



## SN74LVC2G14 Dual Schmitt-Trigger Inverter

### 1 Features

- Available in the TI NanoFree™ Package
- Supports 5-V  $V_{CC}$  Operation
- Inputs Accept Voltages to 5.5 V
- Max  $t_{pd}$  of 5.4 ns at 3.3 V
- Low-Power Consumption, 10- $\mu$ A Maximum  $I_{CC}$
- $\pm 24$ -mA Output Drive at 3.3 V
- Typical  $V_{OLP}$  (Output Ground Bounce)  
<0.8 V at  $V_{CC} = 3.3$  V,  $T_A = 25^\circ\text{C}$
- Typical  $V_{OHV}$  (Output  $V_{OH}$  Undershoot)  
>2 V at  $V_{CC} = 3.3$  V,  $T_A = 25^\circ\text{C}$
- $I_{off}$  Supports Live Insertion, Partial-Power-Down Mode, and Back-Drive Protection
- Support Translation Down  
(5 V to 3.3 V; 3.3 V to 1.8 V)
- Latch-Up Performance Exceeds 100 mA  
Per JESD 78, Class II

### 2 Applications

- Body Control Modules
- Engine Control Modules
- Arcade, Casino, and Gambling Machines
- Servers and High-Performance Computing
- EPOS, ECR, and Cash Drawer
- Routers
- Desktop PC

### 3 Description

This dual Schmitt-trigger inverter is designed for 1.65-V to 5.5-V  $V_{CC}$  operation.

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

The SN74LVC2G14 device contains two inverters and performs the Boolean function  $Y = \bar{A}$ . The device functions as two independent inverters, but because of Schmitt action, it may have different input threshold levels for positive-going ( $V_{T+}$ ) and negative-going ( $V_{T-}$ ) signals.

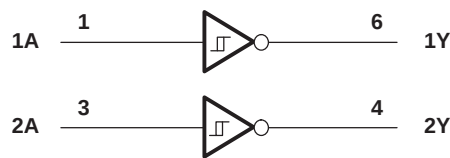
This device is fully specified for partial-power-down applications using  $I_{off}$ . The  $I_{off}$  circuitry disables the outputs, preventing damaging current backflow through the device when it is powered down.

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

| PART NUMBER    | PACKAGE    | BODY SIZE (NOM)   |
|----------------|------------|-------------------|
| SN74LVC2G14DBV | SOT-23 (6) | 2.90 mm × 1.60 mm |
| SN74LVC2G14DCK | SC70 (6)   | 2.00 mm × 1.25 mm |
| SN74LVC2G14YZP | DSBGA (6)  | 1.41 mm × 0.91 mm |

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

#### Block Diagram



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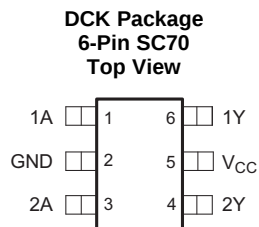
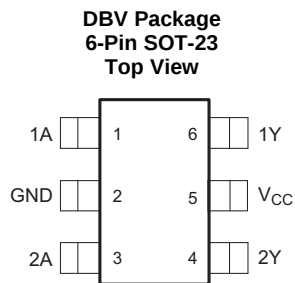
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## 4 Revision History

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

|                                                                                                                                                                                                                                                                                                                                                                                                             |             |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|
| <b>Changes from Revision N (June 2015) to Revision O</b> .....                                                                                                                                                                                                                                                                                                                                              | <b>Page</b> |
| • Added $T_J$ junction temperature spec to Abs Max Ratings .....                                                                                                                                                                                                                                                                                                                                            | <b>4</b>    |
| <b>Changes from Revision M (November 2013) to Revision N</b> .....                                                                                                                                                                                                                                                                                                                                          | <b>Page</b> |
| • Added <i>Applications</i> , <i>Device Information</i> table, <i>ESD Ratings</i> table, <i>Feature Description</i> section, <i>Device Functional Modes</i> , <i>Application and Implementation</i> section, <i>Power Supply Recommendations</i> section, <i>Layout</i> section, <i>Device and Documentation Support</i> section, and <i>Mechanical, Packaging, and Orderable Information</i> section ..... | <b>1</b>    |

## 5 Pin Configuration and Functions



**YZP Package**  
**6-Pin DSBGA**  
**Bottom View**



See mechanical drawing for dimensions.

### Pin Functions

| PIN             |     | I/O | DESCRIPTION            |
|-----------------|-----|-----|------------------------|
| NAME            | NO. |     |                        |
| 1A              | 1   | I   | Gate 1 logic signal    |
| 1Y              | 6   | O   | Gate 1 inverted signal |
| 2A              | 3   | I   | Gate 2 logic signal    |
| 2Y              | 4   | O   | Gate 2 inverted signal |
| GND             | 2   | —   | Ground                 |
| V <sub>CC</sub> | 5   | —   | Supply/Power Pin       |

## 6 Specifications

### 6.1 Absolute Maximum Ratings

over operating free-air temperature range (unless otherwise noted)<sup>(1)</sup>

|                  |                                                                                       |                    | MIN  | MAX                   | UNIT |
|------------------|---------------------------------------------------------------------------------------|--------------------|------|-----------------------|------|
| V <sub>CC</sub>  | Supply voltage                                                                        |                    | −0.5 | 6.5                   | V    |
| V <sub>I</sub>   | Input voltage <sup>(2)</sup>                                                          |                    | −0.5 | 6.5                   | V    |
| V <sub>O</sub>   | Voltage 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 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   |
| T <sub>J</sub>   | Junction temperature                                                                  |                    | −65  | 150                   | °C   |
| T <sub>stg</sub> | Storage temperature                                                                   |                    | −65  | 150                   | °C   |

- (1) Stresses beyond those listed under *Absolute Maximum Ratings* may cause permanent damage to the device. These are stress ratings only, which do not imply functional operation of the device at these or any other conditions beyond those indicated under *Recommended Operating Conditions*. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
- (2) The input negative-voltage and output voltage ratings may be exceeded if the input and output clamp-current ratings are observed.
- (3) The value of V<sub>CC</sub> is provided in the *Recommended Operating Conditions* table.

### 6.2 ESD Ratings

|                    |                         | VALUE                                                                          | UNIT  |
|--------------------|-------------------------|--------------------------------------------------------------------------------|-------|
| V <sub>(ESD)</sub> | Electrostatic discharge | Human-body model (HBM), per ANSI/ESDA/JEDEC JS-001 <sup>(1)</sup>              | ±2000 |
|                    |                         | Charged-device model (CDM), per JEDEC specification JESD22-C101 <sup>(2)</sup> | ±1000 |

- (1) JEDEC document JEP155 states that 500-V HBM allows safe manufacturing with a standard ESD control process. Manufacturing with less than 500-V HBM is possible with the necessary precautions. Pins listed as ±XXX V may actually have higher performance.
- (2) JEDEC document JEP157 states that 250-V CDM allows safe manufacturing with a standard ESD control process. Manufacturing with less than 250-V CDM is possible with the necessary precautions. Pins listed as ±YYY V may actually have higher performance.

