

# BCT1117

## 1A Bipolar Linear Regulator

### Features

- Maximum output current is 1A
- Range of operation input voltage: Max 15V
- Line Regulation: 0.1%/V(typ.)
- Standby current: 2mA(typ.)
- Load Regulation: 10mV(typ.)
- Environment Temperature:-20°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

### Description

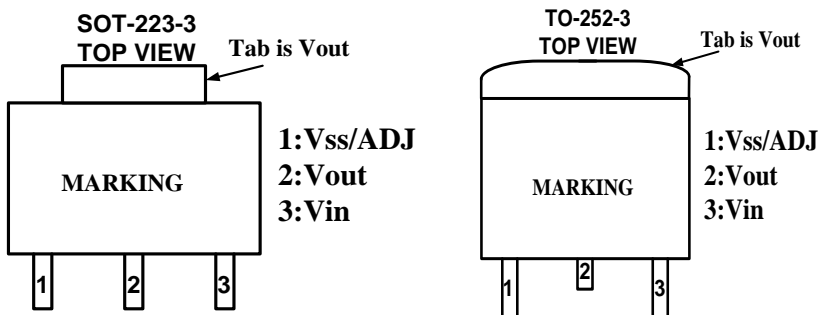
BCT1117 is a series of low dropout three-terminal regulators with a dropout of 1.3V at 1A load current. BCT1117 features a very low standby current 2mA compared to 5mA of competitor.

Other than a fixed version,  $V_{out} = 1.2V, 1.8V, 2.5V, 3.3V, 5V,$  and 12V, BCT1117 has an adjustable version, which can provide an output voltage from 1.25 to 12V with only two external resistors.

BCT1117 offers thermal shut down and current limit functions, 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%.

BCT1117 is available in SOT-223, TO-252 power package.

### Pin Configurations (Top View)



### Pin Functions

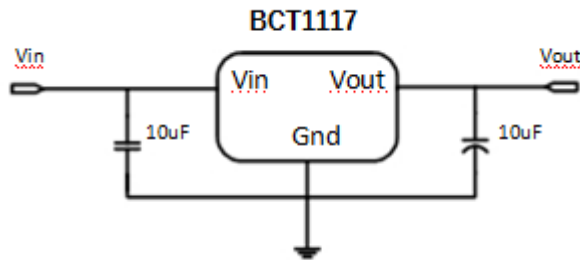
Name	PIN		I/O	DESCRIPTION
	TO-252	SOT-223		
ADJ/GND1	1	1	-	Adjust pin for adjustable output option. Ground Pin for fixed output.
$V_{IN}$	3	3	I	Input voltage pin for the regulator.
$V_{OUT}$	2, Tab	2, Tab	O	Output voltage pin for the regulation.

### Ordering Information

Part	Pin-Package	Temp-Range	Top Mark	Supplied as:
BCT1117ELTXX <sup>1</sup> -TR	SOT-223-3	-40°C to +85°C	1117	3000units/Tape & Reel
BCT1117EOTXX <sup>1</sup> -TR	TO-252-3	-40°C to +85°C	1117	3000units/Tape & Reel

Note 1: XX:voltage version(12:1.2V, 15:1.5V, 18:1.8V, 25:2.5V, 33:3.3V, 50:5.0V, 120:12V, ADJ:Adjustable)

### Typical Application Circuit



### Selection Table

Marking	Part No.	Output Voltage	Package
1117 XXYYZZ	XX=12	1.2V	SOT-223 TO-252
	XX=18	1.8V	
	XX=25	2.5V	
	XX=33	3.3V	
	XX=50	5.0V	
	XX=120	12.0V	
	XX=ADJ	Adjustable	

