

# Product Specification

XBLW SN74LVC1G04

Single Inverter Gate

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## Description

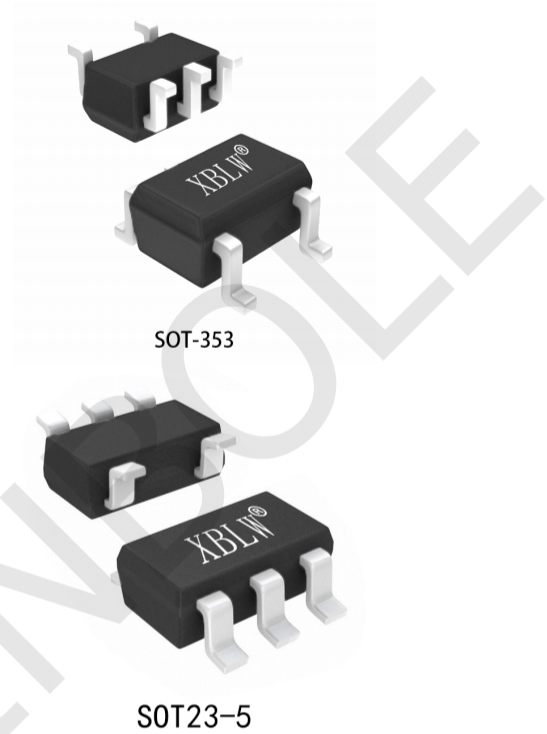
The SN74LVC1G04 provides one inverting buffer. Input can be driven from either 3.3V or 5V devices. These features allow the use of these devices in a mixed 3.3V and 5V environment.

## Feature

- Wide supply voltage range from 1.65V to 5.5V
- 5V tolerant inputs for interfacing with 5V logic
- ±24mA output drive (VCC=3.0V)
- CMOS low power consumption
- Specified from -40°C to +125°C
- Packaging information: SOT23-5/SOT353

## Applications

- AV Receiver
- Audio Dock: Portable
- Blu-ray Player and Home Theater
- Embedded PC
- MP3 Player/Recorder (Portable Audio)
- Personal Digital Assistant (PDA)
- Power: Telecom/Server AC/DC Supply: Single
- Controller: Analog and Digital
- Solid State Drive (SSD): Client and Enterprise
- TV: LCD/Digital and High-Definition (HDTV)
- Tablet: Enterprise
- Video Analytics: Server
- Wireless Headset, Keyboard, and Mouse



## Ordering Information

Product Model	Package Type	Marking	Packing	Packing Qty
XBLW SN74LVC1G04T235	SOT-23-5	ABXX	Tape	3000Pcs/Reel
XBLW SN74LVC1G04T353	SOT-353	ABXX	Tape	3000Pcs/Reel

## Block Diagram

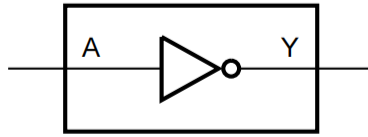


Figure 1. Logic symbol

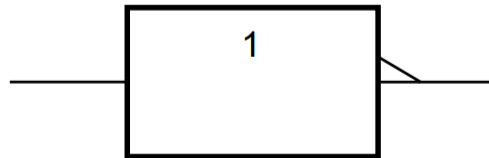


Figure 2. IEC logic symbol

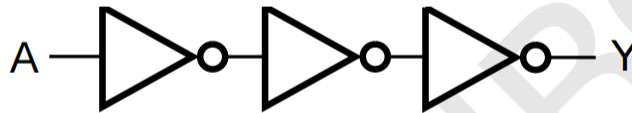
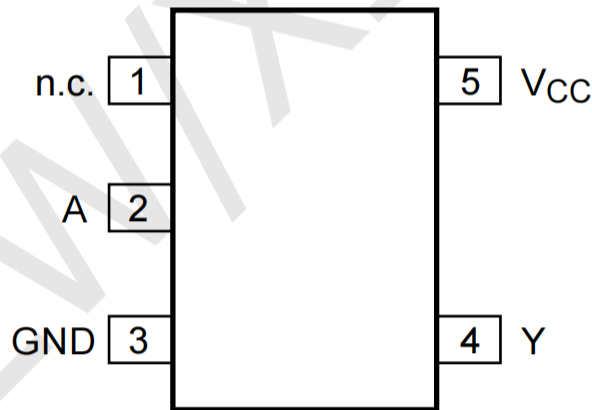


