

# DUAL RETRIGGERABLE MONOSTABLE MULTIVIBRATORS WITH SCHMITT-TRIGGER INPUTS

Check for Samples: [SN54LV123A](#), [SN74LV123A](#)

## FEATURES

- 2-V to 5.5-V  $V_{CC}$  Operation
- Max  $t_{pd}$  of 11 ns at 5 V
- Typical  $V_{OLP}$  (Output Ground Bounce)  
<0.8 V at  $V_{CC} = 3.3$  V,  $T_A = 25^\circ\text{C}$
- Typical  $V_{OHV}$  (Output  $V_{OH}$  Undershoot)  
>2.3 V at  $V_{CC} = 3.3$  V,  $T_A = 25^\circ\text{C}$
- Support Mixed-Mode Voltage Operation on All Ports
- 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
- $I_{off}$  Supports Partial-Power-Down Mode Operation
- Retriggerable for Very Long Output Pulses, up to 100% Duty Cycle
- Overriding Clear Terminates Output Pulse
- Glitch-Free Power-Up Reset on Outputs
- ESD Protection Exceeds JESD 22
  - 2000-V Human-Body Model (A114-A)
  - 200-V Machine Model (A115-A)
  - 1000-V Charged-Device Model (C101)
- Latch-Up Performance Exceeds 100 mA Per JESD 78, Class 11

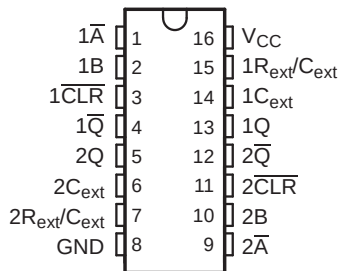
## DESCRIPTION

The 'LV123A devices are dual retriggerable monostable multivibrators designed for 2-V to 5.5-V  $V_{CC}$  operation.

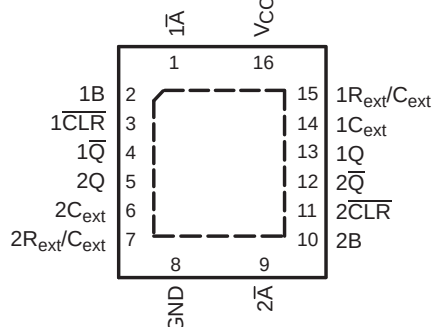
These edge-triggered multivibrators feature output pulse-duration control by three methods. In the first method, the  $\overline{A}$  input is low, and the B input goes high. In the second method, the B input is high, and the  $\overline{A}$  input goes low. In the third method, the  $\overline{A}$ 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

The output pulse duration is programmable 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.

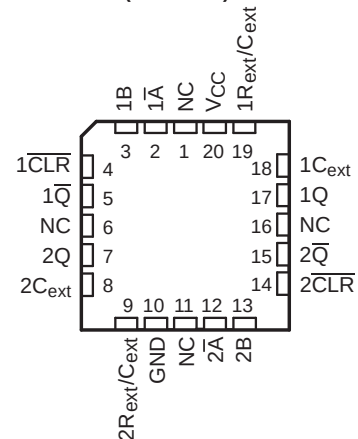
SN54LV123A ... J OR W PACKAGE  
SN74LV123A ... D, DB, DGV, NS,  
OR PW PACKAGE  
(TOP VIEW)



SN74LV123A ... RGY PACKAGE  
(TOP VIEW)



SN54LV123A ... FK PACKAGE  
(TOP VIEW)



NC – No internal connection



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.



This integrated circuit can be damaged by ESD. Texas Instruments recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage.

ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

## DESCRIPTION (CONTINUED)

Pulse triggering occurs at a particular voltage level and is not directly related to the transition time of the input pulse. The  $\bar{A}$ , B, and 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 ( $\bar{A}$ ) or high-level-active (B) input. Pulse duration can be reduced by taking CLR low. The input/output timing diagram illustrates pulse control by retriggering the inputs and early clearing.

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

These devices are fully specified for partial-power-down applications using  $I_{off}$ . The  $I_{off}$  circuitry disables the outputs, preventing damaging current backflow through the device when it is powered down.

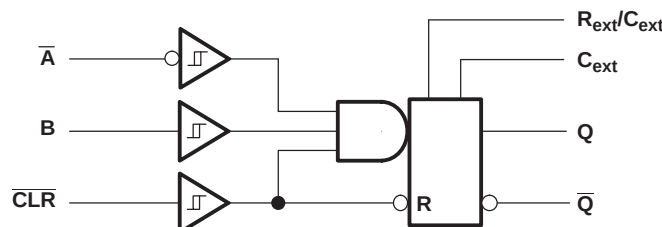
Pin assignments for these devices are identical to those of the 'AHC123A and 'AHCT123A devices for interchangeability, when allowed.

**Table 1. FUNCTION TABLE  
(EACH MULTIVIBRATOR)**

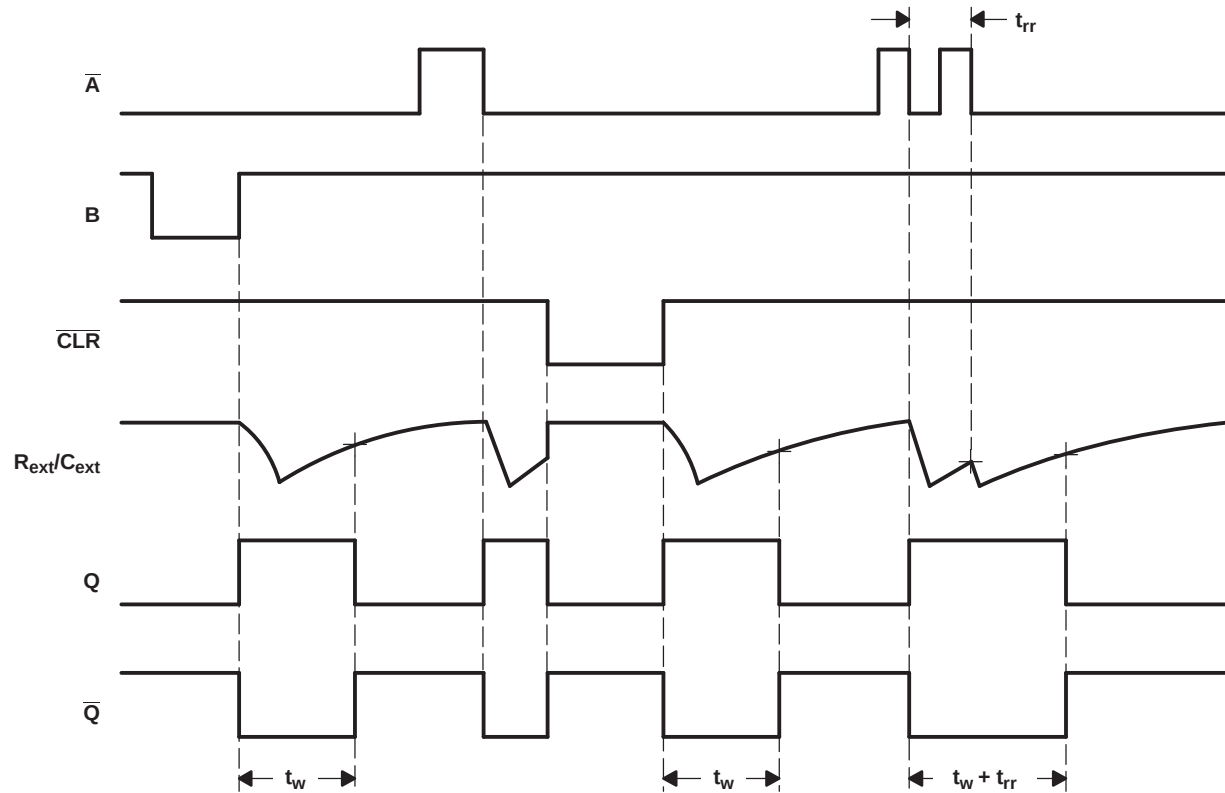
| INPUTS |           |   | OUTPUTS          |                  |
|--------|-----------|---|------------------|------------------|
| CLR    | $\bar{A}$ | B | Q                | $\bar{Q}$        |
| L      | X         | X | L                | H                |
| X      | H         | X | L <sup>(1)</sup> | H <sup>(1)</sup> |
| X      | X         | L | L <sup>(1)</sup> | H <sup>(1)</sup> |
| H      | L         | ↑ | ⌋                | ⌋                |
| H      | ↓         | H | ⌋                | ⌋                |
| ↑      | L         | H | ⌋                | ⌋                |

- (1) These outputs are based on the assumption that the indicated steady-state conditions at the A and B inputs have been set up long enough to complete any pulse started before the setup.

**Figure 1.  
LOGIC DIAGRAM, EACH MULTIVIBRATOR (POSITIVE LOGIC)**



**Figure 2. INPUT/OUTPUT TIMING DIAGRAM**



**ABSOLUTE MAXIMUM RATINGS<sup>(1)</sup>**

over operating free-air temperature (unless otherwise noted)

|               |                                                                                             | MIN                   | MAX            | UNIT |
|---------------|---------------------------------------------------------------------------------------------|-----------------------|----------------|------|
| $V_{CC}$      | Supply voltage range                                                                        | –0.5                  | 7              | V    |
| $V_I$         | Input voltage range <sup>(2)</sup>                                                          | –0.5                  | 7              | V    |
| $V_O$         | Voltage range applied to any output in the high-impedance or power-off state <sup>(2)</sup> | –0.5                  | 7              | V    |
| $V_O$         | Output voltage range in the high or low state <sup>(2)</sup> (3)                            | –0.5                  | $V_{CC} + 0.5$ | V    |
| $V_O$         | Output voltage range in power-off state <sup>(2)</sup>                                      | –0.5                  | 7              | V    |
| $I_{IK}$      | Input clamp current                                                                         | $V_I < 0$             | –20            | mA   |
| $I_{OK}$      | Output clamp current                                                                        | $V_O < 0$             | –50            | mA   |
| $I_O$         | Continuous output current                                                                   | $V_O = 0$ to $V_{CC}$ | ±25            | mA   |
|               | Continuous current through $V_{CC}$ or GND                                                  |                       | ±50            | mA   |
| $\theta_{JA}$ | Package thermal impedance                                                                   | D package             | 73             | °C/W |
|               |                                                                                             | DB package            | 82             |      |
|               |                                                                                             | DBV package           | 120            |      |
|               |                                                                                             | NS package            | 64             |      |
|               |                                                                                             | PW package            | 108            |      |
|               |                                                                                             | RGY package           | 39             |      |
| $T_{stg}$     | Storage temperature range                                                                   | –65                   | 150            | °C   |

- (1) 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.
- (2) The input and output negative-voltage ratings may be exceeded if the input and output current ratings are observed.
- (3) The value is limited to 5.5 V maximum.

**RECOMMENDED OPERATING CONDITIONS<sup>(1)</sup>**

|                     |                                |                                  | SN54LV123A <sup>(2)</sup> |                       | SN74LV123A            |                       | 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> = 2.3 V to 2.7 V | V <sub>CC</sub> × 0.7     |                       | V <sub>CC</sub> × 0.7 |                       |      |
|                     |                                | V <sub>CC</sub> = 3 V to 3.6 V   | V <sub>CC</sub> × 0.7     |                       | V <sub>CC</sub> × 0.7 |                       |      |
|                     |                                | V <sub>CC</sub> = 4.5 V to 5.5 V | V <sub>CC</sub> × 0.7     |                       | V <sub>CC</sub> × 0.7 |                       |      |
| V <sub>IL</sub>     | Low-level input voltage        | V <sub>CC</sub> = 2 V            |                           | 0.5                   |                       | 0.5                   | V    |
|                     |                                | V <sub>CC</sub> = 2.3 V to 2.7 V |                           | V <sub>CC</sub> × 0.3 |                       | V <sub>CC</sub> × 0.3 |      |
|                     |                                | V <sub>CC</sub> = 3 V to 3.6 V   |                           | V <sub>CC</sub> × 0.3 |                       | V <sub>CC</sub> × 0.3 |      |
|                     |                                | V <sub>CC</sub> = 4.5 V to 5.5 V |                           | V <sub>CC</sub> × 0.3 |                       | V <sub>CC</sub> × 0.3 |      |
| 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> = 2.3 V to 2.7 V |                           | –2                    |                       | –2                    | mA   |
|                     |                                | V <sub>CC</sub> = 3 V to 3.6 V   |                           | –6                    |                       | –6                    |      |
|                     |                                | V <sub>CC</sub> = 4.5 V to 5.5 V |                           | –12                   |                       | –12                   |      |
| I <sub>OL</sub>     | Low-level output current       | V <sub>CC</sub> = 2 V            |                           | 50                    |                       | 50                    | μA   |
|                     |                                | V <sub>CC</sub> = 2.3 V to 2.7 V |                           | 2                     |                       | 2                     | mA   |
|                     |                                | V <sub>CC</sub> = 3 V to 3.6 V   |                           | 6                     |                       | 6                     |      |
|                     |                                | V <sub>CC</sub> = 4.5 V to 5.5 V |                           | 12                    |                       | 12                    |      |
| R <sub>ext</sub>    | External timing resistance     | V <sub>CC</sub> = 2 V            | 5                         |                       | 5                     |                       | kΩ   |
|                     |                                | V <sub>CC</sub> ≥ 3 V            | 1                         |                       | 1                     |                       |      |
| C <sub>ext</sub>    | External timing capacitance    |                                  | No restriction            |                       | No restriction        |                       | pF   |
| Δt/ΔV <sub>CC</sub> | Power-up ramp rate             |                                  | 1                         |                       | 1                     |                       | ms/V |
| T <sub>A</sub>      | Operating free-air temperature |                                  | –40                       | 125                   | –40                   | 125                   | °C   |

(1) All unused inputs of the device must be held at V<sub>CC</sub> or GND to ensure proper device operation. Refer to the TI application report, *Implications of Slow or Floating CMOS Inputs*, literature number SCBA004.

