

# CD4098B Types

## CMOS Dual Monostable Multivibrator

High-Voltage Types (20-Volt Rating)

■ CD4098B dual monostable multivibrator provides stable retriggerable/resettable one-shot operation for any fixed-voltage timing application.

An external resistor ( $R_X$ ) and an external capacitor ( $C_X$ ) control the timing for the circuit. Adjustment of  $R_X$  and  $C_X$  provides a wide range of output pulse widths from the Q and  $\bar{Q}$  terminals. The time delay from trigger input to output transition (trigger propagation delay) and the time delay from reset input to output transition (reset propagation delay) are independent of  $R_X$  and  $C_X$ .

Leading-edge-triggering (+TR) and trailing-edge-triggering (–TR) inputs are provided for triggering from either edge of an input pulse. An unused +TR input should be tied to  $V_{SS}$ . An unused –TR input should be tied to  $V_{DD}$ . A RESET (on low level) is provided for immediate termination of the output pulse or to prevent output pulses when power is turned on. An unused RESET input should be tied to  $V_{DD}$ . However, if an entire section of the CD4098B is not used, its RESET should be tied to  $V_{SS}$ . See Table I.

In normal operation the circuit triggers (extends the output pulse one period) on the application of each new trigger pulse. For operation in the non-retriggerable mode,  $\bar{Q}$  is connected to –TR when leading-edge triggering (+TR) is used or Q is connected to +TR when trailing-edge triggering (–TR) is used.

The time period (T) for this multivibrator can be approximated by:  $T_X = \frac{1}{2} R_X C_X$  for  $C_X \geq 0.01 \mu F$ . Time periods as a function of  $R_X$  for values of  $C_X$  and  $V_{DD}$  are given in Fig. 8. Values of T vary from unit to unit and as a function of voltage, temperature, and  $R_X C_X$ .

The minimum value of external resistance,  $R_X$ , is 5 k $\Omega$ . The maximum value of external capacitance,  $C_X$ , is 100  $\mu F$ . Fig. 9 shows time periods as a function of  $C_X$  for values of  $R_X$  and  $V_{DD}$ .

The output pulse width has variations of  $\pm 2.5\%$  typically, over the temperature range of  $-55^\circ C$  to  $125^\circ C$  for  $C_X = 1000$  pF and  $R_X = 100$  k $\Omega$ .

For power supply variations of  $\pm 5\%$ , the output pulse width has variations of  $\pm 0.5\%$  typically, for  $V_{DD} = 10$  V and 15 V and  $\pm 1\%$  typically, for  $V_{DD} = 5$  V at  $C_X = 1000$  pF and  $R_X = 5$  k $\Omega$ .

These 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 (M, M96, and MT suffixes), and 16-lead thin shrink small-outline packages (PW and PWR suffixes).

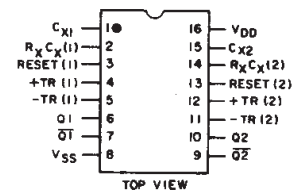
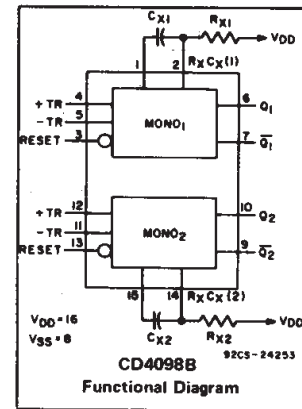
The CD4098B is similar to type MC14528.

### Features:

- Retriggerable/resettable capability
- Trigger and reset propagation delays independent of  $R_X$ ,  $C_X$
- Triggering from leading or trailing edge
- Q and  $\bar{Q}$  buffered outputs available
- Separate resets
- Wide range of output-pulse widths
- 100% tested for maximum 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  $25^\circ C$
- Noise margin (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:

- Pulse delay and timing
- Pulse shaping
- Astable multivibrator



TERMINALS 1, 8, 15 ARE  
ELECTRICALLY CONNECTED  
INTERNALLY

92CS-24648R1

### TERMINAL ASSIGNMENT

### 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  $T_A = -55^\circ C$  to  $+100^\circ C$

500 mW

For  $T_A = +100^\circ C$  to  $+125^\circ C$

Derate Linearly at 12 mW/ $^\circ C$  to 200 mW

DEVICE DISSIPATION PER OUTPUT TRANSISTOR

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

100 mW

OPERATING-TEMPERATURE RANGE ( $T_A$ )

$-55^\circ C$  to  $+125^\circ C$

STORAGE TEMPERATURE RANGE ( $T_{stg}$ )

$-65^\circ C$  to  $+150^\circ C$

LEAD TEMPERATURE (DURING SOLDERING):

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

$+265^\circ C$

### RECOMMENDED OPERATING CONDITIONS

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       |
| Trigger Pulse Width $t_W(TR)$                                     | 5<br>10<br>15 | 140<br>60<br>40                              | –<br>–<br>– | ns      |
| Reset Pulse Width $t_W(R)$<br>(This is a function of $C_X$ )      | –             | See<br>Dynamic Char.<br>Chart and<br>Fig. 10 |             | –       |
| Trigger Rise or Fall Time<br>$t_r(TR)$ , $t_f(TR)$                | 5–15          | –                                            | 100         | $\mu s$ |

