1.5MHz 800mA Synchronous Step Down Converter

Features

• Soft Start • Internal Current Limit
• High Efficiency – Up to 93%
• Very Low Quiescent Current of 24uA
• Guaranteed 800mA Output Current
• 1.5MHz Constant Frequency Operation
• Internal Synchronous Rectifier Eliminates Schottky Diode
• Adjustable Output Voltages From 0.6V to VIN
• Fixed Output Voltage Options Available
• 100% Duty Cycle Low-Dropout Operation
• 0.1uA Shutdown Current
• Tiny SOT23-5L Package

Applications

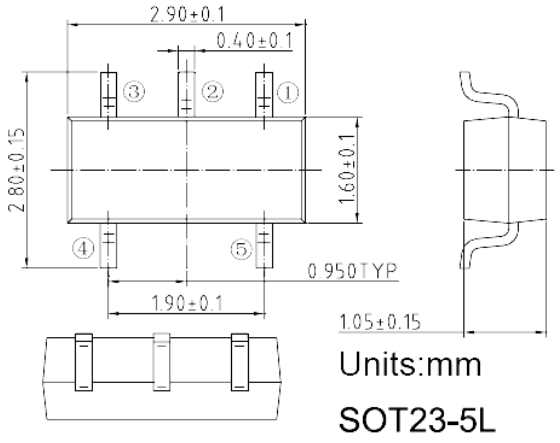
• Blue Tooth Headsets
• Portable Audio Players
• Mobile Phones
• Wireless and DSL Modems
• Digital Cameras
• Portable Instruments

General Description

The TG1611 is a fixed-frequency current-modes Synchronous PWM step down converter that is capable of delivering 800mA of output current while achieving peak efficiency of 93%.Under light load conditions, the TG1611 operates in a proprietary pulse skipping mode that consumes just 24uA of supply current, maximizing battery life in portable applications. The TG1611 operates with a fixed frequency of 1.5MHz, minimizing noise in noise-sensitive applications and allowing the use of small external components. The TG1611 is an ideal solution for applications powered by Li-Ion batteries or other portable applications that require small board space.

The TG1611 is available in a variety of fixed output voltage options, 1.5V,1.8V, 2.5V and is also available in an adjustable output voltage version capable of generating output voltage version from 0.6V to VIN. The TG1611 is available in the tiny 5-pin SOT23-5L package.

