



November 1988
Revised March 2005

74AC245 • 74ACT245

Octal Bidirectional Transceiver with 3-STATE Inputs/Outputs

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 24 mA at both the A and B ports. The Transmit/Receive ($\overline{T/R}$) 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.

Features

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

Ordering Code:

| Order Number | Package Number | Package Description |
|--------------------------|----------------|---|
| 74AC245SC | M20B | 20-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300" Wide |
| 74AC245SJ | M20D | Pb-Free 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 |
| 74ACT245SCX_NL (Note 1) | M20B | Pb-Free 20-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300" Wide |
| 74ACT245SJ | M20D | Pb-Free 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 |
| 74ACT245MTCX_NL (Note 1) | MTC20 | Pb-Free 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 |

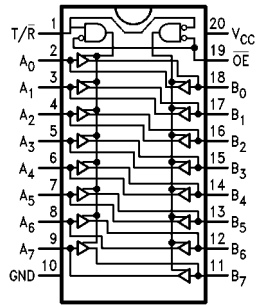
Device also available in Tape and Reel. Specify by appending suffix letter "X" to the ordering code.
Pb-Free package per JEDEC J-STD-020B.

Note 1: "_NL" indicates Pb-Free package (per JEDEC J-STD-020B). Device available in Tape and Reel only.

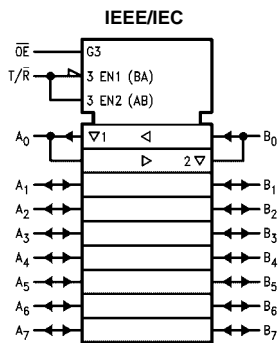
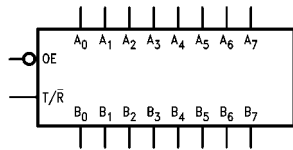
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74AC245 • 74ACT245 Octal Bidirectional Transceiver with 3-STATE

Connection Diagram



Logic Symbols



Pin Descriptions

| Pin Names | Description |
|------------------|--|
| \overline{OE} | Output Enable Input |
| T/\overline{R} | Transmit/Receive Input |
| A_0-A_7 | Side A 3-STATE Inputs or 3-STATE Outputs |
| B_0-B_7 | Side B 3-STATE Inputs or 3-STATE Outputs |

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(Note 2)

| | |
|--|--------------------------|
| Supply Voltage (V_{CC}) | -0.5V to +7.0V |
| DC Input Diode Current (I_{IK}) | |
| $V_I = -0.5V$ | -20 mA |
| $V_I = V_{CC} + 0.5V$ | +20 mA |
| DC Input Voltage (V_I) | -0.5V to $V_{CC} + 0.5V$ |
| DC Output Diode Current (I_{OK}) | |
| $V_O = -0.5V$ | -20 mA |
| $V_O = V_{CC} + 0.5V$ | +20 mA |
| DC Output Voltage (V_O) | -0.5V to $V_{CC} + 0.5V$ |
| DC Output Source or Sink Current (I_O) | ± 50 mA |
| DC V_{CC} or Ground Current per Output Pin (I_{CC} or I_{GND}) | ± 50 mA |
| Storage Temperature (T_{STG}) | -65°C to +150°C |
| Junction Temperature (T_J) | |
| PDIP | 140°C |

Recommended Operating Conditions

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

Note 2: Absolute maximum ratings are those values beyond which damage to the device may occur. The databook specifications should be met, without exception, to ensure that the system design is reliable over its power supply, temperature, and output/input loading variables. Fairchild does not recommend operation of FACT™ circuits outside databook specifications.

