

## SN74LVC2G157 Single 2-Line to 1-Line data selector multiplexer

### 1 Features

- Available in the Texas Instruments NanoFree™ package
- Supports 5-V  $V_{CC}$  operation
- Inputs accept voltages to 5.5 V
- Max  $t_{pd}$  of 6 ns at 3.3 V
- Low power consumption, 10- $\mu$ A Maximum  $I_{CC}$
- $\pm 24$ -mA Output drive at 3.3 V
- Typical  $V_{OLP}$  (Output ground bounce)  $< 0.8$  V at  $V_{CC} = 3.3$  V,  $T_A = 25^\circ\text{C}$
- Typical  $V_{OHV}$  (Output  $V_{OH}$  undershoot)  $> 2$  V at  $V_{CC} = 3.3$  V,  $T_A = 25^\circ\text{C}$
- $I_{off}$  Supports live insertion, partial-power-down mode, and back-drive protection
- Can be used as a down translator to translate inputs from a maximum of 5.5 V down to the  $V_{CC}$  Level
- Latch-up performance exceeds 100 mA per JESD 78, Class II
- ESD Protection exceeds JESD 22
  - 2000-V Human body model (A114-A)
  - 1000-V Charged-device model (C101)

### 2 Applications

- Barcode scanner
- Cable solutions
- E-books
- Embedded PC
- Field transmitter: temperature or pressure sensors
- Fingerprint biometrics
- HVAC: Heating, ventilating, and air conditioning
- Network-attached storage (NAS)
- Server motherboard and PSU
- Software defined radio (SDR)
- TV: High definition (HDTV), LCD, and digital
- Video communications systems
- Wireless data access cards, headsets, keyboards, mice, and LAN cards

### 3 Description

This single 2-line to 1-line data selector multiplexer is designed for 1.65-V to 5.5-V  $V_{CC}$  operation.

The SN74LVC2G157 device features a common strobe ( $\bar{G}$ ) input. When the strobe is high, Y is low and  $\bar{Y}$  is high. When the strobe is low, a single bit is selected from one of two sources and is routed to the outputs. The device provides true and complementary data.

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

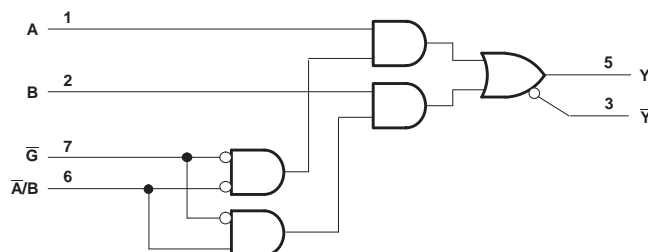
This device is fully specified for partial-power-down applications using  $I_{off}$ . The  $I_{off}$  circuitry disables the outputs, preventing damaging current backflow through the device when it is powered down.

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

PART NUMBER	PACKAGE	BODY SIZE (NOM)
SN74LVC2G157DCT	SSOP (8)	2.95 mm x 2.80 mm
SN74LVC2G157DCU	VSSOP (8)	2.30 mm x 2.00 mm
SN74LVC2G157YZP	DSBGA (8)	1.91 mm x 0.91 mm

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

#### Logic Diagram (Positive Logic)



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## 4 Revision History

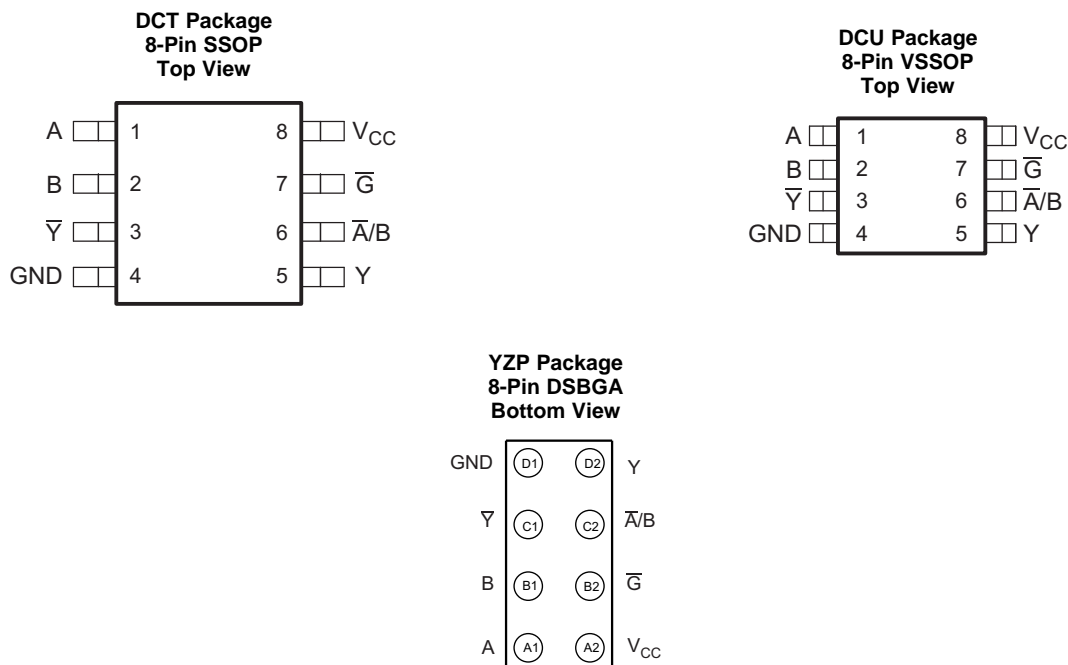
NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