Pin Configurations



- **Absolute Maximum Ratings**

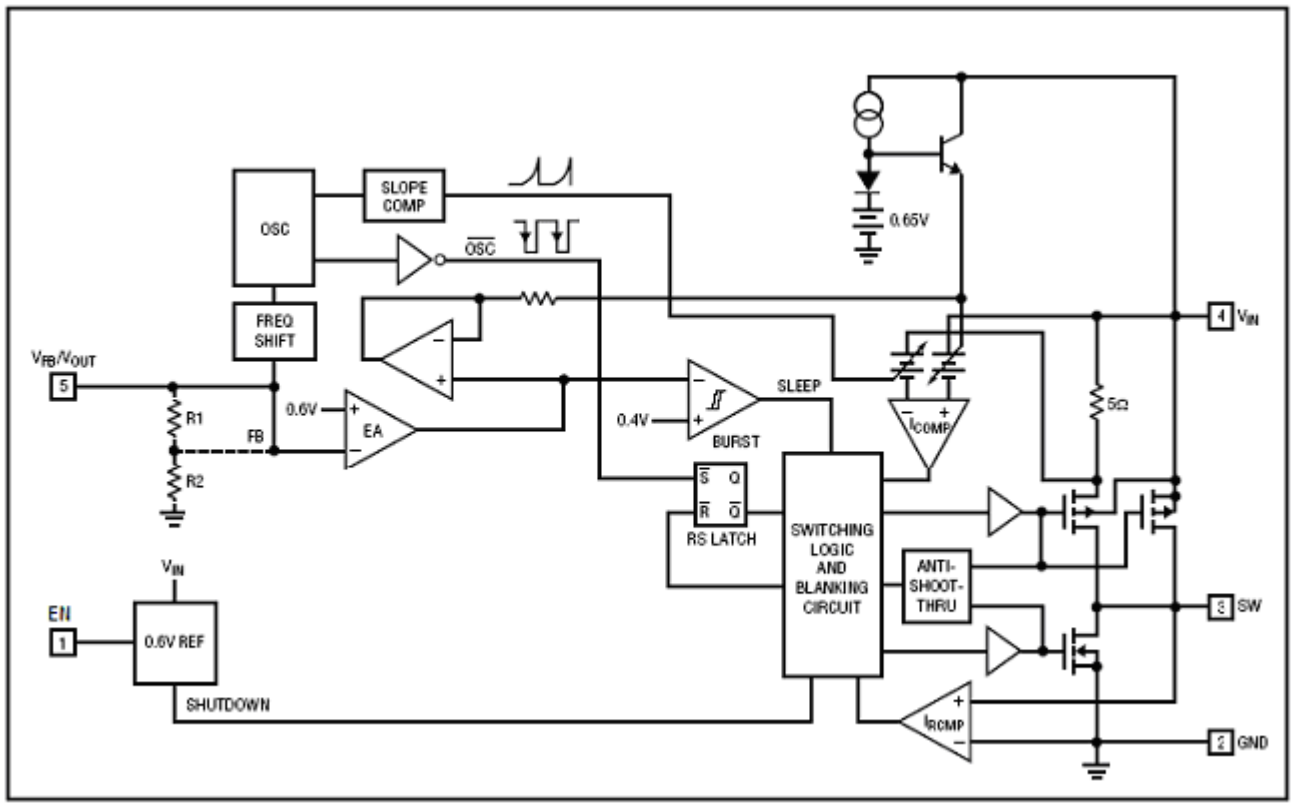
Parameter	Symbol	Ratings	Unit
IN Pin Voltage	VIN	-0.3 to 7V	V
FB Pin Voltage	V_{FB}	-0.3 to 7V	V
EN Pin Voltage	V_{EN}	-0.3 to 7V	V
SW Pin Voltage	Vsw	-0.3 to VIN + 0.3	V
Continuous SW Current	Isw	Internally limited	A
Maximum Power Dissipation (derate 5.3mW/℃ above T_A=50℃)	P_D	530	mW
Operating Junction Temperature	Topr	-40 to + 150	℃
Storage Temperature Range	Tstg	-55 to + 150	
Lead Temperature (Soldering, 10 seconds)	Tsolder	300	

- **Electrical Characteristics**

(VIN=VEN=3.6V,TA= 25℃ Cin=4.7uF Cout=10uF all capacitors are ceramic, unless otherwise specified.)

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Input Voltage Range	V_{IN}		2.5		6.5	V
Under Voltage Lockout Threshold	VUVLO	VIN rising, hysteresis =0.1V	2.25	2.4	2.5	V
Operating Supply Current		VFB=60%,IOUT=0	--	586	--	uA
Standby Supply Current		VFB=105%,IOUT=0	--	22	33	uA
Shutdown Supply Current		VEN=0V,VIN=4.2V	--	0.1	5	uA
Adjustable Version Regulation Voltage	VFB	TA=25℃	0.591	0.6	0.609	V
		0℃<TA<85℃	0.588	0.6	0.612	V
		-40℃<TA<85℃	0.582	0.6	0.618	V
Fixed Output Regulation voltage	VOUT	TG1611-152SK	1.473	1.5	1.527	V
		TG1611-182SK	1.768	1.8	1.832	
		TG1611-252SK	2.455	2.5	2.545	
Output Voltage Line Regulation		VIN=3V to 5V	--	0.016	0.4	%/V
Output Voltage Load Regulation		Iout=10mA to 500mA	--	0.5	--	%
Inductor Current Limit	ILIM	VIN=3.6V,VFB=90% of $V_{out(NOM)}$	--	0.9	--	A
Oscillator Frequency	fSW	VFB or VOUT in regulation	1.0	1.2	1.5	MHz
		VFB or VOUT=80% of $V_{OUT(NOM)}$	--	360	--	KHz
PMOS On Resistance	RONP	ISW=-100mA	--	0.37	0.6	Ω
NMOS On Resistance	RONN	ISW=100mA	--	0.36	0.6	Ω
SW Leakage Current		EN=GND,VIN=5.5V VSW=5.5V	--	--	1	uA
EN Logic High Threshold	VIH	VIN=2.7V to 5.5V	1.4	--	--	V
EN Logic Low Threshold	VIL	VIN=2.7V to 5.5V			0.4	V
EN Input Bias Current	IEN	VIN=5.5V,EN=GND or IN		0.01	0.1	uA

