

## Description

The 74LVC1G14Q is an automotive-compliant, single 1-input Schmitt trigger inverter 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:

$$Y = \overline{A}$$

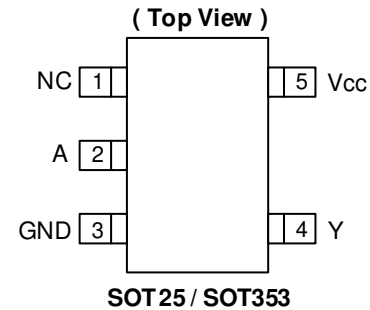
## Features

- 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 74LVC1G14Q 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/>

- 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 Assignments



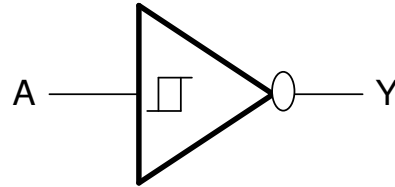
## Applications

- 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

## 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

Input	Output
A	Y
H	L
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>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	—	-24	
		V <sub>CC</sub> = 4.5V	—	-32	
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	—	24	
		V <sub>CC</sub> = 4.5V	—	32	
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**  $T_A = -40^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$  (All typical values are at  $V_{CC} = 3.3\text{V}$ ,  $T_A = +25^{\circ}\text{C}$ )

Symbol	Parameter	Test Conditions	$V_{CC}$	Min	Typ	Max	Unit	
$V_{T+}$	Positive-Going Input Threshold Voltage	—	1.65V	0.79	—	1.16	V	
		—	2.3V	1.11	—	1.56		
		—	3V	1.50	—	1.87		
		—	4.5V	2.16	—	2.74		
		—	5.5V	2.61	—	3.33		
$V_{T-}$	Negative-Going Input Threshold Voltage	—	1.65V	0.39	—	0.64	V	
		—	2.3V	0.58	—	0.89		
		—	3V	0.84	—	1.16		
		—	4.5V	1.41	—	1.79		
		—	5.5V	1.87	—	2.29		
$\Delta V_T$	Hysteresis ( $V_{T+} - V_{T-}$ )	—	1.65V	0.37	—	0.62	V	
		—	2.3V	0.48	—	0.77		
		—	3V	0.56	—	0.87		
		—	4.5V	0.71	—	1.04		
		—	5.5V	0.71	—	1.11		
$V_{OH}$	High Level Output Voltage	$V_I = V_{T-}$	$I_{OH} = -100\mu\text{A}$	1.65V to 5.5V	$V_{CC} - 0.1$	—	—	V
			$I_{OH} = -4\text{mA}$	1.65V	0.95	—	—	
			$I_{OH} = -8\text{mA}$	2.3V	1.7	—	—	
			$I_{OH} = -12\text{mA}$	2.7V	1.9	—	—	
			$I_{OH} = -24\text{mA}$	3V	2.0	—	—	
			$I_{OH} = -32\text{mA}$	4.5V	3.4	—	—	
$V_{OL}$	Low-Level Output Voltage	$V_I = V_{T+}$	$I_{OL} = 100\mu\text{A}$	1.65V to 5.5V	—	—	0.1	V
			$I_{OL} = 4\text{mA}$	1.65V	—	—	0.7	
			$I_{OL} = 8\text{mA}$	2.3V	—	—	0.45	
			$I_{OL} = 12\text{mA}$	2.7V	—	—	0.6	
			$I_{OL} = 24\text{mA}$	3V	—	—	0.8	
			$I_{OL} = 32\text{mA}$	4.5V	—	—	0.8	
$I_I$	Input Current	$V_I = 5.5\text{V}$ or GND	$V_I = 5.5\text{V}$ or GND	0 to 5.5V	—	—	$\pm 1$	$\mu\text{A}$
$I_{OFF}$	Power Down Leakage Current	$V_I$ or $V_O = 5.5\text{V}$		0	—	—	$\pm 2$	$\mu\text{A}$
$I_{CC}$	Supply Current	$V_I = 5.5\text{V}$ or GND $I_O = 0$		1.65V to 5.5V	—	—	4	$\mu\text{A}$
$\Delta I_{CC}$	Additional Supply Current	Input at $V_{CC} - 0.6\text{V}$		2.3V to 5.5V	—	—	500	$\mu\text{A}$
$C_i$	Input Capacitance	$V_I = 5.5\text{V}$ to GND		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	—	$^{\circ}\text{C/W}$
		SOT353		—	385	—	
$\theta_{JC}$	Thermal Resistance Junction-to-Case	SOT25	Note 7	—	62	—	$^{\circ}\text{C/W}$
		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  $T_A = +25^\circ\text{C}$  and nominal voltages 1.8V, 2.5V, 2.7V, 3.3V, and 5.0V.

