- 'LS377 and 'LS378 Contain Eight and Six Flip-Flops, Respectively, with Single-Rail Outputs

- 'LS379 Contains Four Flip-Flops with Double-Rail Outputs

- Individual Data Input to Each Flip-Flop

- Applications Include:
  Buffer/Storage Registers
  Shift Registers
  Pattern Generators

## description

These monolithic, positive-edge-triggered flip-flops utilize TTL circuitry to implement D-type flip-flop logic with an enable input. The 'LS377, 'LS378, and 'LS379 devices are similar to 'LS273, 'LS174, and 'LS175, respectively, but feature a common enable instead of a common clear.

Information at the D inputs meeting the setup time requirements is transferred to the Q outputs on the positive-going edge of the clock pulse if the enable input $\overline{G}$ is low. Clock triggering occurs at a particular voltage level and is not directly related to the transition time of the positive-going pulse. When the clock input is at either the high or low level, the D input signal has no effect at the output. The circuits are designed to prevent false clocking by transitions at the $\overline{G}$ input.

These flip-flops are guaranteed to respond to clock frequencies ranging from 0 to 30 MHz while maximum clock frequency is typically 40 megahertz. Typical power dissipation is 10 milliwatts per flip-flop.

**SN54LS377 . . . J PACKAGE**
**SN74LS377 . . . DW OR N PACKAGE**
**(TOP VIEW)**

| | | |
|---|---|---|
| $\overline{G}$ | 1 | 20 | $V_{CC}$ |
| 1Q | 2 | 19 | 8Q |
| 1D | 3 | 18 | 8D |
| 2D | 4 | 17 | 7D |
| 2Q | 5 | 16 | 7Q |
| 3Q | 6 | 15 | 6Q |
| 3D | 7 | 14 | 6D |
| 4D | 8 | 13 | 5D |
| 4Q | 9 | 12 | 5Q |
| GND | 10 | 11 | CLK |
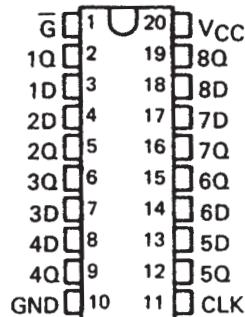
**SN54LS377 . . . FK PACKAGE**
**(TOP VIEW)**

Top pins: 1D(3) 1Q(2) 1G(1) V_CC(20) 8Q(19)

| 2D | 4 | 18 | 8D |
| 2Q | 5 | 17 | 7D |
| 3Q | 6 | 16 | 7Q |
| 3D | 7 | 15 | 6Q |
| 4D | 8 | 14 | 6D |

Bottom pins: 4Q(9) GND(10) CLK(11) 5Q(12) 5D(13)
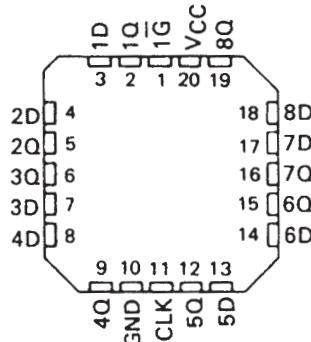
**SN54LS378 . . . J OR W PACKAGE**
**SN74LS378 . . . D OR N PACKAGE**
**(TOP VIEW)**

| $\overline{G}$ | 1 | 16 | $V_{CC}$ |
| 1Q | 2 | 15 | 6Q |
| 1D | 3 | 14 | 6D |
| 2D | 4 | 13 | 5D |
| 2Q | 5 | 12 | 5Q |
| 3D | 6 | 11 | 4D |
| 3Q | 7 | 10 | 4Q |
| GND | 8 | 9 | CLK |
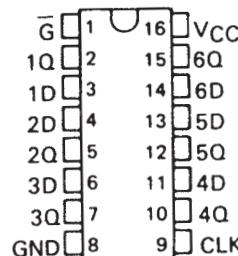
**SN54LS378 . . . FK PACKAGE**
**(TOP VIEW)**
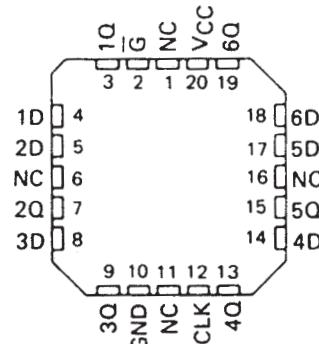
Top pins: 1Q(3) 1G(2) NC(1) V_CC(20) 6Q(19)

| 1D | 4 | 18 | 6D |
| 2D | 5 | 17 | 5D |
| NC | 6 | 16 | NC |
| 2Q | 7 | 15 | 5Q |
| 3D | 8 | 14 | 4D |

Bottom pins: 3Q(9) GND(10) NC(11) CLK(12) 4Q(13)

NC – No internal connection

## FUNCTION TABLE
### (EACH FLIP-FLOP)

| INPUTS | | | OUTPUTS | |
|---|---|---|---|---|
| $\overline{G}$ | CLOCK | DATA | Q | $\overline{Q}$ |
| H | X | X | $Q_0$ | $\overline{Q}_0$ |
| L | ↑ | H | H | L |
| L | ↑ | L | L | H |
| X | L | X | $Q_0$ | $\overline{Q}_0$ |

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**TEXAS INSTRUMENTS**

**SN54LS379 . . . J OR W PACKAGE**
**SN74LS379 . . . D OR N PACKAGE**
**(TOP VIEW)**

| | | | |
|---|---|---|---|
| $\overline{G}$ | 1 | 16 | $V_{CC}$ |
| 1Q | 2 | 15 | 4Q |
| 1$\overline{Q}$ | 3 | 14 | 4$\overline{Q}$ |
| 1D | 4 | 13 | 4D |
| 2D | 5 | 12 | 3D |
| 2$\overline{Q}$ | 6 | 11 | 3$\overline{Q}$ |
| 2Q | 7 | 10 | 3Q |
| GND | 8 | 9 | CLK |
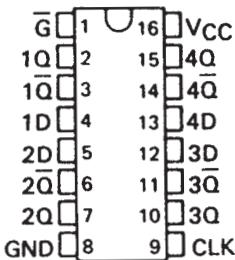
**SN54LS379 . . . FK PACKAGE**
**(TOP VIEW)**

Top pins: 1Q (3), $\overline{G}$ (2), NC (1), $V_{CC}$ (20), 4Q (19)

| | | | |
|---|---|---|---|
| 1$\overline{Q}$ | 4 | 18 | 4Q |
| 1D | 5 | 17 | 4D |
| NC | 6 | 16 | NC |
| 2D | 7 | 15 | 3D |
| 2$\overline{Q}$ | 8 | 14 | 3$\overline{Q}$ |

Bottom pins: 2Q (9), GND (10), NC (11), CLK (12), 3Q (13)
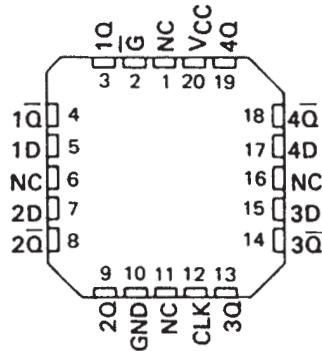
NC – No internal connection

## logic diagram (positive logic)



TO  7 ('LS377)
    5 ('LS378)
    3 ('LS379)
OTHER FLIP-FLOPS

$\overline{Q}$ ('LS379 ONLY)

