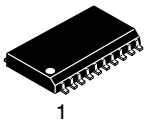
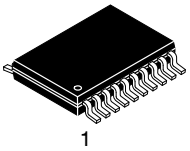
# Octal Buffer/Line Driver with 3-State Outputs

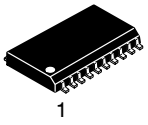
# 74AC541, 74ACT541



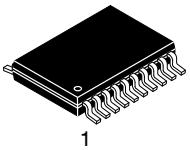

**SOIC−20W**
**CASE 751D**




**TSSOP−20**
**CASE 948E**




**SOIC−20W**
**CASE 751BJ**




**TSSOP−20**
**CASE 948AQ**

## General Description

The 74AC541 and 74ACT541 are octal buffer/line drivers designed to be employed as memory and address drivers, clock drivers and bus oriented transmitter/receivers.

These devices are similar in function to the 74AC244 and 74ACTC244 while providing flow−through architecture (inputs on opposite side from outputs). This pinout arrangement makes these devices especially useful as an output port for microprocessors, allowing ease of layout and greater PC board density.

## Features

- $I_{CC}$ and $I_{OZ}$ Reduced by 50%
- 3−State Outputs
- Inputs and Outputs Opposite Side of Package, allowing easier Interface to Microprocessors
- Outputs Source/Sink 24 mA
- 74AC541 is a Non−inverting Option of the 74AC540
- 74ACT541 has TTL−compatible Inputs
- These are Pb−Free Devices

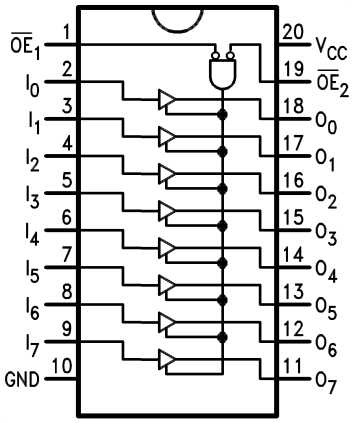



**Figure 1. Connection Diagram**

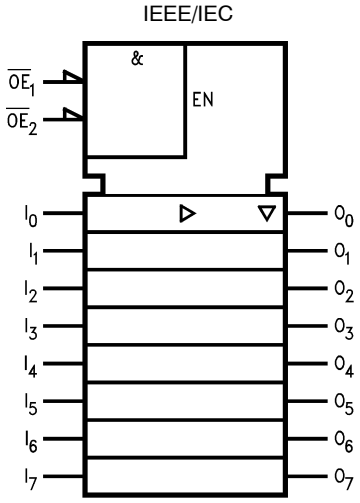



**Figure 2. Logic Symbol**

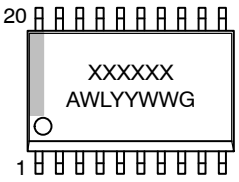
## TRUTH TABLE

| Inputs | | | Outputs |
|---|---|---|---|
| $\overline{OE}_1$ | $\overline{OE}_2$ | I | |
| L | L | H | H |
| H | X | X | Z |
| X | H | X | Z |
| L | L | L | L |

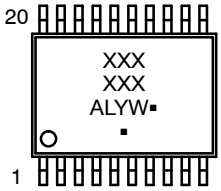
H = HIGH Voltage Level
L = LOW Voltage Level
X = Immaterial
Z = High Impedance

## MARKING DIAGRAMS

**SOIC−20W**




**TSSOP−20**




XXXXXX = Specific Device Code
A = Assembly Location
WL, L = Wafer Lot
YY, Y = Year
WW, W = Work Week
G or ▪ = 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.

