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# 74AC245, 74ACT245

## Octal Bidirectional Transceiver with 3-STATE Inputs/Outputs

### Features

- $I_{CC}$  and  $I_{OZ}$  reduced by 50%
- Non-inverting buffers
- Bidirectional data path
- A and B outputs source/sink 24mA
- ACT245 has TTL-compatible inputs


### General Description

The AC/ACT245 contains eight non-inverting bidirectional buffers with 3-STATE outputs and is intended for bus-oriented applications. Current sinking capability is 24mA at both the A and B ports. The Transmit/Receive ( $T/\bar{R}$ ) input determines the direction of data flow through the bidirectional transceiver. Transmit (active-HIGH) enables data from A ports to B ports; Receive (active-LOW) enables data from B ports to A ports. The Output Enable input, when HIGH, disables both A and B ports by placing them in a HIGH Z condition.

### Ordering Information

| Order Number | Package Number | Package Description   |
|--------------|----------------|---|
| 74AC245SC    | M20B           | 20-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300" Wide  |
| 74AC245SJ    | M20D           | 20-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide               |
| 74AC245MTC   | MTC20          | 20-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide |
| 74AC245PC    | N20A           | 20-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300" Wide      |
| 74ACT245SC   | M20B           | 20-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300" Wide  |
| 74ACT245SJ   | M20D           | 20-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide               |
| 74ACT245MSA  | MSA20          | 20-Lead Shrink Small Outline Package (SSOP), JEDEC MO-150, 5.3mm Wide       |
| 74ACT245MTC  | MTC20          | 20-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide |
| 74ACT245PC   | N20A           | 20-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300" Wide      |

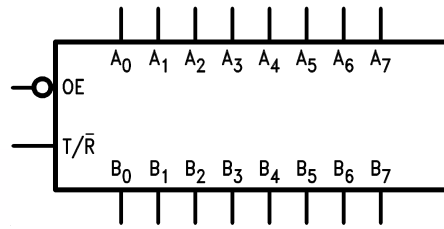
Device also available in Tape and Reel. Specify by appending suffix letter "X" to the ordering number.

 All packages are lead free per JEDEC: J-STD-020B standard.

### Connection Diagram



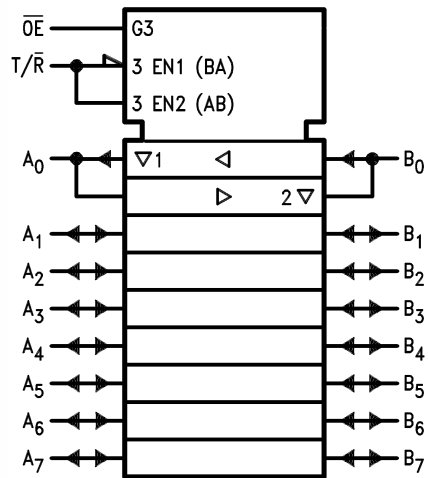
### Logic Symbol



### Pin Description

| Pin Names                      | Description                              |
|--------------------------------|--|
| $\overline{OE}$                | Output Enable Input                      |
| $T/\overline{R}$               | Transmit/Receive Input                   |
| A <sub>0</sub> –A <sub>7</sub> | Side A 3-STATE Inputs or 3-STATE Outputs |
| B <sub>0</sub> –B <sub>7</sub> | Side B 3-STATE Inputs or 3-STATE Outputs |

### IEEE/IEC



### Truth Table

| Inputs          |                  | Outputs             |
|-----------------|------------------|---------------------|
| $\overline{OE}$ | $T/\overline{R}$ |                     |
| L               | L                | Bus B Data to Bus A |
| L               | H                | Bus A Data to Bus B |
| H               | X                | HIGH-Z State        |

H = HIGH Voltage Level

L = LOW Voltage Level

X = Immaterial

## Absolute Maximum Ratings

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only.

