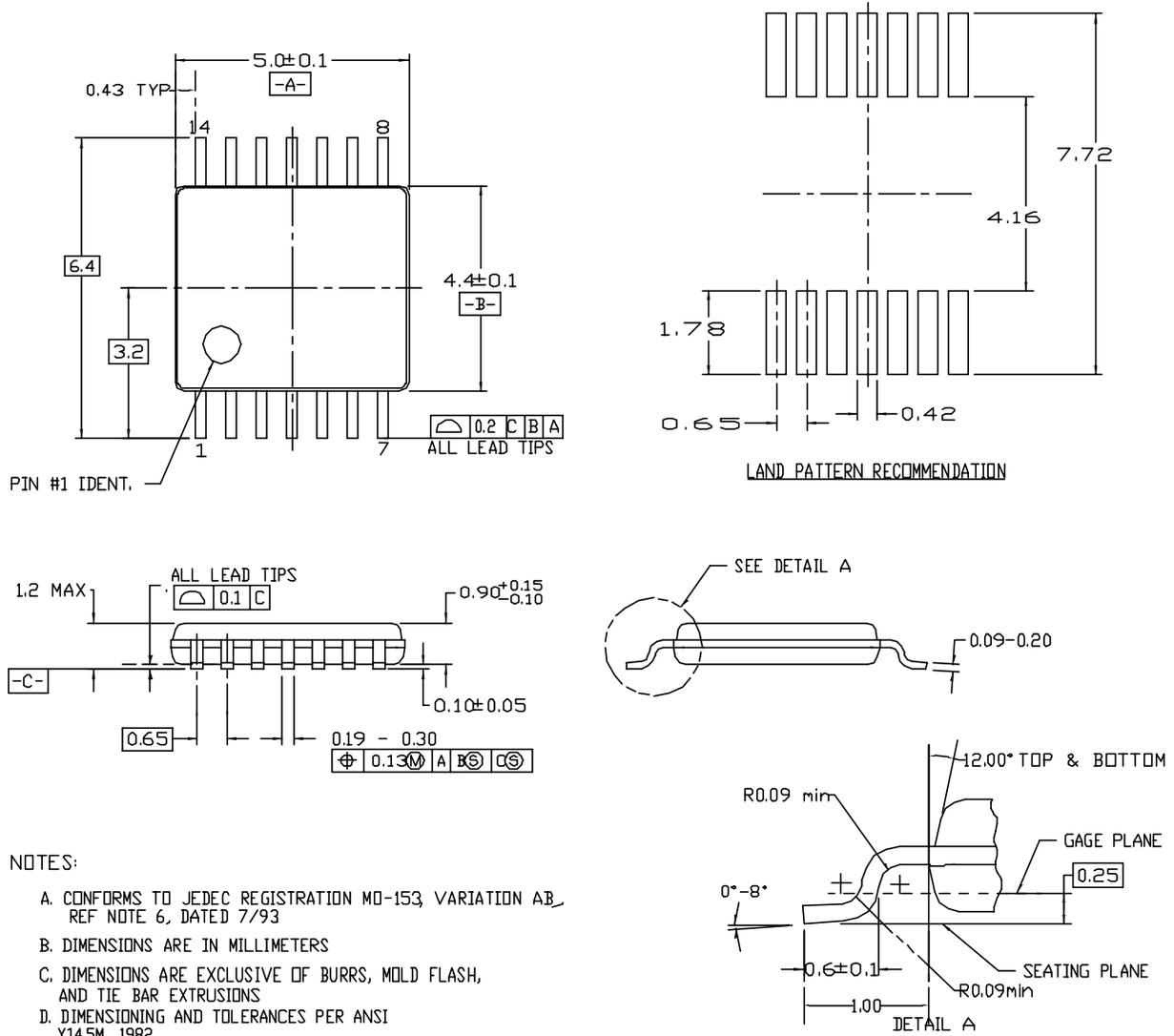
NOTES:

