

OCTAL, HEX, AND QUAD D-TYPE FLIP-FLOPS WITH ENABLE

SDLS167 – OCTOBER 1976 – REVISED MARCH 1988

- '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.

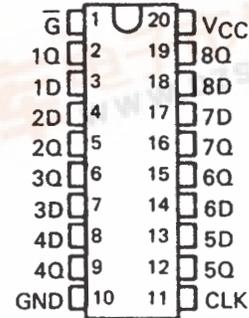
Information at the D inputs meeting the setup time requirements is transferred to the Q outputs on the positive-going edge of the clock pulse if the enable input \bar{G} is low. Clock triggering occurs at a particular voltage level and is not directly related to the transition time of the positive-going 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 \bar{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.

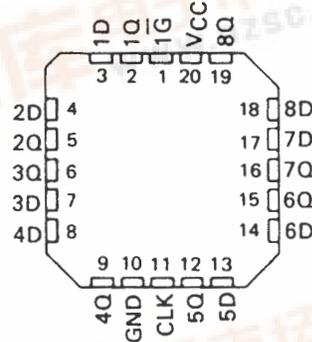
FUNCTION TABLE
(EACH FLIP-FLOP)

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

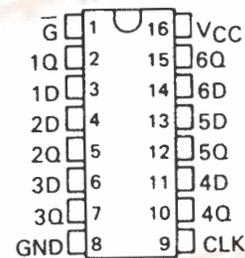
SN54LS377 . . . J PACKAGE
SN74LS377 . . . DW OR N PACKAGE
(TOP VIEW)



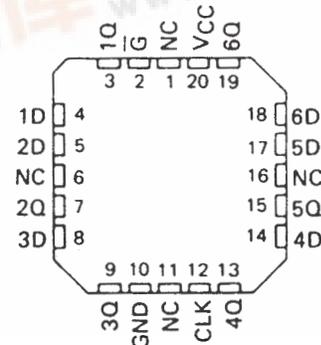
SN54LS377 . . . FK PACKAGE
(TOP VIEW)



SN54LS378 . . . J OR W PACKAGE
SN74LS378 . . . D OR N PACKAGE
(TOP VIEW)



SN54LS378 . . . FK PACKAGE
(TOP VIEW)



NC – No internal connection

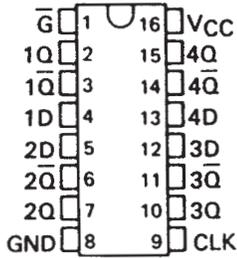


SN54LS377, SN54LS378, SN54LS379, SN74LS377, SN74LS378, SN74LS379

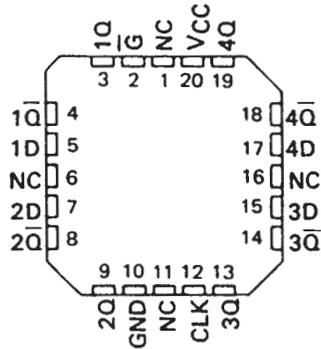
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SN54LS379 . . . J OR W PACKAGE
SN74LS379 . . . D OR N PACKAGE
(TOP VIEW)

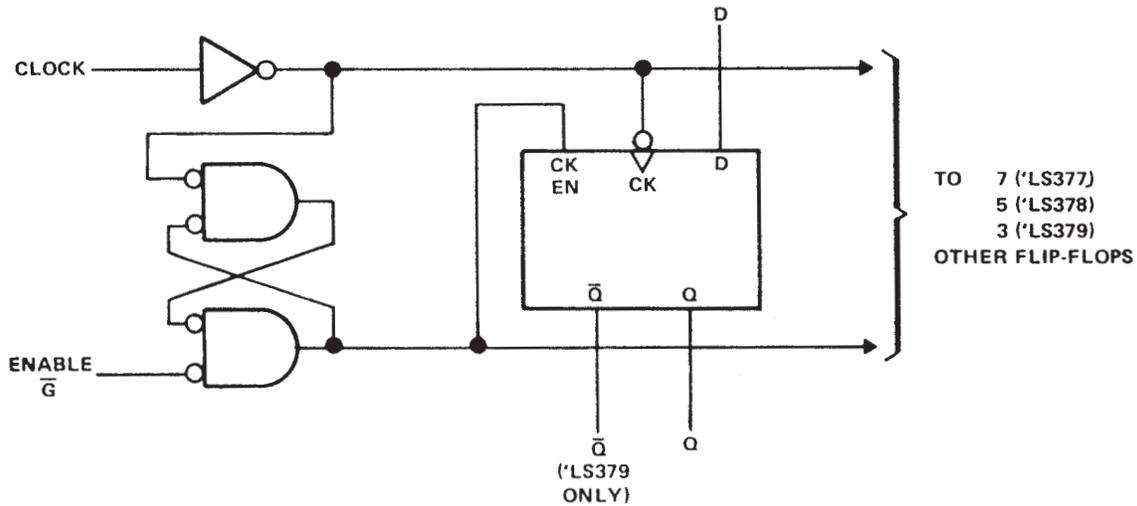


SN54LS379 . . . FK PACKAGE
(TOP VIEW)

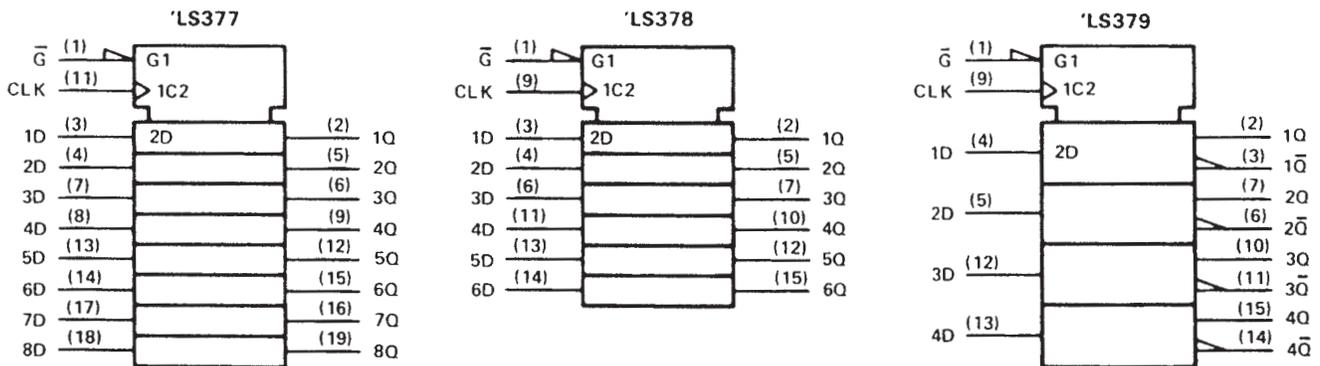


NC - No internal connection

logic diagram (positive logic)