### 6.3 Recommended Operating Conditions

See <sup>(1)</sup>

|                 |                                | MIN                      | MAX             | UNIT |
|-----------------|--------------------------------|--------------------------|-----------------|------|
| V <sub>CC</sub> | Supply voltage                 | Operating                | 1.65            | 5.5  |
|                 |                                | Data retention only      | 1.5             |      |
| 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             |      |
|                 |                                | V <sub>CC</sub> = 4.5 V  | −24             |      |
| I <sub>OL</sub> | Low-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              |      |
|                 |                                | V <sub>CC</sub> = 4.5 V  | 24              |      |
| 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*, [SCBA004](#).

## 6.4 Thermal Information

| THERMAL METRIC <sup>(1)</sup> |                                           | SN74LVC2G14 |            |             | UNIT |
|-------------------------------|-------------------------------------------|-------------|------------|-------------|------|
|                               |                                           | DBV (SOT23) | DCK (SC70) | YZP (DSBGA) |      |
|                               |                                           | 6 PINS      | 6 PINS     | 6 PINS      |      |
| R <sub>θJA</sub>              | Junction-to-ambient thermal resistance    | 215         | 259        | 139         | °C/W |
| R <sub>θJC(top)</sub>         | Junction-to-case (top) thermal resistance | 55          | 87         | 18          | °C/W |
| R <sub>θJB</sub>              | Junction-to-board thermal resistance      | 57          | 89         | N/A         | °C/W |

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

## 6.5 Electrical Characteristics

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

| PARAMETER                                                          |                           | TEST CONDITIONS                                                              | V <sub>CC</sub>       | –40°C to 85°C |                    |                       | –40°C to 125°C |                    |     | UNIT |
|--------------------------------------------------------------------|---------------------------|------------------------------------------------------------------------------|-----------------------|---------------|--------------------|-----------------------|----------------|--------------------|-----|------|
|                                                                    |                           |                                                                              |                       | MIN           | TYP <sup>(1)</sup> | MAX                   | MIN            | TYP <sup>(1)</sup> | MAX |      |
| V <sub>T+</sub><br>Positive-going input threshold voltage          |                           | 1.65 V                                                                       | 0.7                   |               | 1.4                | 0.7                   |                | 1.4                | V   |      |
|                                                                    |                           | 2.3 V                                                                        | 1                     |               | 1.7                | 1                     |                | 1.7                |     |      |
|                                                                    |                           | 3 V                                                                          | 1.3                   |               | 2.2                | 1.3                   |                | 2.2                |     |      |
|                                                                    |                           | 4.5 V                                                                        | 1.9                   |               | 3.1                | 1.9                   |                | 3.1                |     |      |
|                                                                    |                           | 5.5 V                                                                        | 2.2                   |               | 3.7                | 2.2                   |                | 3.7                |     |      |
| V <sub>T–</sub><br>Negative-going input threshold voltage          |                           | 1.65 V                                                                       | 0.3                   |               | 0.7                | 0.3                   |                | 0.7                | V   |      |
|                                                                    |                           | 2.3 V                                                                        | 0.4                   |               | 1                  | 0.4                   |                | 1                  |     |      |
|                                                                    |                           | 3 V                                                                          | 0.6                   |               | 1.3                | 0.6                   |                | 1.3                |     |      |
|                                                                    |                           | 4.5 V                                                                        | 1.1                   |               | 2                  | 1.1                   |                | 2                  |     |      |
|                                                                    |                           | 5.5 V                                                                        | 1.4                   |               | 2.5                | 1.4                   |                | 2.5                |     |      |
| ΔV <sub>T</sub><br>Hysteresis (V <sub>T+</sub> – V <sub>T–</sub> ) |                           | 1.65 V                                                                       | 0.3                   |               | 0.8                | 0.3                   |                | 0.8                | V   |      |
|                                                                    |                           | 2.3 V                                                                        | 0.4                   |               | 0.9                | 0.4                   |                | 0.9                |     |      |
|                                                                    |                           | 3 V                                                                          | 0.4                   |               | 1.1                | 0.4                   |                | 1.1                |     |      |
|                                                                    |                           | 4.5 V                                                                        | 0.6                   |               | 1.3                | 0.6                   |                | 1.3                |     |      |
|                                                                    |                           | 5.5 V                                                                        | 0.7                   |               | 1.4                | 0.7                   |                | 1.4                |     |      |
| V <sub>OH</sub>                                                    | I <sub>OH</sub> = –100 μA | 1.65 V to 4.5 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  | 3 V                                                                          | 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 4.5 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   | 3 V                                                                          | 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                    |                |                    | μA  |      |
| I <sub>off</sub>                                                   |                           | V <sub>I</sub> or V <sub>O</sub> = 5.5 V                                     | 0                     |               |                    | ±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                    |                |                    | μA  |      |
| ΔI <sub>CC</sub>                                                   |                           | One input at V <sub>CC</sub> – 0.6 V, Other inputs at V <sub>CC</sub> or GND | 3 V to 5.5 V          |               |                    | 500                   |                |                    | μA  |      |
| C <sub>I</sub>                                                     |                           | V <sub>I</sub> = V <sub>CC</sub> or GND                                      | 3.3 V                 |               |                    | 4                     |                |                    | pF  |      |

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

## 6.6 Switching Characteristics, –40°C to 85°C

over recommended operating free-air temperature range (unless otherwise noted) (see [Figure 3](#))

| PARAMETER | FROM<br>(INPUT) | TO<br>(OUTPUT) | $V_{CC} = 1.8\text{ V} \pm 0.15\text{ V}$ |     | $V_{CC} = 2.5\text{ V} \pm 0.2\text{ V}$ |     | $V_{CC} = 3.3\text{ V} \pm 0.3\text{ V}$ |     | $V_{CC} = 5\text{ V} \pm 0.5\text{ V}$ |     | UNIT |
|-----------|-----------------|----------------|-------------------------------------------|-----|------------------------------------------|-----|------------------------------------------|-----|----------------------------------------|-----|------|
|           |                 |                | MIN                                       | MAX | MIN                                      | MAX | MIN                                      | MAX | MIN                                    | MAX |      |
| $t_{pd}$  | A               | Y              | 3.9                                       | 9.5 | 1.9                                      | 5.7 | 2                                        | 5.4 | 1.5                                    | 4.3 | ns   |

## 6.7 Switching Characteristics, –40°C to 125°C

over recommended operating free-air temperature range (unless otherwise noted) (see [Figure 3](#))

