

# 1A Bipolar Linear Regulator

#### **Features**

Maximum output current is 1A

Range of operation input voltage: Max 15V

• Line regulation: 0.03%/V (typ.)

• Standby current: 2mA (typ.)

Load regulation: 0.2%/A (typ.)

### **Applications**

 Power Management for Computer Mother Board, Graphic Card

LCD Monitor and LCD TV

- DVD Decode Board
- ADSL Modem
- Post Regulators for Switching Supplies

Environment Temperature: -40°C~125°C

## **General Description**

AMS1117 is a series of low dropout three-terminal regulators with a dropout of 1.3V at 1A load current.

AMS1117 features a very low standby current 2mA compared to 5mA of competitor.

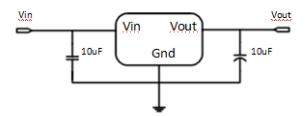
Other than a fixed version, Vout = 1.2V, 1.8V, 2.5V, 2.85V, 3.3V, and 5V,AMS1117 has an adjustable version, which can provide an output voltage from 1.25 to 12V with only

two external resistors.

AMS1117 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%.

AMS1117 is available in SOT-223, TO-252 packages.

## **Typical Application**



Application circuit of AMS1117 fixed version

#### **Selection Table**

		_	
Part No.	Symbol.	Output Voltage	Package
	XX=1.2	1.2V	
	XX=1.8	1.8V	
AMS1117-XX	XX=2.5	2.5V	SOT-223
	XX=3.3	3.3V	TO-252
	XX=5.0	5.0V	
	XX=ADJ	Adj	

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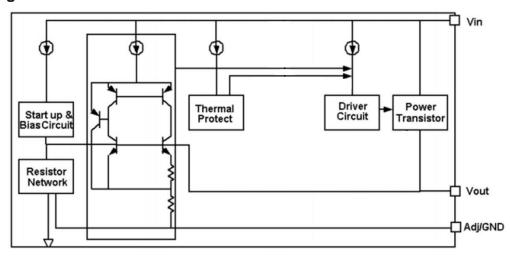


# **Ordering Information**

Part No.	Package Type	Packing type
AMS1117-XX	SOT223	2500 Tape&Reel
AMS1117-XX	TO252	2500 Tape&Reel

Note:"XX" stands for output voltages.

# **Block Diagram**



# **Pin Configuration**

SOT223 (Top View)

4

SOT223

1 2 3

TO252 (Top View)



Table1: TXAMS1117 series (SOT223 PKG)

PIN NO.	PIN NAME	FUNCTION
1	VSS/ADJ	VSS/ADJ pin
2	VOUT	Output voltage pin
3	VIN	Input voltage pin
4	VOUT	Output voltage pin

Table2: TXAMS1117-XXTR series (TO252 PKG)

100102. 170 tivi	Table2. 177 (We 1117 77711 Gollos (16262 1116)						
PIN NO.	PIN NAME	FUNCTION					
1	VSS/ADJ	VSS/ADJ pin					
2	VOUT	Output voltage pin					
3	VIN	Input voltage pin					

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# **Absolute Maximum Ratings**

Max Input Voltage ······	-18V
Max Operating Junction Temperature(Tj) ····································	-150℃
Storage Temperature(Ts)······	55℃~150℃
Lead Temperature & Time	-260°C 10S
Caution: Exceed these limits to damage to the device. Exposure to absolute maximum rating condition	ons may affect
device reliability.	

# **Electrical Characteristics**

T<sub>A</sub>=25°C, unless otherwise noted.

