

# Octal Buffer/Line Driver with 3-STATE Outputs

## 74AC244, 74ACT244

### General Description

The AC/ACT244 is an octal buffer and line driver designed to be employed as a memory address driver, clock driver and bus-oriented transmitter/receiver which provides improved PC board density.

### Features

- $I_{CC}$  and  $I_{OZ}$  Reduced by 50%
- 3-STATE Outputs Drive Bus Lines or Buffer Memory Address Registers
- Outputs Source/Sink 24 mA
- ACT244 has TTL-Compatible Inputs

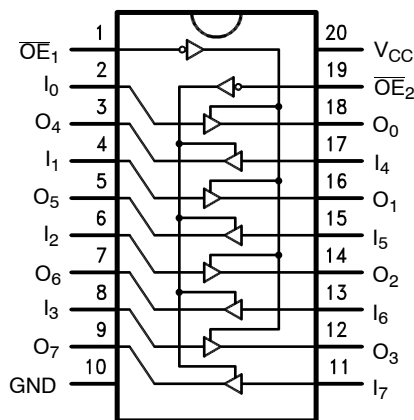


Figure 1. Connection Diagram

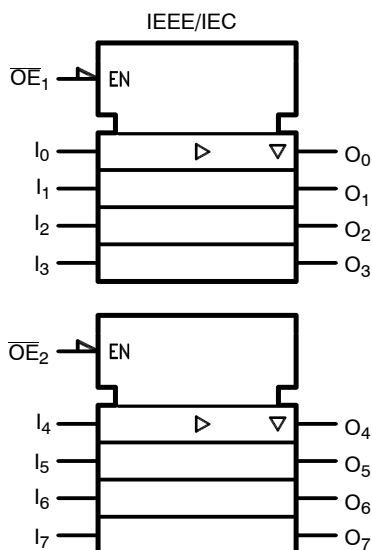
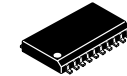


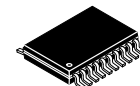
Figure 2. Logic Symbol



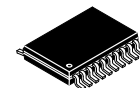
SOIC-20, 300 mils  
CASE 751BJ



SOIC-20 WB  
CASE 751D-05

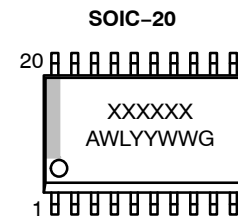


TSSOP-20 WB  
CASE 948E

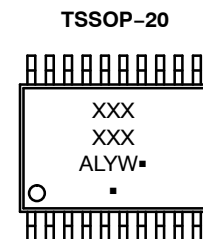


TSSOP20, 4.4 x 6.5  
CASE 948AQ

### MARKING DIAGRAMS



XXXXXX = Specific Device Code  
A = Assembly Location  
WL = Wafer Lot  
YY = Year  
WW = Work Week  
G = Pb-Free Package



XXXXXX = Specific Device Code  
A = Assembly Location  
L = Wafer Lot  
Y = Year  
W = Work Week  
▪ = Pb-Free Package

(Note: Microdot may be in either location)

### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 6 of this data sheet.

# 74AC244, 74ACT244

## PIN DESCRIPTION

| Pin Name                           | Description                  |
|------------------------------------|------------------------------|
| $\overline{OE}_1, \overline{OE}_2$ | 3-STATE Output Enable Inputs |
| $I_0-I_7$                          | Inputs                       |
| $O_0-O_7$                          | Outputs                      |

## TRUTH TABLE

| Inputs            |       | Outputs               |
|-------------------|-------|-----------------------|
| $\overline{OE}_1$ | $I_n$ | (Pins 12, 14, 16, 18) |
| L                 | L     | L                     |
| L                 | H     | H                     |
| H                 | X     | Z                     |

## TRUTH TABLE (continued)

| Inputs            |       | Outputs           |
|-------------------|-------|-------------------|
| $\overline{OE}_2$ | $I_n$ | (Pins 3, 5, 7, 9) |
| L                 | L     | L                 |
| L                 | H     | H                 |
| H                 | X     | Z                 |

