

# SN74LVC2G157

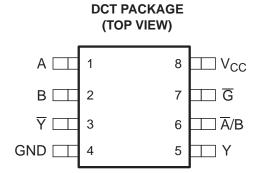
SCES207L - APRIL 1999-REVISED JANUARY 2014

# SN74LVC2G157 Single 2-Line to 1-Line Data Selector Multiplexer

Check for Samples: SN74LVC2G157

## **FEATURES**

- Available in the Texas Instruments NanoFree<sup>™</sup> Package
- Supports 5-V V<sub>CC</sub> Operation
- Inputs Accept Voltages to 5.5 V •
- Max t<sub>pd</sub> of 6 ns at 3.3 V
- Low Power Consumption, 10-µA Max I<sub>CC</sub>
- ±24-mA Output Drive at 3.3 V
- Typical V<sub>OLP</sub> (Output Ground Bounce) <0.8 V at V<sub>CC</sub> = 3.3 V, T<sub>A</sub> = 25°C
- Typical V<sub>OHV</sub> (Output V<sub>OH</sub> Undershoot) >2 V at V<sub>CC</sub> = 3.3 V, T<sub>A</sub> = 25°C
- Ioff Supports Live Insertion, Partial-Power-**Down Mode, and Back-Drive Protection**
- Can Be Used as a Down Translator to Translate Inputs From a Max of 5.5 V Down to the V<sub>CC</sub> 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)



See mechanical drawings for dimensions.

# DESCRIPTION

This single 2-line to 1-line data selector multiplexer is designed for 1.65-V to 5.5-V V<sub>CC</sub> operation.

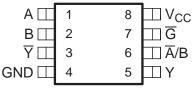
The SN74LVC2G157 device features a common strobe  $(\overline{G})$  input. When the strobe is high, Y is low and  $\overline{Y}$  is high. When the strobe is low, a single bit is selected from one of two sources and is routed to the outputs. The device provides true and complementary data.

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 Ioff. The Ioff circuitry disables the outputs, preventing damaging current backflow through the device when it is powered down.

DCU PACKAGE

(TOP VIEW)



**YZP PACKAGE** (BOTTOM VIEW)

GND	O 4 5 O	Y
Ŧ	O 3 6 O	Ā/B
В	0270	G
Α	0180	$V_{CC}$



Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet. NanoFree is a trademark of Texas Instruments.

Function Table										
INPU	JTS	OUTPUTS								
	Α	В	Y	Ŷ						
	Х	Х	L	Н						

Х

Х

L

Н

L

н

L

Н

Н

L

н

L

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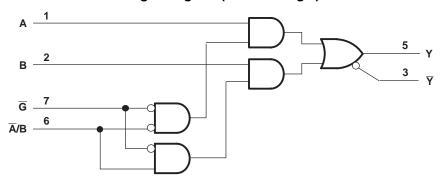
# Logic Diagram (Positive Logic)

L

н

Х

Х



# Absolute Maximum Ratings<sup>(1)</sup>

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

G

Н

L

L

L

L

Ā/B

Х

L

L

Н

Н

			MIN	MAX	UNIT
$V_{CC}$	Supply voltage range		-0.5	6.5	V
VI	Input voltage range <sup>(2)</sup>		-0.5	6.5	V
Vo	Voltage range applied to any output in the high-impedance	-0.5	6.5	V	
Vo	Voltage range applied to any output in the high or low state	-0.5	V <sub>CC</sub> + 0.5	V	
I <sub>IK</sub>	Input clamp current	V <sub>1</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
		DCT package		220	
$\theta_{JA}$	Package thermal impedance <sup>(4)</sup>	DCU package		227	°C/W
		YZP package		102	
T <sub>stg</sub>	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<sub>CC</sub> is provided in the *Recommended Operating Conditions* table.

(4) The package thermal impedance is calculated in accordance with JESD 51-7.