DC Electrical Characteristics for AC

| Symbol | Parameter | V_{CC} (V) | $T_A = +25^\circ\text{C}$ | | $T_A = -40^\circ\text{C to } +85^\circ\text{C}$ | | Units | Conditions |
|-------------------|-----------------------------------|-----------------|---------------------------|-------------------|---|-------------------|---|------------|
| | | | Typ | Guaranteed Limits | Typ | Guaranteed Limits | | |
| V_{IH} | Minimum HIGH Level Input Voltage | 3.0 | 1.5 | 2.1 | 2.1 | V | $V_{OUT} = 0.1V$ or $V_{CC} - 0.1V$ | |
| | | 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 | 1.5 | 0.9 | 0.9 | V | $V_{OUT} = 0.1V$ or $V_{CC} - 0.1V$ | |
| | | 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 | 2.99 | 2.9 | 2.9 | V | $I_{OUT} = -50 \mu\text{A}$ | |
| | | 4.5 | 4.49 | 4.4 | 4.4 | | | |
| | | 5.5 | 5.49 | 5.4 | 5.4 | | | |
| | | 3.0 | | 2.56 | 2.46 | V | $V_{IN} = V_{IL}$ or V_{IH} $I_{OH} = -12 \text{ mA}$ $I_{OH} = -24 \text{ mA}$ $I_{OH} = -24 \text{ mA (Note 3)}$ | |
| | | 4.5 | | 3.86 | 3.76 | | | |
| | | 5.5 | | 4.86 | 4.76 | | | |
| V_{OL} | Maximum LOW Level Output Voltage | 3.0 | 0.002 | 0.1 | 0.1 | V | $I_{OUT} = 50 \mu\text{A}$ | |
| | | 4.5 | 0.001 | 0.1 | 0.1 | | | |
| | | 5.5 | 0.001 | 0.1 | 0.1 | | | |
| | | 3.0 | | 0.36 | 0.44 | V | $V_{IN} = V_{IL}$ or V_{IH} $I_{OL} = 12 \text{ mA}$ $I_{OL} = 24 \text{ mA}$ $I_{OL} = 24 \text{ mA (Note 3)}$ | |
| | | 4.5 | | 0.36 | 0.44 | | | |
| | | 5.5 | | 0.36 | 0.44 | | | |
| I_{IN} (Note 5) | Maximum Input Leakage Current | 5.5 | | ± 0.1 | ± 1.0 | μA | $V_I = V_{CC}, \text{ GND}$ | |
| I_{OLD} | Dynamic Output | 5.5 | | | 75 | mA | $V_{OLD} = 1.65V \text{ Max}$ | |
| I_{OHD} | Current Minimum (Note 4) | 5.5 | | | -75 | mA | $V_{OHD} = 3.85V \text{ Min}$ | |
| I_{CC} (Note 5) | Maximum Quiescent Supply Current | 5.5 | | 4.0 | 40.0 | μA | $V_{IN} = V_{CC}$ or GND | |
| I_{OZT} | Maximum I/O Leakage Current | 5.5 | | ± 0.3 | ± 3.0 | μA | V_I (OE) = V_{IL}, V_{IH} $V_I = V_{CC}, \text{ GND}$ $V_O = V_{CC}, \text{ GND}$ | |

Note 3: All outputs loaded; thresholds on input associated with output under test.

Note 4: Maximum test duration 2.0 ms, one output loaded at a time.

Note 5: I_{IN} and I_{CC} @ 3.0V are guaranteed to be less than or equal to the respective limit @ 5.5V V_{CC} .

