

# MC74AC20, MC74ACT20

## Dual 4-Input NAND Gate

### Features

- Outputs Source/Sink 24 mA
- 'ACT20 Has TTL Compatible Inputs
- Pb-Free Packages are Available

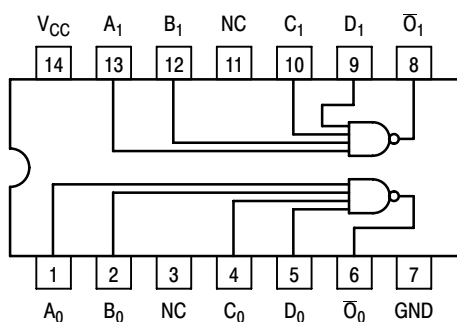


Figure 1. Pinout: 14-Lead Packages  
(Top View)

### PIN ASSIGNMENT

| PIN                  | FUNCTION |
|----------------------|----------|
| $A_n, B_n, C_n, D_n$ | Inputs   |
| $O_n$                | Outputs  |

### MAXIMUM RATINGS

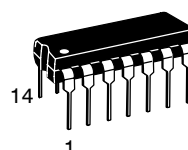
| Rating                                    | Symbol    | Value                  | Unit |
|-------------------------------------------|-----------|------------------------|------|
| DC Supply Voltage (Referenced to GND)     | $V_{CC}$  | -0.5 to +7.0           | V    |
| DC Input Voltage (Referenced to GND)      | $V_{in}$  | -0.5 to $V_{CC} + 0.5$ | V    |
| DC Output Voltage (Referenced to GND)     | $V_{out}$ | -0.5 to $V_{CC} + 0.5$ | V    |
| DC Input Current, per Pin                 | $I_{in}$  | $\pm 20$               | mA   |
| DC Output Sink/Source Current, per Pin    | $I_{out}$ | $\pm 50$               | mA   |
| DC $V_{CC}$ or GND Current per Output Pin | $I_{CC}$  | $\pm 50$               | mA   |
| Storage Temperature                       | $T_{stg}$ | -65 to +150            | °C   |

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

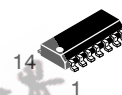


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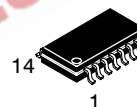
<http://onsemi.com>



PDIP-14  
N SUFFIX  
CASE 646



SOIC-14  
D SUFFIX  
CASE 751A



SOEIAJ-14  
M SUFFIX  
CASE 965

### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 4 of this data sheet.

# MC74AC20, MC74ACT20

## RECOMMENDED OPERATING CONDITIONS

| Symbol                          | Parameter                                                               | Min                     | Typ | Max             | Unit |
|---------------------------------|-------------------------------------------------------------------------|-------------------------|-----|-----------------|------|
| V <sub>CC</sub>                 | Supply Voltage                                                          | 'AC                     | 2.0 | 5.0             | V    |
|                                 |                                                                         | 'ACT                    | 4.5 | 5.0             |      |
| V <sub>REG</sub>                | DC Regulated Power Voltage (Ref. to GND)                                | 0                       | –   | V <sub>CC</sub> | V    |
| t <sub>r</sub> , t <sub>f</sub> | Input Rise and Fall Time (Note 1)<br>'AC Devices except Schmitt Inputs  | V <sub>CC</sub> @ 3.0 V | –   | 150             | ns/V |
|                                 |                                                                         | V <sub>CC</sub> @ 4.5 V | –   | 40              |      |
|                                 |                                                                         | V <sub>CC</sub> @ 5.5 V | –   | 25              |      |
| t <sub>r</sub> , t <sub>f</sub> | Input Rise and Fall Time (Note 2)<br>'ACT Devices except Schmitt Inputs | V <sub>CC</sub> @ 4.5 V | –   | 10              | ns/V |
|                                 |                                                                         | V <sub>CC</sub> @ 5.5 V | –   | 8.0             |      |
| T <sub>J</sub>                  | Junction Temperature (PDIP)                                             | –                       | –   | 140             | °C   |
| T <sub>A</sub>                  | Operating Ambient Temperature Range                                     | –40                     | 25  | 85              | °C   |
| I <sub>OH</sub>                 | Output Current – HIGH                                                   | –                       | –   | –24             | mA   |
| I <sub>OL</sub>                 | Output Current – LOW                                                    | –                       | –   | 24              | mA   |

