



# SN74LVC1G74 Single Positive-Edge-Triggered D-Type Flip-Flop with Clear and Preset

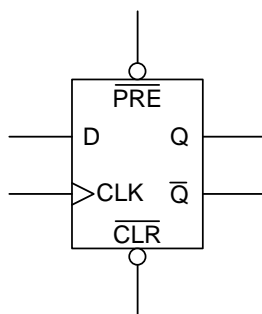
## 1 Features

- Available in the Texas Instruments NanoFree™ Package
- Supports 5-V  $V_{CC}$  Operation
- Inputs Accept Voltages to 5.5 V
- Supports Down Translation to  $V_{CC}$
- Max  $t_{pd}$  of 5.9 ns at 3.3 V
- Low Power Consumption, 10- $\mu$ A Max  $I_{CC}$
- $\pm 24$ -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
- Latch-Up Performance Exceeds 100 mA Per JESD 78, Class II
- ESD Protection Exceeds JESD 22
  - 2000-V Human-Body Model
  - 200-V Machine Model
  - 1000-V Charged-Device Model

## 2 Applications

- Servers
- LED Displays
- Network switch
- Telecom Infrastructure
- Motor Drivers
- I/O Expanders

## 4 Simplified Schematic



## 3 Description

This single positive-edge-triggered D-type flip-flop 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.

A low level at the preset ( $\overline{\text{PRE}}$ ) or clear ( $\overline{\text{CLR}}$ ) input sets or resets the outputs, regardless of the levels of the other inputs. When  $\overline{\text{PRE}}$  and  $\overline{\text{CLR}}$  are inactive (high), data at the data (D) input meeting the setup time requirements is transferred to the outputs on the positive-going edge of the clock pulse. Clock triggering occurs at a voltage level and is not related directly to the rise time of the clock pulse. Following the hold-time interval, data at the D input can be changed without affecting the levels at the outputs.

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         |
|-------------|-----------|-------------------|
| SN74LVC1G74 | SM8 (8)   | 2.95 mm × 2.80 mm |
|             | US8 (8)   | 2.30 mm × 2.00 mm |
|             | X2SON (8) | 1.40 mm × 1.00 mm |
|             | UQFN (8)  | 1.50 mm × 1.50 mm |

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



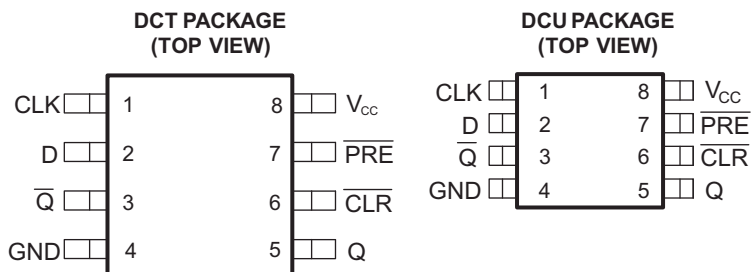
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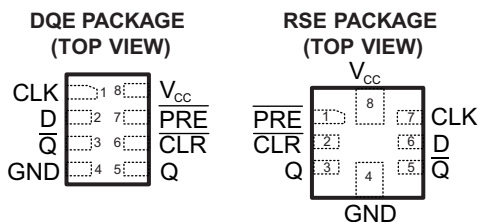
## 5 Revision History

| Changes from Revision D (January 2013) to Revision E   | Page |
|--|------|
| • Added <i>Applications</i> , <i>Device Information</i> table, <i>Pin Functions</i> table, <i>ESD Ratings</i> table, <i>Thermal Information</i> table, <i>Typical Characteristics</i> , <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. .... | 1    |
| • Deleted <i>Ordering Information</i> table. ....  | 1    |
| • Updated <i>Features</i> . ....   | 1    |
| Changes from Original (October 2009) to Revision A   | Page |
| • Changed $I_{off}$ description in <i>Features</i> . ....  | 1    |
| • Changed <i>Timing Requirements</i> table. ....   | 6    |
| • Changed <i>Switching Requirements</i> table. ....  | 6    |

## 6 Pin Configuration and Functions



See mechanical drawings for dimensions.



See mechanical drawings for dimensions

### Pin Functions

| PIN             |     | TYPE | DESCRIPTION                                  |
|-----------------|-----|------|--|
| NAME            | NO. |      |  |
| CLK             | 1   | I    | Clock input                                  |
| CLR             | 6   | I    | Clear input - Pull low to set Q output low   |
| D               | 2   | I    | Input  |
| GND             | 4   | —    | Ground                                       |
| Q               | 5   | O    | Output                                       |
| $\overline{Q}$  | 3   | O    | Inverted output                              |
| PRE             | 7   | I    | Preset input - Pull low to set Q output high |
| V <sub>CC</sub> | 8   | —    | Supply                                       |

## 7 Specifications

### 7.1 Absolute Maximum Ratings

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

|           |   | MIN       | MAX            | UNIT   |
|-----------|---|-----------|----------------|--------|
| $V_{CC}$  | Supply voltage range  | −0.5      | 6.5            | V      |
| $V_I$     | Input voltage range <sup>(2)</sup>  | −0.5      | 6.5            | V      |
| $V_O$     | Voltage range applied to any output in the high-impedance or power-off state <sup>(2)</sup> | −0.5      | 6.5            | V      |
| $V_O$     | Voltage range applied to any output in the high or low state <sup>(2)(3)</sup>              | −0.5      | $V_{CC} + 0.5$ | V      |
| $I_{IK}$  | Input clamp current   | $V_I < 0$ |                | −50 mA |
| $I_{OK}$  | Output clamp current  | $V_O < 0$ |                | −50 mA |
| $I_O$     | Continuous output current   |           | ±50            | mA     |
|           | Continuous current through $V_{CC}$ or GND  |           | ±100           | mA     |
| $T_{stg}$ | Storage temperature range   | −65       | 150            | °C     |

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

### 7.2 ESD Ratings

| PARAMETER                           | DEFINITION   | VALUE | UNIT |
|-------------------------------------|--|-------|------|
| $V_{(ESD)}$ Electrostatic discharge | Human body model (HBM), per ANSI/ESDA/JEDEC JS-001, all pins <sup>(1)</sup>              | 2000  | V    |
|                                     | Charged device model (CDM), per JEDEC specification JESD22-C101, all pins <sup>(2)</sup> | 1000  |      |

