

## SN74LVC1G66 Single Bilateral Analog Switch

### 1 Features

- Available in the Texas Instruments NanoFree™ Package
- 1.65-V to 5.5-V  $V_{CC}$  Operation
- Inputs Accept Voltages to 5.5 V
- Max  $t_{pd}$  of 0.8 ns at 3.3 V
- High On-Off Output Voltage Ratio
- High Degree of Linearity
- High Speed, Typically 0.5 ns ( $V_{CC} = 3$  V,  $C_L = 50$  pF)
- Low ON-State Resistance, Typically  $\approx 5.5 \Omega$  ( $V_{CC} = 4.5$  V)
- Latch-Up Performance Exceeds 100 mA Per JESD 78, Class II
- ESD Protection Exceeds JESD 22
  - 2000-V Human-Body Model (A114-A)
  - 200-V Machine Model (A115-A)
  - 1000-V Charged-Device Model (C101)

### 2 Applications

- Wireless Devices
- Audio and Video Signal Routing
- Portable Computing
- Wearable Devices
- Signal Gating, Chopping, Modulation or Demodulation (Modem)
- Signal Multiplexing for Analog-to-Digital and Digital-to-Analog Conversion Systems

### 3 Description

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

The SN74LVC1G66 device can handle analog and digital signals. The device permits bidirectional transmission of signals with amplitudes of up to 5.5 V (peak).

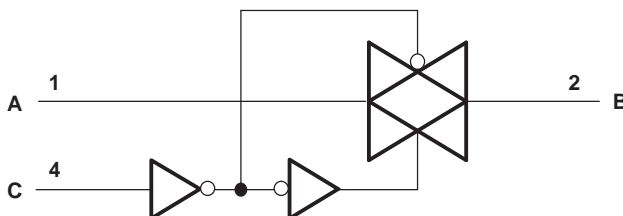
NanoFree package technology is a major breakthrough in IC packaging concepts, using the die as the package.

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

PART NUMBER	PACKAGE	BODY SIZE (NOM)
SN74LVC1G66DBV	SOT-23 (5)	2.90 mm x 1.60 mm
SN74LVC1G66DCK	SC70 (5)	2.00 mm x 1.25 mm
SN74LVC1G66DRL	SOT (5)	1.60 mm x 1.20 mm
SN74LVC1G66DRY	SON (6)	1.45 mm x 1.00 mm
SN74LVC1G66YZP	DSBGA (5)	1.39 mm x 0.89 mm
SN74LVC1G66DSF	SON (6)	1.00 mm x 1.00 mm

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

Logic Diagram (Positive Logic)



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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 P (March 2016) to Revision Q</b>	<b>Page</b>
• Changed the YZP package pin out graphic .....	<b>4</b>

<b>Changes from Revision O (March 2015) to Revision P</b>	<b>Page</b>
• Added Junction temperature spec to <i>Absolute Maximum Ratings</i> table .....	<b>5</b>
• Added "Control" to "Input transition rise and fall time" in <i>Recommended Operating Conditions</i> table .....	<b>5</b>

<b>Changes from Revision N (December 2012) to Revision O</b>	<b>Page</b>
• Added <i>Pin Configuration and Functions</i> section, <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>
• Removed <i>Ordering Information</i> table .....	<b>1</b>
• Added <i>Device Information</i> table .....	<b>1</b>

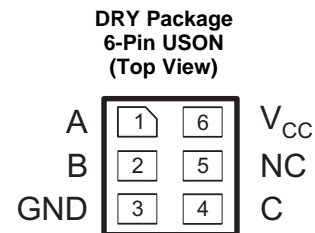
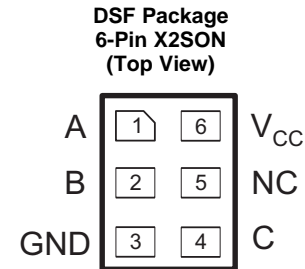
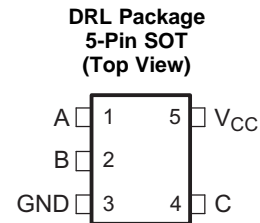
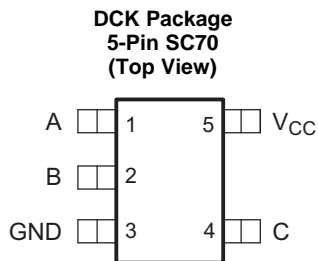
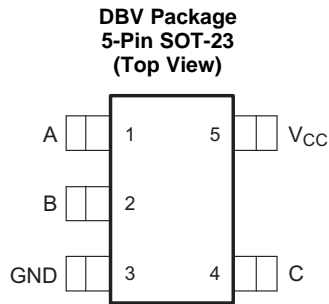
  

<b>Changes from Revision M (January 2012) to Revision N</b>	<b>Page</b>
• Added jumbo reel to <i>Ordering Information</i> table .....	<b>1</b>

<b>Changes from Revision L (January 2007) to Revision M</b>	<b>Page</b>
• Added DSF and DRY package to pin out graphic .....	<b>3</b>

## 5 Pin Configuration and Functions

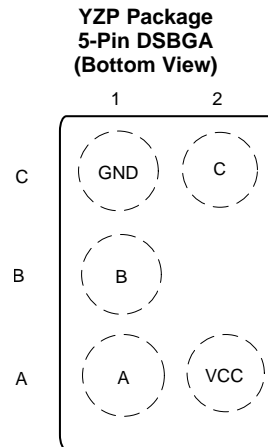


### Pin Functions

NAME	PIN		I/O	DESCRIPTION
	SOT NO.	USON, X2SON NO.		
A	1	1	I/O	Bidirectional signal to be switched
B	2	2	I/O	Bidirectional signal to be switched
C	4	4	I	Controls the switch (L = OFF, H = ON)
GND	3	3	—	Ground pin
NC	—	5	—	Do not connect
V <sub>CC</sub>	5	6	—	Power pin

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**Pin Functions**

PIN		I/O	DESCRIPTION
NAME	DSBGA NO.		
A	A1	I/O	Bidirectional signal to be switched
B	B1	I/O	Bidirectional signal to be switched
C	C2	I	Controls the switch (L = OFF, H = ON)
GND	C1	—	Ground pin
V <sub>CC</sub>	A2	—	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 <sup>(2)</sup>	-0.5	6.5	V
V <sub>I</sub>	Input voltage <sup>(2)(3)</sup>	-0.5	6.5	V
V <sub>I/O</sub>	Switch I/O voltage <sup>(2)(3)(4)</sup>	-0.5	V <sub>CC</sub> + 0.5	V
I <sub>IK</sub>	Control input clamp current	V <sub>I</sub> < 0	-50	mA
I <sub>I/OK</sub>	I/O port diode current	V <sub>I/O</sub> < 0 or V <sub>I/O</sub> > V <sub>CC</sub>	±50	mA
I <sub>T</sub>	ON-state switch current	V <sub>I/O</sub> < 0 to V <sub>CC</sub>	±50	mA
	Continuous current through V <sub>CC</sub> or GND		±100	mA
T <sub>stg</sub>	Storage Temperature	-65	150	°C
T <sub>j</sub>	Junction Temperature		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) All voltages are with respect to ground, unless otherwise specified.

(3) The input and output negative-voltage ratings may be exceeded if the input and output clamp-current ratings are observed.

(4) This value is limited to 5.5 V maximum.

