

# 8-Bit Serial-Input/Parallel-Output Shift Register

## High-Performance Silicon-Gate CMOS

### MC74HC164A

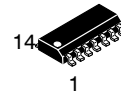
The MC74HC164A is identical in pinout to the LS164. The device inputs are compatible with standard CMOS outputs; with pullup resistors, they are compatible with LSTTL outputs.

The MC74HC164A is an 8-bit, serial-input to parallel-output shift register. Two serial data inputs, A1 and A2, are provided so that one input may be used as a data enable. Data is entered on each rising edge of the clock. The active-low asynchronous Reset overrides the Clock and Serial Data inputs.

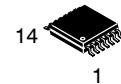
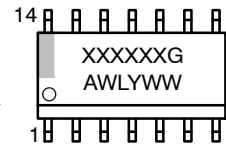
#### Features

- Output Drive Capability: 10 LSTTL Loads
- Outputs Directly Interface to CMOS, NMOS, and TTL
- Operating Voltage Range: 2.0 V to 6.0 V
- Low Input Current: 1  $\mu$ A
- High Noise Immunity Characteristic of CMOS Devices
- In Compliance with the JEDEC Standard No. 7 A Requirements
- Chip Complexity: 244 FETs or 61 Equivalent Gates
- -Q Suffix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q100 Qualified and PPAP Capable\*
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

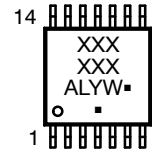
#### MARKING DIAGRAMS



SOIC-14  
D SUFFIX  
CASE 751A

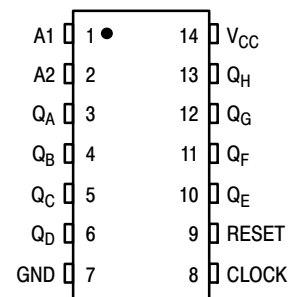


TSSOP-14  
DT SUFFIX  
CASE 948G



XXX = Specific Device Code  
A = Assembly Location  
L, WL = Wafer Lot  
Y, YY = Year  
W, WW = Work Week  
G or  $\blacksquare$  = Pb-Free Package  
(Note: Microdot may be in either location)

#### PIN ASSIGNMENT



#### ORDERING INFORMATION

See detailed ordering, marking and shipping information in the package dimensions section on page 8 of this data sheet.

MC74HC164A

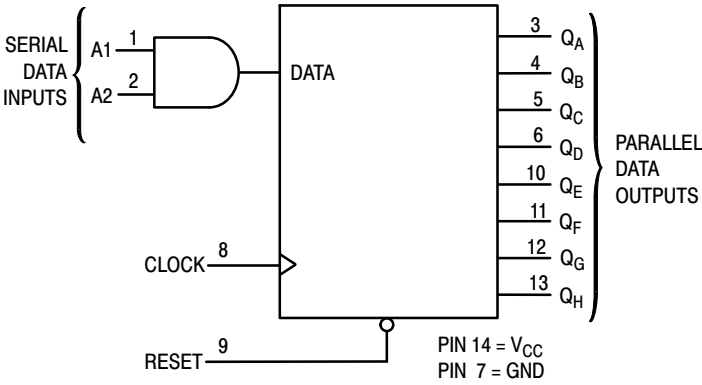


Figure 1. Logic Diagram

FUNCTION TABLE

| Inputs |       |    |    | Outputs   |                 |     |                 |
|--------|-------|----|----|-----------|-----------------|-----|-----------------|
| Reset  | Clock | A1 | A2 | QA        | QB              | ... | QH              |
| L      | X     | X  | X  | L         | L               | ... | L               |
| H      |       | X  | X  | No Change |                 |     |                 |
| H      |       | H  | D  | D         | QA <sub>n</sub> | ... | Q <sub>Gn</sub> |
| H      |       | D  | H  | D         | QA <sub>n</sub> | ... | Q <sub>Gn</sub> |

D = data input  
QA<sub>n</sub> – Q<sub>Gn</sub> = data shifted from the preceding stage on a rising edge at the clock input.