- (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

over operating free-air temperature range (unless otherwise noted)<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             |      |
|                 | V <sub>CC</sub> = 4.5 V            |   | −32                    |                 |      |
| 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              |      |
|                 |                                    |   |                        | 24              |      |
|                 | V <sub>CC</sub> = 4.5 V            |   | 32                     |                 |      |
| Δt/Δv           | Input transition rise or fall rate | V <sub>CC</sub> = 1.8 V ± 0.15 V, 2.5 V ± 0.2 V |                        | 20              | ns/V |
|                 |                                    | 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     | RSE Package                                     | −40                    | 85              | °C   |
|                 |                                    | DQE Package                                     |                        |                 |      |
|                 |                                    | DCT Package                                     | −40                    | 125             |      |
|                 |                                    | DCU Package                                     |                        |                 |      |

(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> |  | SN74LVC1G74 |        |        |        | UNIT |
|-------------------------------|--|-------------|--------|--------|--------|------|
|                               |  | DCT         | DCU    | RSE    | DQE    |      |
|                               |  | 8 PINS      | 8 PINS | 8 PINS | 8 PINS |      |
| R <sub>θJA</sub>              | Junction-to-ambient thermal resistance | 220         | 227    | 243    | 261    | °C/W |

(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> | MIN                   | TYP <sup>(1)</sup> | MAX | UNIT |
|------------------|------------------------|--|-----------------|-----------------------|--------------------|-----|------|
| V <sub>OH</sub>  |                        | I <sub>OH</sub> = –100 µA  | 1.65 V to 5.5 V | V <sub>CC</sub> – 0.1 |                    |     | V    |
|                  |                        | I <sub>OH</sub> = –4 mA  | 1.65 V          | 1.2                   |                    |     |      |
|                  |                        | I <sub>OH</sub> = –8 mA  | 2.3 V           | 1.9                   |                    |     |      |
|                  |                        | I <sub>OH</sub> = –16 mA   | 3 V             | 2.4                   |                    |     |      |
|                  |                        | I <sub>OH</sub> = –24 mA   |                 | 2.3                   |                    |     |      |
|                  |                        | I <sub>OH</sub> = –32 mA   | 4.5 V           | 3.8                   |                    |     |      |
| V <sub>OL</sub>  |                        | I <sub>OL</sub> = 100 µA   | 1.65 V to 5.5 V | 0.1                   |                    |     | V    |
|                  |                        | I <sub>OL</sub> = 4 mA   | 1.65 V          | 0.45                  |                    |     |      |
|                  |                        | I <sub>OL</sub> = 8 mA   | 2.3 V           | 0.3                   |                    |     |      |
|                  |                        | I <sub>OL</sub> = 16 mA  | 3 V             | 0.4                   |                    |     |      |
|                  |                        | I <sub>OL</sub> = 24 mA  |                 | 0.55                  |                    |     |      |
|                  |                        | I <sub>OL</sub> = 32 mA  | 4.5 V           | 0.55                  |                    |     |      |
| I <sub>I</sub>   | Data or control inputs | 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           | 5                     |                    |     | pF   |

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

## 7.6 Timing Requirements

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

| PARAMETER          | FROM<br>(INPUT)     | TO<br>(OUTPUT) | −40°C to 85°C           |     |                         |     |                         |     |                       |     | −40°C to 125°C          |     |                       |     | UNIT |
|--------------------|---------------------|----------------|-------------------------|-----|-------------------------|-----|-------------------------|-----|-----------------------|-----|-------------------------|-----|-----------------------|-----|------|
|                    |                     |                | V <sub>CC</sub> = 1.8 V |     | V <sub>CC</sub> = 2.5 V |     | V <sub>CC</sub> = 3.3 V |     | V <sub>CC</sub> = 5 V |     | V <sub>CC</sub> = 3.3 V |     | V <sub>CC</sub> = 5 V |     |      |
|                    |                     |                | MIN                     | MAX | MIN                     | MAX | MIN                     | MAX | MIN                   | MAX | MIN                     | MAX | MIN                   | MAX |      |
| f <sub>clock</sub> |                     |                | 80                      |     | 175                     |     | 175                     |     | 200                   |     | 175                     |     | 200                   |     | MHz  |
| t <sub>w</sub>     | CLK                 |                | 6.2                     |     | 2.7                     |     | 2.7                     |     | 2                     |     | 2.7                     |     | 2                     |     | ns   |
|                    | PRE or CLR low      |                | 6.2                     |     | 2.7                     |     | 2.7                     |     | 2                     |     | 2.7                     |     | 2                     |     |      |
| t <sub>su</sub>    | Data                |                | 2.9                     |     | 1.7                     |     | 1.3                     |     | 1.1                   |     | 1.3                     |     | 1.1                   |     | ns   |
|                    | PRE or CLR inactive |                | 1.9                     |     | 1.4                     |     | 1.2                     |     | 1                     |     | 1.2                     |     | 1.2                   |     |      |
| t <sub>h</sub>     |                     |                | 0                       |     | 0.3                     |     | 1.2                     |     | 0.5                   |     | 1.2                     |     | 0.5                   |     | ns   |

