

## SN74LVC1G04 Single Inverter Gate

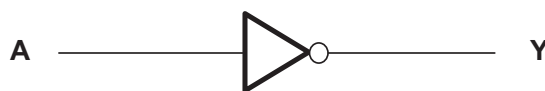
### 1 Features

- Available in the Ultra-Small 0.64-mm<sup>2</sup> Package (DPW) with 0.5-mm Pitch
- Supports 5-V  $V_{CC}$  Operation
- Inputs Accept Voltages up to 5.5 V Allowing Down Translation to  $V_{CC}$
- Max  $t_{pd}$  of 3.3 ns at 3.3-V
- Low Power Consumption, 10- $\mu$ A Max  $I_{CC}$
- $\pm 24$ -mA Output Drive at 3.3-V
- $I_{off}$  Supports Live-Insertion, Partial-Power-Down Mode, and Back-Drive Protection
- 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)

### 2 Applications

- AV Receiver
- Audio Dock: Portable
- Blu-ray Player and Home Theater
- Embedded PC
- MP3 Player/Recorder (Portable Audio)
- Personal Digital Assistant (PDA)
- Power: Telecom/Server AC/DC Supply: Single Controller: Analog and Digital
- Solid State Drive (SSD): Client and Enterprise
- TV: LCD/Digital and High-Definition (HDTV)
- Tablet: Enterprise
- Video Analytics: Server
- Wireless Headset, Keyboard, and Mouse

### 4 Simplified Schematic



### 3 Description

This single inverter gate is designed for 1.65-V to 5.5-V  $V_{CC}$  operation.

The SN74LVC1G04 device performs the Boolean function  $Y = \bar{A}$ .

The CMOS device has high output drive while maintaining low static power dissipation over a broad  $V_{CC}$  operating range.

The SN74LVC1G04 device is available in a variety of packages, including the ultra-small DPW package with a body size of 0.8 mm  $\times$  0.8 mm.

**Device Information<sup>(1)</sup>**

| DEVICE NAME | PACKAGE    | BODY SIZE             |
|-------------|------------|-----------------------|
| SN74LVC1G04 | SOT-23 (5) | 2.9mm $\times$ 1.6mm  |
|             | SC70 (5)   | 2.0mm $\times$ 1.25mm |
|             | SON (6)    | 1.45mm $\times$ 1.0mm |
|             | SON (6)    | 1.0mm $\times$ 1.0mm  |
|             | X2SON (4)  | 0.8mm $\times$ 0.8mm  |

(1) For all available packages, see the orderable addendum at the end of the datasheet.



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## 5 Revision History

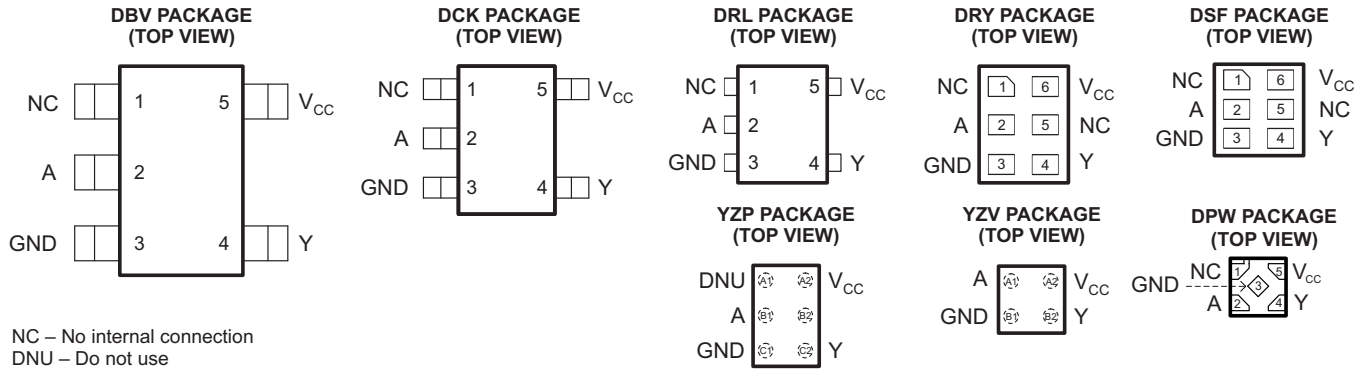
| Changes from Revision AC (March 2014) to Revision AD                | Page      |
|---------------------------------------------------------------------|-----------|
| • Updated Features, Description, and Device Information table. .... | <b>1</b>  |
| • Added Pin Functions table. ....                                   | <b>3</b>  |
| • Added Thermal Information table. ....                             | <b>5</b>  |
| • Added Detailed Description section. ....                          | <b>10</b> |
| • Added Application and Implementation section. ....                | <b>11</b> |
| • Added Power Supply Recommendations section. ....                  | <b>12</b> |
| • Added Layout section. ....                                        | <b>12</b> |

| Changes from Revision AB (October 2013) to Revision AC | Page     |
|--------------------------------------------------------|----------|
| • Added Applications. ....                             | <b>1</b> |
| • Added Device Information table. ....                 | <b>1</b> |
| • Added DPW Package. ....                              | <b>3</b> |
| • Moved $T_{stg}$ to Handling Ratings table. ....      | <b>4</b> |

| Changes from Revision AA (September 2013) to Revision AB                     | Page     |
|------------------------------------------------------------------------------|----------|
| • Updated Input Voltage Feature. ....                                        | <b>1</b> |
| • Corrected typographical error in the Operating Characteristics table. .... | <b>7</b> |

| Changes from Revision Z (November 2012) to Revision AA                                                   | Page     |
|----------------------------------------------------------------------------------------------------------|----------|
| • Removed Ordering Information table. ....                                                               | <b>1</b> |
| • Extended maximum temperature operating range from $85^{\circ}\text{C}$ to $125^{\circ}\text{C}$ . .... | <b>6</b> |

## 6 Pin Configuration and Functions



### Pin Functions

| NAME            | PIN           |          |        |     |     | DESCRIPTION    |
|-----------------|---------------|----------|--------|-----|-----|----------------|
|                 | DBV, DCK, DRL | DSF, DRY | YZP    | YZV | DPW |                |
| NC              | 1             | 1, 5     | A1, B2 | –   | 1   | No connect     |
| A               | 2             | 2        | B1     | A1  | 2   | Input          |
| GND             | 3             | 3        | C1     | B1  | 3   | Ground         |
| Y               | 4             | 4        | C2     | B2  | 4   | Output         |
| V <sub>CC</sub> | 5             | 6        | A2     | A2  | 5   | Power terminal |

## 7 Specifications

### 7.1 Absolute Maximum Ratings<sup>(1)</sup>

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

|                 |                                                                                             | MIN                | MAX                   | UNIT   |
|-----------------|---------------------------------------------------------------------------------------------|--------------------|-----------------------|--------|
| V <sub>CC</sub> | Supply voltage range                                                                        | –0.5               | 6.5                   | V      |
| V <sub>I</sub>  | Input voltage range                                                                         | –0.5               | 6.5                   | V      |
| V <sub>O</sub>  | Voltage range applied to any output in the high-impedance or power-off state <sup>(2)</sup> | –0.5               | 6.5                   | V      |
| V <sub>O</sub>  | Voltage range applied to any output in the high or low state <sup>(2)(3)</sup>              | –0.5               | V <sub>CC</sub> + 0.5 | V      |
| I <sub>IK</sub> | Input clamp current                                                                         | V <sub>I</sub> < 0 |                       | –50 mA |
| I <sub>OK</sub> | Output clamp current                                                                        | V <sub>O</sub> < 0 |                       | –50 mA |
| I <sub>O</sub>  | Continuous output current                                                                   |                    | ±50                   | mA     |
|                 | Continuous current through V <sub>CC</sub> or GND                                           |                    | ±100                  | mA     |

- (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 of V<sub>CC</sub> is provided in the *Recommended Operating Conditions* table.

### 7.2 Handling Ratings

| PARAMETER                                  | DEFINITION                                                                               | MIN | MAX | UNIT |
|--------------------------------------------|------------------------------------------------------------------------------------------|-----|-----|------|
| T <sub>stg</sub>                           | Storage temperature range                                                                | –65 | 150 | °C   |
| V <sub>(ESD)</sub> Electrostatic discharge | Human body model (HBM), per ANSI/ESDA/JEDEC JS-001, all pins <sup>(1)</sup>              | 0   | 2   | kV   |
|                                            | Charged device model (CDM), per JEDEC specification JESD22-C101, all pins <sup>(2)</sup> | 0   | 1   |      |

- (1) JEDEC document JEP155 states that 500-V HBM allows safe manufacturing with a standard ESD control process.
- (2) JEDEC document JEP157 states that 250-V CDM allows safe manufacturing with a standard ESD control process.

### 7.3 Recommended Operating Conditions<sup>(1)</sup>

|                 |                                    | MIN                                             | MAX                    | UNIT |      |
|-----------------|------------------------------------|-------------------------------------------------|------------------------|------|------|
| V <sub>CC</sub> | Supply voltage                     | Operating                                       | 1.65                   | 5.5  | V    |
|                 |                                    | Data retention only                             | 1.5                    |      |      |
| V <sub>IH</sub> | High-level input voltage           | V <sub>CC</sub> = 1.65 V to 1.95 V              | 0.65 × V <sub>CC</sub> |      | V    |
|                 |                                    | V <sub>CC</sub> = 2.3 V to 2.7 V                | 1.7                    |      |      |
|                 |                                    | V <sub>CC</sub> = 3 V to 3.6 V                  | 2                      |      |      |
|                 |                                    | V <sub>CC</sub> = 4.5 V to 5.5 V                | 0.7 × V <sub>CC</sub>  |      |      |
| V <sub>IL</sub> | Low-level input voltage            | V <sub>CC</sub> = 1.65 V to 1.95 V              | 0.35 × V <sub>CC</sub> |      | V    |
|                 |                                    | V <sub>CC</sub> = 2.3 V to 2.7 V                | 0.7                    |      |      |
|                 |                                    | V <sub>CC</sub> = 3 V to 3.6 V                  | 0.8                    |      |      |
|                 |                                    | V <sub>CC</sub> = 4.5 V to 5.5 V                | 0.3 × V <sub>CC</sub>  |      |      |
| V <sub>I</sub>  | Input voltage                      | 0                                               | 5.5                    | V    |      |
| V <sub>O</sub>  | Output voltage                     | 0                                               | V <sub>CC</sub>        | V    |      |
| I <sub>OH</sub> | High-level output current          | V <sub>CC</sub> = 1.65 V                        | −4                     |      | mA   |
|                 |                                    | V <sub>CC</sub> = 2.3 V                         | −8                     |      |      |
|                 |                                    | V <sub>CC</sub> = 3 V                           | −16                    |      |      |
|                 |                                    |                                                 | −24                    |      |      |
| I <sub>OL</sub> | Low-level output current           | V <sub>CC</sub> = 4.5 V                         | −32                    |      | mA   |
|                 |                                    | V <sub>CC</sub> = 1.65 V                        | 4                      |      |      |
|                 |                                    | V <sub>CC</sub> = 2.3 V                         | 8                      |      |      |
|                 |                                    | V <sub>CC</sub> = 3 V                           | 16                     |      |      |
| 24              |                                    |                                                 |                        |      |      |
| Δt/Δv           | Input transition rise or fall rate | V <sub>CC</sub> = 4.5 V                         | 32                     |      | ns/V |
|                 |                                    | V <sub>CC</sub> = 1.8 V ± 0.15 V, 2.5 V ± 0.2 V | 20                     |      |      |
|                 |                                    | V <sub>CC</sub> = 3.3 V ± 0.3 V                 | 10                     |      |      |
|                 |                                    | V <sub>CC</sub> = 5 V ± 0.5 V                   | 5                      |      |      |
| T <sub>A</sub>  | Operating free-air temperature     | −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](#).

### 7.4 Thermal Information

| THERMAL METRIC <sup>(1)</sup> |                                              | SN74LVC1G04 |        |        |        |        |        | UNIT |
|-------------------------------|----------------------------------------------|-------------|--------|--------|--------|--------|--------|------|
|                               |                                              | DBV         | DCK    | DRL    | DRY    | YZP    | DPW    |      |
|                               |                                              | 5 PINS      | 5 PINS | 5 PINS | 6 PINS | 5 PINS | 4 PINS |      |
| R <sub>θJA</sub>              | Junction-to-ambient thermal resistance       | 229         | 278    | 243    | 439    | 130    | 340    | °C/W |
| R <sub>θJCTop</sub>           | Junction-to-case (top) thermal resistance    | 164         | 93     | 78     | 277    | 54     | 215    |      |
| R <sub>θJB</sub>              | Junction-to-board thermal resistance         | 62          | 65     | 78     | 271    | 51     | 294    |      |
| Ψ <sub>JT</sub>               | Junction-to-top characterization parameter   | 44          | 2      | 10     | 84     | 1      | 41     |      |
| Ψ <sub>JB</sub>               | Junction-to-board characterization parameter | 62          | 64     | 77     | 271    | 50     | 294    |      |
| R <sub>θJCbott</sub>          | Junction-to-case (bottom) thermal resistance | –           | –      | –      | –      | –      | 250    |      |

(1) For more information about traditional and new thermal metrics, see the *IC Package Thermal Metrics* application report, [SPRA953](#).

