

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

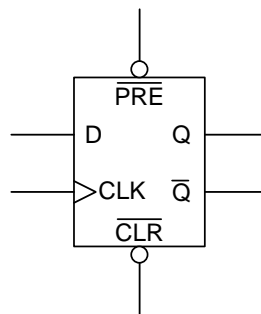
### 1 Features

- 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 x 2.80 mm
	US8 (8)	2.30 mm x 2.00 mm
	X2SON (8)	1.40 mm x 1.00 mm
	UQFN (8)	1.50 mm x 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

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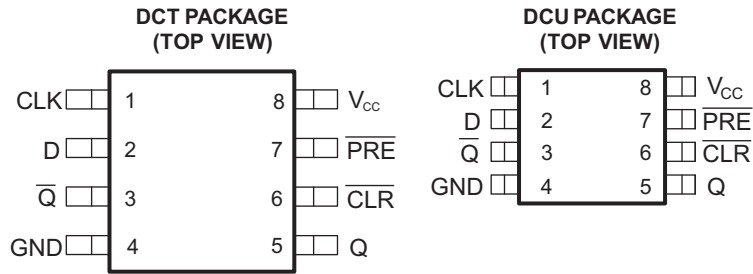
• Added <i>Applications</i> , <i>Device Information</i> table, <i>Pin Functions</i> table, <i>ESD Ratings</i> table, <i>Thermal Information</i> table, <i>Typical Characteristics</i> , <i>Feature Description</i> section, <i>Device Functional Modes</i> , <i>Application and Implementation</i> section, <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

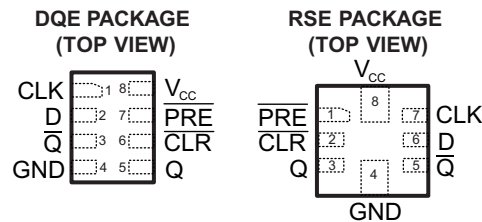
Page

• 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
$\overline{\text{CLR}}$	6	I	Clear input - Pull low to set Q output low
D	2	I	Input
GND	4	—	Ground
Q	5	O	Output
$\overline{\text{Q}}$	3	O	Inverted output
$\overline{\text{PRE}}$	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	
		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	
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 (INPUT)	TO (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
		$\overline{\text{PRE}}$ or $\overline{\text{CLR}}$ 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
		$\overline{\text{PRE}}$ or $\overline{\text{CLR}}$ 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](#))

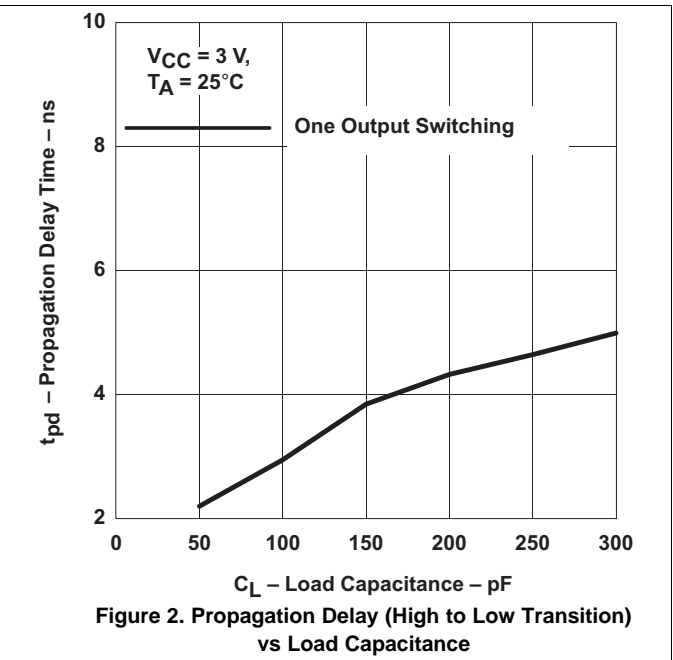
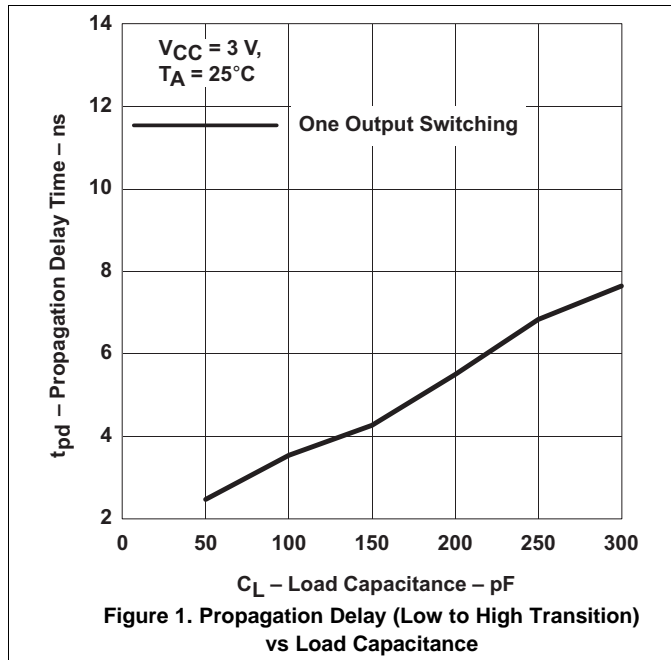
PARAMETER	FROM (INPUT)	TO (OUTPUT)	-40°C to 85°C								-40°C to 125°C				UNIT
			V <sub>CC</sub> = 1.8 V		V <sub>CC</sub> = 2.5 V		V <sub>CC</sub> = 3.3 V		V <sub>CC</sub> = 5 V		V <sub>CC</sub> = 3.3 V		V <sub>CC</sub> = 5 V		
			MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
f <sub>max</sub>			80		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
		$\overline{\text{Q}}$	6	14.4	3	7.7	2.6	6.2	1.6	4.4	2.6	8.2	1.6	6.4	
	$\overline{\text{PRE}}$ or $\overline{\text{CLR}}$ low	Q or $\overline{\text{Q}}$	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<sub>A</sub> = 25°C