## 7.7 Switching Characteristics

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

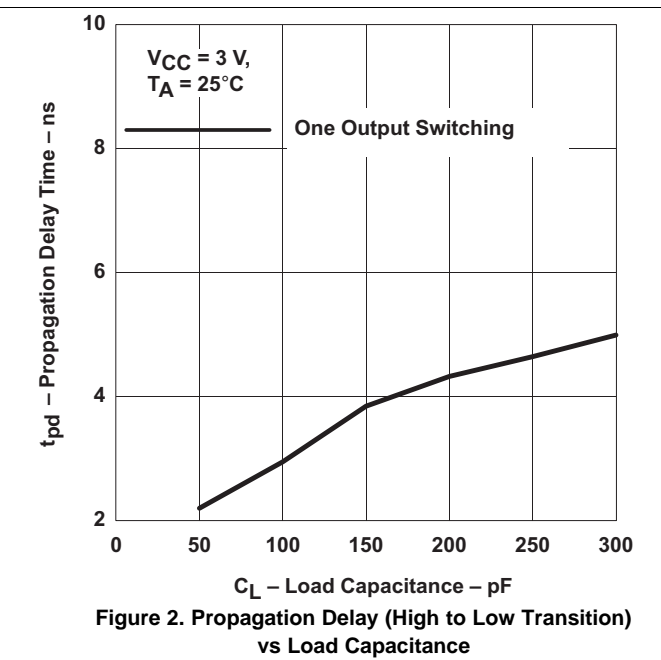
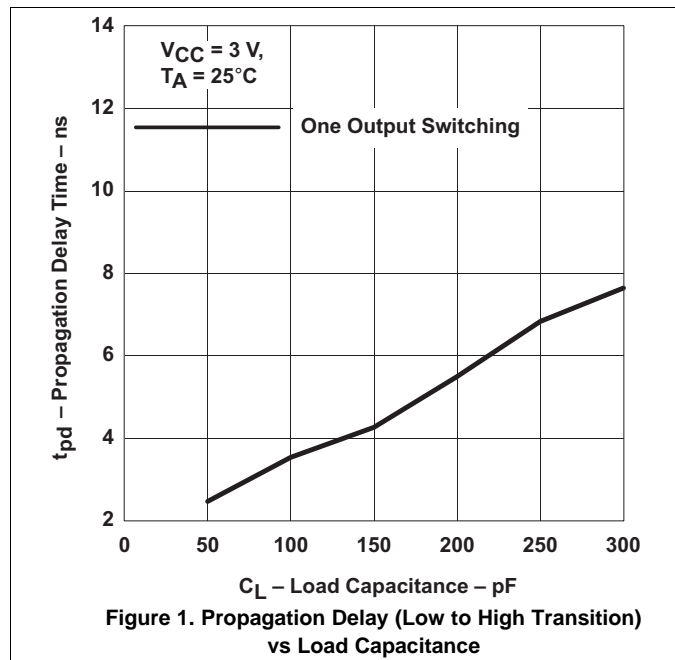
| PARAMETER        | FROM<br>(INPUT)                             | TO<br>(OUTPUT) | –40°C to 85°C           |      |                         |     |                         |     |                       |     | –40°C to 125°C          |     |                       |     | UNIT |
|------------------|---|----------------|-------------------------|------|-------------------------|-----|-------------------------|-----|-----------------------|-----|-------------------------|-----|-----------------------|-----|------|
|                  |   |                | V <sub>CC</sub> = 1.8 V |      | V <sub>CC</sub> = 2.5 V |     | V <sub>CC</sub> = 3.3 V |     | V <sub>CC</sub> = 5 V |     | V <sub>CC</sub> = 3.3 V |     | V <sub>CC</sub> = 5 V |     |      |
|                  |   |                | MIN                     | MAX  | MIN                     | MAX | MIN                     | MAX | MIN                   | MAX | MIN                     | MAX | MIN                   | MAX |      |
| f <sub>max</sub> |   |                | 80                      |      | 175                     |     | 175                     |     | 200                   |     | 175                     |     | 200                   |     | MHz  |
| t <sub>pd</sub>  | CLK   | Q              | 4.8                     | 13.4 | 2.2                     | 7.1 | 2.2                     | 5.9 | 1.4                   | 4.1 | 2.2                     | 7.9 | 1.4                   | 6.1 | ns   |
|                  |   | $\overline{Q}$ | 6                       | 14.4 | 3                       | 7.7 | 2.6                     | 6.2 | 1.6                   | 4.4 | 2.6                     | 8.2 | 1.6                   | 6.4 |      |
|                  | $\overline{PRE}$ or $\overline{CLR}$<br>low | Q or Q         | 4.4                     | 12.9 | 2.3                     | 7   | 1.7                     | 5.9 | 1.6                   | 4.1 | 1.7                     | 7.9 | 1.6                   | 6.1 |      |

## 7.8 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 | $f = 10\text{ MHz}$ | 35                      | 35                      | 37                      | 40                    | pF   |

## 7.9 Typical Characteristics

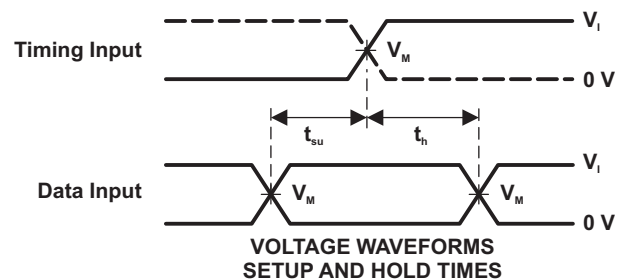
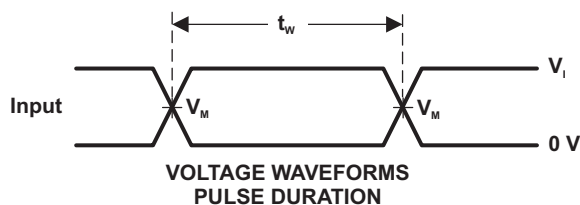


## 8 Parameter Measurement Information



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

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



- 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**

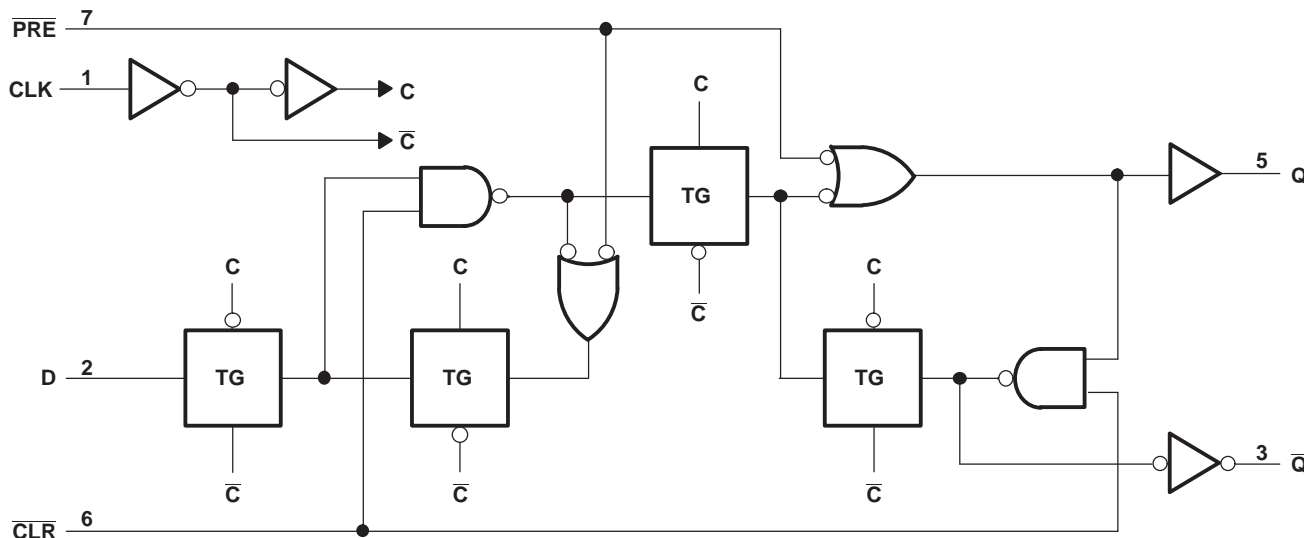


## 9 Detailed Description

### 9.1 Overview

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.

