SN74LVC1G00-EP SINGLE 2-INPUT POSITIVE-NAND GATE

SCES450D-DECEMBER 2003-REVISED SEPTEMBER 2006

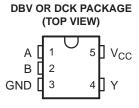
FEATURES

Controlled Baseline

www.ti.com

- One Assembly/Test Site, One Fabrication Site
- Enhanced Diminishing Manufacturing Sources (DMS) Support
- Enhanced Product-Change Notification
- Qualification Pedigree (1)
- Supports 5-V V_{CC} Operation
- Inputs Accept Voltages to 5.5 V
- Max t_{pd} of 3.8 ns at 3.3 V
- Low Power Consumption, 10-μA Max I_{CC}
- ±24-mA Output Drive at 3.3 V
- (1) Component qualification in accordance with JEDEC and industry standards to ensure reliable operation over an extended temperature range. This includes, but is not limited to, Highly Accelerated Stress Test (HAST) or biased 85/85, temperature cycle, autoclave or unbiased HAST, electromigration, bond intermetallic life, and mold compound life. Such qualification testing should not be viewed as justifying use of this component beyond specified performance and environmental limits.

- I_{off} Supports Partial-Power-Down Mode Operation
- 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)



DESCRIPTION/ORDERING INFORMATION

This single 2-input positive-NAND gate is designed for 1.65-V to 5.5-V V_{CC} operation.

The SN74LVC1G00 performs the Boolean function $Y = \overline{A \bullet B}$ or $Y = \overline{A} + \overline{B}$ in positive logic.

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.

ORDERING INFORMATION

T _A	PACKAG	E ⁽¹⁾	ORDERABLE PART NUMBER	TOP-SIDE MARKING(2)
-40°C to 85°C	SOP (SC-70) - DCK	Reel of 3000	SN74LVC1G00IDCKREP	CAO
55°C to 125°C	SOP - DBV	Reel of 3000	SN74LVC1G00MDBVREP	SBFM
–55°C to 125°C	SOP (SC-70) - DCK	Reel of 3000	SN74LVC1G00MDCKREP	BYA

- Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at www.ti.com/sc/package.
- (2) The actual top-side marking has one additional character that designates the assembly/test site.

FUNCTION TABLE

INP	UTS	OUTPUT
Α	В	Y
Н	Н	L
L	X	Н
X	L	Н

LOGIC DIAGRAM (POSITIVE LOGIC)





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.

SN74LVC1G00-EP SINGLE 2-INPUT POSITIVE-NAND GATE

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Absolute Maximum Ratings(1)

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

			MIN	MAX	UNIT	
V_{CC}	Supply voltage range		-0.5	6.5	V	
V_{I}	Input voltage range ⁽²⁾		-0.5	6.5	V	
Vo	Voltage range applied to any output in the high	-impedance or power-off state ⁽²⁾	-0.5	6.5	V	
Vo	Voltage range applied to any output in the high	-0.5	V _{CC} + 0.5	V		
I _{IK}	Input clamp current	V _I < 0		-50	mA	
I _{OK}	Output clamp current	V _O < 0		-50	mA	
Io	Continuous output current	·		±50	mA	
	Continuous current through V _{CC} or GND			±100	mA	
0		DBV package		324.1	°C/W	
θ_{JA}	Package thermal impedance (4)	DCK package		252		
T _{stg}	Storage temperature range			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 and output negative-voltage ratings may be exceeded if the input and output current ratings are observed.
 (3) The value of V_{CC} 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⁽¹⁾

