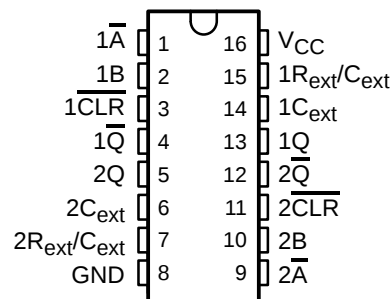


# SN54AHC123A, SN74AHC123A DUAL RETRIGGERABLE MONOSTABLE MULTIVIBRATORS

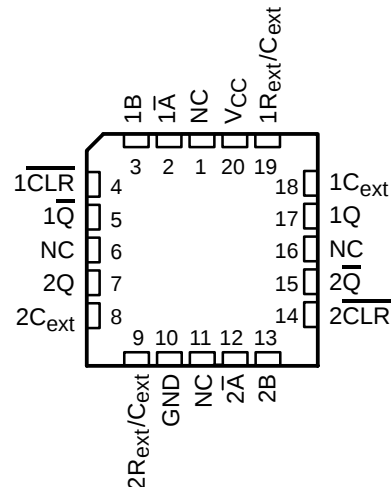
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- Operating Range 2-V to 5.5-V  $V_{CC}$
- Schmitt-Trigger Circuitry On  $\overline{A}$ , B, and  $\overline{CLR}$  Inputs for Slow Input Transition Rates
- Edge Triggered From Active-High or Active-Low Gated Logic Inputs
- Retriggerable for Very Long Output Pulses
- Overriding Clear Terminates Output Pulse
- Glitch-Free Power-Up Reset On Outputs
- Latch-Up Performance Exceeds 100 mA Per JESD 78, Class II
- ESD Protection Exceeds JESD 22
  - 2000-V Human-Body Model (A114-A)
  - 200-V Machine Model (A115-A)
  - 1000-V Charged-Device Model (C101)

SN54AHC123A ... J OR W PACKAGE  
SN74AHC123A ... D, DB, DGV, N, OR PW PACKAGE  
(TOP VIEW)



SN54AHC123A ... FK PACKAGE  
(TOP VIEW)



NC – No internal connection

## description/ordering information

The 'AHC123A devices are dual retriggerable monostable multivibrators designed for 2-V to 5.5-V  $V_{CC}$  operation.

These edge-triggered multivibrators feature output pulse-duration control by three methods. In the first method, the  $\overline{A}$  input is low, and the B input goes high. In the second method, the B input is high, and the  $\overline{A}$  input goes low. In the third method, the  $\overline{A}$  input is low, the B input is high, and the clear ( $\overline{CLR}$ ) input goes high.

## ORDERING INFORMATION

| $T_A$          | PACKAGE†    |               | ORDERABLE PART NUMBER | TOP-SIDE MARKING |
|----------------|-------------|---------------|-----------------------|------------------|
| –40°C to 85°C  | PDIP – N    | Tube          | SN74AHC123AN          | SN74AHC123AN     |
|                | SOIC – D    | Tube          | SN74AHC123AD          | AHC123A          |
|                |             | Tape and reel | SN74AHC123ADR         |                  |
|                | SSOP – DB   | Tape and reel | SN74AHC123ADBR        | HA123A           |
|                | TSSOP – PW  | Tape and reel | SN74AHC123APWR        | HA123A           |
| –55°C to 125°C | TVSOP – DGV | Tape and reel | SN74AHC123ADGVR       | HA123A           |
|                | CDIP – J    | Tube          | SNJ54AHC123AJ         | SNJ54AHC123AJ    |
|                | CFP – W     | Tube          | SNJ54AHC123AW         | SNJ54AHC123AW    |
|                | LCCC – FK   | Tube          | SNJ54AHC123AFK        | SNJ54AHC123AFK   |

† Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at [www.ti.com/sc/package](http://www.ti.com/sc/package).



Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

 **TEXAS  
INSTRUMENTS**

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# SN54AHC123A, SN74AHC123A

## DUAL RETRIGGERABLE MONOSTABLE MULTIVIBRATORS

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### description/ordering information (continued)

The output pulse duration is programmed by selecting external resistance and capacitance values. The external timing capacitor must be connected between  $C_{ext}$  and  $R_{ext}/C_{ext}$  (positive) and an external resistor connected between  $R_{ext}/C_{ext}$  and  $V_{CC}$ . To obtain variable pulse durations, connect an external variable resistance between  $R_{ext}/C_{ext}$  and  $V_{CC}$ . The output pulse duration also can be reduced by taking  $\overline{CLR}$  low.

Pulse triggering occurs at a particular voltage level and is not directly related to the transition time of the input pulse. The  $\overline{A}$ , B, and  $\overline{CLR}$  inputs have Schmitt triggers with sufficient hysteresis to handle slow input transition rates with jitter-free triggering at the outputs.

Once triggered, the basic pulse duration can be extended by retriggering the gated low-level-active ( $\overline{A}$ ) or high-level-active (B) input. Pulse duration can be reduced by taking  $\overline{CLR}$  low.  $\overline{CLR}$  input can be used to override  $\overline{A}$  or B inputs. The input/output timing diagram illustrates pulse control by retriggering the inputs and early clearing.

The variance in output pulse duration from device to device typically is less than  $\pm 0.5\%$  for given external timing components. An example of this distribution for the 'AHC123A is shown in Figure 10. Variations in output pulse duration versus supply voltage and temperature are shown in Figure 6.

During power up, Q outputs are in the low state, and  $\overline{Q}$  outputs are in the high state. The outputs are glitch free, without applying a reset pulse.

For additional application information on multivibrators, see the application report *Designing With the SN74AHC123A and SN74AHCT123A*, literature number SCLA014.

FUNCTION TABLE  
(each multivibrator)

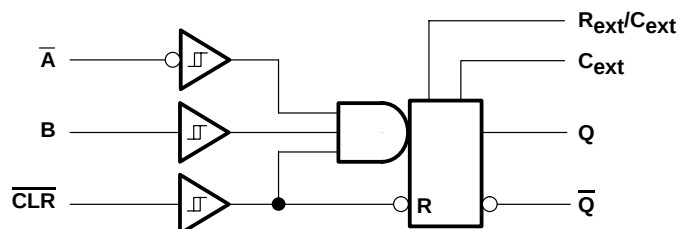
| INPUTS           |                |            | OUTPUTS                                                                             |                                                                                     |
|------------------|----------------|------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| $\overline{CLR}$ | $\overline{A}$ | B          | Q                                                                                   | $\overline{Q}$                                                                      |
| L                | X              | X          | L                                                                                   | H                                                                                   |
| X                | H              | X          | $L^\dagger$                                                                         | $H^\dagger$                                                                         |
| X                | X              | L          | $L^\dagger$                                                                         | $H^\dagger$                                                                         |
| H                | L              | $\uparrow$ |  |  |
| H                | $\downarrow$   | H          |  |  |
| $\uparrow$       | L              | H          |  |  |

<sup>†</sup> These outputs are based on the assumption that the indicated steady-state conditions at the  $\overline{A}$  and B inputs have been set up long enough to complete any pulse started before the setup.

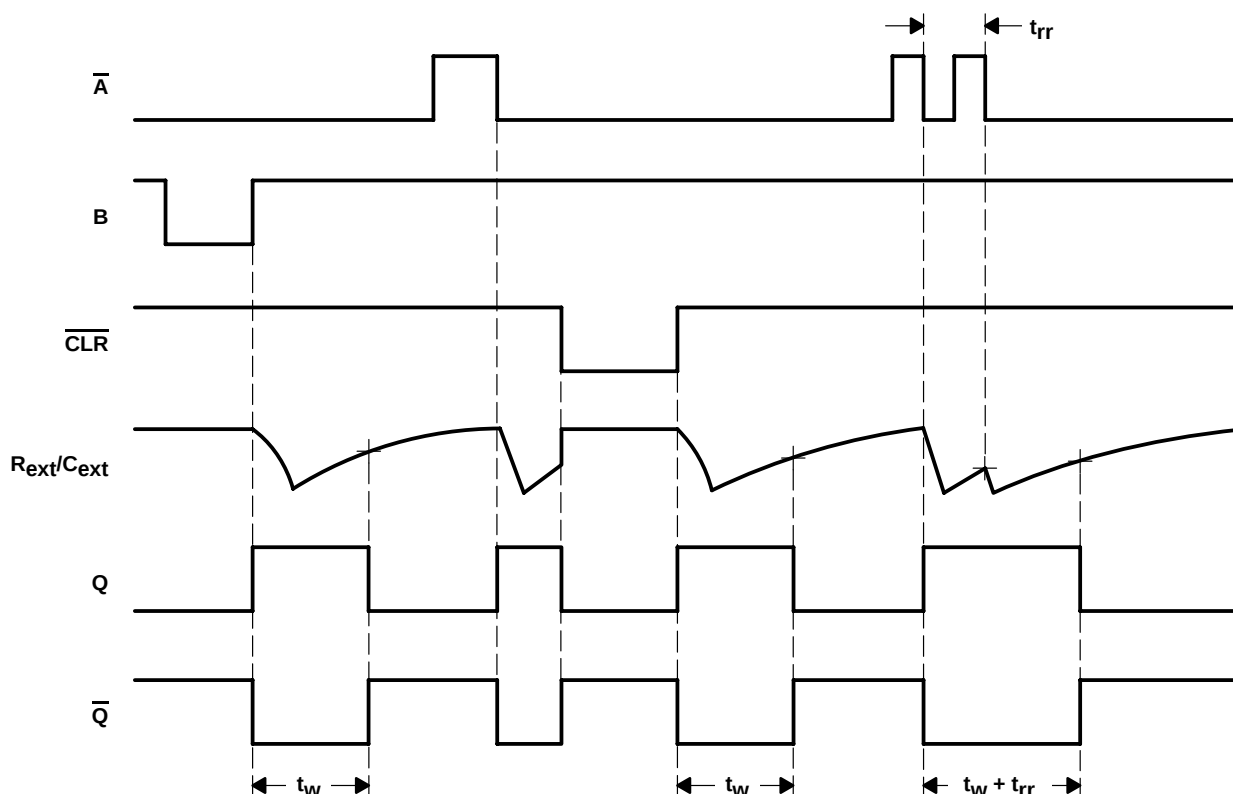
# SN54AHC123A, SN74AHC123A DUAL RETRIGGERABLE MONOSTABLE MULTIVIBRATORS

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logic diagram, each multivibrator (positive logic)



input/output timing diagram



# SN54AHC123A, SN74AHC123A DUAL RETRIGGERABLE MONOSTABLE MULTIVIBRATORS

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## absolute maximum ratings over operating free-air temperature (unless otherwise noted)<sup>†</sup>

|                                                                  |                            |
|------------------------------------------------------------------|----------------------------|
| Supply voltage range, $V_{CC}$ (see Note 1)                      | –0.5 V to 7 V              |
| Input voltage range, $V_I$ (see Note 2)                          | –0.5 V to 7 V              |
| Output voltage range in high or low state, $V_O$ (see Note 1)    | –0.5 V to $V_{CC} + 0.5$ V |
| Output voltage range in power-off state, $V_O$ (see Note 1)      | –0.5 V to 7 V              |
| Input clamp current, $I_{IK}$ ( $V_I < 0$ )                      | –20 mA                     |
| Output clamp current, $I_{OK}$ ( $V_O < 0$ or $V_O > V_{CC}$ )   | ±20 mA                     |
| Continuous output current, $I_O$ ( $V_O = 0$ to $V_{CC}$ )       | ±25 mA                     |
| Continuous current through $V_{CC}$ or GND                       | ±50 mA                     |
| Package thermal impedance, $\theta_{JA}$ (see Note 3): D package | 73°C/W                     |
| DB package                                                       | 82°C/W                     |
| DGV package                                                      | 120°C/W                    |
| N package                                                        | 67°C/W                     |
| PW package                                                       | 108°C/W                    |
| Storage temperature range, $T_{stg}$                             | –65°C to 150°C             |