### 9.2 Functional Block Diagram



### 9.3 Feature Description

- Allow down voltage translation
  - 5 V to 3.3 V
  - 5.0 V to 1.8 V
  - 3.3 V to 1.8 V
- Inputs accept voltage levels up to 5.5 V
- $I_{off}$  Feature
  - Can prevent backflow current that can damage device when powered down

### 9.4 Device Functional Modes

**Table 1. Function Table**

| INPUTS |     |     |   | OUTPUTS   |             |
|--------|-----|-----|---|-----------|-------------|
| PRE    | CLR | CLK | D | Q         | $\bar{Q}$   |
| L      | H   | X   | X | H         | L           |
| H      | L   | X   | X | L         | H           |
| L      | L   | X   | X | $H^{(1)}$ | $H^{(1)}$   |
| H      | H   | ↑   | H | H         | L           |
| H      | H   | ↑   | L | L         | H           |
| H      | H   | L   | X | $Q_0$     | $\bar{Q}_0$ |

(1) This configuration is nonstable; that is, it does not persist when  $\overline{PRE}$  or  $\overline{CLR}$  returns to its inactive (high) level.

## 10 Application and Implementation

### NOTE

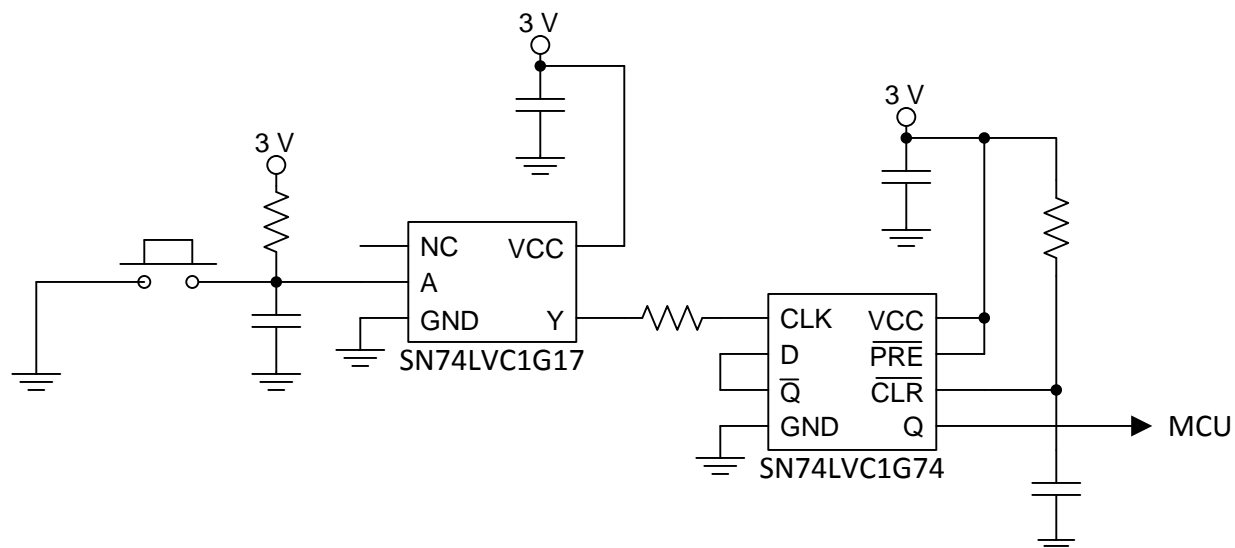
Information in the following applications sections is not part of the TI component specification, and TI does not warrant its accuracy or completeness. TI's customers are responsible for determining suitability of components for their purposes. Customers should validate and test their design implementation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

### 10.1 Application Information

A low level at the preset ( $\overline{\text{PRE}}$ ) or clear ( $\overline{\text{CLR}}$ ) input sets or resets the outputs, regardless of the levels of the other inputs. When  $\overline{\text{PRE}}$  and  $\overline{\text{CLR}}$  are inactive (high), data at the data (D) input meeting the setup time requirements is transferred to the outputs on the positive-going edge of the clock pulse. Clock triggering occurs at a voltage level and is not related directly to the rise time of the clock pulse. Following the hold-time interval, data at the D input can be changed without affecting the levels at the outputs.

The resistor and capacitor at the  $\overline{\text{CLR}}$  pin are optional. If they are not used, the  $\overline{\text{CLR}}$  pin should be connected directly to  $V_{CC}$  to be inactive.

### 10.2 Typical Power Button Circuit



**Figure 4. Device Power Button Circuit**

#### 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. Outputs can be combined to produce higher drive but the high drive will also create faster 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:

- For rise time and fall time specifications, see ( $\Delta t/\Delta V$ ) in [Recommended Operating Conditions](#) table.
- For specified high and low levels, see ( $V_{IH}$  and  $V_{IL}$ ) in [Recommended Operating Conditions](#) table.
- Inputs are overvoltage tolerant allowing them to go as high as 5.5 V at any valid  $V_{CC}$ .