1. V<sub>in</sub> from 30% to 70% V<sub>CC</sub>; see individual Data Sheets for devices that differ from the typical input rise and fall times.
2. V<sub>in</sub> from 0.8 V to 2.0 V; see individual Data Sheets for devices that differ from the typical input rise and fall times.

## DC CHARACTERISTICS

| Symbol           | Parameter                        | V <sub>CC</sub><br>(V) | 74AC                   |                   | 74ACT                           |  | Unit | Conditions                                                                                             |
|------------------|----------------------------------|------------------------|------------------------|-------------------|---------------------------------|--|------|--------------------------------------------------------------------------------------------------------|
|                  |                                  |                        | T <sub>A</sub> = +25°C |                   | T <sub>A</sub> = –40°C to +85°C |  |      |                                                                                                        |
|                  |                                  |                        | Typ                    | Guaranteed Limits |                                 |  |      |                                                                                                        |
| V <sub>IH</sub>  | Minimum High Level Input Voltage | 3.0                    | 1.5                    | 2.1               | 2.1                             |  | V    | V <sub>OUT</sub> = 0.1 V or V <sub>CC</sub> – 0.1 V                                                    |
|                  |                                  | 4.5                    | 2.25                   | 3.15              | 3.15                            |  |      |                                                                                                        |
|                  |                                  | 5.5                    | 2.75                   | 3.85              | 3.85                            |  |      |                                                                                                        |
| V <sub>IL</sub>  | Maximum Low Level Input Voltage  | 3.0                    | 1.5                    | 0.9               | 0.9                             |  | V    | V <sub>OUT</sub> = 0.1 V or V <sub>CC</sub> – 0.1 V                                                    |
|                  |                                  | 4.5                    | 2.25                   | 1.35              | 1.35                            |  |      |                                                                                                        |
|                  |                                  | 5.5                    | 2.75                   | 1.65              | 1.65                            |  |      |                                                                                                        |
| V <sub>OH</sub>  | Minimum Low Level Output Voltage | 3.0                    | 2.99                   | 2.9               | 2.9                             |  | V    | I <sub>OUT</sub> = – 50 μA                                                                             |
|                  |                                  | 4.5                    | 4.49                   | 4.4               | 4.4                             |  |      |                                                                                                        |
|                  |                                  | 5.5                    | 5.49                   | 5.4               | 5.4                             |  |      |                                                                                                        |
|                  |                                  | 3.0                    | –                      | 2.56              | 2.46                            |  | V    | *V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub><br>– 12 mA<br>I <sub>OH</sub> – 24 mA<br>– 24 mA |
|                  |                                  | 4.5                    | –                      | 3.86              | 3.76                            |  |      |                                                                                                        |
|                  |                                  | 5.5                    | –                      | 4.86              | 4.76                            |  |      |                                                                                                        |
| V <sub>OL</sub>  | Maximum Low Level Output Voltage | 3.0                    | 0.002                  | 0.1               | 0.1                             |  | V    | I <sub>OUT</sub> = 50 μA                                                                               |
|                  |                                  | 4.5                    | 0.001                  | 0.1               | 0.1                             |  |      |                                                                                                        |
|                  |                                  | 5.5                    | 0.001                  | 0.1               | 0.1                             |  |      |                                                                                                        |
|                  |                                  | 3.0                    | –                      | 0.36              | 0.44                            |  | V    | *V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub><br>12 mA<br>I <sub>OL</sub> 24 mA<br>24 mA       |
|                  |                                  | 4.5                    | –                      | 0.36              | 0.44                            |  |      |                                                                                                        |
|                  |                                  | 5.5                    | –                      | 0.36              | 0.44                            |  |      |                                                                                                        |
| I <sub>IN</sub>  | Maximum Input Leakage Current    | 5.5                    | –                      | ±0.1              | ±1.0                            |  | μA   | V <sub>I</sub> = V <sub>CC</sub> , GND                                                                 |
| I <sub>OLD</sub> | †Minimum Dynamic Output Current  | 5.5                    | –                      | –                 | 75                              |  | mA   | V <sub>OLD</sub> = 1.65 V Max                                                                          |
| I <sub>OH</sub>  |                                  | 5.5                    | –                      | –                 | –75                             |  | mA   | V <sub>OH</sub> = 3.85 V Min                                                                           |
| I <sub>CC</sub>  | Maximum Quiescent Supply Current | 5.5                    | –                      | 4.0               | 40                              |  | μA   | V <sub>IN</sub> = V <sub>CC</sub> or GND                                                               |