				MIN	MAX	UNIT			
.,	Committee	Operating		1.65	5.5	V			
V_{CC}	Supply voltage	Data retention only		1.5		V			
		V _{CC} = 1.65 V to 1.95	V	$0.65 \times V_{CC}$					
.,	High level innet college	$V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$		1.7		V			
V_{IH}	High-level input voltage	$V_{CC} = 3 \text{ V to } 3.6 \text{ V}$	V _{CC} = 3 V to 3.6 V			V			
		$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$		$0.7 \times V_{CC}$					
		V _{CC} = 1.65 V to 1.95	V		$0.35 \times V_{CC}$				
V	Low lovel input voltage	$V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$			0.7	\/			
V_{IL}	Low-level input voltage	$V_{CC} = 3 \text{ V to } 3.6 \text{ V}$			8.0	V			
		$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$			$0.3\times V_{CC}$				
VI	Input voltage	·	0	5.5	V				
Vo	Output voltage			0	V _{CC}	V			
		V _{CC} = 1.65 V		-4					
		$V_{CC} = 2.3 \text{ V}$		-8					
I_{OH}	High-level output current	V _{CC} = 3 V	2.4-V Min V _{OH}		-16	mA			
		V _{CC} = 3 V	2.3-V Min V _{OH}		-24				
		$V_{CC} = 4.5 \text{ V}$	V _{CC} = 4.5 V						
		$V_{CC} = 1.65 \text{ V}$			4				
		$V_{CC} = 2.3 \text{ V}$			8				
I_{OL}	Low-level output current	V _{CC} = 3 V	0.4-V Max V _{OL}		16	mA			
		vCC = 3 v	0.55-V Max V _{OL}		24				
		$V_{CC} = 4.5 \text{ V}$		32					
		$V_{CC} = 1.8 \text{ V} \pm 0.15 \text{ V}$		20					
$\Delta t/\Delta v$	Input transition rise or fall rate	V_{CC} = 3.3 V \pm 0.3 V		10	ns/V				
		$V_{CC} = 5 V \pm 0.5 V$		5					
T _A	Operating free-air temperature	SN74LVC1G00IDCKI	-40	85	°C				
' A	operating nee an temperature	SN74LVC1G00MDB\	– 55	125					

⁽¹⁾ All unused inputs of the device must be held at V_{CC} or GND to ensure proper device operation. See the TI application report, Implications of Slow or Floating CMOS Inputs, literature number SCBA004.

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Electrical Characteristics

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

PARAMETER	TEST CONDITIONS	V _{cc}	MIN	TYP ⁽¹⁾	MAX	UNIT
	$I_{OH} = -100 \mu\text{A}$	1.65 V to 5.5 V	V _{CC} - 0.1			
	$I_{OH} = -4 \text{ mA}$	1.65 V	1.65 V 1.2			
V	$I_{OH} = -8 \text{ mA}$	2.3 V	1.9			
V _{OH}	I _{OH} = -16 mA	3 V	2.4			V
	$I_{OH} = -24 \text{ mA}$	3 V	2.3			
	$I_{OH} = -32 \text{ mA}$	4.5 V	3.8			
	I _{OL} = 100 μA	1.65 V to 5.5 V			0.1	
	I _{OL} = 4 mA	1.65 V		0.45		
V	I _{OL} = 8 mA	2.3 V			0.3	V
V _{OL}	I _{OL} = 16 mA	3 V			0.4	V
	I _{OL} = 24 mA	3 V			0.55	
	I _{OL} = 32 mA	4.5 V	0.55		0.55	
I _I A or B inputs	V _I = 5.5 V or GND	0 to 5.5 V			±5	μΑ
I _{off}	V_I or $V_O = 5.5 \text{ V}$	0			±10	μΑ
I _{CC}	V _I = 5.5 V or GND, I _O = 0	1.65 V to 5.5 V			10	μΑ
ΔI_{CC}	One input at V_{CC} – 0.6 V, Other inputs at V_{CC} or GND	3 V to 5.5 V		·	500	μΑ
C _i	V _I = V _{CC} or GND	3.3 V		4		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, C_L = 15 pF (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V _{CC} = 1.8 V ± 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 ± 0.5 V		UNIT
			MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
t _{pd}	A or B	Υ	2.2	7.2	0.9	4.4	0.8	3.8	0.8	3.4	ns

Switching Characteristics

over recommended operating free-air temperature range, $C_L = 30 \text{ pF}$ or 50 pF (unless otherwise noted) (see Figure 2)

	PARAMETER	FROM (INPUT)	TO (OUTPUT)	DEVICE	V _{CC} = ± 0.		V _{CC} = ± 0.		V _{CC} = ± 0.		V _{CC} = ± 0.5		UNIT
		(INFUI)	(OUTPUT)		MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
Ī	t _{pd} A	A or D	V	SN74LVC1G00M	3.1	9	1.3	7.0	1	6.3	1	5	20
		A OF B	A or B	Y	SN74LVC1G00I	3.1	9	1.3	5.5	1	4.7	1	4

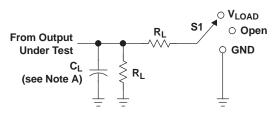
Operating Characteristics

 $T_A = 25^{\circ}C$

PARAMETER		TEST CONDITIONS	V _{CC} = 1.8 V	V _{CC} = 2.5 V	V _{CC} = 3.3 V	$V_{CC} = 5 V$	UNIT
		TEST CONDITIONS	TYP	TYP	TYP	TYP	ONIT
C_{pd}	Power dissipation capacitance	f = 10 MHz	22	22	23	25	pF



