

GENERAL DESCRIPTION

The 74LVC1G125SQ is a single buffer/line driver with a non-inverting 3-state output and it is designed for 1.65V to 5.5V V_{CC} operation. The 3-state output is controlled by the output enable input ($\overline{OE}$). When $\overline{OE}$ is low, the device passes data from the A input to the Y output. When $\overline{OE}$ is high, the output is in the high-impedance state. The input from 3.3V or 5V device makes this device to operate in a mixed 3.3V and 5V system environment.

This device is highly suitable for partial power-down applications by using power-off circuit. When the device is powered down, the output is disabled, and the current backflow can be prevented from passing through the device.

The 74LVC1G125SQ is AEC-Q100 qualified (Automotive Electronics Council (AEC) standard Q100 Grade 1) and it is suitable for automotive applications.

The 74LVC1G125SQ is available in Green SC70-5 and SOT-23-5 packages. It operates over a temperature range of -40°C to +125°C.

FUNCTION TABLE

INPUT		OUTPUT
$\overline{OE}$	A	Y
L	L	L
L	H	H
H	X	Z

H = High Voltage Level

L = Low Voltage Level

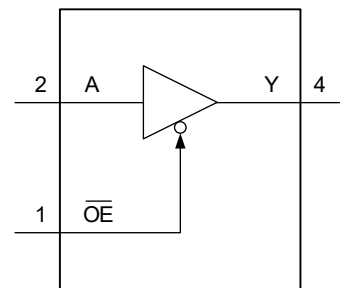
Z = High-Impedance State

X = Don't Care

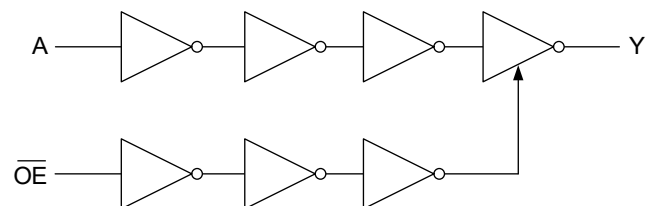
FEATURES

- AEC-Q100 Qualified for Automotive Applications Device Temperature Grade 1
 $T_A = -40^\circ\text{C}$ to $+125^\circ\text{C}$
- Wide Operating Voltage Range: 1.65V to 5.5V
- Inputs Accept Voltages up to 5.5V
- +24mA/-24mA Output Current at $V_{CC} = 3.0\text{V}$
- CMOS Low Power Dissipation
- Direct Interface with TTL Levels
- High Noise Immunity
- -40°C to +125°C Operating Temperature Range
- Available in Green SC70-5 and SOT-23-5 Packages

LOGIC SYMBOL



LOGIC DIAGRAM



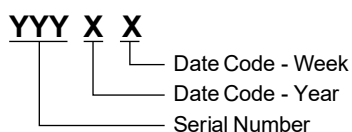
PACKAGE/ORDERING INFORMATION

MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE TOP MARKING	PACKING OPTION
74LVC1G125SQ	SC70-5	-40°C to +125°C	74LVC1G125SQC5G/TR	3H3XX	Tape and Reel, 3000
	SOT-23-5	-40°C to +125°C	74LVC1G125SQN5G/TR	3H4XXXX	Tape and Reel, 3000

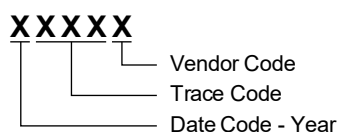
MARKING INFORMATION

NOTE: XX = Date Code. XXXXX = Date Code, Trace Code and Vendor Code.

SC70-5



SOT-23-5



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

Supply Voltage Range, V_{CC}	-0.5V to 6.5V
Input Voltage Range, $V_I^{(1)}$	-0.5V to 6.5V
Output Voltage Range, $V_O^{(1)(2)}$	
Active Mode	-0.5V to MIN(6.5V, $V_{CC} + 0.5V$)
Power-Down Mode ($V_{CC} = 0V$)	-0.5V to 6.5V
Input Clamp Current, I_{IK} ($V_I < 0V$)	-50mA
Output Clamp Current, I_{OK} ($V_O < 0V$)	-50mA
Continuous Output Current, I_O ($V_O = 0V$ to V_{CC})	$\pm 50mA$
Continuous Current through V_{CC} or GND	$\pm 100mA$
Junction Temperature $^{(3)}$	+150°C
Storage Temperature Range	-65°C to +150°C
Lead Temperature (Soldering, 10s)	+260°C
ESD Susceptibility $^{(4)(5)}$	
HBM	$\pm 7000V$
CDM	$\pm 1000V$