<sup>†</sup> Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

- NOTES: 1. Voltage values are with respect to the network ground terminal.  
2. The input and output voltage ratings may be exceeded if the input and output current ratings are observed.  
3. The package thermal impedance is calculated in accordance with JESD 51-7.

## recommended operating conditions (see Note 4)

|                     |                                |                                 | SN54AHC123A |                 | SN74AHC123A |                 | UNIT |
|---------------------|--------------------------------|---------------------------------|-------------|-----------------|-------------|-----------------|------|
|                     |                                |                                 | MIN         | MAX             | MIN         | MAX             |      |
| V <sub>CC</sub>     | Supply voltage                 |                                 | 2           | 5.5             | 2           | 5.5             | V    |
| V <sub>IH</sub>     | High-level input voltage       | V <sub>CC</sub> = 2 V           | 1.5         |                 | 1.5         |                 | V    |
|                     |                                | V <sub>CC</sub> = 3 V           | 2.1         |                 | 2.1         |                 |      |
|                     |                                | V <sub>CC</sub> = 5.5 V         | 3.85        |                 | 3.85        |                 |      |
| V <sub>IL</sub>     | Low-level input voltage        | V <sub>CC</sub> = 2 V           | 0.5         |                 | 0.5         |                 | V    |
|                     |                                | V <sub>CC</sub> = 3 V           | 0.9         |                 | 0.9         |                 |      |
|                     |                                | V <sub>CC</sub> = 5.5 V         | 1.65        |                 | 1.65        |                 |      |
| V <sub>I</sub>      | Input voltage                  |                                 | 0           | 5.5             | 0           | 5.5             | V    |
| V <sub>O</sub>      | Output voltage                 |                                 | 0           | V <sub>CC</sub> | 0           | V <sub>CC</sub> | V    |
| I <sub>OH</sub>     | High-level output current      | V <sub>CC</sub> = 2 V           | −50         |                 | −50         |                 | μA   |
|                     |                                | V <sub>CC</sub> = 3.3 V ± 0.3 V | −4          |                 | −4          |                 | mA   |
|                     |                                | V <sub>CC</sub> = 5 V ± 0.5 V   | −8          |                 | −8          |                 |      |
| I <sub>OL</sub>     | Low-level output current       | V <sub>CC</sub> = 2 V           | 50          |                 | 50          |                 | μA   |
|                     |                                | V <sub>CC</sub> = 3.3 V ± 0.3 V | 4           |                 | 4           |                 | mA   |
|                     |                                | V <sub>CC</sub> = 5 V ± 0.5 V   | 8           |                 | 8           |                 |      |
| R <sub>ext</sub>    | External timing resistance     | V <sub>CC</sub> = 2 V           | 5k          |                 | 5k          |                 | Ω    |
|                     |                                | V <sub>CC</sub> > 3 V           | 1k          |                 | 1k          |                 |      |
| Δt/ΔV <sub>CC</sub> | Power-up ramp rate             |                                 | 1           |                 | 1           |                 | ms/V |
| T <sub>A</sub>      | Operating free-air temperature |                                 | −55         | 125             | −40         | 85              | °C   |

NOTE 4: Unused  $R_{ext}/C_{ext}$  terminals should be left unconnected. All remaining unused inputs of the device must be held at  $V_{CC}$  or GND to ensure proper device operation. Refer to the TI application report, *Implications of Slow or Floating CMOS Inputs*, literature number SCBA004.



# SN54AHC123A, SN74AHC123A

## DUAL RETRIGGERABLE MONOSTABLE MULTIVIBRATORS

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

| PARAMETER       | TEST CONDITIONS                                 | V <sub>CC</sub>                                                                                   | T <sub>A</sub> = 25°C |     |       | SN54AHC123A |      | SN74AHC123A |      | UNIT |
|-----------------|-------------------------------------------------|---------------------------------------------------------------------------------------------------|-----------------------|-----|-------|-------------|------|-------------|------|------|
|                 |                                                 |                                                                                                   | MIN                   | TYP | MAX   | MIN         | MAX  | MIN         | MAX  |      |
| V <sub>OH</sub> | I <sub>OH</sub> = –50 µA                        | 2 V                                                                                               | 1.9                   | 2   |       | 1.9         |      | 1.9         |      | V    |
|                 |                                                 | 3 V                                                                                               | 2.9                   | 3   |       | 2.9         |      | 2.9         |      |      |
|                 |                                                 | 4.5 V                                                                                             | 4.4                   | 4.5 |       | 4.4         |      | 4.4         |      |      |
|                 | I <sub>OH</sub> = –4 mA                         | 3 V                                                                                               | 2.58                  |     |       | 2.48        |      | 2.48        |      |      |
|                 | I <sub>OH</sub> = –8 mA                         | 4.5 V                                                                                             | 3.94                  |     |       | 3.8         |      | 3.8         |      |      |
| V <sub>OL</sub> | I <sub>OL</sub> = 50 µA                         | 2 V                                                                                               |                       |     | 0.1   |             | 0.1  |             | 0.1  | V    |
|                 |                                                 | 3 V                                                                                               |                       |     | 0.1   |             | 0.1  |             | 0.1  |      |
|                 |                                                 | 4.5 V                                                                                             |                       |     | 0.1   |             | 0.1  |             | 0.1  |      |
|                 | I <sub>OL</sub> = 4 mA                          | 3 V                                                                                               |                       |     | 0.36  |             | 0.5  |             | 0.44 |      |
|                 | I <sub>OL</sub> = 8 mA                          | 4.5 V                                                                                             |                       |     | 0.36  |             | 0.5  |             | 0.44 |      |
| I <sub>I</sub>  | R <sub>ext</sub> /C <sub>ext</sub> <sup>†</sup> | V <sub>I</sub> = V <sub>CC</sub> or GND                                                           | 5.5 V                 |     | ±0.25 |             | ±2.5 |             | ±2.5 | µA   |
|                 | $\overline{A}$ , B, and $\overline{CLR}$        | V <sub>I</sub> = V <sub>CC</sub> or GND                                                           | 0 V to 5.5 V          |     | ±0.1  |             | ±1*  |             | ±1   |      |
| I <sub>CC</sub> | Quiescent                                       | V <sub>I</sub> = V <sub>CC</sub> or GND, I <sub>O</sub> = 0                                       | 5.5 V                 |     | 4     |             | 40   |             | 40   | µA   |
| I <sub>CC</sub> | Active state (per circuit)                      | V <sub>I</sub> = V <sub>CC</sub> or GND, R <sub>ext</sub> /C <sub>ext</sub> = 0.5 V <sub>CC</sub> | 3 V                   | 160 | 250   |             | 280  |             | 280  | µA   |
|                 |                                                 |                                                                                                   | 4.5 V                 | 280 | 500   |             | 650  |             | 650  |      |
|                 |                                                 |                                                                                                   | 5.5 V                 | 360 | 750   |             | 975  |             | 975  |      |
| C <sub>i</sub>  |                                                 | V <sub>I</sub> = V <sub>CC</sub> or GND                                                           | 5 V                   | 1.9 | 10    |             |      |             | 10   | pF   |

\* On products compliant to MIL-PRF-38535, this parameter is not production tested at V<sub>CC</sub> = 0 V.

† This test is performed with the terminal in the off-state condition.

**timing requirements over recommended operating free-air temperature range, V<sub>CC</sub> = 3.3 V ± 0.3 V (unless otherwise noted) (see Figure 1)**

|                                      | TEST CONDITIONS                                     | T <sub>A</sub> = 25°C |     |     | SN54AHC123A |     | SN74AHC123A |     | UNIT |
|--------------------------------------|-----------------------------------------------------|-----------------------|-----|-----|-------------|-----|-------------|-----|------|
|                                      |                                                     | MIN                   | TYP | MAX | MIN         | MAX | MIN         | MAX |      |
| t <sub>w</sub> Pulse duration        | $\overline{CLR}$                                    | 5                     |     |     | 5           |     | 5           |     | ns   |
|                                      | $\overline{A}$ or B trigger                         | 5                     |     |     | 5           |     | 5           |     |      |
| t <sub>rr</sub> Pulse retrigger time | R <sub>ext</sub> = 1 kΩ, C <sub>ext</sub> = 100 pF  | ‡                     | 76  |     | ‡           |     | ‡           |     | ns   |
|                                      | R <sub>ext</sub> = 1 kΩ, C <sub>ext</sub> = 0.01 µF | ‡                     | 1.8 |     | ‡           |     | ‡           |     | µs   |

‡ See retriggering data in the *application information* section.