PARAMETER	TEST CONDITIONS	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	UNIT
		TYP	TYP	TYP	TYP	
C <sub>pd</sub> Power dissipation capacitance	f = 10 MHz	35	35	37	40	pF

## 7.9 Typical Characteristics

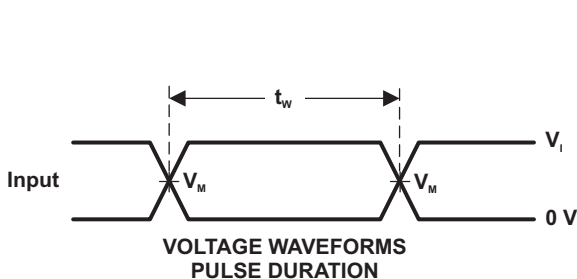


## 8 Parameter Measurement Information



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

$V_{CC}$	INPUTS		$V_M$	$V_{LOAD}$	$C_L$	$R_L$	$V_{\Delta}$
	$V_i$	$t_i/t_r$					
$1.8\text{ V} \pm 0.15\text{ V}$	$V_{CC}$	$\leq 2\text{ ns}$	$V_{CC}/2$	$2 \times V_{CC}$	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: A.  $C_L$  includes probe and jig capacitance.  
 B. Waveform 1 is for an output with internal conditions such that the output is low, except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high, except when disabled by the output control.  
 C. All input pulses are supplied by generators having the following characteristics: PRR  $\leq$  10 MHz,  $Z_o = 50\ \Omega$ .  
 D. The outputs are measured one at a time, with one transition per measurement.  
 E.  $t_{PLZ}$  and  $t_{PHZ}$  are the same as  $t_{dis}$ .  
 F.  $t_{PZL}$  and  $t_{PZH}$  are the same as  $t_{en}$ .  
 G.  $t_{PLH}$  and  $t_{PHL}$  are the same as  $t_{pd}$ .  
 H. All parameters and waveforms are not applicable to all devices.

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

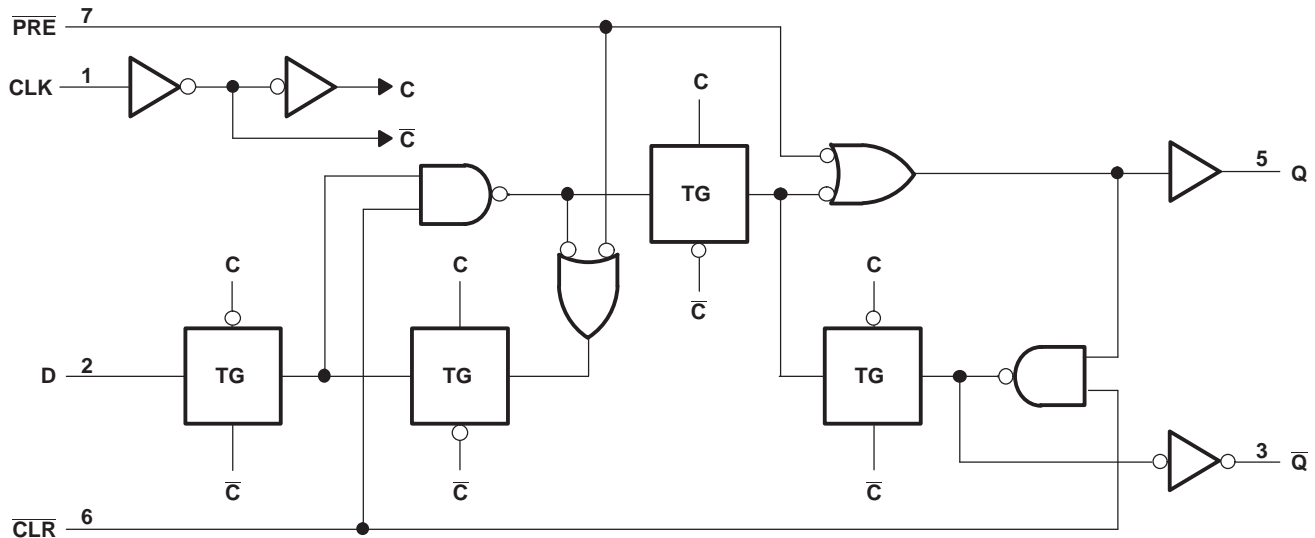


## 9 Detailed Description

### 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	Q̄
L	H	X	X	H	L
H	L	X	X	L	H
L	L	X	X	H <sup>(1)</sup>	H <sup>(1)</sup>
H	H	↑	H	H	L
H	H	↑	L	L	H
H	H	L	X	Q <sub>0</sub>	Q̄ <sub>0</sub>

