TECH PUBLIC
台舟电子

TP6806C Series

1.5 MHz, 600mA Synchronous Step-Down Converter

www.sot23.com.tw

General Description

The TP6806 is a 1.5MHz constant frequency, slope compensated current mode step down converter. Capable of delivering 600mA output current over a wide input voltage from 2.5V to 5.5V, the TP6806 is ideally suited for single Li-Ion battery powered application.

The TP6806C integrates a main switch and a synchronous rectifier for high efficiency without an external Schottky diode. The TP6806C automatically turns off the synchronous rectifier to increase efficiency while enters discontinuous PWM mode.

The TP6806 can run at 100% duty cycle for low dropout operation, maximizing battery life in portable application. TP6806C consumes less than 1uA when enter shutdown mode.

The TP6806 is available in a fixed output voltages of 1.5V, 1.8V, and 2.5V, and is also available in an adjustable output voltage version capable of generating output voltages from 0.6V to VIN .The TP6806C is available in a 5-pin SOT23-5 package.

Features

- High Efficiency - Up to 95%
- Guaranteed 600mA Output Current
- 2.5V to 5.5V Input Voltage Range
- 1.5MHz Constant Frequency Operation
- No external Schottky Diode Needed
- Adjustable Output Voltages From 0.6V to VIN
- Fixed Output Voltage Options Available
- 100% Duty Cycle Low-Dropout Operation
- 0.1μA Shutdown Current
- SOT23-5 Package

Applications

- Cellular phones
- Blue Tooth Headsets
- Portable Audio Players
- Mobile Phones
- Wireless and DSL Modems
- Digital Still Cameras

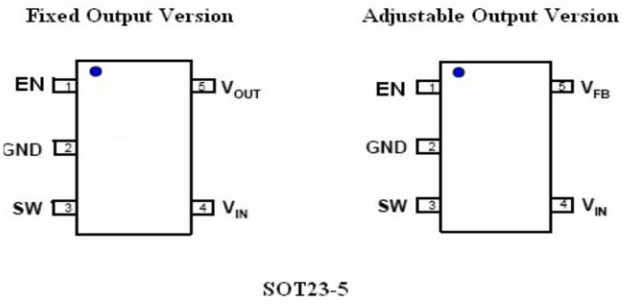
TYPICAL APPLICATION

TP6806C33S5

S5=SOT23-5

33=3.3V
18=1.8V
15=1.5V
12=1.2V
AD=ADJ

PIN CONFIGURATION



Pin	Name	Description
1	EN	Enable control input
2	GND	Ground
3	SW	Switching node, connecting to inductor
4	V_{IN}	Power input
5	V_{FB}/V_{out}	Feedback node. VFB for adjustable version, and Vout for fixed output version