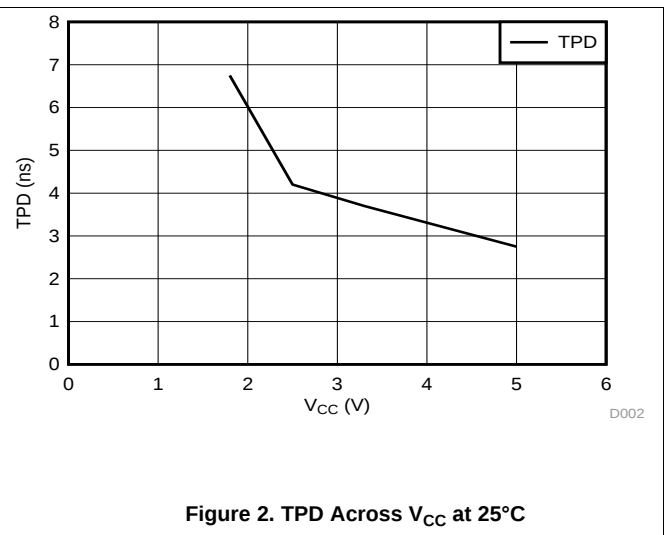
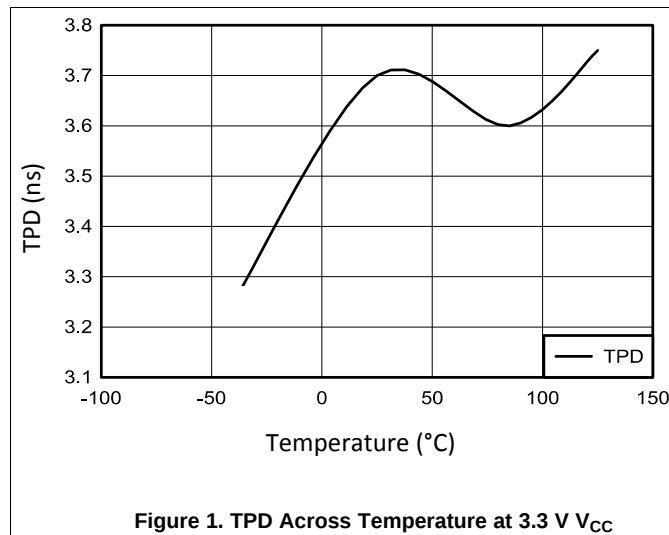
| PARAMETER | FROM<br>(INPUT) | TO<br>(OUTPUT) | $V_{CC} = 1.8\text{ V} \pm 0.15\text{ V}$ |      | $V_{CC} = 2.5\text{ V} \pm 0.2\text{ V}$ |     | $V_{CC} = 3.3\text{ V} \pm 0.3\text{ V}$ |     | $V_{CC} = 5\text{ V} \pm 0.5\text{ V}$ |     | UNIT |
|-----------|-----------------|----------------|-------------------------------------------|------|------------------------------------------|-----|------------------------------------------|-----|----------------------------------------|-----|------|
|           |                 |                | MIN                                       | MAX  | MIN                                      | MAX | MIN                                      | MAX | MIN                                    | MAX |      |
| $t_{pd}$  | A               | Y              | 3.9                                       | 10.5 | 1.9                                      | 6.5 | 2                                        | 6   | 1.5                                    | 4.7 | ns   |

## 6.8 Operating Characteristics

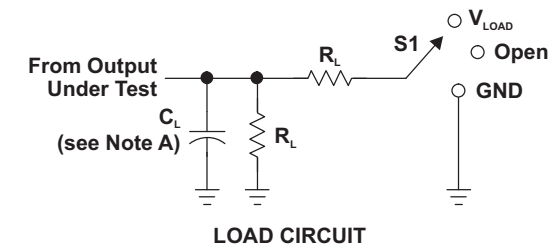
$T_A = 25^\circ\text{C}$

| PARAMETER |                               | TEST CONDITIONS     | $V_{CC} = 1.8\text{ V}$ | $V_{CC} = 2.5\text{ V}$ | $V_{CC} = 3.3\text{ V}$ | $V_{CC} = 5\text{ V}$ | UNIT |
|-----------|-------------------------------|---------------------|-------------------------|-------------------------|-------------------------|-----------------------|------|
|           |                               |                     | TYP                     | TYP                     | TYP                     | TYP                   |      |
| $C_{pd}$  | Power dissipation capacitance | $f = 10\text{ MHz}$ | 16                      | 17                      | 18                      | 21                    | pF   |

## 6.9 Typical Characteristics

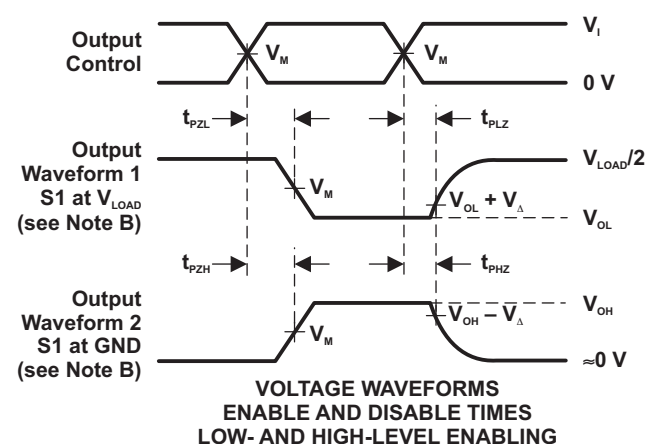
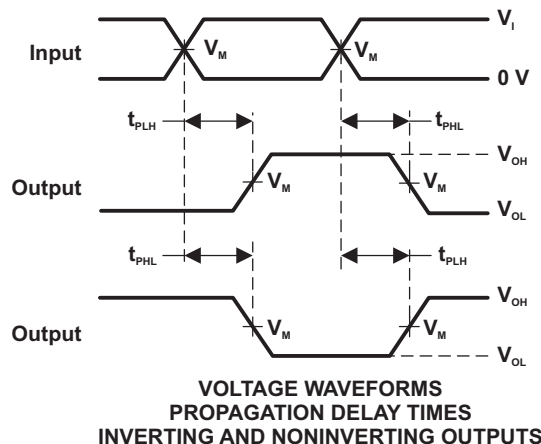
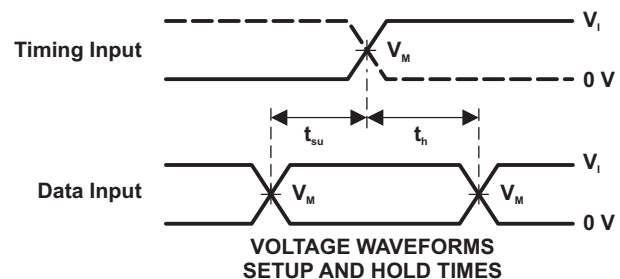
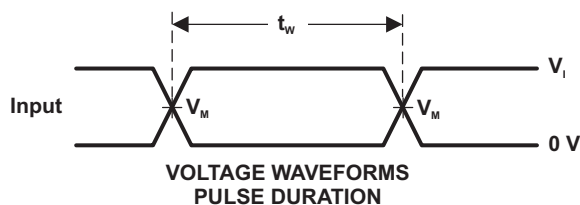


