

## CD4511B Types

## CMOS BCD-to-7-Segment Latch Decoder Drivers

### High-Voltage Types (20-Volt Rating)

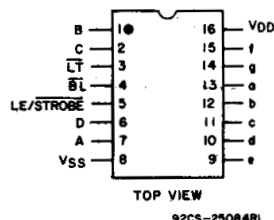


■ **CD4511B types** are BCD-to-7-segment latch decoder drivers constructed with CMOS logic and n-p-n bipolar transistor output devices on a single monolithic structure. These devices combine the low quiescent power dissipation and high noise immunity features of RCA CMOS with n-p-n bipolar output transistors capable of sourcing up to 25 mA. This capability allows the CD4511B types to drive LED's and other displays directly.

Lamp Test ( $\overline{LT}$ ), Blanking ( $\overline{BL}$ ), and Latch Enable or Strobe inputs are provided to test the display, shut off or intensity-modulate it, and store or strobe a BCD code, respectively. Several different signals may be multiplexed and displayed when external multiplexing circuitry is used.

The CD4511B types are supplied in 16-lead hermetic dual-in-line ceramic packages (F3A suffix), 16-lead dual-in-line plastic packages (E suffix), 16-lead small-outline packages (NSR suffix), and 16-lead thin shrink small-outline packages (PW and PWR suffixes).

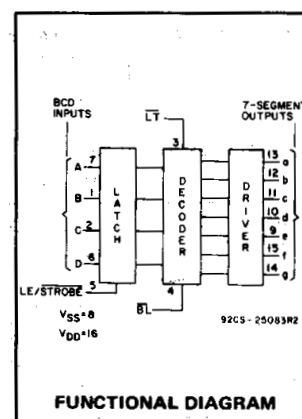
These devices are similar to the type MC14511.



**CD4511B**  
**TERMINAL ASSIGNMENT**

**Features:**

- High-output-sourcing capability . . . . . up to 25 mA
- Input latches for BCD Code storage
- Lamp Test and Blanking capability
- 7-segment outputs blanked for BCD input codes > 1001
- 100% tested for quiescent current at 20 V
- Max. input current of 1  $\mu$ A at 18 V, over full package-temperature range, 100 nA at 18 V and 25°C
- 5-V, 10-V, and 15-V parametric ratings



**Applications:**

- Driving common-cathode LED displays
- Multiplexing with common-cathode LED displays
- Driving incandescent displays
- Driving low-voltage fluorescent displays

**MAXIMUM RATINGS, Absolute-Maximum Values:**

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

Voltages referenced to  $V_{SS}$  Terminal)

INPUT VOLTAGE RANGE, ALL INPUTS

DC INPUT CURRENT, ANY ONE INPUT

**POWER DISSIPATION, PER PACKAGE ( $P_D$ ):**

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

For  $T_A = +100^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$ .

DEVICE DISSIPATION PER OUTPUT TRANSISTOR

FOR T<sub>A</sub> = FULL PACKAGE-TEMPERATURE RANGE (All Package Types)

OPERATING-TEMPERATURE RANGE ( $T_A$ )

**STORAGE TEMPERATURE RANGE ( $T_{\text{stg}}$ )**

LEAD TEMPERATURE (DURING SOLDERING):

At distance  $1/16 \pm 1/32$  inch ( $1.59 \pm 0.79$ mm) from case for 10s max

**OPERATING CONDITIONS AT  $T_A = 25^{\circ}\text{C}$  Unless Otherwise Specified**

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

| Characteristic                                                              | V <sub>DD</sub> | Min. | Max. | Units |
|-----------------------------------------------------------------------------|-----------------|------|------|-------|
| Supply Voltage Range (T <sub>A</sub> ):<br>(Full Package Temperature Range) | —               | 3    | 18   | V     |
| Set-Up Time (t <sub>S</sub> )                                               | 5               | 150  | —    | ns    |
|                                                                             | 10              | 70   | —    | ns    |
|                                                                             | 15              | 40   | —    | ns    |
| Hold Time (t <sub>H</sub> )                                                 | 5               | 0    | —    | ns    |
|                                                                             | 10              | 0    | —    | ns    |
|                                                                             | 15              | 0    | —    | ns    |
| Strobe Pulse Width (t <sub>W</sub> )                                        | 5               | 400  | —    | ns    |
|                                                                             | 10              | 160  | —    | ns    |
|                                                                             | 15              | 100  | —    | ns    |

# CD4511B Types

## STATIC ELECTRICAL CHARACTERISTICS

| CHARACTERISTIC                                        | TEST CONDITIONS         |                       |                        |                        | LIMITS AT INDICATED TEMPERATURES (°C) |       |       |       |       |                   |      | Units |
|-------------------------------------------------------|-------------------------|-----------------------|------------------------|------------------------|---------------------------------------|-------|-------|-------|-------|-------------------|------|-------|
|                                                       | I <sub>OH</sub><br>(mA) | V <sub>O</sub><br>(V) | V <sub>IN</sub><br>(V) | V <sub>DD</sub><br>(V) |                                       |       |       |       |       |                   |      |       |
|                                                       |                         |                       |                        |                        | −55                                   | −40   | +85   | +125  | +25   |                   |      |       |
|                                                       |                         |                       |                        |                        | Min.                                  | Typ.  | Max.  |       |       |                   |      |       |
| Quiescent Device Current: I <sub>DD</sub> Max.        | —                       | —                     | —                      | 5                      | 5                                     | 5     | 150   | 150   | —     | 0.04              | 5    | μA    |
|                                                       | —                       | —                     | —                      | 10                     | 10                                    | 10    | 300   | 300   | —     | 0.04              | 10   |       |
|                                                       | —                       | —                     | —                      | 15                     | 20                                    | 20    | 600   | 600   | —     | 0.04              | 20   |       |
|                                                       | —                       | —                     | —                      | 20                     | 100                                   | 100   | 3000  | 3000  | —     | 0.08              | 100  |       |
| Output Voltage:                                       |                         |                       |                        |                        |                                       |       |       |       |       |                   |      |       |
| Low-Level 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 |       |
| High-Level V <sub>OH</sub> Min.                       | —                       | —                     | 0.5                    | 5                      | 4                                     | 4     | 4.2   | 4.2   | 4.1   | 4.55              | —    | V     |
|                                                       | —                       | —                     | 0.10                   | 10                     | 9                                     | 9     | 9.2   | 9.2   | 9.1   | 9.55              | —    |       |
|                                                       | —                       | —                     | 0.15                   | 15                     | 14                                    | 14    | 14.2  | 14.2  | 14.1  | 14.55             | —    |       |
| Input Low Voltage, V <sub>IL</sub> Max.               | —                       | 0.5,3.8               |                        | 5                      | 1.5                                   |       |       |       | —     | —                 | 1.5  | V     |
|                                                       | —                       | 1.8,8                 | —                      | 10                     | 3                                     |       |       |       | —     | —                 | 3    |       |
|                                                       | —                       | 1.5,13.8              |                        | 15                     | 4                                     |       |       |       | —     | —                 | 4    |       |
| Input High Voltage, V <sub>IH</sub> Min.              | —                       | 0.5,3.8               |                        | 5                      | 3.5                                   |       |       |       | 3.5   | —                 | —    | V     |
|                                                       | —                       | 1.8,8                 |                        | 10                     | 7                                     |       |       |       | 7     | —                 | —    |       |
|                                                       | —                       | 1.5,13.8              |                        | 15                     | 11                                    |       |       |       | 11    | —                 | —    |       |
| Output Drive Voltage: High Level V <sub>OH</sub> Min. | 0                       |                       |                        | 5                      | 4.0                                   | 4.0   | 4.20  | 4.20  | 4.10  | 4.55              | —    | V     |
|                                                       | 5                       | —                     |                        |                        | —                                     | —     | —     | —     | —     | 4.25              | —    |       |
|                                                       | 10                      | —                     |                        |                        | 3.80                                  | 3.80  | 3.90  | 3.90  | 3.90  | 4.10              | —    |       |
|                                                       | 15                      | —                     |                        |                        | —                                     | —     | 3.50  | 3.50  | —     | 3.95              | —    |       |
|                                                       | 20                      | —                     |                        |                        | 3.55                                  | 3.55  | 3.30  | —     | 3.40  | 3.75              | —    |       |
|                                                       | 25                      | —                     |                        | 10                     | 3.40                                  | 3.40  | —     | —     | 3.10  | 3.55              | —    | V     |
|                                                       | 0                       | —                     |                        |                        | 9.0                                   | 9.0   | 9.20  | 9.20  | 9.10  | 9.55              | —    |       |
|                                                       | 5                       | —                     |                        |                        | —                                     | —     | —     | —     | —     | 9.25              | —    |       |
|                                                       | 10                      | —                     |                        |                        | 8.85                                  | 8.85  | 9.00  | 9.00  | 9.00  | 9.15              | —    |       |
|                                                       | 15                      | —                     |                        |                        | —                                     | —     | —     | —     | —     | 9.05              | —    |       |
|                                                       | 20                      | —                     |                        | 15                     | 8.70                                  | 8.70  | 8.40  | 8.40  | 8.60  | 8.90              | —    | V     |
|                                                       | 25                      | —                     |                        |                        | 8.60                                  | 8.60  | —     | —     | 8.30  | 8.75              | —    |       |
|                                                       | 0                       | —                     |                        |                        | 14.0                                  | 14.0  | 14.20 | 14.20 | 14.10 | 14.55             | —    |       |
|                                                       | 5                       | —                     |                        |                        | —                                     | —     | —     | —     | —     | 14.30             | —    |       |
|                                                       | 10                      | —                     |                        |                        | 13.90                                 | 13.90 | 14.0  | 14.0  | 14.0  | 14.20             | —    |       |
|                                                       | 15                      | —                     |                        | 20                     | —                                     | —     | —     | —     | —     | 14.10             | —    | V     |
|                                                       | 20                      | —                     |                        |                        | 13.75                                 | 13.75 | 13.50 | 13.50 | 13.70 | 13.95             | —    |       |
|                                                       | 25                      | —                     |                        |                        | 13.65                                 | 13.65 | —     | —     | 13.50 | 13.80             | —    |       |
|                                                       | 0                       | —                     |                        |                        | —                                     | —     | —     | —     | —     | —                 | —    |       |
|                                                       | 5                       | —                     |                        |                        | —                                     | —     | —     | —     | —     | —                 | —    |       |
| Output Low (Sink) Current, 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               | —    |       |
| Input Current, I <sub>IN</sub> Max.                   | —                       | 0.18                  | 0.18                   | 18                     | ±0.1                                  | ±0.1  | ±1    | ±1    | —     | ±10 <sup>−5</sup> | ±0.1 | μA    |

