

Low Voltage Quad Buffer with 5 V Tolerant Inputs and Outputs

74LCX125

Description

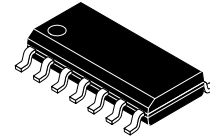
The LCX125 contains four independent non-inverting buffers with 3-STATE outputs. The inputs tolerate Voltages up to 7 V Allowing the interface of 5 V Systems to 3 V Systems.

The 74LCX125 is fabricated with an advanced CMOS technology to achieve high Speed operation while Maintaining CMOS Low Power Dissipation.

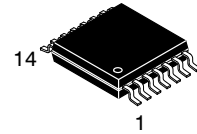
Features

- 5 V Tolerant Inputs and Outputs
- 2.3 V–3.6 V V_{CC} Specifications Provided
- 6.0 ns t_{PD} max. ($V_{CC} = 3.3$ V), 10 μ A I_{CC} max.
- Power Down High Impedance Inputs and Outputs
- Supports Live Insertion/Withdrawal*
- ± 24 mA Output Drive ($V_{CC} = 3.0$ V)
- Latch-up Performance Exceeds JEDEC 78 Conditions
- ESD Performance:
 - ◆ Human body model > 2000 V
 - ◆ Machine model > 100 V
- Leadless DQFN Package

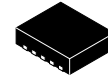
*To ensure the High-Impedance State During Power up or down, \overline{OE} Should be tied to V_{CC} through a pull-up resistor: the minimum value of the resistor is determined by the current-sourcing capability of the driver.



SOIC14,
CASE 751EF



TSSOP-14, WB
CASE 948G



QFN14, 3.0X2.5, 0.5P
CASE 510CB

MARKING DIAGRAM



- Z = Assembly Plan Code
- XY = Date Code (Year & Week)
- KK = Lot Run Traceability Code
- LCX125 = Specific Device Code

ORDERING INFORMATION

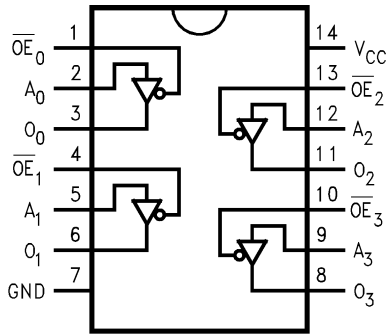
See detailed ordering and shipping information on page 6 of this data sheet.

74LCX125

Connection Diagrams

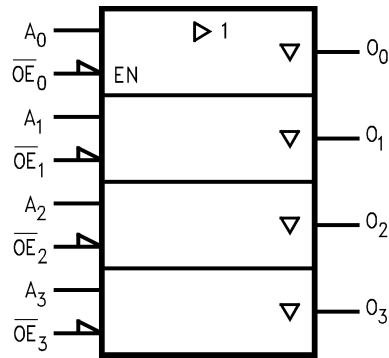
Logic Symbol

Pin Assignments for SOIC, SOP, and TSSOP

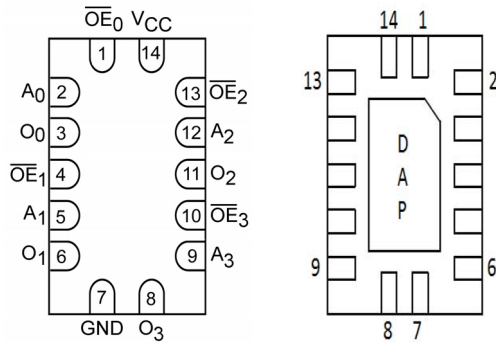


(Top View)

IEEE/IEC



Pad Assignments for DQFN



(Top Through View)

(Bottom View)

Truth Table

| Inputs | | Output |
|-------------------|-------|--------|
| \overline{OE}_n | A_n | O_n |
| L | L | L |
| L | H | H |
| H | X | Z |

H = HIGH Voltage Level

L = HIGH Voltage Level

Z = HIGH Impedance

X = Immaterial

Pin Description

| Pin Names | Description |
|-------------------|----------------------|
| A_n | Inputs |
| \overline{OE}_n | Output Enable Inputs |
| O_n | Outputs |
| DAP | No Connect |

Note: DAP (Die Attach Pad)

