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74AC541, 74ACT541 Octal Buffer/Line Driver with 3-STATE Outputs

Features

- I_{CC} and I_{OZ} reduced by 50%
- 3-STATE outputs
- Inputs and outputs opposite side of package, allowing easier interface to microprocessors
- Output source/sink 24mA
- 74AC541 is a non-inverting option of the 74AC540
- 74ACT541 has TTL-compatible inputs

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.

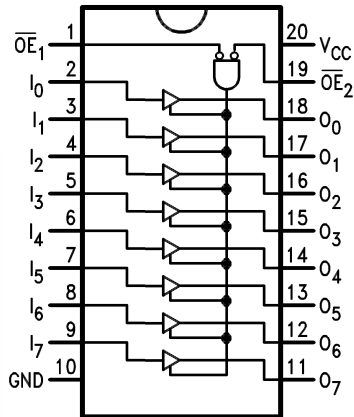
Ordering Information

| Order Number | Package Number | Package Description |
|--------------|----------------|-----------------------------------------------------------------------------|
| 74AC541SC | M20B | 20-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300" Wide |
| 74AC541SJ | M20D | 20-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide |
| 74AC541MTC | MTC20 | 20-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide |
| 74AC541PC | N20A | 20-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300" Wide |
| 74ACT541SC | M20B | 20-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300" Wide |
| 74ACT541MTC | MTC20 | 20-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide |

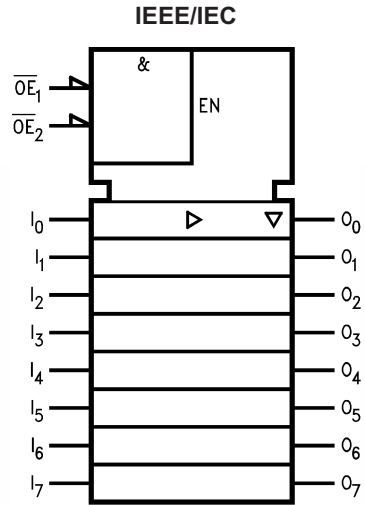
Device also available in Tape and Reel. Specify by appending suffix letter "X" to the ordering number.

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

Connection Diagram



Logic Symbol



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

X = Immaterial

L = LOW Voltage Level

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 |
| I_{IK} | DC Input Diode Current $V_I = -0.5V$ | -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 $V_O = -0.5V$ | -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 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: 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: V_{IN} from 0.8V to 2.0V, V_{CC} @ 4.5V, 5.5V | 125mV/ns |

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} = 0.1V or V _{CC} - 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 _{IL} | Maximum LOW Level Input Voltage | 3.0 | V _{OUT} = 0.1V or V _{CC} - 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 _{OH} | Minimum HIGH Level Output Voltage | 3.0 | I _{OUT} = -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 _{IN} = V _{IL} or V _{IH} , I _{OH} = -12mA | | 2.56 | 2.46 | | | |
| | | 4.5 | | V _{IN} = V _{IL} or V _{IH} , I _{OH} = -24mA | | 3.86 | 3.76 | | |
| | | 5.5 | | | V _{IN} = V _{IL} or V _{IH} , I _{OH} = -24mA ⁽¹⁾ | | 4.86 | | 4.76 |
| V _{OL} | Maximum LOW Level Output Voltage | 3.0 | I _{OUT} = 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 _{IN} = V _{IL} or V _{IH} , I _{OL} = 12mA | | 0.36 | 0.44 | | | |
| | | 4.5 | | V _{IN} = V _{IL} or V _{IH} , I _{OL} = 24mA | | 0.36 | 0.44 | | |
| | | 5.5 | | | V _{IN} = V _{IL} or V _{IH} , I _{OL} = 24mA ⁽¹⁾ | | 0.36 | 0.44 | |
| I _{IN} ⁽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 ⁽³⁾ | 5.5 | V _{OLD} = 1.65V Max. | | | 75 | | mA | |
| I _{OHD} | | 5.5 | V _{OHD} = 3.85V Min. | | | -75 | | mA | |
| I _{CC} ⁽²⁾ | Maximum Quiescent Supply Current | 5.5 | V _{IN} = V _{CC} or GND | | 4.0 | 40.0 | | μA | |

Notes:

- All outputs loaded; thresholds on input associated with output under test.
- I_{IN} and I_{CC} @ 3.0V are guaranteed to be less than or equal to the respective limit @ 5.5V V_{CC}.
- Maximum test duration 2.0ms, 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} = 0.1V or V _{CC} - 0.1V | 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} = 0.1V or V _{CC} - 0.1V | 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} = -50μA | 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} = -24mA | | 3.86 | 3.76 | | |
| | | 5.5 | V _{IN} = V _{IL} or V _{IH} , I _{OH} = -24mA ⁽⁴⁾ | | 4.86 | 4.76 | | |
| V _{OL} | Maximum LOW Level Output Voltage | 4.5 | I _{OUT} = 50μA | 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} = 24mA | | 0.36 | 0.44 | | |
| | | 5.5 | V _{IN} = V _{IL} or V _{IH} , I _{OL} = 24mA ⁽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} - 2.1V | 0.6 | | 1.5 | | mA |
| I _{OLD} | Minimum Dynamic Output Current ⁽⁵⁾ | 5.5 | V _{OLD} = 1.65V Max. | | | 75 | | mA |
| I _{OHD} | | 5.5 | V _{OHD} = 3.85V Min. | | | -75 | | mA |
| I _{CC} | Maximum Quiescent Supply Current | 5.5 | V _{IN} = V _{CC} or GND | | 4.0 | 40.0 | | 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 _{CC} (V) ⁽⁶⁾ | T _A = +25°C, C _L = 50pF | | | T _A = -40°C to +85°C, C _L = 50pF | | 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 | |

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 _{CC} (V) ⁽⁷⁾ | T _A = +25°C, C _L = 50pF | | | T _A = -40°C to +85°C, C _L = 50pF | | 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} | | | 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} | | | 2.0 | 6.5 | 9.0 | 2.0 | 9.5 | |
| t _{PHZ} | Output Disable Time | 5.0 | 1.5 | 5.5 | 7.5 | 1.5 | 8.0 | ns |
| t _{PLZ} | | | 1.5 | 5.5 | 7.5 | 1.5 | 8.0 | |

Note:

7. Voltage range 5.0 is 5.0V ± 0.5V.

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} = 5.0V | 30.0 | pF |
| | Power Dissipation Capacitance for ACT | | 70.0 | |