# CD4098B Types

TABLE I

CD4098B FUNCTIONAL TERMINAL CONNECTIONS

| FUNCTION                                | V <sub>DD</sub> TO TERM. NO. |                   | V <sub>SS</sub> TO TERM. NO. |                   | INPUT PULSE TO TERM. NO. |                   | OTHER CONNECTIONS |                   |
|-----------------------------------------|------------------------------|-------------------|------------------------------|-------------------|--------------------------|-------------------|-------------------|-------------------|
|                                         | MONO <sub>1</sub>            | MONO <sub>2</sub> | MONO <sub>1</sub>            | MONO <sub>2</sub> | MONO <sub>1</sub>        | MONO <sub>2</sub> | MONO <sub>1</sub> | MONO <sub>2</sub> |
| Leading-Edge Trigger/Retriggerable      | 3, 5                         | 11, 13            |                              |                   | 4                        | 12                |                   |                   |
| Leading-Edge Trigger/Non-retriggerable  | 3                            | 13                |                              |                   | 4                        | 12                | 5-7               | 11-9              |
| Trailing-Edge Trigger/Retriggerable     | 3                            | 13                | 4                            | 12                | 5                        | 11                |                   |                   |
| Trailing-Edge Trigger/Non-retriggerable | 3                            | 13                |                              |                   | 5                        | 11                | 4-6               | 12-10             |
| Unused Section                          | 5                            | 11                | 3, 4                         | 12, 13            |                          |                   |                   |                   |

NOTES:

1. A RETRIGGERABLE ONE-SHOT MULTIVIBRATOR HAS AN OUTPUT PULSE WIDTH WHICH IS EXTENDED ONE FULL TIME PERIOD ( $T_X$ ) AFTER APPLICATION OF THE LAST TRIGGER PULSE.

The minimum time between retriggering edges (or trigger and retrigger edges) is 40 per cent of ( $T_X$ ).

2. A NON-RETRIGGERABLE ONE-SHOT MULTIVIBRATOR HAS A TIME PERIOD  $T_X$  REFERENCED FROM THE APPLICATION OF THE FIRST TRIGGER PULSE.

INPUT PULSE TRAIN

RETRIGGERABLE MODE PULSE WIDTH (+TR MODE)

NON-RETRIGGERABLE MODE PULSE WIDTH (+TR MODE)

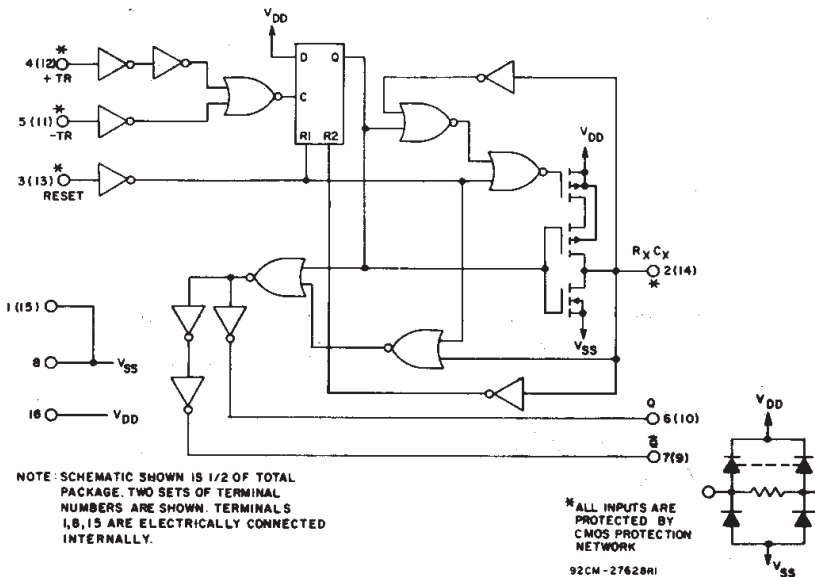


Fig. 4 — CD4098B logic diagram.

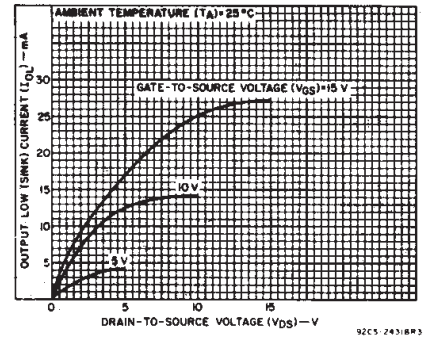


Fig. 1 — Typical output low (sink) current characteristics.

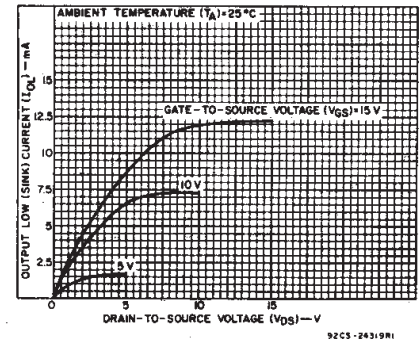


Fig. 2 — Minimum output low (sink) current characteristics.

