# SINGLE RETRIGGERABLE MONOSTABLE MULTIVIBRATOR WITH SCHMITT-TRIGGER INPUTS

**Check for Samples: SN74LVC1G123**

## FEATURES

- **Available in the Texas Instruments NanoFree™ Package**
- **Supports 5-V $V_{CC}$ Operation**
- **Inputs Accept Voltages to 5.5 V**
- **Max $t_{pd}$ of 8 ns at 3.3 V**
- **Supports Mixed-Mode Voltage Operation on All Ports**
- **Schmitt-Trigger Circuitry on $\overline{A}$ and B Inputs for Slow Input Transition Rates**
- **Edge Triggered From Active-High or Active-Low Gated Logic Inputs**
- **Retriggerable for Very Long Output Pulses, up to 100% Duty Cycle**
- **Overriding Clear Terminates Output Pulse**
- **Glitch-Free Power-Up Reset on Outputs**
- **$I_{off}$ Supports Partial-Power-Down Mode Operation**
- **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)**

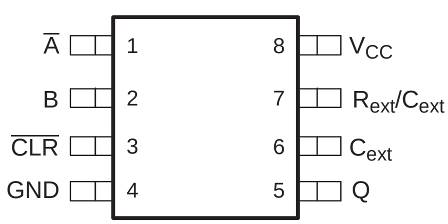
## DESCRIPTION

The SN74LVC1G123 is a single retriggerable monostable multivibrator designed for 1.65-V to 5.5-V $V_{CC}$ operation.

This monostable multivibrator features 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.

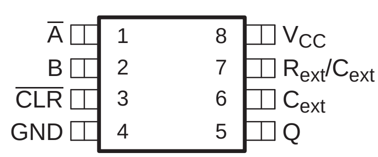
The output pulse duration is programmed by selecting external resistance and capacitance values. The external timing capacitor must be connected between $C_{ext}$ and $R_{ext}/C_{ext}$ (positive) and an external resistor connected between $R_{ext}/C_{ext}$ and $V_{CC}$. To obtain variable pulse durations,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

**DCT PACKAGE (TOP VIEW)**

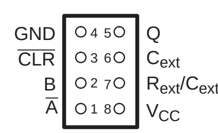



See mechanical drawings for dimensions.

**DCU PACKAGE (TOP VIEW)**




**YZP PACKAGE (BOTTOM VIEW)**




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.

NanoFree is a trademark of Texas Instruments.

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 $\overline{A}$ and B 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 $\overline{\text{CLR}}$ low. $\overline{\text{CLR}}$ 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.

This device is 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.

NanoFree™ package technology is a major breakthrough in IC packaging concepts, using the die as the package.

### FUNCTION TABLE

| INPUTS | | | OUTPUTS |
|---|---|---|---|
| $\overline{\text{CLR}}$ | $\overline{A}$ | B | Q |
| L | X | X | L |
| X | H | X | L (1) |
| X | X | L | L (1) |
| 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 (POSITIVE LOGIC)**

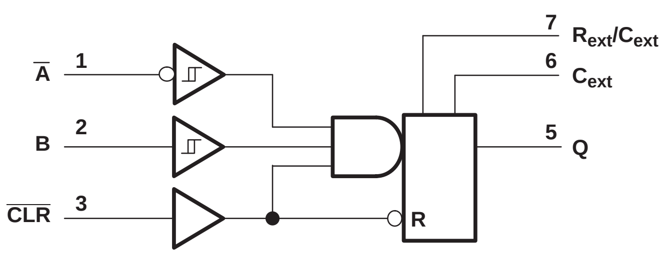


**Figure 2. REQUIRED TIMING CIRCUIT**

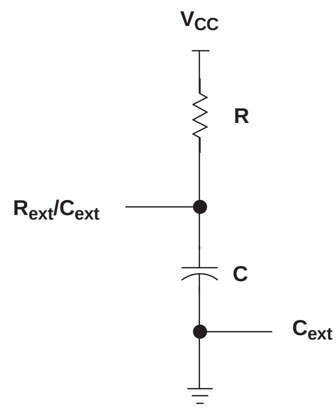
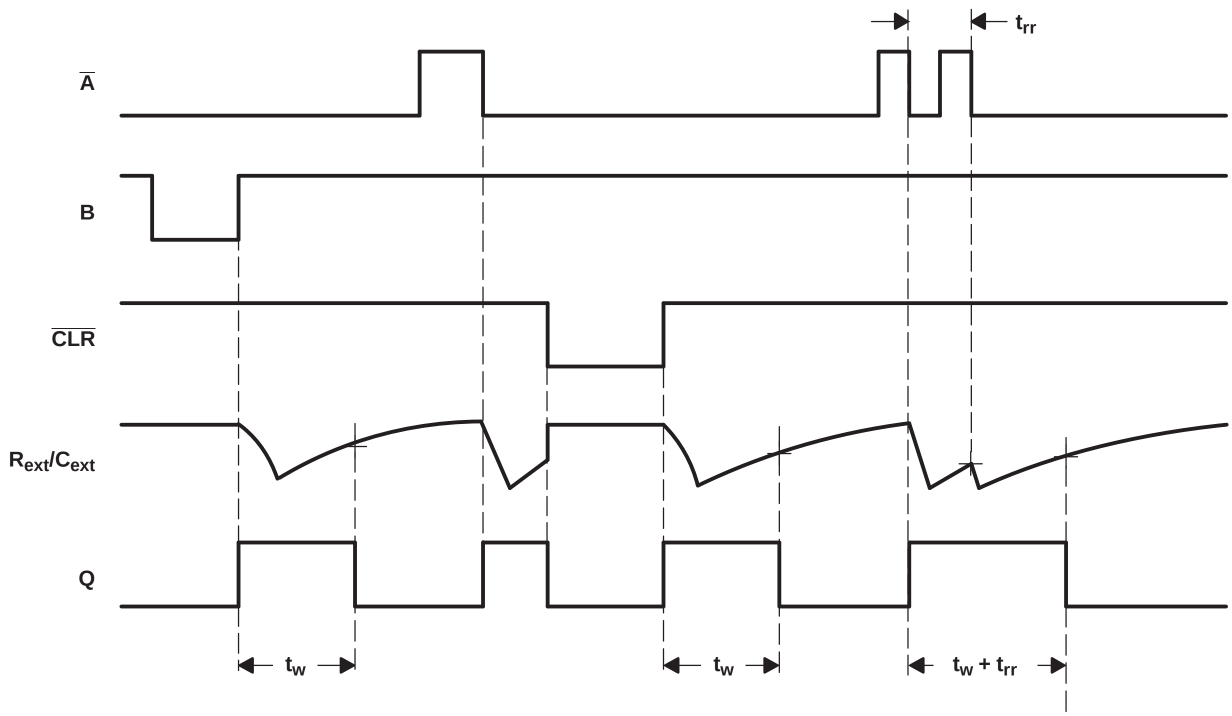



**Figure 3. INPUT/OUTPUT TIMING DIAGRAM**



## Absolute Maximum Ratings[1]

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

| | | | MIN | MAX | UNIT |
|---|---|---|---|---|---|
| $V_{CC}$ | Supply voltage range | | –0.5 | 6.5 | V |
| $V_I$ | Input voltage range[2] | | –0.5 | 6.5 | V |
| $V_O$ | Voltage range applied to any output in the high-impedance or power-off state[2] | | –0.5 | 6.5 | V |
| $V_O$ | Voltage range applied to any output in the high or low state[2] [3] | | –0.5 | $V_{CC}$ + 0.5 | V |
| $I_{IK}$ | Input clamp current | $V_I < 0$ | | –50 | mA |
| $I_{OK}$ | Output clamp current | $V_O < 0$ | | –50 | mA |
| $I_O$ | Continuous output current | | | ±50 | mA |
| | Continuous current through $V_{CC}$ or GND | | | ±100 | mA |
| $θ_{JA}$ | Package thermal impedance[4] | DCT package | | 220 | °C/W |
| | | DCU package | | 227 | |
| | | YZP package | | 102 | |
| $T_{stg}$ | 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 clamp-current ratings are observed.
(3) The value of $V_{CC}$ is provided in the recommended operating conditions table.
(4) The package thermal impedance is calculated in accordance with JESD 51-7.