| Symbol                | Parameter                                    | Rating                   |
|-----------------------|--|--------------------------|
| $V_{CC}$              | Supply Voltage                               | -0.5V to +7.0V           |
| $I_{IK}$              | DC Input Diode Current<br>$V_I = -0.5V$      | -20mA                    |
|                       | $V_I = V_{CC} + 0.5$                         | +20mA                    |
| $V_I$                 | DC Input Voltage                             | -0.5V to $V_{CC} + 0.5V$ |
| $I_{OK}$              | DC Output Diode Current<br>$V_O = -0.5V$     | -20mA                    |
|                       | $V_O = V_{CC} + 0.5V$                        | +20mA                    |
| $V_O$                 | DC Output Voltage                            | -0.5V to $V_{CC} + 0.5V$ |
| $I_O$                 | DC Output Source or Sink Current             | $\pm 50mA$               |
| $I_{CC}$ or $I_{GND}$ | DC $V_{CC}$ or Ground Current per Output Pin | $\pm 50mA$               |
| $T_{STG}$             | Storage Temperature                          | -65°C to +150°C          |
| $T_J$                 | Junction Temperature                         | 140°C                    |

## Recommended Operating Conditions

The Recommended Operating Conditions table defines the conditions for actual device operation. Recommended operating conditions are specified to ensure optimal performance to the datasheet specifications. Fairchild does not recommend exceeding them or designing to absolute maximum ratings.

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

## DC Electrical Characteristics for AC

| Symbol                         | Parameter                                     | V <sub>CC</sub> (V) | Conditions   | T <sub>A</sub> = +25°C   |                   | T <sub>A</sub> = -40°C to +85°C |      | Units |  |
|--------------------------------|---|---------------------|--|--|-------------------|---------------------------------|------|-------|--|
|                                |   |                     |  | Typ.   | Guaranteed Limits |                                 |      |       |  |
| V <sub>IH</sub>                | Minimum HIGH Level Input Voltage              | 3.0                 | V <sub>OUT</sub> = 0.1V or V <sub>CC</sub> - 0.1V  | 1.5  | 2.1               | 2.1                             |      | 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                 | V <sub>OUT</sub> = 0.1V or V <sub>CC</sub> - 0.1V  | 1.5  | 0.9               | 0.9                             |      | V     |  |
|                                |   | 4.5                 |  | 2.25   | 1.35              | 1.35                            |      |       |  |
|                                |   | 5.5                 |  | 2.75   | 1.65              | 1.65                            |      |       |  |
| V <sub>OH</sub>                | Minimum HIGH Level Output Voltage             | 3.0                 | I <sub>OUT</sub> = -50μA   | 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 <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub> ,<br>I <sub>OH</sub> = -12mA  |  | 2.56              | 2.46                            |      |       |  |
|                                |   | 4.5                 |  | V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub> ,<br>I <sub>OH</sub> = -24mA                |                   | 3.86                            | 3.76 |       |  |
|                                |   | 5.5                 |  | V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub> ,<br>I <sub>OH</sub> = -24mA <sup>(1)</sup> |                   | 4.86                            | 4.76 |       |  |
| V <sub>OL</sub>                | Maximum LOW Level Output Voltage              | 3.0                 | I <sub>OUT</sub> = 50μA  | 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 <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub> ,<br>I <sub>OL</sub> = 12mA   |  | 0.36              | 0.44                            |      |       |  |
|                                |   | 4.5                 |  | V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub> ,<br>I <sub>OL</sub> = 24mA                 |                   | 0.36                            | 0.44 |       |  |
|                                |   | 5.5                 |  | V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub> ,<br>I <sub>OL</sub> = 24mA <sup>(1)</sup>  |                   | 0.36                            | 0.44 |       |  |
| I <sub>IN</sub> <sup>(2)</sup> | Maximum Input Leakage Current                 | 5.5                 | V <sub>I</sub> = V <sub>CC</sub> , GND   |  | ±0.1              | ±1.0                            |      | μA    |  |
| I <sub>OLD</sub>               | Minimum Dynamic Output Current <sup>(3)</sup> | 5.5                 | V <sub>OLD</sub> = 1.65V Max.  |  |                   | 75                              |      | mA    |  |
| I <sub>OHD</sub>               |   | 5.5                 | V <sub>OHD</sub> = 3.85V Min.  |  |                   | -75                             |      | mA    |  |
| I <sub>CC</sub> <sup>(2)</sup> | Maximum Quiescent Supply Current              | 5.5                 | V <sub>IN</sub> = V <sub>CC</sub> or GND   |  | 4.0               | 40.0                            |      | μA    |  |
| I <sub>OZT</sub>               | Maximum I/O Leakage Current                   | 5.5                 | V <sub>I</sub> (OE) = V <sub>IL</sub> , V <sub>IH</sub> ;<br>V <sub>I</sub> = V <sub>CC</sub> , GND;<br>V <sub>O</sub> = V <sub>CC</sub> , GND |  | ±0.3              | ±3.0                            |      | μA    |  |