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

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

NOTE: I<sub>IN</sub> and I<sub>CC</sub> @ 3.0 V are guaranteed to be less than or equal to the respective limit @ 5.5 V.

## MC74AC20, MC74ACT20

### AC CHARACTERISTICS

| Symbol           | Parameter         | V <sub>CC</sub> *<br>(V) | 74AC                                             |            |            | 74AC                                                         |             | Unit |
|------------------|-------------------|--------------------------|--------------------------------------------------|------------|------------|--------------------------------------------------------------|-------------|------|
|                  |                   |                          | T <sub>A</sub> = +25°C<br>C <sub>L</sub> = 50 pF |            |            | T <sub>A</sub> = -40°C<br>to +85°C<br>C <sub>L</sub> = 50 pF |             |      |
|                  |                   |                          | Min                                              | Typ        | Max        | Min                                                          | Max         |      |
| t <sub>PLH</sub> | Propagation Delay | 3.3<br>5.0               | 2.0<br>1.5                                       | 6.0<br>5.0 | 8.5<br>7.0 | 1.5<br>1.0                                                   | 10.0<br>8.0 | ns   |
| t <sub>PHL</sub> | Propagation Delay | 3.3<br>5.0               | 1.5<br>1.5                                       | 5.0<br>4.0 | 7.0<br>6.0 | 1.0<br>1.0                                                   | 9.0<br>7.0  | ns   |

\*Voltage Range 3.3 V is 3.3 V ±0.3 V.  
Voltage Range 5.0 V is 5.0 V ±0.5 V.