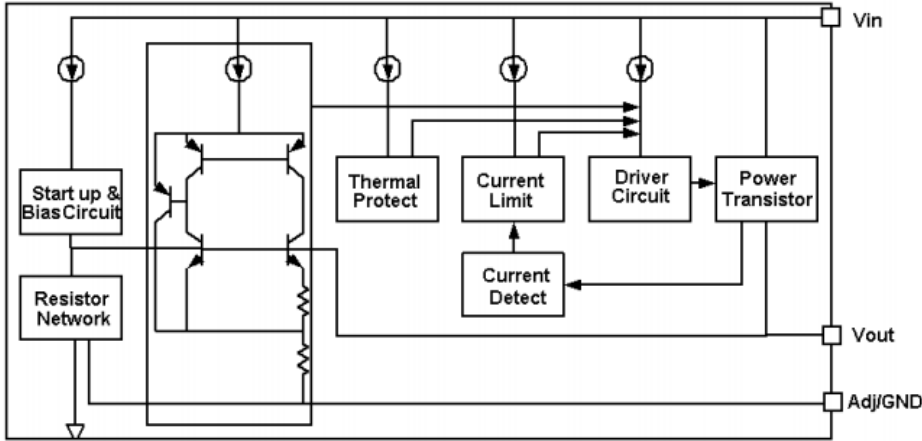
### ORDERING INFORMATION

Marking	Designator	Description
1117 XXYYZZ	1117	Product code
	XX	Output Voltage(1.2~12.0V)
	YY	DATE CODE (YEAR)
	ZZ	DATA CODE (WEEK)

Note:"XX" stands for output voltages. Other voltages can be specially customized

Parameters	Description
Temperature&Rohs	C:-40~85°C, Pb Free Rohs Std.
Package type	L:SOT-223 O:TO-252
PIN number	3
Packing type:	TR: Tape&Reel (Standard)
Voltage accuracy	1%(Customized)

## Block Diagram



## Absolute Maximum Ratings

Max Input Voltage .....	15V	Storage Temperature( $T_s$ ) .....	-40°C~150°C
Max Operating Junction Temperature( $T_j$ ) .....	150°C	Lead Temperature & Time .....	260°C(10S)
Ambient Temperature( $T_a$ ) .....	-40°C~ 85°C		

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.....	12V
Recommended operating junction temperature( $T_j$ ).....	-20~125°C

Exceptional foBCT1117-12V, the maximum input voltage for BCT1117-12V is 20V.

## Thermal Information

Parameter	Package	Rating	Unit
Package thermal resistance	SOT-223	20	°C/W
	TO-252	12.5	°C/W

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**Electrical Characteristics**

 ( $C_{IN}=10\mu F$ ,  $C_{OUT}=10\mu F$ ,  $T_A = 25^\circ C$ , unless otherwise specified.)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Vref	Reference voltage	BCT1117-ADJ $10mA \leq I_{out} \leq 1A$ , $V_{in}=3.25V$	1.225	1.25	1.275	V
Vout	Output voltage	BCT1117-1.2V $0 \leq I_{out} \leq 1A$ , $V_{in}=3.2V$	1.176	1.2	1.224	V
		BCT1117-1.8V $0 \leq I_{out} \leq 1A$ , $V_{in}=3.8V$	1.764	1.8	1.836	V
		BCT1117-2.5V $0 \leq I_{out} \leq 1A$ , $V_{in}=4.5V$	2.45	2.5	2.55	V
		BCT1117-3.3V $0 \leq I_{out} \leq 1A$ , $V_{in}=5.3V$	3.234	3.3	3.366	V
		BCT1117-5.0V $0 \leq I_{out} \leq 1A$ , $V_{in}=7.0V$	4.9	5	5.1	V
		BCT1117-12.0V $0 \leq I_{out} \leq 1A$ , $V_{in}=14V$	11.76	12	12.24	V
$\Delta V_{out}$	Line regulation	BCT1117-1.2V $I_{out}=10mA$ , $2.7V \leq V_{in} \leq 10V$		0.1	0.2	%/V
		BCT1117-ADJ $I_{out}=10mA$ , $2.75V \leq V_{in} \leq 12V$		0.1	0.2	%/V
		BCT1117-1.8V $I_{out}=10mA$ , $3.3V \leq V_{in} \leq 12V$		0.1	0.2	%/V
		BCT1117-2.5V $I_{out}=10mA$ , $4.0V \leq V_{in} \leq 12V$		0.1	0.2	%/V
		BCT1117-3.3V $I_{out}=10mA$ , $4.8V \leq V_{in} \leq 12V$		0.1	0.2	%/V
		BCT1117-5.0V $I_{out}=10mA$ , $6.5V \leq V_{in} \leq 12V$		0.1	0.2	%/V
		BCT1117-1.8V $I_{out}=10mA$ , $13.5V \leq V_{in} \leq 20V$		0.1	0.2	%/V

