

# 74LVC2G14

## Dual Inverter with 5V Tolerant Schmitt Trigger Inputs

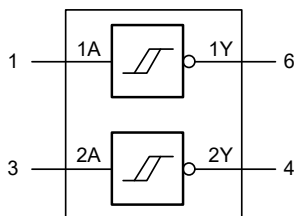
### GENERAL DESCRIPTION

The 74LVC2G14 contains two independent inverters each with Schmitt trigger input. They are capable of transforming slowly changing input signals into sharply defined, jitter-free output signals. The 74LVC2G14 is designed for 1.65V to 5.5V  $V_{CC}$  operation. The device performs the Boolean function  $Y = \bar{A}$ .

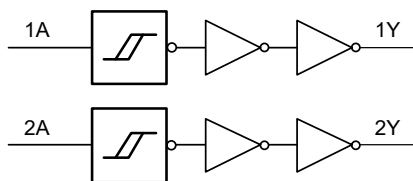
Inputs can be driven from either 3.3V or 5V devices. This feature allows the use of this device in a mixed 3.3V and 5V environment. Schmitt trigger action at the inputs makes the circuit tolerant of slower input rise and fall times.

This device is fully specified for partial power-down applications using  $I_{OFF}$ . The  $I_{OFF}$  circuitry disables the output, preventing the damaging backflow current through the device when it is powered down.

### LOGIC SYMBOL



### LOGIC DIAGRAM



### FEATURES

- **Wide Supply Voltage Range: 1.65V to 5.5V**
- **5V Tolerant Inputs for Interfacing with 5V Logic**
- **High Noise Immunity**
- **$\pm 24\text{mA}$  Output Drive at  $V_{CC} = 3.0\text{V}$**
- **CMOS Low Power Consumption**
- **Direct Interface with TTL Levels**
- **Unlimited Rise and Fall Times**
- **Inputs Accept Voltages up to 5V**
- **$-40^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$  Operating Temperature Range**
- **Available in a Green SC70-6 Package**

### FUNCTIONAL TABLE

INPUT	OUTPUT
nA	nY
L	H
H	L

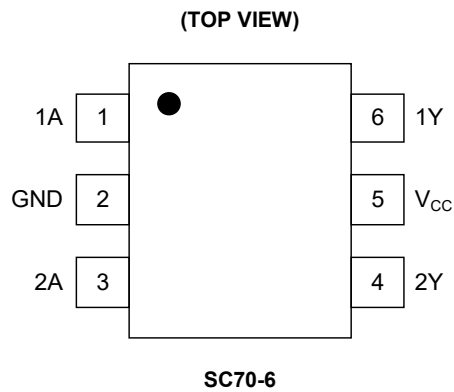
$$Y = \bar{A}$$

H = High Voltage Level

L = Low Voltage Level



## PIN CONFIGURATION



## PIN DESCRIPTION

PIN	NAME	FUNCTION
1, 3	1A, 2A	Data Inputs.
2	GND	Ground.
4, 6	2Y, 1Y	Data Outputs.
5	V <sub>CC</sub>	Supply Voltage.

**ELECTRICAL CHARACTERISTICS**(Full = -40°C to +125°C. All typical values are measured at maximum  $V_{CC}$  and  $T_A = +25^\circ\text{C}$ , unless stated noted.)