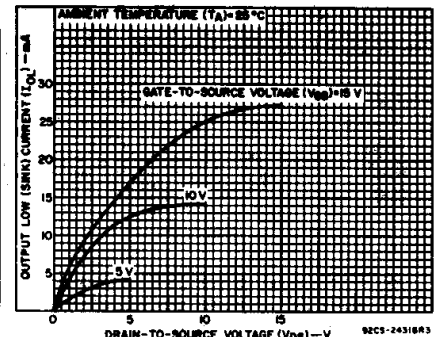


Fig. 1 - Typical output low (sink) current characteristics.

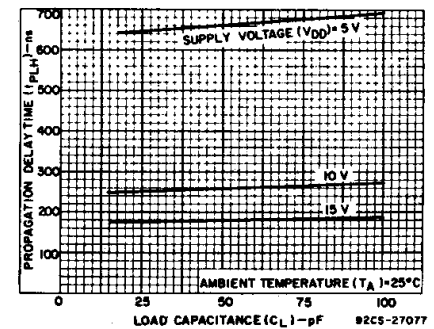


Fig. 2 - Typical data-to-output, low-to-high-level propagation delay time as a function of load capacitance.

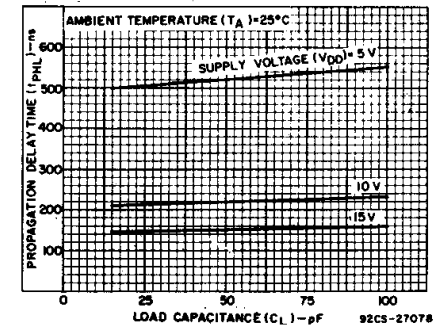


Fig. 3 - Typical data-to-output, high-to-low-level propagation delay time as a function of load capacitance.

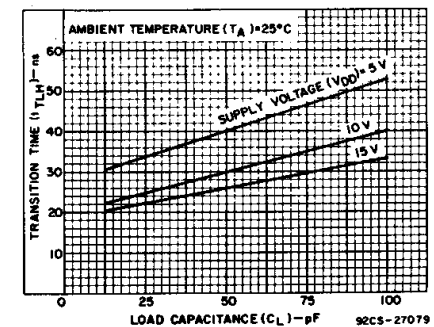


Fig. 4 - Typical low-to-high-level transition time as a function of load capacitance.

## CD4511B 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<br>All Packages |      |      | UNITS |
|-------------------------------------------------------------------|-------------------|------------------------|------|------|-------|
|                                                                   | $V_{DD}$<br>Volts | Min.                   | Typ. | Max. |       |
| Propagation Delay Time:<br>(Data)<br>High-to-Low Level, $t_{PHL}$ | 5                 | —                      | 520  | 1040 | ns    |
|                                                                   | 10                | —                      | 210  | 420  |       |
|                                                                   | 15                | —                      | 150  | 300  |       |
| Low-to-High Level, $t_{PLH}$                                      | 5                 | —                      | 660  | 1320 | ns    |
|                                                                   | 10                | —                      | 260  | 520  |       |
|                                                                   | 15                | —                      | 180  | 360  |       |
| Propagation Delay Time:<br>(BL)<br>High-to-Low Level, $t_{PHL}$   | 5                 | —                      | 350  | 700  | ns    |
|                                                                   | 10                | —                      | 175  | 350  |       |
|                                                                   | 15                | —                      | 125  | 250  |       |
| Low-to-High Level, $t_{PLH}$                                      | 5                 | —                      | 400  | 800  | ns    |
|                                                                   | 10                | —                      | 175  | 350  |       |
|                                                                   | 15                | —                      | 150  | 300  |       |
| Propagation Delay Time:<br>(LT)<br>High-to-Low Level, $t_{PHL}$   | 5                 | —                      | 250  | 500  | ns    |
|                                                                   | 10                | —                      | 125  | 250  |       |
|                                                                   | 15                | —                      | 85   | 170  |       |
| Low-to-High Level, $t_{PLH}$                                      | 5                 | —                      | 150  | 300  | ns    |
|                                                                   | 10                | —                      | 75   | 150  |       |
|                                                                   | 15                | —                      | 50   | 100  |       |
| Transition Time:<br>Low-to-High Level, $t_{TLH}$                  | 5                 | —                      | 40   | 80   | ns    |
|                                                                   | 10                | —                      | 30   | 60   |       |
|                                                                   | 15                | —                      | 25   | 50   |       |
| High-to-Low Level, $t_{THL}$                                      | 5                 | —                      | 125  | 310  | ns    |
|                                                                   | 10                | —                      | 75   | 185  |       |
|                                                                   | 15                | —                      | 65   | 160  |       |
| Minimum Set-Up Time, $t_S$                                        | 5                 | 150                    | 75   | —    | ns    |
|                                                                   | 10                | 70                     | 35   | —    |       |
|                                                                   | 15                | 40                     | 20   | —    |       |
| Minimum Hold Time, $t_H$                                          | 5                 | 0                      | -75  | —    | ns    |
|                                                                   | 10                | 0                      | -35  | —    |       |
|                                                                   | 15                | 0                      | -20  | —    |       |
| Strobe Pulse Width, $t_W$                                         | 5                 | 400                    | 200  | —    | ns    |
|                                                                   | 10                | 160                    | 80   | —    |       |
|                                                                   | 15                | 100                    | 50   | —    |       |
| Input Capacitance, $C_{IN}$                                       |                   | —                      | 5    | 7.5  | pF    |

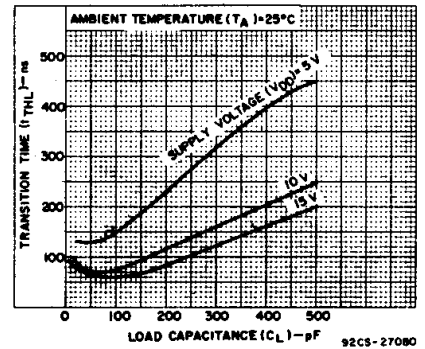


Fig. 5 — Typical high-to-low transition time as a function of load capacitance.

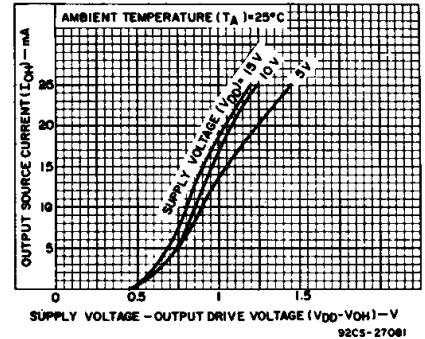


Fig. 6 — Typical voltage drop ( $V_{DD}$  to output) vs. output source current as a function of supply.