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(CONTINUED)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$\Delta V_{out}$	Load regulation	BCT1117-1.2V $V_{in} = 2.7V, 10mA \leq I_{out} \leq 1A$		10	30	mV
		BCT1117-ADJ $V_{in} = 2.75V, 10mA \leq I_{out} \leq 1A$		10	30	mV
		BCT1117-1.8V $V_{in} = 3.3V, 10mA \leq I_{out} \leq 1A$		10	30	mV
		BCT1117-2.5V $V_{in} = 4.0V, 10mA \leq I_{out} \leq 1A$		10	30	mV
		BCT1117-3.3 $V_{in} = 4.8V, 10mA \leq I_{out} \leq 1A$		10	30	mV
		BCT1117-5.0 $V_{in} = 6.5V, 10mA \leq I_{out} \leq 1A$		10	30	mV
		BCT1117-12.0V $V_{in} = 13.5V, 10mA \leq I_{out} \leq 1A$		10	30	mV
$V_{drop}$	Dropout voltage	$I_{out} = 100mA$		1.23	1.3	V
		$I_{out} = 1A$		1.3	1.5	V
$I_{limit}$	Current limit	$V_{in} - V_{out} = 2V; T_j = 25^\circ C$	1			A
$I_{min}$	Minimum load current	BCT1117-ADJ		2	10	mA
$I_q$	Quiescent Current	BCT1117-1.2V, $V_{in} = 10V$		2	5	mA
		BCT1117-1.8V, $V_{in} = 12V$		2	5	mA
		BCT1117-2.5V, $V_{in} = 12V$		2	5	mA
		BCT1117-3.3V, $V_{in} = 12V$		2	5	mA
		BCT1117-5.0V, $V_{in} = 12V$		2	5	mA
		BCT1117-12.0V, $V_{in} = 20V$		2	5	mA
$I_{Adj}$	Adjust pin current	BCT1117-ADJ $V_{in} = 5V, 10mA \leq I_{out} \leq 1A$		55	120	$\mu A$
$I_{change}$	$I_{adj}$ change	BCT1117-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		$^\circ C/W$
		TO-252		10		

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 BCT1117-ADJ will lead to unstable or oscillation output.

## DETAILED DESCRIPTION

BCT1117 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, current limit, power transistors and its driver circuit and so on.

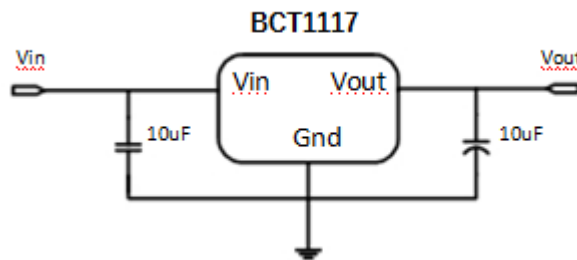
The thermal shut down modules can assure chip and its application system working safety when the junction temperature is larger than 140°C.

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

BCT1117 has an adjustable version and six fixed versions (1.2V, 1.8V, 2.5V, 3.3V, 5V and 12V)

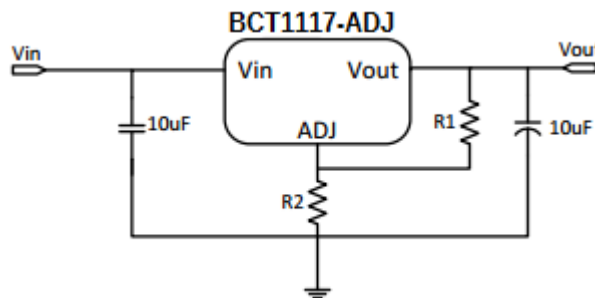
### Fixed Output Voltage Version



Application circuit of BCT1117 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 BCT1117-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

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lower. As BCT1117-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 100Ω~500Ω, the value of  $C_{ADJ}$  should satisfy this equation:  $1/(2\pi \times f_{ripple} \times C_{ADJ}) < R1$ .