74LCX125

ABSOLUTE MAXIMUM RATINGS

| Symbol | Parameter | Ratings | Unit |
|-----------|---|--|----------|
| V_{CC} | Supply Voltage | -0.5 to +7.0 | V |
| V_I | DC Input Voltage | -0.5 to +7.0 | V |
| V_O | DC Output Voltage, - Output in 3-STATE - Output in HIGH or LOW State (Note 1) | -0.5 V to +7.0 -0.5 V to $V_{CC} + 0.5$ | V V |
| I_{IK} | DC Input Diode Current, $V_I < GND$ | -50 | mA |
| I_{OK} | DC Input Diode Current - $V_O < GND$ - $V_O > V_{CC}$ | -50 +50 | mA mA |
| I_O | DC Output Source/Sink Current | ± 50 | mA |
| I_{CC} | DC Supply Current per Supply Pin | ± 50 | mA |
| I_{GND} | DC Ground Current per Ground Pin | ± 100 | mA |
| T_{STG} | Storage Temperature | -65 to +150 | °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.

1. I_O Absolute Maximum Rating must be observed.

RECOMMENDED OPERATING CONDITIONS (Note 4)

| Symbol | Parameter | Min. | Max. | Unit |
|-----------------------|---|------------|---------------------------------|------|
| V_{CC} | Supply Voltage - Operating - Data Retention | 2.0 1.5 | 3.6 3.6 | V |
| V_I | Input Voltage | 0 | 5.5 | V |
| V_O | Output Voltage - HIGH or LOW State - 3-STATE | 0 0 | V_{CC} 5.5 | V |
| I_{OH} / I_{OL} | Common-mode Input Voltage - $V_{CC} = 3.0\text{ V} - 3.6\text{ V}$ - $V_{CC} = 2.7\text{ V} - 3.0\text{ V}$ - $V_{CC} = 2.3\text{ V} - 2.7\text{ V}$ | | ± 24 ± 12 ± 8 | mA |
| T_A | Free-Air Operating Temperature | -40 | 85 | °C |
| $\Delta t / \Delta V$ | Input Edge Rate, $V_{IN} = 0.8\text{ V} - 2.0\text{ V}$, $V_{CC} = 3.0\text{ V}$ | 0 | 10 | ns/V |

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.

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

DC ELECTRICAL CHARACTERISTICS

| Symbol | Parameter | V_{CC} (V) | Test Conditions | $T_A = -40^\circ\text{C to } +85^\circ\text{C}$ | | Unit |
|----------|---------------------------|--------------|------------------------------|---|------|------|
| | | | | Min. | Max. | |
| 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 | $I_{OH} = -100\ \mu\text{A}$ | $V_{CC} - 0.2$ | - | V |
| | | 2.3 | $I_{OH} = -8\ \text{mA}$ | 1.8 | - | |
| | | 2.7 | $I_{OH} = -12\ \text{mA}$ | 2.2 | - | |
| | | 3.0 | $I_{OH} = -18\ \text{mA}$ | 2.4 | - | |
| | | | $I_{OH} = -24\ \text{mA}$ | 2.2 | - | |

74LCX125

DC ELECTRICAL CHARACTERISTICS (continued)

| Symbol | Parameter | V _{CC} (V) | Test Conditions | T _A = -40°C to +85°C | | Unit |
|------------------|---------------------------------------|---------------------|--|---------------------------------|------|------|
| | | | | Min. | Max. | |
| V _{OL} | LOW Level Output Voltage | 2.3-3.6 | I _{OL} = 100 μA | - | 0.2 | V |
| | | 2.3 | I _{OL} = 8 mA | - | 0.6 | |
| | | 2.7 | I _{OL} = 12 mA | - | 0.4 | |
| | | 3.0 | I _{OL} = 16 mA | - | 0.4 | |
| | | | I _{OL} = 24 mA | - | 0.55 | |
| I _I | Input Leakage Current | 2.3-3.6 | 0 ≤ V _I ≤ 5.5 V | - | ±5.0 | μA |
| I _{OZ} | 3-STATE Output Leakage | 2.3-3.6 | 0 ≤ V _O ≤ 5.5 V, V _I = V _{IH} or V _{IL} | - | ±5.0 | μA |
| I _{OFF} | Power-Off Leakage Current | 0 | V _I or V _O = 5.5 V | - | 10 | μA |
| I _{CC} | Quiescent Supply Current | 2.3-3.6 | V _I = V _{CC} or GND | - | 10 | μA |
| | | | 3.6 V ≤ V _I , V _O ≤ 5.5 V (Note 3) | - | ±10 | |
| ΔI _{CC} | Increase in I _{CC} per Input | 2.3-3.6 | V _{IH} = V _{CC} - 0.6 V | - | 500 | μA |