## 7.5 Electrical Characteristics

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

| PARAMETER        |                                                                                 | TEST CONDITIONS               | V <sub>CC</sub> | –40°C to 85°C         |                    |     | RECOMMENDED<br>–40°C to 125°C |     |     | UNIT |
|------------------|---------------------------------------------------------------------------------|-------------------------------|-----------------|-----------------------|--------------------|-----|-------------------------------|-----|-----|------|
|                  |                                                                                 |                               |                 | MIN                   | TYP <sup>(1)</sup> | MAX | MIN                           | TYP | MAX |      |
| V <sub>OH</sub>  | I <sub>OH</sub> = –100 μA                                                       |                               | 1.65 V to 5.5 V | V <sub>CC</sub> – 0.1 |                    |     | V <sub>CC</sub> – 0.1         |     |     | V    |
|                  | I <sub>OH</sub> = –4 mA                                                         |                               | 1.65 V          | 1.2                   |                    |     | 1.2                           |     |     |      |
|                  | I <sub>OH</sub> = –8 mA                                                         |                               | 2.3 V           | 1.9                   |                    |     | 1.9                           |     |     |      |
|                  | I <sub>OH</sub> = –16 mA                                                        |                               | 3 V             | 2.4                   |                    |     | 2.4                           |     |     |      |
|                  | I <sub>OH</sub> = –24 mA                                                        |                               |                 | 2.3                   |                    |     | 2.3                           |     |     |      |
|                  | I <sub>OH</sub> = –32 mA                                                        |                               | 4.5 V           | 3.8                   |                    |     | 3.8                           |     |     |      |
| V <sub>OL</sub>  | I <sub>OL</sub> = 100 μA                                                        |                               | 1.65 V to 5.5 V | 0.1                   |                    |     | 0.1                           |     |     | V    |
|                  | I <sub>OL</sub> = 4 mA                                                          |                               | 1.65 V          | 0.45                  |                    |     | 0.45                          |     |     |      |
|                  | I <sub>OL</sub> = 8 mA                                                          |                               | 2.3 V           | 0.3                   |                    |     | 0.3                           |     |     |      |
|                  | I <sub>OL</sub> = 16 mA                                                         |                               | 3 V             | 0.4                   |                    |     | 0.4                           |     |     |      |
|                  | I <sub>OL</sub> = 24 mA                                                         |                               |                 | 0.55                  |                    |     | 0.55                          |     |     |      |
|                  | I <sub>OL</sub> = 32 mA                                                         |                               | 4.5 V           | 0.55                  |                    |     | 0.55                          |     |     |      |
| I <sub>I</sub>   | A input                                                                         | V <sub>I</sub> = 5.5 V or GND | 0 to 5.5 V      | ±5                    |                    |     | ±5                            |     |     | μA   |
| I <sub>off</sub> | V <sub>I</sub> or V <sub>O</sub> = 5.5 V                                        |                               | 0               | ±10                   |                    |     | ±10                           |     |     | μA   |
| I <sub>CC</sub>  | V <sub>I</sub> = 5.5 V or GND      I <sub>O</sub> = 0                           |                               | 1.65 V to 5.5 V | 10                    |                    |     | 10                            |     |     | μA   |
| ΔI <sub>CC</sub> | One input at V <sub>CC</sub> – 0.6 V,<br>Other inputs at V <sub>CC</sub> or GND |                               | 3 V to 5.5 V    | 500                   |                    |     | 500                           |     |     | μA   |
| C <sub>i</sub>   | V <sub>I</sub> = V <sub>CC</sub> or GND                                         |                               | 3.3 V           | 3.5                   |                    |     | 3.50                          |     |     | pF   |

(1) All typical values are at V<sub>CC</sub> = 3.3 V, T<sub>A</sub> = 25°C.

## 7.6 Switching Characteristics, C<sub>L</sub> = 15 pF

over recommended operating free-air temperature range, C<sub>L</sub> = 15 pF (unless otherwise noted)

(see Figure 3)

| PARAMETER       | FROM<br>(INPUT) | TO<br>(OUTPUT) | –40°C to 85°C                       |     |                                    |     |                                    |     |                                  |     | UNIT |
|-----------------|-----------------|----------------|-------------------------------------|-----|------------------------------------|-----|------------------------------------|-----|----------------------------------|-----|------|
|                 |                 |                | V <sub>CC</sub> = 1.8 V<br>± 0.15 V |     | V <sub>CC</sub> = 2.5 V<br>± 0.2 V |     | V <sub>CC</sub> = 3.3 V<br>± 0.3 V |     | V <sub>CC</sub> = 5 V<br>± 0.5 V |     |      |
|                 |                 |                | MIN                                 | MAX | MIN                                | MAX | MIN                                | MAX | MIN                              | MAX |      |
| t <sub>pd</sub> | A               | Y              | 2                                   | 6.4 | 1                                  | 4.2 | 0.7                                | 3.3 | 0.7                              | 3.1 | ns   |

## 7.7 Switching Characteristics, C<sub>L</sub> = 30 pF or 50 pF, –40°C to 85°C

over recommended operating free-air temperature range, C<sub>L</sub> = 30 pF or 50 pF (unless otherwise noted)

(see Figure 4)

| PARAMETER       | FROM<br>(INPUT) | TO<br>(OUTPUT) | –40°C to 85°C                       |     |                                    |     |                                    |     |                                  |     | UNIT |
|-----------------|-----------------|----------------|-------------------------------------|-----|------------------------------------|-----|------------------------------------|-----|----------------------------------|-----|------|
|                 |                 |                | V <sub>CC</sub> = 1.8 V<br>± 0.15 V |     | V <sub>CC</sub> = 2.5 V<br>± 0.2 V |     | V <sub>CC</sub> = 3.3 V<br>± 0.3 V |     | V <sub>CC</sub> = 5 V<br>± 0.5 V |     |      |
|                 |                 |                | MIN                                 | MAX | MIN                                | MAX | MIN                                | MAX | MIN                              | MAX |      |
| t <sub>pd</sub> | A               | Y              | 3                                   | 7.5 | 1.4                                | 5.2 | 1                                  | 4.2 | 1                                | 3.7 | ns   |

## 7.8 Switching Characteristics, C<sub>L</sub> = 15 pF, –40°C to 125°C

over recommended operating free-air temperature range, C<sub>L</sub> = 15 pF (unless otherwise noted)

(see Figure 3)

| PARAMETER       | FROM<br>(INPUT) | TO<br>(OUTPUT) | –40°C to 125°C                      |     |                                    |     |                                    |     |                                  |     | UNIT |
|-----------------|-----------------|----------------|-------------------------------------|-----|------------------------------------|-----|------------------------------------|-----|----------------------------------|-----|------|
|                 |                 |                | V <sub>CC</sub> = 1.8 V<br>± 0.15 V |     | V <sub>CC</sub> = 2.5 V<br>± 0.2 V |     | V <sub>CC</sub> = 3.3 V<br>± 0.3 V |     | V <sub>CC</sub> = 5 V<br>± 0.5 V |     |      |
|                 |                 |                | MIN                                 | MAX | MIN                                | MAX | MIN                                | MAX | MIN                              | MAX |      |
| t <sub>pd</sub> | A               | Y              | 2                                   | 6.4 | 1                                  | 4.2 | 0.7                                | 3.3 | 0.7                              | 3.1 | ns   |

## 7.9 Switching Characteristics, $C_L = 30\text{ pF}$ or $50\text{ pF}$ , $-40^\circ\text{C}$ to $125^\circ\text{C}$

over recommended operating free-air temperature range,  $C_L = 30\text{ pF}$  or  $50\text{ pF}$  (unless otherwise noted)  
(see Figure 4)

| PARAMETER       | FROM<br>(INPUT) | TO<br>(OUTPUT) | -40°C to 125°C                      |     |                                    |     |                                    |     |                                  |     | UNIT |
|-----------------|-----------------|----------------|-------------------------------------|-----|------------------------------------|-----|------------------------------------|-----|----------------------------------|-----|------|
|                 |                 |                | V <sub>CC</sub> = 1.8 V<br>± 0.15 V |     | V <sub>CC</sub> = 2.5 V<br>± 0.2 V |     | V <sub>CC</sub> = 3.3 V<br>± 0.3 V |     | V <sub>CC</sub> = 5 V<br>± 0.5 V |     |      |
|                 |                 |                | MIN                                 | MAX | MIN                                | MAX | MIN                                | MAX | MIN                              | MAX |      |
| t <sub>pd</sub> | A               | Y              | 3                                   | 7.5 | 1.4                                | 5.2 | 1                                  | 4.2 | 1                                | 3.7 | ns   |

## 7.10 Operating Characteristics

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

| PARAMETER                              | TEST CONDITIONS     | $V_{CC} = 1.8\text{ V}$ | $V_{CC} = 2.5\text{ V}$ | $V_{CC} = 3.3\text{ V}$ | $V_{CC} = 5.0\text{ V}$ | UNIT |
|----------------------------------------|---------------------|-------------------------|-------------------------|-------------------------|-------------------------|------|
|                                        |                     | TYP                     | TYP                     | TYP                     | TYP                     |      |
| $C_{pd}$ Power dissipation capacitance | $f = 10\text{ MHz}$ | 16                      | 18                      | 18                      | 20                      | pF   |

## 7.11 Typical Characteristics

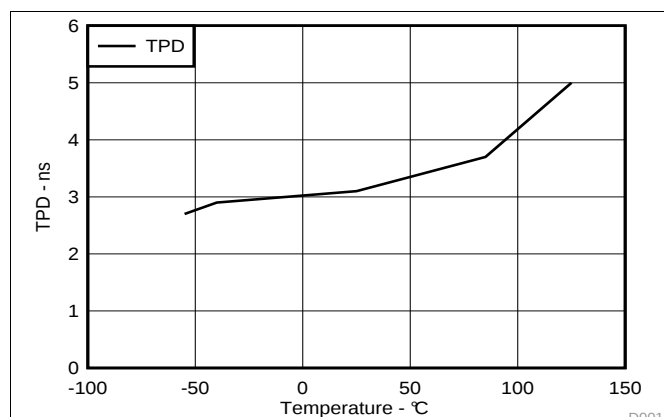


Figure 1. TPD Across Temperature at 3.3-V  $V_{CC}$

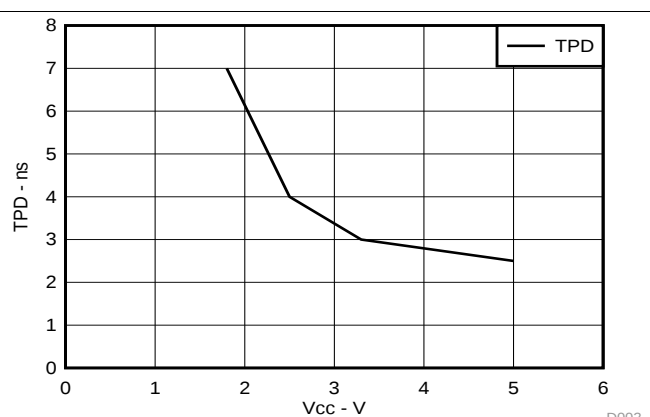
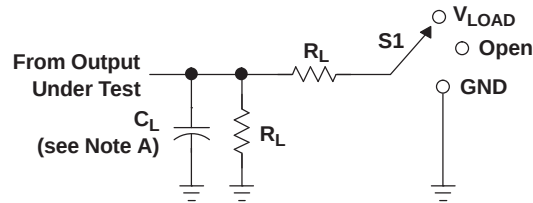


