

# Dual D-Type Flip-Flop with Preset and Clear

## MM74HC74A

The MM74HC74A utilizes advanced silicon-gate CMOS technology to achieve operating speeds similar to the equivalent LS-TTL part. It possesses the high noise immunity and low power consumption of standard CMOS integrated circuits, along with the ability to drive 10 LS-TTL loads.

This flip-flop has independent data, preset, clear, and clock inputs and Q and  $\bar{Q}$  outputs. The logic level present at the data input is transferred to the output during the positive-going transition of the clock pulse. Preset and clear are independent of the clock and accomplished by a low level at the appropriate input.

The 74HC logic family is functionally and pinout compatible with the standard 74LS logic family. All inputs are protected from damage due to static discharge by internal diode clamps to  $V_{CC}$  and ground.

### Features

- Typical Propagation Delay: 12 ns
- Wide Power Supply Range: 2 V – 6 V
- Low Quiescent Current: 80  $\mu$ A maximum (74HC Series)
- Low Input Current: 1  $\mu$ A Maximum
- Fanout of 10 LS-TTL Loads
- These Devices are Pb-Free, Halide Free and are RoHS Compliant

### Connection Diagram

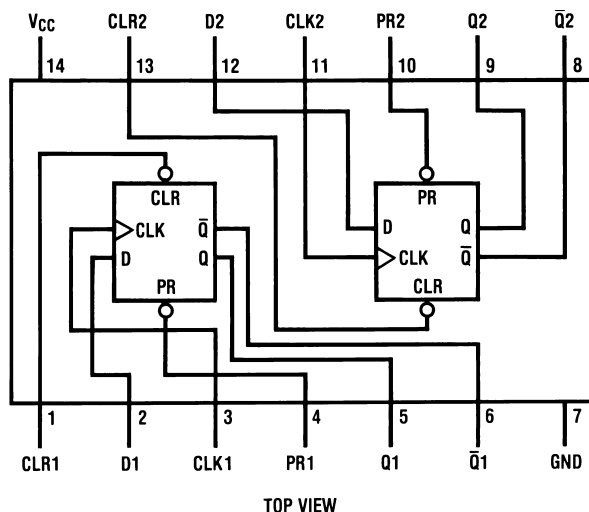
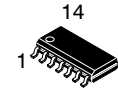
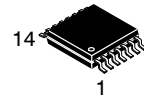


Figure 1. Pin Assignments for SOIC and TSSOP

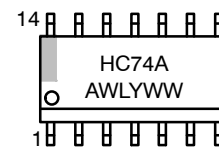


SOIC-14  
CASE 751EF

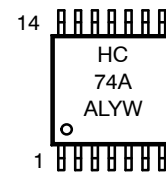


TSSOP-14 WB  
CASE 948G

### MARKING DIAGRAM



SOIC-14 NB



TSSOP-14 WB

HC74A = Specific Device Code  
A = Assembly Location  
WL, L = Wafer Lot  
Y = Year  
WW, W = Work Week

### TRUTH TABLE

| Inputs |     |     |   | Outputs      |              |
|--------|-----|-----|---|--------------|--------------|
| PR     | CLR | CLK | D | Q            | $\bar{Q}$    |
| L      | H   | X   | X | H            | L            |
| H      | L   | X   | X | L            | H            |
| L      | L   | X   | X | H<br>(Note1) | H<br>(Note1) |
| H      | H   | ↑   | H | H            | L            |
| H      | H   | ↑   | L | L            | H            |
| H      | H   | L   | X | Q0           | $\bar{Q}0$   |

Q0 = the level of Q before the indicated input conditions were established.

1. This configuration is nonstable; that is, it will not persist when preset and clear inputs return to their inactive (HIGH) level.

### ORDERING INFORMATION

See detailed ordering and shipping information on page 5 of this data sheet.