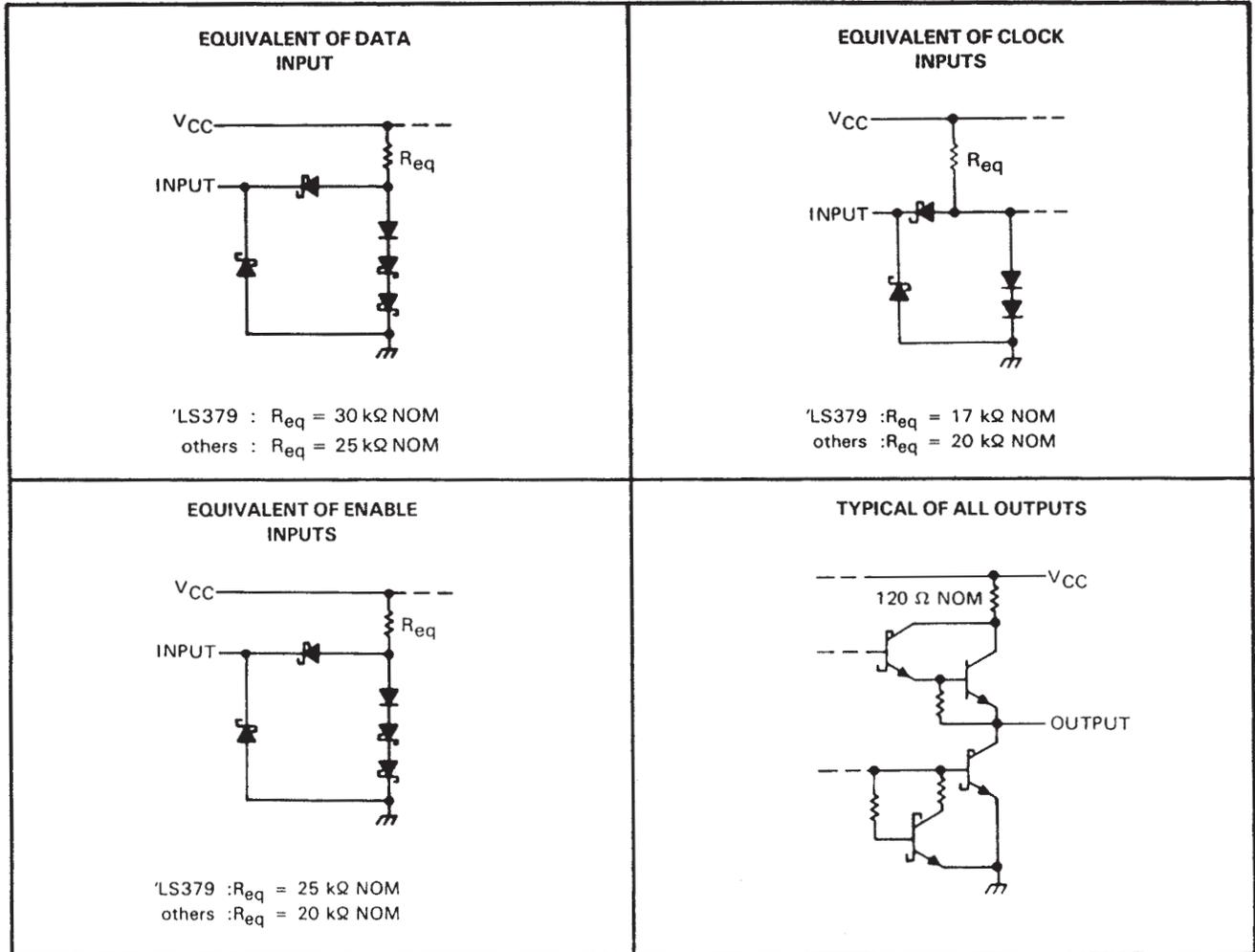
logic symbols†



† 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.

SN54LS377, SN54LS378, SN54LS379,
SN74LS377, SN74LS378, SN74LS379
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schematics of inputs and outputs



absolute maximum rating over operating free-air temperature range (unless otherwise noted)

| | |
|---|----------------|
| Supply voltage, VCC (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.

**SN54LS377, SN54LS378, SN54LS379,
SN74LS377, SN74LS378, SN74LS379
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recommended operating conditions

| | SN54LS' | | | SN74LS' | | | UNIT |
|---------------------------------------|-----------------------|-----|------|---------|-----|------|-------------|
| | MIN | NOM | MAX | MIN | NOM | MAX | |
| 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 | $^{\circ}C$ |

† 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' | | SN74LS' | | UNIT | |
|--|--|---------|------|---------|------|------|------|
| | | MIN | TYP‡ | MAX | MIN | | TYP‡ |
| V_{IH} High-level input voltage | | 2 | | 2 | | V | |
| V_{IL} Low-level input voltage | | | | | | 0.8 | |
| V_{IK} Input clamp voltage | $V_{CC} = \text{MIN}, I_I = -18 \text{ mA}$ | | | -1.5 | | -1.5 | |
| V_{OH} High-level output voltage | $V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V},$ $V_{IL} = V_{IL \text{ max}}, I_{OH} = -400 \mu A$ | 2.5 | 3.5 | 2.7 | 3.5 | V | |
| | $V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V},$ $V_{IL} = V_{IL \text{ max}}$ | | | 0.25 | 0.4 | 0.25 | 0.4 |
| V_{OL} Low-level output voltage | $I_{OL} = 4 \text{ mA}$ | | | | | 0.35 | 0.5 |
| | $I_{OL} = 8 \text{ mA}$ | | | | | | |
| I_I Input current at maximum input voltage | $V_{CC} = \text{MAX}, V_I = 7 \text{ V}$ | | | 0.1 | | 0.1 | |
| I_{IH} High-level input current | $V_{CC} = \text{MAX}, V_I = 2.7 \text{ V}$ | | | 20 | | 20 | |
| I_{IL} Low-level input current | $V_{CC} = \text{MAX}, V_I = 0.4 \text{ V}$ | | | -0.4 | | -0.4 | |
| I_{OS} Short-circuit output current§ | $V_{CC} = \text{MAX}$ | -20 | -100 | -20 | -100 | mA | |
| I_{CC} Supply current | $V_{CC} = \text{MAX},$ 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 $V_{CC} = 5 \text{ V}, T_A = 25^{\circ}C$.

§ 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, $V_{CC} = 5 \text{ V}, T_A = 25^{\circ}C$

| PARAMETER | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|---|---------------------------|-----|-----|-----|------|
| f_{max} Maximum clock frequency | $C_L = 15 \text{ pF},$ | 30 | 40 | | MHz |
| t_{PLH} Propagation delay time, low-to-high-level output from clock | $R_L = 2 \text{ k}\Omega$ | | 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.