### DC CHARACTERISTICS

| Symbol             | Parameter                              | V <sub>CC</sub><br>(V) | 74ACT                  |                   | 74ACT                                 |    | Unit                                                                                        | Conditions |
|--------------------|----------------------------------------|------------------------|------------------------|-------------------|---------------------------------------|----|---------------------------------------------------------------------------------------------|------------|
|                    |                                        |                        | T <sub>A</sub> = +25°C |                   | T <sub>A</sub> =<br>-40°C to<br>+85°C |    |                                                                                             |            |
|                    |                                        |                        | Typ                    | Guaranteed Limits |                                       |    |                                                                                             |            |
| V <sub>IH</sub>    | Minimum High Level Input Voltage       | 4.5<br>5.5             | 1.5<br>1.5             | 2.0<br>2.0        | 2.0<br>2.0                            | V  | V <sub>OUT</sub> = 0.1 V<br>or V <sub>CC</sub> - 0.1 V                                      |            |
| V <sub>IL</sub>    | Maximum Low Level Input Voltage        | 4.5<br>5.5             | 1.5<br>1.5             | 0.8<br>0.8        | 0.8<br>0.8                            | V  | V <sub>OUT</sub> = 0.1 V<br>or V <sub>CC</sub> - 0.1 V                                      |            |
| V <sub>OH</sub>    | Minimum High Level Output Voltage      | 4.5<br>5.5             | 4.49<br>5.49           | 4.4<br>5.4        | 4.4<br>5.4                            | V  | I <sub>OUT</sub> = - 50 μA                                                                  |            |
|                    |                                        | 4.5<br>5.5             | -<br>-                 | 3.86<br>4.86      | 3.76<br>4.76                          | V  | *V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub><br>- 24 mA<br>I <sub>OH</sub> - 24 mA |            |
| V <sub>OL</sub>    | Maximum Low Level Output Voltage       | 4.5<br>5.5             | 0.001<br>0.001         | 0.1<br>0.1        | 0.1<br>0.1                            | V  | I <sub>OUT</sub> = 50 μA                                                                    |            |
|                    |                                        | 4.5<br>5.5             | -<br>-                 | 0.36<br>0.36      | 0.44<br>0.44                          | V  | *V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub><br>24 mA<br>I <sub>OH</sub> 24 mA     |            |
| I <sub>IN</sub>    | Maximum Input Leakage Current          | 5.5                    | -                      | ±0.1              | ±1.0                                  | μA | V <sub>I</sub> = V <sub>CC</sub> , GND                                                      |            |
| ΔI <sub>CC</sub> T | Additional Max. I <sub>CC</sub> /Input | 5.5                    | 0.6                    | -                 | 1.5                                   | mA | V <sub>I</sub> = V <sub>CC</sub> - 2.1 V                                                    |            |
| I <sub>OLD</sub>   | †Minimum Dynamic Output Current        | 5.5                    | -                      | -                 | 75                                    | mA | V <sub>OLD</sub> = 1.65 V Max                                                               |            |
| I <sub>OHD</sub>   |                                        | 5.5                    | -                      | -                 | -75                                   | mA | V <sub>OHD</sub> = 3.85 V Min                                                               |            |
| I <sub>CC</sub>    | Maximum Quiescent Supply Current       | 5.5                    | -                      | 4.0               | 40                                    | μA | V <sub>IN</sub> = V <sub>CC</sub> or GND                                                    |            |

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

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

## MC74AC20, MC74ACT20

### AC CHARACTERISTICS

| Symbol           | Parameter         | V <sub>CC</sub> *<br>(V) | 74ACT                                            |     |     | 74ACT                                                        |      | Unit |
|------------------|-------------------|--------------------------|--------------------------------------------------|-----|-----|--------------------------------------------------------------|------|------|
|                  |                   |                          | T <sub>A</sub> = +25°C<br>C <sub>L</sub> = 50 pF |     |     | T <sub>A</sub> = -40°C<br>to +85°C<br>C <sub>L</sub> = 50 pF |      |      |
|                  |                   |                          | Min                                              | Typ | Max | Min                                                          | Max  |      |
| t <sub>PLH</sub> | Propagation Delay | 5.0                      | 2.0                                              | 6.5 | 9.0 | 1.5                                                          | 10.5 | ns   |
| t <sub>PHL</sub> | Propagation Delay | 5.0                      | 2.0                                              | 5.5 | 9.0 | 1.5                                                          | 10.5 | ns   |