# MM74HC74A

## Logic Diagram

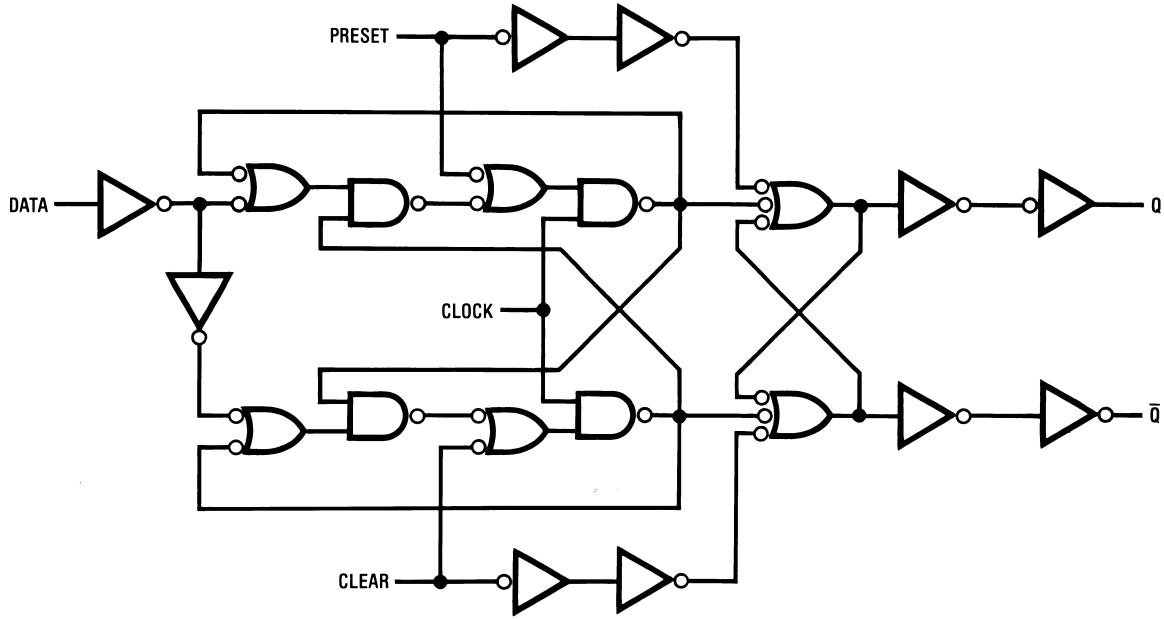


Figure 2. Logic Diagram

## MAXIMUM RATINGS (Note 2)

| Symbol           | Parameter                               | Rating                                   |
|------------------|-----------------------------------------|------------------------------------------|
| $V_{CC}$         | Supply Voltage                          | -0.5 to +6.5 V                           |
| $V_{IN}$         | DC Input Voltage                        | -0.5 to $V_{CC} + 0.5$ V                 |
| $V_{OUT}$        | DC Output Voltage                       | -0.5 to $V_{CC} + 0.5$ V                 |
| $I_{IK}, I_{OK}$ | Clamp Diode Current                     | $\pm 20$ mA                              |
| $I_{OUT}$        | DC Output Current, per Pin              | $\pm 25$ mA                              |
| $I_{CC}$         | DC $V_{CC}$ or GND Current, per Pin     | $\pm 50$ mA                              |
| $T_{STG}$        | Storage Temperature Range               | -65°C to +150°C                          |
| $P_D$            | Power Dissipation                       | SOIC-14<br>TSSOP-14<br>1077 mW<br>833 mW |
| $T_L$            | Lead Temperature (Soldering 10 Seconds) | 260°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.

2. Unless otherwise specified all voltages are referenced to ground.

## RECOMMENDED OPERATING CONDITIONS

| Symbol            | Parameter                   | Min              | Max      | Unit |
|-------------------|-----------------------------|------------------|----------|------|
| $V_{CC}$          | Supply Voltage              | 2                | 6        | V    |
| $V_{IN}, V_{OUT}$ | DC Input or Output Voltage  | 0                | $V_{CC}$ | V    |
| $T_A$             | Operating Temperature Range | -55              | +125     | °C   |
| $t_r, t_f$        | Input Rise or Fall Times    | $V_{CC} = 2.0$ V |          |      |
|                   |                             | -                | 1000     | ns   |
|                   |                             | $V_{CC} = 4.5$ V |          |      |
|                   |                             | -                | 500      | ns   |
|                   |                             | $V_{CC} = 6.0$ V |          |      |
|                   |                             | -                | 400      | ns   |

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.

