Hex Inverter with Schmitt Trigger Input

74AC14, 74ACT14

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 1.0 V) which is determined internally by transistor ratios and is essentially insensitive to temperature and supply voltage variations.

Features

- I_{CC} Reduced by 50%
- Outputs Source/Sink 24 mA
- 74ACT14 has TTL−Compatible Inputs
- These are Pb−Free Devices

SOIC−14 NB
CASE 751A−03

SOIC14
CASE 751EF

TSSOP−14 WB
CASE 948G

TSSOP−14 WB
CASE 948G−01

ABSOLUTE MAXIMUM RATINGS

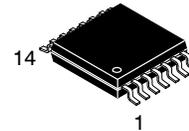| Parameter	Symbol	Value	Unit
Supply Voltage	V_{CC}	−0.5 to +6.5	V
DC Input Diode Current V_I = −0.5 V V_I = V_{CC} + 1.5 V	I_{IK}	−20 +20	mA
DC Input Voltage	V_I	−0.5 to V_{CC} + 1.5	V
DC Output Diode Current V_O = −0.5 V V_O = V_{CC} + 0.5 V	I_{OK}	−20 +20	mA
DC Output Voltage	V_O	−0.5 to V_{CC} + 0.5	V
DC Output Source or Sink Current	I_O	±50	mA
DC V_{CC} or Ground Current per Output Pin	I_{CC} or I_{GND}	±50	mA
Storage Temperature Range	T_{STG}	−65 to +150	°C
Junction Temperature	T_J	140	°C

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.
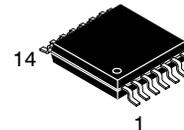
MARKING DIAGRAM

```
14  ▯▯▯▯▯▯▯
    ┌─────────┐
    │ XXXXXX  │
    │ AWLYWW  │
    ○└─────────┘
 1  ▯▯▯▯▯▯▯
```

XXXXXX	= Specific Device Code
A	= Assembly Location
WL	= Wafer Lot
Y	= Year
WW	= Work Week