## ABSOLUTE MAXIMUM RATINGS

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

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

## DC ELECTRICAL CHARACTERISTICS FOR AC

| Symbol | Parameter | $V_{CC}$ (V) | Conditions | $T_A$ = +25°C | $T_A$ = −40°C to +85°C | | Units |
|---|---|---|---|---|---|---|---|
| | | | | Typ. | Guaranteed Limits | | |
| $V_{IH}$ | Minimum HIGH Level Input Voltage | 3.0 | $V_{OUT}$ = 0.1 V or $V_{CC}$ − 0.1 V | 1.5 | 2.1 | 2.1 | V |
| | | 4.5 | | 2.25 | 3.15 | 3.15 | |
| | | 5.5 | | 2.75 | 3.85 | 3.85 | |
| $V_{IL}$ | Maximum LOW Level Input Voltage | 3.0 | $V_{OUT}$ = 0.1 V or $V_{CC}$ − 0.1 V | 1.5 | 0.9 | 0.9 | V |
| | | 4.5 | | 2.25 | 1.35 | 1.35 | |
| | | 5.5 | | 2.75 | 1.65 | 1.65 | |
| $V_{OH}$ | Minimum HIGH Level Output Voltage | 3.0 | $I_{OUT}$ = −50 μA | 2.99 | 2.9 | 2.9 | V |
| | | 4.5 | | 4.49 | 4.4 | 4.4 | |
| | | 5.5 | | 5.49 | 5.4 | 5.4 | |
| | | 3.0 | $V_{IN}$ = $V_{IL}$ or $V_{IH}$, $I_{OH}$ = −12 mA | | 2.56 | 2.46 | |
| | | 4.5 | $V_{IN}$ = $V_{IL}$ or $V_{IH}$, $I_{OH}$ = −24 mA | | 3.86 | 3.76 | |
| | | 5.5 | $V_{IN}$ = $V_{IL}$ or $V_{IH}$, $I_{OH}$ = −24 mA (1) | | 4.86 | 4.76 | |
| $V_{OL}$ | Maximum LOW Level Output Voltage | 3.0 | $I_{OUT}$ = 50 μA | 0.002 | 0.1 | 0.1 | V |
| | | 4.5 | | 0.001 | 0.1 | 0.1 | |
| | | 5.5 | | 0.001 | 0.1 | 0.1 | |
| | | 3.0 | $V_{IN}$ = $V_{IL}$ or $V_{IH}$, $I_{OL}$ = 12 mA | | 0.36 | 0.44 | |
| | | 4.5 | $V_{IN}$ = $V_{IL}$ or $V_{IH}$, $I_{OL}$ = 24 mA | | 0.36 | 0.44 | |
| | | 5.5 | $V_{IN}$ = $V_{IL}$ or $V_{IH}$, $I_{OL}$ = 24 mA (1) | | 0.36 | 0.44 | |
| $I_{IN}$ (Note 2) | Maximum Input Leakage Current | 5.5 | $V_I$ = $V_{CC}$, GND | | ±0.1 | ±1.0 | μA |
| $I_{OZ}$ | Maximum 3−STATE Leakage Current | 5.5 | $V_I$ (OE) = $V_{IL}$, $V_{IH}$; $V_I$ = $V_{CC}$, GND; $V_O$ = $V_{CC}$, GND | | ±0.25 | ±2.5 | μA |
| $I_{OLD}$ | Minimum Dynamic Output Current (Note 3) | 5.5 | $V_{OLD}$ = 1.65 V Max. | | | 75 | mA |
| $I_{OHD}$ | | 5.5 | $V_{OHD}$ = 3.85 V Min. | | | −75 | mA |
| $I_{CC}$ (Note 2) | Maximum Quiescent Supply Current | 5.5 | $V_{IN}$ = $V_{CC}$ or GND | | 4.0 | 40.0 | μA |

1. All outputs loaded; thresholds on input associated with output under test.
2. $I_{IN}$ and $I_{CC}$ @ 3.0 V are guaranteed to be less than or equal to the respective limit @ 5.5 V $V_{CC}$.
3. Maximum test duration 2.0 ms, one output loaded at a time.

