

Quad 2-Input NAND Gate

High-Performance Silicon-Gate CMOS

MC74AC00, MC74ACT00

Features

- Output Drive Capability: ± 24 mA
- Operating Voltage Range: 2 to 6 V AC00; 4.5 to 5.5 ACT00
- Low Input Current: 1.0 μ A
- High Noise Immunity Characteristic of CMOS Devices
- In Compliance With the JEDEC Standard No. 7A Requirements
- Chip Complexity: 32 FETs
- These are Pb-Free Devices

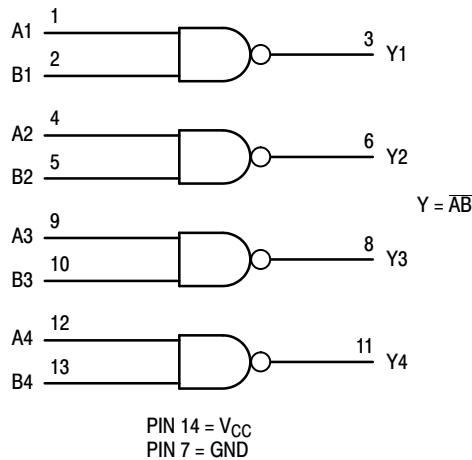


Figure 1. Logic Diagram

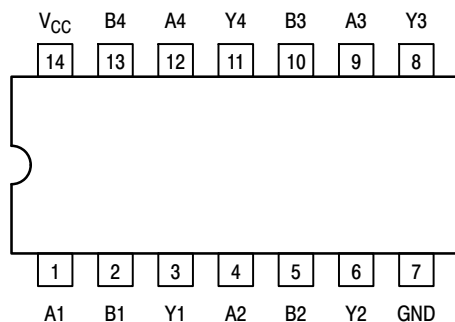
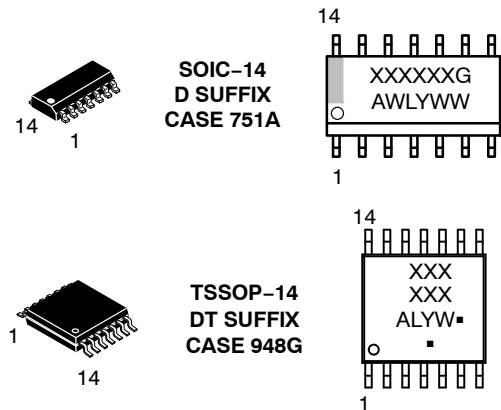


Figure 2. Pinout: 14-Lead Packages (Top View)

MARKING DIAGRAMS



XXXXXX = Specific Device Code
A = Assembly Location
WL or L = Wafer Lot
Y = Year
WW or W = Work Week
G or \blacksquare = Pb-Free Package

(Note: Microdot may be in either location)

FUNCTION TABLE

| Inputs | | Output |
|--------|---|--------|
| A | B | Y |
| L | L | H |
| L | H | H |
| H | L | H |
| H | H | L |

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 5 of this data sheet.

MC74AC00, MC74ACT00

MAXIMUM RATINGS

| Symbol | Parameter | Value | Unit |
|-----------------------|---|--|------|
| V _{CC} | DC Supply Voltage | − 0.5 to +6.5 | V |
| V _I | DC Input Voltage | − 0.5 ≤ V _I ≤ V _{CC} + 0.5 | V |
| V _O | DC Output Voltage (Note 1) | − 0.5 ≤ V _O ≤ V _{CC} + 0.5 | V |
| I _{IK} | DC Input Diode Current | ± 20 | mA |
| I _{OK} | DC Output Diode Current | ± 50 | mA |
| I _O | DC Output Sink/Source Current | ± 50 | mA |
| I _{CC} | DC Supply Current per Output Pin | ± 50 | mA |
| I _{GND} | DC Ground Current per Output Pin | ± 50 | mA |
| T _{STG} | Storage Temperature Range | − 65 to + 150 | °C |
| T _L | Lead temperature, 1 mm from Case for 10 Seconds | 260 | °C |
| T _J | Junction temperature under Bias | + 150 | °C |
| θ _{JA} | Thermal Resistance (Note 2) SOIC TSSOP | 116 150 | °C/W |
| P _D | Power Dissipation in Still Air at 25°C SOIC TSSOP | 1077 833 | mW |
| MSL | Moisture Sensitivity | Level 1 | |
| F _R | Flammability Rating Oxygen Index: 30% – 35% | UL 94 V-0 @ 0.125 in | |
| V _{ESD} | ESD Withstand Voltage Human Body Model (Note 3) Charged Device Model (Note 4) | > 2000 > 1000 | V |
| I _{Latch-Up} | Latch-Up Performance Above V _{CC} and Below GND at 85°C (Note 5) | ± 100 | mA |