3. Outputs disabled or 3-STATE only.

AC ELECTRICAL CHARACTERISTICS

| Symbol | Parameter | T _A = -40°C to +85°C, R _L = 500 Ω | | | | | | Unit |
|---------------------------------------|--------------------------------|--|------|--|------|--|------|------|
| | | V _{CC} = 3.3 V ± 0.3 V, C _L = 50 pF | | V _{CC} = 2.7 V, C _L = 50 pF | | V _{CC} = 2.5 V ± 0.2 V, C _L = 30 pF | | |
| | | Min. | Max. | Min. | Max. | Min. | Max. | |
| t _{PHL} , t _{PLH} | Propagation Delay | 1.5 | 6.0 | 1.5 | 6.5 | 1.5 | 7.2 | ns |
| t _{PZL} , t _{PZH} | Output Enable Time | 1.5 | 7.0 | 1.5 | 8.0 | 1.5 | 9.1 | ns |
| t _{PLZ} , t _{PHZ} | Output Disable Time | 1.5 | 6.0 | 1.5 | 7.0 | 1.5 | 7.2 | ns |
| t _{OSSL} , t _{OSLH} | Output to Output Skew (Note 4) | - | 1.0 | - | - | - | - | ns |

4. 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_{OSSL}) or LOW-to-HIGH (t_{OSLH}).

DYNAMIC SWITCHING CHARACTERISTICS

| Symbol | Parameter | V _{CC} (V) | Test Conditions | T _A = 25°C | Unit |
|------------------|---|---------------------|--|-----------------------|------|
| | | | | Typical | |
| V _{OLP} | Quiet Output Dynamic Peak V _{OL} | 3.3 | C _L = 50 pF, V _{IH} = 3.3 V, V _{IL} = 0 V | 0.8 | V |
| | | 2.5 | C _L = 30 pF, V _{IH} = 2.5 V, V _{IL} = 0 V | 0.6 | |
| V _{OLV} | Quiet Output Dynamic Peak V _{OL} | 3.3 | C _L = 50 pF, V _{IH} = 3.3 V, V _{IL} = 0 V | -0.8 | V |
| | | 2.5 | C _L = 30 pF, V _{IH} = 2.5 V, V _{IL} = 0 V | -0.6 | |

CAPACITANCE

| Symbol | Parameter | Test Conditions | Typical | Unit |
|------------------|-------------------------------|---|---------|------|
| C _{IN} | Input Capacitance | V _{CC} = Open, V _I = 0 V or V _{CC} | 7.0 | pF |
| C _{OUT} | Output Capacitance | V _{CC} = 3.3 V, V _I = 0 V or V _{CC} | 8.0 | pF |
| C _{PD} | Power Dissipation Capacitance | V _{CC} = 3.3 V, V _I = 0 V or V _{CC} , f = 10 MHz | 25.0 | pF |

74LCX125

AC LOADING AND WAVEFORMS (GENERIC FOR LCX FAMILY)

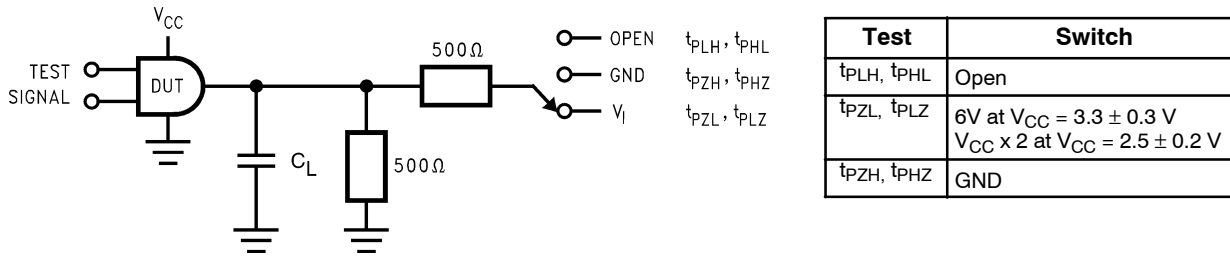
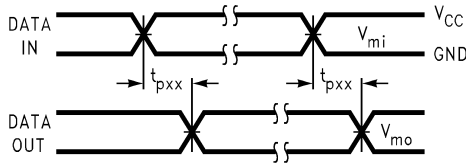
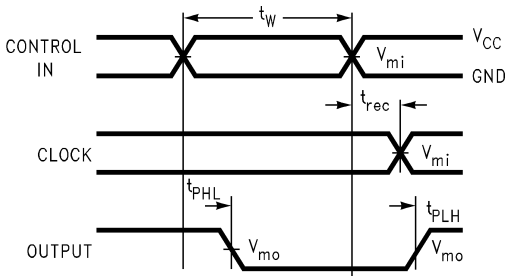