## DC ELECTRICAL CHARACTERISTICS FOR ACT

| Symbol | Parameter | $V_{CC}$ (V) | Conditions | $T_A$ = +25°C | $T_A$ = −40°C to +85°C | | Units |
|---|---|---|---|---|---|---|---|
| | | | | Typ. | Guaranteed Limits | | |
| $V_{IH}$ | Minimum HIGH Level Input Voltage | 4.5 | $V_{OUT}$ = 0.1 V or $V_{CC}$ − 0.1 V | 1.5 | 2.0 | 2.0 | V |
| | | 5.5 | | 1.5 | 2.0 | 2.0 | |
| $V_{IL}$ | Maximum LOW Level Input Voltage | 4.5 | $V_{OUT}$ = 0.1 V or $V_{CC}$ − 0.1 V | 1.5 | 0.8 | 0.8 | V |
| | | 5.5 | | 1.5 | 0.8 | 0.8 | |
| $V_{OH}$ | Minimum HIGH Level Output Voltage | 4.5 | $I_{OUT}$ = −50 μA | 4.49 | 4.4 | 4.4 | V |
| | | 5.5 | | 5.49 | 5.4 | 5.4 | |
| | | 4.5 | $V_{IN}$ = $V_{IL}$ or $V_{IH}$, $I_{OH}$ = −24 mA | | 3.86 | 3.76 | |
| | | 5.5 | $V_{IN}$ = $V_{IL}$ or $V_{IH}$, $I_{OH}$ = −24 mA (4) | | 4.86 | 4.76 | |
| $V_{OL}$ | Maximum LOW Level Output Voltage | 4.5 | $I_{OUT}$ = 50 μA | 0.001 | 0.1 | 0.1 | V |
| | | 5.5 | | 0.001 | 0.1 | 0.1 | |
| | | 4.5 | $V_{IN}$ = $V_{IL}$ or $V_{IH}$, $I_{OL}$ = 24 mA | | 0.36 | 0.44 | |
| | | 5.5 | $V_{IN}$ = $V_{IL}$ or $V_{IH}$, $I_{OL}$ = 24 mA (4) | | 0.36 | 0.44 | |
| $I_{IN}$ | Maximum Input Leakage Current | 5.5 | $V_I$ = $V_{CC}$, GND | | ±0.1 | ±1.0 | μA |
| $I_{OZ}$ | Maximum 3−STATE Leakage Current | 5.5 | $V_I$ = $V_{IL}$, $V_{IH}$; $V_O$ = $V_{CC}$, GND | | ±0.25 | ±2.5 | μA |
| $I_{CCT}$ | Maximum $I_{CC}$/Input | 5.5 | $V_I$ = $V_{CC}$ − 2.1 V | 0.6 | | 1.5 | mA |
| $I_{OLD}$ | Minimum Dynamic Output Current (Note 5) | 5.5 | $V_{OLD}$ = 1.65 V Max. | | | 75 | mA |
| $I_{OHD}$ | | 5.5 | $V_{OHD}$ = 3.85 V Min. | | | −75 | mA |
| $I_{CC}$ | Maximum Quiescent Supply Current | 5.5 | $V_{IN}$ = $V_{CC}$ or GND | | 4.0 | 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.