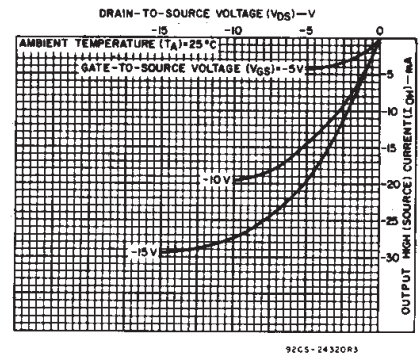


Fig. 3 — Typical output high (source) current characteristics.

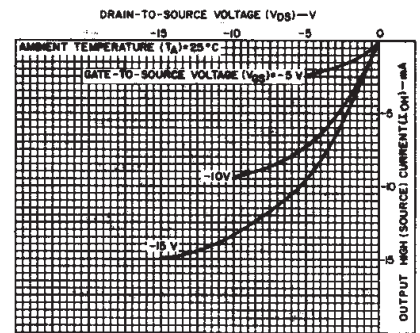


Fig. 5 — Minimum output high (source) current characteristics.

3  
COMMERCIAL CMOS  
HIGH VOLTAGE ICs

# CD4098B Types

## STATIC ELECTRICAL CHARACTERISTICS

| CHARACTERISTIC                                     | 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) | -55                                   | -40   | +85   | +125  | +25   |                   |      |       |
|                                                    |                       |                        |                        |                                       |       |       |       | Min.  | Typ.              | Max. |       |
| Quiescent Device Current<br>I <sub>DD</sub> Max.   | —                     | 0.5                    | 5                      | 1                                     | 1     | 30    | 30    | —     | 0.02              | 1    | μA    |
|                                                    | —                     | 0.10                   | 10                     | 2                                     | 2     | 60    | 60    | —     | 0.02              | 2    |       |
|                                                    | —                     | 0.15                   | 15                     | 4                                     | 4     | 120   | 120   | —     | 0.02              | 4    |       |
|                                                    | —                     | 0.20                   | 20                     | 20                                    | 20    | 600   | 600   | —     | 0.04              | 20   |       |
| 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               | —    |       |
| Output High (Source) Current, 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: 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 |       |
| Output Voltage: High-Level, 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 Voltage, 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 Voltage, 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, I <sub>IN</sub> Max.                | —                     | 0.18                   | 18                     | ±0.1                                  | ±0.1  | ±1    | ±1    | —     | ±10 <sup>-5</sup> | ±0.1 | μA    |

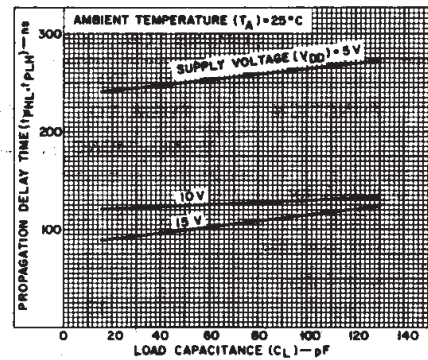


Fig. 6 – Typical propagation delay time vs. load capacitance, trigger into Q out. (All values of  $C_X$  and  $R_X$ .)

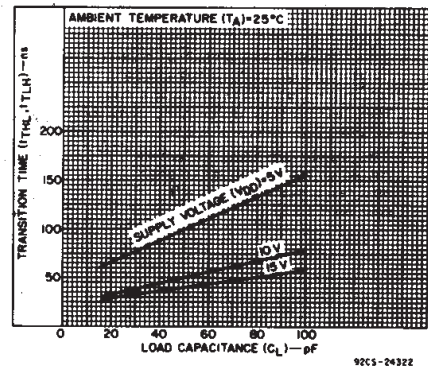


Fig. 7 – Transition time vs. load capacitance for  $R_X = 5\text{ k}\Omega$ -10000  $\text{k}\Omega$  and  $C_X = 15\text{ pF}$ -10000  $\text{pF}$ .

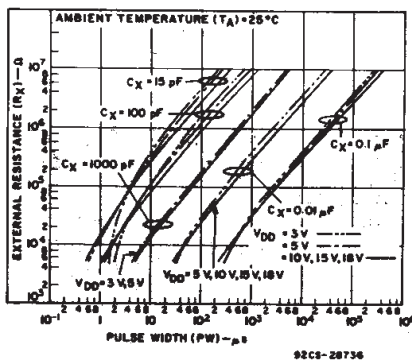


Fig. 8 – Typical external resistance vs. pulse width.

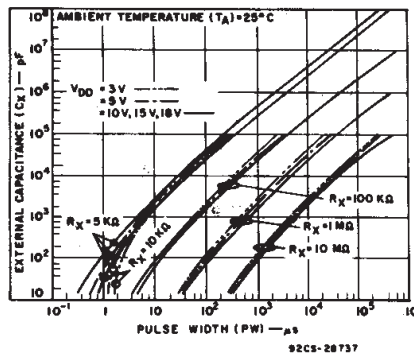


Fig. 9 – Typical external capacitance vs. pulse width.

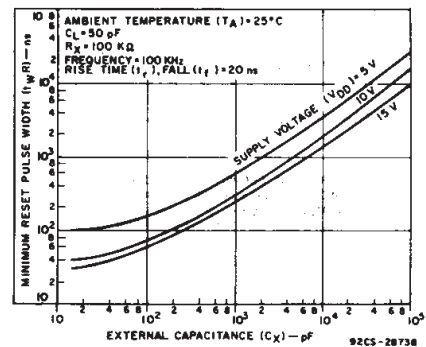


Fig. 10 – Typical minimum reset pulse width vs. external capacitance.