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

### CAPACITANCE

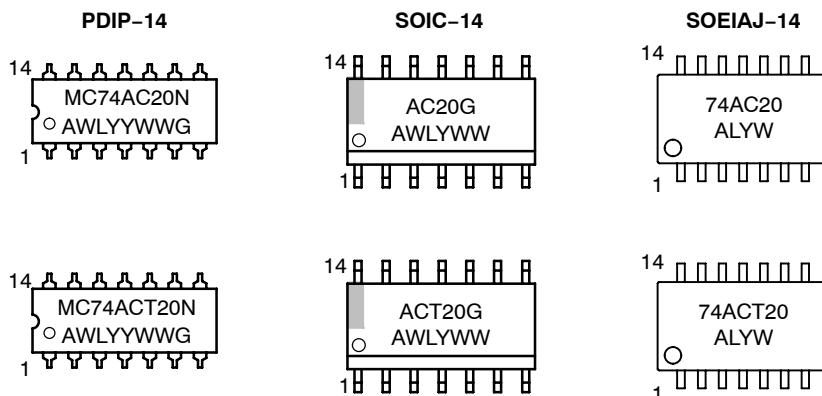
| Symbol          | Parameter                     | Value<br>Typ | Unit | Test Conditions         |
|-----------------|-------------------------------|--------------|------|-------------------------|
| C <sub>IN</sub> | Input Capacitance             | 4.5          | pF   | V <sub>CC</sub> = 5.0 V |
| C <sub>PD</sub> | Power Dissipation Capacitance | 40           | pF   | V <sub>CC</sub> = 5.0 V |

### ORDERING INFORMATION

| Device        | Package                | Shipping <sup>†</sup> |
|---------------|------------------------|-----------------------|
| MC74AC20N     | PDIP-14                | 25 Units/Rail         |
| MC74AC20NG    | PDIP-14<br>(Pb-Free)   |                       |
| MC74ACT20N    | PDIP-14                |                       |
| MC74ACT20NG   | PDIP-14<br>(Pb-Free)   |                       |
| MC74AC20D     | SOIC-14                | 55 Units/Rail         |
| MC74AC20DG    | SOIC-14<br>(Pb-Free)   |                       |
| MC74AC20DR2   | SOIC-14                | 2500/Tape & Reel      |
| MC74AC20DR2G  | SOIC-14<br>(Pb-Free)   |                       |
| MC74ACT20D    | SOIC-14                | 55 Units/Rail         |
| MC74ACT20DG   | SOIC-14<br>(Pb-Free)   |                       |
| MC74ACT20DR2  | SOIC-14                | 2500/Tape & Reel      |
| MC74ACT20DR2G | SOIC-14<br>(Pb-Free)   |                       |
| MC74AC20M     | SOEIAJ-14              | 50 Units/Rail         |
| MC74AC20MG    | SOEIAJ-14<br>(Pb-Free) |                       |
| MC74AC20MEL   | SOEIAJ-14              | 2000/Tape & Reel      |
| MC74AC20MELG  | SOEIAJ-14<br>(Pb-Free) |                       |

## MC74AC20, MC74ACT20

### MARKING DIAGRAMS



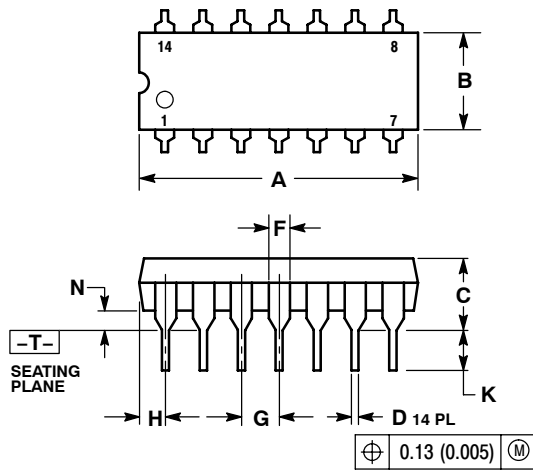
A = Assembly Location  
 WL, L = Wafer Lot  
 YY, Y = Year  
 WW, W = Work Week  
 G = Pb-Free Package

