

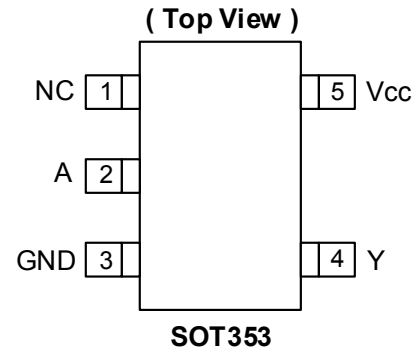
## Description

The 74LVC1G04Q is an automotive-compliant, single inverter 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:

$$Y = \overline{A}$$

## 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 Regardless of V<sub>CC</sub> Level
- 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 74LVC1G04Q is suitable for automotive applications requiring specific change control and is AEC-Q100 qualified, has a grade 1 -40°C to 125°C temperature rating, is PPAP capable, and is manufactured in IATF16949:2016 certified facilities.**

## 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.

## Ordering Information (Note 4)

74 LVC 1G 04 Q XX -7				
Logic Device	Function	Automotive	Package	Packing
74 : Logic Prefix LVC : 1.65 to 5.5 V Logic Family 1G : One Gate	04: 1-Input Inverter/Buffer	Q : AECQ100	SE : SOT353	-7 : 7" Tape & Reel

Part Number	Package Code	Package (Notes 5 & 6)	Package Size	7" Tape and Reel	
				Quantity	Part Number Suffix
74LVC1G04QSE-7	SE	SOT353	2.0mm × 2.0mm × 1.1mm 0.65mm lead pitch	3000/Tape & Reel	-7

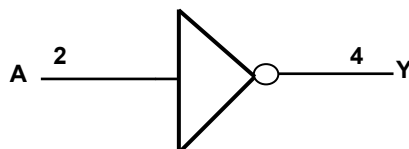
Notes:

4. For packaging details, go to our website at <http://www.diodes.com/products/packages.html>.
5. Pad layout as shown in Diodes Inc. suggested pad layouts, which can be found on our website at see <http://www.diodes.com/package-outlines.html>.
6. The taping orientation is located on our website at <http://www.diodes.com/datasheets/ap02007.pdf>.

## Pin Descriptions

Pin Name	Description
NC	No Connection
A	Data Input
GND	Ground
Y	Data Output
V <sub>CC</sub>	Supply Voltage

## Logic Diagram



## Function Table

Inputs	Output
A	Y
H	L
L	H

**Absolute Maximum Ratings** (Notes 7 & 8)

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: 7. Stresses beyond the absolute maximum may result in immediate failure or reduced reliability. These are stress values and device operation should be within recommend values.  
 8. 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 9)

Symbol	Parameter	Min	Max	Unit
V <sub>CC</sub>	Operating Voltage	Operating	1.65	5.5
		Data Retention Only	1.5	—
V <sub>IH</sub>	High-Level Input Voltage	V <sub>CC</sub> = 1.65V to 1.95V	0.65 × V <sub>CC</sub>	—
		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 <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
		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	—	-32
		V <sub>CC</sub> = 2.3V	—	4
		V <sub>CC</sub> = 2.7V	—	8
		V <sub>CC</sub> = 3V	—	12
		V <sub>CC</sub> = 4.5V	—	16
Δt/ΔV	Input Transition Rise or Fall Rate	V <sub>CC</sub> = 1.8V ± 0.15V, 2.5V ± 0.2V	—	20
		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

Note: 9. 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	$V_I = V_{IL}$	$I_{OH} = -100\mu A$	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	$V_I = V_{IH}$	$I_{OL} = 100\mu A$	1.65V to 5.5V	—	0.10	V
			$I_{OL} = 4mA$	1.65V	—	0.70	
			$I_{OL} = 8mA$	2.3V	—	0.45	
			$I_{OL} = 12mA$	2.7V	—	0.60	
			$I_{OL} = 24mA$	3V	—	0.80	
			$I_{OL} = 32mA$	4.5V	—	0.80	
$I_I$	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	Input at $V_{CC} - 0.6V$	3V to 5.5V	—	—	500	$\mu A$
$C_I$	Input Capacitance	$V_I = GND$ to $V_{CC}$	3.3V	—	5.0	—	pF

**Package Characteristics**

Symbol	Parameter	Test Conditions	$V_{CC}$	Min	Typ.	Max	Unit
$\theta_{JA}$	Thermal Resistance Junction-to-Ambient	SOT353	Note 10	—	371	—	$^\circ C/W$
$\theta_{JC}$	Thermal Resistance Junction-to-Case	SOT353	Note 10	—	143	—	$^\circ C/W$

Note: 10. Device mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout.

**Switching Characteristics**

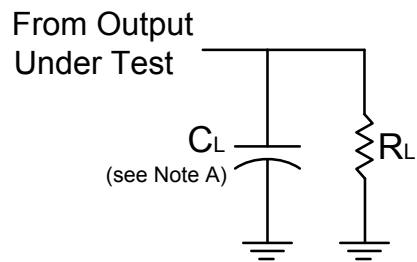
 Figure 1 Typical Values at  $T_A = +25^\circ C$  and nominal voltages 1.8V, 2.5V, 2.7V, 3.3V, and 5.0V.