**timing requirements over recommended operating free-air temperature range, V<sub>CC</sub> = 5 V ± 0.5 V (unless otherwise noted) (see Figure 1)**

|                                      | TEST CONDITIONS                                     | T <sub>A</sub> = 25°C |     |     | SN54AHC123A |     | SN74AHC123A |     | UNIT |
|--------------------------------------|-----------------------------------------------------|-----------------------|-----|-----|-------------|-----|-------------|-----|------|
|                                      |                                                     | MIN                   | TYP | MAX | MIN         | MAX | MIN         | MAX |      |
| t <sub>w</sub> Pulse duration        | $\overline{CLR}$                                    | 5                     |     |     | 5           |     | 5           |     | ns   |
|                                      | $\overline{A}$ or B trigger                         | 5                     |     |     | 5           |     | 5           |     |      |
| t <sub>rr</sub> Pulse retrigger time | R <sub>ext</sub> = 1 kΩ, C <sub>ext</sub> = 100 pF  | ‡                     | 59  |     | ‡           |     | ‡           |     | ns   |
|                                      | R <sub>ext</sub> = 1 kΩ, C <sub>ext</sub> = 0.01 µF | ‡                     | 1.5 |     | ‡           |     | ‡           |     | µs   |

‡ See retriggering data in the *application information* section.



# SN54AHC123A, SN74AHC123A DUAL RETRIGGERABLE MONOSTABLE MULTIVIBRATORS

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switching characteristics over recommended operating free-air temperature range,  
 $V_{CC} = 3.3 \text{ V} \pm 0.3 \text{ V}$  (unless otherwise noted) (see Figure 1)

| PARAMETER             | FROM<br>(INPUT)                 | TO<br>(OUTPUT) | TEST<br>CONDITIONS                                                                                        | $T_A = 25^\circ\text{C}$ |       |     | SN54AHC123A |       | SN74AHC123A |      | UNIT          |
|-----------------------|---------------------------------|----------------|-----------------------------------------------------------------------------------------------------------|--------------------------|-------|-----|-------------|-------|-------------|------|---------------|
|                       |                                 |                |                                                                                                           | MIN                      | TYP   | MAX | MIN         | MAX   | MIN         | MAX  |               |
| $t_{PLH}$             | $\bar{A}$ or B                  | Q or $\bar{Q}$ | $C_L = 15 \text{ pF}$                                                                                     | 9.5*                     | 20.6* |     | 1*          | 24*   | 1           | 24   | ns            |
| $t_{PHL}$             |                                 |                |                                                                                                           | 10.2*                    | 20.6* |     | 1*          | 24*   | 1           | 24   |               |
| $t_{PLH}$             | $\overline{\text{CLR}}$         | Q or $\bar{Q}$ | $C_L = 15 \text{ pF}$                                                                                     | 7.5*                     | 15.8* |     | 1*          | 18.5* | 1           | 18.5 | ns            |
| $t_{PHL}$             |                                 |                |                                                                                                           | 9.3*                     | 15.8* |     | 1*          | 18.5* | 1           | 18.5 |               |
| $t_{PLH}$             | $\overline{\text{CLR}}$ trigger | Q or $\bar{Q}$ | $C_L = 15 \text{ pF}$                                                                                     | 10*                      | 22.4* |     | 1*          | 26*   | 1           | 26   | ns            |
| $t_{PHL}$             |                                 |                |                                                                                                           | 10.6*                    | 22.4* |     | 1*          | 26*   | 1           | 26   |               |
| $t_{PLH}$             | $\bar{A}$ or B                  | Q or $\bar{Q}$ | $C_L = 50 \text{ pF}$                                                                                     | 10.5                     | 24.1  |     | 1           | 27.5  | 1           | 27.5 | ns            |
| $t_{PHL}$             |                                 |                |                                                                                                           | 11.8                     | 24.1  |     | 1           | 27.5  | 1           | 27.5 |               |
| $t_{PLH}$             | $\overline{\text{CLR}}$         | Q or $\bar{Q}$ | $C_L = 50 \text{ pF}$                                                                                     | 8.9                      | 19.3  |     | 1           | 22    | 1           | 22   | ns            |
| $t_{PHL}$             |                                 |                |                                                                                                           | 10.5                     | 19.3  |     | 1           | 22    | 1           | 22   |               |
| $t_{PLH}$             | $\overline{\text{CLR}}$ trigger | Q or $\bar{Q}$ | $C_L = 50 \text{ pF}$                                                                                     | 11                       | 25.9  |     | 1           | 29.5  | 1           | 29.5 | ns            |
| $t_{PHL}$             |                                 |                |                                                                                                           | 12.3                     | 25.9  |     | 1           | 29.5  | 1           | 29.5 |               |
| $t_w^\dagger$         |                                 | Q or $\bar{Q}$ | $C_L = 50 \text{ pF}$ ,<br>$C_{\text{ext}} = 28 \text{ pF}$ ,<br>$R_{\text{ext}} = 2 \text{ k}\Omega$     | 182                      | 240   |     | 300         |       | 300         |      | ns            |
|                       |                                 |                | $C_L = 50 \text{ pF}$ ,<br>$C_{\text{ext}} = 0.01 \mu\text{F}$ ,<br>$R_{\text{ext}} = 10 \text{ k}\Omega$ | 90                       | 100   | 110 | 90          | 110   | 90          | 110  | $\mu\text{s}$ |
|                       |                                 |                | $C_L = 50 \text{ pF}$ ,<br>$C_{\text{ext}} = 0.1 \mu\text{F}$ ,<br>$R_{\text{ext}} = 10 \text{ k}\Omega$  | 0.9                      | 1     | 1.1 | 0.9         | 1.1   | 0.9         | 1.1  | ms            |
| $\Delta t_w^\ddagger$ |                                 |                |                                                                                                           | $\pm 1$                  |       |     |             |       |             |      | %             |

\* On products compliant to MIL-PRF-38535, this parameter is not production tested.

$^\dagger t_w$  = Pulse duration at Q and  $\bar{Q}$  outputs

$^\ddagger \Delta t_w$  = Output pulse-duration variation (Q and  $\bar{Q}$ ) between circuits in same package

# SN54AHC123A, SN74AHC123A

## DUAL RETRIGGERABLE MONOSTABLE MULTIVIBRATORS

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switching characteristics over recommended operating free-air temperature range,  
 $V_{CC} = 5\text{ V} \pm 0.5\text{ V}$  (unless otherwise noted) (see Figure 1)

| PARAMETER             | FROM<br>(INPUT)                 | TO<br>(OUTPUT) | TEST<br>CONDITIONS                                                                               | $T_A = 25^\circ\text{C}$ |       |     | SN54AHC123A |     | SN74AHC123A |     | UNIT          |
|-----------------------|---------------------------------|----------------|--------------------------------------------------------------------------------------------------|--------------------------|-------|-----|-------------|-----|-------------|-----|---------------|
|                       |                                 |                |                                                                                                  | MIN                      | TYP   | MAX | MIN         | MAX | MIN         | MAX |               |
| $t_{PLH}$             | $\bar{A}$ or B                  | Q or $\bar{Q}$ | $C_L = 15\text{ pF}$                                                                             | 6.5*                     | 12*   |     | 1*          | 14* | 1           | 14  | ns            |
| $t_{PHL}$             |                                 |                |                                                                                                  | 7.1*                     | 12*   |     | 1*          | 14* | 1           | 14  |               |
| $t_{PLH}$             | $\overline{\text{CLR}}$         | Q or $\bar{Q}$ | $C_L = 15\text{ pF}$                                                                             | 5.3*                     | 9.4*  |     | 1*          | 11* | 1           | 11  | ns            |
| $t_{PHL}$             |                                 |                |                                                                                                  | 6.5*                     | 9.4*  |     | 1*          | 11* | 1           | 11  |               |
| $t_{PLH}$             | $\overline{\text{CLR}}$ trigger | Q or $\bar{Q}$ | $C_L = 15\text{ pF}$                                                                             | 6.9*                     | 12.9* |     | 1*          | 15* | 1           | 15  | ns            |
| $t_{PHL}$             |                                 |                |                                                                                                  | 7.4*                     | 12.9* |     | 1*          | 15* | 1           | 15  |               |
| $t_{PLH}$             | $\bar{A}$ or B                  | Q or $\bar{Q}$ | $C_L = 50\text{ pF}$                                                                             | 7.3                      | 14    |     | 1           | 16  | 1           | 16  | ns            |
| $t_{PHL}$             |                                 |                |                                                                                                  | 8.3                      | 14    |     | 1           | 16  | 1           | 16  |               |
| $t_{PLH}$             | $\overline{\text{CLR}}$         | Q or $\bar{Q}$ | $C_L = 50\text{ pF}$                                                                             | 6.3                      | 11.4  |     | 1           | 13  | 1           | 13  | ns            |
| $t_{PHL}$             |                                 |                |                                                                                                  | 7.4                      | 11.4  |     | 1           | 13  | 1           | 13  |               |
| $t_{PLH}$             | $\overline{\text{CLR}}$ trigger | Q or $\bar{Q}$ | $C_L = 50\text{ pF}$                                                                             | 7.6                      | 14.9  |     | 1           | 17  | 1           | 17  | ns            |
| $t_{PHL}$             |                                 |                |                                                                                                  | 8.7                      | 14.9  |     | 1           | 17  | 1           | 17  |               |
| $t_w^\dagger$         |                                 | Q or $\bar{Q}$ | $C_L = 50\text{ pF}$ ,<br>$C_{ext} = 28\text{ pF}$ ,<br>$R_{ext} = 2\text{ k}\Omega$             | 167                      | 200   |     |             | 240 |             | 240 | ns            |
|                       |                                 |                | $C_L = 50\text{ pF}$ ,<br>$C_{ext} = 0.01\text{ }\mu\text{F}$ ,<br>$R_{ext} = 10\text{ k}\Omega$ | 90                       | 100   | 110 | 90          | 110 | 90          | 110 | $\mu\text{s}$ |
|                       |                                 |                | $C_L = 50\text{ pF}$ ,<br>$C_{ext} = 0.1\text{ }\mu\text{F}$ ,<br>$R_{ext} = 10\text{ k}\Omega$  | 0.9                      | 1     | 1.1 | 0.9         | 1.1 | 0.9         | 1.1 | ms            |
| $\Delta t_w^\ddagger$ |                                 |                |                                                                                                  | $\pm 1$                  |       |     |             |     |             |     | %             |

\* On products compliant to MIL-PRF-38535, this parameter is not production tested.