- **Typical Block Diagram**



- **Pin Description**

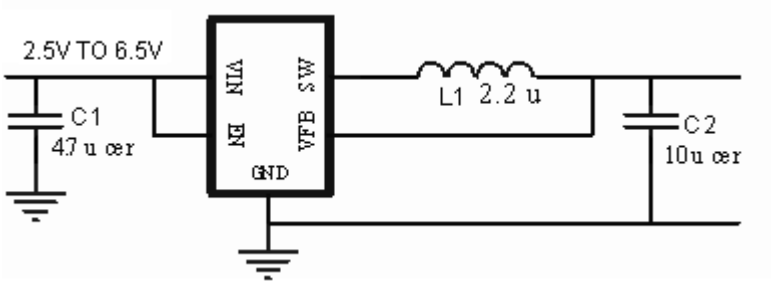
TG1611A/B-①②③④

Deslgnator	Symbol	Description
①②	Output Detection Voltage	18=1.8V,33=3.3V, ADJ=ADJ
③④	Package Type:	SK：SOT23-5L

A	B	Pin Name	Pin Description
①	③	EN	Enable Control Input. Drive EN to IN or to a logic high for normal operation, drive to GND or a logic low to disable the regulator.
②	②	GND	Ground.
③	⑤	SW	Switching Node Output. Connect this pin to the switching end of the inductor.
④	①	IN	Power Input. Bypass to GND as close as possible to the IC with a high quality ceramic capacitor.
⑤	④	FB	Feedback Node. For fixed output voltage options, connects this pin directly to the output. For the Adjustable output version the voltage at this pin is regulated to 0.6V; connect to this pin to the center of the output voltage feedback network.

- **Application Information**

TG1611



Application note:

1、 Inductor Value (Table 1)

Table 1. Typical Inductor Values

VOUT	0.6V to 0.9V	0.9V to 1.8V	>1.8V
L	1.5uH	2.2uH	2.7uH

2、 Cin=4.7uF(ceramic capacitor).

3、 Cout=10uF(ceramic capacitor).

4、 Output Voltage Programming

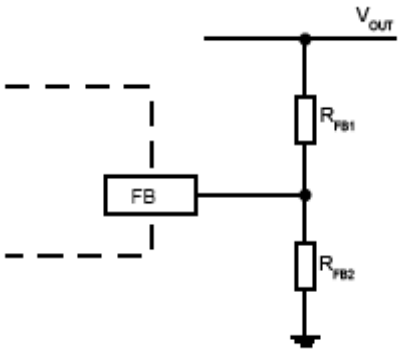


Figure 1. Output Voltage Programming

Figure 1 shows the Feedback network necessary to set the output voltage when the adjustable version is used. Select the proper ratio of the two feedback resistors RFB1 and RFB2 based on the desired output voltage. Typically choose RFB2 ≈100KΩ and determine RFB1 from the output voltage:

$$R_{FB1}=R_{FB2}(\frac{V_{OUT}}{0.6V}-1)$$

Connect a small capacitor across RFB1 for feed forward capacitance at the FB pin:

$$C_{ff}=2\times10^{-5}/R_{FB1}$$

where RFB1=900KΩ use 22pF. When using very low ESR output capacitors, such as ceramic, check for stability while examining load-transient response, and increase the compensation capacitor C1 if needed.

