



DESCRIPTION

A1117 is a series of low-dropout three-terminal regulators with a typical dropout of 1.3V at 1A load current.

Besides the fixed voltage version ($V_{OUT} = 1.2V, 1.8V, 2.5V, 2.85V, 3.3V, 5V$), A1117 has an adjustable version that can provide an output voltage from 1.25V to 12V with two external resistors.

A1117 offers thermal shutdown functions to assure the stability of the chip and power system. The trimming technique is used to guarantee output voltage accuracy within $\pm 2\%$.

The A1117 is available in SOT-223 and TO-252 packages.

APPLICATION

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

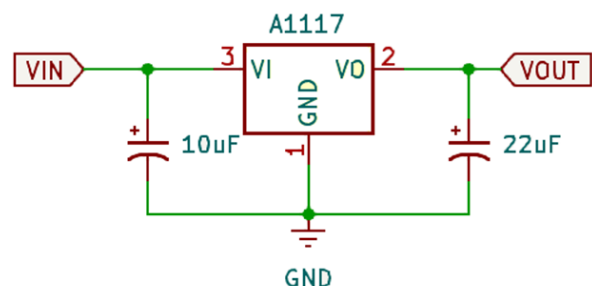
ORDERING INFORMATION

Package Type	Part Number	
SOT-223 SPQ: 2,500pcs/Reel	N	A1117NR-XX
TO-252 SPQ: 2,500pcs/Reel	D	A1117DR-XX
Note	XX: Output Voltage, 12=1.2V, 18=1.8V, 25=2.5V, 285= 2.85V, 33=3.3V, 50=5.0V ADJ= Adjustable R: Tape & Reel	
AiT provides all RoHS products		

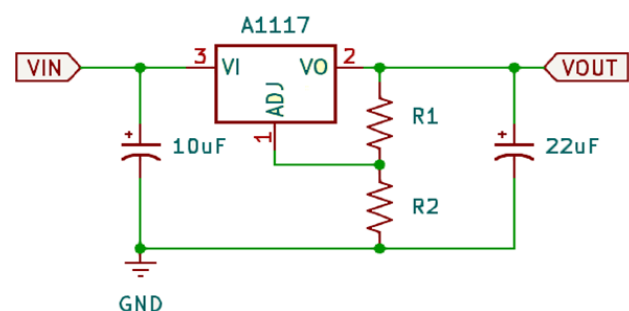
FEATURES

- Maximum Output Current is 1A
- Range of Operation Input Voltage: Max 20V
- Standby Current: 2mA (Typ.)
- Line Regulation: 0.03%/V (Typ.)
- Load Regulation: 0.2%/A (Typ.)
- Compatible with Tantalum Capacitor, Electrolytic Capacitor and MLCC
- Operation Temperature: $-20^{\circ}C \sim 85^{\circ}C$
- Available in SOT-223, TO-252, Packages.

TYPICAL APPLICATION



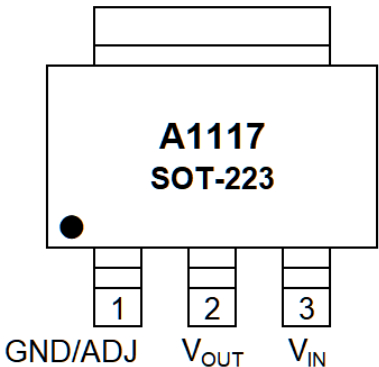
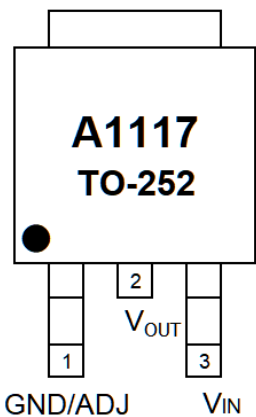
A1117 fixed Version



A1117 ADJ Version



PIN DESCRIPTION

 SOT-223, N Top View			 TO-252, D Top View		
Pin #	SOT-223		TO-252		
	A1117 -XX	A1117 -ADJ	A1117 -XX	A1117 -ADJ	
1	GND	ADJ	GND	ADJ	
2	V _{OUT}	V _{OUT}	V _{OUT}	V _{OUT}	
3	V _{IN}	V _{IN}	V _{IN}	V _{IN}	

Note: A1117-XX is a fixed voltage output regulator. A1117-ADJ is an adjustable voltage output regulator.