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| Low Power Wireless | www.ti.com/lpw | Telephony | www.ti.com/telephony |
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| | | Wireless | www.ti.com/wireless |

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 | A42 SNPB | N / A for Pkg Type |
| 5962-8992501FA | ACTIVE | CFP | W | 16 | 1 | TBD | A42 | N / A for Pkg Type |
| 5962-8992501FA | ACTIVE | CFP | W | 16 | 1 | TBD | A42 | N / A for Pkg Type |
| JM38510/32504B2A | ACTIVE | LCCC | FK | 20 | 1 | TBD | POST-PLATE | N / A for Pkg Type |
| JM38510/32504B2A | ACTIVE | LCCC | FK | 20 | 1 | TBD | POST-PLATE | N / A for Pkg Type |
| JM38510/32504BRA | ACTIVE | CDIP | J | 20 | 1 | TBD | A42 SNPB | N / A for Pkg Type |
| JM38510/32504BRA | ACTIVE | CDIP | J | 20 | 1 | TBD | A42 SNPB | N / A for Pkg Type |
| JM38510/32504BSA | ACTIVE | CFP | W | 20 | 1 | TBD | A42 | N / A for Pkg Type |
| JM38510/32504BSA | ACTIVE | CFP | W | 20 | 1 | TBD | A42 | N / A for Pkg Type |
| SN54LS377J | ACTIVE | CDIP | J | 20 | 1 | TBD | A42 SNPB | N / A for Pkg Type |
| SN54LS377J | ACTIVE | CDIP | J | 20 | 1 | TBD | A42 SNPB | N / A for Pkg Type |
| SN54LS378J | ACTIVE | CDIP | J | 16 | 1 | TBD | A42 SNPB | N / A for Pkg Type |
| SN54LS378J | ACTIVE | CDIP | J | 16 | 1 | TBD | A42 SNPB | N / A for Pkg Type |
| SN54LS379J | ACTIVE | CDIP | J | 16 | 1 | TBD | A42 SNPB | N / A for Pkg Type |
| SN54LS379J | ACTIVE | CDIP | J | 16 | 1 | TBD | A42 SNPB | N / A for Pkg Type |
| 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 |
| SN74LS377DWG4 | ACTIVE | SOIC | DW | 20 | 25 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74LS377DWG4 | 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 |
| SN74LS377DWRG4 | ACTIVE | SOIC | DW | 20 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74LS377DWRG4 | 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 | N / A for Pkg Type |
| SN74LS377N | ACTIVE | PDIP | N | 20 | 20 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type |
| 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 | CU NIPDAU | N / A for Pkg Type |

| Orderable Device | Status ⁽¹⁾ | Package Type | Package Drawing | Pins | Package Qty | Eco Plan ⁽²⁾ | Lead/Ball Finish | MSL Peak Temp ⁽³⁾ |
|------------------|-----------------------|--------------|-----------------|------|-------------|-------------------------|------------------|------------------------------|
| | | | | | | (RoHS) | | |
| SN74LS377NE4 | ACTIVE | PDIP | N | 20 | 20 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type |
| 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 & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74LS377NSRE4 | ACTIVE | SO | NS | 20 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74LS377NSRG4 | ACTIVE | SO | NS | 20 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74LS377NSRG4 | 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 |
| SN74LS378DG4 | ACTIVE | SOIC | D | 16 | 40 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74LS378DG4 | 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 |
| SN74LS378DRG4 | ACTIVE | SOIC | D | 16 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74LS378DRG4 | 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 | N / A for Pkg Type |
| SN74LS378N | ACTIVE | PDIP | N | 16 | 25 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type |
| SN74LS378N3 | OBSOLETE | PDIP | N | 16 | | TBD | Call TI | Call TI |
| SN74LS378N3 | OBSOLETE | PDIP | N | 16 | | TBD | Call TI | Call TI |
| SN74LS378NE4 | ACTIVE | PDIP | N | 16 | 25 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type |
| SN74LS378NE4 | ACTIVE | PDIP | N | 16 | 25 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type |
| SN74LS378NSR | ACTIVE | SO | NS | 16 | 2000 | Green (RoHS & no Sb/Br) | 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⁾ |
|------------------|-----------------------|--------------|-----------------|------|-------------|-------------------------|------------------|------------------------------|
| 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 |
| SN74LS378NSRG4 | ACTIVE | SO | NS | 16 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74LS378NSRG4 | 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 | POST-PLATE | N / A for Pkg Type |
| SNJ54LS377FK | ACTIVE | LCCC | FK | 20 | 1 | TBD | POST-PLATE | N / A for Pkg Type |
| SNJ54LS377J | ACTIVE | CDIP | J | 20 | 1 | TBD | A42 SNPB | N / A for Pkg Type |
| SNJ54LS377J | ACTIVE | CDIP | J | 20 | 1 | TBD | A42 SNPB | N / A for Pkg Type |
| SNJ54LS377W | ACTIVE | CFP | W | 20 | 1 | TBD | A42 | N / A for Pkg Type |
| SNJ54LS377W | ACTIVE | CFP | W | 20 | 1 | TBD | A42 | N / A for Pkg Type |
| 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 | A42 SNPB | N / A for Pkg Type |
| SNJ54LS378J | ACTIVE | CDIP | J | 16 | 1 | TBD | A42 SNPB | N / A for Pkg Type |
| SNJ54LS378W | ACTIVE | CFP | W | 16 | 1 | TBD | A42 | N / A for Pkg Type |
| SNJ54LS378W | ACTIVE | CFP | W | 16 | 1 | TBD | A42 | N / A for Pkg Type |
| SNJ54LS379FK | ACTIVE | LCCC | FK | 20 | 1 | TBD | POST-PLATE | N / A for Pkg Type |
| SNJ54LS379FK | ACTIVE | LCCC | FK | 20 | 1 | TBD | POST-PLATE | N / A for Pkg Type |
| SNJ54LS379J | ACTIVE | CDIP | J | 16 | 1 | TBD | A42 SNPB | N / A for Pkg Type |
| SNJ54LS379J | ACTIVE | CDIP | J | 16 | 1 | TBD | A42 SNPB | N / A for Pkg Type |
| SNJ54LS379W | ACTIVE | CFP | W | 16 | 1 | TBD | A42 | N / A for Pkg Type |
| SNJ54LS379W | ACTIVE | CFP | W | 16 | 1 | TBD | A42 | N / A for Pkg Type |

⁽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), Pb-Free (RoHS Exempt), 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.