MARKING DIAGRAM
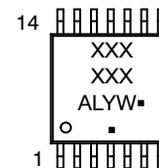
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14  ▯▯▯▯▯▯▯
    ┌─────────┐
    │  XXX    │
    │  XXX    │
    │  ALYW■  │
    ○└───■────┘
 1  ▯▯▯▯▯▯▯
```

XXXXXX	= Specific Device Code
A	= Assembly Location
L	= Wafer Lot
Y	= Year
W	= Work Week
■	= Pb−Free Package

(Note: Microdot may be in either location)

ORDERING INFORMATION
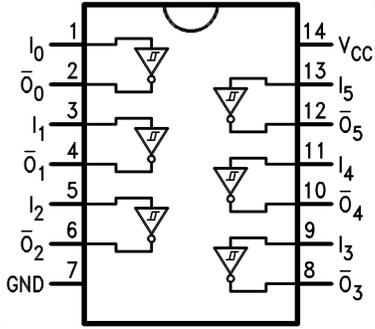
74AC14, 74ACT14

Figure 1. Connection Diagram
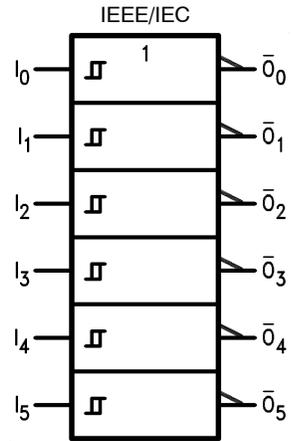
Figure 2. Logic Symbol

PIN DESCRIPTION

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

FUNCTION TABLE

Input	Output
A	$\overline{O}$
L	H
H	L

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Min	Max	Unit
V_{CC}	Supply Voltage AC ACT	 2.0 4.5	 6.0 5.5	V
V_I	Input Voltage	0	V_{CC}	V
V_O	Output Voltage	0	V_{CC}	V
T_A	Operating Temperature	−40	+85	°C

Functional operation above the stresses listed in the Recommended Operating Ranges is not implied. Extended exposure to stresses beyond the Recommended Operating Ranges limits may affect device reliability.

DC ELECTRICAL CHARACTERISTICS FOR AC

Symbol	Parameter	V_{CC}(V)	Conditions	T_A = +25°C Typ	T_A = −40°C to +85°C Guaranteed Limits		Unit
V_{OH}	Minimum HIGH Level Output Voltage	3.0	I_{OUT} = −50 µA	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_{OH} = 12 mA	−	2.56	2.46	
		4.5	I_{OH} = 24 mA	−	3.86	3.76	
		5.5	I_{OH} = 24 mA (Note 1)	−	4.86	4.76	
V_{OL}	Maximum LOW Level Output Voltage	3.0	I_{OUT} = 50 µA	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_{OL} = 12 mA	−	0.36	0.44	
		4.5	I_{OL} = 24 mA	−	0.36	0.44	
		5.5	I_{OL} = 24 mA (Note 1)	−	0.36	0.44	
I_{IN} (Note 3)	Maximum Input Leakage Current	5.5	V_I = V_{CC}, GND	−	±0.1	±1.0	µA
V_{t+}	Maximum Positive Threshold	3.0	T_A = Worst Case	−	2.2	2.2	V
		4.5		−	3.2	3.2	
		5.5		−	3.9	3.9	
$V_{t−}$	Minimum Negative Threshold	3.0	T_A = Worst Case	−	0.5	0.5	V
		4.5		−	0.9	0.9	
		5.5		−	1.1	1.1	
$V_{H(MAX)}$	Maximum Hysteresis	3.0	T_A = Worst Case	−	1.2	1.2	V
		4.5		−	1.4	1.4	
		5.5		−	1.6	1.6	