TYPICAL APPLICATION

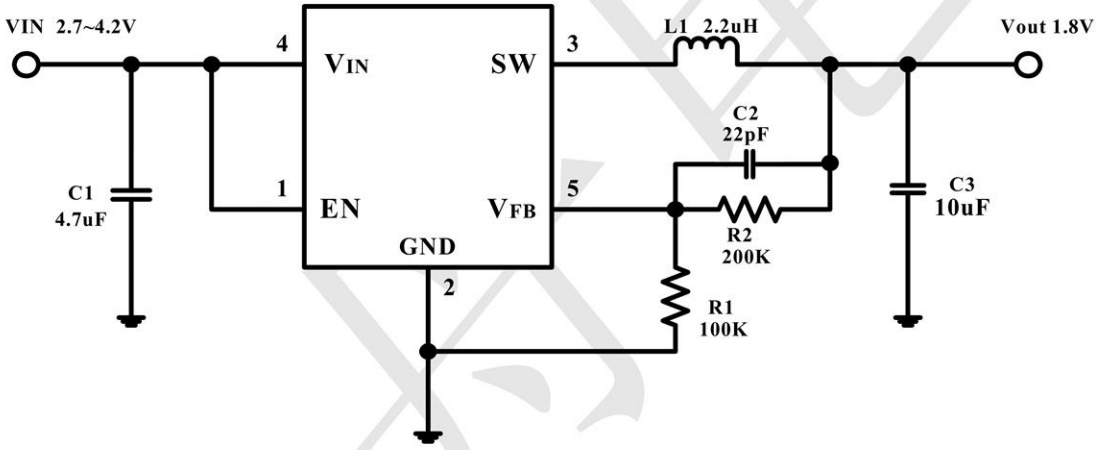


Figure 1: Typical Application Circuit

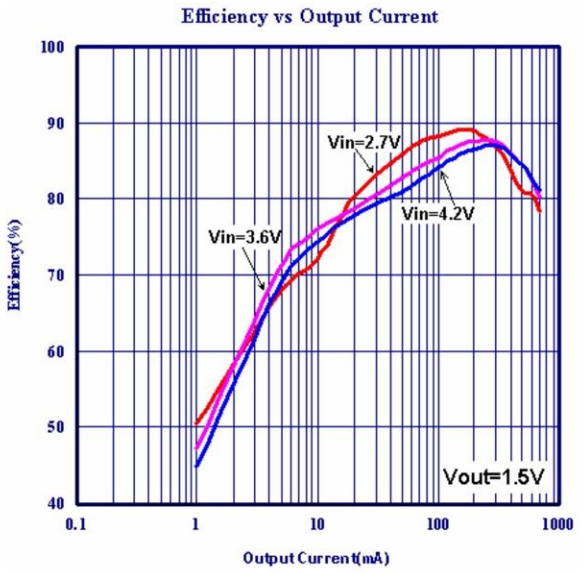
Absolute Maximum Rating (T_A=25°C unless otherwise noted)

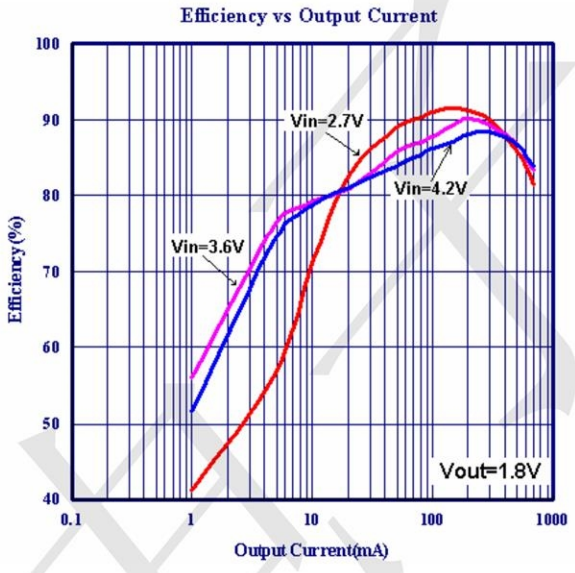
VIN to GND……-0.3V to 6V
EN to GND……-0.3V to (VIN+0.3)
VFB to GND……-0.3V to (VIN+0.3)
SW to GND……-0.3V to (VIN+0.3)
Peak SW Sink and Source Current……Internally Limited
Junction to Ambient Thermal Resistance (θ_{JA})……250℃/W
Operating Temperature Range……-40℃ to +85℃
Junction Temperature……-40℃ to +150℃
Storage Temperature Range ……-55℃ to +150℃
Lead Temperature (Soldering, 10sec) ……300℃