Pb-Free (RoHS Exempt): This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

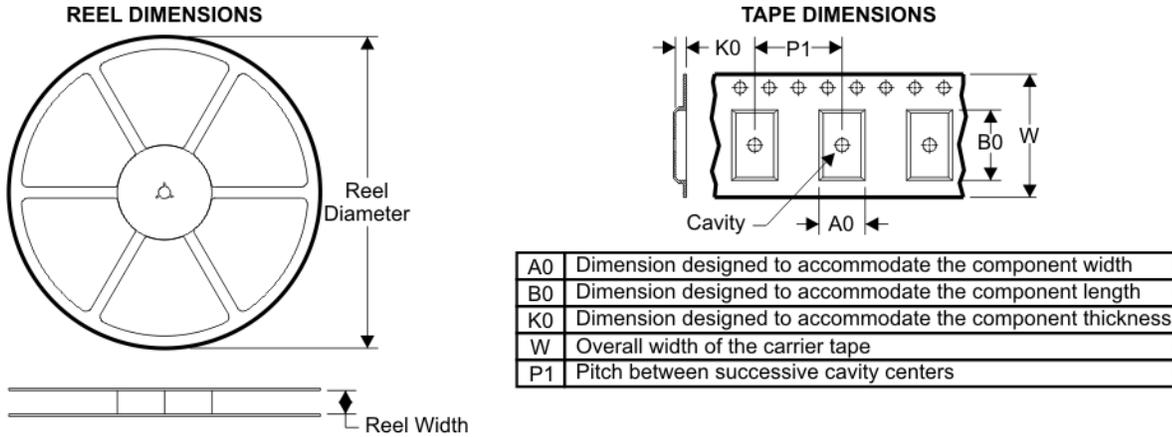
Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

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

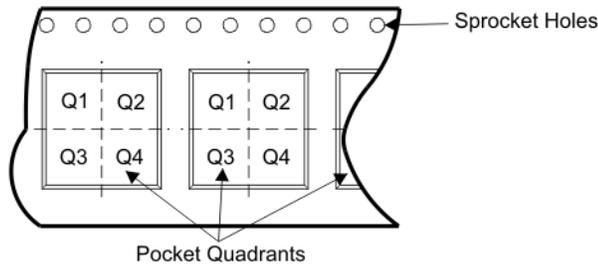
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TAPE AND REEL BOX INFORMATION

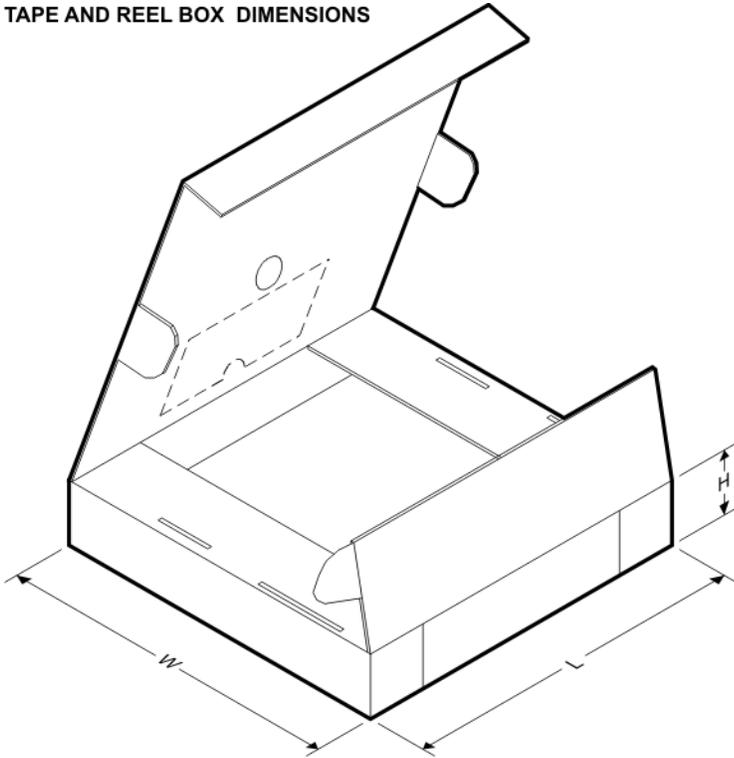


QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



| Device | Package | Pins | Site | Reel Diameter (mm) | Reel Width (mm) | A0 (mm) | B0 (mm) | K0 (mm) | P1 (mm) | W (mm) | Pin1 Quadrant |
|--------------|---------|------|---------|--------------------|-----------------|---------|---------|---------|---------|--------|---------------|
| SN74LS377DWR | DW | 20 | SITE 41 | 330 | 24 | 10.8 | 13.0 | 2.7 | 12 | 24 | Q1 |
| SN74LS378DR | D | 16 | SITE 27 | 330 | 16 | 6.5 | 10.3 | 2.1 | 8 | 16 | Q1 |
| SN74LS378NSR | NS | 16 | SITE 41 | 330 | 16 | 8.2 | 10.5 | 2.5 | 12 | 16 | Q1 |

TAPE AND REEL BOX DIMENSIONS

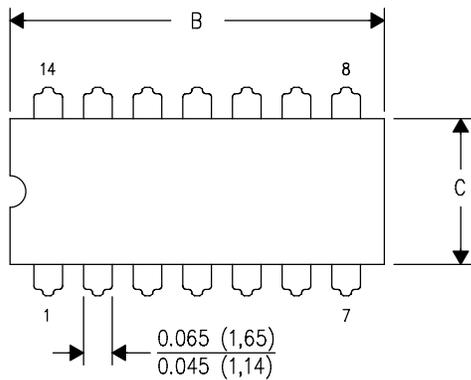


| Device | Package | Pins | Site | Length (mm) | Width (mm) | Height (mm) |
|--------------|---------|------|---------|-------------|------------|-------------|
| SN74LS377DWR | DW | 20 | SITE 41 | 346.0 | 346.0 | 41.0 |
| SN74LS378DR | D | 16 | SITE 27 | 342.9 | 336.6 | 28.58 |
| SN74LS378NSR | NS | 16 | SITE 41 | 346.0 | 346.0 | 33.0 |

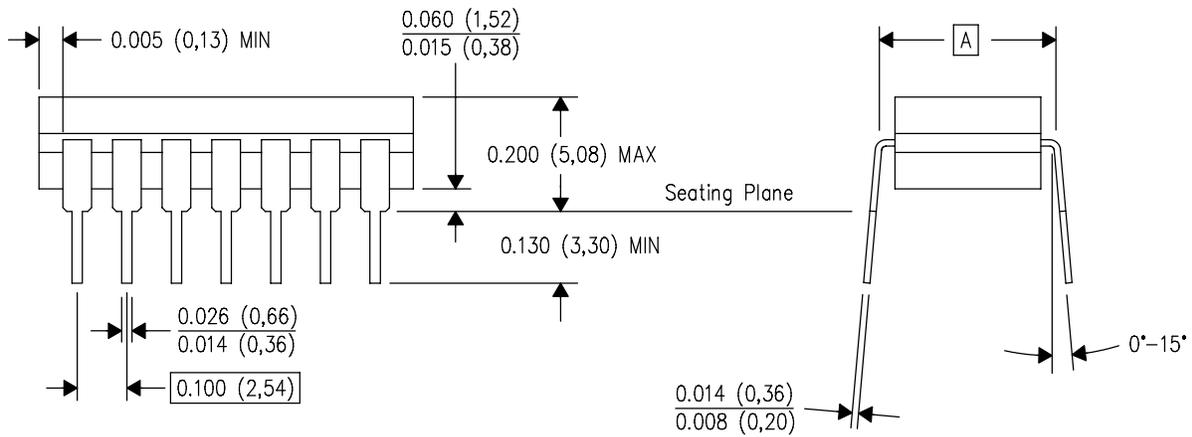
J (R-GDIP-T**)