PARAMETER	SYMBOL	CONDITIONS	TEMP	MIN	TYP	MAX	UNITS	
High-Level Output Voltage	$V_{OH}$	$V_I = V_{T+}$ or $V_{T-}$	$I_O = -100\mu\text{A}$ , $V_{CC} = 1.65\text{V}$ to $5.5\text{V}$	Full	$V_{CC} - 0.05$	$V_{CC} - 0.01$	V	
			$I_O = -4\text{mA}$ , $V_{CC} = 1.65\text{V}$	Full	1.43	1.55		
			$I_O = -8\text{mA}$ , $V_{CC} = 2.3\text{V}$	Full	2.02	2.18		
			$I_O = -12\text{mA}$ , $V_{CC} = 2.7\text{V}$	Full	2.38	2.56		
			$I_O = -24\text{mA}$ , $V_{CC} = 3\text{V}$	Full	2.52	2.74		
			$I_O = -32\text{mA}$ , $V_{CC} = 4.5\text{V}$	Full	4	4.22		
Low-Level Output Voltage	$V_{OL}$	$V_I = V_{T+}$ or $V_{T-}$	$I_O = 100\mu\text{A}$ , $V_{CC} = 1.65\text{V}$ to $5.5\text{V}$	Full		0.01	0.05	V
			$I_O = 4\text{mA}$ , $V_{CC} = 1.65\text{V}$	Full		0.1	0.22	
			$I_O = 8\text{mA}$ , $V_{CC} = 2.3\text{V}$	Full		0.12	0.28	
			$I_O = 12\text{mA}$ , $V_{CC} = 2.7\text{V}$	Full		0.16	0.34	
			$I_O = 24\text{mA}$ , $V_{CC} = 3\text{V}$	Full		0.3	0.56	
			$I_O = 32\text{mA}$ , $V_{CC} = 4.5\text{V}$	Full		0.32	0.6	
Input Leakage Current	$I_I$	$V_I = 5.5\text{V}$ or GND, $V_{CC} = 0\text{V}$ to $5.5\text{V}$	Full		$\pm 0.01$	$\pm 1$	$\mu\text{A}$	
Power-Off Leakage Current	$I_{OFF}$	$V_I$ or $V_O = 5.5\text{V}$ , $V_{CC} = 0\text{V}$	Full		$\pm 0.01$	$\pm 1$	$\mu\text{A}$	
Supply Current	$I_{CC}$	$V_I = 5.5\text{V}$ or GND, $V_{CC} = 1.65\text{V}$ to $5.5\text{V}$ , $I_O = 0\text{A}$	Full		0.01	1	$\mu\text{A}$	
Additional Supply Current <sup>(1)</sup>	$\Delta I_{CC}$	$V_I = V_{CC} - 0.6\text{V}$ , $I_O = 0\text{A}$ , $V_{CC} = 2.3\text{V}$ to $5.5\text{V}$	Full		0.05	10	$\mu\text{A}$	
Input Capacitance	$C_I$	$V_{CC} = 3.3\text{V}$ , $V_I = \text{GND}$ to $V_{CC}$	+25°C		3		pF	

NOTE:

1. This is the increase in supply current for each input at the specified voltage level other than  $V_{CC}$  or GND.**DYNAMIC CHARACTERISTICS**(For test circuit, see Figure 4. Full = -40°C to +125°C, all typical values are measured at  $T_A = +25^\circ\text{C}$  and  $V_{CC} = 1.8\text{V}$ ,  $2.5\text{V}$ ,  $2.7\text{V}$ ,  $3.3\text{V}$  and  $5\text{V}$  respectively, unless stated noted.)

PARAMETER	SYMBOL	CONDITIONS	TEMP	MIN <sup>(1)</sup>	TYP	MAX <sup>(1)</sup>	UNITS	
Propagation Delay <sup>(2)</sup>	$t_{PD}$	nA to nY, see Figure 5	$V_{CC} = 1.65\text{V}$ to $1.95\text{V}$	Full	0.5	10.1	23.0	ns
			$V_{CC} = 2.3\text{V}$ to $2.7\text{V}$	Full	0.5	5.6	11.0	
			$V_{CC} = 2.7\text{V}$	Full	0.5	5.2	10.0	
			$V_{CC} = 3\text{V}$ to $3.6\text{V}$	Full	0.5	5.2	8.5	
			$V_{CC} = 4.5\text{V}$ to $5.5\text{V}$	Full	0.5	4.4	6.5	
Power Dissipation Capacitance <sup>(3)</sup>	$C_{PD}$	$V_I = \text{GND}$ to $V_{CC}$ , $V_{CC} = 3.3\text{V}$	+25°C		40		pF	