Figure 3. Logic diagram

## Pin Configurations



## PinDescription

Pin No.	Pin Name	Description
1	n.c.	not connected
2	A	data input
3	GND	ground (0V)
4	Y	data output
5	V <sub>CC</sub>	supply voltage

## Function Table

Input	Output
A	Y
L	H
H	L

Note: H=HIGH voltage level; L=LOW voltage level.

## Electrical Parameter

### Absolute Maximum Ratings

(Voltages are referenced to GND (ground=0V), unless otherwise specified.)

Parameter	Symbol	Conditions	Min.	Max.	Unit
supply voltage	$V_{CC}$	-	-0.5	+6.5	V
input clamping current	$I_{IK}$	$V_I < 0V$	-50	-	mA
input voltage	$V_I$	-	-0.5	+6.5	V
output clamping current	$I_{OK}$	$V_O > V_{CC}$ or $V_O < 0V$	-	$\pm 50$	mA
output voltage	$V_O$	Active mode	-0.5	$V_{CC}+0.5$	V
		Power-down mode; $V_{CC}=0V$	-0.5	+6.5	V
output current	$I_O$	$V_O=0V$ to $V_{CC}$	-	$\pm 50$	mA
supply current	$I_{CC}$	-	-	100	mA
ground current	$I_{GND}$	-	-100	-	mA
storage temperature	$T_{stg}$	-	-65	+150	$^{\circ}C$
total power dissipation	$P_{tot}$	-	-	250	mW
soldering temperature	$T_L$	10s	260		$^{\circ}C$

### Recommended Operating Conditions

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
supply voltage	$V_{CC}$	-	1.65	-	5.5	V
input voltage	$V_I$	-	0	-	5.5	V
output voltage	$V_O$	Active mode	0	-	$V_{CC}$	V
		Power-down mode; $V_{CC}=0V$	0	-	5.5	V
ambient temperature	$T_{amb}$	-	-40	-	+125	$^{\circ}C$

### ESD Ratings

Parameter	Defintion	Vaue	Unit
$V_{(ESD)}$ Electrostatic discharge	Human body model (HBM), per ANSI/ESDA/JEDEC JS-001, all pins <sup>(1)</sup>	$\pm 2000$	V
	Charged device model (CDM), per JEDEC specification JESD22-C101, all pins <sup>(2)</sup>	$\pm 1000$	

(1) JEDEC document JEP155 states that 500-V HBM allows safe manufacturing with a standard ESD control process.

(2) JEDEC document JEP157 states that 250-V CDM allows safe manufacturing with a standard ESD control process.