Parameter	From Input	To Output	$V_{CC}$	$T_A = -40^\circ C$ to $125^\circ C$			Unit
				Min	Typ	Max	
$t_{PD}$	A	Y	$1.8V \pm 0.15V$	1.0	3.0	9.5	ns
			$2.5V \pm 0.2V$	0.5	2.0	6.5	
			2.7V	0.5	2.3	7.0	
			$3.3V \pm 0.3V$	0.5	2.0	5.5	
			$5.0V \pm 0.5V$	0.5	1.6	5.0	

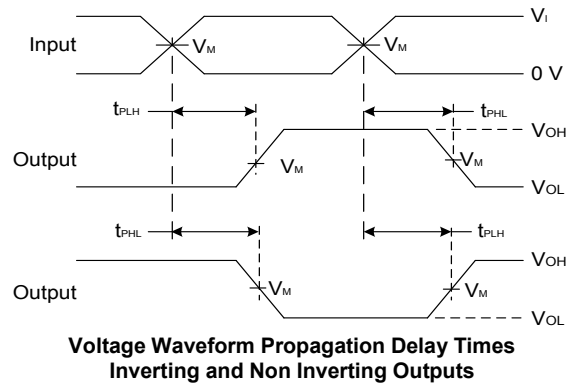
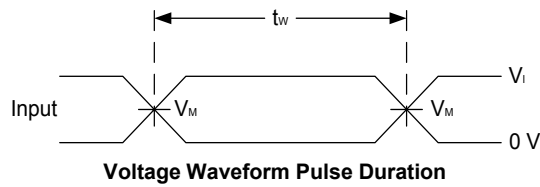
**Operating Characteristics**
 $T_A = +25^\circ C$ 

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	$f = 10 MHz$	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 $\Omega$

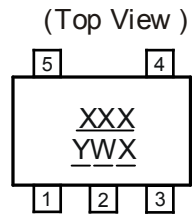


**Figure 1 Load Circuit and Voltage Waveforms**

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

## Marking Information

SOT353



SOT353

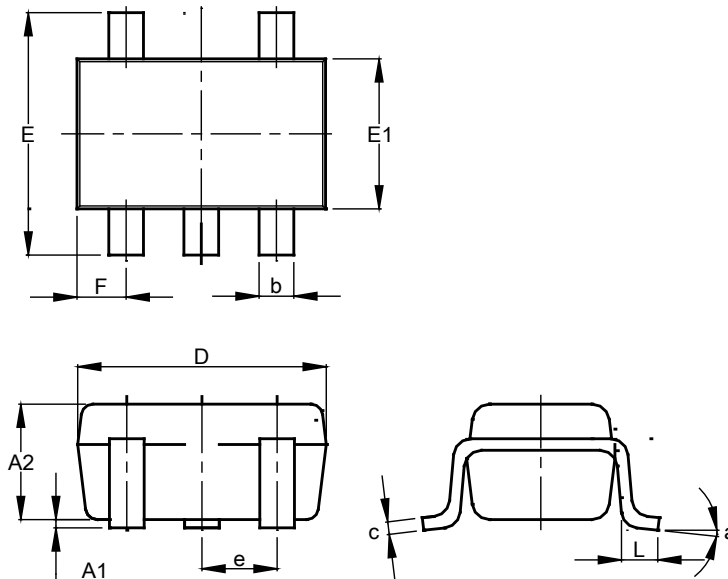
XXX : Identification Code  
Y : Year 0~9  
W : Week: A~Z 1~26 week  
       a~z 27~52 week  
       z represents week 52 and 53  
       : A~ Z: Internal Code

Part Number	Package	Identification Code
74LVC1G04QSE-7	SOT353	UUQ

## Package Outline Dimensions

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

**SOT353**

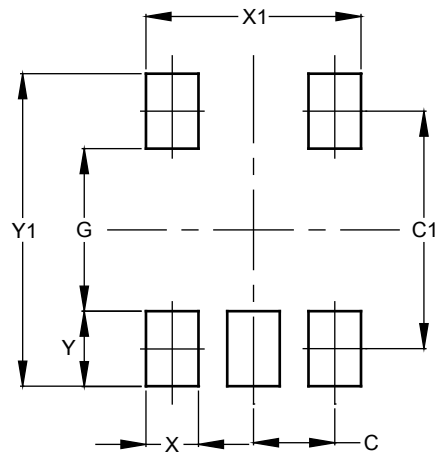


SOT353			
Dim	Min	Max	Typ
A1	0.00	0.10	0.05
A2	0.90	1.00	0.95
b	0.10	0.30	0.25
c	0.10	0.22	0.11
D	1.80	2.20	2.15
E	2.00	2.20	2.10
E1	1.15	1.35	1.30
e	0.650 BSC		
F	0.40	0.45	0.425
L	0.25	0.40	0.30
a	0°	8°	--
All Dimensions in mm			

## Suggested Pad Layout

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

**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

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