$V_{H(MIN)}$	Minimum Hysteresis	3.0	T_A = Worst Case	−	0.3	0.3	V
		4.5		−	0.4	0.4	
		5.5		−	0.5	0.5	
I_{OLD}	Minimum Dynamic	5.5	V_{OLD} = 1.65 V Max.	−	−	75	mA
I_{OHD}	Output Current (Note 2)	5.5	V_{OHD} = 3.85 V Min.	−	−	−75	mA
I_{CC} (Note 3)	Maximum Quiescent Supply Current	5.5	V_{IN} = V_{CC} or GND	−	2.0	20.0	µA

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

DC ELECTRICAL CHARACTERISTICS FOR ACT

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

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.
4. All outputs loaded; thresholds on input associated with output under test.
5. Maximum test duration 2.0 ms, one output loaded at a time.

AC ELECTRICAL CHARACTERISTICS FOR AC

Symbol	Parameter	V$_{CC}$(V) (Note 6)	T$_A$ = +25°C, C$_L$ = 50 pF			T$_A$ = −40°C to +85°C, C$_L$ = 50 pF		Unit
			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	

6. Voltage range 3.3 is 3.3 V + 0.3 V. Voltage range 5.0 is 5.0 V + 0.5 V.

AC ELECTRICAL CHARACTERISTICS FOR ACT

Symbol	Parameter	V$_{CC}$(V) (Note 7)	T$_A$ = +25°C, C$_L$ = 50 pF			T$_A$ = −40°C to +85°C, C$_L$ = 50 pF		Unit
			Min	Typ	Max	Min	Max	
t$_{PLH}$	Propagation Delay	5.0	3.0	8.0	10.0	3.0	11.0	ns
t$_{PLH}$	Propagation Delay	5.0	3.0	8.0	10.0	3.0	11.0	ns

7. Voltage range 5.0 is 5.0 V + 0.5 V.

CAPACITANCE

Symbol	Parameter	Conditions	Typ	Unit
C$_{IN}$	Input Capacitance	V$_{CC}$ = OPEN	4.5	pF
C$_{PD}$	Power Dissipation Capacitance AC ACT	V$_{CC}$ = 5.0 V	 25.0 80	pF

ORDERING INFORMATION

Order Number	Marking	Package	Shipping[†]
74AC14SC	AC14	SOIC−14	55 Units / Rail
74AC14SCX	AC14	SOIC−14	2500 / Tape & Reel
74AC14MTCX	AC 14	TSSOP−14	2500 / Tape & Reel
74ACT14MTC	ACT 14	TSSOP−14	96 Units / Rail
74ACT14MTCX	ACT 14	TSSOP−14	2500 / Tape & Reel
74ACT14SCX	ACT14	SOIC−14	2500 / Tape & Reel

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

SOIC−14 NB
CASE 751A−03
ISSUE L

DATE 03 FEB 2016

14

1

SCALE 1:1

DETAIL A

DETAIL A

X 45°

SEATING PLANE
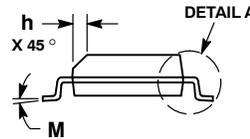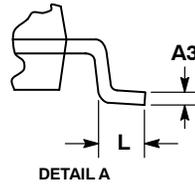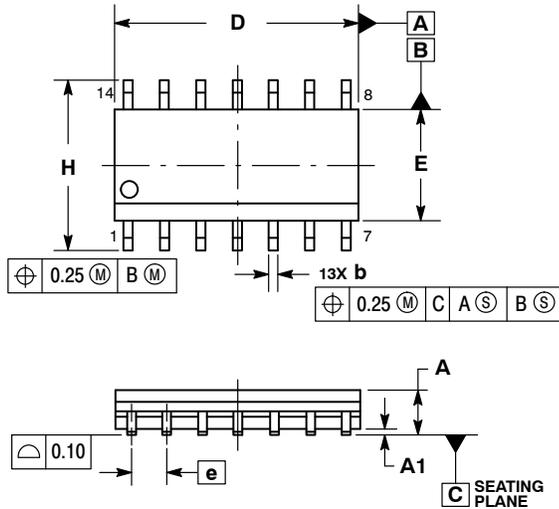
NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION b DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE PROTRUSION SHALL BE 0.13 TOTAL IN EXCESS OF AT MAXIMUM MATERIAL CONDITION.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD PROTRUSIONS.
5. MAXIMUM MOLD PROTRUSION 0.15 PER SIDE.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	1.35	1.75	0.054	0.068
A1	0.10	0.25	0.004	0.010
A3	0.19	0.25	0.008	0.010
b	0.35	0.49	0.014	0.019
D	8.55	8.75	0.337	0.344
E	3.80	4.00	0.150	0.157
e	1.27 BSC		0.050 BSC	
H	5.80	6.20	0.228	0.244
h	0.25	0.50	0.010	0.019
L	0.40	1.25	0.016	0.049
M	0°	7°	0°	7°

SOLDERING FOOTPRINT*

6.50

14X 1.18

1

1.27 PITCH

14X 0.58

DIMENSIONS: MILLIMETERS

GENERIC MARKING DIAGRAM*

14

XXXXXXXXXG
AWLYWW

1

XXXXX = Specific Device Code
A = Assembly Location
WL = Wafer Lot
Y = Year
WW = Work Week
G = Pb−Free Package

*This information is generic. Please refer to device data sheet for actual part marking. Pb−Free indicator, "G" or microdot "▪", may or may not be present. Some products may not follow the Generic Marking.
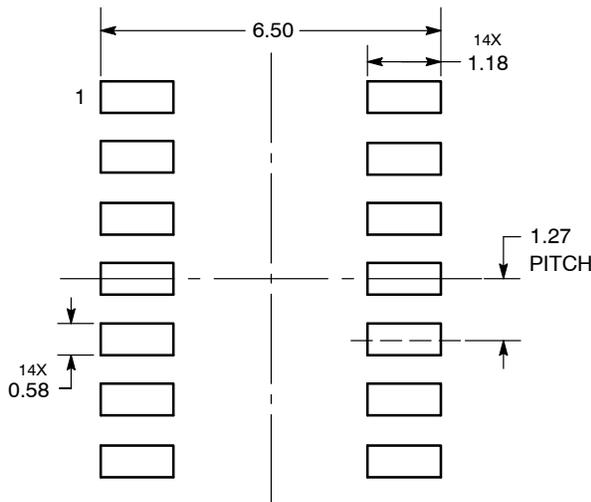
*For additional information on our Pb−Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

STYLES ON PAGE 2

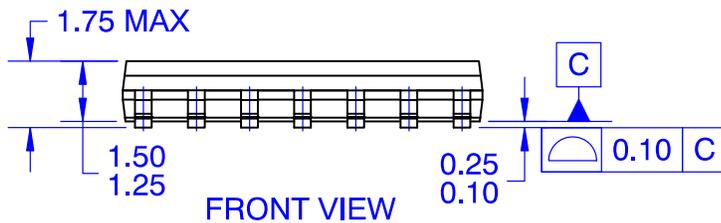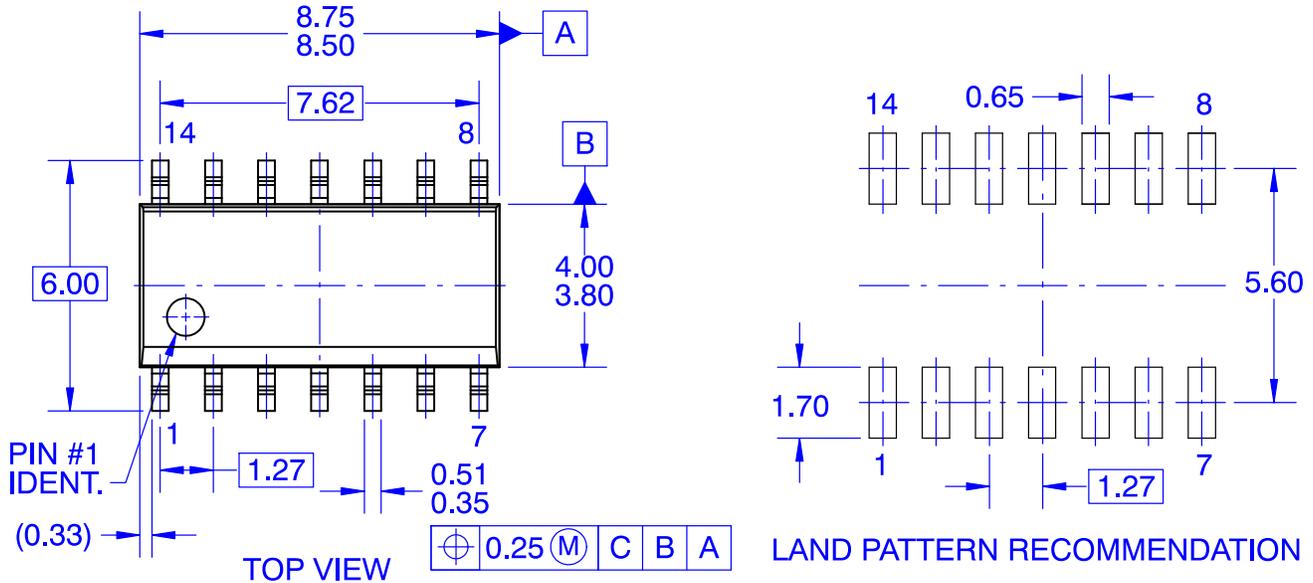| DOCUMENT NUMBER:	98ASB42565B	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.	
DESCRIPTION:	SOIC−14 NB		PAGE 1 OF 2

SOIC−14
CASE 751A−03
ISSUE L

DATE 03 FEB 2016

STYLE 1:
PIN 1. COMMON CATHODE
   2. ANODE/CATHODE
   3. ANODE/CATHODE
   4. NO CONNECTION
   5. ANODE/CATHODE
   6. NO CONNECTION
   7. ANODE/CATHODE
   8. ANODE/CATHODE
   9. ANODE/CATHODE
  10. NO CONNECTION
  11. ANODE/CATHODE
  12. ANODE/CATHODE
  13. NO CONNECTION
  14. COMMON ANODE

STYLE 2:
    CANCELLED

STYLE 3:
PIN 1. NO CONNECTION
   2. ANODE
   3. ANODE
   4. NO CONNECTION
   5. ANODE
   6. NO CONNECTION
   7. ANODE
   8. ANODE
   9. ANODE
  10. NO CONNECTION
  11. ANODE
  12. ANODE
  13. NO CONNECTION
  14. COMMON CATHODE

STYLE 4:
PIN 1. NO CONNECTION
