

# MC74VHC126

## Quad Bus Buffer with 3-State Control Inputs

The MC74VHC126 is a high speed CMOS quad bus buffer fabricated with silicon gate CMOS technology. It achieves noninverting high speed operation similar to equivalent Bipolar Schottky TTL while maintaining CMOS low power dissipation.

The MC74VHC126 requires the 3-state control input (OE) to be set Low to place the output into high impedance.

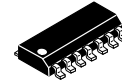
The internal circuit is composed of three stages, including a buffer output which provides high noise immunity and stable output. The inputs tolerate voltages up to 7.0 V, allowing the interface of 5.0 V systems to 3.0 V systems.

- High Speed:  $t_{PD} = 3.8 \text{ ns}$  (Typ) at  $V_{CC} = 5.0 \text{ V}$
- Low Power Dissipation:  $I_{CC} = 4.0 \mu\text{A}$  (Max) at  $T_A = 25^\circ\text{C}$
- High Noise Immunity:  $V_{NIH} = V_{NIL} = 28\% V_{CC}$
- Power Down Protection Provided on Inputs
- Balanced Propagation Delays
- Designed for 2.0 V to 5.5 V Operating Range
- Low Noise:  $V_{OLP} = 0.8 \text{ V}$  (Max)
- Pin and Function Compatible with Other Standard Logic Families
- Latchup Performance Exceeds 300 mA
- ESD Performance: HBM > 2000 V; Machine Model > 200 V
- Chip Complexity: 72 FETs or 18 Equivalent Gates
- These Devices are Pb-Free and are RoHS Compliant



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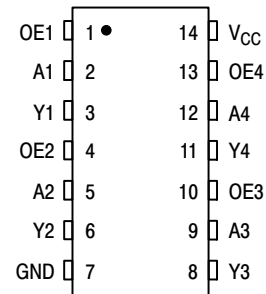


14-LEAD SOIC  
D SUFFIX  
CASE 751A



14-LEAD TSSOP  
DT SUFFIX  
CASE 948G

### PIN CONNECTIONS



(Top View)

### ORDERING INFORMATION

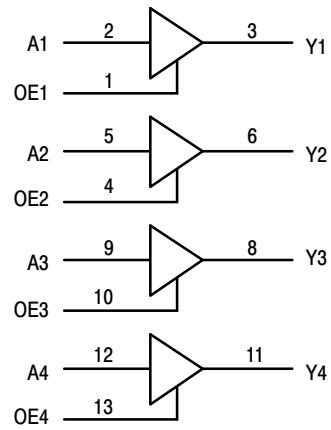
| Device          | Package | Shipping        |
|-----------------|---------|-----------------|
| MC74VHC126DR2G  | SOIC    | 2500 Units/Reel |
| MC74VHC126DTR2G | TSSOP   | 2500 Units/Reel |

### DEVICE MARKING INFORMATION

See general marking information in the device marking section on page 7 of this data sheet.

# MC74VHC126

## Active-High Output Enables



## FUNCTION TABLE

| VHC126 |    |        |
|--------|----|--------|
| Inputs |    | Output |
| A      | OE | Y      |
| H      | H  | H      |
| L      | H  | L      |
| X      | L  | Z      |

Figure 1. Logic Diagram

# MC74VHC126

## MAXIMUM RATINGS (Note 1)

| Symbol    | Parameter                                | Value                          | Unit        |    |
|-----------|--|--------------------------------|-------------|----|
| $V_{CC}$  | DC Supply Voltage                        | -0.5 to +7.0                   | V           |    |
| $V_{in}$  | DC Input Voltage                         | -0.5 to +7.0                   | V           |    |
| $V_{out}$ | DC Output Voltage                        | -0.5 to $V_{CC} + 0.5$         | V           |    |
| $I_{IK}$  | Input Diode Current                      | -20                            | mA          |    |
| $I_{OK}$  | Output Diode Current                     | $\pm 20$                       | mA          |    |
| $I_{out}$ | DC Output Current, per Pin               | $\pm 25$                       | mA          |    |
| $I_{CC}$  | DC Supply Current, $V_{CC}$ and GND Pins | $\pm 50$                       | mA          |    |
| $P_D$     | Power Dissipation in Still Air (Note 2)  | SOIC Packages<br>TSSOP Package | 500<br>450  | mW |
| $T_{stg}$ | Storage Temperature                      | -65 to +150                    | $^{\circ}C$ |    |