NOTE: X = Immaterial, Z = High Impedance

## ABSOLUTE MAXIMUM RATINGS

| Parameter                                    | Symbol                | Rating                 | Unit |
|----------------------------------------------|-----------------------|------------------------|------|
| Supply Voltage                               | $V_{CC}$              | -0.5 to +6.5           | V    |
| DC Input Diode Current<br>$V_I = -0.5$ V     | $I_{IK}$              | -20                    | mA   |
| $V_I = V_{CC} + 0.5$                         |                       | +20                    |      |
| DC Input Voltage                             | $V_I$                 | -0.5 to $V_{CC} + 0.5$ | V    |
| DC Output Diode Current<br>$V_O = -0.5$ V    | $I_{OK}$              | -20                    | mA   |
| $V_I = V_{CC} + 0.5$ V                       |                       | +20                    |      |
| DC Output Voltage                            | $V_O$                 | -0.5 to $V_{CC} + 0.5$ | V    |
| DC Output Source or Sink Current             | $I_O$                 | $\pm 50$               | mA   |
| DC $V_{CC}$ or Ground Current per Output Pin | $I_{CC}$ or $I_{GND}$ | $\pm 50$               | mA   |
| Storage Temperature                          | $T_{STG}$             | -65 to +150            | °C   |
| Junction Temperature                         | $T_J$                 | 140                    | °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.

## RECOMMENDED OPERATING CONDITIONS

| Parameter                                                                                                     | Symbol                | Rating        | Unit  |
|---------------------------------------------------------------------------------------------------------------|-----------------------|---------------|-------|
| Supply Voltage<br>AC                                                                                          | $V_{CC}$              | 2.0 to 6.0    | V     |
| ACT                                                                                                           |                       | 4.5 to 5.5    |       |
| Input Voltage                                                                                                 | $V_I$                 | 0 to $V_{CC}$ | V     |
| Output Voltage                                                                                                | $V_O$                 | 0 to $V_{CC}$ | V     |
| Operating Temperature                                                                                         | $T_A$                 | -40 to +85    | °C    |
| Minimum Input Edge Rate, AC Devices:<br>$V_{IN}$ from 30% to 70% of $V_{CC}$ , $V_{CC}$ @ 3.3 V, 4.5 V, 5.5 V | $\Delta V / \Delta t$ | 125           | mV/ns |
| Minimum Input Edge Rate, ACT Devices:<br>$V_{IN}$ from 0.8 V to 2.0 V, $V_{CC}$ @ 4.5 V, 5.5 V                | $\Delta V / \Delta t$ | 125           | mV/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.