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

## 10 Application and Implementation

### NOTE

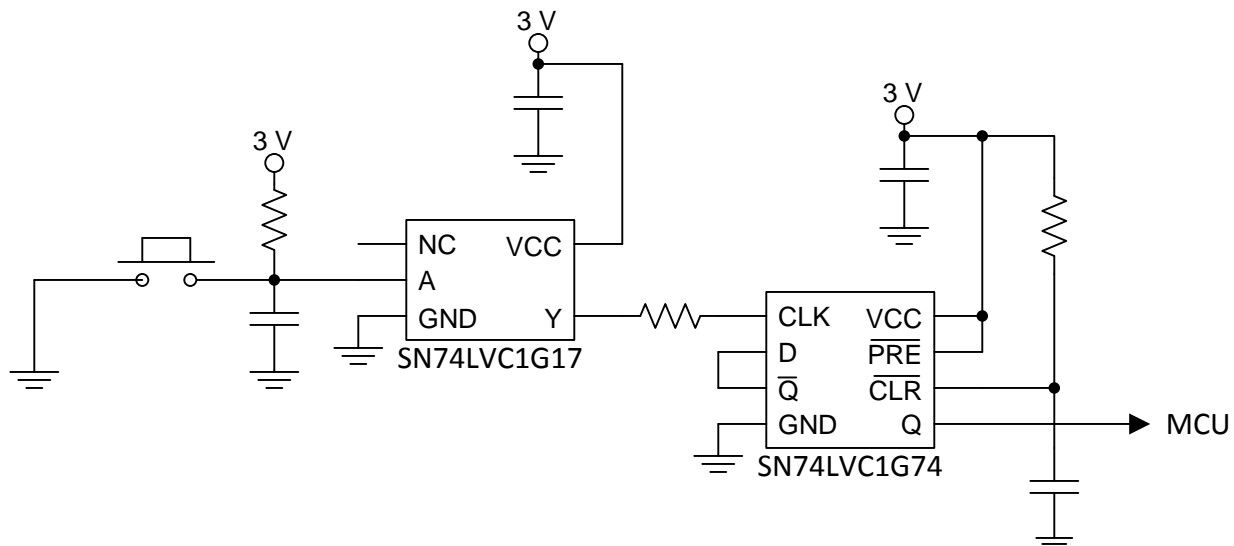
Information in the following applications sections is not part of the TI component specification, and TI does not warrant its accuracy or completeness. TI's customers are responsible for determining suitability of components for their purposes. Customers should validate and test their design implementation 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  $V_{\text{CC}}$  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.

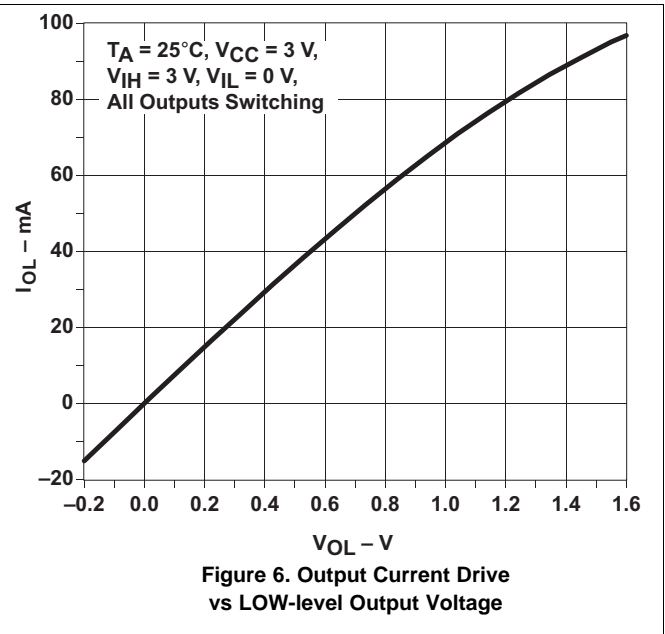
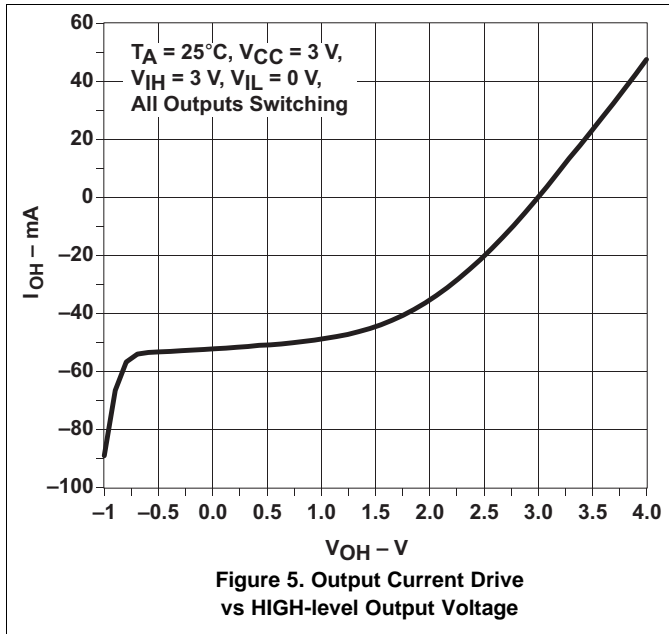
#### 10.2.2 Detailed Design Procedure

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  $(V_{\text{IH}}$  and  $V_{\text{IL}})$  in [Recommended Operating Conditions](#) table.
  - Inputs are overvoltage tolerant allowing them to go as high as 5.5 V at any valid  $V_{\text{CC}}$ .
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.