DC Characteristics for ACT

| Symbol | Parameter | V _{CC} (V) | T _A = +25°C | | T _A = -40°C to +85°C | | Units | Conditions |
|------------------|--|------------------------|------------------------|-------------------|---------------------------------|--|-------|---|
| | | | Typ | Guaranteed Limits | | | | |
| V _{IH} | Minimum HIGH Level Input Voltage | 4.5 | 1.5 | 2.0 | 2.0 | | V | V _{OUT} = 0.1V or V _{CC} - 0.1V |
| | | 5.5 | 1.5 | 2.0 | 2.0 | | | |
| V _{IL} | Maximum LOW Level Input Voltage | 4.5 | 1.5 | 0.8 | 0.8 | | V | V _{OUT} = 0.1V or V _{CC} - 0.1V |
| | | 5.5 | 1.5 | 0.8 | 0.8 | | | |
| V _{OH} | Minimum HIGH Level Output Voltage | 4.5 | 4.49 | 4.4 | 4.4 | | V | I _{OUT} = -50 μA |
| | | 5.5 | 5.49 | 5.4 | 5.4 | | | |
| | | 4.5 | | 3.86 | 3.76 | | V | V _{IN} = V _{IL} or V _{IH} I _{OH} = -24 mA I _{OH} = -24 mA (Note 6) |
| | | 5.5 | | 4.86 | 4.76 | | | |
| V _{OL} | Maximum LOW Level Output Voltage | 4.5 | 0.001 | 0.1 | 0.1 | | V | I _{OUT} = 50 μA |
| | | 5.5 | 0.001 | 0.1 | 0.1 | | | |
| | | 4.5 | | 0.36 | 0.44 | | V | V _{IN} = V _{IL} or V _{IH} I _{OL} = 24 mA I _{OL} = 24 mA (Note 6) |
| | | 5.5 | | 0.36 | 0.44 | | | |
| I _{IN} | Maximum Input Leakage Current | 5.5 | | ±0.1 | ±1.0 | | μA | V _I = V _{CC} , GND |
| I _{CCT} | Maximum I _{CC} /Input | 5.5 | 0.6 | | 1.5 | | mA | V _I = V _{CC} - 2.1V |
| I _{OLD} | Dynamic Output Current Minimum (Note 7) | 5.5 | | | 75 | | mA | V _{OLD} = 1.65V Max |
| I _{OHD} | Current Minimum (Note 7) | 5.5 | | | -75 | | mA | V _{OHD} = 3.85V Min |
| I _{CC} | Maximum Quiescent Supply Current | 5.5 | | 4.0 | 40.0 | | μA | V _{IN} = V _{CC} or GND |
| I _{OZT} | Maximum I/O Leakage Current | 5.5 | | ±0.3 | ±3.0 | | μA | V _I (OE) = V _{IL} , V _{IH} V _I = V _{CC} , GND V _O = V _{CC} , GND |

Note 6: All outputs loaded; thresholds on input associated with output under test.

Note 7: Maximum test duration 2.0 ms, one output loaded at a time.

AC Electrical Characteristics for AC

| Symbol | Parameter | V _{CC} (V) (Note 8) | 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 A _n to B _n or B _n to A _n | 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 _{PHL} | Propagation Delay A _n to B _n or B _n to A _n | 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 _{PZH} | 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 _{PZL} | 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 _{PHZ} | 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 _{PLZ} | 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 8: Voltage Range 3.3 is 3.3V ± 0.3V
Voltage Range 5.0 is 5.0V ± 0.5V