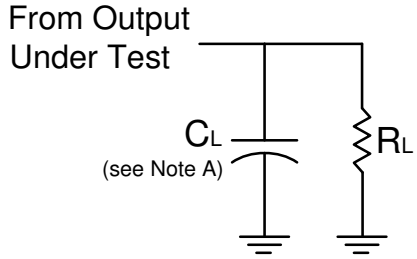
Parameter	From Input	To Output	Vcc	$T_A = -40^\circ\text{C to } +125^\circ\text{C}$			Unit
				Min	Typ	Max	
$t_{PD}$	A	Y	$1.8\text{V} \pm 0.15\text{V}$	1.0	4.1	14.0	ns
			$2.5\text{V} \pm 0.2\text{V}$	0.7	2.8	8.5	
			2.7V	0.7	3.2	8.5	
			$3.3\text{V} \pm 0.3\text{V}$	0.7	3.0	7.0	
			$5.0\text{V} \pm 0.5\text{V}$	0.7	2.2	6.5	

## Operating Characteristics

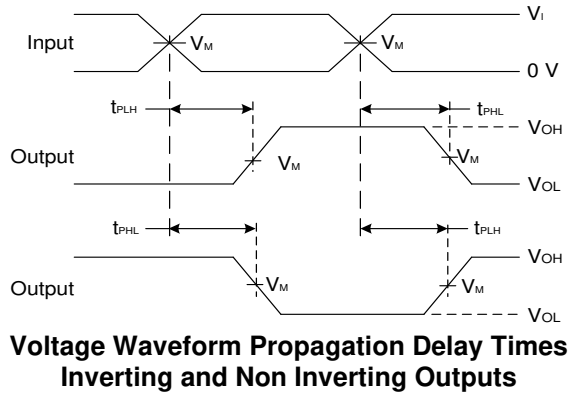
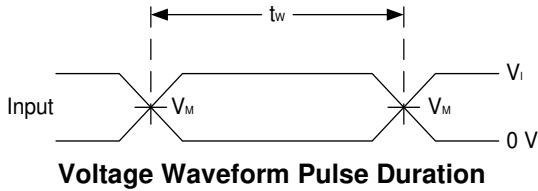
$T_A = +25^\circ\text{C}$

Parameter		Test Conditions	Vcc = 1.8V	Vcc = 2.5V	Vcc = 3.3V	Vcc = 5V	Unit
			Typ	Typ	Typ	Typ	
$C_{PD}$	Power Dissipation Capacitance	$f = 10\text{MHz}$	14	15	15	16	pF

**Parameter Measurement Information**



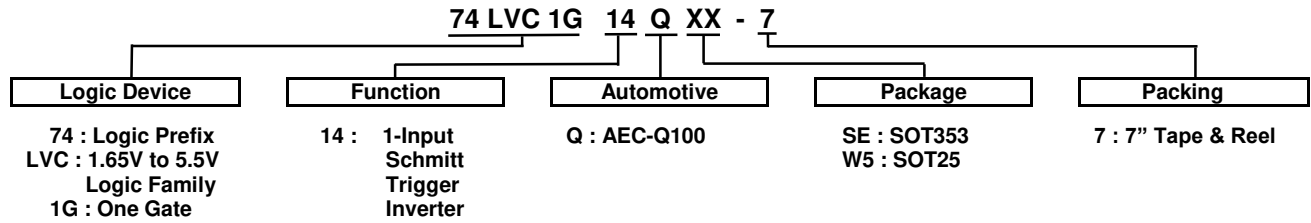
V <sub>CC</sub>	Inputs		V <sub>M</sub>	C <sub>L</sub>	R <sub>L</sub>
	V <sub>I</sub>	t <sub>R</sub> /t <sub>F</sub>			
1.8V±0.15V	V <sub>CC</sub>	≤2ns	V <sub>CC</sub> /2	30pF	1kΩ
2.5V±0.2V	V <sub>CC</sub>	≤2ns	V <sub>CC</sub> /2	30pF	500Ω
3.3V±0.3V	3V	≤2.5ns	1.5V	50pF	500Ω
5V±0.5V	V <sub>CC</sub>	≤2.5ns	V <sub>CC</sub> /2	50pF	500Ω



**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 ≤ 10MHz.
  - C. Inputs are measured separately one transition per measurement.
  - D. t<sub>PLH</sub> and t<sub>PHL</sub> are the same as t<sub>PD</sub>.