1. Maximum Ratings are those values beyond which damage to the device may occur. Exposure to these conditions or conditions beyond those indicated may adversely affect device reliability. Functional operation under absolute maximum-rated conditions is not implied. Functional operation should be restricted to the Recommended Operating Conditions.

2. Derating – SOIC Packages: - 7.0 mW/ $^{\circ}C$  from 65 $^{\circ}$  to 125 $^{\circ}C$   
TSSOP Package: - 6.1 mW/ $^{\circ}C$  from 65 $^{\circ}$  to 125 $^{\circ}C$

## RECOMMENDED OPERATING CONDITIONS

| Symbol     | Parameter                                | Min  | Max      | Unit        |
|------------|--|--|----------|-------------|
| $V_{CC}$   | DC Supply Voltage                        | 2.0  | 5.5      | V           |
| $V_{in}$   | DC Input Voltage                         | 0  | 5.5      | V           |
| $V_{out}$  | DC Output Voltage                        | 0  | $V_{CC}$ | V           |
| $T_A$      | Operating Temperature, All Package Types | -55  | +125     | $^{\circ}C$ |
| $t_r, t_f$ | Input Rise and Fall Time                 | $V_{CC} = 3.3 V \pm 0.3 V$<br>$V_{CC} = 5.0 V \pm 0.5 V$ | 0<br>100 | ns/V        |
|            |  | 0  | 20       |             |

# MC74VHC126

## DC ELECTRICAL CHARACTERISTICS

| Symbol          | Parameter   | Test Conditions  | V <sub>CC</sub><br>(V)   | T <sub>A</sub> = 25°C      |                   |                            | T <sub>A</sub> ≤ 85°C      |                            | T <sub>A</sub> ≤ 125°C     |                            | Unit |
|-----------------|---|--|--------------------------|----------------------------|-------------------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|------|
|                 |   |  |                          | Min                        | Typ               | Max                        | Min                        | Max                        | Min                        | Max                        |      |
| V <sub>IH</sub> | Minimum High-Level Input Voltage  |  | 2.0<br>3.0<br>4.5<br>5.5 | 1.5<br>2.1<br>3.15<br>3.85 |                   |                            | 1.5<br>2.1<br>3.15<br>3.85 |                            | 1.5<br>2.1<br>3.15<br>3.85 | V                          |      |
| V <sub>IL</sub> | Maximum Low-Level Input Voltage   |  | 2.0<br>3.0<br>4.5<br>5.5 |                            |                   | 0.5<br>0.9<br>1.35<br>1.65 |                            | 0.5<br>0.9<br>1.35<br>1.65 |                            | 0.5<br>0.9<br>1.35<br>1.65 | V    |
| V <sub>OH</sub> | Minimum High-Level Output Voltage<br>V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub> | V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub><br>I <sub>OH</sub> = -50 μA                               | 2.0<br>3.0<br>4.5        | 1.9<br>2.9<br>4.4          | 2.0<br>3.0<br>4.5 |                            | 1.9<br>2.9<br>4.4          |                            | 1.9<br>2.9<br>4.4          | V                          |      |
|                 |   | V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub><br>I <sub>OH</sub> = -4.0 mA<br>I <sub>OH</sub> = -8.0 mA | 3.0<br>4.5               | 2.58<br>3.94               |                   |                            | 2.48<br>3.80               |                            | 2.34<br>3.66               | V                          |      |
| V <sub>OL</sub> | Maximum Low-Level Output Voltage<br>V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub>  | V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub><br>I <sub>OL</sub> = 50 μA                                | 2.0<br>3.0<br>4.5        |                            | 0.0<br>0.0<br>0.0 | 0.1<br>0.1<br>0.1          |                            | 0.1<br>0.1<br>0.1          |                            | 0.1<br>0.1<br>0.1          | V    |
|                 |   | V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub><br>I <sub>OL</sub> = 4.0 mA<br>I <sub>OL</sub> = 8.0 mA   | 3.0<br>4.5               |                            |                   | 0.36<br>0.36               | 0.44<br>0.44               |                            | 0.52<br>0.52               | V                          |      |
| I <sub>OZ</sub> | Maximum 3-State Leakage Current   | V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub><br>V <sub>OUT</sub> = V <sub>CC</sub> or GND              | 5.5                      |                            |                   | ±0.25                      |                            | ±2.5                       |                            | ±2.5                       | μA   |
| I <sub>IN</sub> | Maximum Input Leakage Current   | V <sub>IN</sub> = 5.5 V or GND   | 0 to 5.5                 |                            |                   | ±0.1                       |                            | ±1.0                       |                            | ±1.0                       | μA   |
| I <sub>CC</sub> | Maximum Quiescent Supply Current  | V <sub>IN</sub> = V <sub>CC</sub> or GND   | 5.5                      |                            |                   | 4.0                        |                            | 40                         |                            | 40                         | μA   |

