74LVC1G04Q
Single Inverter Gate

GENERAL DESCRIPTION

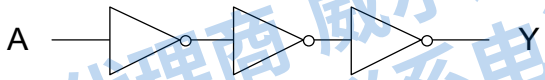
The 74LVC1G04Q is a single inverter gate which can accept supply voltage range from 1.65V to 5.5V. The device features the Boolean function $Y = \overline{A}$.

The 74LVC1G04Q is capable of holding high output drive while low static power dissipation can be maintained over the supply voltage operating range.

This device is AEC-Q100 qualified (Automotive Electronics Council (AEC) standard Q100 Grade 1) and the use of this device is suitable for automotive applications.

The 74LVC1G04Q is available in Green SC70-5 and SOT-23-5 packages and supports -40℃ to +125℃ temperature range.

LOGIC SYMBOL



FUNCTIONAL TABLE

INPUT	OUTPUT
A	Y
H	L
L	H

$Y = \overline{A}$

H = High Voltage Level

L = Low Voltage Level

FEATURES

- **AEC-Q100 (Grade 1) Qualified for Automotive Applications**
  T_A = -40℃ to +125℃
- **Wide Supply Voltage Range: 1.65V to 5.5V**
- **Inputs Accept Voltages up to 5.5V**
- **+24mA/-24mA Output Current at V_{CC} = 3.3V**
- **Low Quiescent Current: I_{CC} = 1μA (MAX)**
- **Propagation Delays:**
  4.5ns (MAX) at V_{CC} = 3.3V and C_L = 15pF
- **Support Partial Power-Down Mode, Live Insertion and Back-Drive Protection**
- **Latch-up Performance Exceeds 100mA**
- **-40℃ to +125℃ Operating Temperature Range**
- **Available in Green SC70-5 and SOT-23-5 Packages**

APPLICATIONS

Automotive Applications
Audio Equipment
Battery Powered Equipment
Industrial Equipment
Computing: Server, PC and Notebook
Medical Equipment
Smart Phone

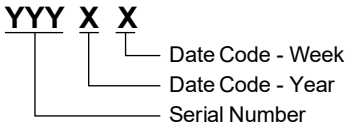
代理商 威尔迈 www.visvie.com 联系电话 138 2526 5270

PACKAGE/ORDERING INFORMATION

MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
74LVC1G04Q	SC70-5	-40℃ to +125℃	74LVC1G04QC5G/TR	0G0XX	Tape and Reel, 3000
	SOT-23-5	-40℃ to +125℃	74LVC1G04QN5G/TR	0G1XX	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)
High-State or Low-State ..... -0.5V to V_{CC} + 0.5V
High-Impedance or Power-Off Mode ..... -0.5V to 6.5V
Input Clamp Current, I_{IK} (V_I < 0) ..... -50mA
Output Clamp Current, I_{OK} (V_O < 0) ..... -50mA
Continuous Output Current, I_O ..... ±50mA
Continuous Current through V_{CC} or GND ..... ±100mA
Junction Temperature (3) ..... +150℃
Storage Temperature Range ..... -65℃ to +150℃
Lead Temperature (Soldering, 10s) ..... +260℃
ESD Susceptibility
HBM 6000V
CDM 1000V

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 negative 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.

DISCLAIMER

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

RECOMMENDED OPERATING CONDITIONS

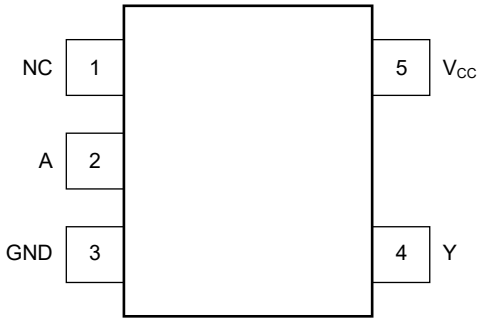
Supply Voltage, V_{CC}
Operating ..... 1.65V to 5.5V
Data Retention Only ..... 1.5V (MIN)
Input Voltage, V_I ..... 0V to 5.5V
Output Voltage, V_O ..... 0V to V_{CC}
High-Level Output Current, I_{OH}
V_{CC} = 1.65V ..... -4mA (MAX)
V_{CC} = 2.3V ..... -8mA (MAX)
V_{CC} = 3.0V ..... -16mA (MAX)
V_{CC} = 3.0V ..... -24mA (MAX)
V_{CC} = 4.5V ..... -32mA (MAX)
Low-Level Output Current, I_{OL}
V_{CC} = 1.65V ..... 4mA (MAX)
V_{CC} = 2.3V ..... 8mA (MAX)
V_{CC} = 3.0V ..... 16mA (MAX)
V_{CC} = 3.0V ..... 24mA (MAX)
V_{CC} = 4.5V ..... 32mA (MAX)
Input Transition Rise or Fall Rate, Δt/ΔV
V_{CC} = 1.8V ± 0.15V, 2.5V ± 0.2V ..... 20ns/V (MAX)
V_{CC} = 3.3V ± 0.3V ..... 10ns/V (MAX)
V_{CC} = 5.0V ± 0.5V ..... 5ns/V (MAX)
Operating Temperature Range ..... -40℃ to +125℃

