

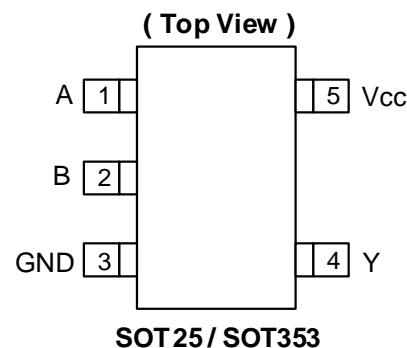
## Description

The 74LVC1G00Q is an automotive compliant, single, 2-input positive NAND gate with a standard push-pull output. The device is designed for operation with a power supply range of 1.65V to 5.5V. The inputs are tolerant to 5.5V allowing this device to be used in a mixed-voltage environment. The device is fully specified for partial power-down applications using I<sub>OFF</sub>. The I<sub>OFF</sub> circuitry disables the output preventing damaging current backflow when the device is powered down.

The gate performs the positive Boolean function:

$$Y = \overline{A \cdot B} \text{ or } Y = \overline{A} + \overline{B}$$

## Pin Assignments



## Features

- Grade 1 Ambient Temperature Operation: -40°C to +125°C
- Wide Supply Voltage Range from 1.65V to 5.5V
- ±24mA Output Drive at 3.3V
- CMOS Low Power Consumption
- I<sub>OFF</sub> Supports Partial-Power-Down Mode Operation
- Inputs Accept up to 5.5V
- ESD Protection Tested per AEC-Q100
- Exceeds 2000V Human Body Model (AEC-Q100-002)
- Exceeds 1000V Charged Device Model (AEC-Q100-011)
- Latch-Up Exceeds 100mA (AEC-Q100-004)
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **The 74LVC1G00Q is suitable for automotive applications requiring specific change control; this part is AEC-Q100 qualified, PPAP capable, and manufactured in IATF 16949 certified facilities.**

<https://www.diodes.com/quality/product-definitions/>

## Applications

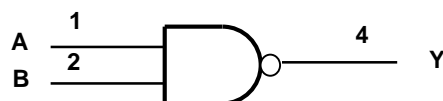
- Voltage Level Shifting
- General Purpose Logic
- Power-Down Signal Isolation
- Wide Array of Products such as:
  - Automotive Applications within Grade 1 Temperature Range
  - Industrial Computing/Controls/Automation
  - High-Reliability Networking/Communications
  - Industrial/Agricultural Equipment

- Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
  2. See <https://www.diodes.com/quality/lead-free/> for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
  3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.

## Pin Descriptions

Pin Name	Description
A	Data Input
B	Data Input
GND	Ground
Y	Data Output
V <sub>CC</sub>	Supply Voltage

## Logic Diagram



## Function Table

Inputs		Output
A	B	Y
H	H	L
L	X	H
X	L	H

## Absolute Maximum Ratings (Notes 4 & 5)

Symbol	Description	Rating	Unit
ESD HBM	Human Body Model ESD Protection	2	kV
ESD CDM	Charged Device Model ESD Protection	1	kV
V <sub>CC</sub>	Supply Voltage Range	-0.5 to 6.5	V
V <sub>I</sub>	Input Voltage Range	-0.5 to 6.5	V
V <sub>O</sub>	Voltage Applied to Output in High Impedance or I <sub>OFF</sub> State	-0.5 to 6.5	V
V <sub>O</sub>	Voltage Applied to Output in High or Low State	-0.5 to 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	-50	mA
I <sub>O</sub>	Continuous Output Current	±50	mA
I <sub>CC</sub> , I <sub>GND</sub>	Continuous Current Through V <sub>CC</sub> or GND	±100	mA
T <sub>J</sub>	Operating Junction Temperature	-40 to +150	°C
T <sub>STG</sub>	Storage Temperature	-65 to +150	°C

- Notes:
- Stresses beyond the absolute maximum can result in immediate failure or reduced reliability. These are stress values and device operation should be within recommend values.
  - Forcing the maximum allowed voltage could cause a condition exceeding the maximum current or conversely forcing the maximum current could cause a condition exceeding the maximum voltage. The ratings of both current and voltage must be maintained within the controlled range.