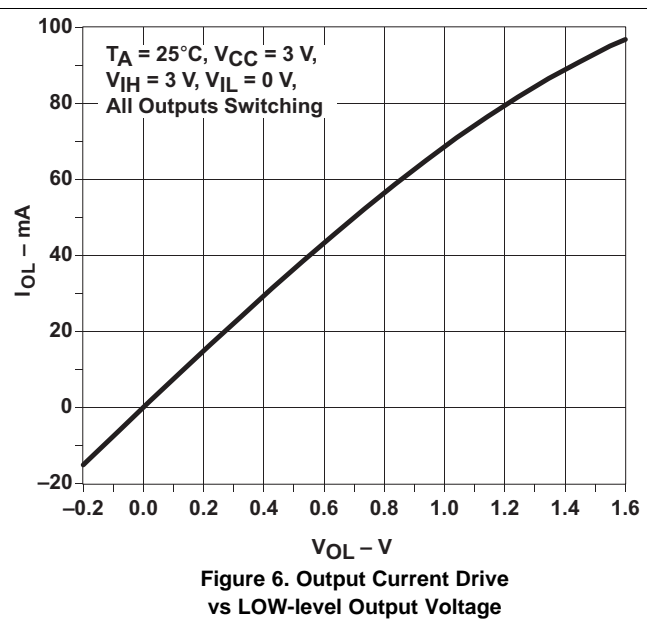
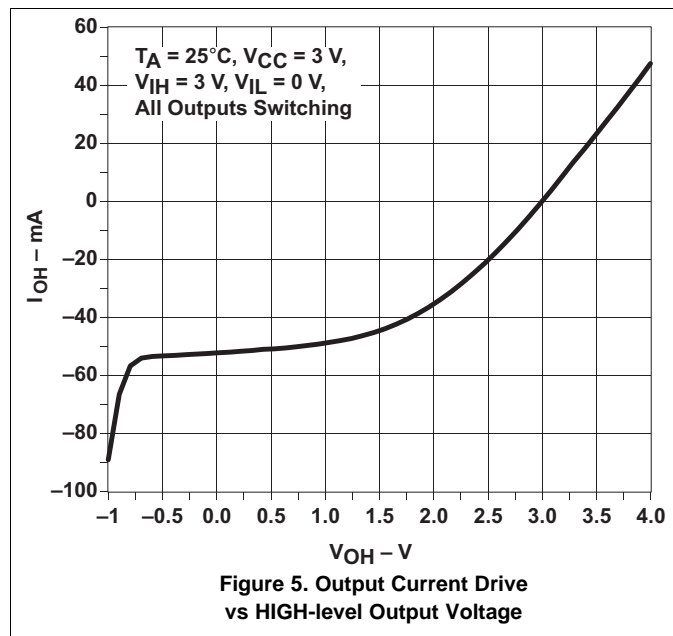
##### 2. Recommend Output Conditions:

- Load currents should not exceed 50 mA per output and 100 mA total for the part.
- Series resistors on the output may be used if the user desires to slow the output edge signal or limit the

## Typical Power Button Circuit (continued)

output current.

### 10.2.3 Application Curves



## 11 Power Supply Recommendations

The power supply can be any voltage between the minimum and maximum supply voltage rating located in the [Recommended Operating Conditions](#) table. Each  $V_{CC}$  terminal should have a good bypass capacitor to prevent power disturbance. For devices with a single supply, a 0.1- $\mu\text{F}$  capacitor is recommended and if there are multiple  $V_{CC}$  terminals then .01- $\mu\text{F}$  or .022- $\mu\text{F}$  capacitors are recommended for each power terminal. It is acceptable to parallel multiple bypass caps to reject different frequencies of noise. The 0.1- $\mu\text{F}$  and 1- $\mu\text{F}$  capacitors are commonly used in parallel. The bypass capacitor should be installed as close to the power terminal as possible for best results.

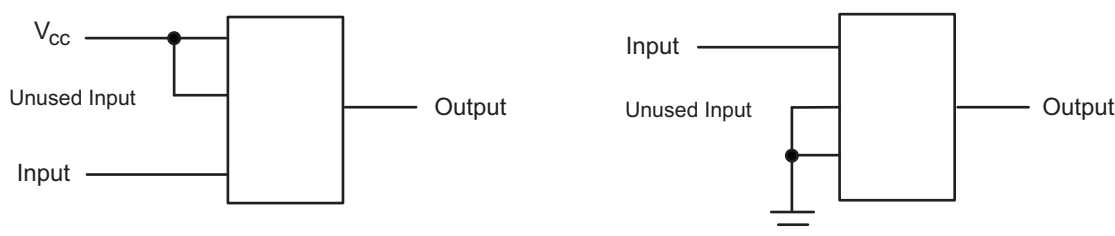
## 12 Layout

### 12.1 Layout Guidelines

When using multiple bit logic devices, inputs should not float. In many cases, functions or parts of functions of digital logic devices are unused. Some examples are when only two inputs of a triple-input AND gate are used, or when 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.

Specified in [Figure 7](#) are rules that 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 makes more sense or is more convenient. It is acceptable to float outputs unless the part is a transceiver. If the transceiver has an output enable pin, it will disable the outputs section of the part when asserted. This will not disable the input section of the I/Os so they also cannot float when disabled.

### 12.2 Layout Example



**Figure 7. Layout Diagram**

## 13 Device and Documentation Support

### 13.1 Trademarks

NanoFree is a trademark of Texas Instruments.  
All other 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.

**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 |
|-------------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| SN74LVC1G74DCTR   | SM8          | DCT             | 8    | 3000 | 180.0              | 13.0               | 3.35    | 4.5     | 1.55    | 4.0     | 12.0   | Q3            |
| SN74LVC1G74DCUR   | US8          | DCU             | 8    | 3000 | 180.0              | 8.4                | 2.25    | 3.35    | 1.05    | 4.0     | 8.0    | Q3            |
| SN74LVC1G74DCUR   | US8          | DCU             | 8    | 3000 | 178.0              | 9.5                | 2.25    | 3.35    | 1.05    | 4.0     | 8.0    | Q3            |
| SN74LVC1G74DCURG4 | US8          | DCU             | 8    | 3000 | 180.0              | 8.4                | 2.25    | 3.35    | 1.05    | 4.0     | 8.0    | Q3            |
| SN74LVC1G74DCUT   | US8          | DCU             | 8    | 250  | 178.0              | 9.5                | 2.25    | 3.35    | 1.05    | 4.0     | 8.0    | Q3            |
| SN74LVC1G74DCUT   | US8          | DCU             | 8    | 250  | 180.0              | 8.4                | 2.25    | 3.35    | 1.05    | 4.0     | 8.0    | Q3            |
| SN74LVC1G74DQER   | X2SON        | DQE             | 8    | 5000 | 180.0              | 9.5                | 1.15    | 1.6     | 0.5     | 4.0     | 8.0    | Q1            |
| SN74LVC1G74RSE2   | UQFN         | RSE             | 8    | 5000 | 180.0              | 9.5                | 1.7     | 1.7     | 0.75    | 4.0     | 8.0    | Q3            |
| SN74LVC1G74RSER   | UQFN         | RSE             | 8    | 5000 | 180.0              | 9.5                | 1.7     | 1.7     | 0.75    | 4.0     | 8.0    | Q2            |

