

## Features

- Maximum output current is 1.4A
- Range of operation input voltage: Max 30V
- Line regulation: 0.03%/V (typ.)
- Standby current: 2mA (typ.)
- Load regulation: 0.2%/A (typ.)
- Environment Temperature: -40°C ~ 85°C

## Applications

- Power Management for Computer Mother Board, Graphic Card
- LCD Monitor and LCD TV
- DVD Decode Board
- ADSL Modem
- Post Regulators For Switching Supplies

## General Description

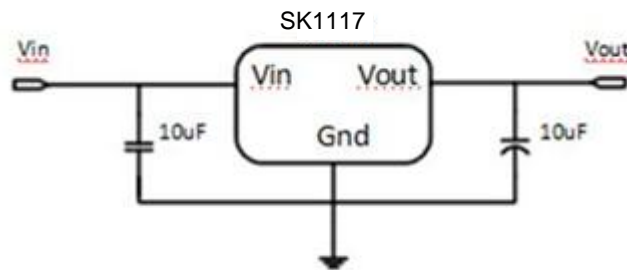
SK1117 is a series of low dropout three-terminal regulators with a dropout of 1.3V at 1A load current. SK1117 features a very low standby current 2mA compared to 5mA of competitor.

Other than a fixed version,  $V_{out} = 1.2V, 1.8V, 2.5V, 2.85V, 3.3V,$  and 5V, SK1117 has an adjustable version, which can provide an output voltage from 1.25 to 12V with only two external resistors.

SK1117 offers thermal shut down function, to assure the stability of chip and power system. And it uses trimming technique to guarantee output voltage accuracy within 2%. Other output voltage accuracy can be customized on demand, such as 1%.

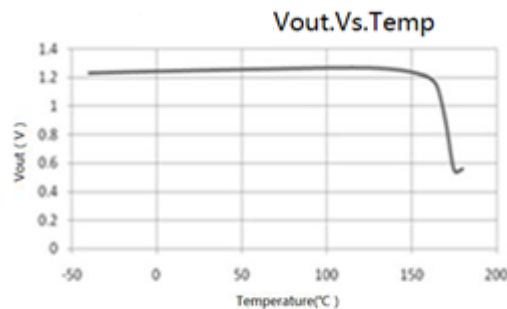
SK1117 is available in SOT-223 package.

## Typical Application

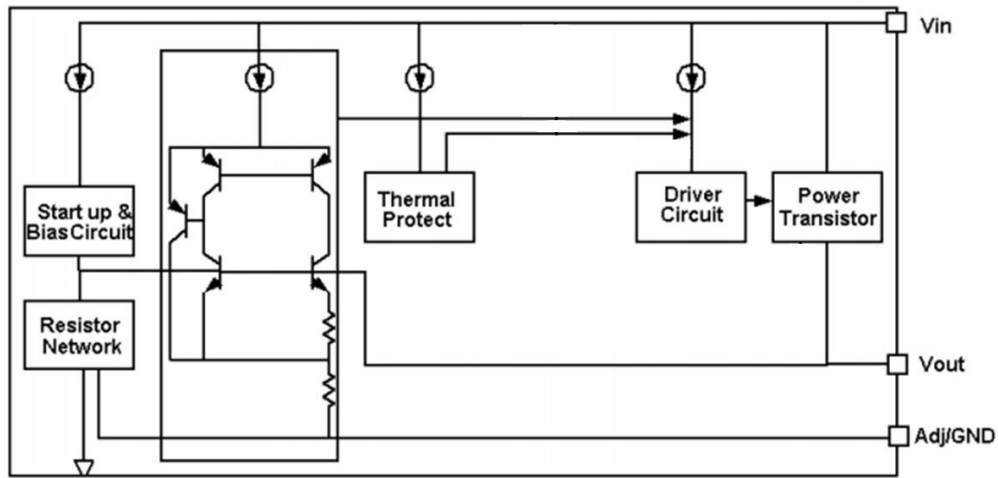


Application circuit of SK1117 fixed version

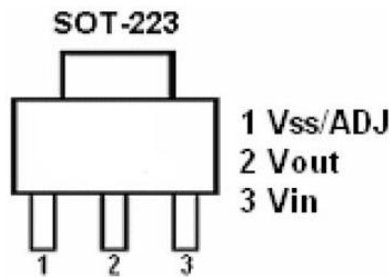
## Typical Electrical Characteristic



Block Diagram



Pin Configuration



Marking

Type number	Marking code
SK1117-1.2	1117-1.2XX
SK1117-1.8	1117-1.8XX
SK1117-2.5	1117-2.5XX
SK1117-2.85	1117-2.85XX
SK1117-3.3	1117-3.3XX
SK1117-5.0	1117-5.0XX
SK1117-ADJ	1117-ADJXX

Absolute Maximum Ratings

Max Input Voltage..... 30V  
 Max Operating Junction Temperature(Tj)..... 150°C  
 Ambient Temperature(Ta) ..... -40°C~ 85°C  
 Storage Temperature(Ts) ..... -40°C~150°C  
 Lead Temperature & Time..... 260°C 10S  
 Caution: Exceed these limits to damage to the device. Exposure to absolute maximum rating conditions may affect device reliability.