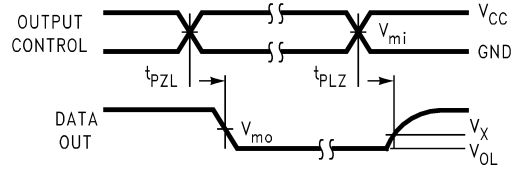
Figure 1. AC Test Circuit (C_L includes probe and jig capacitance)



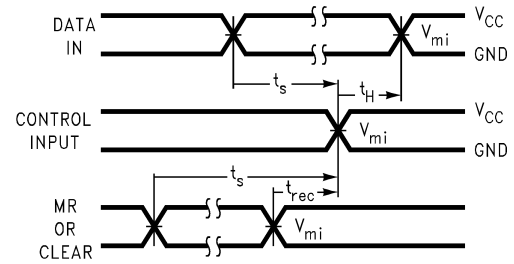
Waveform for Inverting and Non-Inverting Functions



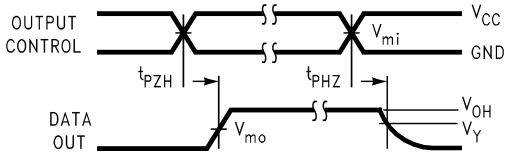
Propagation Delay, Pulse Width and t_{rec} Waveforms



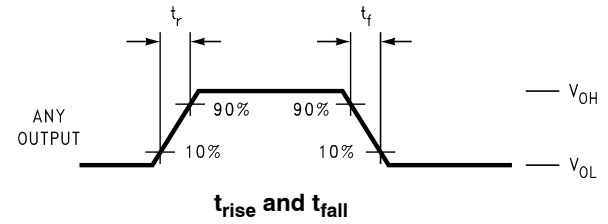
3-STATE Output High Enable and Disable Times for Logic



Setup Time, Hold Time and Recovery Time for Logic



3-STATE Output Low Enable and Disable Times for Logic



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

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

74LCX125

SCHEMATIC DIAGRAM (GENERIC FOR LCX FAMILY)

