

May 1995

54F/74F240•54F/74F241•54F/74F244 Octal Buffers/Line Drivers with TRI-STATE® Outputs

General Description

The 'F240, 'F241 and 'F244 are octal buffers and line drivers designed to be employed as memory and address drivers, clock drivers and bus-oriented transmitters/receivers which provide improved PC and board density.

Features

- TRI-STATE outputs drive bus lines or buffer memory address registers
- Outputs sink 64 mA (48 mA mil)
- 12 mA source current
- Input clamp diodes limit high-speed termination effects
- Guaranteed 4000V minimum ESD protection

| Commercial | Military | Package Number | Package Description |
|--------------------|-------------------|----------------|---|
| 74F240PC | | N20A | 20-Lead (0.300" Wide) Molded Dual-In-Line |
| | 54F240DM (Note 2) | J20A | 20-Lead Ceramic Dual-In-Line |
| 74F240SC (Note 1) | | M20B | 20-Lead (0.300" Wide) Molded Small Outline, JEDEC |
| 74F240SJ (Note 1) | | M20D | 20-Lead (0.300" Wide) Molded Small Outline, EIAJ |
| | 54F240FM (Note 2) | W20A | 20-Lead Cerpack |
| | 54F240LM (Note 2) | E20A | 20-Lead Ceramic Leadless Chip Carrier, Type C |
| 74F241PC | | N20A | 20-Lead (0.300" Wide) Molded Dual-In-Line |
| | 54F241DM (Note 2) | J20A | 20-Lead Ceramic Dual-In-Line |
| 74F241SC (Note 1) | | M20B | 20-Lead (0.300" Wide) Molded Small Outline, JEDEC |
| 74F241SJ (Note 1) | | M20D | 20-Lead (0.300" Wide) Molded Small Outline, EIAJ |
| | 54F241FM (Note 2) | W20A | 20-Lead Cerpack |
| | 54F241LM (Note 2) | E20A | 20-Lead Ceramic Leadless Chip Carrier, Type C |
| 74F244PC | | N20A | 20-Lead (0.300" Wide) Molded Dual-In-Line |
| | 54F244DM (Note 2) | J20A | 20-Lead Ceramic Dual-In-Line |
| 74F244SC (Note 1) | | M20B | 20-Lead (0.300" Wide) Molded Small Outline, JEDEC |
| 74F244SJ (Note 1) | | M20D | 20-Lead (0.300" Wide) Molded Small Outline, EIAJ |
| 74F244MSA (Note 1) | | MSA20 | 20-Lead Molded Shrink Small Outline, EIAJ Type II |
| | 54F244FM (Note 2) | W20A | 20-Lead Cerpack |
| | 54F244LM (Note 2) | E20A | 20-Lead Ceramic Leadless Chip Carrier, Type C |

Note 1: Devices also available in 13" reel. Use Suffix = SCX, SJX and MSAX.

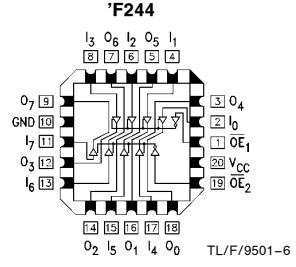
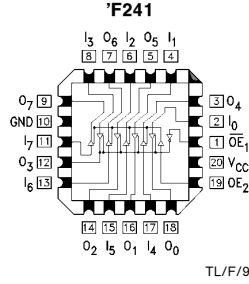
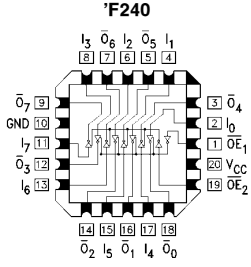
Note 2: Military grade device with environmental and burn-in processing. Use suffix = DMOB, FMOB and LMOB.