<b>Changes from Revision M (June 2015) to Revision N</b>	<b>Page</b>
• Changed YZP package pinout drawing to match mechanical data drawing; and, pin functions description for clarity .....	<b>3</b>
• Added additional thermal metrics for all packages .....	<b>5</b>
• Added detailed feature description sections for Standard CMOS Inputs, Balanced High-Drive CMOS Push-Pull Outputs, and Negative Clamping Diodes. ....	<b>8</b>
• Added improved Design Requirements and Detailed Design Procedure .....	<b>10</b>
• Changed verbiage to better reflect recommendations for this specific device rather than logic devices in general .....	<b>12</b>
• Added layout example for the YZP package .....	<b>12</b>

<b>Changes from Revision L (January 2014) to Revision M</b>	<b>Page</b>
• Added <i>ESD Ratings</i> table .....	<b>4</b>
• Added <i>Thermal Information</i> table .....	<b>5</b>
• Added <i>Typical Characteristics</i> .....	<b>6</b>
• Added <i>Mechanical, Packaging, and Orderable Information</i> section .....	<b>14</b>

<b>Changes from Revision K (January 2007) to Revision L</b>	<b>Page</b>
• Updated document to new TI data sheet format .....	<b>1</b>
• Removed <i>Ordering Information</i> table .....	<b>1</b>
• Updated <i>Features</i> .....	<b>1</b>
• Added <i>Device Information</i> table .....	<b>1</b>

## 5 Pin Configuration and Functions



Drawing are not to scale. See mechanical drawings for dimensions

### Pin Functions

NAME	PIN		I/O	DESCRIPTION
	SSOP, VSSOP	DSBGA		
A	1	A1	Input	Data Input A
$\overline{A/B}$	6	C2	Input	Input Selector
B	2	B1	Input	Data Input B
$\overline{G}$	7	B2	Input	Common Strobe Input
GND	4	D1	—	Ground
V <sub>CC</sub>	8	A2	—	Positive Supply
Y	5	D2	Output	Output
$\overline{Y}$	3	C1	Output	Inverted Output

## 6 Specifications

### 6.1 Absolute Maximum Ratings

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

		MIN	MAX	UNIT
V <sub>CC</sub>	Supply voltage	-0.5	6.5	V
V <sub>I</sub>	Input voltage <sup>(2)</sup>	-0.5	6.5	V
V <sub>O</sub>	Voltage applied to any output in the high-impedance or power-off state <sup>(2)</sup>	-0.5	6.5	V
V <sub>O</sub>	Voltage applied to any output in the high or low state <sup>(2)(3)</sup>	-0.5	V <sub>CC</sub> + 0.5	V
I <sub>IK</sub>	Input clamp current	V <sub>I</sub> < 0		-50 mA
I <sub>OK</sub>	Output clamp current	V <sub>O</sub> < 0		-50 mA
I <sub>O</sub>	Continuous output current			±50 mA
	Continuous current through V <sub>CC</sub> or GND			±100 mA
T <sub>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) The input negative-voltage and output voltage ratings may be exceeded if the input and output clamp-current ratings are observed.
- (3) The value of V<sub>CC</sub> is provided in the *Recommended Operating Conditions* table.

### 6.2 ESD Ratings

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

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

### 6.3 Recommended Operating Conditions

See <sup>(1)</sup>.

		MIN	MAX	UNIT
V <sub>CC</sub>	Supply voltage	Operating	1.65	5.5
		Data retention only	1.5	
V <sub>IH</sub>	High-level input voltage	V <sub>CC</sub> = 1.65 V to 1.95 V	0.65 × V <sub>CC</sub>	
		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 <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	
		V <sub>CC</sub> = 2.3 V	-8	
		V <sub>CC</sub> = 3 V	-16	
			-24	
		V <sub>CC</sub> = 4.5 V	-32	

- (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](#).

## Recommended Operating Conditions (continued)

See <sup>(1)</sup>.

		MIN	MAX	UNIT
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	-40	85	°C

## 6.4 Thermal Information

THERMAL METRIC <sup>(1)</sup>		SN74LVC2G157			UNIT
		DCT (SSOP)	DCU (VSSOP)	YZP (DSBGA)	
		8 PINS	8 PINS	8 PINS	
R <sub>θJA</sub>	Junction-to-ambient thermal resistance	192.0	289.9	99.9	°C/W
R <sub>θJctop</sub>	Junction-to-case (top) thermal resistance	70.2	86.9	1.0	°C/W
R <sub>θJB</sub>	Junction-to-board thermal resistance	105.2	208.5	27.8	°C/W
Ψ <sub>JT</sub>	Junction-to-top characterization parameter	7.7	23.1	0.4	°C/W
Ψ <sub>JB</sub>	Junction-to-board characterization parameter	103.6	206.5	27.8	°C/W
R <sub>θJcbot</sub>	Junction-to-case (bottom) thermal resistance	n/a	n/a	n/a	°C/W

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

## 6.5 Electrical Characteristics

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

PARAMETER	TEST CONDITIONS	V <sub>CC</sub>	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>	A, B, 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.

