

# CD4514B, CD4515B Types

## CMOS 4-Bit Latch/4-to-16 Line Decoders

High-Voltage Types (20-Volt Rating)

CD4514B Output "High" on Select

CD4515B Output "Low" on Select

■ CD4514B and -CD4515B consist of a 4-bit strobed latch and a 4-to-16-line decoder. The latches hold the last input data presented prior to the strobe transition from 1 to 0. Inhibit control allows all outputs to be placed at 0 (CD4514B) or 1 (CD4515B) regardless of the state of the data or strobe inputs.

The decode truth table indicates all combinations of data inputs and appropriate selected outputs.

These devices are similar to industry types MC14514 and MC14515.

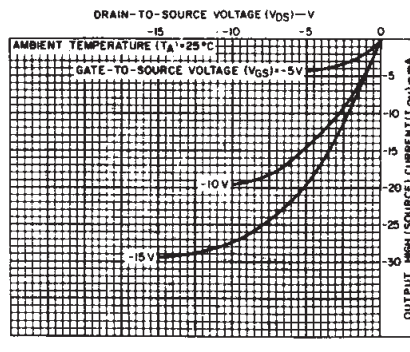
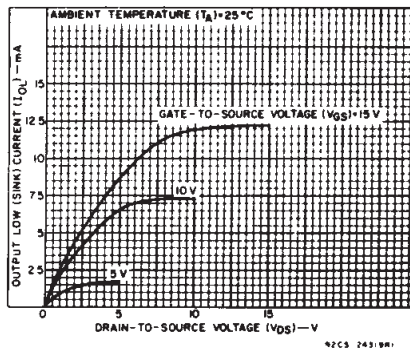
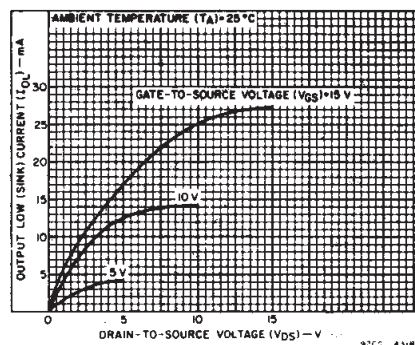
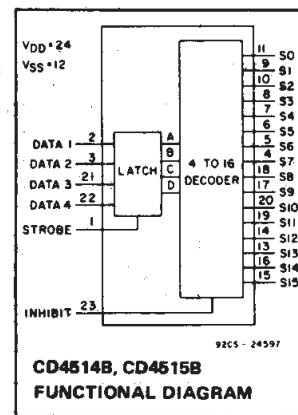
The CD4514B and CD4515B types are supplied in 16-lead hermetic dual-in-line ceramic packages (F3A suffix), 16-lead dual-in-line plastic packages (E suffix), and 16-lead small-outline packages (M and M96 suffixes).

### Features:

- Strobed input latch
- Inhibit control
- 100% tested for quiescent current at 20 V
- Maximum input current of 1  $\mu$ A at 18 V over full package-temperature range; 100 nA at 18 V and 25°C
- Noise margin (over full package temperature range):
  - 1 V at  $V_{DD} = 5$  V
  - 2 V at  $V_{DD} = 10$  V
  - 2.5 V at  $V_{DD} = 15$  V
- 5-V, 10-V, and 15-V parametric ratings
- Standardized, symmetrical output characteristics.
- Meets all requirements of JEDEC Tentative Standard No. 13B; "Standard Specifications for Description of 'B' Series CMOS Devices"

### Applications:

- Digital multiplexing
- Address decoding
- Hexadecimal/BCD decoding
- Program-counter decoding
- Control decoder



### MAXIMUM RATINGS, Absolute-Maximum Values:

#### DC SUPPLY-VOLTAGE RANGE, ( $V_{DD}$ )

Voltages referenced to  $V_{SS}$  Terminal ..... -0.5V to +20V

INPUT VOLTAGE RANGE, ALL INPUTS ..... -0.5V to  $V_{DD} + 0.5$  V

DC INPUT CURRENT, ANY ONE INPUT .....  $\pm 10$  mA

#### POWER DISSIPATION PER PACKAGE ( $P_D$ ):

For  $T_A = -55^\circ\text{C}$  to  $+100^\circ\text{C}$  ..... 500mW

For  $T_A = +100^\circ\text{C}$  to  $+125^\circ\text{C}$  ..... Derate Linearly at 12mW/ $^\circ\text{C}$  to 200mW

#### DEVICE DISSIPATION PER OUTPUT TRANSISTOR

FOR  $T_A =$  FULL PACKAGE-TEMPERATURE RANGE (All Package Types) ..... 100mW

OPERATING-TEMPERATURE RANGE ( $T_A$ ) .....  $-55^\circ\text{C}$  to  $+125^\circ\text{C}$

STORAGE TEMPERATURE RANGE ( $T_{stg}$ ) .....  $-65^\circ\text{C}$  to  $+150^\circ\text{C}$

#### LEAD TEMPERATURE (DURING SOLDERING):

At distance 1/16  $\pm$  1/32 inch (1.59  $\pm$  0.79mm) from case for 10s max .....  $+265^\circ\text{C}$

### RECOMMENDED OPERATING CONDITIONS at $T_A = 25^\circ\text{C}$ , Except as Noted.

For maximum reliability, nominal operating conditions should be selected so that operation is always within the following ranges:

| CHARACTERISTIC                                                    | $V_{DD}$<br>(V) | LIMITS |      | UNITS |
|-------------------------------------------------------------------|-----------------|--------|------|-------|
|                                                                   |                 | Min.   | Max. |       |
| Supply-Voltage Range (For $T_A =$ Full Package-Temperature Range) |                 | 3      | 18   | V     |
| Data Setup Time, $t_S$                                            | 5               | 150    | —    | ns    |
|                                                                   | 10              | 70     | —    |       |
|                                                                   | 15              | 40     | —    |       |
| Strobe Pulse Width, $t_W$                                         | 5               | 250    | —    | ns    |
|                                                                   | 10              | 100    | —    |       |
|                                                                   | 15              | 75     | —    |       |