## Recommended Operating Conditions[1]

| | | | MIN | MAX | UNIT |
|---|---|---|---|---|---|
| $V_{CC}$ | Supply voltage | Operating | 1.65 | 5.5 | V |
| | | Data retention only | 1.5 | | |
| $V_{IH}$ | High-level input voltage | $V_{CC}$ = 1.65 V to 1.95 V | 0.65 × $V_{CC}$ | | V |
| | | $V_{CC}$ = 2.3 V to 2.7 V | 1.7 | | |
| | | $V_{CC}$ = 3 V to 3.6 V | 2 | | |
| | | $V_{CC}$ = 4.5 V to 5.5 V | 0.7 × $V_{CC}$ | | |
| $V_{IL}$ | Low-level input voltage | $V_{CC}$ = 1.65 V to 1.95 V | | 0.35 × $V_{CC}$ | V |
| | | $V_{CC}$ = 2.3 V to 2.7 V | | 0.7 | |
| | | $V_{CC}$ = 3 V to 3.6 V | | 0.8 | |
| | | $V_{CC}$ = 4.5 V to 5.5 V | | 0.3 × $V_{CC}$ | |
| $V_I$ | Input voltage | | 0 | 5.5 | V |
| $V_O$ | Output voltage | | 0 | $V_{CC}$ | V |
| $I_{OH}$ | High-level output current | $V_{CC}$ = 1.65 V | | –4 | mA |
| | | $V_{CC}$ = 2.3 V | | –8 | |
| | | $V_{CC}$ = 3 V | | –16 | |
| | | | | –24 | |
| | | $V_{CC}$ = 4.5 V | | –32 | |
| $I_{OL}$ | Low-level output current | $V_{CC}$ = 1.65 V | | 4 | mA |
| | | $V_{CC}$ = 2.3 V | | 8 | |
| | | $V_{CC}$ = 3 V | | 16 | |
| | | | | 24 | |
| | | $V_{CC}$ = 4.5 V | | 32 | |
| $R_{ext}$ [2] | External timing resistance | $V_{CC}$ = 2 V | 5 k | | Ω |
| | | $V_{CC}$ ≥ 3 V | 1 k | | |
| $T_A$ | Operating free-air temperature | | –40 | 125 | °C |

(1) All 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.
(2) $R_{ext}/C_{ext}$ is an I/O and must not be connected directly to GND or $V_{CC}$.

## Electrical Characteristics

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

| PARAMETER | | TEST CONDITIONS | | $V_{CC}$ | –40°C to 85°C SN74LVC1G123 MIN | TYP(1) | MAX | –40°C to 125°C SN74LVC1G123 MIN | TYP(1) | MAX | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $V_{OH}$ | | $I_{OH}$ = –100 µA | | 1.65 V to 5.5 V | $V_{CC}$ – 0.1 | | | $V_{CC}$ – 0.1 | | | V |
| | | $I_{OH}$ = –4 mA | | 1.65 V | 1.2 | | | 1.2 | | | |
| | | $I_{OH}$ = –8 mA | | 2.3 V | 1.9 | | | 1.9 | | | |
| | | $I_{OH}$ = –16 mA | | 3 V | 2.4 | | | 2.4 | | | |
| | | $I_{OH}$ = –24 mA | | | 2.3 | | | 2.3 | | | |
| | | $I_{OH}$ = –32 mA | | 4.5 V | 3.8 | | | 3.8 | | | |
| $V_{OL}$ | | $I_{OL}$ = 100 µA | | 1.65 V to 5.5 V | | | 0.1 | | | 0.1 | V |
| | | $I_{OL}$ = 4 mA | | 1.65 V | | | 0.45 | | | 0.45 | |
| | | $I_{OL}$ = 8 mA | | 2.3 V | | | 0.3 | | | 0.3 | |
| | | $I_{OL}$ = 16 mA | | 3 V | | | 0.4 | | | 0.4 | |
| | | $I_{OL}$ = 24 mA | | | | | 0.55 | | | 0.55 | |
| | | $I_{OL}$ = 32 mA | | 4.5 V | | | 0.55 | | | 0.55 | |
| $I_I$ | $R_{ext}/C_{ext}$ (2) | B = GND, | $\overline{A}$ = $\overline{CLR}$ = $V_{CC}$ | 1.65 V to 5.5 V | | | ±0.25 | | | ±0.25 | µA |
| | $\overline{A}$, B, $\overline{CLR}$ | $V_I$ = 5.5 V or GND | | | | | ±1 | | | ±1 | |
| $I_{off}$ | $\overline{A}$, B, Q, $\overline{CLR}$ | $V_I$ or $V_O$ = 5.5 V | | 0 | | | ±10 | | | ±10 | µA |
| $I_{CC}$ | Quiescent | $V_I$ = $V_{CC}$ or GND, | $I_O$ = 0 | 5.5 V | | | 20 | | | 20 | µA |
| $I_{CC}$ | Active state | $V_I$ = $V_{CC}$ or GND, | $R_{ext}/C_{ext}$ = 0.5 $V_{CC}$ | 1.65 V | | | 165 | | | 165 | µA |
| | | | | 2.3 V | | | 220 | | | 220 | |
| | | | | 3 V | | | 280 | | | 280 | |
| | | | | 4.5 V | | | 650 | | | 650 | |
| | | | | 5.5 V | | | 975 | | | 975 | |
| $C_I$ | | $V_I$ = $V_{CC}$ or GND | | 3.3 V | | 3 | | | | | pF |

(1) All typical values are at $V_{CC}$ = 3.3 V, $T_A$ = 25°C.
(2) This test is performed with the terminal in the off-state condition.

## Timing Requirements

over recommended operating free-air temperature range (unless otherwise noted) (see Figure 4)

| PARAMETER | | | TEST CONDITIONS | | SN74LVC1G123 –40°C to 85°C $V_{CC}$ = 1.8 V ± 0.15 V MIN | TYP | $V_{CC}$ = 2.5 V ± 0.2 V MIN | TYP | $V_{CC}$ = 3.3 V ± 0.3 V MIN | TYP | $V_{CC}$ = 5 V ± 0.5 V MIN | TYP | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $t_w$IN | Pulse duration | $\overline{CLR}$ | | | 8 | | 4 | | 3 | | 2.5 | | ns |
| | | $\overline{A}$ or B trigger | | | 8 | | 4 | | 3 | | 2.5 | | |
| $t_{rr}$ | Pulse retrigger time | | $R_{ext}$ = 1 kΩ | $C_{ext}$ = 100 pF | | | | | | 5.5 | | 4.5 | ns |
| | | | | $C_{ext}$ = 100 µF | | | | | | 1.4 | | 1.1 | µs |
| | | | $R_{ext}$ = 5 kΩ | $C_{ext}$ = 100 pF | | 75 | | 45 | | | | | ns |
| | | | | $C_{ext}$ = 100 µF | | 1.8 | | 1.4 | | | | | µs |

## Timing Requirements

over recommended operating free-air temperature range (unless otherwise noted) (see Figure 4)

| PARAMETER | | | TEST CONDITIONS | | SN74LVC1G123 –40°C to 125°C | | | | | | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | $V_{CC}$ = 1.8 V ± 0.15 V | | $V_{CC}$ = 2.5 V ± 0.2 V | | $V_{CC}$ = 3.3 V ± 0.3 V | | $V_{CC}$ = 5 V ± 0.5 V | | |
| | | | | | MIN | TYP | MIN | TYP | MIN | TYP | MIN | TYP | |
| $t_w$IN | Pulse duration | $\overline{CLR}$ | | | 8 | | 4 | | 3 | | 2.5 | | ns |
| | | $\overline{A}$ or B trigger | | | 8 | | 4 | | 3 | | 2.5 | | |
| $t_{rr}$ | Pulse retrigger time | | $R_{ext}$ = 1 kΩ | $C_{ext}$ = 100 pF | | | | | | 5.5 | | 4.5 | ns |
| | | | | $C_{ext}$ = 100 µF | | | | | | 1.4 | | 1.1 | µs |
| | | | $R_{ext}$ = 5 kΩ | $C_{ext}$ = 100 pF | | 75 | | 45 | | | | | ns |
| | | | | $C_{ext}$ = 100 µF | | 1.8 | | 1.4 | | | | | µs |

## Switching Characteristics

over recommended operating free-air temperature range, $C_L$ = 15 pF (unless otherwise noted) (see Figure 4)

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | SN74LVC1G123 –40°C to 85°C | | | | | | | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | $V_{CC}$ = 1.8 V ± 0.15 V | | | $V_{CC}$ = 2.5 V ± 0.2 V | | $V_{CC}$ = 3.3 V ± 0.3 V | | $V_{CC}$ = 5 V ± 0.5 V | | |
| | | | MIN | TYP | MAX | MIN | MAX | MIN | MAX | MIN | MAX | |
| $t_{pd}$ | $\overline{A}$ or B | Q | 7 | 18.5 | 52 | 4 | 17 | 3 | 11.5 | 2 | 7.6 | ns |
| | $\overline{CLR}$ | | 5 | 12.4 | 34 | 3 | 11.5 | 2 | 8 | 1.5 | 5.5 | |
| | $\overline{CLR}$ trigger | | 7 | 17.4 | 54 | 4 | 15.5 | 3 | 10.5 | 2 | 7 | |

## Switching Characteristics

over recommended operating free-air temperature range, $C_L$ = 50 pF (unless otherwise noted) (see Figure 5)