### 6.6 Switching Characteristics

over recommended operating free-air temperature range (unless otherwise noted) (see Figure 2)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC} = 1.8\text{ V} \pm 0.15\text{ V}$		$V_{CC} = 2.5\text{ V} \pm 0.2\text{ V}$		$V_{CC} = 3.3\text{ V} \pm 0.3\text{ V}$		$V_{CC} = 5\text{ V} \pm 0.5\text{ V}$		UNIT
			MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
$t_{pd}$	A or B	Y or $\bar{Y}$	4.4	14	2.1	8	2	6	1.4	4	ns
	$\bar{A}/B$		4.9	16	2.5	9	2.1	6	1.6	4	
	$\bar{G}$		4.2	14	2	8	1.6	6	1.3	4	

### 6.7 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 MHz	35	35	37	40	pF

### 6.8 Typical Characteristics

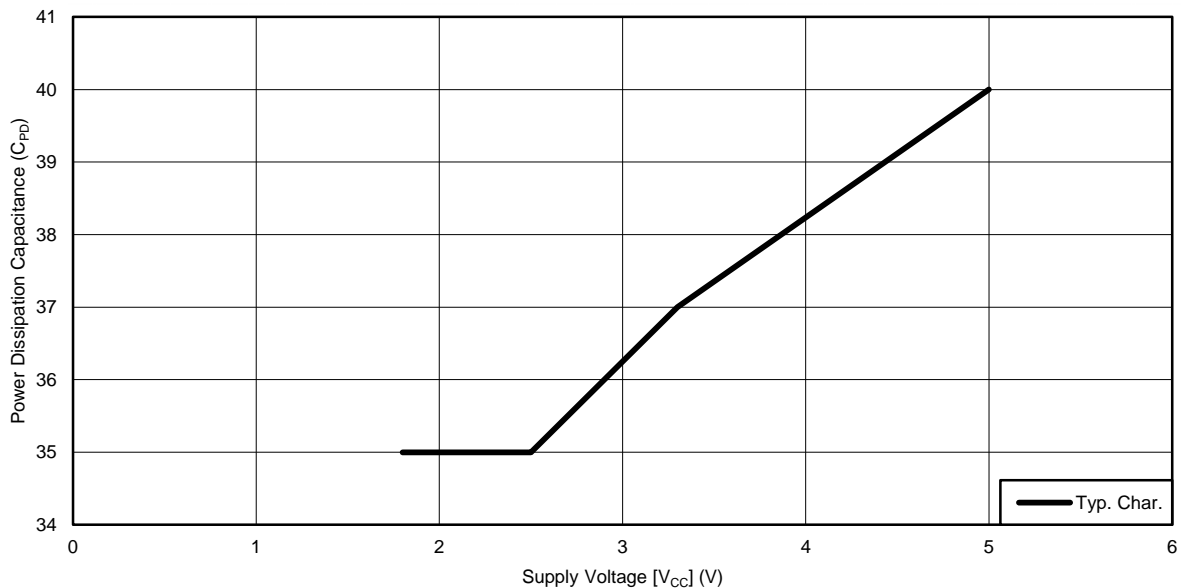
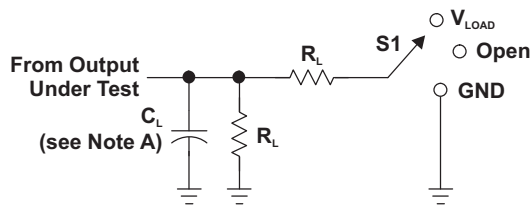


Figure 1. Voltage vs Capacitance

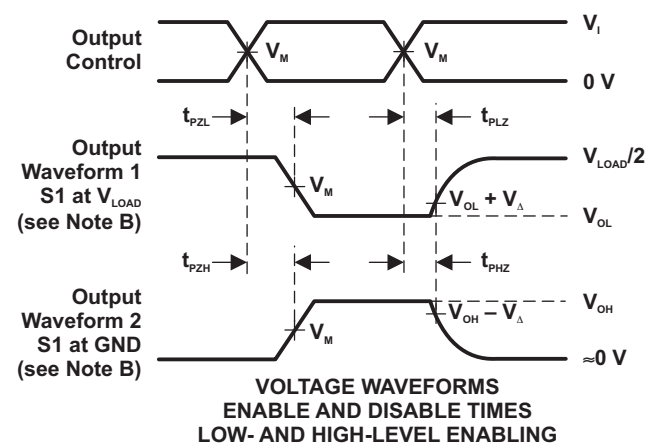
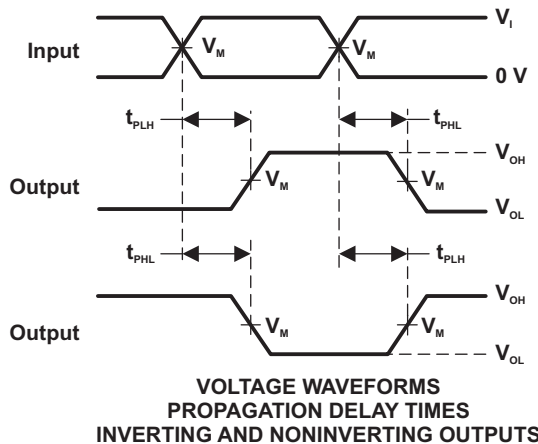
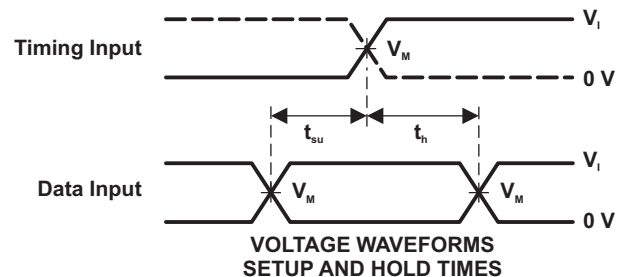
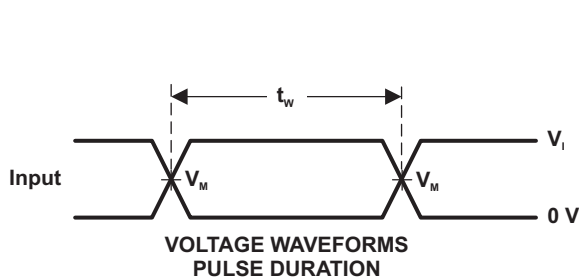
## 7 Parameter Measurement Information