# CD4514B, CD4515B Types

## STATIC ELECTRICAL CHARACTERISTICS

| CHARACTER-<br>ISTIC                                         | CONDITIONS            |                        |                        | LIMITS AT INDICATED TEMPERATURES (°C) |       |       |       |       |                   |      | UNITS |
|-------------------------------------------------------------|-----------------------|------------------------|------------------------|---------------------------------------|-------|-------|-------|-------|-------------------|------|-------|
|                                                             | V <sub>O</sub><br>(V) | V <sub>IN</sub><br>(V) | V <sub>DD</sub><br>(V) |                                       |       |       |       | +25   |                   |      |       |
|                                                             |                       |                        |                        | -55                                   | -40   | +85   | +125  | Min.  | Typ.              | Max. |       |
| Quiescent Device<br>Current,<br>I <sub>DD</sub> Max.        | —                     | 0,5                    | 5                      | 5                                     | 5     | 150   | 150   | —     | 0.04              | 5    | μA    |
|                                                             | —                     | 0,10                   | 10                     | 10                                    | 10    | 300   | 300   | —     | 0.04              | 10   |       |
|                                                             | —                     | 0,15                   | 15                     | 20                                    | 20    | 600   | 600   | —     | 0.04              | 20   |       |
|                                                             | —                     | 0,20                   | 20                     | 100                                   | 100   | 3000  | 3000  | —     | 0.08              | 100  |       |
| Output Low<br>(Sink) Current<br>I <sub>OL</sub> Min.        | 0.4                   | 0,5                    | 5                      | 0.64                                  | 0.61  | 0.42  | 0.36  | 0.51  | 1                 | —    | mA    |
|                                                             | 0.5                   | 0,10                   | 10                     | 1.6                                   | 1.5   | 1.1   | 0.9   | 1.3   | 2.6               | —    |       |
|                                                             | 1.5                   | 0,15                   | 15                     | 4.2                                   | 4     | 2.8   | 2.4   | 3.4   | 6.8               | —    |       |
| Output High<br>(Source)<br>Current,<br>I <sub>OH</sub> Min. | 4.6                   | 0,5                    | 5                      | -0.64                                 | -0.61 | -0.42 | -0.36 | -0.51 | -1                | —    | mA    |
|                                                             | 2.5                   | 0,5                    | 5                      | -2                                    | -1.8  | -1.3  | -1.15 | -1.6  | -3.2              | —    |       |
|                                                             | 9.5                   | 0,10                   | 10                     | -1.6                                  | -1.5  | -1.1  | -0.9  | -1.3  | -2.6              | —    |       |
|                                                             | 13.5                  | 0,15                   | 15                     | -4.2                                  | -4    | -2.8  | -2.4  | -3.4  | -6.8              | —    |       |
| Output Voltage:<br>Low-Level,<br>V <sub>OL</sub> Max.       | —                     | 0,5                    | 5                      | 0.05                                  |       |       |       | —     | 0                 | 0.05 | V     |
|                                                             | —                     | 0,10                   | 10                     | 0.05                                  |       |       |       | —     | 0                 | 0.05 |       |
|                                                             | —                     | 0,15                   | 15                     | 0.05                                  |       |       |       | —     | 0                 | 0.05 |       |
| Output Voltage:<br>High-Level,<br>V <sub>OH</sub> Min.      | —                     | 0,5                    | 5                      | 4.95                                  |       |       |       | 4.95  | 5                 | —    | V     |
|                                                             | —                     | 0,10                   | 10                     | 9.95                                  |       |       |       | 9.95  | 10                | —    |       |
|                                                             | —                     | 0,15                   | 15                     | 14.95                                 |       |       |       | 14.95 | 15                | —    |       |
| Input Low<br>Voltage,<br>V <sub>IL</sub> Max.               | 0.5, 4.5              | —                      | 5                      | 1.5                                   |       |       |       | —     | —                 | 1.5  | V     |
|                                                             | 1, 9                  | —                      | 10                     | 3                                     |       |       |       | —     | —                 | 3    |       |
|                                                             | 1.5, 13.5             | —                      | 15                     | 4                                     |       |       |       | —     | —                 | 4    |       |
| Input High<br>Voltage,<br>V <sub>IH</sub> Min.              | 0.5, 4.5              | —                      | 5                      | 3.5                                   |       |       |       | 3.5   | —                 | —    | V     |
|                                                             | 1, 9                  | —                      | 10                     | 7                                     |       |       |       | 7     | —                 | —    |       |
|                                                             | 1.5, 13.5             | —                      | 15                     | 11                                    |       |       |       | 11    | —                 | —    |       |
| Input Current<br>I <sub>IN</sub> Max.                       | —                     | 0,18                   | 18                     | ±0.1                                  | ±0.1  | ±1    | ±1    | —     | ±10 <sup>-5</sup> | ±0.1 | μA    |

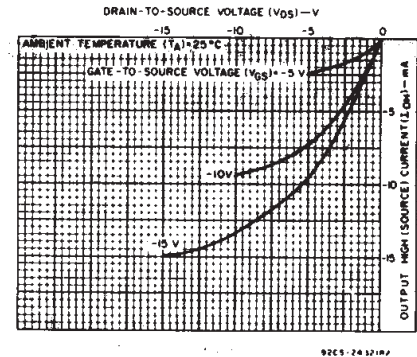


Fig. 4 — Minimum output high (source) current characteristics.

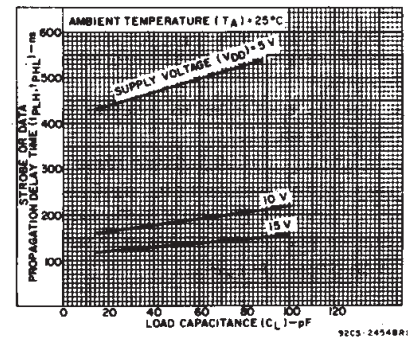


Fig. 5 — Typical strobe or data propagation delay time vs. load capacitance.

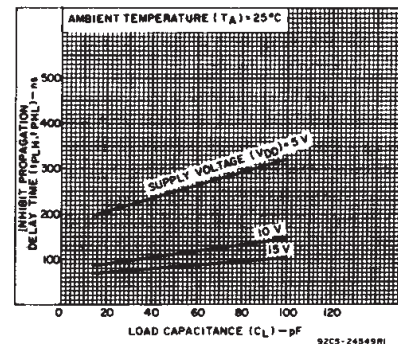


Fig. 6 — Typical inhibit propagation delay time vs. load capacitance.

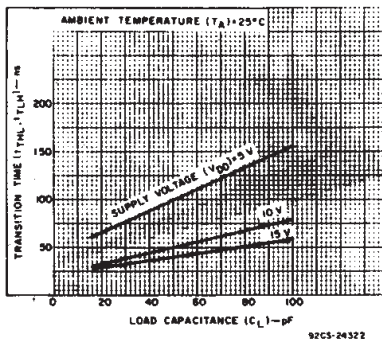


Fig. 7 — Typical low-to-high transition time vs. load capacitance.

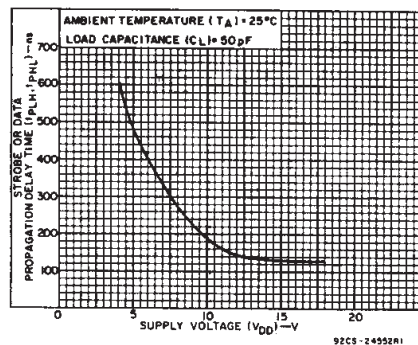


Fig. 8 — Typical strobe or data propagation delay time vs. supply voltage.

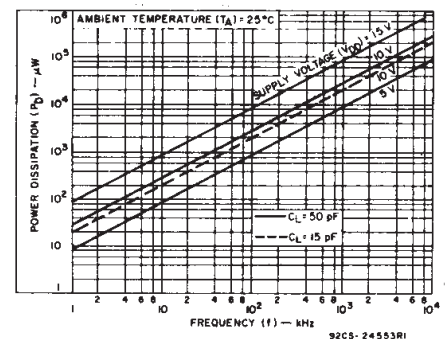


Fig. 9 — Typical power dissipation vs. frequency.