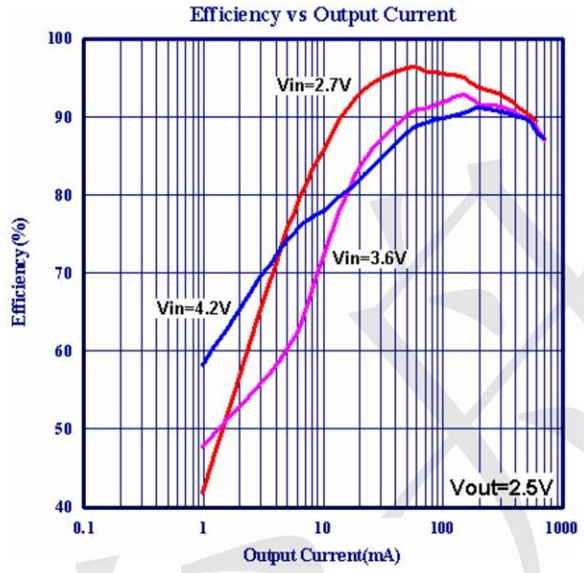
Electrical Characteristics

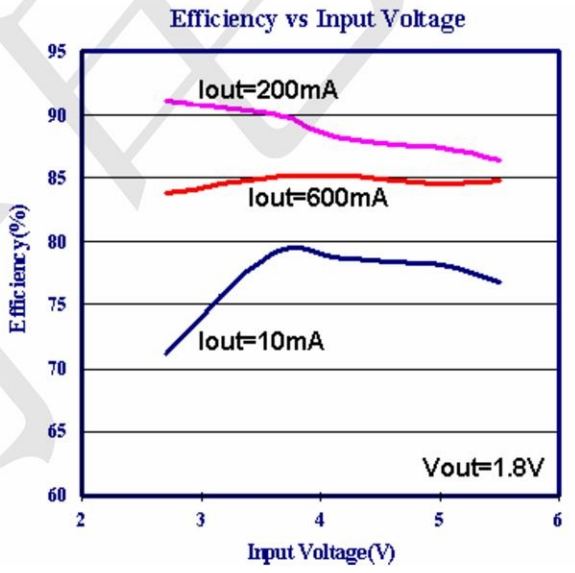
Parameter	Conditions	MIN	TYP	MAX	unit
Input Voltage Range		2.5		5.5	V
Input DC Supply Current Active Mode Shutdown Mode	 V_{FB}=0.5V V_{FB}=0V, V_{IN}=4.2V		 270 0.08	 400 1.0	 μA μA
Regulated Feedback Voltage	T_A = +25°C	0.5880	0.6000	0.6120	V
	T_A= 0°C ≤ T_A ≤ 85°C	0.5865	0.6000	0.6135	V
	T_A= -40°C ≤ T_A ≤ 85°C	0.5850	0.6000	0.6150	V
V_{FB} Input Bias Current	V_{FB} = 0.65V			±30	nA
Reference Voltage Line Regulation	V_{IN} = 2.5V to 5.5V, V_{OUT} = V_{FB} (R2=0)		0.11	0.40	%/V
Regulated Output Voltage	TP6806C12S5	1.164	1.200	1.236	V
	TP6806C15S5	1.455	1.500	1.545	V
	TP6806C18S5	1.746	1.800	1.854	V
Output Voltage Line Regulation	V_{IN} = 2.5V to 5.5V, I_{OUT}=10mA		0.11	0.40	%/V
Output Voltage Load Regulation	I_{OUT} from 10 to 600mA		0.0015		%/mA
Maximum Output Current	V_{IN} = 3.0V	600			mA
Oscillator Frequency	V_{FB}=0.6V or V_{OUT}=100%	1.2	1.5	1.8	MHz
$R_{DS(ON)}$ of P-CH MOSFET	I_{SW} = 300mA		0.30	0.50	Ω
$R_{DS(ON)}$ of N-CH MOSFET	I_{SW} = -300mA		0.20	0.45	Ω
Peak Inductor Current	V_{IN}=3V, V_{FB}=0.5V or V_{OUT}=90% Duty Cycle <35%		1.20		A
SW Leakage	V_{RUN} = 0V, V_{SW}= 0V or 5V, V_{IN} = 5V		±0.01	±1	μA
Output over voltage lockout	ΔV_{OVL} = V_{OVL} – V_{FB}		60		mV
RUN Threshold	-40°C ≤ T_A ≤ 85°C	0.3	0.45	1.5	V
RUN Leakage Current			±0.1	±1	μA