## logic symbols†



'LS377

'LS378

'LS379
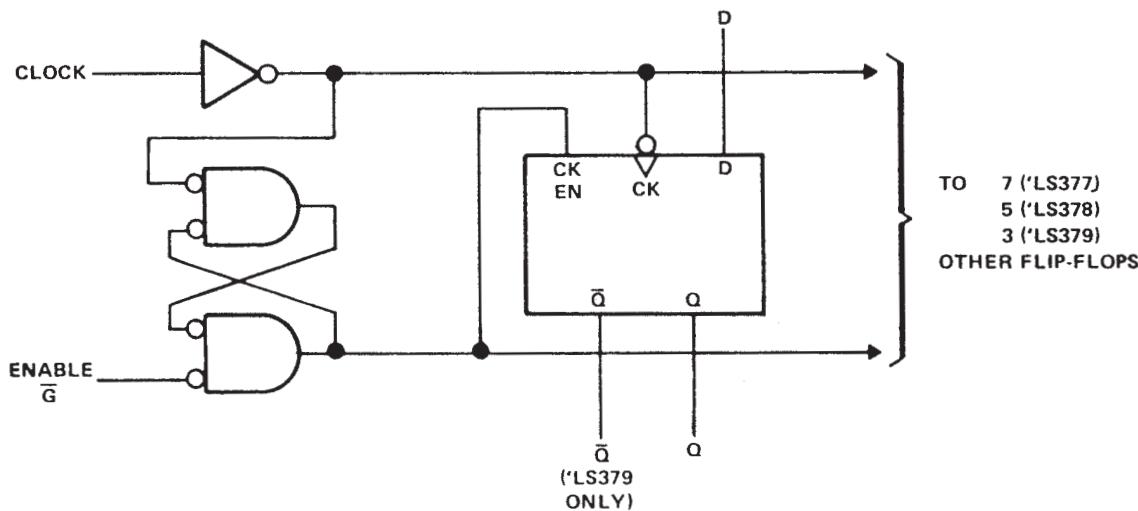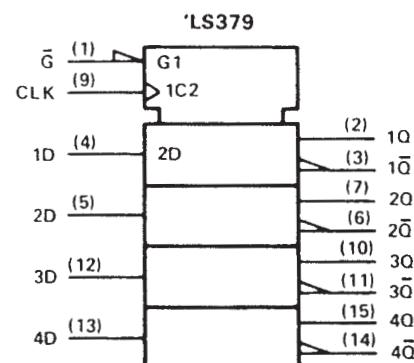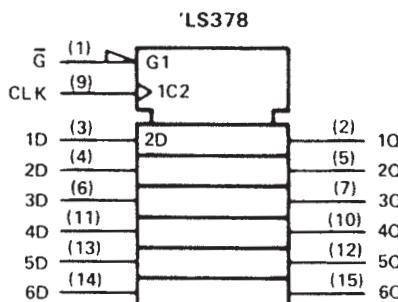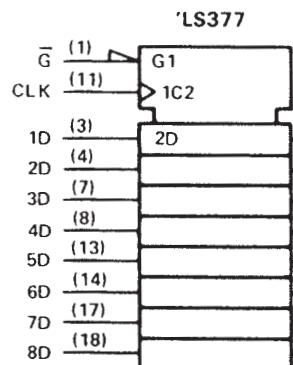
† These symbols are in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.
Pin numbers shown are for DW, J, and N packages.

## schematics of inputs and outputs

| EQUIVALENT OF DATA INPUT | EQUIVALENT OF CLOCK INPUTS |
|---|---|
| 'LS379 : $R_{eq}$ = 30 kΩ NOM<br>others : $R_{eq}$ = 25 kΩ NOM | 'LS379 : $R_{eq}$ = 17 kΩ NOM<br>others : $R_{eq}$ = 20 kΩ NOM |
| EQUIVALENT OF ENABLE INPUTS | TYPICAL OF ALL OUTPUTS |
| 'LS379 : $R_{eq}$ = 25 kΩ NOM<br>others : $R_{eq}$ = 20 kΩ NOM | |
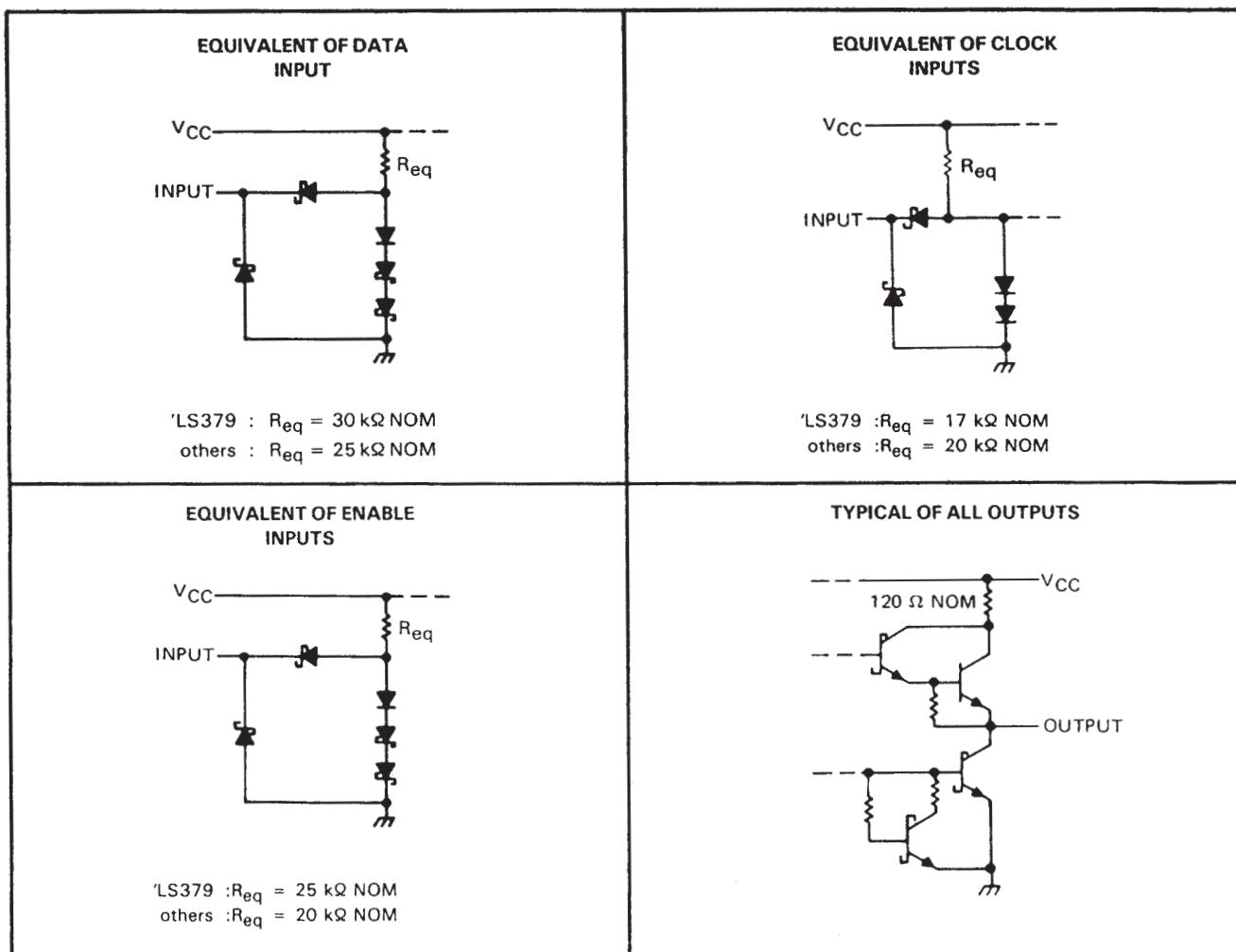
## absolute maximum rating over operating free-air temperature range (unless otherwise noted)

Supply voltage, $V_{CC}$ (see Note 1) . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 7 V

Input voltage . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 7 V

Operating free-air temperature range: SN54LS' . . . . . . . . . . . . . . . . . . . . . . −55°C to 125°C

SN74LS' . . . . . . . . . . . . . . . . . . . . . . . . . 0°C to 70°C

Storage temperature range . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . −65°C to 150°C

NOTE 1:  Voltage values are with respect to network ground terminal.