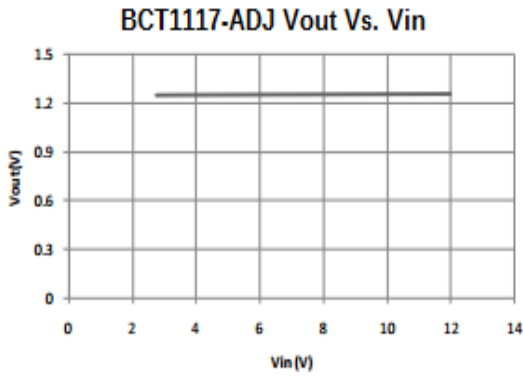
## THERMAL CONSIDERATIONS

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 BCT1117 is very large. BCT1117 series uses SOT-223 package type and its thermal resistance is about 20°C/W. And the copper area of application board can affect the total thermal resistance. If copper area is 5cm\*5cm (two sides), the resistance is about 30°C/W. So the total thermal resistance is about 20°C/W + 30°C/W. We can decrease total thermal resistance by increasing copper area in application board. When there is no good heat dissipation copper are in PCB, the total thermal resistance will be as high as 120°C/W, then the power dissipation of BCT1117 could allow on itself is less than 1W. And furthermore, BCT1117 will work at junction temperature higher than 125°C under such condition and no lifetime is guaranteed.

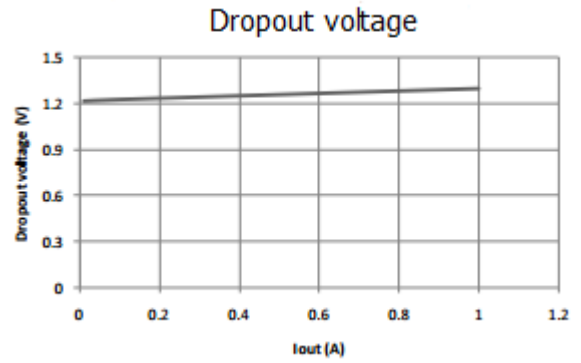
## TYPICAL PERFORMANCE CHARACTERISTICS

(T=25°C unless specified.)

