

74LVC2G04

Dual Inverter

GENERAL DESCRIPTION

The 74LVC2G04 contains two independent inverters and it is designed for 1.65V to 5.5V V_{CC} operation. The device performs the Boolean function $Y = \overline{A}$.

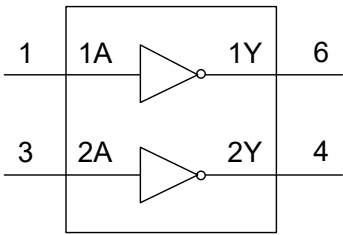
Inputs can be driven from either 3.3V or 5V devices. This feature allows the use of this device as a translator in a mixed 3.3V and 5V environment.

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.

FEATURES

- 5V Tolerant Inputs for Interfacing with 5V Logic
- Wide Supply Voltage Range: 1.65V to 5.5V
- 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
- Inputs Accept Voltages up to 5V
- -40°C to $+125^{\circ}\text{C}$ Operating Temperature Range
- Available in a Green SOT-23-6 Package

LOGIC SYMBOL



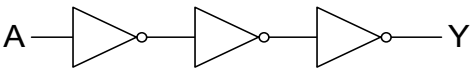
FUNCTION TABLE

INPUT	OUTPUT
nA	nY
L	H
H	L

H = High Voltage Level

L = Low Voltage Level

LOGIC DIAGRAM

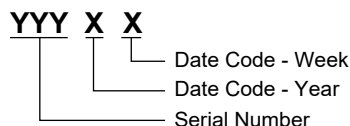


PACKAGE/ORDERING INFORMATION

MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
74LVC2G04	SOT-23-6	-40°C to +125°C	74LVC2G04XN6G/TR	R53XX	Tape and Reel, 3000

MARKING INFORMATION

NOTE: XX = Date Code.



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⁾

Supply Voltage, V_{CC}	-0.5V to 6.5V
Input Voltage, V_I ⁽²⁾	-0.5V to 6.5V
Output Voltage, V_O ^{(2) (3)}	
Active Mode	-0.5V to $V_{CC} + 0.5V$
Power-Down Mode	-0.5V to 6.5V
Input Clamping Current, I_{IK} ($V_I < 0V$).....	-50mA
Output Clamping Current, I_{OK} ($V_O > V_{CC}$ or $V_O < 0V$)	
.....	$\pm 50mA$
Output Current, I_O ($V_O = 0V$ to V_{CC})	$\pm 50mA$
Supply Current, I_{CC}	100mA
Ground Current, I_{GND}	-100mA
Junction Temperature ⁽⁴⁾	+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

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, $\Delta t/\Delta V$	
$V_{CC} = 1.65V$ 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. When $V_{CC} = 0V$ (power-down mode), the output voltage can be 5.5V in normal operation.
4. The performance capability of a high-performance integrated circuit in conjunction with its thermal environment can create junction temperatures which are detrimental to reliability.

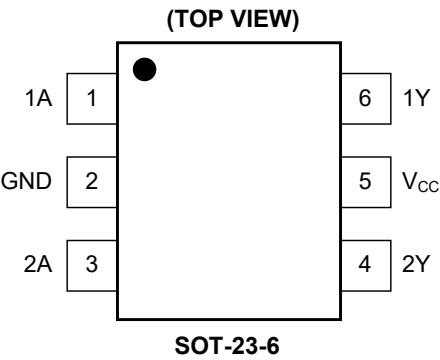
ESD SENSITIVITY CAUTION

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	V _{CC}	Supply Voltage.