LOAD CIRCUIT

TEST	S1
t <sub>PLH</sub> /t <sub>PHL</sub>	Open
t <sub>PLZ</sub> /t <sub>PZL</sub>	V <sub>LOAD</sub>
t <sub>PHZ</sub> /t <sub>PZH</sub>	GND

V <sub>CC</sub>	INPUTS		V <sub>M</sub>	V <sub>LOAD</sub>	C <sub>L</sub>	R <sub>L</sub>	V <sub>Δ</sub>
	V <sub>I</sub>	t <sub>r</sub> /t <sub>f</sub>					
1.8 V ± 0.15 V	V <sub>CC</sub>	≤ 2 ns	V <sub>CC</sub> /2	2 × V <sub>CC</sub>	30 pF	1 kΩ	0.15 V
2.5 V ± 0.2 V	V <sub>CC</sub>	≤ 2 ns	V <sub>CC</sub> /2	2 × V <sub>CC</sub>	30 pF	500 Ω	0.15 V
3.3 V ± 0.3 V	3 V	≤ 2.5 ns	1.5 V	6 V	50 pF	500 Ω	0.3 V
5 V ± 0.5 V	V <sub>CC</sub>	≤ 2.5 ns	V <sub>CC</sub> /2	2 × V <sub>CC</sub>	50 pF	500 Ω	0.3 V



- NOTES: A. C<sub>L</sub> 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 ≤ 10 MHz, Z<sub>o</sub> = 50 Ω.  
 D. The outputs are measured one at a time, with one transition per measurement.  
 E. t<sub>PLZ</sub> and t<sub>PHZ</sub> are the same as t<sub>dis</sub>.  
 F. t<sub>PZL</sub> and t<sub>PZH</sub> are the same as t<sub>en</sub>.  
 G. t<sub>PLH</sub> and t<sub>PHL</sub> are the same as t<sub>pd</sub>.  
 H. All parameters and waveforms are not applicable to all devices.

Figure 2. Load Circuit and Voltage Waveforms

## 8 Detailed Description

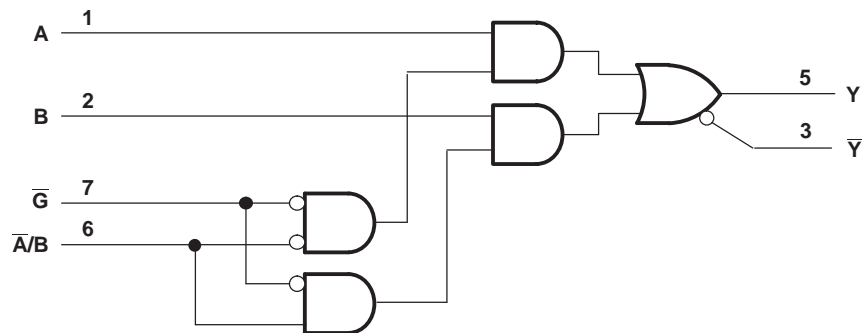
### 8.1 Overview

This single 2-line to 1-line data selector multiplexer is designed for 1.65-V to 5.5-V  $V_{CC}$  operation.

The SN74LVC2G157 device features a common strobe ( $\overline{G}$ ) input. When the strobe is high, Y is low and  $\overline{Y}$  is high. When the strobe is low, a single bit is selected from one of two sources and is routed to the outputs. The device provides true and complementary data.

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.

### 8.2 Functional Block Diagram



### 8.3 Feature Description

The SN74LVC2G157 device has a wide operating  $V_{CC}$  range of 1.65 V to 5.5 V, which allows it to be used in a broad range of systems. The 5.5 V I/Os allow down translation and also allow voltages at the inputs when  $V_{CC} = 0$ .

#### 8.3.1 Standard CMOS Inputs

Standard CMOS inputs are high impedance and are typically modeled as a resistor in parallel with the input capacitance given in the [Electrical Characteristics](#). The worst case resistance is calculated with the maximum input voltage, given in the [Absolute Maximum Ratings](#), and the maximum input leakage current, given in the [Electrical Characteristics](#), using ohm's law ( $R = V \div I$ ).

Signals applied to the inputs need to have fast edge rates, as defined by  $\Delta t/\Delta v$  in [Recommended Operating Conditions](#) to avoid excessive current consumption and oscillations. If a slow or noisy input signal is required, a device with a Schmitt-trigger input should be used to condition the input signal prior to the standard CMOS input.

#### 8.3.2 Balanced High-Drive CMOS Push-Pull Outputs

A balanced output allows the device to sink and source similar currents. The high drive capability of this device creates fast edges into light loads so routing and load conditions should be considered to prevent ringing. Additionally, the outputs of this device are capable of driving larger currents than the device can sustain without being damaged. It is important for the power output of the device to be limited to avoid thermal runaway and damage due to over-current. The electrical and thermal limits defined in the [Absolute Maximum Ratings](#) must be followed at all times.

#### 8.3.3 Negative Clamping Diodes

The inputs and outputs to this device have negative clamping diodes as depicted in [Figure 3](#).



Feature Description (continued)

**CAUTION**

Voltages beyond the values specified in the *Absolute Maximum Ratings* table can cause damage to the device. The input negative-voltage and output voltage ratings may be exceeded if the input and output clamp-current ratings are observed.

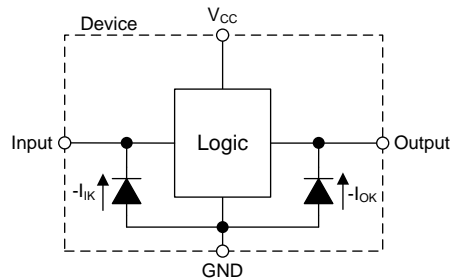


Figure 3. Electrical Placement of Clamping Diodes for Each Input and Output

8.4 Device Functional Modes

Table 1 lists the functional modes for SN74LVC2G157.