# 74AC244, 74ACT244

## DC ELECTRICAL CHARACTERISTICS FOR AC

| Symbol                   | Parameter                               | V <sub>CC</sub> (V) | Conditions                                                                                                                                             | T <sub>A</sub> = +25°C |                   | T <sub>A</sub> = -55°C to +125°C | T <sub>A</sub> = -40°C to +85°C | Unit |
|--------------------------|-----------------------------------------|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|-------------------|----------------------------------|---------------------------------|------|
|                          |                                         |                     |                                                                                                                                                        | Typ                    | Guaranteed Limits |                                  |                                 |      |
| V <sub>IH</sub>          | Minimum HIGH Level Input Voltage        | 3.0                 | V <sub>OUT</sub> = 0.1 V or V <sub>CC</sub> - 0.1 V                                                                                                    | 1.5                    | 2.1               | 2.1                              | 2.1                             | V    |
|                          |                                         | 4.5                 |                                                                                                                                                        | 2.25                   | 3.15              | 3.15                             | 3.15                            |      |
|                          |                                         | 5.5                 |                                                                                                                                                        | 2.75                   | 3.85              | 3.85                             | 3.85                            |      |
| V <sub>IL</sub>          | Maximum LOW Level Input Voltage         | 3.0                 | V <sub>OUT</sub> = 0.1 V or V <sub>CC</sub> - 0.1 V                                                                                                    | 1.5                    | 0.9               | 0.9                              | 0.9                             | V    |
|                          |                                         | 4.5                 |                                                                                                                                                        | 2.25                   | 1.35              | 1.35                             | 1.35                            |      |
|                          |                                         | 5.5                 |                                                                                                                                                        | 2.75                   | 1.65              | 1.65                             | 1.65                            |      |
| V <sub>OH</sub>          | Minimum HIGH Level Output Voltage       | 3.0                 | I <sub>OUT</sub> = -50 μA                                                                                                                              | 2.99                   | 2.9               | 2.9                              | 2.9                             | V    |
|                          |                                         | 4.5                 |                                                                                                                                                        | 4.49                   | 4.4               | 4.4                              | 4.4                             |      |
|                          |                                         | 5.5                 |                                                                                                                                                        | 5.49                   | 5.4               | 5.4                              | 5.4                             |      |
|                          |                                         | 3.0                 | V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub> , I <sub>OH</sub> = 12 mA                                                                         |                        | 2.56              | 2.40                             | 2.46                            |      |
|                          |                                         | 4.5                 | V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub> , I <sub>OH</sub> = 24 mA                                                                         |                        | 3.86              | 3.70                             | 3.76                            |      |
|                          |                                         | 5.5                 | V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub> , I <sub>OH</sub> = 24 mA (Note 1)                                                                |                        | 4.86              | 4.70                             | 4.76                            |      |
| V <sub>OL</sub>          | Maximum LOW Level Output Voltage        | 3.0                 | I <sub>OUT</sub> = 50 μA                                                                                                                               | 0.002                  | 0.1               | 0.1                              | 0.1                             | V    |
|                          |                                         | 4.5                 |                                                                                                                                                        | 0.001                  | 0.1               | 0.1                              | 0.1                             |      |
|                          |                                         | 5.5                 |                                                                                                                                                        | 0.001                  | 0.1               | 0.1                              | 0.1                             |      |
|                          |                                         | 3.0                 | V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub> , I <sub>OL</sub> = 12 mA                                                                         |                        | 0.36              | 0.50                             | 0.44                            |      |
|                          |                                         | 4.5                 | V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub> , I <sub>OL</sub> = 24 mA                                                                         |                        | 0.36              | 0.50                             | 0.44                            |      |
|                          |                                         | 5.5                 | V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub> , I <sub>OL</sub> = 24 mA (Note 1)                                                                |                        | 0.36              | 0.50                             | 0.44                            |      |
| I <sub>IN</sub> (Note 2) | Maximum Input Leakage Current           | 5.5                 | V <sub>I</sub> = V <sub>CC</sub> , GND                                                                                                                 |                        | ±0.1              | ±1.0                             | ±1.0                            | μA   |
| I <sub>OZ</sub>          | Maximum 3-STATE Leakage Current         | 5.5                 | V <sub>I</sub> (OE) = V <sub>IL</sub> , V <sub>IH</sub> ; V <sub>I</sub> = V <sub>CC</sub> , V <sub>GND</sub> ; V <sub>O</sub> = V <sub>CC</sub> , GND |                        | ±0.25             | ±5.0                             | ±2.5                            | μA   |
| I <sub>OLD</sub>         | Minimum Dynamic Output Current (Note 3) | 5.5                 | V <sub>OLD</sub> = 1.65 V Max.                                                                                                                         |                        |                   | 50                               | 75                              | mA   |
| I <sub>OHD</sub>         |                                         | 5.5                 | V <sub>OHD</sub> = 3.85 V Min.                                                                                                                         |                        |                   | -50                              | -75                             | mA   |
| I <sub>CC</sub> (Note 2) | Maximum Quiescent Supply Current        | 5.5                 | V <sub>IN</sub> = V <sub>CC</sub> or GND                                                                                                               |                        | 4.0               | 80.0                             | 40.0                            | μA   |

1. All outputs loaded; thresholds on input associated with output under test.
2. 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 V<sub>CC</sub>.
3. Maximum test duration 2.0 ms, one output loaded at a time.

