



**THE DATASHEET OF  
74ACT521SC**



## 74AC521 • 74ACT521 8-Bit Identity Comparator

### General Description

The AC/ACT521 is an expandable 8-bit comparator. It compares two words of up to eight bits each and provides a LOW output when the two words match bit for bit. The expansion input  $\bar{I}_{A=B}$  also serves as an active LOW enable input.

### Features

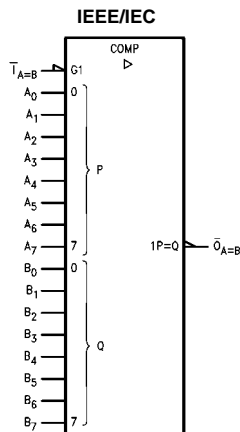
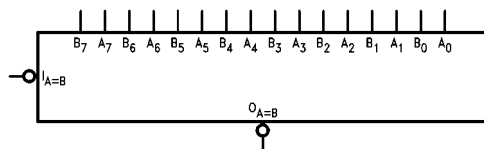
- $I_{CC}$  reduced by 50%
- Compares two 8-bit words in 6.5 ns typ
- Expandable to any word length
- 20-pin package
- Outputs source/sink 24 mA
- ACT521 has TTL-compatible inputs

### Ordering Code:

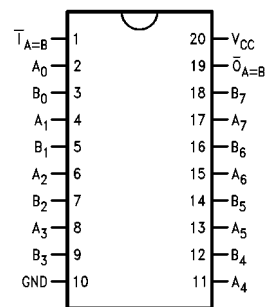
| Order Number | Package Number | Package Description   |
|--------------|----------------|---|
| 74AC521SC    | M20B           | 20-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300 Wide   |
| 74AC521SJ    | M20D           | 20-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide               |
| 74AC521MTC   | MTC20          | 20-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide |
| 74AC521PC    | N20A           | 20-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300 Wide       |
| 74ACT521SC   | M20B           | 20-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300 Wide   |
| 74ACT521SJ   | M20D           | 20-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide               |
| 74ACT521MTC  | MTC20          | 20-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide |
| 74ACT521PC   | 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 table.

### Logic Symbols



### Connection Diagram



### Pin Descriptions

| Pin Names                      | Description               |
|--------------------------------|---------------------------|
| A <sub>0</sub> -A <sub>7</sub> | Word A Inputs             |
| B <sub>0</sub> -B <sub>7</sub> | Word B Inputs             |
| $\bar{I}_{A=B}$                | Expansion or Enable Input |
| $\bar{O}_{A=B}$                | Identity Output           |

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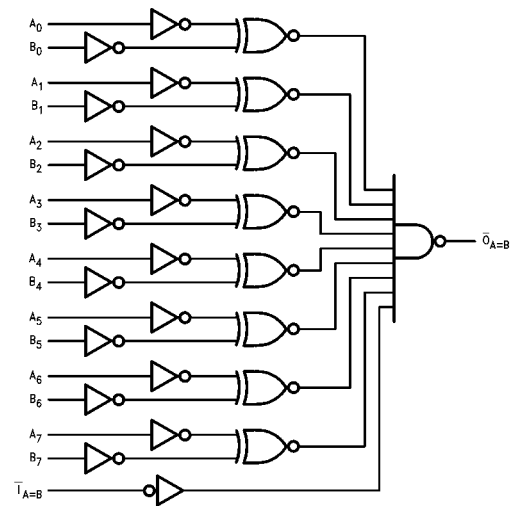
**Truth Table**

| Inputs          |                | Outputs         |
|-----------------|----------------|-----------------|
| $\bar{I}_{A=B}$ | A, B           | $\bar{O}_{A=B}$ |
| L               | A = B (Note 1) | L               |
| L               | A $\neq$ B     | H               |
| H               | A = B (Note 1) | H               |
| H               | A $\neq$ B     | H               |