# CD4098B 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         |
|-------------------------------------------------------------------------------------|---------------------|-----------------------------------------|---------------|-------------------|--------------------|---------------|
|                                                                                     | $R_X$ (k $\Omega$ ) | $C_X$ (pF)                              | $V_{DD}$ (V)  | Typ.              | Max.               |               |
| Trigger Propagation Delay Time<br>+TR, -TR to Q, $\bar{Q}$<br>$t_{PHL}$ , $t_{PLH}$ | 5 to 10,000         | $\geq 15$                               | 5<br>10<br>15 | 250<br>125<br>100 | 500<br>250<br>200  | ns            |
| Minimum Trigger Pulse Width,<br>$t_{WH}$ , $t_{WL}$                                 | 5 to 10,000         | $\geq 15$                               | 5<br>10<br>15 | 70<br>30<br>20    | 140<br>60<br>40    | ns            |
| Transition Time,<br>$t_{TLH}$                                                       | 5 to 10,000         | $\geq 15$                               | 5<br>10<br>15 | 100<br>50<br>40   | 200<br>100<br>80   | ns            |
| $t_{THL}$                                                                           | 5 to 10,000         | 15 to 10,000                            | 5<br>10<br>15 | 100<br>50<br>40   | 200<br>100<br>80   |               |
|                                                                                     | 5 to 10,000         | 0.01 $\mu\text{F}$ to 0.1 $\mu\text{F}$ | 5<br>10<br>15 | 150<br>75<br>65   | 300<br>150<br>130  |               |
|                                                                                     | 5 to 10,000         | 0.1 $\mu\text{F}$ to 1 $\mu\text{F}$    | 5<br>10<br>15 | 250<br>150<br>80  | 500<br>300<br>160  |               |
| Reset Propagation Delay Time,<br>$T_{PHL}$ , $T_{PLH}$                              | 5 to 10,000         | $\geq 15$                               | 5<br>10<br>15 | 225<br>125<br>75  | 450<br>250<br>150  | ns            |
| Minimum Reset Pulse Width,<br>$t_{WR}$                                              | 100                 | 15                                      | 5<br>10<br>15 | 100<br>40<br>30   | 200<br>80<br>60    | ns            |
|                                                                                     |                     |                                         | 5<br>10<br>15 | 600<br>300<br>250 | 1200<br>600<br>500 |               |
|                                                                                     |                     | 0.1 $\mu\text{F}$                       | 5<br>10<br>15 | 25<br>15<br>10    | 50<br>30<br>20     | $\mu\text{s}$ |
|                                                                                     |                     |                                         | 5<br>10<br>15 | 5<br>7.5<br>7.5   | 10<br>15<br>15     |               |
| Trigger Rise or Fall Time<br>$t_r$ (TR), $t_f$ (TR)                                 | —                   | —                                       | 5 to 15       | —                 | 100                | $\mu\text{s}$ |
| Pulse Width Match<br>Between Circuits in<br>Same Package                            | 10                  | 10,000                                  | 5<br>10<br>15 | 5<br>7.5<br>7.5   | 10<br>15<br>15     | %             |
| Input Capacitance, $C_{IN}$                                                         | Any Input           |                                         |               | 5                 | 7.5                | pF            |

## TEST CIRCUITS

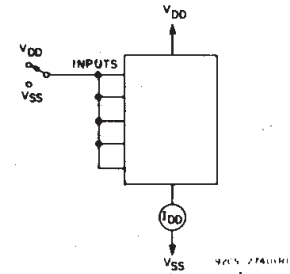


Fig. 12 - Quiescent-device-current test circuits.

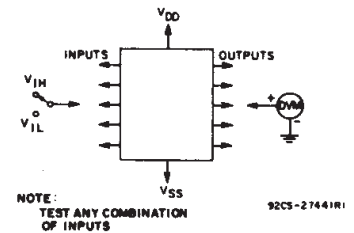


Fig. 13 - Input-voltage test circuit.

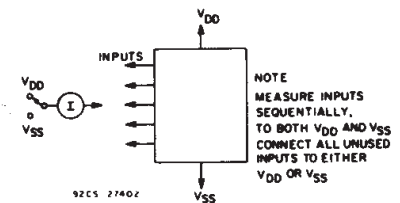


Fig. 14 - Input leakage current test circuit.

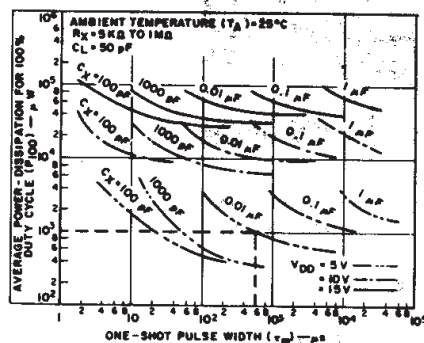
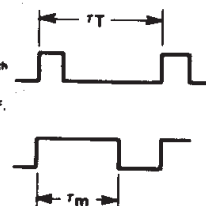


Fig. 11 - Average power dissipation vs. one-shot pulse width.