(2) Product Preview

## ELECTRICAL CHARACTERISTICS

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

| PARAMETER        |                                                   | TEST CONDITIONS                                                                                      | V <sub>CC</sub> | –55°C to 125°C<br>SN54LV123A <sup>(1)</sup> |     |     | –40°C to 85°C<br>SN74LV123A |     |     | Recommended<br>–40°C to 125°C<br>SN74LV123A |     |     | UNIT |
|------------------|---------------------------------------------------|------------------------------------------------------------------------------------------------------|-----------------|---------------------------------------------|-----|-----|-----------------------------|-----|-----|---------------------------------------------|-----|-----|------|
|                  |                                                   |                                                                                                      |                 | MIN                                         | TYP | MAX | MIN                         | TYP | MAX | MIN                                         | TYP | MAX |      |
| V <sub>OH</sub>  |                                                   | I <sub>OH</sub> = –50 μA                                                                             | 2 V to 5.5 V    | V <sub>CC</sub> – 0.1                       |     |     | V <sub>CC</sub> – 0.1       |     |     | V <sub>CC</sub> – 0.1                       |     |     | V    |
|                  |                                                   | I <sub>OH</sub> = –2 mA                                                                              | 2.3 V           | 2                                           |     |     | 2                           |     |     | 2                                           |     |     |      |
|                  |                                                   | I <sub>OH</sub> = –6 mA                                                                              | 3 V             | 2.48                                        |     |     | 2.48                        |     |     | 2.48                                        |     |     |      |
|                  |                                                   | I <sub>OH</sub> = –12 mA                                                                             | 4.5 V           | 3.8                                         |     |     | 3.8                         |     |     | 3.8                                         |     |     |      |
| V <sub>OL</sub>  |                                                   | I <sub>OL</sub> = 50 μA                                                                              | 2 V to 5.5 V    | 0.1                                         |     |     | 0.1                         |     |     | 0.1                                         |     |     | V    |
|                  |                                                   | I <sub>OL</sub> = 2 mA                                                                               | 2.3 V           | 0.4                                         |     |     | 0.4                         |     |     | 0.4                                         |     |     |      |
|                  |                                                   | I <sub>OL</sub> = 6 mA                                                                               | 3 V             | 0.44                                        |     |     | 0.44                        |     |     | 0.44                                        |     |     |      |
|                  |                                                   | I <sub>OL</sub> = 12 mA                                                                              | 4.5 V           | 0.55                                        |     |     | 0.55                        |     |     | 0.55                                        |     |     |      |
| I <sub>I</sub>   | R <sub>ext</sub> /C <sub>ext</sub> <sup>(2)</sup> | V <sub>I</sub> = 5.5 V or GND                                                                        | 5.5 V           | ±2.5                                        |     |     | ±2.5                        |     |     | ±25                                         |     |     | μA   |
|                  | A̅, B, and<br>CLR                                 | V <sub>I</sub> = 5.5 V or GND                                                                        | 0 V             | ±1                                          |     |     | ±1                          |     |     | ±1                                          |     |     |      |
|                  |                                                   |                                                                                                      | 0 to 5.5 V      | ±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           | 20                                          |     |     | 20                          |     |     | 20                                          |     |     | μA   |
| I <sub>CC</sub>  | Active state<br>(per circuit)                     | V <sub>I</sub> = V <sub>CC</sub> or GND,<br>R <sub>ext</sub> /C <sub>ext</sub> = 0.5 V <sub>CC</sub> | 3 V             | 280                                         |     |     | 280                         |     |     | 280                                         |     |     | μA   |
|                  |                                                   |                                                                                                      | 4.5 V           | 650                                         |     |     | 650                         |     |     | 650                                         |     |     |      |
|                  |                                                   |                                                                                                      | 5.5 V           | 975                                         |     |     | 975                         |     |     | 975                                         |     |     |      |
| I <sub>off</sub> |                                                   | V <sub>I</sub> or V <sub>O</sub> = 0 to 5.5 V                                                        | 0 V             |                                             |     |     | 5                           |     |     | 5                                           |     |     | μA   |
| C <sub>i</sub>   |                                                   | V <sub>I</sub> = V <sub>CC</sub> or GND                                                              | 3.3 V           | 1.9                                         |     |     | 1.9                         |     |     | 1.9                                         |     |     | pF   |
|                  |                                                   |                                                                                                      | 5 V             | 1.9                                         |     |     | 1.9                         |     |     | 1.9                                         |     |     |      |

(1) Product Preview

(2) This test is performed with the terminal in the off-state condition.

## TIMING REQUIREMENTS

over recommended operating free-air temperature range,  $V_{CC} = 2.5\ V \pm 0.2\ V$  (unless otherwise noted) (see Figure 3)

| PARAMETER |                      | TEST CONDITIONS             |                         | $T_A = 25^\circ C$ |     | –55°C to 125°C<br>SN54LV123A <sup>(1)</sup> |     | –40°C to 85°C<br>SN74LV123A |     | –40°C to 125°C<br>SN74LV123A |     | UNIT    |
|-----------|----------------------|-----------------------------|-------------------------|--------------------|-----|---------------------------------------------|-----|-----------------------------|-----|------------------------------|-----|---------|
|           |                      |                             |                         | MIN                | TYP | MIN                                         | MAX | MIN                         | MAX | MIN                          | MAX |         |
| $t_w$     | Pulse duration       | $\overline{CLR}$            |                         | 6                  |     | 6.5                                         |     | 6.5                         |     | 6.5                          |     | ns      |
|           |                      | $\overline{A}$ or B trigger |                         | 6                  |     | 6.5                                         |     | 6.5                         |     | 6.5                          |     |         |
| $t_{rr}$  | Pulse retrigger time | $R_{ext} = 1\ k\Omega$      | $C_{ext} = 100\ pF$     | See <sup>(2)</sup> | 94  | See <sup>(2)</sup>                          |     | See <sup>(2)</sup>          |     | See <sup>(2)</sup>           |     | ns      |
|           |                      |                             | $C_{ext} = 0.01\ \mu F$ | See <sup>(2)</sup> | 2   | See <sup>(2)</sup>                          |     | See <sup>(2)</sup>          |     | See <sup>(2)</sup>           |     | $\mu s$ |

(1) Product Preview

(2) See etriggering data in the [Application Information](#) section

## TIMING REQUIREMENTS

over recommended operating free-air temperature range,  $V_{CC} = 3.3\ V \pm 0.3\ V$  (unless otherwise noted) (see Figure 3)

| PARAMETER |                      | TEST CONDITIONS             |                         | $T_A = 25^\circ C$ |     | –55°C to 125°C<br>SN54LV123A <sup>(1)</sup> |     | –40°C to 85°C<br>SN74LV123A |     | –40°C to 125°C<br>SN74LV123A |     | UNIT    |
|-----------|----------------------|-----------------------------|-------------------------|--------------------|-----|---------------------------------------------|-----|-----------------------------|-----|------------------------------|-----|---------|
|           |                      |                             |                         | MIN                | TYP | MIN                                         | MAX | MIN                         | MAX | MIN                          | MAX |         |
| $t_w$     | Pulse duration       | $\overline{CLR}$            |                         | 5                  |     | 5                                           |     | 5                           |     | 5                            |     | ns      |
|           |                      | $\overline{A}$ or B trigger |                         | 5                  |     | 5                                           |     | 5                           |     | 5                            |     |         |
| $t_{rr}$  | Pulse retrigger time | $R_{ext} = 1\ k\Omega$      | $C_{ext} = 100\ pF$     | See <sup>(2)</sup> | 76  | See <sup>(2)</sup>                          |     | See <sup>(2)</sup>          |     | See <sup>(2)</sup>           |     | ns      |
|           |                      |                             | $C_{ext} = 0.01\ \mu F$ | See <sup>(2)</sup> | 1.8 | See <sup>(2)</sup>                          |     | See <sup>(2)</sup>          |     | See <sup>(2)</sup>           |     | $\mu s$ |

(1) Product Preview

(2) See retriggering data in the [Application Information](#) section

## TIMING REQUIREMENTS

over recommended operating free-air temperature range,  $V_{CC} = 5\text{ V} \pm 0.5\text{ V}$  (unless otherwise noted) (see [Figure 3](#))

| PARAMETER |                      | TEST CONDITIONS                    |                                     | $T_A = 25^\circ\text{C}$ |     | $-55^\circ\text{C to } 125^\circ\text{C}$<br>SN54LV123A <sup>(1)</sup> |     | $-40^\circ\text{C to } 85^\circ\text{C}$<br>SN74LV123A |     | $-40^\circ\text{C to } 125^\circ\text{C}$<br>SN74LV123A |     | UNIT          |
|-----------|----------------------|------------------------------------|-------------------------------------|--------------------------|-----|------------------------------------------------------------------------|-----|--------------------------------------------------------|-----|---------------------------------------------------------|-----|---------------|
|           |                      |                                    |                                     | MIN                      | TYP | MIN                                                                    | MAX | MIN                                                    | MAX | MIN                                                     | MAX |               |
| $t_w$     | Pulse duration       | $\overline{\text{CLR}}$            |                                     | 5                        |     | 5                                                                      |     | 5                                                      |     | 5                                                       |     | ns            |
|           |                      | $\overline{\text{A}}$ or B trigger |                                     | 5                        |     | 5                                                                      |     | 5                                                      |     | 5                                                       |     |               |
| $t_{rr}$  | Pulse retrigger time | $R_{ext} = 1\text{ k}\Omega$       | $C_{ext} = 100\text{ pF}$           | See <sup>(2)</sup>       | 59  | See <sup>(2)</sup>                                                     |     | See <sup>(2)</sup>                                     |     | See <sup>(2)</sup>                                      |     | ns            |
|           |                      |                                    | $C_{ext} = 0.01\text{ }\mu\text{F}$ | See <sup>(2)</sup>       | 1.5 | See <sup>(2)</sup>                                                     |     | See <sup>(2)</sup>                                     |     | See <sup>(2)</sup>                                      |     | $\mu\text{s}$ |

(1) Product Preview

(2) See retriggering data in the [Application Information](#) section

## SWITCHING CHARACTERISTICS

over recommended operating free-air temperature range,  $V_{CC} = 2.5\text{ V} \pm 0.2\text{ V}$  (unless otherwise noted) (see [Figure 3](#))

| PARAMETER                   | FROM<br>(INPUT)                 | TO<br>(OUTPUT) | TEST<br>CONDITIONS                                                                           | $T_A = 25^\circ\text{C}$ |                     |     | $-55^\circ\text{C}$ to $125^\circ\text{C}$<br>SN54LV123A <sup>(1)</sup> |                     | $-40^\circ\text{C}$ to<br>$85^\circ\text{C}$<br>SN74LV123A |      | $-40^\circ\text{C}$ to $125^\circ\text{C}$<br>SN74LV123A |      | UNIT          |
|-----------------------------|---------------------------------|----------------|----------------------------------------------------------------------------------------------|--------------------------|---------------------|-----|-------------------------------------------------------------------------|---------------------|------------------------------------------------------------|------|----------------------------------------------------------|------|---------------|
|                             |                                 |                |                                                                                              | MIN                      | TYP                 | MAX | MIN                                                                     | MAX                 | MIN                                                        | MAX  | MIN                                                      | MAX  |               |
| $t_{pd}$                    | $\bar{A}$ or B                  | Q or $\bar{Q}$ | $C_L = 15\text{ pF}$                                                                         | 14.5                     | 31.4 <sup>(2)</sup> |     | 1 <sup>(2)</sup>                                                        | 37 <sup>(2)</sup>   | 1                                                          | 37   | 1                                                        | 37   | ns            |
|                             | $\overline{\text{CLR}}$         | Q or $\bar{Q}$ |                                                                                              | 13                       | 25 <sup>(2)</sup>   |     | 1 <sup>(2)</sup>                                                        | 29.5 <sup>(2)</sup> | 1                                                          | 29.5 | 1                                                        | 29.5 |               |
|                             | $\overline{\text{CLR}}$ trigger | Q or $\bar{Q}$ |                                                                                              | 15.1                     | 33.4 <sup>(2)</sup> |     | 1 <sup>(2)</sup>                                                        | 39 <sup>(2)</sup>   | 1                                                          | 39   | 1                                                        | 39   |               |
| $t_{pd}$                    | $\bar{A}$ or B                  | Q or $\bar{Q}$ | $C_L = 50\text{ pF}$                                                                         | 16.6                     | 36                  |     | 1                                                                       | 42                  | 1                                                          | 42   | 1                                                        | 42   | ns            |
|                             | $\overline{\text{CLR}}$         | Q or $\bar{Q}$ |                                                                                              | 14.7                     | 32.8                |     | 1                                                                       | 34.5                | 1                                                          | 34.5 | 1                                                        | 34.5 |               |
|                             | $\overline{\text{CLR}}$ trigger | Q or $\bar{Q}$ |                                                                                              | 17.4                     | 38                  |     | 1                                                                       | 44                  | 1                                                          | 44   | 1                                                        | 44   |               |
| $t_w$ <sup>(3)</sup>        |                                 |                | $C_L = 50\text{ pF}$<br>$C_{ext} = 28\text{ pF}$<br>$R_{ext} = 2\text{ k}\Omega$             | 197                      | 260                 |     |                                                                         | 320                 |                                                            | 320  |                                                          | 320  | 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  | 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  | 0.9                                                      | 1.1  | ms            |
| $\Delta t_w$ <sup>(4)</sup> |                                 |                | $C_L = 50\text{ pF}$                                                                         |                          | $\pm 1$             |     |                                                                         |                     |                                                            |      |                                                          |      | %             |

(1) Product Preview

(2) On products compliant to MIL-PRF-38535, this parameter is not production tested.