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | TEST CONDITIONS | SN74LVC1G123 –40°C to 85°C | | | | | | | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | $V_{CC}$ = 1.8 V ± 0.15 V | | | $V_{CC}$ = 2.5 V ± 0.2 V | | $V_{CC}$ = 3.3 V ± 0.3 V | | $V_{CC}$ = 5 V ± 0.5 V | | |
| | | | | MIN | TYP (1) | MAX | MIN | MAX | MIN | MAX | MIN | MAX | |
| $t_{pd}$ | $\overline{A}$ or B | Q | | 6 | 18.6 | 57 | 3 | 18.5 | 2 | 12.5 | 1.5 | 8.2 | ns |
| | $\overline{CLR}$ | | | 4 | 11.6 | 36.5 | 2 | 12.5 | 1.5 | 8.6 | 1.5 | 6 | |
| | $\overline{CLR}$ trigger | | | 5 | 17.3 | 59 | 2.5 | 17 | 2 | 11.5 | 1.5 | 7.5 | |
| $t_w$OUT (2) | | Q | $C_{ext}$ = 28 pF, $R_{ext}$ = 2 kΩ | | 225 | 600 | 190 | 220 | 170 | 200 | 150 | 180 | ns |
| | | | $C_{ext}$ = 0.01 µF, $R_{ext}$ = 10 kΩ | | 100 | 110 | 100 | 110 | 100 | 110 | 100 | 110 | µs |
| | | | $C_{ext}$ = 0.1 µF, $R_{ext}$ = 10 kΩ | | 1 | 1.1 | 1 | 1.1 | 1 | 1.1 | 1 | 1.1 | ms |

(1) $T_A$ = 25°C
(2) $t_w$ = Duration of pulse at Q output

## Switching Characteristics

over recommended operating free-air temperature range, $C_L$ = 50 pF (unless otherwise noted) (see Figure 5)

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | TEST CONDITIONS | SN74LVC1G123 –40°C to 125°C | | | | | | | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | $V_{CC}$ = 1.8 V ± 0.15 V | | | $V_{CC}$ = 2.5 V ± 0.2 V | | $V_{CC}$ = 3.3 V ± 0.3 V | | $V_{CC}$ = 5 V ± 0.5 V | | |
| | | | | MIN | TYP[1] | MAX | MIN | MAX | MIN | MAX | MIN | MAX | |
| $t_{pd}$ | $\overline{A}$ or B | Q | | 6 | | 58 | 3 | 19.5 | 2 | 13.2 | 1.5 | 8.7 | ns |
| | $\overline{CLR}$ | | | 4 | | 37 | 2 | 13.5 | 1.5 | 9.2 | 1.5 | 6.5 | |
| | $\overline{CLR}$ trigger | | | 5 | | 60 | 2.5 | 18 | 2 | 12 | 1.5 | 8 | |
| $t_w$OUT[2] | | Q | $C_{ext}$ = 28 pF, $R_{ext}$ = 2 kΩ | | 225 | 600 | 190 | 220 | 170 | 200 | 150 | 180 | ns |
| | | | $C_{ext}$ = 0.01 μF, $R_{ext}$ = 10 kΩ | | 100 | 110 | 100 | 110 | 100 | 110 | 100 | 110 | μs |
| | | | $C_{ext}$ = 0.1 μF, $R_{ext}$ = 10 kΩ | | 1 | 1.1 | 1 | 1.1 | 1 | 1.1 | 1 | 1.1 | ms |

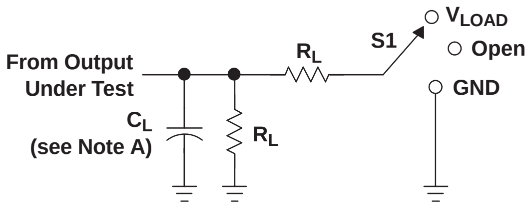
(1) $T_A$ = 25°C
(2) $t_w$ = Duration of pulse at Q output

## Operating Characteristics

$T_A$ = 25°C

| PARAMETER | | TEST CONDITIONS | | $V_{CC}$ = 1.8 V | $V_{CC}$ = 2.5 V | $V_{CC}$ = 3.3 V | $V_{CC}$ = 5 V | UNIT |
|---|---|---|---|---|---|---|---|---|
| | | | | TYP | TYP | TYP | TYP | |
| $C_{pd}$ | Power dissipation capacitance | $\overline{A}$ = low, B = high, $\overline{CLR}$ = 10 MHz | $R_{ext}$ = 1 kΩ, No $C_{ext}$ | | | 35 | 37 | pF |
| | | | $R_{ext}$ = 5 kΩ, No $C_{ext}$ | 41 | 40 | | | |

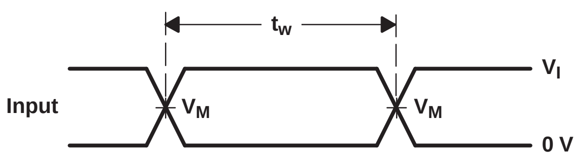
## PARAMETER MEASUREMENT INFORMATION



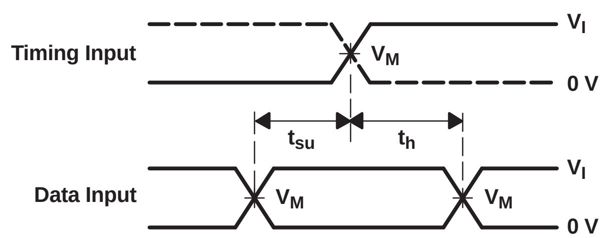

LOAD CIRCUIT

| TEST | S1 |
|---|---|
| $t_{PLH}/t_{PHL}$ | Open |
| $t_{PLZ}/t_{PZL}$ | $V_{LOAD}$ |
| $t_{PHZ}/t_{PZH}$ | GND |

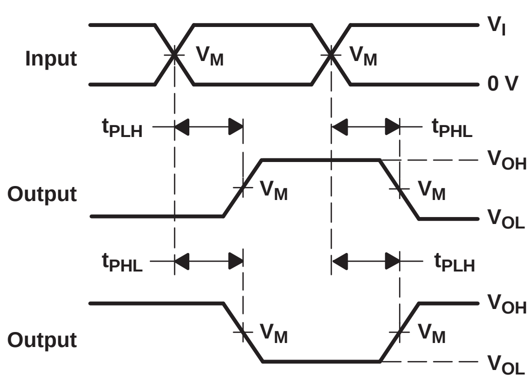
| $V_{CC}$ | INPUTS | | $V_M$ | $V_{LOAD}$ | $C_L$ | $R_L$ | $V_\Delta$ |
|---|---|---|---|---|---|---|---|
| | $V_I$ | $t_r/t_f$ | | | | | |
| 1.8 V ± 0.15 V | $V_{CC}$ | ≤2 ns | $V_{CC}/2$ | 2 × $V_{CC}$ | 15 pF | 1 MΩ | 0.15 V |
| 2.5 V ± 0.2 V | $V_{CC}$ | ≤2 ns | $V_{CC}/2$ | 2 × $V_{CC}$ | 15 pF | 1 MΩ | 0.15 V |
| 3.3 V ± 0.3 V | 3 V | ≤2.5 ns | 1.5 V | 6 V | 15 pF | 1 MΩ | 0.3 V |
| 5 V ± 0.5 V | $V_{CC}$ | ≤2.5 ns | $V_{CC}/2$ | 2 × $V_{CC}$ | 15 pF | 1 MΩ | 0.3 V |



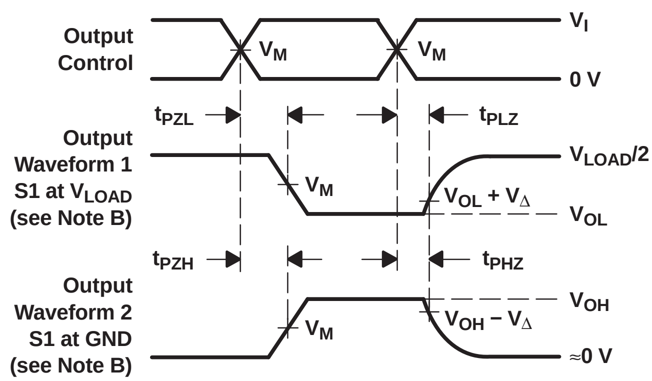

VOLTAGE WAVEFORMS
PULSE DURATION




VOLTAGE WAVEFORMS
SETUP AND HOLD TIMES




VOLTAGE WAVEFORMS
PROPAGATION DELAY TIMES
INVERTING AND NONINVERTING OUTPUTS




VOLTAGE WAVEFORMS
ENABLE AND DISABLE TIMES
LOW- AND HIGH-LEVEL ENABLING

NOTES: A. $C_L$ includes probe and jig capacitance.

B. Waveform 1 is for an output with internal conditions such that the output is low, except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high, except when disabled by the output control.

