74LVC2G14 Dual Inverter with 5V Tolerant Schmitt Trigger Inputs

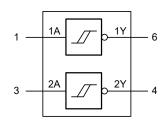
GENERAL DESCRIPTION

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 = \overline{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



FEATURES

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

FUNCTIONAL TABLE

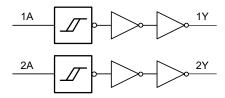
INPUT	OUTPUT
nA	nY
L	Н
Н	L

 $Y = \overline{A}$

H = High Voltage Level

L = Low Voltage Level

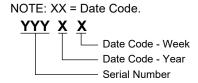
LOGIC DIAGRAM



PACKAGE/ORDERING INFORMATION

MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION	
74LVC2G14	SC70-6	-40°C to +125°C	74LVC2G14XC6G/TR	R55XX	Tape and Reel, 3000	

MARKING INFORMATION



Green (RoHS & HSF): SG Micro Corp defines "Green" to mean Pb-Free (RoHS compatible) and free of halogen substances. If you have additional comments or questions, please contact your SGMICRO representative directly.

ABSOLUTE MAXIMUM RATINGS (1)

ADOCEOTE INAMINION NATIN	00
Supply Voltage, V _{CC}	0.5V to 6.5V
Input Voltage, V _I ⁽²⁾	0.5V to 6.5V
Output Voltage, V _O ⁽²⁾	
Active Mode	$0.5V$ to $V_{CC} + 0.5V$
Power-Down Mode, V _{CC} = 0V	0.5V to 6.5V
Input Clamping Current, I _{IK} (V _I < 0V)	50mA
Output Clamping Current, I _{OK} (V _O > V _{CC} or	$V_0 < 0V$
	±50mA
Output Current, I_O ($V_O = 0V$ to V_{CC})	±50mA
Supply Current, I _{CC}	
Ground Current, I _{GND}	
Junction Temperature (3)	+150°C
Storage Temperature Range	65°C to +150°C
Lead Temperature (Soldering, 10s)	+260°C
ESD Susceptibility	
HBM	8000V
CDM	1000V

RECOMMENDED OPERATING CONDITIONS

MEGONIMIENDED OF ENATING	COMPINION
Supply Voltage, V _{CC}	1.65V to 5.5V
Input Voltage, V _I	0V to 5.5V
Output Voltage, V _O	
Active Mode	0V to V _{CC}
Power-Down Mode, V _{CC} = 0V	0V to 5.5V
Input Transition Rise and Fall Rate, $\Delta t/\Delta V$	1
V _{CC} = 1.65V to 2.7V	20ns/V (MAX)
V _{CC} = 2.7V to 5.5V	10ns/V (MAX)
Operating Temperature Range	40°C to +125°C

OVERSTRESS CAUTION

- 1. Stresses beyond those listed in Absolute Maximum Ratings may cause permanent damage to the device. Exposure to absolute maximum rating conditions for extended periods may affect reliability. Functional operation of the device at any conditions beyond those indicated in the Recommended Operating Conditions section is not implied.
- 2. The input and output voltage ratings may be exceeded if the input and output clamp current ratings are observed.
- 3. The performance capability of a high-performance integrated circuit in conjunction with its thermal environment can create junction temperatures which are detrimental to reliability.

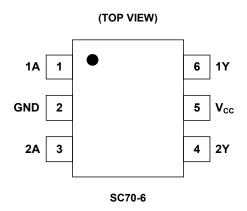
ESD SENSITIVITY CAUTION

This integrated circuit can be damaged if ESD protections are not considered carefully. SGMICRO recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage. ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because even small parametric changes could cause the device not to meet the published specifications.

DISCLAIMER

SG Micro Corp reserves the right to make any change in circuit design, or specifications without prior notice.

PIN CONFIGURATION



PIN DESCRIPTION

PIN	NAME	FUNCTION
1, 3	1A, 2A	Data Inputs.
2	GND	Ground.
4, 6	2Y, 1Y	Data Outputs.
5	Vcc	Supply Voltage.

ELECTRICAL CHARACTERISTICS

(Full = -40°C to +125°C. All typical values are measured at maximum V_{CC} and T_A = +25°C, unless stated noted.)