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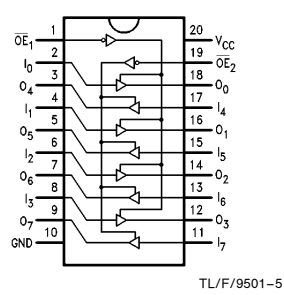
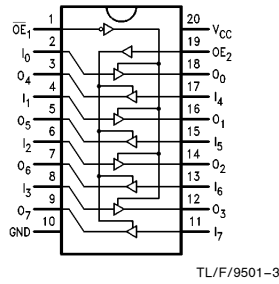
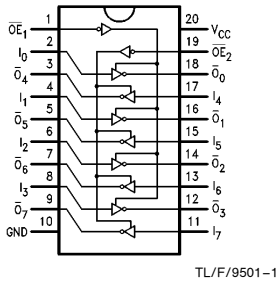
54F/74F240•54F/74F241•54F/74F244
Octal Buffers/Line Drivers with TRI-STATE Outputs

Connection Diagrams

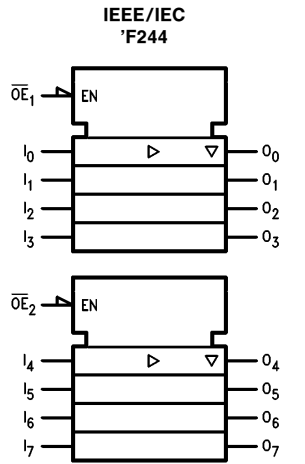
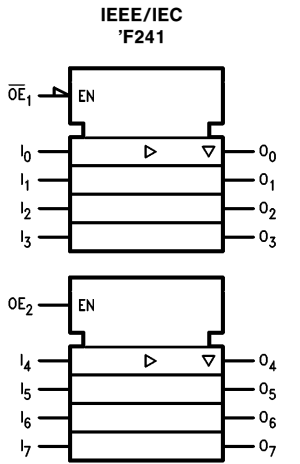
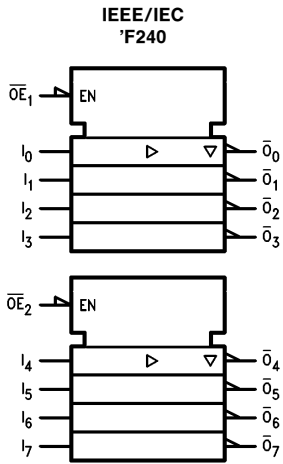
Pin Assignment for LCC



Pin Assignment for DIP, SOIC, SSOP and Flatpak



Logic Symbols



Unit Loading/Fan Out

| Pin Names | Description | 54F/74F | |
|------------------------------------|---|------------------|---|
| | | U.L. HIGH/LOW | Input I_{IH}/I_{IL} Output I_{OH}/I_{OL} |
| $\overline{OE}_1, \overline{OE}_2$ | TRI-STATE Output Enable Input (Active LOW) | 1.0/1.667 | 20 μ A/ -1 mA |
| OE_2 | TRI-STATE Output Enable Input (Active HIGH) | 1.0/1.667 | 20 μ A/ -1 mA |
| I_0-I_7 | Inputs ('F240) | 1.0/1.667* | 20 μ A/ -1 mA |
| I_0-I_7 | Inputs ('F241, 'F244) | 1.0/2.667* | 20 μ A/ -1.6 mA |
| O_0-O_7, O_0-O_7 | Outputs | 600/106.6 (80) | -12 mA/64 mA (48 mA) |

*Worst-case 'F240 enabled; 'F241, 'F244 disabled

Truth Tables

'F240

| \overline{OE}_1 | D_{1n} | O_{1n} | \overline{OE}_2 | D_{2n} | O_{2n} |
|-------------------|----------|----------|-------------------|----------|----------|
| H | X | Z | H | X | Z |
| L | H | L | L | H | L |
| L | L | H | L | L | H |

'F244

| \overline{OE}_1 | D_{1n} | O_{1n} | \overline{OE}_2 | D_{2n} | O_{2n} |
|-------------------|----------|----------|-------------------|----------|----------|
| H | X | Z | H | X | Z |
| L | H | H | L | H | H |
| L | L | L | L | L | L |

'F241

| \overline{OE}_1 | D_{1n} | O_{1n} | OE_2 | D_{2n} | O_{2n} |
|-------------------|----------|----------|--------|----------|----------|
| H | X | Z | L | X | Z |
| L | H | H | H | H | H |
| L | L | L | H | L | L |

H = HIGH Voltage Level
L = LOW Voltage Level
X = Immaterial
Z = High Impedance

Absolute Maximum Ratings (Note 1)

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.

| | |
|---------------------------------|-----------------|
| Storage Temperature | -65°C to +150°C |
| Ambient Temperature under Bias | -55°C to +125°C |
| Junction Temperature under Bias | -55°C to +175°C |
| Plastic | -55°C to +150°C |