# MM74HC74A

## DC CHARACTERISTICS (Note 3)

| Symbol          | Parameter                         | V <sub>CC</sub> (V) | Conditions                                                                             | T <sub>A</sub> = 25°C |                   | T <sub>A</sub> = -40°C<br>to 85°C | T <sub>A</sub> = -55°C<br>to 125°C | Unit |
|-----------------|-----------------------------------|---------------------|----------------------------------------------------------------------------------------|-----------------------|-------------------|-----------------------------------|------------------------------------|------|
|                 |                                   |                     |                                                                                        | Typ                   | Guaranteed Limits |                                   |                                    |      |
| V <sub>IH</sub> | Minimum HIGH Level Input Voltage  | 2.0                 |                                                                                        | –                     | 1.5               | 1.5                               | 1.5                                | V    |
|                 |                                   | 4.5                 |                                                                                        | –                     | 3.15              | 3.15                              | 3.15                               |      |
|                 |                                   | 6.0                 |                                                                                        | –                     | 4.2               | 4.2                               | 4.2                                |      |
| V <sub>IL</sub> | Maximum LOW Level Input Voltage   | 2.0                 |                                                                                        | –                     | 0.5               | 0.5                               | 0.5                                | V    |
|                 |                                   | 4.5                 |                                                                                        | –                     | 1.35              | 1.35                              | 1.35                               |      |
|                 |                                   | 6.0                 |                                                                                        | –                     | 1.8               | 1.8                               | 1.8                                |      |
| V <sub>OH</sub> | Minimum HIGH Level Output Voltage | 2.0                 | V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub> ,<br> I <sub>OUT</sub>   ≤ 20 μA  | 2.0                   | 1.9               | 1.9                               | 1.9                                | V    |
|                 |                                   | 4.5                 |                                                                                        | 4.5                   | 4.4               | 4.4                               | 4.4                                |      |
|                 |                                   | 6.0                 |                                                                                        | 6.0                   | 5.9               | 5.9                               | 5.9                                |      |
|                 |                                   | 4.5                 | V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub> ,<br> I <sub>OUT</sub>   ≤ 4.0 mA | 4.3                   | 3.98              | 3.84                              | 3.7                                |      |
|                 |                                   | 6.0                 | V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub> ,<br> I <sub>OUT</sub>   ≤ 5.2 mA | 5.2                   | 5.48              | 5.34                              | 5.2                                |      |
| V <sub>OL</sub> | Maximum LOW Level Output Voltage  | 2.0                 | V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub> ,<br> I <sub>OUT</sub>   ≤ 20 μA  | 0                     | 0.1               | 0.1                               | 0.1                                | V    |
|                 |                                   | 4.5                 |                                                                                        | 0                     | 0.1               | 0.1                               | 0.1                                |      |
|                 |                                   | 6.0                 |                                                                                        | 0                     | 0.1               | 0.1                               | 0.1                                |      |
|                 |                                   | 4.5                 | V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub> ,<br> I <sub>OUT</sub>   ≤ 4.0 mA | 0.2                   | 0.26              | 0.33                              | 0.4                                |      |
|                 |                                   | 6.0                 | V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub> ,<br> I <sub>OUT</sub>   ≤ 5.2 mA | 0.2                   | 0.26              | 0.33                              | 0.4                                |      |
| I <sub>IN</sub> | Maximum Input Current             | 6.0                 | V <sub>IN</sub> = V <sub>CC</sub> or GND                                               | –                     | ±0.1              | ±1.0                              | ±1.0                               | μA   |
| I <sub>CC</sub> | Maximum Quiescent Supply Current  | 6.0                 | V <sub>IN</sub> = V <sub>CC</sub> or GND,<br>I <sub>OUT</sub> = 0 μA                   | –                     | 4.0               | 40                                | 80                                 | μA   |

3. For a power supply of 5 V ±10% the worst case output voltages (V<sub>OH</sub>, and V<sub>OL</sub>) occur for HC at 4.5 V. Thus the 4.5 V values should be used when designing with this supply. Worst case V<sub>IH</sub> and V<sub>IL</sub> occur at V<sub>CC</sub> = 5.5 V and 4.5 V respectively. (The V<sub>IH</sub> value at 5.5 V is 3.85 V.) The worst case leakage current (I<sub>IN</sub>, I<sub>CC</sub>, and I<sub>OZ</sub>) occur for CMOS at the higher voltage and so the 6.0 V values should be used.

