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# 74VHCT540A

## Octal Buffer/Line Driver with 3-STATE Outputs

### Features

- High Speed:  $t_{PD} = 5.4\text{ns}$  (Typ.) at  $V_{CC} = 5\text{V}$
- Low Power Dissipation:  $I_{CC} = 4\mu\text{A}$  (Max.) at  $T_A = 25^\circ\text{C}$
- Power down protection is provided on all inputs and outputs
- Pin and function compatible with 74HCT540

### General Description

The VHCT540A is an advanced high-speed CMOS device fabricated with silicon gate CMOS technology. It achieves the high-speed operation similar to equivalent Bipolar Schottky TTL while maintaining the CMOS low power dissipation.

The VHCT540A is an octal buffer/line driver designed to be employed as memory and address drivers, clock drivers and bus oriented transmitter/receivers.

This device is similar in function to the VHCT240A while providing flow-through architecture (inputs on opposite side from outputs). This pinout arrangement makes this device especially useful as an output port for micro-processors, allowing ease of layout and greater PC board density.

Protection circuits ensure that 0V to 7V can be applied to the input and output<sup>(1)</sup> pins without regard to the supply voltage. This device can be used to interface 3V to 5V systems and two supply systems such as battery backup. This circuit prevents device destruction due to mismatched supply and input voltages.

#### Note:

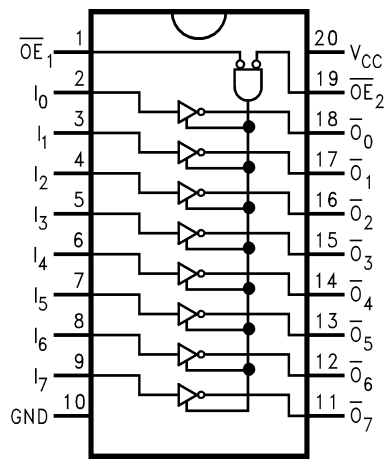
1. Outputs in OFF-State.

### Ordering Information

| Order Number  | Package Number | Package Dissipation                                                         |
|---------------|----------------|-----------------------------------------------------------------------------|
| 74VHCT540AM   | M20B           | 20-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300" Wide  |
| 74VHCT540ASJ  | M20D           | 20-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide               |
| 74VHCT540AMTC | MTC20          | 20-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide |

Surface mount packages are also available on Tape and Reel. Specify by appending the suffix letter "X" to the ordering number. Pb-Free package per JEDEC J-STD-020B.

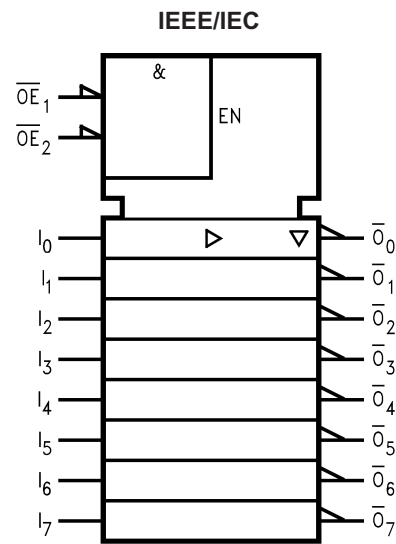
Connection Diagram



Pin Description

| Pin Names                          | Description                  |
|------------------------------------|------------------------------|
| $\overline{OE}_1, \overline{OE}_2$ | 3-STATE Output Enable Inputs |
| $I_0-I_7$                          | Inputs                       |
| $\overline{O}_0-\overline{O}_7$    | 3-STATE Outputs              |