V_{CC} Pin Potential to Ground Pin -0.5V to +7.0V

Input Voltage (Note 2) -0.5V to +7.0V

Input Current (Note 2) -30 mA to +5.0 mA

Voltage Applied to Output in HIGH State (with V_{CC} = 0V)
 Standard Output -0.5V to V_{CC}
 TRI-STATE Output -0.5V to +5.5V

Current Applied to Output in LOW State (Max) twice the rated I_{OL} (mA)

ESD Last Passing Voltage (Min) 4000V

Note 1: Absolute maximum ratings are values beyond which the device may be damaged or have its useful life impaired. Functional operation under these conditions is not implied.

Note 2: Either voltage limit or current limit is sufficient to protect inputs.

Recommended Operating Conditions

| | |
|------------------------------|-----------------|
| Free Air Ambient Temperature | -55°C to +125°C |
| Military | |
| Commercial | 0°C to +70°C |
| Supply Voltage | +4.5V to +5.5V |
| Military | |
| Commercial | +4.5V to +5.5V |

DC Electrical Characteristics

| Symbol | Parameter | | 54F/74F | | | Units | V _{CC} | Conditions |
|------------------|-----------------------------------|--|---------------------------------|-----|-----|-------|-----------------|---|
| | | | Min | Typ | Max | | | |
| V _{IH} | Input HIGH Voltage | | 2.0 | | | V | | Recognized as a HIGH Signal |
| V _{IL} | Input LOW Voltage | | 0.8 | | | V | | Recognized as a LOW Signal |
| V _{CD} | Input Clamp Diode Voltage | | -1.2 | | | V | Min | I _{IN} = -18 mA |
| V _{OH} | Output HIGH Voltage | 54F 10% V _{CC} 54F 10% V _{CC} 74F 10% V _{CC} 74F 10% V _{CC} 74F 5% V _{CC} | 2.4 2.0 2.4 2.0 2.7 | | | V | Min | I _{OH} = -3 mA I _{OH} = -12 mA I _{OH} = -3 mA I _{OH} = -15 mA I _{OH} = -3 mA |
| V _{OL} | Output LOW Voltage | 54F 10% V _{CC} 74F 10% V _{CC} | 0.55 0.55 | | | V | Min | I _{OL} = 48 mA I _{OL} = 64 mA |
| I _{IH} | Input HIGH Current | 54F 74F | 20.0 5.0 | | | μA | Max | V _{IN} = 2.7V |
| I _{BVI} | Input HIGH Current Breakdown Test | 54F 74F | 100 7.0 | | | μA | Max | V _{IN} = 7.0V |
| I _{CEX} | Output HIGH Leakage Current | 54F 74F | 250 50 | | | μA | Max | V _{OUT} = V _{CC} |
| V _{ID} | Input Leakage Test | 74F | 4.75 | | | V | 0.0 | I _{ID} = 1.9 μA All Other Pins Grounded |
| I _{OD} | Output Leakage Circuit Current | 74F | 3.75 | | | μA | 0.0 | V _{IOD} = 150 mV All Other Pins Grounded |
| I _{IL} | Input LOW Current | | -1.0 -1.6 | | | mA | Max | V _{IN} = 0.5V ($\overline{OE}_1, \overline{OE}_2, OE_2, D_n$ ('F240)) V _{IN} = 0.5V (D _n ('F241, 'F244)) |
| I _{OZH} | Output Leakage Current | | 50 | | | μA | Max | V _{OUT} = 2.7V |
| I _{OZL} | Output Leakage Current | | -50 | | | μA | Max | V _{OUT} = 0.5V |
| I _{OS} | Output Short-Circuit Current | | -100 -225 | | | mA | Max | V _{OUT} = 0V |
| I _{ZZ} | Bus Drainage Test | | 500 | | | μA | 0.0V | V _{OUT} = 5.25V |

DC Electrical Characteristics (Continued)