## TAPE AND REEL BOX DIMENSIONS



\*All dimensions are nominal

| Device            | Package Type | Package Drawing | Pins | SPQ  | Length (mm) | Width (mm) | Height (mm) |
|-------------------|--------------|-----------------|------|------|-------------|------------|-------------|
| SN74LVC1G74DCTR   | SM8          | DCT             | 8    | 3000 | 182.0       | 182.0      | 20.0        |
| SN74LVC1G74DCUR   | US8          | DCU             | 8    | 3000 | 202.0       | 201.0      | 28.0        |
| SN74LVC1G74DCUR   | US8          | DCU             | 8    | 3000 | 202.0       | 201.0      | 28.0        |
| SN74LVC1G74DCURG4 | US8          | DCU             | 8    | 3000 | 202.0       | 201.0      | 28.0        |
| SN74LVC1G74DCUT   | US8          | DCU             | 8    | 250  | 202.0       | 201.0      | 28.0        |
| SN74LVC1G74DCUT   | US8          | DCU             | 8    | 250  | 202.0       | 201.0      | 28.0        |
| SN74LVC1G74DQER   | X2SON        | DQE             | 8    | 5000 | 184.0       | 184.0      | 19.0        |
| SN74LVC1G74RSE2   | UQFN         | RSE             | 8    | 5000 | 184.0       | 184.0      | 19.0        |
| SN74LVC1G74RSER   | UQFN         | RSE             | 8    | 5000 | 184.0       | 184.0      | 19.0        |

## DCT (R-PDSO-G8)

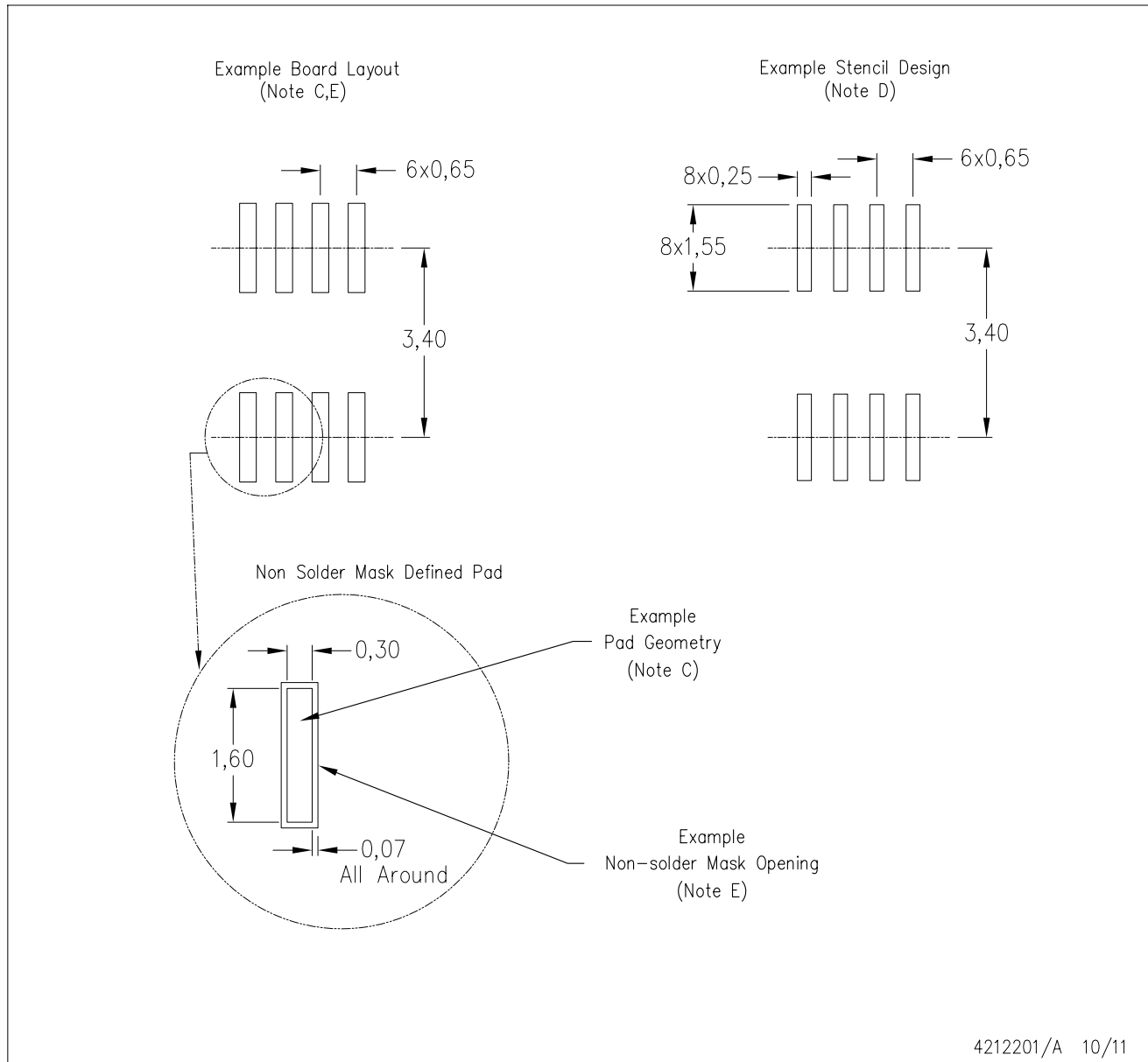
## PLASTIC SMALL-OUTLINE PACKAGE



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

DCT (R-PDSO-G8)

PLASTIC SMALL OUTLINE



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



DCU (R-PDSO-G8)

PLASTIC SMALL-OUTLINE PACKAGE (DIE DOWN)



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DCU (S-PDSO-G8)