Logic Symbol



Truth Table

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

H = HIGH Voltage Level

L = LOW Voltage Level

X = Immaterial

Z = High Impedance

## 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                             |
| $V_{IN}$  | DC Input Voltage                         | –0.5V to +7.0V                             |
| $V_{OUT}$ | DC Output Voltage<br>Note 2<br>Note 3    | –0.5V to +7.0V<br>–0.5V to $V_{CC} + 0.5V$ |
| $I_{IK}$  | Input Diode Current                      | –20mA                                      |
| $I_{OK}$  | Output Diode Current <sup>(4)</sup>      | ±20mA                                      |
| $I_{OUT}$ | DC Output Current                        | ±25mA                                      |
| $I_{CC}$  | DC $V_{CC}$ / GND Current                | ±75mA                                      |
| $T_{STG}$ | Storage Temperature                      | –65°C to +150°C                            |
| $T_L$     | Lead Temperature (Soldering, 10 seconds) | 260°C                                      |

## Recommended Operating Conditions<sup>(5)</sup>

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                                     | 4.5V to +5.5V                |
| $V_{IN}$   | Input Voltage                                      | 0V to +5.5V                  |
| $V_{OUT}$  | Output Voltage<br>Note 2<br>Note 3                 | 0V to 5.5V<br>0V to $V_{CC}$ |
| $T_{OPR}$  | Operating Temperature                              | –40°C to +85°C               |
| $t_r, t_f$ | Input Rise and Fall Time, $V_{CC} = 5.0V \pm 0.5V$ | 0ns/V ~ 20ns/V               |

### Notes:

- When outputs are in OFF-STATE or when  $V_{CC} = 0V$ .
- HIGH or LOW state.  $I_{OUT}$  absolute maximum rating must be observed.
- $V_{OUT} < GND$ ,  $V_{OUT} > V_{CC}$  (outputs active).
- Unused inputs must be held HIGH or LOW. They may not float.

**DC Electrical Characteristics**

| Symbol           | Parameter                        | V <sub>CC</sub> (V) | Conditions                                                                                                | T <sub>A</sub> = 25°C |      |             | T <sub>A</sub> = -40°C to +85°C |             | Units |
|------------------|----------------------------------|---------------------|-----------------------------------------------------------------------------------------------------------|-----------------------|------|-------------|---------------------------------|-------------|-------|
|                  |                                  |                     |                                                                                                           | Min.                  | Typ. | Max.        | Min.                            | Max.        |       |
| V <sub>IH</sub>  | HIGH Level Input Voltage         | 4.5–5.5             |                                                                                                           | 2.0                   |      |             | 2.0                             |             | V     |
| V <sub>IL</sub>  | LOW Level Input Voltage          | 4.5–5.5             |                                                                                                           |                       |      | 0.8         |                                 | 0.8         | V     |
| V <sub>OH</sub>  | HIGH Level Output Voltage        | 4.5                 | V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub><br>I <sub>OH</sub> = -50μA<br>I <sub>OH</sub> = -8mA | 4.4<br>3.94           | 4.5  |             | 4.4<br>3.80                     |             | V     |
| V <sub>OL</sub>  | LOW Level Output Voltage         | 4.5                 | V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub><br>I <sub>OL</sub> = 50μA<br>I <sub>OL</sub> = 8mA   |                       | 0.0  | 0.1<br>0.36 |                                 | 0.1<br>0.44 | V     |
| I <sub>OZ</sub>  | 3-STATE Output OFF-STATE Current | 5.5                 | V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub> ,<br>V <sub>OUT</sub> = V <sub>CC</sub> or GND       |                       |      | ±0.25       |                                 | ±2.5        | μA    |
| I <sub>IN</sub>  | Input Leakage Current            | 0–5.5               | V <sub>IN</sub> = 5.5V or GND                                                                             |                       |      | ±0.1        |                                 | ±1.0        | μA    |
| I <sub>CC</sub>  | Quiescent Supply Current         | 5.5                 | V <sub>IN</sub> = V <sub>CC</sub> or GND                                                                  |                       |      | 4.0         |                                 | 40.0        | μA    |
| I <sub>CCT</sub> | Maximum I <sub>CC</sub> /Input   | 5.5                 | V <sub>IN</sub> = 3.4V, Other Inputs = V <sub>CC</sub> or GND                                             |                       |      | 1.35        |                                 | 1.50        | mA    |
| I <sub>OFF</sub> | Output Leakage Current           | 0                   | V <sub>OUT</sub> = 5.5V                                                                                   |                       |      | 0.5         |                                 | 5.0         | μA    |