$^\dagger t_w$  = Pulse duration at Q and  $\bar{Q}$  outputs

$^\ddagger \Delta t_w$  = Output pulse-duration variation (Q and  $\bar{Q}$ ) between circuits in same package

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

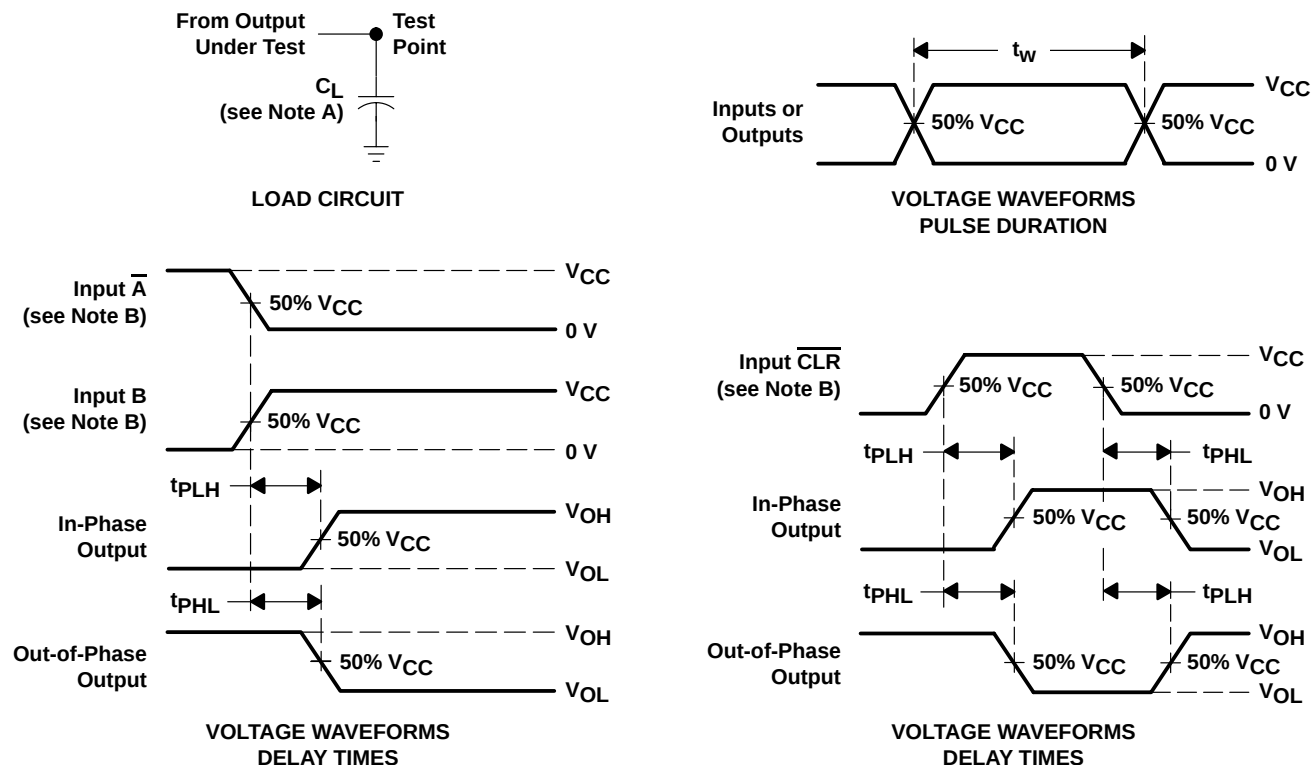
| PARAMETER                              | TEST CONDITIONS | TYP | UNIT |
|----------------------------------------|-----------------|-----|------|
| $C_{pd}$ Power dissipation capacitance | No load         | 29  | pF   |



# SN54AHC123A, SN74AHC123A DUAL RETRIGGERABLE MONOSTABLE MULTIVIBRATORS

SCLS352G – JULY 1997 – REVISED APRIL 2003

## PARAMETER MEASUREMENT INFORMATION



- NOTES: A.  $C_L$  includes probe and jig capacitance.  
B. All input pulses are supplied by generators having the following characteristics:  $Z_O = 50 \Omega$ ,  $t_r = 3 \text{ ns}$ ,  $t_f = 3 \text{ ns}$ .  
C. The outputs are measured one at a time with one input transition per measurement.

**Figure 1. Load Circuit and Voltage Waveforms**

## APPLICATION INFORMATION

### caution in use

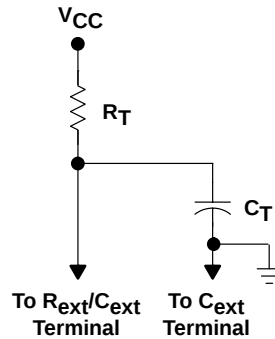
To prevent malfunctions due to noise, connect a high-frequency capacitor between  $V_{CC}$  and GND, and keep the wiring between the external components and  $C_{ext}$  and  $R_{ext}/C_{ext}$  terminals as short as possible.

### power-down considerations

Large values of  $C_{ext}$  can cause problems when powering down the 'AHC123A devices because of the amount of energy stored in the capacitor. When a system containing this device is powered down, the capacitor can discharge from  $V_{CC}$  through the protection diodes at pin 2 or pin 14. Current through the input protection diodes must be limited to 30 mA; therefore, the turn-off time of the  $V_{CC}$  power supply must not be faster than  $t = V_{CC} \times C_{ext}/30 \text{ mA}$ . For example, if  $V_{CC} = 5 \text{ V}$  and  $C_{ext} = 15 \text{ pF}$ , the  $V_{CC}$  supply must turn off no faster than  $t = (5 \text{ V}) \times (15 \text{ pF})/30 \text{ mA} = 2.5 \text{ ns}$ . Usually, this is not a problem because power supplies are heavily filtered and cannot discharge at this rate. When a more rapid decrease of  $V_{CC}$  to zero occurs, the 'AHC123A devices can sustain damage. To avoid this possibility, use external clamping diodes.

### output pulse duration

The output pulse duration,  $t_w$ , is determined primarily by the values of the external capacitance ( $C_T$ ) and timing resistance ( $R_T$ ). The timing components are connected as shown in Figure 2.



**Figure 2. Timing-Component Connections**

The pulse duration is given by:

$$t_w = K \times R_T \times C_T \quad (1)$$

if  $C_T$  is  $\geq 1000 \text{ pF}$ ,  $K = 1.0$  or

if  $C_T$  is  $< 1000 \text{ pF}$ ,  $K$  can be determined from Figure 5

where:

$t_w$  = pulse duration in ns

$R_T$  = external timing resistance in  $k\Omega$

$C_T$  = external capacitance in pF

$K$  = multiplier factor

Equation 1 and Figure 3 can be used to determine values for pulse duration, external resistance, and external capacitance.

# SN54AHC123A, SN74AHC123A DUAL RETRIGGERABLE MONOSTABLE MULTIVIBRATORS

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## APPLICATION INFORMATION

### retriggering data

The minimum input retriggering time ( $t_{MIR}$ ) is the minimum time required after the initial signal before retriggering the input. After  $t_{MIR}$ , the device retriggers the output. Experimentally, it also can be shown that to retrigger the output pulse, the two adjacent input signals should be  $t_{MIR}$  apart, where  $t_{MIR} = 0.30 \times t_w$ . The retrigger pulse duration is calculated as shown in Figure 3.

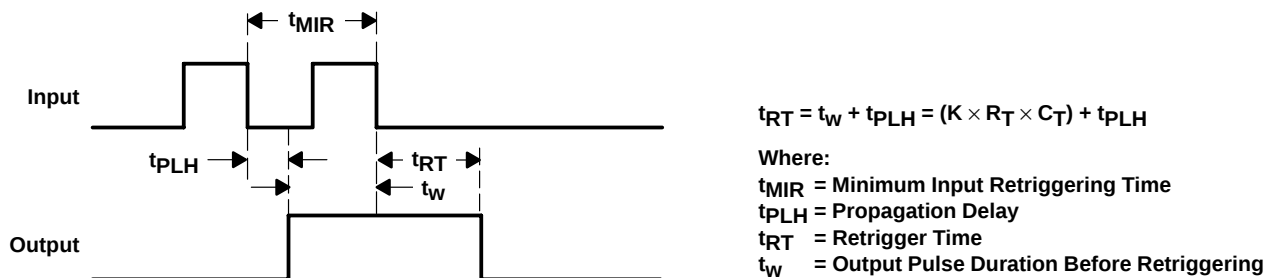


Figure 3. Retrigger Pulse Duration

The minimum value from the end of the input pulse to the beginning of the retriggered output should be approximately 15 ns to ensure a retriggered output (see Figure 4).