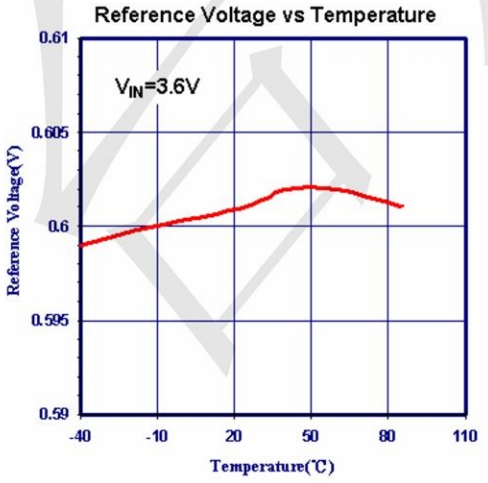
Typical Characteristics

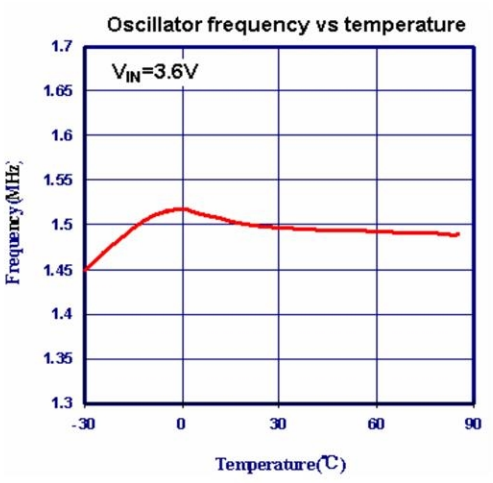




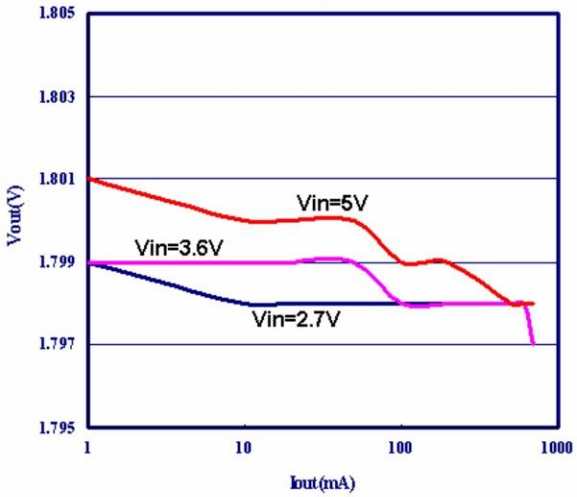




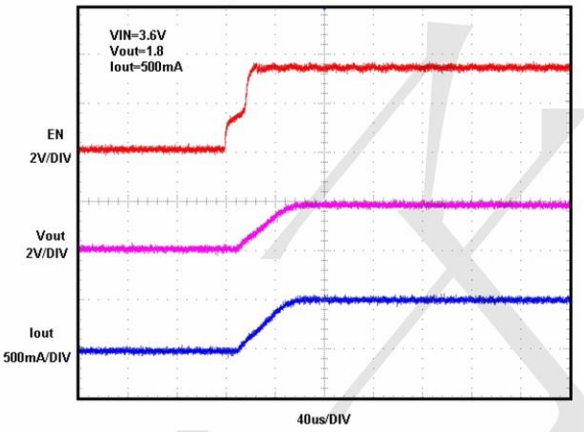




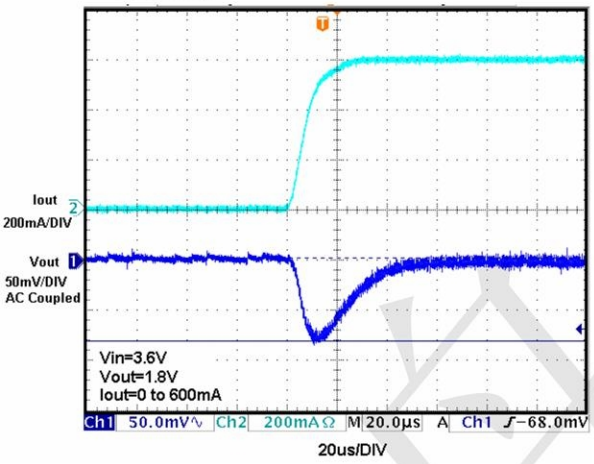
Load Regulation



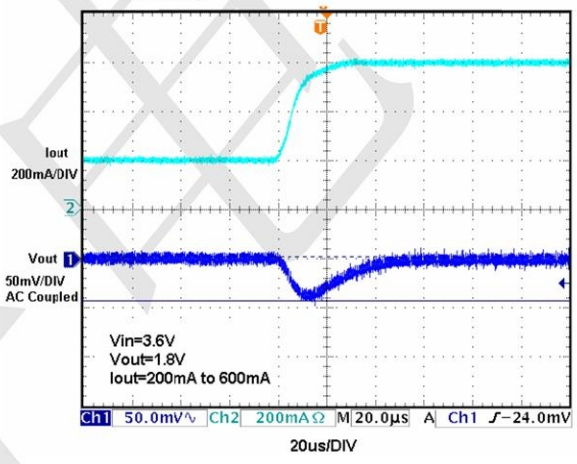