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.

1. I_O absolute maximum rating must be observed.
2. The package thermal impedance is calculated in accordance with JESD51-7.
3. Tested to EIA/JESD22-A114-A.
4. Tested to JESD22-C101-A.
5. Tested to EIA/JESD78.

RECOMMENDED OPERATING CONDITIONS

| Symbol | Parameter | Min | Typ | Max | Unit |
|------------------------------------|--|-------------|-----------------|-----------------|------|
| V _{CC} | Supply Voltage MC74AC00 MC74ACT00 | 2.0 4.5 | 5.0 5.0 | 6.0 5.5 | V |
| V _{in} , V _{out} | DC Input Voltage, Output Voltage (Ref. to GND) | 0 | – | V _{CC} | V |
| t _r , t _f | Input Rise and Fall Time (Note 6) MC74AC00 V _{CC} @ 3.0 V V _{CC} @ 4.5 V V _{CC} @ 5.5 V | – – – | 150 40 25 | – – – | ns/V |
| t _r , t _f | Input Rise and Fall Time (Note 7) MC74ACT00 V _{CC} @ 4.5 V V _{CC} @ 5.5 V | – – | 10 8.0 | – – | ns/V |
| T _J | Junction Temperature | – | – | 150 | °C |
| T _A | Operating Ambient Temperature Range | –55 | 25 | 125 | °C |
| I _{OH} | Output Current – High | – | – | –24 | mA |
| I _{OL} | Output Current – Low | – | – | 24 | mA |

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.

6. V_{in} from 30% to 70% V_{CC}.
7. V_{in} from 0.8 V to 2.0 V.

MC74AC00, MC74ACT00

DC CHARACTERISTICS

| Symbol | Parameter | V _{CC} (V) | MC74AC00 | | | | | Unit | Conditions |
|------------------|-----------------------------------|------------------------|------------------------|-------------------|---------------------------------|--------------------------------|----|---|------------|
| | | | T _A = +25°C | | T _A = -40°C to +85°C | T _A = -55°C + 125°C | | | |
| | | | Typ | Guaranteed Limits | | | | | |
| V _{IH} | Minimum High Level Input Voltage | 3.0 | 1.5 | 2.1 | 2.1 | 2.1 | V | V _{OUT} = 0.1 V or V _{CC} - 0.1 V | |
| | | 4.5 | 2.25 | 3.15 | 3.15 | 3.15 | | | |
| | | 5.5 | 2.75 | 3.85 | 3.85 | 3.85 | | | |
| V _{IL} | Maximum Low Level Input Voltage | 3.0 | 1.5 | 0.9 | 0.9 | 0.9 | V | V _{OUT} = 0.1 V or V _{CC} - 0.1 V | |
| | | 4.5 | 2.25 | 1.35 | 1.35 | 1.35 | | | |
| | | 5.5 | 2.75 | 1.65 | 1.65 | 1.65 | | | |
| V _{OH} | Minimum High Level Output Voltage | 3.0 | 2.99 | 2.9 | 2.9 | 2.9 | V | I _{OUT} = -50 μA | |
| | | 4.5 | 4.49 | 4.4 | 4.4 | 4.4 | | | |
| | | 5.5 | 5.49 | 5.4 | 5.4 | 5.4 | | | |
| | | 3.0 | - | 2.56 | 2.46 | 2.4 | V | *V _{IN} = V _{IL} or V _{IH} -12 mA I _{OH} -24 mA -24 mA | |
| | | 4.5 | - | 3.86 | 3.76 | 3.7 | | | |
| | | 5.5 | - | 4.86 | 4.76 | 4.7 | | | |
| V _{OL} | Maximum Low Level Output Voltage | 3.0 | 0.002 | 0.1 | 0.1 | 0.1 | V | I _{OUT} = 50 μA | |
| | | 4.5 | 0.001 | 0.1 | 0.1 | 0.1 | | | |
| | | 5.5 | 0.001 | 0.1 | 0.1 | 0.1 | | | |
| | | 3.0 | - | 0.36 | 0.44 | 0.5 | V | *V _{IN} = V _{IL} or V _{IH} 12 mA I _{OL} 24 mA 24 mA | |
| | | 4.5 | - | 0.36 | 0.44 | 0.5 | | | |
| | | 5.5 | - | 0.36 | 0.44 | 0.5 | | | |
| I _{IN} | Maximum Input Leakage Current | 5.5 | - | ±0.1 | ±1.0 | ±1.0 | μA | V _I = V _{CC} , GND | |
| I _{OLD} | †Minimum Dynamic Output Current | 5.5 | - | - | 75 | 50 | mA | V _{OLD} = 1.65 V Max | |
| I _{OHD} | | 5.5 | - | - | -75 | -50 | mA | V _{OHD} = 3.85 V Min | |
| I _{CC} | Maximum Quiescent Supply Current | 5.5 | - | 4.0 | 40 | 40 | μA | V _{IN} = V _{CC} or GND | |