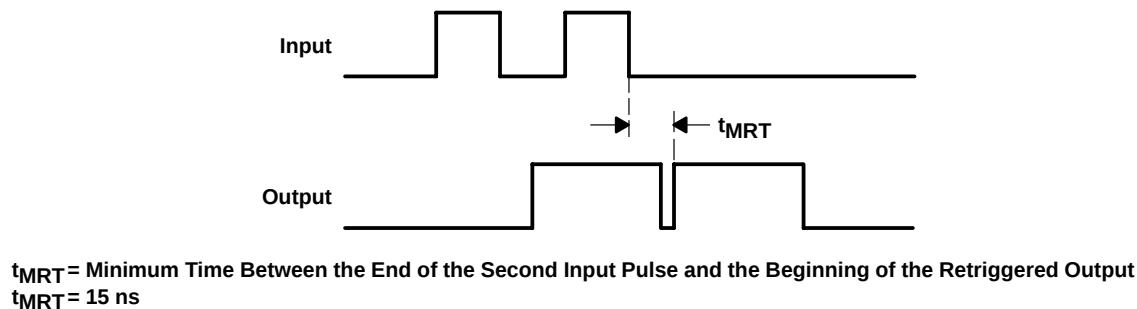


Figure 4. Input/Output Requirements

APPLICATION INFORMATION†

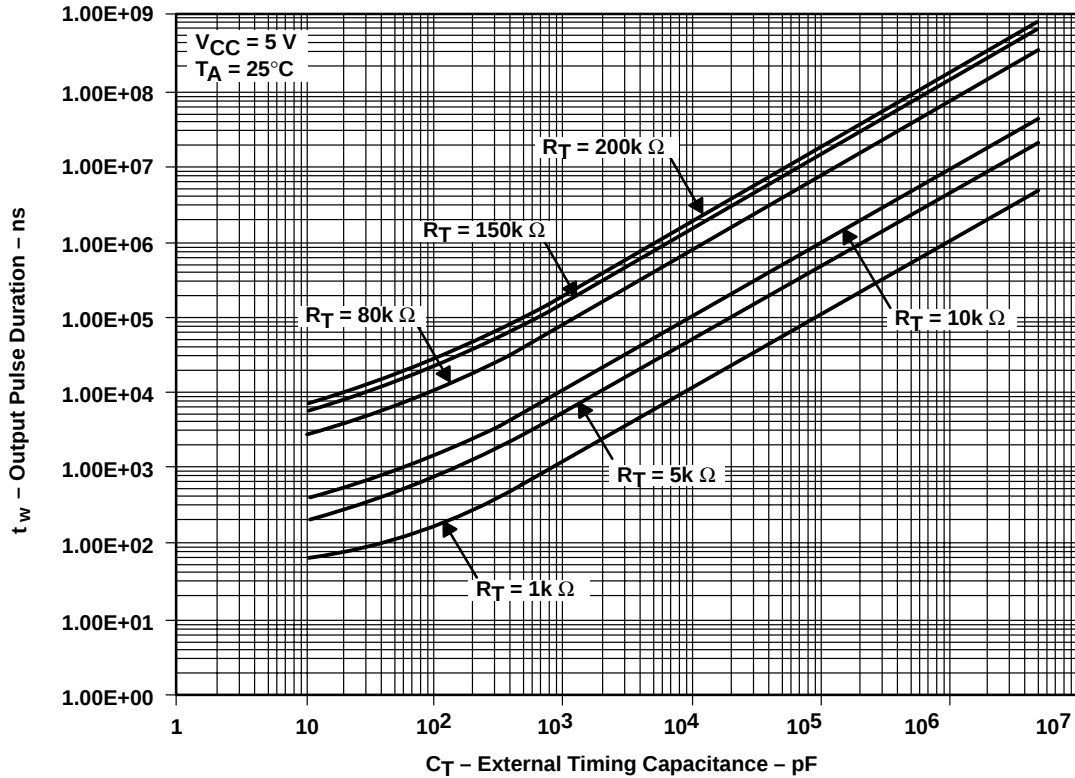


Figure 5. Output Pulse Duration vs External Timing Capacitance

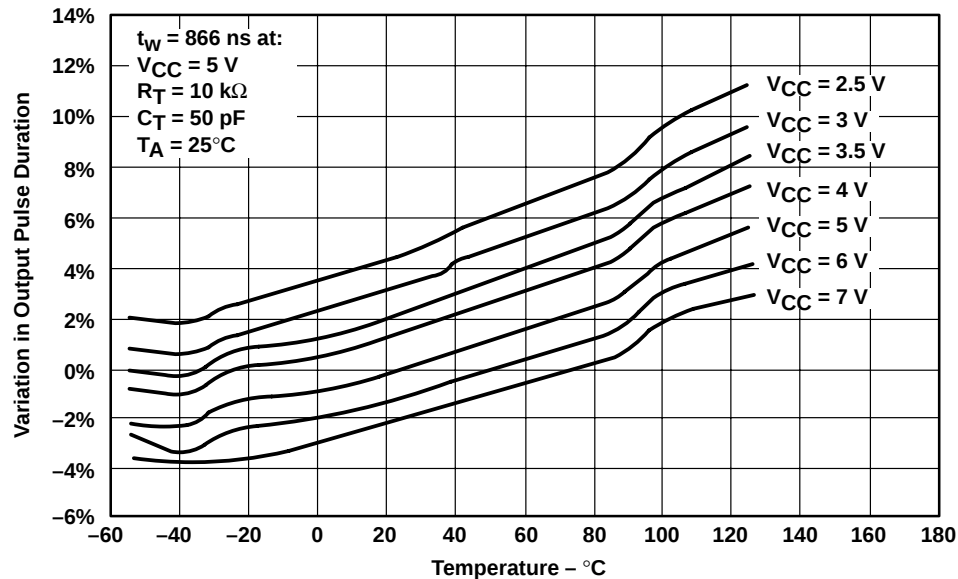


Figure 6. Variations in Output Pulse Duration vs Temperature

† Operation of the device at these or any other conditions beyond those indicated under "recommended operating conditions" is not implied.

# SN54AHC123A, SN74AHC123A DUAL RETRIGGERABLE MONOSTABLE MULTIVIBRATORS

SCLS352G – JULY 1997 – REVISED APRIL 2003

## APPLICATION INFORMATION†

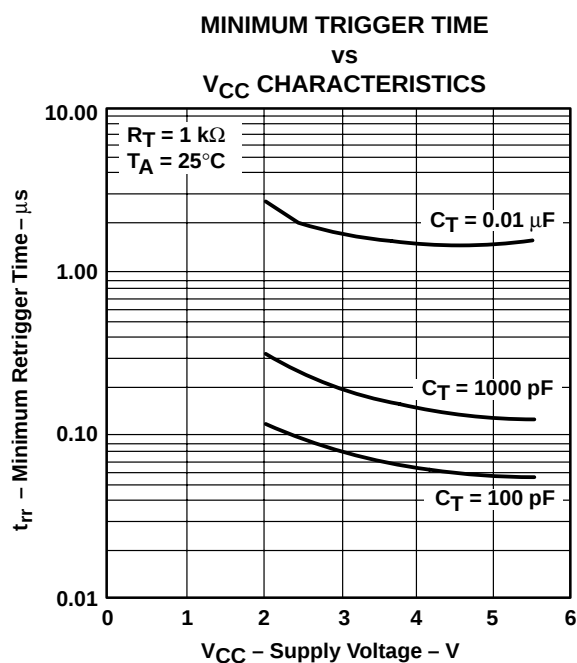


Figure 7

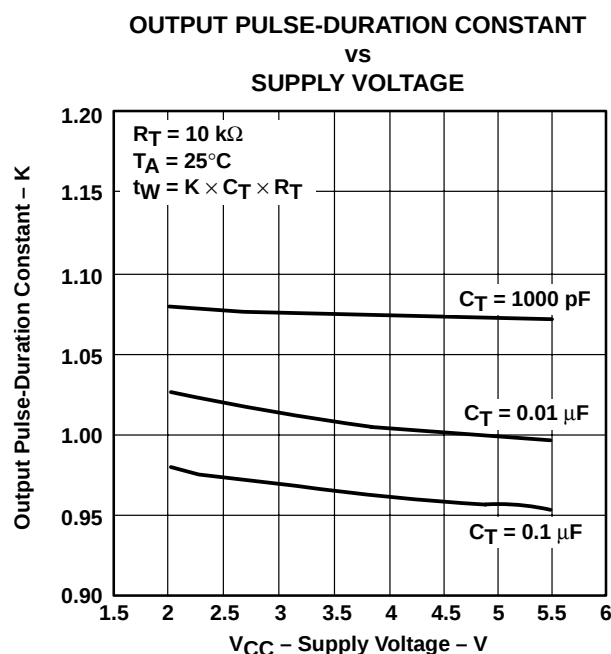


Figure 8

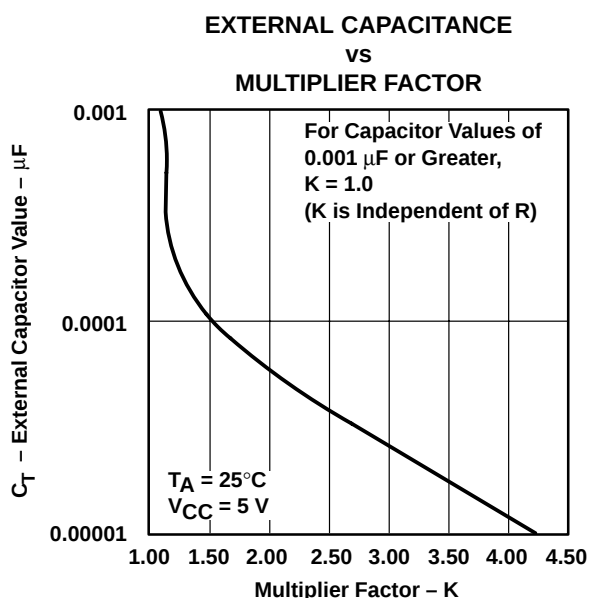


Figure 9

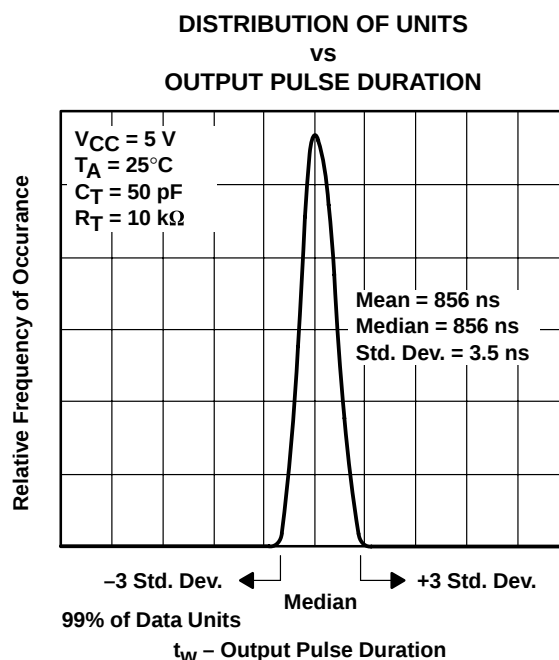


Figure 10

† Operation of the device at these or any other conditions beyond those indicated under "recommended operating conditions" is not implied.

**PACKAGING INFORMATION**

| Orderable Device | Status <sup>(1)</sup> | Package Type | Package Drawing | Pins | Package Qty | Eco Plan <sup>(2)</sup> | Lead/Ball Finish | MSL Peak Temp <sup>(3)</sup>               |
|------------------|-----------------------|--------------|-----------------|------|-------------|-------------------------|------------------|--------------------------------------------|
| 5962-9860801Q2A  | ACTIVE                | LCCC         | FK              | 20   | 1           | TBD                     | Call TI          | Level-NC-NC-NC                             |
| 5962-9860801QEA  | ACTIVE                | CDIP         | J               | 16   | 1           | TBD                     | Call TI          | Level-NC-NC-NC                             |
| 5962-9860801QFA  | ACTIVE                | CFP          | W               | 16   | 1           | TBD                     | Call TI          | Level-NC-NC-NC                             |
| SN74AHC123AD     | ACTIVE                | SOIC         | D               | 16   | 40          | Pb-Free (RoHS)          | CU NIPDAU        | Level-2-260C-1 YEAR/<br>Level-1-235C-UNLIM |
| SN74AHC123ADBR   | ACTIVE                | SSOP         | DB              | 16   | 2000        | Pb-Free (RoHS)          | CU NIPDAU        | Level-2-260C-1 YEAR/<br>Level-1-235C-UNLIM |
| SN74AHC123ADGVR  | ACTIVE                | TVSOP        | DGV             | 16   | 2000        | Pb-Free (RoHS)          | CU NIPDAU        | Level-1-250C-UNLIM                         |
| SN74AHC123ADR    | ACTIVE                | SOIC         | D               | 16   | 2500        | Pb-Free (RoHS)          | CU NIPDAU        | Level-2-260C-1 YEAR/<br>Level-1-235C-UNLIM |
| SN74AHC123AN     | ACTIVE                | PDIP         | N               | 16   | 25          | Pb-Free (RoHS)          | CU NIPDAU        | Level-NC-NC-NC                             |
| SN74AHC123APWR   | ACTIVE                | TSSOP        | PW              | 16   | 2000        | Pb-Free (RoHS)          | CU NIPDAU        | Level-1-250C-UNLIM                         |
| SN74AHC123APWRE4 | ACTIVE                | TSSOP        | PW              | 16   | 2000        | Pb-Free (RoHS)          | CU NIPDAU        | Level-1-250C-UNLIM                         |
| SNJ54AHC123AFK   | ACTIVE                | LCCC         | FK              | 20   | 1           | TBD                     | Call TI          | Level-NC-NC-NC                             |
| SNJ54AHC123AJ    | ACTIVE                | CDIP         | J               | 16   | 1           | TBD                     | Call TI          | Level-NC-NC-NC                             |
| SNJ54AHC123AW    | ACTIVE                | CFP          | W               | 16   | 1           | TBD                     | Call TI          | Level-NC-NC-NC                             |

<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.