**Notes:**

- All outputs loaded; thresholds on input associated with output under test.
- I<sub>IN</sub> and I<sub>CC</sub> @ 3.0V are guaranteed to be less than or equal to the respective limit @ 5.5V V<sub>CC</sub>.
- Maximum test duration 2.0ms, one output loaded at a time.

## DC Electrical Characteristics for ACT

| Symbol           | Parameter                                     | V <sub>CC</sub> (V) | Conditions   | T <sub>A</sub> = +25°C |                   | T <sub>A</sub> = -40°C to +85°C |  | Units |
|------------------|---|---------------------|--|------------------------|-------------------|---------------------------------|--|-------|
|                  |   |                     |  | Typ.                   | Guaranteed Limits |                                 |  |       |
| V <sub>IH</sub>  | Minimum HIGH Level Input Voltage              | 4.5                 | V <sub>OUT</sub> = 0.1V or V <sub>CC</sub> - 0.1V  | 1.5                    | 2.0               | 2.0                             |  | V     |
|                  |   | 5.5                 |  | 1.5                    | 2.0               | 2.0                             |  |       |
| V <sub>IL</sub>  | Maximum LOW Level Input Voltage               | 4.5                 | V <sub>OUT</sub> = 0.1V or V <sub>CC</sub> - 0.1V  | 1.5                    | 0.8               | 0.8                             |  | V     |
|                  |   | 5.5                 |  | 1.5                    | 0.8               | 0.8                             |  |       |
| V <sub>OH</sub>  | Minimum HIGH Level Output Voltage             | 4.5                 | I <sub>OUT</sub> = -50μA   | 4.49                   | 4.4               | 4.4                             |  | V     |
|                  |   | 5.5                 |  | 5.49                   | 5.4               | 5.4                             |  |       |
|                  |   | 4.5                 | V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub> , I <sub>OH</sub> = -24mA   |                        | 3.86              | 3.76                            |  |       |
|                  |   | 5.5                 | V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub> , I <sub>OH</sub> = -24mA <sup>(4)</sup>  |                        | 4.86              | 4.76                            |  |       |
| V <sub>OL</sub>  | Maximum LOW Level Output Voltage              | 4.5                 | I <sub>OUT</sub> = 50μA  | 0.001                  | 0.1               | 0.1                             |  | V     |
|                  |   | 5.5                 |  | 0.001                  | 0.1               | 0.1                             |  |       |
|                  |   | 4.5                 | V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub> , I <sub>OL</sub> = 24mA  |                        | 0.36              | 0.44                            |  |       |
|                  |   | 5.5                 | V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub> , I <sub>OL</sub> = 24mA <sup>(4)</sup>   |                        | 0.36              | 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                            |  | μA    |
| I <sub>CCT</sub> | Maximum I <sub>CC</sub> /Input                | 5.5                 | V <sub>I</sub> = V <sub>CC</sub> - 2.1V  | 0.6                    |                   | 1.5                             |  | mA    |
| I <sub>OLD</sub> | Minimum Dynamic Output Current <sup>(5)</sup> | 5.5                 | V <sub>OLD</sub> = 1.65V Max.  |                        |                   | 75                              |  | mA    |
|                  |   | 5.5                 | V <sub>OHD</sub> = 3.85V Min.  |                        |                   | -75                             |  |       |
| I <sub>CC</sub>  | Maximum Quiescent Supply Current              | 5.5                 | V <sub>IN</sub> = V <sub>CC</sub> or GND   |                        | 4.0               | 40.0                            |  | μA    |
| I <sub>OZT</sub> | Maximum I/O Leakage Current                   | 5.5                 | V <sub>I</sub> (OE) = V <sub>IL</sub> , V <sub>IH</sub> ;<br>V <sub>I</sub> = V <sub>CC</sub> , GND;<br>V <sub>O</sub> = V <sub>CC</sub> , GND |                        | ±0.3              | ±3.0                            |  | μA    |