NOTES:

- The input and output voltage ratings may be exceeded if the input and output clamp current ratings are observed.
- The V_O can reach 5.5V in normal operation when $V_{CC} = 0V$.
- The performance capability of a high-performance integrated circuit in conjunction with its thermal environment can create junction temperatures which are detrimental to reliability.
- For human body model (HBM), all pins comply with AEC-Q100-002 specification.
- For charged device model (CDM), all pins comply with AEC-Q100-011 specification.

RECOMMENDED OPERATING CONDITIONS

Supply Voltage Range, V_{CC}	1.65V to 5.5V
Input Voltage Range, V_I	0V to 5.5V
Output Voltage Range, V_O	
Active Mode	0V to V_{CC}
Power-Down Mode ($V_{CC} = 0V$)	0V to 5.5V
Input Transition Rise or 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

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.

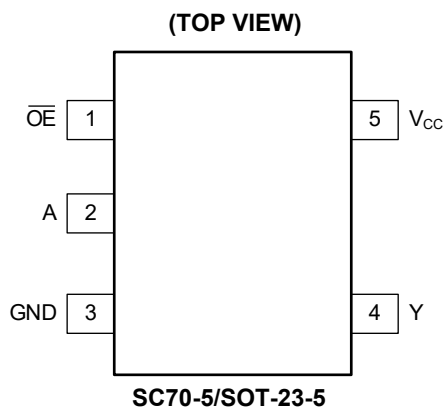
ESD SENSITIVITY CAUTION

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 CONFIGURATIONS



PIN DESCRIPTION

PIN	NAME	FUNCTION
1	$\overline{OE}$	Output Enable Input.
2	A	Data Input.
3	GND	Ground.
4	Y	Data Output.
5	V _{CC}	Supply Voltage.

ELECTRICAL CHARACTERISTICS(Full = -40°C to +125°C, all typical values are measured at T_A = +25°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 × 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	0.70 × 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			0.30 × V _{CC}	
High-Level Output Voltage	V _{OH}	V _{CC} = 1.65V to 5.5V, I _{OH} = -100μA	Full	V _{CC} - 0.05	V _{CC} - 0.01		V
		V _{CC} = 1.65V, I _{OH} = -4mA	Full	1.43	1.56		
		V _{CC} = 2.3V, I _{OH} = -8mA	Full	2.02	2.20		
		V _{CC} = 2.7V, I _{OH} = -12mA	Full	2.38	2.57		
		V _{CC} = 3.0V, I _{OH} = -24mA	Full	2.52	2.75		
		V _{CC} = 4.5V, I _{OH} = -32mA	Full	4.00	4.27		
Low-Level Output Voltage	V _{OL}	V _{CC} = 1.65V to 5.5V, I _{OL} = 100μA	Full		0.01	0.05	V
		V _{CC} = 1.65V, I _{OL} = 4mA	Full		0.08	0.22	
		V _{CC} = 2.3V, I _{OL} = 8mA	Full		0.11	0.28	
		V _{CC} = 2.7V, I _{OL} = 12mA	Full		0.15	0.34	
		V _{CC} = 3.0V, I _{OL} = 24mA	Full		0.28	0.56	
		V _{CC} = 4.5V, I _{OL} = 32mA	Full		0.31	0.60	
Input Leakage Current	I _I	V _{CC} = 0V to 5.5V, V _I = 5.5V or GND	Full		±0.01	±1	μA
Off-State Output Current	I _{OZ}	V _{CC} = 3.6V, V _I = V _{IH} or V _{IL} , V _O = 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		5		pF