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

<sup>(2)</sup> Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS) or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

**TBD:** The Pb-Free/Green conversion plan has not been defined.

**Pb-Free (RoHS):** TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

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

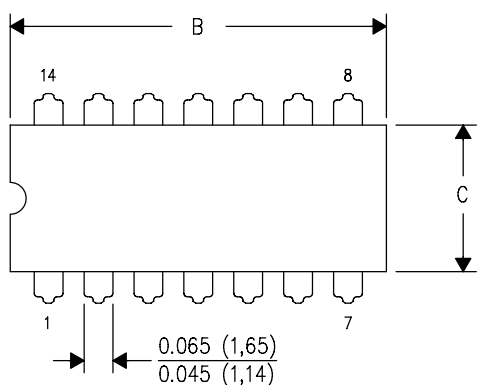
<sup>(3)</sup> MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

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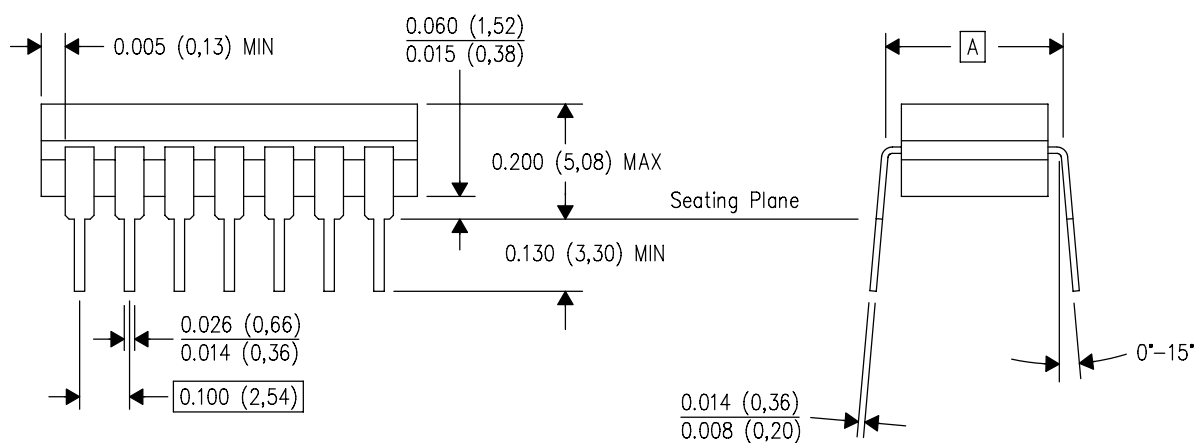
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14 LEADS SHOWN

CERAMIC DUAL IN-LINE PACKAGE



| DIM \ PINS ** | 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)        |



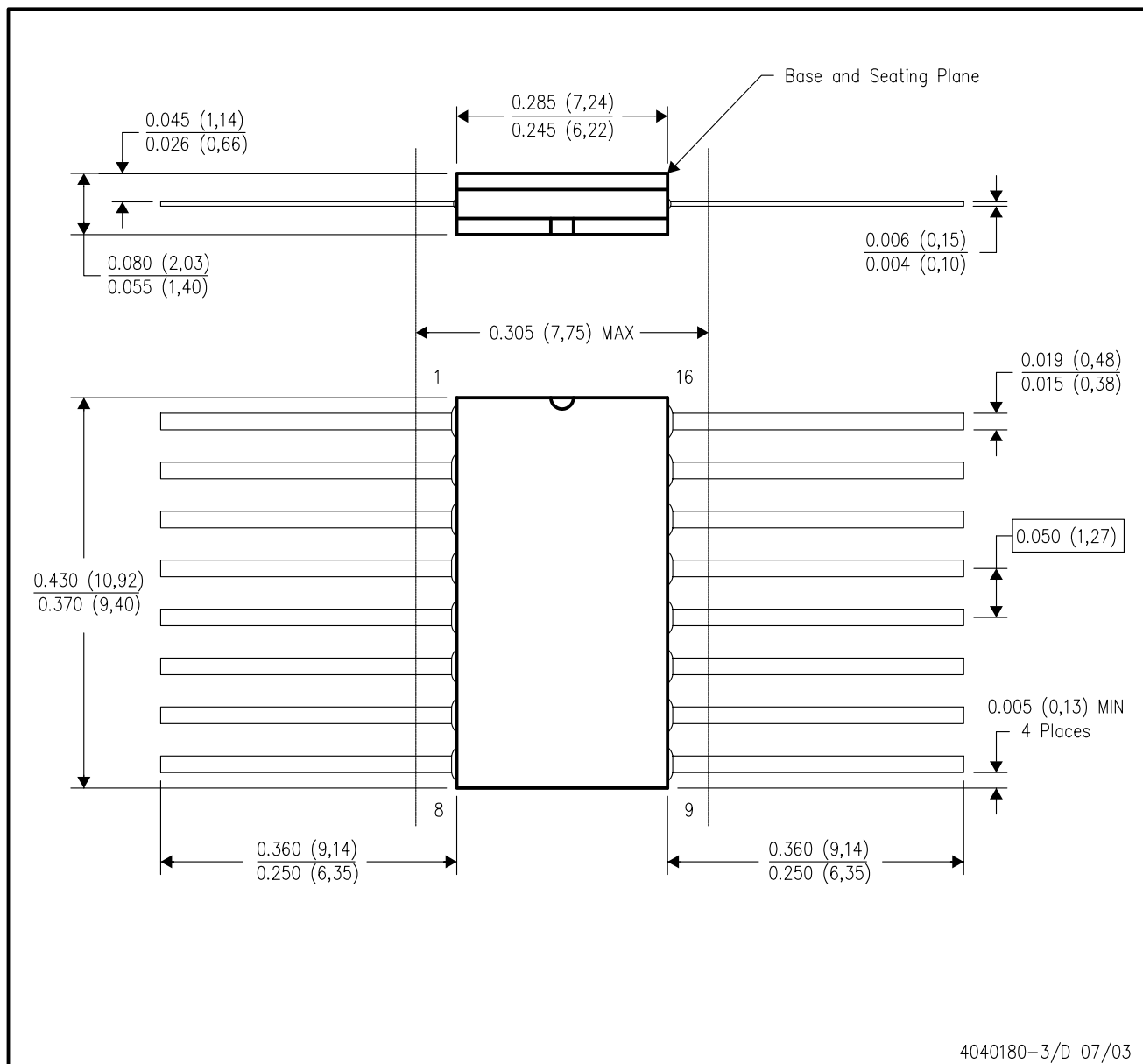
4040083/F 03/03

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.

W (R-GDFP-F16)

CERAMIC DUAL FLATPACK

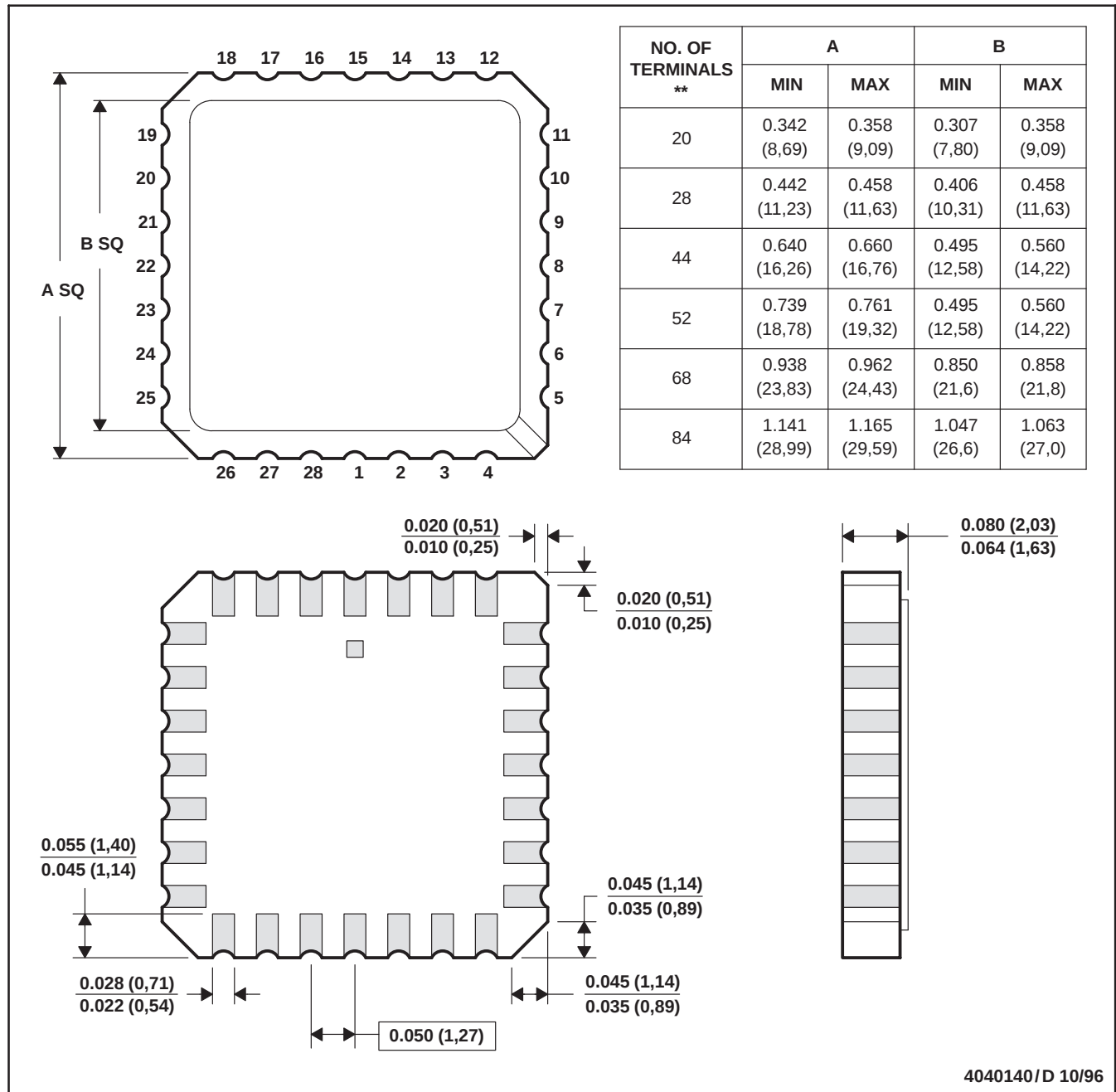


- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - C. This package can be hermetically sealed with a ceramic lid using glass frit.
  - D. Index point is provided on cap for terminal identification only.
  - E. Falls within MIL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