# MC74HC164A

## MAXIMUM RATINGS

| Symbol           | Parameter                                                                          | Value                        | Unit |
|------------------|------------------------------------------------------------------------------------|------------------------------|------|
| V <sub>CC</sub>  | DC Supply Voltage                                                                  | −0.5 to +6.5                 | V    |
| V <sub>IN</sub>  | DC Input Voltage                                                                   | −0.5 to V <sub>CC</sub> +0.5 | V    |
| V <sub>OUT</sub> | DC Output Voltage                                                                  | −0.5 to V <sub>CC</sub> +0.5 | V    |
| I <sub>IN</sub>  | DC Input Diode Current, per Pin                                                    | ±20                          | mA   |
| I <sub>OUT</sub> | DC Output Diode Current, per Pin                                                   | ±25                          | mA   |
| I <sub>CC</sub>  | DC Supply Current, V <sub>CC</sub> and GND Pins                                    | ±50                          | mA   |
| I <sub>IK</sub>  | Input Clamp Current (V <sub>IN</sub> < 0 or V <sub>IN</sub> > V <sub>CC</sub> )    | ±20                          | mA   |
| I <sub>OK</sub>  | Output Clamp Current (V <sub>OUT</sub> < 0 or V <sub>OUT</sub> > V <sub>CC</sub> ) | ±20                          | mA   |
| T <sub>STG</sub> | Storage Temperature Range                                                          | −65 to +150                  | °C   |
| T <sub>L</sub>   | Lead Temperature, 1 mm from Case for 10 Seconds                                    | 260                          | °C   |
| T <sub>J</sub>   | Junction Temperature Under Bias                                                    | +150                         | °C   |
| θ <sub>JA</sub>  | Thermal Resistance (Note 1)<br>SOIC-14<br>TSSOP-14                                 | 116<br>150                   | °C/W |
| P <sub>D</sub>   | Power Dissipation in Still Air at 25°C<br>SOIC-14<br>TSSOP-14                      | 1077<br>833                  | mW   |
| MSL              | Moisture Sensitivity                                                               | Level 1                      | –    |
| F <sub>R</sub>   | Flammability Rating<br>Oxygen Index: 28 to 34                                      | UL 94 V-0 @ 0.125 in.        | –    |
| V <sub>ESD</sub> | ESD Withstand Voltage (Note 2)<br>Human Body Model<br>Charged Device Model         | 2000<br>N/A                  | V    |

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. Measured with minimum pad spacing on an FR4 board, using 76mm-by-114mm, 2-ounce copper trace no air flow per JESD51-7.

2. HBM tested to EIA / JESD22-A114-A. CDM tested to JESD22-C101-A. JEDEC recommends that ESD qualification to EIA/JESD22-A115A (Machine Model) be discontinued.

## RECOMMENDED OPERATING CONDITIONS

| Symbol                             | Parameter                                 | Min                     | Max             | Unit |    |     |
|------------------------------------|-------------------------------------------|-------------------------|-----------------|------|----|-----|
| V <sub>CC</sub>                    | DC Supply Voltage                         | 2.0                     | 6.0             | V    |    |     |
| V <sub>in</sub> , V <sub>out</sub> | DC Input Voltage, Output Voltage (Note 3) | 0                       | V <sub>CC</sub> | V    |    |     |
| T <sub>A</sub>                     | Operating Temperature, All Package Types  | −55                     | +125            | °C   |    |     |
| t <sub>r</sub> , t <sub>f</sub>    | Input Rise and Fall Time<br>(Figure 3)    | V <sub>CC</sub> = 2.0 V | 0               | 1000 | ns |     |
|                                    |                                           | V <sub>CC</sub> = 4.5 V | 0               |      |    | 500 |
|                                    |                                           | V <sub>CC</sub> = 6.0 V | 0               |      |    | 400 |

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.