## Electrical Characteristics

### DC Characteristics 1

( $T_{amb} = -40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$ , voltages are referenced to GND (ground=0V), unless otherwise specified.)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit	
HIGH-level input voltage	$V_{IH}$	$V_{CC}=1.65\text{V}$ to $1.95\text{V}$	$0.65 \times V_{CC}$	-	-	V	
		$V_{CC}=2.3\text{V}$ to $2.7\text{V}$	1.7	-	-	V	
		$V_{CC}=2.7\text{V}$ to $3.6\text{V}$	2.0	-	-	V	
		$V_{CC}=4.5\text{V}$ to $5.5\text{V}$	$0.7 \times V_{CC}$	-	-	V	
LOW-level input voltage	$V_{IL}$	$V_{CC}=1.65\text{V}$ to $1.95\text{V}$	-	-	$0.35 \times V_{CC}$	V	
		$V_{CC}=2.3\text{V}$ to $2.7\text{V}$	-	-	0.7	V	
		$V_{CC}=2.7\text{V}$ to $3.6\text{V}$	-	-	0.8	V	
		$V_{CC}=4.5\text{V}$ to $5.5\text{V}$	-	-	$0.3 \times V_{CC}$	V	
HIGH-level output voltage	$V_{OH}$	$V_I = V_{IH}$ or $V_{IL}$	$I_o = -100\mu\text{A}; V_{CC}=1.65\text{V}$ to $5.5\text{V}$	$V_{CC} - 0.1$	-	-	V
			$I_o = -4\text{mA}; V_{CC}=1.65\text{V}$	1.2	-	-	V
			$I_o = -8\text{mA}; V_{CC}=2.3\text{V}$	1.9	-	-	V
			$I_o = -12\text{mA}; V_{CC}=2.7\text{V}$	2.2	-	-	V
			$I_o = -24\text{mA}; V_{CC}=3.0\text{V}$	2.3	-	-	V
			$I_o = -32\text{mA}; V_{CC}=4.5\text{V}$	3.8	-	-	V
LOW-level output voltage	$V_{OL}$	$V_I = V_{IH}$ or $V_{IL}$	$I_o = 100\mu\text{A}; V_{CC}=1.65\text{V}$ to $5.5\text{V}$	-	-	0.1	V
			$I_o = 4\text{mA}; V_{CC}=1.65\text{V}$	-	-	0.45	V
			$I_o = 8\text{mA}; V_{CC}=2.3\text{V}$	-	-	0.3	V
			$I_o = 12\text{mA}; V_{CC}=2.7\text{V}$	-	-	0.4	V
			$I_o = 24\text{mA}; V_{CC}=3.0\text{V}$	-	-	0.55	V
			$I_o = 32\text{mA}; V_{CC}=4.5\text{V}$	-	-	0.55	V
input leakage current	$I_I$	$V_I = 5.5\text{V}$ or GND; $V_{CC} = 0\text{V}$ to $5.5\text{V}$	-	-	$\pm 1$	$\mu\text{A}$	
power-off leakage current	$I_{OFF}$	$V_I$ or $V_O = 5.5\text{V}; V_{CC} = 0\text{V}$	-	-	$\pm 2$	$\mu\text{A}$	
supply current	$I_{CC}$	$V_I = 5.5\text{V}$ or GND; $I_o = 0\text{A}; V_{CC} = 1.65\text{V}$ to $5.5\text{V}$	-	-	4	$\mu\text{A}$	
additional supply current	$\Delta I_{CC}$	per pin; $V_I = V_{CC} - 0.6\text{V}; I_o = 0\text{A}; V_{CC} = 2.3\text{V}$ to $5.5\text{V}$	-	-	500	$\mu\text{A}$	
input capacitance	$C_I$	$V_{CC} = 3.3\text{V}; V_I = \text{GND}$ to $V_{CC}$	-	5	-	pF	

Note: All typical values are measured at  $V_{CC} = 3.3\text{V}$  and  $T_{amb} = 25^{\circ}\text{C}$ .