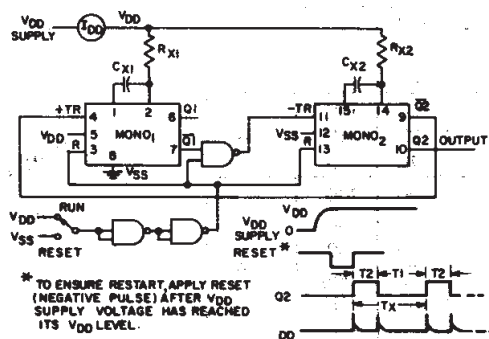
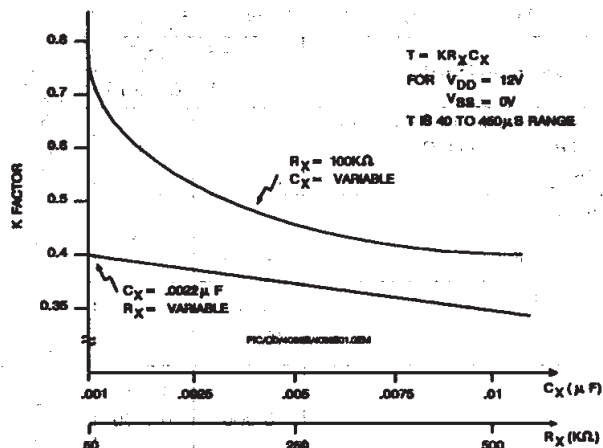
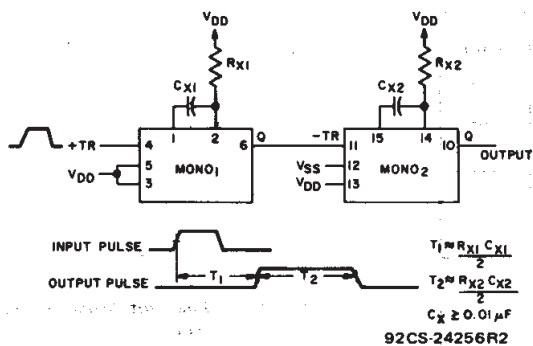
To calculate average power dissipation ( $P$ ) for less than 100% duty cycle:  
 $P_{100}$  = average power for 100% duty cycle  
 $P = \left(\frac{t_m}{T}\right) P_{100}$  where  $t_m$  = one-shot pulse width  
 $T$  = trigger pulse period  
 e.g. For  $t_m = 600\text{ }\mu\text{s}$ ,  $T = 1000\text{ }\mu\text{s}$ ,  $C_X = 0.01\text{ }\mu\text{F}$ ,  
 $V_{DD} = 5\text{ V}$   
 $P = \left(\frac{600}{1000}\right) 1000\text{ }\mu\text{W} = 600\text{ }\mu\text{W}$  (see dotted line on graph)



92CN-28739

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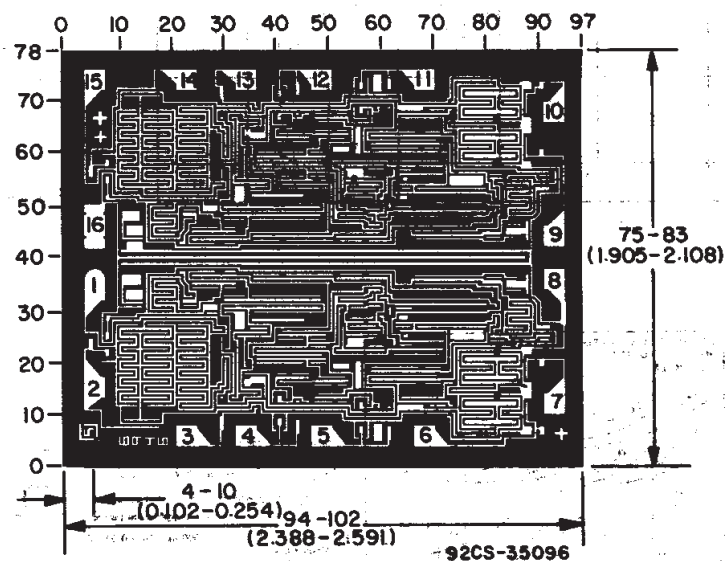
## APPLICATIONS



$I_{DD}, T_X$  vs.  $R_X$

| $R_X$ | $I_{DD}$ (Avg.) | $T_X$ ( $T_1 + T_2$ ) | $V_{DD}$ |
|-------|-----------------|-----------------------|----------|
| 10 kΩ | 1 mA            | 3.8 μs                | 5 V      |
|       | 0.05 mA         | 0.5 s                 |          |
|       | 2.5 mA          | 3.2 μs                | 10 V     |
|       | 0.5 mA          | 0.5 s                 |          |
|       | 5 mA            | 3 μs                  | 15 V     |
|       | 1 mA            | 0.5 s                 |          |

Note: All values are typical.  
 $C_X$  range: 0.0001 μF to 0.1 μF.