3. Unused inputs may not be left open. All inputs must be tied to a high- or low-logic input voltage level.

## DC ELECTRICAL CHARACTERISTICS

| Symbol   | Parameter                        | Test Conditions                                                                               | $V_{CC}$<br>V            | Guaranteed Limit          |                           |                           | Unit |
|----------|----------------------------------|-----------------------------------------------------------------------------------------------|--------------------------|---------------------------|---------------------------|---------------------------|------|
|          |                                  |                                                                                               |                          | -55°C to<br>25°C          | $\leq 85^\circ\text{C}$   | $\leq 125^\circ\text{C}$  |      |
| $V_{IH}$ | Minimum High-Level Input Voltage | $V_{out} = 0.1\text{ V}$ or $V_{CC} - 0.1\text{ V}$<br>$ I_{out}  \leq 20\text{ }\mu\text{A}$ | 2.0<br>3.0<br>4.5<br>6.0 | 1.5<br>2.1<br>3.15<br>4.2 | 1.5<br>2.1<br>3.15<br>4.2 | 1.5<br>2.1<br>3.15<br>4.2 | V    |
| $V_{IL}$ | Maximum Low-Level Input Voltage  | $V_{out} = 0.1\text{ V}$ or $V_{CC} - 0.1\text{ V}$<br>$ I_{out}  \leq 20\text{ }\mu\text{A}$ | 2.0<br>3.0<br>4.5<br>6.0 | 0.5<br>0.9<br>1.35<br>1.8 | 0.5<br>0.9<br>1.35<br>1.8 | 0.5<br>0.9<br>1.35<br>1.8 | V    |

# MC74HC164A

## DC ELECTRICAL CHARACTERISTICS

| Symbol          | Parameter                                      | Test Conditions                                                                                                                                   | V <sub>CC</sub><br>V | Guaranteed Limit     |                      |                      | Unit |
|-----------------|------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|----------------------|----------------------|----------------------|------|
|                 |                                                |                                                                                                                                                   |                      | -55°C to<br>25°C     | ≤ 85°C               | ≤ 125°C              |      |
| V <sub>OH</sub> | Minimum High-Level Output Voltage              | V <sub>in</sub> = V <sub>IH</sub> or V <sub>IL</sub><br> I <sub>out</sub>   ≤ 20 μA                                                               | 2.0<br>4.5<br>6.0    | 1.9<br>4.4<br>5.9    | 1.9<br>4.4<br>5.9    | 1.9<br>4.4<br>5.9    | V    |
|                 |                                                | V <sub>in</sub> = V <sub>IH</sub> or V <sub>IL</sub>  I <sub>out</sub>   ≤ 2.4 mA<br> I <sub>out</sub>   ≤ 4.0 mA<br> I <sub>out</sub>   ≤ 5.2 mA | 3.0<br>4.5<br>6.0    | 2.48<br>3.98<br>5.48 | 2.34<br>3.84<br>5.34 | 2.20<br>3.70<br>5.20 |      |
| V <sub>OL</sub> | Maximum Low-Level Output Voltage               | V <sub>in</sub> = V <sub>IH</sub> or V <sub>IL</sub><br> I <sub>out</sub>   ≤ 20 μA                                                               | 2.0<br>4.5<br>6.0    | 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>  I <sub>out</sub>   ≤ 2.4 mA<br> I <sub>out</sub>   ≤ 4.0 mA<br> I <sub>out</sub>   ≤ 5.2 mA | 3.0<br>4.5<br>6.0    | 0.26<br>0.26<br>0.26 | 0.33<br>0.33<br>0.33 | 0.40<br>0.40<br>0.40 |      |
| I <sub>in</sub> | Maximum Input Leakage Current                  | V <sub>in</sub> = V <sub>CC</sub> or GND                                                                                                          | 6.0                  | ±0.1                 | ±1.0                 | ±1.0                 | μA   |
| I <sub>CC</sub> | Maximum Quiescent Supply Current (per Package) | V <sub>in</sub> = V <sub>CC</sub> or GND<br>I <sub>out</sub> = 0 μA                                                                               | 6.0                  | 4                    | 40                   | 160                  | 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.