## recommended operating conditions

| | | SN54LS' MIN | SN54LS' NOM | SN54LS' MAX | SN74LS' MIN | SN74LS' NOM | SN74LS' MAX | UNIT |
|---|---|---|---|---|---|---|---|---|
| Supply voltage, $V_{CC}$ | | 4.5 | 5 | 5.5 | 4.75 | 5 | 5.25 | V |
| High-level output current, $I_{OH}$ | | | | −400 | | | −400 | μA |
| Low-level output current, $I_{OL}$ | | | | 4 | | | 8 | mA |
| Clock frequency, $f_{clock}$ | | 0 | | 30 | 0 | | 30 | MHz |
| Width of clock pulse, $t_W$ | | 20 | | | 20 | | | ns |
| Setup time, $t_{su}$ | Data input | 20† | | | 20† | | | ns |
| | Enable active-state | 25† | | | 25† | | | |
| | Enable inactive-state | 10† | | | 10† | | | |
| Hold time, $t_h$ | Data and enable | 5† | | | 5† | | | ns |
| Operating free-air temperature, $T_A$ | | −55 | | 125 | 0 | | 70 | °C |

† The arrow indicates that the rising edge of the clock pulse is used for reference.

## electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

| PARAMETER | | TEST CONDITIONS† | | SN54LS' MIN | SN54LS' TYP‡ | SN54LS' MAX | SN74LS' MIN | SN74LS' TYP‡ | SN74LS' MAX | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|
| $V_{IH}$ | High-level input voltage | | | 2 | | | 2 | | | V |
| $V_{IL}$ | Low-level input voltage | | | | | 0.7 | | | 0.8 | V |
| $V_{IK}$ | Input clamp voltage | $V_{CC}$ = MIN, | $I_I$ = −18 mA | | | −1.5 | | | −1.5 | V |
| $V_{OH}$ | High-level output voltage | $V_{CC}$ = MIN, $V_{IL} = V_{IL}$ max, | $V_{IH}$ = 2 V, $I_{OH}$ = −400 μA | 2.5 | 3.5 | | 2.7 | 3.5 | | V |
| $V_{OL}$ | Low-level output voltage | $V_{CC}$ = MIN, $V_{IL} = V_{IL}$ max | $V_{IH}$ = 2 V, $I_{OL}$ = 4 mA | | 0.25 | 0.4 | | 0.25 | 0.4 | V |
| | | | $I_{OL}$ = 8 mA | | | | | 0.35 | 0.5 | |
| $I_I$ | Input current at maximum input voltage | $V_{CC}$ = MAX, | $V_I$ = 7 V | | | 0.1 | | | 0.1 | mA |
| $I_{IH}$ | High-level input current | $V_{CC}$ = MAX, | $V_I$ = 2.7 V | | | 20 | | | 20 | μA |
| $I_{IL}$ | Low-level input current | $V_{CC}$ = MAX, | $V_I$ = 0.4 V | | | −0.4 | | | −0.4 | mA |
| $I_{OS}$ | Short-circuit output current§ | $V_{CC}$ = MAX | | −20 | | −100 | −20 | | −100 | mA |
| $I_{CC}$ | Supply current | $V_{CC}$ = MAX, | See Note 2 'LS377 | | 17 | 28 | | 17 | 28 | mA |
| | | | 'LS378 | | 13 | 22 | | 13 | 22 | mA |
| | | | 'LS379 | | 9 | 15 | | 9 | 15 | mA |

† For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

‡ All typical values are at $V_{CC}$ = 5 V, $T_A$ = 25°C.

§ Note more than one input should be shorted at a time, and duration of the short-circuit should not exceed one second.

NOTE 2: With all outputs open and ground applied to all data and enable inputs, $I_{CC}$ is measured after a momentary ground, then 4.5 V, is applied to clock.

## switching characteristics, $V_{CC}$ = 5 V, $T_A$ = 25°C

| PARAMETER | | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|
| $f_{max}$ | Maximum clock frequency | $C_L$ = 15 pF, | 30 | 40 | | MHz |
| $t_{PLH}$ | Propagation delay time, low-to-high-level output from clock | $R_L$ = 2 kΩ | | 17 | 27 | ns |
| $t_{PHL}$ | Propagation delay time, high-to-low-level output from clock | See Note 3 | | 18 | 27 | ns |

NOTE 3: Load circuits and voltage waveforms are shown in Section 1.

## PACKAGING INFORMATION

| Orderable Device | Status [1] | Package Type | Package Drawing | Pins | Package Qty | Eco Plan [2] | Lead/Ball Finish | MSL Peak Temp [3] |
|---|---|---|---|---|---|---|---|---|
| 5962-8992501EA | ACTIVE | CDIP | J | 16 | 1 | TBD | Call TI | Level-NC-NC-NC |
| 5962-8992501FA | ACTIVE | CFP | W | 16 | 1 | TBD | Call TI | Level-NC-NC-NC |
| 5962-8992501FA | ACTIVE | CFP | W | 16 | 1 | TBD | Call TI | Level-NC-NC-NC |
| JM38510/32504B2A | ACTIVE | LCCC | FK | 20 | 1 | TBD | Call TI | Level-NC-NC-NC |
| JM38510/32504B2A | ACTIVE | LCCC | FK | 20 | 1 | TBD | Call TI | Level-NC-NC-NC |
| JM38510/32504BRA | ACTIVE | CDIP | J | 20 | 1 | TBD | Call TI | Level-NC-NC-NC |
| JM38510/32504BRA | ACTIVE | CDIP | J | 20 | 1 | TBD | Call TI | Level-NC-NC-NC |
| JM38510/32504BSA | ACTIVE | CFP | W | 20 | 1 | TBD | Call TI | Level-NC-NC-NC |
| JM38510/32504BSA | ACTIVE | CFP | W | 20 | 1 | TBD | Call TI | Level-NC-NC-NC |
| SN54LS377J | ACTIVE | CDIP | J | 20 | 1 | TBD | Call TI | Level-NC-NC-NC |
| SN54LS377J | ACTIVE | CDIP | J | 20 | 1 | TBD | Call TI | Level-NC-NC-NC |
| SN54LS378J | ACTIVE | CDIP | J | 16 | 1 | TBD | Call TI | Level-NC-NC-NC |
| SN54LS378J | ACTIVE | CDIP | J | 16 | 1 | TBD | Call TI | Level-NC-NC-NC |
| SN54LS379J | ACTIVE | CDIP | J | 16 | 1 | TBD | Call TI | Level-NC-NC-NC |
| SN54LS379J | ACTIVE | CDIP | J | 16 | 1 | TBD | Call TI | Level-NC-NC-NC |
| SN74LS377DW | ACTIVE | SOIC | DW | 20 | 25 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74LS377DW | ACTIVE | SOIC | DW | 20 | 25 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74LS377DWE4 | ACTIVE | SOIC | DW | 20 | 25 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74LS377DWE4 | ACTIVE | SOIC | DW | 20 | 25 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74LS377DWR | ACTIVE | SOIC | DW | 20 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74LS377DWR | ACTIVE | SOIC | DW | 20 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74LS377DWRE4 | ACTIVE | SOIC | DW | 20 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74LS377DWRE4 | ACTIVE | SOIC | DW | 20 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74LS377N | ACTIVE | PDIP | N | 20 | 20 | Pb-Free (RoHS) | CU NIPDAU | Level-NC-NC-NC |
| SN74LS377N | ACTIVE | PDIP | N | 20 | 20 | Pb-Free (RoHS) | CU NIPDAU | Level-NC-NC-NC |
| SN74LS377N3 | OBSOLETE | PDIP | N | 20 | | TBD | Call TI | Call TI |
| SN74LS377N3 | OBSOLETE | PDIP | N | 20 | | TBD | Call TI | Call TI |
| SN74LS377NE4 | ACTIVE | PDIP | N | 20 | 20 | Pb-Free (RoHS) | CU NIPDAU | Level-NC-NC-NC |
| SN74LS377NE4 | ACTIVE | PDIP | N | 20 | 20 | Pb-Free (RoHS) | CU NIPDAU | Level-NC-NC-NC |
| SN74LS377NSR | ACTIVE | SO | NS | 20 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74LS377NSR | ACTIVE | SO | NS | 20 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74LS377NSRE4 | ACTIVE | SO | NS | 20 | 2000 | Green (RoHS & | CU NIPDAU | Level-1-260C-UNLIM |