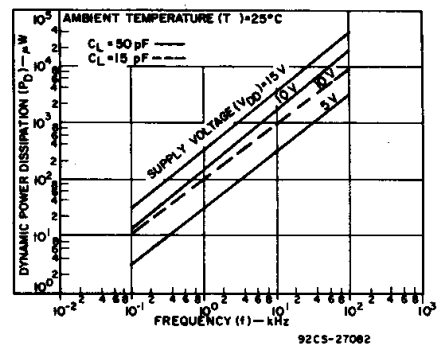


Fig. 7 — Typical dynamic power dissipation characteristics.

3

COMMERCIAL CMOS  
HIGH VOLTAGE ICs

# CD4511B Types

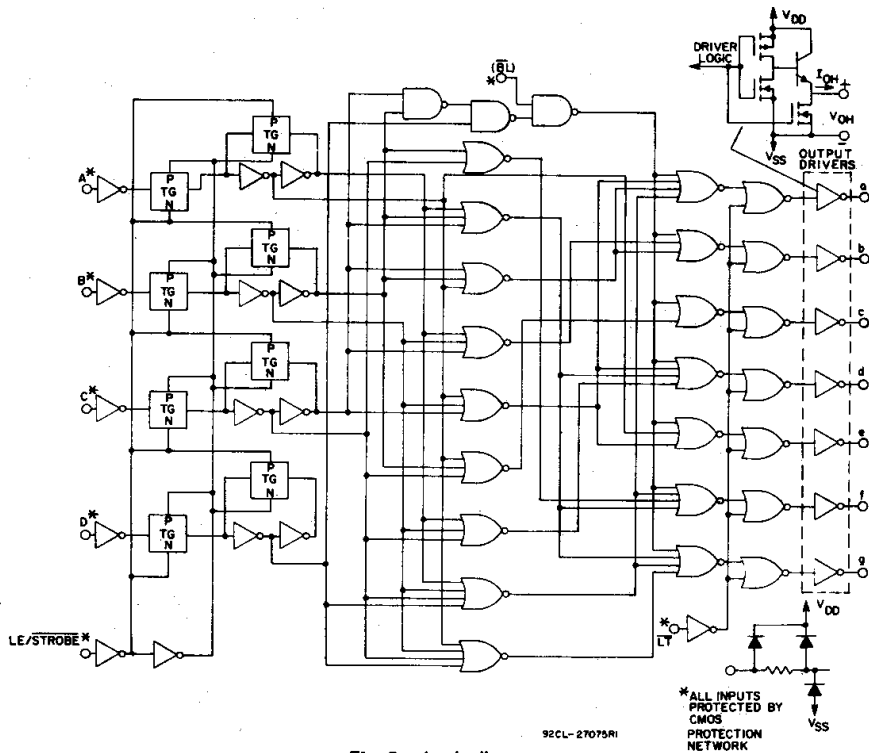


Fig. 8 - Logic diagram.

| TRUTH TABLE |    |    |   |   |   |   |   |   |   |   |   |   |   |         |
|-------------|----|----|---|---|---|---|---|---|---|---|---|---|---|---------|
| LE          | BI | LT | D | C | B | A | a | b | c | d | e | f | g | Display |
| X           | X  | 0  | X | X | X | X | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 8       |
| X           | 0  | 1  | X | X | X | X | 0 | 0 | 0 | 0 | 0 | 0 | 0 | Blank   |
| 0           | 1  | 1  | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0       |
| 0           | 1  | 1  | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1       |
| 0           | 1  | 1  | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 2       |
| 0           | 1  | 1  | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 3       |
| 0           | 1  | 1  | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 4       |
| 0           | 1  | 1  | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 5       |
| 0           | 1  | 1  | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 6       |
| 0           | 1  | 1  | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 7       |
| 0           | 1  | 1  | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 8       |
| 0           | 1  | 1  | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 9       |
| 0           | 1  | 1  | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | Blank   |
| 0           | 1  | 1  | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | Blank   |
| 0           | 1  | 1  | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | Blank   |
| 0           | 1  | 1  | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | Blank   |
| 0           | 1  | 1  | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | Blank   |
| 0           | 1  | 1  | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | Blank   |
| 1           | 1  | 1  | X | X | X | X | * | * | * | * | * | * | * | *       |

X = Don't Care

\* Depends on BCD code previously applied when LE = 0

Note: Display is blank for all illegal input codes (BCD > 1001).

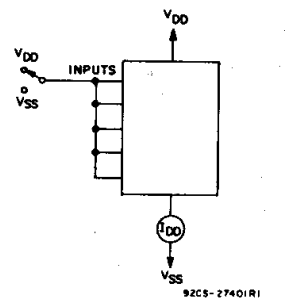


Fig. 9 - Quiescent device current.

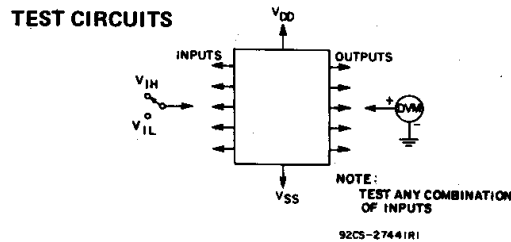


Fig. 10 - Input voltage.

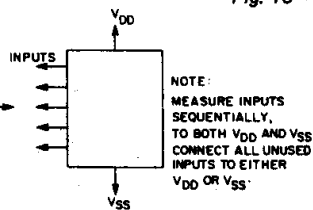


Fig. 11 - Input current.

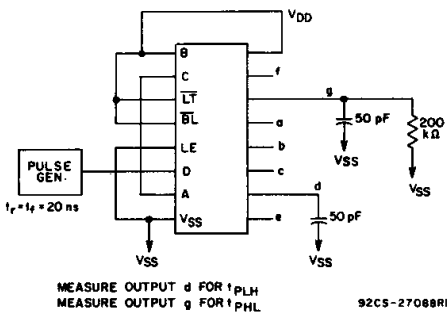


Fig. 12 - Data propagation delay.

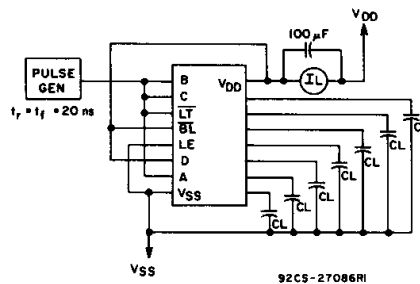


Fig. 13 - Dynamic power dissipation.

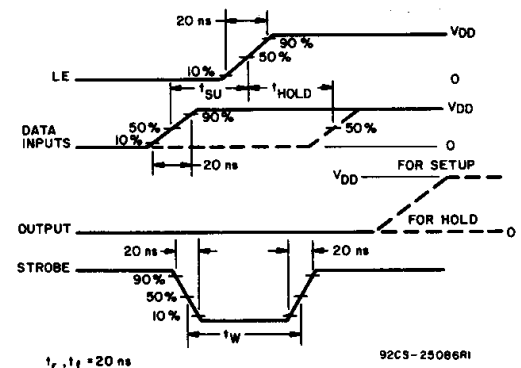
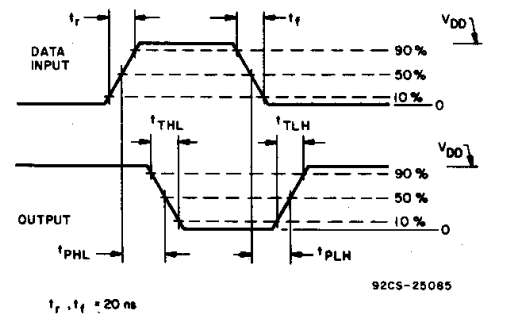
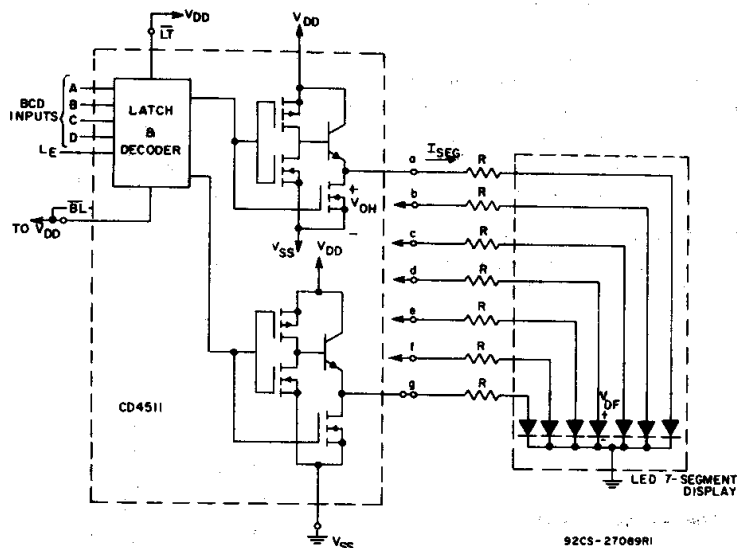


Fig. 14 - Dynamic waveforms.