NOTES:

- Specified by design and characterization; not production tested.
- $t_{PD}$  is the same as  $t_{PLH}$  and  $t_{PHL}$ .
- $C_{PD}$  is used to determine the dynamic power dissipation ( $P_D$  in  $\mu\text{W}$ ).

$$P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \Sigma(C_L \times V_{CC}^2 \times f_o)$$

where:

 $f_i$  = Input frequency in MHz. $f_o$  = Output frequency in MHz. $C_L$  = Output load capacitance in pF. $V_{CC}$  = Supply voltage in Volts.

N = Number of inputs switching.

 $\Sigma(C_L \times V_{CC}^2 \times f_o)$  = Sum of outputs.

**TRANSFER CHARACTERISTICS**

(Full = -40°C to +125°C. All typical values are measured at  $T_A = +25^\circ\text{C}$ , unless stated noted.)

PARAMETER	SYMBOL	CONDITIONS	TEMP	MIN	TYP	MAX	UNITS	
Positive-Going Threshold Voltage	$V_{T+}$	See Figure 1 and Figure 2	$V_{CC} = 1.8\text{V}$	Full	0.7	1.1	1.7	V
			$V_{CC} = 2.3\text{V}$	Full	1	1.4	2	
			$V_{CC} = 3\text{V}$ , see Figure 3	Full	1.3	1.76	2.4	
			$V_{CC} = 4.5\text{V}$	Full	1.9	2.47	3.3	
			$V_{CC} = 5.5\text{V}$	Full	2.2	2.91	3.8	
Negative-Going Threshold Voltage	$V_{T-}$	See Figure 1 and Figure 2	$V_{CC} = 1.8\text{V}$	Full	0.25	0.61	1.1	V
			$V_{CC} = 2.3\text{V}$	Full	0.4	0.8	1.35	
			$V_{CC} = 3\text{V}$ , see Figure 3	Full	0.6	1.04	1.7	
			$V_{CC} = 4.5\text{V}$	Full	1	1.55	2.2	
			$V_{CC} = 5.5\text{V}$	Full	1.2	1.86	2.5	
Hysteresis Voltage	$V_H$	$(V_{T+} - V_{T-})$ , See Figure 1 and Figure 2	$V_{CC} = 1.8\text{V}$	Full	0.15	0.49	1.2	V
			$V_{CC} = 2.3\text{V}$	Full	0.25	0.6	1.3	
			$V_{CC} = 3\text{V}$ , see Figure 3	Full	0.4	0.73	1.4	
			$V_{CC} = 4.5\text{V}$	Full	0.6	0.92	1.7	
			$V_{CC} = 5.5\text{V}$	Full	0.7	1.02	1.9	