## AC CHARACTERISTICS (V<sub>CC</sub> = 5 V, T<sub>A</sub> = 25°C, C<sub>L</sub> = 15 pF, t<sub>r</sub> = t<sub>f</sub> = 6 ns)

| Symbol                              | Parameter                                                    | Conditions | Typ | Guaranteed Limit | Unit |
|-------------------------------------|--------------------------------------------------------------|------------|-----|------------------|------|
| f <sub>MAX</sub>                    | Maximum Operating Frequency                                  |            | 72  | 30               | MHz  |
| t <sub>PHL</sub> , t <sub>PLH</sub> | Maximum Propagation Delay, Clock to Q or $\bar{Q}$           |            | 10  | 30               | ns   |
| t <sub>PHL</sub> , t <sub>PLH</sub> | Maximum Propagation Delay, Preset or Clear to Q or $\bar{Q}$ |            | 17  | 40               | ns   |
| t <sub>REM</sub>                    | Minimum Removal Time, Preset or Clear to Clock               |            | 6   | 5                | ns   |
| t <sub>s</sub>                      | Minimum Setup Time, Data to Clock                            |            | 10  | 20               | ns   |
| t <sub>H</sub>                      | Minimum Hold Time, Clock to Data                             |            | 0   | 0                | ns   |
| t <sub>W</sub>                      | Minimum Pulse Width Clock, Preset or Clear                   |            | 8   | 16               | ns   |