(3)  $t_w$  = Duration of pulse at Q and  $\bar{Q}$  outputs

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

## 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 3](#))

| PARAMETER                   | FROM<br>(INPUT)                 | TO<br>(OUTPUT) | TEST<br>CONDITIONS                                                                           | $T_A = 25^\circ\text{C}$ |                     |     | $-55^\circ\text{C}$ to $125^\circ\text{C}$<br>SN54LV123A <sup>(1)</sup> |                     | $-40^\circ\text{C}$ to<br>$85^\circ\text{C}$<br>SN74LV123A |      | $-40^\circ\text{C}$ to<br>$125^\circ\text{C}$<br>SN74LV123A |      | UNIT          |
|-----------------------------|---------------------------------|----------------|----------------------------------------------------------------------------------------------|--------------------------|---------------------|-----|-------------------------------------------------------------------------|---------------------|------------------------------------------------------------|------|-------------------------------------------------------------|------|---------------|
|                             |                                 |                |                                                                                              | MIN                      | TYP                 | MAX | MIN                                                                     | MAX                 | MIN                                                        | MAX  | MIN                                                         | MAX  |               |
| $t_{pd}$                    | $\bar{A}$ or B                  | Q or $\bar{Q}$ | $C_L = 15\text{ pF}$                                                                         | 10.2                     | 20.6 <sup>(2)</sup> |     | 1 <sup>(2)</sup>                                                        | 24 <sup>(2)</sup>   | 1                                                          | 24   | 1                                                           | 24   | ns            |
|                             | $\overline{\text{CLR}}$         | Q or $\bar{Q}$ |                                                                                              | 9.3                      | 15.8 <sup>(2)</sup> |     | 1 <sup>(2)</sup>                                                        | 18.5 <sup>(2)</sup> | 1                                                          | 18.5 | 1                                                           | 18.5 |               |
|                             | $\overline{\text{CLR}}$ trigger | Q or $\bar{Q}$ |                                                                                              | 10.6                     | 22.4 <sup>(2)</sup> |     | 1 <sup>(2)</sup>                                                        | 26 <sup>(2)</sup>   | 1                                                          | 26   | 1                                                           | 26   |               |
| $t_{pd}$                    | $\bar{A}$ or B                  | Q or $\bar{Q}$ | $C_L = 50\text{ pF}$                                                                         | 11.8                     | 24.1                |     | 1                                                                       | 27.5                | 1                                                          | 27.5 | 1                                                           | 27.5 | ns            |
|                             | $\overline{\text{CLR}}$         | Q or $\bar{Q}$ |                                                                                              | 10.5                     | 19.3                |     | 1                                                                       | 22                  | 1                                                          | 22   | 1                                                           | 22   |               |
|                             | $\overline{\text{CLR}}$ trigger | Q or $\bar{Q}$ |                                                                                              | 12.3                     | 25.9                |     | 1                                                                       | 29.5                | 1                                                          | 29.5 | 1                                                           | 29.5 |               |
| $t_w$ <sup>(3)</sup>        |                                 |                | $C_L = 50\text{ pF}$<br>$C_{ext} = 28\text{ pF}$<br>$R_{ext} = 2\text{ k}\Omega$             | 182                      | 240                 |     |                                                                         | 300                 |                                                            | 300  |                                                             | 300  | 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  | 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  | 0.9                                                         | 1.1  | ms            |
| $\Delta t_w$ <sup>(4)</sup> |                                 |                | $C_L = 50\text{ pF}$                                                                         |                          | $\pm 1$             |     |                                                                         |                     |                                                            |      |                                                             |      | %             |

(1) Product Preview

(2) On products compliant to MIL-PRF-38535, this parameter is not production tested.

(3)  $t_w$  = Duration of pulse at Q and  $\bar{Q}$  outputs

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



## SWITCHING CHARACTERISTICS

over recommended operating free-air temperature range,  $V_{CC} = 5\text{ V} \pm 0.5\text{ V}$  (unless otherwise noted) (see [Figure 3](#))

| PARAMETER          | FROM<br>(INPUT)          | TO<br>(OUTPUT)      | TEST<br>CONDITIONS                                                                           | $T_A = 25^\circ\text{C}$ |                     |     | $-55^\circ\text{C to } 125^\circ\text{C}$<br>SN54LV123A <sup>(1)</sup> |                   | $-40^\circ\text{C to } 85^\circ\text{C}$<br>SN74LV123<br>A |     | $-40^\circ\text{C to } 125^\circ\text{C}$<br>SN74LV123A |     | UNIT          |
|--------------------|--------------------------|---------------------|----------------------------------------------------------------------------------------------|--------------------------|---------------------|-----|------------------------------------------------------------------------|-------------------|------------------------------------------------------------|-----|---------------------------------------------------------|-----|---------------|
|                    |                          |                     |                                                                                              | MIN                      | TYP                 | MAX | MIN                                                                    | MAX               | MIN                                                        | MAX | MIN                                                     | MAX |               |
| $t_{pd}$           | $\overline{A}$ or B      | Q or $\overline{Q}$ | $C_L = 15\text{ pF}$                                                                         | 7.1                      | 12 <sup>(2)</sup>   |     | 1 <sup>(2)</sup>                                                       | 14 <sup>(2)</sup> | 1                                                          | 14  | 1                                                       | 14  | ns            |
|                    | $\overline{CLR}$         | Q or $\overline{Q}$ |                                                                                              | 6.5                      | 9.4 <sup>(2)</sup>  |     | 1 <sup>(2)</sup>                                                       | 11 <sup>(2)</sup> | 1                                                          | 11  | 1                                                       | 11  |               |
|                    | $\overline{CLR}$ trigger | Q or $\overline{Q}$ |                                                                                              | 7.4                      | 12.9 <sup>(2)</sup> |     | 1 <sup>(2)</sup>                                                       | 15 <sup>(2)</sup> | 1                                                          | 15  | 1                                                       | 15  |               |
| $t_{pd}$           | $\overline{A}$ or B      | Q or $\overline{Q}$ | $C_L = 50\text{ pF}$                                                                         | 8.3                      | 14                  |     | 1                                                                      | 16                | 1                                                          | 16  | 1                                                       | 16  | ns            |
|                    | $\overline{CLR}$         | Q or $\overline{Q}$ |                                                                                              | 7.4                      | 11.4                |     | 1                                                                      | 13                | 1                                                          | 13  | 1                                                       | 13  |               |
|                    | $\overline{CLR}$ trigger | Q or $\overline{Q}$ |                                                                                              | 8.7                      | 14.9                |     | 1                                                                      | 17                | 1                                                          | 17  | 1                                                       | 17  |               |
| $t_w^{(3)}$        |                          |                     | $C_L = 50\text{ pF}$<br>$C_{ext} = 28\text{ pF}$<br>$R_{ext} = 2\text{ k}\Omega$             | 167                      | 200                 |     |                                                                        | 240               |                                                            | 240 |                                                         | 240 | ns            |
|                    |                          | Q or $\overline{Q}$ | $C_L = 50\text{ pF}$<br>$C_{ext} = 0.01\text{ }\mu\text{F}$<br>$R_{ext} = 10\text{ k}\Omega$ | 90                       | 100                 | 110 | 90                                                                     | 110               | 90                                                         | 110 | 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 | 0.9                                                     | 1.1 | ms            |
| $\Delta t_w^{(4)}$ |                          |                     | $C_L = 50\text{ pF}$                                                                         | $\pm 1$                  |                     |     |                                                                        |                   |                                                            |     |                                                         |     | %             |

(1) Product Preview

(2) On products compliant to MIL-PRF-38535, this parameter is not production tested.

(3)  $t_w$  = Duration of pulse at Q and  $\overline{Q}$  outputs

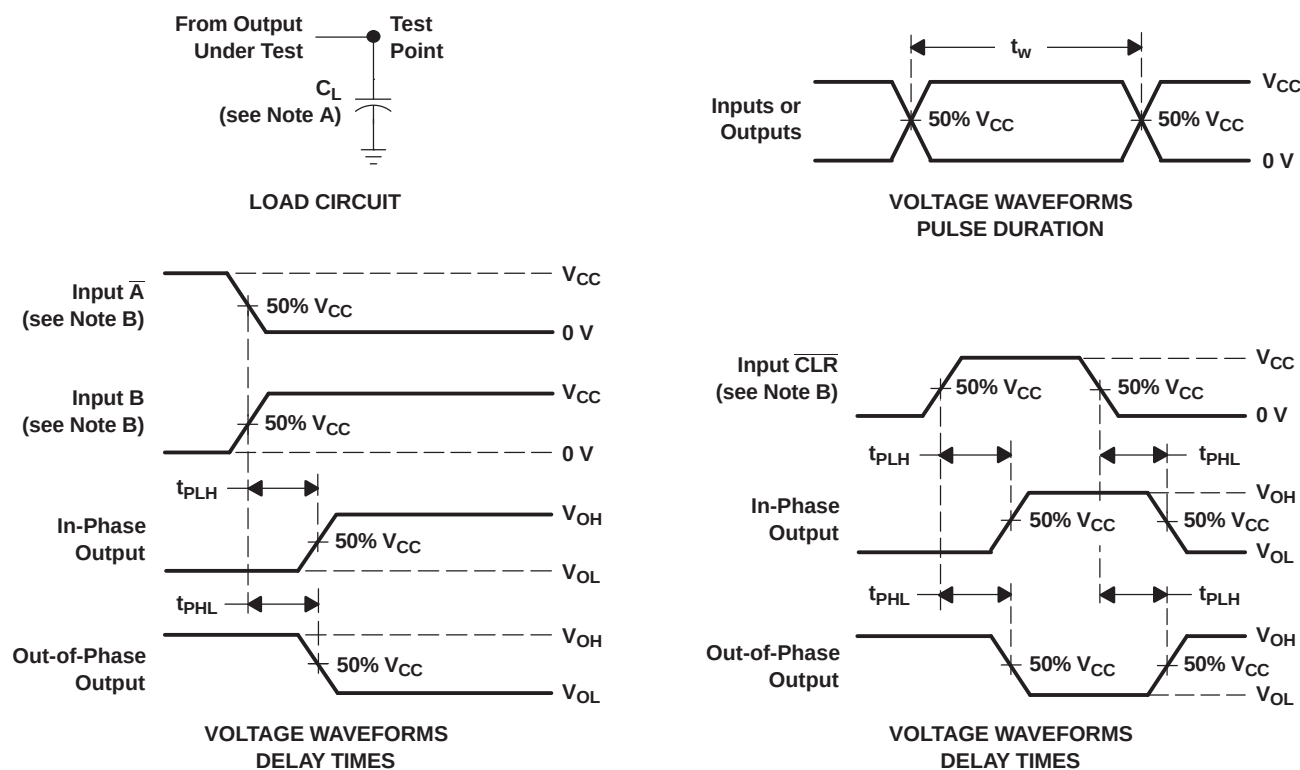
(4)  $\Delta t_w$  = Output pulse-duration variation (Q and  $\overline{Q}$ ) between circuits in same package

## OPERATING CHARACTERISTICS

$T_A = 25^\circ\text{C}$

| PARAMETER |                               | TEST CONDITIONS        |                     | $V_{CC}$ | TYP | UNIT |
|-----------|-------------------------------|------------------------|---------------------|----------|-----|------|
| $C_{pd}$  | Power dissipation capacitance | $C_L = 50\text{ pF}$ , | $f = 10\text{ MHz}$ | 3.3 V    | 44  | pF   |
|           |                               |                        |                     | 5 V      | 49  |      |

## PARAMETER MEASUREMENT INFORMATION



- NOTES: A.  $C_L$  includes probe and jig capacitance.
- B. All input pulses are supplied by generators having the following characteristics:  $PRR \leq 1 \text{ MHz}$ ,  $Z_O = 50 \Omega$ ,  $t_r = 3 \text{ ns}$ ,  $t_f = 3 \text{ ns}$ .
- C. The outputs are measured one at a time, with one input transition per measurement.