Recommended Work Conditions

Recommended maximum input voltage..... 18V  
 Recommended operating junction temperature(Tj) ..... -20~125°C

Thermal Information

Parameter	Package	Rating	Unit
Package thermal resistance	SOT-223	20	°C/W

**Electrical Characteristics**

TA=25°C, unless otherwise noted.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Vref	Reference voltage	SK1117 -Adj 10mA ≤ Iout ≤ 1A, Vin=3.25V	1.225	1.25	1.275	V
Vout	Output voltage	-1.2V 0 ≤ Iout ≤ 1A, Vin=3.2V	1.176	1.2	1.224	V
		-1.8V 0 ≤ Iout ≤ 1A, Vin=3.8V	1.764	1.8	1.836	V
		-2.5V 0 ≤ Iout ≤ 1A, Vin=4.5V	2.45	2.5	2.55	V
		-2.85V 0 ≤ Iout ≤ 1A, Vin=4.85V	2.793	2.85	2.907	V
		-3.3V 0 ≤ Iout ≤ 1A, Vin=5.3V	3.234	3.3	3.366	V
		-5.0V 0 ≤ Iout ≤ 1A, Vin=7.0V	4.9	5	5.1	V

ΔVout	Line regulation	-1.2V Iout=10mA, 2.7V ≤ Vin ≤ 10V		0.03	0.2	%/V
		-ADJ Iout=10mA, 2.75V ≤ Vin ≤ 12V		0.03	0.2	%/V
		-1.8V Iout=10mA, 3.3V ≤ Vin ≤ 12V		0.03	0.2	%/V
		-2.5V Iout=10mA, 4.0V ≤ Vin ≤ 12V		0.03	0.2	%/V
		-2.85V Iout=10mA, 4.35V ≤ Vin ≤ 12V		0.03	0.2	%/V
		-3.3V Iout=10mA, 4.8V ≤ Vin ≤ 12V		0.03	0.2	%/V
		-5.0V Iout=10mA, 6.5V ≤ Vin ≤ 12V		0.03	0.2	%/V

		-1.2V Vin =2.7V, 10mA ≤ Iout ≤ 1A		2	8	mV
		-ADJ Vin =2.75V, 10mA ≤ Iout ≤ 1A		2	8	mV
		-1.8V Vin =3.3V, 10mA ≤ Iout ≤ 1A		3	12	mV

$\Delta V_{out}$	Load regulation	SK1117-2.5V $V_{in} = 4.0V, 10mA \leq I_{out} \leq 1A$	4	16	mV
		-2.85V $V_{in} = 4.35V, 10mA \leq I_{out} \leq 1A$	5	20	mV
		-3.3 $V_{in} = 4.8V, 10mA \leq I_{out} \leq 1A$	6	24	mV
		-5.0 $V_{in} = 6.5V, 10mA \leq I_{out} \leq 1A$	9	36	mV
Vdrop	Dropout voltage	$I_{out} = 100mA$	1.15	1.3	V
		$I_{out} = 1A$	1.3	1.5	V
Imin	Minimum load current	SK1117 -ADJ	2	10	mA
Iq	Quiescent Current	SK1117 -1.2V, $V_{in} = 10V$	2	5	mA
		-1.8V, $V_{in} = 12V$	2	5	mA
		-2.5V, $V_{in} = 12V$	2	5	mA
		-2.85V, $V_{in} = 12V$	2	5	mA
		-3.3V, $V_{in} = 12V$	2	5	mA
		-5.0V, $V_{in} = 12V$	2	5	mA
IAdj	Adjust pin current	SK1117-ADJ $V_{in} = 5V, 10mA \leq I_{out} \leq 1A$	55	120	$\mu A$
Ichange	Iadj change	SK1117-ADJ $V_{in} = 5V, 10mA \leq I_{out} \leq 1A$	0.2	10	$\mu A$
$\Delta V / \Delta T$	Temperature coefficient		$\pm 100$		ppm
$\theta_{JC}$	Thermal resistance	SOT-223	20		$^{\circ}C/W$

Note1: All test are conducted under ambient temperature  $25^{\circ} C$  and within a short period of time 20ms

Note2: Load current smaller than minimum load current of SK1117- ADJ will lead to unstable or oscillation output.

## Detailed Description

SK1117 is a series of low dropout voltage, three terminal regulators. Its application circuit is very simple: the fixed version only needs two capacitors and the adjustable version only needs two resistors and two capacitors to work. It is composed of some modules including start-up circuit, bias circuit, bandgap, thermal shutdown, power transistors and its driver circuit and so on.