## Recommended Operating Conditions (Note 6)

Symbol	Parameter		Min	Max	Unit
V <sub>CC</sub>	Operating Voltage	Operating	1.65	5.5	V
		Data Retention Only	1.5	—	V
V <sub>IH</sub>	High-Level Input Voltage	V <sub>CC</sub> = 1.65V to 1.95V	0.65 × V <sub>CC</sub>	—	V
		V <sub>CC</sub> = 2.3V to 2.7V	1.7	—	
		V <sub>CC</sub> = 3V to 3.6V	2	—	
		V <sub>CC</sub> = 4.5V to 5.5V	0.7 × V <sub>CC</sub>	—	
V <sub>IL</sub>	Low-Level Input Voltage	V <sub>CC</sub> = 1.65V to 1.95V	—	0.35 × V <sub>CC</sub>	V
		V <sub>CC</sub> = 2.3V to 2.7V	—	0.7	
		V <sub>CC</sub> = 3V to 3.6V	—	0.8	
		V <sub>CC</sub> = 4.5V to 5.5V	—	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> = 1.65V	—	-4	mA
		V <sub>CC</sub> = 2.3V	—	-8	
		V <sub>CC</sub> = 2.7V	—	-12	
		V <sub>CC</sub> = 3V	—	-16	
		V <sub>CC</sub> = 4.5V	—	-24	
I <sub>OL</sub>	Low-Level Output Current	V <sub>CC</sub> = 1.65V	—	4	mA
		V <sub>CC</sub> = 2.3V	—	8	
		V <sub>CC</sub> = 2.7V	—	12	
		V <sub>CC</sub> = 3V	—	16	
		V <sub>CC</sub> = 4.5V	—	24	
Δt/ΔV	Input Transition Rise or Fall Rate	V <sub>CC</sub> = 1.8V ± 0.15V, 2.5V ± 0.2V	—	20	ns/V
		V <sub>CC</sub> = 3.3V ± 0.3V	—	10	
		V <sub>CC</sub> = 5V ± 0.5V	—	5	
T <sub>A</sub>	Operating Free-Air Temperature		-40	+125	°C

Note: 6. Unused inputs should be held at V<sub>CC</sub> or Ground.

## Electrical Characteristics

(All typical values are at  $V_{CC} = 3.3V$ ,  $T_A = +25^\circ C$ )

Symbol	Parameter	Test Conditions	$V_{CC}$	-40°C to +125°C			Unit
				Min	Typ	Max	
$V_{OH}$	High Level Output Voltage	$V_I = V_{IH}$ or $V_{IL}$	$I_{OH} = -100\mu A$	1.65V to 5.5V	$V_{CC} - 0.1$	—	V
			$I_{OH} = -4mA$	1.65V	0.95	—	
			$I_{OH} = -8mA$	2.3V	1.7	—	
			$I_{OH} = -12mA$	2.7V	1.9	—	
			$I_{OH} = -24mA$	3V	2.0	—	
			$I_{OH} = -32mA$	4.5V	3.4	—	
$V_{OL}$	Low Level Output Voltage	$V_I = V_{IH}$ or $V_{IL}$	$I_{OL} = 100\mu A$	1.65V to 5.5V	—	—	V
			$I_{OL} = 4mA$	1.65V	—	—	
			$I_{OL} = 8mA$	2.3V	—	—	
			$I_{OL} = 12mA$	2.7V	—	—	
			$I_{OL} = 24mA$	3V	—	—	
			$I_{OL} = 32mA$	4.5V	—	—	
$I_I$	Input Current	$V_I = 5.5V$ or GND	0 to 5.5V	—	$\pm 0.1$	$\pm 1$	$\mu A$
$I_{OFF}$	Power Down Leakage Current	$V_I$ or $V_O = 5.5V$	0V	—	—	$\pm 2$	$\mu A$
$I_{CC}$	Supply Current	$V_I = 5.5V$ or GND $I_O = 0$	5.5V	—	0.1	4	$\mu A$
$\Delta I_{CC}$	Additional Supply Current	One input at $V_{CC} - 0.6V$ Other inputs at $V_{CC}$ or GND	3V to 5.5V	—	—	500	$\mu A$
$C_I$	Input Capacitance	$V_I = \text{GND to } V_{CC}$	3.3V	—	5.0	—	pF