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.

PIN CONFIGURATIONS

(TOP VIEW)



SC70-5/SOT-23-5

PIN DESCRIPTION

PIN	NAME	FUNCTION
SC70-5/SOT-23-5		
1	NC	No Connection.
2	A	Data Input.
3	GND	Ground.
4	Y	Data Output.
5	V_{CC}	Supply Voltage.

ELECTRICAL CHARACTERISTICS

(Full = -40℃ to +125℃, all typical values are at T_A = +25℃ and V_{CC} = 3.3V, 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 × V_{CC}			V
		V_{CC} = 2.3V to 2.7V	Full	1.7			
		V_{CC} = 2.7V to 3.6V	Full	2.0			
		V_{CC} = 4.5V to 5.5V	Full	0.7 × V_{CC}			
Low-Level Input Voltage	V_{IL}	V_{CC} = 1.65V to 1.95V	Full			0.35 × 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 × V_{CC}	
High-Level Output Voltage	V_{OH}	V_{CC} = 1.65V to 5.5V, I_{OH} = -100μA	Full	V_{CC} - 0.01			V
		V_{CC} = 1.65V, I_{OH} = -4mA	Full	1.2			
		V_{CC} = 2.3V, I_{OH} = -8mA	Full	1.9			
		V_{CC} = 2.7V, I_{OH} = -8mA	Full	2.3			
		V_{CC} = 3.0V, I_{OH} = -16mA	Full	2.4			
		V_{CC} = 3.0V, I_{OH} = -24mA	Full	2.3			
		V_{CC} = 4.5V, I_{OH} = -32mA	Full	3.8			
Low-Level Output Voltage	V_{OL}	V_{CC} = 1.65V to 5.5V, I_{OL} = 100μA	Full			0.1	V
		V_{CC} = 1.65V, I_{OL} = 4mA	Full			0.45	
		V_{CC} = 2.3V, I_{OL} = 8mA	Full			0.3	
		V_{CC} = 2.7V, I_{OL} = 12mA	Full			0.5	
		V_{CC} = 3.0V, I_{OL} = 16mA	Full			0.4	
		V_{CC} = 3.0V, I_{OL} = 24mA	Full			0.55	
		V_{CC} = 4.5V, I_{OL} = 32mA	Full			0.55	
Input Leakage Current	I_I	V_{CC} = 0V to 5.5V, V_I = 5.5V or GND	Full		±0.1	±1	μA
Power-Off Leakage Current	I_{OFF}	V_{CC} = 0V, V_I or V_O = 5.5V	Full		±0.1	±1	μA
Supply Current	I_{CC}	V_{CC} = 1.65V to 5.5V, V_I = 5.5V or GND, I_O = 0A	Full		0.1	1	μA
Additional Supply Current	ΔI_{CC}	Per pin, V_{CC} = 3.0V to 5.5V, V_I = V_{CC} - 0.6V, I_O = 0A	Full		0.1	5	μA
Input Capacitance	C_I	V_{CC} = 3.3V, V_I = GND to V_{CC}	+25℃		4		pF

DYNAMIC CHARACTERISTICS

(See Figure 1 for test circuit. Full = -40℃ to +125℃, all typical values are at T_A = +25℃, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS			TEMP	MIN	TYP	MAX	UNITS
Propagation Delay (1)	t_{PD}	A to Y	C_L = 15pF	V_{CC} = 1.8V ± 0.15V	Full	1.5		10	ns
				V_{CC} = 2.5V ± 0.2V	Full	1		6	
				V_{CC} = 3.3V ± 0.3V	Full	0.5		4.5	
				V_{CC} = 5.0V ± 0.5V	Full	0.5		3.5	
			C_L = 30pF or 50pF. See Table 1.	V_{CC} = 1.8V ± 0.15V	Full	2		11.5	
				V_{CC} = 2.5V ± 0.2V	Full	1		6.5	
				V_{CC} = 3.3V ± 0.3V	Full	1		5.5	
				V_{CC} = 5.0V ± 0.5V	Full	1		5	
Power Dissipation Capacitance (2)	C_{PD}	f = 10MHz		V_{CC} = 1.8V	Full		39		pF
				V_{CC} = 2.5V	Full		35		
				V_{CC} = 3.3V	Full		36		
				V_{CC} = 5.0V	Full		41		

NOTES:

1. t_{PD} is the same as t_{PLH} and t_{PHL}.
2. 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.