5、Dropout Operation

As the input supply voltage decreases to a value approaching the output voltage, the duty cycle increases toward the maximum on-time. Further reduction of the supply voltage forces the main switch to remain on for move than one cycle until it reaches 100% duty cycle. Possible occurred larger ripple on the low-dropout operation. Recommended operating voltage $V_{IN} \geqslant V_{OUT} + 0.7V$

PCB layout caution

1、The power traces, consisting of the GND trace, the SW trace and the Vin trace should be keep short,direct and wide.

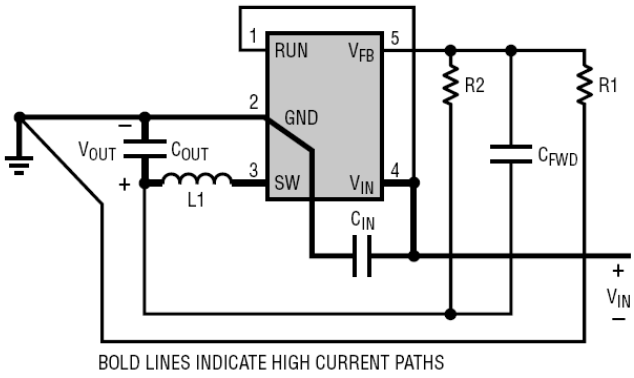
2、Vfb should be connected directly to the feedback resistors, The resistive divider R1/R2 must connected between the (+) plate of Cout and ground.

3、The (+) plate of Cin should be connected to Vin as closely as possible, because this capacitor provides the AC current to the internal power MOSFETS.

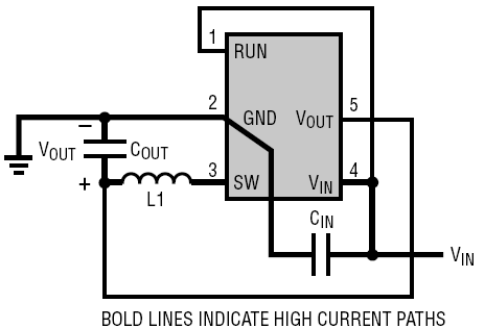
4、Keep the switching node SW away form the sensitive Vfb node