**DC Characteristics 2**

 (T<sub>amb</sub> = -40°C to +125°C, voltages are referenced to GND (ground=0V), unless otherwise specified.)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit	
HIGH-level input voltage	V <sub>IH</sub>	V <sub>CC</sub> =1.65V to 1.95V	0.65× V <sub>CC</sub>	-	-	V	
		V <sub>CC</sub> =2.3V to 2.7V	1.7	-	-	V	
		V <sub>CC</sub> =2.7V to 3.6V	2.0	-	-	V	
		V <sub>CC</sub> =4.5V to 5.5V	0.7× V <sub>CC</sub>	-	-	V	
LOW-level input voltage	V <sub>IL</sub>	V <sub>CC</sub> =1.65V to 1.95V	-	-	0.35× V <sub>CC</sub>	V	
		V <sub>CC</sub> =2.3V to 2.7V	-	-	0.7	V	
		V <sub>CC</sub> =2.7V to 3.6V	-	-	0.8	V	
		V <sub>CC</sub> =4.5V to 5.5V	-	-	0.3× V <sub>CC</sub>	V	
HIGH-level output voltage	V <sub>OH</sub>	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>	I <sub>O</sub> = -100µA; V <sub>CC</sub> = 1.65V to 5.5V	V <sub>CC</sub> - 0.1	-	-	V
			I <sub>O</sub> = -4mA; V <sub>CC</sub> = 1.65V	0.95	-	-	V
			I <sub>O</sub> = -8mA; V <sub>CC</sub> = 2.3V	1.7	-	-	V
			I <sub>O</sub> = -12mA; V <sub>CC</sub> = 2.7V	1.9	-	-	V
			I <sub>O</sub> = -24mA; V <sub>CC</sub> = 3.0V	2.0	-	-	V
			I <sub>O</sub> = -32mA; V <sub>CC</sub> = 4.5V	3.4	-	-	V
LOW-level output voltage	V <sub>OL</sub>	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>	I <sub>O</sub> = 100µA; V <sub>CC</sub> = 1.65V to 5.5V	-	-	0.1	V
			I <sub>O</sub> = 4mA; V <sub>CC</sub> = 1.65V	-	-	0.70	V
			I <sub>O</sub> = 8mA; V <sub>CC</sub> = 2.3V	-	-	0.45	V
			I <sub>O</sub> = 12mA; V <sub>CC</sub> = 2.7V	-	-	0.60	V
			I <sub>O</sub> = 24mA; V <sub>CC</sub> = 3.0V	-	-	0.80	V
			I <sub>O</sub> = 32mA; V <sub>CC</sub> = 4.5V	-	-	0.80	V
input leakage current	I <sub>I</sub>	V <sub>I</sub> = 5.5V or GND; V <sub>CC</sub> = 0V to 5.5V	-	-	±1	µA	
power-off leakage current	I <sub>OFF</sub>	V <sub>I</sub> or V <sub>O</sub> = 5.5V; V <sub>CC</sub> = 0V	-	-	±2	µA	
supply current	I <sub>CC</sub>	V <sub>I</sub> = 5.5V or GND; I <sub>O</sub> = 0A; V <sub>CC</sub> = 1.65V to 5.5V	-	-	4	µA	
additional supply current	ΔI <sub>CC</sub>	per pin; V <sub>I</sub> = V <sub>CC</sub> - 0.6V; I <sub>O</sub> = 0A; V <sub>CC</sub> = 2.3V to 5.5V	-	-	500	µA	

**AC Characteristics 1**

( $T_{amb} = -40^{\circ}C$  to  $+85^{\circ}C$ , voltages are referenced to GND (ground=0V), unless otherwise specified.)

Parameter	Symbol	Conditions	Min.	Typ. <sup>[1]</sup>	Max.	Unit	
A to Y propagation delay	$t_{PHL}$	see Figure 5	$V_{CC}=1.65V$ to $1.95V$	-	12.5	18.8	ns
			$V_{CC}=2.3V$ to $2.7V$	-	10.5	15.8	ns
			$V_{CC}=2.7V$	-	10	15	ns
			$V_{CC}=3.0V$ to $3.6V$	-	9.5	14.3	ns
			$V_{CC}=4.5V$ to $5.5V$	-	9	13.5	ns
A to Y propagation delay	$t_{PLH}$	see Figure 5	$V_{CC}=1.65V$ to $1.95V$	-	14	21	ns
			$V_{CC}=2.3V$ to $2.7V$	-	10	15	ns
			$V_{CC}=2.7V$	-	9.5	14.3	ns
			$V_{CC}=3.0V$ to $3.6V$	-	8.5	12.8	ns
			$V_{CC}=4.5V$ to $5.5V$	-	7.5	11.3	ns

Note:

[1] Typical values are measured at  $T_{amb} = 25^{\circ}C$  and  $V_{CC} = 1.8V, 2.5V, 2.7V, 3.3V$  and  $5.0V$  respectively.