C. All input pulses are supplied by generators having the following characteristics: PRR ≤ 10 MHz, $Z_O$ = 50 Ω.

D. The outputs are measured one at a time, with one transition per measurement.

E. $t_{PLZ}$ and $t_{PHZ}$ are the same as $t_{dis}$.

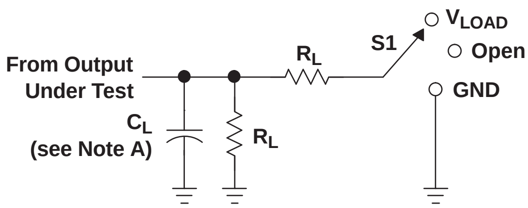
F. $t_{PZL}$ and $t_{PZH}$ are the same as $t_{en}$.

G. $t_{PLH}$ and $t_{PHL}$ are the same as $t_{pd}$.

H. All parameters and waveforms are not applicable to all devices.

**Figure 4. Load Circuit and Voltage Waveforms**

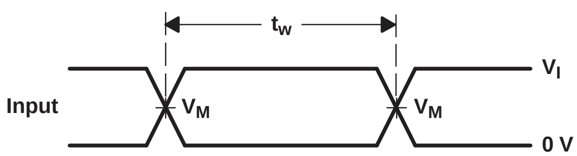
## PARAMETER MEASUREMENT INFORMATION



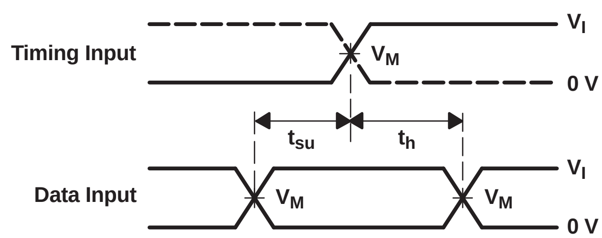

LOAD CIRCUIT

| TEST | S1 |
|---|---|
| $t_{PLH}/t_{PHL}$ | Open |
| $t_{PLZ}/t_{PZL}$ | $V_{LOAD}$ |
| $t_{PHZ}/t_{PZH}$ | GND |

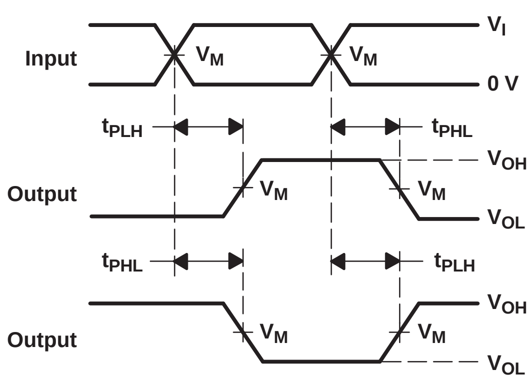
| $V_{CC}$ | INPUTS | | $V_M$ | $V_{LOAD}$ | $C_L$ | $R_L$ | $V_\Delta$ |
|---|---|---|---|---|---|---|---|
| | $V_I$ | $t_r/t_f$ | | | | | |
| 1.8 V ± 0.15 V | $V_{CC}$ | ≤2 ns | $V_{CC}/2$ | 2 × $V_{CC}$ | 30 pF | 1 kΩ | 0.15 V |
| 2.5 V ± 0.2 V | $V_{CC}$ | ≤2 ns | $V_{CC}/2$ | 2 × $V_{CC}$ | 30 pF | 500 Ω | 0.15 V |
| 3.3 V ± 0.3 V | 3 V | ≤2.5 ns | 1.5 V | 6 V | 50 pF | 500 Ω | 0.3 V |
| 5 V ± 0.5 V | $V_{CC}$ | ≤2.5 ns | $V_{CC}/2$ | 2 × $V_{CC}$ | 50 pF | 500 Ω | 0.3 V |



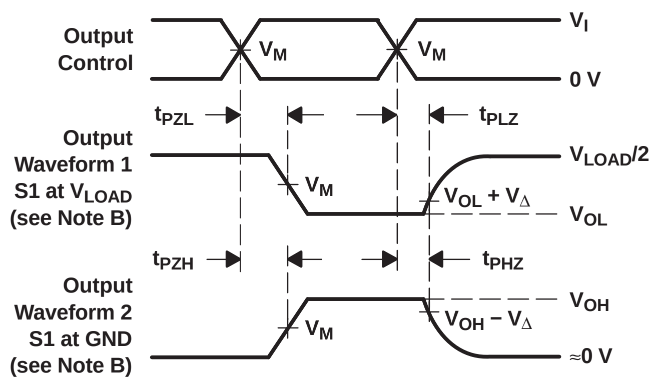

VOLTAGE WAVEFORMS
PULSE DURATION




VOLTAGE WAVEFORMS
SETUP AND HOLD TIMES




VOLTAGE WAVEFORMS
PROPAGATION DELAY TIMES
INVERTING AND NONINVERTING OUTPUTS




VOLTAGE WAVEFORMS
ENABLE AND DISABLE TIMES
LOW- AND HIGH-LEVEL ENABLING

NOTES: A. $C_L$ includes probe and jig capacitance.
B. Waveform 1 is for an output with internal conditions such that the output is low, except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high, except when disabled by the output control.
C. All input pulses are supplied by generators having the following characteristics: PRR ≤ 10 MHz, $Z_O$ = 50 Ω.
D. The outputs are measured one at a time, with one transition per measurement.
E. $t_{PLZ}$ and $t_{PHZ}$ are the same as $t_{dis}$.
F. $t_{PZL}$ and $t_{PZH}$ are the same as $t_{en}$.
G. $t_{PLH}$ and $t_{PHL}$ are the same as $t_{pd}$.
H. All parameters and waveforms are not applicable to all devices.