| Orderable Device | Status [1] | Package Type | Package Drawing | Pins | Package Qty | Eco Plan [2] | Lead/Ball Finish | MSL Peak Temp [3] |
|---|---|---|---|---|---|---|---|---|
| | | | | | | no Sb/Br) | | |
| SN74LS377NSRE4 | ACTIVE | SO | NS | 20 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74LS378D | ACTIVE | SOIC | D | 16 | 40 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74LS378D | ACTIVE | SOIC | D | 16 | 40 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74LS378DE4 | ACTIVE | SOIC | D | 16 | 40 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74LS378DE4 | ACTIVE | SOIC | D | 16 | 40 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74LS378DR | ACTIVE | SOIC | D | 16 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74LS378DR | ACTIVE | SOIC | D | 16 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74LS378DRE4 | ACTIVE | SOIC | D | 16 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74LS378DRE4 | ACTIVE | SOIC | D | 16 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74LS378N | ACTIVE | PDIP | N | 16 | 25 | Pb-Free (RoHS) | CU NIPDAU | Level-NC-NC-NC |
| SN74LS378N | ACTIVE | PDIP | N | 16 | 25 | Pb-Free (RoHS) | CU NIPDAU | Level-NC-NC-NC |
| SN74LS378N3 | OBSOLETE | PDIP | N | 16 | | TBD | Call TI | Call TI |
| SN74LS378N3 | OBSOLETE | PDIP | N | 16 | | TBD | Call TI | Call TI |
| SN74LS378NSR | ACTIVE | SO | NS | 16 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74LS378NSR | ACTIVE | SO | NS | 16 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74LS378NSRE4 | ACTIVE | SO | NS | 16 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74LS378NSRE4 | ACTIVE | SO | NS | 16 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74LS379D | OBSOLETE | SOIC | D | 16 | | TBD | Call TI | Call TI |
| SN74LS379D | OBSOLETE | SOIC | D | 16 | | TBD | Call TI | Call TI |
| SN74LS379J | OBSOLETE | CDIP | J | 16 | | TBD | Call TI | Call TI |
| SN74LS379J | OBSOLETE | CDIP | J | 16 | | TBD | Call TI | Call TI |
| SN74LS379N | OBSOLETE | PDIP | N | 16 | | TBD | Call TI | Call TI |
| SN74LS379N | OBSOLETE | PDIP | N | 16 | | TBD | Call TI | Call TI |
| SNJ54LS377FK | ACTIVE | LCCC | FK | 20 | 1 | TBD | Call TI | Level-NC-NC-NC |
| SNJ54LS377FK | ACTIVE | LCCC | FK | 20 | 1 | TBD | Call TI | Level-NC-NC-NC |
| SNJ54LS377J | ACTIVE | CDIP | J | 20 | 1 | TBD | Call TI | Level-NC-NC-NC |
| SNJ54LS377J | ACTIVE | CDIP | J | 20 | 1 | TBD | Call TI | Level-NC-NC-NC |
| SNJ54LS377W | ACTIVE | CFP | W | 20 | 1 | TBD | Call TI | Level-NC-NC-NC |
| SNJ54LS377W | ACTIVE | CFP | W | 20 | 1 | TBD | Call TI | Level-NC-NC-NC |
| SNJ54LS378FK | OBSOLETE | LCCC | FK | 20 | | TBD | Call TI | Call TI |
| SNJ54LS378FK | OBSOLETE | LCCC | FK | 20 | | TBD | Call TI | Call TI |
| SNJ54LS378J | ACTIVE | CDIP | J | 16 | 1 | TBD | Call TI | Level-NC-NC-NC |

| Orderable Device | Status [1] | Package Type | Package Drawing | Pins | Package Qty | Eco Plan [2] | Lead/Ball Finish | MSL Peak Temp [3] |
|---|---|---|---|---|---|---|---|---|
| SNJ54LS378J | ACTIVE | CDIP | J | 16 | 1 | TBD | Call TI | Level-NC-NC-NC |
| SNJ54LS378W | ACTIVE | CFP | W | 16 | 1 | TBD | Call TI | Level-NC-NC-NC |
| SNJ54LS378W | ACTIVE | CFP | W | 16 | 1 | TBD | Call TI | Level-NC-NC-NC |
| SNJ54LS379FK | ACTIVE | LCCC | FK | 20 | 1 | TBD | Call TI | Level-NC-NC-NC |
| SNJ54LS379FK | ACTIVE | LCCC | FK | 20 | 1 | TBD | Call TI | Level-NC-NC-NC |
| SNJ54LS379J | ACTIVE | CDIP | J | 16 | 1 | TBD | Call TI | Level-NC-NC-NC |
| SNJ54LS379J | ACTIVE | CDIP | J | 16 | 1 | TBD | Call TI | Level-NC-NC-NC |
| SNJ54LS379W | ACTIVE | CFP | W | 16 | 1 | TBD | Call TI | Level-NC-NC-NC |
| SNJ54LS379W | ACTIVE | CFP | W | 16 | 1 | TBD | Call TI | Level-NC-NC-NC |

[1] The marketing status values are defined as follows:
**ACTIVE:** Product device recommended for new designs.
**LIFEBUY:** TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.
**NRND:** Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.
**PREVIEW:** Device has been announced but is not in production. Samples may or may not be available.
**OBSOLETE:** TI has discontinued the production of the device.

[2] Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS) or Green (RoHS & no Sb/Br) - please check http://www.ti.com/productcontent for the latest availability information and additional product content details.
**TBD:** The Pb-Free/Green conversion plan has not been defined.
**Pb-Free (RoHS):** TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.
**Green (RoHS & no Sb/Br):** TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

[3] MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

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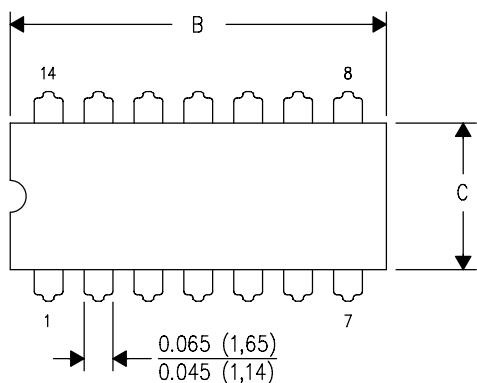
| DIM \ PINS ** | 14 | 16 | 18 | 20 |
|---|---|---|---|---|
| A | 0.300 (7,62) BSC | 0.300 (7,62) BSC | 0.300 (7,62) BSC | 0.300 (7,62) BSC |
| B MAX | 0.785 (19,94) | .840 (21,34) | 0.960 (24,38) | 1.060 (26,92) |
| B MIN | —— | —— | —— | —— |
| C MAX | 0.300 (7,62) | 0.300 (7,62) | 0.310 (7,87) | 0.300 (7,62) |
| C MIN | 0.245 (6,22) | 0.245 (6,22) | 0.220 (5,59) | 0.245 (6,22) |

B

14        8

1        7

0.065 (1,65)
0.045 (1,14)

0.005 (0,13) MIN

0.060 (1,52)
0.015 (0,38)

0.200 (5,08) MAX

Seating Plane

0.130 (3,30) MIN

0.026 (0,66)
0.014 (0,36)

0.100 (2,54)

A

0°-15°

0.014 (0,36)
0.008 (0,20)