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# **Recommended Operating Conditions**<sup>(1)</sup>

			MIN	MAX	UNIT
V	Supply voltogo	Operating	1.65	5.5	V
V <sub>CC</sub>	Supply voltage	Data retention only	1.5		v
		V <sub>CC</sub> = 1.65 V to 1.95 V	0.65 × V <sub>CC</sub>		
V	Lligh lovel input veltage	$V_{CC}$ = 2.3 V to 2.7 V	1.7		V
V <sub>IH</sub>	High-level input voltage	$V_{CC} = 3 V \text{ to } 3.6 V$	2		v
		$V_{CC}$ = 4.5 V to 5.5 V	$0.7 \times V_{CC}$		
		$V_{CC} = 1.65 \text{ V} \text{ to } 1.95 \text{ V}$		$0.35 \times V_{CC}$	
V <sub>IL</sub> Low-lev		$V_{CC}$ = 2.3 V to 2.7 V		0.7	V
	Low-level input voltage	$V_{CC} = 3 V$ to 3.6 V		0.8	v
		$V_{CC} = 4.5 \text{ V} \text{ to } 5.5 \text{ V}$		$0.3 \times V_{CC}$	
VI	Input voltage		0	5.5	V
Vo	Output voltage		0	V <sub>CC</sub>	V
		V <sub>CC</sub> = 1.65 V		-4	
		V <sub>CC</sub> = 2.3 V		-8	
I <sub>OH</sub>	High-level output current	$V_{CC} = 3 V$		-16	mA
		$v_{CC} = 3 v$		-24	
		$V_{CC} = 4.5 V$		-32	
		V <sub>CC</sub> = 1.65 V		4	
		V <sub>CC</sub> = 2.3 V		8	
I <sub>OL</sub>	Low-level output current	$V_{CC} = 3 V$		16	mA
		$v_{CC} = 3 v$		24	
		$V_{CC} = 4.5 V$		32	
		$V_{CC}$ = 1.8 V ± 0.15 V, 2.5 V ± 0.2 V		20	
Δt/Δv	Input transition rise or fall rate	$V_{CC} = 3.3 \text{ V} \pm 0.3 \text{ V}$		10	) ns/V
		$V_{CC} = 5 \text{ V} \pm 0.5 \text{ V}$		5	
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, literature number SCBA004.

# SN74LVC2G157

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STRUMENTS

EXAS

## **Electrical Characteristics**

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

P/	ARAMETER	TEST CON	DITIONS	V <sub>cc</sub>	MIN	TYP <sup>(1)</sup>	MAX	UNIT
		I <sub>OH</sub> = −100 μA		1.65 V to 5.5 V	$V_{CC} - 0.1$			
		I <sub>OH</sub> = -4 mA		1.65 V	1.2			
		I <sub>OH</sub> = -8 mA		2.3 V	1.9			V
V <sub>ОН</sub>		I <sub>OH</sub> = -16 mA		2.1/	2.4			V
		I <sub>OH</sub> = -24 mA		3 V	2.3			
		I <sub>OH</sub> = -32 mA		4.5 V	3.8			
		I <sub>OL</sub> = 100 μA		1.65 V to 5.5 V			0.1	
		$I_{OL} = 4 \text{ mA}$		1.65 V			0.45	
		I <sub>OL</sub> = 8 mA	2.3 V			0.3	V	
V <sub>OL</sub>		I <sub>OL</sub> = 16 mA	- 3 V	0.4			V	
		I <sub>OL</sub> = 24 mA	3 V					
		I <sub>OL</sub> = 32 mA	4.5 V			0.55		
I <sub>I</sub>	A, B, or control inputs	$V_{I} = 5.5 V \text{ or GND}$		0 to 5.5 V			±5	μA
I <sub>off</sub>		$V_{I} \text{ or } V_{O} = 5.5 \text{ V}$		0			±10	μA
I <sub>CC</sub>		$V_{I} = 5.5 \text{ V or GND},$ I	<sub>D</sub> = 0	1.65 V to 5.5 V			10	μA
ΔI <sub>CC</sub>		One input at $V_{CC} - 0.6 V$ , 0	Other inputs at V <sub>CC</sub> or GND	3 V to 5.5 V			500	μA
$C_i$ $V_l = V_l$		$V_{I} = V_{CC}$ or GND		3.3 V		5		pF

(1) All typical values are at  $V_{CC}$  = 3.3 V,  $T_A$  = 25°C.