H = HIGH Voltage Level  
L = LOW Voltage Level

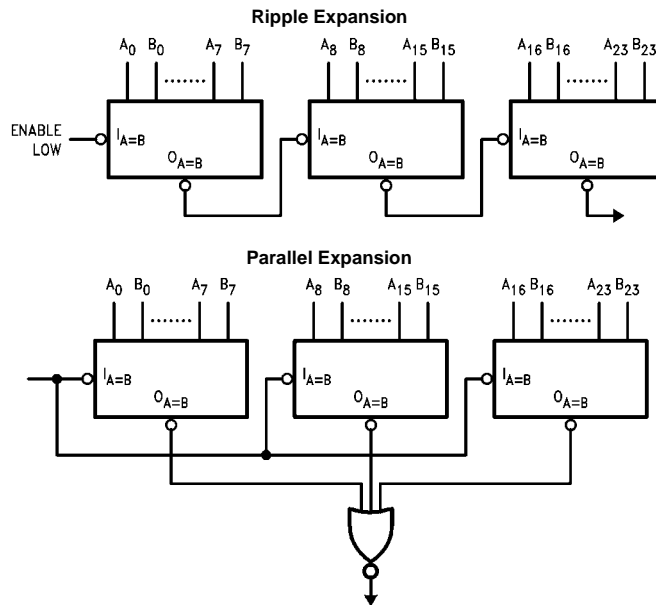
**Note 1:** A<sub>0</sub> = B<sub>0</sub>, A<sub>1</sub> = B<sub>1</sub>, A<sub>2</sub> = B<sub>2</sub>, etc.

**Logic Diagram**



Please note that this diagram is provided only for the understanding of logic operations and should not be used to estimate propagation delays.

**Applications**



**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 ( $I_O$ )                | $\pm 50$ mA              |
| DC $V_{CC}$ or Ground Current            |                          |
| per Output Pin ( $I_{CC}$ or $I_{GND}$ ) | $\pm 50$ mA              |
| Storage Temperature ( $T_{STG}$ )        | -65°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, with-out exception, to ensure that the system design is reliable over its power supply, temperature, output/input loading variables. Fairchild does not recommend operation of FACT™ circuits outside databook specifications.

**DC Electrical Characteristics for AC**

| Symbol               | Parameter                            | $V_{CC}$<br>(V) | $T_A = +25^\circ\text{C}$ |                   | $T_A = -40^\circ\text{C to } +85^\circ\text{C}$ | Units   | Conditions  |
|----------------------|--------------------------------------|-----------------|---------------------------|-------------------|---|---------|---|
|                      |                                      |                 | Typ                       | Guaranteed Limits |   |         |   |
| $V_{IH}$             | Minimum HIGH Level<br>Input Voltage  | 3.0             | 1.5                       | 2.1               | 2.1   | V       | $V_{OUT} = 0.1V$<br>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<br>Input Voltage   | 3.0             | 1.5                       | 0.9               | 0.9   | V       | $V_{OUT} = 0.1V$<br>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<br>Output Voltage | 3.0             | 2.99                      | 2.9               | 2.9   | V       | $I_{OUT} = -50 \mu A$   |
|                      |                                      | 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 $V_{IH}$<br>$I_{OH} = -12$ mA<br>$I_{OH} = -24$ mA<br>$I_{OH} = -24$ mA (Note 3) |
|                      |                                      | 4.5             |                           | 3.86              | 3.76  |         |   |
|                      |                                      | 5.5             |                           | 4.86              | 4.76  |         |   |
| $V_{OL}$             | Maximum LOW Level<br>Output Voltage  | 3.0             | 0.002                     | 0.1               | 0.1   | V       | $I_{OUT} = 50 \mu A$  |
|                      |                                      | 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 $V_{IH}$<br>$I_{OL} = 12$ mA<br>$I_{OL} = 24$ mA<br>$I_{OL} = 24$ mA (Note 3)    |
|                      |                                      | 4.5             |                           | 0.36              | 0.44  |         |   |
|                      |                                      | 5.5             |                           | 0.36              | 0.44  |         |   |
| $I_{IN}$<br>(Note 5) | Maximum Input<br>Leakage Current     | 5.5             |                           | $\pm 0.1$         | $\pm 1.0$                                       | $\mu A$ | $V_I = V_{CC}, GND$   |
| $I_{OLD}$            | Minimum Dynamic                      | 5.5             |                           |                   | 75  | mA      | $V_{OLD} = 1.65V$ Max   |
| $I_{OHD}$            | Output Current (Note 4)              | 5.5             |                           |                   | -75   | mA      | $V_{OHD} = 3.85V$ Min   |
| $I_{CC}$<br>(Note 5) | Maximum Quiescent<br>Supply Current  | 5.5             |                           | 4.0               | 40.0  | $\mu A$ | $V_{IN} = V_{CC}$<br>or 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 Electrical Characteristics for ACT