**Figure 5. 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.

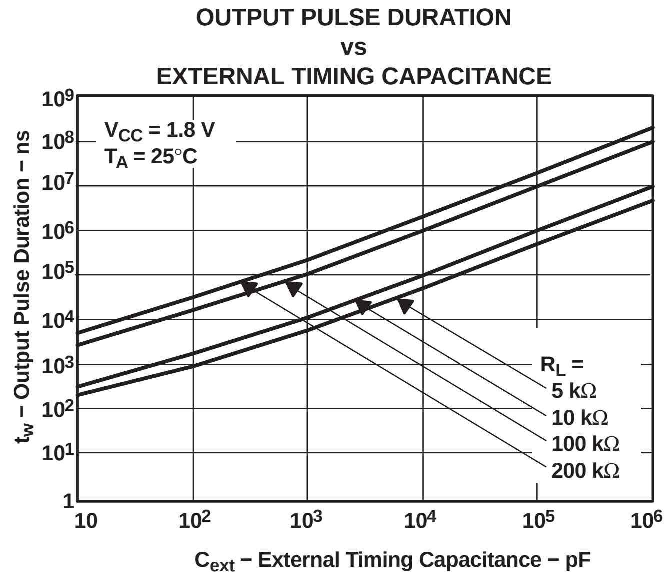



**Figure 6.**

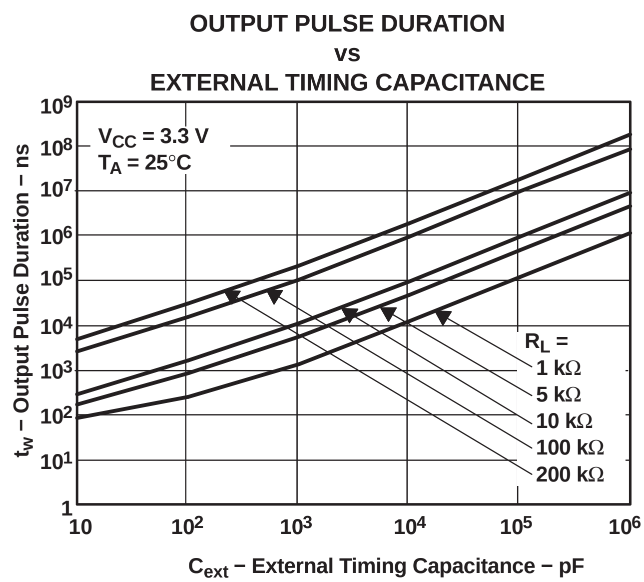



**Figure 7.**

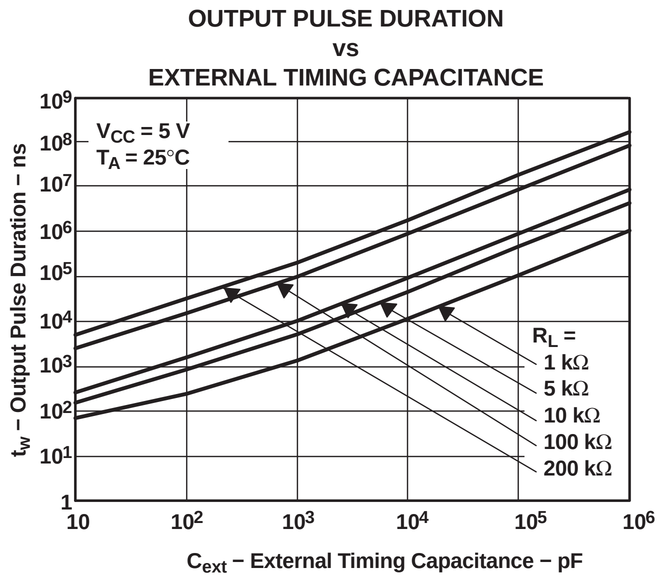



**Figure 8.**

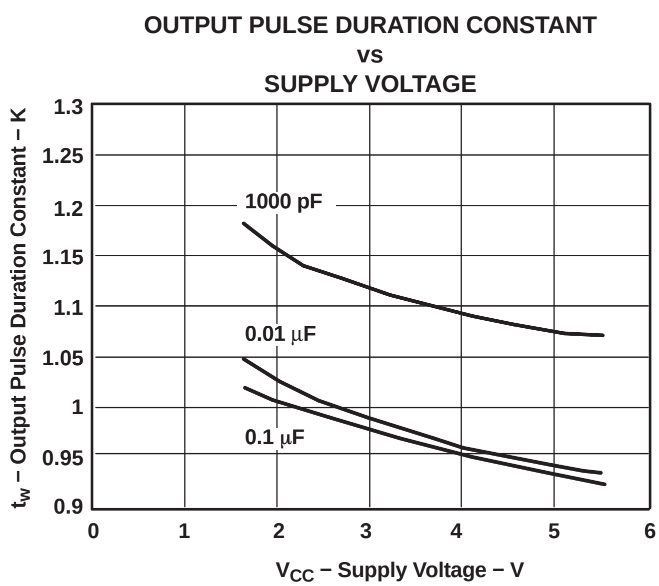



**Figure 9.**

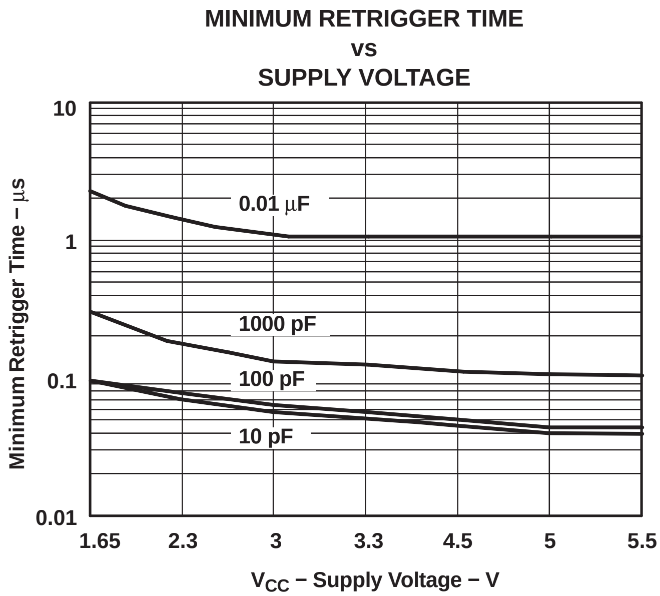

MINIMUM RETRIGGER TIME
vs
SUPPLY VOLTAGE
Minimum Retrigger Time – µs
10
1
0.1
0.01
0.01 µF
1000 pF
100 pF
10 pF
1.65
2.3
3
3.3
4.5
5
5.5
VCC – Supply Voltage – V

**Figure 10.**

## REVISION HISTORY

**Changes from Revision B (January 2007) to Revision C** **Page**

- Updated document to new TI datasheet format - no specification changes ........ 1
- Removed Ordering Information table. ........ 2
- Updated operating temperature range. ........ 5

## PACKAGING INFORMATION

| Orderable Device | Status (1) | Package Type | Package Drawing | Pins | Package Qty | Eco Plan (2) | Lead/Ball Finish (6) | MSL Peak Temp (3) | Op Temp (°C) | Device Marking (4/5) | Samples |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 74LVC1G123DCTRE4 | ACTIVE | SM8 | DCT | 8 | 3000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | C23 Z | Samples |
| 74LVC1G123DCTRG4 | ACTIVE | SM8 | DCT | 8 | 3000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | C23 Z | Samples |
| 74LVC1G123DCTTE4 | ACTIVE | SM8 | DCT | 8 | 250 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | C23 Z | Samples |
| 74LVC1G123DCTTG4 | ACTIVE | SM8 | DCT | 8 | 250 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | C23 Z | Samples |
| 74LVC1G123DCURE4 | ACTIVE | US8 | DCU | 8 | 3000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | (C23Q ~ C23R) | Samples |
| 74LVC1G123DCURG4 | ACTIVE | US8 | DCU | 8 | 3000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | (C23Q ~ C23R) | Samples |
| 74LVC1G123DCUTE4 | ACTIVE | US8 | DCU | 8 | 250 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | (C23Q ~ C23R) | Samples |
| 74LVC1G123DCUTG4 | ACTIVE | US8 | DCU | 8 | 250 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | (C23Q ~ C23R) | Samples |
| SN74LVC1G123DCTR | ACTIVE | SM8 | DCT | 8 | 3000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | C23 Z | Samples |
| SN74LVC1G123DCTT | ACTIVE | SM8 | DCT | 8 | 250 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | C23 Z | Samples |
| SN74LVC1G123DCUR | ACTIVE | US8 | DCU | 8 | 3000 | Green (RoHS & no Sb/Br) | CU NIPDAU \| CU SN | Level-1-260C-UNLIM | -40 to 125 | (C23Q ~ C23R) | Samples |
| SN74LVC1G123DCUT | ACTIVE | US8 | DCU | 8 | 250 | Green (RoHS & no Sb/Br) | CU NIPDAU \| CU SN | Level-1-260C-UNLIM | -40 to 125 | (C23Q ~ C23R) | Samples |
| SN74LVC1G123YZPR | ACTIVE | DSBGA | YZP | 8 | 3000 | Green (RoHS & no Sb/Br) | SNAGCU | Level-1-260C-UNLIM | -40 to 85 | (D87 ~ D8N) | Samples |

(1) The marketing status values are defined as follows:
**ACTIVE:** Product device recommended for new designs.
**LIFEBUY:** TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.
**NRND:** Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.
**PREVIEW:** Device has been announced but is not in production. Samples may or may not be available.
**OBSOLETE:** TI has discontinued the production of the device.

(2) 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)

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

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

(5) 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.

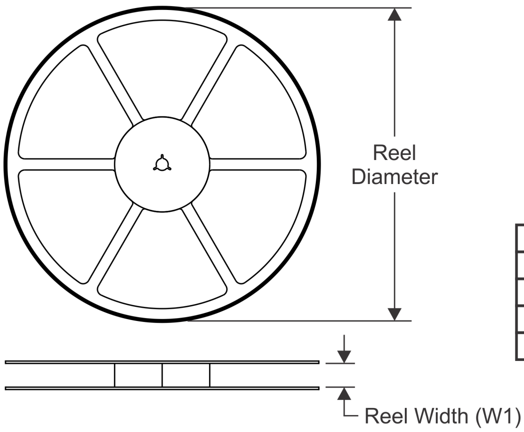
(6) Lead/Ball Finish - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead/Ball Finish values may wrap to two lines if the finish value exceeds the maximum column width.

**Important Information and Disclaimer:** The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. TI has taken and continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. TI and TI suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

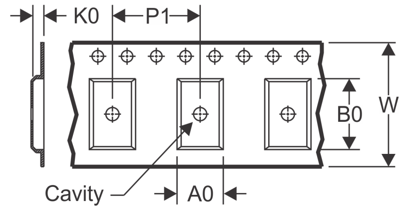
In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

## TAPE AND REEL INFORMATION

**REEL DIMENSIONS**

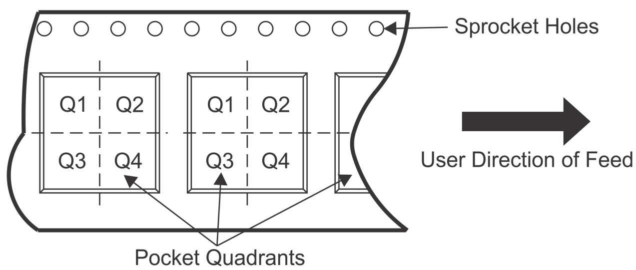



**TAPE DIMENSIONS**




| | |
|---|---|
| A0 | Dimension designed to accommodate the component width |
| B0 | Dimension designed to accommodate the component length |
| K0 | Dimension designed to accommodate the component thickness |
| W | Overall width of the carrier tape |
| P1 | Pitch between successive cavity centers |