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# MC74AC20, MC74ACT20

## PACKAGE DIMENSIONS

PDIP-14  
CASE 646-06  
ISSUE P



### NOTES:

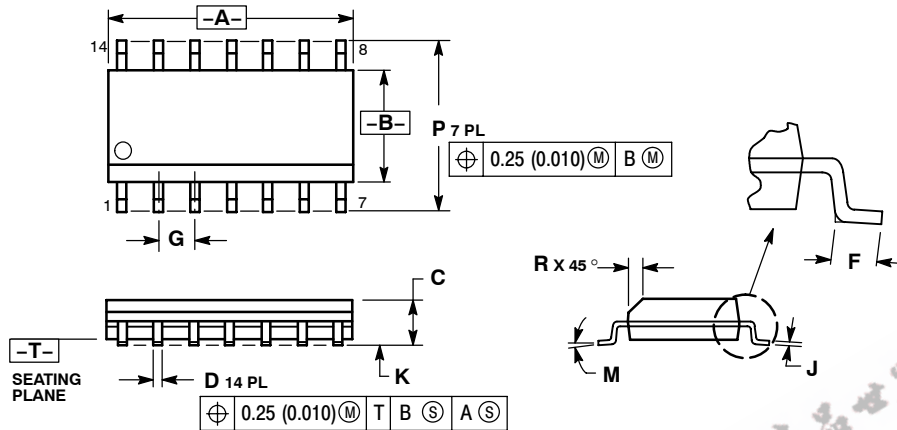
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION L TO CENTER OF LEADS WHEN FORMED PARALLEL.
4. DIMENSION B DOES NOT INCLUDE MOLD FLASH.
5. ROUNDED CORNERS OPTIONAL.

| DIM | INCHES    |       | MILLIMETERS |       |
|-----|-----------|-------|-------------|-------|
|     | MIN       | MAX   | MIN         | MAX   |
| A   | 0.715     | 0.770 | 18.16       | 19.56 |
| B   | 0.240     | 0.260 | 6.10        | 6.60  |
| C   | 0.145     | 0.185 | 3.69        | 4.69  |
| D   | 0.015     | 0.021 | 0.38        | 0.53  |
| F   | 0.040     | 0.070 | 1.02        | 1.78  |
| G   | 0.100 BSC |       | 2.54 BSC    |       |
| H   | 0.052     | 0.095 | 1.32        | 2.41  |
| J   | 0.008     | 0.015 | 0.20        | 0.38  |
| K   | 0.115     | 0.135 | 2.92        | 3.43  |
| L   | 0.290     | 0.310 | 7.37        | 7.87  |
| M   | 10 °      |       | 10 °        |       |
| N   | 0.015     | 0.039 | 0.38        | 1.01  |

# MC74AC20, MC74ACT20

## PACKAGE DIMENSIONS

SOIC-14  
CASE 751A-03  
ISSUE H

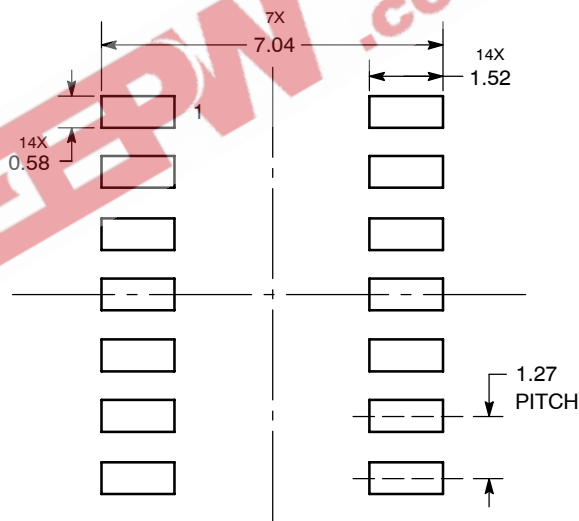


### NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSIONS A AND B DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 (0.005) TOTAL IN EXCESS OF THE D DIMENSION AT MAXIMUM MATERIAL CONDITION.