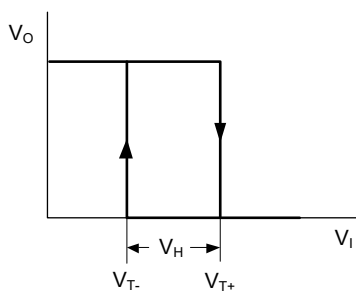


Figure 1. Transfer Characteristic

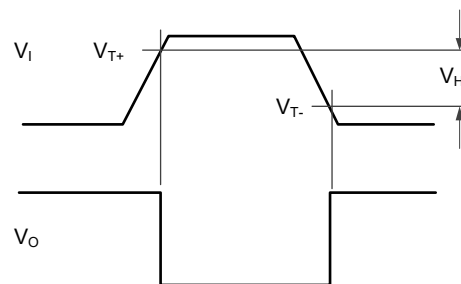


Figure 2. Definition of  $V_{T+}$ ,  $V_{T-}$ , and  $V_H$

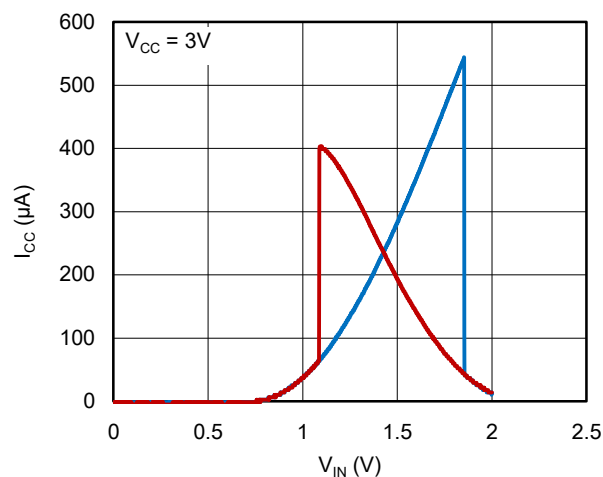
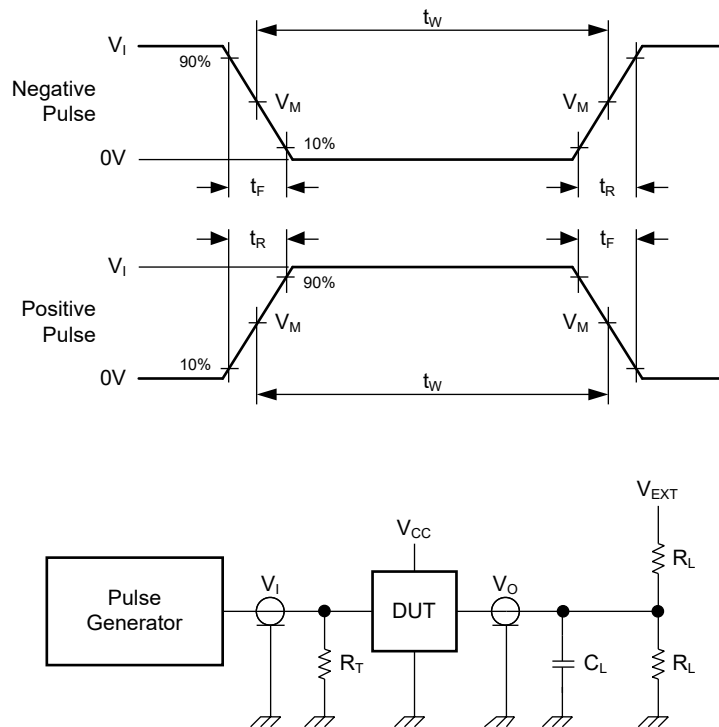


Figure 3. Typical Transfer Characteristics

## TEST CIRCUIT



Test conditions are given in Table 1.

Definitions for test circuit:

$R_L$  = Load resistance.

$C_L$  = Load capacitance including jig and probe capacitance.

$R_T$  = Termination resistance should be equal to the output impedance  $Z_o$  of the pulse generator.

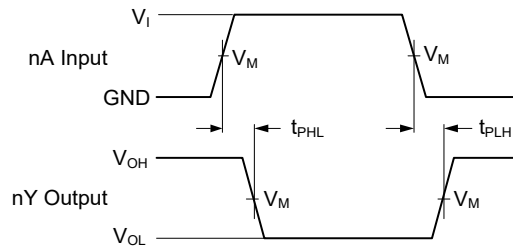
$V_{EXT}$  = External voltage for measuring switching times.