Figure 3. Load Circuit and Voltage Waveforms

## APPLICATION INFORMATION

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

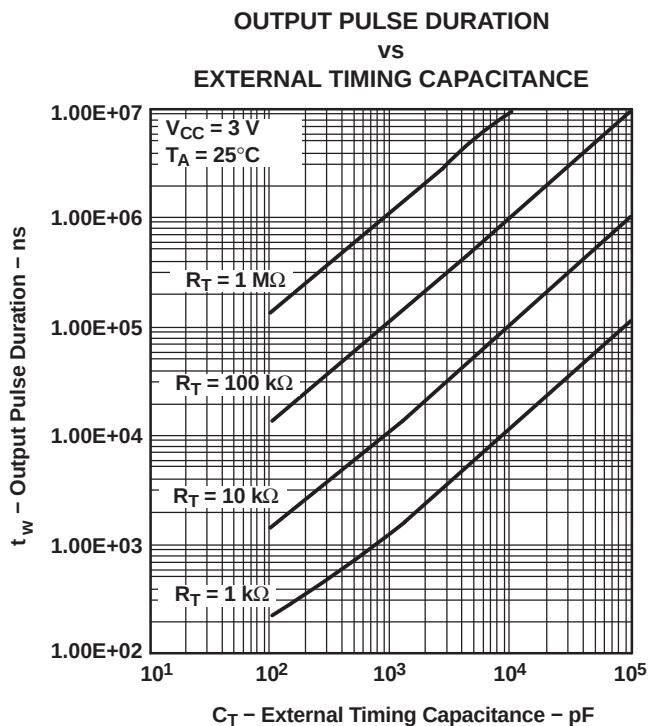


Figure 4.

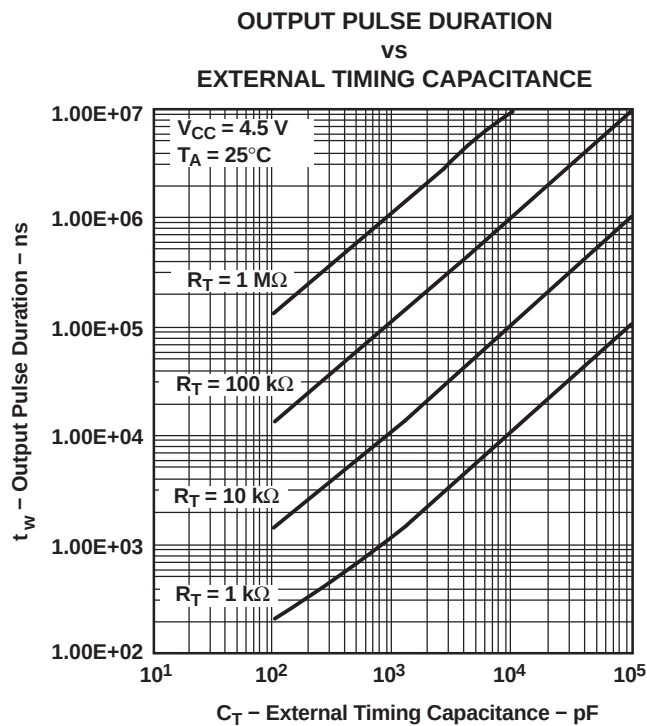


Figure 5.

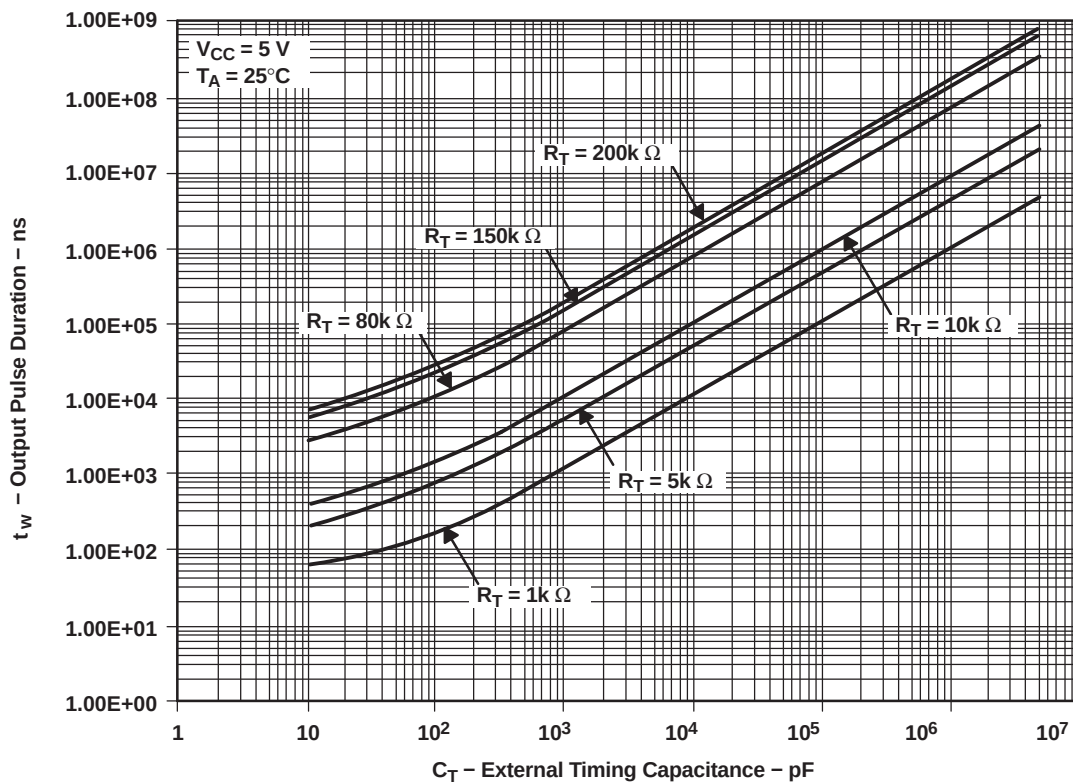


Figure 6. Output Pulse Duration vs External Timing Capacitance

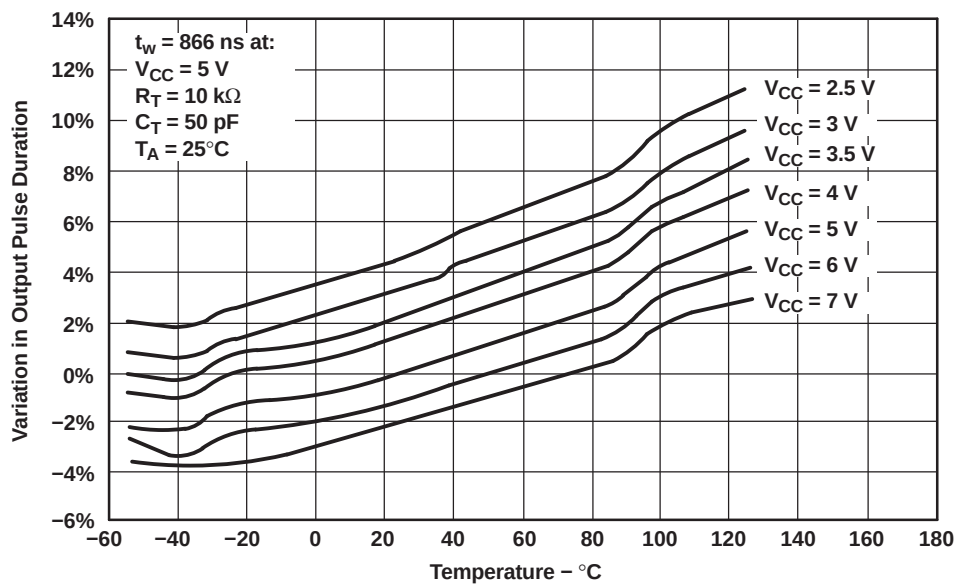


Figure 7. Variations in Output Pulse Duration vs Temperature

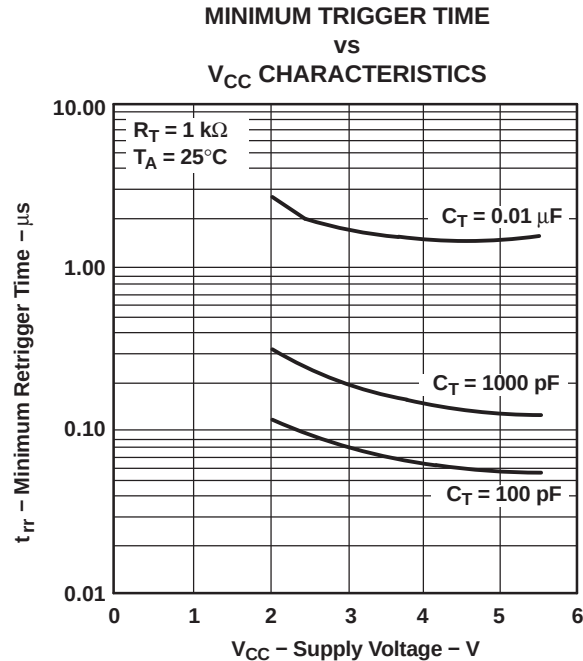


Figure 8.

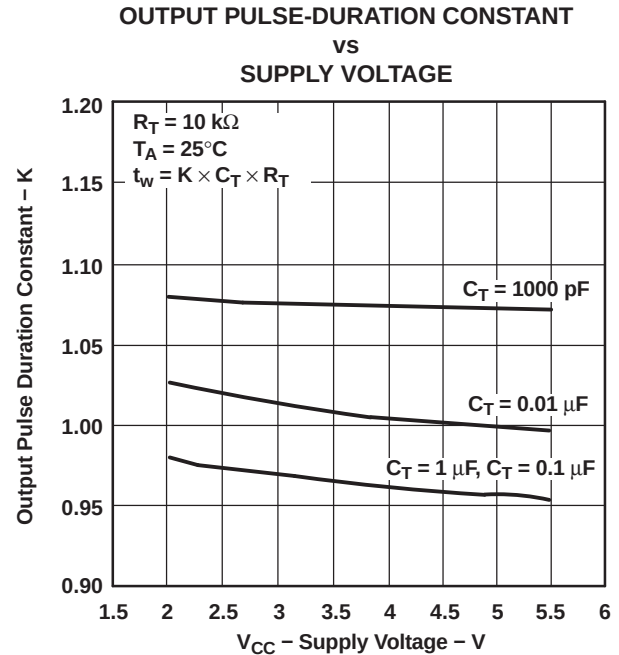


Figure 9.

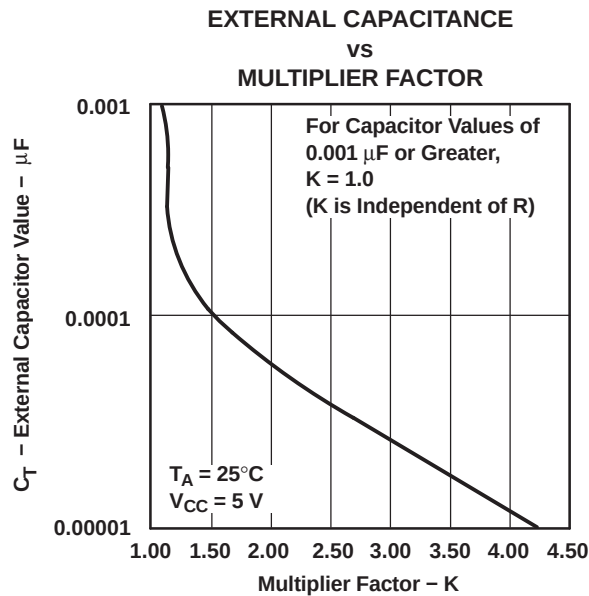


Figure 10.