## AC ELECTRICAL CHARACTERISTICS FOR AC

| Symbol | Parameter | $V_{CC}$ (V) (Note 6) | $T_A$ = +25°C, $C_L$ = 50 pF | | | $T_A$ = −40°C to +85°C, $C_L$ = 50 pF | | Units |
|---|---|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | Min. | Max. | |
| $t_{PLH}$ | Propagation Delay, Data to Output | 3.3 | 2.0 | 5.5 | 8.0 | 1.5 | 9.0 | ns |
| | | 5.0 | 1.5 | 4.0 | 6.0 | 1.0 | 6.5 | |
| $t_{PHL}$ | Propagation Delay, Data to Output | 3.3 | 2.0 | 5.5 | 8.0 | 1.5 | 8.5 | ns |
| | | 5.0 | 1.5 | 4.0 | 6.0 | 1.0 | 6.5 | |
| $t_{PZH}$ | Output Enable Time | 3.3 | 3.0 | 8.0 | 11.5 | 3.0 | 12.5 | ns |
| | | 5.0 | 2.0 | 6.0 | 8.5 | 1.5 | 9.5 | |
| $t_{PZL}$ | Output Enable Time | 3.3 | 2.5 | 7.0 | 10.0 | 2.5 | 11.5 | ns |
| | | 5.0 | 1.5 | 5.5 | 7.5 | 1.0 | 8.5 | |
| $t_{PHZ}$ | Output Disable Time | 3.3 | 3.5 | 9.0 | 12.5 | 2.5 | 14.0 | ns |
| | | 5.0 | 2.0 | 7.0 | 9.5 | 1.0 | 10.5 | |
| $t_{PLZ}$ | Output Disable Time | 3.3 | 2.5 | 6.5 | 9.5 | 2.0 | 10.5 | ns |
| | | 5.0 | 2.0 | 5.5 | 7.5 | 1.0 | 8.5 | |

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 | $V_{CC}$ (V) (Note 7) | $T_A$ = +25°C, $C_L$ = 50 pF | | | $T_A$ = −40°C to +85°C, $C_L$ = 50 pF | | Units |
|---|---|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | Min. | Max. | |
| $t_{PLH}$ | Propagation Delay, Data to Output | 5.0 | 2.0 | 4.5 | 7.0 | 2.0 | 7.5 | ns |
| $t_{PHL}$ | | 5.0 | 2.0 | 5.5 | 7.0 | 2.0 | 7.5 | |
| $t_{PZH}$ | Output Enable Time | 5.0 | 2.0 | 5.0 | 9.0 | 2.0 | 9.5 | ns |
| $t_{PZL}$ | | 5.0 | 2.0 | 6.5 | 9.0 | 2.0 | 9.5 | |
| $t_{PHZ}$ | Output Disable Time | 5.0 | 1.5 | 5.5 | 7.5 | 1.0 | 8.0 | ns |
| $t_{PLZ}$ | | 5.0 | 1.5 | 5.5 | 7.5 | 1.0 | 8.0 | |

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

## CAPACITANCE

| Symbol | Parameter | Conditions | Typ. | Units |
|---|---|---|---|---|
| $C_{IN}$ | Input Capacitance | $V_{CC}$ = OPEN | 4.5 | pF |
| $C_{PD}$ | Power Dissipation Capacitance for AC | $V_{CC}$ = 5.0 V | 30.0 | pF |
| | Power Dissipation Capacitance for ACT | | 70.0 | |