### 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.

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

### 6.3 Recommended Operating Conditions

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

		MIN	MAX	UNIT
V <sub>CC</sub>	Supply voltage	1.65	5.5	V
V <sub>I/O</sub>	I/O port voltage.	0	V <sub>CC</sub>	V
V <sub>IH</sub>	High-level input voltage, control input	V <sub>CC</sub> = 1.65 V to 1.95 V	V <sub>CC</sub> × 0.65	V
		V <sub>CC</sub> = 2.3 V to 2.7 V	V <sub>CC</sub> × 0.7	
		V <sub>CC</sub> = 3 V to 3.6 V	V <sub>CC</sub> × 0.7	
		V <sub>CC</sub> = 4.5 V to 5.5 V	V <sub>CC</sub> × 0.7	
V <sub>IL</sub>	Low-level input voltage, control input	V <sub>CC</sub> = 1.65 V to 1.95 V	V <sub>CC</sub> × 0.35	V
		V <sub>CC</sub> = 2.3 V to 2.7 V	V <sub>CC</sub> × 0.3	
		V <sub>CC</sub> = 3 V to 3.6 V	V <sub>CC</sub> × 0.3	
		V <sub>CC</sub> = 4.5 V to 5.5 V	V <sub>CC</sub> × 0.3	
V <sub>I</sub>	Control input voltage	0	5.5	V
Δt/Δv	Control input transition rise and fall time	V <sub>CC</sub> = 1.65 V to 1.95 V	20	ns/V
		V <sub>CC</sub> = 2.3 V to 2.7 V	20	
		V <sub>CC</sub> = 3 V to 3.6 V	10	
		V <sub>CC</sub> = 4.5 V to 5.5 V	10	
T <sub>A</sub>	Operating free-air temperature	-40	85	°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	SN74LVC1G66						UNIT
	DBV (SOT-23)	DCK (SC70)	DRL (SOT)	DRY (USON)	DSF (X2SON)	YZP (DSBGA)	
	5 PINS	5 PINS	5 PINS	6 PINS	6 PINS	5 PINS	
$R_{\theta JA}$ Junction-to-ambient thermal resistance	206	252	142	—	—	132	°C/W

## 6.5 Electrical Characteristics

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

PARAMETER	TEST CONDITIONS	$V_{CC}$	MIN	TYP <sup>(1)</sup>	MAX	UNIT
$r_{on}$ ON-state switch resistance	$V_I = V_{CC}$ or GND, $V_C = V_{IH}$ (see Figure 2 and Figure 1)	$I_S = 4$ mA	1.65 V	12	30	$\Omega$
		$I_S = 8$ mA	2.3 V	9	20	
		$I_S = 24$ mA	3 V	7.5	15	
		$I_S = 32$ mA	4.5 V	5.5	10	
$r_{on(p)}$ Peak on resistance	$V_I = V_{CC}$ or GND, $V_C = V_{IH}$ (see Figure 2 and Figure 1)	$I_S = 4$ mA	1.65 V	74.5	120	$\Omega$
		$I_S = 8$ mA	2.3 V	20	30	
		$I_S = 24$ mA	3 V	11.5	20	
		$I_S = 32$ mA	4.5 V	7.5	15	
$I_{S(off)}$ OFF-state switch leakage current	$V_I = V_{CC}$ and $V_O =$ GND or $V_I =$ GND and $V_O = V_{CC}$ , $V_C = V_{IL}$ (see Figure 3)	$T_A = 25^\circ\text{C}$	5.5 V		$\pm 1$ $\pm 0.1$	$\mu\text{A}$
$I_{S(on)}$ ON-state switch leakage current	$V_I = V_{CC}$ or GND, $V_C = V_{IH}$ , $V_O =$ Open (see Figure 4)	$T_A = 25^\circ\text{C}$	5.5 V		$\pm 1$ $\pm 0.1$	$\mu\text{A}$
$I_I$ Control input current	$V_C = V_{CC}$ or GND	$T_A = 25^\circ\text{C}$	5.5 V		$\pm 1$ $\pm 0.1$	$\mu\text{A}$
$I_{CC}$ Supply current	$V_C = V_{CC}$ or GND	$T_A = 25^\circ\text{C}$	5.5 V		10 1	$\mu\text{A}$
$\Delta I_{CC}$ Supply current change	$V_C = V_{CC} - 0.6$ V		5.5 V		500	$\mu\text{A}$
$C_{ic}$ Control input capacitance			5 V		2	pF
$C_{io(off)}$ Switch input and output capacitance			5 V		6	pF
$C_{io(on)}$ Switch input and output capacitance			5 V		13	pF

(1)  $T_A = 25^\circ\text{C}$

## 6.6 Switching Characteristics

over recommended operating free-air temperature range (unless otherwise noted) (see Figure 5)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC} = 1.8$ V $\pm 0.15$ V		$V_{CC} = 2.5$ V $\pm 0.2$ V		$V_{CC} = 3.3$ V $\pm 0.3$ V		$V_{CC} = 5$ V $\pm 0.5$ V		UNIT
			MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
$t_{pd}^{(1)}$	A or B	B or A		2		1.2		0.8		0.6	ns
$t_{en}^{(2)}$	C	A or B	2.5	12	1.9	6.5	1.8	5	1.5	4.2	ns
$t_{dis}^{(3)}$	C	A or B	2.2	10	1.4	6.9	2	6.5	1.4	5	ns

(1)  $t_{PLH}$  and  $t_{PHL}$  are the same as  $t_{pd}$ . The propagation delay is the calculated RC time constant of the typical ON-state resistance of the switch and the specified load capacitance, when driven by an ideal voltage source (zero output impedance).

(2)  $t_{PZL}$  and  $t_{PZH}$  are the same as  $t_{en}$ .

(3)  $t_{PLZ}$  and  $t_{PHZ}$  are the same as  $t_{dis}$ .

## 6.7 Analog Switch Characteristics

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

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	$V_{CC}$	TYP	UNIT
Frequency response <sup>(1)</sup> (switch ON)	A or B	B or A	$C_L = 50\text{ pF}$ , $R_L = 600\ \Omega$ , $f_{in} = \text{sine wave}$ (see Figure 6)	1.65 V	35	MHz
				2.3 V	120	
				3 V	175	
				4.5 V	195	
			$C_L = 5\text{ pF}$ , $R_L = 50\ \Omega$ , $f_{in} = \text{sine wave}$ (see Figure 6)	1.65 V	>300	
				2.3 V	>300	
				3 V	>300	
				4.5 V	>300	
Crosstalk (control input to signal output)	C	A or B	$C_L = 50\text{ pF}$ , $R_L = 600\ \Omega$ , $f_{in} = 1\text{ MHz}$ (square wave) (see Figure 7)	1.65 V	35	mV
				2.3 V	50	
				3 V	70	
				4.5 V	100	
Feedthrough attenuation <sup>(2)</sup> (switch OFF)	A or B	B or A	$C_L = 50\text{ pF}$ , $R_L = 600\ \Omega$ , $f_{in} = 1\text{ MHz}$ (sine wave) (see Figure 8)	1.65 V	-58	dB
				2.3 V	-58	
				3 V	-58	
				4.5 V	-58	
			$C_L = 5\text{ pF}$ , $R_L = 50\ \Omega$ , $f_{in} = 1\text{ MHz}$ (sine wave) (see Figure 8)	1.65 V	-42	
				2.3 V	-42	
				3 V	-42	
				4.5 V	-42	
Sine-wave distortion	A or B	B or A	$C_L = 50\text{ pF}$ , $R_L = 10\text{ k}\Omega$ , $f_{in} = 1\text{ kHz}$ (sine wave) (see Figure 9)	1.65 V	0.1%	
				2.3 V	0.025%	
				3 V	0.015%	
				4.5 V	0.01%	
			$C_L = 50\text{ pF}$ , $R_L = 10\text{ k}\Omega$ , $f_{in} = 10\text{ kHz}$ (sine wave) (see Figure 9)	1.65 V	0.15%	
				2.3 V	0.025%	
				3 V	0.015%	
				4.5 V	0.01%	

(1) Adjust  $f_{in}$  voltage to obtain 0 dBm at output. Increase  $f_{in}$  frequency until dB meter reads -3 dB.

(2) Adjust  $f_{in}$  voltage to obtain 0 dBm at input.

## 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	$f = 10\text{ MHz}$	8	9	9	11	pF

**SN74LVC1G66**

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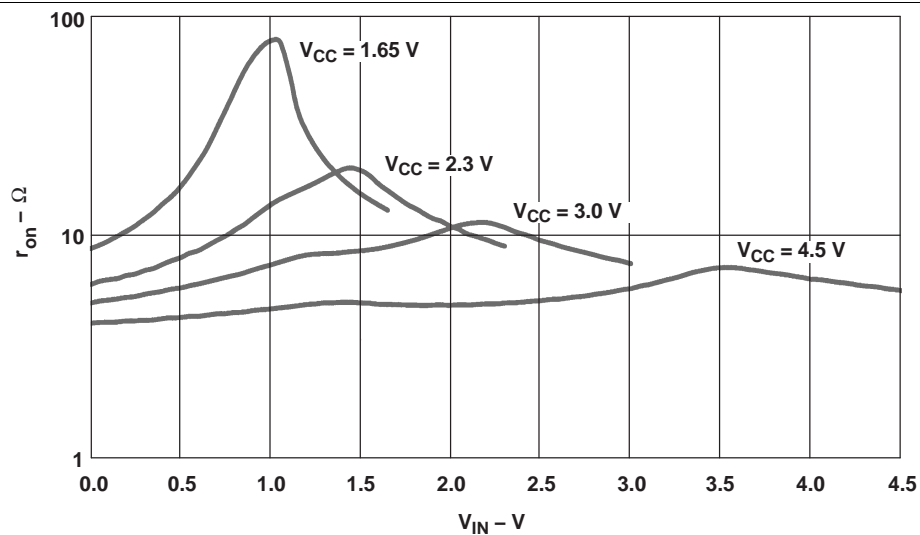
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**6.9 Typical Characteristics**
 $T_A = 25^\circ\text{C}$ 