**Noise Characteristics**

| Symbol                          | Parameter                                    | V <sub>CC</sub> (V) | Conditions            | T <sub>A</sub> = 25°C |        | Units |
|---------------------------------|----------------------------------------------|---------------------|-----------------------|-----------------------|--------|-------|
|                                 |                                              |                     |                       | Typ.                  | Limits |       |
| V <sub>OLP</sub> <sup>(6)</sup> | Quiet Output Maximum Dynamic V <sub>OL</sub> | 5.0                 | C <sub>L</sub> = 50pF | 1.2                   | 1.6    | V     |
| V <sub>OLV</sub> <sup>(6)</sup> | Quiet Output Minimum Dynamic V <sub>OL</sub> | 5.0                 | C <sub>L</sub> = 50pF | -1.2                  | 1.6    | V     |
| V <sub>IHD</sub> <sup>(6)</sup> | Minimum HIGH Level Dynamic Input Voltage     | 5.0                 | C <sub>L</sub> = 50pF |                       | 2.0    | V     |
| V <sub>ILD</sub> <sup>(6)</sup> | Maximum HIGH Level Dynamic Input Voltage     | 5.0                 | C <sub>L</sub> = 50pF |                       | 0.8    | V     |

**Note:**

6. Parameter guaranteed by design.

## AC Electrical Characteristics

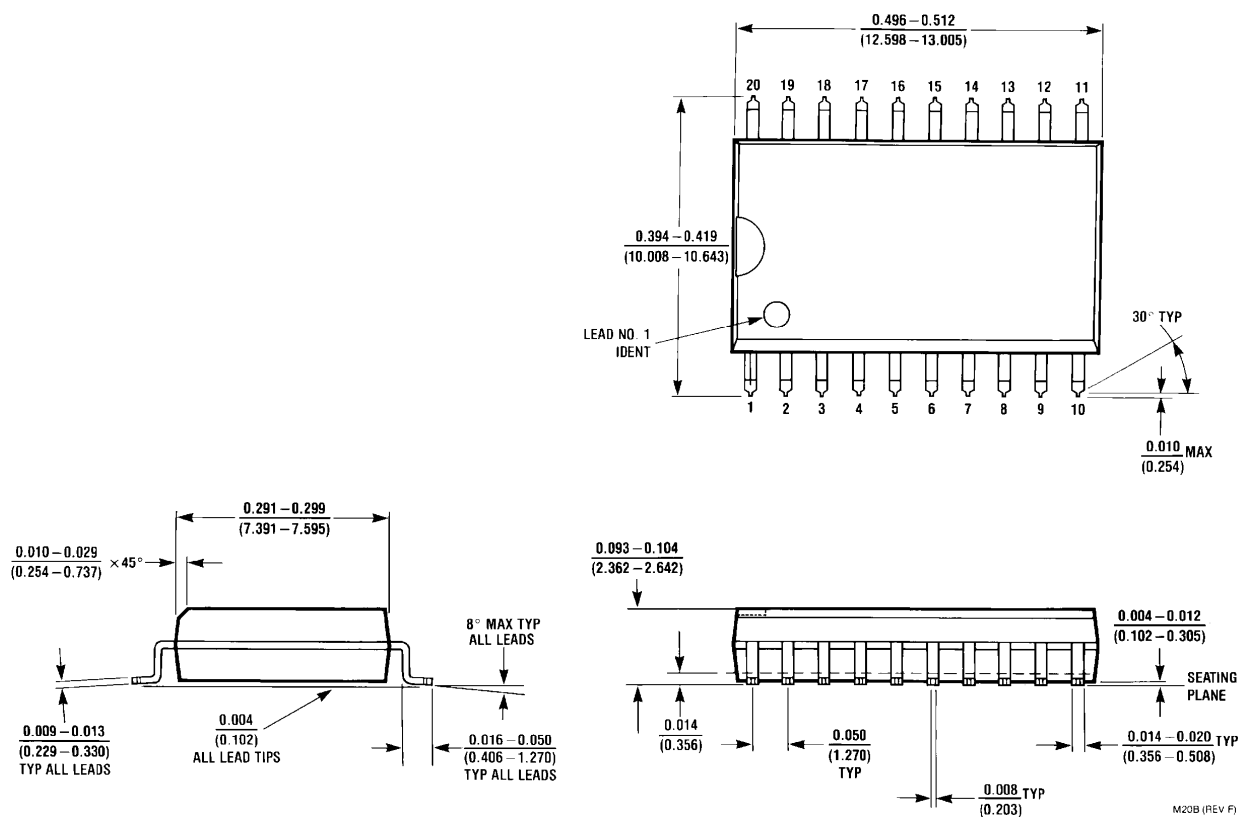
| Symbol                                | Parameter                     | V <sub>CC</sub> (V) | Conditions             |                       | T <sub>A</sub> = 25°C |      |      | T <sub>A</sub> = −40°C to +85°C |      | Units |
|---------------------------------------|-------------------------------|---------------------|------------------------|-----------------------|-----------------------|------|------|---------------------------------|------|-------|
|                                       |                               |                     |                        |                       | Min.                  | Typ. | Max. | Min.                            | Max. |       |
| t <sub>PLH</sub> , t <sub>PHL</sub>   | Propagation Delay Time        | 5.0 ± 0.5           |                        | C <sub>L</sub> = 15pF |                       | 5.4  | 7.4  | 1.0                             | 8.5  | ns    |