# MM74HC74A

## AC CHARACTERISTICS (C<sub>L</sub> = 50 pF, t<sub>r</sub> = t<sub>f</sub> = 6 ns (unless otherwise specified))

| Symbol                              | Parameter                                                            | V <sub>CC</sub> (V) | Conditions      | T <sub>A</sub> = 25°C |                   | T <sub>A</sub> = -40°C<br>to 85°C | T <sub>A</sub> = -55°C<br>to 125°C | Unit |
|-------------------------------------|----------------------------------------------------------------------|---------------------|-----------------|-----------------------|-------------------|-----------------------------------|------------------------------------|------|
|                                     |                                                                      |                     |                 | Typ                   | Guaranteed Limits |                                   |                                    |      |
| f <sub>MAX</sub>                    | Maximum Operating Frequency                                          | 2.0                 |                 | 22                    | 6                 | 5                                 | 4                                  | ns   |
|                                     |                                                                      | 4.5                 |                 | 72                    | 30                | 24                                | 20                                 |      |
|                                     |                                                                      | 6.0                 |                 | 94                    | 35                | 28                                | 24                                 |      |
| t <sub>PHL</sub> , t <sub>PLH</sub> | Maximum Propagation Delay,<br>Clock to Q or $\overline{Q}$           | 2.0                 |                 | 34                    | 110               | 140                               | 165                                | ns   |
|                                     |                                                                      | 4.5                 |                 | 12                    | 22                | 28                                | 33                                 |      |
|                                     |                                                                      | 6.0                 |                 | 10                    | 19                | 24                                | 28                                 |      |
| t <sub>PHL</sub> , t <sub>PLH</sub> | Maximum Propagation Delay,<br>Preset or Clear to Q or $\overline{Q}$ | 2.0                 |                 | 66                    | 150               | 190                               | 225                                | ns   |
|                                     |                                                                      | 4.5                 |                 | 20                    | 30                | 38                                | 45                                 |      |
|                                     |                                                                      | 6.0                 |                 | 16                    | 26                | 33                                | 38                                 |      |
| t <sub>REM</sub>                    | Minimum Removal Time,<br>Preset or Clear to Clock                    | 2.0                 |                 | 20                    | 50                | 65                                | 75                                 | ns   |
|                                     |                                                                      | 4.5                 |                 | 6                     | 10                | 13                                | 15                                 |      |
|                                     |                                                                      | 6.0                 |                 | 5                     | 9                 | 11                                | 13                                 |      |
| t <sub>s</sub>                      | Minimum Setup Time,<br>Data to Clock                                 | 2.0                 |                 | 35                    | 80                | 100                               | 120                                | ns   |
|                                     |                                                                      | 4.5                 |                 | 10                    | 16                | 20                                | 24                                 |      |
|                                     |                                                                      | 6.0                 |                 | 8                     | 14                | 17                                | 20                                 |      |
| t <sub>H</sub>                      | Minimum Hold Time,<br>Clock to Data                                  | 2.0                 |                 | –                     | 0                 | 0                                 | 0                                  | ns   |
|                                     |                                                                      | 4.5                 |                 | –                     | 0                 | 0                                 | 0                                  |      |
|                                     |                                                                      | 6.0                 |                 | –                     | 0                 | 0                                 | 0                                  |      |
| t <sub>W</sub>                      | Minimum Pulse Width Clock,<br>Preset or Clear                        | 2.0                 |                 | 30                    | 80                | 101                               | 119                                | ns   |
|                                     |                                                                      | 4.5                 |                 | 9                     | 16                | 20                                | 24                                 |      |
|                                     |                                                                      | 6.0                 |                 | 8                     | 14                | 17                                | 20                                 |      |
| t <sub>TLH</sub> , t <sub>THL</sub> | Maximum Output Rise and Fall Time                                    | 2.0                 |                 | 25                    | 75                | 95                                | 110                                | ns   |
|                                     |                                                                      | 4.5                 |                 | 7                     | 15                | 19                                | 22                                 |      |
|                                     |                                                                      | 6.0                 |                 | 6                     | 13                | 16                                | 19                                 |      |
| t <sub>r</sub> , t <sub>f</sub>     | Maximum Input Rise and Fall Time                                     | 2.0                 |                 | –                     | 1000              | 1000                              | 1000                               | ns   |
|                                     |                                                                      | 4.5                 |                 | –                     | 500               | 500                               | 500                                |      |
|                                     |                                                                      | 6.0                 |                 | –                     | 400               | 400                               | 400                                |      |
| C <sub>PD</sub>                     | Power Dissipation Capacitance<br>(Note 4)                            |                     | (per flip-flop) | 80                    | –                 | –                                 | –                                  | pF   |
| C <sub>IN</sub>                     | Maximum Input Capacitance                                            |                     |                 | 5                     | 10                | 10                                | 10                                 | pF   |

4. C<sub>PD</sub> determines 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>, and the no load dynamic current consumption, I<sub>S</sub> = C<sub>PD</sub> V<sub>CC</sub> f + I<sub>CC</sub>.