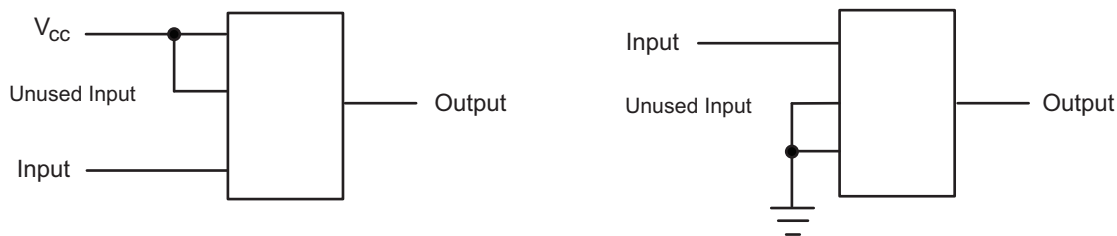
## 12 Layout

### 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.

**PACKAGING INFORMATION**

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
SN74LVC1G74DCTR	ACTIVE	SM8	DCT	8	3000	Green (RoHS & no Sb/Br)	NIPDAU	Level-1-260C-UNLIM	-40 to 125	N74 Z	<a href="#">Samples</a>
SN74LVC1G74DCUR	ACTIVE	VSSOP	DCU	8	3000	Green (RoHS & no Sb/Br)	NIPDAU   SN	Level-1-260C-UNLIM	-40 to 125	(N74Q, N74R)	<a href="#">Samples</a>
SN74LVC1G74DCURG4	ACTIVE	VSSOP	DCU	8	3000	Green (RoHS & no Sb/Br)	NIPDAU	Level-1-260C-UNLIM	-40 to 125	N74R	<a href="#">Samples</a>
SN74LVC1G74DCUT	ACTIVE	VSSOP	DCU	8	250	Green (RoHS & no Sb/Br)	NIPDAU   SN	Level-1-260C-UNLIM	-40 to 125	(N74Q, N74R)	<a href="#">Samples</a>
SN74LVC1G74DQER	ACTIVE	X2SON	DQE	8	5000	Green (RoHS & no Sb/Br)	NIPDAU	Level-1-260C-UNLIM	-40 to 125	DP	<a href="#">Samples</a>
SN74LVC1G74RSE2	ACTIVE	UQFN	RSE	8	5000	Green (RoHS & no Sb/Br)	NIPDAU	Level-1-260C-UNLIM	-40 to 125	DP	<a href="#">Samples</a>
SN74LVC1G74RSER	ACTIVE	UQFN	RSE	8	5000	Green (RoHS & no Sb/Br)	NIPDAU	Level-1-260C-UNLIM	-40 to 125	DP	<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.

**Green:** TI defines "Green" to mean the content of Chlorine (Cl) and Bromine (Br) based flame retardants meet JS709B low halogen requirements of <=100ppm threshold. Antimony trioxide based flame retardants must also meet the <=1000ppm 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.

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

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**TAPE AND REEL INFORMATION**

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


\*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
SN74LVC1G74DCTR	SM8	DCT	8	3000	180.0	13.0	3.35	4.5	1.55	4.0	12.0	Q3
SN74LVC1G74DCUR	VSSOP	DCU	8	3000	180.0	8.4	2.25	3.35	1.05	4.0	8.0	Q3
SN74LVC1G74DCUR	VSSOP	DCU	8	3000	178.0	9.5	2.25	3.35	1.05	4.0	8.0	Q3
SN74LVC1G74DCURG4	VSSOP	DCU	8	3000	180.0	8.4	2.25	3.35	1.05	4.0	8.0	Q3
SN74LVC1G74DCUT	VSSOP	DCU	8	250	180.0	8.4	2.25	3.35	1.05	4.0	8.0	Q3
SN74LVC1G74DCUT	VSSOP	DCU	8	250	178.0	9.5	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**

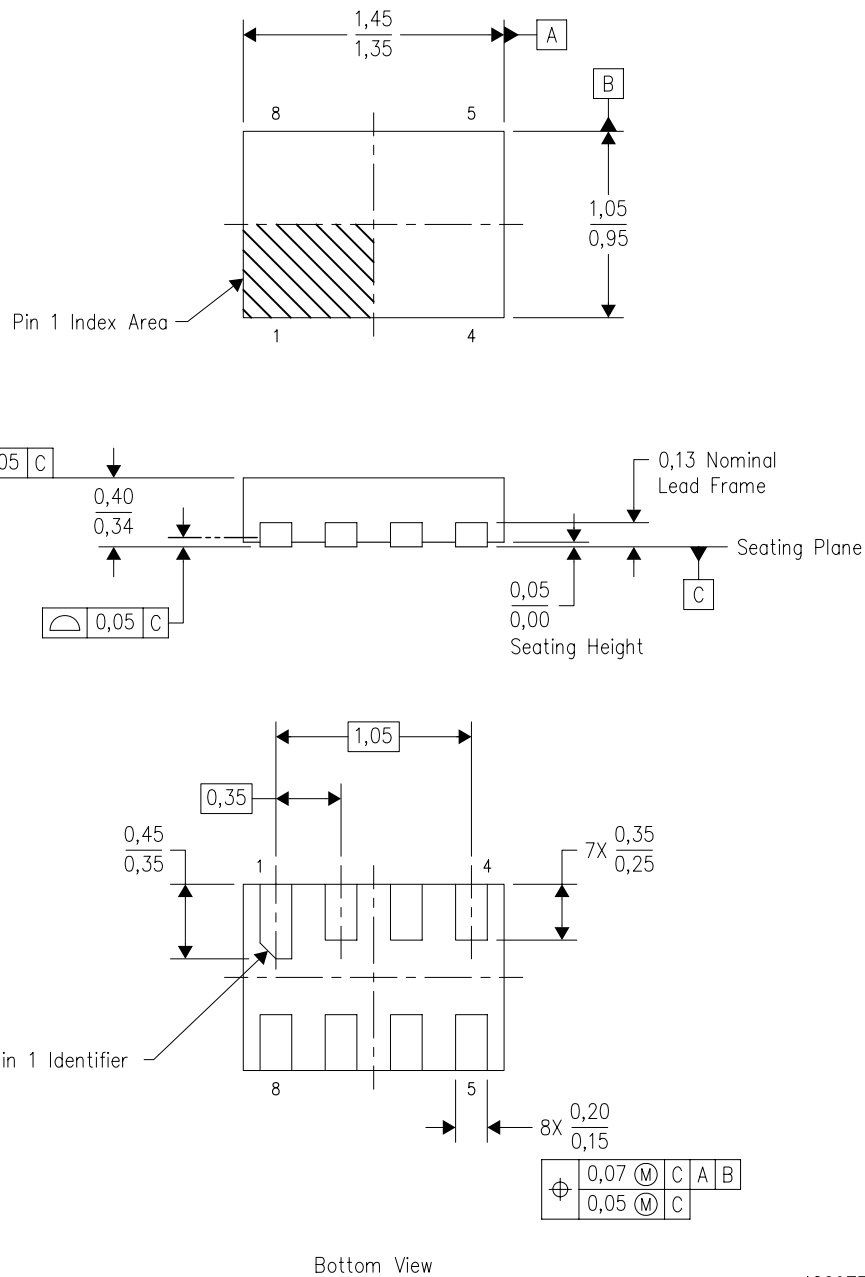

\*All dimensions are nominal

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	VSSOP	DCU	8	3000	202.0	201.0	28.0
SN74LVC1G74DCUR	VSSOP	DCU	8	3000	202.0	201.0	28.0
SN74LVC1G74DCURG4	VSSOP	DCU	8	3000	202.0	201.0	28.0
SN74LVC1G74DCUT	VSSOP	DCU	8	250	202.0	201.0	28.0
SN74LVC1G74DCUT	VSSOP	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



