# CL74LVC1G14 Single Schmitt-Trigger Inverter

## General Description

This single Schmitt-trigger inverter is designed for 1.65-V to5.5-V $V_{CC}$ operation.

The CL74LVC1G14 device contains one inverter and performs the Boolean function $Y = \overline{A}$. The device functions as an independent inverter with Schmitt-trigger inputs, so the device has different input threshold levels for positive-going ($V_{T+}$) which makes the device tolerant to slow or noisy input signals.

This device is fully specified for partial-power-down applications using $I_{off}$. The $I_{off}$ circuitry disables the outputs when the device is powered down. This inhibits current backflow into the device which prevents damage to the device.

## Ordering Information

| Part Number | Package | |
|---|---|---|
| CL74LVC1G14 | SOT-23-5<br>SOT-25<br>SOT-353<br>SOT-553<br>DFN1X1-4L | |

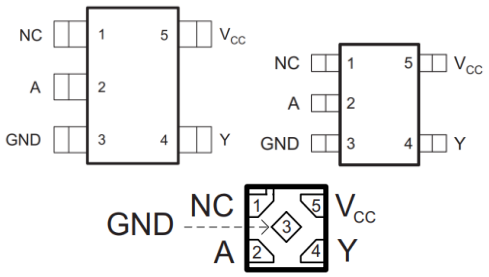
## Features

- Available in the Ultra Small DFN1X1
- Inputs Accept Voltages 1.65V to 5.5 V
- Max Tpd of 4.6 ns at 3.3 V
- Low Power Consumption, 10-μA Max $I_{CC}$
- ±24-mA Output Drive at 3.3 V
- 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)

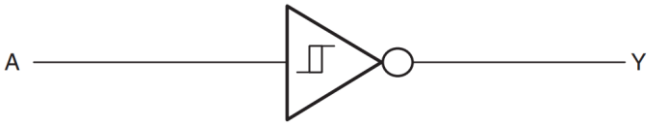
## Applications

- AV Receiver
- Audio Dock: Portable
- Blu-ray Player and Home Theater
- Embedded PC
- MP3 Player/Recorder (Portable Audio)
- Personal Digital Assistant (PDA)
- Power: Telecom/Server AC/DC Supply: Single
- Controller: Analog and Digital
- Solid State Drive (SSD): Client and Enterprise
- TV: LCD/Digital and High-Definition (HDTV)
- Tablet: Enterprise
- Video Analytics: Server
- Wireless Headset, Keyboard, and Mouse

## Pin Configuration




## Simplified Schematic



## Pin Assignment

| Pin Name | Pin No. | Pin Function |
|---|---|---|
| NC | 1 | No connect |
| A | 2 | Input |
| GND | 3 | Ground |
| Y | 4 | Output |
| $V_{CC}$ | 5 | Power pin |

## Absolute Maximum Ratings (Note1)

- $V_{CC}$ ---------- -0.5V to +6.5V
- $V_I$ ---------- -0.5V to +6.5V
- $V_O$ (Voltage range applied to any output in the high-impedance or power-off state) ---------- -0.5V to +6.5V
- $V_O$ (Voltage range applied to any output in the high or slow state) ---------- -0.5V to $V_{CC}$+0.5V
- Input clamp current ---------- -50mA
- Output clamp current ---------- -50mA
- Continuous output current ---------- ±50mA
- Storage Temperature ---------- –65°C to 150°C

## Recommended Operating Conditions

| Parameter | Symbol | Test Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|
| Supply voltage | $V_{CC}$ | Operating | 1.65 | | 5.5 | V |
| | | Data retention only | 1.5 | | | |
| Input voltage | $V_I$ | | 0 | | 5.5 | V |
| Output voltage | $V_O$ | | | | VCC | V |
| High- level output current | $I_{OH}$ | $V_{CC}$ = 1.65V | | | -4 | mA |
| | | $V_{CC}$ = 2.3V | | | -8 | |
| | | $V_{CC}$ = 3V | | | -16 | |
| | | $V_{CC}$ = 3V | | | -24 | |
| | | $V_{CC}$ = 4.5V | | | -32 | |
| Low- level output current | $I_{OL}$ | $V_{CC}$ = 1.65V | | | 4 | mA |
| | | $V_{CC}$ = 2.3V | | | 8 | |
| | | $V_{CC}$ = 3V | | | 16 | |
| | | $V_{CC}$ = 3V | | | 24 | |
| | | $V_{CC}$ = 4.5V | | | 32 | |
| Operating temperature | $T_A$ | | -40 | | 125 | ℃ |