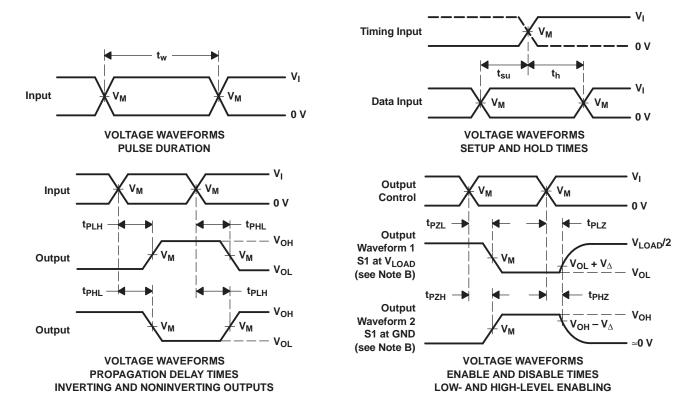
PARAMETER MEASUREMENT INFORMATION



TEST	S1		
t _{PLH} /t _{PHL}	Open		
t _{PLZ} /t _{PZL}	V _{LOAD}		
t _{PHZ} /t _{PZH}	GND		

LOAD CIRCUIT

V	INPUTS		· ·	V			.,	
V _{CC}	VI	t _r /t _f	V _M	V _{LOAD}	CL	R _L	V_{Δ}	
1.8 V \pm 0.15 V	v _{cc}	≤ 2 ns	V _{CC} /2	2×V _{CC}	15 pF	1 M Ω	0.15 V	
2.5 V \pm 0.2 V	V _{CC}	≤2 ns	V _{CC} /2	2×V _{CC}	15 pF	1 M Ω	0.15 V	
3.3 V \pm 0.3 V	3 V	≤2.5 ns	1.5 V	6 V	15 pF	1 M Ω	0.3 V	
5 V \pm 0.5 V	V _{CC}	≤2.5 ns	V _{CC} /2	2×V _{CC}	15 pF	1 M Ω	0.3 V	

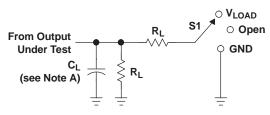


- NOTES: A. C_L includes probe and jig capacitance.
 - B. Waveform 1 is for an output with internal conditions such that the output is low, except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high, except when disabled by the output control.
 - C. All input pulses are supplied by generators having the following characteristics: PRR \leq 10 MHz, $Z_O = 50 \Omega$.
 - D. The outputs are measured one at a time, with one transition per measurement.
 - E. t_{PLZ} and t_{PHZ} are the same as t_{dis} .
 - F. t_{PZL} and t_{PZH} are the same as t_{en}.
 - G. t_{PLH} and t_{PHL} are the same as t_{pd} .
 - H. All parameters and waveforms are not applicable to all devices.

Figure 1. Load Circuit and Voltage Waveforms



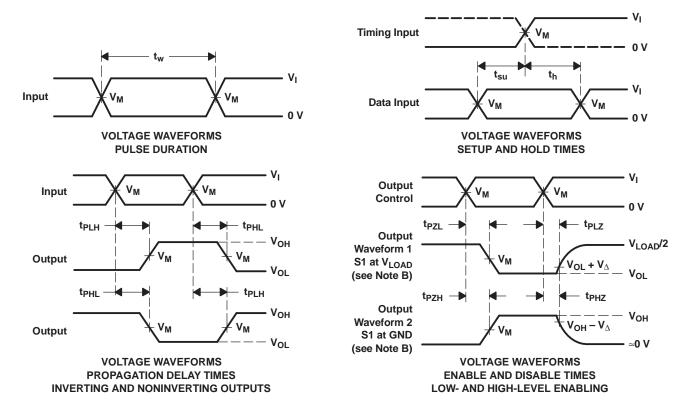
PARAMETER MEASUREMENT INFORMATION (continued)



TEST	S1
t _{PLH} /t _{PHL}	Open
t _{PLZ} /t _{PZL}	V _{LOAD}
t _{PHZ} /t _{PZH}	GND

LOAD CIRCUIT

V	INPUTS		.,	V			V	
V _{CC}	VI	t _r /t _f	V _M	V _{LOAD}	CL	R _L	$V_{\!\scriptscriptstyle \Delta}$	
1.8 V ± 0.15 V	V _{CC}	≤2 ns	V _{CC} /2	2×V _{CC}	30 pF	1 k Ω	0.15 V	
2.5 V \pm 0.2 V	V _{CC}	≤2 ns	V _{CC} /2	2×V _{CC}	30 pF	500 Ω	0.15 V	
3.3 V \pm 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 _{CC}	≤2.5 ns	V _{CC} /2	2×V _{CC}	50 pF	500 Ω	0.3 V	



NOTES: A. C_L includes probe and jig capacitance.