# CD4511B Types

## APPLICATIONS Interfacing with Various Displays

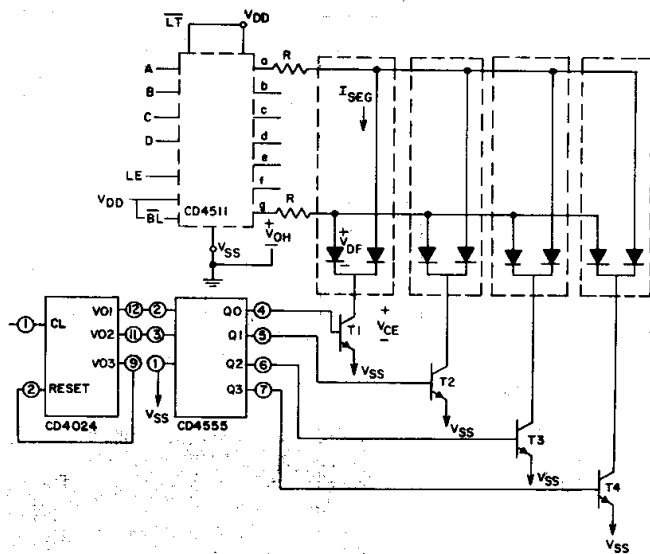


Duty Cycle = 100%

$I_{SEG} = I_{DIODE\ AVG.} = 20\text{ mA at Luminous Intensity/Segment} = 250\text{ microcandles}$

$$R = \frac{V_{OH} - V_{DF}}{I_{SEG}}$$

Fig. 15 - Driving common-cathode 7-segment LED displays (example Hewlett-Packard 5082-7740).



Multiplexing Scheme Showing 2 of 7 Segments Connected

Transistors  $T_1-T_4$  (RCA-2N3053 or 2N2102) have  $I_C$  Max. rating  $> 7 \times I_{SEG}$

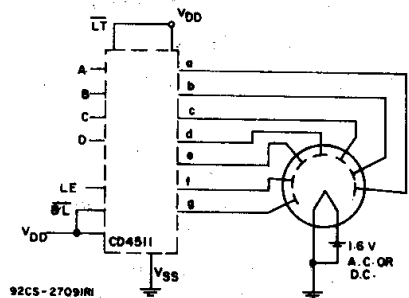
Duty Cycle = 25%

$$I_{SEG} = (I_{DIODE\ AVG.}) \times 4$$

$$R = \frac{(V_{OH} - V_{DF} - V_{CE})}{I_{SEG}}$$

All unused inputs on CD4555 are connected to  $V_{DD}$  or  $V_{SS}$ .

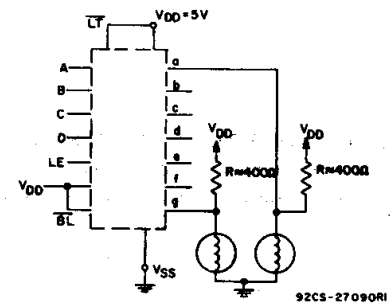
Fig. 18 - Multiplexing with common-cathode 7-segment LED displays (example Hewlett-Packard 5082-7404 4 character display or 4 discrete Monosanto Man 3 displays).



A medium-brightness intensity display can be obtained with low-voltage fluorescent displays such as the Tung-Sol Digivac S/G\*\* Series.

\*\*Trademark Tung-Sol Division Wagner Electric Co.

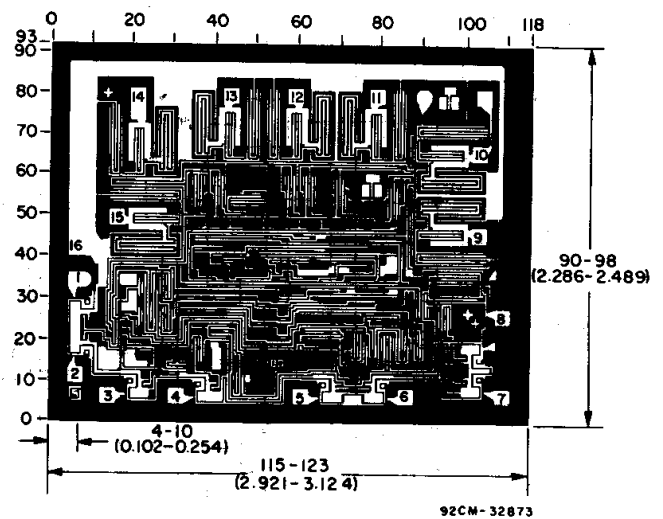
Fig. 16 - Driving low-voltage fluorescent displays.



2 of 7 Segments Shown Connected

Resistors R from  $V_{DD}$  to each 7-segment driver output are chosen to keep all Numitron segments slightly on and warm.

Fig. 17 - Driving incandescent displays (RCA Numitron DR2000 series displays).



Dimensions and pad layout for CD4511B chip.

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 part number        | Status<br>(1) | Material type<br>(2) | Package   Pins  | Package qty   Carrier | RoHS<br>(3) | Lead finish/<br>Ball material<br>(4) | MSL rating/<br>Peak reflow<br>(5) | Op temp (°C) | Part marking<br>(6) |
|------------------------------|---------------|----------------------|-----------------|-----------------------|-------------|--------------------------------------|-----------------------------------|--------------|---------------------|
| <a href="#">CD4511BE</a>     | Active        | Production           | PDIP (N)   16   | 25   TUBE             | Yes         | NIPDAU                               | N/A for Pkg Type                  | -55 to 125   | CD4511BE            |
| CD4511BE.A                   | Active        | Production           | PDIP (N)   16   | 25   TUBE             | Yes         | NIPDAU                               | N/A for Pkg Type                  | -55 to 125   | CD4511BE            |
| CD4511BEE4                   | Active        | Production           | PDIP (N)   16   | 25   TUBE             | Yes         | NIPDAU                               | N/A for Pkg Type                  | -55 to 125   | CD4511BE            |
| <a href="#">CD4511BF</a>     | Active        | Production           | CDIP (J)   16   | 25   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | CD4511BF            |
| CD4511BF.A                   | Active        | Production           | CDIP (J)   16   | 25   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | CD4511BF            |
| <a href="#">CD4511BF3A</a>   | Active        | Production           | CDIP (J)   16   | 25   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | CD4511BF3A          |
| CD4511BF3A.A                 | Active        | Production           | CDIP (J)   16   | 25   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | CD4511BF3A          |
| <a href="#">CD4511BNSR</a>   | Active        | Production           | SOP (NS)   16   | 2000   LARGE T&R      | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | -55 to 125   | CD4511B             |
| CD4511BNSR.A                 | Active        | Production           | SOP (NS)   16   | 2000   LARGE T&R      | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | -55 to 125   | CD4511B             |
| CD4511BNSRG4                 | Active        | Production           | SOP (NS)   16   | 2000   LARGE T&R      | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | -55 to 125   | CD4511B             |
| <a href="#">CD4511BPW</a>    | Obsolete      | Production           | TSSOP (PW)   16 | -                     | -           | Call TI                              | Call TI                           | -55 to 125   | CM511B              |
| <a href="#">CD4511BPWR</a>   | Active        | Production           | TSSOP (PW)   16 | 2000   LARGE T&R      | Yes         | NIPDAU   SN                          | Level-1-260C-UNLIM                | -55 to 125   | CM511B              |
| CD4511BPWR.A                 | Active        | Production           | TSSOP (PW)   16 | 2000   LARGE T&R      | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | -55 to 125   | CM511B              |
| <a href="#">CD4511BPWRG4</a> | Active        | Production           | TSSOP (PW)   16 | 2000   LARGE T&R      | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | -55 to 125   | CM511B              |

<sup>(1)</sup> **Status:** For more details on status, see our [product life cycle](#).