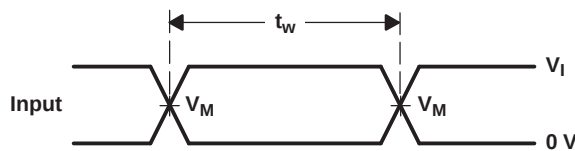
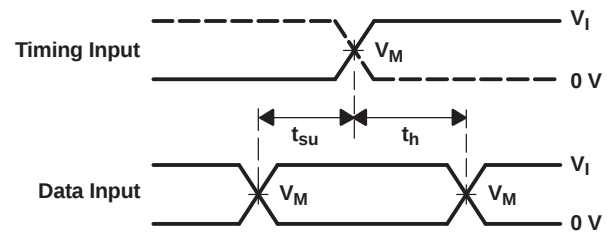
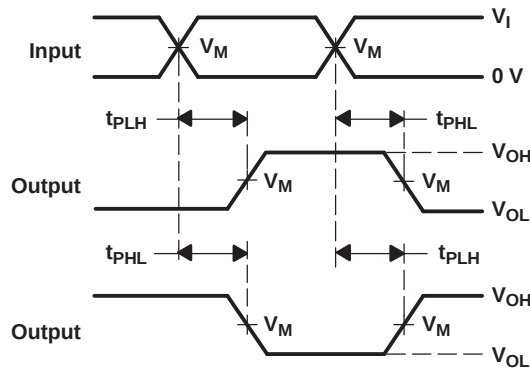
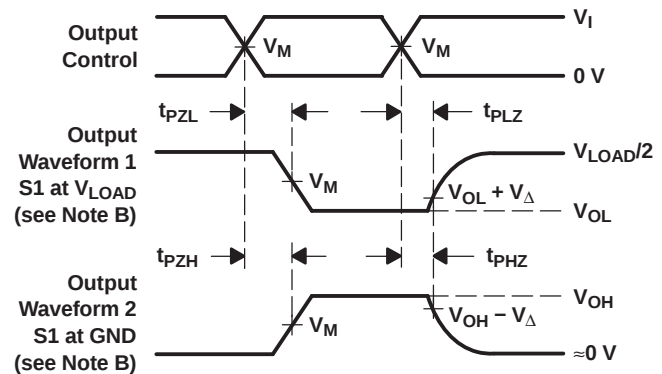
Figure 2. TPD Across  $V_{CC}$  at  $25^\circ\text{C}$

## 8 Parameter Measurement Information


**LOAD CIRCUIT**

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

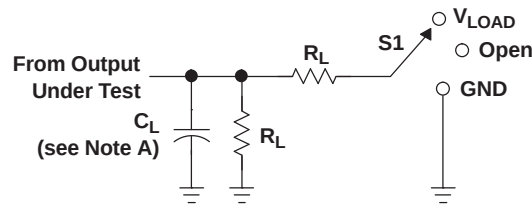
| $V_{CC}$                         | INPUTS   |                      | $V_M$      | $V_{LOAD}$        | $C_L$ | $R_L$        | $V_{\Delta}$ |
|----------------------------------|----------|----------------------|------------|-------------------|-------|--------------|--------------|
|                                  | $V_I$    | $t_r/t_f$            |            |                   |       |              |              |
| $1.8\text{ V} \pm 0.15\text{ V}$ | $V_{CC}$ | $\leq 2\text{ ns}$   | $V_{CC}/2$ | $2 \times V_{CC}$ | 15 pF | 1 M $\Omega$ | 0.15 V       |
| $2.5\text{ V} \pm 0.2\text{ V}$  | $V_{CC}$ | $\leq 2\text{ ns}$   | $V_{CC}/2$ | $2 \times V_{CC}$ | 15 pF | 1 M $\Omega$ | 0.15 V       |
| $3.3\text{ V} \pm 0.3\text{ V}$  | 3 V      | $\leq 2.5\text{ ns}$ | 1.5 V      | 6 V               | 15 pF | 1 M $\Omega$ | 0.3 V        |
| $5\text{ V} \pm 0.5\text{ V}$    | $V_{CC}$ | $\leq 2.5\text{ ns}$ | $V_{CC}/2$ | $2 \times V_{CC}$ | 15 pF | 1 M $\Omega$ | 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:
- $C_L$  includes probe and jig capacitance.
  - 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.
  - All input pulses are supplied by generators having the following characteristics:  $PRR \leq 10\text{ MHz}$ ,  $Z_O = 50\text{ }\Omega$ .
  - The outputs are measured one at a time, with one transition per measurement.
  - $t_{PLZ}$  and  $t_{PHZ}$  are the same as  $t_{dis}$ .
  - $t_{PZL}$  and  $t_{PZH}$  are the same as  $t_{en}$ .
  - $t_{PLH}$  and  $t_{PHL}$  are the same as  $t_{pd}$ .
  - All parameters and waveforms are not applicable to all devices.

**Figure 3. Load Circuit and Voltage Waveforms**

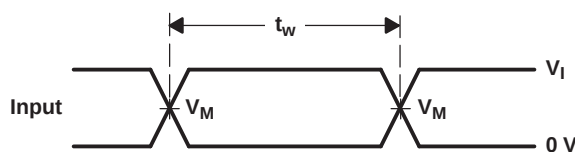
## Parameter Measurement Information (continued)



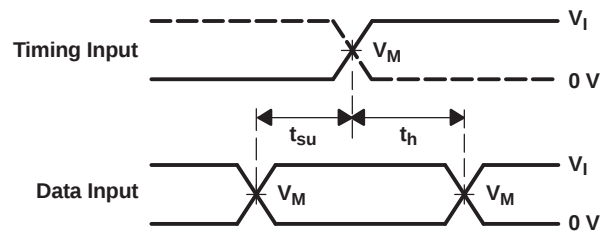
**LOAD CIRCUIT**

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

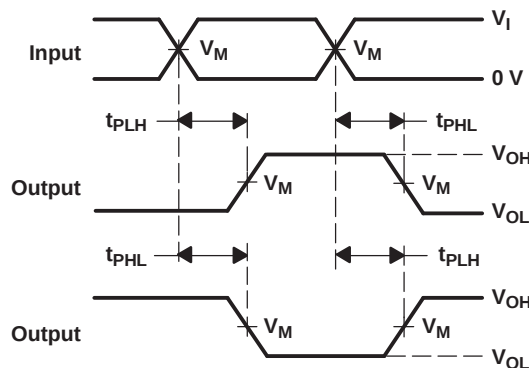
| $V_{CC}$                         | INPUTS   |                      | $V_M$      | $V_{LOAD}$        | $C_L$ | $R_L$        | $V_{\Delta}$ |
|----------------------------------|----------|----------------------|------------|-------------------|-------|--------------|--------------|
|                                  | $V_I$    | $t_r/t_f$            |            |                   |       |              |              |
| $1.8\text{ V} \pm 0.15\text{ V}$ | $V_{CC}$ | $\leq 2\text{ ns}$   | $V_{CC}/2$ | $2 \times V_{CC}$ | 30 pF | 1 k $\Omega$ | 0.15 V       |
| $2.5\text{ V} \pm 0.2\text{ V}$  | $V_{CC}$ | $\leq 2\text{ ns}$   | $V_{CC}/2$ | $2 \times V_{CC}$ | 30 pF | 500 $\Omega$ | 0.15 V       |
| $3.3\text{ V} \pm 0.3\text{ V}$  | 3 V      | $\leq 2.5\text{ ns}$ | 1.5 V      | 6 V               | 50 pF | 500 $\Omega$ | 0.3 V        |
| $5\text{ V} \pm 0.5\text{ V}$    | $V_{CC}$ | $\leq 2.5\text{ ns}$ | $V_{CC}/2$ | $2 \times V_{CC}$ | 50 pF | 500 $\Omega$ | 0.3 V        |



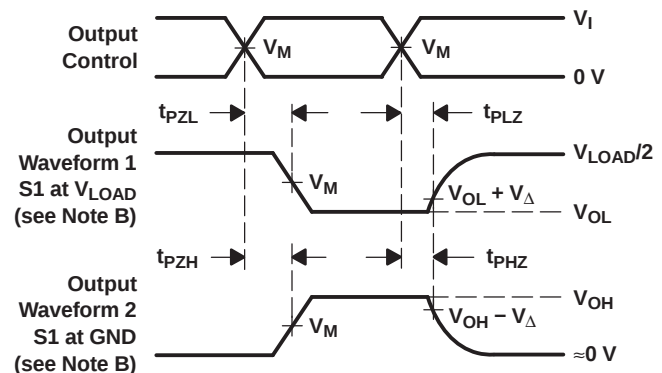
**VOLTAGE WAVEFORMS  
PULSE DURATION**



**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:
- $C_L$  includes probe and jig capacitance.
  - 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.
  - All input pulses are supplied by generators having the following characteristics:  $PRR \leq 10\text{ MHz}$ ,  $Z_O = 50\ \Omega$ .
  - The outputs are measured one at a time, with one transition per measurement.
  - $t_{PLZ}$  and  $t_{PHZ}$  are the same as  $t_{dis}$ .
  - $t_{PZL}$  and  $t_{PZH}$  are the same as  $t_{en}$ .
  - $t_{PLH}$  and  $t_{PHL}$  are the same as  $t_{pd}$ .
  - All parameters and waveforms are not applicable to all devices.

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

## 9 Detailed Description

### 9.1 Overview

The SN74LVC1G04 device contains inverter gate and performs the Boolean function  $Y = \overline{A}$ . 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.

The DPW package technology is a major breakthrough in IC packaging. Its tiny 0.64 mm square footprint saves significant board space over other package options while still retaining the traditional manufacturing friendly lead pitch of 0.5 mm.

### 9.2 Functional Block Diagram



### 9.3 Feature Description

- Wide operating voltage range.
  - Operates from 1.65 V to 5.5 V.
- Allows down voltage translation.
- Inputs accept voltages to 5.5 V.
- $I_{off}$  feature allows voltages on the inputs and outputs, when  $V_{CC}$  is 0 V.

### 9.4 Device Functional Modes

**Function Table**

| INPUT<br>A | OUTPUT<br>Y |
|------------|-------------|
| H          | L           |
| L          | H           |

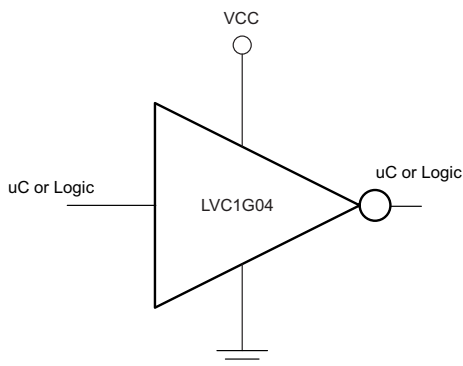
## 10 Application and Implementation

### 10.1 Application Information

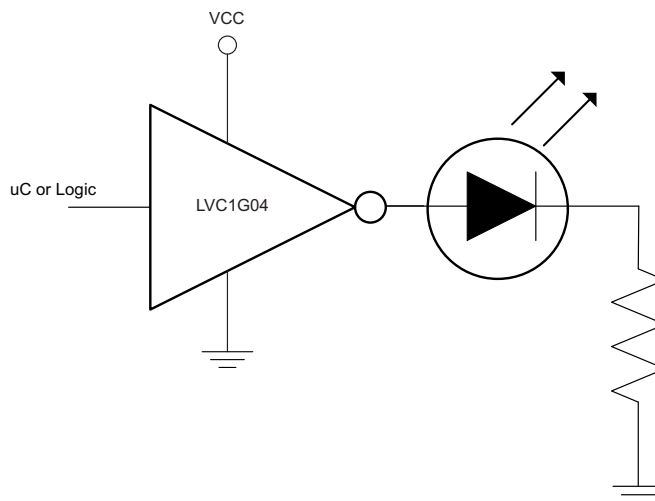
The SN74LVC1G04 is a high drive CMOS device that can be used for implementing inversion logic with a high output drive, such as an LED application. It can produce 24 mA of drive current at 3.3 V making it Ideal for driving multiple outputs and good for high speed applications up to 100 Mhz. The inputs are 5.5 V tolerant allowing it to translate down to  $V_{CC}$ .

### 10.2 Typical Application

Inverter Logic Function



Basic LED Driver



#### 10.2.1 Design Requirements

This device uses CMOS technology and has balanced output drive. Care should be taken to avoid bus contention because it can drive currents that would exceed maximum limits. The high drive will also create fast edges into light loads so routing and load conditions should be considered to prevent ringing.

#### 10.2.2 Detailed Design Procedure

##### 1. Recommended Input Conditions

- Rise time and fall time specs: See ( $\Delta t/\Delta V$ ) in the [Recommended Operating Conditions](#) table.
- Specified high and low levels: See ( $V_{IH}$  and  $V_{IL}$ ) in the [Recommended Operating Conditions](#) table.
- Inputs are overvoltage tolerant allowing them to go as high as ( $V_I$  max) in the [Recommended Operating Conditions](#) table at any valid  $V_{CC}$ .

##### 2. Recommend Output Conditions

- Load currents should not exceed ( $I_O$  max) per output and should not exceed total current (continuous current through  $V_{CC}$  or GND) for the part. These limits are located in the [Absolute Maximum Ratings](#) table.
- Outputs should not be pulled above  $V_{CC}$ .