ABSOLUTE MAXIMUM RATINGS

Max Input Voltage		30V
T _J , Max Operating Junction Temperature		150°C
T _A , Ambient Temperature		-40°C ~ +85°C
Package Thermal Resistance	SOT-223	20°C/W
	TO-252	12.5°C/W
T _S , Storage Temperature		-40°C ~ +150°C
Lead Temperature & Time 10s		260°C

Stress beyond above listed "Absolute Maximum Ratings" may lead permanent damage to the device. These are stress ratings only and operations of the device at these or any other conditions beyond those indicated in the operational sections of the specifications are not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.



RECOMMENDED WORKING CONDITIONS

Parameter	Symbol	Value	Units
Recommended maximum input voltage	-	20	V
Recommended Operating Junction Temperature	T _J	-20 ~ +125	°C

ELECTRICAL CHARACTERISTICS

T_A = 25°C, unless otherwise noted.

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
Reference Voltage	V _{REF}	10mA ≤ I _{OUT} ≤ 1A, V _{IN} = 3.25V	ADJ	1.225	1.250	1.275	V
Output Voltage	V _{OUT}	0 ≤ I _{OUT} ≤ 1A, V _{IN} = 3.2V	1.2V	1.176	1.200	1.224	V
		0 ≤ I _{OUT} ≤ 1A, V _{IN} = 3.8V	1.8V	1.764	1.800	1.836	
		0 ≤ I _{OUT} ≤ 1A, V _{IN} = 4.5V	2.5V	2.450	2.500	2.550	
		0 ≤ I _{OUT} ≤ 1A, V _{IN} = 4.85V	2.85V	2.793	2.850	2.907	
		0 ≤ I _{OUT} ≤ 1A, V _{IN} = 5.3V	3.3V	3.234	3.300	3.366	
		0 ≤ I _{OUT} ≤ 1A, V _{IN} = 7.0V	5.0V	4.900	5.000	5.100	
Line Regulation	ΔV _{OUT}	I _{OUT} = 10mA, 2.7V ≤ V _{IN} ≤ 12V	1.2V	-	0.03	0.2	% / V
		I _{OUT} = 10mA, 2.75V ≤ V _{IN} ≤ 12V	ADJ				
		I _{OUT} = 10mA, 3.3V ≤ V _{IN} ≤ 12V	1.8V				
		I _{OUT} = 10mA, 4.0V ≤ V _{IN} ≤ 12V	2.5V				
		I _{OUT} = 10mA, 4.35V ≤ V _{IN} ≤ 12V	2.85V				
		I _{OUT} = 10mA, 4.8V ≤ V _{IN} ≤ 12V	3.3V				
Load Regulation	ΔV _{OUT}	I _{OUT} = 10mA, 6.5V ≤ V _{IN} ≤ 12V	5.0V	-	9	36	mV
		V _{IN} = 2.7V, 10mA ≤ I _{OUT} ≤ 1A	1.2V				
		V _{IN} = 2.75V, 10mA ≤ I _{OUT} ≤ 1A	ADJ				
		V _{IN} = 3.3V, 10mA ≤ I _{OUT} ≤ 1A	1.8V				
		V _{IN} = 4.0V, 10mA ≤ I _{OUT} ≤ 1A	2.5V				
		V _{IN} = 4.35V, 10mA ≤ I _{OUT} ≤ 1A	2.85V				
Dropout Voltage	V _{DROP}	V _{IN} = 4.8V, 10mA ≤ I _{OUT} ≤ 1A	3.3V	-	6	24	V
		V _{IN} = 6.5V, 10mA ≤ I _{OUT} ≤ 1A	5.0V	-	9	36	
Dropout Voltage	V _{DROP}	I _{OUT} = 100mA		-	1.15	1.30	V
		I _{OUT} = 1A		-	1.30	1.50	
Minimum Load Current	I _{min}	-	ADJ	-	2	10	mA
Quiescent Current	I _q	V _{IN} = 10V	1.2V	-	2	5	mA
		V _{IN} = 12V	1.8V				
		V _{IN} = 12V	2.5V				
		V _{IN} = 12V	2.85V				
		V _{IN} = 12V	3.3V				
		V _{IN} = 12V	5.0V				
Adjust Pin Current	I _{ADJ}	V _{IN} = 5V, 10mA ≤ I _{OUT} ≤ 1A	ADJ	-	55	120	μA
I _{ADJ} change	I _{CHANGE}	V _{IN} = 5V, 10mA ≤ I _{OUT} ≤ 1A	ADJ	-	0.2	10	μA
Temperature Coefficient	ΔV/ΔT			-	±100	-	ppm
Thermal Resistor	θ _{JC}	SOT-223		-	20	-	°C/W
		TO-252		-	10	-	

NOTE1: All tests conducted under ambient temperature of 25°C and within a short period of time 20ms

NOTE2: Load current smaller than minimum load current of A1117-ADJ will lead to unstable or oscillation output.