DQE (R-PX2SON-N8)

PLASTIC SMALL OUTLINE NO-LEAD



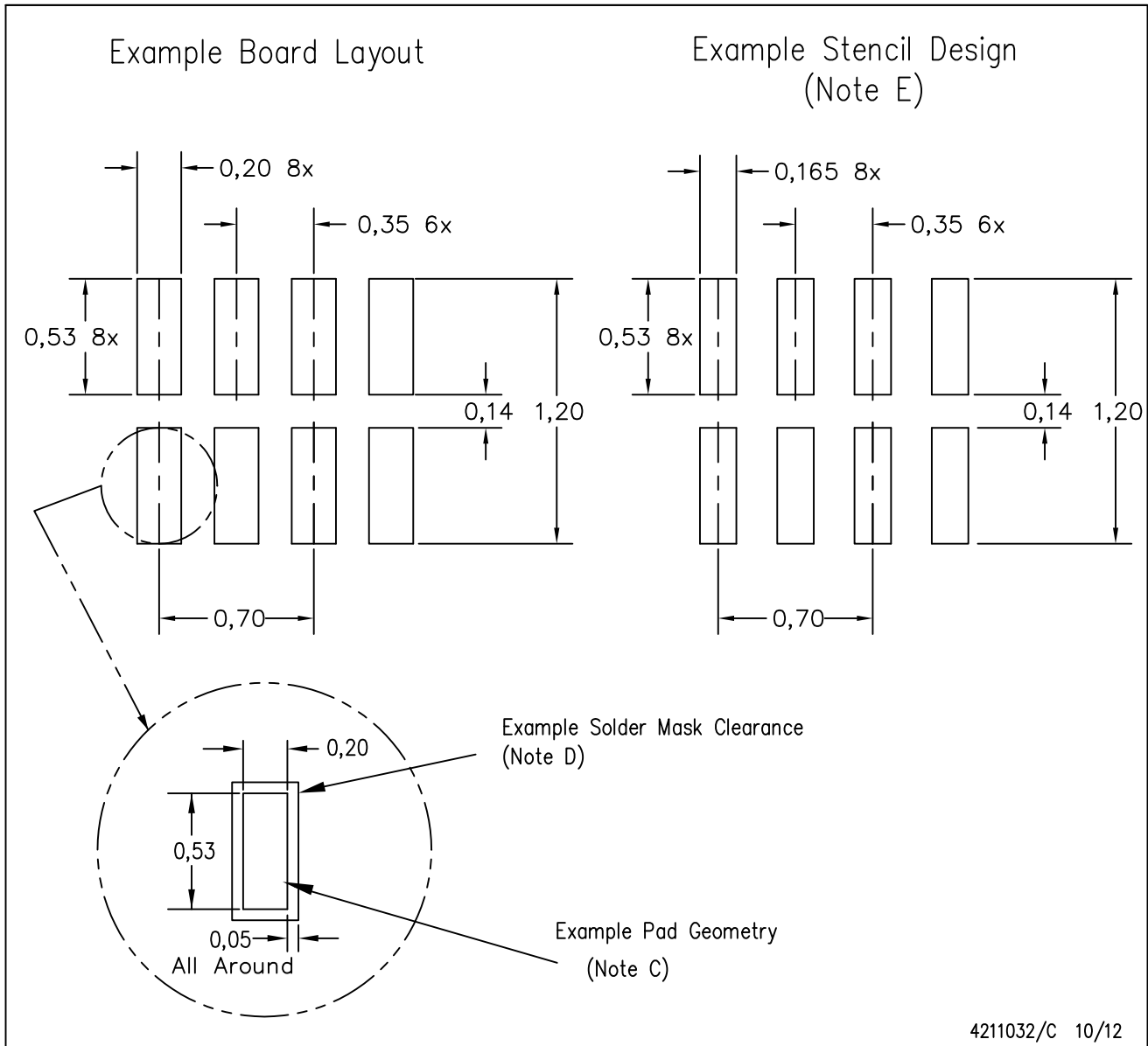
Bottom View

4209779/B 10/2008

- NOTES:
- All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M-1994.
  - This drawing is subject to change without notice.
  - SON (Small Outline No-Lead) package configuration.
  - This package complies to JEDEC MO-287 variation X2EAF.

DQE (R-PX2SON-N8)