## Typical Application (continued)

### 10.2.3 Application Curves

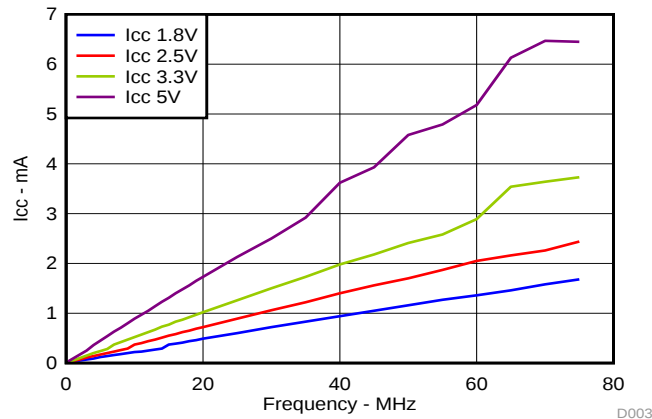


Figure 5. I<sub>CC</sub> vs Frequency

## 11 Power Supply Recommendations

The power supply can be any voltage between the min and max supply voltage rating located in the [Recommended Operating Conditions](#) table.

Each VCC pin should have a good bypass capacitor to prevent power disturbance. For devices with a single supply, a 0.1-μF capacitor is recommended. If there are multiple VCC pins, then a 0.01-μF or 0.022-μF capacitor is recommended for each power pin. It is ok to parallel multiple bypass capacitors to reject different frequencies of noise. 0.1-μF and 1-μF capacitors are commonly used in parallel. The bypass capacitor should be installed as close to the power pin as possible for best results.

## 12 Layout

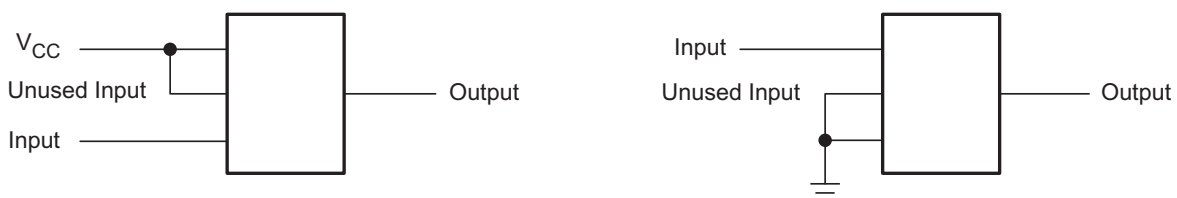
### 12.1 Layout Guidelines

When using multiple bit logic devices, inputs should never float.

In many cases, functions or parts of functions of digital logic devices are unused; for example, when only two inputs of a triple-input AND gate are used or only 3 of the 4 buffer gates are used. Such input pins should not be left unconnected because the undefined voltages at the outside connections result in undefined operational states. The rules that must be observed under all circumstances are specified in the next paragraph.

All unused inputs of digital logic devices must be connected to a high or low bias to prevent them from floating. The logic level that should be applied to any particular unused input depends on the function of the device. Generally they will be tied to GND or VCC; whichever makes more sense or is more convenient.

### 12.2 Layout Example



## 13 Device and Documentation Support

### 13.1 Trademarks

All trademarks are the property of their respective owners.

### 13.2 Electrostatic Discharge Caution



These devices have limited built-in ESD protection. The leads should be shorted together or the device placed in conductive foam during storage or handling to prevent electrostatic damage to the MOS gates.

### 13.3 Glossary

[SLYZ022](#) — *TI Glossary*.

This glossary lists and explains terms, acronyms and definitions.

## 14 Mechanical, Packaging, and Orderable Information

The following pages include mechanical packaging and orderable information. This information is the most current data available for the designated devices. This data is subject to change without notice and revision of this document. For browser-based versions of this data sheet, refer to the left-hand navigation.

**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                 |
|-------------------|---------------|--------------|--------------------|------|----------------|----------------------------|-------------------------|----------------------|--------------|------------------------------------------|-------------------------|
| SN74LVC1G04DBVR   | ACTIVE        | SOT-23       | DBV                | 5    | 3000           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -40 to 125   | (C042 ~ C045 ~<br>C04F ~ C04K ~<br>C04R) | <a href="#">Samples</a> |
| SN74LVC1G04DBVRE4 | ACTIVE        | SOT-23       | DBV                | 5    | 3000           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -40 to 125   | (C042 ~ C045 ~<br>C04F ~ C04K ~<br>C04R) | <a href="#">Samples</a> |
| SN74LVC1G04DBVRG4 | ACTIVE        | SOT-23       | DBV                | 5    | 3000           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -40 to 125   | (C042 ~ C045 ~<br>C04F ~ C04K ~<br>C04R) | <a href="#">Samples</a> |
| SN74LVC1G04DBVT   | ACTIVE        | SOT-23       | DBV                | 5    | 250            | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -40 to 125   | (C045 ~ C04F ~<br>C04K ~ C04R)           | <a href="#">Samples</a> |
| SN74LVC1G04DBVTE4 | ACTIVE        | SOT-23       | DBV                | 5    | 250            | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -40 to 125   | (C045 ~ C04F ~<br>C04K ~ C04R)           | <a href="#">Samples</a> |
| SN74LVC1G04DBVTG4 | ACTIVE        | SOT-23       | DBV                | 5    | 250            | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -40 to 125   | (C045 ~ C04F ~<br>C04K ~ C04R)           | <a href="#">Samples</a> |
| SN74LVC1G04DCKR   | ACTIVE        | SC70         | DCK                | 5    | 3000           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -40 to 125   | (CC5 ~ CCF ~ CCK ~<br>CCR)               | <a href="#">Samples</a> |
| SN74LVC1G04DCKRE4 | ACTIVE        | SC70         | DCK                | 5    | 3000           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -40 to 125   | (CC5 ~ CCF ~ CCK ~<br>CCR)               | <a href="#">Samples</a> |
| SN74LVC1G04DCKRG4 | ACTIVE        | SC70         | DCK                | 5    | 3000           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -40 to 125   | (CC5 ~ CCF ~ CCK ~<br>CCR)               | <a href="#">Samples</a> |
| SN74LVC1G04DCKT   | ACTIVE        | SC70         | DCK                | 5    | 250            | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -40 to 125   | (CC5 ~ CCF ~ CCK ~<br>CCR)               | <a href="#">Samples</a> |
| SN74LVC1G04DCKTE4 | ACTIVE        | SC70         | DCK                | 5    | 250            | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -40 to 125   | (CC5 ~ CCF ~ CCK ~<br>CCR)               | <a href="#">Samples</a> |
| SN74LVC1G04DCKTG4 | ACTIVE        | SC70         | DCK                | 5    | 250            | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -40 to 125   | (CC5 ~ CCF ~ CCK ~<br>CCR)               | <a href="#">Samples</a> |
| SN74LVC1G04DPWR   | ACTIVE        | X2SON        | DPW                | 4    | 3000           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -40 to 125   | K4                                       | <a href="#">Samples</a> |
| SN74LVC1G04DRLR   | ACTIVE        | SOT          | DRL                | 5    | 4000           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -40 to 125   | (CC7 ~ CCR)                              | <a href="#">Samples</a> |
| SN74LVC1G04DRLRG4 | ACTIVE        | SOT          | DRL                | 5    | 4000           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -40 to 125   | (CC7 ~ CCR)                              | <a href="#">Samples</a> |
| SN74LVC1G04DRY2   | ACTIVE        | SON          | DRY                | 6    | 5000           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -40 to 125   | CC                                       | <a href="#">Samples</a> |

| 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                 |
|-------------------|---------------|--------------|--------------------|------|----------------|----------------------------|-------------------------|----------------------|--------------|-------------------------|-------------------------|
| SN74LVC1G04DRYR   | ACTIVE        | SON          | DRY                | 6    | 5000           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -40 to 125   | CC                      | <a href="#">Samples</a> |
| SN74LVC1G04DRYRG4 | ACTIVE        | SON          | DRY                | 6    | 5000           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -40 to 125   | CC                      | <a href="#">Samples</a> |
| SN74LVC1G04DSF2   | ACTIVE        | SON          | DSF                | 6    | 5000           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -40 to 85    | CC                      | <a href="#">Samples</a> |
| SN74LVC1G04DSFR   | ACTIVE        | SON          | DSF                | 6    | 5000           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -40 to 125   | CC                      | <a href="#">Samples</a> |
| SN74LVC1G04YZPR   | ACTIVE        | DSBGA        | YZP                | 5    | 3000           | Green (RoHS<br>& no Sb/Br) | SNAGCU                  | Level-1-260C-UNLIM   | -40 to 85    | (CC2 ~ CC7 ~ CCN)       | <a href="#">Samples</a> |
| SN74LVC1G04YZVR   | ACTIVE        | DSBGA        | YZV                | 4    | 3000           | Green (RoHS<br>& no Sb/Br) | SNAGCU                  | Level-1-260C-UNLIM   | -40 to 85    | CC<br>(2 ~ 7)           | <a href="#">Samples</a> |

(1) The marketing status values are defined as follows:

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

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

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

**PREVIEW:** Device has been announced but is not in production. Samples may or may not be available.

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

(2) 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.

<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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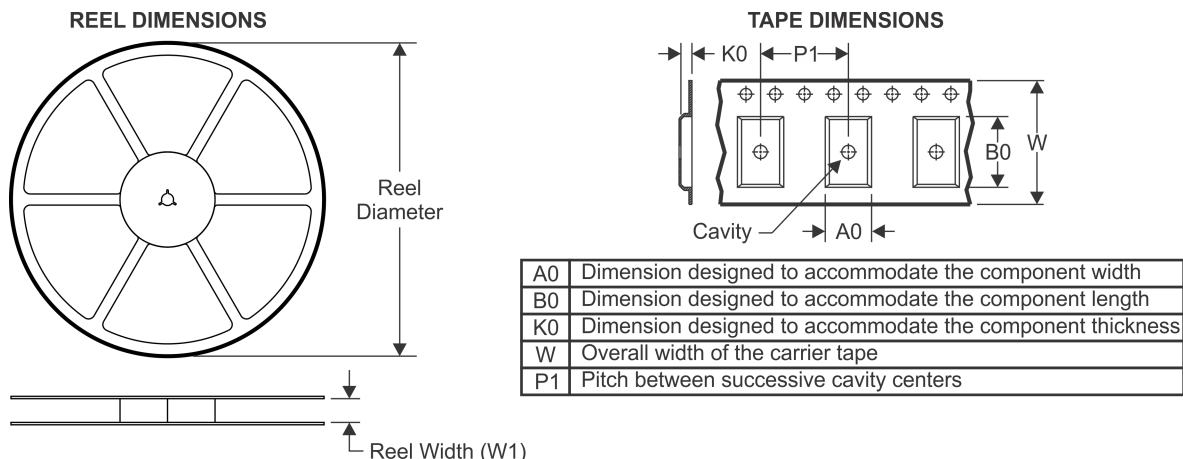
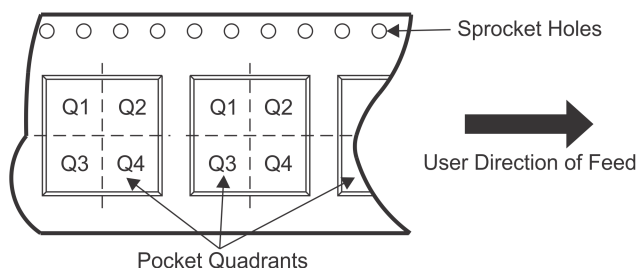
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**OTHER QUALIFIED VERSIONS OF SN74LVC1G04 :**

- Automotive: [SN74LVC1G04-Q1](#)
- Enhanced Product: [SN74LVC1G04-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