# 74AC244, 74ACT244

## DC ELECTRICAL CHARACTERISTICS FOR ACT

| Symbol            | Parameter                               | V <sub>CC</sub> (V) | Conditions                                                                                  | T <sub>A</sub> = +25°C |                   | T <sub>A</sub> = -55°C to +125°C | T <sub>A</sub> = -40°C to +85°C | Unit |
|-------------------|-----------------------------------------|---------------------|---------------------------------------------------------------------------------------------|------------------------|-------------------|----------------------------------|---------------------------------|------|
|                   |                                         |                     |                                                                                             | Typ                    | Guaranteed Limits |                                  |                                 |      |
| V <sub>IH</sub>   | Minimum HIGH Level Input Voltage        | 4.5                 | V <sub>OUT</sub> = 0.1 V or V <sub>CC</sub> - 0.1 V                                         | 1.5                    | 2.0               | 2.0                              | 2.0                             | V    |
|                   |                                         | 5.5                 |                                                                                             | 1.5                    | 2.0               | 2.0                              | 2.0                             |      |
| V <sub>IL</sub>   | Maximum LOW Level Input Voltage         | 4.5                 | V <sub>OUT</sub> = 0.1 V or V <sub>CC</sub> - 0.1 V                                         | 1.5                    | 0.8               | 0.8                              | 0.8                             | V    |
|                   |                                         | 5.5                 |                                                                                             | 1.5                    | 0.8               | 0.8                              | 0.8                             |      |
| V <sub>OH</sub>   | Minimum HIGH Level Output Voltage       | 4.5                 | I <sub>OUT</sub> = -50 μA                                                                   | 4.49                   | 4.4               | 4.4                              | 4.4                             | V    |
|                   |                                         | 5.5                 |                                                                                             | 5.49                   | 5.4               | 5.4                              | 5.4                             |      |
|                   |                                         | 4.5                 | V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub> , I <sub>OH</sub> = 24 mA              |                        | 3.86              | 3.70                             | 3.76                            |      |
|                   |                                         | 5.5                 | V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub> , I <sub>OH</sub> = 24 mA (Note 4)     |                        | 4.86              | 4.70                             | 4.76                            |      |
| V <sub>OL</sub>   | Maximum LOW Level Output Voltage        | 4.5                 | I <sub>OUT</sub> = 50 μA                                                                    | 0.001                  | 0.1               | 0.1                              | 0.1                             | V    |
|                   |                                         | 5.5                 |                                                                                             | 0.001                  | 0.1               | 0.1                              | 0.1                             |      |
|                   |                                         | 4.5                 | V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub> , I <sub>OL</sub> = 24 mA              |                        | 0.36              | 0.50                             | 0.44                            |      |
|                   |                                         | 5.5                 | V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub> , I <sub>OL</sub> = 24 mA (Note 4)     |                        | 0.36              | 0.50                             | 0.44                            |      |
| I <sub>IN</sub>   | Maximum Input Leakage Current           | 5.5                 | V <sub>I</sub> = V <sub>CC</sub> , GND                                                      |                        | ±0.1              | ±1.0                             | ±1.0                            | μA   |
| I <sub>OZ</sub>   | Maximum 3-STATE Leakage Current         | 5.5                 | V <sub>I</sub> = V <sub>IL</sub> , V <sub>IH</sub> ; V <sub>O</sub> = V <sub>CC</sub> , GND |                        | ±0.25             | ±5.0                             | ±2.5                            | μA   |
| I <sub>CCCT</sub> | Maximum I <sub>CC</sub> /Input          | 5.5                 | V <sub>I</sub> = V <sub>CC</sub> - 2.1 V                                                    | 0.6                    |                   | 1.6                              | 1.5                             | mA   |
| I <sub>OLD</sub>  | Minimum Dynamic Output Current (Note 5) | 5.5                 | V <sub>OLD</sub> = 1.65 V Max.                                                              |                        |                   | 50                               | 75                              | mA   |
| I <sub>OHD</sub>  |                                         | 5.5                 | V <sub>OHD</sub> = 3.85 V Min.                                                              |                        |                   | -50                              | -75                             | mA   |
| I <sub>CC</sub>   | Maximum Quiescent Supply Current        | 5.5                 | V <sub>IN</sub> = V <sub>CC</sub> or GND                                                    |                        | 4.0               | 80.0                             | 40.0                            | μA   |

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

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

# 74AC244, 74ACT244

## AC ELECTRICAL CHARACTERISTICS FOR AC

| Symbol           | Parameter                            | V <sub>CC</sub> (V)<br>(Note 6) | T <sub>A</sub> = +25°C,<br>C <sub>L</sub> = 50 pF |     |      | T <sub>A</sub> = -55°C to<br>+125°C<br>C <sub>L</sub> = 50 pF |      | T <sub>A</sub> = -40°C to<br>+85°C<br>C <sub>L</sub> = 50 pF |      | Unit |
|------------------|--------------------------------------|---------------------------------|---------------------------------------------------|-----|------|---------------------------------------------------------------|------|--------------------------------------------------------------|------|------|
|                  |                                      |                                 | Min                                               | Typ | Max  | Min                                                           | Max  | Min                                                          | Max  |      |
| t <sub>PLH</sub> | Propagation Delay,<br>Data to Output | 3.3                             | 2.0                                               | 6.5 | 9.0  | 1.0                                                           | 12.5 | 1.5                                                          | 10.0 | ns   |
|                  |                                      | 5.0                             | 1.5                                               | 5.0 | 7.0  | 1.0                                                           | 9.5  | 1.0                                                          | 7.5  |      |
| t <sub>PHL</sub> | Propagation Delay,<br>Data to Output | 3.3                             | 2.0                                               | 6.5 | 9.0  | 1.0                                                           | 12.0 | 2.0                                                          | 10.0 | ns   |
|                  |                                      | 5.0                             | 1.5                                               | 5.0 | 7.0  | 1.0                                                           | 9.0  | 1.0                                                          | 7.5  |      |
| t <sub>PZH</sub> | Output Enable Time                   | 3.3                             | 2.0                                               | 6.0 | 10.5 | 1.0                                                           | 11.5 | 1.5                                                          | 11.0 | ns   |
|                  |                                      | 5.0                             | 1.5                                               | 5.0 | 7.0  | 1.0                                                           | 9.0  | 1.5                                                          | 8.0  |      |
| t <sub>PZL</sub> | Output Enable Time                   | 3.3                             | 2.5                                               | 7.5 | 10.0 | 1.0                                                           | 13.0 | 2.0                                                          | 11.0 | ns   |
|                  |                                      | 5.0                             | 1.5                                               | 5.5 | 8.0  | 1.0                                                           | 10.5 | 1.5                                                          | 8.5  |      |
| t <sub>PHZ</sub> | Output Disable Time                  | 3.3                             | 3.0                                               | 7.0 | 10.0 | 1.0                                                           | 12.5 | 1.5                                                          | 10.5 | ns   |
|                  |                                      | 5.0                             | 2.5                                               | 6.5 | 9.0  | 1.0                                                           | 10.5 | 1.0                                                          | 9.5  |      |
| t <sub>PLZ</sub> | Output Disable Time                  | 3.3                             | 2.5                                               | 7.5 | 10.5 | 1.0                                                           | 13.0 | 2.5                                                          | 11.5 | ns   |
|                  |                                      | 5.0                             | 2.0                                               | 6.5 | 9.0  | 1.0                                                           | 11.0 | 2.0                                                          | 9.5  |      |