Physical Dimensions

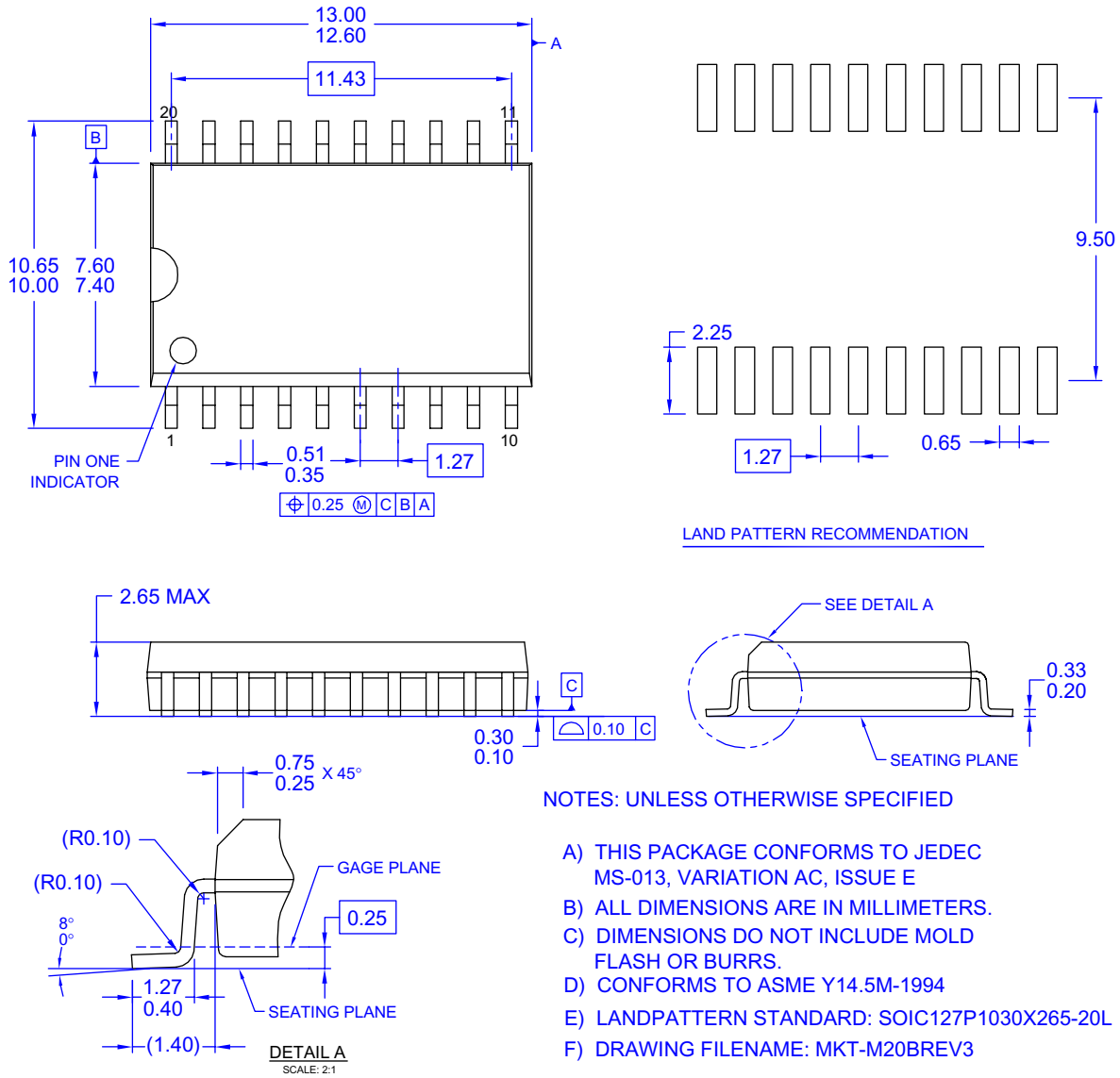


Figure 1. 20-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300" Wide

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Physical Dimensions (Continued)



M20DREVC

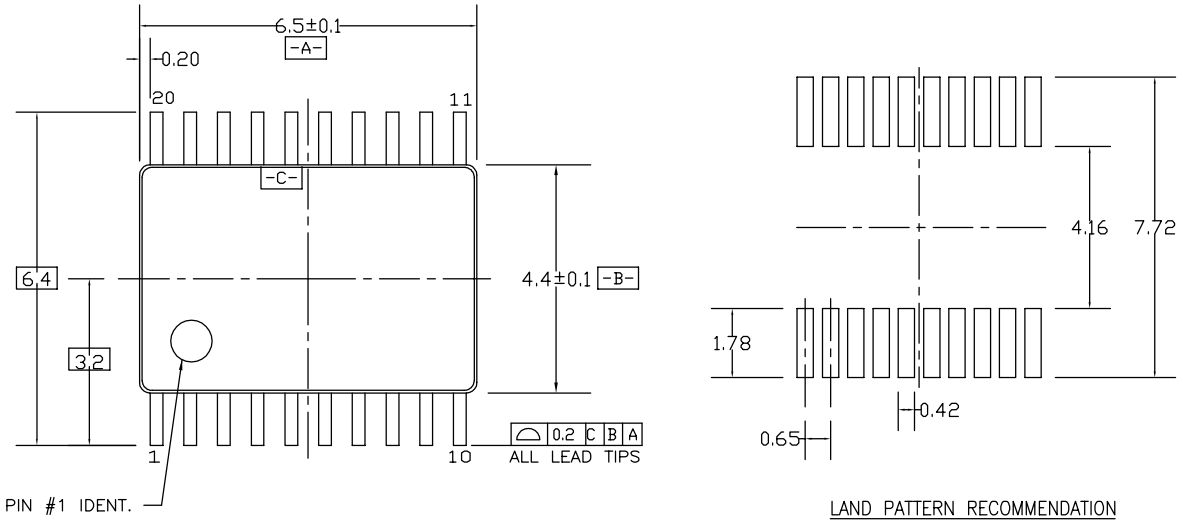
Figure 2. 20-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide

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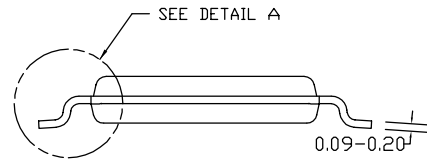
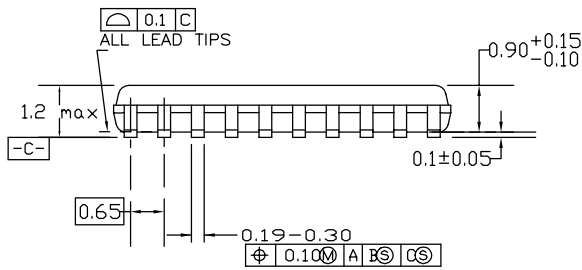
<http://www.fairchildsemi.com/packaging/>