## PACKAGING INFORMATION

| Orderable Device | Status<br>(1) | Package Type | Package Drawing | Pins | Package Qty | Eco Plan<br>(2)         | Lead finish/<br>Ball material<br>(6) | MSL Peak Temp<br>(3) | Op Temp (°C) | Device Marking<br>(4/5) | Samples                 |
|------------------|---------------|--------------|-----------------|------|-------------|-------------------------|--------------------------------------|----------------------|--------------|-------------------------|-------------------------|
| CD4098BE         | ACTIVE        | PDIP         | N               | 16   | 25          | RoHS & Green            | NIPDAU                               | N / A for Pkg Type   | -55 to 125   | CD4098BE                | <a href="#">Samples</a> |
| CD4098BEE4       | ACTIVE        | PDIP         | N               | 16   | 25          | RoHS & Green            | NIPDAU                               | N / A for Pkg Type   | -55 to 125   | CD4098BE                | <a href="#">Samples</a> |
| CD4098BF         | ACTIVE        | CDIP         | J               | 16   | 25          | Non-RoHS &<br>Non-Green | SNPB                                 | N / A for Pkg Type   | -55 to 125   | CD4098BF                | <a href="#">Samples</a> |
| CD4098BF3A       | ACTIVE        | CDIP         | J               | 16   | 25          | Non-RoHS<br>& Green     | SNPB                                 | N / A for Pkg Type   | -55 to 125   | CD4098BF3A              | <a href="#">Samples</a> |
| CD4098BM96       | ACTIVE        | SOIC         | D               | 16   | 2500        | RoHS & Green            | NIPDAU                               | Level-1-260C-UNLIM   | -55 to 125   | CD4098BM                | <a href="#">Samples</a> |
| CD4098BM96G4     | ACTIVE        | SOIC         | D               | 16   | 2500        | RoHS & Green            | NIPDAU                               | Level-1-260C-UNLIM   | -55 to 125   | CD4098BM                | <a href="#">Samples</a> |
| CD4098BPWR       | ACTIVE        | TSSOP        | PW              | 16   | 2000        | RoHS & Green            | NIPDAU                               | Level-1-260C-UNLIM   | -55 to 125   | CM098B                  | <a href="#">Samples</a> |
| JM38510/17504BEA | ACTIVE        | CDIP         | J               | 16   | 25          | Non-RoHS<br>& Green     | SNPB                                 | N / A for Pkg Type   | -55 to 125   | JM38510/<br>17504BEA    | <a href="#">Samples</a> |
| M38510/17504BEA  | ACTIVE        | CDIP         | J               | 16   | 25          | Non-RoHS<br>& Green     | SNPB                                 | N / A for Pkg Type   | -55 to 125   | JM38510/<br>17504BEA    | <a href="#">Samples</a> |

(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) **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.

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

(4) 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 finish/Ball material - Orderable Devices 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.

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**OTHER QUALIFIED VERSIONS OF CD4098B, CD4098B-MIL :**

- Catalog : [CD4098B](#)
- Military : [CD4098B-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 |
|------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| CD4098BM96 | SOIC         | D               | 16   | 2500 | 330.0              | 16.4               | 6.5     | 10.3    | 2.1     | 8.0     | 16.0   | Q1            |
| CD4098BPWR | 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) |
|------------|--------------|-----------------|------|------|-------------|------------|-------------|
| CD4098BM96 | SOIC         | D               | 16   | 2500 | 340.5       | 336.1      | 32.0        |
| CD4098BPWR | TSSOP        | PW              | 16   | 2000 | 356.0       | 356.0      | 35.0        |

## TUBE



\*All dimensions are nominal

| Device     | Package Name | Package Type | Pins | SPQ | L (mm) | W (mm) | T (μm) | B (mm) |
|------------|--------------|--------------|------|-----|--------|--------|--------|--------|
| CD4098BE   | N            | PDIP         | 16   | 25  | 506    | 13.97  | 11230  | 4.32   |
| CD4098BE   | N            | PDIP         | 16   | 25  | 506    | 13.97  | 11230  | 4.32   |
| CD4098BEE4 | N            | PDIP         | 16   | 25  | 506    | 13.97  | 11230  | 4.32   |
| CD4098BEE4 | N            | PDIP         | 16   | 25  | 506    | 13.97  | 11230  | 4.32   |

D (R-PDSO-G16)