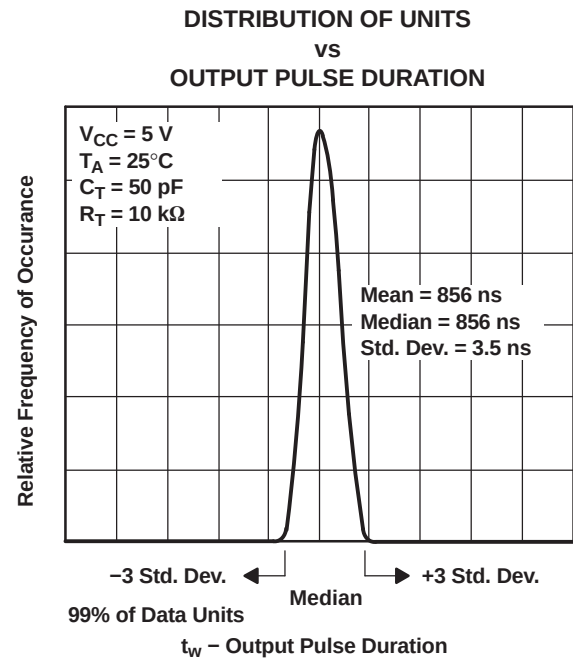


Figure 11.

## Caution In Use

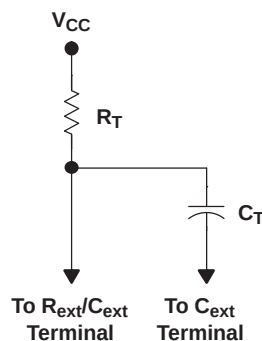
To prevent malfunctions due to noise, connect a high-frequency capacitor between  $V_{CC}$  and GND, and keep the wiring between the external components and Cext and Rext/Cext terminals as short as possible.

## Power-Down Considerations

Large values of Cext can cause problems when powering down the 'LV123A 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 'LV123A 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 12](#).



**Figure 12. 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 10](#)

where:

$t_w$  = pulse duration in ns

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

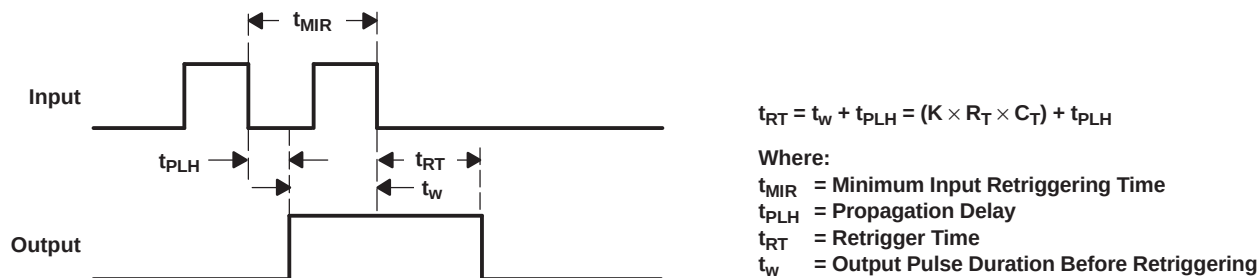
$C_T$  = external capacitance in pF

$K$  = multiplier factor

Equation 1 and [Figure 5](#) can be used to determine values for pulse duration, external resistance, and external capacitance.

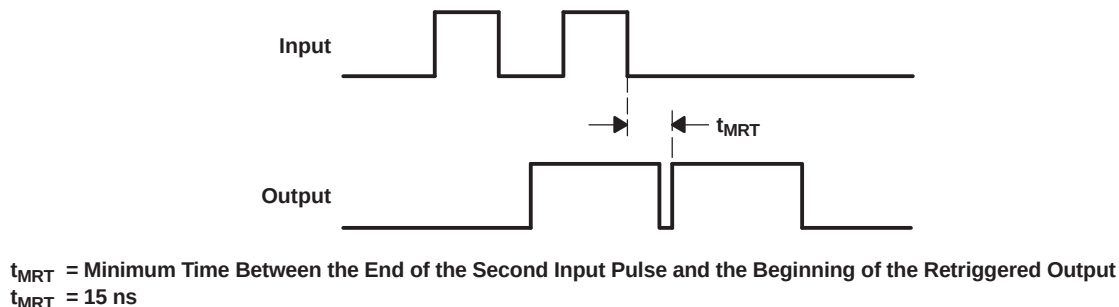
## Retriggering Data

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 13.



**Figure 13. 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 14).



**Figure 14. Input/Output Requirements**

## REVISION HISTORY

| Changes from Revision O (April 1998) to Revision P                             | Page              |
|--------------------------------------------------------------------------------|-------------------|
| • Updated document to new TI datasheet format - no specification changes. .... | <a href="#">1</a> |
| • Removed Ordering Information table. ....                                     | <a href="#">2</a> |
| • Updated operating temperature range. ....                                    | <a href="#">5</a> |



## PACKAGING INFORMATION

| Orderable Device | Status<br>(1) | Package Type | Package<br>Drawing | Pins | Package<br>Qty | Eco Plan<br>(2)            | Lead/Ball Finish<br>(6) | MSL Peak Temp<br>(3) | Op Temp (°C) | Device Marking<br>(4/5) | Samples                 |
|------------------|---------------|--------------|--------------------|------|----------------|----------------------------|-------------------------|----------------------|--------------|-------------------------|-------------------------|
| SN74LV123AD      | ACTIVE        | SOIC         | D                  | 16   | 40             | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -40 to 125   | LV123A                  | <a href="#">Samples</a> |
| SN74LV123ADBR    | ACTIVE        | SSOP         | DB                 | 16   | 2000           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -40 to 125   | LV123A                  | <a href="#">Samples</a> |
| SN74LV123ADG4    | ACTIVE        | SOIC         | D                  | 16   | 40             | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -40 to 125   | LV123A                  | <a href="#">Samples</a> |
| SN74LV123ADGVR   | ACTIVE        | TVSOP        | DGV                | 16   | 2000           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -40 to 125   | LV123A                  | <a href="#">Samples</a> |
| SN74LV123ADR     | ACTIVE        | SOIC         | D                  | 16   | 2500           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU   CU SN       | Level-1-260C-UNLIM   | -40 to 125   | LV123A                  | <a href="#">Samples</a> |
| SN74LV123ADRE4   | ACTIVE        | SOIC         | D                  | 16   | 2500           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -40 to 125   | LV123A                  | <a href="#">Samples</a> |
| SN74LV123ADRG4   | ACTIVE        | SOIC         | D                  | 16   | 2500           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -40 to 125   | LV123A                  | <a href="#">Samples</a> |
| SN74LV123ANSR    | ACTIVE        | SO           | NS                 | 16   | 2000           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -40 to 125   | 74LV123A                | <a href="#">Samples</a> |
| SN74LV123APW     | ACTIVE        | TSSOP        | PW                 | 16   | 90             | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -40 to 125   | LV123A                  | <a href="#">Samples</a> |
| SN74LV123APWG4   | ACTIVE        | TSSOP        | PW                 | 16   | 90             | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -40 to 125   | LV123A                  | <a href="#">Samples</a> |
| SN74LV123APWR    | ACTIVE        | TSSOP        | PW                 | 16   | 2000           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU   CU SN       | Level-1-260C-UNLIM   | -40 to 125   | LV123A                  | <a href="#">Samples</a> |
| SN74LV123APWRG4  | ACTIVE        | TSSOP        | PW                 | 16   | 2000           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -40 to 125   | LV123A                  | <a href="#">Samples</a> |
| SN74LV123APWT    | ACTIVE        | TSSOP        | PW                 | 16   | 250            | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -40 to 125   | LV123A                  | <a href="#">Samples</a> |
| SN74LV123ARGYR   | ACTIVE        | VQFN         | RGY                | 16   | 3000           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-2-260C-1 YEAR  | -40 to 125   | LV123A                  | <a href="#">Samples</a> |
| SN74LV123ARGYRG4 | ACTIVE        | VQFN         | RGY                | 16   | 3000           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-2-260C-1 YEAR  | -40 to 125   | LV123A                  | <a href="#">Samples</a> |

<sup>(1)</sup> The marketing status values are defined as follows:

**ACTIVE:** Product device recommended for new designs.

**LIFEBUY:** TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

**NRND:** Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

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**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), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

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

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

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

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

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

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

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

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

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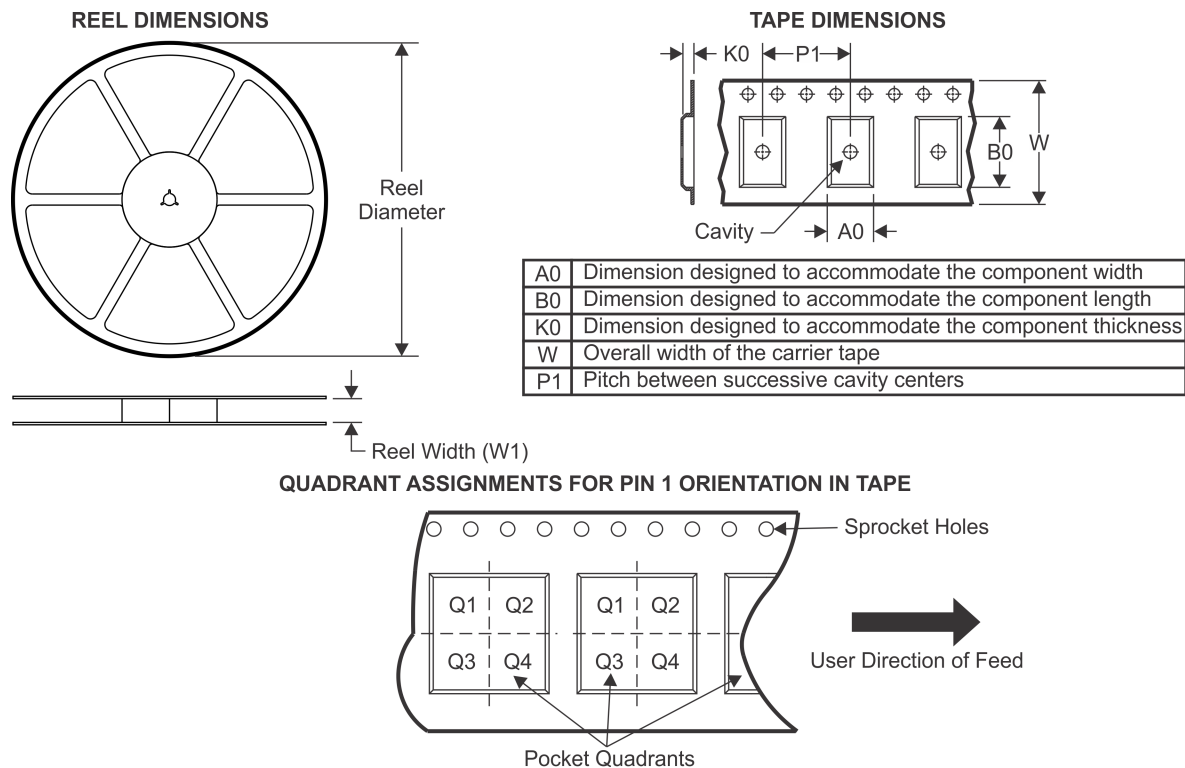
#### **OTHER QUALIFIED VERSIONS OF SN74LV123A :**

- Automotive: [SN74LV123A-Q1](#)
- Enhanced Product: [SN74LV123A-EP](#)

NOTE: Qualified Version Definitions:

- Automotive - Q100 devices qualified for high-reliability automotive applications targeting zero defects

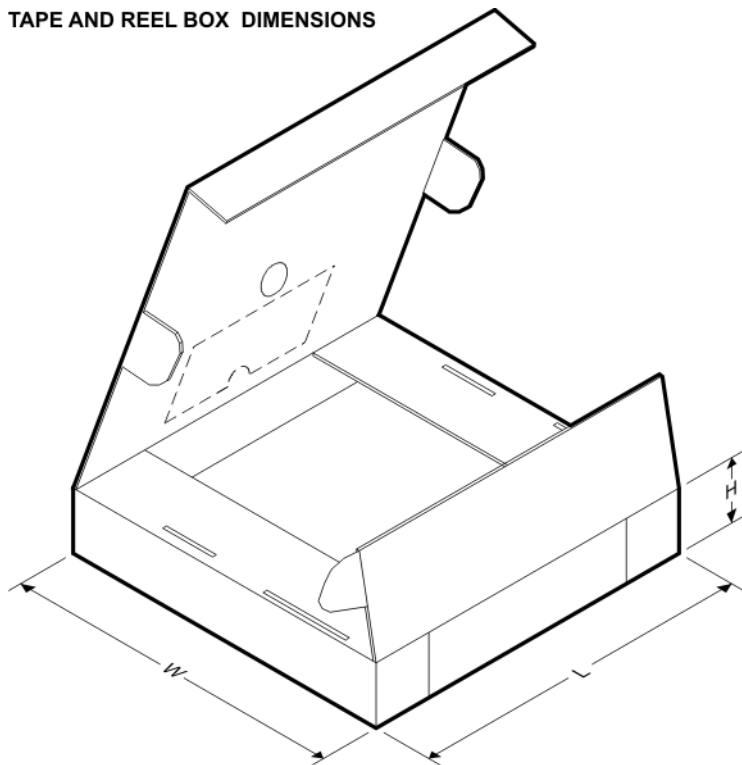
- 
- Enhanced Product - Supports Defense, Aerospace and Medical Applications