# CD4514B, CD4515B Types

DYNAMIC ELECTRICAL CHARACTERISTICS at  $T_A = 25^\circ\text{C}$ ; Input  $t_r, t_f = 20\text{ ns}$ ,  
 $C_L = 50\text{ pF}$ ,  $R_L = 200\text{ K}\Omega$

| CHARACTERISTIC                                                  | TEST CONDITIONS | LIMITS        |      | UNITS |
|-----------------------------------------------------------------|-----------------|---------------|------|-------|
|                                                                 |                 | $V_{DD}$<br>V | Typ. | Max.  |
| Propagation Delay Time: $t_{PHL}$ , $t_{PLH}$<br>Strobe or Data |                 | 5             | 485  | 970   |
|                                                                 |                 | 10            | 185  | 370   |
|                                                                 |                 | 15            | 135  | 270   |
| Inhibit                                                         |                 | 5             | 250  | 500   |
|                                                                 |                 | 10            | 110  | 220   |
|                                                                 |                 | 15            | 85   | 170   |
| Transition Time, $t_{TLH}$ , $t_{THL}$                          |                 | 5             | 100  | 200   |
|                                                                 |                 | 10            | 50   | 100   |
|                                                                 |                 | 15            | 40   | 80    |
| Minimum Strobe Pulse Width, $t_W$                               |                 | 5             | 125  | 250   |
|                                                                 |                 | 10            | 50   | 100   |
|                                                                 |                 | 15            | 40   | 75    |
| Minimum Data Setup Time, $t_S$                                  |                 | 5             | 75   | 150   |
|                                                                 |                 | 10            | 35   | 70    |
|                                                                 |                 | 15            | 20   | 40    |
| Input Capacitance, $C_{IN}$                                     | Any Input       | —             | 5    | 7.5   |
|                                                                 |                 |               |      | pF    |

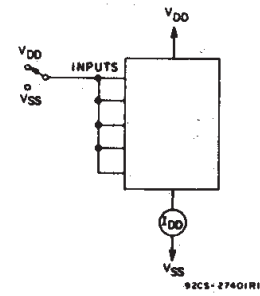


Fig. 10 — Quiescent device current test circuit.

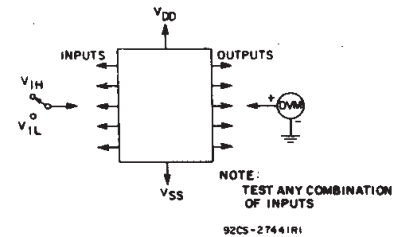


Fig. 11 — Input voltage test circuit.

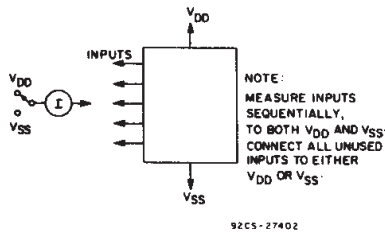


Fig. 12 — Input current test circuit.

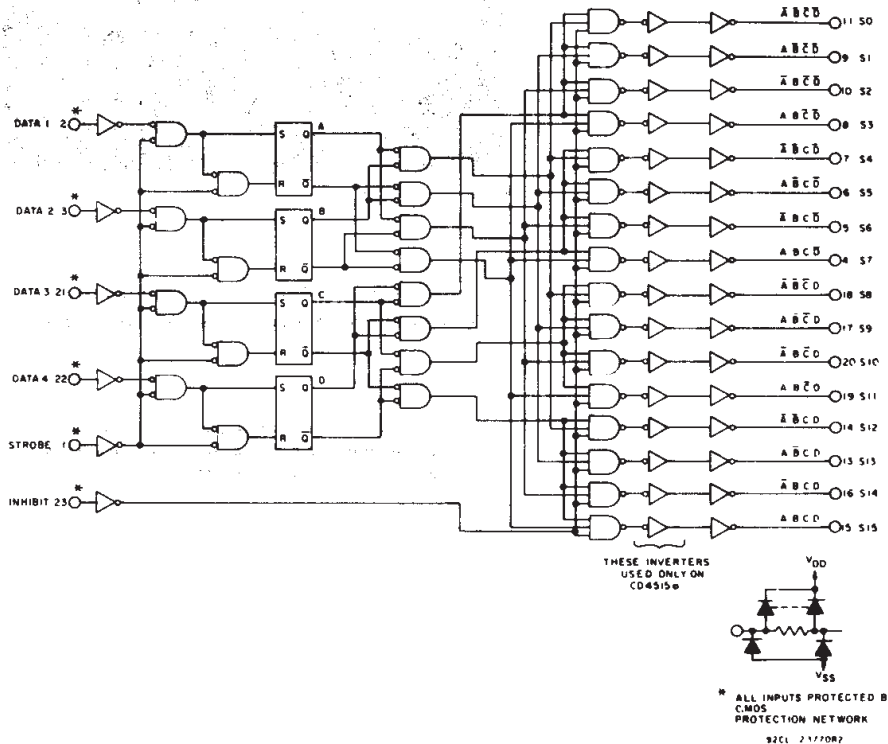


Fig. 13 — Logic diagram for CD4514B and CD4515B.

3  
 COMMERCIAL CMOS  
 HIGH VOLTAGE ICs

## CD4514B, CD4515B Types

DECODE TRUTH TABLE (Strobe = 1)

| INHIBIT | DECODER INPUTS |   |   |   | SELECTED OUTPUT                                      |
|---------|----------------|---|---|---|------------------------------------------------------|
|         | D              | C | B | A |                                                      |
| 0       | 0              | 0 | 0 | 0 | S0                                                   |
| 0       | 0              | 0 | 0 | 1 | S1                                                   |
| 0       | 0              | 0 | 1 | 0 | S2                                                   |
| 0       | 0              | 0 | 1 | 1 | S3                                                   |
| 0       | 0              | 1 | 0 | 0 | S4                                                   |
| 0       | 0              | 1 | 0 | 1 | S5                                                   |
| 0       | 0              | 1 | 1 | 0 | S6                                                   |
| 0       | 0              | 1 | 1 | 1 | S7                                                   |
| 0       | 1              | 0 | 0 | 0 | S8                                                   |
| 0       | 1              | 0 | 0 | 1 | S9                                                   |
| 0       | 1              | 0 | 1 | 0 | S10                                                  |
| 0       | 1              | 0 | 1 | 1 | S11                                                  |
| 0       | 1              | 1 | 0 | 0 | S12                                                  |
| 0       | 1              | 1 | 0 | 1 | S13                                                  |
| 0       | 1              | 1 | 1 | 0 | S14                                                  |
| 0       | 1              | 1 | 1 | 1 | S15                                                  |
| 1       | X              | X | X | X | All Outputs = 0, CD4514B<br>All Outputs = 1, CD4515B |

X = Don't Care Logic 1 = high Logic 0 = low

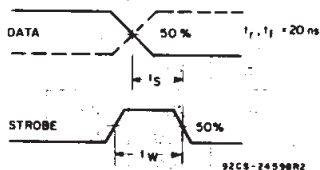
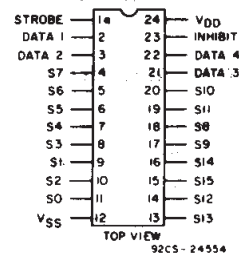
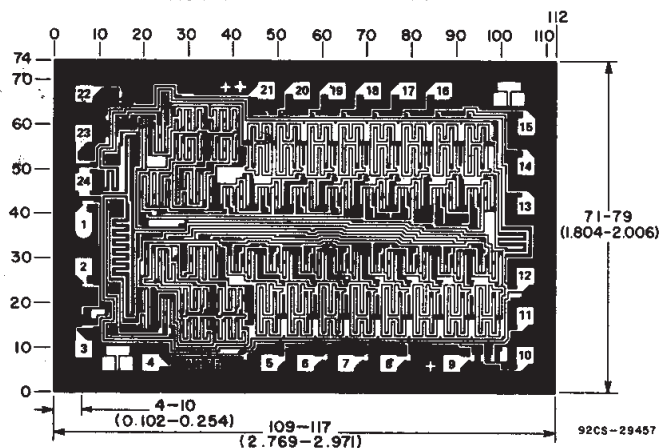


Fig. 14 — Waveforms for setup time and strobe pulse width.



CD4514B  
CD4515B

TERMINAL ASSIGNMENT



Dimensions and Pad Layout for CD4515B Chip  
(Dimensions and pad layout for the CD4514B are identical)

Dimensions in parentheses are in millimeters and are derived from the basic inch dimensions as indicated. Grid graduations are in mils ( $10^{-3}$  inch).