6. Voltage range 3.3 is 3.3 V ± 0.3 V. Voltage range 5.0 is 5.0 V ± 0.5 V.

## AC ELECTRICAL CHARACTERISTICS FOR ACT

| Symbol           | Parameter                            | V <sub>CC</sub> (V)<br>(Note 7) | T <sub>A</sub> = +25°C,<br>C <sub>L</sub> = 50 pF |     |      | T <sub>A</sub> = -55°C to<br>+125°C<br>C <sub>L</sub> = 50 pF |      | T <sub>A</sub> = -40°C to<br>+85°C<br>C <sub>L</sub> = 50 pF |      | Unit |
|------------------|--------------------------------------|---------------------------------|---------------------------------------------------|-----|------|---------------------------------------------------------------|------|--------------------------------------------------------------|------|------|
|                  |                                      |                                 | Min                                               | Typ | Max  | Min                                                           | Max  | Min                                                          | Max  |      |
| t <sub>PLH</sub> | Propagation Delay,<br>Data to Output | 5.0                             | 2.0                                               | 6.5 | 9.0  | 1.0                                                           | 10.0 | 1.5                                                          | 10.0 | ns   |
| t <sub>PHL</sub> | Propagation Delay,<br>Data to Output | 5.0                             | 2.0                                               | 7.0 | 9.0  | 1.0                                                           | 10.0 | 1.5                                                          | 10.0 | ns   |
| t <sub>PZH</sub> | Output Enable Time                   | 5.0                             | 1.5                                               | 6.0 | 8.5  | 1.0                                                           | 9.5  | 1.0                                                          | 9.5  | ns   |
| t <sub>PZL</sub> | Output Enable Time                   | 5.0                             | 2.0                                               | 7.0 | 9.5  | 1.0                                                           | 11.0 | 1.5                                                          | 10.5 | ns   |
| t <sub>PHZ</sub> | Output Disable Time                  | 5.0                             | 2.0                                               | 7.0 | 9.5  | 1.0                                                           | 11.0 | 1.5                                                          | 10.5 | ns   |
| t <sub>PLZ</sub> | Output Disable Time                  | 5.0                             | 2.0                                               | 7.5 | 10.0 | 1.0                                                           | 11.5 | 2.0                                                          | 10.5 | ns   |

7. Voltage range 5.0 is 5.0 V ± 0.5 V.

## CAPACITANCE

| Symbol          | Parameter                     | Conditions              | Typ  | Unit |
|-----------------|-------------------------------|-------------------------|------|------|
| C <sub>IN</sub> | Input Capacitance             | V <sub>CC</sub> = OPEN  | 4.5  | pF   |
| C <sub>PD</sub> | Power Dissipation Capacitance | V <sub>CC</sub> = 5.0 V | 45.0 | pF   |