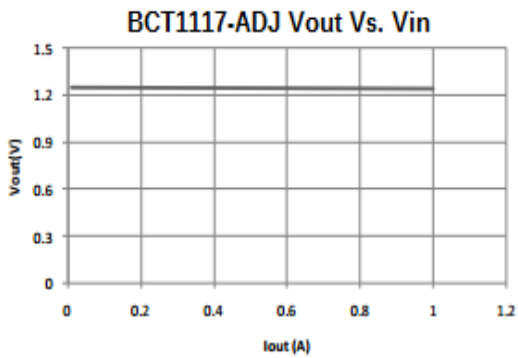
Line regulation



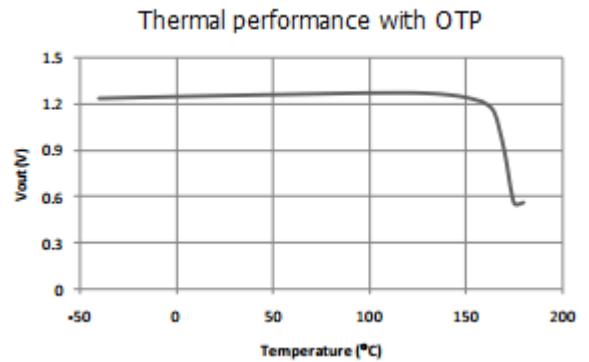
Dropout voltage



Load regulation



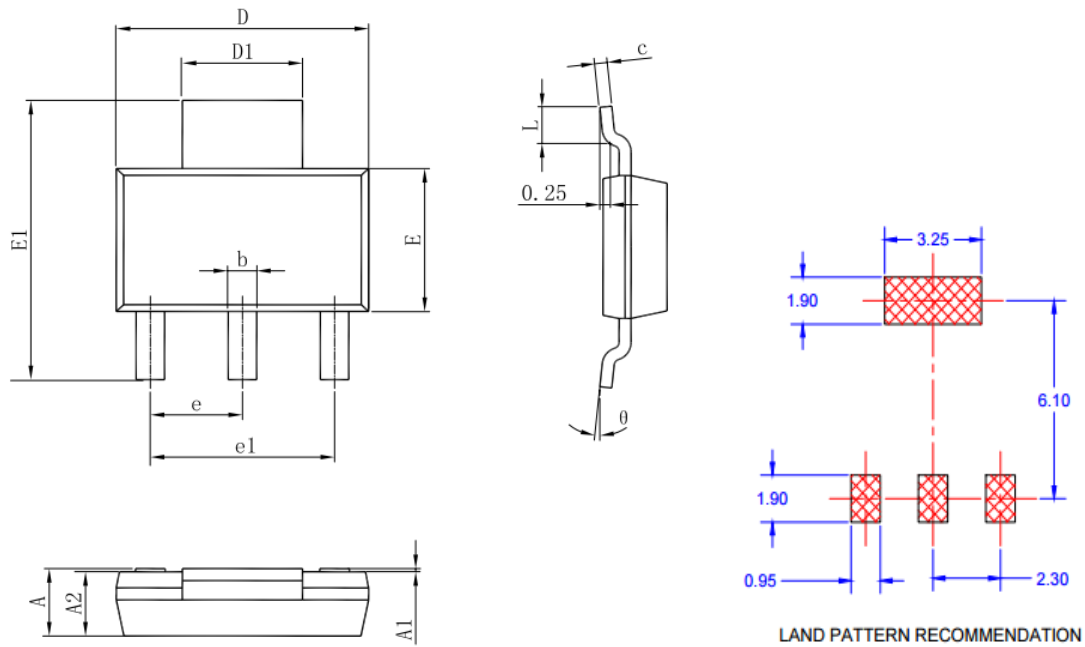
Thermal performance with OTP





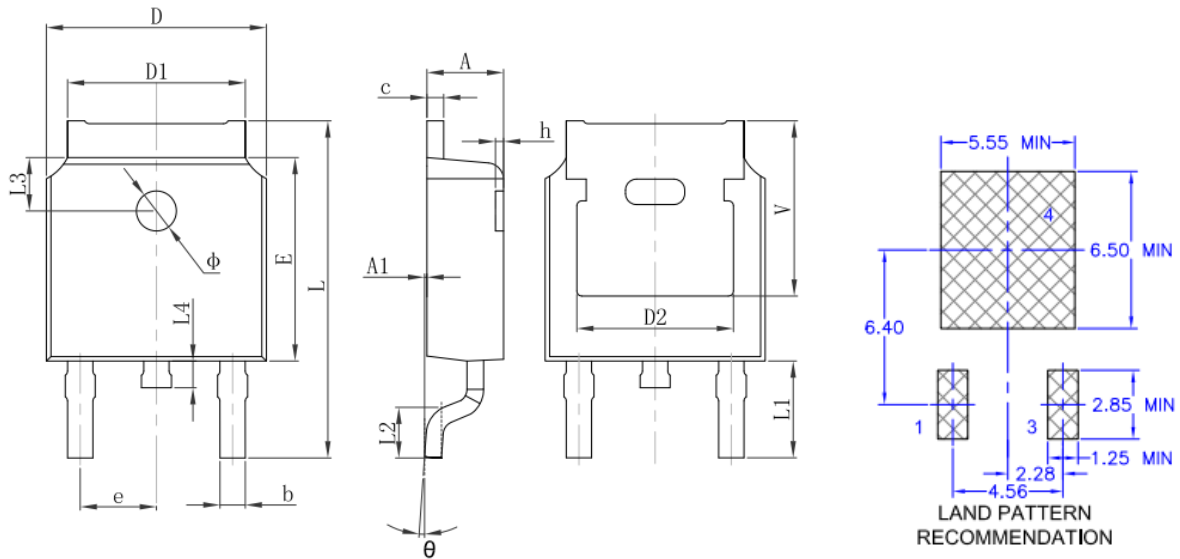
## PACKAGE OUTLINE

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
θ	0°	10°	0°	10°

TO-252-2L PACKAGE OUTLINE DIMENSIONS



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	2.200	2.400	0.087	0.094
A1	0.000	0.127	0.000	0.005
b	0.660	0.860	0.026	0.034
c	0.460	0.580	0.018	0.023
D	6.500	6.700	0.256	0.264
D1	5.100	5.460	0.201	0.215
D2	4.830 REF.		0.190 REF.	
E	6.000	6.200	0.236	0.244
e	2.186	2.386	0.086	0.094
L	9.800	10.400	0.386	0.409
L1	2.900 REF.		0.114 REF.	
L2	1.400	1.700	0.055	0.067
L3	1.600 REF.		0.063 REF.	
L4	0.600	1.000	0.024	0.039
Φ	1.100	1.300	0.043	0.051
θ	0°	8°	0°	8°
h	0.000	0.300	0.000	0.012
V	5.350 REF.		0.211 REF.	