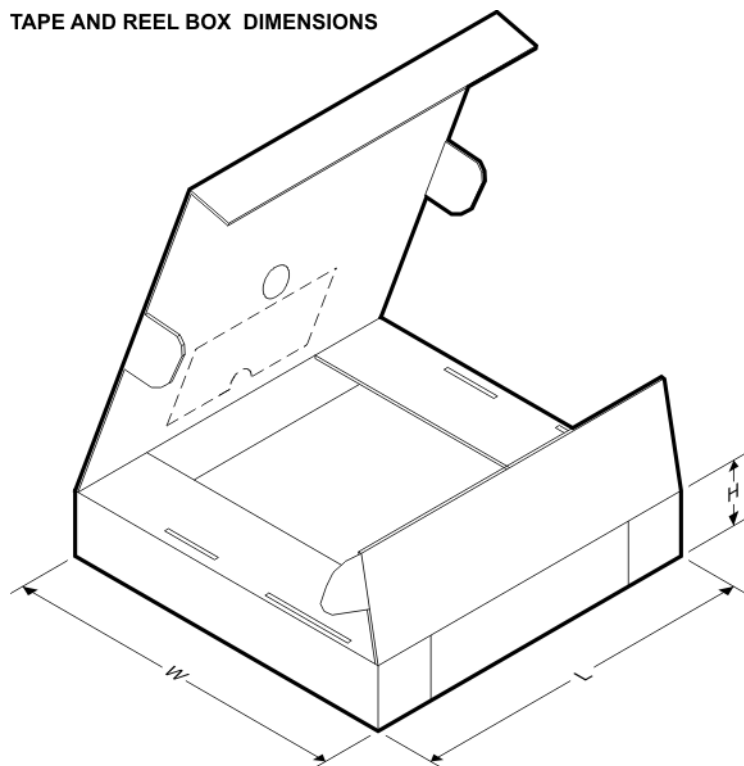
**TAPE AND REEL INFORMATION**

**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 |
|-----------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| SN74LVC1G04DBVR | SOT-23       | DBV             | 5    | 3000 | 180.0              | 9.2                | 3.17    | 3.23    | 1.37    | 4.0     | 8.0    | Q3            |
| SN74LVC1G04DBVR | SOT-23       | DBV             | 5    | 3000 | 178.0              | 9.0                | 3.23    | 3.17    | 1.37    | 4.0     | 8.0    | Q3            |
| SN74LVC1G04DBVR | SOT-23       | DBV             | 5    | 3000 | 178.0              | 9.2                | 3.3     | 3.2     | 1.55    | 4.0     | 8.0    | Q3            |
| SN74LVC1G04DBVR | SOT-23       | DBV             | 5    | 3000 | 180.0              | 8.4                | 3.23    | 3.17    | 1.37    | 4.0     | 8.0    | Q3            |
| SN74LVC1G04DBVT | SOT-23       | DBV             | 5    | 250  | 178.0              | 9.0                | 3.23    | 3.17    | 1.37    | 4.0     | 8.0    | Q3            |
| SN74LVC1G04DBVT | SOT-23       | DBV             | 5    | 250  | 178.0              | 9.2                | 3.3     | 3.2     | 1.55    | 4.0     | 8.0    | Q3            |
| SN74LVC1G04DCKR | SC70         | DCK             | 5    | 3000 | 178.0              | 9.2                | 2.4     | 2.4     | 1.22    | 4.0     | 8.0    | Q3            |
| SN74LVC1G04DCKR | SC70         | DCK             | 5    | 3000 | 180.0              | 9.2                | 2.3     | 2.55    | 1.2     | 4.0     | 8.0    | Q3            |
| SN74LVC1G04DCKR | SC70         | DCK             | 5    | 3000 | 178.0              | 9.0                | 2.4     | 2.5     | 1.2     | 4.0     | 8.0    | Q3            |
| SN74LVC1G04DCKT | SC70         | DCK             | 5    | 250  | 178.0              | 9.2                | 2.4     | 2.4     | 1.22    | 4.0     | 8.0    | Q3            |
| SN74LVC1G04DCKT | SC70         | DCK             | 5    | 250  | 178.0              | 9.0                | 2.4     | 2.5     | 1.2     | 4.0     | 8.0    | Q3            |
| SN74LVC1G04DCKT | SC70         | DCK             | 5    | 250  | 180.0              | 9.2                | 2.3     | 2.55    | 1.2     | 4.0     | 8.0    | Q3            |
| SN74LVC1G04DPWR | X2SON        | DPW             | 4    | 3000 | 180.0              | 8.4                | 0.91    | 0.91    | 0.5     | 4.0     | 8.0    | Q3            |
| SN74LVC1G04DRLR | SOT          | DRL             | 5    | 4000 | 180.0              | 8.4                | 1.98    | 1.78    | 0.69    | 4.0     | 8.0    | Q3            |
| SN74LVC1G04DRLR | SOT          | DRL             | 5    | 4000 | 180.0              | 9.5                | 1.78    | 1.78    | 0.69    | 4.0     | 8.0    | Q3            |
| SN74LVC1G04DRY2 | SON          | DRY             | 6    | 5000 | 180.0              | 9.5                | 1.6     | 1.15    | 0.75    | 4.0     | 8.0    | Q3            |
| SN74LVC1G04DRY2 | SON          | DRY             | 6    | 5000 | 180.0              | 8.4                | 1.65    | 1.2     | 0.7     | 4.0     | 8.0    | Q3            |
| SN74LVC1G04DRYR | SON          | DRY             | 6    | 5000 | 180.0              | 9.5                | 1.15    | 1.6     | 0.75    | 4.0     | 8.0    | Q1            |

| 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 |
|-----------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| SN74LVC1G04DSF2 | SON          | DSF             | 6    | 5000 | 180.0              | 9.5                | 1.16    | 1.16    | 0.5     | 4.0     | 8.0    | Q3            |
| SN74LVC1G04DSFR | SON          | DSF             | 6    | 5000 | 180.0              | 9.5                | 1.16    | 1.16    | 0.5     | 4.0     | 8.0    | Q2            |
| SN74LVC1G04YZPR | DSBGA        | YZP             | 5    | 3000 | 178.0              | 9.2                | 1.02    | 1.52    | 0.63    | 4.0     | 8.0    | Q1            |
| SN74LVC1G04YZVR | DSBGA        | YZV             | 4    | 3000 | 180.0              | 8.4                | 1.0     | 1.0     | 0.63    | 4.0     | 8.0    | Q1            |

## TAPE AND REEL BOX DIMENSIONS



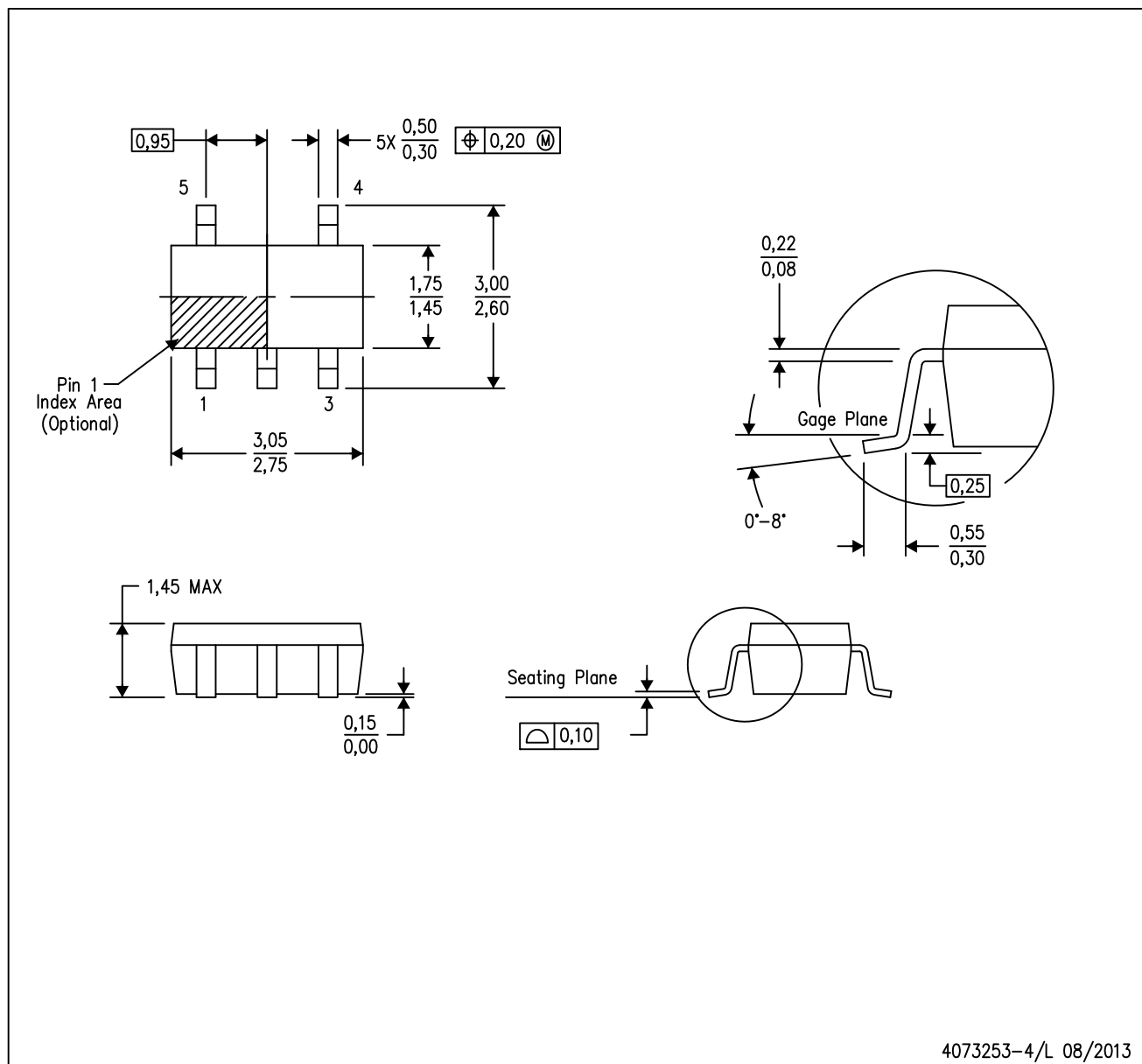
\*All dimensions are nominal

| Device          | Package Type | Package Drawing | Pins | SPQ  | Length (mm) | Width (mm) | Height (mm) |
|-----------------|--------------|-----------------|------|------|-------------|------------|-------------|
| SN74LVC1G04DBVR | SOT-23       | DBV             | 5    | 3000 | 205.0       | 200.0      | 33.0        |
| SN74LVC1G04DBVR | SOT-23       | DBV             | 5    | 3000 | 180.0       | 180.0      | 18.0        |
| SN74LVC1G04DBVR | SOT-23       | DBV             | 5    | 3000 | 180.0       | 180.0      | 18.0        |
| SN74LVC1G04DBVR | SOT-23       | DBV             | 5    | 3000 | 202.0       | 201.0      | 28.0        |
| SN74LVC1G04DBVT | SOT-23       | DBV             | 5    | 250  | 180.0       | 180.0      | 18.0        |
| SN74LVC1G04DBVT | SOT-23       | DBV             | 5    | 250  | 180.0       | 180.0      | 18.0        |
| SN74LVC1G04DCKR | SC70         | DCK             | 5    | 3000 | 180.0       | 180.0      | 18.0        |
| SN74LVC1G04DCKR | SC70         | DCK             | 5    | 3000 | 205.0       | 200.0      | 33.0        |
| SN74LVC1G04DCKR | SC70         | DCK             | 5    | 3000 | 180.0       | 180.0      | 18.0        |
| SN74LVC1G04DCKT | SC70         | DCK             | 5    | 250  | 180.0       | 180.0      | 18.0        |
| SN74LVC1G04DCKT | SC70         | DCK             | 5    | 250  | 180.0       | 180.0      | 18.0        |
| SN74LVC1G04DCKT | SC70         | DCK             | 5    | 250  | 205.0       | 200.0      | 33.0        |
| SN74LVC1G04DPWR | X2SON        | DPW             | 4    | 3000 | 205.0       | 200.0      | 33.0        |

| Device          | Package Type | Package Drawing | Pins | SPQ  | Length (mm) | Width (mm) | Height (mm) |
|-----------------|--------------|-----------------|------|------|-------------|------------|-------------|
| SN74LVC1G04DRLR | SOT          | DRL             | 5    | 4000 | 202.0       | 201.0      | 28.0        |
| SN74LVC1G04DRLR | SOT          | DRL             | 5    | 4000 | 184.0       | 184.0      | 19.0        |
| SN74LVC1G04DRY2 | SON          | DRY             | 6    | 5000 | 184.0       | 184.0      | 19.0        |
| SN74LVC1G04DRY2 | SON          | DRY             | 6    | 5000 | 202.0       | 201.0      | 28.0        |
| SN74LVC1G04DRYR | SON          | DRY             | 6    | 5000 | 184.0       | 184.0      | 19.0        |
| SN74LVC1G04DSF2 | SON          | DSF             | 6    | 5000 | 184.0       | 184.0      | 19.0        |
| SN74LVC1G04DSFR | SON          | DSF             | 6    | 5000 | 184.0       | 184.0      | 19.0        |
| SN74LVC1G04YZPR | DSBGA        | YZP             | 5    | 3000 | 220.0       | 220.0      | 35.0        |
| SN74LVC1G04YZVR | DSBGA        | YZV             | 4    | 3000 | 210.0       | 185.0      | 35.0        |

DBV (R-PDSO-G5)

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. Mold flash and protrusion shall not exceed 0.15 per side.
  - D. Falls within JEDEC MO-178 Variation AA.