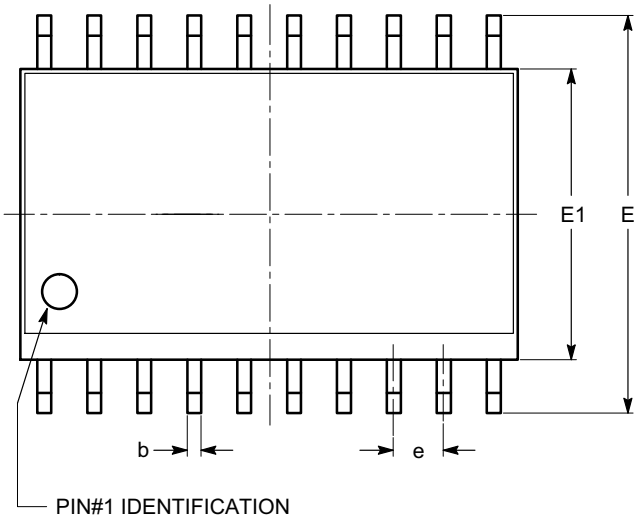
## ORDERING INFORMATION

| Device | Marking | Package | Shipping† |
|---|---|---|---|
| 74AC541MTC | AC<br>541 | TSSOP−20 | 75 Units / Tube |
| 74AC541MTCX | AC<br>541 | TSSOP−20 | 2500 Units / Tape & Reel |
| 74AC541SC | AC541 | SOIC−20 | 38 Units / Tube |
| 74AC541SCX | AC541 | SOIC−20 | 1000 Units / Tape & Reel |
| 74ACT541MTCX | ACT<br>541 | TSSOP−20 | 2500 Units / Tape & Reel |
| 74ACT541SC | ACT541 | SOIC−20 | 38 Units / Tube |
| 74ACT541SCX | ACT541 | SOIC−20 | 1000 Units / Tape & Reel |

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

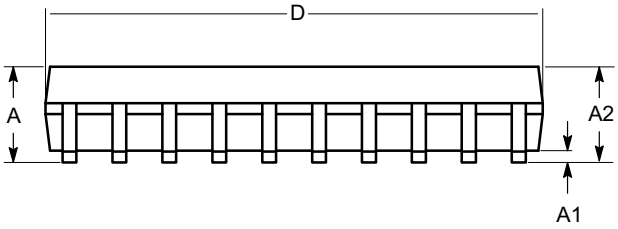
**SOIC−20, 300 mils**
CASE 751BJ
ISSUE O

DATE 19 DEC 2008

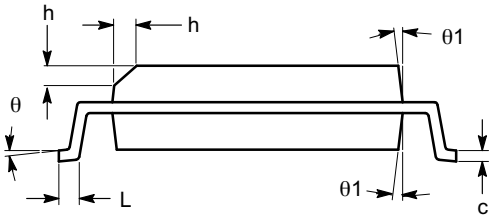



**TOP VIEW**

| 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 |
| θ | 0° | | 8° |
| θ1 | 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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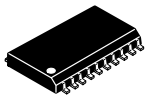
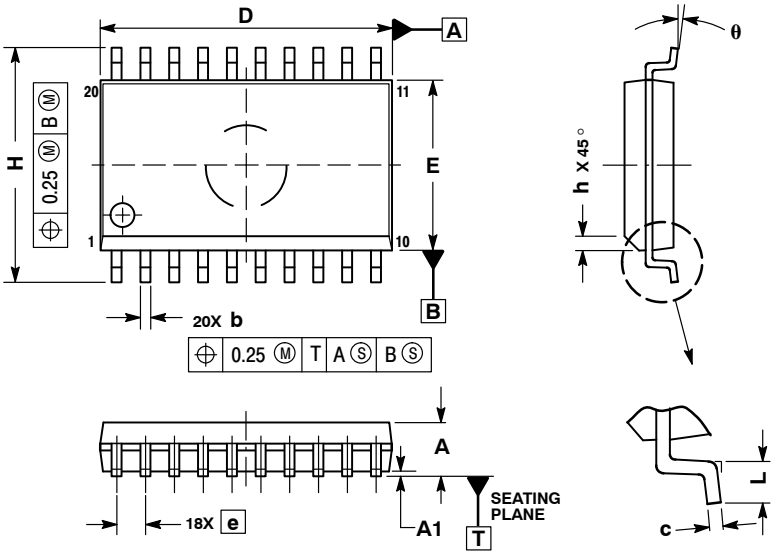
| DESCRIPTION: | SOIC−20, 300 MILS | PAGE 1 OF 1 |