**AC Characteristics 2**

( $T_{amb} = -40^{\circ}C$  to  $+125^{\circ}C$ , voltages are referenced to GND (ground=0V), unless otherwise specified.)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit	
A to Y propagation	$t_{PHL}$	see Figure 5	$V_{CC}=1.65V$ to $1.95V$	-	-	20.8	ns
			$V_{CC}=2.3V$ to $2.7V$	-	-	17.8	ns
			$V_{CC}=2.7V$	-	-	17	ns
			$V_{CC}=3.0V$ to $3.6V$	-	-	16.3	ns
			$V_{CC}=4.5V$ to $5.5V$	-	-	15.5	ns
A to Y propagation	$t_{PLH}$	see Figure 5	$V_{CC}=1.65V$ to $1.95V$	-	-	23	ns
			$V_{CC}=2.3V$ to $2.7V$	-	-	17	ns
			$V_{CC}=2.7V$	-	-	16.3	ns
			$V_{CC}=3.0V$ to $3.6V$	-	-	14.8	ns
			$V_{CC}=4.5V$ to $5.5V$	-	-	13.3	ns

## Testing Circuit

### AC Testing Circuit

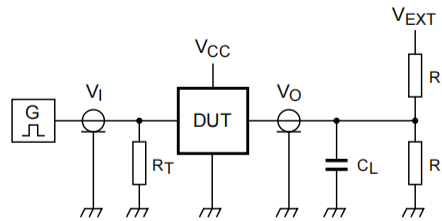


Figure 4. Test circuit for measuring switching times

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.

### AC Testing Waveforms

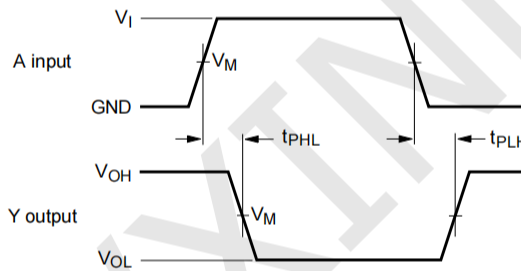


Figure 5. The input A to output Y propagation delays

### Measurement Points

Supply voltage	Input	Output
$V_{CC}$	$V_M$	$V_M$
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	$0.5 \times V_{CC}$	$0.5 \times V_{CC}$