Figure 1. Typical  $r_{on}$  as a Function of Input Voltage ( $V_I$ ) for  $V_I = 0$  to  $V_{CC}$



## 7 Parameter Measurement Information

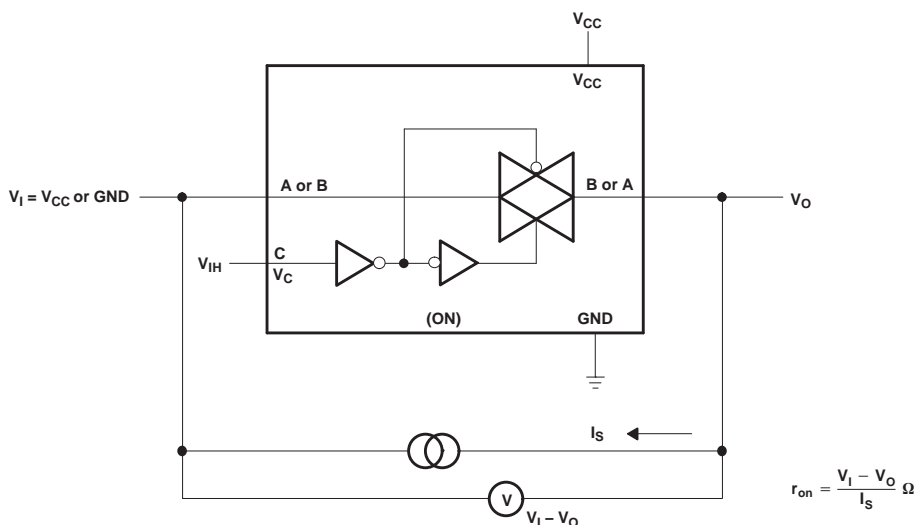


Figure 2. ON-State Resistance Test Circuit

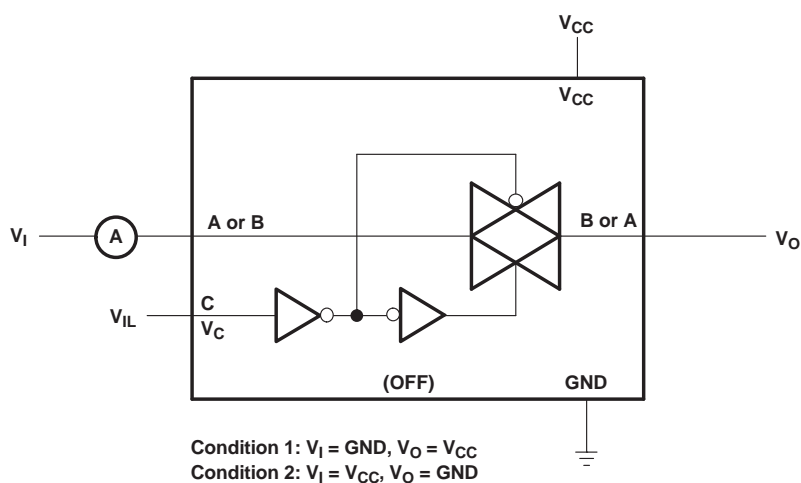


Figure 3. OFF-State Switch Leakage-Current Test Circuit

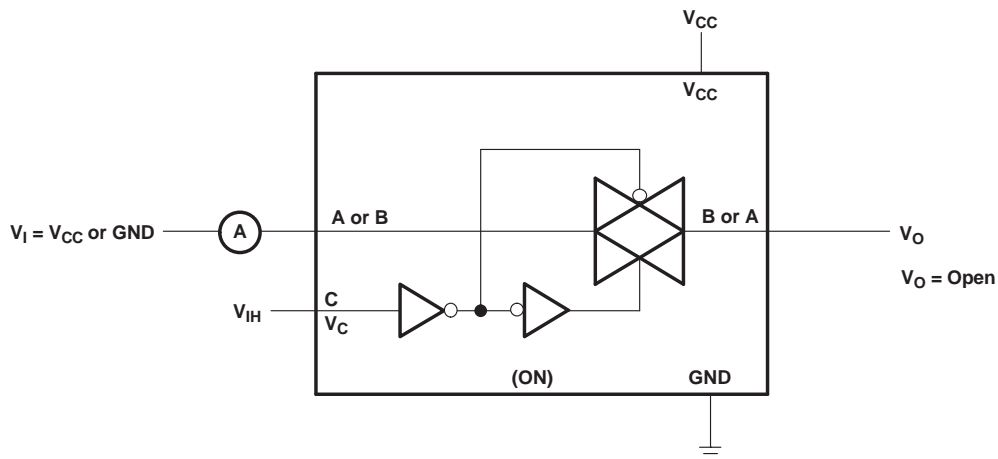


Figure 4. ON-State Switch Leakage-Current Test Circuit

Parameter Measurement Information (continued)



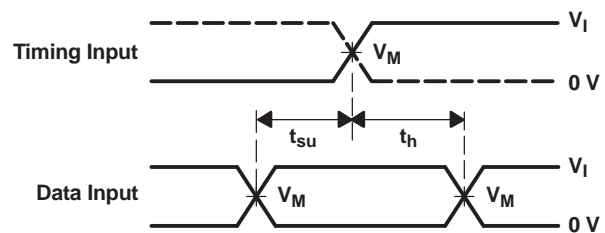
LOAD CIRCUIT

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

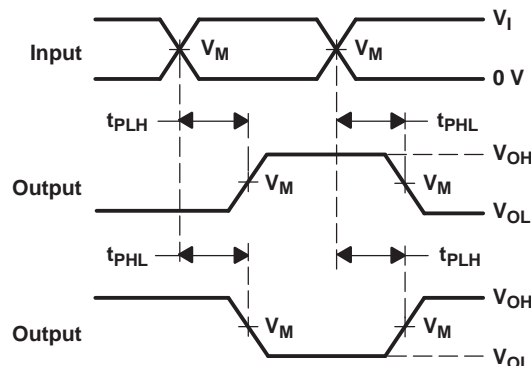
$V_{CC}$	INPUTS		$V_M$	$V_{LOAD}$	$C_L$	$R_L$	$V_{\Delta}$
	$V_I$	$t_r/t_f$					
$1.8\text{ V} \pm 0.15\text{ V}$	$V_{CC}$	$\leq 2\text{ ns}$	$V_{CC}/2$	$2 \times V_{CC}$	30 pF	1 k $\Omega$	0.15 V
$2.5\text{ V} \pm 0.2\text{ V}$	$V_{CC}$	$\leq 2\text{ ns}$	$V_{CC}/2$	$2 \times V_{CC}$	30 pF	500 $\Omega$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



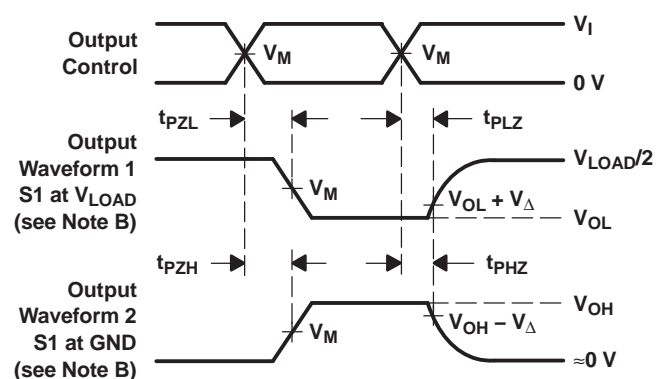
VOLTAGE WAVEFORMS PULSE DURATION



VOLTAGE WAVEFORMS SETUP AND HOLD TIMES



VOLTAGE WAVEFORMS PROPAGATION DELAY TIMES INVERTING AND NONINVERTING OUTPUTS



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

- NOTES:
- 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:  $PRR \leq 10\text{ MHz}$ ,  $Z_O = 50\ \Omega$ .
  - 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 5. Load Circuit and Voltage Waveforms

Parameter Measurement Information (continued)