## AC ELECTRICAL CHARACTERISTICS

| Symbol                                 | Parameter                                                    | V <sub>CC</sub><br>V     | Guaranteed Limit       |                        |                        | Unit |
|----------------------------------------|--------------------------------------------------------------|--------------------------|------------------------|------------------------|------------------------|------|
|                                        |                                                              |                          | −55°C to<br>25°C       | ≤ 85°C                 | ≤ 125°C                |      |
| f <sub>max</sub>                       | Maximum Clock Frequency (50% Duty Cycle)<br>(Figures 2, 3)   | 2.0<br>3.0<br>4.5<br>6.0 | 10<br>20<br>40<br>50   | 10<br>20<br>35<br>45   | 10<br>20<br>30<br>40   | MHz  |
| t <sub>PLH</sub> ,<br>t <sub>PHL</sub> | Maximum Propagation Delay, Clock to Q<br>(Figures 2, 3)      | 2.0<br>3.0<br>4.5<br>6.0 | 160<br>100<br>32<br>27 | 200<br>150<br>40<br>34 | 250<br>200<br>48<br>42 | ns   |
| t <sub>PHL</sub>                       | Maximum Propagation Delay, Reset to Q<br>(Figures 2, 4)      | 2.0<br>3.0<br>4.5<br>6.0 | 175<br>100<br>35<br>30 | 220<br>150<br>44<br>37 | 260<br>200<br>53<br>45 | ns   |
| t <sub>TLH</sub> ,<br>t <sub>THL</sub> | Maximum Output Transition Time, Any Output<br>(Figures 2, 3) | 2.0<br>3.0<br>4.5<br>6.0 | 75<br>27<br>15<br>13   | 95<br>32<br>19<br>16   | 110<br>36<br>22<br>19  | ns   |
| C <sub>in</sub>                        | Maximum Input Capacitance                                    | —                        | 10                     | 10                     | 10                     | pF   |

|                 |                                              |                                         |    |
|-----------------|----------------------------------------------|-----------------------------------------|----|
| C <sub>PD</sub> | Power Dissipation Capacitance (Per Package)* | Typical @ 25°C, V <sub>CC</sub> = 5.0 V | pF |
|                 |                                              | 180                                     |    |

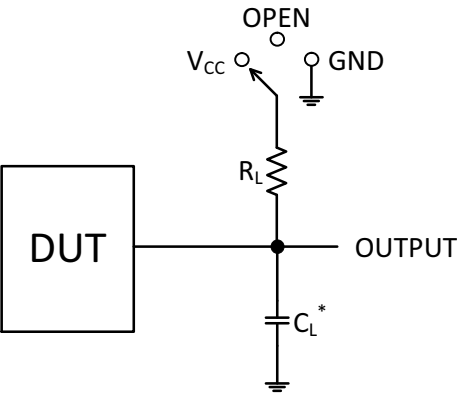
\* Used to determine the no-load dynamic power consumption: P<sub>D</sub> = C<sub>PD</sub> V<sub>CC</sub><sup>2</sup>f + I<sub>CC</sub> V<sub>CC</sub>.