**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 |
|-----------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| SN74LV123ADBR   | SSOP         | DB              | 16   | 2000 | 330.0              | 16.4               | 8.2     | 6.6     | 2.5     | 12.0    | 16.0   | Q1            |
| SN74LV123ADGVR  | TVSOP        | DGV             | 16   | 2000 | 330.0              | 12.4               | 6.8     | 4.0     | 1.6     | 8.0     | 12.0   | Q1            |
| SN74LV123ADR    | SOIC         | D               | 16   | 2500 | 330.0              | 16.8               | 6.5     | 10.3    | 2.1     | 8.0     | 16.0   | Q1            |
| SN74LV123ADR    | SOIC         | D               | 16   | 2500 | 330.0              | 16.4               | 6.5     | 10.3    | 2.1     | 8.0     | 16.0   | Q1            |
| SN74LV123ADRG4  | SOIC         | D               | 16   | 2500 | 330.0              | 16.4               | 6.5     | 10.3    | 2.1     | 8.0     | 16.0   | Q1            |
| SN74LV123APWR   | TSSOP        | PW              | 16   | 2000 | 330.0              | 12.4               | 6.9     | 5.6     | 1.6     | 8.0     | 12.0   | Q1            |
| SN74LV123APWR   | TSSOP        | PW              | 16   | 2000 | 330.0              | 12.4               | 6.9     | 5.6     | 1.6     | 8.0     | 12.0   | Q1            |
| SN74LV123APWRG4 | TSSOP        | PW              | 16   | 2000 | 330.0              | 12.4               | 6.9     | 5.6     | 1.6     | 8.0     | 12.0   | Q1            |
| SN74LV123APWT   | TSSOP        | PW              | 16   | 250  | 330.0              | 12.4               | 6.9     | 5.6     | 1.6     | 8.0     | 12.0   | Q1            |
| SN74LV123ARGYR  | VQFN         | RGY             | 16   | 3000 | 330.0              | 12.4               | 3.8     | 4.3     | 1.5     | 8.0     | 12.0   | Q1            |

## TAPE AND REEL BOX DIMENSIONS

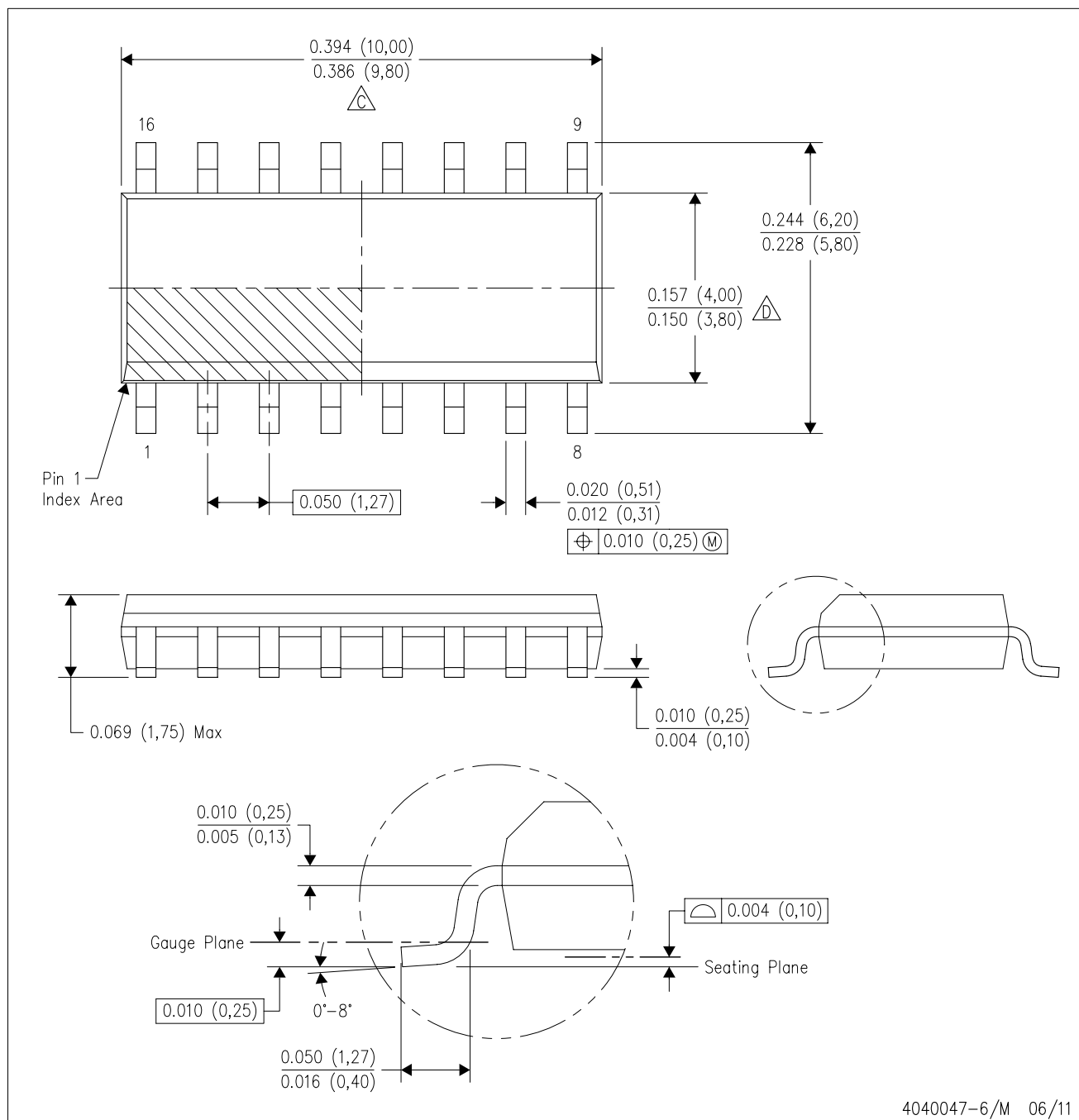


\*All dimensions are nominal

| Device          | Package Type | Package Drawing | Pins | SPQ  | Length (mm) | Width (mm) | Height (mm) |
|-----------------|--------------|-----------------|------|------|-------------|------------|-------------|
| SN74LV123ADBR   | SSOP         | DB              | 16   | 2000 | 367.0       | 367.0      | 38.0        |
| SN74LV123ADGVR  | TVSOP        | DGV             | 16   | 2000 | 367.0       | 367.0      | 35.0        |
| SN74LV123ADR    | SOIC         | D               | 16   | 2500 | 364.0       | 364.0      | 27.0        |
| SN74LV123ADR    | SOIC         | D               | 16   | 2500 | 333.2       | 345.9      | 28.6        |
| SN74LV123ADRG4  | SOIC         | D               | 16   | 2500 | 333.2       | 345.9      | 28.6        |
| SN74LV123APWR   | TSSOP        | PW              | 16   | 2000 | 367.0       | 367.0      | 35.0        |
| SN74LV123APWR   | TSSOP        | PW              | 16   | 2000 | 364.0       | 364.0      | 27.0        |
| SN74LV123APWRG4 | TSSOP        | PW              | 16   | 2000 | 367.0       | 367.0      | 35.0        |
| SN74LV123APWT   | TSSOP        | PW              | 16   | 250  | 367.0       | 367.0      | 35.0        |
| SN74LV123ARGYR  | VQFN         | RGY             | 16   | 3000 | 367.0       | 367.0      | 35.0        |

## D (R-PDSO-G16)

## PLASTIC SMALL OUTLINE

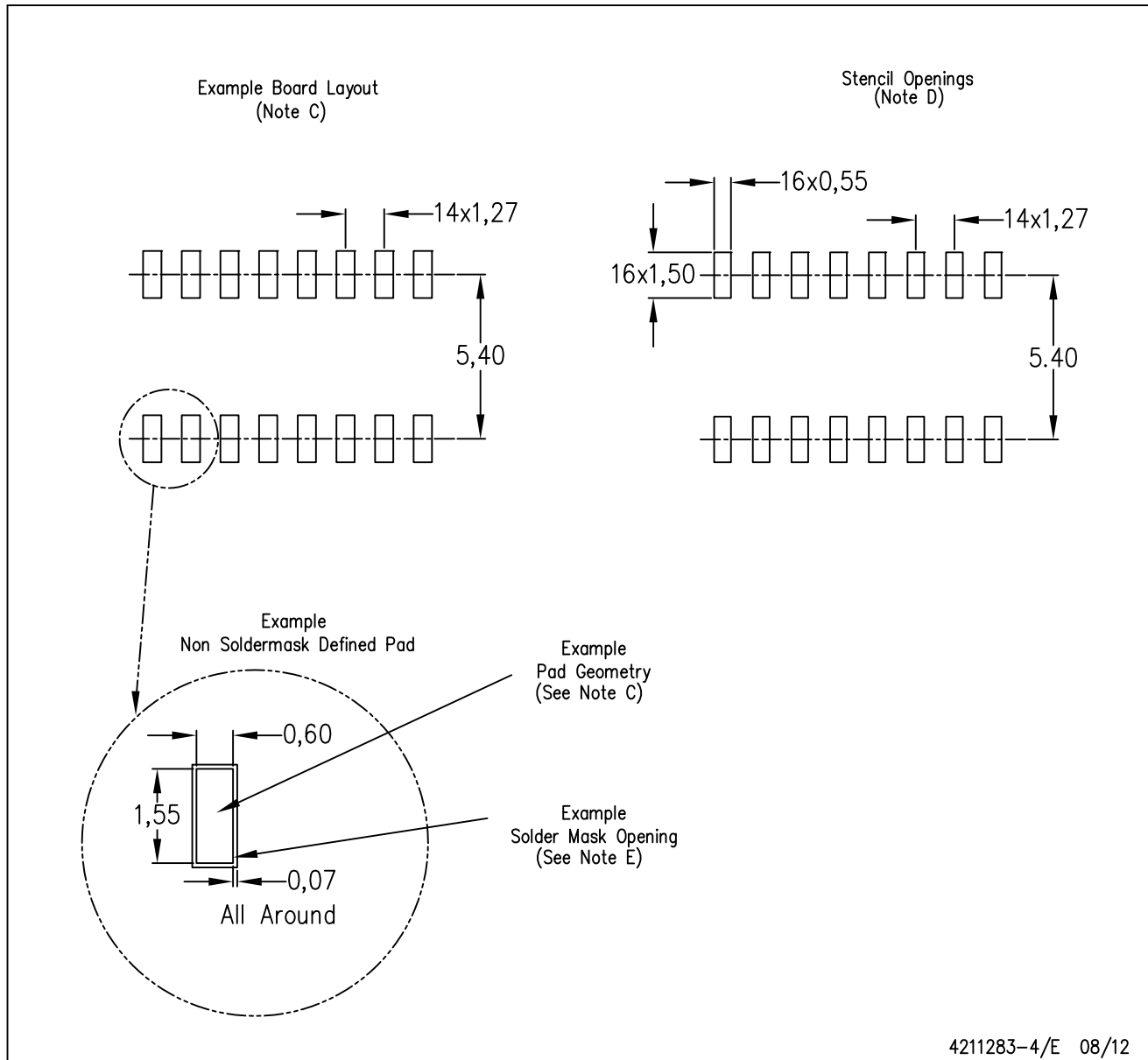


NOTES:

- A. All linear dimensions are in inches (millimeters).  
B. This drawing is subject to change without notice.  
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.  
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)