| Symbol           | Parameter                            | V <sub>CC</sub><br>(V) | T <sub>A</sub> = +25°C |                   | T <sub>A</sub> = -40°C to +85°C |    | Units   | Conditions |
|------------------|--------------------------------------|------------------------|------------------------|-------------------|---------------------------------|----|---|------------|
|                  |                                      |                        | Typ                    | Guaranteed Limits |                                 |    |   |            |
| V <sub>IH</sub>  | Minimum HIGH Level<br>Input Voltage  | 4.5                    | 1.5                    | 2.0               | 2.0                             | V  | V <sub>OUT</sub> = 0.1V<br>or V <sub>CC</sub> - 0.1V  |            |
|                  |                                      | 5.5                    | 1.5                    | 2.0               | 2.0                             |    |   |            |
| V <sub>IL</sub>  | Maximum LOW Level<br>Input Voltage   | 4.5                    | 1.5                    | 0.8               | 0.8                             | V  | V <sub>OUT</sub> = 0.1V<br>or V <sub>CC</sub> - 0.1V  |            |
|                  |                                      | 5.5                    | 1.5                    | 0.8               | 0.8                             |    |   |            |
| V <sub>OH</sub>  | Minimum HIGH Level<br>Output Voltage | 4.5                    | 4.49                   | 4.4               | 4.4                             | V  | I <sub>OUT</sub> = -50 μA   |            |
|                  |                                      | 5.5                    | 5.49                   | 5.4               | 5.4                             |    |   |            |
|                  |                                      | 4.5                    |                        | 3.86              | 3.76                            | V  | V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub><br>I <sub>OH</sub> = -24 mA<br>I <sub>OH</sub> = -24 mA (Note 6) |            |
|                  |                                      | 5.5                    |                        | 4.86              | 4.76                            |    |   |            |
| V <sub>OL</sub>  | Maximum LOW Level<br>Output Voltage  | 4.5                    | 0.001                  | 0.1               | 0.1                             | V  | I <sub>OUT</sub> = 50 μA  |            |
|                  |                                      | 5.5                    | 0.001                  | 0.1               | 0.1                             |    |   |            |
|                  |                                      | 4.5                    |                        | 0.36              | 0.44                            | V  | V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub><br>I <sub>OL</sub> = 24 mA<br>I <sub>OL</sub> = 24 mA (Note 6)   |            |
|                  |                                      | 5.5                    |                        | 0.36              | 0.44                            |    |   |            |
| I <sub>IN</sub>  | Maximum Input<br>Leakage Current     | 5.5                    |                        | ±0.1              | ±1.0                            | μA | V <sub>I</sub> = V <sub>CC</sub> , GND  |            |
| I <sub>CCT</sub> | Maximum<br>I <sub>CC</sub> /Input    | 5.5                    | 0.6                    |                   | 1.5                             | mA | V <sub>I</sub> = V <sub>CC</sub> - 2.1V   |            |
| I <sub>OLD</sub> | Minimum Dynamic                      | 5.5                    |                        |                   | 75                              | mA | V <sub>OLD</sub> = 1.65V Max  |            |
| I <sub>OHD</sub> | Output Current (Note 7)              | 5.5                    |                        |                   | -75                             | mA | V <sub>OHD</sub> = 3.85V Min  |            |
| I <sub>CC</sub>  | Maximum Quiescent<br>Supply Current  | 5.5                    |                        | 4.0               | 40.0                            | μA | V <sub>IN</sub> = V <sub>CC</sub><br>or 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 <sub>CC</sub><br>(V)<br>(Note 8) | T <sub>A</sub> = +25°C |     |      | T <sub>A</sub> = -40°C to +85°C |      | Units |
|------------------|---|------------------------------------|------------------------|-----|------|---------------------------------|------|-------|
|                  |   |                                    | C <sub>L</sub> = 50 pF |     |      | C <sub>L</sub> = 50 pF          |      |       |
|                  |   |                                    | Min                    | Typ | Max  | Min                             | Max  |       |
| t <sub>PLH</sub> | Propagation Delay<br>A <sub>n</sub> or B <sub>n</sub> to $\overline{O}_{A=B}$ | 3.3                                | 3.5                    | 7.0 | 11.0 | 3.0                             | 12.0 | ns    |
|                  |   | 5.0                                | 2.5                    | 5.0 | 8.0  | 2.0                             | 9.0  |       |
| t <sub>PHL</sub> | Propagation Delay<br>A <sub>n</sub> or B <sub>n</sub> to $\overline{O}_{A=B}$ | 3.3                                | 4.5                    | 7.5 | 11.5 | 3.5                             | 12.5 | ns    |
|                  |   | 5.0                                | 3.0                    | 5.5 | 8.5  | 2.5                             | 9.0  |       |
| t <sub>PLH</sub> | Propagation Delay<br>$\overline{I}_{A=B}$ to $\overline{O}_{A=B}$             | 3.3                                | 3.0                    | 5.5 | 8.0  | 2.5                             | 9.0  | ns    |
|                  |   | 5.0                                | 2.5                    | 4.0 | 6.0  | 2.0                             | 7.0  |       |
| t <sub>PHL</sub> | Propagation Delay<br>$\overline{I}_{A=B}$ to $\overline{O}_{A=B}$             | 3.3                                | 3.0                    | 5.5 | 8.0  | 2.5                             | 9.0  | ns    |
|                  |   | 5.0                                | 2.0                    | 4.0 | 6.0  | 2.0                             | 7.0  |       |