|                                       |                               |                     |                        | C <sub>L</sub> = 50pF |                       | 5.9  | 8.4  | 1.0                             | 9.5  |       |
| t <sub>PZL</sub> , t <sub>PZH</sub>   | 3-STATE Output Enable Time    | 5.0 ± 0.5           | R <sub>L</sub> = 1kΩ   | C <sub>L</sub> = 15pF |                       | 8.3  | 11.3 | 1.0                             | 13.0 | ns    |
|                                       |                               |                     |                        | C <sub>L</sub> = 50pF |                       | 8.8  | 12.3 | 1.0                             | 14.0 |       |
| t <sub>PLZ</sub> , t <sub>PHZ</sub>   | 3-STATE Output Disable Time   | 5.0 ± 0.5           | R <sub>L</sub> = 1kΩ   | C <sub>L</sub> = 50pF |                       | 9.4  | 11.9 | 1.0                             | 13.5 | ns    |
| t <sub>OSLH</sub> , t <sub>OSHL</sub> | Output to Output Skew         | 5.0 ± 0.5           | (7)                    | C <sub>L</sub> = 50pF |                       |      | 1.0  |                                 | 1.0  | ns    |
| C <sub>IN</sub>                       | Input Capacitance             |                     | V <sub>CC</sub> = Open |                       |                       | 4    | 10   |                                 | 10   | pF    |
| C <sub>OUT</sub>                      | Output Capacitance            |                     | V <sub>CC</sub> = 5.0V |                       |                       | 9    |      |                                 |      | pF    |
| C <sub>PD</sub>                       | Power Dissipation Capacitance |                     | (8)                    |                       |                       | 19   |      |                                 |      | pF    |

## Notes:

7. Parameter guaranteed by design. t<sub>OSLH</sub> = |t<sub>PLHmax</sub> - t<sub>PLHmin</sub>|; t<sub>OSLH</sub> = |t<sub>PHLmax</sub> - t<sub>PHLmin</sub>|
8. C<sub>PD</sub> is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load. Average operating current can be obtained by the equation:  
 $I_{CC} (Opr.) = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC} / 8$  (per bit).