DBV (R-PDSO-G5)

PLASTIC SMALL OUTLINE



- NOTES:
- A. All linear dimensions are in millimeters.
  - B. This drawing is subject to change without notice.
  - C. Customers should place a note on the circuit board fabrication drawing not to alter the center solder mask defined pad.
  - D. Publication IPC-7351 is recommended for alternate designs.
  - E. 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. Example stencil design based on a 50% volumetric metal load solder paste. Refer to IPC-7525 for other stencil recommendations.

## DCK (R-PDSO-G5)

## PLASTIC SMALL-OUTLINE PACKAGE



4093553-3/G 01/2007

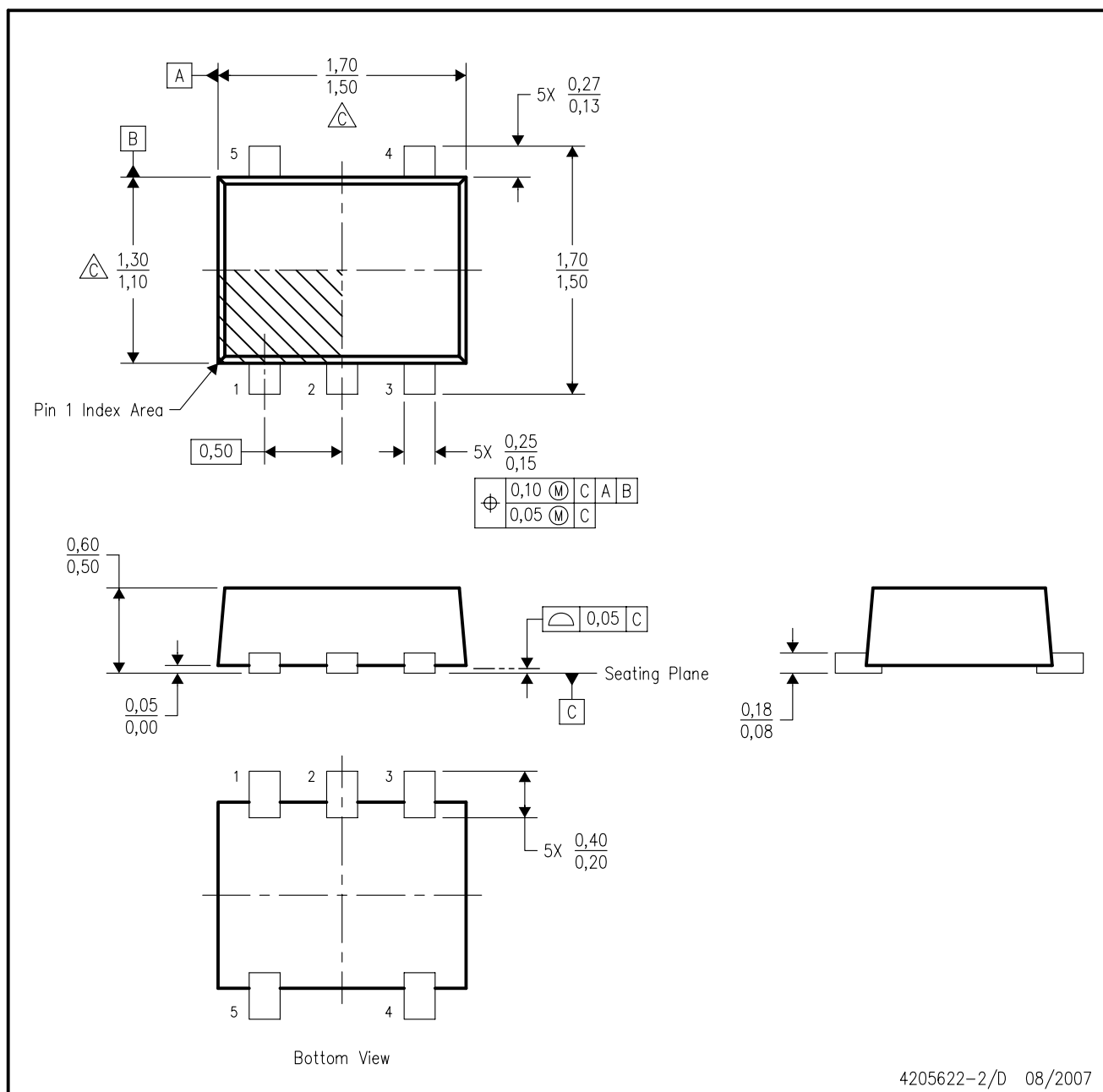
- NOTES:
- All linear dimensions are in millimeters.
  - This drawing is subject to change without notice.
  - Body dimensions do not include mold flash or protrusion. Mold flash and protrusion shall not exceed 0.15 per side.
  - Falls within JEDEC MO-203 variation AA.

DCK (R-PDSO-G5)

PLASTIC SMALL OUTLINE



- NOTES:
- A. All linear dimensions are in millimeters.
  - B. This drawing is subject to change without notice.
  - C. Customers should place a note on the circuit board fabrication drawing not to alter the center solder mask defined pad.
  - D. Publication IPC-7351 is recommended for alternate designs.
  - E. 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. Example stencil design based on a 50% volumetric metal load solder paste. Refer to IPC-7525 for other stencil recommendations.



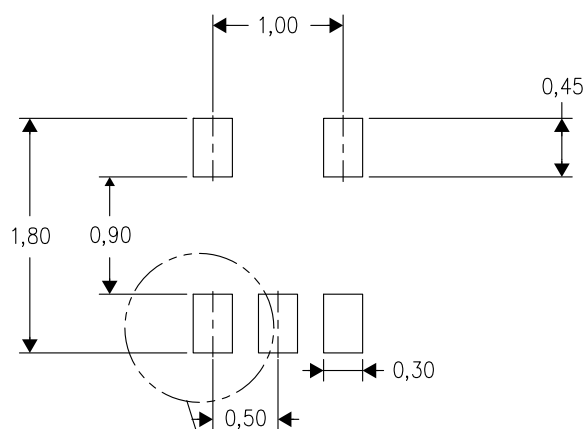
4205622-2/D 08/2007

- 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 dimensions do not include mold flash, interlead flash, protrusions, or gate burrs. Mold flash, interlead flash, protrusions, or gate burrs shall not exceed 0,15 per end or side.
  - D. JEDEC package registration is pending.

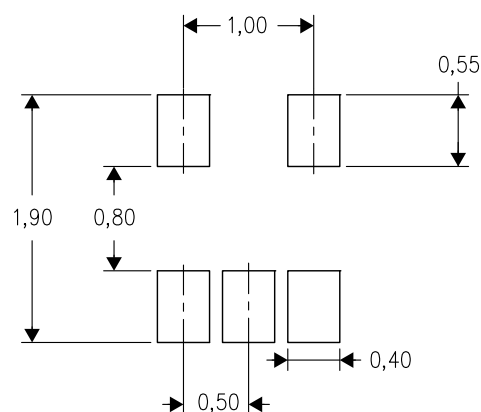
DRL (R-PDSO-N5)

PLASTIC SMALL OUTLINE

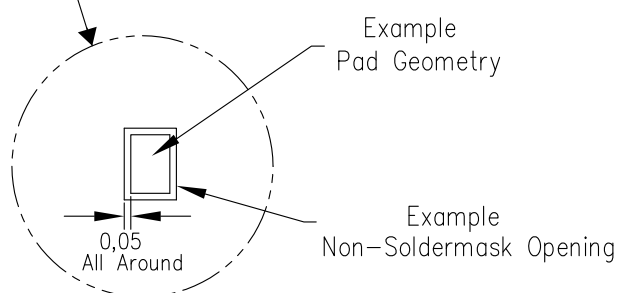
Example Board Layout



Example Stencil Design  
(Note E)



Example  
Non-Soldermask Defined Pad



Example  
Pad Geometry

Example  
Non-Soldermask Opening

4208207-2/E 06/12

- 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. Customers should contact their board fabrication site for minimum solder mask web tolerances between signal pads.
  - E. Maximum stencil thickness 0,127 mm (5 mils). All linear dimensions are in millimeters.
  - F. 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.
  - G. Side aperture dimensions over-print land for acceptable area ratio > 0.66. Customer may reduce side aperture dimensions if stencil manufacturing process allows for sufficient release at smaller opening.

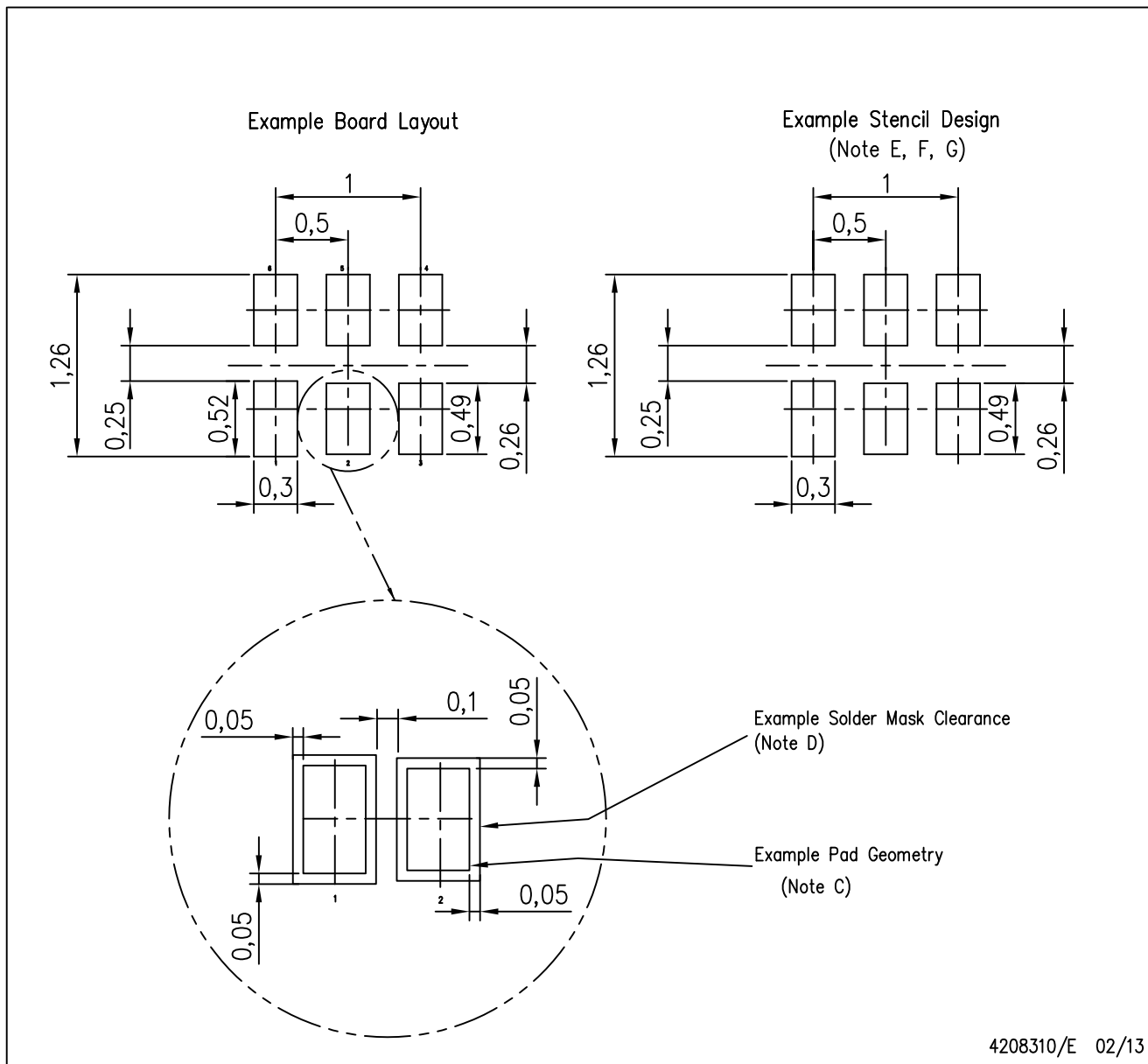


4207181/F 12/11

- 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. SON (Small Outline No-Lead) package configuration.
  -  D. The exposed lead frame feature on side of package may or may not be present due to alternative lead frame designs.
  - E. This package complies to JEDEC MO-287 variation UFAD.
  -  F. See the additional figure in the Product Data Sheet for details regarding the pin 1 identifier shape.