## PACKAGING INFORMATION

| Orderable Device | Status<br>(1) | Package Type | Package<br>Drawing | Pins | Package<br>Qty | Eco Plan<br>(2)            | Lead/Ball Finish<br>(6) | MSL Peak Temp<br>(3) | Op Temp (°C) | Device Marking<br>(4/5) | Samples                 |
|------------------|---------------|--------------|--------------------|------|----------------|----------------------------|-------------------------|----------------------|--------------|-------------------------|-------------------------|
| 7703201JA        | ACTIVE        | CDIP         | J                  | 24   | 1              | TBD                        | Call TI                 | N / A for Pkg Type   | -55 to 125   | 7703201JA<br>CD4515BF3A | <a href="#">Samples</a> |
| CD4514BF         | ACTIVE        | CDIP         | J                  | 24   | 1              | TBD                        | Call TI                 | N / A for Pkg Type   | -55 to 125   | CD4514BF                | <a href="#">Samples</a> |
| CD4514BF3A       | ACTIVE        | CDIP         | J                  | 24   | 1              | TBD                        | Call TI                 | N / A for Pkg Type   | -55 to 125   | CD4514BF3A              | <a href="#">Samples</a> |
| CD4514BM         | ACTIVE        | SOIC         | DW                 | 24   | 25             | Green (RoHS<br>& no Sb/Br) | NIPDAU                  | Level-1-260C-UNLIM   | -55 to 125   | CD4514BM                | <a href="#">Samples</a> |
| CD4514BM96       | ACTIVE        | SOIC         | DW                 | 24   | 2000           | Green (RoHS<br>& no Sb/Br) | NIPDAU   SN             | Level-1-260C-UNLIM   | -55 to 125   | CD4514BM                | <a href="#">Samples</a> |
| CD4514BM96G4     | ACTIVE        | SOIC         | DW                 | 24   | 2000           | Green (RoHS<br>& no Sb/Br) | NIPDAU                  | Level-1-260C-UNLIM   | -55 to 125   | CD4514BM                | <a href="#">Samples</a> |
| CD4515BF3A       | ACTIVE        | CDIP         | J                  | 24   | 1              | TBD                        | Call TI                 | N / A for Pkg Type   | -55 to 125   | 7703201JA<br>CD4515BF3A | <a href="#">Samples</a> |
| CD4515BM         | ACTIVE        | SOIC         | DW                 | 24   | 25             | Green (RoHS<br>& no Sb/Br) | NIPDAU                  | Level-1-260C-UNLIM   | -55 to 125   | CD4515BM                | <a href="#">Samples</a> |
| CD4515BM96       | ACTIVE        | SOIC         | DW                 | 24   | 2000           | Green (RoHS<br>& no Sb/Br) | NIPDAU                  | Level-1-260C-UNLIM   | -55 to 125   | CD4515BM                | <a href="#">Samples</a> |
| CD4515BME4       | ACTIVE        | SOIC         | DW                 | 24   | 25             | Green (RoHS<br>& no Sb/Br) | NIPDAU                  | Level-1-260C-UNLIM   | -55 to 125   | CD4515BM                | <a href="#">Samples</a> |

<sup>(1)</sup> 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.

**OBSELETE:** TI has discontinued the production of the device.

<sup>(2)</sup> **RoHS:** TI defines "RoHS" to mean semiconductor products that are compliant with the current EU RoHS requirements for all 10 RoHS substances, including the requirement that RoHS substance do not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, "RoHS" products are suitable for use in specified lead-free processes. TI may reference these types of products as "Pb-Free".

**RoHS Exempt:** TI defines "RoHS Exempt" to mean products that contain lead but are compliant with EU RoHS pursuant to a specific EU RoHS exemption.

**Green:** TI defines "Green" to mean the content of Chlorine (Cl) and Bromine (Br) based flame retardants meet JS709B low halogen requirements of <=1000ppm threshold. Antimony trioxide based flame retardants must also meet the <=1000ppm threshold requirement.

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

<sup>(4)</sup> There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

<sup>(5)</sup> Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

<sup>(6)</sup> Lead/Ball Finish - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead/Ball Finish values may wrap to two lines if the finish value exceeds the maximum column width.

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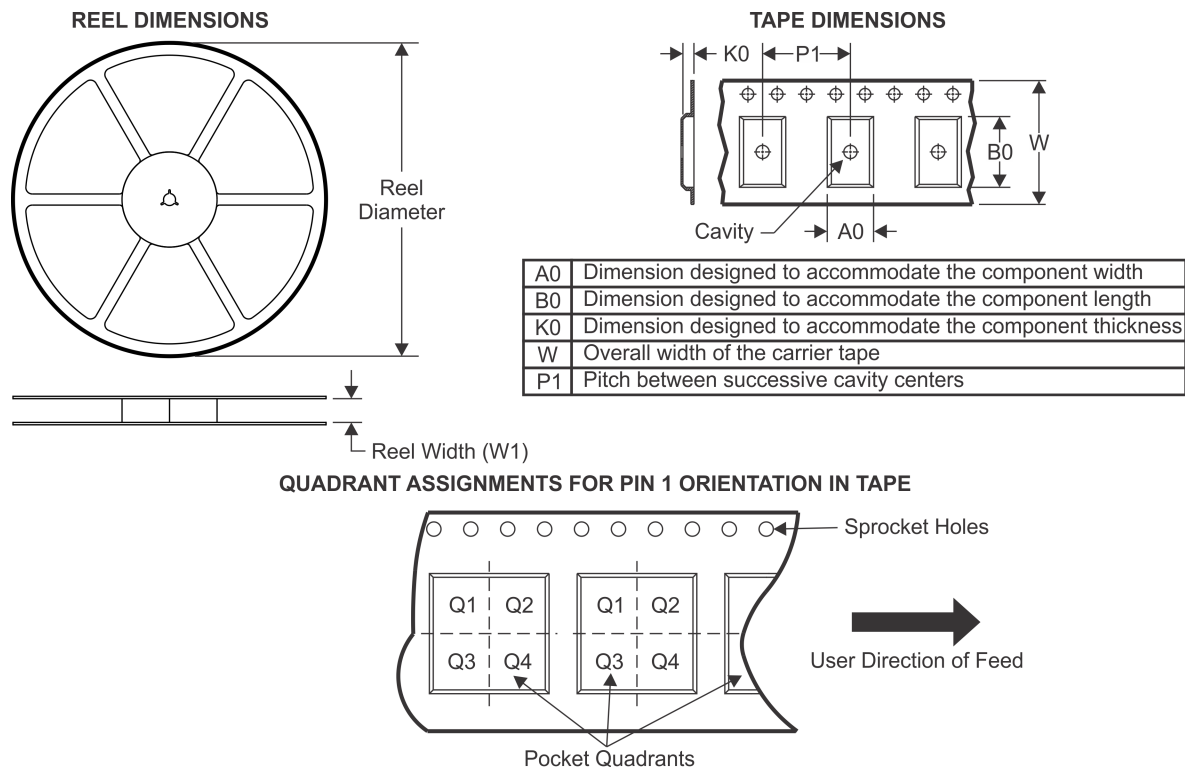
**OTHER QUALIFIED VERSIONS OF CD4514B, CD4514B-MIL, CD4515B, CD4515B-MIL :**

- Catalog: [CD4514B](#), [CD4515B](#)
- Military: [CD4514B-MIL](#), [CD4515B-MIL](#)

**NOTE: Qualified Version Definitions:**

- Catalog - TI's standard catalog product
- Military - QML certified for Military and Defense Applications