14 LEADS SHOWN

CERAMIC DUAL IN-LINE PACKAGE



| 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) |



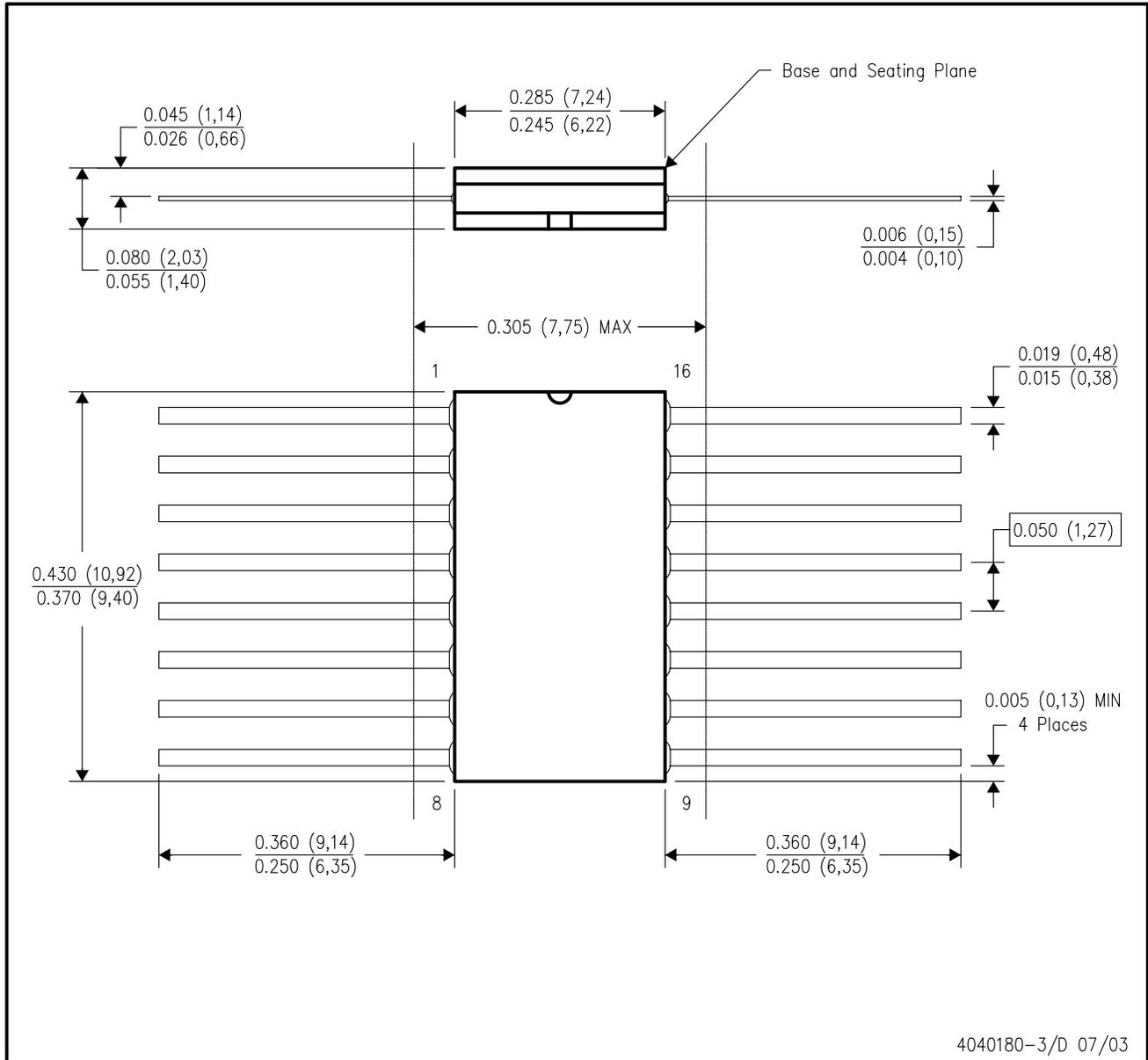
4040083/F 03/03

- 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.

MECHANICAL DATA

W (R-GDFP-F16)