<sup>(2)</sup> **Material type:** When designated, preproduction parts are prototypes/experimental devices, and are not yet approved or released for full production. Testing and final process, including without limitation quality assurance, reliability performance testing, and/or process qualification, may not yet be complete, and this item is subject to further changes or possible discontinuation. If available for ordering, purchases will be subject to an additional waiver at checkout, and are intended for early internal evaluation purposes only. These items are sold without warranties of any kind.

<sup>(3)</sup> **RoHS values:** Yes, No, RoHS Exempt. See the [TI RoHS Statement](#) for additional information and value definition.

<sup>(4)</sup> **Lead finish/Ball material:** Parts may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

<sup>(5)</sup> **MSL rating/Peak reflow:** The moisture sensitivity level ratings and peak solder (reflow) temperatures. In the event that a part has multiple moisture sensitivity ratings, only the lowest level per JEDEC standards is shown. Refer to the shipping label for the actual reflow temperature that will be used to mount the part to the printed circuit board.

<sup>(6)</sup> **Part marking:** There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.

Multiple part markings will be inside parentheses. Only one part marking contained in parentheses and separated by a "~" will appear on a part. If a line is indented then it is a continuation of the previous line and the two combined represent the entire part marking for that device.

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In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

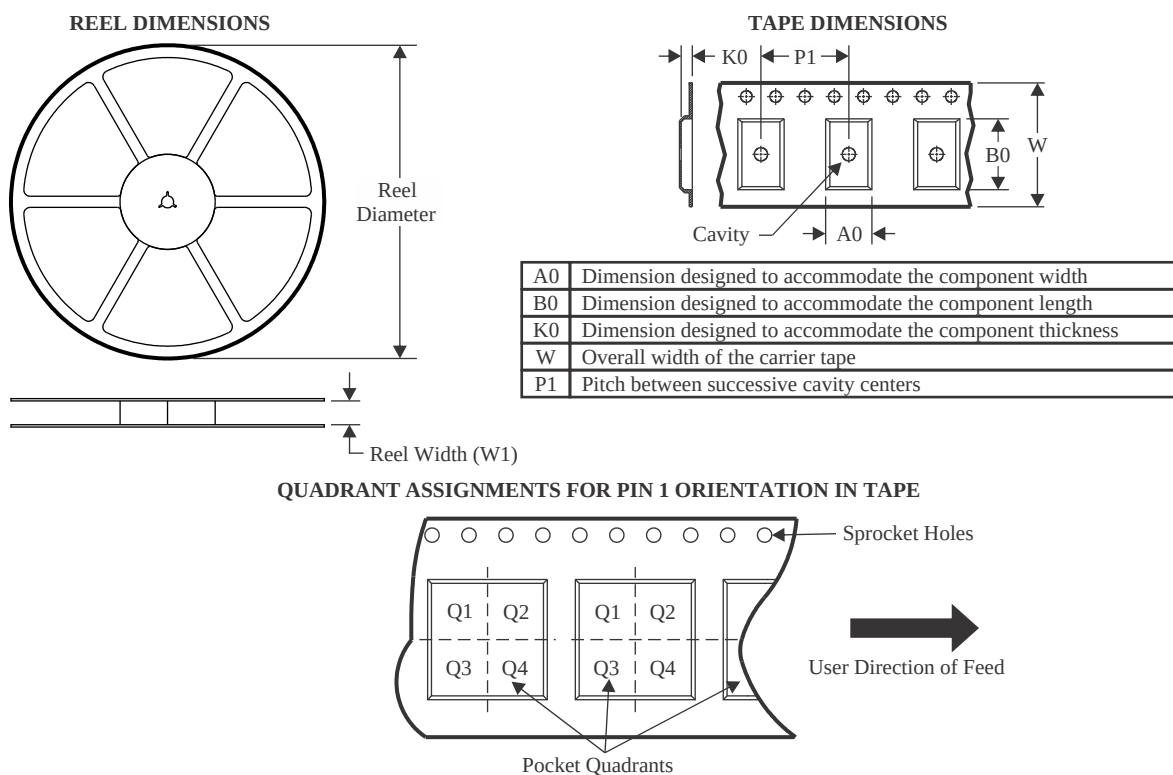
**OTHER QUALIFIED VERSIONS OF CD4511B, CD4511B-MIL :**

- Catalog : [CD4511B](#)
- Military : [CD4511B-MIL](#)

**NOTE: Qualified Version Definitions:**

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

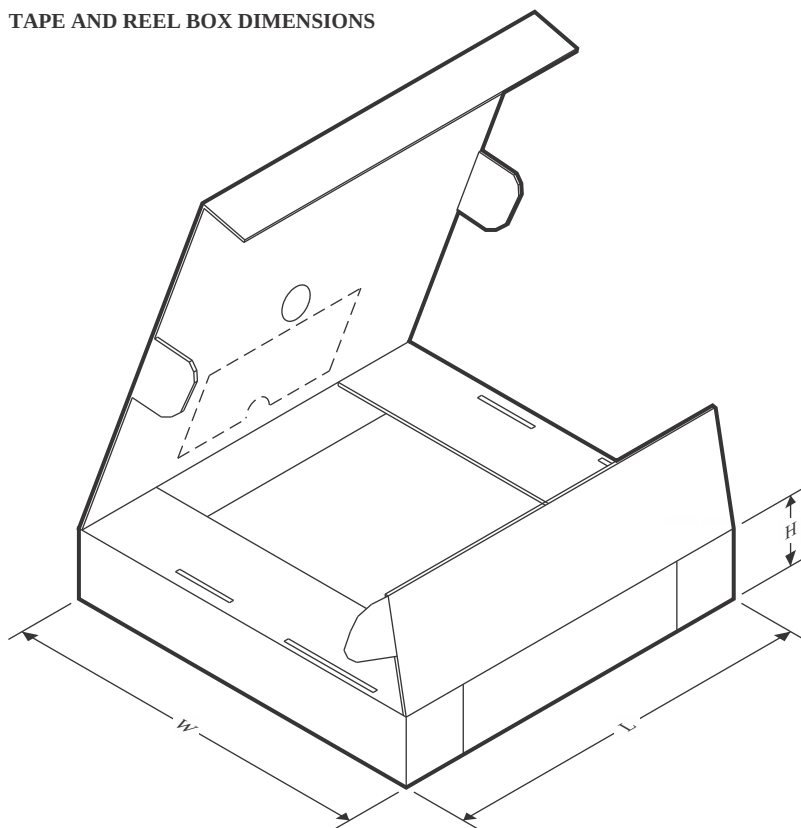
## TAPE AND REEL INFORMATION



\*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 |
|--------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| CD4511BNSR   | SOP          | NS              | 16   | 2000 | 330.0              | 16.4               | 8.1     | 10.4    | 2.5     | 12.0    | 16.0   | Q1            |
| CD4511BPWR   | TSSOP        | PW              | 16   | 2000 | 330.0              | 12.4               | 6.9     | 5.6     | 1.6     | 8.0     | 12.0   | Q1            |
| CD4511BPWRG4 | TSSOP        | PW              | 16   | 2000 | 330.0              | 12.4               | 6.9     | 5.6     | 1.6     | 8.0     | 12.0   | Q1            |

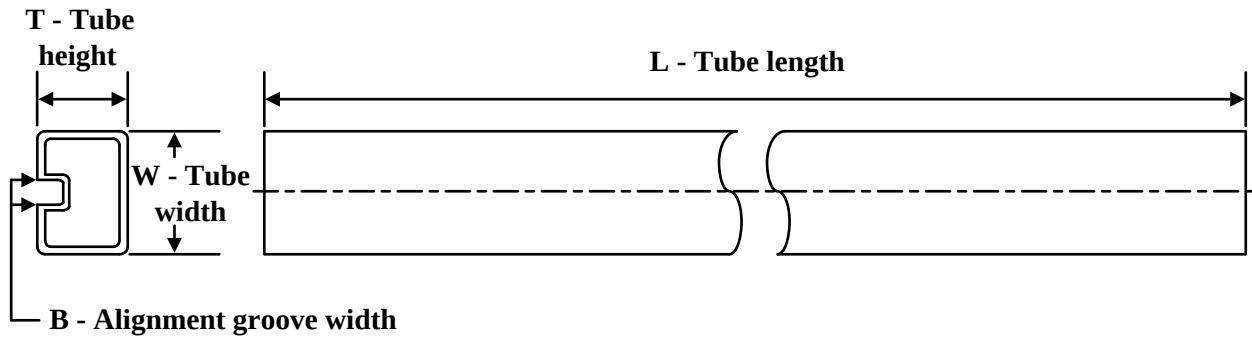
## TAPE AND REEL BOX DIMENSIONS



\*All dimensions are nominal

| Device       | Package Type | Package Drawing | Pins | SPQ  | Length (mm) | Width (mm) | Height (mm) |
|--------------|--------------|-----------------|------|------|-------------|------------|-------------|
| CD4511BNSR   | SOP          | NS              | 16   | 2000 | 353.0       | 353.0      | 32.0        |
| CD4511BPWR   | TSSOP        | PW              | 16   | 2000 | 356.0       | 356.0      | 35.0        |
| CD4511BPWRG4 | TSSOP        | PW              | 16   | 2000 | 353.0       | 353.0      | 32.0        |