Startup from Shutdown



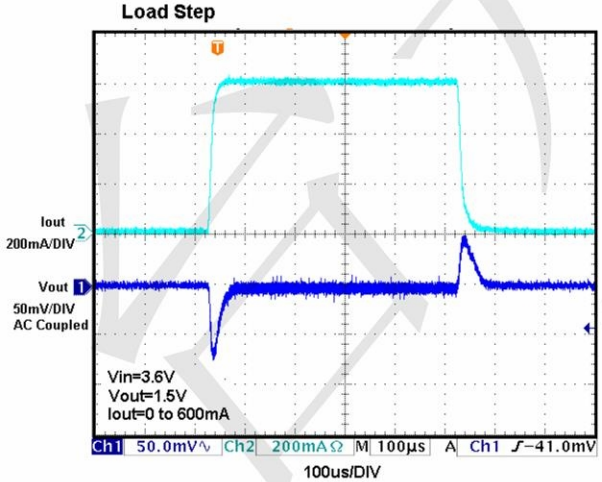
Load Step



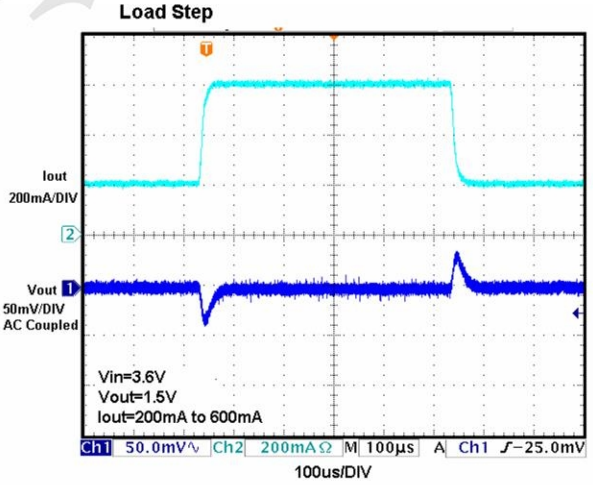
Load Step



Load Step



Load Step



APPLICATION INFORMATION

Figure5 below shows the typical application circuit with TP6806C fixed output versions.