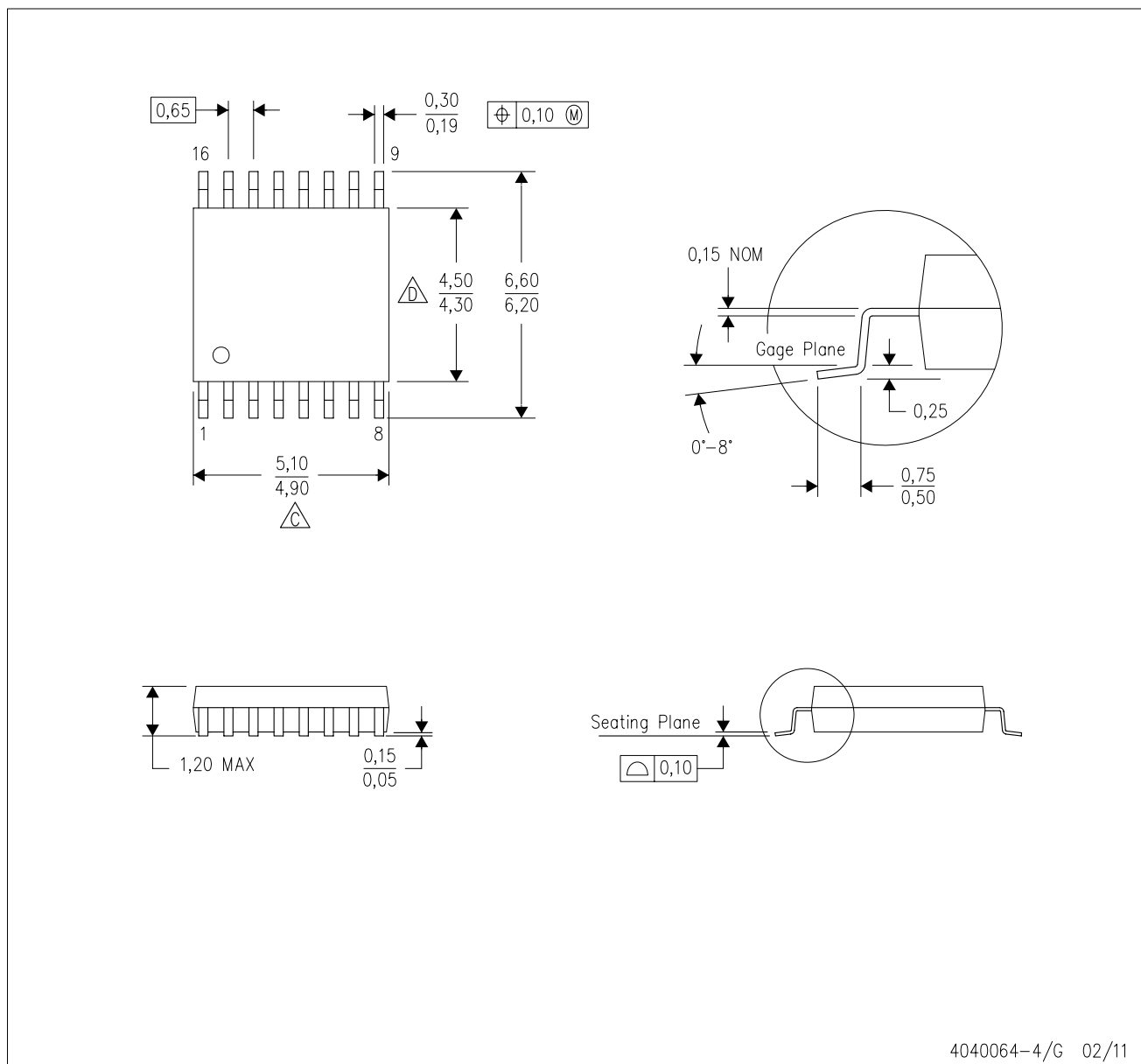
PLASTIC SMALL OUTLINE



- 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.

PW (R-PDSO-G16)

PLASTIC SMALL OUTLINE



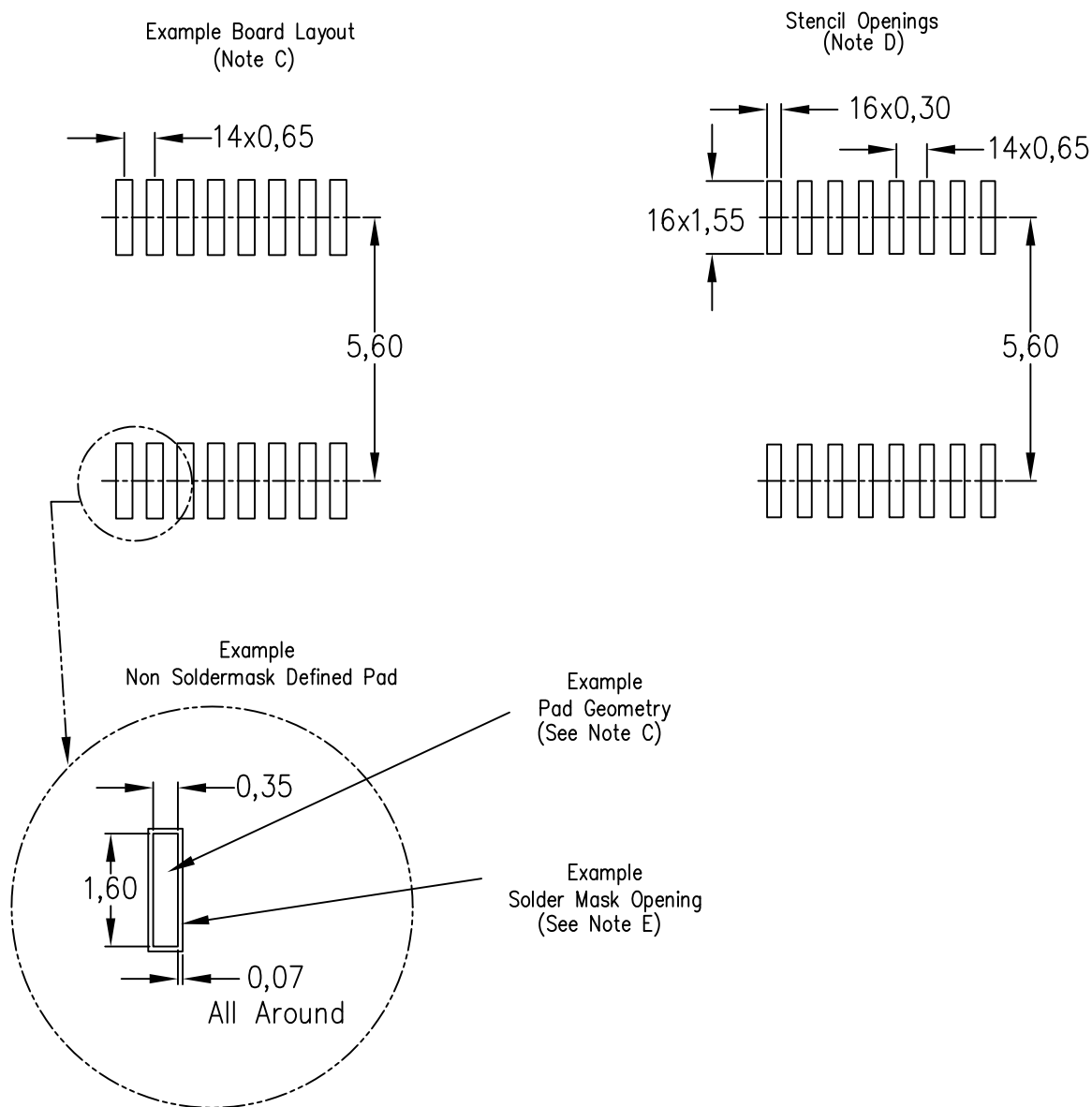
4040064-4/G 02/11

- NOTES:
- A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M-1994.
  - B. This drawing is subject to change without notice.
  - C. Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0,15 each side.
  - D. Body width does not include interlead flash. Interlead flash shall not exceed 0,25 each side.
  - E. Falls within JEDEC MO-153



PW (R-PDSO-G16)

PLASTIC SMALL OUTLINE



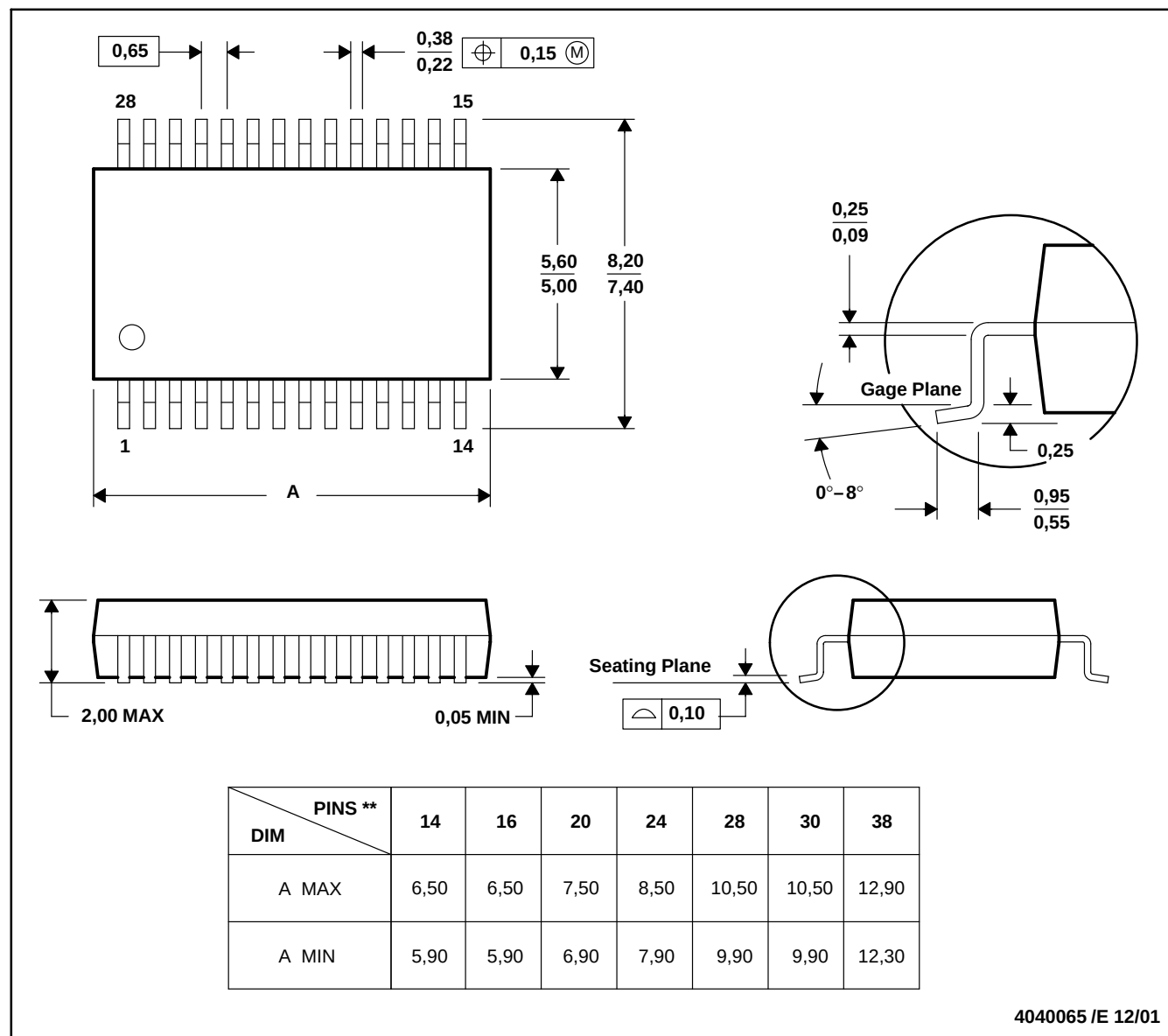
4211284-3/F 12/12

- 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.

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

## PLASTIC SMALL-OUTLINE

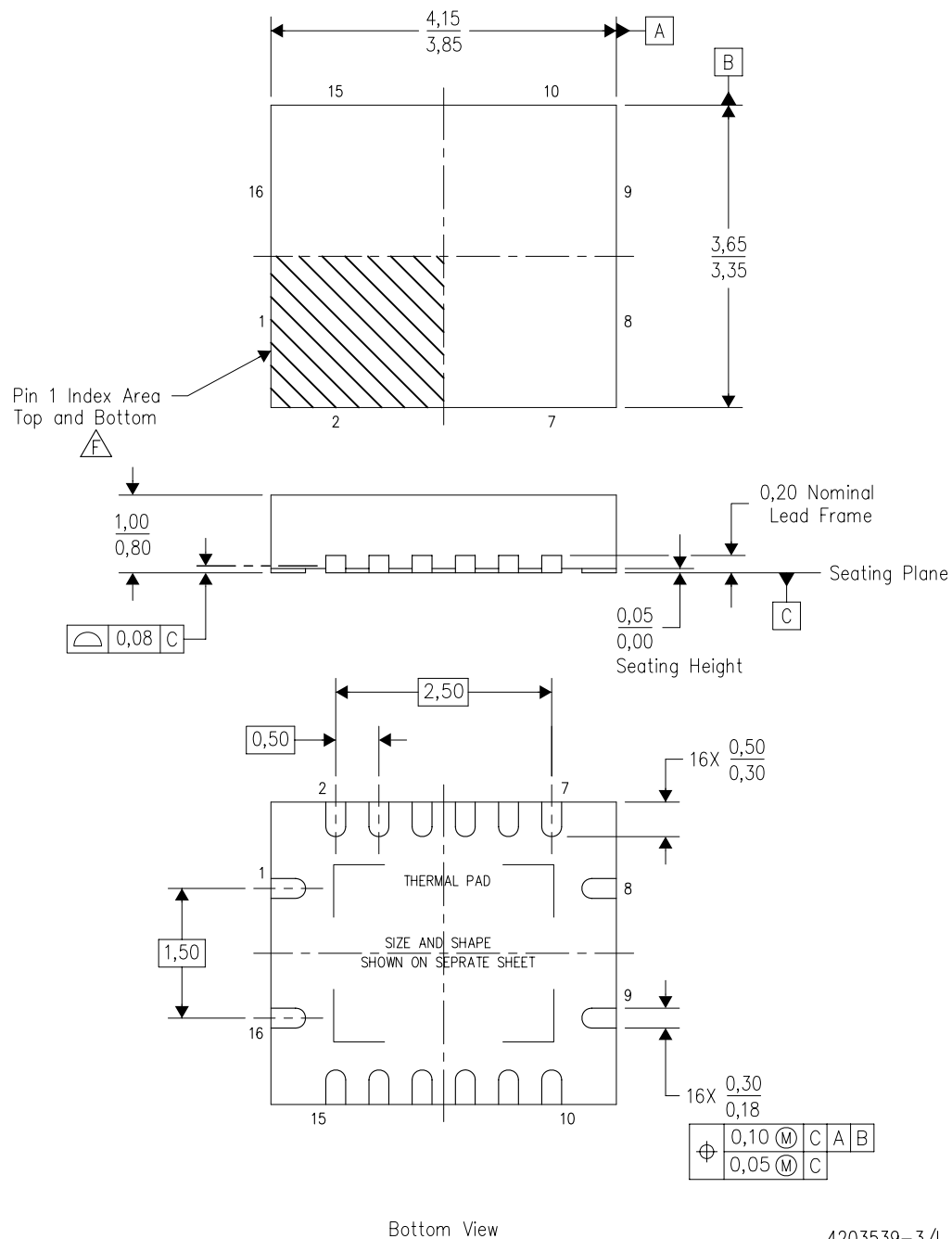
28 PINS SHOWN



- 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

RGY (R-PVQFN-N16)