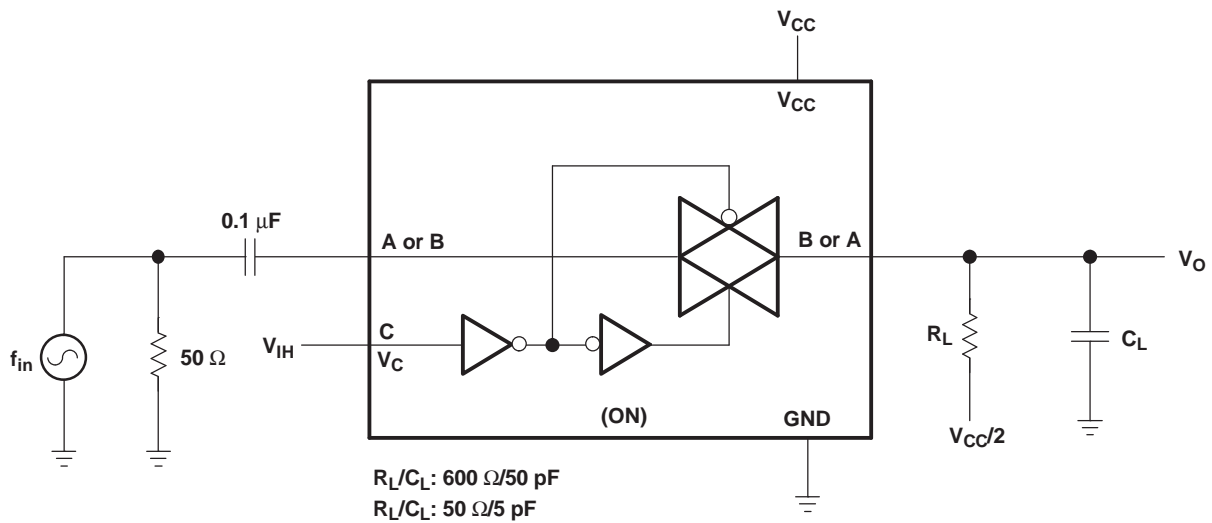


Figure 6. Frequency Response (Switch ON)

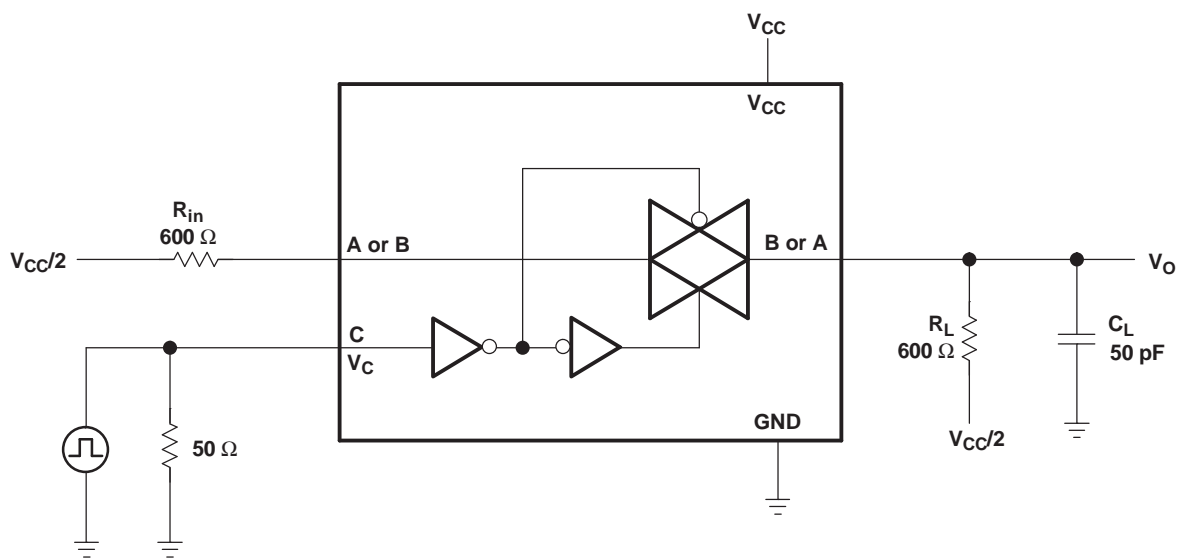


Figure 7. Crosstalk (Control Input – Switch Output)

Parameter Measurement Information (continued)

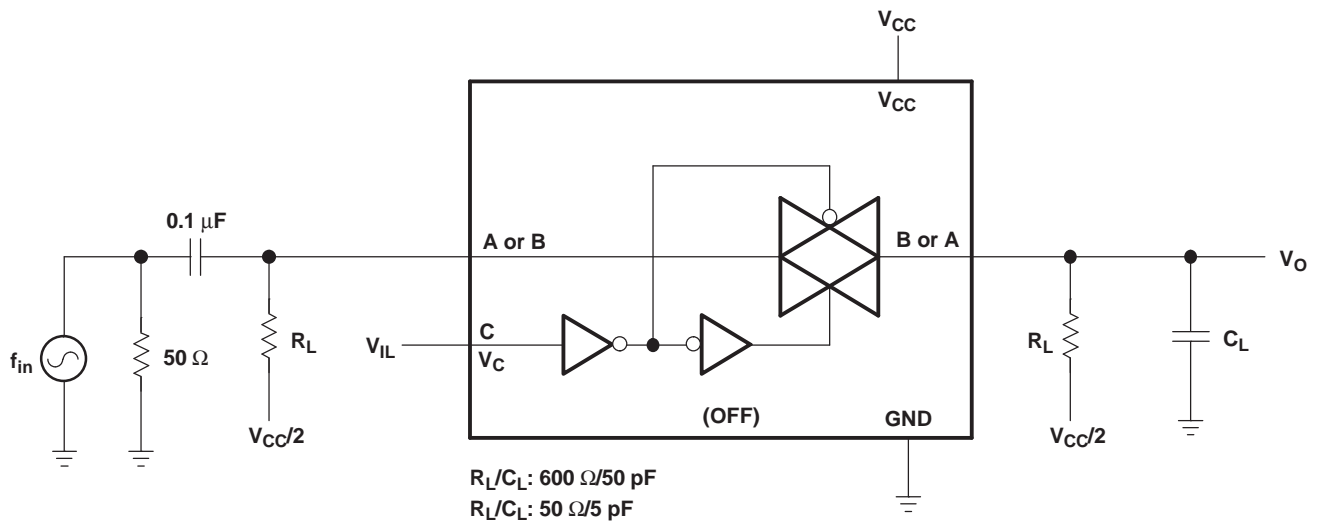


Figure 8. Feedthrough (Switch OFF)

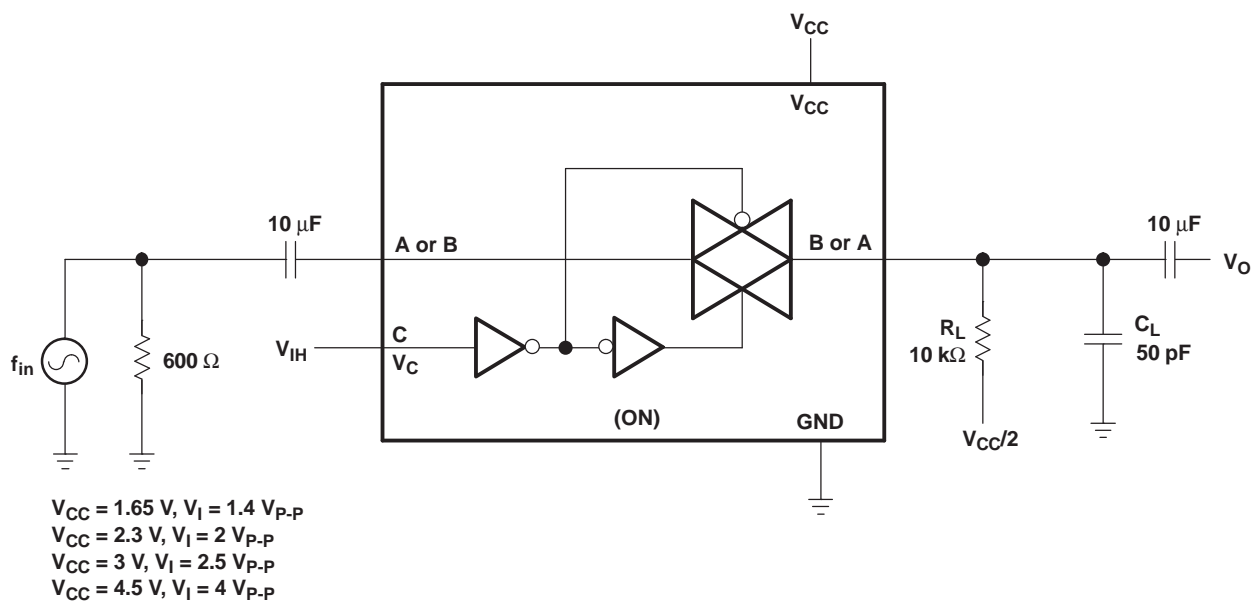


Figure 9. Sine-Wave Distortion

## 8 Detailed Description

### 8.1 Overview

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

The SN74LVC1G66 device can handle analog and digital signals. The device permits bidirectional transmission of signals with amplitudes of up to 5.5 V (peak). Like all analog switches, the SN74LVC1G66 is bidirectional.