FK (S-CQCC-N\*\*)

LEADLESS CERAMIC CHIP CARRIER

28 TERMINAL SHOWN

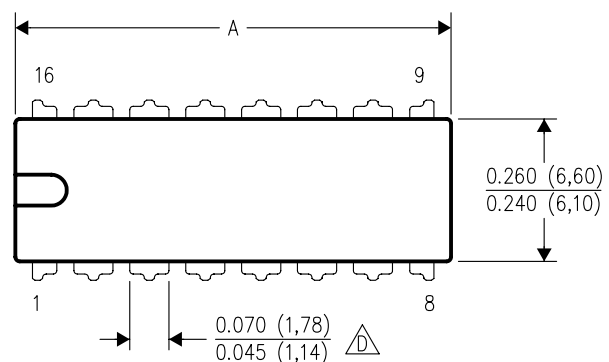


- NOTES:
- All linear dimensions are in inches (millimeters).
  - This drawing is subject to change without notice.
  - This package can be hermetically sealed with a metal lid.
  - The terminals are gold plated.
  - Falls within JEDEC MS-004

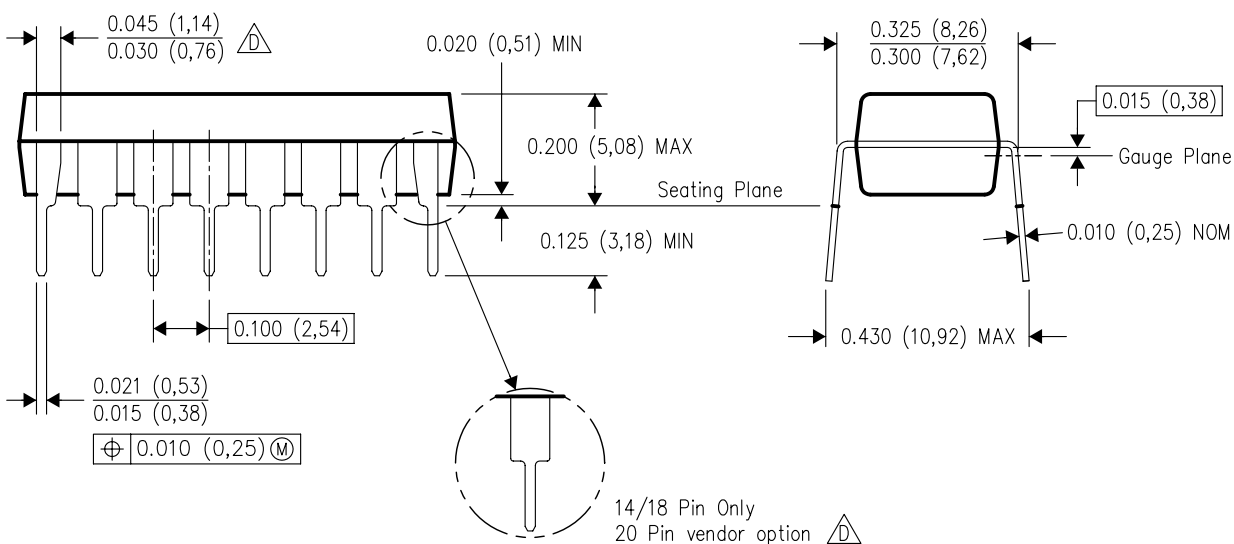
N (R-PDIP-T\*\*)

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

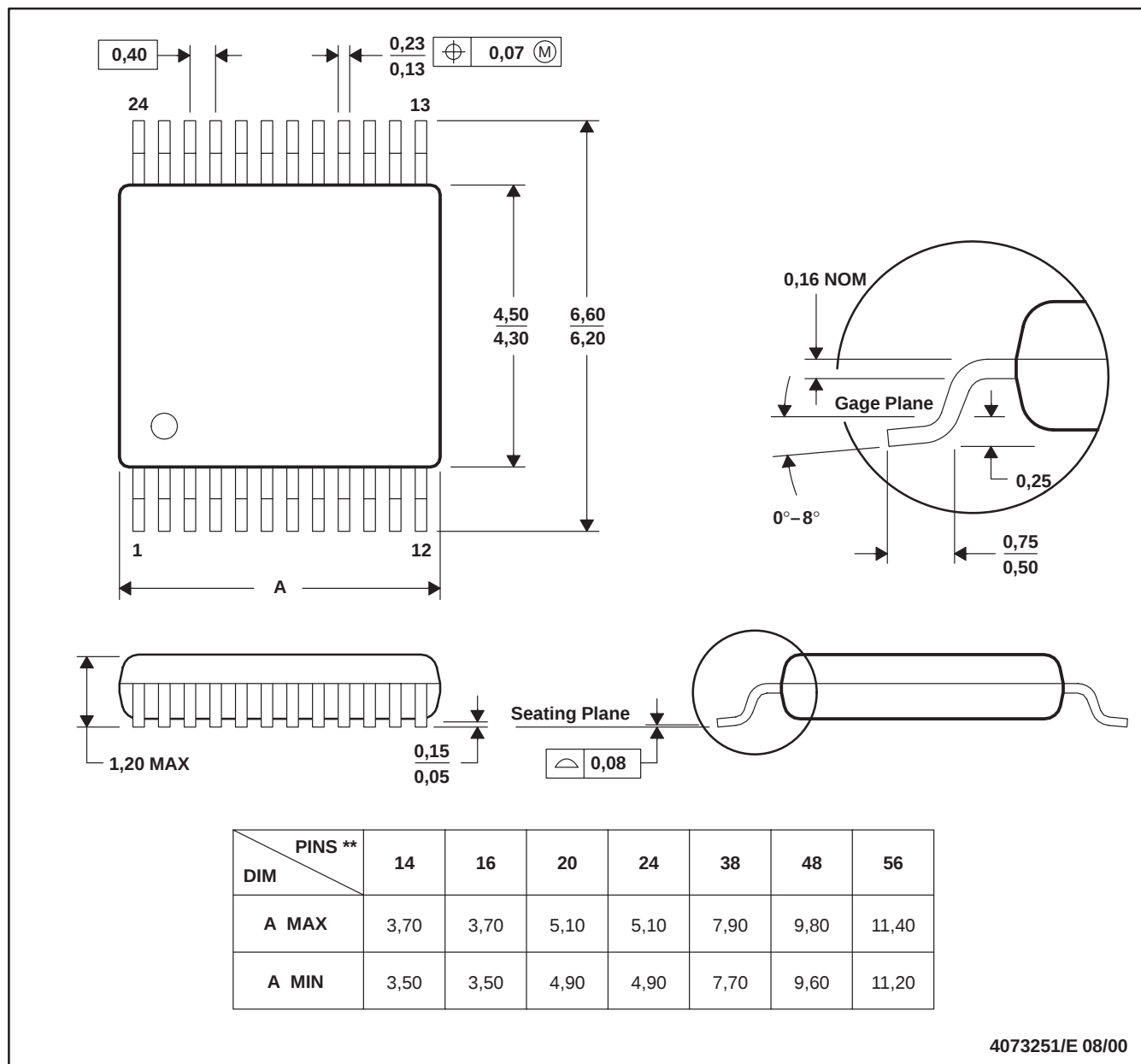
NOTES:

- 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.