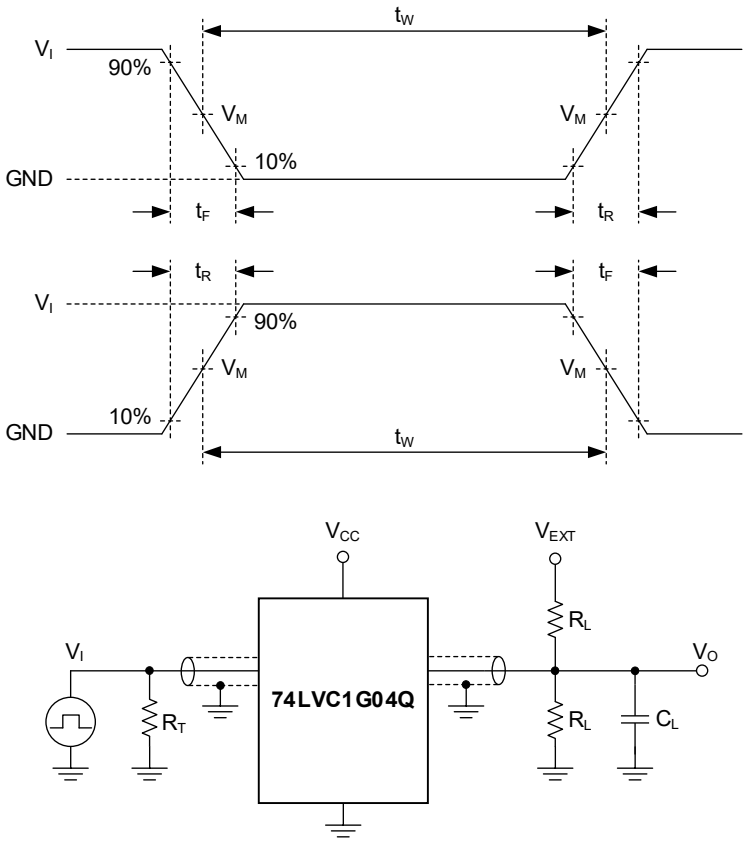
   C_L = Output load capacitance in pF.

   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 (includes jig and probe).

R_T: Termination resistance (equals to output impedance Zo of the pulse generator).

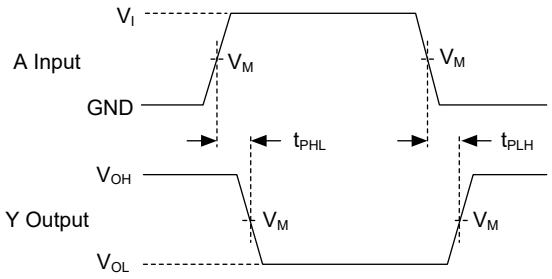
V_{EXT}: External voltage is used to measure switching times.

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}
1.8V ± 0.15V	V_{CC}	≤ 2.0ns	30pF	1kΩ	Open
2.5V ± 0.2V	V_{CC}	≤ 2.0ns	30pF	500Ω	Open
3.3V ± 0.3V	3V	≤ 2.5ns	50pF	500Ω	Open
5.0V ± 0.5V	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 2. The Data Input A to Output Y Propagation Delays

Table 2. Measurement Points

SUPPLY VOLTAGE	INPUT		OUTPUT
V_{CC}	V_I	V_M (1)	V_M
1.8V ± 0.15V	V_{CC}	0.5 × V_{CC}	0.5 × V_{CC}
2.5V ± 0.2V	V_{CC}	0.5 × V_{CC}	0.5 × V_{CC}
3.3V ± 0.3V	3V	1.5V	1.5V
5.0V ± 0.5V	V_{CC}	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.