**Notes:**

- All outputs loaded; thresholds on input associated with output under test.
- Maximum test duration 2.0ms, one output loaded at a time.

### AC Electrical Characteristics for AC

| Symbol           | Parameter  | V <sub>CC</sub> (V) <sup>(6)</sup> | T <sub>A</sub> = +25°C,<br>C <sub>L</sub> = 50pF |      |      | T <sub>A</sub> = -40°C to +85°C,<br>C <sub>L</sub> = 50pF |      | Units |
|------------------|--|------------------------------------|--|------|------|---|------|-------|
|                  |  |                                    | Min.   | Typ. | Max. | Min.  | Max. |       |
| t <sub>PLH</sub> | Propagation Delay,<br>A <sub>n</sub> to B <sub>n</sub> or B <sub>n</sub> to A <sub>n</sub> | 3.3                                | 1.5  | 5.0  | 8.5  | 1.0   | 9.0  | ns    |
|                  |  | 5.0                                | 1.5  | 3.5  | 6.5  | 1.0   | 7.0  |       |
| t <sub>PHL</sub> | Propagation Delay,<br>A <sub>n</sub> to B <sub>n</sub> or B <sub>n</sub> to A <sub>n</sub> | 3.3                                | 1.5  | 5.0  | 8.5  | 1.0   | 9.0  | ns    |
|                  |  | 5.0                                | 1.5  | 3.5  | 6.0  | 1.0   | 7.0  |       |
| t <sub>PZH</sub> | Output Enable Time   | 3.3                                | 2.5  | 7.0  | 11.5 | 2.0   | 12.5 | ns    |
|                  |  | 5.0                                | 1.5  | 5.0  | 8.5  | 1.0   | 9.0  |       |
| t <sub>PZL</sub> | Output Enable Time   | 3.3                                | 2.5  | 7.5  | 12.0 | 2.0   | 13.5 | ns    |
|                  |  | 5.0                                | 1.5  | 5.5  | 9.0  | 1.0   | 9.5  |       |
| t <sub>PHZ</sub> | Output Disable Time  | 3.3                                | 2.0  | 6.5  | 12.0 | 1.0   | 12.5 | ns    |
|                  |  | 5.0                                | 1.5  | 5.5  | 9.0  | 1.0   | 10.0 |       |
| t <sub>PLZ</sub> | Output Disable Time  | 3.3                                | 2.0  | 7.0  | 11.5 | 1.5   | 13.0 | ns    |
|                  |  | 5.0                                | 1.5  | 5.5  | 9.0  | 1.0   | 10.0 |       |