**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

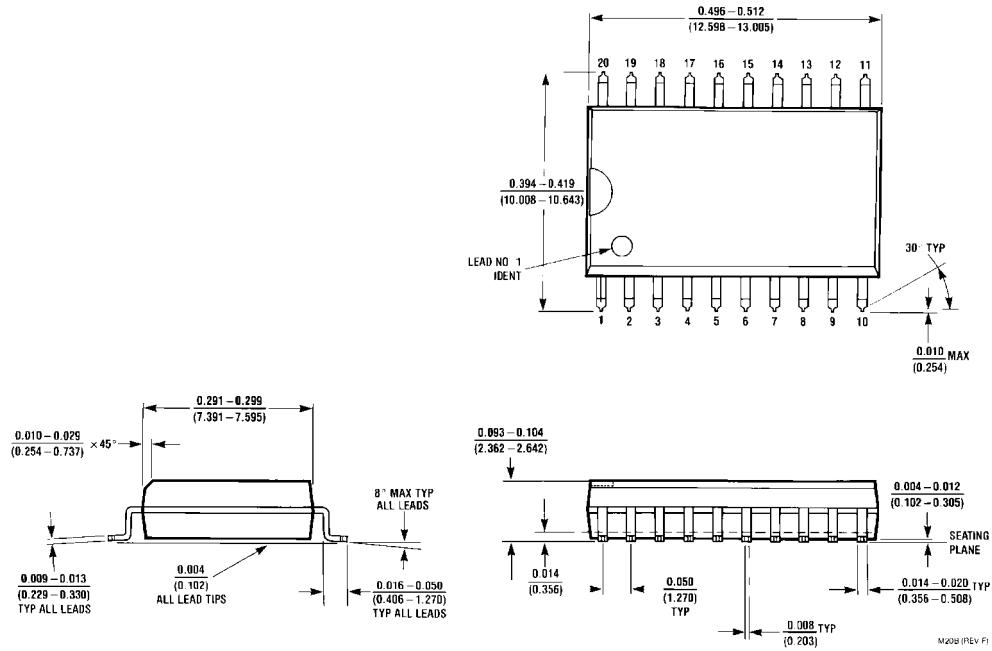
| Symbol           | Parameter   | V <sub>CC</sub><br>(V)<br>(Note 9) | T <sub>A</sub> = +25°C<br>C <sub>L</sub> = 50 pF |     |      | T <sub>A</sub> = -40°C to +85°C<br>C <sub>L</sub> = 50 pF |      | Units |
|------------------|---|------------------------------------|--|-----|------|---|------|-------|
|                  |   |                                    | Min  | Typ | Max  | Min   | Max  |       |
| t <sub>PLH</sub> | Propagation Delay<br>A <sub>n</sub> or B <sub>n</sub> to $\overline{O}_{A=B}$ | 5.0                                | 3.0  | 5.5 | 9.0  | 2.5   | 9.5  | ns    |
| t <sub>PHL</sub> | Propagation Delay<br>A <sub>n</sub> or B <sub>n</sub> to $\overline{O}_{A=B}$ | 5.0                                | 3.0  | 6.0 | 10.0 | 2.5   | 11.0 | ns    |
| t <sub>PLH</sub> | Propagation Delay<br>$\overline{I}_{A=B}$ to $\overline{O}_{A=B}$             | 5.0                                | 2.0  | 4.0 | 6.5  | 2.0   | 7.0  | ns    |
| t <sub>PHL</sub> | Propagation Delay<br>$\overline{I}_{A=B}$ to $\overline{O}_{A=B}$             | 5.0                                | 2.5  | 5.0 | 7.5  | 2.0   | 8.0  | ns    |