## DGV (R-PDSO-G\*\*)

## PLASTIC SMALL-OUTLINE

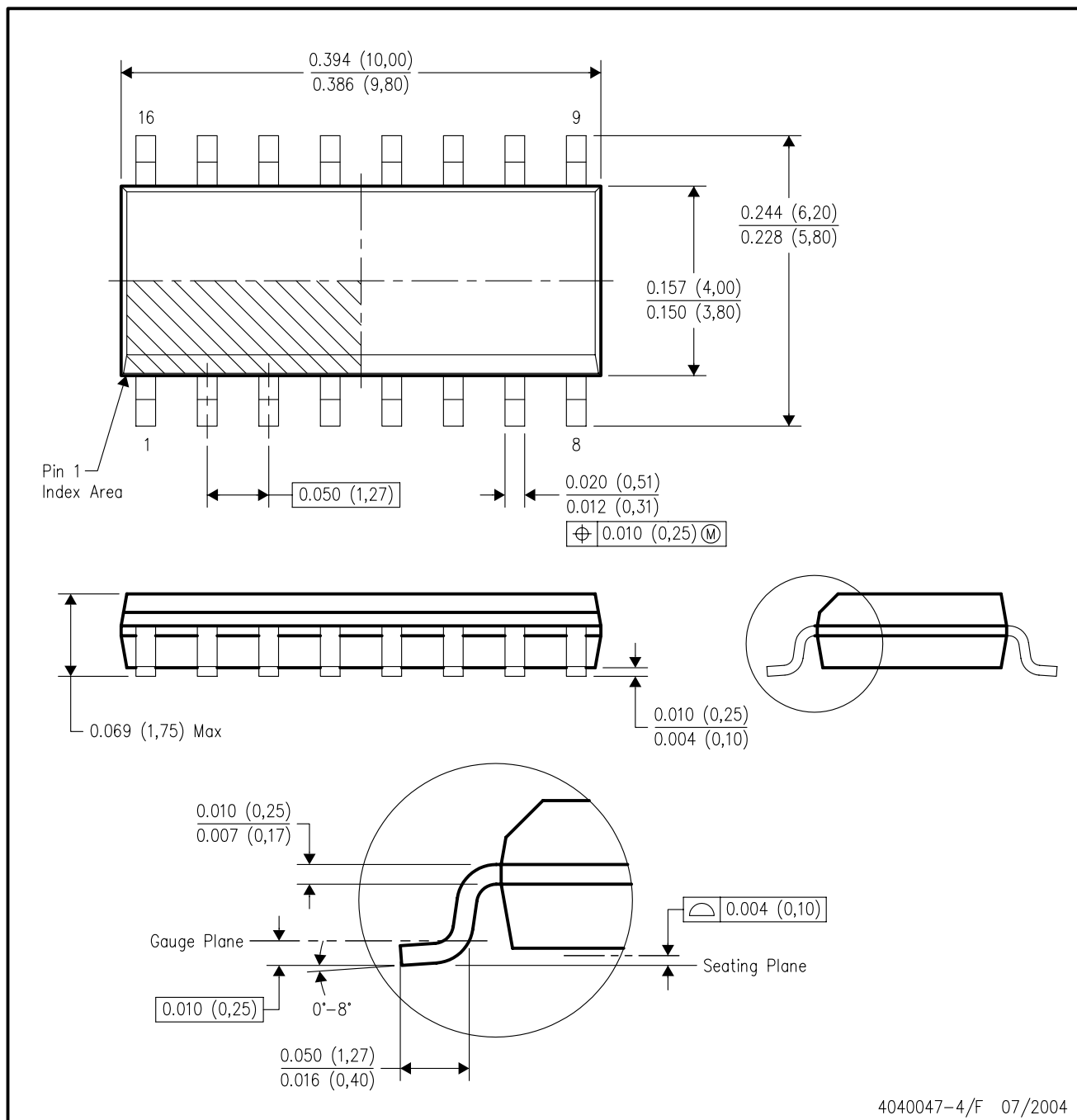
24 PINS SHOWN



- 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 per side.  
 D. Falls within JEDEC: 24/48 Pins – MO-153  
 14/16/20/56 Pins – MO-194

## D (R-PDSO-G16)

## PLASTIC SMALL-OUTLINE PACKAGE

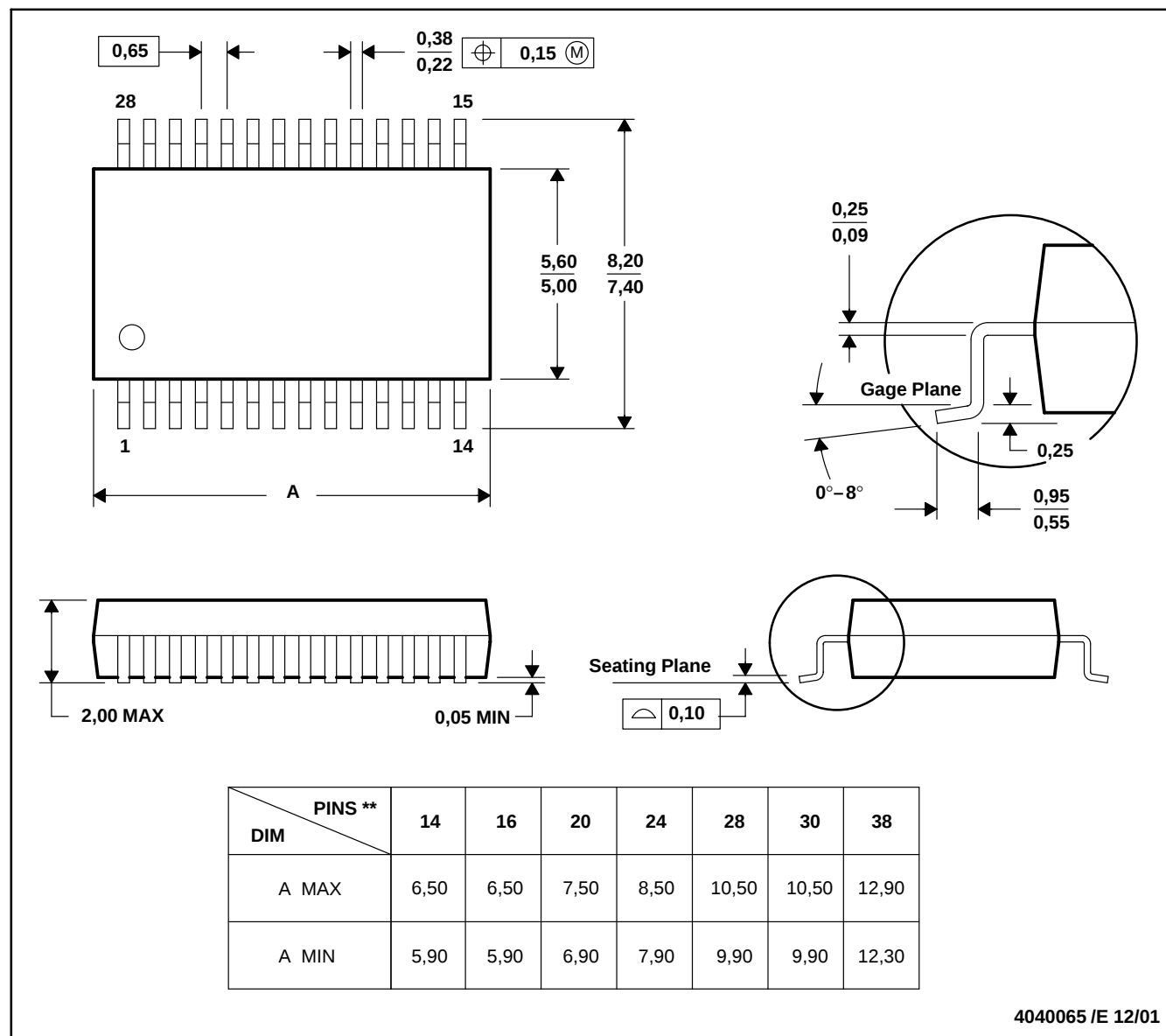


- NOTES:
- All linear dimensions are in inches (millimeters).
  - This drawing is subject to change without notice.
  - Body dimensions do not include mold flash or protrusion not to exceed 0.006 (0,15).
  - Falls within JEDEC MS-012 variation AC.

## DB (R-PDSO-G\*\*)

## PLASTIC SMALL-OUTLINE

28 PINS SHOWN

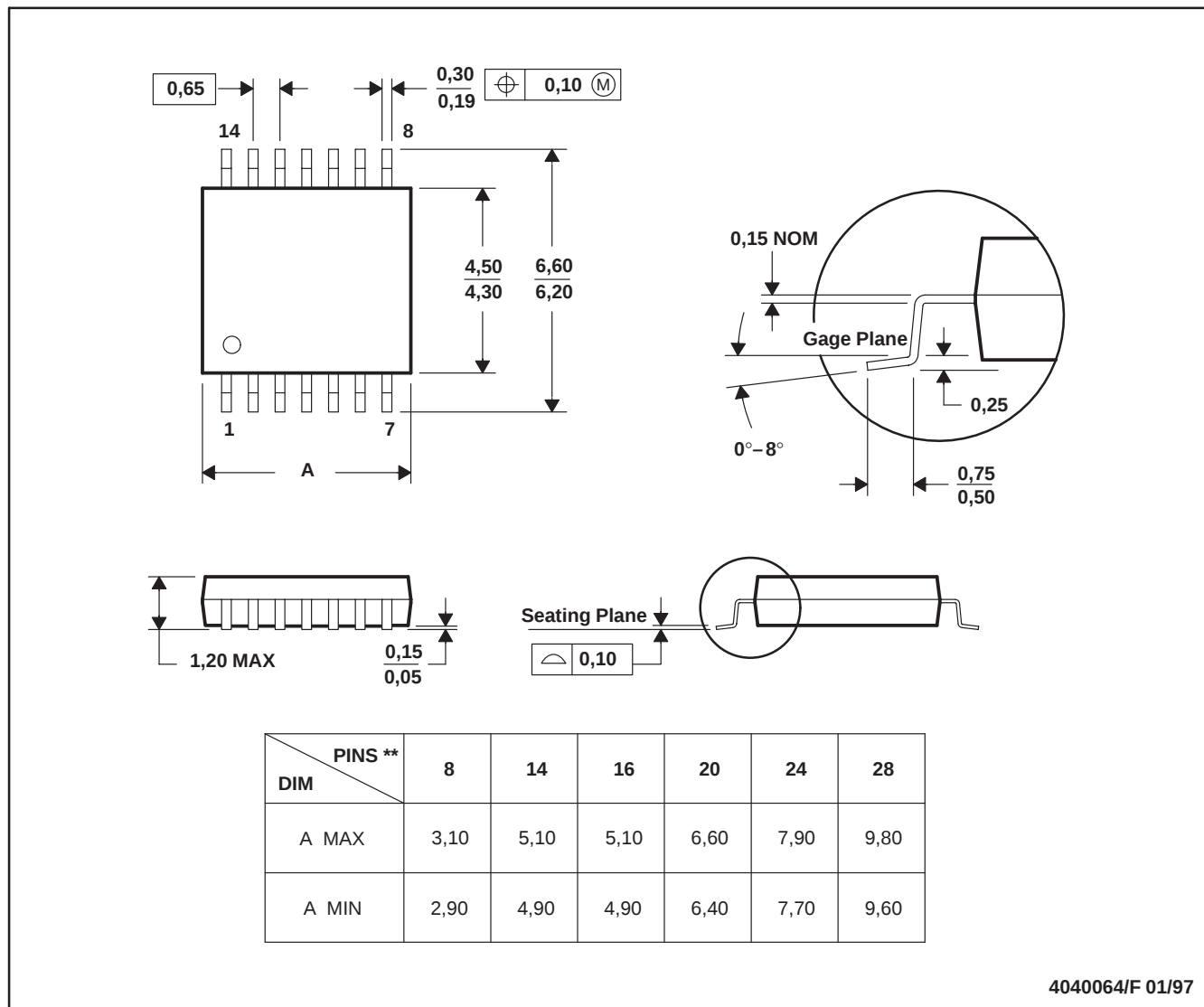


- NOTES: A. All linear dimensions are in millimeters.  
 B. This drawing is subject to change without notice.  
 C. Body dimensions do not include mold flash or protrusion not to exceed 0,15.  
 D. Falls within JEDEC MO-150

## PW (R-PDSO-G\*\*)

## PLASTIC SMALL-OUTLINE PACKAGE

14 PINS SHOWN



- 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.  
 D. Falls within JEDEC MO-153

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