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

### 8.2 Functional Block Diagram

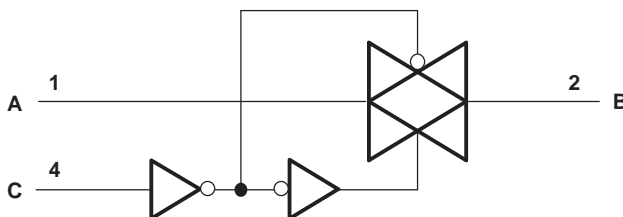


Figure 10. Logic Diagram (Positive Logic)

### 8.3 Feature Description

The TI NanoFree package is one of TI's smallest packages and allows customers to save board space while the solder bumps allow for easy testing. The SN74LVC1G66 has a wide  $V_{CC}$  range, allowing rail-to-rail operation of signals anywhere from a 1.8-V system to a 5-V system. In addition, the control input (C Pin) is 5.5-V tolerant, allowing higher-voltage logic to interface to the switch control system.

### 8.4 Device Functional Modes

Table 1. Function Table

CONTROL INPUT (C)	SWITCH
L	OFF
H	ON

## 9 Application and Implementation

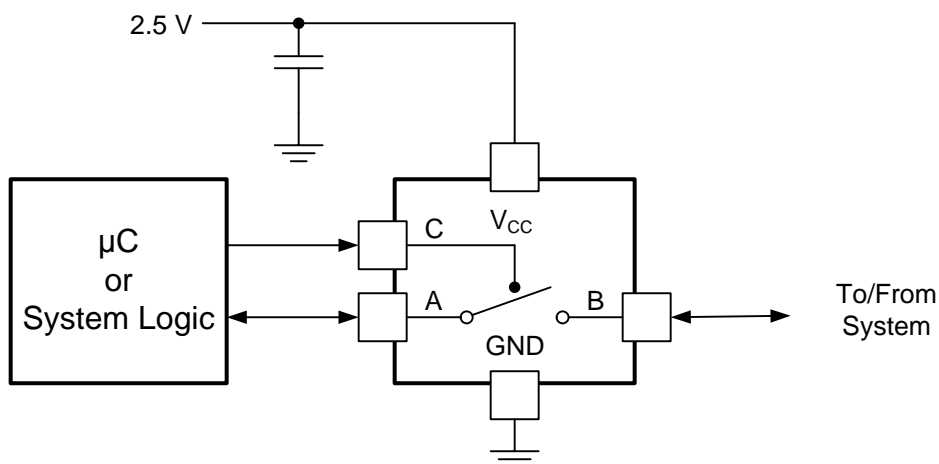
### NOTE

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 SN74LVC1G66 can be used in any situation where an SPST switch would be used and a solid-state, voltage-controlled version is preferred.

### 9.2 Typical Application



**Figure 11. Typical Application Schematic**

#### 9.2.1 Design Requirements

The SN74LVC1G66 allows on and off control of analog and digital signals with a digital control signal. All input signals should remain between 0 V and V<sub>CC</sub> for optimal operation.

#### 9.2.2 Detailed Design Procedure

##### 1. Recommended Input Conditions:

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

##### 2. Recommended Output Conditions:

- Load currents should not exceed ±50 mA.

##### 3. Frequency Selection Criterion:

- Maximum frequency tested is 150 MHz.
- Added trace resistance/capacitance can reduce maximum frequency capability; use layout practices as directed in [Layout](#).

## Typical Application (continued)

### 9.2.3 Application Curve

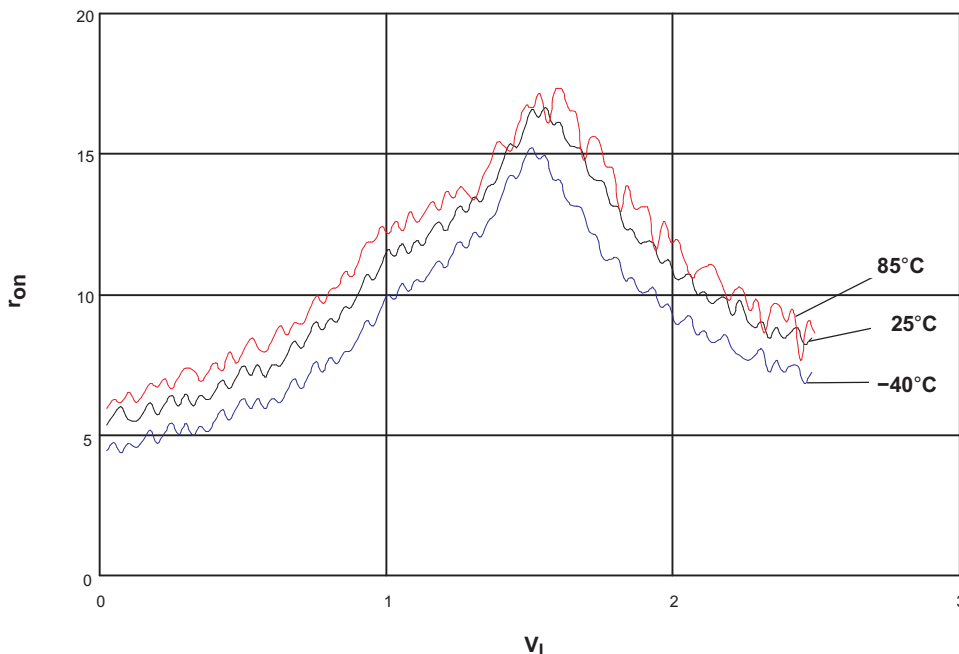


Figure 12.  $r_{on}$  vs  $V_I$ ,  $V_{CC} = 2.5$  V (SN74LVC1G66)

## 10 Power Supply Recommendations

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

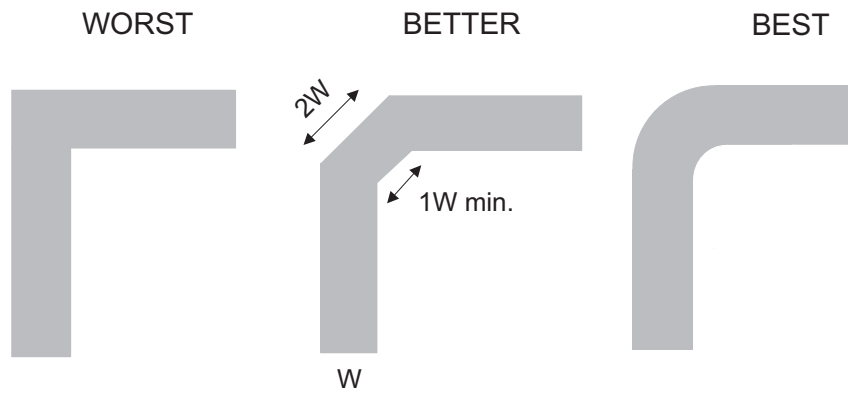
Each  $V_{CC}$  terminal should have a good bypass capacitor to prevent power disturbance. For devices with a single supply, a 0.1- $\mu$ F bypass capacitor is recommended. If there are multiple pins labeled  $V_{CC}$ , then a 0.01- $\mu$ F or 0.022- $\mu$ F capacitor is recommended for each  $V_{CC}$  because the  $V_{CC}$  pins will be tied together internally. For devices with dual supply pins operating at different voltages, for example  $V_{CC}$  and  $V_{DD}$ , a 0.1- $\mu$ F bypass capacitor is recommended for each supply pin. It is acceptable 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 terminal as possible for best results.

## 11 Layout

### 11.1 Layout Guidelines

Reflections and matching are closely related to loop antenna theory, but different enough to warrant their own discussion. When a PCB trace turns a corner at a 90° angle, a reflection can occur. This is primarily due to the change of width of the trace. At the apex of the turn, the trace width is increased to 1.414 times its width. This upsets the transmission line characteristics, especially the distributed capacitance and self-inductance of the trace — resulting in the reflection. It is a given that not all PCB traces can be straight, and so they will have to turn corners. [Figure 13](#) shows progressively better techniques of rounding corners. Only the last example maintains constant trace width and minimizes reflections.