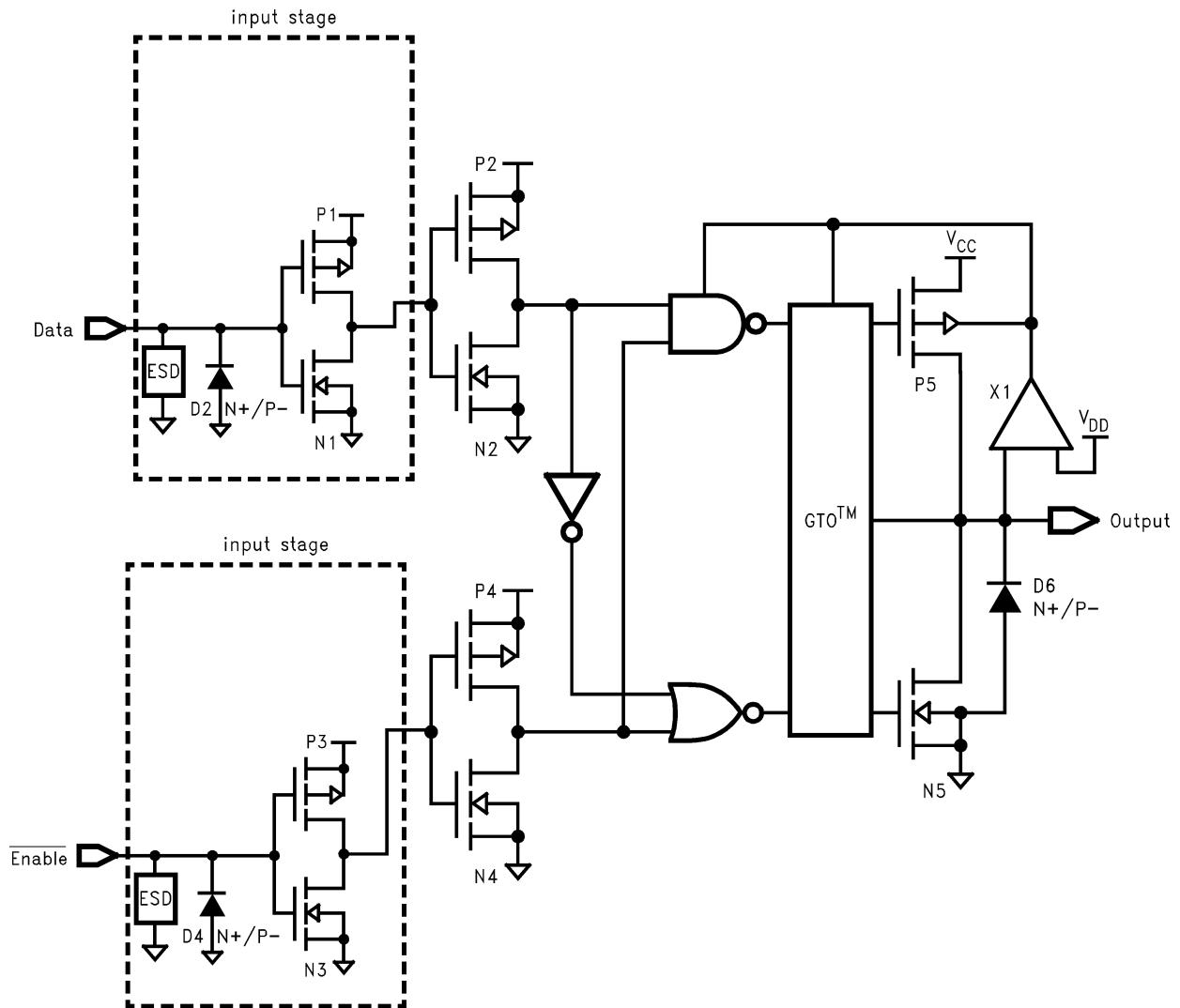


Figure 3. Schematic Diagram

ORDERING INFORMATION

| Product Number | Package | Shipping [†] |
|----------------------|--------------------------------------|-----------------------|
| 74LCX125M | SOIC-14 (Pb-Free/Halide Free) | 1150 Units / Tube |
| 74LCX125MX | SOIC-14 (Pb-Free/Halide Free) | 2500 / Tape and Reel |
| 74LCX125MTCX | TSSOP-14 WB (Pb-Free/Halide Free) | 2500 / Tape and Reel |
| 74LCX125BQX (Note 5) | QFN-14 (Pb-Free/Halide Free) | 3000 / Tape and Reel |
| 74LCX125MTC | TSSOP-14 WB (Pb-Free/Halide Free) | 2350 Units / Tube |

[†]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](#).