**Note:**

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

### AC Electrical Characteristics for ACT

| Symbol           | Parameter  | V <sub>CC</sub> (V) <sup>(7)</sup> | T <sub>A</sub> = +25°C,<br>C <sub>L</sub> = 50pF |      |      | T <sub>A</sub> = -40°C to +85°C,<br>C <sub>L</sub> = 50pF |      | Units |
|------------------|--|------------------------------------|--|------|------|---|------|-------|
|                  |  |                                    | Min.   | Typ. | Max. | Min.  | Max. |       |
| t <sub>PLH</sub> | Propagation Delay,<br>A <sub>n</sub> to B <sub>n</sub> or B <sub>n</sub> to A <sub>n</sub> | 5.0                                | 1.5  | 4.0  | 7.5  | 1.5   | 8.0  | ns    |
| t <sub>PHL</sub> | Propagation Delay,<br>A <sub>n</sub> to B <sub>n</sub> or B <sub>n</sub> to A <sub>n</sub> | 5.0                                | 1.5  | 4.0  | 8.0  | 1.0   | 9.0  | ns    |
| t <sub>PZH</sub> | Output Enable Time   | 5.0                                | 1.5  | 5.0  | 10.0 | 1.5   | 11.0 | ns    |
| t <sub>PZL</sub> | Output Enable Time   | 5.0                                | 1.5  | 5.5  | 10.0 | 1.5   | 12.0 | ns    |
| t <sub>PHZ</sub> | Output Disable Time  | 5.0                                | 1.5  | 5.5  | 10.0 | 1.0   | 11.0 | ns    |
| t <sub>PLZ</sub> | Output Disable Time  | 5.0                                | 2.0  | 5.0  | 10.0 | 1.5   | 11.0 | ns    |

**Note:**

7. Voltage range 5.0 is 5.0V ± 0.5V.

### Capacitance

| Symbol           | Parameter                     | Conditions             | Typ. | Units |
|------------------|-------------------------------|------------------------|------|-------|
| C <sub>IN</sub>  | Input Capacitance             | V <sub>CC</sub> = OPEN | 4.5  | pF    |
| C <sub>I/O</sub> | Input/Output Capacitance      | V <sub>CC</sub> = 5.0V | 15.0 | pF    |
| C <sub>PD</sub>  | Power Dissipation Capacitance | V <sub>CC</sub> = 5.0V | 45.0 | pF    |

Physical Dimensions



Figure 1. 20-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300" Wide

Package drawings are provided as a service to customers considering Fairchild components. Drawings may change in any manner without notice. Please note the revision and/or date on the drawing and contact a Fairchild Semiconductor representative to verify or obtain the most recent revision. Package specifications do not expand the terms of Fairchild's worldwide terms and conditions, specifically the warranty therein, which covers Fairchild products.

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Physical Dimensions (Continued)