Table 1. Function Table

INPUTS				OUTPUTS	
$\bar{G}$	$\bar{A/B}$	A	B	Y	$\bar{Y}$
H	X	X	X	L	H
L	L	L	X	L	H
L	L	H	X	H	L
L	H	X	L	L	H
L	H	X	H	H	L

## 9 Application and Implementation

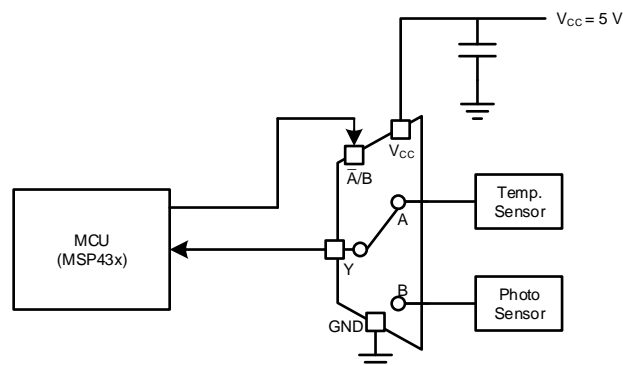
### NOTE

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 SN74LVC2G157 allows a single controller input to receive data from two different digital signal sources. In this application, a digital temperature sensor's output and a digital photo sensor's output are multiplexed. Both of these sensors have a relatively slow read rate, typically less than one read per second.

### 9.2 Typical Application



**Figure 4. Multiplexer Controlled by Processor**

#### 9.2.1 Design Requirements

- 5-V Operation
- Selectable input from two digital signal sources
  - Select LOW: Temperature Sensor, 1 kbps 5-V signal
  - Select HIGH: Photo Sensor, 1 kbps 5-V signal
- 15 pF, low leakage CMOS load

##### 9.2.1.1 Power

Ensure the desired supply voltage is within the range specified in the [Recommended Operating Conditions](#). The supply voltage sets the device's electrical characteristics as described in the [Electrical Characteristics](#).

The supply must be capable of sourcing current equal to the total current to be sourced by all outputs of the SN74LVC2G157 plus the maximum supply current,  $I_{CC}$ , listed in [Electrical Characteristics](#). The logic device can only source or sink as much current as it is provided at the supply and ground pins, respectively. Be sure not to exceed the maximum total current through GND or  $V_{CC}$  listed in [Absolute Maximum Ratings](#).

The SN74LVC2G157 can drive a load with a total capacitance less than or equal to 50 pF connected to a high-impedance CMOS input while still meeting all of the datasheet specifications. Larger capacitive loads can be applied, however it is not recommended to exceed 70 pF.

Total power consumption can be calculated using the information provided in [CMOS Power Consumption and  \$C\_{pd}\$  Calculation](#).

Thermal increase can be calculated using the information provided in [Thermal Characteristics of Standard Linear and Logic \(SLL\) Packages and Devices](#).

## Typical Application (continued)

### CAUTION

The maximum junction temperature,  $T_J(\text{max})$  listed in [Absolute Maximum Ratings](#), is an *additional limitation* to prevent damage to the device. Do not violate any values listed in the [Absolute Maximum Ratings](#).  
. These limits are provided to prevent damage to the device.

### 9.2.1.2 Inputs

Unused inputs must be terminated to either  $V_{CC}$  or ground. These can be directly terminated if the input is completely unused, or they can be connected with a pull-up or pull-down resistor if the input is to be used sometimes, but not always. A pull-up resistor is used for a default state of HIGH, and a pull-down resistor is used for a default state of LOW. The resistor size is limited by drive current of the controller, leakage current into the SN74LVC2G157, as specified in [Electrical Characteristics](#), and the desired input transition rate. A 10 k $\Omega$  resistor value is often used due to these factors.

The SN74LVC2G157 has standard CMOS inputs, so input signal edge rates cannot be slow. Slow input edge rates can cause oscillations and damaging shoot-through current. The recommended rates are defined in the [Recommended Operating Conditions](#).

Refer to [Feature Description](#) for additional information regarding the inputs for this device.

### 9.2.1.3 Outputs

The positive supply voltage is used to produce the output HIGH voltage. Drawing current from the output will decrease the output voltage as specified by the  $V_{OH}$  specification in the [Electrical Characteristics](#). Similarly, the ground voltage is used to produce the output LOW voltage. Sinking current into the output will increase the output voltage as specified by the  $V_{OL}$  specification in the [Electrical Characteristics](#).

Unused outputs can be left floating.

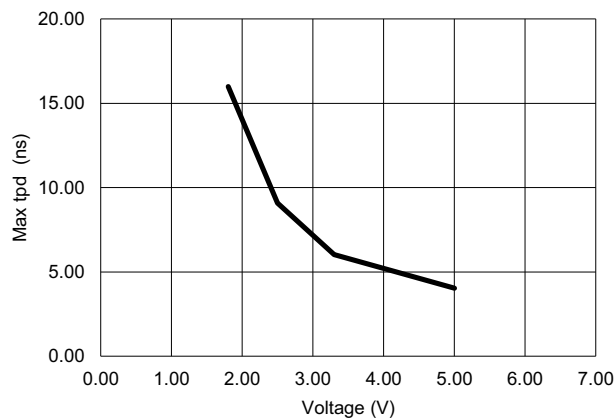
Refer to [Feature Description](#) for additional information regarding the outputs for this device.