C
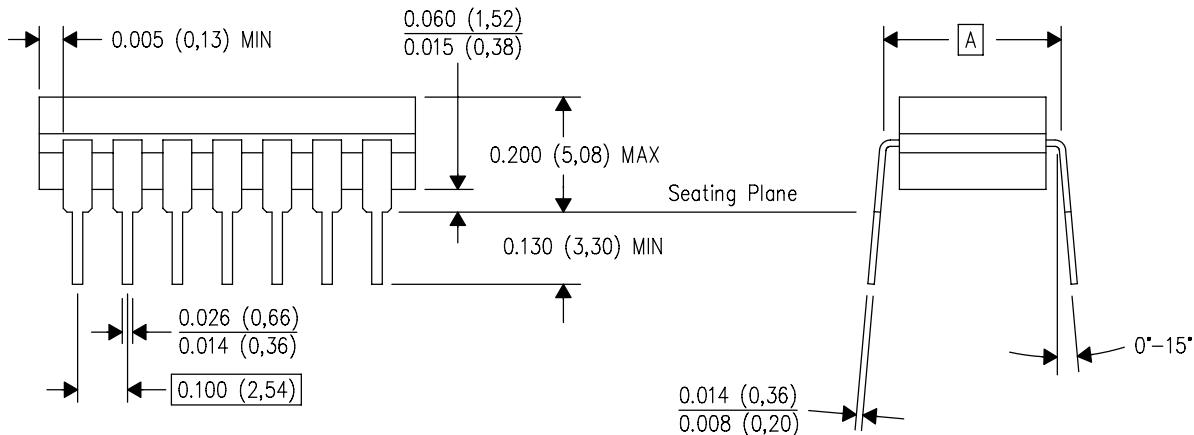
4040083/F 03/03

NOTES:   A.   All linear dimensions are in inches (millimeters).
         B.   This drawing is subject to change without notice.
         C.   This package is hermetically sealed with a ceramic lid using glass frit.
         D.   Index point is provided on cap for terminal identification only on press ceramic glass frit seal only.
         E.   Falls within MIL STD 1835 GDIP1-T14, GDIP1-T16, GDIP1-T18 and GDIP1-T20.

W (R−GDFP−F16)                                    CERAMIC DUAL FLATPACK
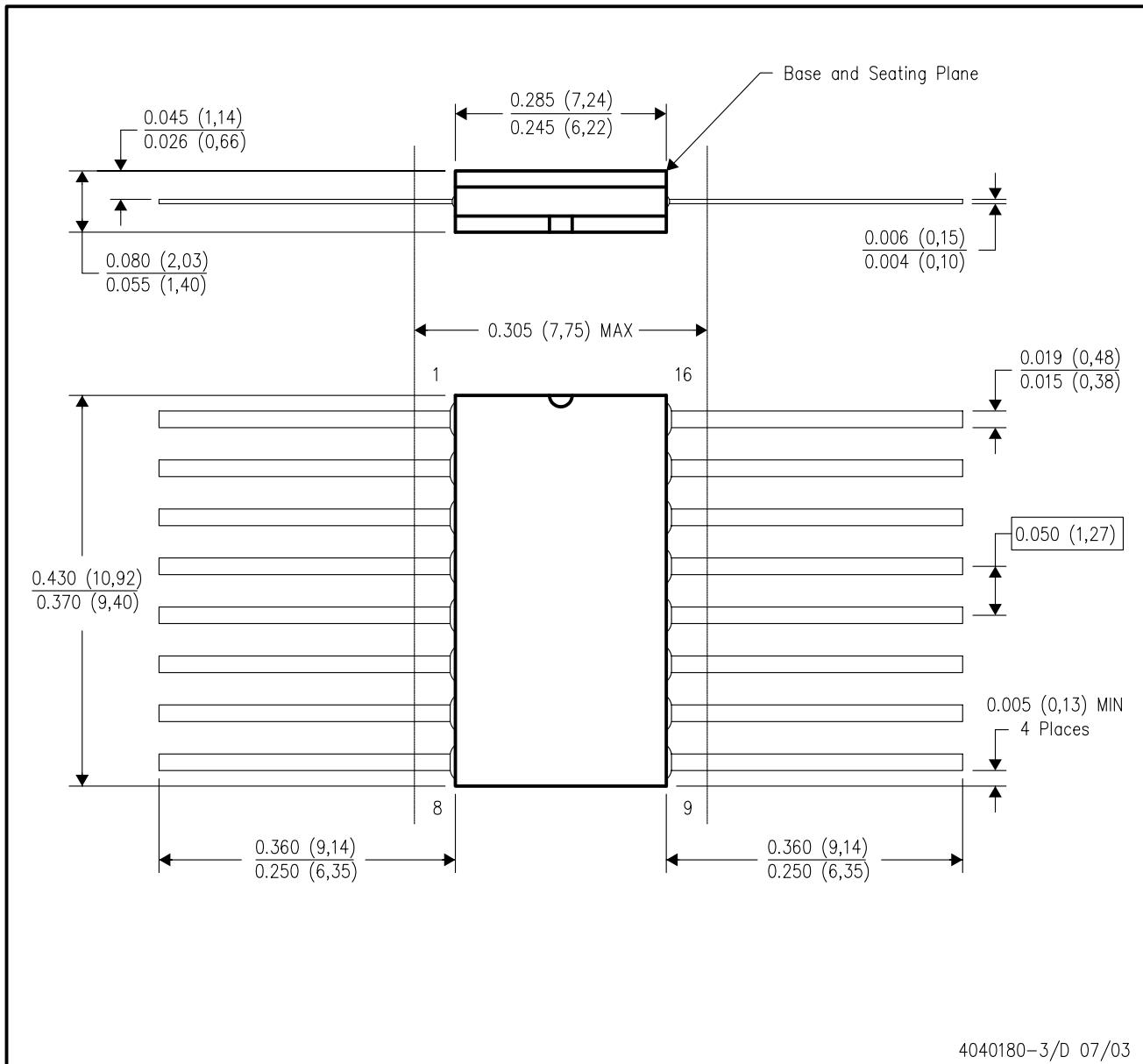
Base and Seating Plane

$\dfrac{0.045\ (1,14)}{0.026\ (0,66)}$

$\dfrac{0.285\ (7,24)}{0.245\ (6,22)}$

$\dfrac{0.080\ (2,03)}{0.055\ (1,40)}$

$\dfrac{0.006\ (0,15)}{0.004\ (0,10)}$

0.305 (7,75) MAX

$\dfrac{0.019\ (0,48)}{0.015\ (0,38)}$

1                16

$\dfrac{0.430\ (10,92)}{0.370\ (9,40)}$

0.050 (1,27)

8                9

0.005 (0,13) MIN
4 Places

$\dfrac{0.360\ (9,14)}{0.250\ (6,35)}$

$\dfrac{0.360\ (9,14)}{0.250\ (6,35)}$

4040180−3/D 07/03

NOTES:   A.  All linear dimensions are in inches (millimeters).
         B.  This drawing is subject to change without notice.
         C.  This package can be hermetically sealed with a ceramic lid using glass frit.
         D.  Index point is provided on cap for terminal identification only.
         E.  Falls within MIL STD 1835 GDFP1−F16 and JEDEC MO−092AC

## W (R–GDFP–F20)                    CERAMIC DUAL FLATPACK

Base and Seating Plane

0.300 (7,62)
0.245 (6,22)

0.045 (1,14)
0.026 (0,66)

0.009 (0,23)
0.004 (0,10)

0.100 (2,45)
0.045 (1,14)

0.320 (8,13) MAX

1                    20

0.022 (0,56)
0.015 (0,38)

0.540 (13,72) MAX

0.050 (1,27)