## TUBE



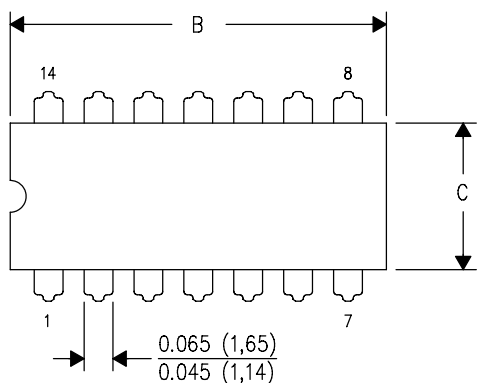
\*All dimensions are nominal

| Device     | Package Name | Package Type | Pins | SPQ | L (mm) | W (mm) | T (μm) | B (mm) |
|------------|--------------|--------------|------|-----|--------|--------|--------|--------|
| CD4511BE   | N            | PDIP         | 16   | 25  | 506    | 13.97  | 11230  | 4.32   |
| CD4511BE.A | N            | PDIP         | 16   | 25  | 506    | 13.97  | 11230  | 4.32   |
| CD4511BEE4 | N            | PDIP         | 16   | 25  | 506    | 13.97  | 11230  | 4.32   |

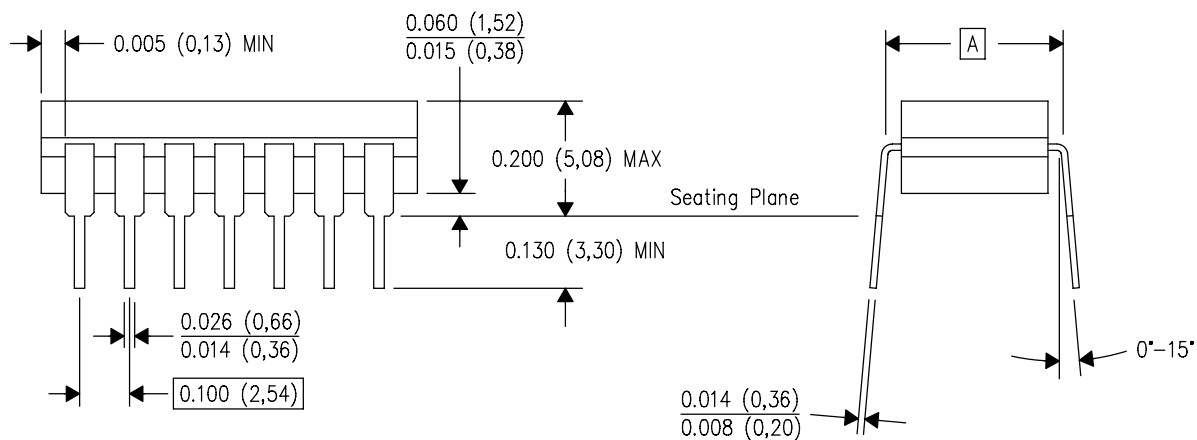
J (R-GDIP-T\*\*)

14 LEADS SHOWN

# CERAMIC DUAL IN-LINE PACKAGE

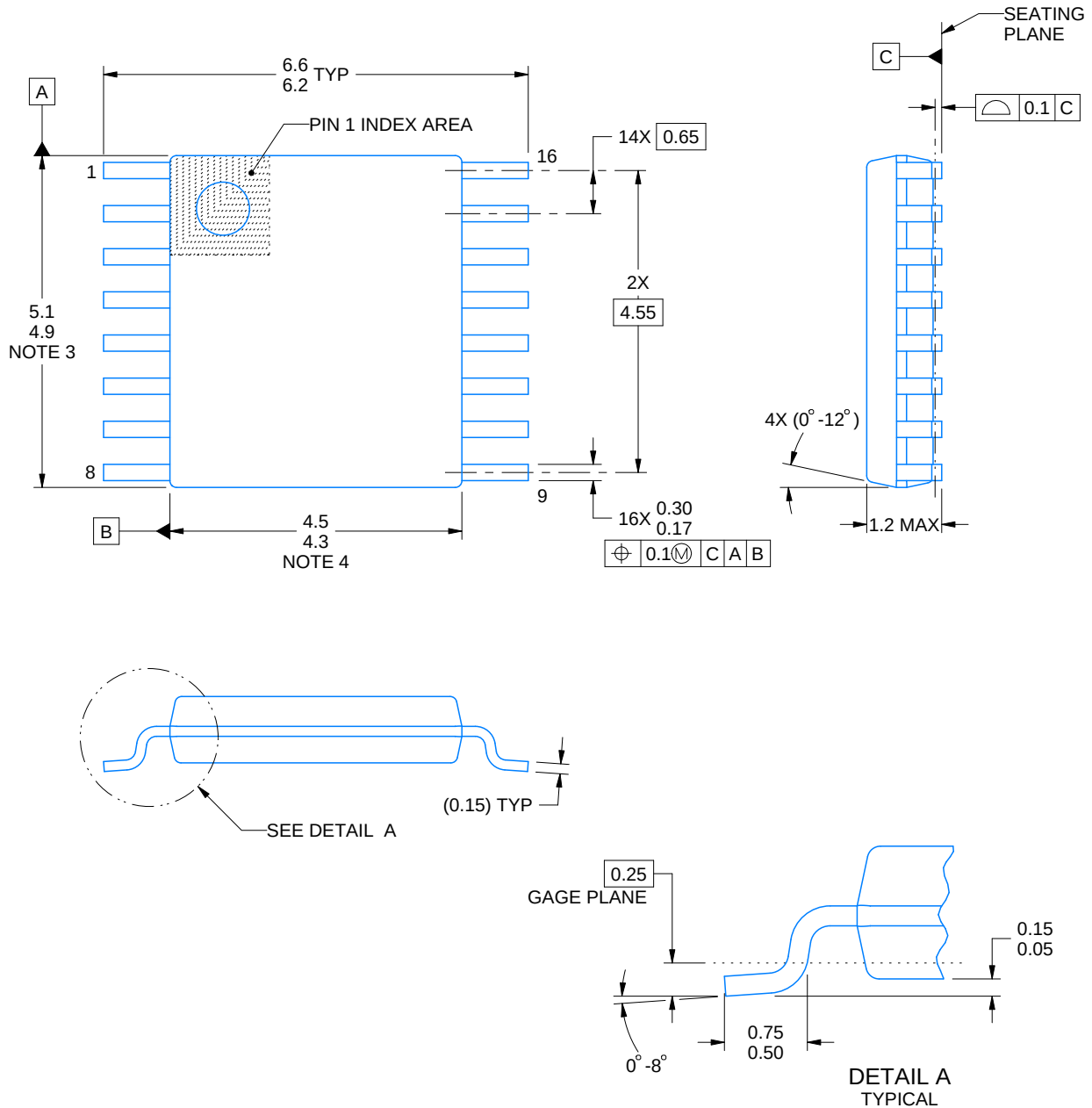
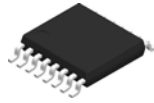


| PINS **<br>DIM | 14                     | 16                     | 18                     | 20                     |
|----------------|------------------------|------------------------|------------------------|------------------------|
| A              | 0.300<br>(7,62)<br>BSC | 0.300<br>(7,62)<br>BSC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



4220204/B 12/2023

## NOTES:

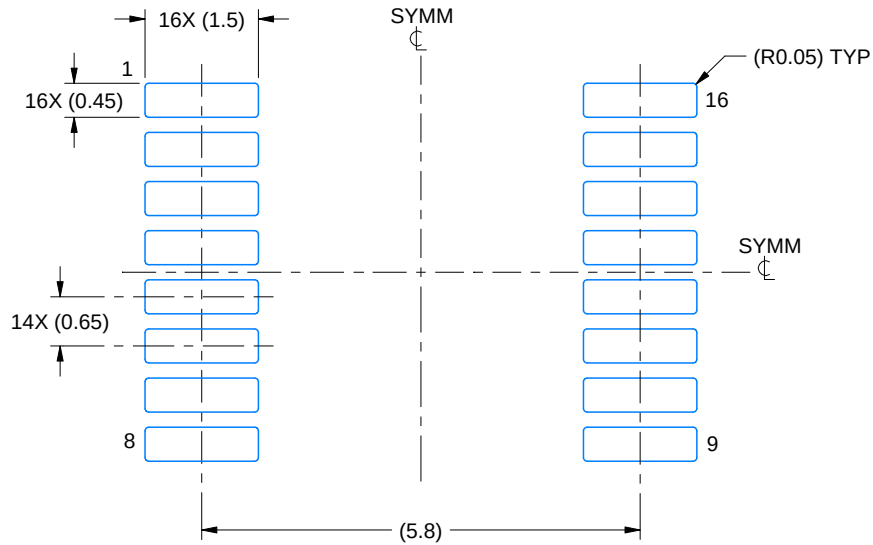
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or 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.