# MC74VHC126

## AC ELECTRICAL CHARACTERISTICS (Input $t_r = t_f = 3.0$ ns)

| Symbol                     | Parameter   | Test Conditions                                 | $T_A = 25^\circ\text{C}$ |     |      | $T_A = \leq 85^\circ\text{C}$ |      | $T_A = \leq 125^\circ\text{C}$ |      | Unit |
|----------------------------|---|---|--------------------------|-----|------|-------------------------------|------|--------------------------------|------|------|
|                            |   |   | Min                      | Typ | Max  | Min                           | Max  | Min                            | Max  |      |
| $t_{PLH}$ ,<br>$t_{PHL}$   | Maximum Propagation Delay, A to Y                                       | $V_{CC} = 3.3 \pm 0.3$ V $C_L = 15$ pF          |                          | 5.6 | 8.0  | 1.0                           | 9.5  | 1.0                            | 12.0 | ns   |
|                            |   | $C_L = 50$ pF                                   |                          | 8.1 | 11.5 | 1.0                           | 13.0 | 1.0                            | 15.0 |      |
|                            |   | $V_{CC} = 5.0 \pm 0.5$ V $C_L = 15$ pF          |                          | 3.8 | 5.5  | 1.0                           | 6.5  | 1.0                            | 8.5  |      |
|                            |   | $C_L = 50$ pF                                   |                          | 5.3 | 7.5  | 1.0                           | 8.5  | 1.0                            | 10.5 |      |
| $t_{PZL}$ ,<br>$t_{PZH}$   | Maximum Output Enable Time, OE to Y                                     | $V_{CC} = 3.3 \pm 0.3$ V $C_L = 15$ pF          |                          | 5.4 | 8.0  | 1.0                           | 9.5  | 1.0                            | 11.5 | ns   |
|                            |   | $R_L = 1.0$ k $\Omega$ $C_L = 50$ pF            |                          | 7.9 | 11.5 | 1.0                           | 13.0 | 1.0                            | 15.0 |      |
|                            |   | $V_{CC} = 5.0 \pm 0.5$ V $C_L = 15$ pF          |                          | 3.6 | 5.1  | 1.0                           | 6.0  | 1.0                            | 7.5  |      |
|                            |   | $R_L = 1.0$ k $\Omega$ $C_L = 50$ pF            |                          | 5.1 | 7.1  | 1.0                           | 8.0  | 1.0                            | 9.5  |      |
| $t_{PLZ}$ ,<br>$t_{PHZ}$   | Maximum Output Disable Time, OE to Y                                    | $V_{CC} = 3.3 \pm 0.3$ V $C_L = 50$ pF          |                          | 9.5 | 13.2 | 1.0                           | 15.0 | 1.0                            | 18.0 | ns   |
|                            |   | $R_L = 1.0$ k $\Omega$                          |                          |     |      |                               |      |                                |      |      |
|                            |   | $V_{CC} = 5.0 \pm 0.5$ V $C_L = 50$ pF          |                          | 6.1 | 8.8  | 1.0                           | 10.0 | 1.0                            | 12.0 |      |
|                            |   | $R_L = 1.0$ k $\Omega$                          |                          |     |      |                               |      |                                |      |      |
| $t_{OSLH}$ ,<br>$t_{OSHL}$ | Output-to-Output Skew   | $V_{CC} = 3.3 \pm 0.3$ V $C_L = 50$ pF (Note 3) |                          |     | 1.5  |                               | 1.5  |                                | 1.5  | ns   |
|                            |   | $V_{CC} = 5.0 \pm 0.5$ V $C_L = 50$ pF (Note 3) |                          |     | 1.0  |                               | 1.0  |                                | 1.0  |      |
| $C_{in}$                   | Maximum Input Capacitance   |   |                          | 4.0 | 10   |                               | 10   |                                | 10   | pF   |
| $C_{out}$                  | Maximum Three-State Output Capacitance (Output in High Impedance State) |   |                          | 6.0 |      |                               |      |                                |      | pF   |