0.005 (0,13) MIN
4 Places

10                   11

0.370 (9,40)            0.370 (9,40)
0.250 (6,35)            0.250 (6,35)
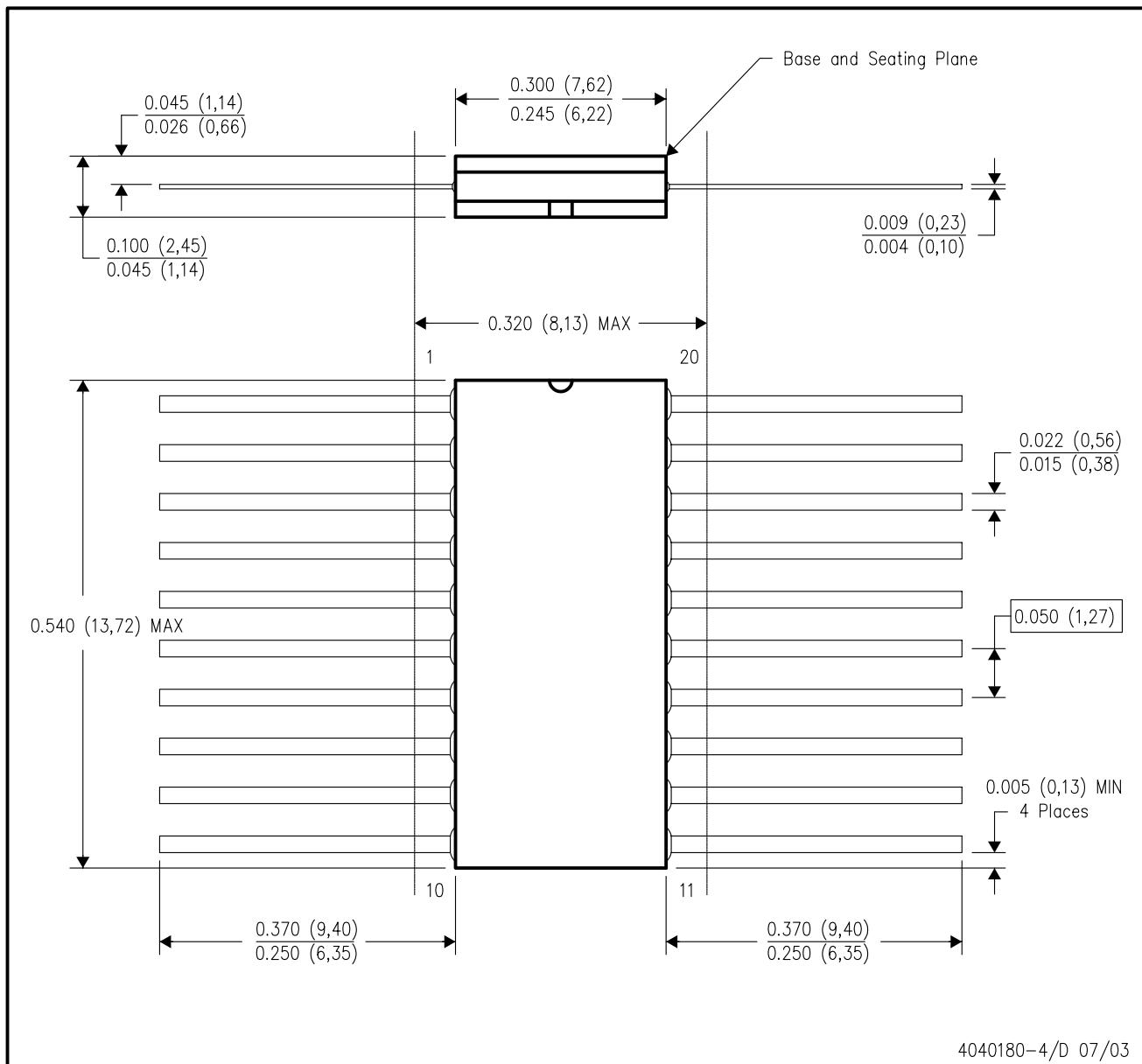
4040180–4/D 07/03

NOTES:  A.  All linear dimensions are in inches (millimeters).
        B.  This drawing is subject to change without notice.
        C.  This package can be hermetically sealed with a ceramic lid using glass frit.
        D.  Index point is provided on cap for terminal identification only.
        E.  Falls within Mil–Std 1835 GDFP2–F20

**FK (S-CQCC-N\*\*)**                                    **LEADLESS CERAMIC CHIP CARRIER**

**28 TERMINAL SHOWN**
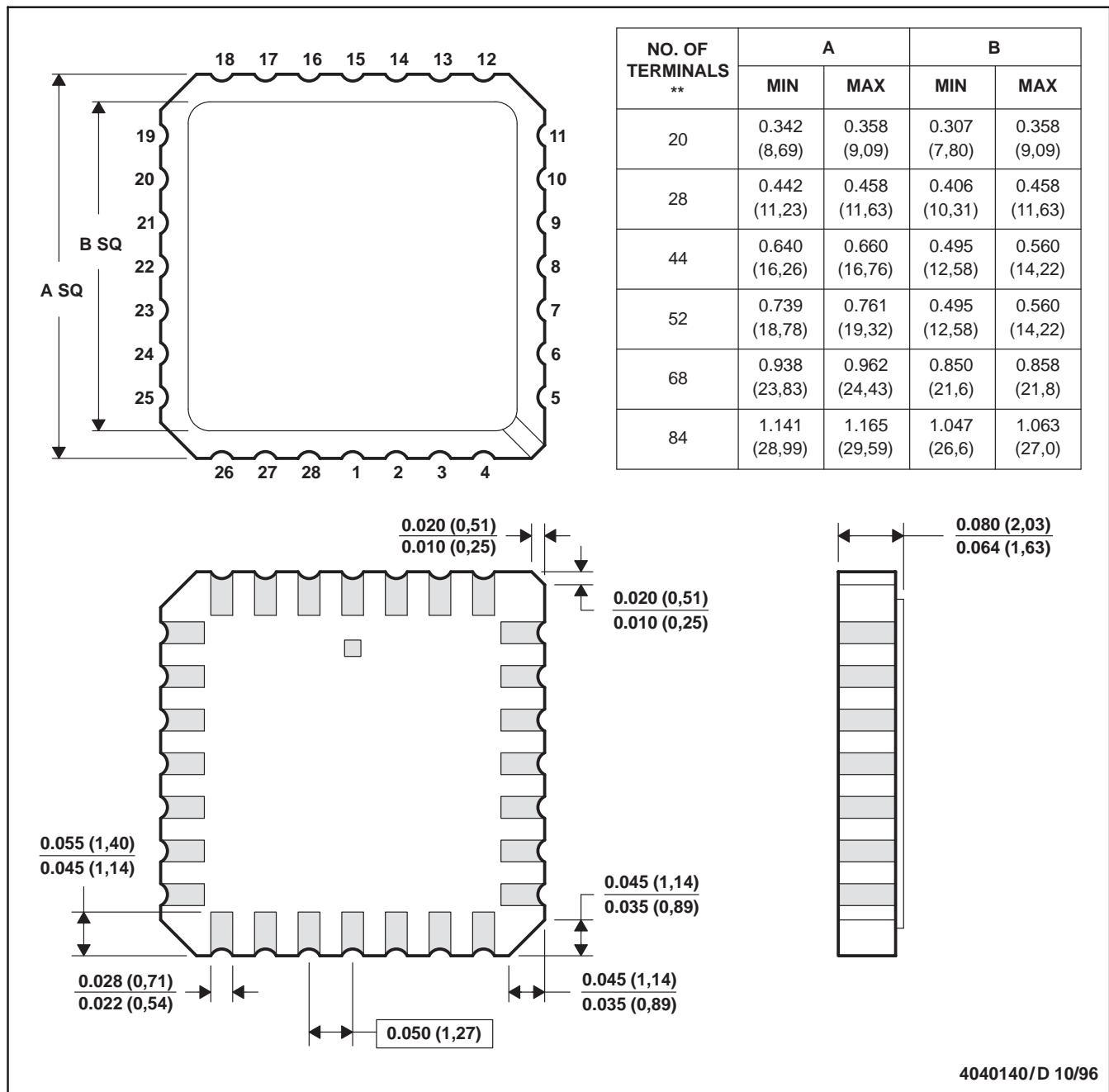
| NO. OF TERMINALS ** | A | | B | |
|---|---|---|---|---|
| | MIN | MAX | MIN | MAX |
| 20 | 0.342 (8,69) | 0.358 (9,09) | 0.307 (7,80) | 0.358 (9,09) |
| 28 | 0.442 (11,23) | 0.458 (11,63) | 0.406 (10,31) | 0.458 (11,63) |
| 44 | 0.640 (16,26) | 0.660 (16,76) | 0.495 (12,58) | 0.560 (14,22) |
| 52 | 0.739 (18,78) | 0.761 (19,32) | 0.495 (12,58) | 0.560 (14,22) |
| 68 | 0.938 (23,83) | 0.962 (24,43) | 0.850 (21,6) | 0.858 (21,8) |
| 84 | 1.141 (28,99) | 1.165 (29,59) | 1.047 (26,6) | 1.063 (27,0) |