### Test Data

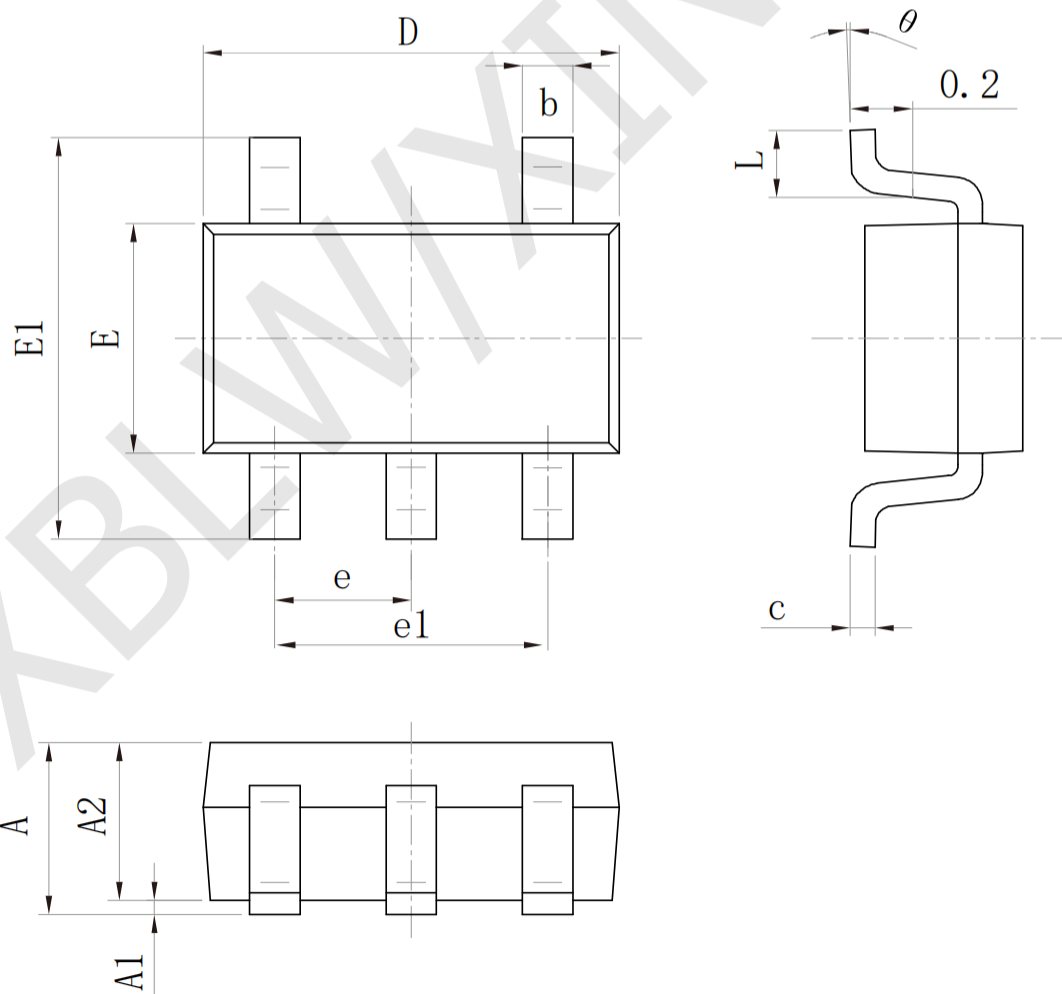
Supply voltage	Input		Load		$V_{EXT}$
	$V_I$	$t_r = t_f$	$C_L$	$R_L$	$t_{PLH}, t_{PHL}$
1.65V to 1.95V	$V_{CC}$	$\leq 3ns$	30pF	1k $\Omega$	open
2.3V to 2.7V	$V_{CC}$	$\leq 3ns$	30pF	500 $\Omega$	open
2.7V	2.7V	$\leq 3ns$	50pF	500 $\Omega$	open
3.0V to 3.6V	2.7V	$\leq 3ns$	50pF	500 $\Omega$	open
4.5V to 5.5V	$V_{CC}$	$\leq 3ns$	50pF	500 $\Omega$	open