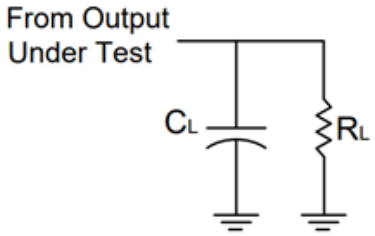
## Electrical Characteristics

| Parameter | Symbol | Test Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|
| Positive-going input threshold voltage | $V_{T+}$ | $V_{CC}$ = 1.65V | 0.79 | | 1.16 | V |
| | | $V_{CC}$ = 2.3V | 1.11 | | 1.56 | |
| | | $V_{CC}$ = 3V | 1.5 | | 1.87 | |
| | | $V_{CC}$ = 4.5V | 2.16 | | 2.74 | |
| | | $V_{CC}$ = 5.5V | 2.61 | | 3.33 | |
| Negative-going input threshold voltage | $V_{T-}$ | $V_{CC}$ = 1.65V | 0.39 | | 0.62 | V |
| | | $V_{CC}$ = 2.3V | 0.58 | | 0.87 | |
| | | $V_{CC}$ = 3V | 0.84 | | 1.14 | |
| | | $V_{CC}$ = 4.5V | 1.41 | | 1.79 | |
| | | $V_{CC}$ = 5.5V | 1.87 | | 2.29 | |
| Hysteresis voltage | $\triangle V_T$ | $V_{CC}$ = 1.65V | 0.37 | | 0.62 | V |
| | | $V_{CC}$ = 2.3V | 0.48 | | 0.77 | |
| | | $V_{CC}$ = 3V | 0.56 | | 0.87 | |
| | | $V_{CC}$ = 4.5V | 0.71 | | 1.04 | |
| | | $V_{CC}$ = 5.5V | 0.71 | | 1.11 | |
| High- level output voltage | $V_{OH}$ | $V_{CC}$ = 1.65~5.5V, $I_{OH}$= 100uA | VCC-0.1 | | | V |
| | | $V_{CC}$ = 1.65V, $I_{OH}$= 4mA | 1.2 | | | |
| | | $V_{CC}$ = 2.3V, $I_{OH}$= 8mA | 1.9 | | | |
| | | $V_{CC}$ = 3V, $I_{OH}$= 16mA | 2.4 | | | |
| | | $V_{CC}$ = 3V, $I_{OH}$= 24mA | 2.3 | | | |
| | | $V_{CC}$ = 4.5V, $I_{OH}$= 32mA | 3.8 | | | |
| Low- level output voltage | $V_{OL}$ | $V_{CC}$ = 1.65~5.5V, $I_{OL}$= 100uA | | | 0.1 | V |
| | | $V_{CC}$ = 1.65V, $I_{OL}$= 4mA | | | 0.45 | |
| | | $V_{CC}$ = 2.3V, $I_{OL}$= 8mA | | | 0.3 | |
| | | $V_{CC}$ = 3V, $I_{OL}$= 16mA | | | 0.4 | |
| | | $V_{CC}$ = 3V, $I_{OL}$= 24mA | | | 0.55 | |
| | | $V_{CC}$ = 4.5V, $I_{OL}$= 32mA | | | 0.55 | |
| Input leakage current | $I_I$ | $V_{IN}$= 5.5V or GND, $V_{CC}$= 0~5.5V | | | ±5 | uA |
| Power off leakage current | $I_{OFF}$ | $V_I$ or $V_O$ = 5.5V, $V_{CC}$=0V | | | ±10 | uA |
| Supply current | $I_{CC}$ | $V_{IN}$= $V_{CC}$ or GND, $I_{OUT}$=0, $V_{CC}$=1.65~5.5V | | | 10 | uA |
| Additional supply current per input pin | $\triangle I_{CC}$ | $V_{CC}$=3~5.5V, one input ate $V_{CC}$-0.6V, other input at $V_{CC}$ or GND | | | 500 | uA |