**SOIC−20 WB**
CASE 751D−05
ISSUE H

DATE 22 APR 2015



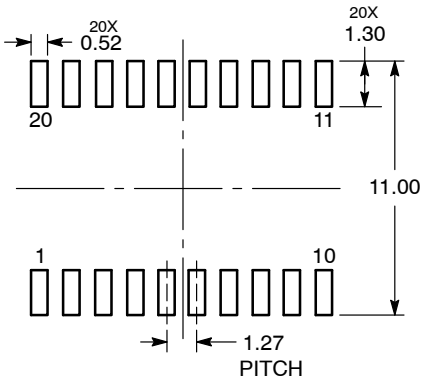
**SCALE 1:1**




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.

| | MILLIMETERS | |
|---|---|---|
| DIM | 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° |

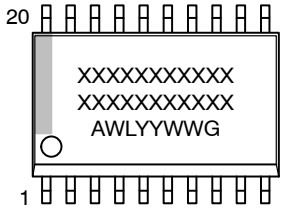
## RECOMMENDED SOLDERING FOOTPRINT*




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*




XXXXX = 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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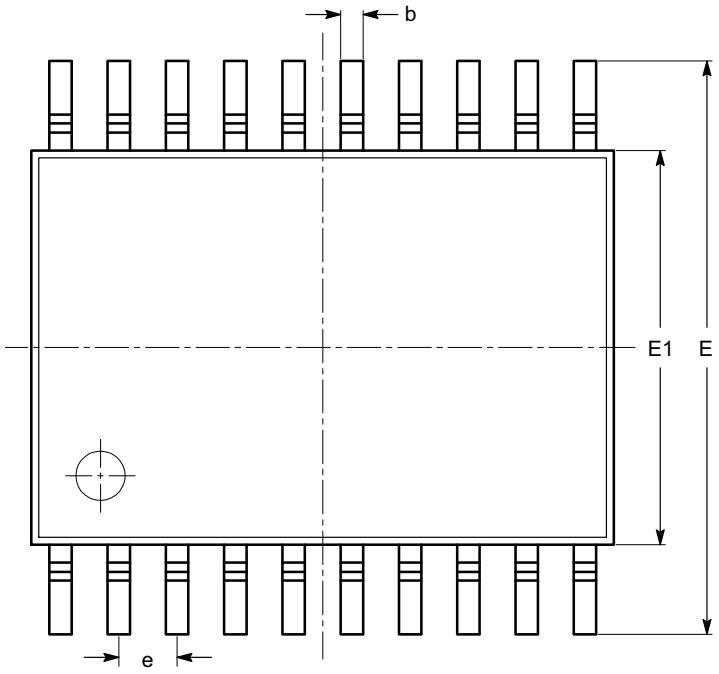
| **DESCRIPTION:** | **SOIC−20 WB** | | **PAGE 1 OF 1** |

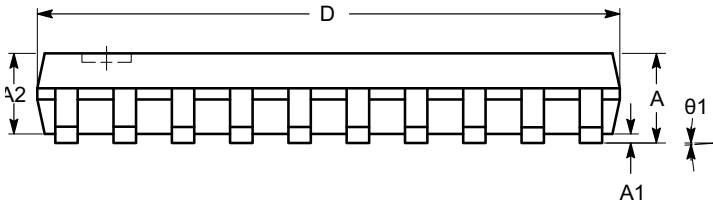
**TSSOP20, 4.4x6.5**
CASE 948AQ
ISSUE A

DATE 19 MAR 2009

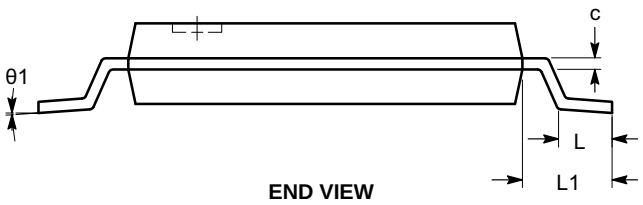



TOP VIEW

| 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 | |
| θ | 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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|---|---|---|
| DESCRIPTION: | TSSOP20, 4.4X6.5 | PAGE 1 OF 1 |

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