TYPICAL PERFORMANCE CHARACTERISTICS

Fig 1. Line Regulation
A1117-ADJ V_{OUT} vs. V_{IN}

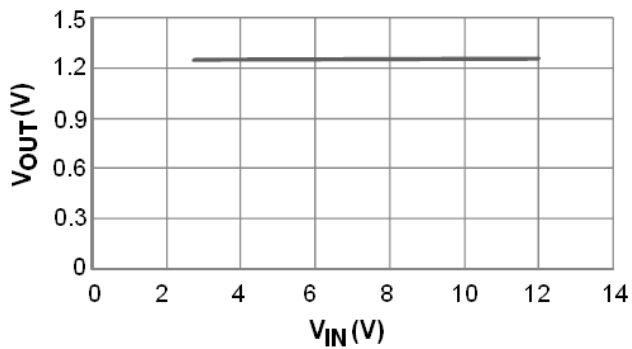


Fig 2. Thermal Performance with OTP

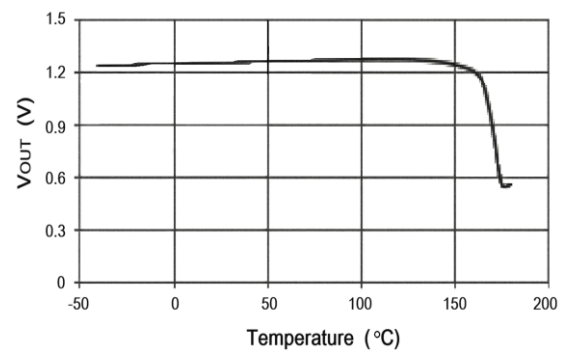


Fig 3. Dropout Voltage
A1117-ADJ Dropout vs. I_{OUT}

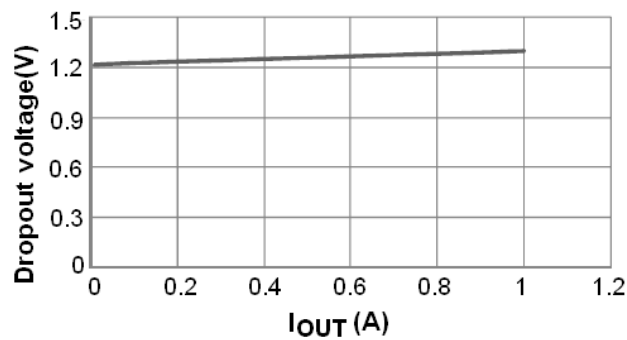
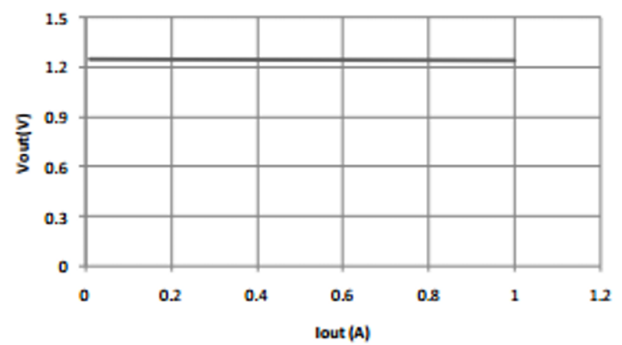
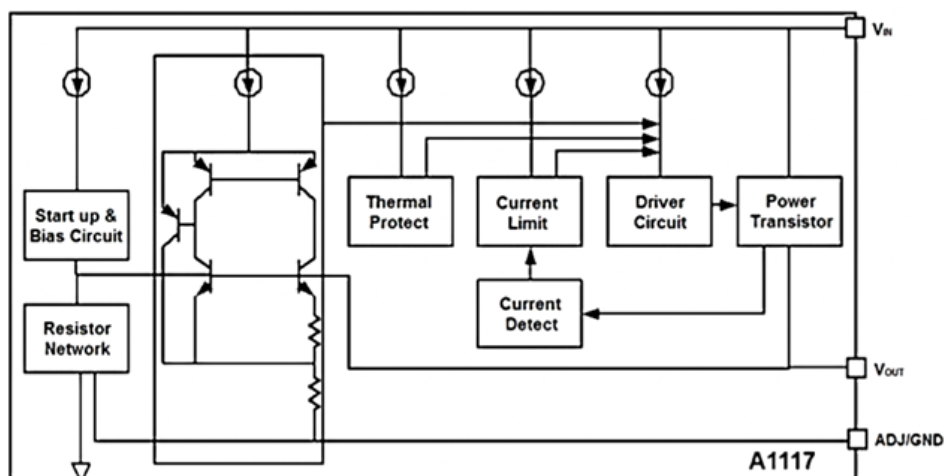