Physical Dimensions (Continued)

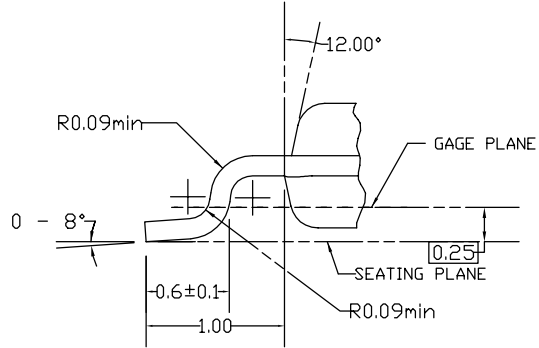


PIN #1 IDENT.

LAND PATTERN RECOMMENDATION



DIMENSIONS ARE IN MILLIMETERS



DETAIL A

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

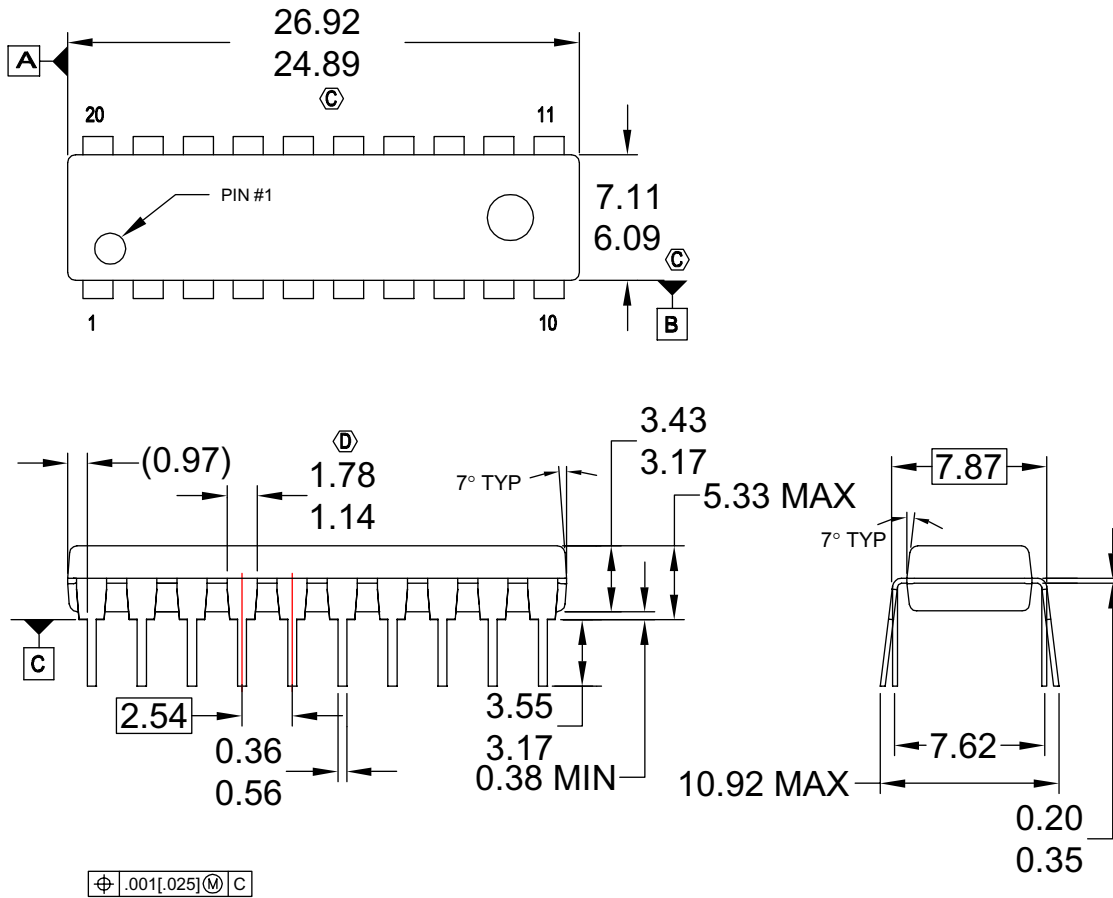
Figure 3. 20-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide

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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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|--------------------------|------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Advance Information | Formative or In Design | This datasheet contains the design specifications for product development. Specifications may change in any manner without notice. |
| Preliminary | First Production | This datasheet contains preliminary data; supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve design. |
| No Identification Needed | Full Production | This datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve the design. |
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