5、Keep the (-) plates of Cin and Cout as close as possible

6、The high current paths

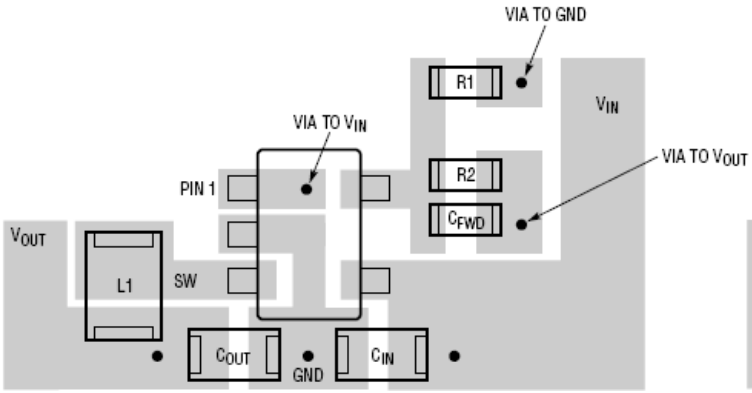


The high current paths for adjustable voltage output

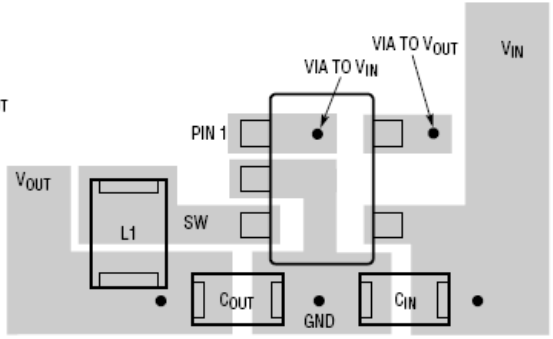


The high current paths for fixed voltage output

7、The recommended PCB layout



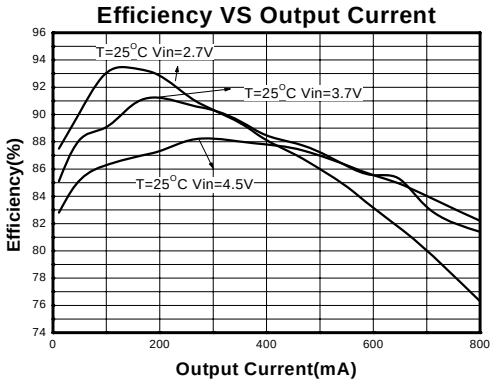
The suggested layout for adjustable

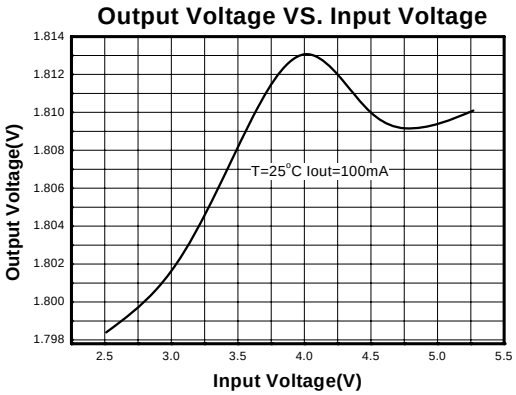


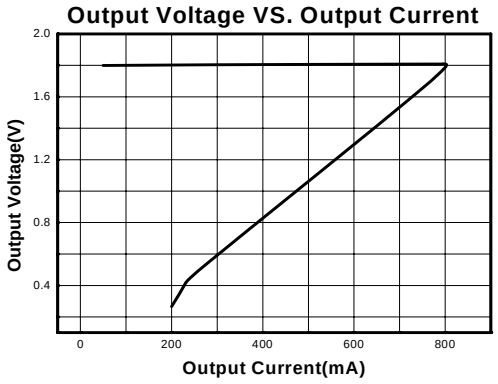
The suggested layout for fixed voltage

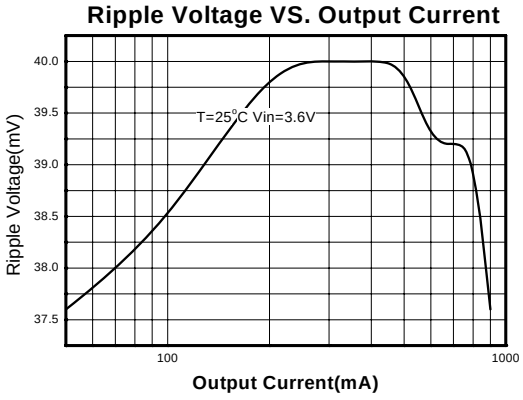
- **Typical Performance Characteristics**