- B. Waveform 1 is for an output with internal conditions such that the output is low, except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high, except when disabled by the output control.
- C. All input pulses are supplied by generators having the following characteristics: PRR \leq 10 MHz, $Z_O = 50 \Omega$.
- D. The outputs are measured one at a time, with one transition per measurement.
- E. t_{PLZ} and t_{PHZ} are the same as t_{dis} .
- F. t_{PZL} and t_{PZH} are the same as t_{en}.
- G. t_{PLH} and t_{PHL} are the same as t_{pd} .
- H. All parameters and waveforms are not applicable to all devices.

Figure 2. Load Circuit and Voltage Waveforms





10-Dec-2020

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan	Lead finish/ Ball material	MSL Peak Temp	Op Temp (°C)	Device Marking (4/5)	Samples
SN74LVC1G00IDCKREP	ACTIVE	SC70	DCK	5	3000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	CAO	Samples
SN74LVC1G00MDBVREP	ACTIVE	SOT-23	DBV	5	3000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-55 to 125	SBFM	Samples
SN74LVC1G00MDCKREP	ACTIVE	SC70	DCK	5	3000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-55 to 125	ВҮА	Samples
V62/04732-01XE	ACTIVE	SC70	DCK	5	3000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	CAO	Samples
V62/04732-02XE	ACTIVE	SC70	DCK	5	3000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-55 to 125	ВҮА	Samples
V62/04732-02YE	ACTIVE	SOT-23	DBV	5	3000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-55 to 125	SBFM	Samples

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



PACKAGE OPTION ADDENDUM

10-Dec-2020

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OTHER QUALIFIED VERSIONS OF SN74LVC1G00-EP:

Catalog: SN74LVC1G00

NOTE: Qualified Version Definitions:

Catalog - TI's standard catalog product

PACKAGE MATERIALS INFORMATION

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TAPE AND REEL INFORMATION





Α0	Dimension designed to accommodate the component width
B0	Dimension designed to accommodate the component length
	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

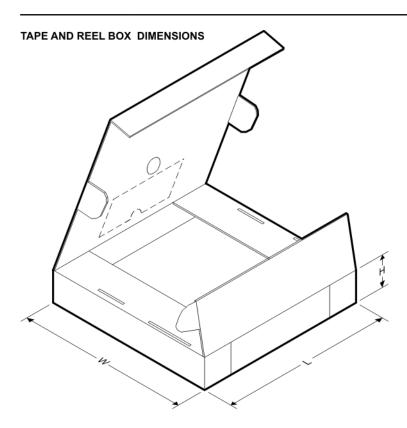
QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*All dimensions are nominal

Device	Package Type	Package Drawing		SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
SN74LVC1G00IDCKREP	SC70	DCK	5	3000	179.0	8.4	2.2	2.5	1.2	4.0	8.0	Q3
SN74LVC1G00MDBVREP	SOT-23	DBV	5	3000	179.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
SN74LVC1G00MDCKREP	SC70	DCK	5	3000	179.0	8.4	2.2	2.5	1.2	4.0	8.0	Q3

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*All dimensions are nominal

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Device	Package Type	Package Drawing	Pins SPQ		Length (mm)	Width (mm)	Height (mm)	
SN74LVC1G00IDCKREP	SC70	DCK	5	3000	203.0	203.0	35.0	
SN74LVC1G00MDBVREP	SOT-23	DBV	5	3000	203.0	203.0	35.0	
SN74LVC1G00MDCKREP	SC70	DCK	5	3000	203.0	203.0	35.0	





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.
 3. Reference JEDEC MO-178.

- 4. Body dimensions do not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.25 mm per side.
- 5. Support pin may differ or may not be present.





NOTES: (continued)

6. Publication IPC-7351 may have alternate designs.

7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.





NOTES: (continued)

- 8. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
- 9. Board assembly site may have different recommendations for stencil design.







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.

 3. Reference JEDEC MO-203.

- 4. Support pin may differ or may not be present.
- 5. Lead width does not comply with JEDEC.
- 6. Body dimensions do not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.25mm per side





NOTES: (continued)

7. Publication IPC-7351 may have alternate designs.8. Solder mask tolerances between and around signal pads can vary based on board fabrication site.





NOTES: (continued)

- 9. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
- 10. Board assembly site may have different recommendations for stencil design.



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