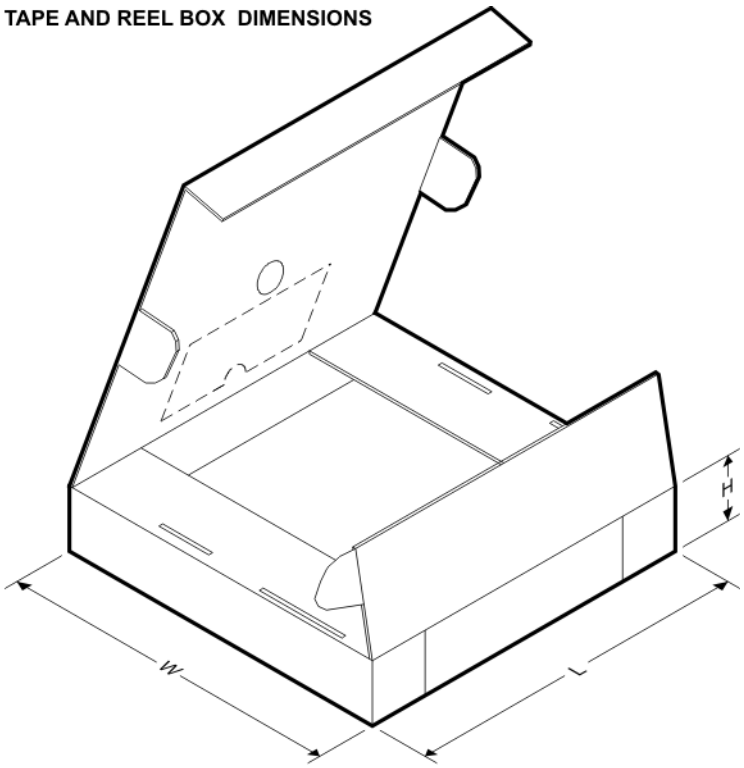
**QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE**




*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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SN74LVC1G123DCUR | US8 | DCU | 8 | 3000 | 180.0 | 8.4 | 2.25 | 3.35 | 1.05 | 4.0 | 8.0 | Q3 |
| SN74LVC1G123YZPR | DSBGA | YZP | 8 | 3000 | 178.0 | 9.2 | 1.02 | 2.02 | 0.63 | 4.0 | 8.0 | Q1 |

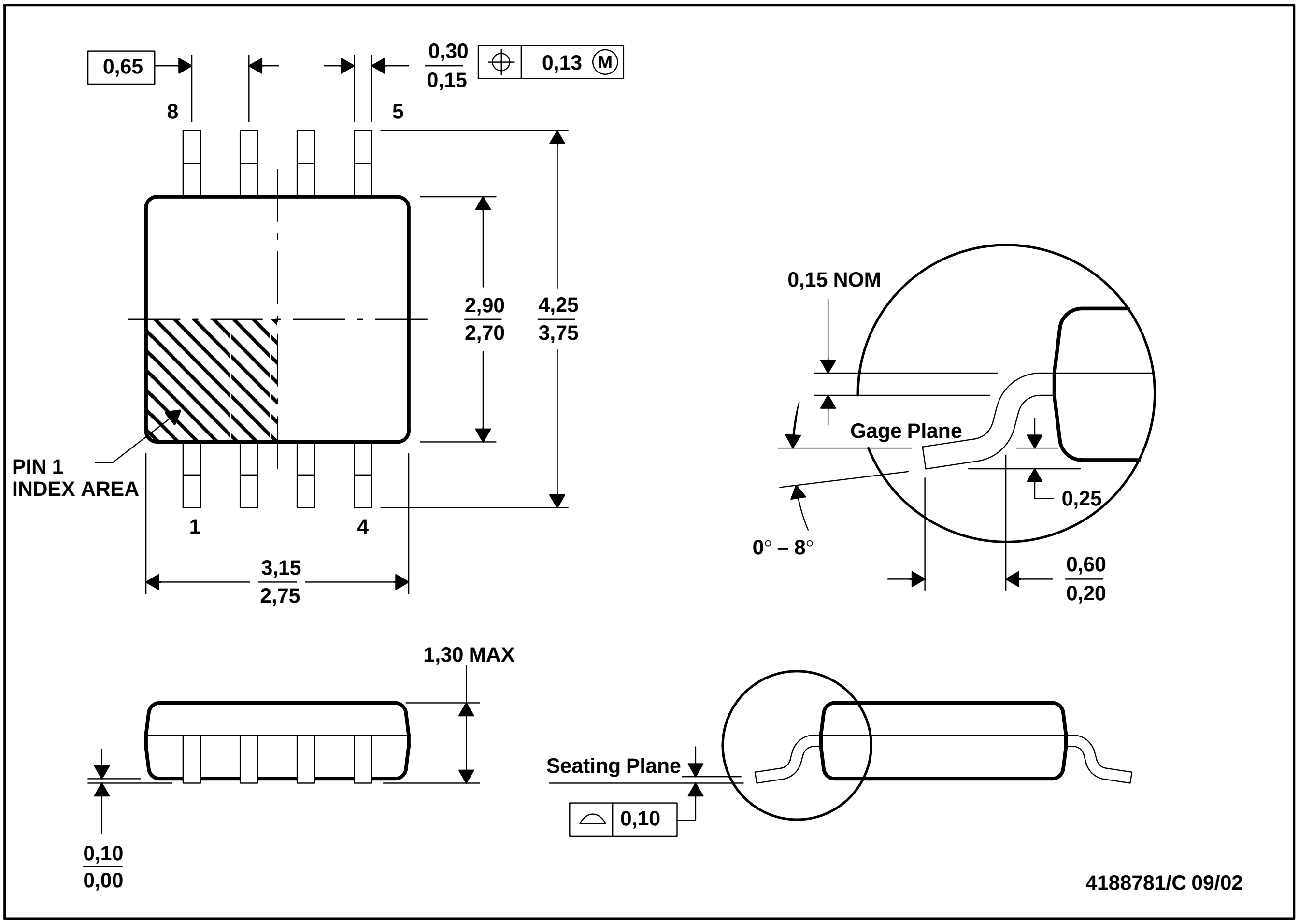
TAPE AND REEL BOX DIMENSIONS




*All dimensions are nominal

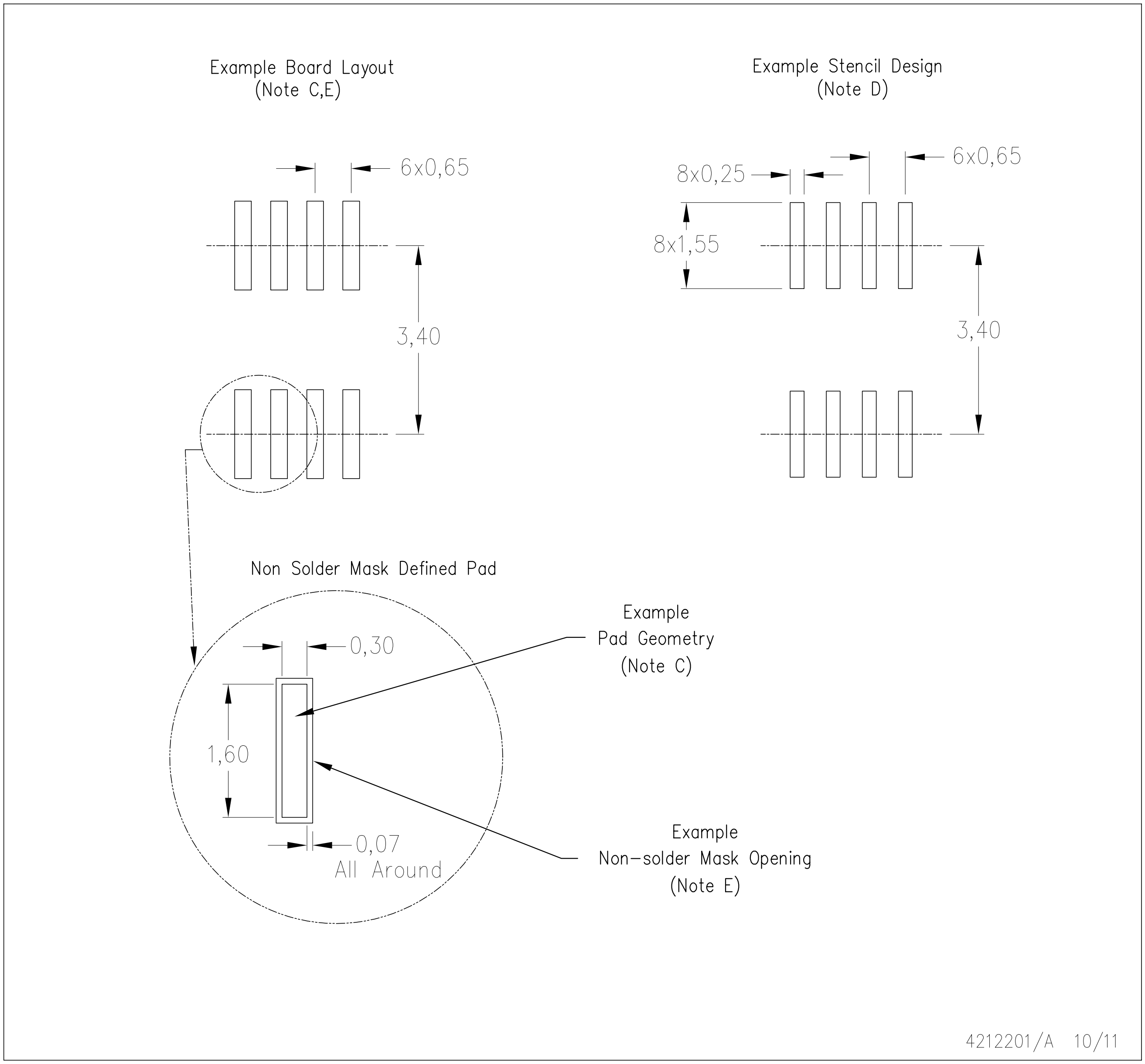
| Device | Package Type | Package Drawing | Pins | SPQ | Length (mm) | Width (mm) | Height (mm) |
|---|---|---|---|---|---|---|---|
| SN74LVC1G123DCUR | US8 | DCU | 8 | 3000 | 202.0 | 201.0 | 28.0 |
| SN74LVC1G123YZPR | DSBGA | YZP | 8 | 3000 | 220.0 | 220.0 | 35.0 |