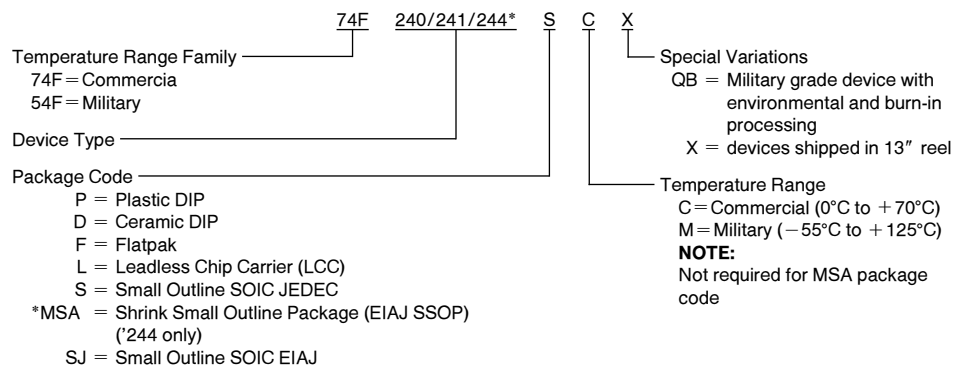
| Symbol | Parameter | 54F/74F | | | Units | V _{CC} | Conditions |
|------------------|-------------------------------------|---------|-----|-----|-------|-----------------|-------------------------|
| | | Min | Typ | Max | | | |
| I _{CCH} | Power Supply Current ('F240) | | 19 | 29 | mA | Max | V _O = HIGH |
| I _{CCL} | Power Supply Current ('F240) | | 50 | 75 | mA | Max | V _O = LOW |
| I _{CCZ} | Power Supply Current ('F240) | | 42 | 63 | mA | Max | V _O = HIGH Z |
| I _{CCH} | Power Supply Current ('F241, 'F244) | | 40 | 60 | mA | Max | V _O = HIGH |
| I _{CCL} | Power Supply Current ('F241, 'F244) | | 60 | 90 | mA | Max | V _O = LOW |
| I _{CCZ} | Power Supply Current ('F241, 'F244) | | 60 | 90 | mA | Max | V _O = HIGH Z |

AC Electrical Characteristics

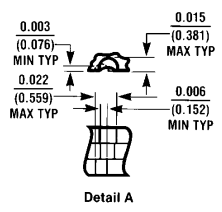
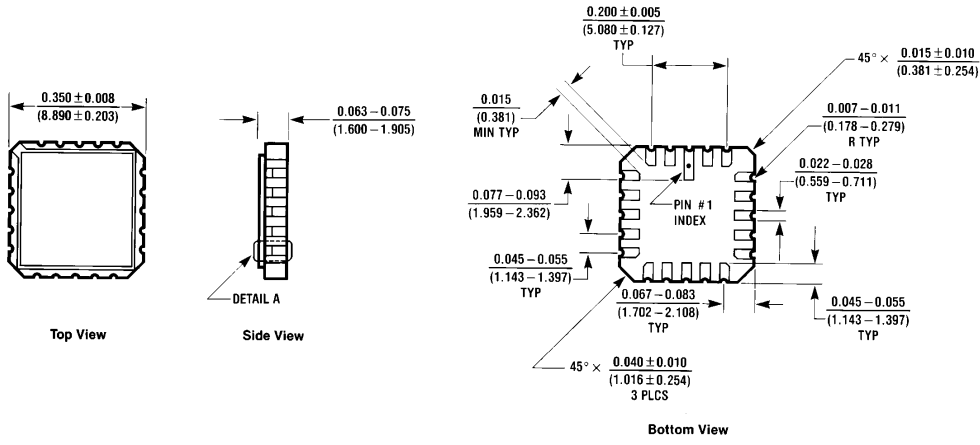
| Symbol | Parameter | 74F | | | 54F | | 74F | | Units |
|------------------|------------------------------------|---|-----|-----|--|------|--|------|-------|
| | | T _A = +25°C V _{CC} = +5.0V C _L = 50 pF | | | T _A , V _{CC} = Mil C _L = 50 pF | | T _A , V _{CC} = Com C _L = 50 pF | | |
| | | Min | Typ | Max | Min | Max | Min | Max | |
| t _{PLH} | Propagation Delay | 3.0 | 5.1 | 7.0 | 3.0 | 9.0 | 3.0 | 8.0 | ns |
| t _{PHL} | Data to Output ('F240) | 2.0 | 3.5 | 4.7 | 2.0 | 6.0 | 2.0 | 5.7 | |
| t _{PZH} | Output Enable Time ('F240) | 2.0 | 3.5 | 4.7 | 2.0 | 6.5 | 2.0 | 5.7 | ns |
| t _{PZL} | | 4.0 | 6.9 | 9.0 | 4.0 | 10.5 | 4.0 | 10.0 | |
| t _{PHZ} | Output Disable Time ('F240) | 2.0 | 4.0 | 5.3 | 2.0 | 6.5 | 2.0 | 6.3 | ns |
| t _{PLZ} | | 2.0 | 6.0 | 8.0 | 2.0 | 12.5 | 2.0 | 9.5 | |
| t _{PLH} | Propagation Delay | 2.5 | 4.0 | 5.2 | 2.0 | 6.5 | 2.5 | 6.2 | ns |
| t _{PHL} | Data to Output ('F241, 'F244) | 2.5 | 4.0 | 5.2 | 2.0 | 7.0 | 2.5 | 6.5 | |
| t _{PZH} | Output Enable Time ('F241, 'F244) | 2.0 | 4.3 | 5.7 | 2.0 | 7.0 | 2.0 | 6.7 | ns |
| t _{PZL} | | 2.0 | 5.4 | 7.0 | 2.0 | 8.5 | 2.0 | 8.0 | |
| t _{PHZ} | Output Disable Time ('F241, 'F244) | 2.0 | 4.5 | 6.0 | 2.0 | 7.0 | 2.0 | 7.0 | ns |
| t _{PLZ} | | 2.0 | 4.5 | 6.0 | 2.0 | 7.5 | 2.0 | 7.0 | |