## 7 Parameter Measurement Information



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

| $V_{CC}$                         | INPUTS   |                      | $V_M$      | $V_{LOAD}$        | $C_L$ | $R_L$        | $V_{\Delta}$ |
|----------------------------------|----------|----------------------|------------|-------------------|-------|--------------|--------------|
|                                  | $V_I$    | $t_i/t_f$            |            |                   |       |              |              |
| $1.8\text{ V} \pm 0.15\text{ V}$ | $V_{CC}$ | $\leq 2\text{ ns}$   | $V_{CC}/2$ | $2 \times V_{CC}$ | 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        |



- 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 3. Load Circuit and Voltage Waveforms

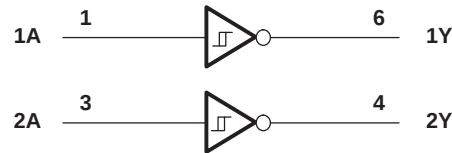
## 8 Detailed Description

### 8.1 Overview

The SN74LVC2G14 device contains two Schmitt Trigger Inverter and performs the Boolean function  $Y = \overline{A}$ . The device functions as an independent inverter, but because of Schmitt Trigger action, it will have different input threshold levels for a positive-going ( $V_{t+}$ ) and negative-going ( $V_{t-}$ ) signals.

This device is fully specified for partial-power-down applications using  $I_{off}$ . The  $I_{off}$  circuit disables the output, preventing damaging current back-flow through the device when it is powered down.

### 8.2 Functional Block Diagram



### 8.3 Feature Description

#### 8.3.1 Support Translation Down (5 V to 3.3 V; 3.3 V to 1.8 V)

As the inputs are 5.5-V tolerant, the device can be used as a down translator. When the input voltage exceeds  $V_{T+ (Max)}$ , the output will follow  $V_{CC}$ , performing down-translation if the input voltage exceeds  $V_{CC}$ .

### 8.4 Device Functional Modes

[Table 1](#) lists the functional modes of the SN74LVC2G14.

**Table 1. Functional Table  
(Each Inverter)**

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

## 9 Application and Implementation

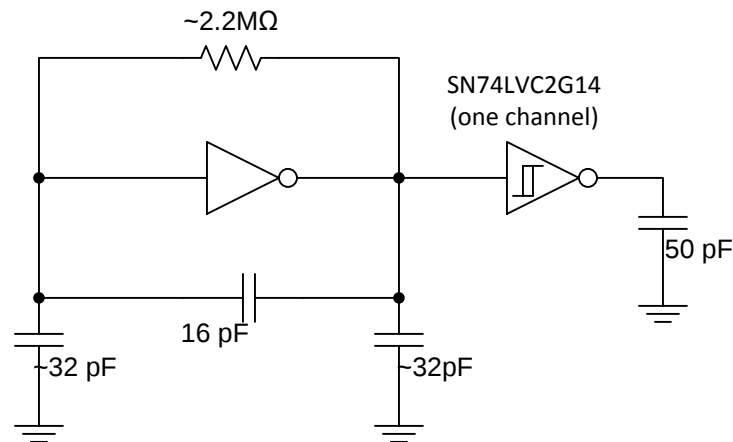
### NOTE

Information in the following applications sections is not part of the TI component specification, and TI does not warrant its accuracy or completeness. TI's customers are responsible for determining suitability of components for their purposes. Customers should validate and test their design implementation to confirm system functionality.

### 9.1 Application Information

The SN74LVC2G14 device is a high-drive CMOS device that can be used for a multitude of buffer type functions where the input is slow or noisy. The device 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  $V_{CC}$ .

### 9.2 Typical Application



**Figure 4. Typical Application Schematic**

#### 9.2.1 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.

#### 9.2.2 Detailed Design Procedure

##### 1. Recommended Input Conditions

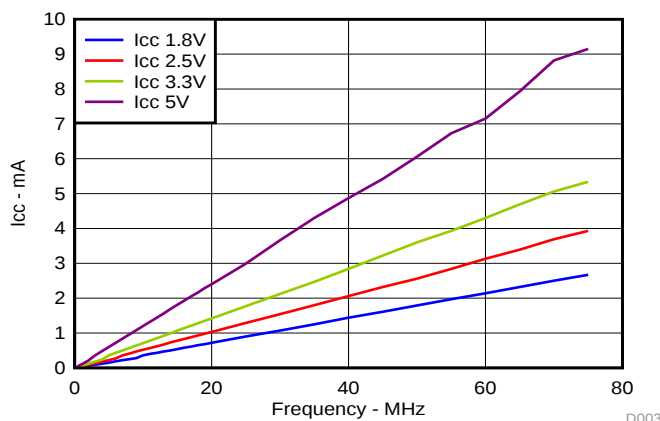
- Rise time and fall time specs. See  $(\Delta t/\Delta V)$  in the [Recommended Operating Conditions](#) table.
- Specified high and low levels. See  $(V_{IH}$  and  $V_{IL})$  in the [Recommended Operating Conditions](#) table.
- Inputs are overvoltage tolerant allowing them to go as high as  $(V_I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

##### 2. Recommend Output Conditions

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

## Typical Application (continued)

### 9.2.3 Application Curve



**Figure 5. ICC vs Frequency**

## 10 Power Supply Recommendations

The power supply can be any voltage between the minimum and maximum supply voltage rating located in the table. Each  $V_{CC}$  pin should have a good bypass capacitor to prevent power disturbance. For devices with a single supply, TI recommends a 0.1- $\mu$ F capacitor. If there are multiple  $V_{CC}$  pins, then TI recommends a 0.01- $\mu$ F or 0.022- $\mu$ F capacitor for each power pin. It is ok to parallel multiple bypass capacitors to reject different frequencies of noise. 0.1- $\mu$ F and 1- $\mu$ F capacitors are commonly used in parallel. The bypass capacitor should be installed as close to the power pin as possible for best results.

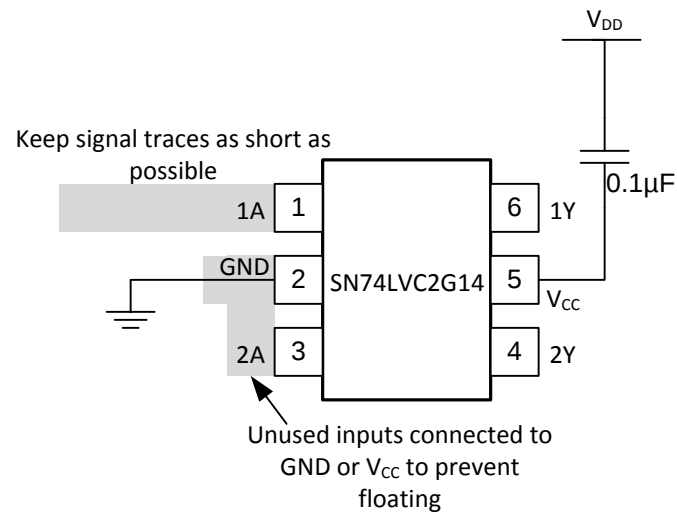
## 11 Layout

### 11.1 Layout Guidelines

When using multiple bit logic devices inputs should not ever 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 terminals should not be left unconnected because the undefined voltages at the outside connections result in undefined operational states. The following rules must be observed under all circumstances:

- 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  $V_{CC}$  whichever make more sense or is more convenient.