ELECTRICAL CHARACTERISTICS

(Full = -40°C to +125°C, all typical values are measured at $V_{CC} = 3.3V$ and $T_A = +25^\circ C$, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	TEMP	MIN	TYP	MAX	UNITS
High-Level Input Voltage	V_{IH}	$V_{CC} = 1.65V$ to $1.95V$	Full	$0.65 \times V_{CC}$			V
		$V_{CC} = 2.3V$ to $2.7V$	Full	1.7			
		$V_{CC} = 2.7V$ to $3.6V$	Full	2			
		$V_{CC} = 4.5V$ to $5.5V$	Full	$0.7 \times V_{CC}$			
Low-Level Input Voltage	V_{IL}	$V_{CC} = 1.65V$ to $1.95V$	Full			$0.35 \times V_{CC}$	V
		$V_{CC} = 2.3V$ to $2.7V$	Full			0.7	
		$V_{CC} = 2.7V$ to $3.6V$	Full			0.8	
		$V_{CC} = 4.5V$ to $5.5V$	Full			$0.3 \times V_{CC}$	
High-Level Output Voltage	V_{OH}	$V_I = V_{IH}$ or V_{IL}	$V_{CC} = 1.65V$ to $5.5V$, $I_O = -100\mu A$	Full	$V_{CC} - 0.05$	$V_{CC} - 0.01$	V
			$V_{CC} = 1.65V$, $I_O = -4mA$	Full	1.43	1.55	
			$V_{CC} = 2.3V$, $I_O = -8mA$	Full	2.02	2.18	
			$V_{CC} = 2.7V$, $I_O = -12mA$	Full	2.38	2.56	
			$V_{CC} = 3.0V$, $I_O = -24mA$	Full	2.52	2.74	
			$V_{CC} = 4.5V$, $I_O = -32mA$	Full	4	4.22	
Low-Level Output Voltage	V_{OL}	$V_I = V_{IH}$ or V_{IL}	$V_{CC} = 1.65V$ to $5.5V$, $I_O = 100\mu A$	Full		0.01	V
			$V_{CC} = 1.65V$, $I_O = 4mA$	Full		0.1	
			$V_{CC} = 2.3V$, $I_O = 8mA$	Full		0.12	
			$V_{CC} = 2.7V$, $I_O = 12mA$	Full		0.16	
			$V_{CC} = 3.0V$, $I_O = 24mA$	Full		0.3	
			$V_{CC} = 4.5V$, $I_O = 32mA$	Full		0.32	
Input Leakage Current	I_I	$V_{CC} = 0V$ to $5.5V$, $V_I = 5.5V$ or GND	Full		± 0.01	± 1	μA
Power-Off Leakage Current	I_{OFF}	$V_{CC} = 0V$, V_I or $V_O = 5.5V$	Full		± 0.01	± 1	μA
Supply Current	I_{CC}	$V_{CC} = 1.65V$ to $5.5V$, $V_I = 5.5V$ or GND, $I_O = 0A$	Full		0.01	1	μA
Additional Supply Current	ΔI_{CC}	Per pin, $V_{CC} = 2.3V$ to $5.5V$, $V_I = V_{CC} - 0.6V$, $I_O = 0A$	Full		0.05	10	μA
Input Capacitance	C_I	$V_{CC} = 3.3V$, $V_I = GND$ to V_{CC}	+25°C		3.5		pF

DYNAMIC CHARACTERISTICS

(For test circuit, see Figure 1. 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 5.0V respectively, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	TEMP	MIN ⁽¹⁾	TYP	MAX ⁽¹⁾	UNITS
Propagation Delay ⁽²⁾	t_{PD}	nA to nY, see Figure 2	$V_{CC} = 1.65\text{V to } 1.95\text{V}$	Full	0.5	6.0	ns
			$V_{CC} = 2.3\text{V to } 2.7\text{V}$	Full	0.5	3.2	
			$V_{CC} = 2.7\text{V}$	Full	0.5	3.1	
			$V_{CC} = 3.0\text{V to } 3.6\text{V}$	Full	0.1	3.5	
			$V_{CC} = 4.5\text{V to } 5.5\text{V}$	Full	0.1	3.1	
Power Dissipation Capacitance ⁽³⁾	C_{PD}	$V_{CC} = 3.3\text{V}, V_I = \text{GND to } V_{CC}$	+25°C		30.5		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 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.