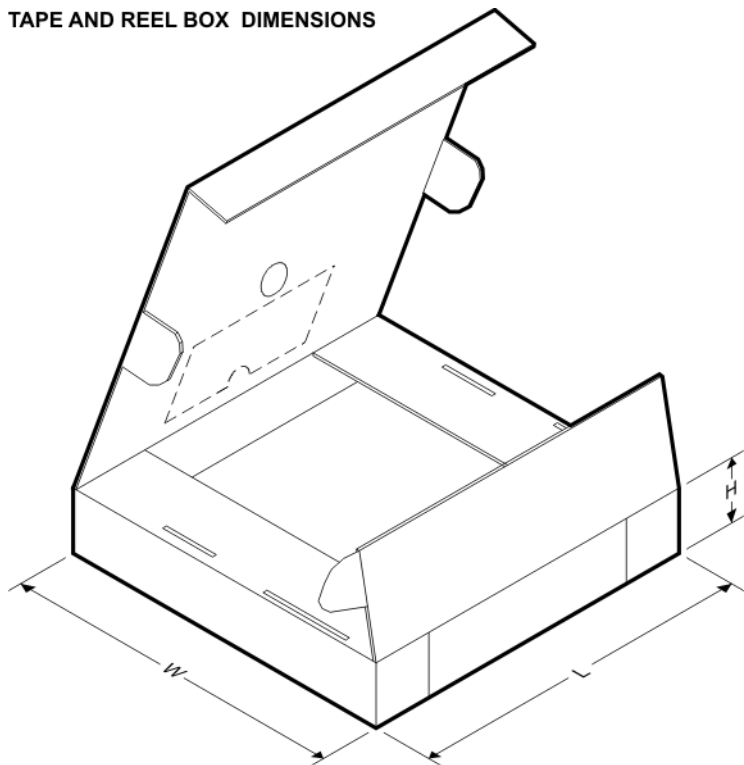


**TAPE AND REEL INFORMATION**


\*All dimensions are nominal

| Device       | Package Type | Package Drawing | Pins | SPQ  | Reel Diameter (mm) | Reel Width W1 (mm) | A0 (mm) | B0 (mm) | K0 (mm) | P1 (mm) | W (mm) | Pin1 Quadrant |
|--------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| CD4514BM96   | SOIC         | DW              | 24   | 2000 | 330.0              | 24.4               | 10.75   | 15.7    | 2.7     | 12.0    | 24.0   | Q1            |
| CD4514BM96G4 | SOIC         | DW              | 24   | 2000 | 330.0              | 24.4               | 10.75   | 15.7    | 2.7     | 12.0    | 24.0   | Q1            |
| CD4515BM96   | SOIC         | DW              | 24   | 2000 | 330.0              | 24.4               | 10.75   | 15.7    | 2.7     | 12.0    | 24.0   | Q1            |

## TAPE AND REEL BOX DIMENSIONS



\*All dimensions are nominal

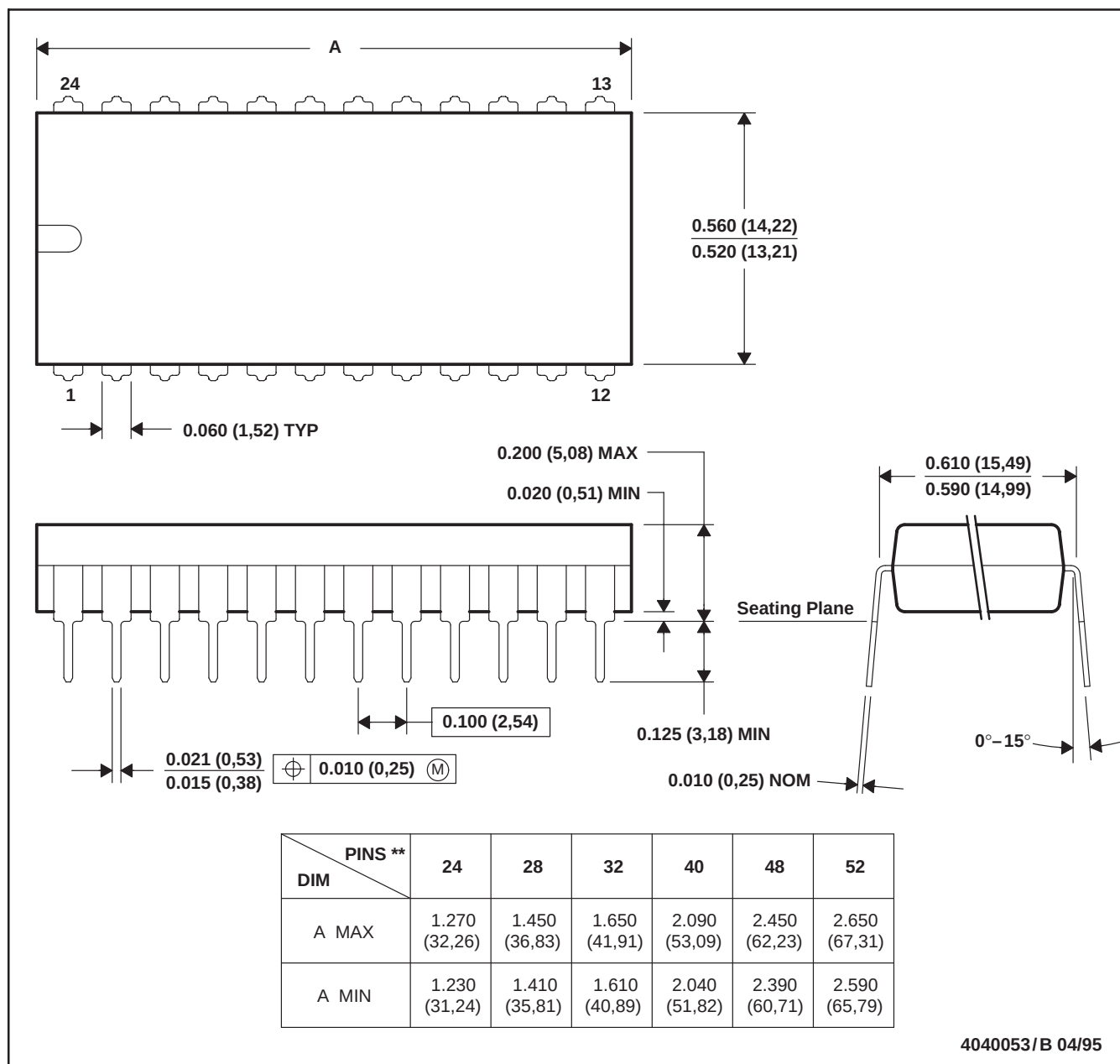
| Device       | Package Type | Package Drawing | Pins | SPQ  | Length (mm) | Width (mm) | Height (mm) |
|--------------|--------------|-----------------|------|------|-------------|------------|-------------|
| CD4514BM96   | SOIC         | DW              | 24   | 2000 | 350.0       | 350.0      | 43.0        |
| CD4514BM96G4 | SOIC         | DW              | 24   | 2000 | 350.0       | 350.0      | 43.0        |
| CD4515BM96   | SOIC         | DW              | 24   | 2000 | 350.0       | 350.0      | 43.0        |