## 9.2.2 Detailed Design Procedure

1. Add a decoupling capacitor, typically 0.1  $\mu\text{F}$ , from  $V_{CC}$  to GND. The capacitor needs to be placed physically close to the device and electrically close to both the  $V_{CC}$  and GND pins. An example layout is shown in [Figure 7](#).
2. Ensure the capacitive load at the output is  $\leq 70$  pF. This is not a hard limit, however it will ensure optimal performance. This can be accomplished by providing short, appropriately sized traces from the SN74LVC2G157 to the receiving device.
3. Ensure the resistive load at the output is larger than  $(V_{CC} / 25 \text{ mA}) \Omega$ . This will ensure that the maximum output current from the [Absolute Maximum Ratings](#) is not violated. Most CMOS inputs have a resistive load measured in megaohms; much larger than the minimum calculated above.
4. Thermal issues are rarely a concern for logic gates, however the power consumption and thermal increase can be calculated using the steps provided in the application report, [CMOS Power Consumption and Cpd Calculation](#)

## Typical Application (continued)

### 9.2.3 Application Curve



**Figure 5. Max propagation delay vs voltage for the LVC logic family**

## 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. A 0.1- $\mu\text{F}$  capacitor is recommended for this device. 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, as shown in [Figure 7](#).

## 11 Layout

### 11.1 Layout Guidelines

When using multiple-input and multiple-channel logic devices inputs must not ever be left floating. In many cases, functions or parts of functions of digital logic devices are unused; for example, when only two inputs of a triple-input AND gate are used or only 3 of the 4 buffer gates are used. Such unused input pins must not be left unconnected because the undefined voltages at the outside connections result in undefined operational states. All unused inputs of digital logic devices must be connected to a logic high or logic low voltage, as defined by the input voltage specifications, to prevent them from floating. The logic level that must be applied to any particular unused input depends on the function of the device. Generally, the inputs are tied to GND or  $V_{CC}$ , whichever makes more sense for the logic function or is more convenient.

## 11.2 Layout Example

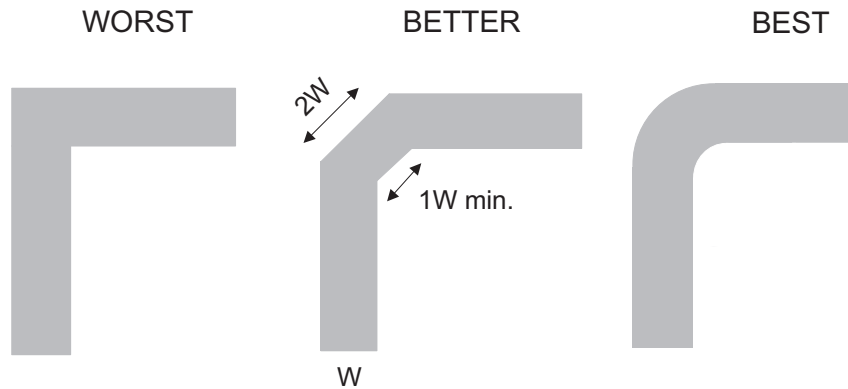


Figure 6. Trace Example

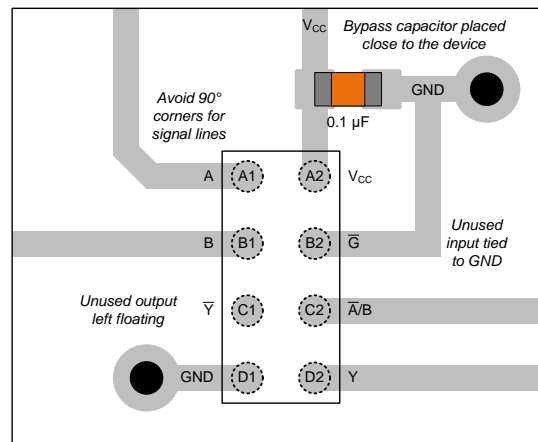


Figure 7. Example layout for SN74LVC2G157

## 12 Device and Documentation Support

### 12.1 Documentation Support

#### 12.1.1 Related Documentation

For related documentation see the following:

- *Implications of Slow or Floating CMOS Inputs*, [SCBA004](#)
- *Selecting the Right Texas Instruments Signal Switch*, [SZZA030](#)

### 12.2 Community Resources

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

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

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

### 12.3 Trademarks

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

### 12.4 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.

### 12.5 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
74LVC2G157DCTRE4	ACTIVE	SM8	DCT	8	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	C57 (R, Z)	<a href="#">Samples</a>
74LVC2G157DCURG4	ACTIVE	VSSOP	DCU	8	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	C57R	<a href="#">Samples</a>
74LVC2G157DCUTG4	ACTIVE	VSSOP	DCU	8	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	C57R	<a href="#">Samples</a>
SN74LVC2G157DCT3	ACTIVE	SM8	DCT	8	3000	Pb-Free (RoHS)	CU SNBI	Level-1-260C-UNLIM	-40 to 85	C57 Z	<a href="#">Samples</a>
SN74LVC2G157DCTR	ACTIVE	SM8	DCT	8	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	C57 (R, Z)	<a href="#">Samples</a>
SN74LVC2G157DCTRG4	ACTIVE	SM8	DCT	8	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	C57 (R, Z)	<a href="#">Samples</a>
SN74LVC2G157DCU3	ACTIVE	VSSOP	DCU	8	3000	Pb-Free (RoHS)	CU SNBI	Level-1-260C-UNLIM	-40 to 85	57 CZ	<a href="#">Samples</a>
SN74LVC2G157DCUR	ACTIVE	VSSOP	DCU	8	3000	Green (RoHS & no Sb/Br)	CU NIPDAU   CU SN	Level-1-260C-UNLIM	-40 to 85	(C57Q, C57R)	<a href="#">Samples</a>
SN74LVC2G157DCUT	ACTIVE	VSSOP	DCU	8	250	Green (RoHS & no Sb/Br)	CU NIPDAU   CU SN	Level-1-260C-UNLIM	-40 to 85	(C57Q, C57R)	<a href="#">Samples</a>
SN74LVC2G157YZPR	ACTIVE	DSBGA	YZP	8	3000	Green (RoHS & no Sb/Br)	SNAGCU	Level-1-260C-UNLIM	-40 to 85	(C37, C3N)	<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 <=1000ppm 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.