Ordering Information

The device number is used to form part of a simplified purchasing code where the package type and temperature range are defined as follows:

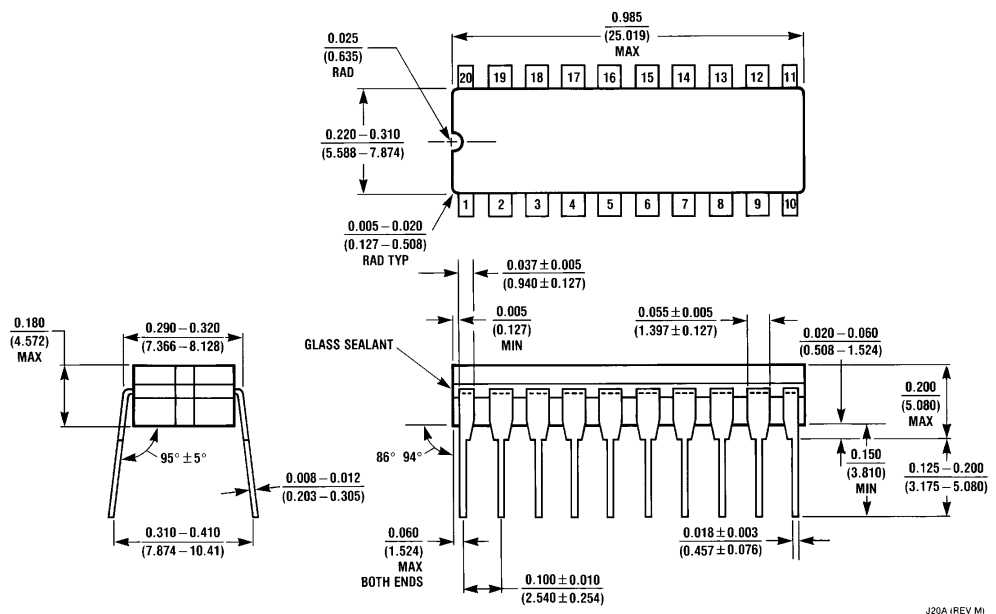


Physical Dimensions inches (millimeters)