4040140/D 10/96

NOTES: A. All linear dimensions are in inches (millimeters).
B. This drawing is subject to change without notice.
C. This package can be hermetically sealed with a metal lid.
D. The terminals are gold plated.
E. Falls within JEDEC MS-004

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## N (R−PDIP−T**)

16 PINS SHOWN

## PLASTIC DUAL−IN−LINE PACKAGE

| DIM \ PINS ** | 14 | 16 | 18 | 20 |
|---|---|---|---|---|
| A   MAX | 0.775 (19,69) | 0.775 (19,69) | 0.920 (23,37) | 1.060 (26,92) |
| A   MIN | 0.745 (18,92) | 0.745 (18,92) | 0.850 (21,59) | 0.940 (23,88) |
| MS−001 VARIATION | AA | BB | AC | AD |

A

16    9

0.260 (6,60)
0.240 (6,10)

1    8

0.070 (1,78)
0.045 (1,14)  D

0.045 (1,14)
0.030 (0,76)  D

0.020 (0,51) MIN

0.200 (5,08) MAX

Seating Plane

0.125 (3,18) MIN

0.100 (2,54)

0.021 (0,53)
0.015 (0,38)

⊕ 0.010 (0,25) Ⓜ

14/18 Pin Only
20 Pin vendor option  D

0.325 (8,26)
0.300 (7,62)

0.015 (0,38)

Gauge Plane

0.010 (0,25) NOM

0.430 (10,92) MAX

4040049/E  12/2002

NOTES:    A.  All linear dimensions are in inches (millimeters).
          B.  This drawing is subject to change without notice.
        Ⓒ  Falls within JEDEC MS−001, except 18 and 20 pin minimum body length (Dim A).
        Ⓓ  The 20 pin end lead shoulder width is a vendor option, either half or full width.

DW (R−PDSO−G20)                                    PLASTIC SMALL−OUTLINE PACKAGE
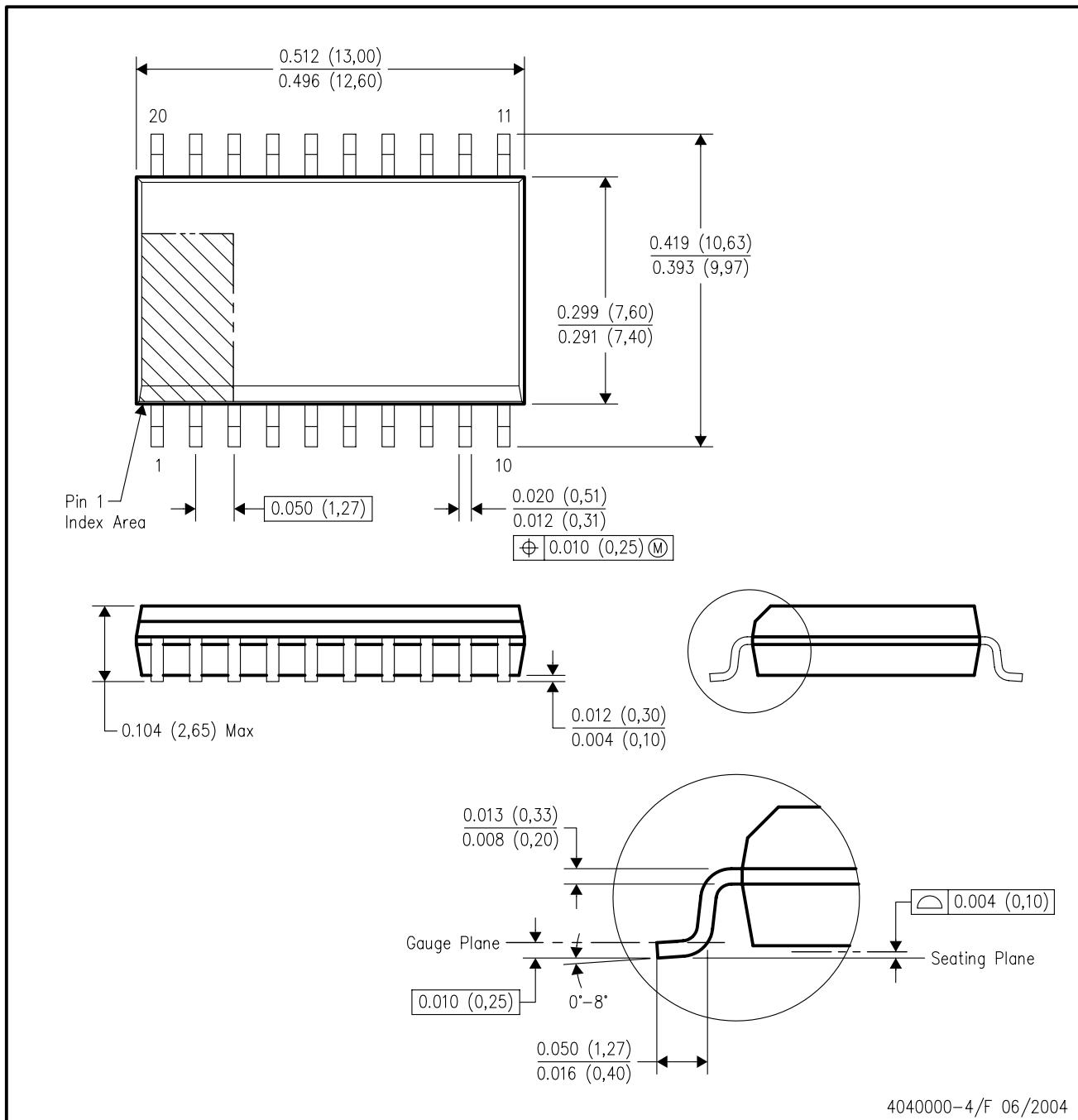
0.512 (13,00)
0.496 (12,60)

20                                          11

0.419 (10,63)
0.393 (9,97)

0.299 (7,60)
0.291 (7,40)

1                                           10

Pin 1
Index Area

0.050 (1,27)

0.020 (0,51)
0.012 (0,31)

⊕ | 0.010 (0,25) Ⓜ

0.104 (2,65) Max

0.012 (0,30)
0.004 (0,10)

0.013 (0,33)
0.008 (0,20)

Gauge Plane

⌒ | 0.004 (0,10)

Seating Plane

0.010 (0,25)                0°−8°

0.050 (1,27)
0.016 (0,40)

4040000−4/F 06/2004

NOTES:   A.  All linear dimensions are in inches (millimeters).
         B.  This drawing is subject to change without notice.
         C.  Body dimensions do not include mold flash or protrusion not to exceed 0.006 (0,15).
         D.  Falls within JEDEC MS−013 variation AC.

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**D (R−PDSO−G16)**                    **PLASTIC SMALL−OUTLINE PACKAGE**

0.394 (10,00)
0.386 (9,80)

16

9

0.244 (6,20)
0.228 (5,80)

0.157 (4,00)
0.150 (3,80)

1

8

Pin 1
Index Area

0.050 (1,27)

0.020 (0,51)
0.012 (0,31)

⊕ | 0.010 (0,25) Ⓜ

0.069 (1,75) Max

0.010 (0,25)
0.004 (0,10)

0.010 (0,25)
0.007 (0,17)

| 0.004 (0,10)