## 74AC244, 74ACT244

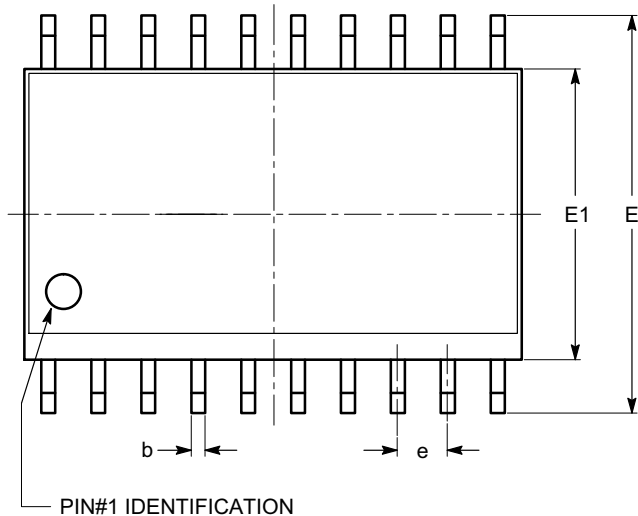
### ORDERING INFORMATION

| Order Number | Marking    | Package  | Shipping <sup>†</sup> |
|--------------|------------|----------|-----------------------|
| 74AC244SC    | AC244      | SOIC-20  | 38 / Tube             |
| 74AC244SCX   | AC244      | SOIC-20  | 1000 / Tape & Reel    |
| 74AC244MTC   | AC<br>244  | TSSOP-20 | 75 / Tube             |
| 74AC244MTCX  | AC<br>244  | TSSOP-20 | 2500 / Tape & Reel    |
| 74ACT244SC   | ACT244     | SOIC-20  | 38 / Tube             |
| 74ACT244SCX  | ACT244     | SOIC-20  | 1000 / Tape & Reel    |
| 74ACT244MTC  | ACT<br>244 | TSSOP-20 | 75 / Tube             |
| 74ACT244MTCX | ACT<br>244 | TSSOP-20 | 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

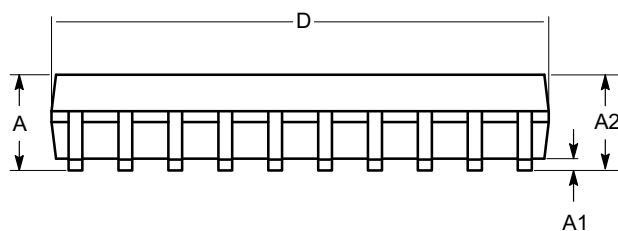
**SOIC-20, 300 mils**  
CASE 751BJ  
ISSUE O

DATE 19 DEC 2008

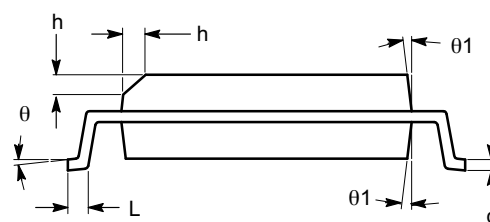


**TOP VIEW**

| SYMBOL     | MIN      | NOM   | MAX   |
|------------|----------|-------|-------|
| A          | 2.36     | 2.49  | 2.64  |
| A1         | 0.10     |       | 0.30  |
| A2         | 2.05     |       | 2.55  |
| b          | 0.31     | 0.41  | 0.51  |
| c          | 0.20     | 0.27  | 0.33  |
| D          | 12.60    | 12.80 | 13.00 |
| E          | 10.01    | 10.30 | 10.64 |
| E1         | 7.40     | 7.50  | 7.60  |
| e          | 1.27 BSC |       |       |
| h          | 0.25     |       | 0.75  |
| L          | 0.40     | 0.81  | 1.27  |
| $\theta$   | 0°       |       | 8°    |
| $\theta 1$ | 5°       |       | 15°   |



**SIDE VIEW**



**END VIEW**

**Notes:**

- (1) All dimensions are in millimeters. Angles in degrees.
- (2) Complies with JEDEC MS-013.

|                         |                          |                                                                                                                                                                                     |
|-------------------------|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
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| <b>DESCRIPTION:</b>     | <b>SOIC-20, 300 MILS</b> | <b>PAGE 1 OF 1</b>                                                                                                                                                                  |