(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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## 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
74LVC2G157DCURG4	VSSOP	DCU	8	3000	180.0	8.4	2.25	3.35	1.05	4.0	8.0	Q3
74LVC2G157DCUTG4	VSSOP	DCU	8	250	180.0	8.4	2.25	3.35	1.05	4.0	8.0	Q3
SN74LVC2G157DCT3	SM8	DCT	8	3000	180.0	13.0	3.35	4.5	1.55	4.0	12.0	Q3
SN74LVC2G157DCTR	SM8	DCT	8	3000	180.0	13.0	3.35	4.5	1.55	4.0	12.0	Q3
SN74LVC2G157DCUR	VSSOP	DCU	8	3000	180.0	8.4	2.25	3.35	1.05	4.0	8.0	Q3
SN74LVC2G157DCUR	VSSOP	DCU	8	3000	178.0	9.5	2.25	3.35	1.05	4.0	8.0	Q3
SN74LVC2G157DCUT	VSSOP	DCU	8	250	178.0	9.5	2.25	3.35	1.05	4.0	8.0	Q3
SN74LVC2G157YZPR	DSBGA	YZP	8	3000	178.0	9.2	1.02	2.02	0.63	4.0	8.0	Q1

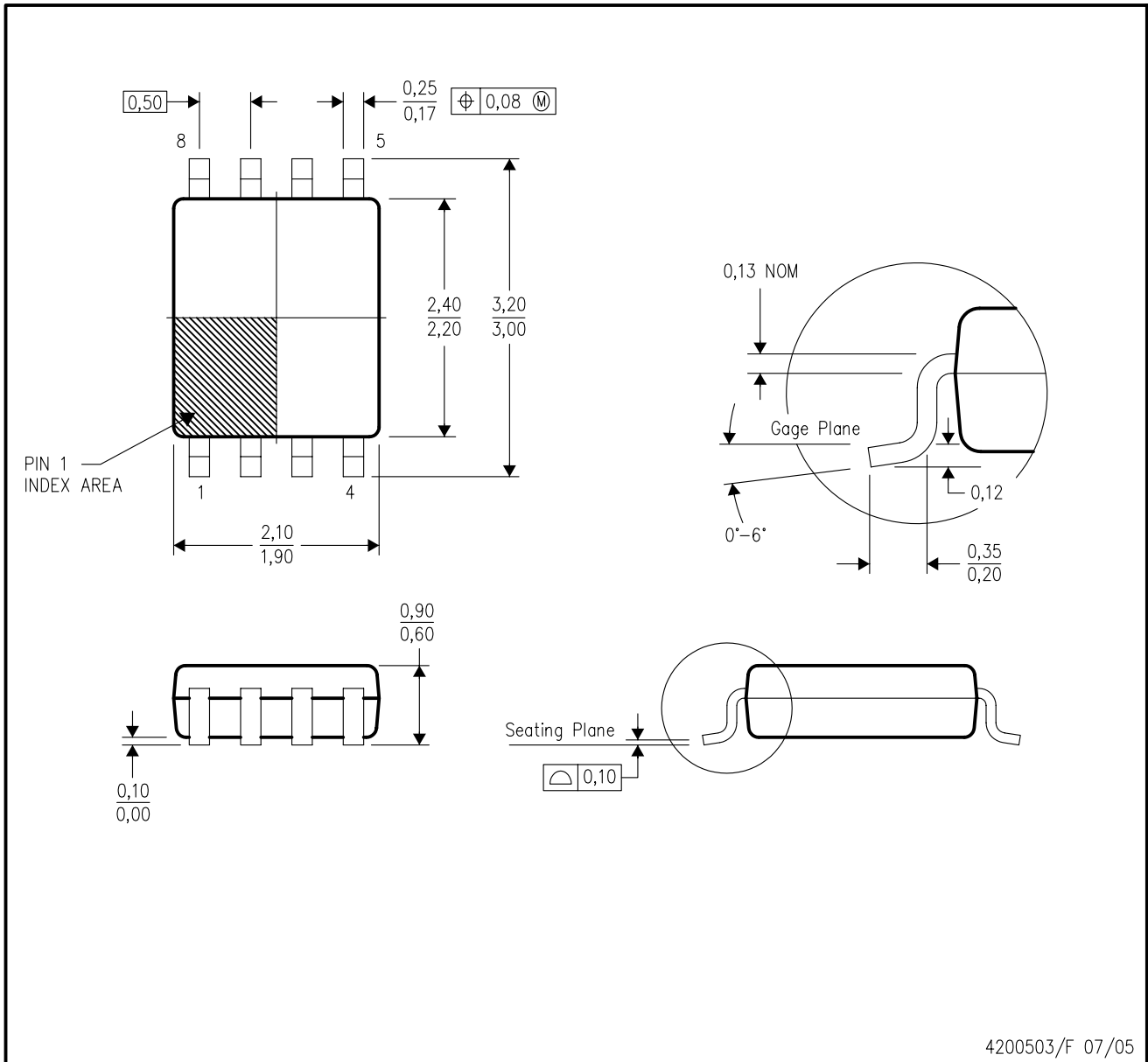
**TAPE AND REEL BOX DIMENSIONS**


\*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
74LVC2G157DCURG4	VSSOP	DCU	8	3000	202.0	201.0	28.0
74LVC2G157DCUTG4	VSSOP	DCU	8	250	202.0	201.0	28.0
SN74LVC2G157DCT3	SM8	DCT	8	3000	182.0	182.0	20.0
SN74LVC2G157DCTR	SM8	DCT	8	3000	182.0	182.0	20.0
SN74LVC2G157DCUR	VSSOP	DCU	8	3000	202.0	201.0	28.0