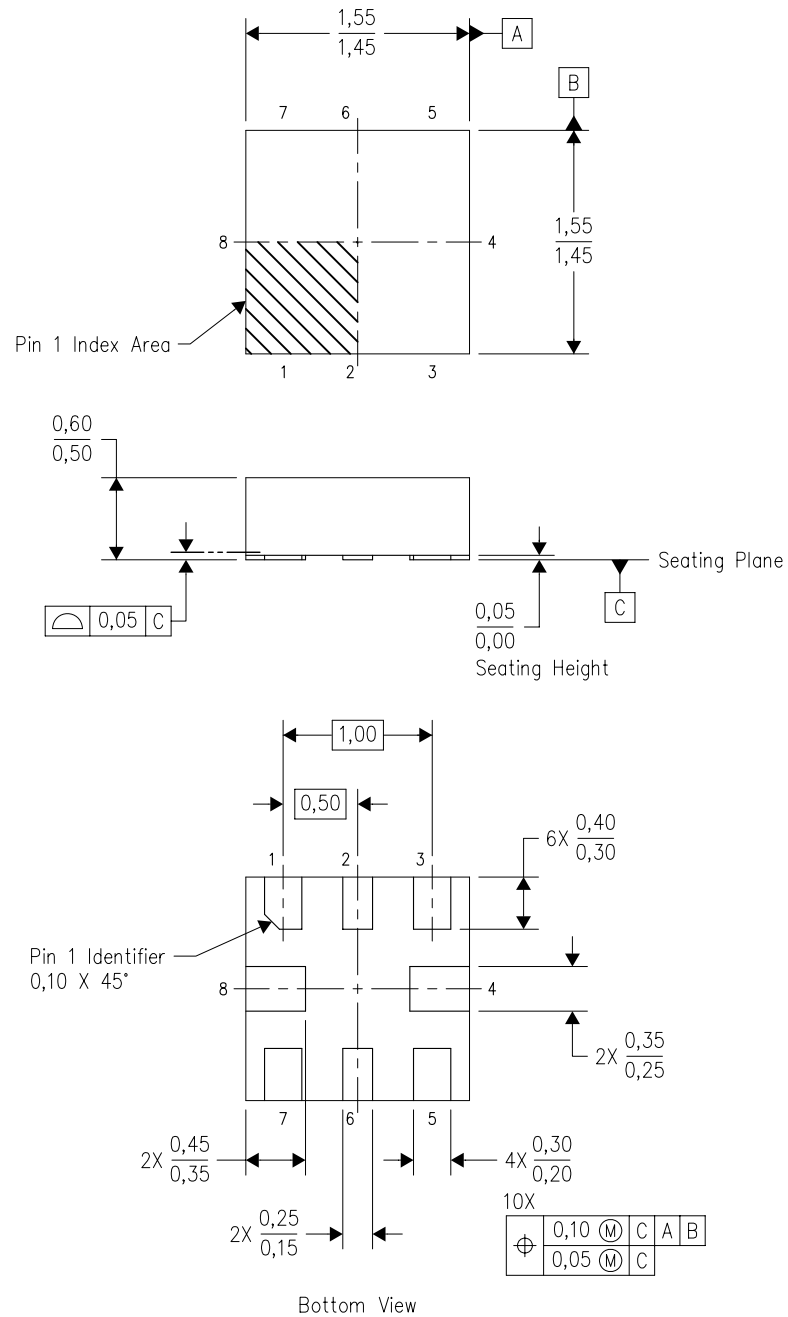
PLASTIC SMALL OUTLINE PACKAGE (DIE DOWN)



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

RSE (S-PUQFN-N8)

PLASTIC QUAD FLATPACK NO-LEAD



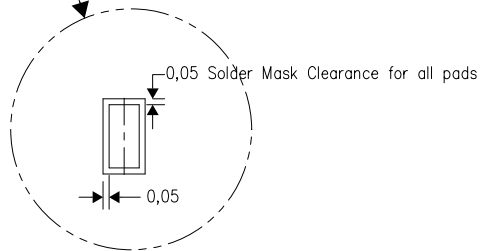
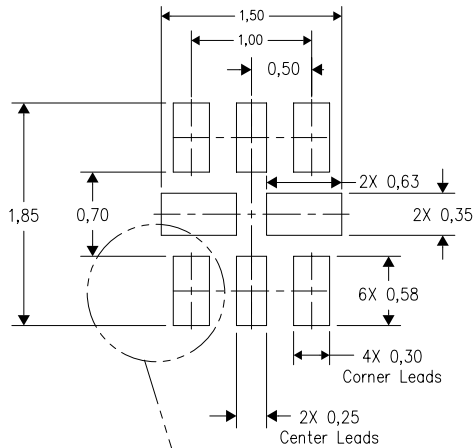
4207268-2/D 01/11

- 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. QFN (Quad Flatpack No-Lead) package configuration.
  - D. This package complies to JEDEC MO-288 variation UECD.

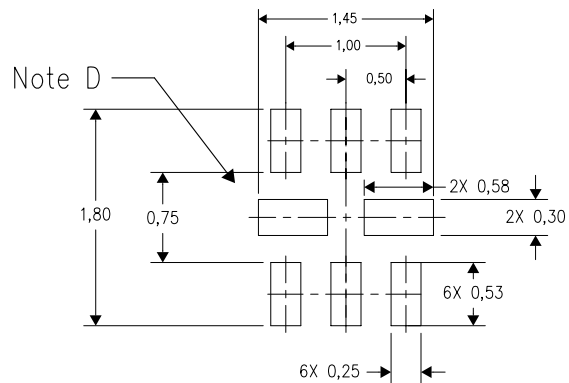
RSE (S-PUQFN-N8)

PLASTIC QUAD FLATPACK NO-LEAD

Example Board Layout



Example Stencil Design  
(Note E)