PARAMETER	SYMBOL		CONDITIONS	TEMP	MIN	TYP	MAX	UNITS
			I_{O} = -100 μ A, V_{CC} = 1.65V to 5.5V	Full	V _{CC} - 0.05	V _{CC} - 0.01		
			$I_{O} = -4mA$, $V_{CC} = 1.65V$	Full	1.43	1.55		
High Loyal Output Valtage	\/	$V_I = V_{T+} \text{ or } V_{T-}$	I_{O} = -8mA, V_{CC} = 2.3V	Full	2.02	2.18		V
High-Level Output Voltage	V _{OH}	VI - VT+ OI VT-	$I_{O} = -12mA$, $V_{CC} = 2.7V$	Full	2.38	2.56		V
			$I_{O} = -24$ mA, $V_{CC} = 3$ V	Full	2.52	2.74		
			$I_{O} = -32$ mA, $V_{CC} = 4.5$ V	Full	4	4.22		
	V _{OL}		I_{O} = 100 μ A, V_{CC} = 1.65 V to 5.5 V	Full		0.01	0.05	
		$V_I = V_{T+} \text{ or } V_{T-}$	$I_{O} = 4mA, V_{CC} = 1.65V$	Full		0.1	0.22	V
			$I_0 = 8mA$, $V_{CC} = 2.3V$	Full		0.12	0.28	
Low-Level Output Voltage			$I_0 = 12mA$, $V_{CC} = 2.7V$	Full		0.16	0.34	V
			$I_{O} = 24mA, V_{CC} = 3V$	Full		0.3	0.56	
			$I_{O} = 32mA, V_{CC} = 4.5V$	Full		0.32	0.6	
Input Leakage Current	l ₁	V _I = 5.5V or G	ND, $V_{CC} = 0V$ to 5.5V	Full		±0.01	±1	μΑ
Power-Off Leakage Current	I _{OFF}	$V_1 \text{ or } V_0 = 5.5 V_0$	V_1 or $V_0 = 5.5V$, $V_{CC} = 0V$			±0.01	±1	μΑ
Supply Current	I _{cc}	$V_1 = 5.5V$ or GND, $V_{CC} = 1.65V$ to 5.5V, $I_0 = 0A$		Full		0.01	1	μΑ
Additional Supply Current (1)	ΔI_{CC}	$V_I = V_{CC} - 0.6V$	$'$, $I_0 = 0A$, $V_{CC} = 2.3V$ to 5.5V	Full		0.05	10	μΑ
Input Capacitance	Cı	V_{CC} = 3.3V, V_I	= GND to V _{CC}	+25℃		3		pF

NOTE:

DYNAMIC CHARACTERISTICS

(For test circuit, see Figure 4. Full = -40°C to +125°C, all typical values are measured at T_A = +25°C and V_{CC} = 1.8V, 2.5V, 2.7V, 3.3V and 5V respectively, unless stated noted.)

PARAMETER	SYMBOL	С	TEMP	MIN (1)	TYP	MAX (1)	UNITS	
Propagation Delay ⁽²⁾	T _{DD}	nA to nY, see Figure 5	V _{CC} = 1.65V to 1.95V	Full	0.5	10.1	23.0	
			V _{CC} = 2.3V to 2.7V	Full	0.5	5.6	11.0	
			V _{CC} = 2.7V	Full	0.5	5.2	10.0	ns
			V _{CC} = 3V to 3.6V	Full	0.5	5.2	8.5	
			V _{CC} = 4.5V to 5.5V	Full	0.5	4.4	6.5	
Power Dissipation Capacitance (3)	C _{PD}	V_1 = GND to V_{CC} , V_{CC} = 3.3V		+25℃		40		pF

NOTES:

- 1. Specified by design and characterization; not production tested.
- 2. t_{PD} is the same as t_{PLH} and t_{PHL} .
- 3. C_{PD} is used to determine the dynamic power dissipation (P_D in μW).

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

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.

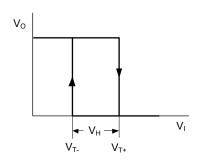
 $\Sigma(C_L \times V_{CC}^2 \times f_0) = \text{Sum of outputs.}$

^{1.} This is the increase in supply current for each input at the specified voltage level other than V_{CC} or GND.

TRANSFER CHARACTERISTICS

(Full = -40°C to +125°C. All typical values are measured at T_A = +25°C, unless stated noted.)