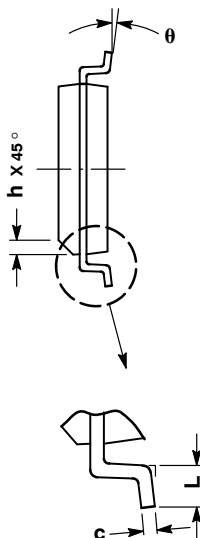
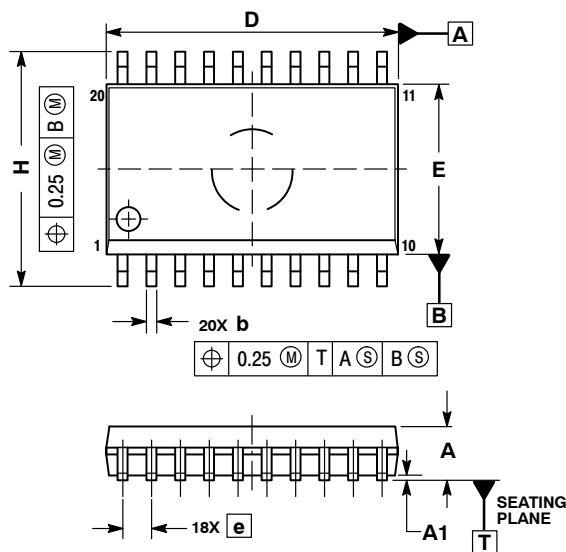
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SCALE 1:1

SOIC-20 WB  
CASE 751D-05  
ISSUE H

DATE 22 APR 2015



NOTES:

1. DIMENSIONS ARE IN MILLIMETERS.
2. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994.
3. DIMENSIONS D AND E DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 PER SIDE.
5. DIMENSION B DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE PROTRUSION SHALL BE 0.13 TOTAL IN EXCESS OF B DIMENSION AT MAXIMUM MATERIAL CONDITION.

| DIM | MILLIMETERS |       |
|-----|-------------|-------|
|     | MIN         | MAX   |
| A   | 2.35        | 2.65  |
| A1  | 0.10        | 0.25  |
| b   | 0.35        | 0.49  |
| c   | 0.23        | 0.32  |
| D   | 12.65       | 12.95 |
| E   | 7.40        | 7.60  |
| e   | 1.27 BSC    |       |
| H   | 10.05       | 10.55 |
| h   | 0.25        | 0.75  |
| L   | 0.50        | 0.90  |
| θ   | 0°          | 7°    |

RECOMMENDED  
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\*

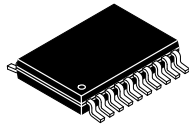


XXXXXX = Specific Device Code  
A = Assembly Location  
WL = Wafer Lot  
YY = Year  
WW = Work Week  
G = Pb-Free Package

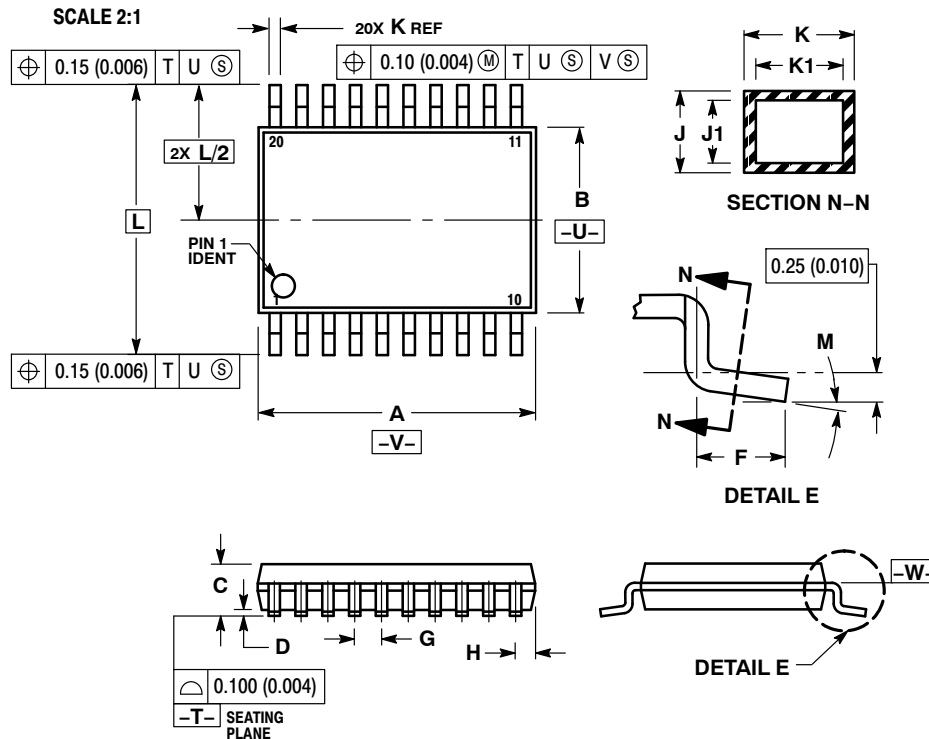
\*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "▪", may or may not be present. Some products may not follow the Generic Marking.

|                  |             |                                                                                                                                                                                     |
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| DESCRIPTION:     | SOIC-20 WB  | PAGE 1 OF 1                                                                                                                                                                         |

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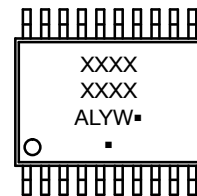

**TSSOP-20 WB**  
**CASE 948E**  
**ISSUE D**

DATE 17 FEB 2016


**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   | 6.40        | 6.60 | 0.252     | 0.260 |
| 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   | 0.27        | 0.37 | 0.011     | 0.015 |
| 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.