20-Lead Ceramic Leadless Chip Carrier (L)
 NS Package Number E20A

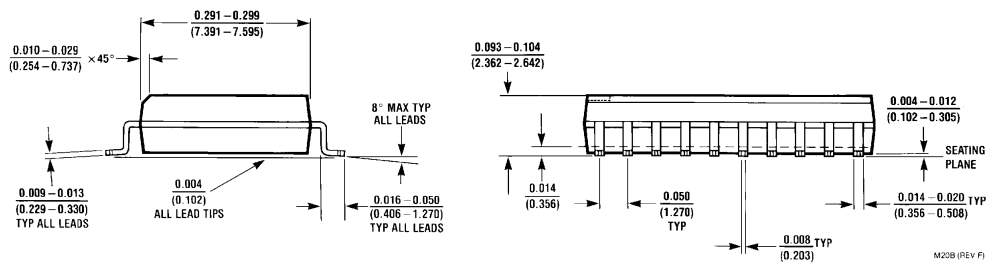
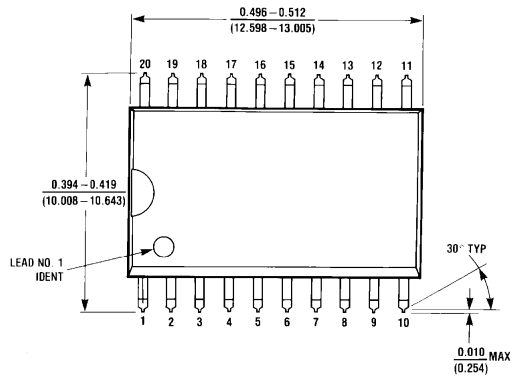
E20A (REV D)



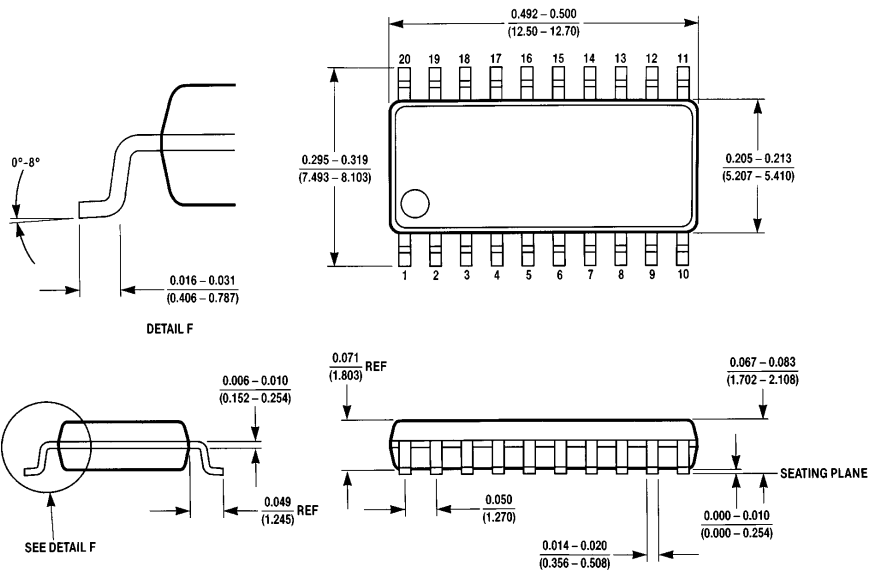
20-Lead Ceramic Dual-In-Line Package (D)
 NS Package Number J20A

J20A (REV M)

Physical Dimensions inches (millimeters) (Continued)