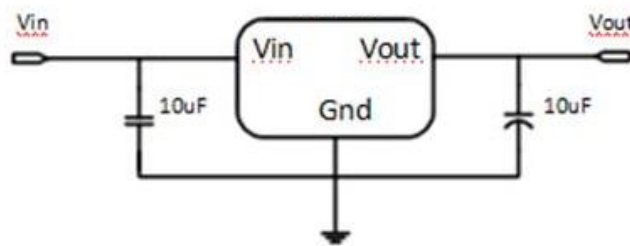
The thermal shut down modules can assure chip and its application system working safety when the junction temperature is larger than 140° C.

The bandgap module provides stable reference voltage, whose temperature coefficient is compensated by careful design considerations. The temperature coefficient is under 100 ppm/°C. And the accuracy of output voltage is guaranteed by trimming technique.

## Typical Application

SK1117 has an adjustable version and six fixed versions (1.2V, 1.8V, 2.5V, 2.85V , 3.3V and 5V)

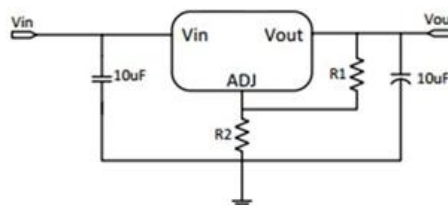
### Fixed Output Voltage Version



Application circuit of SK1117 fixed version

- 1) Recommend using 10uF tan capacitor as bypass capacitor (C1) for all application circuit.
- 2) Recommend using 10uF tan capacitor to assure circuit stability.

### Adjustable Output Voltage Version



Application Circuit of SK1117-ADJ

The output voltage of adjustable version follows the equation:  $V_{out} = 1.25 \times (1 + R2/R1) + I_{Adj} \times R2$ . We can ignore  $I_{Adj}$  because  $I_{Adj}$  (about 50uA) is much less than the current of  $R1$  (about 2~10mA).

- 1) To meet the minimum load current (>10mA) requirement,  $R1$  is recommended to be 125ohm or lower. As SK1117-ADJ can keep itself stable at load current about 2mA,  $R1$  is not allowed to be higher than 625ohm.

2) Using a bypass capacitor ( $C_{ADJ}$ ) between the ADJ pin and ground can improve ripple rejection. This bypass capacitor prevents ripple from being amplified as the output voltage is increased. The impedance of  $C_{ADJ}$  should be less than  $R1$  to prevent ripple from being amplified. As  $R1$  is normally in the range of  $100\Omega\sim 500\Omega$ , the value of  $C_{ADJ}$  should satisfy this equation:  $1/(2\pi \times f_{ripple} \times C_{ADJ}) < R1$ .

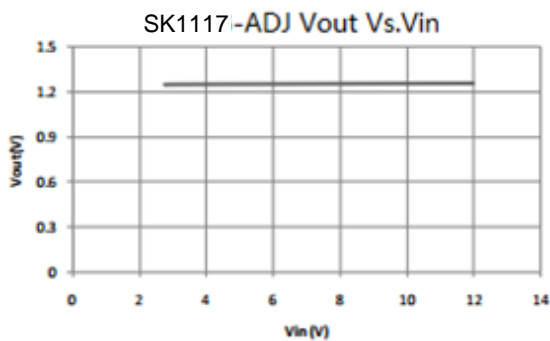
### Thermal Considerations

We have to take heat dissipation into great consideration when output current or differential voltage of input and output voltage is large. Because in such cases, the power dissipation consumed by SK1117 is very large. SK1117 series uses SOT-223 package type and its thermal resistance is about  $20^{\circ}\text{C}/\text{W}$ . And the copper area of application board can affect the total thermal resistance. If copper area is  $5\text{cm} \times 5\text{cm}$  (two sides), the resistance is about  $30^{\circ}\text{C}/\text{W}$ . So the total thermal resistance is about  $20^{\circ}\text{C}/\text{W} + 30^{\circ}\text{C}/\text{W}$ . We can decrease total thermal resistance by increasing copper area in application board. When there is no good heat dissipation copper area in PCB, the total thermal resistance will be as high as  $120^{\circ}\text{C}/\text{W}$ , then the power dissipation of SK1117 could allow on itself is less than 1W. And furthermore, SK1117 will work at junction temperature higher than  $125^{\circ}\text{C}$  under such condition and no lifetime is guaranteed.