## Physical Dimensions

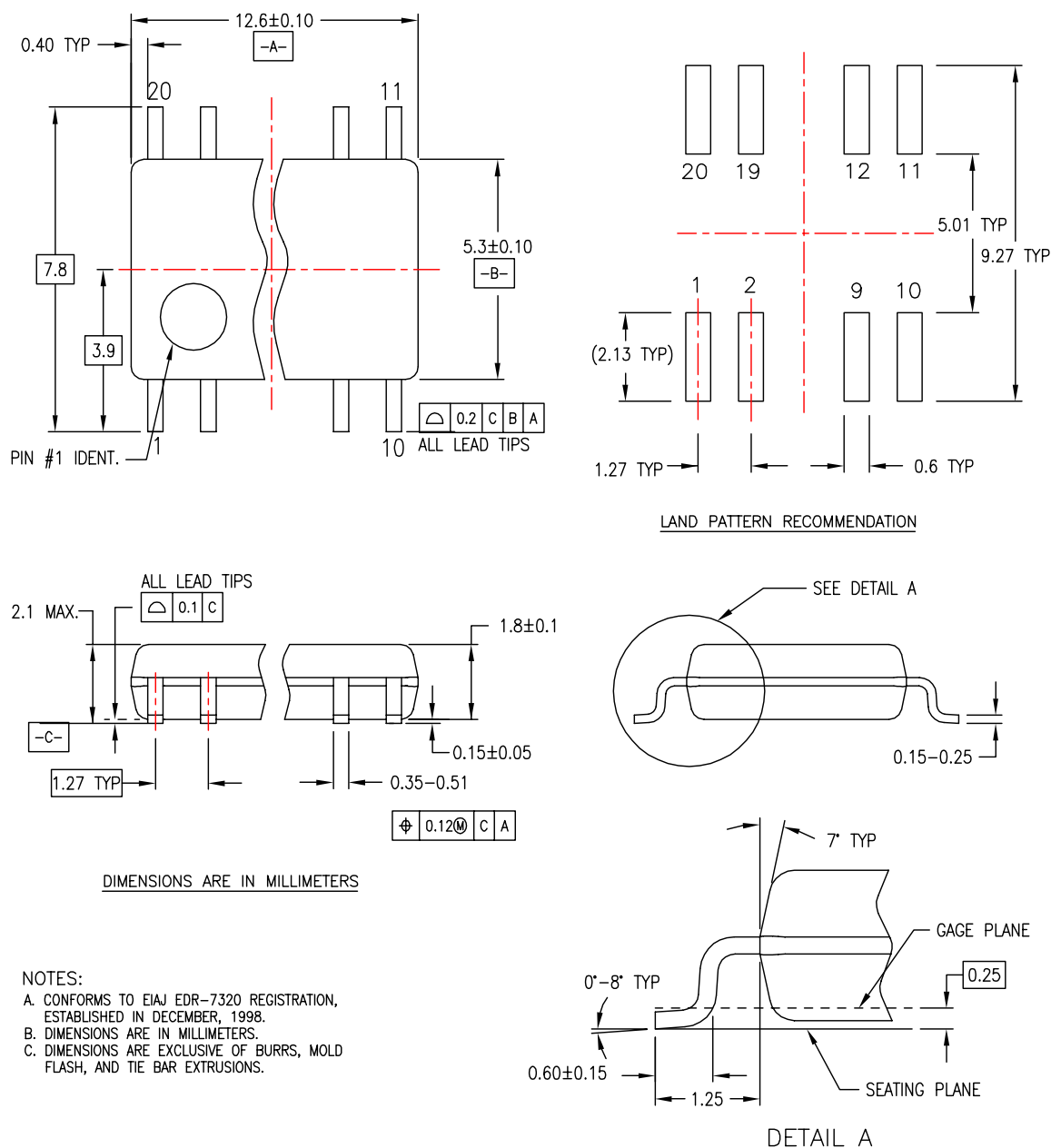
Dimensions are in millimeters unless otherwise noted.



**Figure 1. 20-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300" Wide  
Package Number M20B**

# Physical Dimensions (Continued)

Dimensions are in millimeters unless otherwise noted.