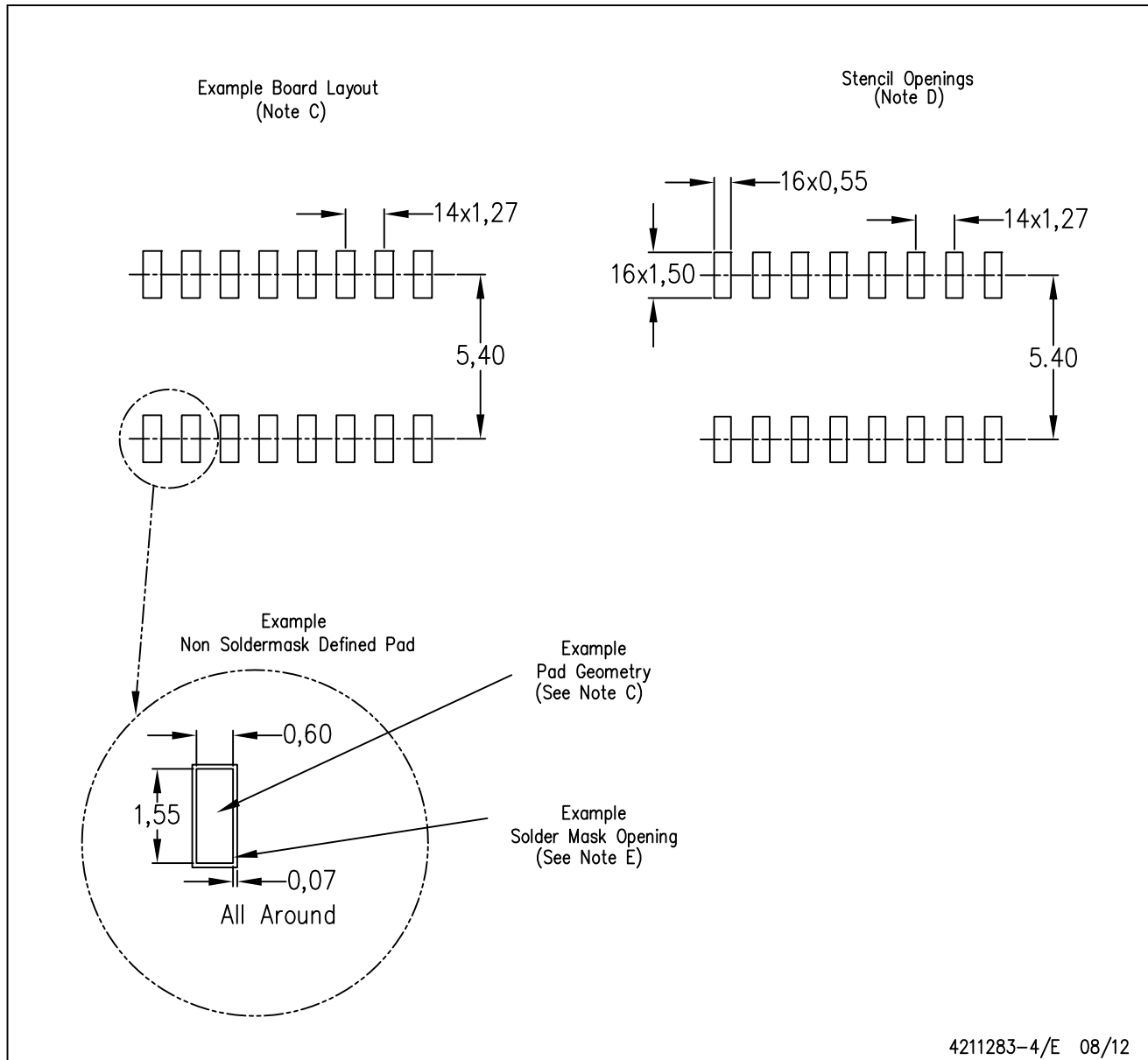
PLASTIC SMALL OUTLINE



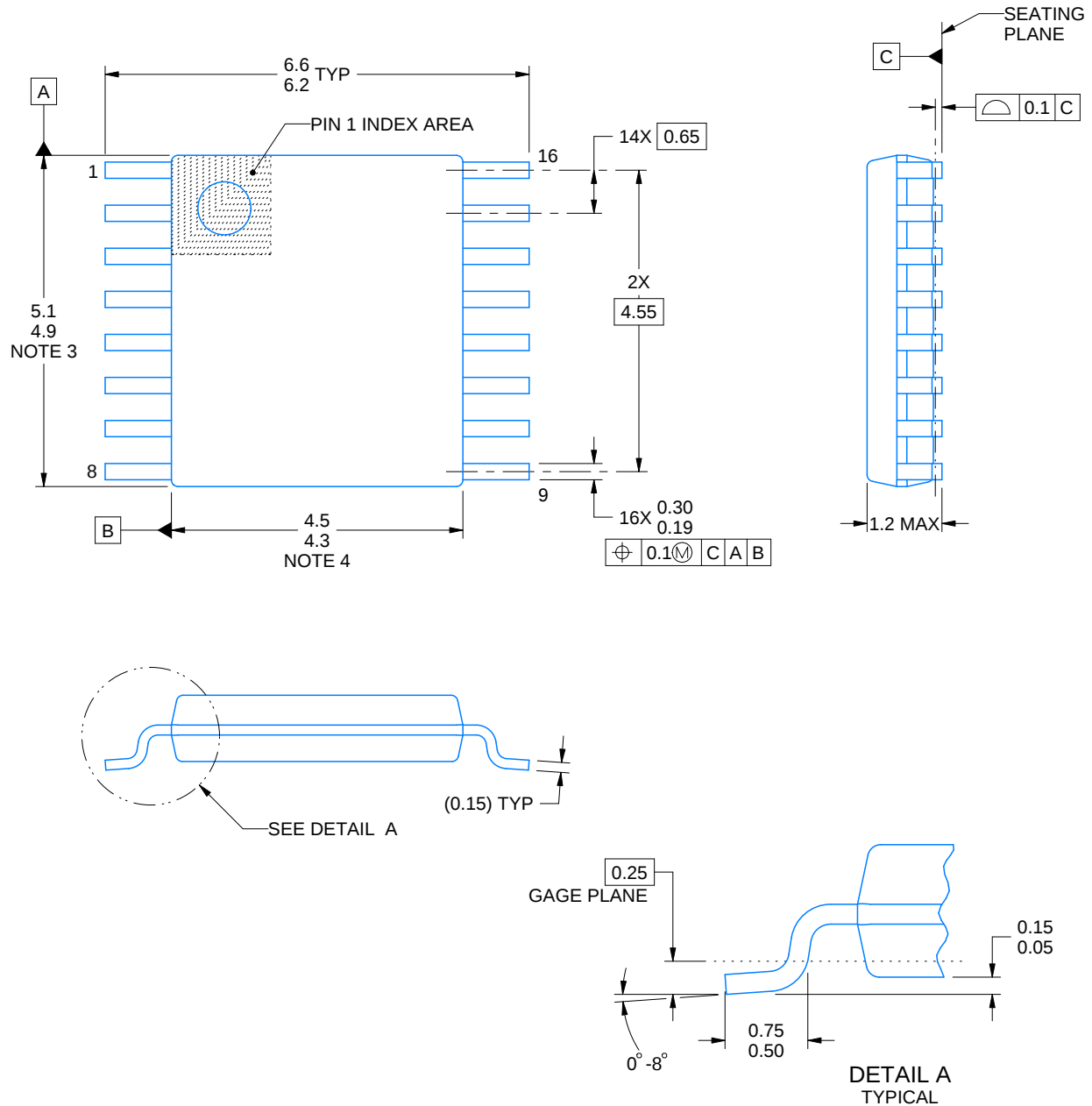
- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - $\triangle C$  Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.006 (0,15) each side.
  - $\triangle D$  Body width does not include interlead flash. Interlead flash shall not exceed 0.017 (0,43) each side.
  - E. Reference JEDEC MS-012 variation AC.