AC Electrical Characteristics for ACT

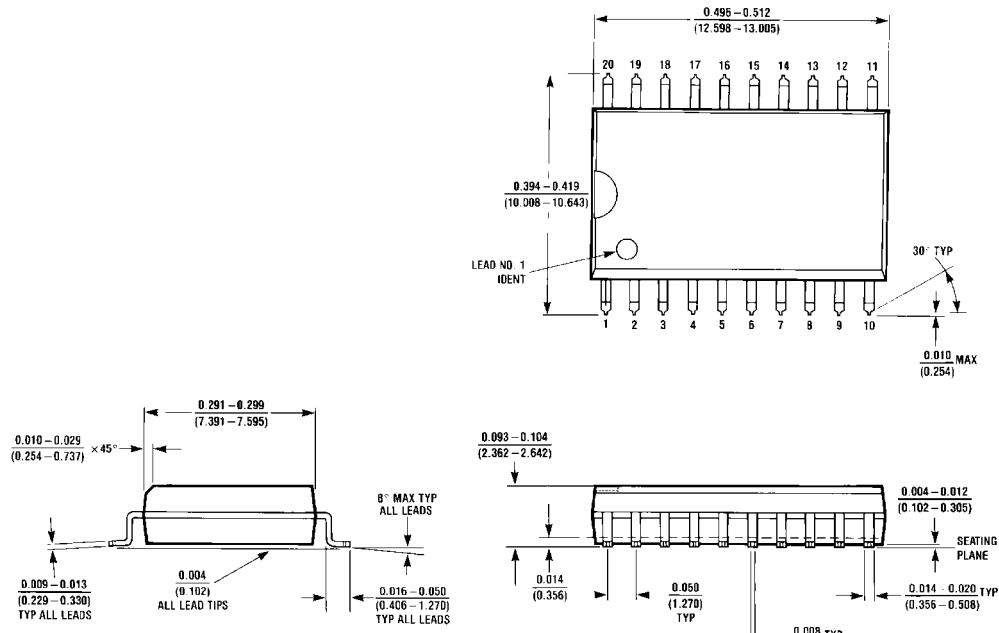
| Symbol | Parameter | V _{CC} (V) (Note 9) | T _A = +25°C C _L = 50 pF | | | T _A = -40°C to +85°C C _L = 50 pF | | Units |
|------------------|---|------------------------------------|--|-----|------|---|------|-------|
| | | | Min | Typ | Max | Min | Max | |
| t _{PLH} | Propagation Delay A _n to B _n or B _n to A _n | 5.0 | 1.5 | 4.0 | 7.5 | 1.5 | 8.0 | ns |
| t _{PHL} | Propagation Delay A _n to B _n or B _n to A _n | 5.0 | 1.5 | 4.0 | 8.0 | 1.0 | 9.0 | ns |
| t _{PZH} | Output Enable Time | 5.0 | 1.5 | 5.0 | 10.0 | 1.5 | 11.0 | ns |
| t _{PZL} | Output Enable Time | 5.0 | 1.5 | 5.5 | 10.0 | 1.5 | 12.0 | ns |
| t _{PHZ} | Output Disable Time | 5.0 | 1.5 | 5.5 | 10.0 | 1.0 | 11.0 | ns |
| t _{PLZ} | Output Disable Time | 5.0 | 2.0 | 5.0 | 10.0 | 1.5 | 11.0 | ns |

Note 9: Voltage Range 5.0 is 5.0V ± 0.5V

Capacitance

| Symbol | Parameter | Typ | Units | Conditions |
|------------------|-------------------------------|------|-------|------------------------|
| C _{IN} | Input Capacitance | 4.5 | pF | V _{CC} = OPEN |
| C _{I/O} | Input/Output Capacitance | 15.0 | pF | V _{CC} = 5.0V |
| C _{PD} | Power Dissipation Capacitance | 45.0 | pF | V _{CC} = 5.0V |

Physical Dimensions inches (millimeters) unless otherwise noted



**20-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300" Wide
Package Number M20B**

Physical Dimensions inches (millimeters) unless otherwise noted (Continued)



LAND PATTERN RECOMMENDATION



DIMENSIONS ARE IN MILLIMETERS



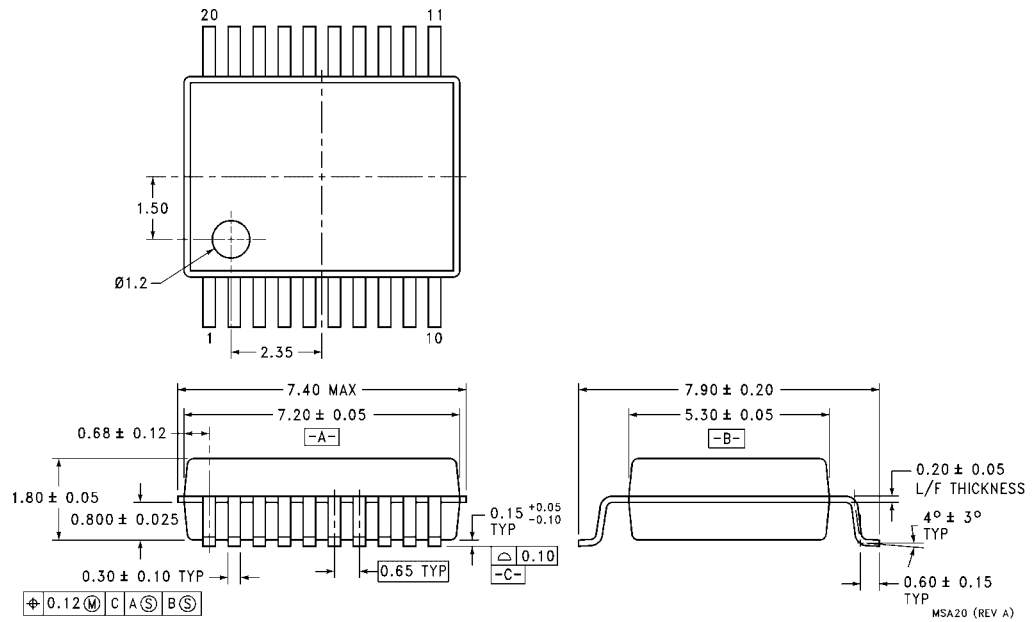
- NOTES:
- A. CONFORMS TO EIAJ EDR-7320 REGISTRATION, ESTABLISHED IN DECEMBER, 1998.
 - B. DIMENSIONS ARE IN MILLIMETERS.
 - C. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.