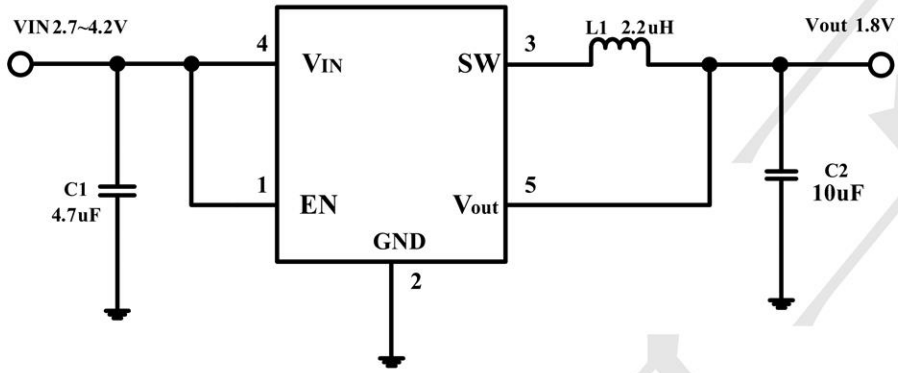


Figure 5: Typical Application Circuit with fixed output versions

Inductor Selection

Under normal operation, the inductor maintains continuous current to the output. Its value is chosen based on the desired ripple current. Large value inductors lower ripple current, and small value inductors result in higher ripple currents. The inductor value can be derived from the following equation:

$L = \frac{V_{out} \times (V_{IN} - V_{out})}{V_{IN} \times \Delta I_L \times f_{osc}}$, Where ΔI_L is inductor ripple current.

Input Capacitor Selection

The input capacitor reduces input voltage ripple to the converter; a 4.7uF ceramic capacitor is recommended for most applications.

Output Capacitor Selection

The output capacitor is required to keep the output voltage ripple small and to ensure regulation loop stability. The output capacitor must have low impedance at the switching frequency. The output ripple ΔVout approximately:

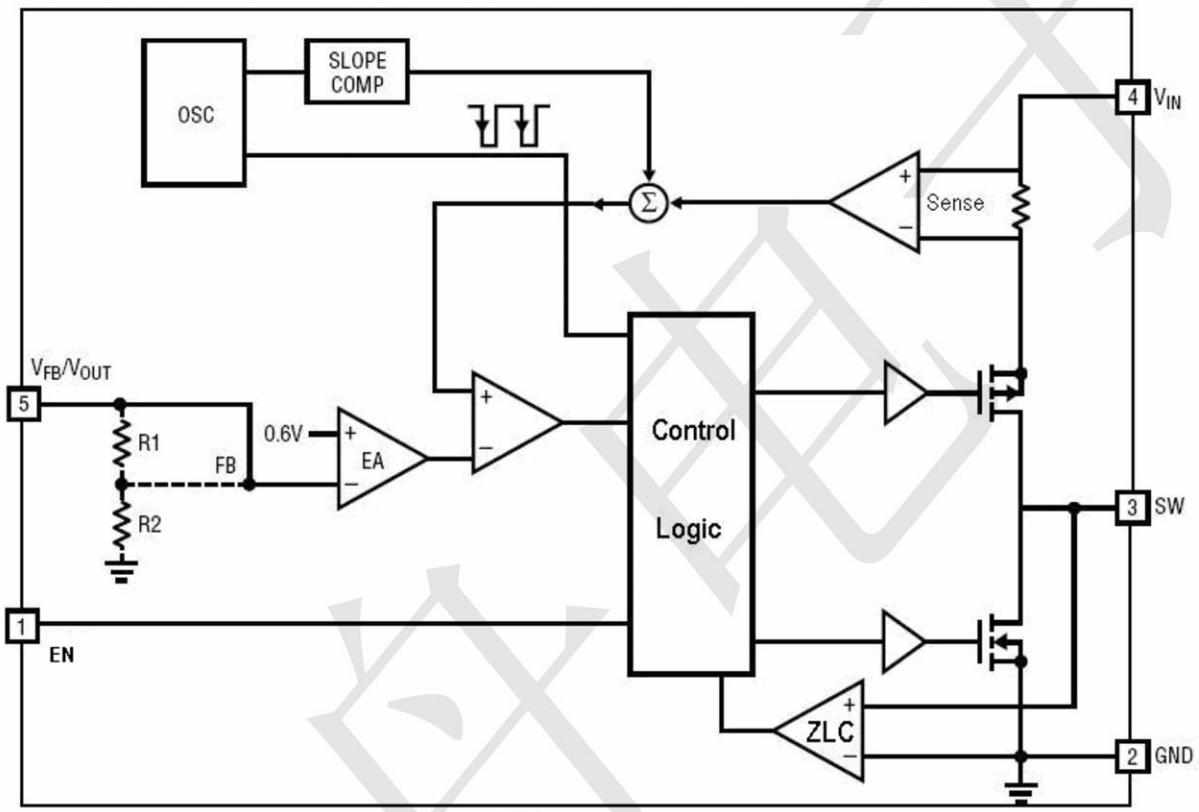
$$\Delta V_{OUT} \cong \Delta I_L \times (ESR + \frac{1}{8fC_{OUT}})$$