D (R-PDSO-G16)

PLASTIC SMALL OUTLINE



- NOTES:
- A. All linear dimensions are in millimeters.
  - B. This drawing is subject to change without notice.
  - C. Publication IPC-7351 is recommended for alternate designs.
  - 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 for other stencil recommendations.
  - E. Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.



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## NOTES:

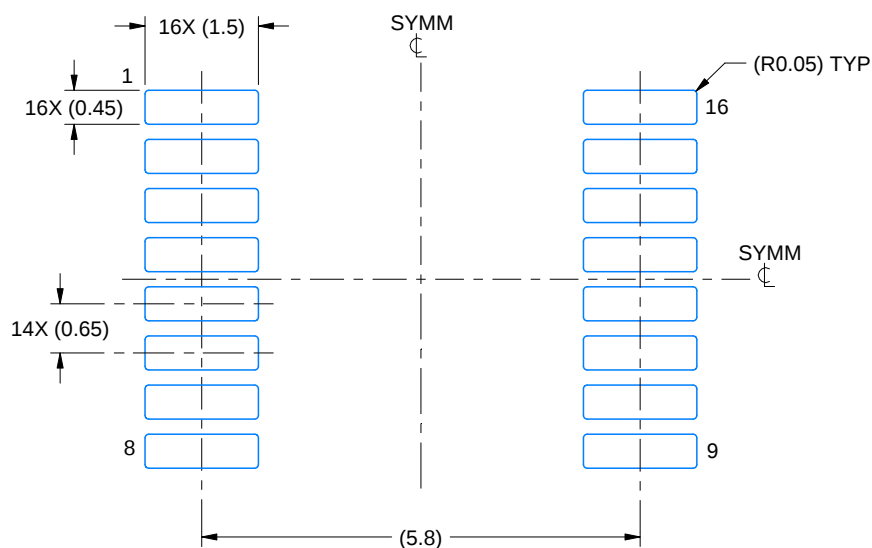
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or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

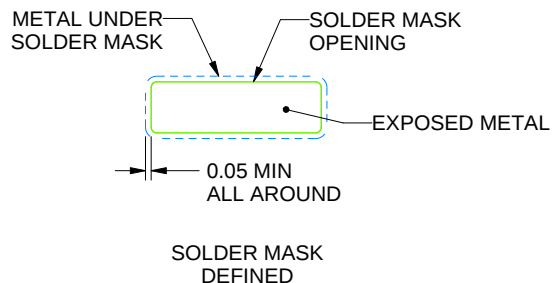
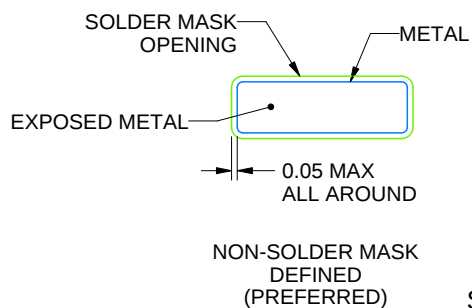
PW0016A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



LAND PATTERN EXAMPLE  
EXPOSED METAL SHOWN  
SCALE: 10X



SOLDER MASK DETAILS

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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

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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.

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.

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

16 PINS SHOWN

## PLASTIC DUAL-IN-LINE PACKAGE



| PINS **             | 14               | 16               | 18               | 20               |
|---------------------|------------------|------------------|------------------|------------------|
| DIM                 |                  |                  |                  |                  |
| 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               |



14/18 Pin Only  
20 Pin vendor option

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.

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