DYNAMIC CHARACTERISTICS

(See Figure 1 for test circuit. 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 5.0V respectively, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	TEMP	MIN ⁽¹⁾	TYP	MAX ⁽¹⁾	UNITS
Propagation Delay ⁽²⁾	t _{PD}	A to Y, see Figure 2	V _{CC} = 1.65V to 1.95V	Full	1.0	8.5	ns
			V _{CC} = 2.3V to 2.7V	Full	0.5	5.5	
			V _{CC} = 2.7V	Full	0.5	5.0	
			V _{CC} = 3.0V to 3.6V	Full	0.5	4.5	
			V _{CC} = 4.5V to 5.5V	Full	0.5	4.5	
Enable Time ⁽²⁾	t _{EN}	$\overline{\text{OE}}$ to Y, see Figure 3	V _{CC} = 1.65V to 1.95V	Full	1.0	8.5	ns
			V _{CC} = 2.3V to 2.7V	Full	0.5	5.5	
			V _{CC} = 2.7V	Full	0.5	5.0	
			V _{CC} = 3.0V to 3.6V	Full	0.5	4.5	
			V _{CC} = 4.5V to 5.5V	Full	0.5	4.5	
Disable Time ⁽²⁾	t _{DIS}	$\overline{\text{OE}}$ to Y, see Figure 3	V _{CC} = 1.65V to 1.95V	Full	1.0	8.5	ns
			V _{CC} = 2.3V to 2.7V	Full	0.5	5.5	
			V _{CC} = 2.7V	Full	1.0	5.5	
			V _{CC} = 3.0V to 3.6V	Full	1.0	5.5	
			V _{CC} = 4.5V to 5.5V	Full	0.5	4.0	
Power Dissipation Capacitance ⁽³⁾	C _{PD}	V _I = GND to V _{CC}	Output enabled	+25°C		35.0	pF
			Output disabled	+25°C		0.8	

NOTES:

- Specified by design and characterization, not production tested.
- t_{PD} is the same as t_{PLH} and t_{PHL}. t_{EN} is the same as t_{PZH} and t_{PZL}. t_{DIS} is the same as t_{PLZ} and t_{PHZ}.
- 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.

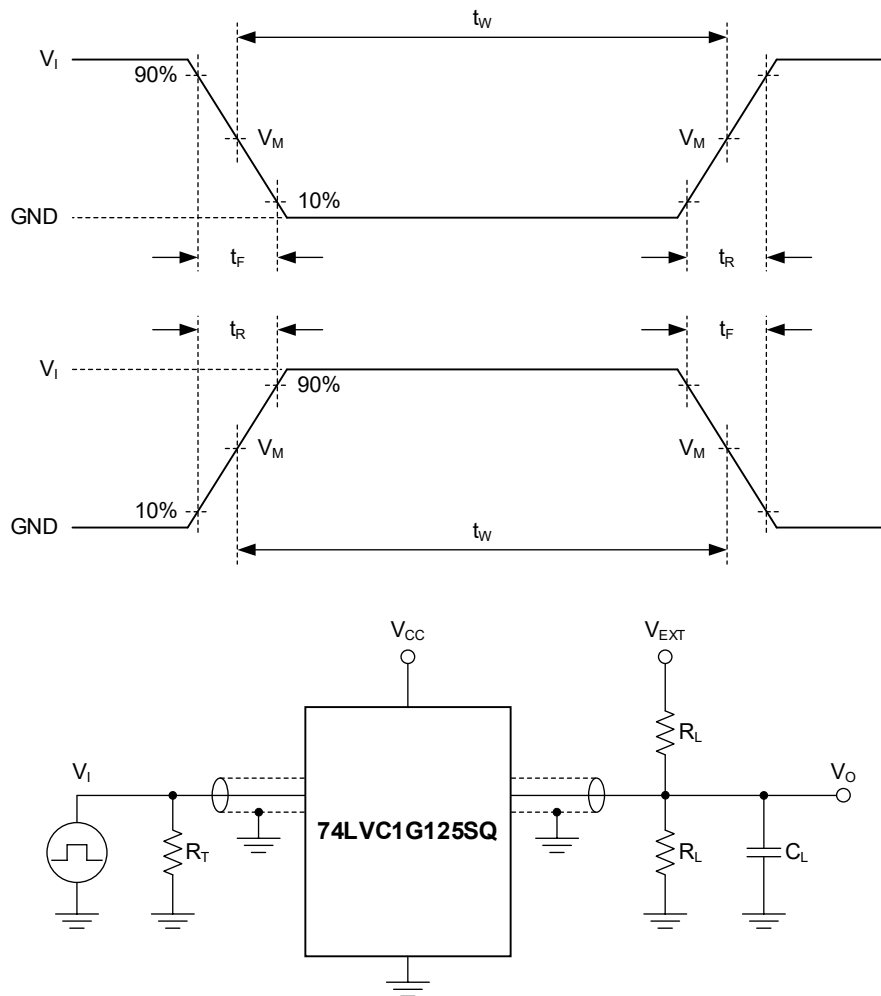
C_L = Output load capacitance in pF.