# MC74HC164A

## TIMING REQUIREMENTS

| Symbol                          | Parameter                                                    | V <sub>CC</sub><br>V | Guaranteed Limit |        |         | Unit |
|---------------------------------|--------------------------------------------------------------|----------------------|------------------|--------|---------|------|
|                                 |                                                              |                      | -55°C to<br>25°C | ≤ 85°C | ≤ 125°C |      |
| t <sub>su</sub>                 | Minimum Setup Time, A1 or A2 to Clock<br>(Figure 5)          | 2.0                  | 25               | 35     | 40      | ns   |
|                                 |                                                              | 3.0                  | 15               | 20     | 25      |      |
|                                 |                                                              | 4.5                  | 7                | 8      | 9       |      |
|                                 |                                                              | 6.0                  | 5                | 6      | 6       |      |
| t <sub>h</sub>                  | Minimum Hold Time, Clock to A1 or A2<br>(Figure 5)           | 2.0                  | 3                | 3      | 3       | ns   |
|                                 |                                                              | 3.0                  | 3                | 3      | 3       |      |
|                                 |                                                              | 4.5                  | 3                | 3      | 3       |      |
|                                 |                                                              | 6.0                  | 3                | 3      | 3       |      |
| t <sub>rec</sub>                | Minimum Recovery Time, Reset Inactive to Clock<br>(Figure 4) | 2.0                  | 3                | 3      | 3       | ns   |
|                                 |                                                              | 3.0                  | 3                | 3      | 3       |      |
|                                 |                                                              | 4.5                  | 3                | 3      | 3       |      |
|                                 |                                                              | 6.0                  | 3                | 3      | 3       |      |
| t <sub>w</sub>                  | Minimum Pulse Width, Clock<br>(Figure 3)                     | 2.0                  | 50               | 60     | 75      | ns   |
|                                 |                                                              | 3.0                  | 26               | 35     | 45      |      |
|                                 |                                                              | 4.5                  | 12               | 15     | 20      |      |
|                                 |                                                              | 6.0                  | 10               | 12     | 15      |      |
| t <sub>w</sub>                  | Minimum Pulse Width, Reset<br>(Figure 4)                     | 2.0                  | 50               | 60     | 75      | ns   |
|                                 |                                                              | 3.0                  | 26               | 35     | 45      |      |
|                                 |                                                              | 4.5                  | 12               | 15     | 20      |      |
|                                 |                                                              | 6.0                  | 10               | 12     | 15      |      |
| t <sub>r</sub> , t <sub>f</sub> | Maximum Input Rise and Fall Times<br>(Figure 3)              | 2.0                  | 1000             | 1000   | 1000    | ns   |
|                                 |                                                              | 3.0                  | 800              | 800    | 800     |      |
|                                 |                                                              | 4.5                  | 500              | 500    | 500     |      |
|                                 |                                                              | 6.0                  | 400              | 400    | 400     |      |

MC74HC164A



\*C<sub>L</sub> Includes probe and jig capacitance

| Test                                | Switch Position | C <sub>L</sub> | R <sub>L</sub> |
|-------------------------------------|-----------------|----------------|----------------|
| t <sub>PLH</sub> / t <sub>PHL</sub> | Open            | 50 pF          | 1 kΩ           |
| t <sub>PLZ</sub> / t <sub>PZL</sub> | V <sub>CC</sub> |                |                |
| t <sub>PHZ</sub> / t <sub>PZH</sub> | GND             |                |                |

Figure 2. Test Circuit

SWITCHING WAVEFORMS

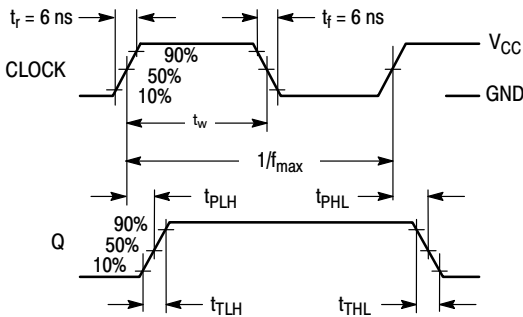


Figure 3.

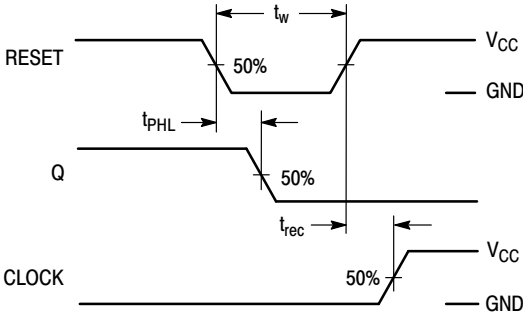


Figure 4.

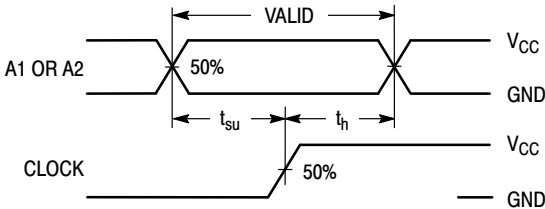


Figure 5.