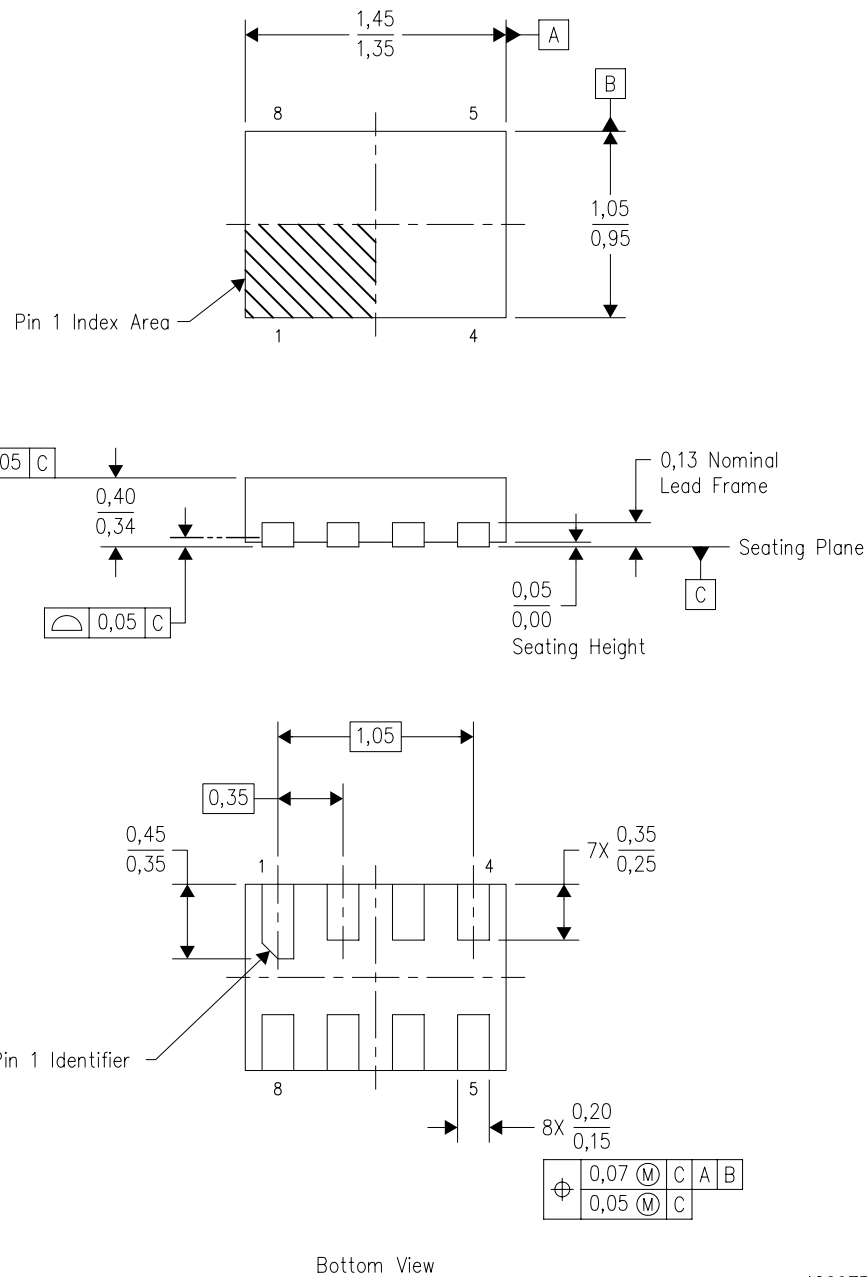


4208106-2/E 01/12

- 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.

DQE (R-PX2SON-N8)

PLASTIC SMALL OUTLINE NO-LEAD

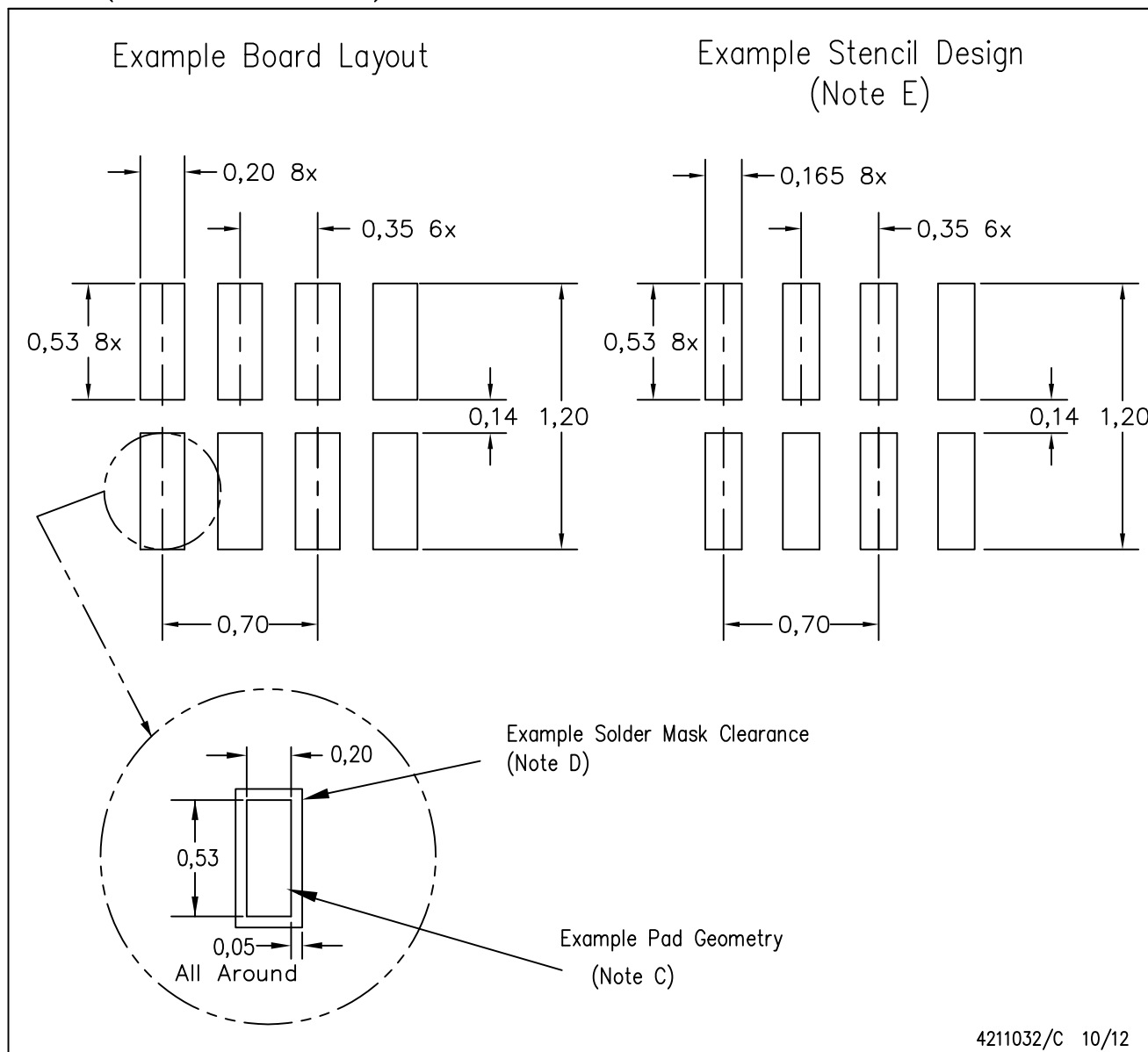


4209779/B 10/2008

- 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 X2EAF.

DQE (R-PX2SON-N8)

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.  
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. Over-printing land for acceptable area ratio is not viable due to land width and bridging potential. Customer may further reduce side aperture dimensions if stencil manufacturing process allows for sufficient release at smaller opening.
  - H. Suggest stencils cut with lasers such as Fiber Laser that produce the greatest positional accuracy.
  - I. Component placement force should be minimized to prevent excessive paste block deformation.

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| Interface                    | <a href="http://interface.ti.com">interface.ti.com</a>                               |
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| Medical                       | <a href="http://www.ti.com/medical">www.ti.com/medical</a>                               |
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