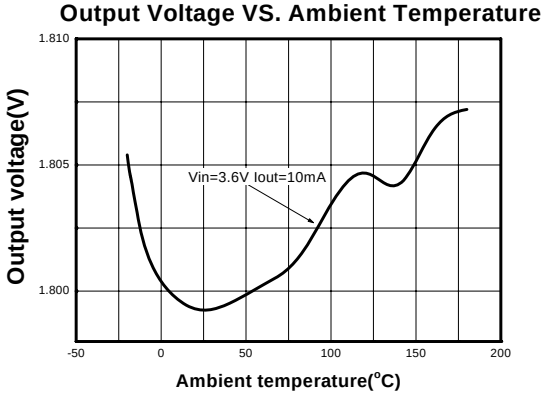
For TG1611A/B-1.8V

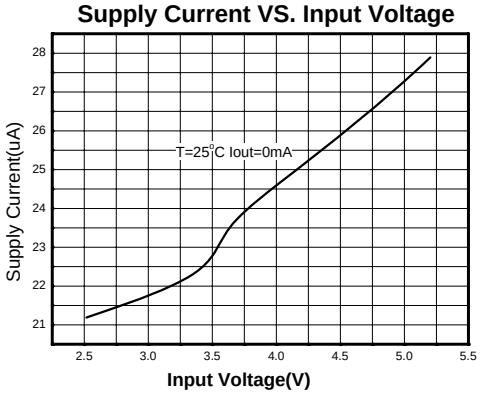




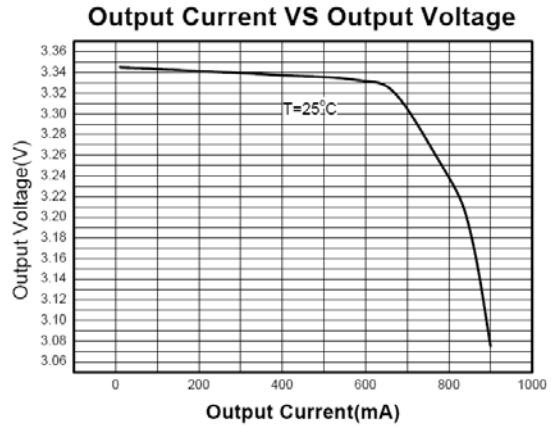


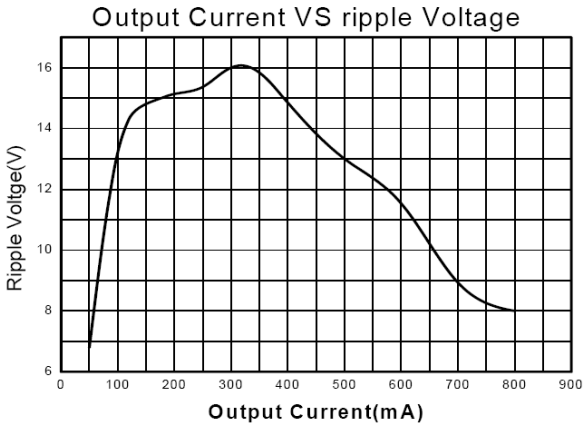


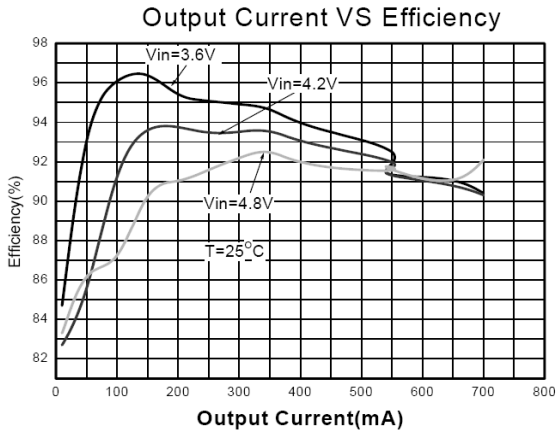


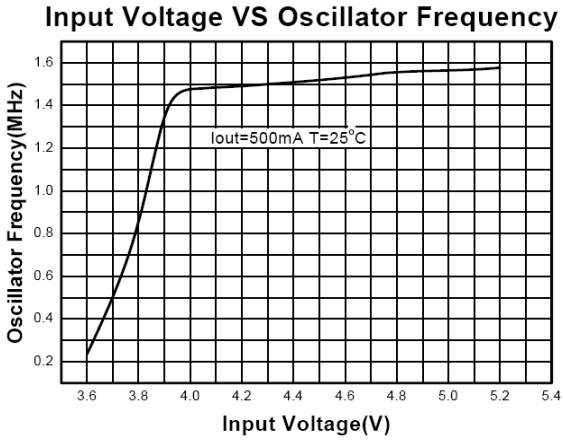


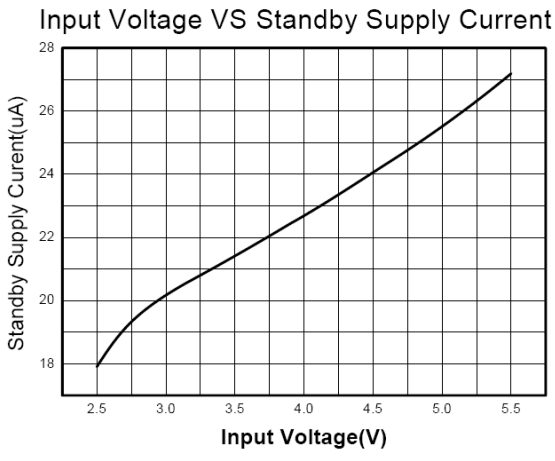
For TG1611A/B-3.3V