**DCT (R-PDSO-G8)** **PLASTIC SMALL-OUTLINE PACKAGE**



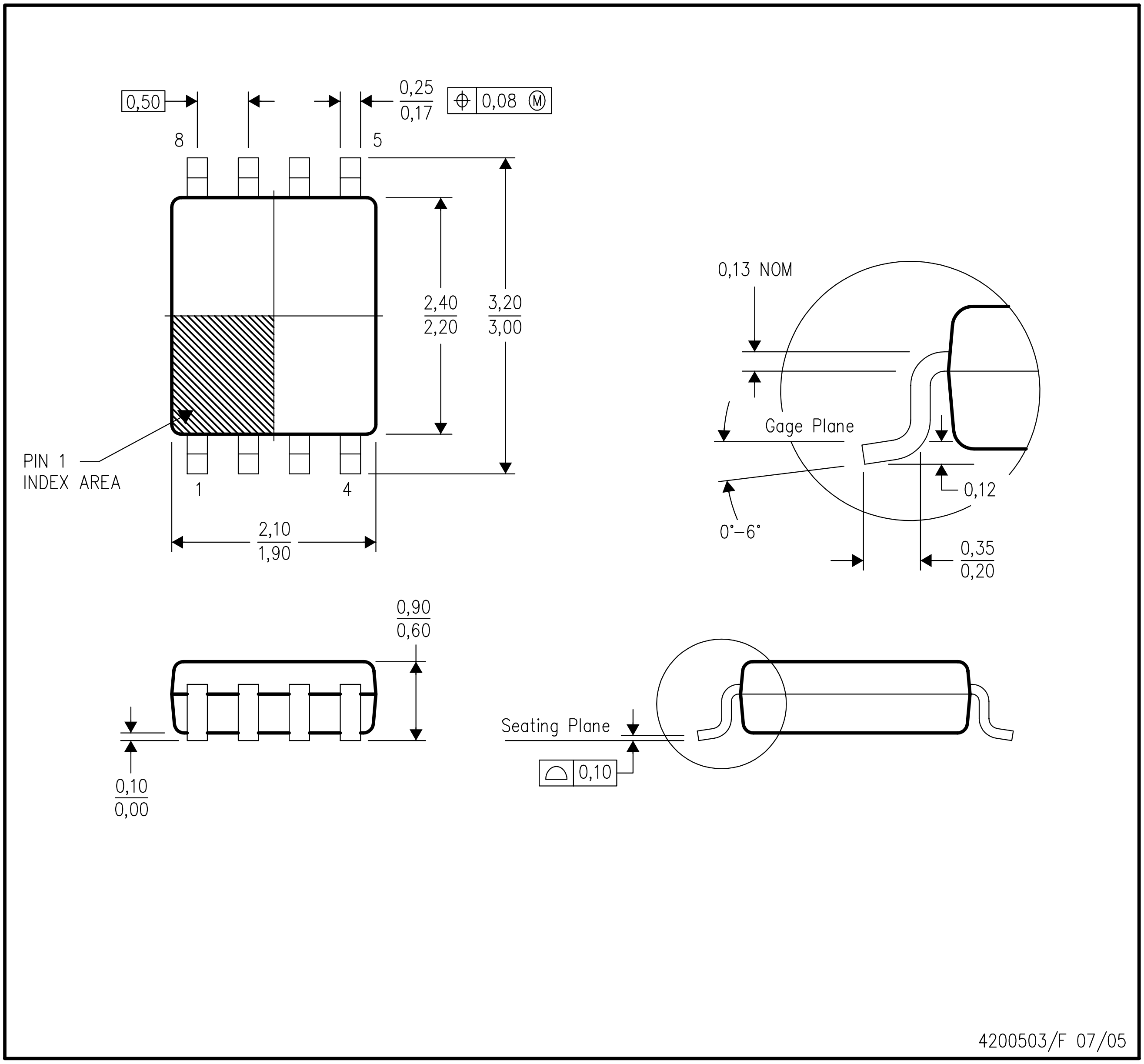

NOTES: A. All linear dimensions are in millimeters.
B. This drawing is subject to change without notice.
C. Body dimensions do not include mold flash or protrusion
D. Falls within JEDEC MO-187 variation DA.

DCT (R-PDSO-G8) PLASTIC SMALL OUTLINE



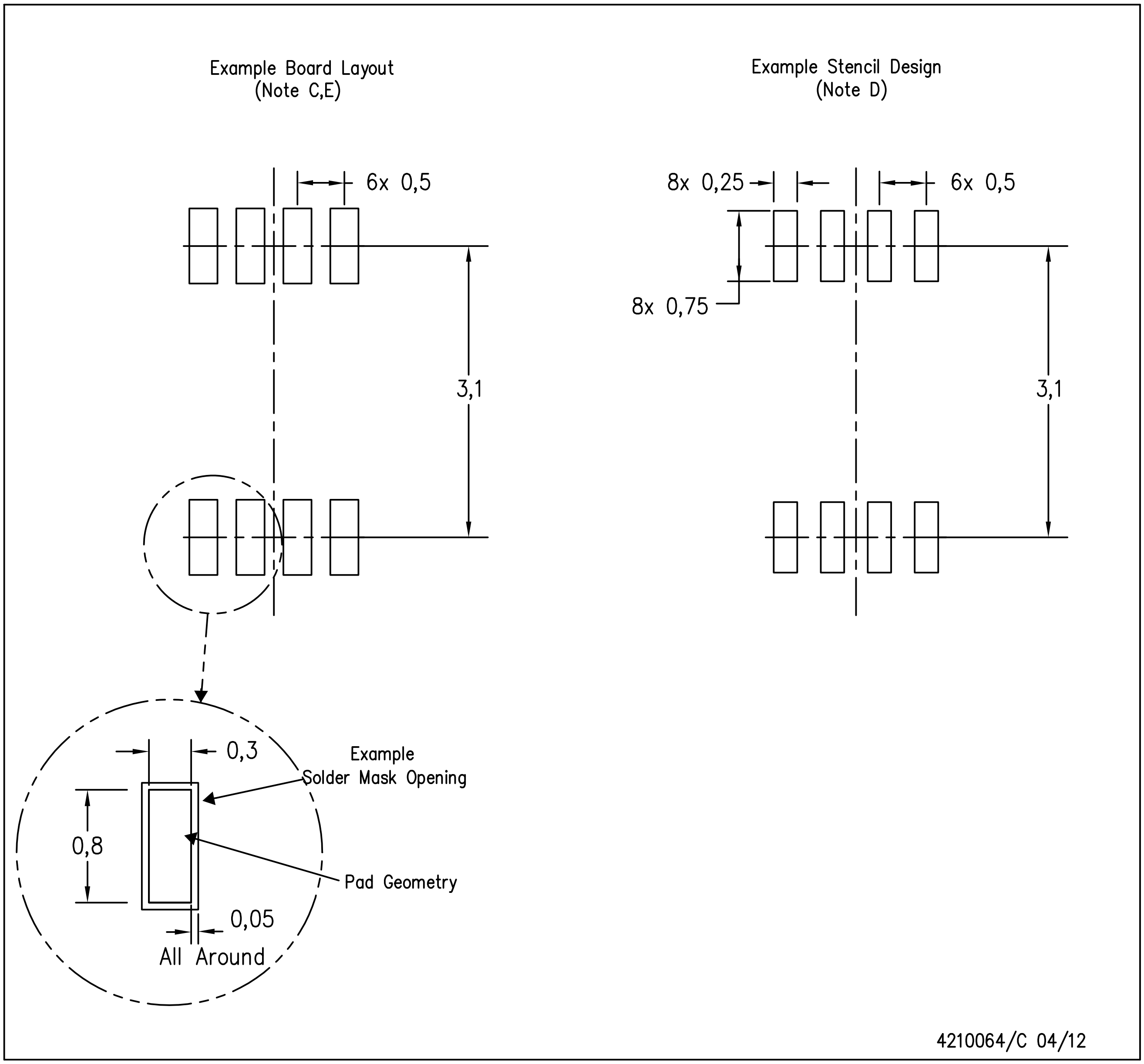

NOTES:
A. All linear dimensions are in millimeters.
B. This drawing is subject to change without notice.
C. Publication IPC-7351 is recommended for alternate designs.
D. Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC-7525.
E. Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.