# EXAMPLE BOARD LAYOUT

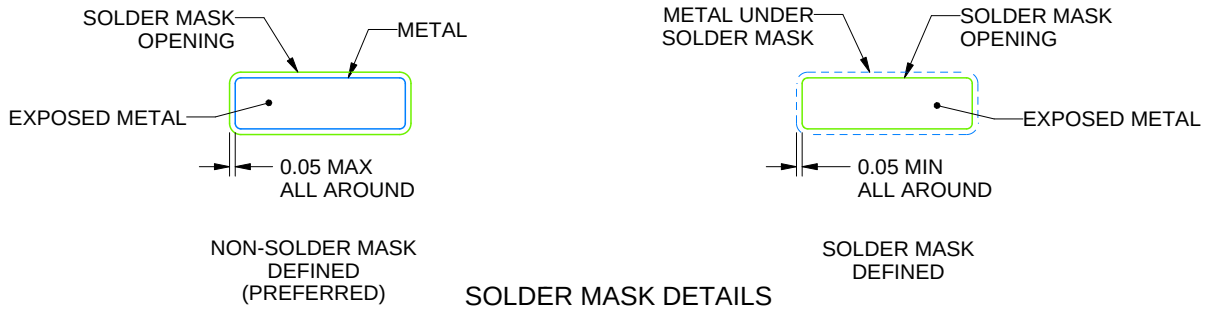
PW0016A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



LAND PATTERN EXAMPLE  
EXPOSED METAL SHOWN  
SCALE: 10X



SOLDER MASK DETAILS

4220204/B 12/2023

NOTES: (continued)

6. Publication IPC-7351 may have alternate designs.

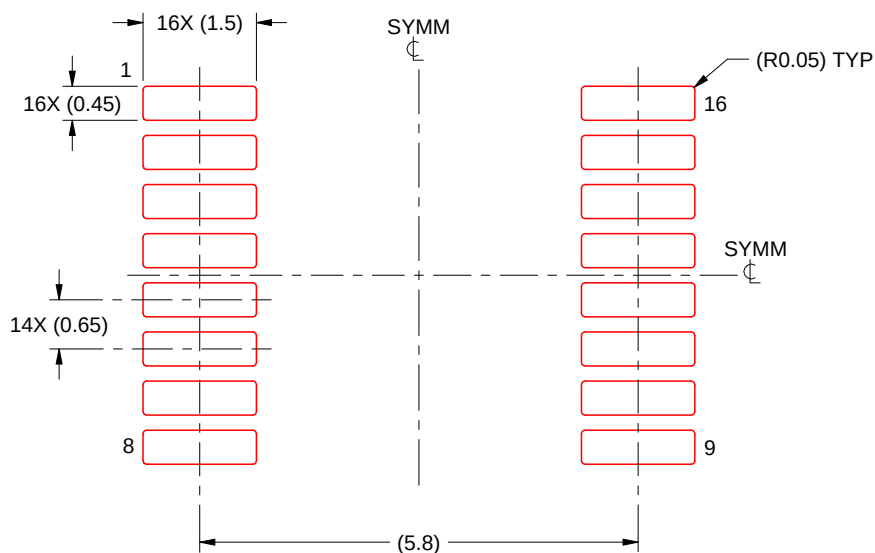
7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

## EXAMPLE STENCIL DESIGN

PW0016A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



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

4220204/B 12/2023

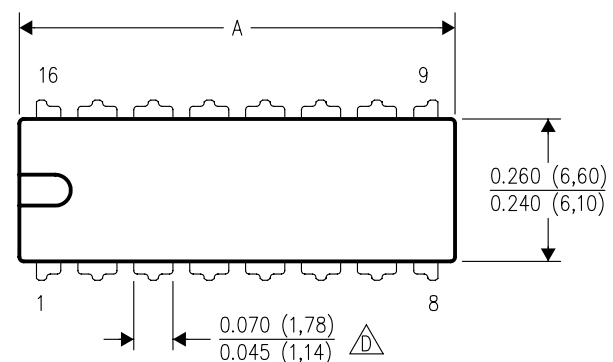
NOTES: (continued)

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.

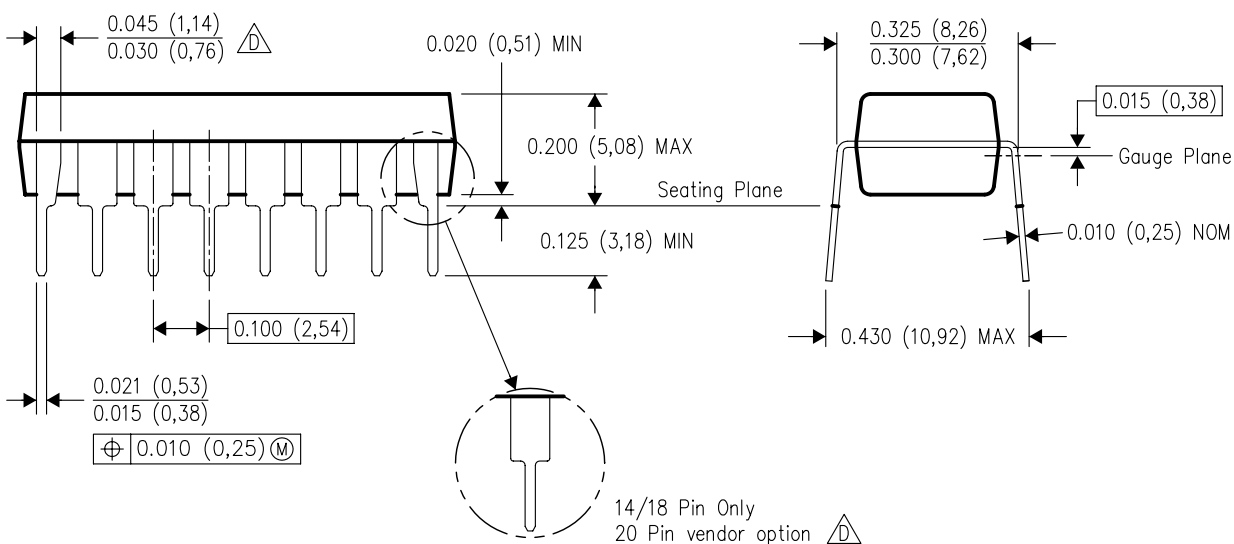
N (R-PDIP-T\*\*)

16 PINS SHOWN

## PLASTIC DUAL-IN-LINE PACKAGE



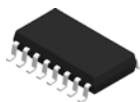
| PINS **<br>DIM      | 14               | 16               | 18               | 20               |
|---------------------|------------------|------------------|------------------|------------------|
| A MAX               | 0.775<br>(19,69) | 0.775<br>(19,69) | 0.920<br>(23,37) | 1.060<br>(26,92) |
| A MIN               | 0.745<br>(18,92) | 0.745<br>(18,92) | 0.850<br>(21,59) | 0.940<br>(23,88) |
| MS-001<br>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.