# MC74HC164A

## PIN DESCRIPTIONS

### INPUTS

#### A1, A2 (Pins 1, 2)

Serial Data Inputs. Data at these inputs determine the data to be entered into the first stage of the shift register. For a high level to be entered into the shift register, both A1 and A2 inputs must be high, thereby allowing one input to be used as a data–enable input. When only one serial input is used, the other must be connected to  $V_{CC}$ .

#### Clock (Pin 8)

Shift Register Clock. A positive–going transition on this pin shifts the data at each stage to the next stage. The shift

register is completely static, allowing clock rates down to DC in a continuous or intermittent mode.

### OUTPUTS

#### $Q_A - Q_H$ (Pins 3, 4, 5, 6, 10, 11, 12, 13)

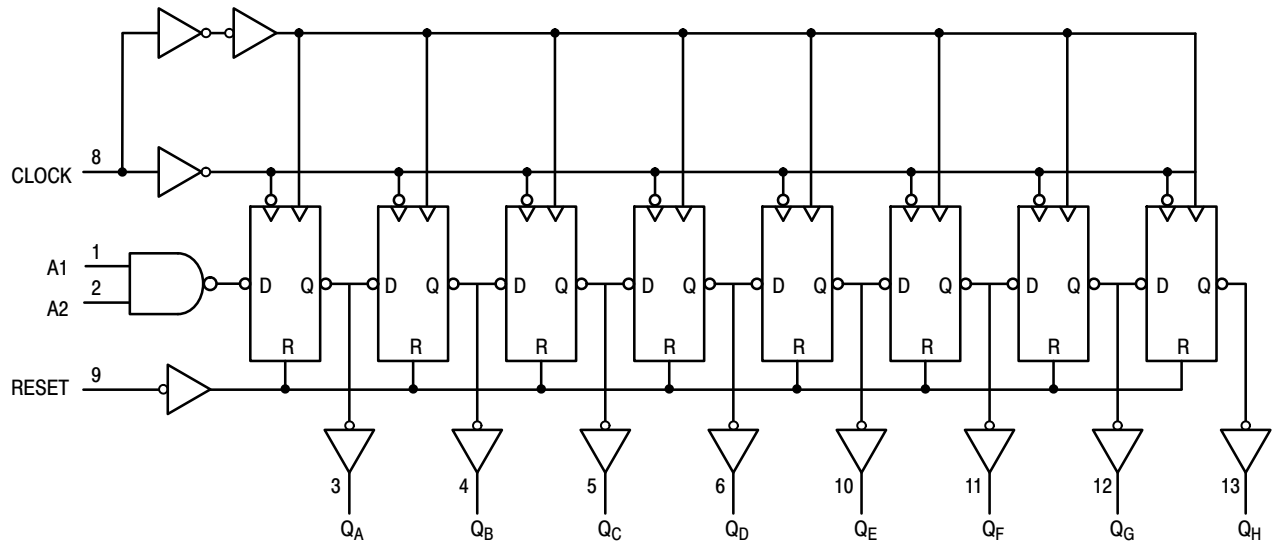
Parallel Shift Register Outputs. The shifted data is presented at these outputs in true, or noninverted, form.

### CONTROL INPUT

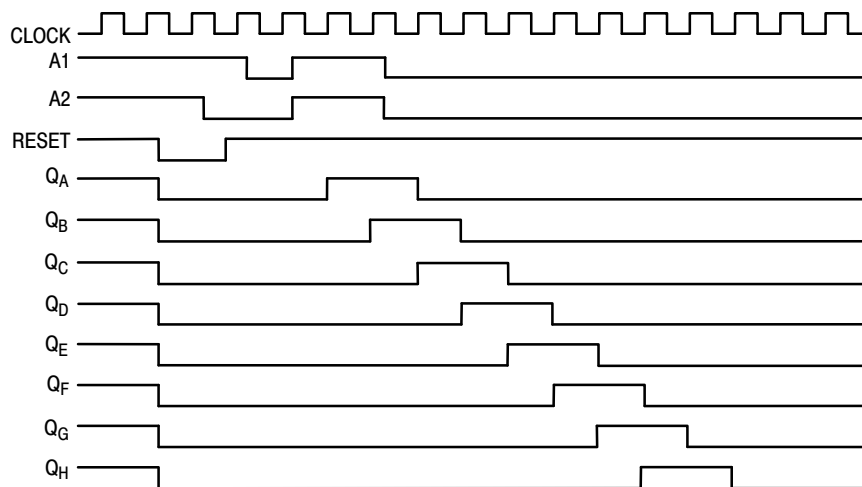
#### Reset (Pin 9)