## 11.2 Layout Example



**Figure 6. Layout Schematic**

## 12 Device and Documentation Support

### 12.1 Community Resources

The following links connect to TI community resources. Linked contents are provided "AS IS" by the respective contributors. They do not constitute TI specifications and do not necessarily reflect TI's views; see TI's [Terms of Use](#).

**TI E2E™ Online Community** *TI's Engineer-to-Engineer (E2E) Community*. Created to foster collaboration among engineers. At [e2e.ti.com](http://e2e.ti.com), you can ask questions, share knowledge, explore ideas and help solve problems with fellow engineers.

**Design Support** *TI's Design Support* Quickly find helpful E2E forums along with design support tools and contact information for technical support.

### 12.2 Trademarks

NanoFree, E2E are trademarks of Texas Instruments.  
All other trademarks are the property of their respective owners.

### 12.3 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.

### 12.4 Glossary

[SLYZ022](#) — *TI Glossary*.

This glossary lists and explains terms, acronyms, and definitions.

## 13 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                 |
|-------------------|---------------|--------------|--------------------|------|----------------|----------------------------|-------------------------|----------------------|--------------|-------------------------------|-------------------------|
| SN74LVC2G14DBVR   | ACTIVE        | SOT-23       | DBV                | 6    | 3000           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU   CU SN       | Level-1-260C-UNLIM   | -40 to 125   | (C145, C14F, C14K,<br>C14R)   | <a href="#">Samples</a> |
| SN74LVC2G14DBVRE4 | ACTIVE        | SOT-23       | DBV                | 6    | 3000           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -40 to 125   | (C14F, C14R)                  | <a href="#">Samples</a> |
| SN74LVC2G14DBVRG4 | ACTIVE        | SOT-23       | DBV                | 6    | 3000           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -40 to 125   | (C14F, C14R)                  | <a href="#">Samples</a> |
| SN74LVC2G14DBVT   | ACTIVE        | SOT-23       | DBV                | 6    | 250            | Green (RoHS<br>& no Sb/Br) | CU NIPDAU   CU SN       | Level-1-260C-UNLIM   | -40 to 125   | (C145, C14F, C14K,<br>C14R)   | <a href="#">Samples</a> |
| SN74LVC2G14DBVTG4 | ACTIVE        | SOT-23       | DBV                | 6    | 250            | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -40 to 125   | (C14F, C14R)                  | <a href="#">Samples</a> |
| SN74LVC2G14DCK3   | ACTIVE        | SC70         | DCK                | 6    | 3000           | Pb-Free<br>(RoHS)          | CU SNBI                 | Level-1-260C-UNLIM   | -40 to 125   | (CFF, CFZ)                    | <a href="#">Samples</a> |
| SN74LVC2G14DCKR   | ACTIVE        | SC70         | DCK                | 6    | 3000           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU   CU SN       | Level-1-260C-UNLIM   | -40 to 125   | (CF5, CFF, CFJ, CF<br>K, CFR) | <a href="#">Samples</a> |
| SN74LVC2G14DCKRE4 | ACTIVE        | SC70         | DCK                | 6    | 3000           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -40 to 125   | CF5                           | <a href="#">Samples</a> |
| SN74LVC2G14DCKRG4 | ACTIVE        | SC70         | DCK                | 6    | 3000           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -40 to 125   | CF5                           | <a href="#">Samples</a> |
| SN74LVC2G14DCKT   | ACTIVE        | SC70         | DCK                | 6    | 250            | Green (RoHS<br>& no Sb/Br) | CU NIPDAU   CU SN       | Level-1-260C-UNLIM   | -40 to 125   | (CF5, CFF, CFJ, CF<br>K, CFR) | <a href="#">Samples</a> |
| SN74LVC2G14DCKTG4 | ACTIVE        | SC70         | DCK                | 6    | 250            | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -40 to 125   | CF5                           | <a href="#">Samples</a> |
| SN74LVC2G14YZPR   | ACTIVE        | DSBGA        | YZP                | 6    | 3000           | Green (RoHS<br>& no Sb/Br) | SNAGCU                  | Level-1-260C-UNLIM   | -40 to 125   | (CF7, CFN)                    | <a href="#">Samples</a> |

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

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

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

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

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

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

(2) **RoHS:** TI defines "RoHS" to mean semiconductor products that are compliant with the current EU RoHS requirements for all 10 RoHS substances, including the requirement that RoHS substance do not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, "RoHS" products are suitable for use in specified lead-free processes. TI may reference these types of products as "Pb-Free".

**RoHS Exempt:** TI defines "RoHS Exempt" to mean products that contain lead but are compliant with EU RoHS pursuant to a specific EU RoHS exemption.

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**Green:** TI defines "Green" to mean the content of Chlorine (Cl) and Bromine (Br) based flame retardants meet JS709B low halogen requirements of  $\leq 1000$ ppm threshold. Antimony trioxide based flame retardants must also meet the  $\leq 1000$ ppm threshold requirement.

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

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

(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.

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**OTHER QUALIFIED VERSIONS OF SN74LVC2G14 :**

- Automotive: [SN74LVC2G14-Q1](#)

NOTE: Qualified Version Definitions:

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

**TAPE AND REEL INFORMATION**


\*All dimensions are nominal

| Device            | Package Type | Package Drawing | Pins | SPQ  | Reel Diameter (mm) | Reel Width W1 (mm) | A0 (mm) | B0 (mm) | K0 (mm) | P1 (mm) | W (mm) | Pin1 Quadrant |
|-------------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| SN74LVC2G14DBVR   | SOT-23       | DBV             | 6    | 3000 | 178.0              | 9.2                | 3.3     | 3.23    | 1.55    | 4.0     | 8.0    | Q3            |
| SN74LVC2G14DBVRG4 | SOT-23       | DBV             | 6    | 3000 | 178.0              | 9.0                | 3.23    | 3.17    | 1.37    | 4.0     | 8.0    | Q3            |
| SN74LVC2G14DBVT   | SOT-23       | DBV             | 6    | 250  | 178.0              | 9.2                | 3.3     | 3.23    | 1.55    | 4.0     | 8.0    | Q3            |
| SN74LVC2G14DBVTG4 | SOT-23       | DBV             | 6    | 250  | 178.0              | 9.0                | 3.23    | 3.17    | 1.37    | 4.0     | 8.0    | Q3            |
| SN74LVC2G14DCKR   | SC70         | DCK             | 6    | 3000 | 178.0              | 9.0                | 2.4     | 2.5     | 1.2     | 4.0     | 8.0    | Q3            |
| SN74LVC2G14DCKR   | SC70         | DCK             | 6    | 3000 | 178.0              | 9.2                | 2.4     | 2.4     | 1.22    | 4.0     | 8.0    | Q3            |
| SN74LVC2G14DCKRG4 | SC70         | DCK             | 6    | 3000 | 178.0              | 9.2                | 2.4     | 2.4     | 1.22    | 4.0     | 8.0    | Q3            |
| SN74LVC2G14DCKT   | SC70         | DCK             | 6    | 250  | 178.0              | 9.0                | 2.4     | 2.5     | 1.2     | 4.0     | 8.0    | Q3            |
| SN74LVC2G14DCKTG4 | SC70         | DCK             | 6    | 250  | 178.0              | 9.2                | 2.4     | 2.4     | 1.22    | 4.0     | 8.0    | Q3            |
| SN74LVC2G14YZPR   | DSBGA        | YZP             | 6    | 3000 | 178.0              | 9.2                | 1.02    | 1.52    | 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) |
|-------------------|--------------|-----------------|------|------|-------------|------------|-------------|
| SN74LVC2G14DBVR   | SOT-23       | DBV             | 6    | 3000 | 180.0       | 180.0      | 18.0        |
| SN74LVC2G14DBVRG4 | SOT-23       | DBV             | 6    | 3000 | 180.0       | 180.0      | 18.0        |
| SN74LVC2G14DBVT   | SOT-23       | DBV             | 6    | 250  | 180.0       | 180.0      | 18.0        |
| SN74LVC2G14DBVTG4 | SOT-23       | DBV             | 6    | 250  | 180.0       | 180.0      | 18.0        |
| SN74LVC2G14DCKR   | SC70         | DCK             | 6    | 3000 | 180.0       | 180.0      | 18.0        |
| SN74LVC2G14DCKR   | SC70         | DCK             | 6    | 3000 | 180.0       | 180.0      | 18.0        |
| SN74LVC2G14DCKRG4 | SC70         | DCK             | 6    | 3000 | 180.0       | 180.0      | 18.0        |
| SN74LVC2G14DCKT   | SC70         | DCK             | 6    | 250  | 180.0       | 180.0      | 18.0        |
| SN74LVC2G14DCKTG4 | SC70         | DCK             | 6    | 250  | 180.0       | 180.0      | 18.0        |
| SN74LVC2G14YZPR   | DSBGA        | YZP             | 6    | 3000 | 220.0       | 220.0      | 35.0        |

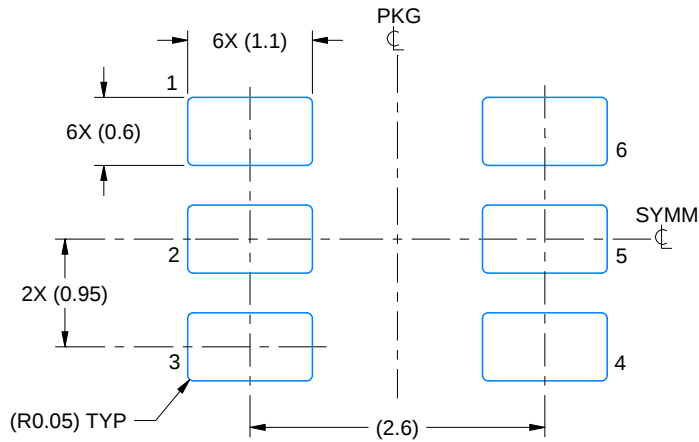


# EXAMPLE BOARD LAYOUT

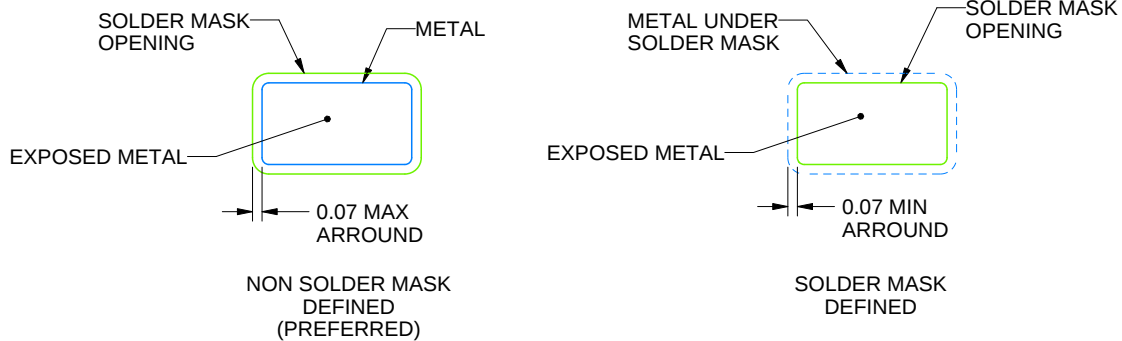
DBV0006A

SOT-23 - 1.45 mm max height

SMALL OUTLINE TRANSISTOR



LAND PATTERN EXAMPLE  
EXPOSED METAL SHOWN  
SCALE:15X



SOLDER MASK DETAILS

4214840/B 03/2018

NOTES: (continued)

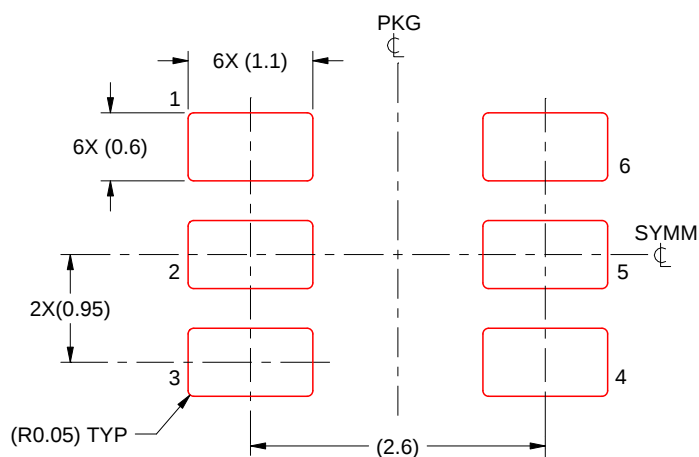
6. Publication IPC-7351 may have alternate designs.
7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