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.

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

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

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

AC CHARACTERISTICS (t_r = t_f = 3.0 nS; C_L = 50 pF; see Figures 3 and 4 for Waveforms)

| Symbol | Parameter | V _{CC} * (V) | MC74AC00 | | | | | | | Unit |
|------------------|-------------------|--------------------------|------------------------|------------|------------|---------------------------------|-------------|-----------------------------------|-------------|------|
| | | | T _A = +25°C | | | T _A = -40°C to +85°C | | T _A = -55°C to + 125°C | | |
| | | | Min | Typ | Max | Min | Max | Min | Max | |
| t _{PLH} | Propagation Delay | 3.3 5.0 | 2.0 1.5 | 7.0 6.0 | 9.5 8.0 | 2.0 1.5 | 10.0 8.5 | 1.0 1.0 | 11.0 8.5 | ns |
| t _{PHL} | Propagation Delay | 3.3 5.0 | 1.5 1.5 | 5.5 4.5 | 8.0 6.5 | 1.0 1.0 | 8.5 7.0 | 1.0 1.0 | 9.0 7.0 | ns |

*Voltage Range 3.3 V is 3.3 V ± 0.3 V.

Voltage Range 5.0 V is 5.0 V ± 0.5 V.

MC74AC00, MC74ACT00

DC CHARACTERISTICS

| Symbol | Parameter | V _{CC} (V) | MC74ACT00 | | | | Unit | Conditions |
|-------------------|--|------------------------|------------------------|-------------------|---------------------------------|-----------------------------------|------|---|
| | | | T _A = +25°C | | T _A = -40°C to +85°C | T _A = -55°C to + 125°C | | |
| | | | Typ | Guaranteed Limits | | | | |
| V _{IH} | Minimum High Level Input Voltage | 4.5 5.5 | 1.5 1.5 | 2.0 2.0 | 2.0 2.0 | 2.0 2.0 | V | V _{OUT} = 0.1 V or V _{CC} - 0.1 V |
| V _{IL} | Maximum Low Level Input Voltage | 4.5 5.5 | 1.5 1.5 | 0.8 0.8 | 0.8 0.8 | 0.8 0.8 | V | V _{OUT} = 0.1 V or V _{CC} - 0.1 V |
| V _{OH} | Minimum High Level Output Voltage | 4.5 | 4.49 | 4.4 | 4.4 | 4.4 | V | I _{OUT} = -50 μA |
| | | 5.5 | 5.49 | 5.4 | 5.4 | 5.4 | V | I _{OH} = -24 mA |
| | | 4.5 5.5 | - - | 3.86 4.86 | 3.76 4.76 | 3.7 4.7 | V | *V _{IN} = V _{IL} or V _{IH} -24 mA -24 mA |