## N (R-PDIP-T\*\*)

## PLASTIC DUAL-IN-LINE PACKAGE

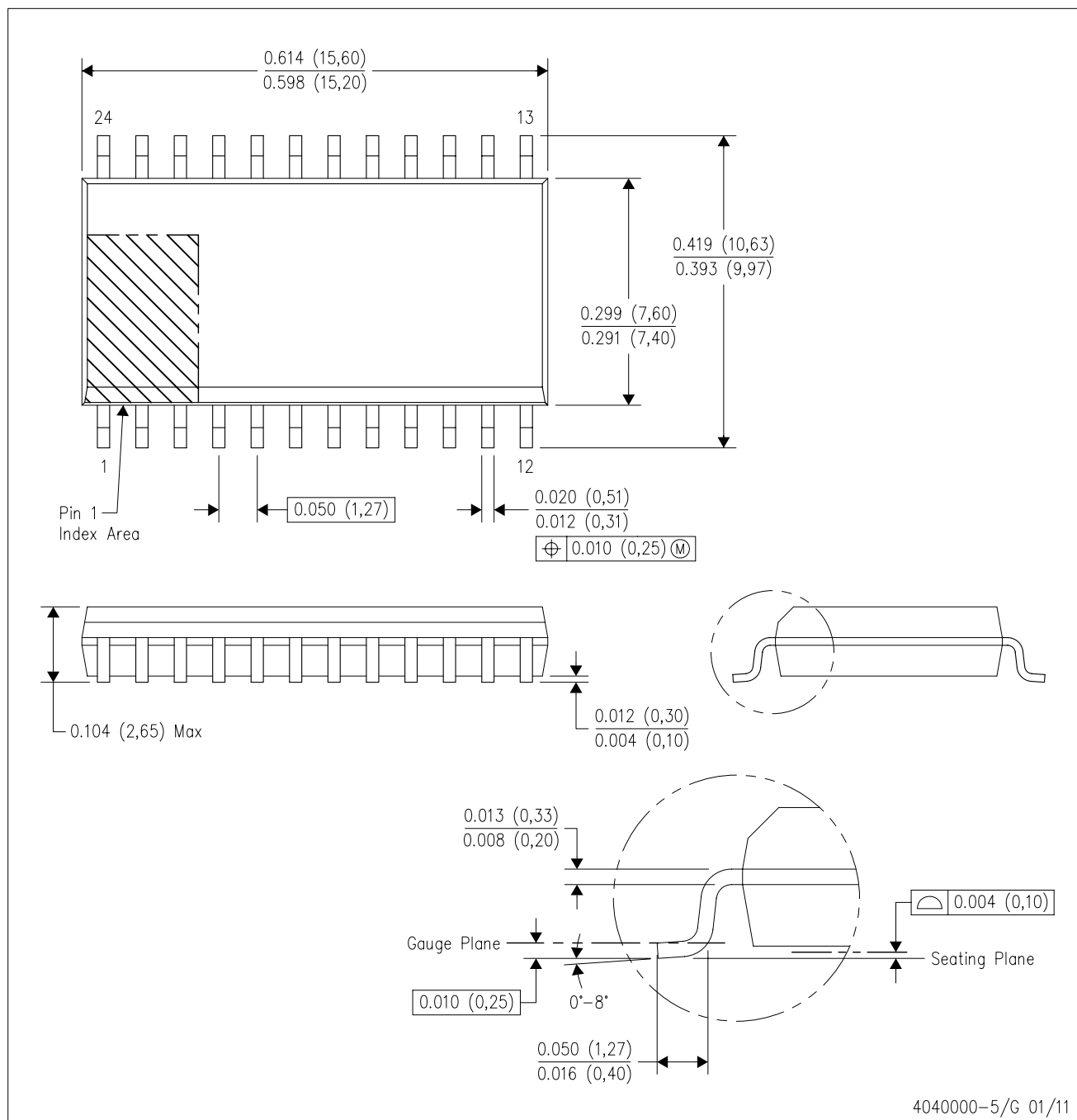
24 PIN SHOWN



- NOTES: A. All linear dimensions are in inches (millimeters).  
 B. This drawing is subject to change without notice.  
 C. Falls within JEDEC MS-011  
 D. Falls within JEDEC MS-015 (32 pin only)

DW (R-PDSO-G24)

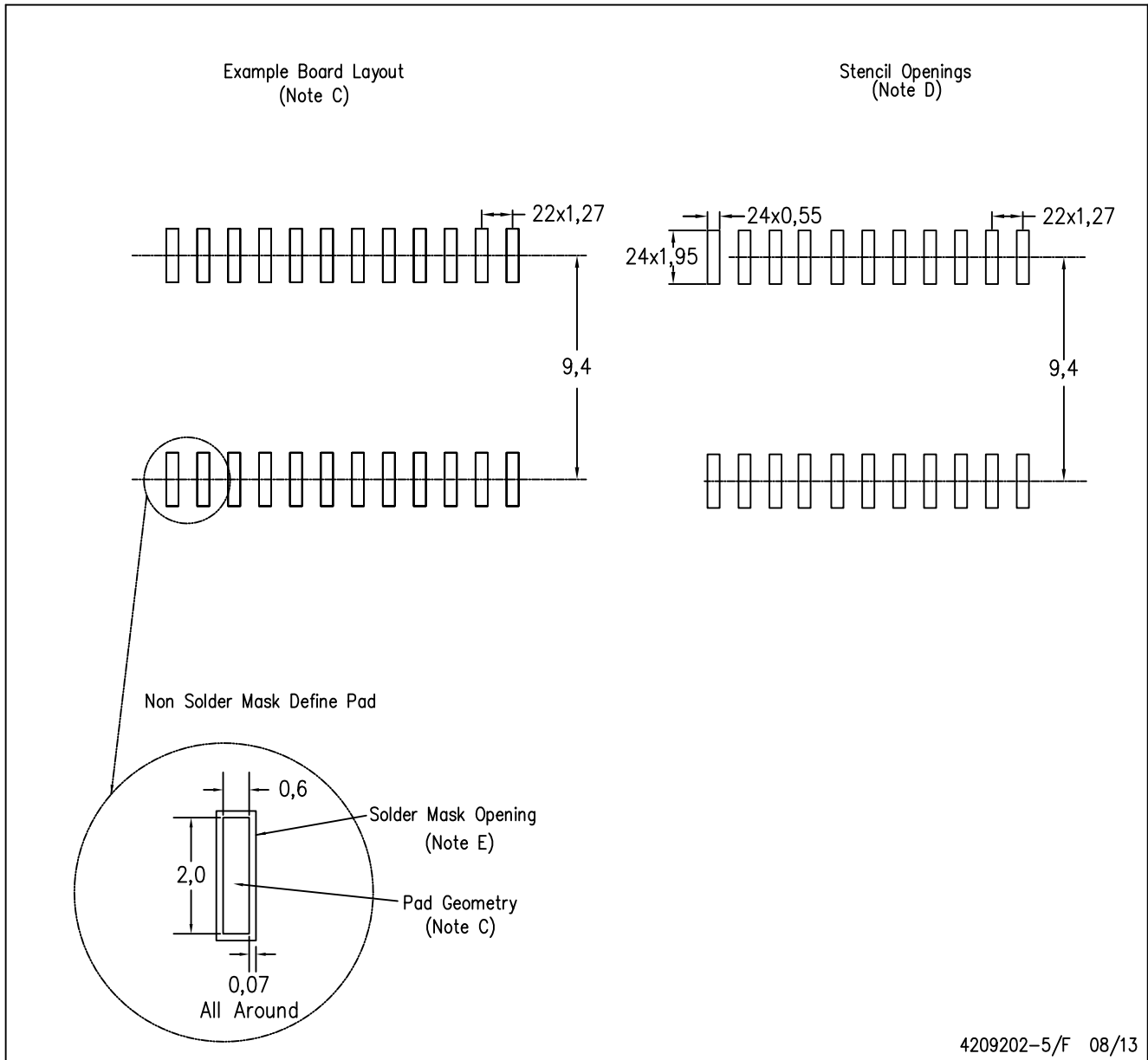
PLASTIC SMALL OUTLINE



- NOTES:
- All linear dimensions are in inches (millimeters). Dimensioning and tolerancing per ASME Y14.5M-1994.
  - This drawing is subject to change without notice.
  - Body dimensions do not include mold flash or protrusion not to exceed 0.006 (0,15).
  - Falls within JEDEC MS-013 variation AD.