## EXAMPLE STENCIL DESIGN

DBV0006A

SOT-23 - 1.45 mm max height

SMALL OUTLINE TRANSISTOR



SOLDER PASTE EXAMPLE  
BASED ON 0.125 mm THICK STENCIL  
SCALE:15X

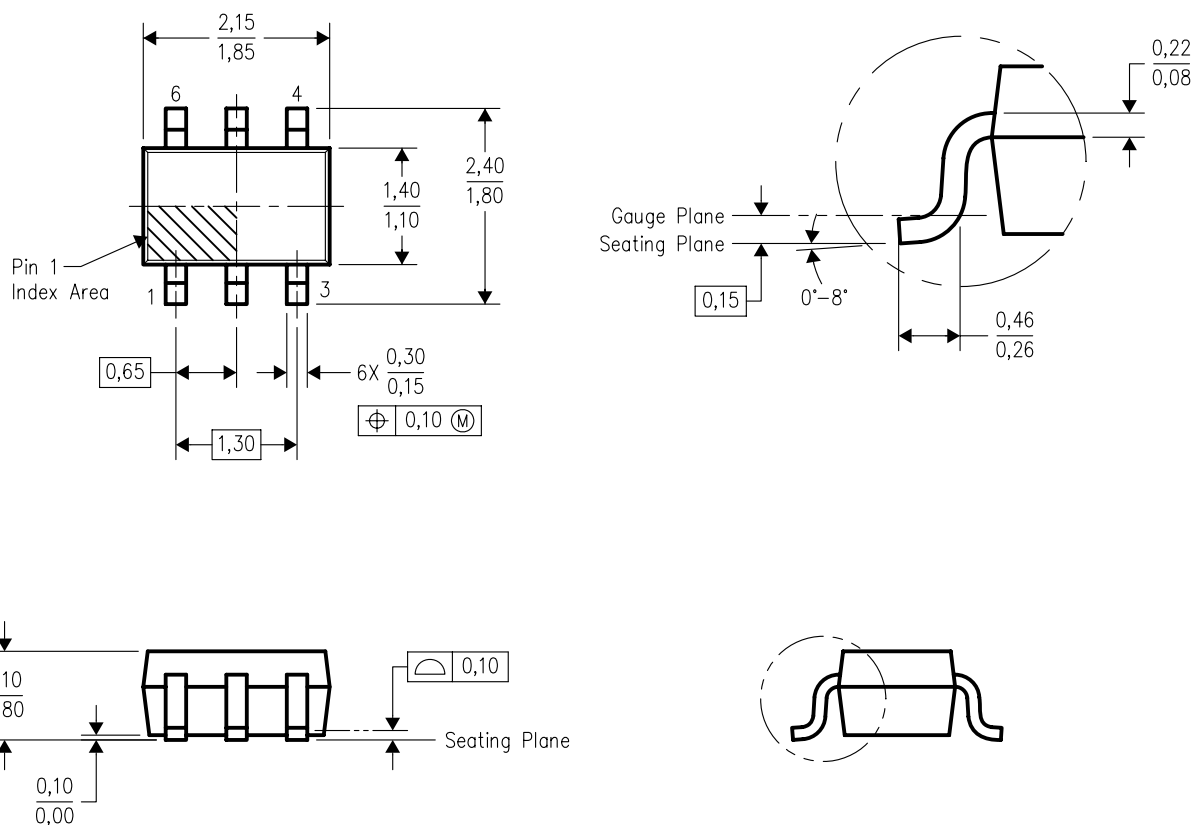
4214840/B 03/2018

NOTES: (continued)

8. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
9. Board assembly site may have different recommendations for stencil design.

## DCK (R-PDSO-G6)

# PLASTIC SMALL-OUTLINE PACKAGE



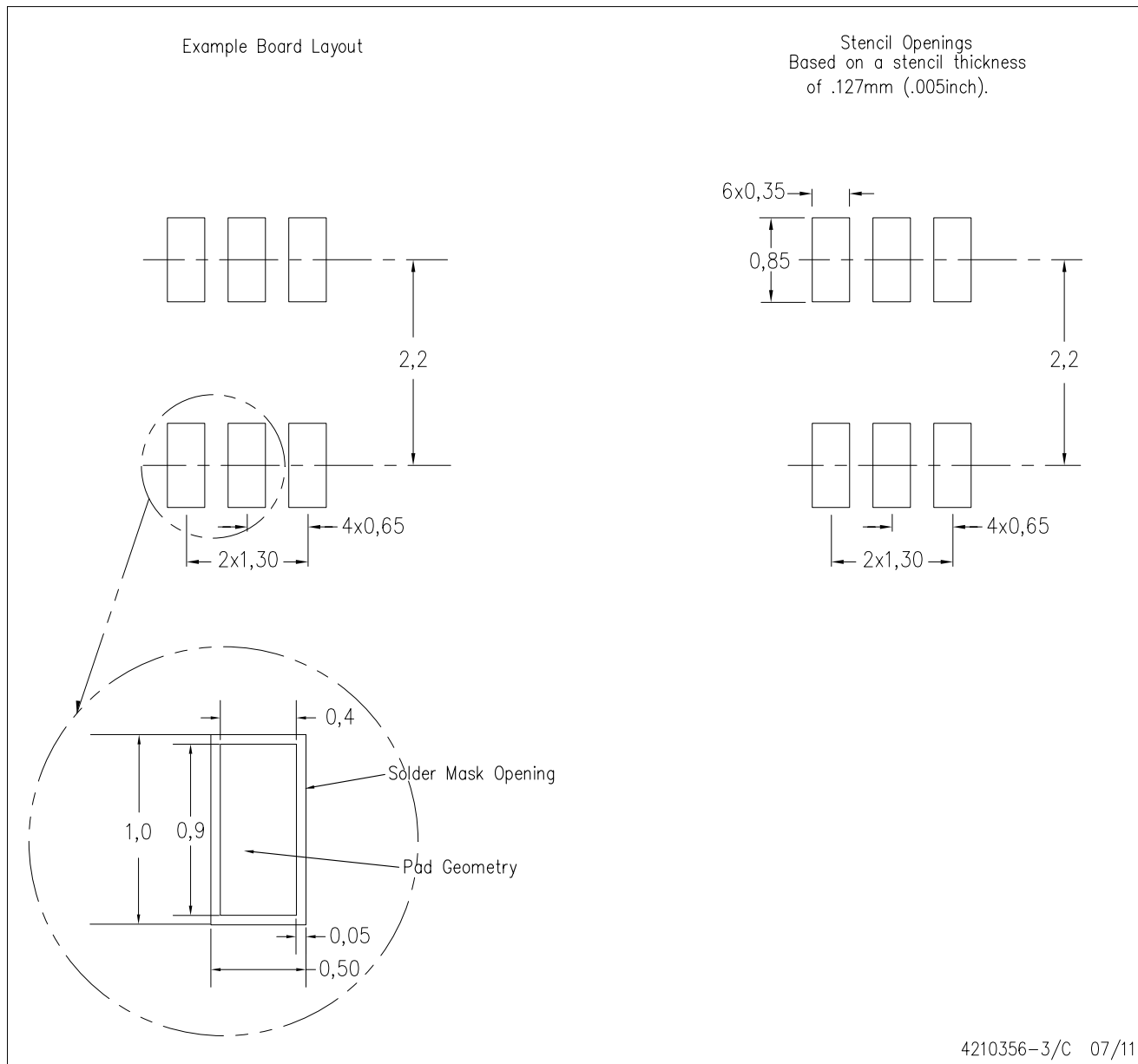
4093553-4/G 01/2007

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-203 variation AB.