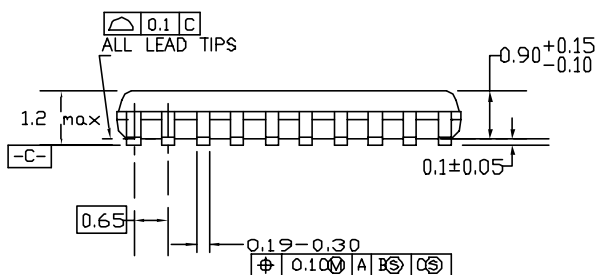
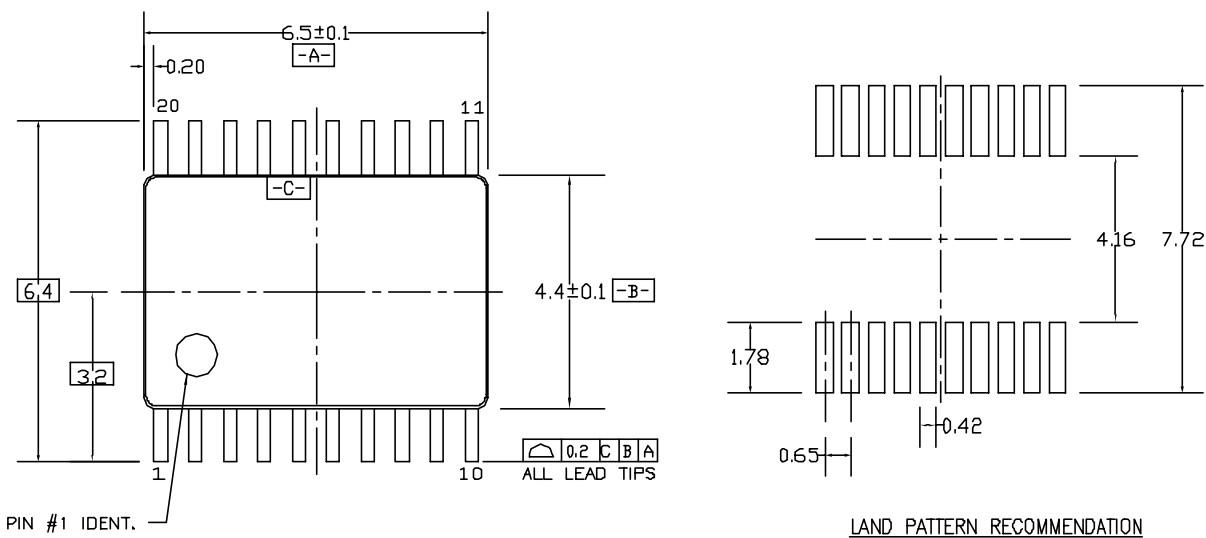
M20DREV

**Figure 2. 20-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide Package Number M20D**

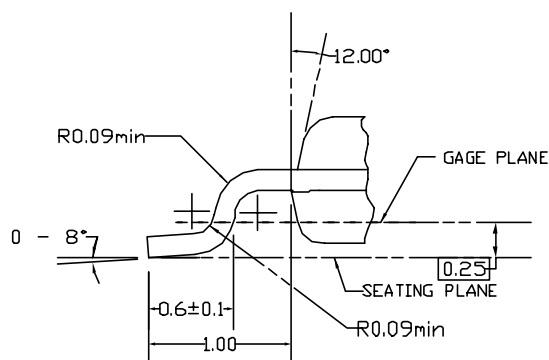
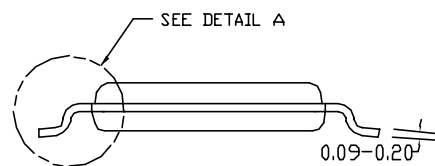


**Physical Dimensions** (Continued)

Dimensions are in millimeters unless otherwise noted.



DIMENSIONS ARE IN MILLIMETERS



DETAIL A

## NOTES:

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- DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLDS FLASH, AND TIE BAR EXTRUSIONS.
- DIMENSIONS AND TOLERANCES PER ANSI Y14.5M, 1982.

MTC20REVD1

**Figure 3. 20-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide Package Number MTC20**

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