DW (R-PDSO-G24)

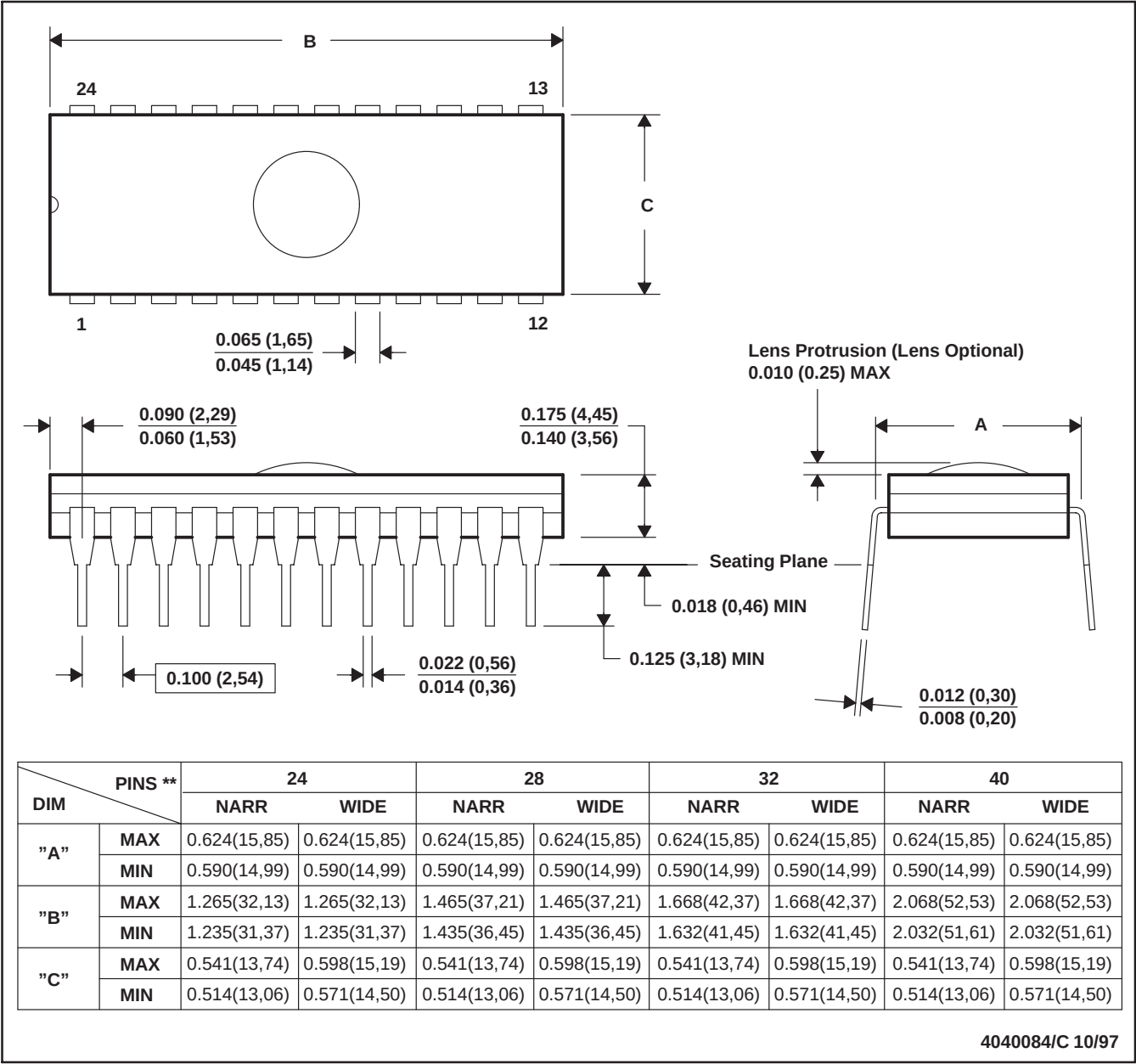
PLASTIC SMALL OUTLINE



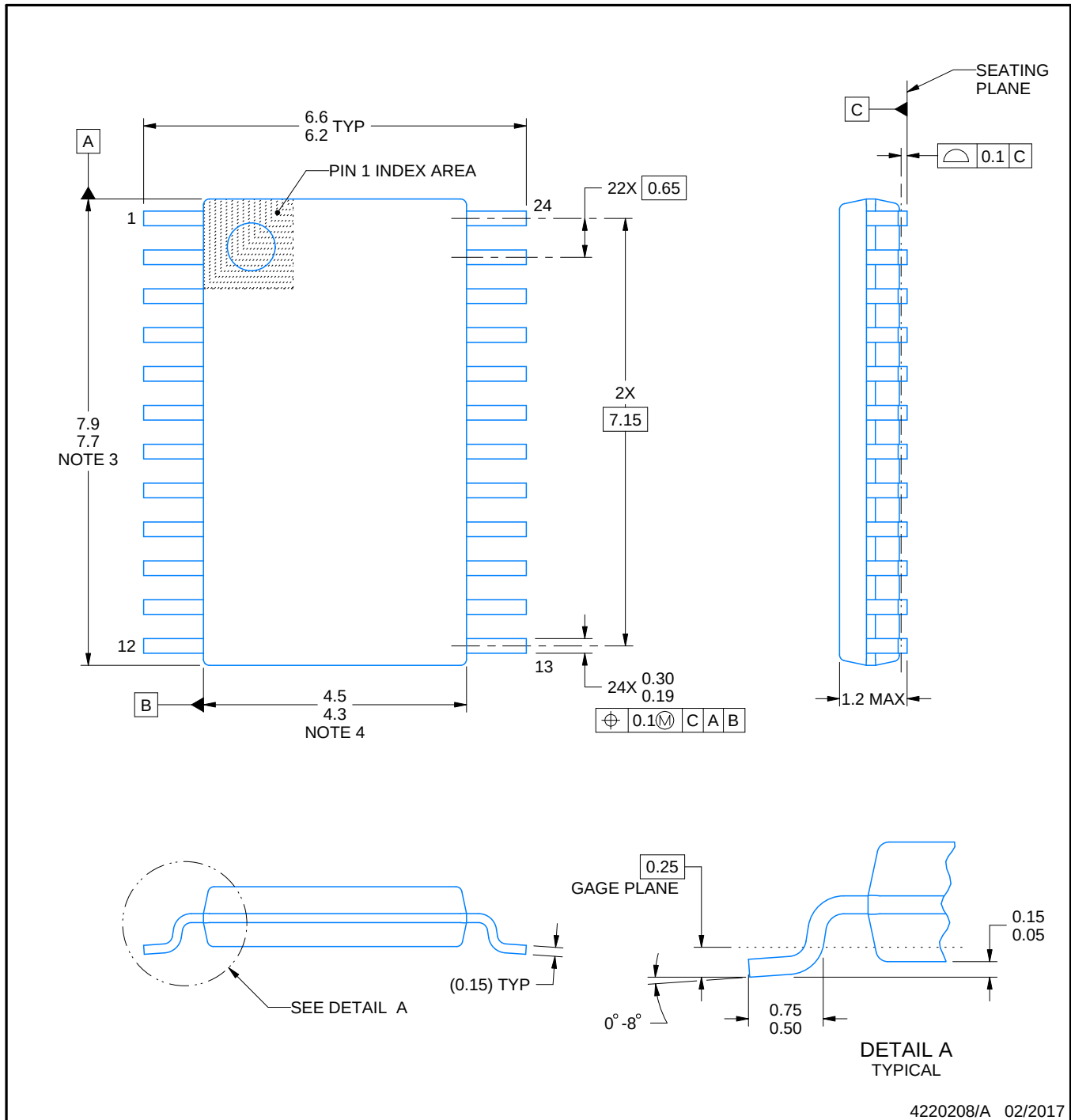
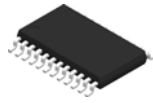
- NOTES:
- A. All linear dimensions are in millimeters.
  - B. This drawing is subject to change without notice.
  - C. Refer to IPC7351 for alternate board design.
  - D. Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC-7525
  - E. Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.