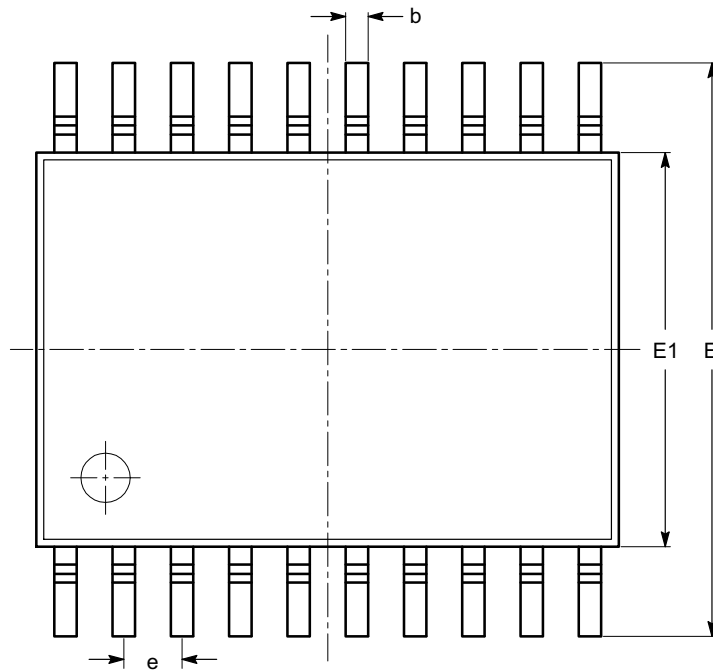
\*For additional information on our Pb-Free strategy and soldering details, please download the onsemi Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

|                         |                    |                                                                                                                                                                                  |
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| <b>DESCRIPTION:</b>     | <b>TSSOP-20 WB</b> | <b>PAGE 1 OF 1</b>                                                                                                                                                               |

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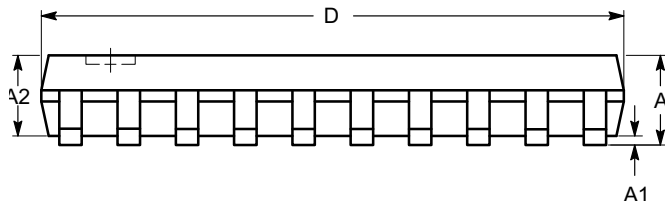
**TSSOP20, 4.4x6.5**  
CASE 948AQ  
ISSUE A

DATE 19 MAR 2009

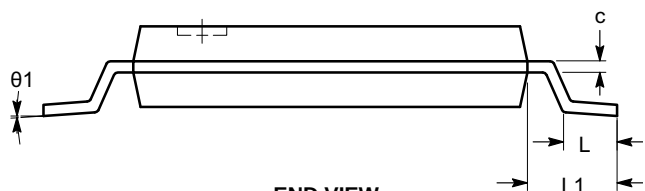


TOP VIEW

| SYMBOL   | MIN      | NOM  | MAX  |
|----------|----------|------|------|
| A        |          |      | 1.20 |
| A1       | 0.05     |      | 0.15 |
| A2       | 0.80     |      | 1.05 |
| b        | 0.19     |      | 0.30 |
| c        | 0.09     |      | 0.20 |
| D        | 6.40     | 6.50 | 6.60 |
| E        | 6.30     | 6.40 | 6.50 |
| E1       | 4.30     | 4.40 | 4.50 |
| e        | 0.65 BSC |      |      |
| L        | 0.45     | 0.60 | 0.75 |
| L1       | 1.00 REF |      |      |
| $\theta$ | 0°       |      | 8°   |



SIDE VIEW



END VIEW

**Notes:**

- (1) All dimensions are in millimeters. Angles in degrees.
- (2) Complies with JEDEC MO-153.

|                         |                         |                                                                                                                                                                                     |
|-------------------------|-------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
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| <b>DESCRIPTION:</b>     | <b>TSSOP20, 4.4X6.5</b> | <b>PAGE 1 OF 1</b>                                                                                                                                                                  |

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