## **Switching Characteristics**

over recommended operating free-air temperature range (unless otherwise noted) (see Figure 1)

Р	ARAMETER	FROM (INPUT)	TO	V <sub>CC</sub> = ± 0.1		V <sub>CC</sub> = ± 0.2		V <sub>CC</sub> = ± 0.3		V <sub>CC</sub> = ± 0.5		UNIT
	(INFOT)	(OUTPUT)	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX		
	t <sub>pd</sub>	A or B	Y or Y	4.4	14	2.1	8	2	6	1.4	4	ns
		Ā/B		4.9	16	2.5	9	2.1	6	1.6	4	
		G		4.2	14	2	8	1.6	6	1.3	4	

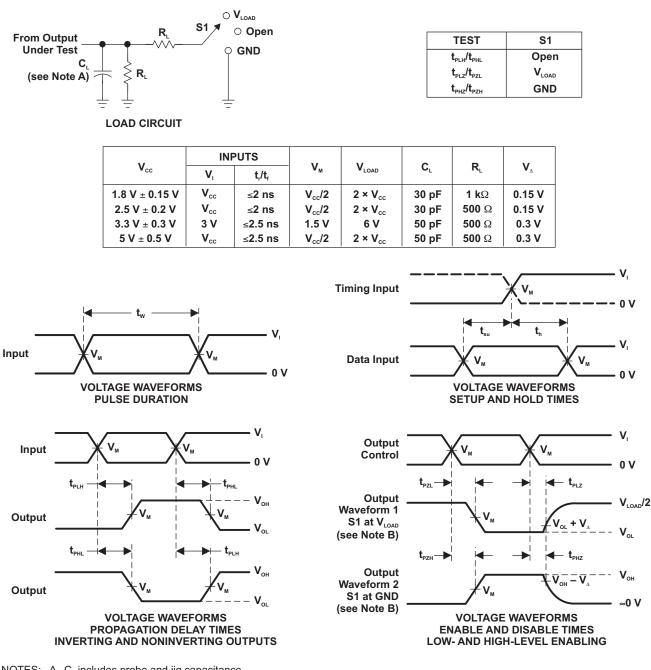
# **Operating Characteristics**

 $T_A = 25^{\circ}C$ 

	PARAMETER	TEST CONDITIONS	V <sub>CC</sub> = 1.8 V V <sub>CC</sub> = 2.5		V <sub>CC</sub> = 3.3 V	$V_{CC} = 5 V$	UNIT
	FARAMETER	TYP		TYP	ТҮР	ТҮР	UNIT
$C_{\text{pd}}$	Power dissipation capacitance	f = 10 MHz	35	35	37	40	pF



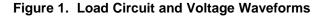
#### Parameter Measurement Information



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  $\leq$  10 MHz, Z<sub>0</sub> = 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.  $t_{\mbox{\tiny PLH}}$  and  $t_{\mbox{\tiny PHL}}$  are the same as  $t_{\mbox{\tiny pd}}$
- H. All parameters and waveforms are not applicable to all devices.



SN74LVC2G157

SCES207L-APRIL 1999-REVISED JANUARY 2014

# **REVISION HISTORY**

# Changes from Revision K (January 2007) to Revision L Page • Updated document to new TI data sheet format. 1 • Removed ordering information. 1 • Updated Features. 1



17-May-2014

# PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish	MSL Peak Temp	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 Z	Samples
74LVC2G157DCURE4	ACTIVE	US8	DCU	8		TBD	Call TI	Call TI	-40 to 85		Samples
74LVC2G157DCURG4	ACTIVE	US8	DCU	8	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	C57R	Samples
74LVC2G157DCUTE4	ACTIVE	US8	DCU	8		TBD	Call TI	Call TI	-40 to 85		Samples
74LVC2G157DCUTG4	ACTIVE	US8	DCU	8	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	C57R	Samples
SN74LVC2G157DCTR	ACTIVE	SM8	DCT	8	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	C57 Z	Samples
SN74LVC2G157DCTRG4	ACTIVE	SM8	DCT	8	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	C57 Z	Samples
SN74LVC2G157DCUR	ACTIVE	US8	DCU	8	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	C57R	Samples
SN74LVC2G157DCUT	ACTIVE	US8	DCU	8	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	C57R	Samples
SN74LVC2G157YZPR	ACTIVE	DSBGA	YZP	8	3000	Green (RoHS & no Sb/Br)	SNAGCU	Level-1-260C-UNLIM	-40 to 85	(C37 ~ C3N)	Samples

<sup>(1)</sup> 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.