**Package Information**

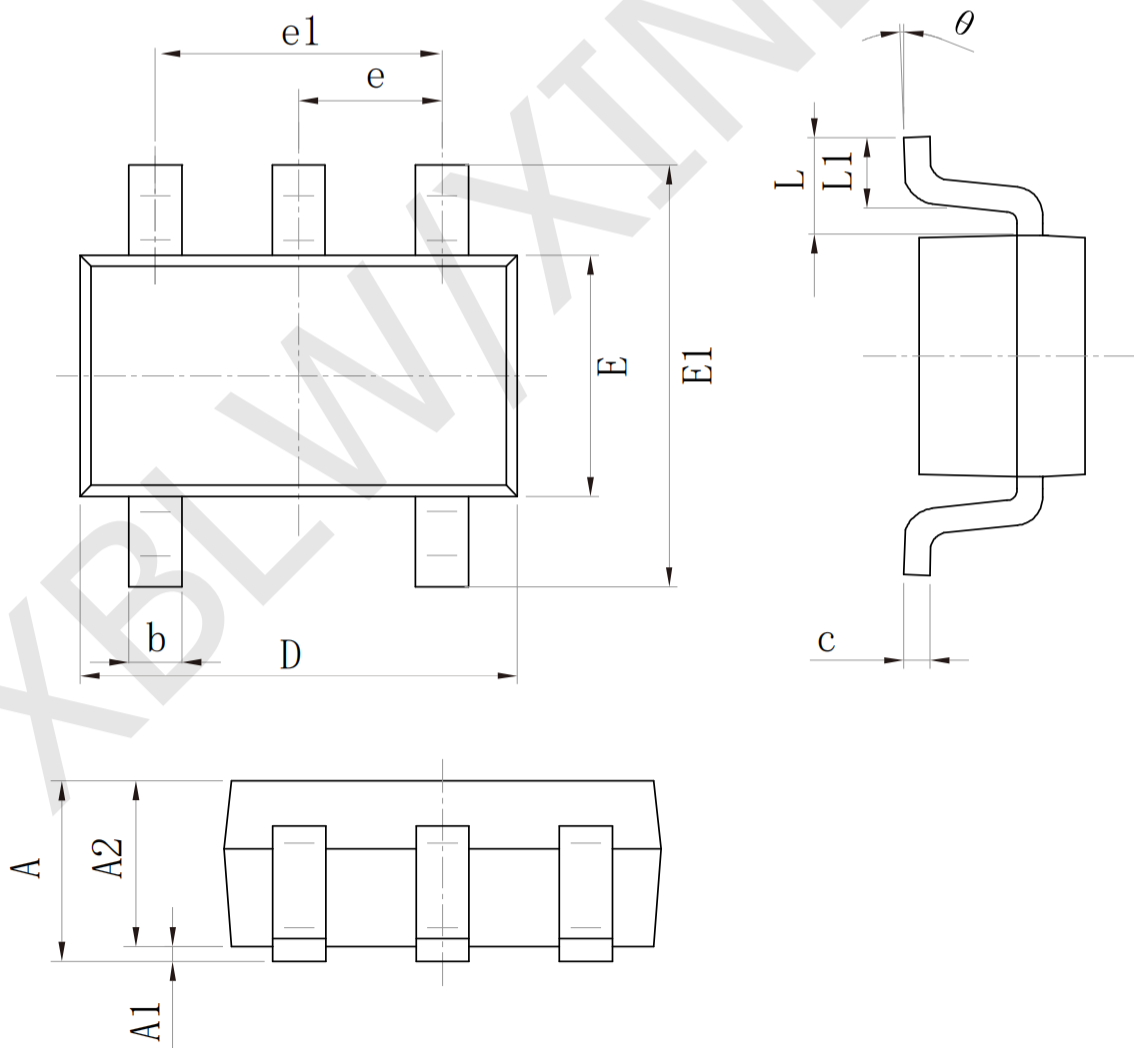
- SOT23-5

SIZE SYMBOL	Dimensions In Millimeters		SIZE SYMBOL	Dimensions In Inches	
	MIN (mm)	MAX (mm)		MIN (in)	MAX (in)
A	1.050	1.250	A	0.041	0.049
A1	0.000	0.100	A1	0.000	0.004
A2	1.050	1.150	A2	0.041	0.045
b	0.300	0.500	b	0.012	0.020
c	0.100	0.200	c	0.004	0.008
D	2.820	3.020	D	0.111	0.119
E	1.500	1.700	E	0.059	0.067
E1	2.650	2.950	E1	0.104	0.116
e	0.95 (BSC)		e	0.037 (BSC)	
e1	1.800	2.000	e1	0.071	0.079
L	0.300	0.600	L	0.012	0.024
θ	0°	8°	θ	0°	8°



• SOT-353

Size Symbol	Dimensions In Millimeters		Size Symbol	Dimensions In Inches	
	Min (mm)	Max (mm)		Min (in)	Max (in)
A	0.900	1.100	A	0.035	0.043
A1	0.000	0.100	A1	0.000	0.004
A2	0.900	1.000	A2	0.035	0.039
b	0.150	0.350	b	0.006	0.014
c	0.080	0.150	C	0.003	0.006
D	2.000	2.200	D	0.079	0.087
E	1.150	1.350	E	0.045	0.053
E1	2.150	2.450	E1	0.085	0.096
e	0.650 (TYP)		e	0.026 (TYP)	
e1	1.200	1.400	e1	0.047	0.055
L	0.525 (REF)		L	0.021 (REF)	
L1	0.260	0.460	L1	0.010	0.018
θ	0°	8°	θ	0°	8°



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