| $C_{PD}$ | Power Dissipation Capacitance (Note 4) | Typical @ 25°C, $V_{CC} = 5.0$ V |  | pF |
|----------|--|----------------------------------|--|----|
|          |  | 15                               |  |    |
|          |  |                                  |  |    |

3. Parameter guaranteed by design.  $t_{OSLH} = |t_{PLHm} - t_{PLHn}|$ ,  $t_{OSHL} = |t_{PHLm} - t_{PHLn}|$ .

4.  $C_{PD}$  is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load. Average operating current can be obtained by the equation:  $I_{CC(OPR)} = C_{PD} \cdot V_{CC} \cdot f_{in} + I_{CC}/4$  (per buffer).  $C_{PD}$  is used to determine the no-load dynamic power consumption;  $P_D = C_{PD} \cdot V_{CC}^2 \cdot f_{in} + I_{CC} \cdot V_{CC}$ .

## NOISE CHARACTERISTICS (Input $t_r = t_f = 3.0$ ns, $C_L = 50$ pF, $V_{CC} = 5.0$ V)

| Symbol    | Characteristic                           | $T_A = 25^\circ\text{C}$ |       | Unit |
|-----------|--|--------------------------|-------|------|
|           |  | Typ                      | Max   |      |
| $V_{OLP}$ | Quiet Output Maximum Dynamic $V_{OL}$    | 0.3                      | 0.8   | V    |
| $V_{OLV}$ | Quiet Output Minimum Dynamic $V_{OL}$    | - 0.3                    | - 0.8 | V    |
| $V_{IHD}$ | Minimum High Level Dynamic Input Voltage |                          | 3.5   | V    |
| $V_{ILD}$ | Maximum Low Level Dynamic Input Voltage  |                          | 1.5   | V    |

# MC74VHC126

## SWITCHING WAVEFORMS

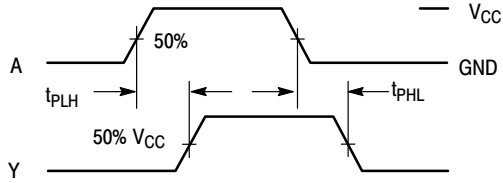


Figure 2.