**11.2 Layout Example**



**Figure 13. Trace Example**



## 12 Device and Documentation Support

### 12.1 Documentation Support

#### 12.1.1 Related Documentation

- *Implications of Slow or Floating CMOS Inputs*, [SCBA004](#)

### 12.2 Trademarks

NanoFree is a trademark 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 (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
SN74LVC1G66DBVR	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	(C665 ~ C66R ~ C66T)	<a href="#">Samples</a>
SN74LVC1G66DBVRE4	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	(C665 ~ C66R ~ C66T)	<a href="#">Samples</a>
SN74LVC1G66DBVRG4	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	(C665 ~ C66R ~ C66T)	<a href="#">Samples</a>
SN74LVC1G66DBVT	ACTIVE	SOT-23	DBV	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	(C665 ~ C66R)	<a href="#">Samples</a>
SN74LVC1G66DBVTG4	ACTIVE	SOT-23	DBV	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	(C665 ~ C66R)	<a href="#">Samples</a>
SN74LVC1G66DCKR	ACTIVE	SC70	DCK	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	(C65 ~ C6F ~ C6K ~ C6O ~ C6R ~ C6T)	<a href="#">Samples</a>
SN74LVC1G66DCKRE4	ACTIVE	SC70	DCK	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	(C65 ~ C6F ~ C6K ~ C6O ~ C6R ~ C6T)	<a href="#">Samples</a>
SN74LVC1G66DCKRG4	ACTIVE	SC70	DCK	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	(C65 ~ C6F ~ C6K ~ C6O ~ C6R ~ C6T)	<a href="#">Samples</a>
SN74LVC1G66DCKT	ACTIVE	SC70	DCK	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	(C65 ~ C6R ~ C6T)	<a href="#">Samples</a>
SN74LVC1G66DCKTG4	ACTIVE	SC70	DCK	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	(C65 ~ C6R ~ C6T)	<a href="#">Samples</a>
SN74LVC1G66DRLR	ACTIVE	SOT-5X3	DRL	5	4000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	(C67 ~ C6R)	<a href="#">Samples</a>
SN74LVC1G66DRLRG4	ACTIVE	SOT-5X3	DRL	5	4000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	(C67 ~ C6R)	<a href="#">Samples</a>
SN74LVC1G66DRYR	ACTIVE	SON	DRY	6	5000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	C6	<a href="#">Samples</a>
SN74LVC1G66DSF2	ACTIVE	SON	DSF	6	5000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	C6	<a href="#">Samples</a>
SN74LVC1G66DSFR	ACTIVE	SON	DSF	6	5000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	C6	<a href="#">Samples</a>
SN74LVC1G66YZPR	ACTIVE	DSBGA	YZP	5	3000	Green (RoHS & no Sb/Br)	SNAGCU	Level-1-260C-UNLIM	-40 to 85	C6N	<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  $\leq 1000$ 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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In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

#### **OTHER QUALIFIED VERSIONS OF SN74LVC1G66 :**

- Automotive: [SN74LVC1G66-Q1](#)

NOTE: Qualified Version Definitions:

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

**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
SN74LVC1G66DBVR	SOT-23	DBV	5	3000	178.0	9.2	3.3	3.23	1.55	4.0	8.0	Q3
SN74LVC1G66DBVR	SOT-23	DBV	5	3000	180.0	8.4	3.23	3.17	1.37	4.0	8.0	Q3
SN74LVC1G66DBVT	SOT-23	DBV	5	250	178.0	9.2	3.3	3.23	1.55	4.0	8.0	Q3
SN74LVC1G66DBVT	SOT-23	DBV	5	250	180.0	8.4	3.23	3.17	1.37	4.0	8.0	Q3
SN74LVC1G66DCKR	SC70	DCK	5	3000	178.0	9.2	2.4	2.4	1.22	4.0	8.0	Q3
SN74LVC1G66DCKR	SC70	DCK	5	3000	180.0	9.2	2.3	2.55	1.2	4.0	8.0	Q3
SN74LVC1G66DCKT	SC70	DCK	5	250	178.0	9.2	2.4	2.4	1.22	4.0	8.0	Q3
SN74LVC1G66DRLR	SOT-5X3	DRL	5	4000	180.0	8.4	1.98	1.78	0.69	4.0	8.0	Q3
SN74LVC1G66DRLR	SOT-5X3	DRL	5	4000	180.0	9.5	1.78	1.78	0.69	4.0	8.0	Q3
SN74LVC1G66DRYR	SON	DRY	6	5000	180.0	9.5	1.15	1.6	0.75	4.0	8.0	Q1
SN74LVC1G66DSF2	SON	DSF	6	5000	180.0	9.5	1.16	1.16	0.5	4.0	8.0	Q3
SN74LVC1G66DSFR	SON	DSF	6	5000	180.0	9.5	1.16	1.16	0.5	4.0	8.0	Q2
SN74LVC1G66YZPR	DSBGA	YZP	5	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)
SN74LVC1G66DBVR	SOT-23	DBV	5	3000	180.0	180.0	18.0
SN74LVC1G66DBVR	SOT-23	DBV	5	3000	202.0	201.0	28.0
SN74LVC1G66DBVT	SOT-23	DBV	5	250	180.0	180.0	18.0
SN74LVC1G66DBVT	SOT-23	DBV	5	250	202.0	201.0	28.0
SN74LVC1G66DCKR	SC70	DCK	5	3000	180.0	180.0	18.0
SN74LVC1G66DCKR	SC70	DCK	5	3000	205.0	200.0	33.0
SN74LVC1G66DCKT	SC70	DCK	5	250	180.0	180.0	18.0
SN74LVC1G66DRLR	SOT-5X3	DRL	5	4000	202.0	201.0	28.0
SN74LVC1G66DRLR	SOT-5X3	DRL	5	4000	184.0	184.0	19.0
SN74LVC1G66DRYR	SON	DRY	6	5000	184.0	184.0	19.0
SN74LVC1G66DSF2	SON	DSF	6	5000	184.0	184.0	19.0
SN74LVC1G66DSFR	SON	DSF	6	5000	184.0	184.0	19.0
SN74LVC1G66YZPR	DSBGA	YZP	5	3000	220.0	220.0	35.0

DCK (R-PDSO-G5)

PLASTIC SMALL-OUTLINE PACKAGE



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

DCK (R-PDSO-G5)