A. CONFORMS TO JEDEC REGISTRATION MO-153, VARIATION AB, REF NOTE 6, DATED 7/93

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

MTC14revD

**Figure 3. 14-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide
Package Number MTC14**

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Physical Dimensions (Continued)
Dimensions are in inches (millimeters) unless otherwise noted.
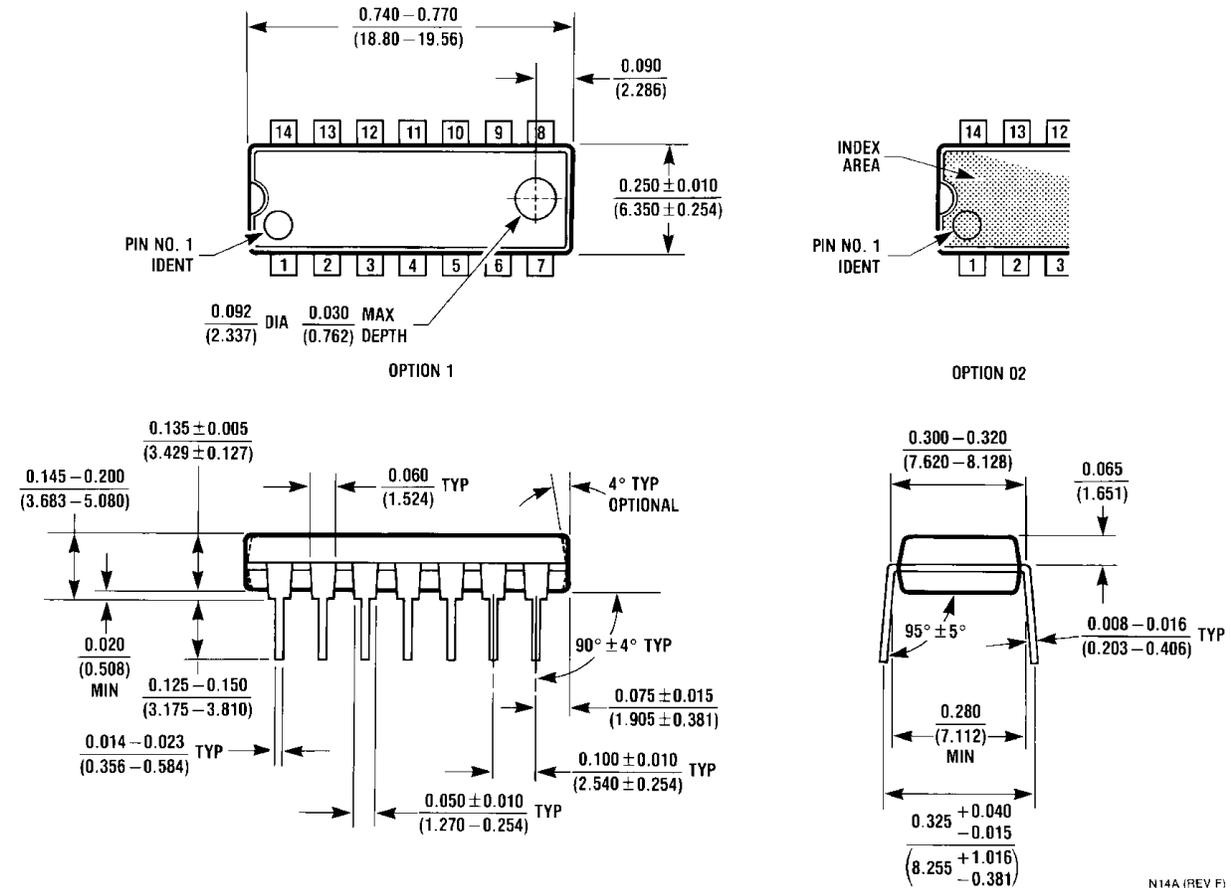
Figure 4. 14-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300" Wide
Package Number N14A

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DOME™	MSXPro™	SPM®	Wire™
E^2CMOS™	OCX™	STEALTH™	
EcoSPARK®	OCXPro™	SuperFET™	
EnSigna™	OPTOLOGIC®	SuperSOT™-3	
FACT Quiet Series™	OPTOPLANAR®	SuperSOT™-6	
FACT®	PACMAN™	SuperSOT™-8	
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GlobalOptoisolator™	PowerSaver™	TinyBoost™	
GTO™	PowerTrench®	TinyBuck™	

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2. A critical component in any component of a life support, device, or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

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Definition of Terms

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Advance Information	Formative or In Design	This datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
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