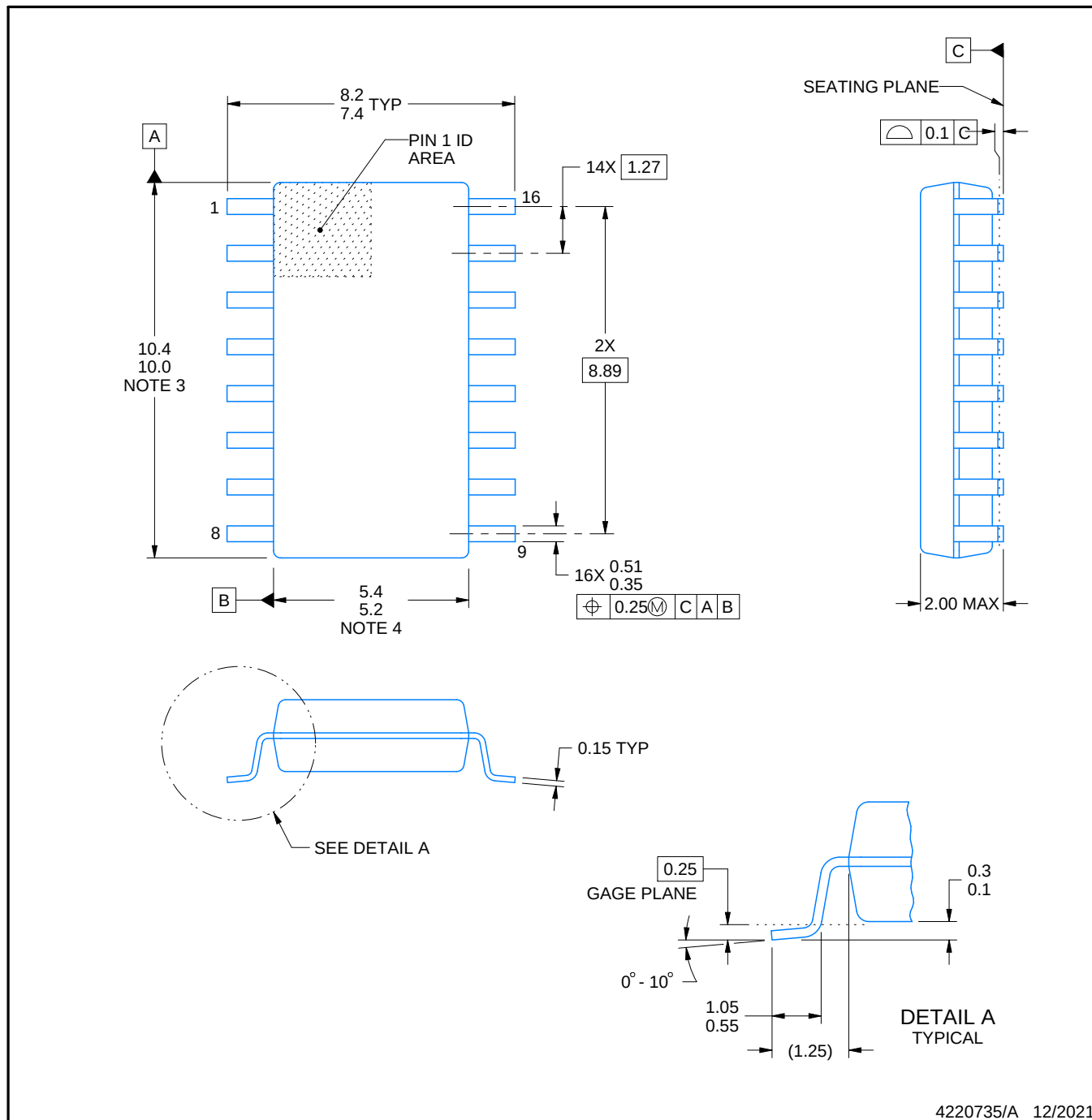


# PACKAGE OUTLINE

NS0016A

SOP - 2.00 mm max height

SOP



## NOTES:

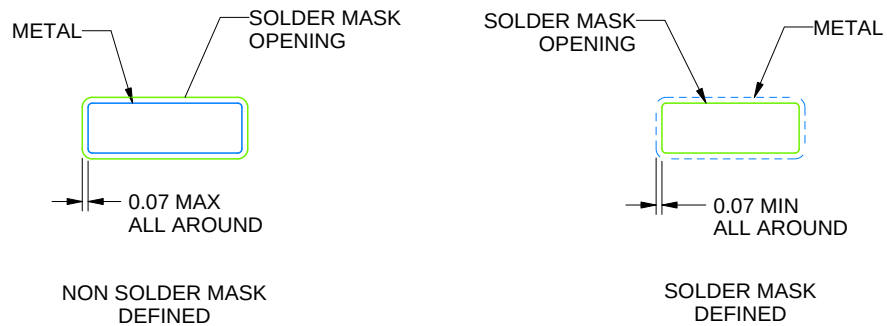
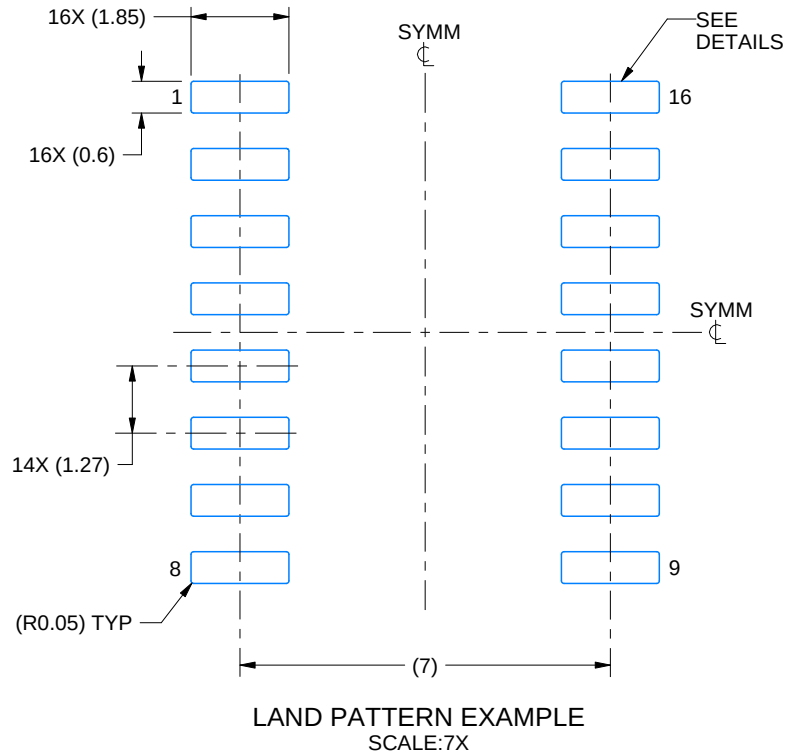
1. All linear dimensions are in millimeters. Dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate 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.

# EXAMPLE BOARD LAYOUT

NS0016A

SOP - 2.00 mm max height

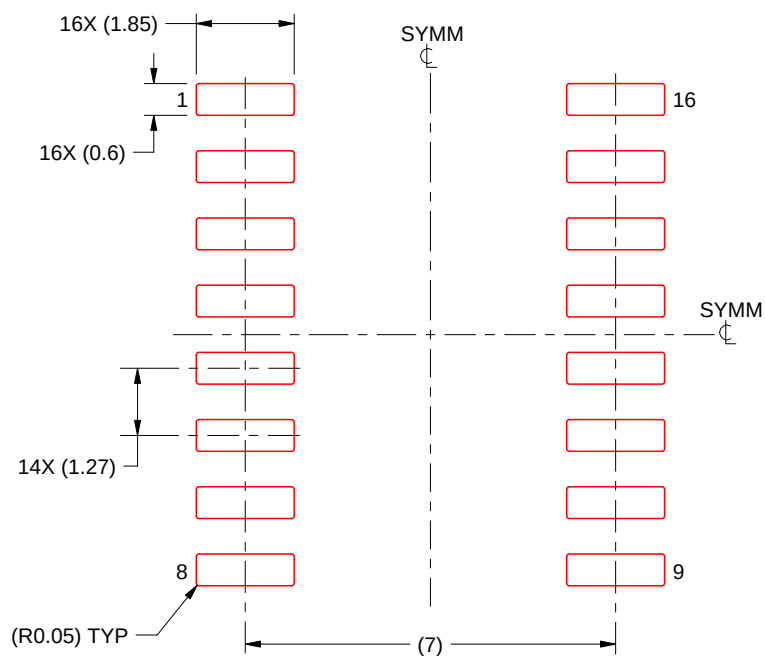
SOP



4220735/A 12/2021

NOTES: (continued)

5. Publication IPC-7351 may have alternate designs.
6. Solder mask tolerances between and around signal pads can vary based on board fabrication site.



SOLDER PASTE EXAMPLE  
BASED ON 0.125 mm THICK STENCIL  
SCALE:7X

4220735/A 12/2021

NOTES: (continued)

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

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