| DIM | MILLIMETERS |      | INCHES    |       |
|-----|-------------|------|-----------|-------|
|     | MIN         | MAX  | MIN       | MAX   |
| A   | 8.55        | 8.75 | 0.337     | 0.344 |
| B   | 3.80        | 4.00 | 0.150     | 0.157 |
| C   | 1.35        | 1.75 | 0.054     | 0.068 |
| D   | 0.35        | 0.49 | 0.014     | 0.019 |
| F   | 0.40        | 1.25 | 0.016     | 0.049 |
| G   | 1.27 BSC    |      | 0.050 BSC |       |
| J   | 0.19        | 0.25 | 0.008     | 0.009 |
| K   | 0.10        | 0.25 | 0.004     | 0.009 |
| M   | 0°          | 7°   | 0°        | 7°    |
| P   | 5.80        | 6.20 | 0.228     | 0.244 |
| R   | 0.25        | 0.50 | 0.010     | 0.019 |

### SOLDERING FOOTPRINT\*



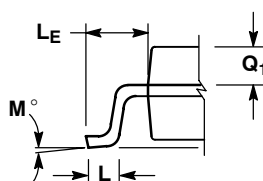
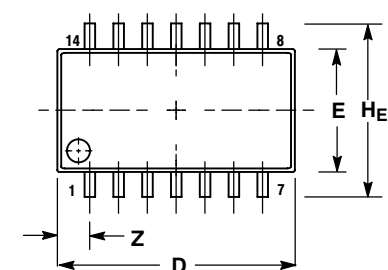
DIMENSIONS: MILLIMETERS

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

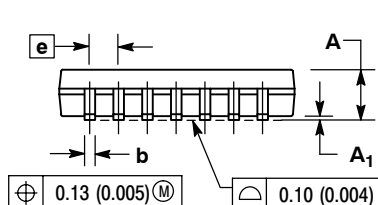
# MC74AC20, MC74ACT20

## PACKAGE DIMENSIONS

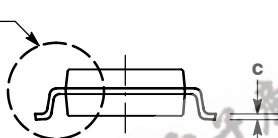
SOEIAJ-14  
CASE 965-01  
ISSUE A



DETAIL P



VIEW P



### NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH OR PROTRUSIONS AND ARE MEASURED AT THE PARTING LINE. MOLD FLASH OR PROTRUSIONS SHALL NOT EXCEED 0.15 (0.006) PER SIDE.
4. TERMINAL NUMBERS ARE SHOWN FOR REFERENCE ONLY.
5. THE LEAD WIDTH DIMENSION (b) DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 (0.003) TOTAL IN EXCESS OF THE LEAD WIDTH DIMENSION AT MAXIMUM MATERIAL CONDITION. DAMBAR CANNOT BE LOCATED ON THE LOWER RADIUS OR THE FOOT. MINIMUM SPACE BETWEEN PROTRUSIONS AND ADJACENT LEAD TO BE 0.46 (0.018).

| DIM            | MILLIMETERS |       | INCHES    |       |
|----------------|-------------|-------|-----------|-------|
|                | MIN         | MAX   | MIN       | MAX   |
| A              | ---         | 2.05  | ---       | 0.081 |
| A <sub>1</sub> | 0.05        | 0.20  | 0.002     | 0.008 |
| b              | 0.35        | 0.50  | 0.014     | 0.020 |
| c              | 0.10        | 0.20  | 0.004     | 0.008 |
| D              | 9.90        | 10.50 | 0.390     | 0.413 |
| E              | 5.10        | 5.45  | 0.201     | 0.215 |
| e              | 1.27 BSC    |       | 0.050 BSC |       |
| H <sub>E</sub> | 7.40        | 8.20  | 0.291     | 0.323 |
| 0.50           | 0.50        | 0.85  | 0.020     | 0.033 |
| LE             | 1.10        | 1.50  | 0.043     | 0.059 |
| M              | 0°          | 10°   | 0°        | 10°   |
| Q <sub>1</sub> | 0.70        | 0.90  | 0.028     | 0.035 |
| Z              | ---         | 1.42  | ---       | 0.056 |

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