5. DQFN package available in Tape and Reel only.

MECHANICAL CASE OUTLINE

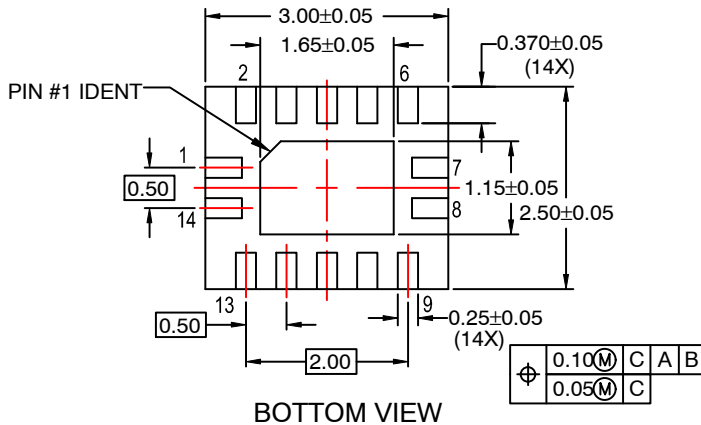
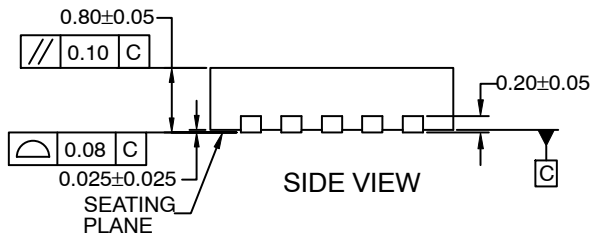
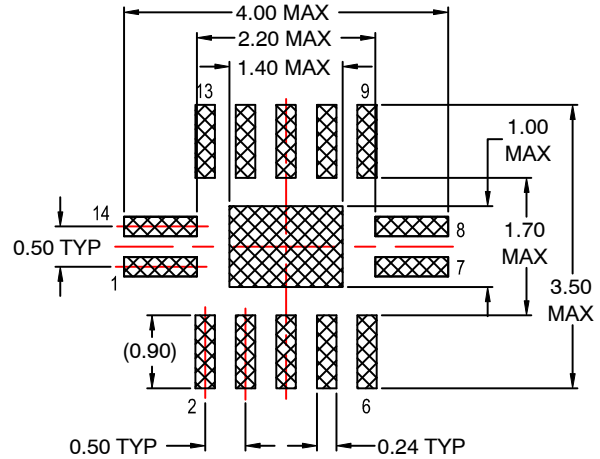
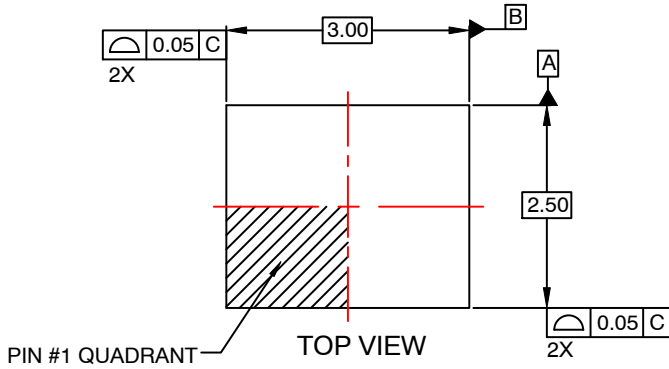
PACKAGE DIMENSIONS

ON Semiconductor®



QFN14 3.0x2.5, 0.5P
CASE 510CB
ISSUE O

DATE 31 AUG 2016



NOTES:

- A. CONFORMS TO JEDEC REGISTRATION MO-241, VARIATION AA
- B. DIMENSIONS ARE IN MILLIMETERS.
- C. DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 2009.
- D. LAND PATTERN RECOMMENDATION IS EXISTING INDUSTRY LAND PATTERN.

| | | |
|-------------------------|----------------------------|--|
| DOCUMENT NUMBER: | 98AON13643G | Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red. |
| DESCRIPTION: | QFN14 3.0X2.5, 0.5P | PAGE 1 OF 1 |

ON Semiconductor and are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ON Semiconductor assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. ON Semiconductor does not convey any license under its patent rights nor the rights of others.