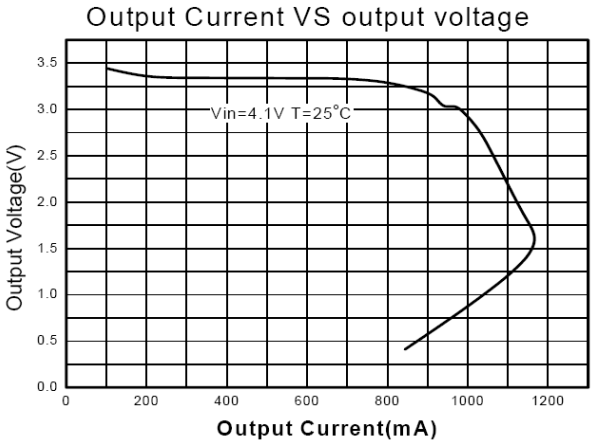






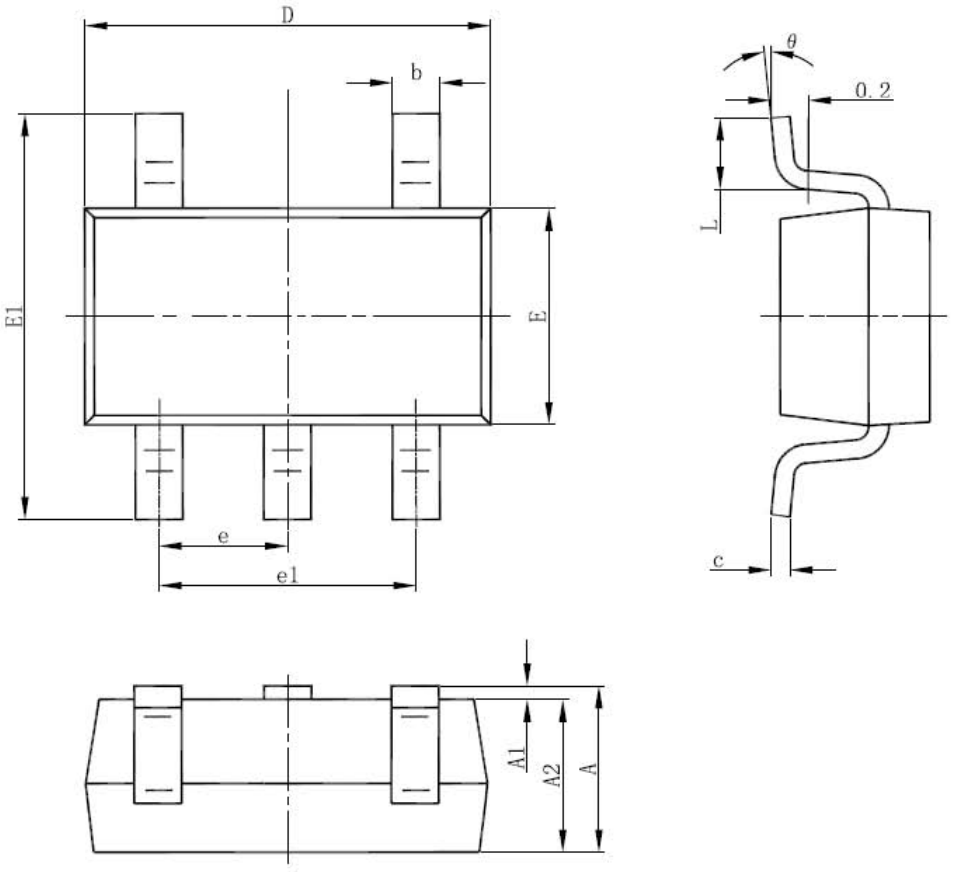






- **Package Information**

SOT-23-5L PACKAGE OUTLINE DIMENSIONS



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	1.800	2.000	0.071	0.079
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°

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