Figure 4. Test Circuit for Measuring Switching Times

Table 1. Test Conditions

SUPPLY VOLTAGE	INPUT		LOAD		$V_{EXT}$
$V_{CC}$	$V_I$	$t_R = t_F$	$C_L$	$R_L$	$t_{PLH}, t_{PHL}$
1.65V to 1.95V	$V_{CC}$	$\leq 2.0\text{ns}$	30pF	1k $\Omega$	Open
2.3V to 2.7V	$V_{CC}$	$\leq 2.0\text{ns}$	30pF	500 $\Omega$	Open
2.7V	2.7V	$\leq 2.5\text{ns}$	50pF	500 $\Omega$	Open
3.0V to 3.6V	2.7V	$\leq 2.5\text{ns}$	50pF	500 $\Omega$	Open
4.5V to 5.5V	$V_{CC}$	$\leq 2.5\text{ns}$	50pF	500 $\Omega$	Open

## WAVEFORMS



Test conditions are given in Table 1.

Measurement points are given in Table 2.

Logic levels:  $V_{OL}$  and  $V_{OH}$  are typical output voltage levels that occur with the output load.

Figure 5. The Data Input (nA) to Output (nY) Propagation Delays

Table 2. Measurement Points

SUPPLY VOLTAGE	INPUT	OUTPUT
$V_{CC}$	$V_M^{(1)}$	$V_M$
1.65V to 1.95V	$0.5 \times V_{CC}$	$0.5 \times V_{CC}$
2.3V to 2.7V	$0.5 \times V_{CC}$	$0.5 \times V_{CC}$
2.7V	1.5V	1.5V
3.0V to 3.6V	1.5V	1.5V
4.5V to 5.5V	$0.5 \times V_{CC}$	$0.5 \times V_{CC}$

## NOTE:

- The measurement points should be  $V_{IH}$  or  $V_{IL}$  when the input rising or falling time exceeds 2.5ns.

## REVISION HISTORY

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

## NOVEMBER 2021 – REV.A to REV.A.1

Page

Updated Dynamic Characteristics section..... 4

Added note of Table 2 ..... 7

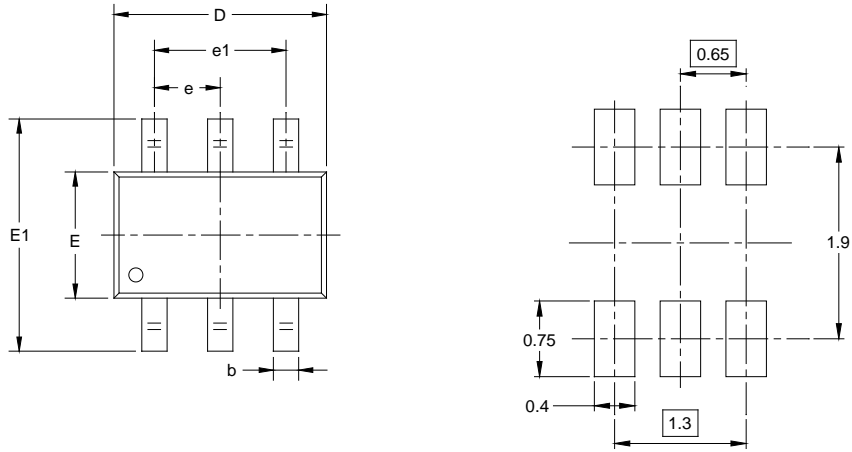
## Changes from Original (FEBRUARY 2021) to REV.A

Page

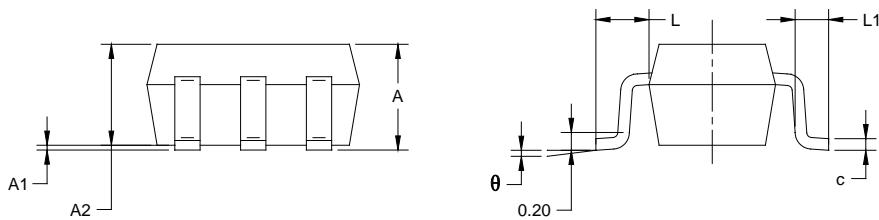
Changed from product preview to production data..... All

PACKAGE OUTLINE DIMENSIONS

SC70-6



RECOMMENDED LAND PATTERN (Unit: mm)