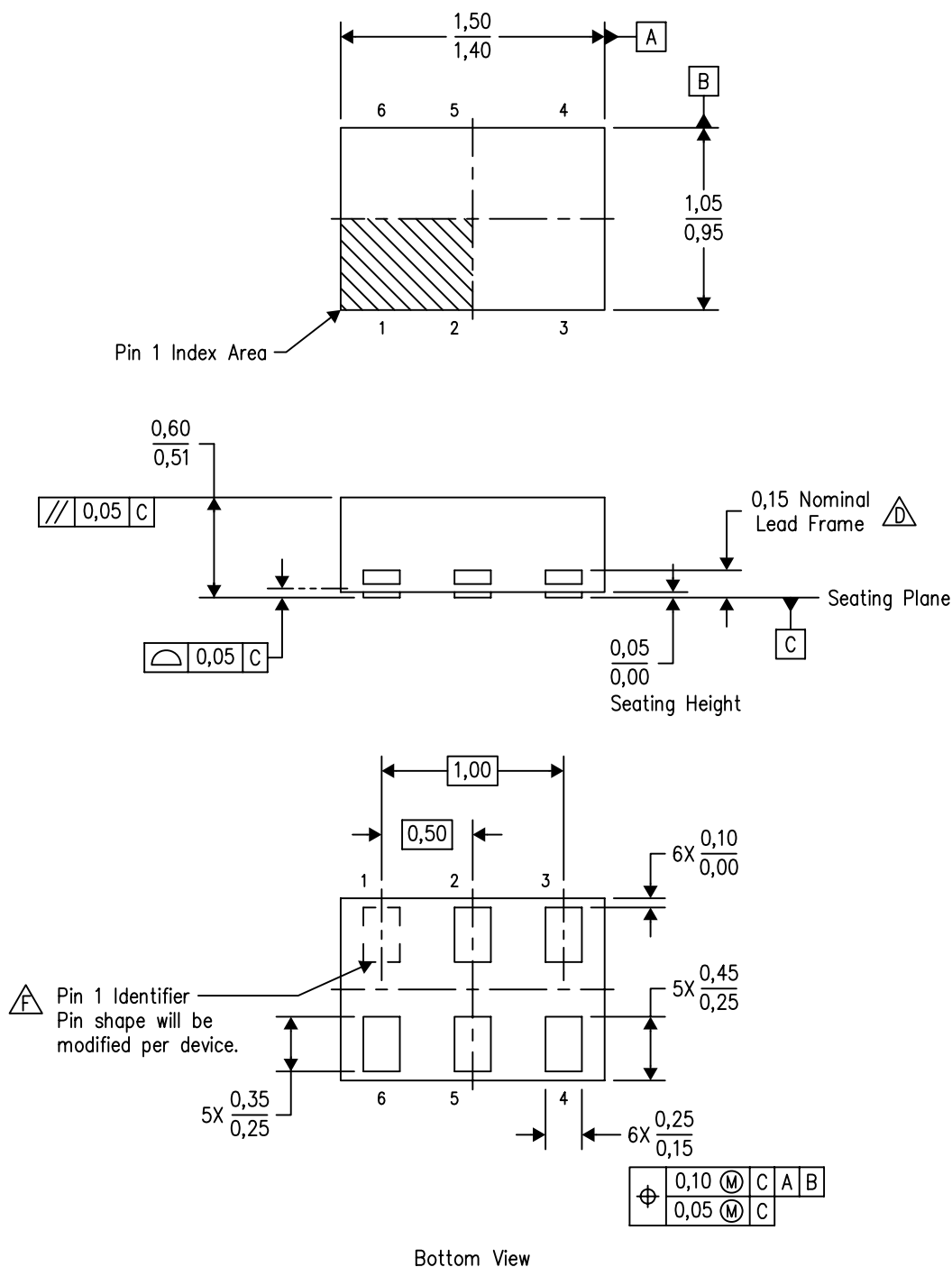
PLASTIC SMALL OUTLINE



- NOTES:
- All linear dimensions are in millimeters.
  - This drawing is subject to change without notice.
  - Customers should place a note on the circuit board fabrication drawing not to alter the center solder mask defined pad.
  - Publication IPC-7351 is recommended for alternate designs.
  - 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.

DRY (R-PUSON-N6)

PLASTIC SMALL OUTLINE NO-LEAD



4207181/F 12/11

- NOTES:
- A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M-1994.
  - B. This drawing is subject to change without notice.
  - C. SON (Small Outline No-Lead) package configuration.
  - $\triangle D$  The exposed lead frame feature on side of package may or may not be present due to alternative lead frame designs.
  - E. This package complies to JEDEC MO-287 variation UFAD.
  - $\triangle F$  See the additional figure in the Product Data Sheet for details regarding the pin 1 identifier shape.



DRY (R-PUSON-N6)

PLASTIC SMALL OUTLINE NO-LEAD



- NOTES:
- All linear dimensions are in millimeters.
  - This drawing is subject to change without notice.
  - Publication IPC-7351 is recommended for alternate designs.
  - Customers should contact their board fabrication site for minimum solder mask web tolerances between signal pads.
  - Maximum stencil thickness 0,127 mm (5 mils). All linear dimensions are in millimeters.
  - 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.
  - 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.



# EXAMPLE BOARD LAYOUT

YZP0005

DSBGA - 0.5 mm max height

DIE SIZE BALL GRID ARRAY



LAND PATTERN EXAMPLE  
SCALE:40X



SOLDER MASK DETAILS  
NOT TO SCALE

4219492/A 05/2017

NOTES: (continued)

3. Final dimensions may vary due to manufacturing tolerance considerations and also routing constraints. For more information, see Texas Instruments literature number SNVA009 ([www.ti.com/lit/snva009](http://www.ti.com/lit/snva009)).