## Package Characteristics

Symbol	Parameter	Package	Test Conditions	Min	Typ	Max	Unit
$\theta_{JA}$	Thermal Resistance Junction-to-Ambient	SOT25	Note 7	—	184	—	$^\circ C/W$
		SOT353		—	385	—	
$\theta_{JC}$	Thermal Resistance Junction-to-Case	SOT25	Note 7	—	62	—	$^\circ C/W$
		SOT353		—	164	—	

Note: 7. Device mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout.

## Switching Characteristics

Figure 1 Typical Values at  $T_A = +25^\circ C$  and nominal voltages 1.8V, 2.5V, 2.7V, 3.3V, and 5.0V.

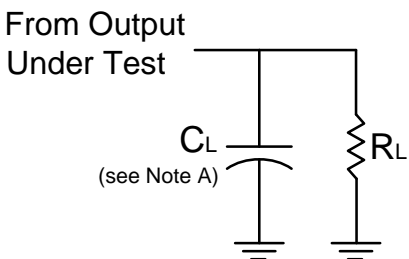
Parameter	From Input	To Output	$V_{CC}$	$T_A = -40^\circ C$ to $+125^\circ C$			Unit
				Min	Typ	Max	
$t_{PD}$	A or B	Y	$1.8V \pm 0.15V$	1.0	3.3	10.5	ns
			$2.5V \pm 0.2V$	0.5	2.2	7.0	
			2.7V	0.5	2.6	7.5	
			$3.3V \pm 0.3V$	0.5	2.2	6.0	
			$5.0V \pm 0.5V$	0.5	1.8	5.5	

## Operating Characteristics

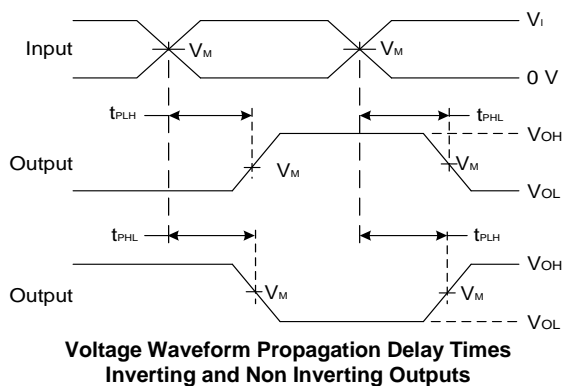
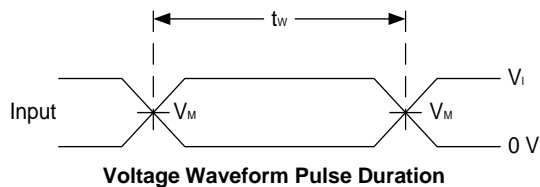
$T_A = +25^\circ C$

Parameter		Test Conditions	$V_{CC} = 1.8V$	$V_{CC} = 2.5V$	$V_{CC} = 3.3V$	$V_{CC} = 5V$	Unit
			Typ	Typ	Typ	Typ	
$C_{PD}$	Power Dissipation Capacitance	$f = 10MHz$	15	16	16	16	pF