Active–Low, Asynchronous Reset Input. A low voltage applied to this input resets all internal flip–flops and sets Outputs  $Q_A - Q_H$  to the low level state.

## EXPANDED LOGIC DIAGRAM



## TIMING DIAGRAM



## MC74HC164A

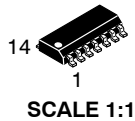
### ORDERING INFORMATION

| Device             | Marking    | Package  | Shipping†                |
|--------------------|------------|----------|--------------------------|
| MC74HC164ADR2G     | HC164AG    | SOIC–14  | 2500 Units / Tape & Reel |
| MC74HC164ADTR2G    | HC<br>164A | TSSOP–14 | 2500 Units / Tape & Reel |
| MC74HC164ADTR2G–Q* | HC<br>164A | TSSOP–14 | 2500 Units / 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.

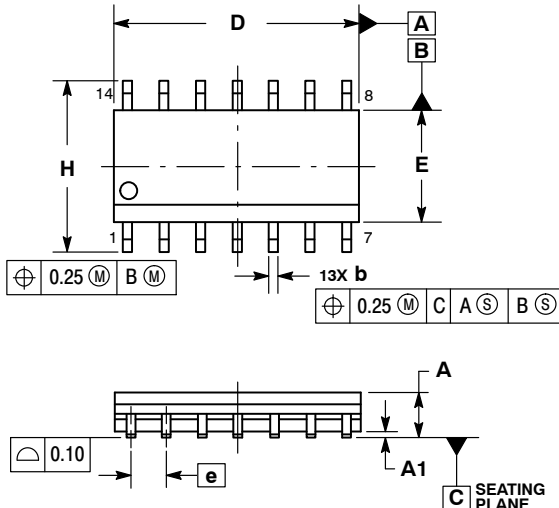
\*–Q Suffix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC–Q100 Qualified and PPAP Capable.





SOIC-14 NB  
CASE 751A-03  
ISSUE L

DATE 03 FEB 2016

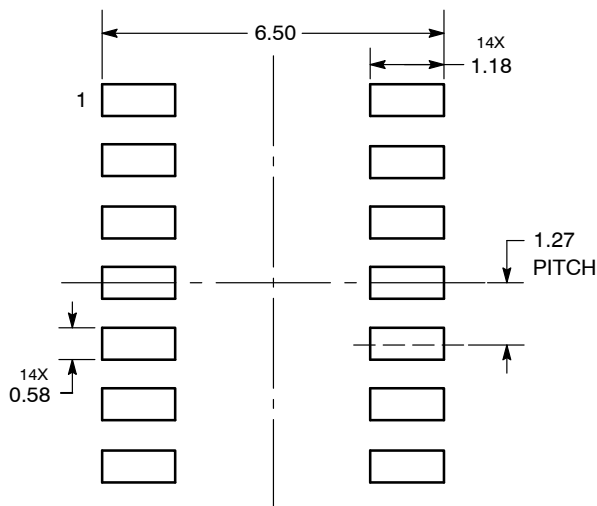


NOTES:

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°    |

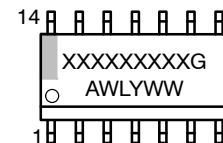
SOLDERING FOOTPRINT\*



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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| DESCRIPTION:     | SOIC-14 NB  | PAGE 1 OF 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