SN74LVC2G157DCUR	VSSOP	DCU	8	3000	202.0	201.0	28.0
SN74LVC2G157DCUT	VSSOP	DCU	8	250	202.0	201.0	28.0
SN74LVC2G157YZPR	DSBGA	YZP	8	3000	220.0	220.0	35.0

DCU (R-PDSO-G8)

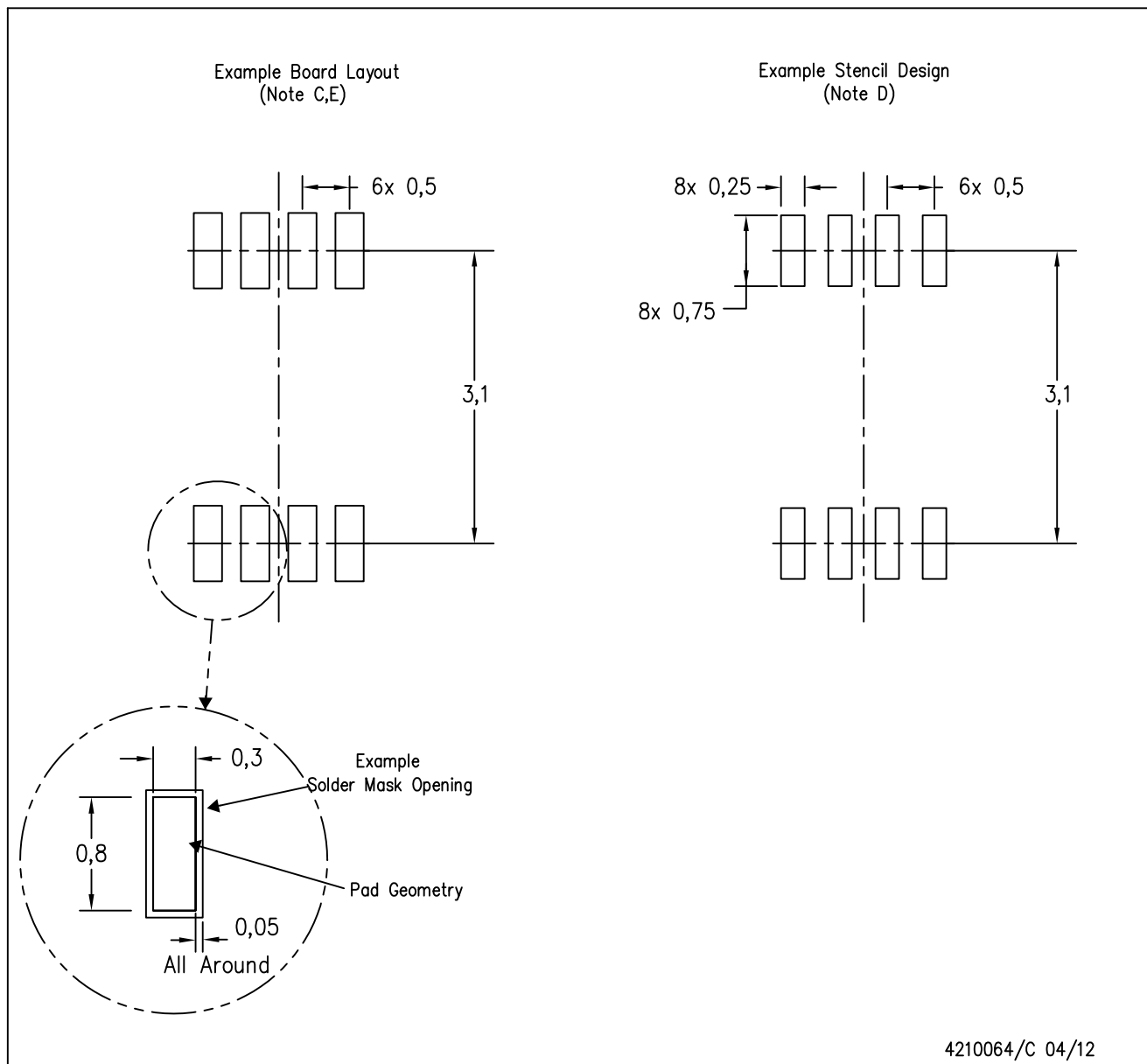
PLASTIC SMALL-OUTLINE PACKAGE (DIE DOWN)



- 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)



4210064/C 04/12

- 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. 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.



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.

YZP0008



# PACKAGE OUTLINE

DSBGA - 0.5 mm max height

DIE SIZE BALL GRID ARRAY



4223082/A 07/2016

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

YZP0008

DSBGA - 0.5 mm max height

DIE SIZE BALL GRID ARRAY



LAND PATTERN EXAMPLE  
SCALE:40X



SOLDER MASK DETAILS  
NOT TO SCALE

4223082/A 07/2016

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

YZP0008

DSBGA - 0.5 mm max height

DIE SIZE BALL GRID ARRAY



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

4223082/A 07/2016

NOTES: (continued)

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

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