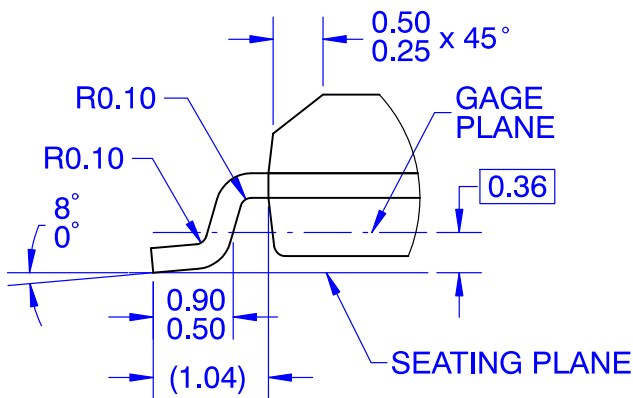
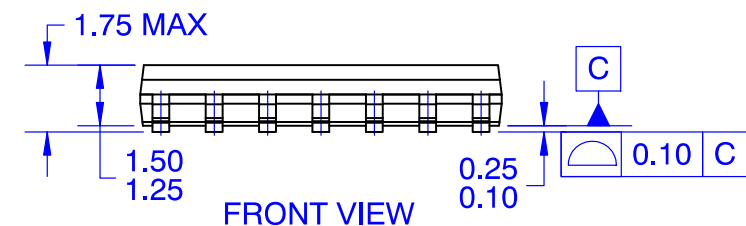
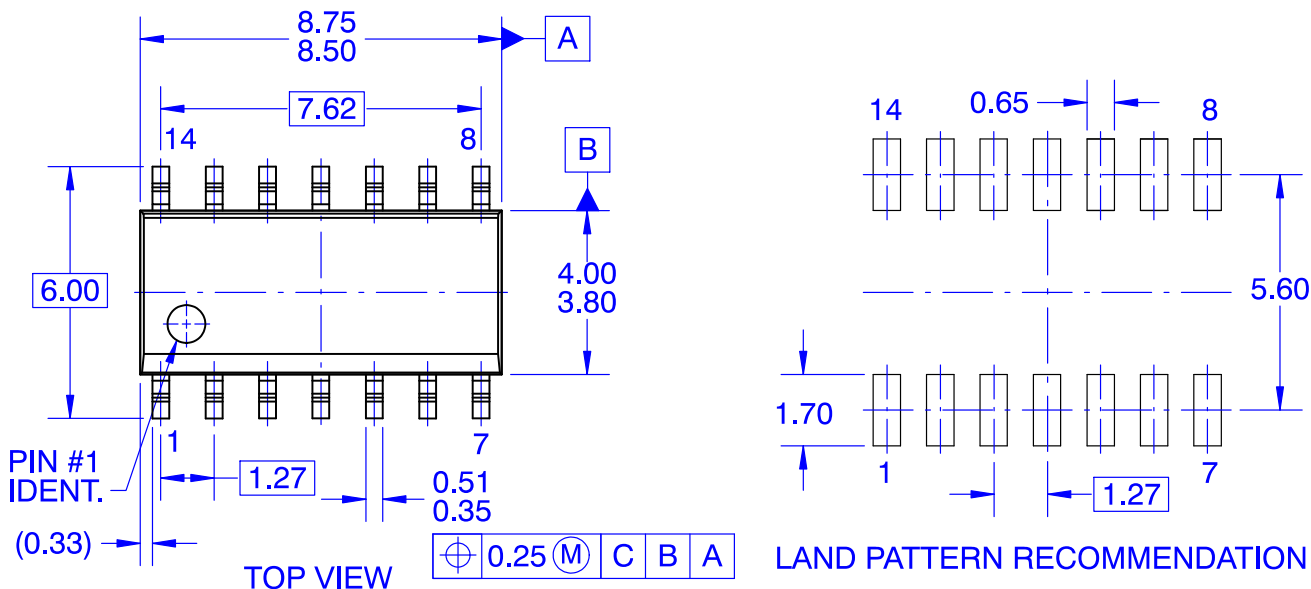
MECHANICAL CASE OUTLINE
PACKAGE DIMENSIONS

ON Semiconductor®



SOIC14
CASE 751EF
ISSUE O

DATE 30 SEP 2016



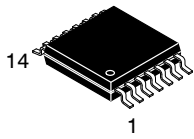
NOTES:

- 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

| | | |
|-------------------------|--------------------|--|
| 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 |

ON Semiconductor and are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ON Semiconductor assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. ON Semiconductor does not convey any license under its patent rights nor the rights of others.