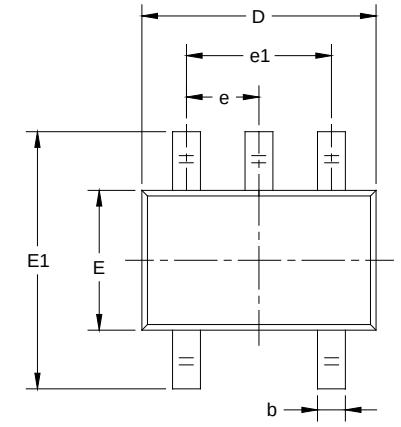
REVISION HISTORY

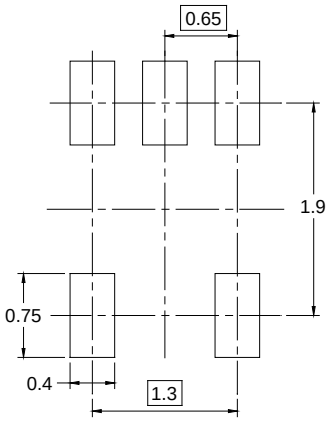
NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

Changes from Original (NOVEMBER 2023) to REV.A	Page
Changed from product preview to production data	All

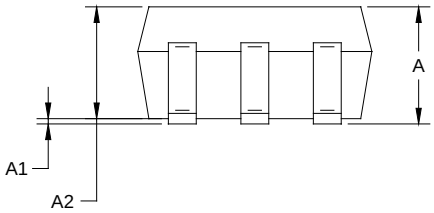
PACKAGE OUTLINE DIMENSIONS

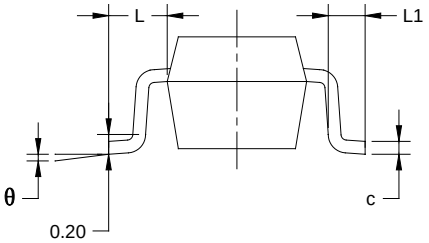
SC70-5





RECOMMENDED LAND PATTERN (Unit: mm)



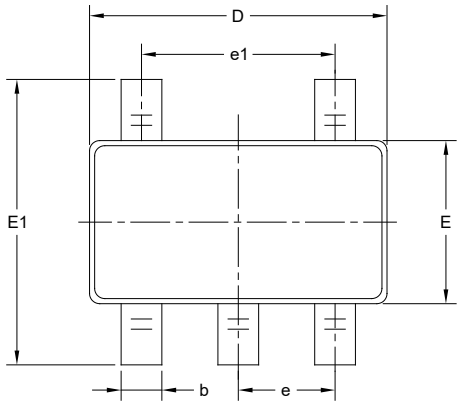


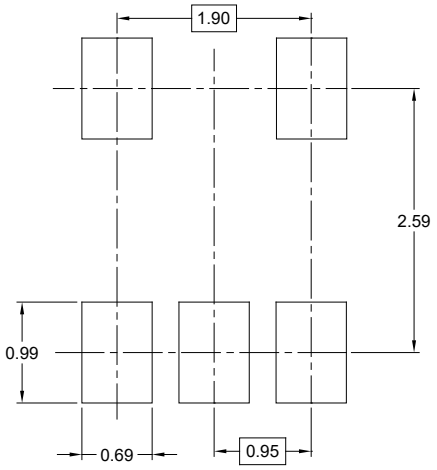
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	0.800	1.100	0.031	0.043
A1	0.000	0.100	0.000	0.004
A2	0.800	1.000	0.031	0.039
b	0.150	0.350	0.006	0.014
c	0.080	0.220	0.003	0.009
D	2.000	2.200	0.079	0.087
E	1.150	1.350	0.045	0.053
E1	2.150	2.450	0.085	0.096
e	0.65 TYP		0.026 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.

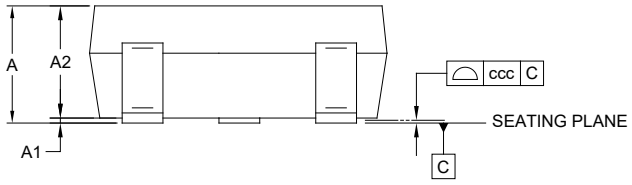
PACKAGE OUTLINE DIMENSIONS

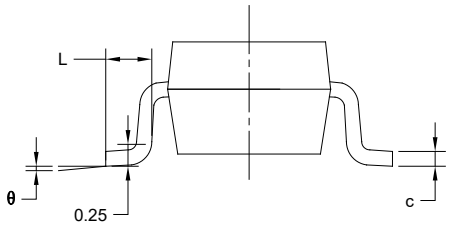
SOT-23-5





RECOMMENDED LAND PATTERN (Unit: mm)