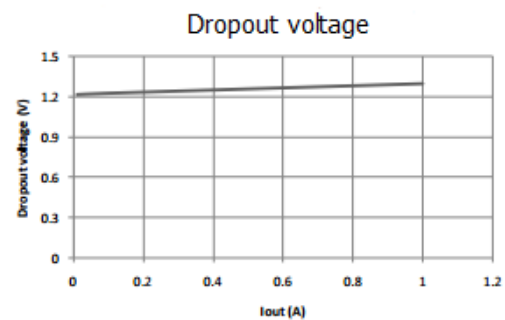
### Typical Performance Characteristics

$T_A=25^{\circ}\text{C}$ , unless otherwise noted.

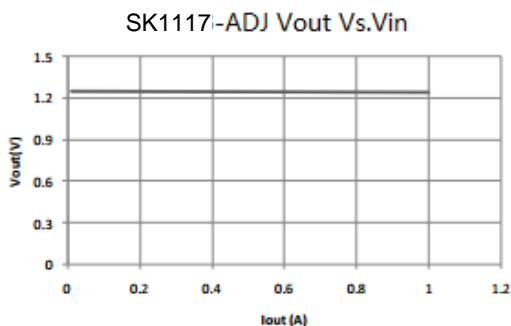
#### Line regulation



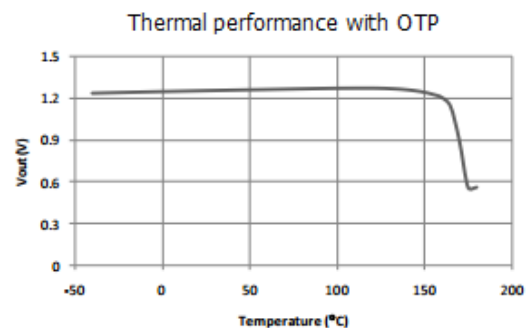
#### Dropout voltage



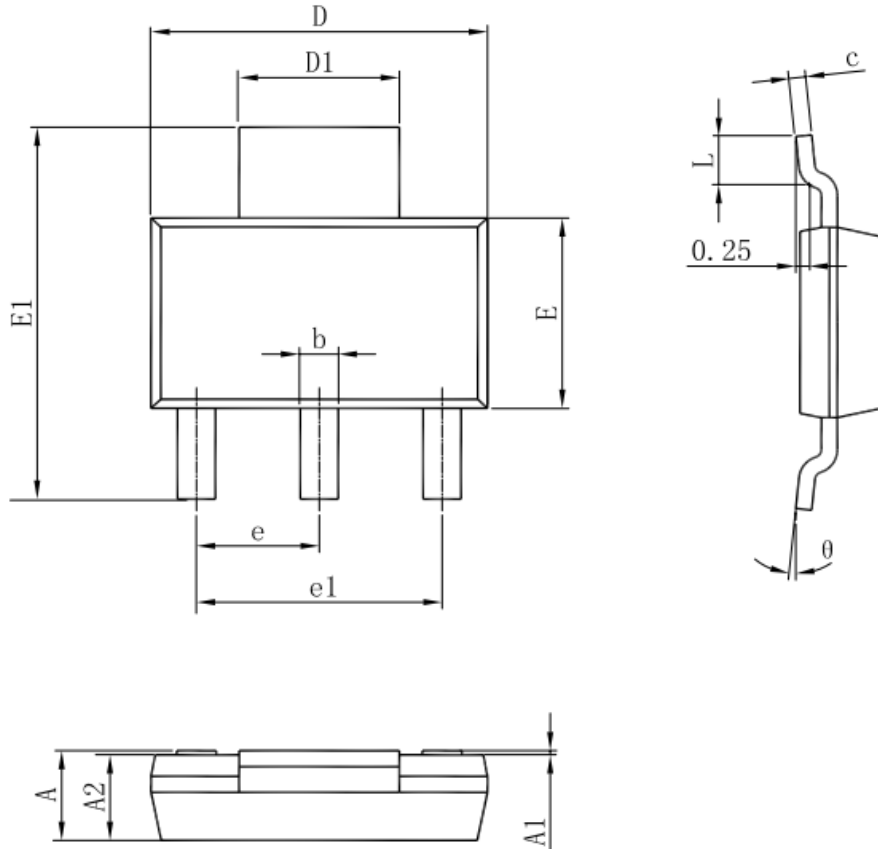
#### Load regulation



#### Thermal performance with OTP



SOT-223 PACKAGE OUTLINE DIMENSIONS



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.520	1.800	0.060	0.071
A1	0.000	0.100	0.000	0.004
A2	1.500	1.700	0.059	0.067
b	0.660	0.820	0.026	0.032
c	0.250	0.350	0.010	0.014
D	6.200	6.400	0.244	0.252
D1	2.900	3.100	0.114	0.122
E	3.300	3.700	0.130	0.146
E1	6.830	7.070	0.269	0.278
e	2.300(BSC)		0.091(BSC)	
e1	4.500	4.700	0.177	0.185
L	0.900	1.150	0.035	0.045
theta	0°	10°	0°	10°