V_{CC} = Supply voltage in Volts.

N = Number of inputs switching.

Σ(C_L × V_{CC}² × 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 Z_O of the pulse generator).

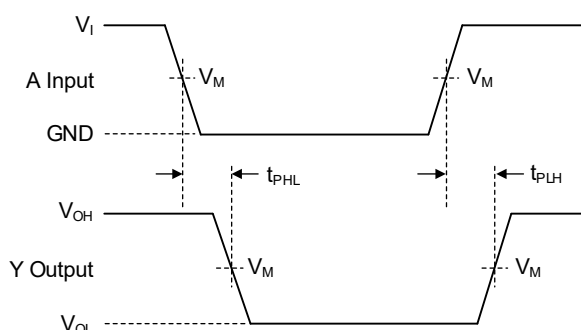
V_{EXT} : External voltage is used to measure switching time.

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}	t_{PLZ}, t_{PZL}	t_{PHZ}, t_{PZH}
1.65V to 1.95V	V_{CC}	$\leq 2.0\text{ns}$	30pF	1k Ω	Open	$2 \times V_{CC}$	GND
2.3V to 2.7V	V_{CC}	$\leq 2.0\text{ns}$	30pF	500 Ω	Open	$2 \times V_{CC}$	GND
2.7V	2.7V	$\leq 2.5\text{ns}$	50pF	500 Ω	Open	6V	GND
3.0V to 3.6V	2.7V	$\leq 2.5\text{ns}$	50pF	500 Ω	Open	6V	GND
4.5V to 5.5V	V_{CC}	$\leq 2.5\text{ns}$	50pF	500 Ω	Open	$2 \times V_{CC}$	GND

WAVEFORMS

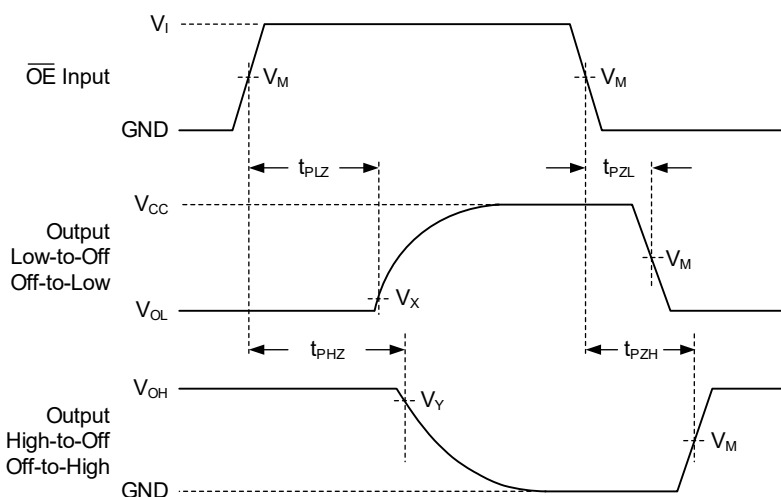


Test conditions are given in Table 1.

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 A to Output Y Propagation Delay Times



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 3. Enable and Disable Times

Table 2. Measurement Points

SUPPLY VOLTAGE	INPUT		OUTPUT		
V_{CC}	V_I	$V_M^{(1)}$	V_M	V_X	V_Y
1.65V to 1.95V	V_{CC}	$0.5 \times V_{CC}$	$0.5 \times V_{CC}$	$V_{OL} + 0.15V$	$V_{OH} - 0.15V$
2.3V to 2.7V	V_{CC}	$0.5 \times V_{CC}$	$0.5 \times V_{CC}$	$V_{OL} + 0.15V$	$V_{OH} - 0.15V$
2.7V	2.7V	1.5V	1.5V	$V_{OL} + 0.3V$	$V_{OH} - 0.3V$
3.0V to 3.6V	2.7V	1.5V	1.5V	$V_{OL} + 0.3V$	$V_{OH} - 0.3V$
4.5V to 5.5V	V_{CC}	$0.5 \times V_{CC}$	$0.5 \times V_{CC}$	$V_{OL} + 0.3V$	$V_{OH} - 0.3V$

NOTE:

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

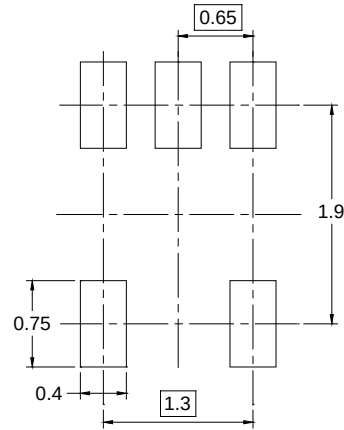
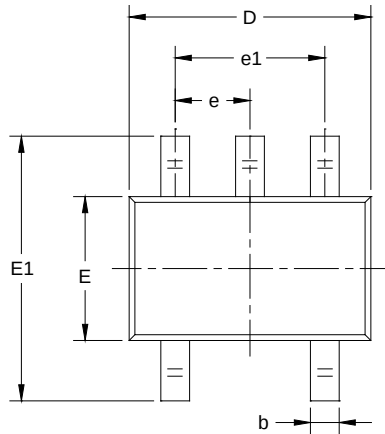
REVISION HISTORY

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

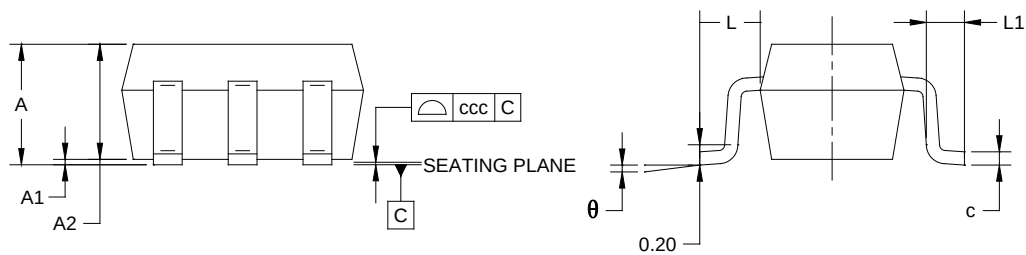
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PACKAGE OUTLINE DIMENSIONS

SC70-5



RECOMMENDED LAND PATTERN (Unit: mm)



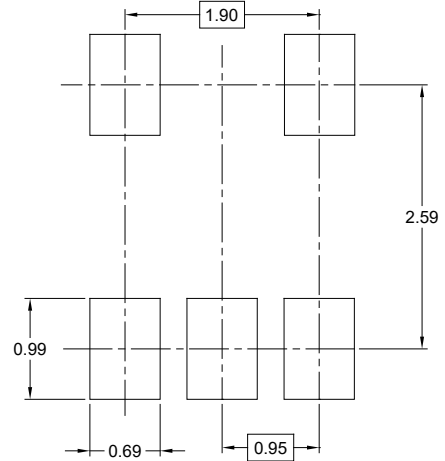
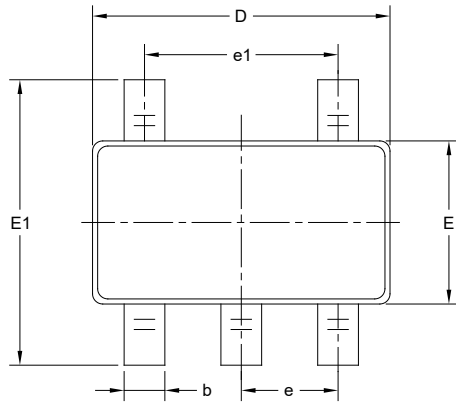
Symbol	Dimensions In Millimeters		
	MIN	NOM	MAX
A	0.800	-	1.100
A1	0.000	-	0.100
A2	0.800	-	1.000
b	0.150	-	0.350
c	0.080	-	0.220
D	2.000	-	2.200
E	1.150	-	1.350
E1	2.150	-	2.450
e	0.600	0.650	0.700
e1	1.200	1.300	1.400
L	0.525 REF		
L1	0.260	-	0.460
ccc	0.100		
θ	0°	-	8°

NOTES:

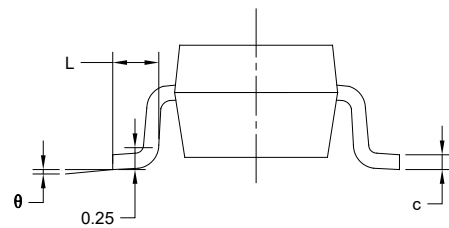
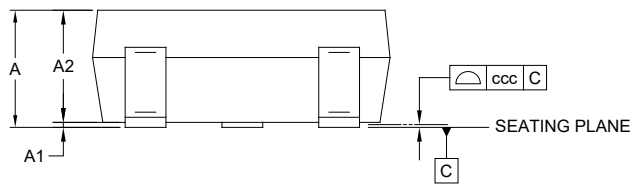
1. This drawing is subject to change without notice.
2. This dimension does not include mold flash, protrusions or gate burrs. Mold flash, protrusions or gate burrs shall not exceed 0.2mm per side.
3. Reference JEDEC MO-203.