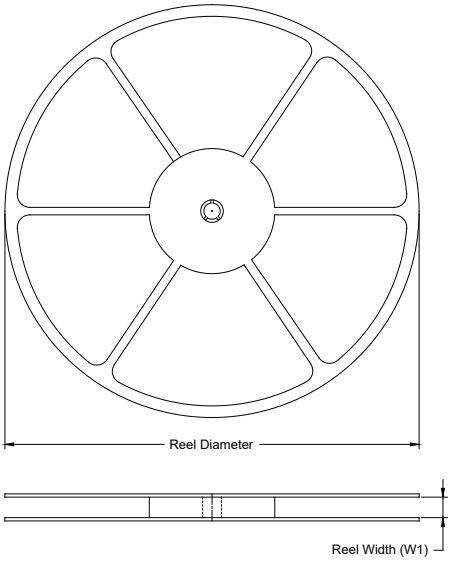


Symbol	Dimensions In Millimeters		
	MIN	MOD	MAX
A	-	-	1.450
A1	0.000	-	0.150
A2	0.900	-	1.300
b	0.300	-	0.500
c	0.080	-	0.220
D	2.750	-	3.050
E	1.450	-	1.750
E1	2.600	-	3.000
e	0.950 BSC		
e1	1.900 BSC		
L	0.300	-	0.600
θ	0°	-	8°
ccc	0.100		

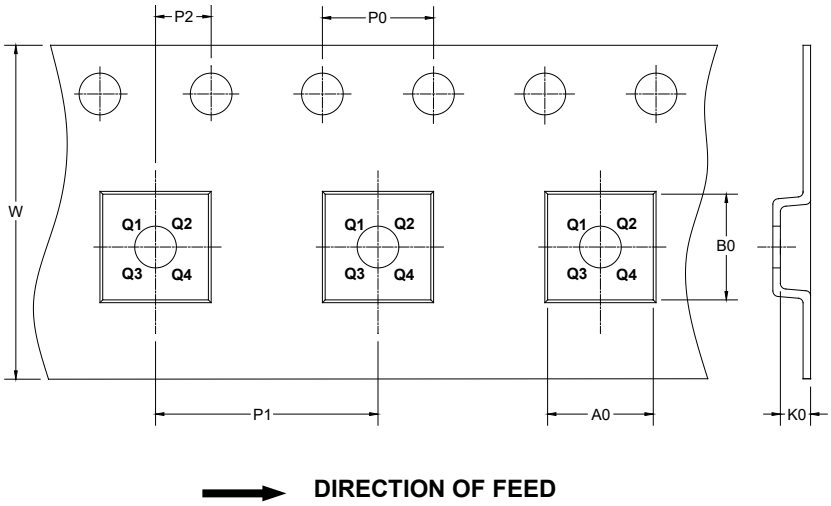
NOTES:
1. This drawing is subject to change without notice.
2. The dimensions do not include mold flashes, protrusions or gate burrs.
3. Reference JEDEC MO-178.

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS



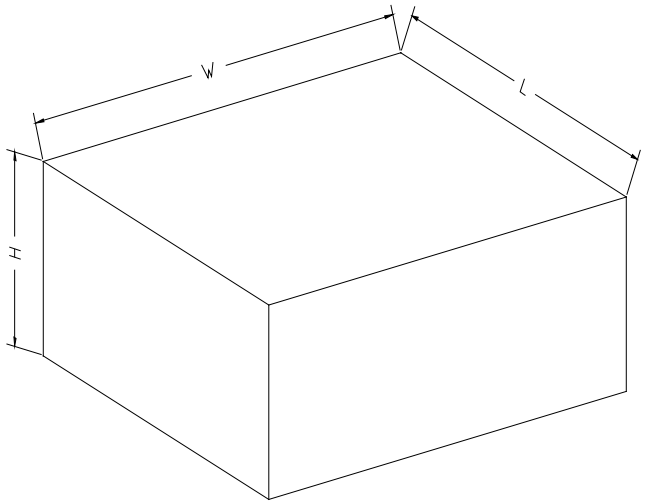
NOTE: The picture is only for reference. Please make the object as the standard.

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
SC70-5	7"	9.5	2.40	2.50	1.20	4.0	4.0	2.0	8.0	Q3
SOT-23-5	7"	9.5	3.20	3.20	1.40	4.0	4.0	2.0	8.0	Q3

DD0001

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