## Measurement Information



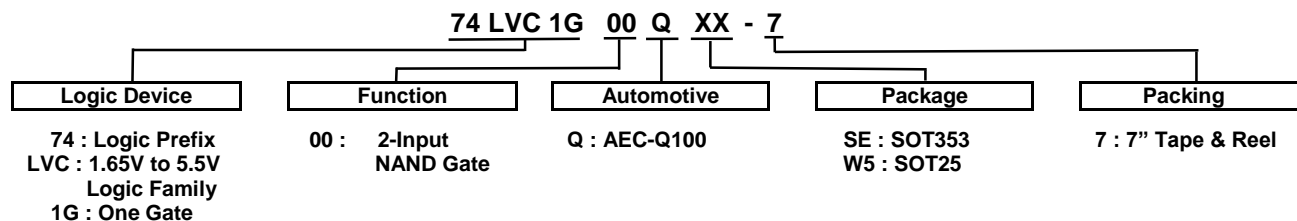
$V_{CC}$	Inputs		$V_M$	$C_L$	$R_L$
	$V_I$	$t_R/t_F$			
$1.8V \pm 0.15V$	$V_{CC}$	$\leq 2ns$	$V_{CC}/2$	30pF	1k $\Omega$
$2.5V \pm 0.2V$	$V_{CC}$	$\leq 2ns$	$V_{CC}/2$	30pF	500 $\Omega$
2.7V	$V_{CC}$	$\leq 2.5ns$	1.5V	50pF	500 $\Omega$
$3.3V \pm 0.3V$	3.0V	$\leq 2.5ns$	1.5V	50pF	500 $\Omega$
$5.0V \pm 0.5V$	$V_{CC}$	$\leq 2.5ns$	$V_{CC}/2$	50pF	500 $\Omega$



**Figure 1. Load Circuit and Voltage Waveforms**

- Notes:
- A. Includes test lead and test apparatus capacitance.
  - B. All pulses are supplied at pulse repetition rate  $\leq 10MHz$ .
  - C. Inputs are measured separately one transition per measurement.
  - D.  $t_{PLH}$  and  $t_{PHL}$  are the same as  $t_{PD}$ .

## Ordering Information (Note 8)

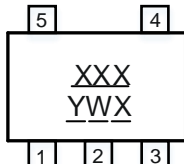


Part Number	Package Code	Package (Notes 9 & 10)	Package Size	7" Tape and Reel	
				Quantity	Part Number Suffix
74LVC1G00QSE-7	SE	SOT353	2.0mm × 2.0mm × 1.1mm 0.65mm lead pitch	3000/Tape & Reel	-7
74LVC1G00QW5-7	W5	SOT25	3.0mm × 2.8mm × 1.2mm 0.95mm lead pitch	3000/Tape & Reel	-7

Notes: 8. For packaging details, go to our website at <https://www.diodes.com/design/support/packaging/diodes-packaging/>.  
 9. Pad layout as shown in Diodes Incorporated's package outline PDFs, which can be found on our website at <http://www.diodes.com/package-outlines.html>.  
 10. The taping orientation is located on our website at <https://www.diodes.com/assets/Packaging-Support-Docs/ap02007.pdf>.

## Marking Information

(Top View)



SOT25 / SOT353

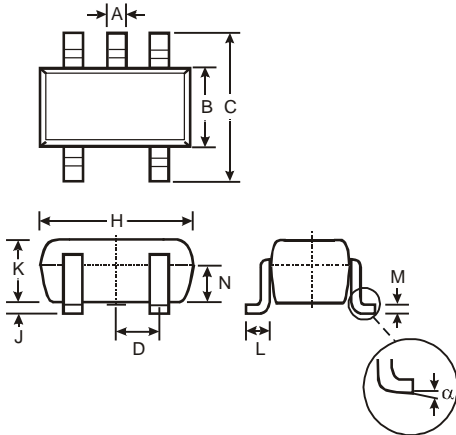
**XXX** : Identification Code  
**Y** : Year 0~9  
**W** : Week: A~Z 1~26 week  
           a~z 27~52 week  
           z represents week 52 and 53  
**X** : A~Z: Internal Code

Part Number	Package	Identification Code
74LVC1G00QW5-7	SOT25	USQ
74LVC1G00QSE-7	SOT353	USQ