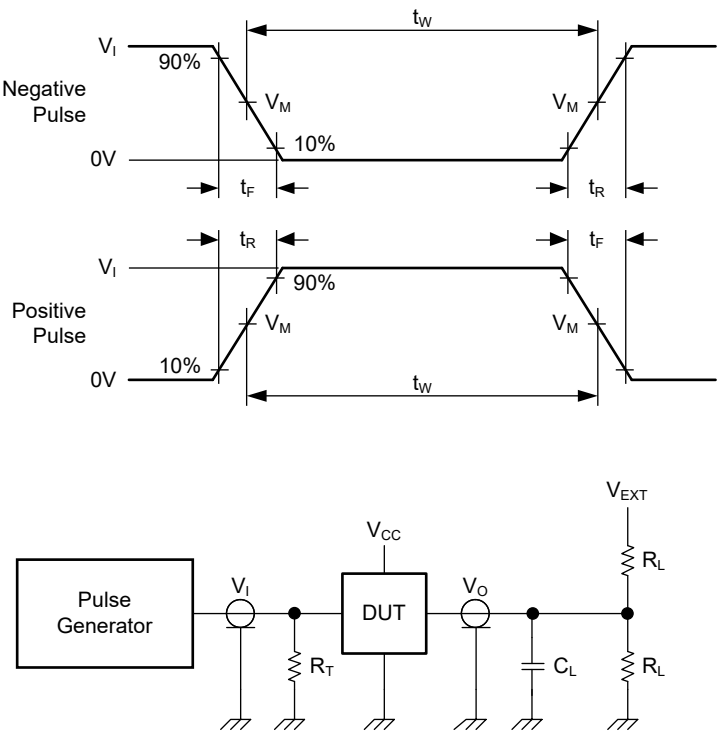
C_L = Output load capacitance in pF.

V_{CC} = Supply voltage in Volts.

N = Number of inputs switching.

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

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.

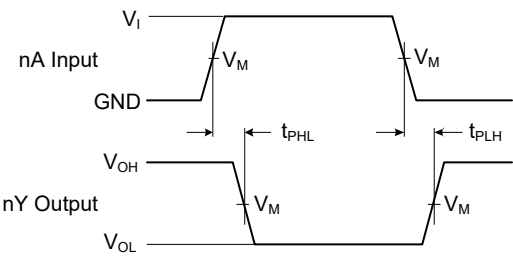
V_{EXT} = External voltage for measuring switching times.

Figure 1. 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}	$\leq 2.0ns$	30pF	1k Ω	Open
2.3V to 2.7V	V_{CC}	$\leq 2.0ns$	30pF	500 Ω	Open
2.7V	2.7V	$\leq 2.5ns$	50pF	500 Ω	Open
3.0V to 3.6V	2.7V	$\leq 2.5ns$	50pF	500 Ω	Open
4.5V to 5.5V	V_{CC}	$\leq 2.5ns$	50pF	500 Ω	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 2. Input nA to Output nY Propagation Delays

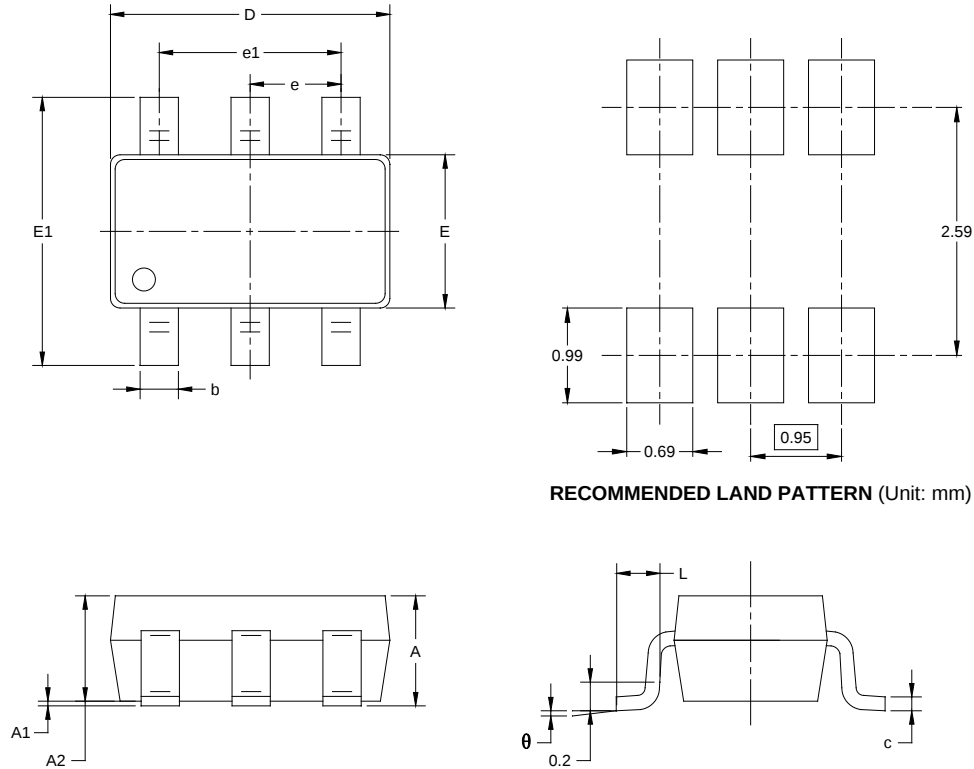
Table 2. Measurement Points

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

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

SOT-23-6



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950 BSC		0.037 BSC	
e1	1.900 BSC		0.075 BSC	
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°