DRY (R-PUSON-N6)

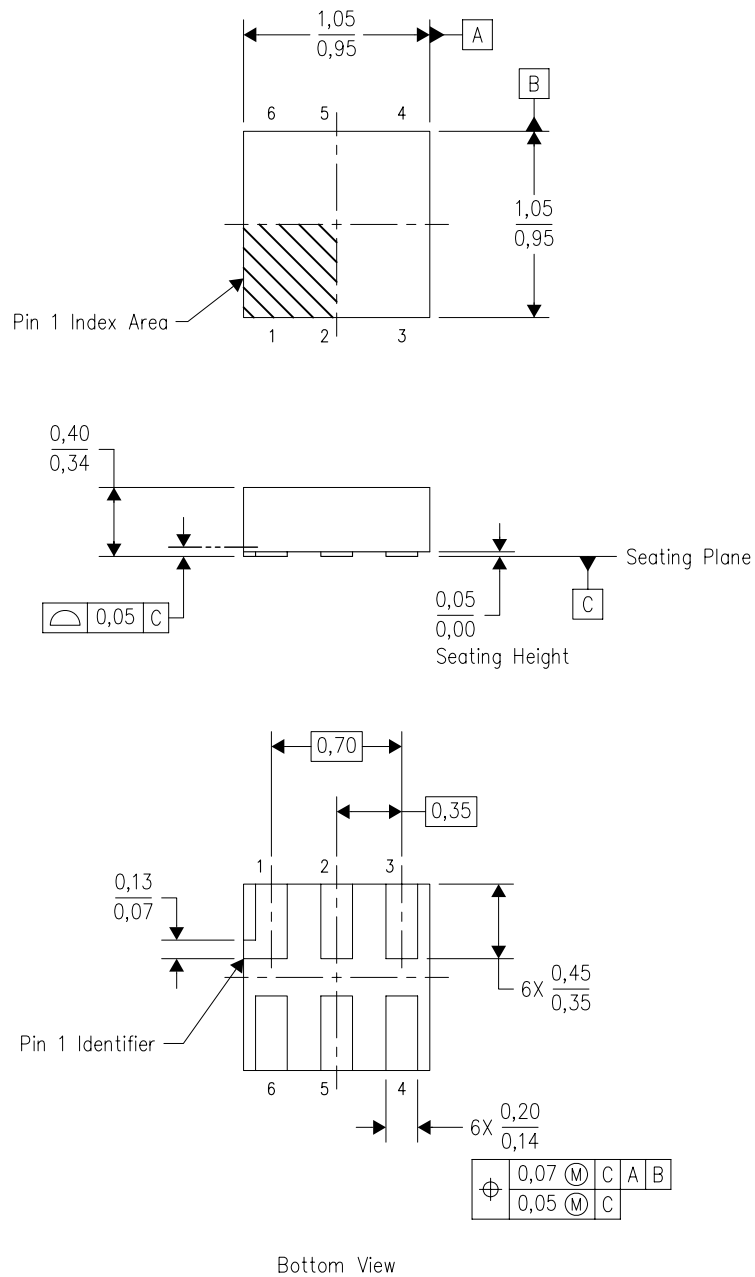
PLASTIC SMALL OUTLINE NO-LEAD



- 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. Customers should contact their board fabrication site for minimum solder mask web tolerances between signal pads.
  - E. Maximum stencil thickness 0,127 mm (5 mils). All linear dimensions are in millimeters.
  - F. 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.
  - G. Side aperture dimensions over-print land for acceptable area ratio > 0.66. Customer may reduce side aperture dimensions if stencil manufacturing process allows for sufficient release at smaller opening.

DSF (S-PX2SON-N6)

PLASTIC SMALL OUTLINE NO-LEAD

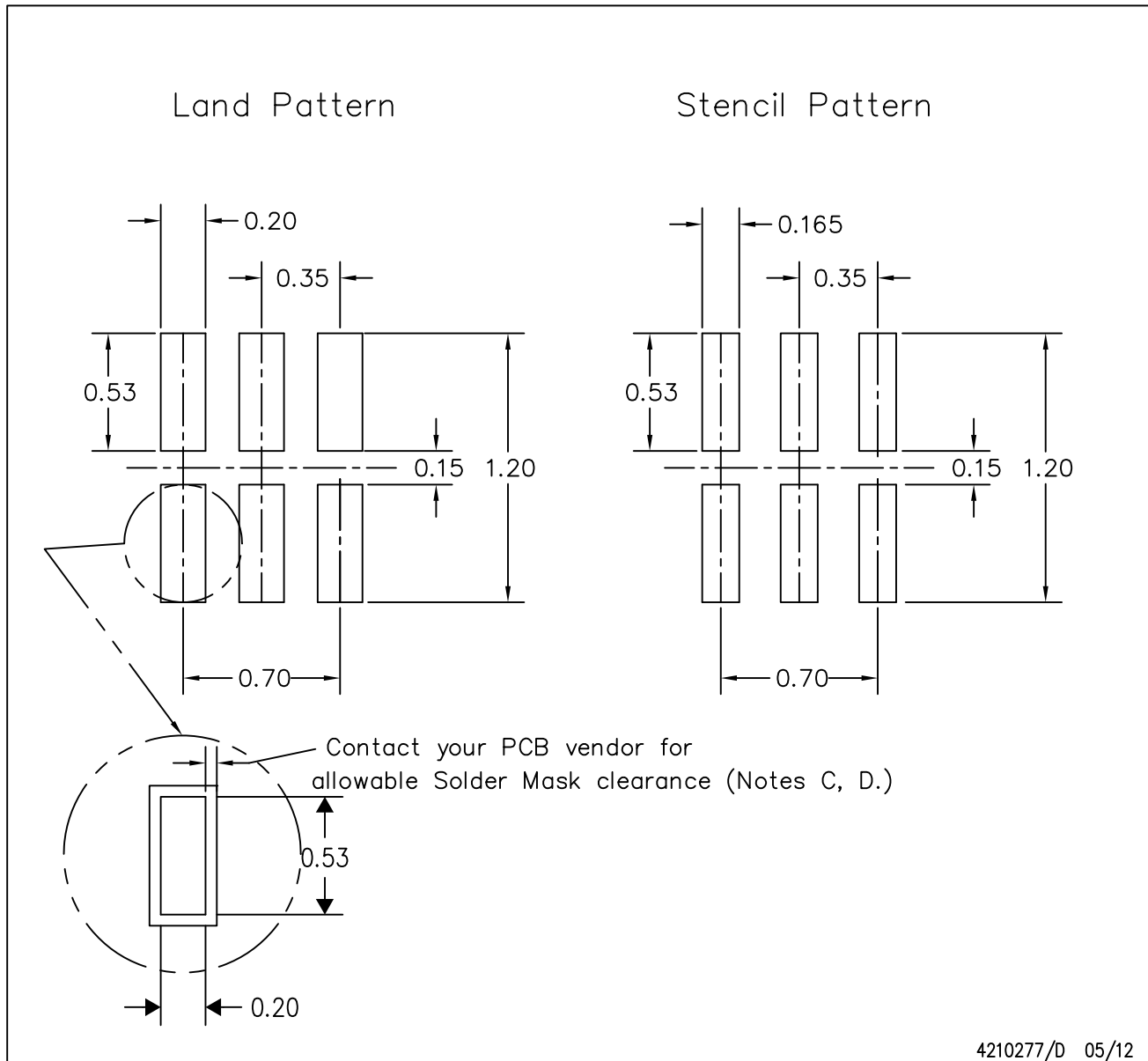


4208186/E 03/11

- 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. SON (Small Outline No-Lead) package configuration.
  - D. This package complies to JEDEC MO-287 variation X2AAF.

DSF (S-PX2SON-N6)

PLASTIC SMALL OUTLINE NO-LEAD

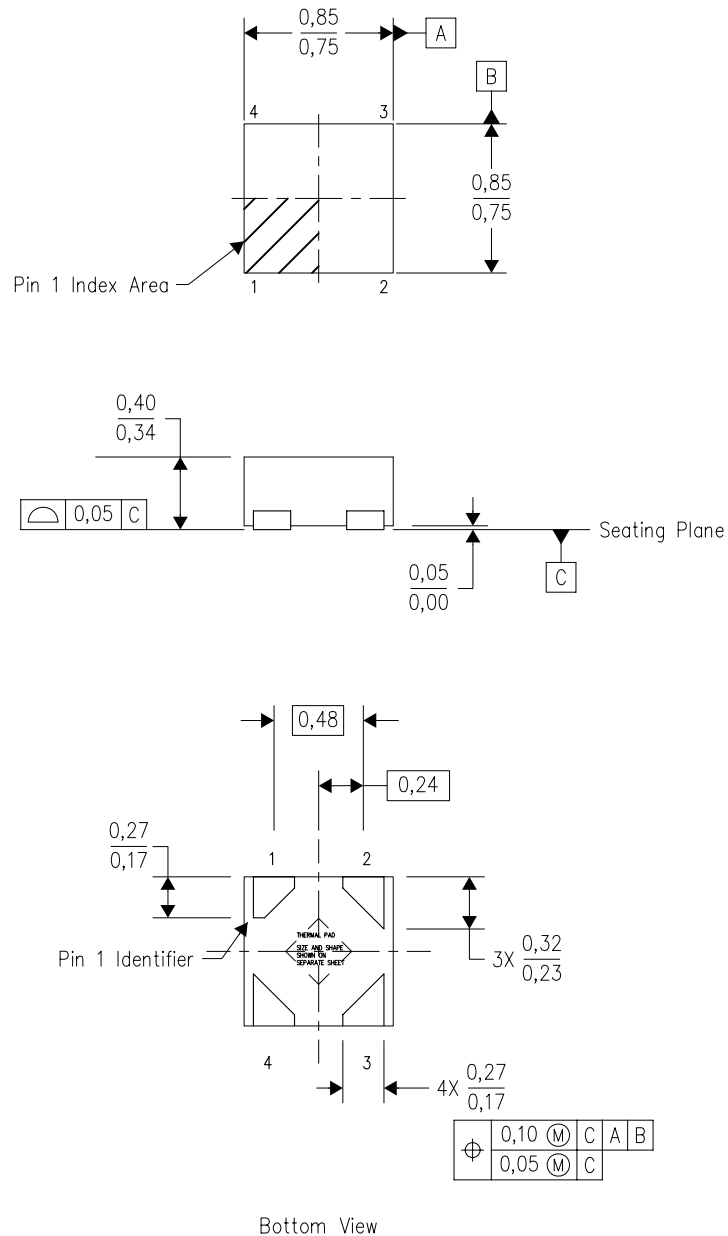


4210277/D 05/12

- 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. Customers should contact their board fabrication site for minimum solder mask web tolerances between signal pads. If 2 mil solder mask is outside PCB vendor capability, it is advised to omit solder mask.
  - E. Maximum stencil thickness 0,1016 mm (4 mils). All linear dimensions are in millimeters.
  - F. 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.
  - G. Suggest stencils cut with lasers such as Fiber Laser that produce the greatest positional accuracy.
  - H. Component placement force should be minimized to prevent excessive paste block deformation.

DPW (S-PX2SON-N4)

PLASTIC SMALL OUTLINE NO-LEAD



4211218/C 05/11

- NOTES:
- All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M-1994.
  - This drawing is subject to change without notice.
  - SON (Small Outline 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.