# EXAMPLE STENCIL DESIGN

YZP0005

DSBGA - 0.5 mm max height

DIE SIZE BALL GRID ARRAY

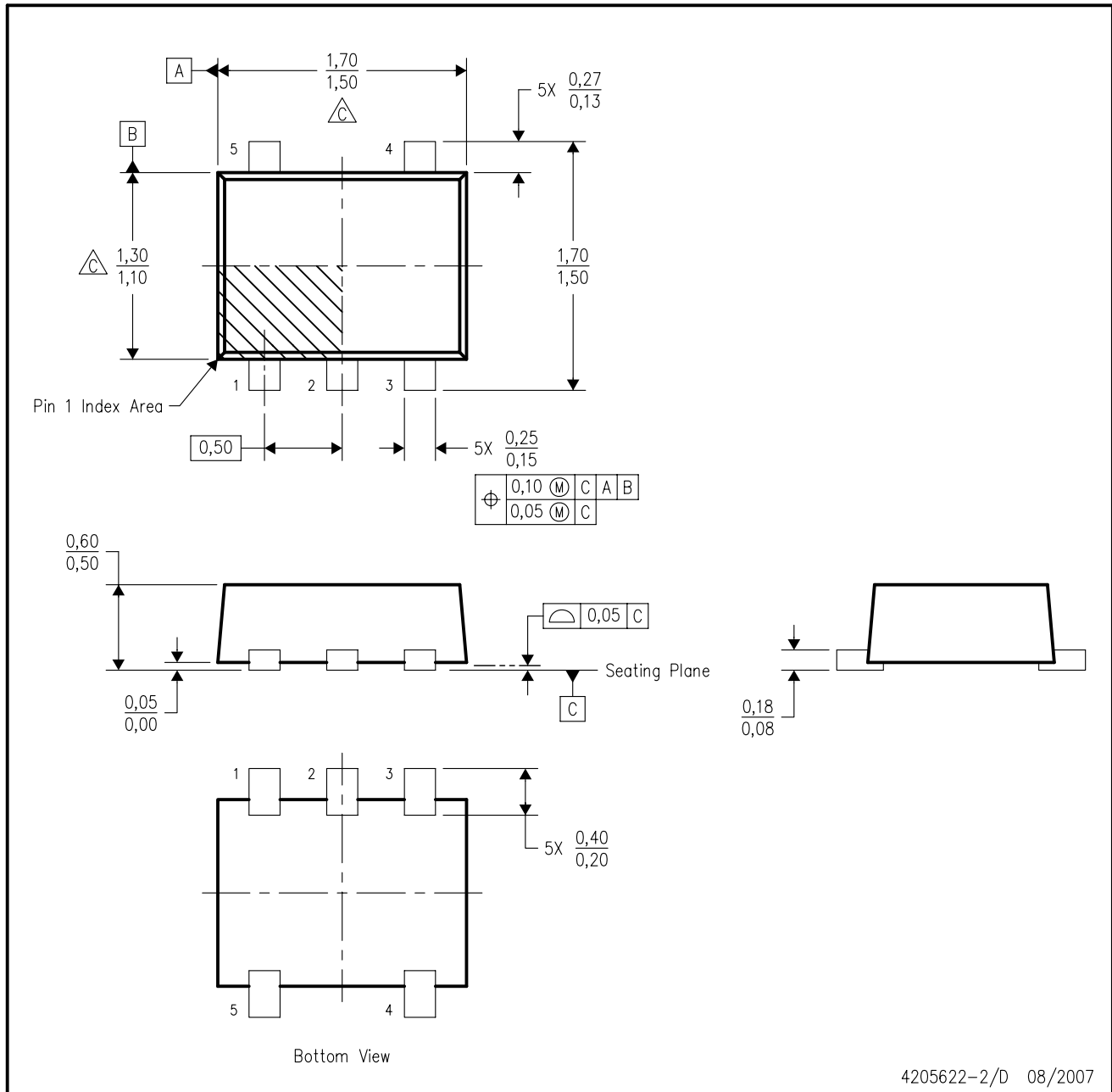


SOLDER PASTE EXAMPLE  
BASED ON 0.1 mm THICK STENCIL  
SCALE:40X

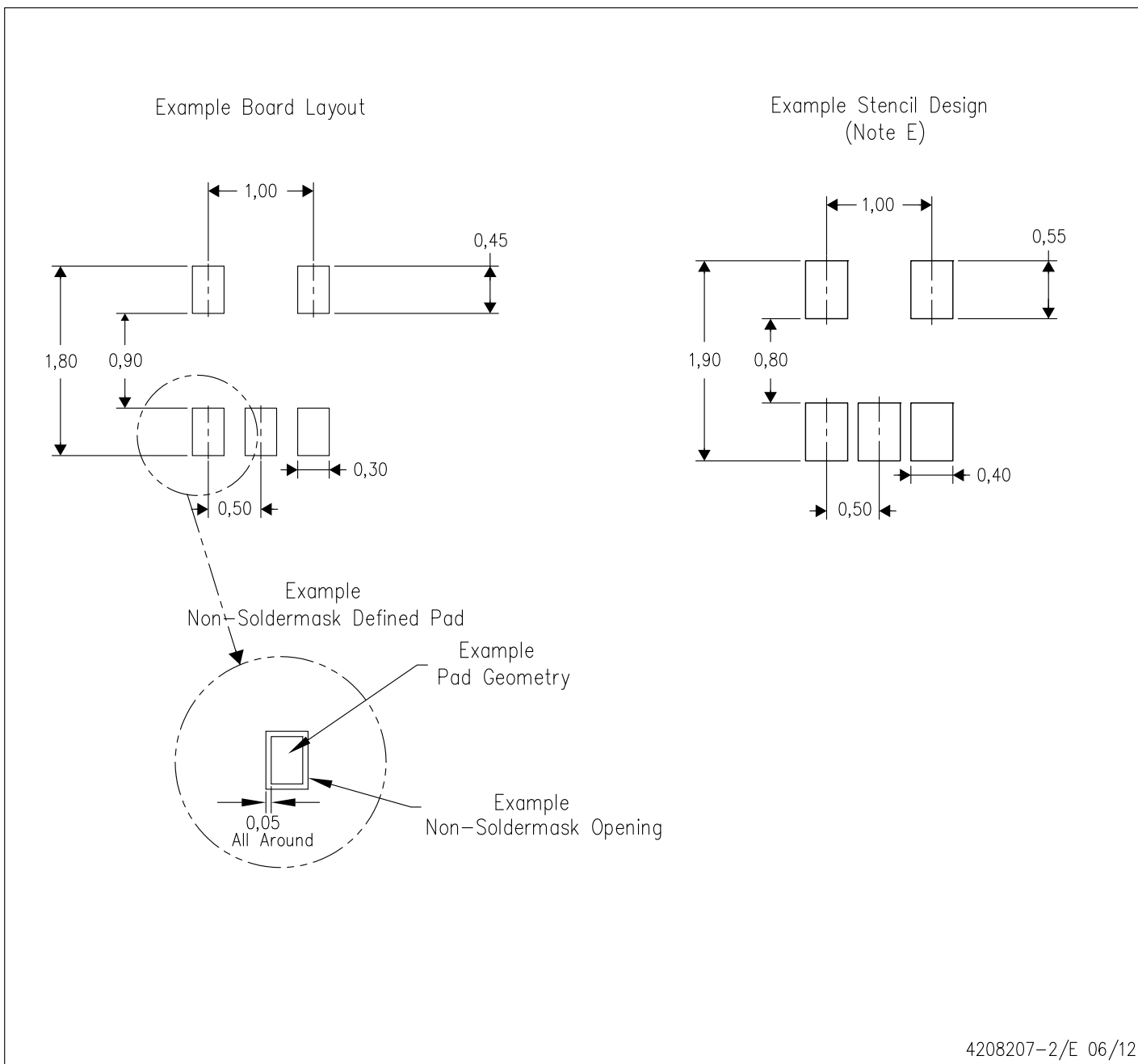
4219492/A 05/2017

NOTES: (continued)

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



- NOTES:
- A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M-1994.
  - B. This drawing is subject to change without notice.
  - C. Body dimensions do not include mold flash, interlead flash, protrusions, or gate burrs. Mold flash, interlead flash, protrusions, or gate burrs shall not exceed 0,15 per end or side.
  - D. JEDEC package registration is pending.



- 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.

DBV (R-PDSO-G5)

PLASTIC SMALL-OUTLINE PACKAGE



- NOTES:
- A. All linear dimensions are in millimeters.
  - B. This drawing is subject to change without notice.
  - C. Body dimensions do not include mold flash or protrusion. Mold flash and protrusion shall not exceed 0.15 per side.
  - D. Falls within JEDEC MO-178 Variation AA.

DBV (R-PDSO-G5)

PLASTIC SMALL OUTLINE



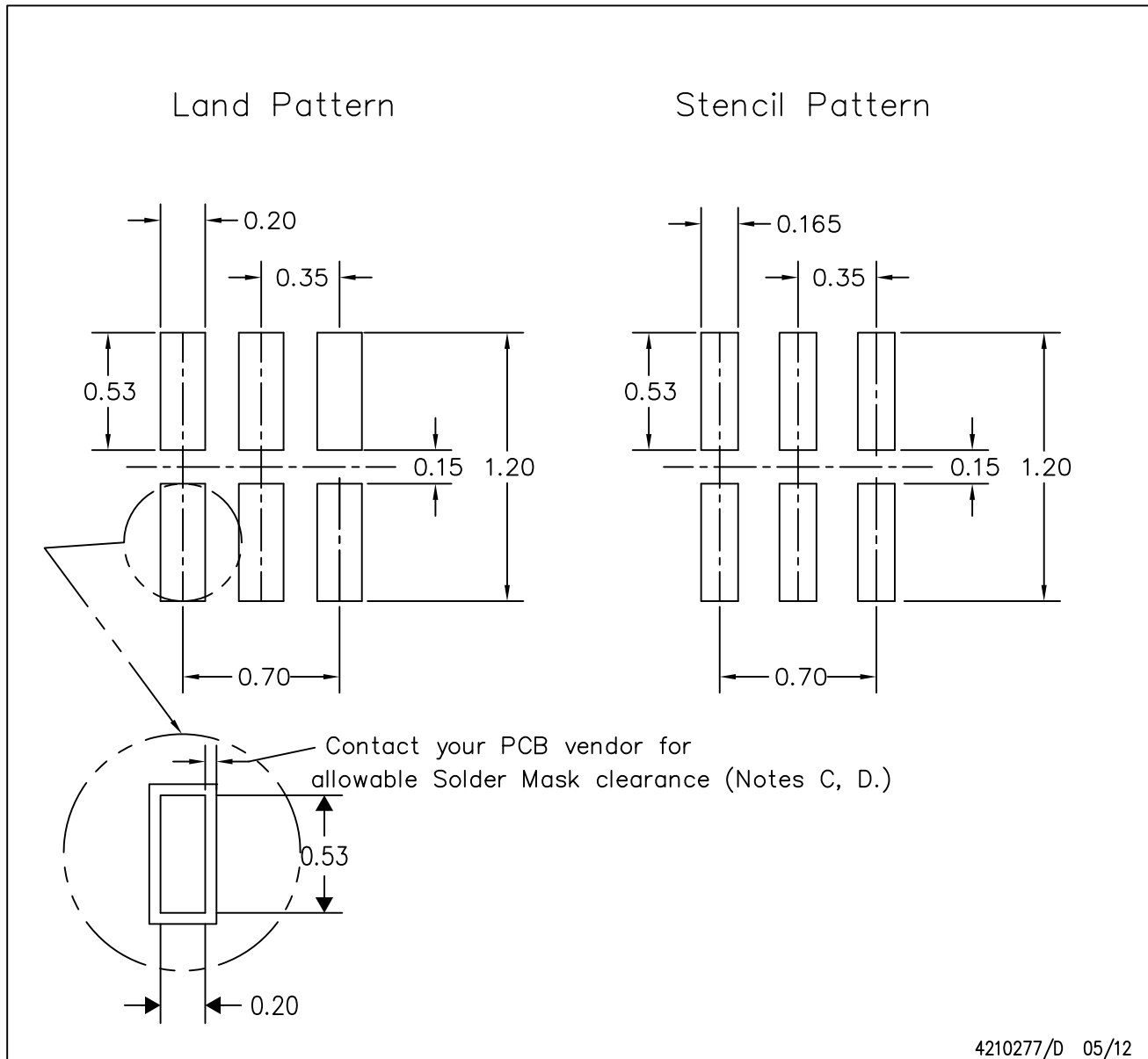
- NOTES:
- A. All linear dimensions are in millimeters.
  - B. This drawing is subject to change without notice.
  - C. Customers should place a note on the circuit board fabrication drawing not to alter the center solder mask defined pad.
  - D. Publication IPC-7351 is recommended for alternate designs.
  - E. Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Example stencil design based on a 50% volumetric metal load solder paste. Refer to IPC-7525 for other stencil recommendations.





DSF (S-PX2SON-N6)

PLASTIC SMALL OUTLINE NO-LEAD



- NOTES:
- A. All linear dimensions are in millimeters.
  - B. This drawing is subject to change without notice.
  - C. Publication IPC-7351 is recommended for alternate designs.
  - D. Customers should contact their board fabrication site for minimum solder mask web tolerances between signal pads. If 2 mil solder mask is outside PCB vendor capability, it is advised to omit solder mask.
  - E. Maximum stencil thickness 0,1016 mm (4 mils). All linear dimensions are in millimeters.
  - F. Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC 7525 for stencil design considerations.
  - G. Suggest stencils cut with lasers such as Fiber Laser that produce the greatest positional accuracy.
  - H. Component placement force should be minimized to prevent excessive paste block deformation.

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