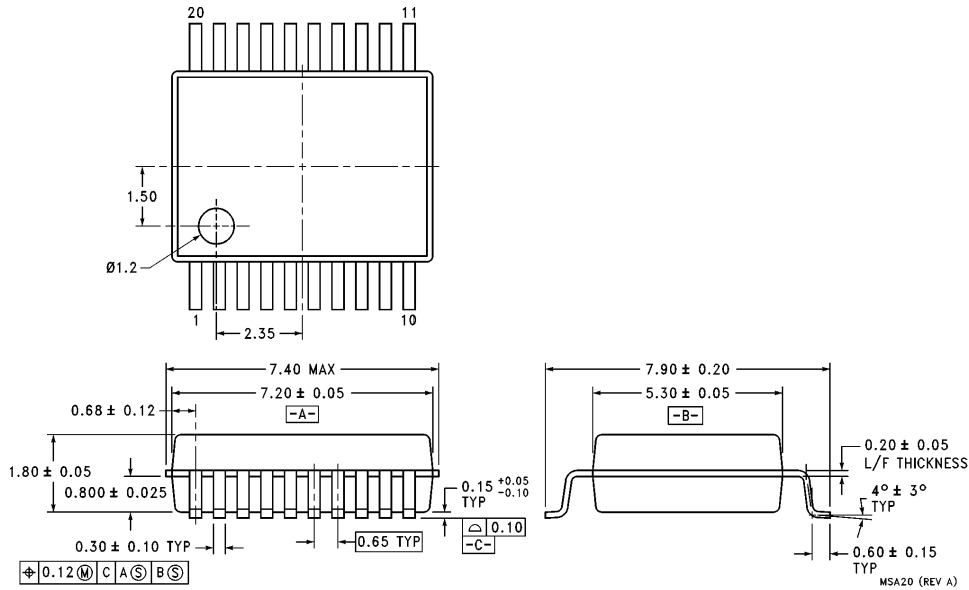


20-Lead (0.300" Wide) Molded Small Outline Package, JEDEC (S)
NS Package Number M20B

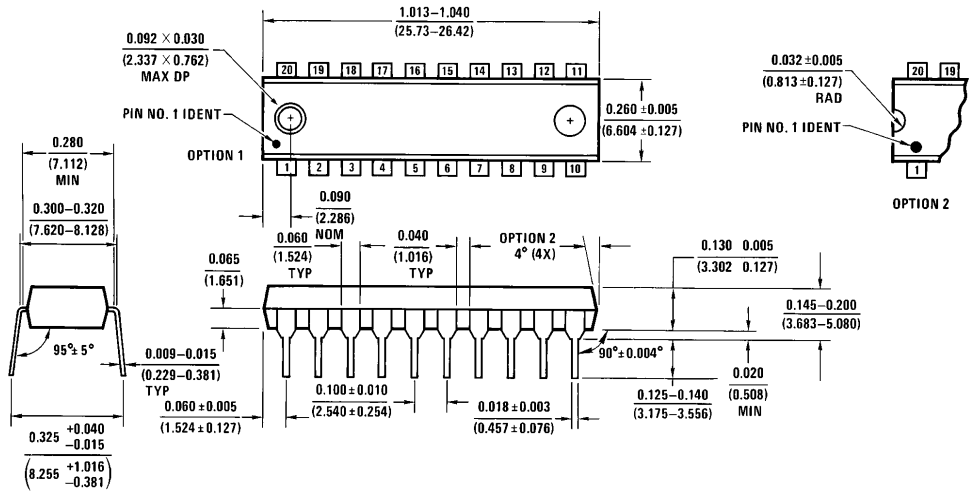


20-Lead (0.300" Wide) Molded Small Outline Package, EIAJ (SJ)
NS Package Number M20D

Physical Dimensions inches (millimeters) (Continued)

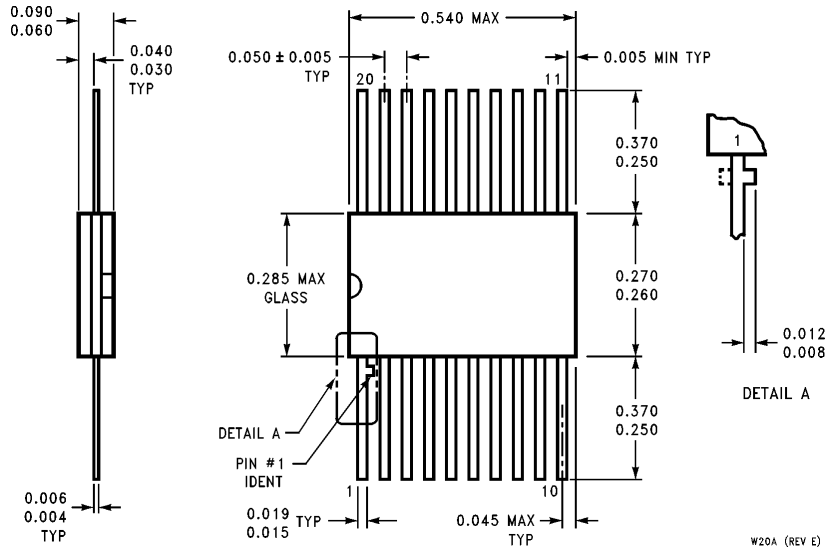


**20-Lead Molded Shrink Small Outline, EIAJ Type II (MSA)
NS Package Number MSA20**



**20-Lead (0.300" Wide) Molded Dual-In-Line Package (P)
NS Package Number N20A**

Physical Dimensions inches (millimeters) (Continued)



**20-Lead Ceramic Flatpak (F)
NS Package Number W20A**

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2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.



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