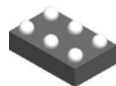
DCK (R-PDSO-G6)

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.

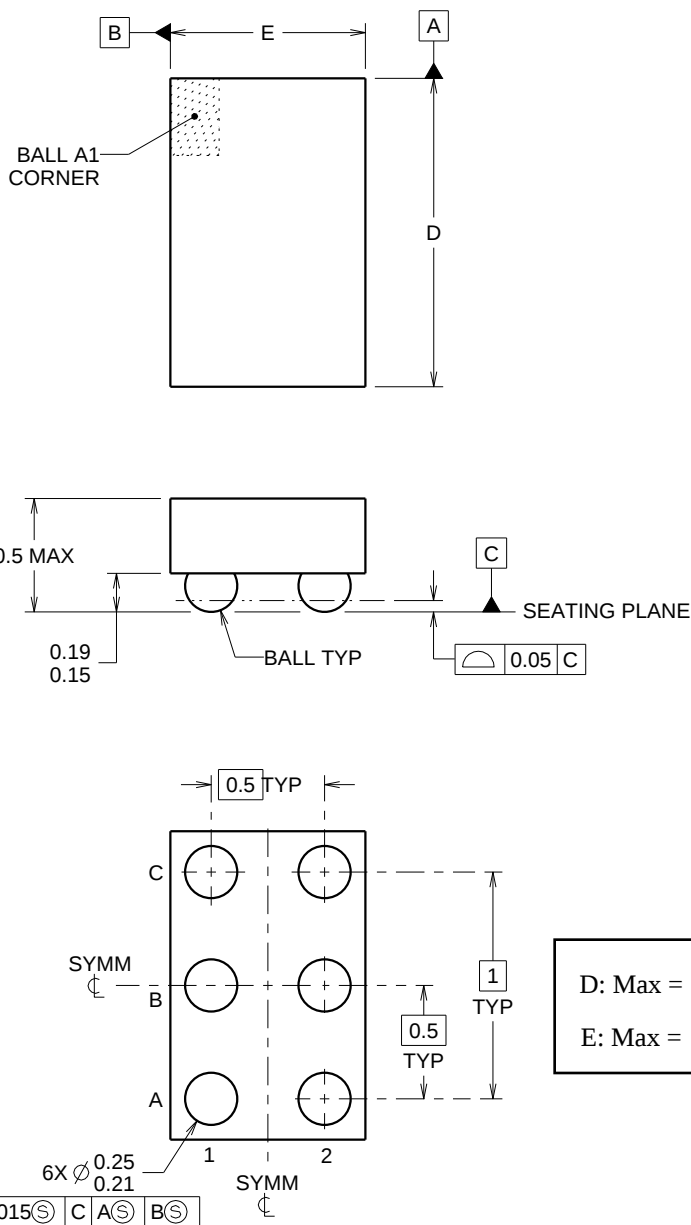
YZP0006



# PACKAGE OUTLINE

DSBGA - 0.5 mm max height

DIE SIZE BALL GRID ARRAY



4219524/A 06/2014

## NOTES:

NanoFree Is a trademark of Texas Instruments.

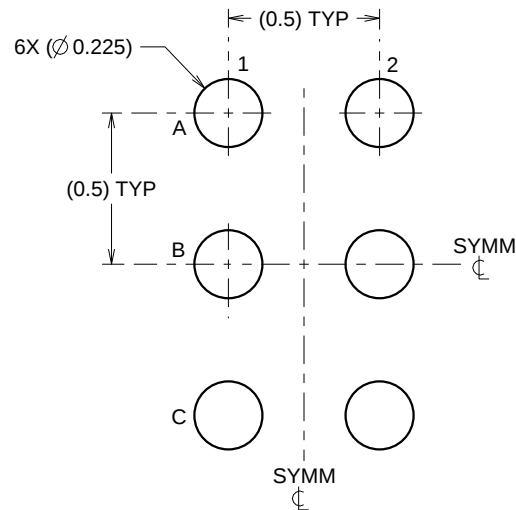
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. NanoFree™ package configuration.

# EXAMPLE BOARD LAYOUT

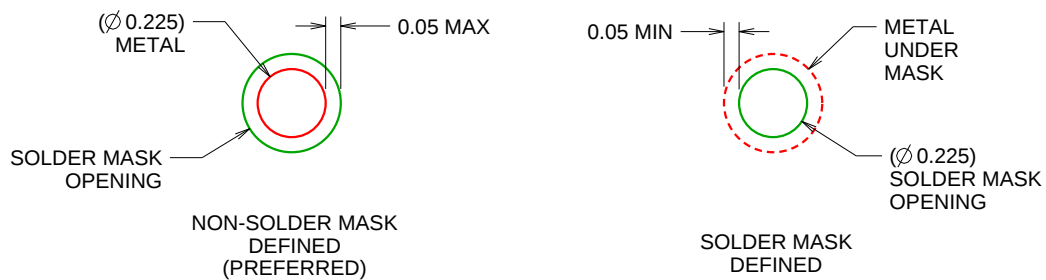
YZP0006

DSBGA - 0.5 mm max height

DIE SIZE BALL GRID ARRAY



LAND PATTERN EXAMPLE  
SCALE:40X

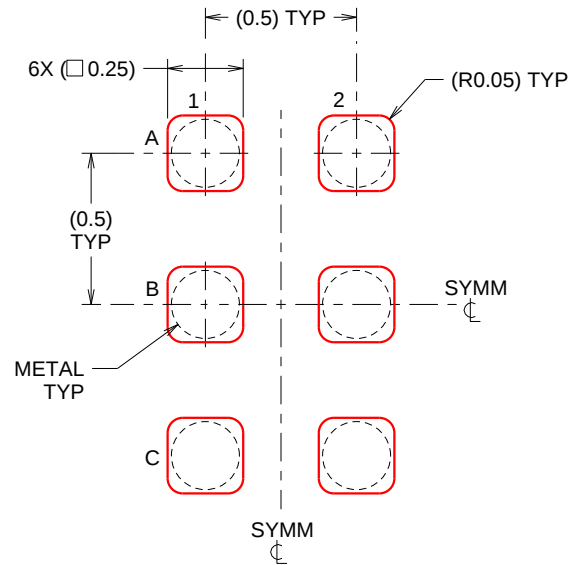


SOLDER MASK DETAILS  
NOT TO SCALE

4219524/A 06/2014

NOTES: (continued)

- Final dimensions may vary due to manufacturing tolerance considerations and also routing constraints. For more information, see Texas Instruments literature number SBVA017 ([www.ti.com/lit/sbva017](http://www.ti.com/lit/sbva017)).



SOLDER PASTE EXAMPLE  
 BASED ON 0.1 mm THICK STENCIL  
 SCALE:40X

4219524/A 06/2014

NOTES: (continued)

5. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release.

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