| V _{OL} | Maximum Low Level Output Voltage | 4.5 | 0.001 | 0.1 | 0.1 | 0.1 | V | I _{OUT} = 50 μA |
| | | 5.5 | 0.001 | 0.1 | 0.1 | 0.1 | V | I _{OL} = 24 mA |
| | | 4.5 5.5 | - - | 0.36 0.36 | 0.44 0.44 | 0.5 0.5 | V | *V _{IN} = V _{IL} or V _{IH} 24 mA 24 mA |
| I _{IN} | Maximum Input Leakage Current | 5.5 | - | ±0.1 | ±1.0 | ±1.0 | μA | V _I = V _{CC} , GND |
| ΔI _{CCT} | Additional Max. I _{CC} /Input | 5.5 | 0.6 | - | 1.5 | 1.6 | mA | V _I = V _{CC} - 2.1 V |
| I _{OLD} | †Minimum Dynamic Output Current | 5.5 | - | - | 75 | 50 | mA | V _{OLD} = 1.65 V Max |
| I _{OHD} | | 5.5 | - | - | -75 | -50 | mA | V _{OHD} = 3.85 V Min |
| I _{CC} | Maximum Quiescent Supply Current | 5.5 | - | 4.0 | 40 | 40 | μA | V _{IN} = V _{CC} or GND |

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.

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

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

AC CHARACTERISTICS (t_r = t_f = 3.0 nS; C_L = 50 pF; see Figures 3 and 4 for Waveforms)

| Symbol | Parameter | V _{CC} * (V) | MC74ACT00 | | | | | | | Unit |
|------------------|-------------------|--------------------------|------------------------|-----|-----|---------------------------------|-----|----------------------------------|-----|------|
| | | | T _A = +25°C | | | T _A = −40°C to +85°C | | T _A = −55°C to +125°C | | |
| | | | Min | Typ | Max | Min | Max | Min | Max | |
| t _{PLH} | Propagation Delay | 5.0 | 1.5 | 5.5 | 9.0 | 1.0 | 9.5 | 1.0 | 9.5 | ns |
| t _{PHL} | Propagation Delay | 5.0 | 1.5 | 4.0 | 7.0 | 1.0 | 8.0 | 1.0 | 8.0 | ns |

*Voltage Range 5.0 V is 5.0 V ± 0.5 V.

CAPACITANCE

| Symbol | Parameter | Value Typ | Test Conditions | Unit |
|-----------------|-------------------------------|--------------|-------------------------|------|
| C _{IN} | Input Capacitance | 4.5 | V _{CC} = 5.0 V | pF |
| C _{PD} | Power Dissipation Capacitance | 30 | V _{CC} = 5.0 V | pF |

MC74AC00, MC74ACT00

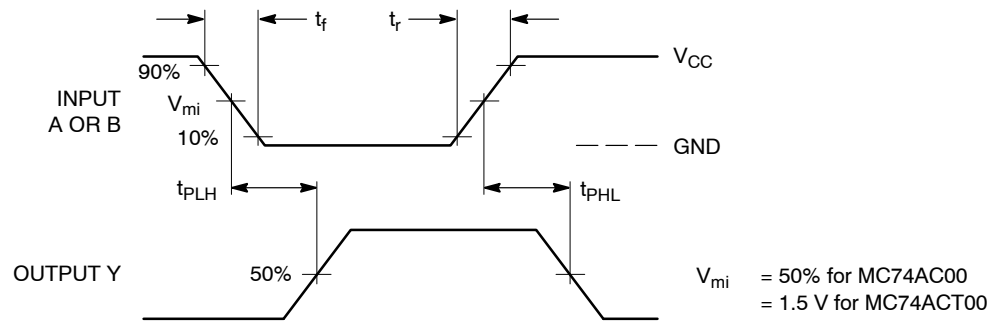
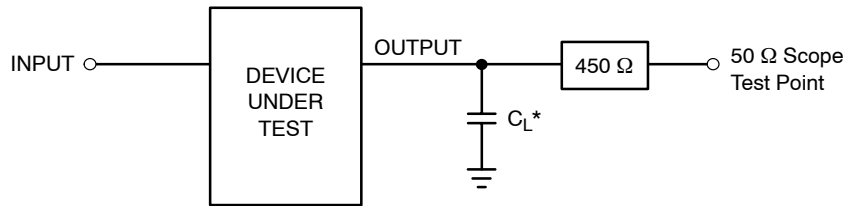