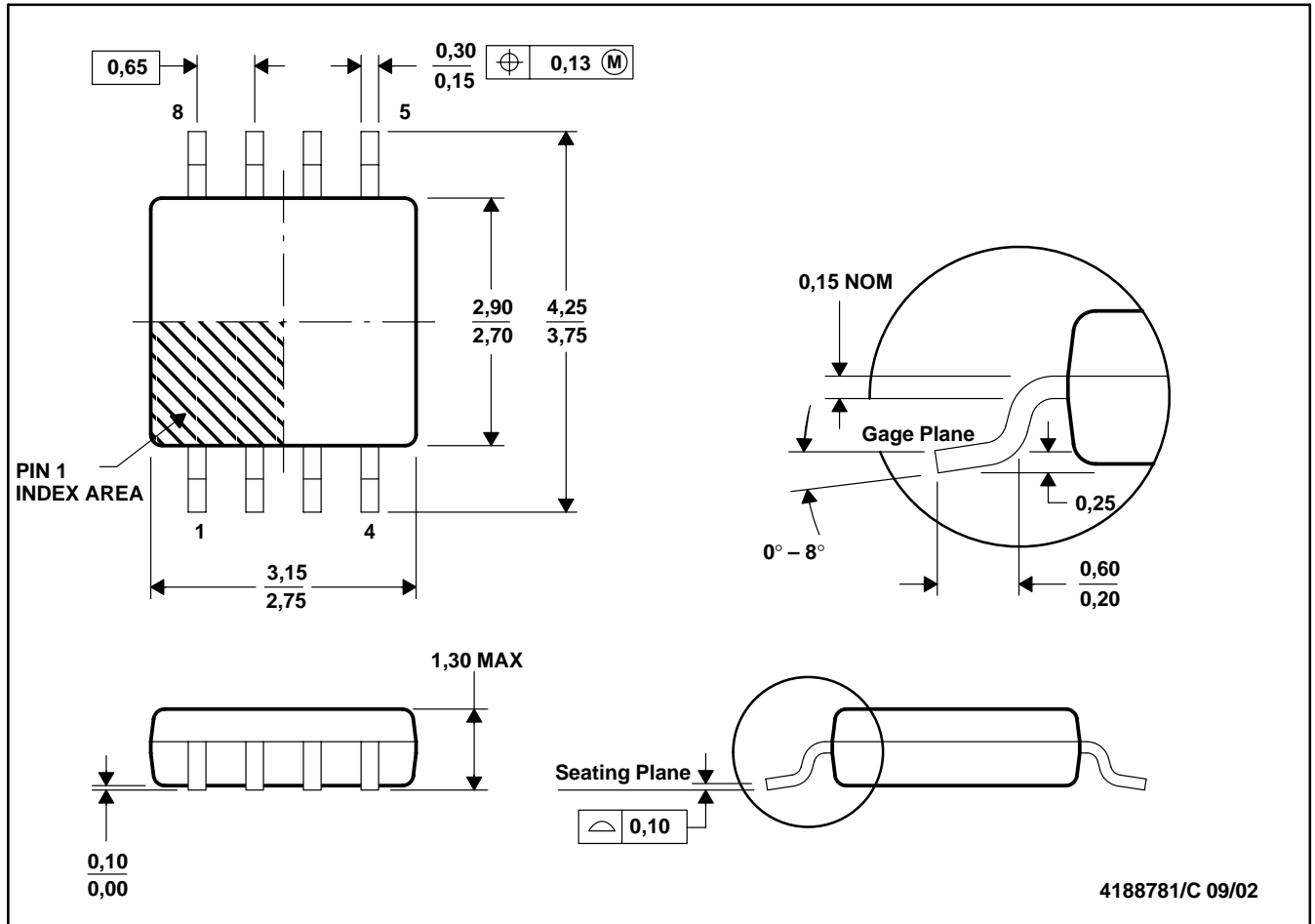
PLASTIC SMALL OUTLINE NO-LEAD



- 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.

DCT (R-PDSO-G8)

PLASTIC SMALL-OUTLINE PACKAGE



4188781/C 09/02

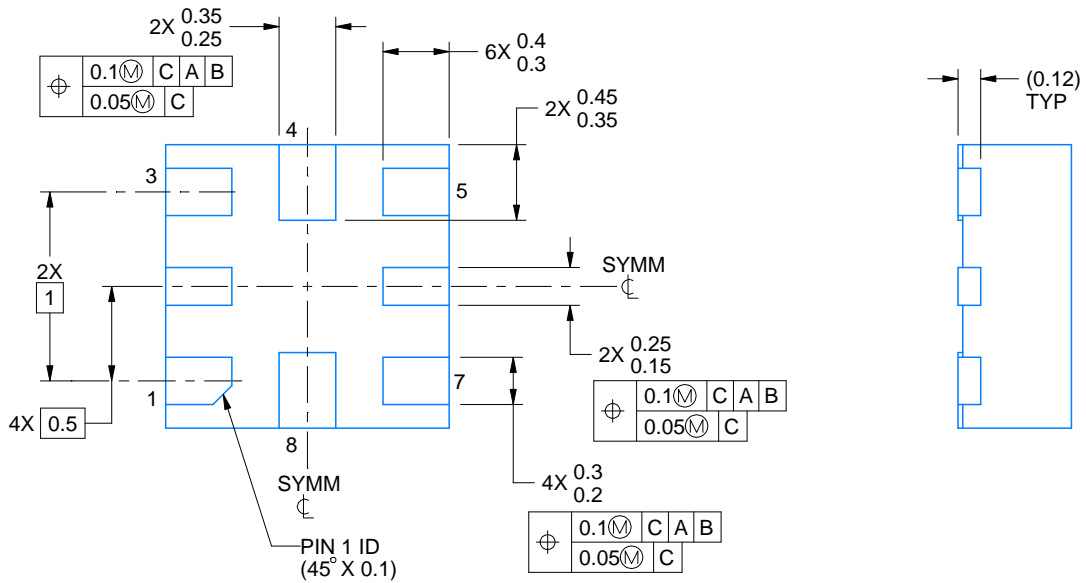
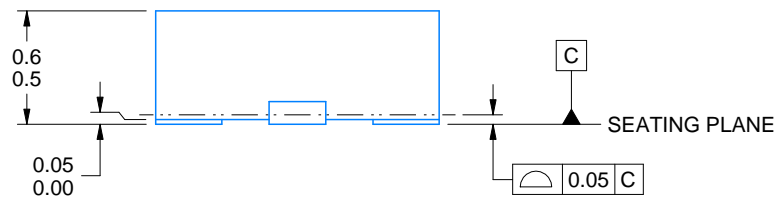
- NOTES:
- A. All linear dimensions are in millimeters.
  - B. This drawing is subject to change without notice.
  - C. Body dimensions do not include mold flash or protrusion.
  - D. Falls within JEDEC MO-187 variation DA.