<sup>(2)</sup> Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check http://www.ti.com/productcontent for the latest availability information and additional product content details.

**TBD:** The Pb-Free/Green conversion plan has not been defined.

**Pb-Free (RoHS):** TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

**Pb-Free (RoHS Exempt):** This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)



17-May-2014

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

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

<sup>(5)</sup> 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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# PACKAGE MATERIALS INFORMATION

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## TAPE AND REEL INFORMATION





## QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



All dimensions are nominal           Device         Package         Package         Pins         SPQ         Reel         A0         B0         K0         P1         W         Pin1												
Device	Туре	Drawing		SPQ	Diameter		(mm)	ыл (mm)	(mm)	(mm)		Quadrant
74LVC2G157DCURG4	US8	DCU	8	3000	180.0	8.4	2.25	3.35	1.05	4.0	8.0	Q3
SN74LVC2G157DCUR	US8	DCU	8	3000	180.0	8.4	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

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# PACKAGE MATERIALS INFORMATION

9-May-2014



\*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
74LVC2G157DCURG4	US8	DCU	8	3000	202.0	201.0	28.0
SN74LVC2G157DCUR	US8	DCU	8	3000	202.0	201.0	28.0
SN74LVC2G157YZPR	DSBGA	YZP	8	3000	220.0	220.0	35.0

# **MECHANICAL DATA**

MPDS049B - MAY 1999 - REVISED OCTOBER 2002

#### DCT (R-PDSO-G8)

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

D. Falls within JEDEC MO-187 variation DA.



DCT (R-PDSO-G8) PLASTIC SMALL OUTLINE Example Board Layout Example Stencil Design (Note C,E) (Note D) - 6x0,65 - 6x0,65 8x0,25-8x1,55 3,40 3,40 Non Solder Mask Defined Pad Example Pad Geometry -0,30 (Note C) 1,60 Example -0,07 Non-solder Mask Opening All Around (Note E) 4212201/A 10/11

NOTES: A. All linear dimensions are in millimeters.

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



DCU (R-PDSO-G8)

PLASTIC SMALL-OUTLINE PACKAGE (DIE DOWN)



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.



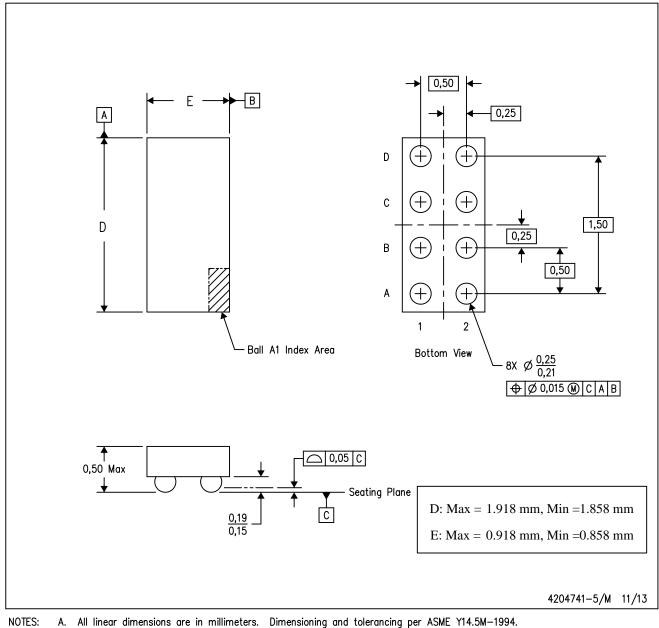


- NOTES: A. All linear dimensions are in millimeters. В. This drawing is subject to change without notice.
  - C. Publication IPC-7351 is recommended for alternate designs.
  - D. Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should 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.



YZP (R-XBGA-N8)

DIE-SIZE BALL GRID ARRAY



- A. All linear dimensions are in millimeters. Dimension B. This drawing is subject to change without notice.
- C. NanoFree™ package configuration.

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