M20DREVC

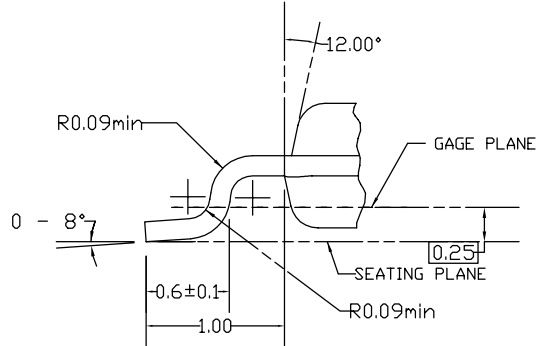
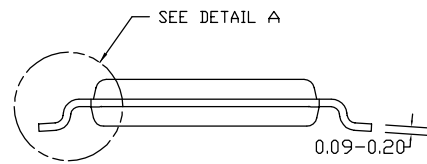
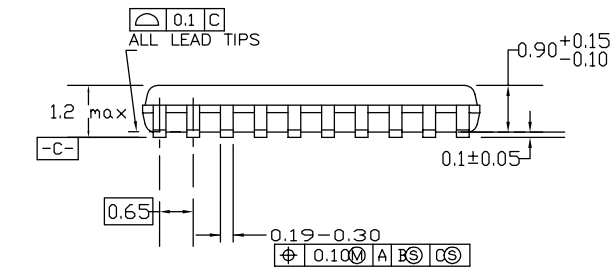
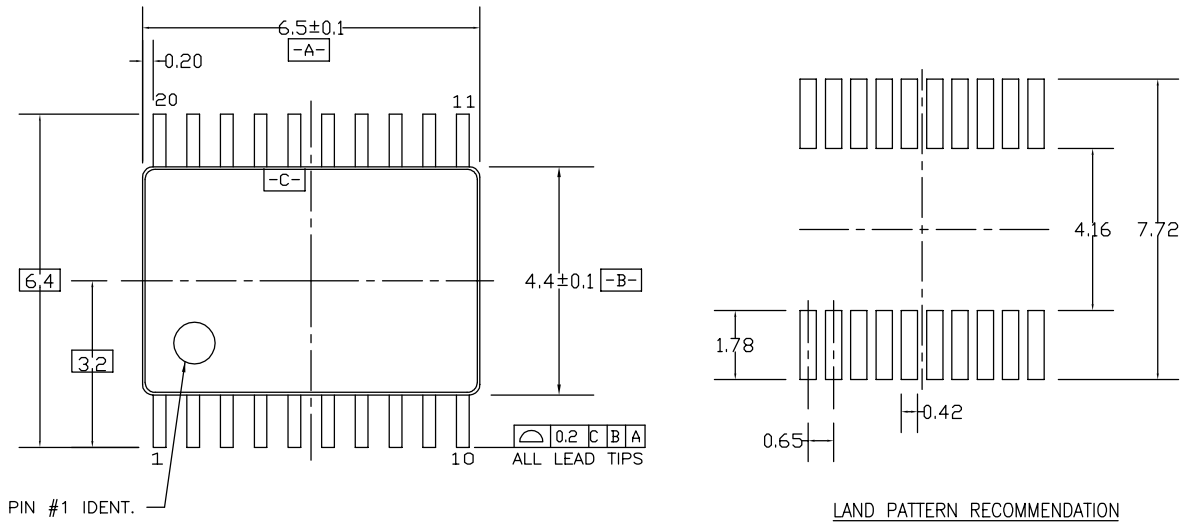
Figure 2. 20-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide

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**Physical Dimensions (Continued)**



DIMENSIONS ARE IN MILLIMETERS

**NOTES:**

- A. CONFORMS TO JEDEC REGISTRATION MD-153, VARIATION AC, REF NOTE 6, DATE 7/93.
- B. DIMENSIONS ARE IN MILLIMETERS.
- C. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLDS FLASH, AND TIE BAR EXTRUSIONS.
- D. DIMENSIONS AND TOLERANCES PER ANSI Y14.5M, 1982.

MTC20REV D1

**Figure 3. 20-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide**

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**Physical Dimensions** (Continued)



**NOTES:**

- A. CONFORMS TO JEDEC REGISTRATION MS-001, VARIATIONS AD.
- B. ALL DIMENSIONS ARE IN MILLIMETERS
- C. DOES NOT INCLUDE MOLD FLASH OR PROTRUSIONS. MOLD FLASH OR PROTRUSIONS SHALL NOT EXCEED 0.25MM.
- D. DOES NOT INCLUDE DAMBAR PROTRUSIONS. DAMBAR PROTRUSIONS SHALL NOT EXCEED 0.25MM.
- E. DIMENSIONING AND TOLERANCING PER ASME Y14.5M-1994.
- F. DRAWING FILE NAME: N20AREV8