Figure 3. Switching Waveforms



*Includes all probe and jig capacitance

Figure 4. Test Circuit

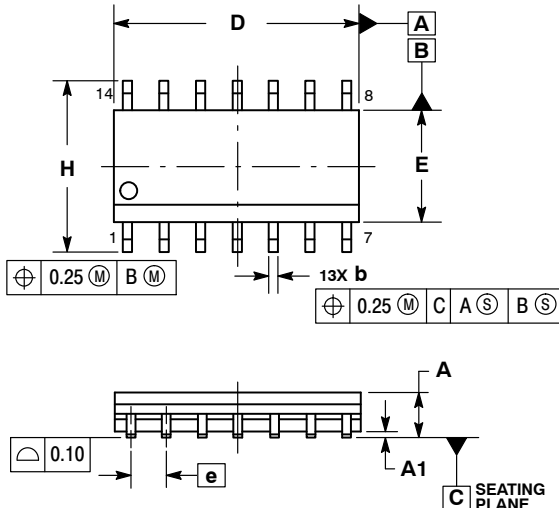
ORDER INFORMATION

| Device | Marking | Package | Shipping [†] |
|----------------|-----------|--------------------|-----------------------|
| MC74AC00DG | AC00 | SOIC-14 (Pb-Free) | 55 Units / Rail |
| MC74AC00DR2G | AC00 | SOIC-14 (Pb-Free) | 2500 / Tape and Reel |
| MC74AC00DTR2G | AC 00 | TSSOP-14 (Pb-Free) | |
| MC74ACT00DG | ACT00 | SOIC-14 (Pb-Free) | 55 Units / Rail |
| MC74ACT00DR2G | ACT00 | SOIC-14 (Pb-Free) | 2500 / Tape and Reel |
| MC74ACT00DTR2G | ACT 00 | TSSOP-14 (Pb-Free) | |

[†]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.

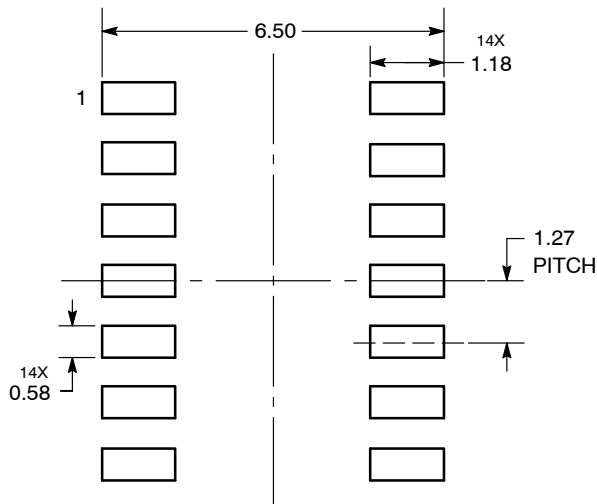

SOIC-14 NB
CASE 751A-03
ISSUE L

DATE 03 FEB 2016


NOTES:

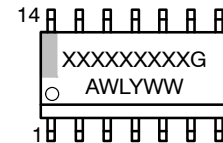
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION b DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE PROTRUSION SHALL BE 0.13 TOTAL IN EXCESS OF AT MAXIMUM MATERIAL CONDITION.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD PROTRUSIONS.
5. MAXIMUM MOLD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


DIMENSIONS: MILLIMETERS

*For additional information on our Pb-Free strategy and soldering details, please download the **onsemi** Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

GENERIC MARKING DIAGRAM*


XXXXXX = 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.

STYLES ON PAGE 2

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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

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MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS



TSSOP-14 WB
CASE 948G
ISSUE C

DATE 17 FEB 2016

SCALE 2:1



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*



- 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



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DESCRIPTION: TSSOP-14 WB

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