## MM74HC74A

### ORDERING INFORMATION

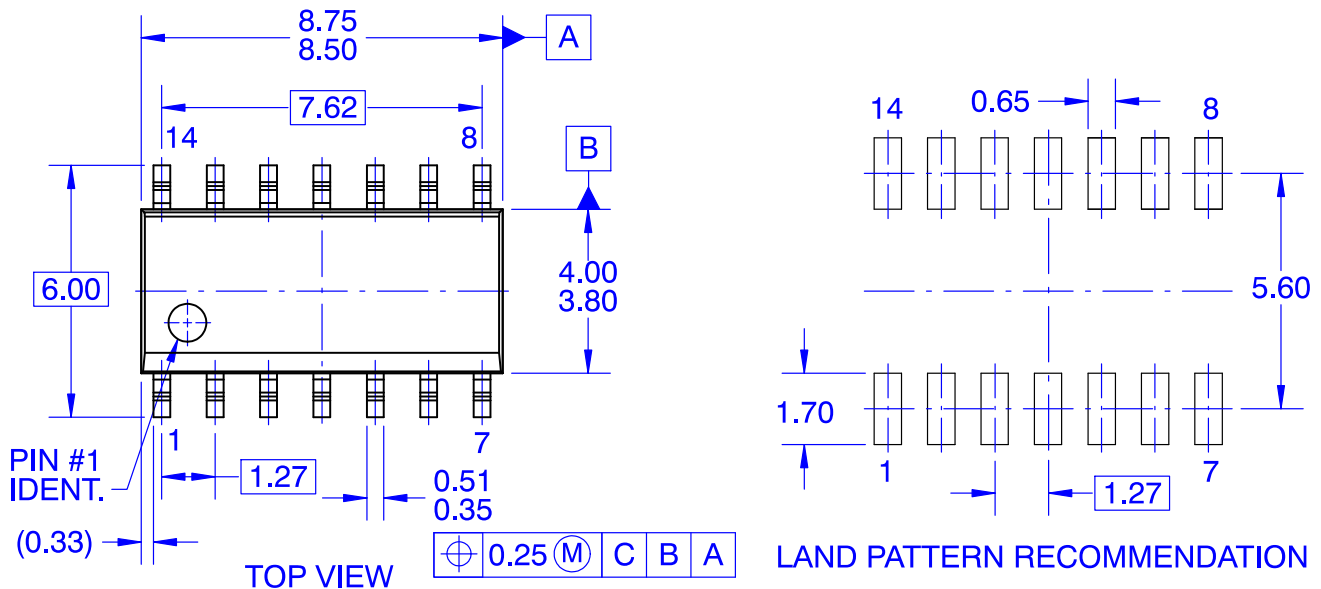
| Part Number   | Package                                             | Shipping <sup>†</sup> |
|---------------|-----------------------------------------------------|-----------------------|
| MM74HC74AM    | SOIC-14, Case 751EF<br>(Pb-Free, Halide Free)       | 55 Units / Tube       |
| MM74HC74AMTC  | TSSOP-14, Case 948G-01<br>(Pb-Free, Halide Free)    | 96 Units / Tube       |
| MM74HC74AMX   | SOIC-14, Case 751EF<br>(Pb-Free, Halide Free)       | 2500 / Tape & Reel    |
| MM74HC74AMTCX | TSSOP-14 WB, Case 948G-01<br>(Pb-Free, Halide Free) | 2500 / Tape & Reel    |

<sup>†</sup>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.

NOTE: Device also available in Tape and Reel. Specify by appending suffix letter "X" to the ordering number.

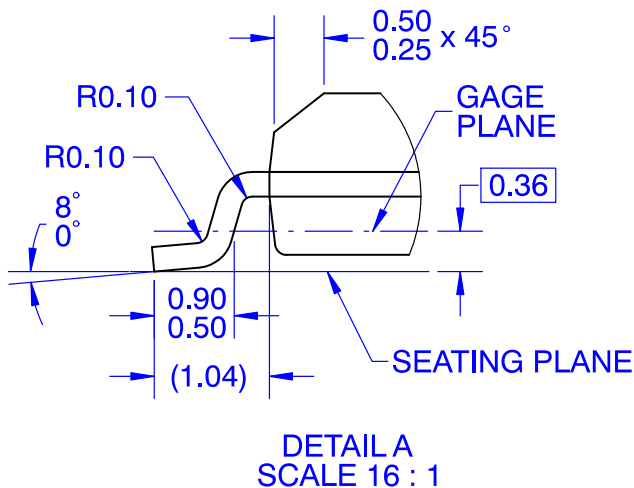
**SOIC14**  
**CASE 751EF**  
**ISSUE O**

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



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

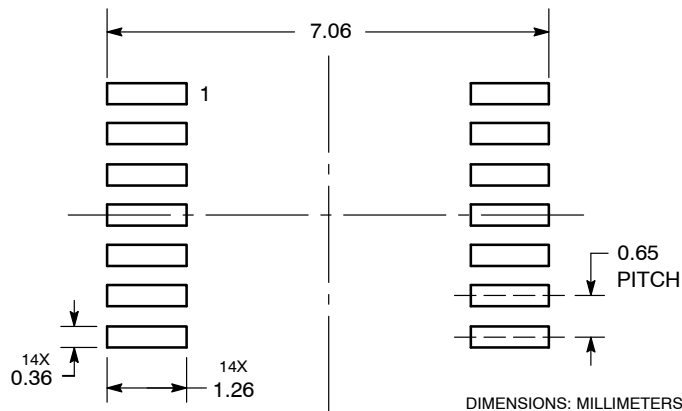
DATE 17 FEB 2016

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.

**DOCUMENT NUMBER:** 98ASH70246A

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**DESCRIPTION:** TSSOP-14 WB

**PAGE 1 OF 1**

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