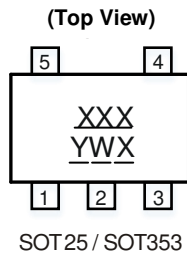
## Ordering Information (Note 8)



Part Number	Package Code	Package (Notes 9 & 10)	Package Size	7" Tape and Reel	
				Quantity	Part Number Suffix
74LVC1G14QSE-7	SE	SOT353	2.15mm × 2.1mm × 1.1mm 0.65mm lead pitch	3000/Tape & Reel	-7
74LVC1G14QW5-7	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



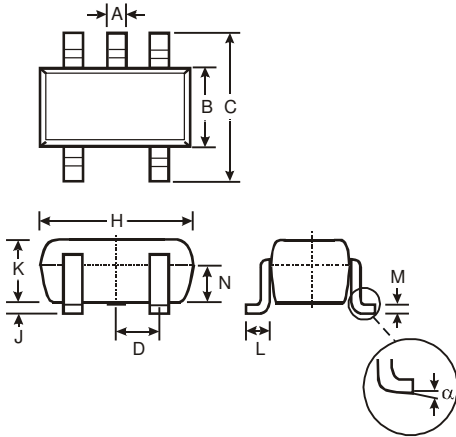
XXX : Identification Code  
Y : Year 0~9  
W : Week: A~Z 1~26 week  
           a~z 27~52 week  
           z represents week 52 and 53  
X : A~Z : Internal Code

Part Number	Package	Identification Code
74LVC1G14QW5-7	SOT25	UPQ
74LVC1G14QSE-7	SOT353	UPQ

**Package Outline Dimensions**

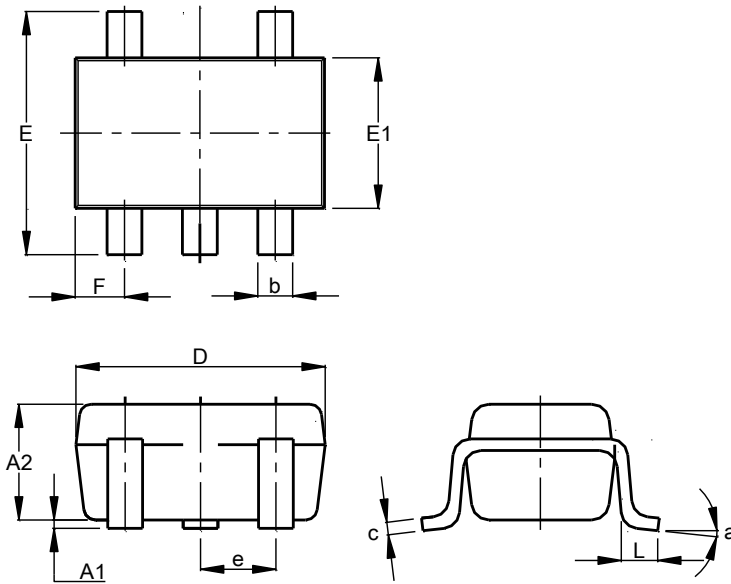
Please see <http://www.diodes.com/package-outlines.html> for the latest version.

(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
α	0°	8°	-
All Dimensions in mm			

(2) Package Type: SOT353



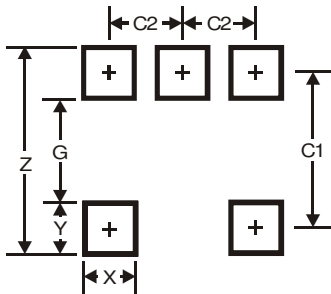
SOT353			
Dim	Min	Max	Typ
A1	0.00	0.10	0.05
A2	0.90	1.00	0.95
b	0.10	0.30	0.25
c	0.10	0.22	0.11
D	1.80	2.20	2.15
E	2.00	2.20	2.10
E1	1.15	1.35	1.30
e	0.650 BSC		
F	0.40	0.45	0.425
L	0.25	0.40	0.30
a	0°	8°	--
All Dimensions in mm			



## Suggested Pad Layout

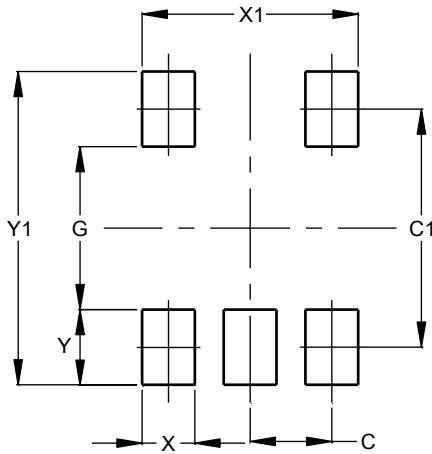
Please see <http://www.diodes.com/package-outlines.html> for the latest version.

### (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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