Gauge Plane

Seating Plane

0.010 (0,25)        0°−8°

0.050 (1,27)
0.016 (0,40)
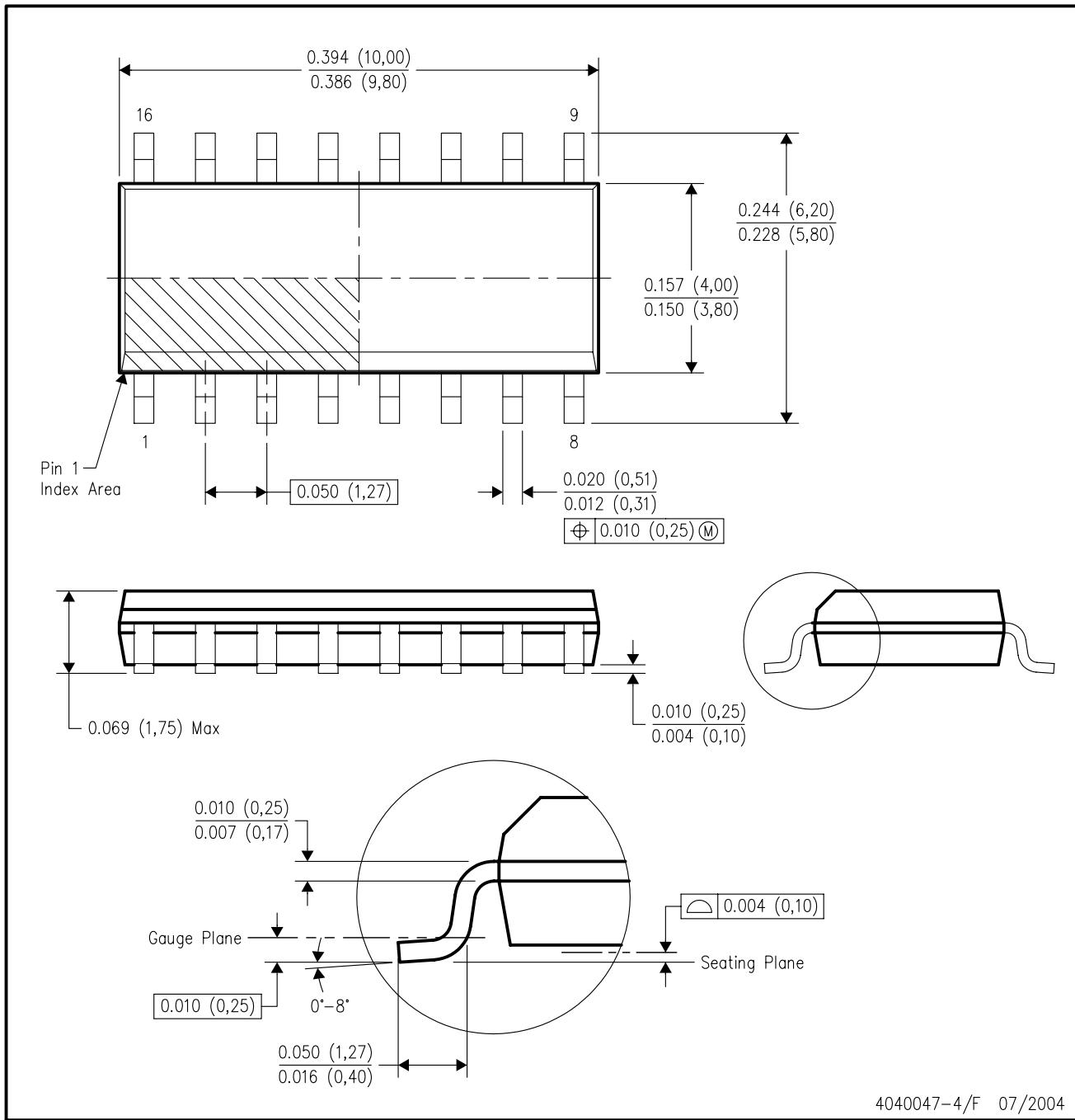
4040047−4/F   07/2004

NOTES:   A.   All linear dimensions are in inches (millimeters).
         B.   This drawing is subject to change without notice.
         C.   Body dimensions do not include mold flash or protrusion not to exceed 0.006 (0,15).
         D.   Falls within JEDEC MS−012 variation AC.

## MECHANICAL DATA

PLASTIC SMALL-OUTLINE PACKAGE

| PINS ** DIM | 14 | 16 | 20 | 24 |
|---|---|---|---|---|
| A MAX | 10,50 | 10,50 | 12,90 | 15,30 |
| A MIN | 9,90 | 9,90 | 12,30 | 14,70 |

4040062/C 03/03
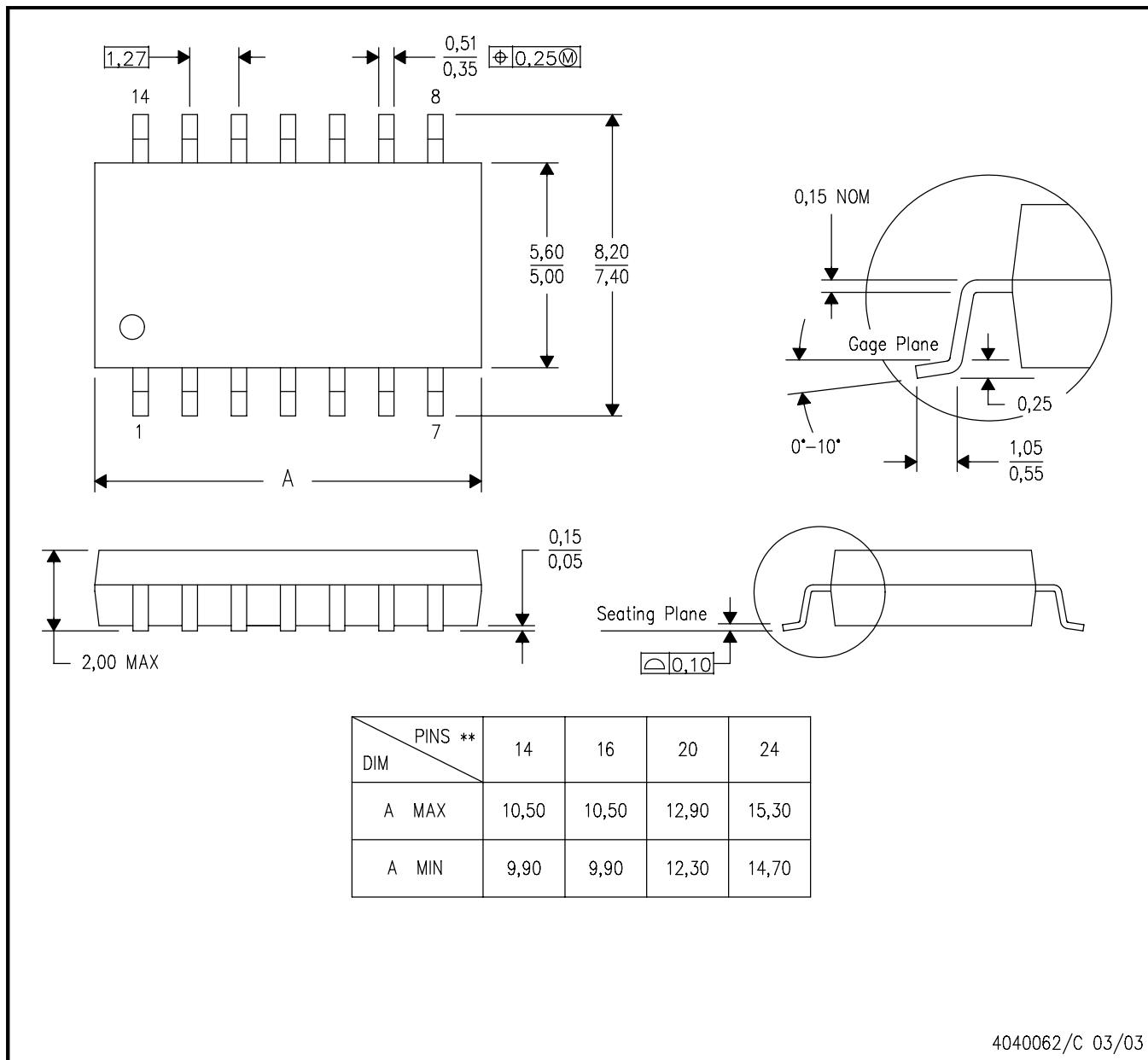
NOTES:   A.  All linear dimensions are in millimeters.
         B.  This drawing is subject to change without notice.
         C.  Body dimensions do not include mold flash or protrusion, not to exceed 0,15.

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