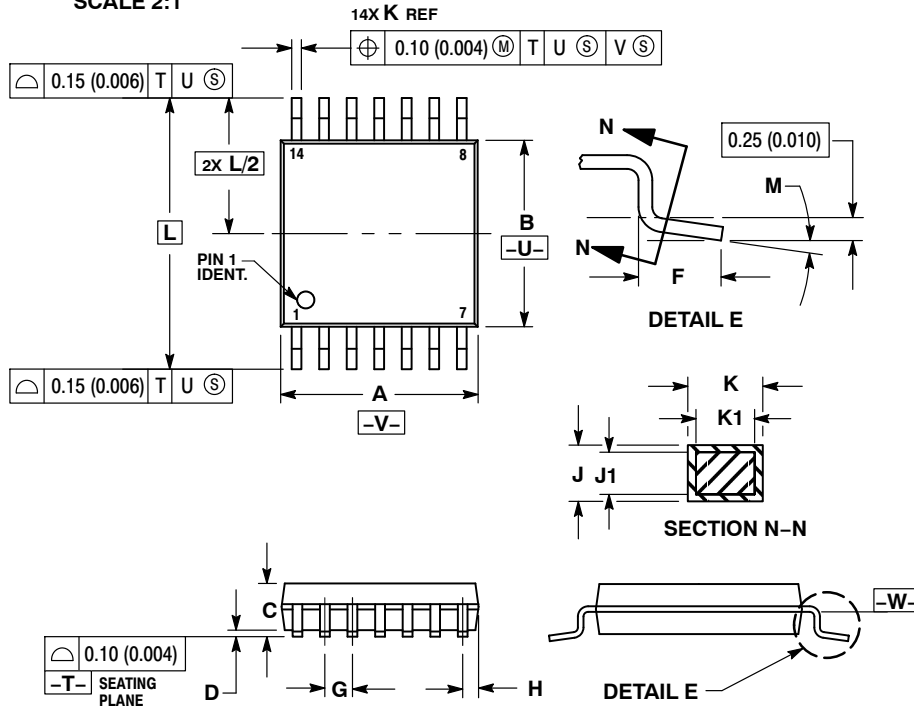
MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS



TSSOP-14 WB
CASE 948G
ISSUE C

DATE 17 FEB 2016

SCALE 2:1

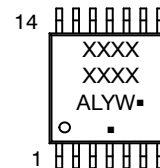


NOTES:

- 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° |

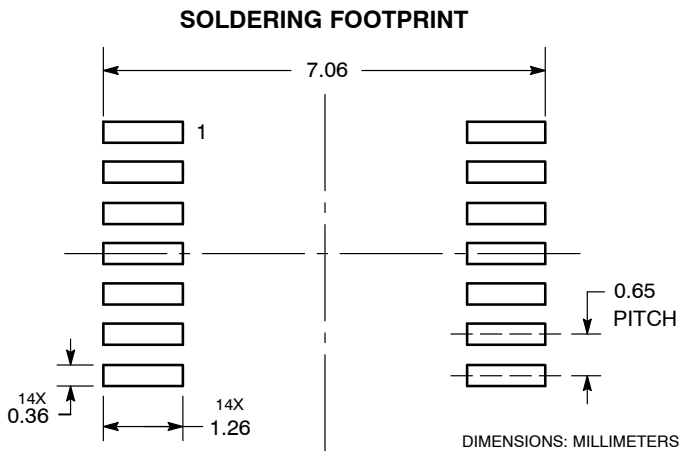
GENERIC MARKING DIAGRAM*



- 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. Some products may not follow the Generic Marking.



| | | |
|-------------------------|--------------------|--|
| DOCUMENT NUMBER: | 98ASH70246A | Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red. |
| DESCRIPTION: | TSSOP-14 WB | PAGE 1 OF 1 |

onsemi and onsemi are trademarks of Semiconductor Components Industries, LLC dba onsemi or its subsidiaries in the United States and/or other countries. onsemi reserves the right to make changes without further notice to any products herein. onsemi makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does onsemi assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. onsemi does not convey any license under its patent rights nor the rights of others.

onsemi, **Onsemi**, and other names, marks, and brands are registered and/or common law trademarks of Semiconductor Components Industries, LLC dba "**onsemi**" or its affiliates and/or subsidiaries in the United States and/or other countries. **onsemi** owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of **onsemi**'s product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent-Marking.pdf. **onsemi** reserves the right to make changes at any time to any products or information herein, without notice. The information herein is provided "as-is" and **onsemi** makes no warranty, representation or guarantee regarding the accuracy of the information, product features, availability, functionality, or suitability of its products for any particular purpose, nor does **onsemi** assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using **onsemi** products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by **onsemi**. "Typical" parameters which may be provided in **onsemi** data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. **onsemi** does not convey any license under any of its intellectual property rights nor the rights of others. **onsemi** products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use **onsemi** products for any such unintended or unauthorized application, Buyer shall indemnify and hold **onsemi** and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that **onsemi** was negligent regarding the design or manufacture of the part. **onsemi** is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

ADDITIONAL INFORMATION

TECHNICAL PUBLICATIONS:

Technical Library: www.onsemi.com/design/resources/technical-documentation
onsemi Website: www.onsemi.com

ONLINE SUPPORT: www.onsemi.com/support

For additional information, please contact your local Sales Representative at www.onsemi.com/support/sales