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



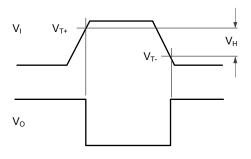


Figure 1. Transfer Characteristic

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

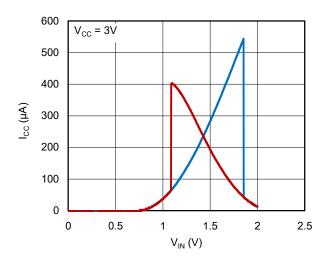
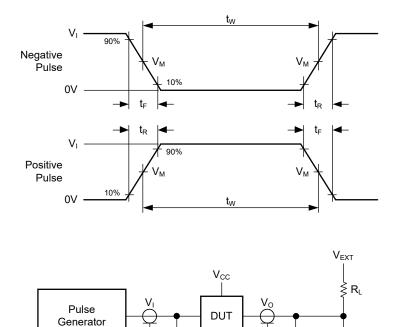


Figure 3. Typical Transfer Characteristics

∮R⊾

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 Zo of the pulse generator.

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

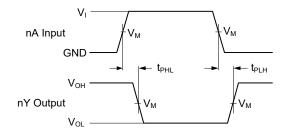
Figure 4. Test Circuit for Measuring Switching Times

∮ R⊤

Table 1. Test Conditions

SUPPLY VOLTAGE	INF	TUT	LO	V _{EXT}	
V _{CC}	Vı	$t_R = t_F$	CL	R _L	t _{PLH} , t _{PHL}
1.65V to 1.95V	V _{CC}	≤ 2.0ns	30pF	1kΩ	Open
2.3V to 2.7V	V _{CC}	≤ 2.0ns	30pF	500Ω	Open
2.7V	2.7V	≤ 2.5ns	50pF	500Ω	Open
3.0V to 3.6V	2.7V	≤ 2.5ns	50pF	500Ω	Open
4.5V to 5.5V	V _{CC}	≤ 2.5ns	50pF	500Ω	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

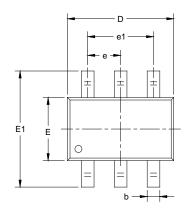
Table 2. Measurement Points

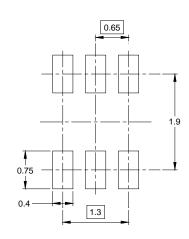
SUPPLY VOLTAGE	INPUT	OUTPUT
Vcc	V _M ⁽¹⁾	V _M
1.65V to 1.95V	0.5 × V _{CC}	0.5 × V _{CC}
2.3V to 2.7V	0.5 × V _{CC}	0.5 × V _{CC}
2.7V	1.5V	1.5V
3.0V to 3.6V	1.5V	1.5V
4.5V to 5.5V	0.5 × V _{CC}	0.5 × V _{CC}

NOTE:

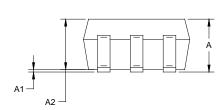
1. The measurement points should be V_{IH} or V_{IL} when the input rising or falling time exceeds 2.5ns.

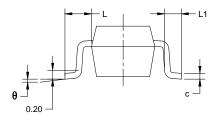
PACKAGE OUTLINE DIMENSIONS SC70-6





RECOMMENDED LAND PATTERN (Unit: mm)



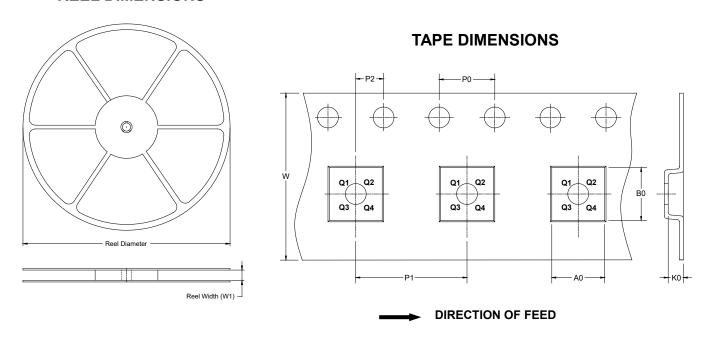


Symbol		nsions meters	Dimensions In Inches			
	MIN MAX		MIN	MAX		
А	0.800	1.100	0.031	0.043		
A1	0.000	0.100	0.000	0.004		
A2	0.800	1.000	0.031	0.039		
b	0.150	0.350	0.006	0.014		
С	0.080	0.220	0.003	0.009		
D	2.000	2.200	0.079	0.087		
E	1.150	1.350	0.045	0.053		
E1	2.150	2.450	0.085	0.096		
е	0.65	TYP	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.

TAPE AND REEL INFORMATION

REEL DIMENSIONS

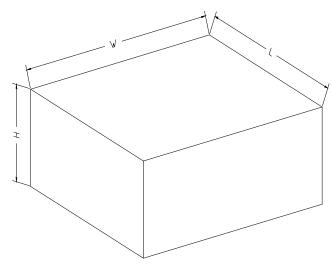


NOTE: The picture is only for reference. Please make the object as the standard.

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

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