## DCU (R-PDSO-G8) PLASTIC SMALL-OUTLINE PACKAGE (DIE DOWN)



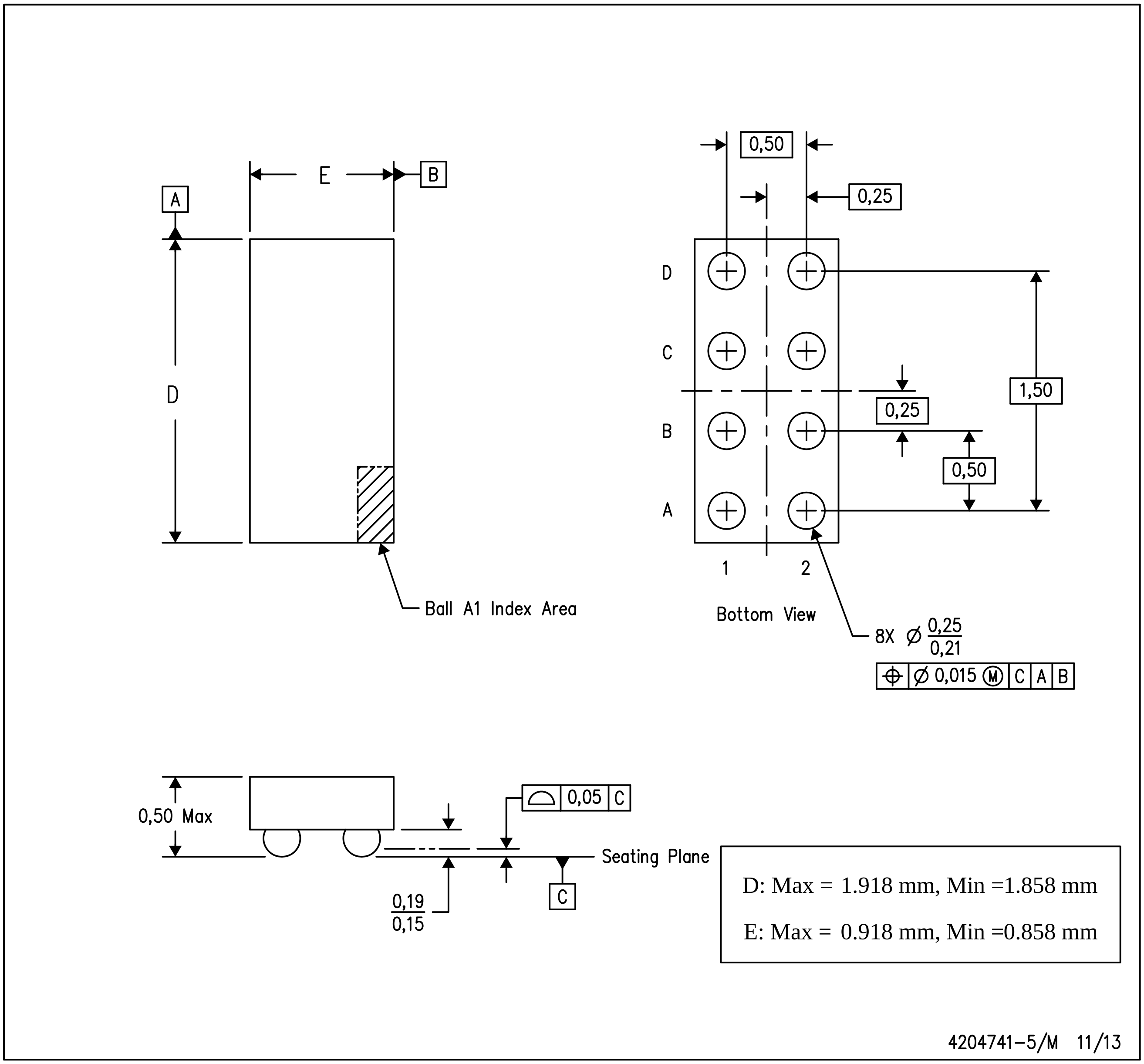

NOTES:
A. All linear dimensions are in millimeters.
B. This drawing is subject to change without notice.
C. Body dimensions do not include mold flash or protrusion. Mold flash and protrusion shall not exceed 0.15 per side.
D. Falls within JEDEC MO-187 variation CA.

DCU (S–PDSO–G8) PLASTIC SMALL OUTLINE PACKAGE (DIE DOWN)




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.

YZP (R–XBGA–N8) DIE–SIZE BALL GRID ARRAY




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. NanoFree™ package configuration.

NanoFree is a trademark of Texas Instruments.

## IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, enhancements, improvements and other changes to its semiconductor products and services per JESD46, latest issue, and to discontinue any product or service per JESD48, latest issue. Buyers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All semiconductor products (also referred to herein as “components”) are sold subject to TI’s terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its components to the specifications applicable at the time of sale, in accordance with the warranty in TI’s terms and conditions of sale of semiconductor products. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by applicable law, testing of all parameters of each component is not necessarily performed.

TI assumes no liability for applications assistance or the design of Buyers’ products. Buyers are responsible for their products and applications using TI components. To minimize the risks associated with Buyers’ products and applications, Buyers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right relating to any combination, machine, or process in which TI components or services are used. Information published by TI regarding third-party products or services does not constitute a license to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of significant portions of TI information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

Resale of TI components or services with statements different from or beyond the parameters stated by TI for that component or service voids all express and any implied warranties for the associated TI component or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

Buyer acknowledges and agrees that it is solely responsible for compliance with all legal, regulatory and safety-related requirements concerning its products, and any use of TI components in its applications, notwithstanding any applications-related information or support that may be provided by TI. Buyer represents and agrees that it has all the necessary expertise to create and implement safeguards which anticipate dangerous consequences of failures, monitor failures and their consequences, lessen the likelihood of failures that might cause harm and take appropriate remedial actions. Buyer will fully indemnify TI and its representatives against any damages arising out of the use of any TI components in safety-critical applications.

In some cases, TI components may be promoted specifically to facilitate safety-related applications. With such components, TI’s goal is to help enable customers to design and create their own end-product solutions that meet applicable functional safety standards and requirements. Nonetheless, such components are subject to these terms.

No TI components are authorized for use in FDA Class III (or similar life-critical medical equipment) unless authorized officers of the parties have executed a special agreement specifically governing such use.

Only those TI components which TI has specifically designated as military grade or “enhanced plastic” are designed and intended for use in military/aerospace applications or environments. Buyer acknowledges and agrees that any military or aerospace use of TI components which have ***not*** been so designated is solely at the Buyer's risk, and that Buyer is solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI has specifically designated certain components as meeting ISO/TS16949 requirements, mainly for automotive use. In any case of use of non-designated products, TI will not be responsible for any failure to meet ISO/TS16949.

| **Products** | | **Applications** | |
|---|---|---|---|
| Audio | www.ti.com/audio | Automotive and Transportation | www.ti.com/automotive |
| Amplifiers | amplifier.ti.com | Communications and Telecom | www.ti.com/communications |
| Data Converters | dataconverter.ti.com | Computers and Peripherals | www.ti.com/computers |
| DLP® Products | www.dlp.com | Consumer Electronics | www.ti.com/consumer-apps |
| DSP | dsp.ti.com | Energy and Lighting | www.ti.com/energy |
| Clocks and Timers | www.ti.com/clocks | Industrial | www.ti.com/industrial |
| Interface | interface.ti.com | Medical | www.ti.com/medical |
| Logic | logic.ti.com | Security | www.ti.com/security |
| Power Mgmt | power.ti.com | Space, Avionics and Defense | www.ti.com/space-avionics-defense |
| Microcontrollers | microcontroller.ti.com | Video and Imaging | www.ti.com/video |
| RFID | www.ti-rfid.com | | |
| OMAP Applications Processors | www.ti.com/omap | **TI E2E Community** | e2e.ti.com |
| Wireless Connectivity | www.ti.com/wirelessconnectivity | | |

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265