J (R-GDIP-T\*\*)
24 PINS SHOWN

CERAMIC DUAL-IN-LINE PACKAGE



- NOTES: A. All linear dimensions are in inches (millimeters).
B. This drawing is subject to change without notice.
C. Window (lens) added to this group of packages (24-, 28-, 32-, 40-pin).
D. This package can be hermetically sealed with a ceramic lid using glass frit.
E. Index point is provided on cap for terminal identification.



## NOTES:

1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.15 mm per side.
4. This dimension does not include interlead flash. Interlead flash shall not exceed 0.25 mm per side.
5. Reference JEDEC registration MO-153.

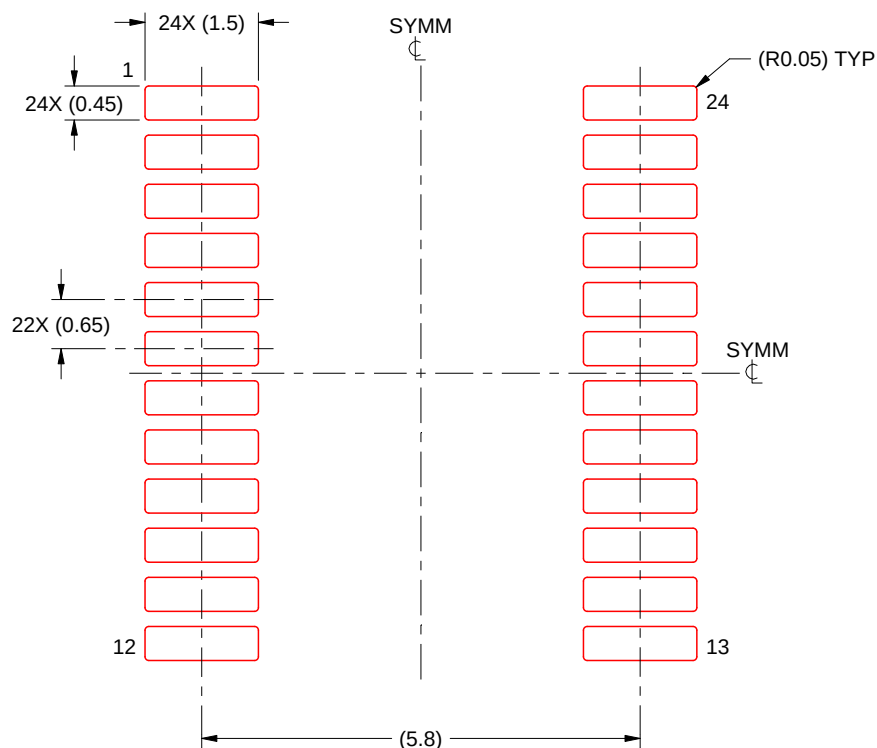
## SMALL OUTLINE PACKAGE

## EXAMPLE STENCIL DESIGN

PW0024A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



SOLDER PASTE EXAMPLE  
BASED ON 0.125 mm THICK STENCIL  
SCALE: 10X

4220208/A 02/2017

NOTES: (continued)

8. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
9. Board assembly site may have different recommendations for stencil design.

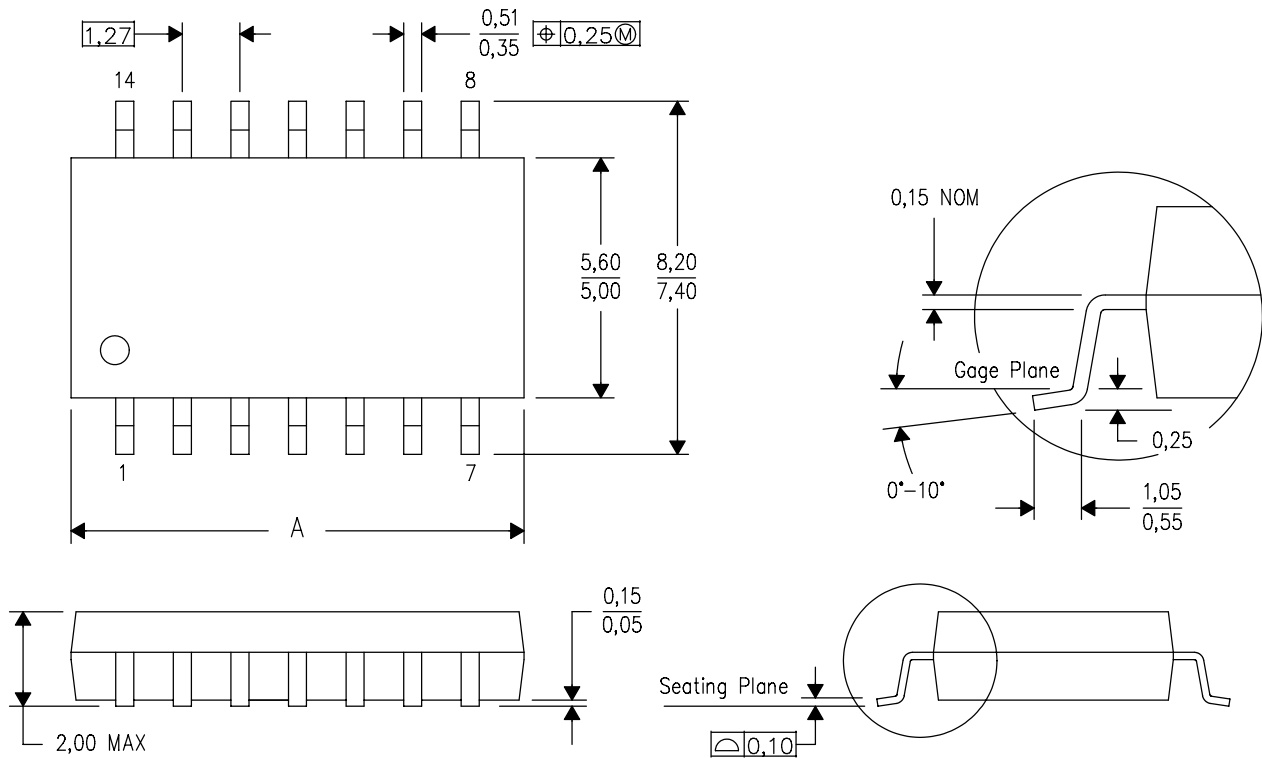


# MECHANICAL DATA

NS (R-PDSO-G\*\*)

PLASTIC SMALL-OUTLINE PACKAGE

14-PINS SHOWN



| DIM \ PINS ** | 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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