Output Voltage Programming

Figure1 above shows the typical application withTP6806C adjustable version. The external resistor sets the output voltage according to following equation:

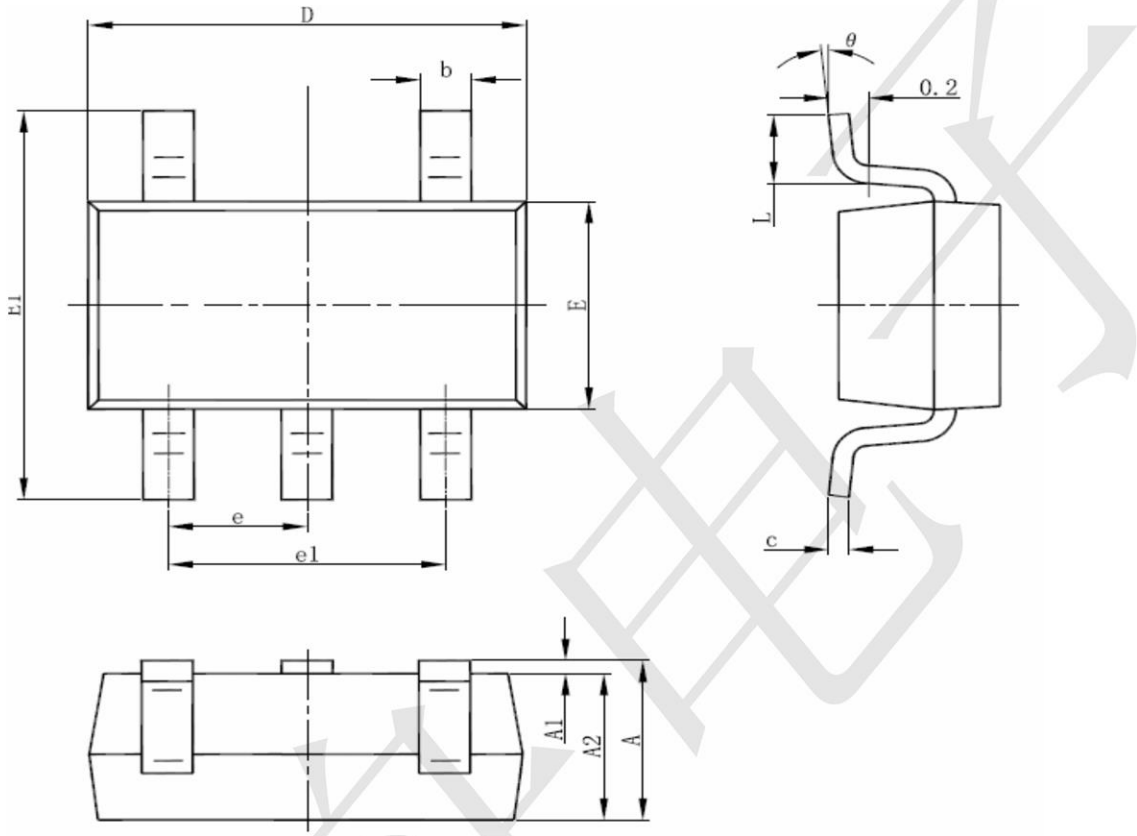
$$V_{OUT} = 0.6V \times (1 + \frac{R2}{R1})$$

BLOCK DIAGRAM



Package information

SOT23-5



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	0.95 (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°	6°