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	0.800	1.100	0.031	0.043
A1	0.000	0.100	0.000	0.004
A2	0.800	1.000	0.031	0.039
b	0.150	0.350	0.006	0.014
c	0.080	0.220	0.003	0.009
D	2.000	2.200	0.079	0.087
E	1.150	1.350	0.045	0.053
E1	2.150	2.450	0.085	0.096
e	0.65 TYP		0.026 TYP	
e1	1.300 BSC		0.051 BSC	
L	0.525 REF		0.021 REF	
L1	0.260	0.460	0.010	0.018
θ	0°	8°	0°	8°

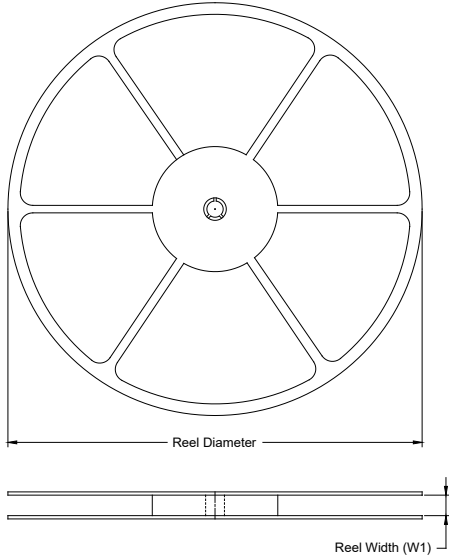
- NOTES:  
 1. Body dimensions do not include mode flash or protrusion.  
 2. This drawing is subject to change without notice.



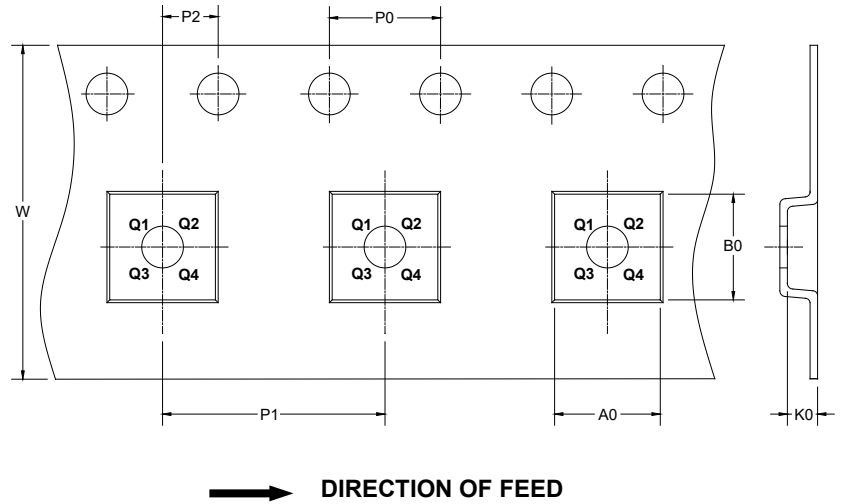
# PACKAGE INFORMATION

## TAPE AND REEL INFORMATION

### REEL DIMENSIONS



### TAPE DIMENSIONS



NOTE: The picture is only for reference. Please make the object as the standard.

### KEY PARAMETER LIST OF TAPE AND REEL

Package Type	Reel Diameter	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P0 (mm)	P1 (mm)	P2 (mm)	W (mm)	Pin1 Quadrant
SC70-6	7"	9.5	2.40	2.50	1.20	4.0	4.0	2.0	8.0	Q3

DD0001

# PACKAGE INFORMATION

## CARTON BOX DIMENSIONS



NOTE: The picture is only for reference. Please make the object as the standard.

## KEY PARAMETER LIST OF CARTON BOX

Reel Type	Length (mm)	Width (mm)	Height (mm)	Pizza/Carton
7" (Option)	368	227	224	8
7"	442	410	224	18

DD0002