   2. CATHODE
   3. CATHODE
   4. NO CONNECTION
   5. CATHODE
   6. NO CONNECTION
   7. CATHODE
   8. CATHODE
   9. CATHODE
  10. NO CONNECTION
  11. CATHODE
  12. CATHODE
  13. NO CONNECTION
  14. COMMON ANODE

STYLE 5:
PIN 1. COMMON CATHODE
   2. ANODE/CATHODE
   3. ANODE/CATHODE
   4. ANODE/CATHODE
   5. ANODE/CATHODE
   6. NO CONNECTION
   7. COMMON ANODE
   8. COMMON CATHODE
   9. ANODE/CATHODE
  10. ANODE/CATHODE
  11. ANODE/CATHODE
  12. ANODE/CATHODE
  13. NO CONNECTION
  14. COMMON ANODE

STYLE 6:
PIN 1. CATHODE
   2. CATHODE
   3. CATHODE
   4. CATHODE
   5. CATHODE
   6. CATHODE
   7. CATHODE
   8. ANODE
   9. ANODE
  10. ANODE
  11. ANODE
  12. ANODE
  13. ANODE
  14. ANODE

STYLE 7:
PIN 1. ANODE/CATHODE
   2. COMMON ANODE
   3. COMMON CATHODE
   4. ANODE/CATHODE
   5. ANODE/CATHODE
   6. ANODE/CATHODE
   7. ANODE/CATHODE
   8. ANODE/CATHODE
   9. ANODE/CATHODE
  10. ANODE/CATHODE
  11. COMMON CATHODE
  12. COMMON ANODE
  13. ANODE/CATHODE
  14. ANODE/CATHODE

STYLE 8:
PIN 1. COMMON CATHODE
   2. ANODE/CATHODE
   3. ANODE/CATHODE
   4. NO CONNECTION
   5. ANODE/CATHODE
   6. ANODE/CATHODE
   7. COMMON ANODE
   8. COMMON ANODE
   9. ANODE/CATHODE
  10. ANODE/CATHODE
  11. NO CONNECTION
  12. ANODE/CATHODE
  13. ANODE/CATHODE
  14. COMMON CATHODE

SOIC14
CASE 751EF
ISSUE O

DATE 30 SEP 2016

8.75
8.50
A

7.62

14
8
B

6.00

4.00
3.80

PIN #1
IDENT.
1
7

1.27
0.51
0.35

(0.33)

TOP VIEW

⊕ | 0.25 Ⓜ | C | B | A

1.75 MAX

C

1.50
1.25

0.25
0.10

⌒ | 0.10 | C

FRONT VIEW

0.65

14
8

5.60

1.70

1
7

1.27

LAND PATTERN RECOMMENDATION

A

0.25
0.19

SIDE VIEW

NOTES:
A. 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. LAND PATTERN STANDARD:
   SOIC127P600X145−14M
E. CONFORMS TO ASME Y14.5M, 2009

0.50
0.25 x 45°

R0.10
GAGE
PLANE

R0.10

8°
0°

0.36

0.90
0.50

(1.04)

SEATING PLANE
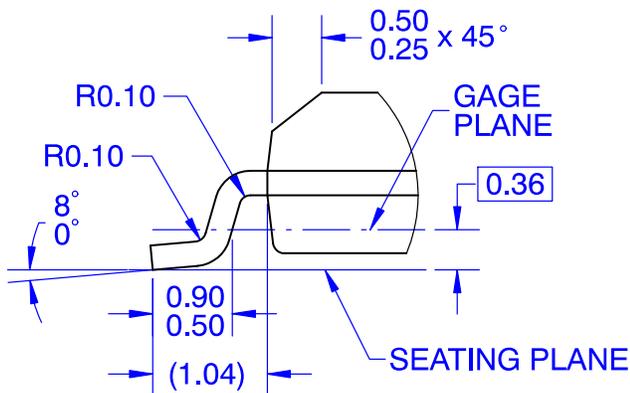
DETAIL A
SCALE 16 : 1

DOCUMENT NUMBER:	98AON13739G	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.	
DESCRIPTION:	SOIC14		PAGE 1 OF 1

MECHANICAL CASE OUTLINE
PACKAGE DIMENSIONS

onsemi