DCT (R-PDSO-G8)

PLASTIC SMALL OUTLINE



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



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NOTES:

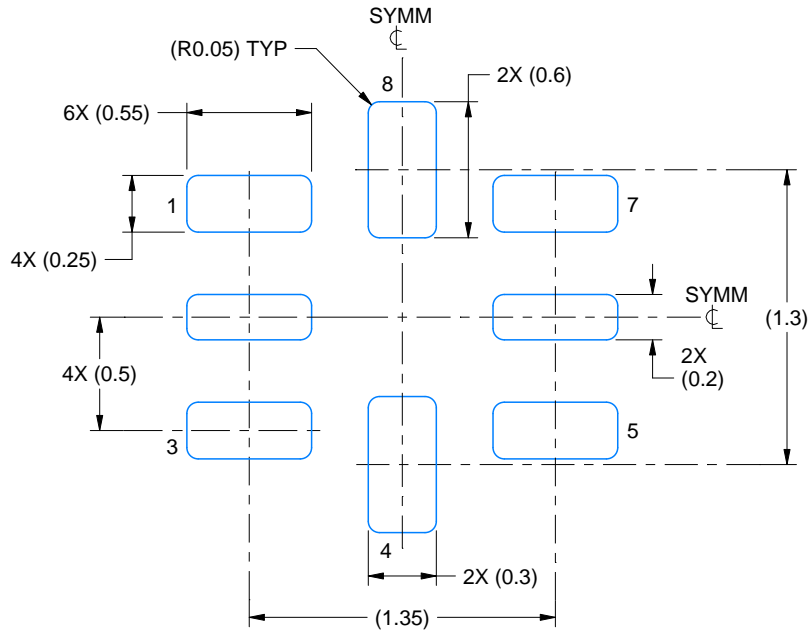
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.

# EXAMPLE BOARD LAYOUT

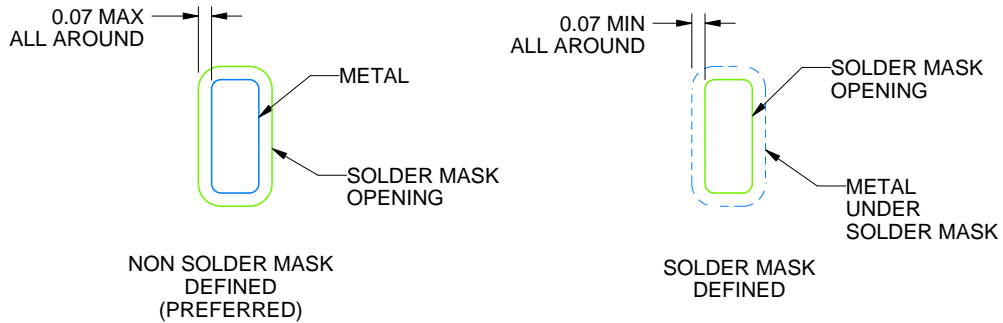
RSE0008A

UQFN - 0.6 mm max height

PLASTIC QUAD FLATPACK - NO LEAD



LAND PATTERN EXAMPLE  
SCALE:30X



SOLDER MASK DETAILS  
NOT TO SCALE

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NOTES: (continued)

3. For more information, see Texas Instruments literature number SLUA271 ([www.ti.com/lit/slua271](http://www.ti.com/lit/slua271)).

# EXAMPLE STENCIL DESIGN

RSE0008A

UQFN - 0.6 mm max height

PLASTIC QUAD FLATPACK - NO LEAD



SOLDER PASTE EXAMPLE  
BASED ON 0.1 mm THICKNESS  
SCALE: 30X

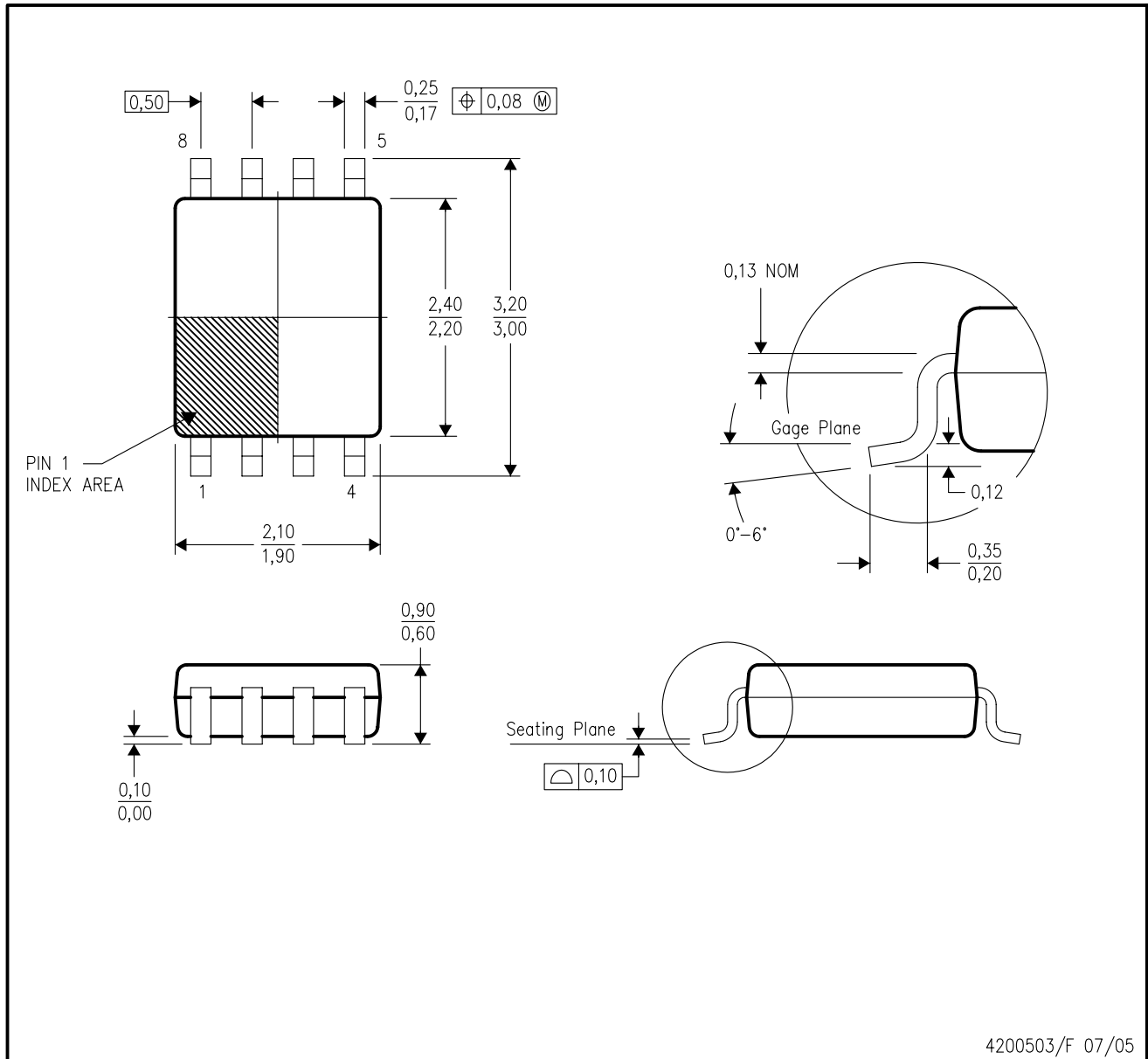
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NOTES: (continued)

5. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.

DCU (R-PDSO-G8)

PLASTIC SMALL-OUTLINE PACKAGE (DIE DOWN)

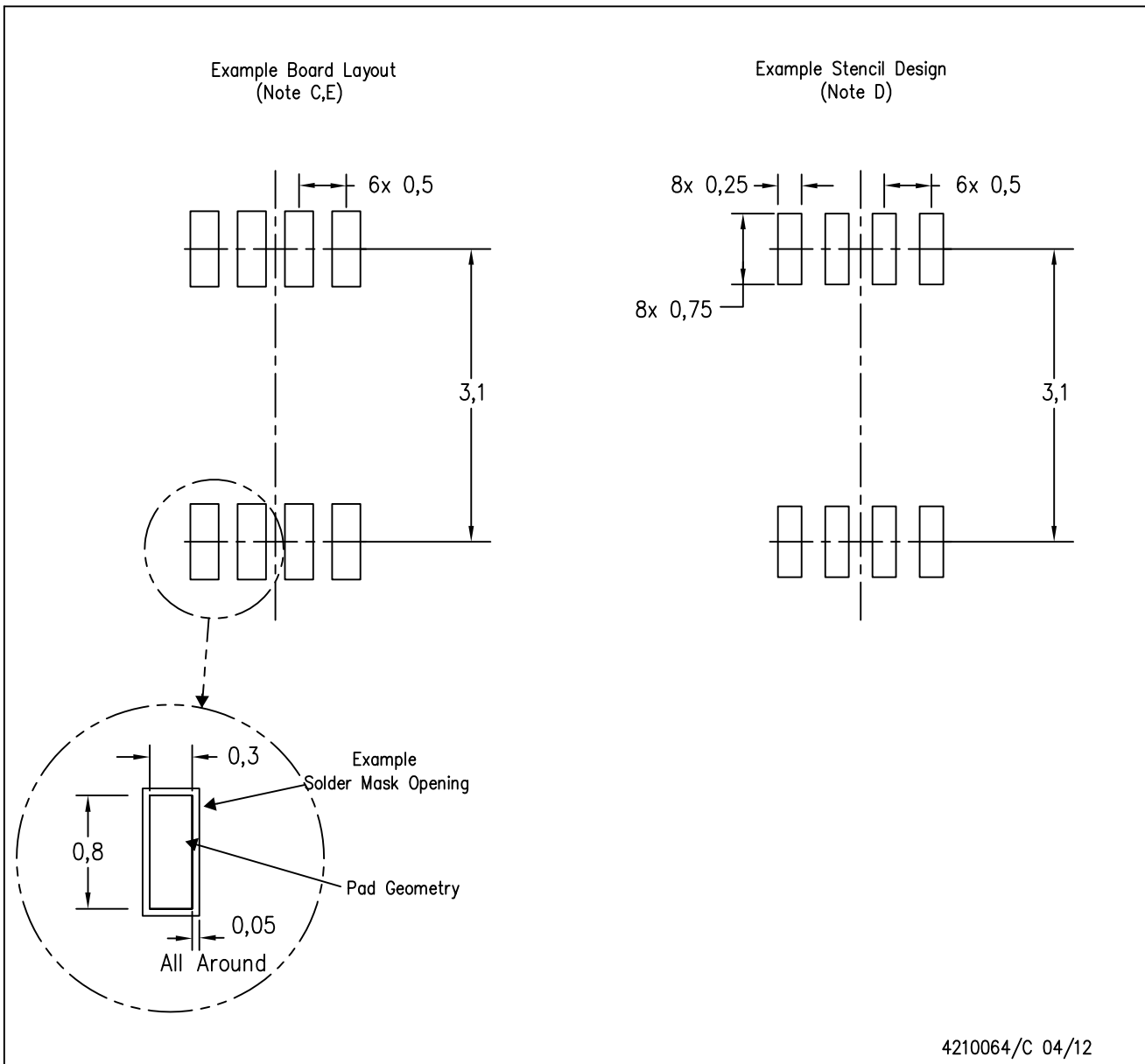


- NOTES:
- A. All linear dimensions are in millimeters.
  - B. This drawing is subject to change without notice.
  - C. Body dimensions do not include mold flash or protrusion. Mold flash and protrusion shall not exceed 0.15 per side.
  - D. Falls within JEDEC MO-187 variation CA.



DCU (S-PDSO-G8)

PLASTIC SMALL OUTLINE PACKAGE (DIE DOWN)



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

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