Fig 4. Load Regulation
A1117-ADJ V_{OUT} vs. V_{IN}



BLOCK DIAGRAM





DETAILED DESCRIPTION

A1117 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.

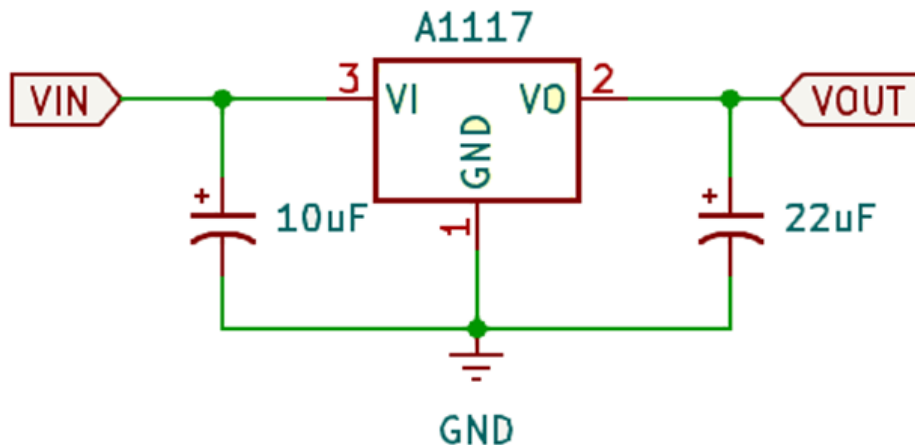
The thermal shut down modules can ensure chip and its application system working safety when the junction temperature is larger than 140°C.

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

A1117 has an adjustable version and fixed versions (1.2V, 1.8V, 2.5V, 2.85V, 3.3V and 5V)

Fixed Output Voltage Version

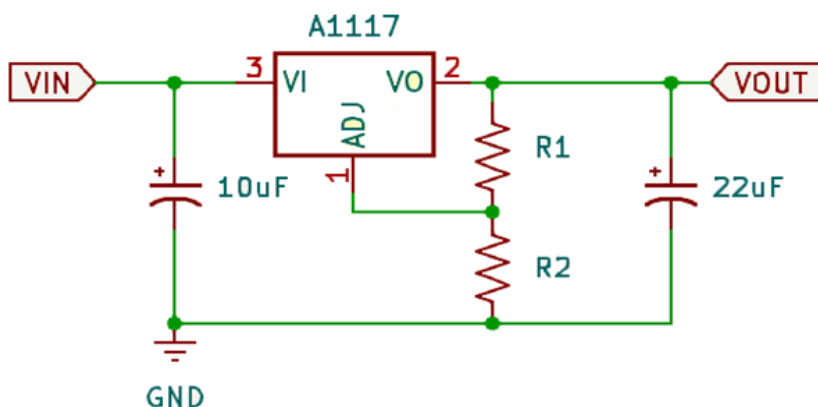


Application circuit of A1117 fixed version

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

**Adjustable Output Voltage Version**

A1117-ADJ provides a 1.25V reference voltage. Any output voltage between 1.25V~12V can be achievable by choosing two external resistors (schematic is shown below), R1 and R2



Application Circuit of A1117-ADJ

The output voltage of adjustable version is determined by the following 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 A1117-ADJ can keep itself stable at load current about 2mA, R1 is not allowed to be higher than 625ohm.
2. Connecting a bypass capacitor (C_{ADJ}) between the ADJ pin and GND improves ripple rejection by preventing input ripple from being amplified as the output voltage increases. To achieve effective ripple suppression, the impedance of C_{ADJ} should be lower than R1 at the ripple frequency. Since R1 is typically between 100Ω and 500Ω, C_{ADJ} should satisfy the following condition:

$$1/(2\pi \times f_{ripple} \times C_{ADJ}) < R1.$$

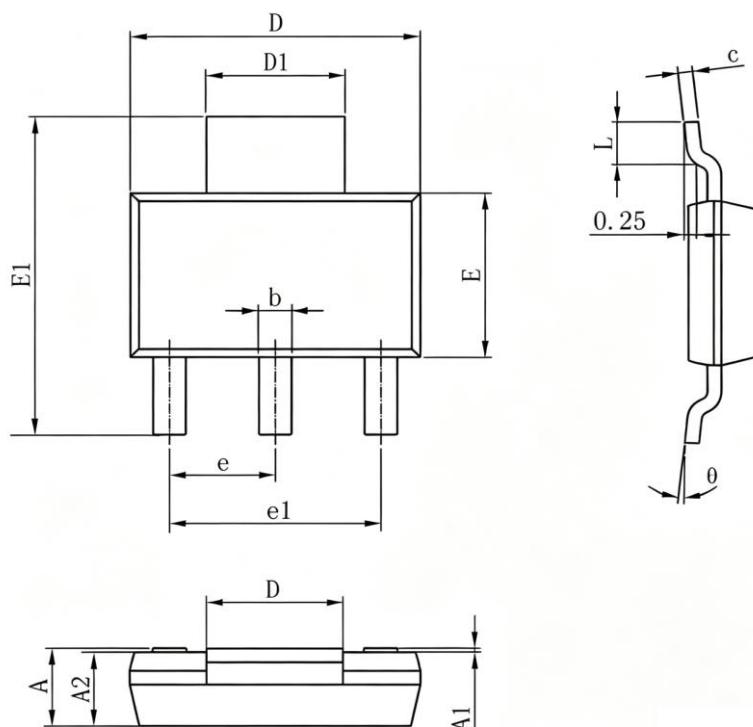
THERMAL CONSIDERATIONS

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 A1117 is very large. A1117 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 A1117 could allow on itself is less than 1W. And furthermore, A1117 will work at junction temperature higher than 125°C under such condition and no lifetime is guaranteed.



PACKAGE INFORMATION

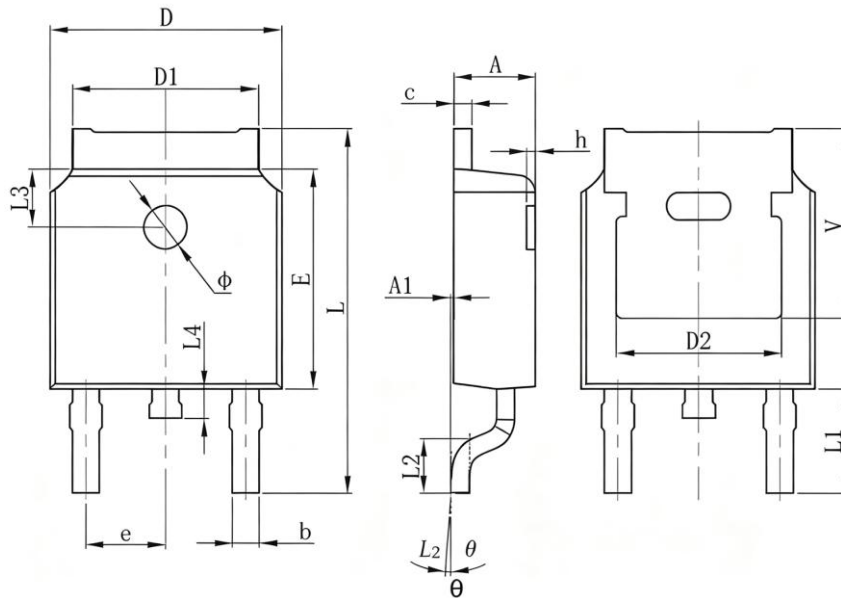
Dimension in SOT-223 (Unit: mm)



Symbol	Min	Max
A	1.520	1.800
A1	0.000	0.100
A2	1.500	1.700
b	0.660	0.820
c	0.250	0.350
D	6.200	6.400
D1	2.900	3.100
E	3.300	3.700
E1	6.830	7.070
e	2.300 BSC.	
e1	4.500	4.700
L	0.900	1.150
θ	0°	10°



Dimension in TO-252 Package (Unit: mm)



Symbol	Min	Max
A	1.520	1.800
A1	0.000	0.100
A2	1.500	1.700
b	0.660	0.820
c	0.250	0.350
D	6.200	6.400
D1	2.900	3.100
E	3.300	3.700
E1	6.830	7.070
e	2.300 BSC.	
e1	4.500	4.700
L	0.900	1.150
θ	0°	10°



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