PLASTIC QUAD FLATPACK NO-LEAD



- NOTES:
- All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M-1994.
  - This drawing is subject to change without notice.
  - QFN (Quad Flatpack No-Lead) package configuration.
  - The package thermal pad must be soldered to the board for thermal and mechanical performance.
  - See the additional figure in the Product Data Sheet for details regarding the exposed thermal pad features and dimensions.
- F** Pin 1 identifiers are located on both top and bottom of the package and within the zone indicated. The Pin 1 identifiers are either a molded, marked, or metal feature.
- G. Package complies to JEDEC MO-241 variation BA.

RGY (R-PVQFN-N16)

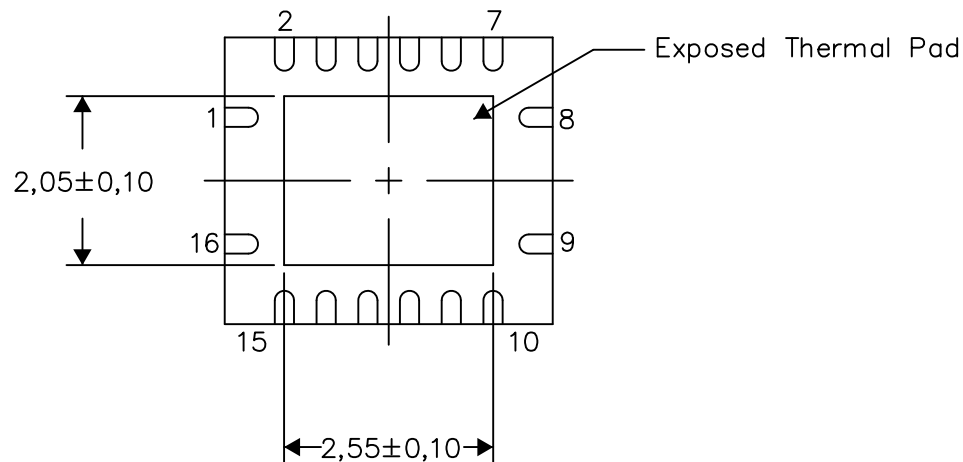
PLASTIC QUAD FLATPACK NO-LEAD

## THERMAL INFORMATION

This package incorporates an exposed thermal pad that is designed to be attached directly to an external heatsink. The thermal pad must be soldered directly to the printed circuit board (PCB). After soldering, the PCB can be used as a heatsink. In addition, through the use of thermal vias, the thermal pad can be attached directly to the appropriate copper plane shown in the electrical schematic for the device, or alternatively, can be attached to a special heatsink structure designed into the PCB. This design optimizes the heat transfer from the integrated circuit (IC).

For information on the Quad Flatpack No-Lead (QFN) package and its advantages, refer to Application Report, QFN/SON PCB Attachment, Texas Instruments Literature No. SLUA271. This document is available at [www.ti.com](http://www.ti.com).

The exposed thermal pad dimensions for this package are shown in the following illustration.



Bottom View

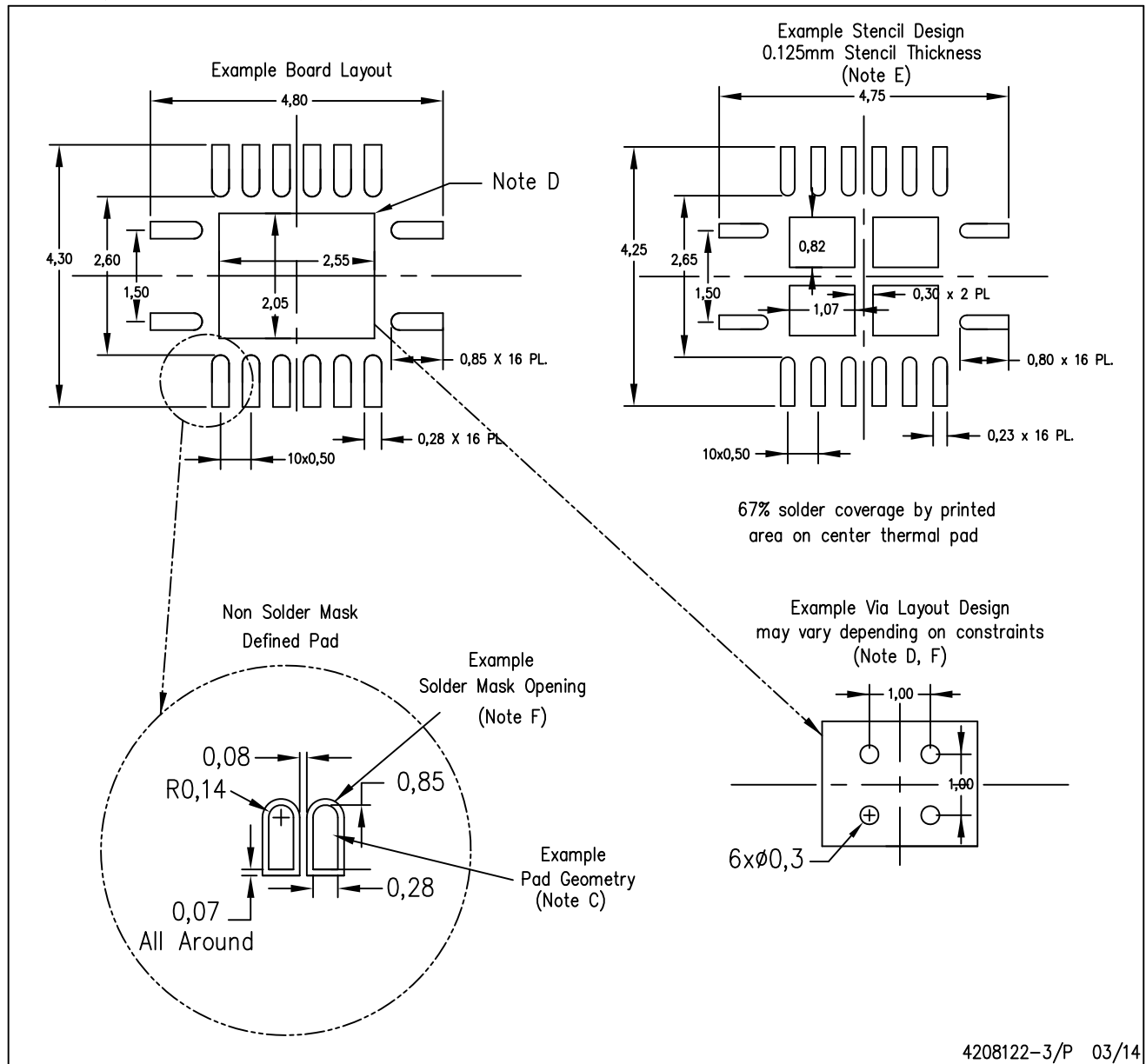
Exposed Thermal Pad Dimensions

4206353-3/P 03/14

NOTE: All linear dimensions are in millimeters

RGY (R-PVQFN-N16)

PLASTIC QUAD FLATPACK NO-LEAD



4208122-3/P 03/14

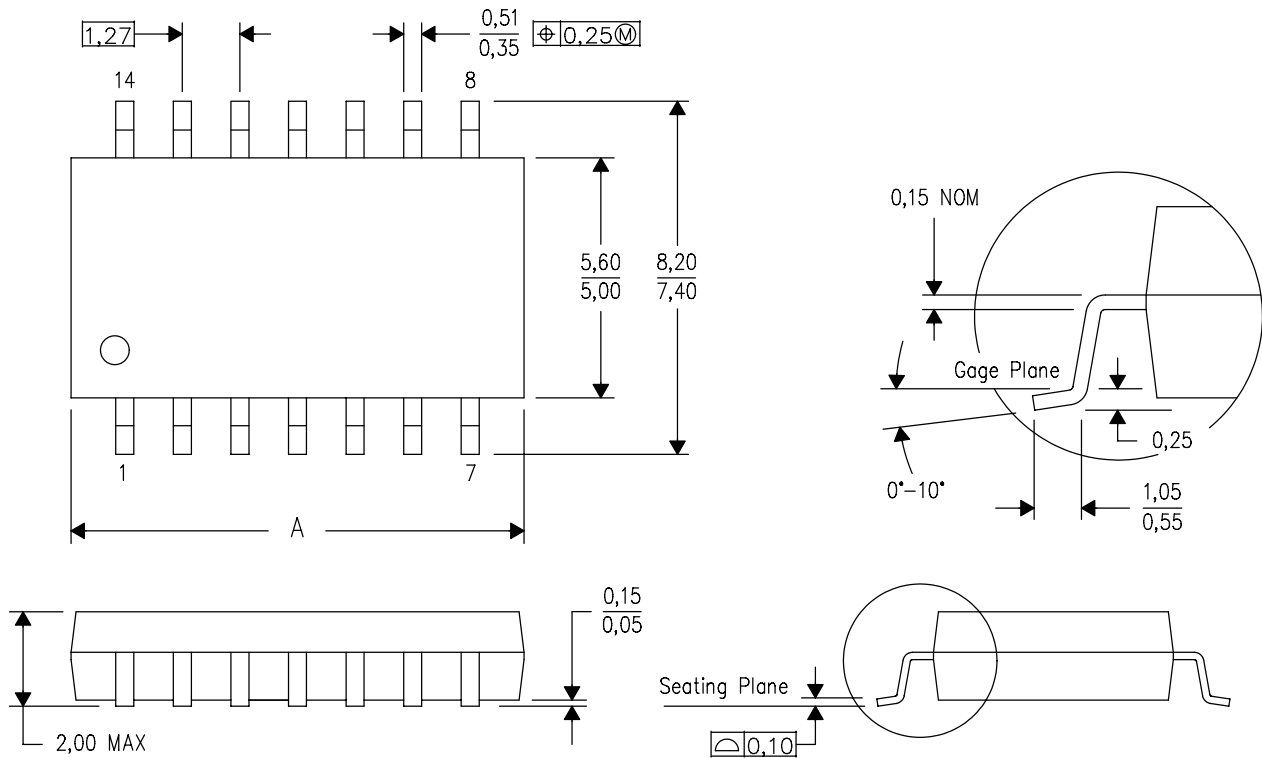
- NOTES:
- All linear dimensions are in millimeters.
  - This drawing is subject to change without notice.
  - Publication IPC-7351 is recommended for alternate designs.
  - This package is designed to be soldered to a thermal pad on the board. Refer to Application Note, Quad Flat-Pack QFN/SON PCB Attachment, Texas Instruments Literature No. SLUA271, and also the Product Data Sheets for specific thermal information, via requirements, and recommended board layout. These documents are available at [www.ti.com](http://www.ti.com) <<http://www.ti.com>>.
  - 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 stencil design considerations.
  - Customers should contact their board fabrication site for minimum solder mask web tolerances between signal pads.

# MECHANICAL DATA

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

PLASTIC SMALL-OUTLINE PACKAGE

14-PINS SHOWN



| DIM \ PINS ** | 14    | 16    | 20    | 24    |
|---------------|-------|-------|-------|-------|
| A MAX         | 10,50 | 10,50 | 12,90 | 15,30 |
| A MIN         | 9,90  | 9,90  | 12,30 | 14,70 |

4040062/C 03/03

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

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