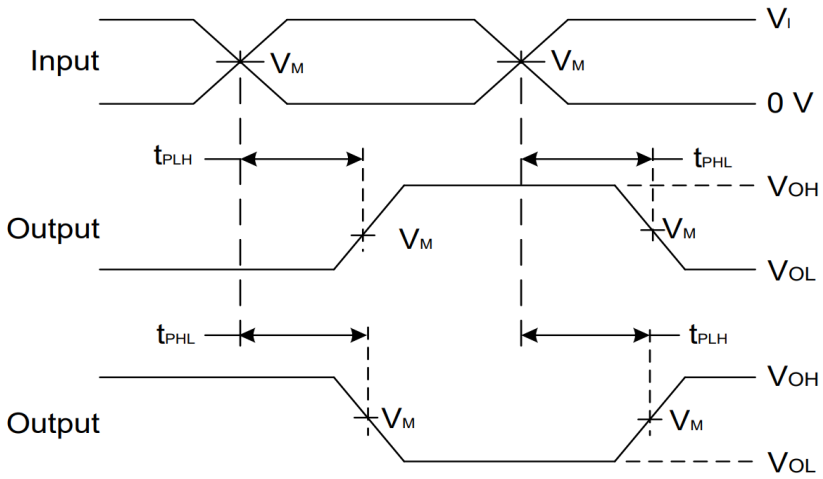
## Switching Characteristics

| Parameter | Symbol | Test Conditions | | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|---|
| Propagation delay from input (A ) to output(Y) | $T_{PD}$ | $V_{CC}$ = 1.8V±0.15V, | $C_L$=15pF $R_L$=1MΩ | 2.8 | | 9.9 | ns |
| | | $V_{CC}$ = 2.5V±0.2V | | 1.6 | | 5.5 | |
| | | $V_{CC}$ = 3.3V±0.3V | | 1.5 | | 4.6 | |
| | | $V_{CC}$ = 5V±0.5V | | 0.9 | | 4.4 | |

## Parameter Measurement Information



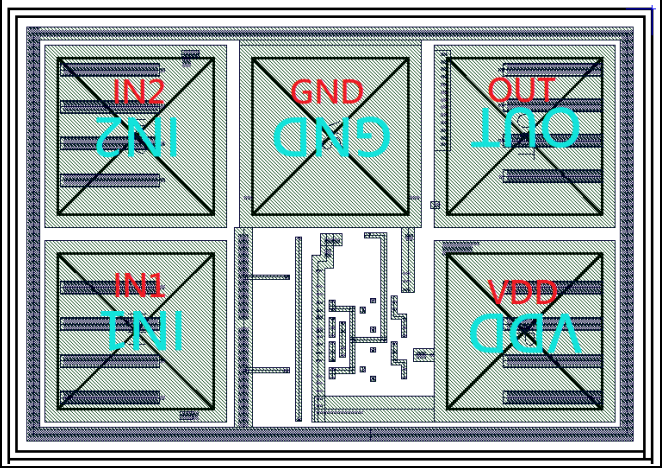

| VCC | INPUTS | | VM | CL | RL |
|---|---|---|---|---|---|
| | VI | tr/tf | | | |
| 1.8V ± 0.15V | VCC | ≦2ns | VCC/2 | 15pF | 1MΩ |
| 2.5V ± 0.2V | VCC | ≦2ns | VCC/2 | 15pF | 1MΩ |
| 3.3V ± 0.3V | 3V | ≦2.5ns | 1.5V | 15pF | 1MΩ |
| 5V ± 0.5V | VCC | ≦2.5ns | VCC/2 | 15pF | 1MΩ |




**Voltage Waveform Propagation Delay Times**
**Inverting and Non Inverting Outputs**

Notes:
A. $C_L$ includes probe and jig capacitance
B. All pulses and supplied at pulse repetition rate≦10MHz
C. The Inputs are measured separately one transition per measurement
D. $t_{PLH}$ and $t_{PHL}$ are the same as $t_{PD}$

## PAD Location and Coordinates

| PHYSICAL CHARACTERISTICS | | UNIT | CHIP DRAWING |
|---|---|---|---|
| Wafer Size | 200 | mm |  |
| Die Size (with S/L) | 0.308 * 0.233 | $mm^2$ | |
| Scribe line width | 60 | um | |
| TOP Metal thickness | 3 | µm | |
| Top Metallization | Al-Cu | | |
| Wafer Thickness | 726 | µm | |
| CUP (circuit under PAD) or not | YES | | |
| Bonding Wire Diameter | 20 | um | |



| PAD NAME | PAD SIZE (µm²) | Coordinate |
|---|---|---|
| IN 1 | 60*60 | (49,49) |
| IN 2 | 60*60 | (49,124) |
| GND | 60*60 | (124,124) |
| OUT (Y) | 60*60 | (199,124) |
| VDD | 60*60 | (199,49) |

## Bonding Diagram Example