CERAMIC DUAL FLATPACK

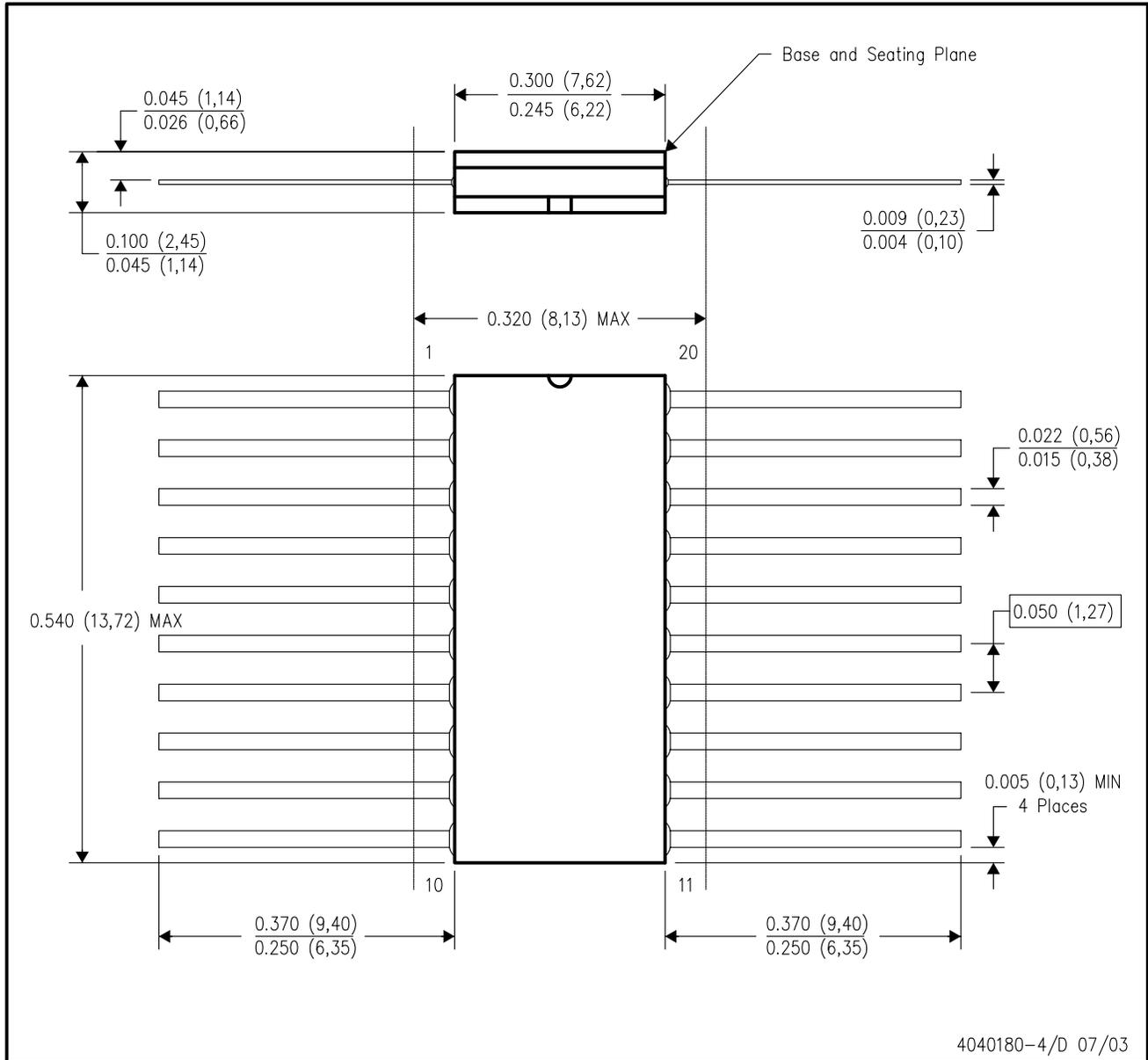


- NOTES:
- A. All linear dimensions are in inches (millimeters).
 - B. This drawing is subject to change without notice.
 - C. This package can be hermetically sealed with a ceramic lid using glass frit.
 - D. Index point is provided on cap for terminal identification only.
 - E. Falls within MIL STD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

MECHANICAL DATA

W (R-GDFP-F20)

CERAMIC DUAL FLATPACK



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

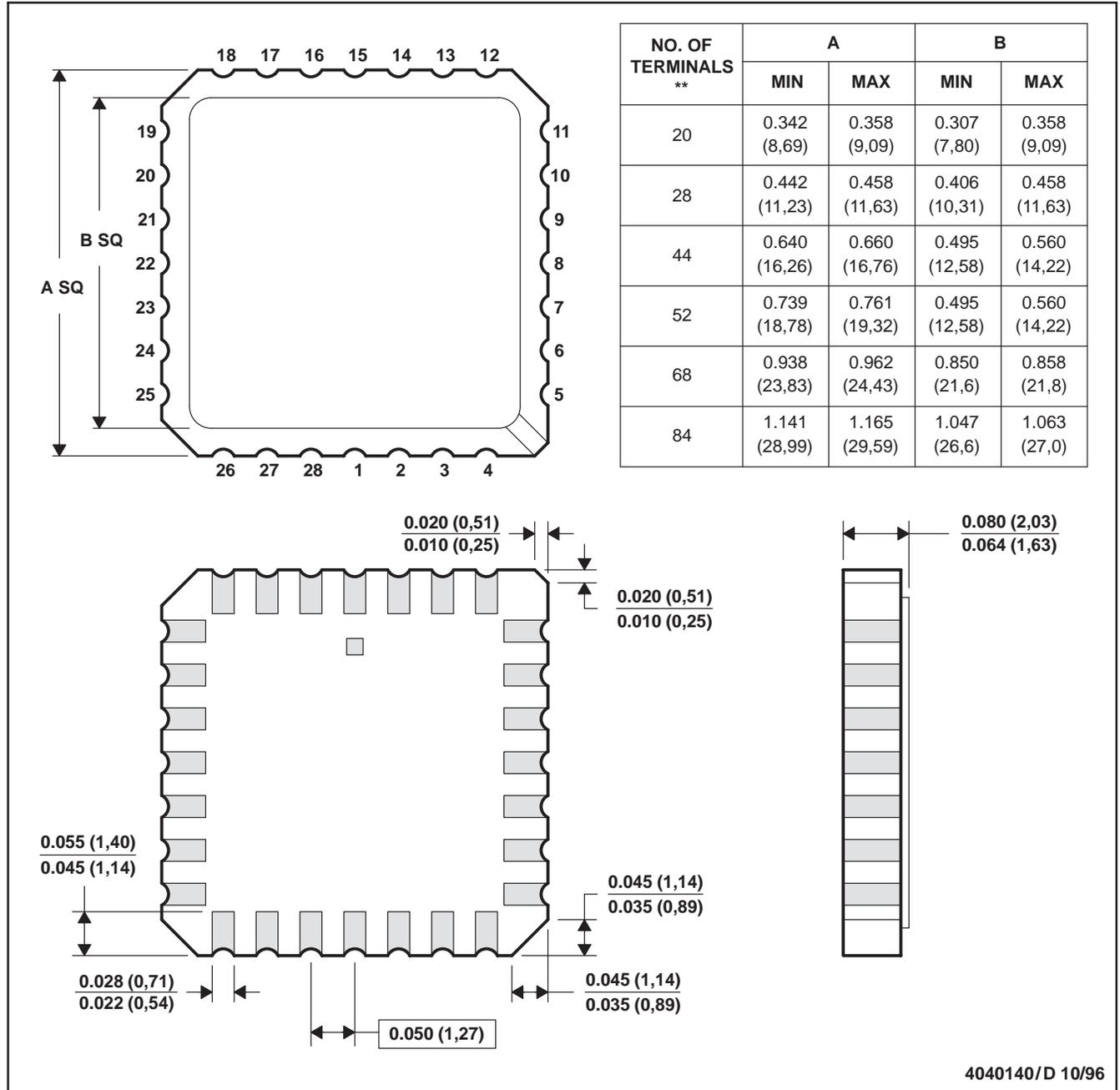
MECHANICAL DATA

MLCC006B – OCTOBER 1996

FK (S-CQCC-N**)