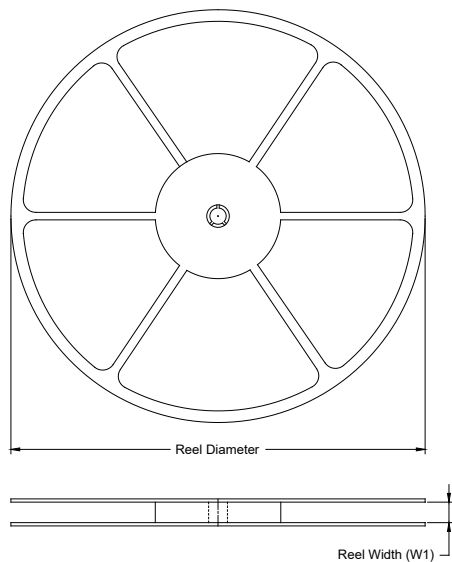
NOTES:

1. Body dimensions do not include mold flash or protrusion.
2. This drawing is subject to change without notice.

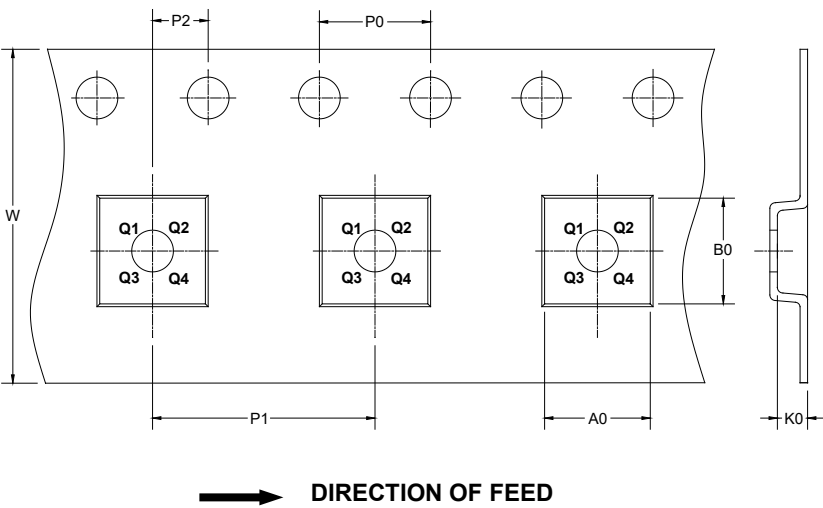
PACKAGE INFORMATION

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS



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

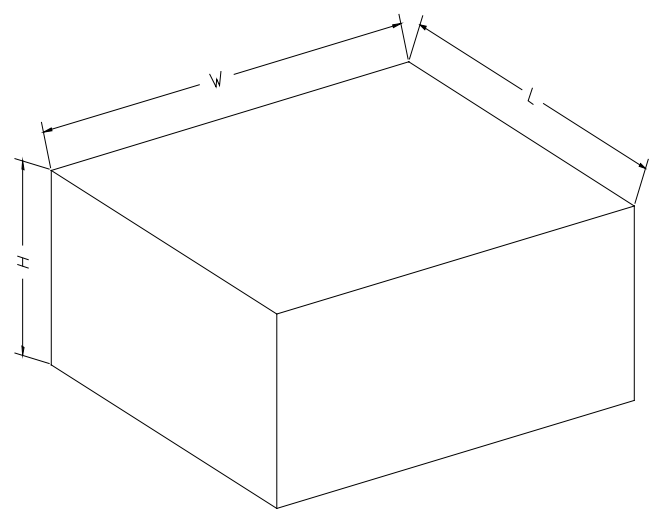
KEY PARAMETER LIST OF TAPE AND REEL

Package Type	Reel Diameter	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P0 (mm)	P1 (mm)	P2 (mm)	W (mm)	Pin1 Quadrant
SOT-23-6	7"	9.5	3.17	3.23	1.37	4.0	4.0	2.0	8.0	Q3

DD00001

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