PACKAGE OUTLINE DIMENSIONS

SOT-23-5



RECOMMENDED LAND PATTERN (Unit: mm)



Symbol	Dimensions In Millimeters		
	MIN	NOM	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		

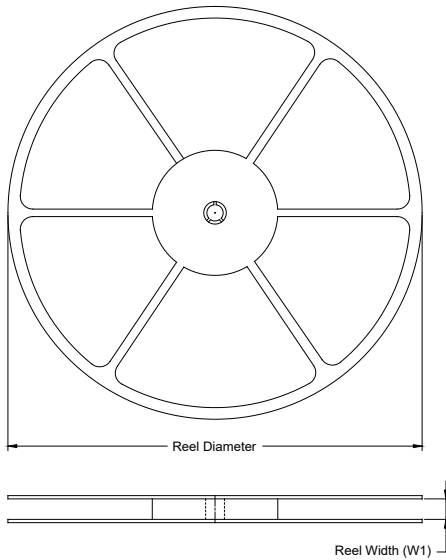
NOTES:

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.

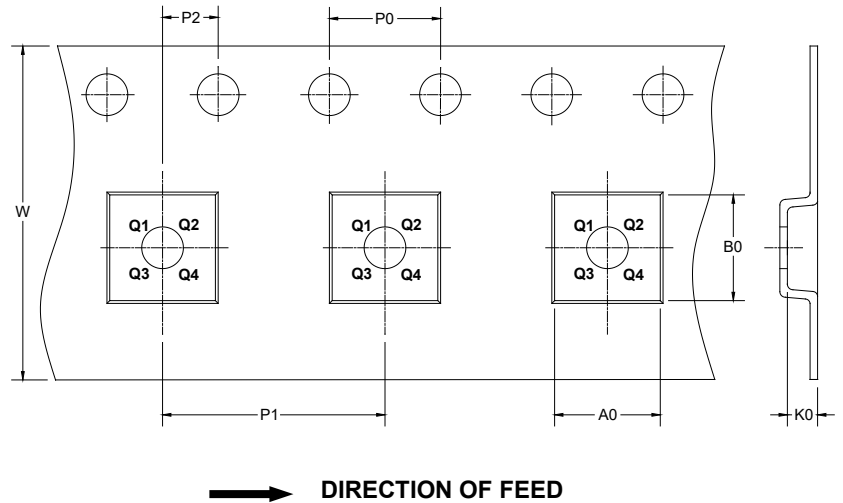
PACKAGE INFORMATION

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS



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

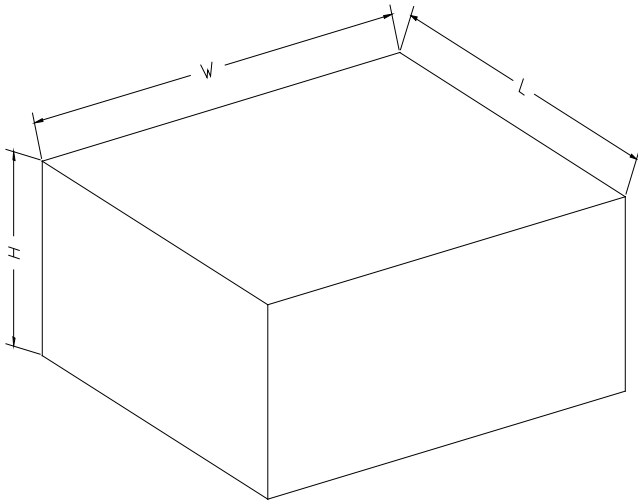
KEY PARAMETER LIST OF TAPE AND REEL

Package Type	Reel Diameter	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P0 (mm)	P1 (mm)	P2 (mm)	W (mm)	Pin1 Quadrant
SC70-5	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

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