LEADLESS CERAMIC CHIP CARRIER

28 TERMINAL SHOWN



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

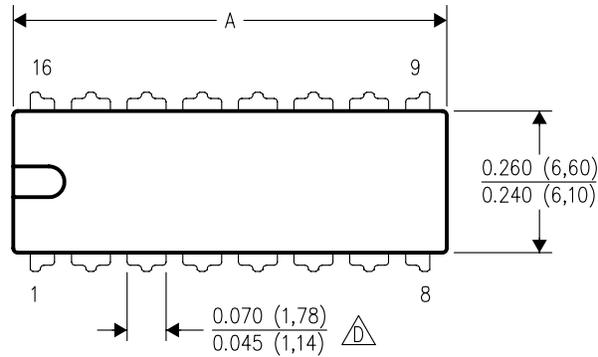
4040140/D 10/96

MECHANICAL DATA

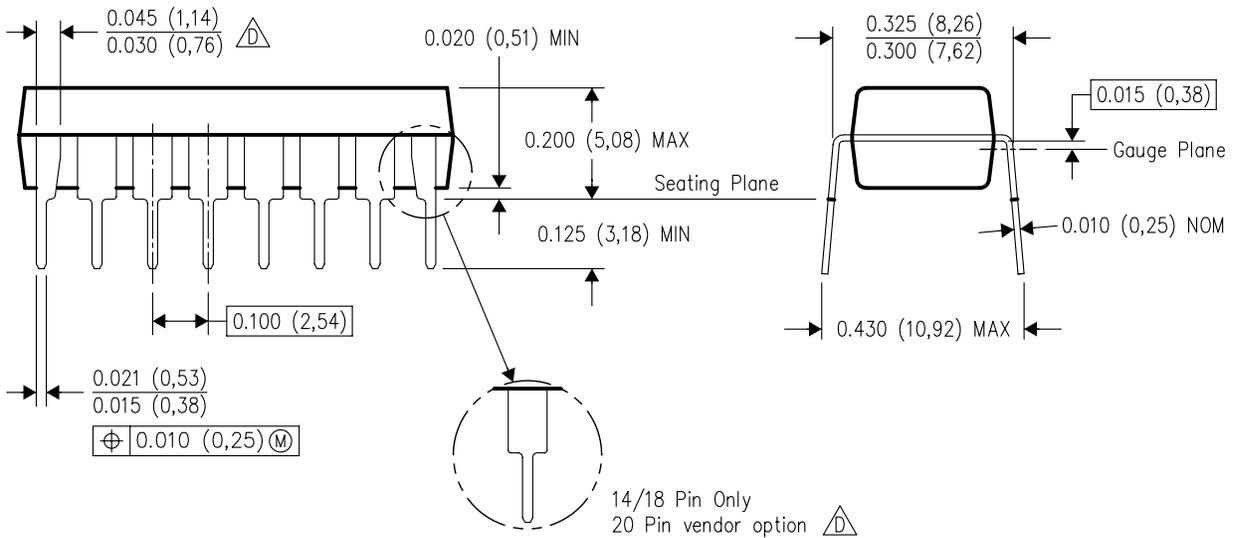
N (R-PDIP-T**)

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) |
| 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 |