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

### Capacitance

| Symbol          | Parameter                     | Typ | Units | Conditions             |
|-----------------|-------------------------------|-----|-------|------------------------|
| C <sub>IN</sub> | Input Capacitance             | 4.5 | pF    | V <sub>CC</sub> = OPEN |
| C <sub>PD</sub> | Power Dissipation Capacitance | 40  | pF    | V <sub>CC</sub> = 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**

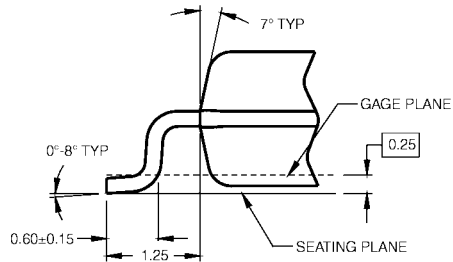
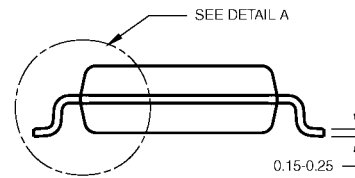
**Physical Dimensions** inches (millimeters) unless otherwise noted (Continued)



LAND PATTERN RECOMMENDATION



DIMENSIONS ARE IN MILLIMETERS



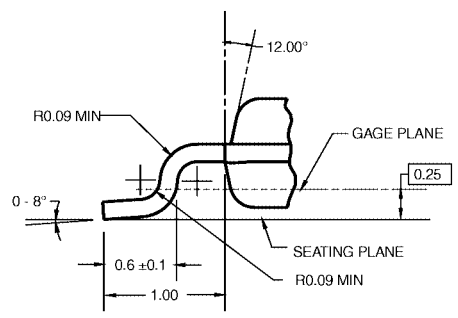
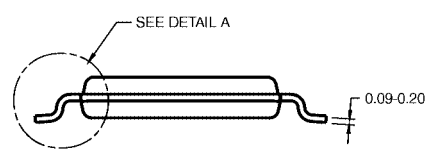