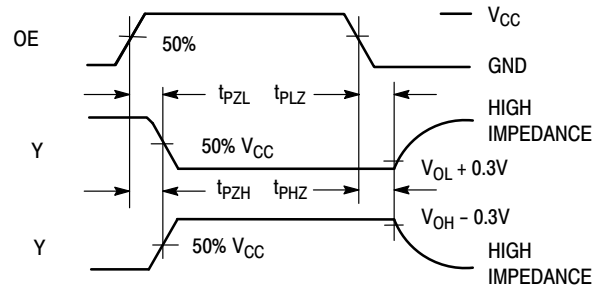
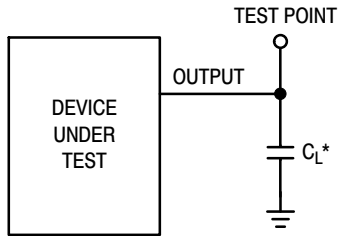
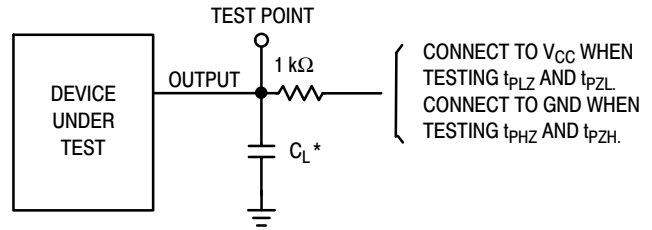


Figure 3.



\*Includes all probe and jig capacitance

Figure 4. Test Circuit



\*Includes all probe and jig capacitance

Figure 5. Test Circuit

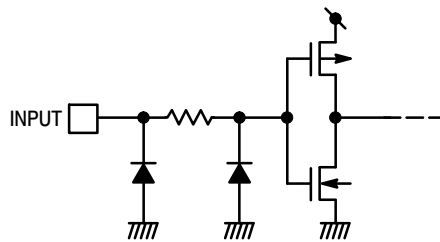
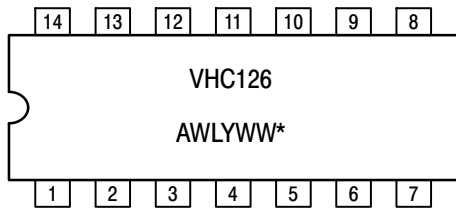


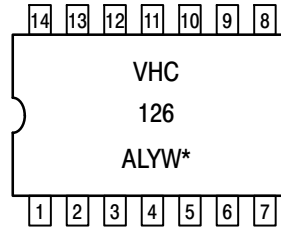
Figure 6. Input Equivalent Circuit

# MC74VHC126

## MARKING DIAGRAMS



**14-LEAD SOIC  
D SUFFIX  
CASE 751A**



**14-LEAD TSSOP  
DT SUFFIX  
CASE 948G**

\*See Applications Note #AND8004/D for date code and traceability information.

# MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS

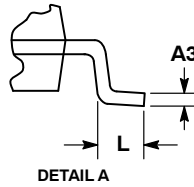
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SCALE 1:1

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 ON Semiconductor 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.

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

ON Semiconductor®



**TSSOP-14 WB**  
CASE 948G  
ISSUE C

DATE 17 FEB 2016

SCALE 2:1



**NOTES:**

- DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
- CONTROLLING DIMENSION: MILLIMETER.
- 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.
- DIMENSION B DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. INTERLEAD FLASH OR PROTRUSION SHALL NOT EXCEED 0.25 (0.010) PER SIDE.
- 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.
- TERMINAL NUMBERS ARE SHOWN FOR REFERENCE ONLY.
- 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.

**SOLDERING FOOTPRINT**



|                         |                    |  |
|-------------------------|--------------------|--|
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| <b>DESCRIPTION:</b>     | <b>TSSOP-14 WB</b> | <b>PAGE 1 OF 1</b>   |

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