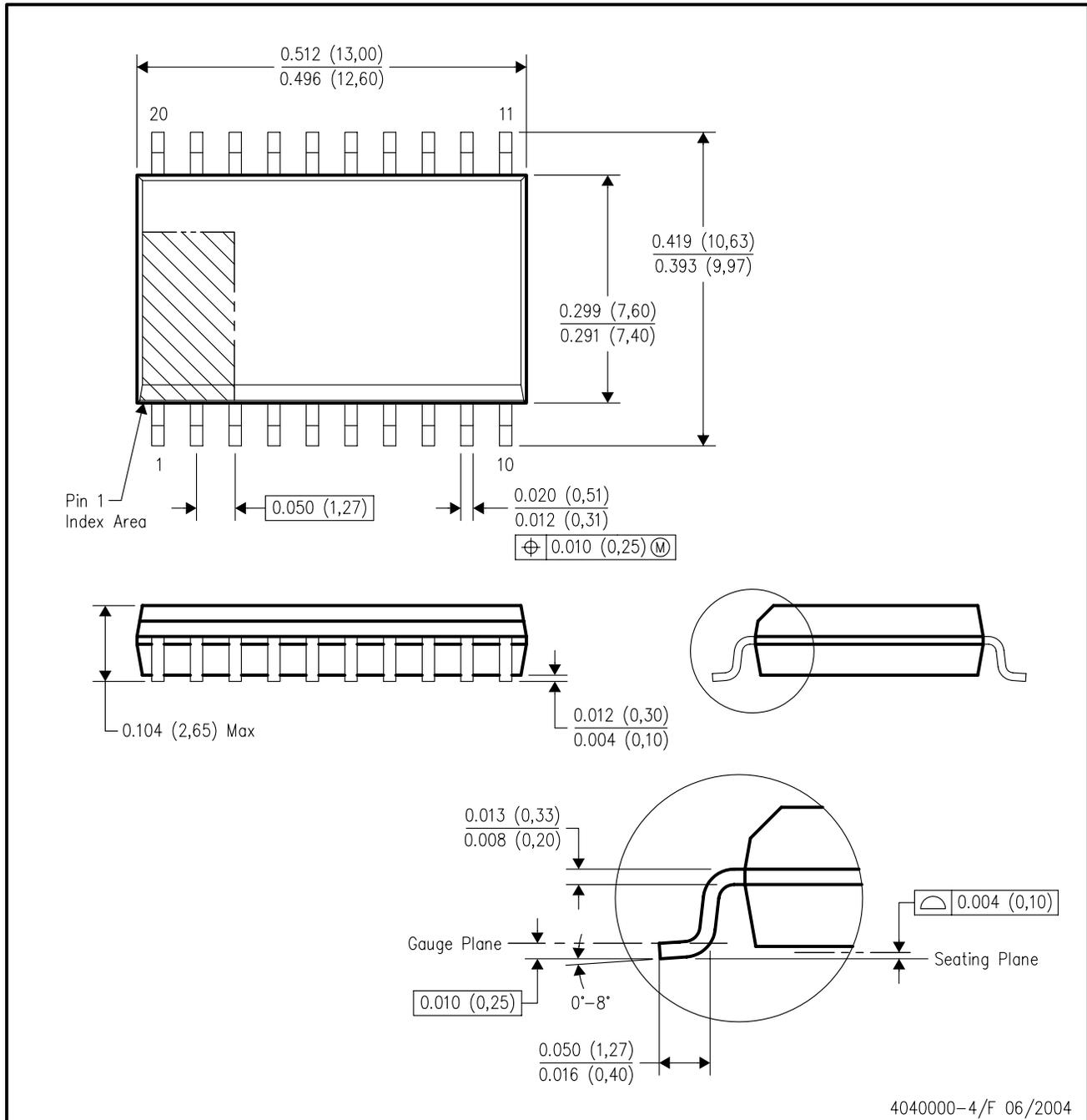


4040049/E 12/2002

- 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



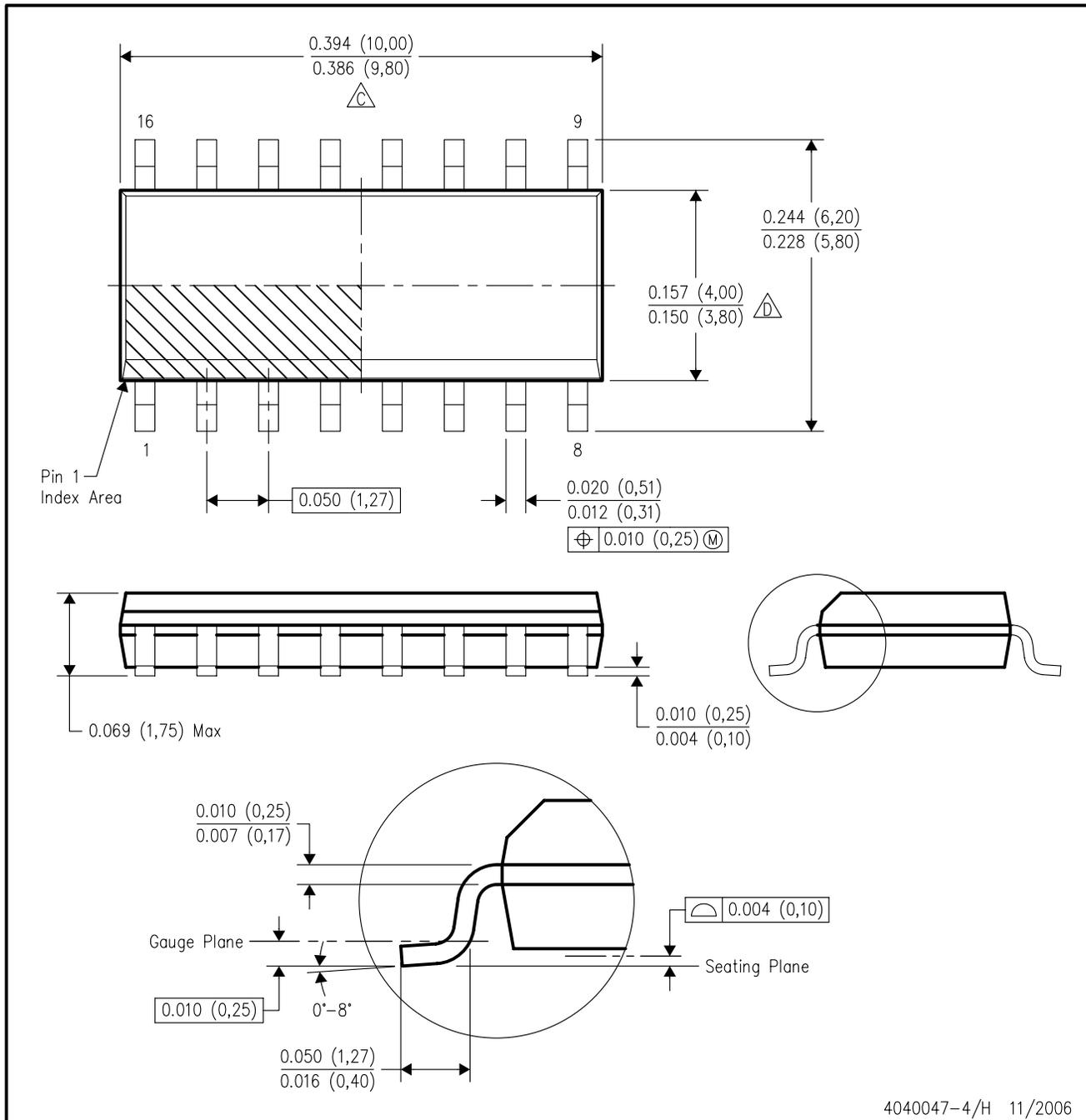
4040000-4/F 06/2004

- 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.

MECHANICAL DATA

D (R-PDSO-G16)

PLASTIC SMALL-OUTLINE PACKAGE



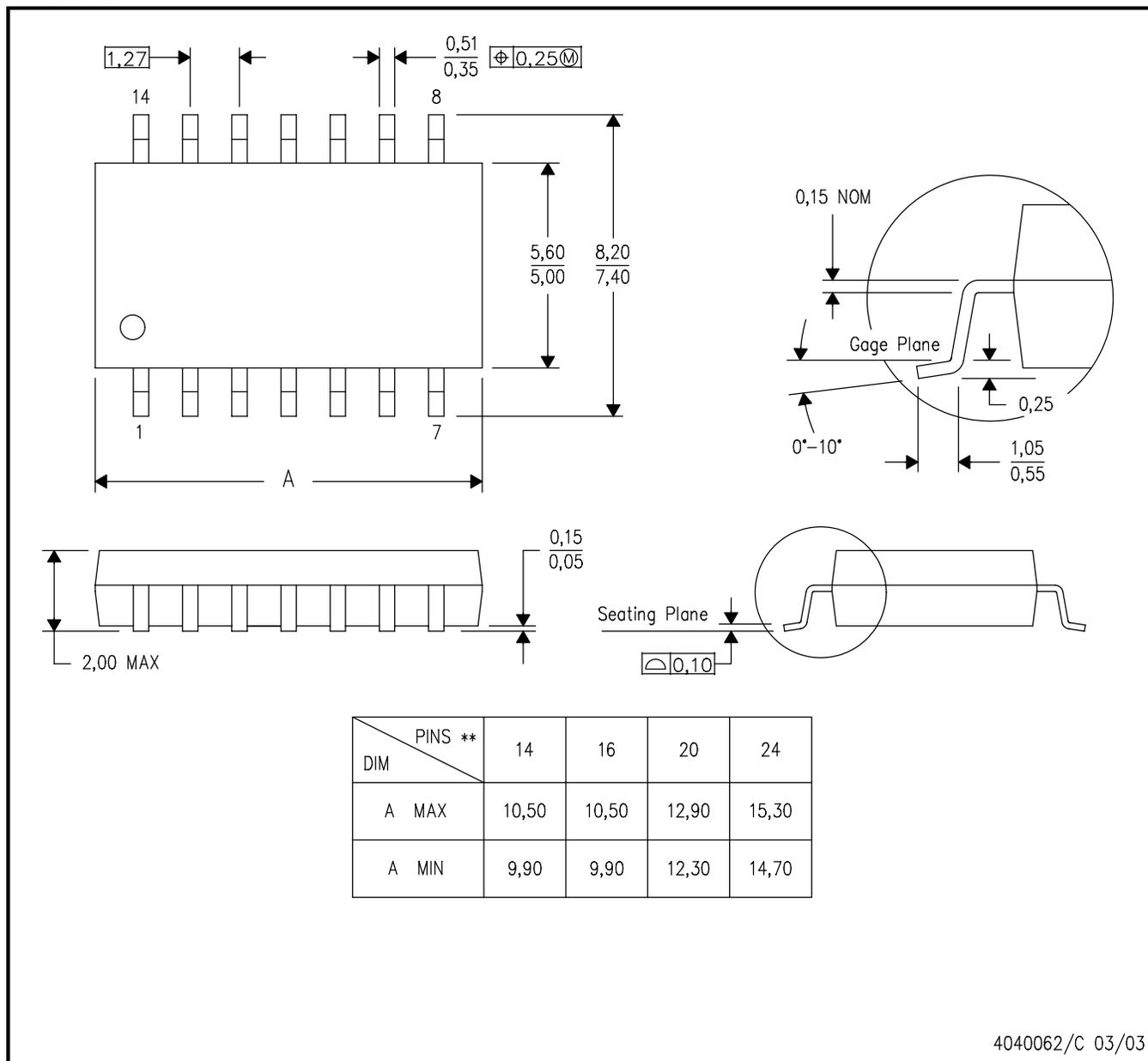
- NOTES:
- A. All linear dimensions are in inches (millimeters).
 - B. This drawing is subject to change without notice.
 - (C) Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed .006 (0,15) per end.
 - (D) Body width does not include interlead flash. Interlead flash shall not exceed .017 (0,43) per side.
 - E. Reference JEDEC MS-012 variation AC.

MECHANICAL DATA

NS (R-PDSO-G)**

PLASTIC SMALL-OUTLINE PACKAGE

14-PINS SHOWN



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.