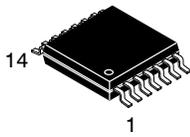
TSSOP−14 WB
CASE 948G
ISSUE C

DATE 17 FEB 2016

14

SCALE 2:1

1

14X **K** REF

⊕ | 0.10 (0.004) Ⓜ | T | U Ⓢ | V Ⓢ

⌓ | 0.15 (0.006) | T | U Ⓢ

2X **L**/2

L

PIN 1
IDENT.

14   8

B
–U–

1   7

A
–V–

⌓ | 0.15 (0.006) | T | U Ⓢ

N

0.25 (0.010)

M

N

F

DETAIL E

K
K1

J J1

SECTION N–N

C

⌓ | 0.10 (0.004)
–T– SEATING
PLANE

D   **G**   **H**

DETAIL E

–W–
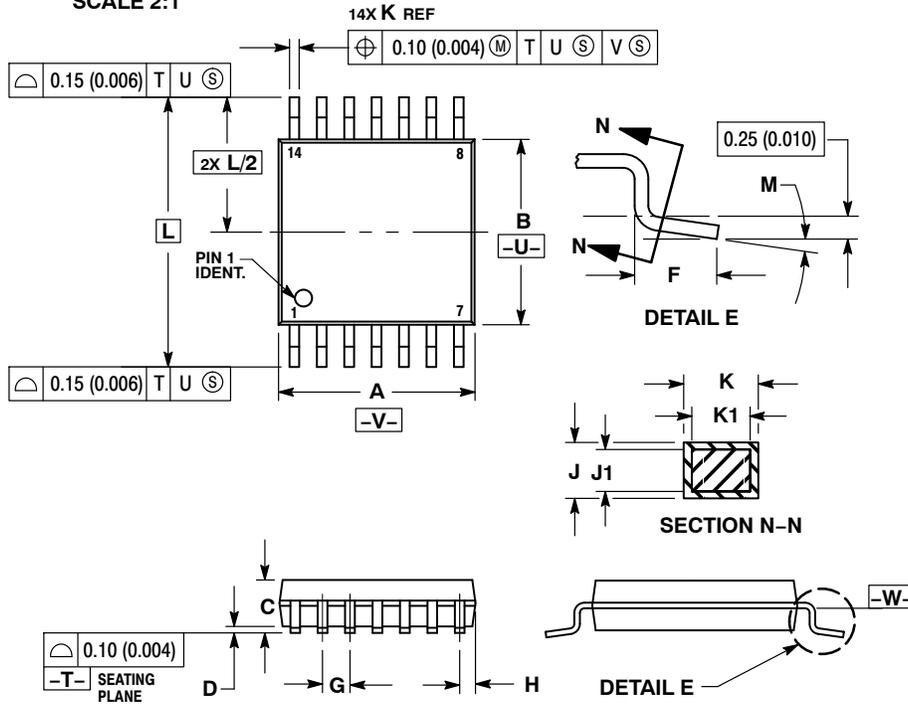
NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION A DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH OR GATE BURRS SHALL NOT EXCEED 0.15 (0.006) PER SIDE.
4. DIMENSION B DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. INTERLEAD FLASH OR PROTRUSION SHALL NOT EXCEED 0.25 (0.010) PER SIDE.
5. DIMENSION K DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 (0.003) TOTAL IN EXCESS OF THE K DIMENSION AT MAXIMUM MATERIAL CONDITION.
6. TERMINAL NUMBERS ARE SHOWN FOR REFERENCE ONLY.
7. DIMENSION A AND B ARE TO BE DETERMINED AT DATUM PLANE –W–.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.90	5.10	0.193	0.200
B	4.30	4.50	0.169	0.177
C	---	1.20	---	0.047
D	0.05	0.15	0.002	0.006
F	0.50	0.75	0.020	0.030
G	0.65 BSC		0.026 BSC	
H	0.50	0.60	0.020	0.024
J	0.09	0.20	0.004	0.008
J1	0.09	0.16	0.004	0.006
K	0.19	0.30	0.007	0.012
K1	0.19	0.25	0.007	0.010
L	6.40 BSC		0.252 BSC	
M	0 °	8 °	0 °	8 °

GENERIC MARKING DIAGRAM*
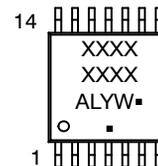
14
XXXX
XXXX
ALYW▪

1

A = Assembly Location
L = Wafer Lot
Y = Year
W = Work Week
▪ = Pb−Free Package

(Note: Microdot may be in either location)

*This information is generic. Please refer to device data sheet for actual part marking. Pb−Free indicator, "G" or microdot "▪", may or may not be present. Some products may not follow the Generic Marking.

SOLDERING FOOTPRINT

7.06

1

0.65
PITCH

14X
0.36

14X
1.26

DIMENSIONS: MILLIMETERS
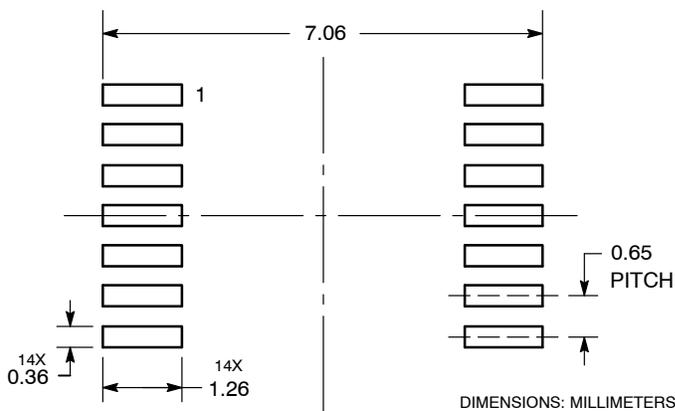
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DESCRIPTION:	TSSOP−14 WB		PAGE 1 OF 1

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