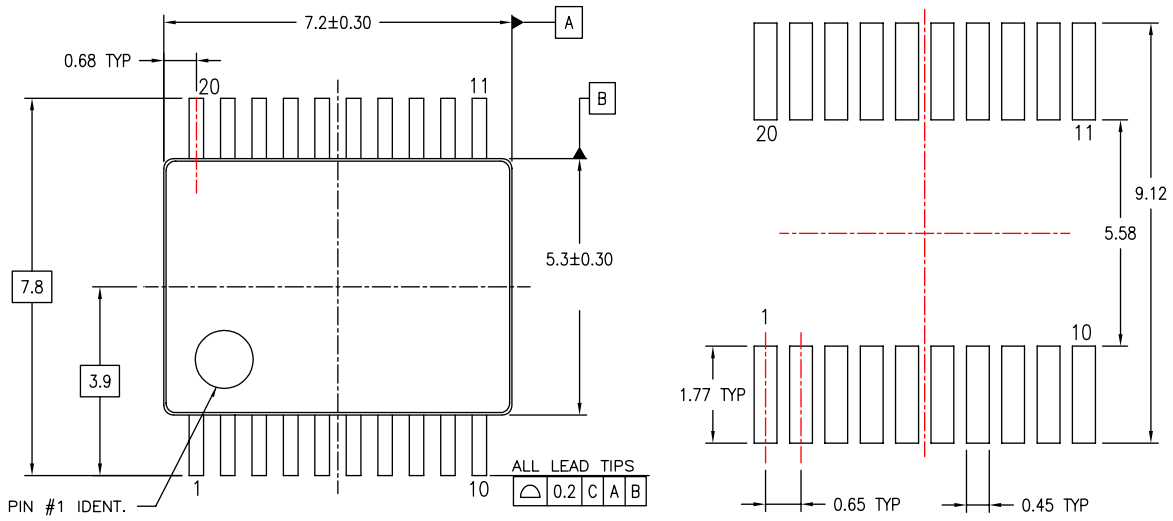
**Figure 4. 20-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300" Wide**

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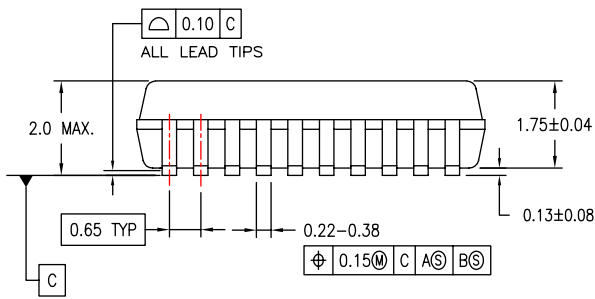
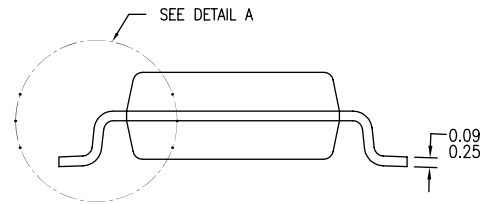
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**Physical Dimensions (Continued)**



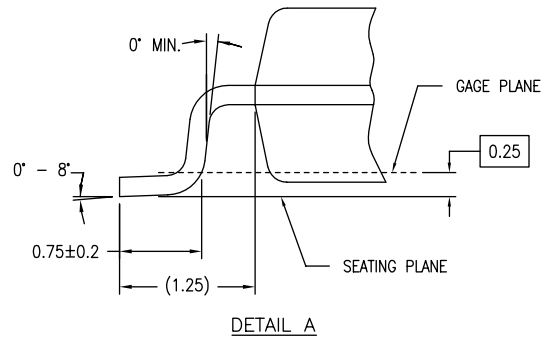
LAND PATTERN RECOMMENDATIONS



DIMENSIONS ARE IN MILLIMETERS

NOTES:

- A. CONFORMS TO JEDEC REGISTRATION MO-150, VARIATION AE, DATE 1/94.
- B. DIMENSIONS ARE IN MILLIMETERS.
- C. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.
- D. DIMENSIONS AND TOLERANCES PER ASME Y14.5M - 1994.



MSA20REV B

**Figure 5. 20-Lead Shrink Small Outline Package (SSOP), JEDEC MO-150, 5.3mm Wide**

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|   |  | SuperSOT <sup>™</sup> -6               |                                  |
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