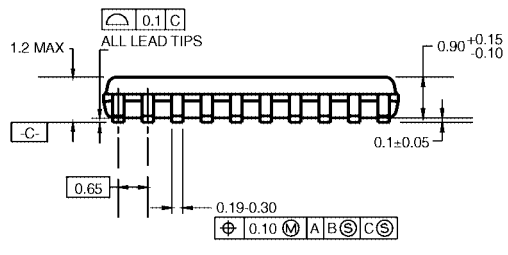
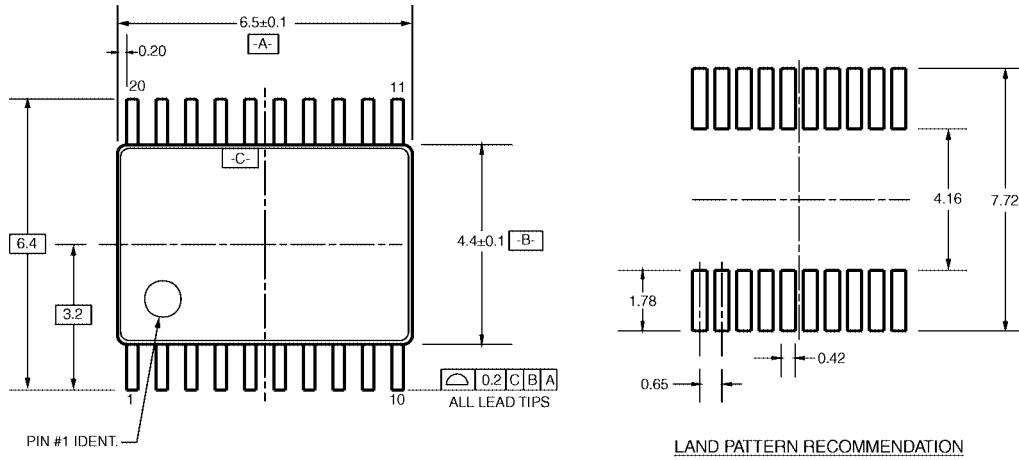
DETAIL A

- 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

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

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



DIMENSIONS ARE IN MILLIMETERS

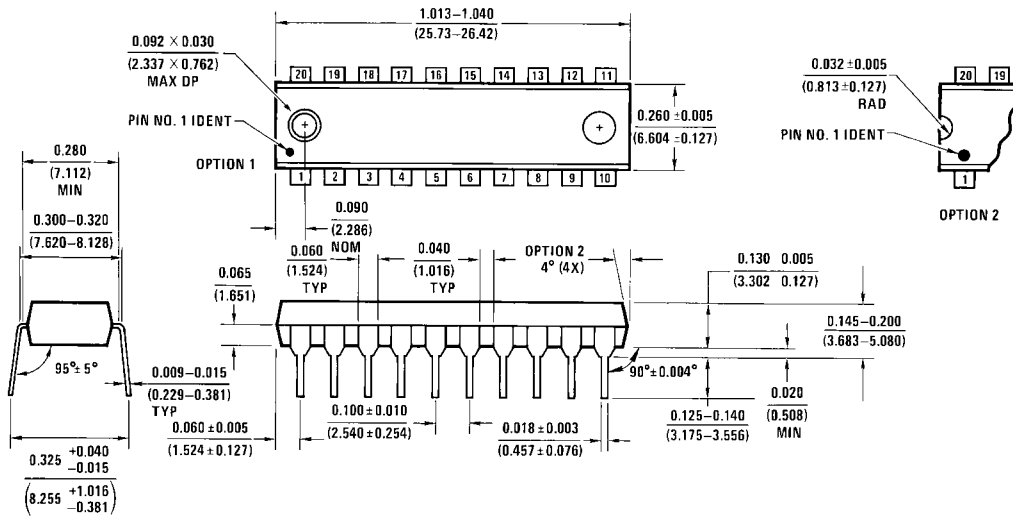
- NOTES:
- A. CONFORMS TO JEDEC REGISTRATION MO-153, VARIATION AC, REF NOTE 6, DATE 7/93.
  - B. DIMENSIONS ARE IN MILLIMETERS.
  - C. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.
  - D. DIMENSIONS AND TOLERANCES PER ANSI Y14.5M, 1982.

MTC20RevD1

DETAIL A

**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)



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

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