M20DRevB1

DETAIL A

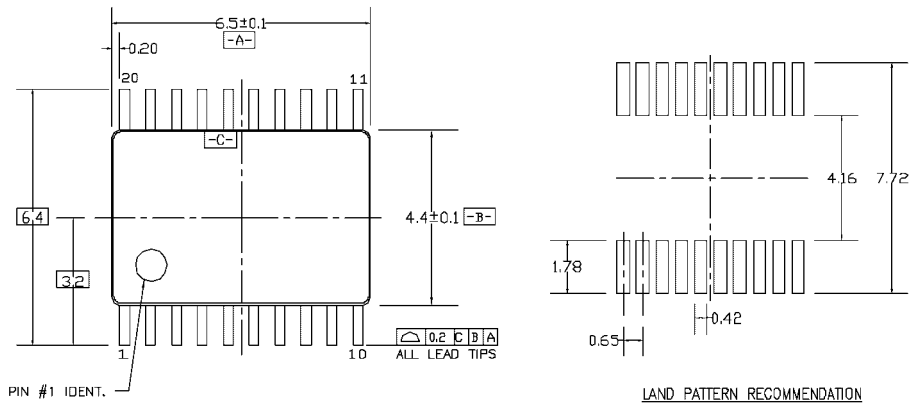
**Pb-Free 20-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide
Package Number M20D**

Physical Dimensions inches (millimeters) unless otherwise noted (Continued)



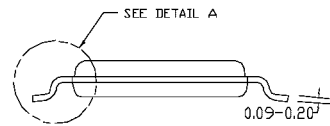
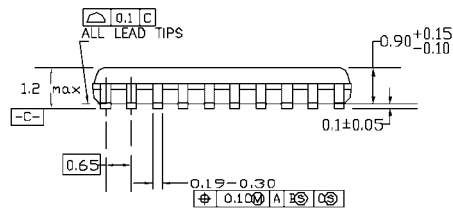
**20-Lead Shrink Small Outline Package (SSOP), JEDEC MO-150, 5.3mm Wide
Package Number MSA20**

Physical Dimensions inches (millimeters) unless otherwise noted (Continued)



PIN #1 IDENT.

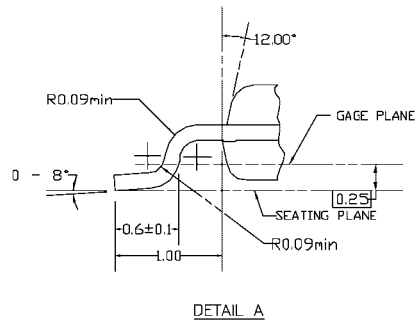
LAND PATTERN RECOMMENDATION



DIMENSIONS ARE IN MILLIMETERS

NOTES:

- A. CONFORMS TO JEDEC REGISTRATION MO-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.



DETAIL A

MTC20REVD1

20-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide Package Number MTC20

Physical Dimensions inches (millimeters) unless otherwise noted (Continued)



N20A (REV G)

**20-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300" Wide
Package Number N20A**

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