## Package Outline Dimensions

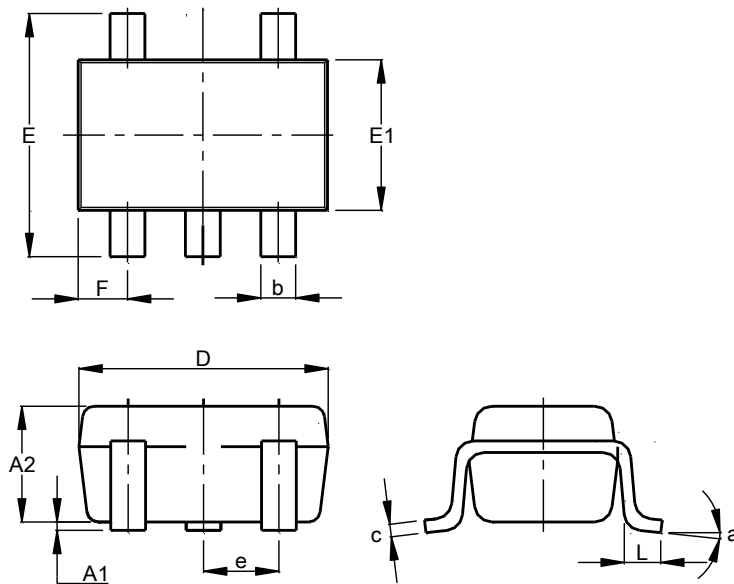
Please see <http://www.diodes.com/package-outlines.html> for the latest version.

### (1) Package Type: SOT25



SOT25			
Dim	Min	Max	Typ
A	0.35	0.50	0.38
B	1.50	1.70	1.60
C	2.70	3.00	2.80
D	-	-	0.95
H	2.90	3.10	3.00
J	0.013	0.10	0.05
K	1.00	1.30	1.10
L	0.35	0.55	0.40
M	0.10	0.20	0.15
N	0.70	0.80	0.75
$\alpha$	0°	8°	-
All Dimensions in mm			

### (2) Package Type: SOT353

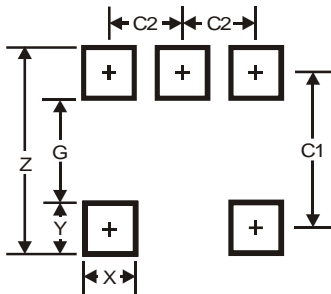


SOT353			
Dim	Min	Max	Typ
A1	0.00	0.10	0.05
A2	0.90	1.00	0.95
b	0.10	0.30	0.25
c	0.10	0.22	0.11
D	1.80	2.20	2.15
E	2.00	2.20	2.10
E1	1.15	1.35	1.30
e	0.650 BSC		
F	0.40	0.45	0.425
L	0.25	0.40	0.30
a	0°	8°	--
All Dimensions in mm			

## Suggested Pad Layout

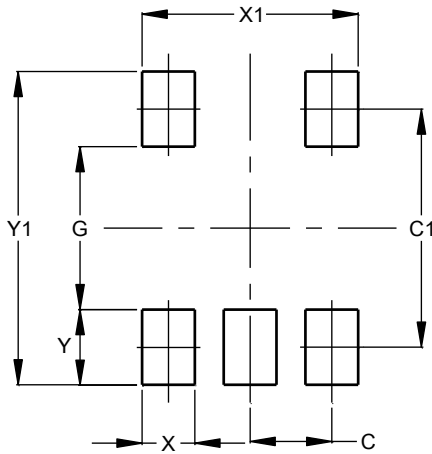
Please see <http://www.diodes.com/package-outlines.html> for the latest version.

### (1) Package Type: SOT25



Dimensions	Value
Z	3.20
G	1.60
X	0.55
Y	0.80
C1	2.40
C2	0.95

### (2) Package Type: SOT353



Dimensions	Value (in mm)
C	0.650
C1	1.900
G	1.300
X	0.420
X1	1.720
Y	0.600
Y1	2.500

## Mechanical Data

### SOT25

- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish – Matte Tin Plated Leads, Solderable per MIL-STD-202, Method 208@3
- Weight: 0.0158 grams (Approximate)

### SOT353

- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish – Matte Tin Plated Leads, Solderable per MIL-STD-202, Method 208@3
- Weight: 0.0064 grams (Approximate)



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