DPW (S-PX2SON-N4)

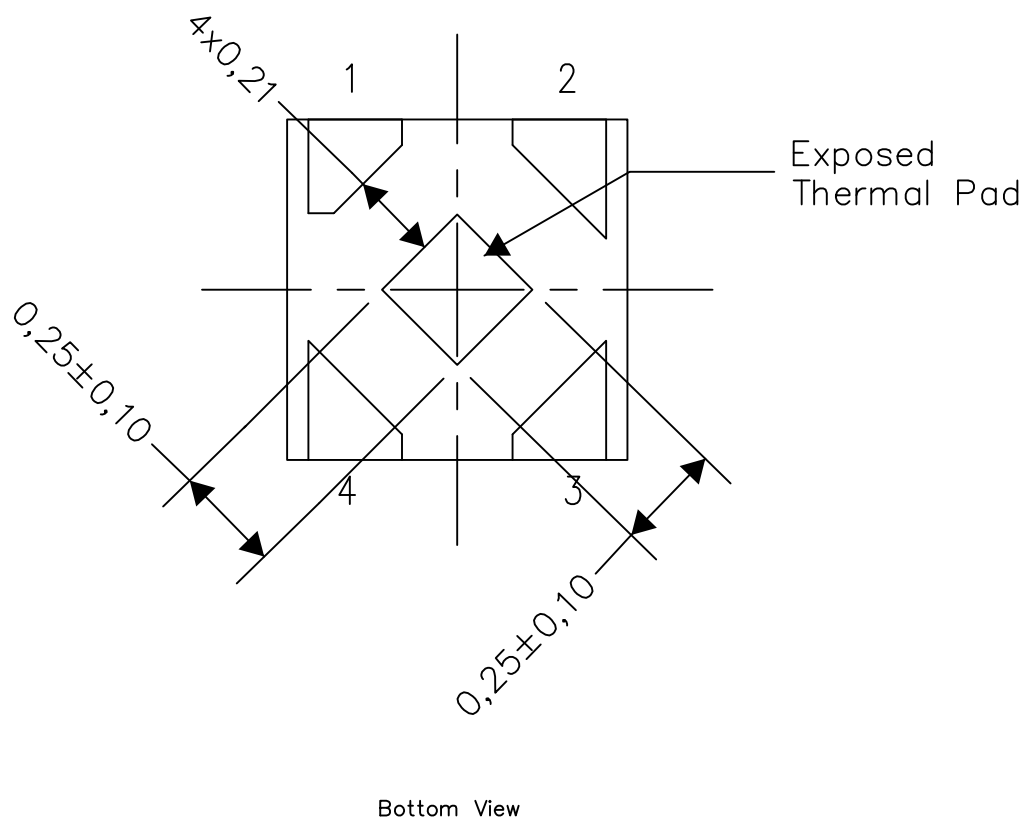
PLASTIC SMALL OUTLINE NO-LEAD

## 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.



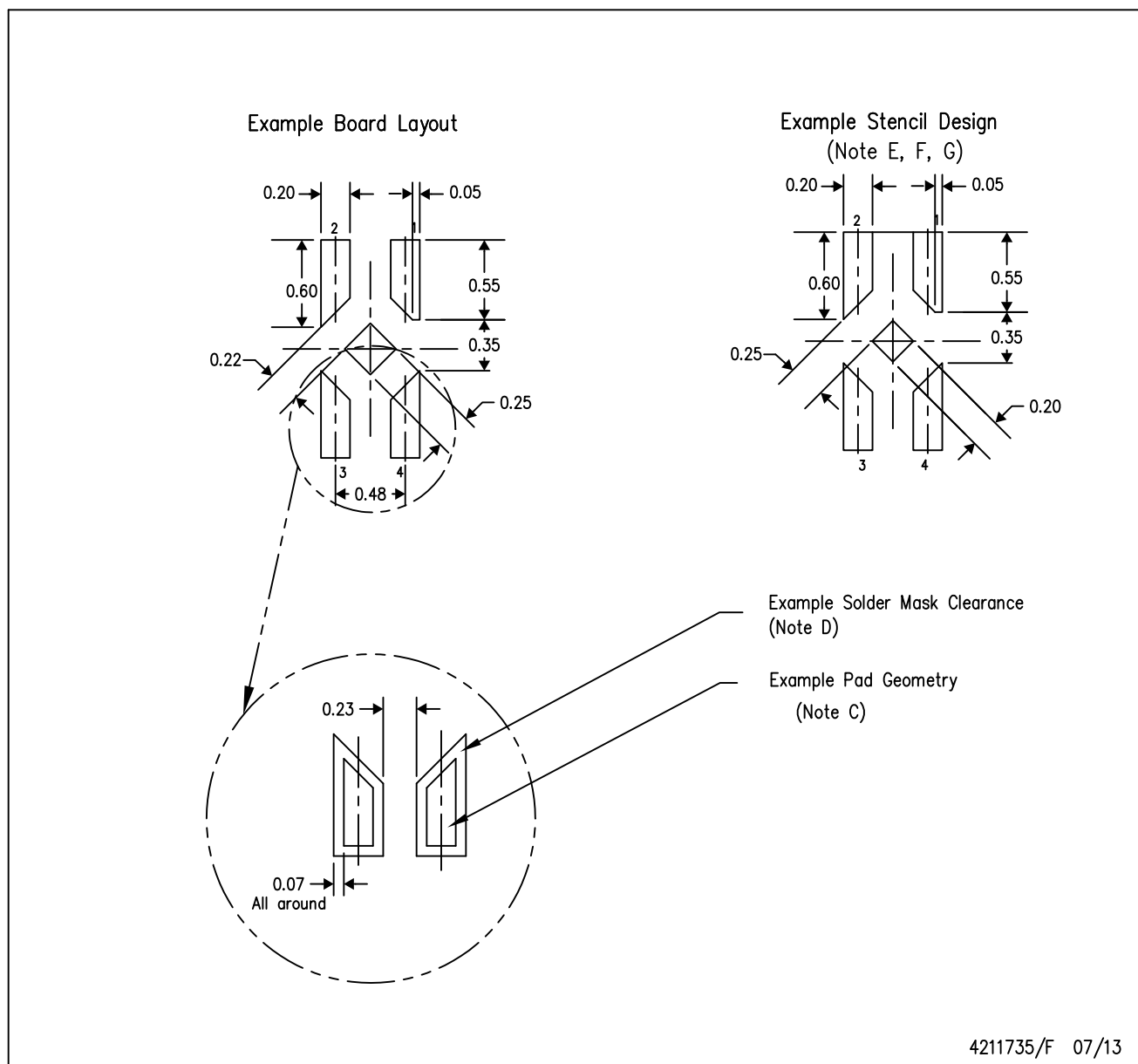
Exposed Thermal Pad Dimensions

4211578/G 07/13

NOTES: All linear dimensions are in millimeters

DPW (S-PX2SON-N4)

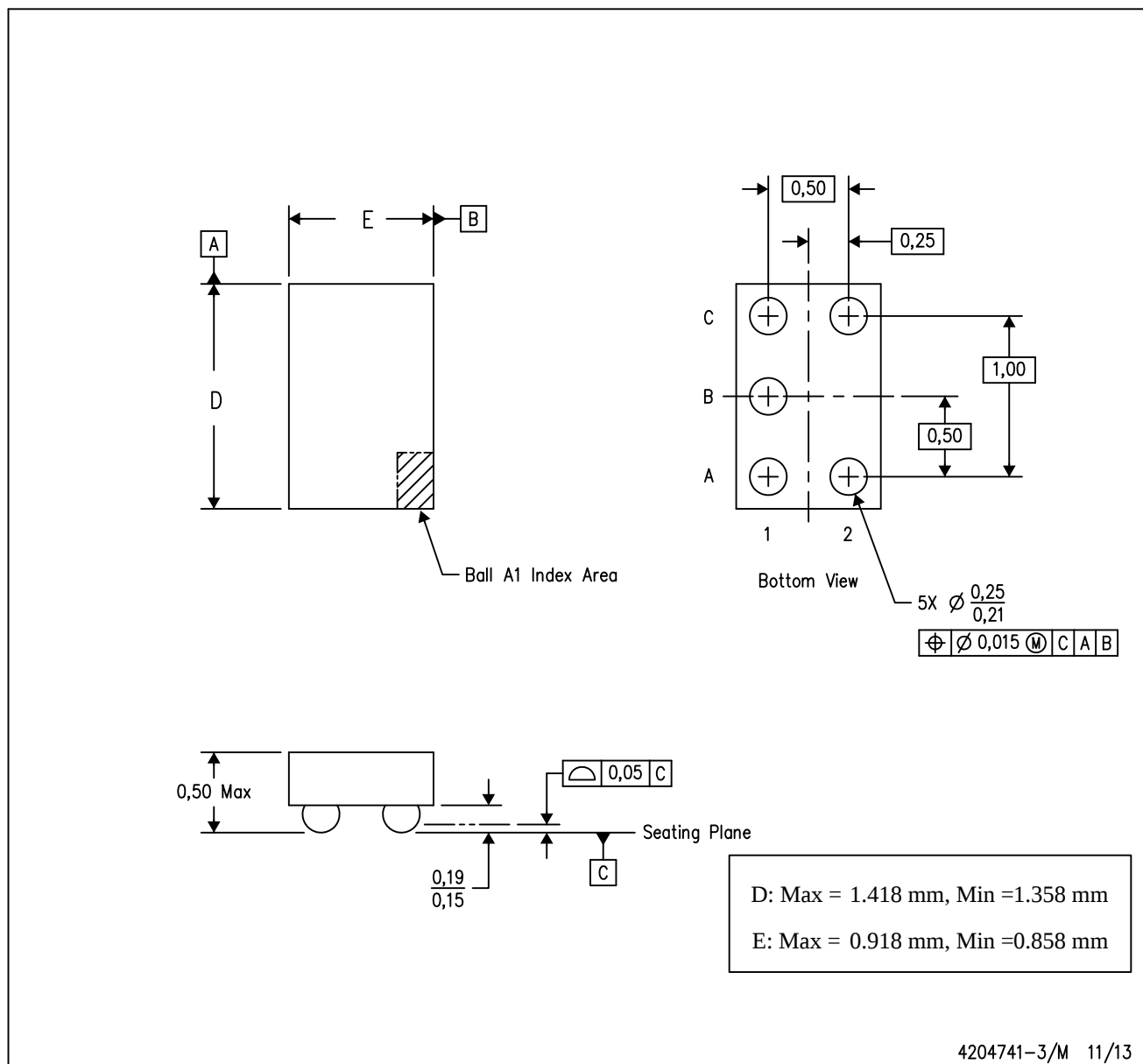
PLASTIC SMALL OUTLINE NO-LEAD



- 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. Customers should contact their board fabrication site for minimum solder mask web tolerances between signal pads.
  - E. Maximum stencil thickness 0,127 mm (5 mils). All linear dimensions are in millimeters.
  - F. 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.
  - G. Side aperture dimensions over-print land for acceptable area ratio > 0.66. Customer may reduce side aperture dimensions if stencil manufacturing process allows for sufficient release at smaller opening.

YZP (R-XBGA-N5)

DIE-SIZE BALL GRID ARRAY

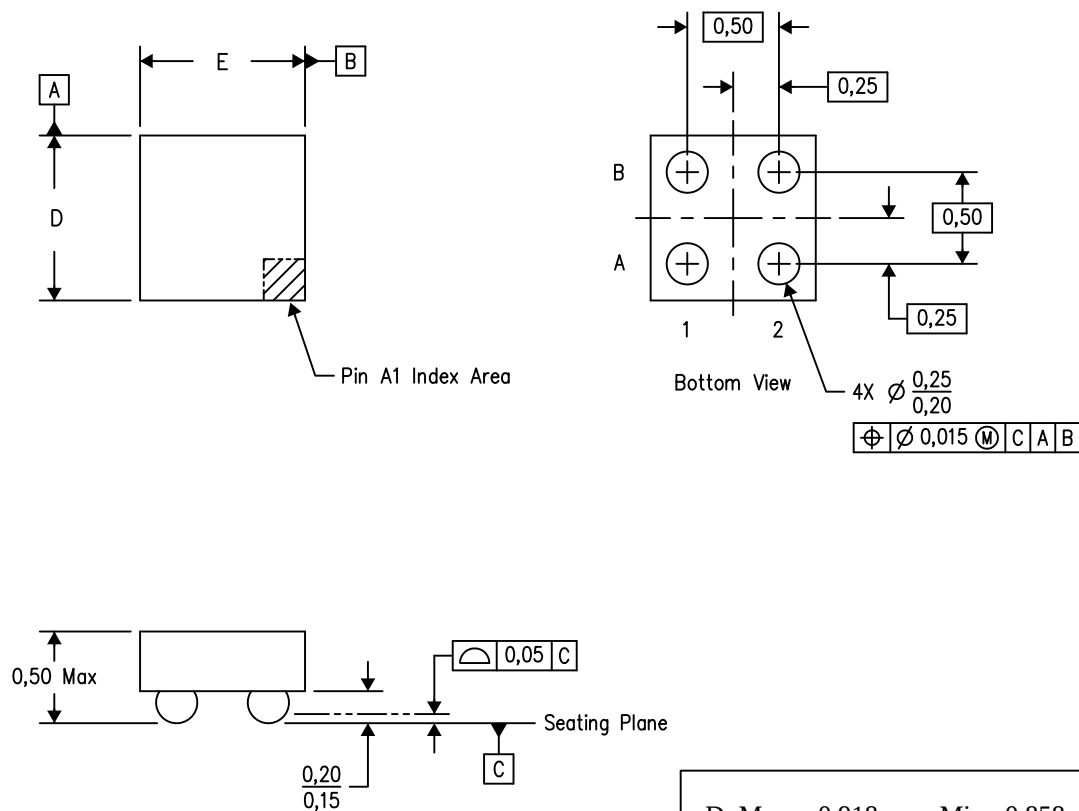


- NOTES:
- A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M-1994.
  - B. This drawing is subject to change without notice.
  - C. NanoFree™ package configuration.

NanoFree is a trademark of Texas Instruments.

YZV (S-XBGA-N4)

DIE-SIZE BALL GRID ARRAY



D: Max = 0.918 mm, Min = 0.858 mm

E: Max = 0.918 mm, Min = 0.858 mm

4206083/C 07/13

- 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.

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