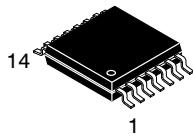
STYLE 6:  
PIN 1. CATHODE  
2. CATHODE  
3. CATHODE  
4. CATHODE  
5. CATHODE  
6. CATHODE  
7. CATHODE  
8. ANODE  
9. ANODE  
10. ANODE  
11. ANODE  
12. ANODE  
13. ANODE  
14. ANODE

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

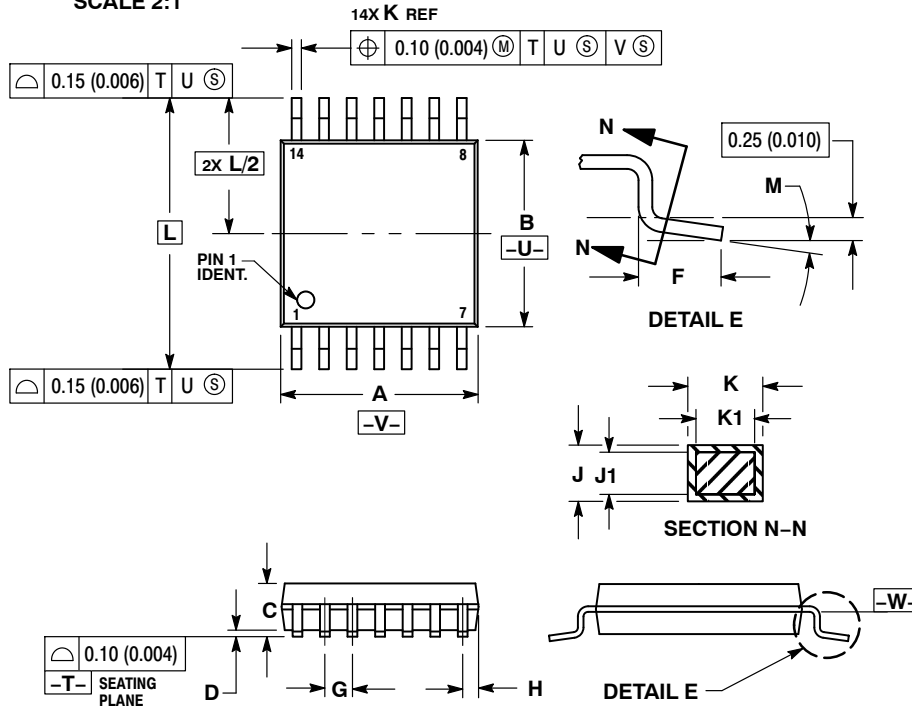
|                  |             |                                                                                                                                                                                     |
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| DESCRIPTION:     | SOIC-14 NB  | PAGE 2 OF 2                                                                                                                                                                         |

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

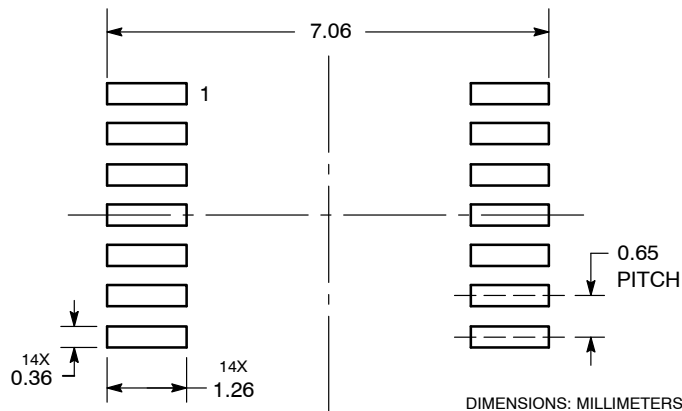
DATE 17 FEB 2016

SCALE 2:1

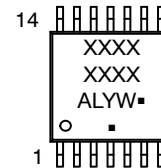

**NOTES:**

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°    |

**RECOMMENDED  
SOLDERING FOOTPRINT\***


\*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\***


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.

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**DESCRIPTION:** TSSOP-14 WB

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