voltage         10mA ≤ lout ≤ 1A, Vin=3.25V         1.176         1.2         1.224         V           AMS1117 -1.2V         0 ≤ lout ≤ 1A, Vin=3.2V         1.764         1.8         1.836         V           AMS1117 -1.8V         1.764         1.8         1.836         V           O ≤ lout ≤ 1A, Vin=3.8V         2.45         2.5         2.55         V           AMS1117 -2.5V         2.45         2.5         2.55         V           AMS1117 -3.3V         3.234         3.3         3.366         V           O ≤ lout ≤ 1A, Vin=5.3V         4.9         5.0         5.1         V           AMS1117 -5.0V         4.9         5.0         5.1         V           O ≤ lout ≤ 1A, Vin=7.0V         4.9         5.0         5.1         V           AMS1117 -1.2V         4         20         m           Iout=10mA, 2.7V ≤ Vin ≤ 12V         5         30         m           AMS1117 -1.8V         5         40         m           Iout=10mA, 3.3V ≤ Vin ≤ 12V         8         50         m           AMS1117 -2.5V         8         50         m           Iout=10mA, 4.8V ≤ Vin ≤ 12V         10         70         m           AMS1117 -5.0V	Symbol	Parameter	Conditions	Min	Тур	Max	Unit
AMS1117-1.2V 0 ≤ lout ≤ 1A, Vin=3.2V AMS1117-1.8V 0 ≤ lout ≤ 1A, Vin=3.8V AMS1117-2.5V 2.45  Vout  Output voltage  O ≤ lout ≤ 1A, Vin=4.5V AMS1117-3.3V 0 ≤ lout ≤ 1A, Vin=5.3V AMS1117-5.0V 0 ≤ lout ≤ 1A, Vin=7.0V   AMS1117-1.2V 1 lout=10mA, 2.7V ≤ Vin ≤ 12V  AMS1117-3.3V 1 lout=10mA, 4.0V ≤ Vin ≤ 12V  AMS1117-3.3V 1 lout=10mA, 4.8V ≤ Vin ≤ 12V  AMS1117-5.0V AMS1117-5.0V 1 lout=10mA, 4.8V ≤ Vin ≤ 12V  AMS1117-5.0V 1 lout=10mA, 6.5V ≤ Vin ≤ 12V	Vref	Reference	AMS1117-Adj	1.225	1.25	1.275	V
O≪lout≪1A, Vin=3.2V         AMS1117-1.8V       1.764       1.8       1.836       V         O≪lout≪1A, Vin=3.8V       AMS1117-2.5V       2.45       2.5       2.55       V         AMS1117-2.5V       2.45       2.5       2.55       V         AMS1117-3.3V       3.234       3.3       3.366       V         O≪lout≪1A, Vin=5.3V       4.9       5.0       5.1       V         AMS1117-5.0V       4.9       5.0       5.1       V         Iout=10mA, 2.7V≪Vin≤10V       4       20       m         Iout=10mA, 2.7V≪Vin≤10V       5       30       m         Iout=10mA, 2.75V≪Vin≤12V       5       40       m         Iout=10mA, 3.3V≪Vin≤12V       8       50       m         Iout=10mA, 4.0V≪Vin≤12V       9       60       m         Iout=10mA, 4.8V≪Vin≤12V       10       70       m         Iout=10mA, 6.5V≪Vin≤12V       10       70       m		voltage	10mA≤lout≤1A , Vin=3.25V				
Vout       Output voltage       1.764       1.8       1.836       Voltage         Vout       Oslout≤1A, Vin=3.8V       2.45       2.5       2.55       Voltage         AMS1117-2.5V       0slout≤1A, Vin=4.5V       3.234       3.3       3.366       Voltage         AMS1117-3.3V       4.9       5.0       5.1       Voltage         AMS1117-5.0V       4.9       5.0       5.1       Voltage         AMS1117-1.2V       4.9       5.0       5.0       m         Iout=10mA, 2.7V≤Vin≤12V       5       30       m         AMS1117-1.8V       5       40       m         Iout=10mA, 3.3V≤Vin≤12V       8       50       m         AMS1117-2.5V       8       50       m         Iout=10mA, 4.0V≤Vin≤12V       9       60       m         AMS1117-5.0V       10       70       m         Iout=10mA, 6.5V≤Vin≤12V			AMS1117 -1.2V	1.176	1.2	1.224	V
Vout       Output voltage       0 ≤ lout ≤ 1A , Vin=3.8V       2.45       2.5       2.55       Note of the control			0≤lout≤1A , Vin=3.2V				
Vout       Output voltage       AMS1117 - 2.5V 0 ≤ lout ≤ 1A , Vin=4.5V AMS1117 - 3.3V 0 ≤ lout ≤ 1A , Vin=5.3V       3.234       3.3       3.366       No.         AMS1117 - 5.0V 0 ≤ lout ≤ 1A , Vin=7.0V       4.9       5.0       5.1       No.         AMS1117 - 1.2V lout=10mA, 2.7V ≤ Vin ≤ 10V AMS1117 - ADJ lout=10mA, 2.75V ≤ Vin ≤ 12V       5       30       m         AMS1117 - 1.8V lout=10mA, 3.3V ≤ Vin ≤ 12V       5       40       m         AMS1117 - 2.5V lout=10mA, 4.0V ≤ Vin ≤ 12V AMS1117 - 3.3V lout=10mA, 4.8V ≤ Vin ≤ 12V       9       60       m         AMS1117 - 5.0V lout=10mA, 6.5V ≤ Vin ≤ 12V       10       70       m			AMS1117 -1.8V	1.764	1.8	1.836	V
Vout         Output voltage         0 ≤ lout ≤ 1A , Vin=4.5V         3.234         3.3         3.366         Voltage           AMS1117-3.3V AMS1117-5.0V 0 ≤ lout ≤ 1A , Vin=7.0V         4.9         5.0         5.1         Voltage           AMS1117-1.2V lout=10mA, 2.7V ≤ Vin ≤ 10V AMS1117-ADJ lout=10mA, 2.75V ≤ Vin ≤ 12V AMS1117-1.8V lout=10mA, 3.3V ≤ Vin ≤ 12V         5         40         m           AMS1117-2.5V regulation         AMS1117-2.5V lout=10mA, 4.0V ≤ Vin ≤ 12V AMS1117-3.3V lout=10mA, 4.8V ≤ Vin ≤ 12V         9         60         m           AMS1117-5.0V lout=10mA, 6.5V ≤ Vin ≤ 12V         10         70         m			0≤lout≤1A , Vin=3.8V				
AMS1117-3.3V 0 ≤ lout ≤ 1A , Vin=5.3V  AMS1117-5.0V 0 ≤ lout ≤ 1A , Vin=7.0V   AMS1117-1.2V 1out=10mA, 2.7V ≤ Vin ≤ 10V  AMS1117-ADJ 1out=10mA, 2.75V ≤ Vin ≤ 12V  AMS1117-1.8V 1out=10mA, 3.3V ≤ Vin ≤ 12V  AMS1117-2.5V 1out=10mA, 4.0V ≤ Vin ≤ 12V  AMS1117-3.3V 1out=10mA, 4.8V ≤ Vin ≤ 12V  AMS1117-5.0V 1out=10mA, 4.8V ≤ Vin ≤ 12V  AMS1117-5.0V 1out=10mA, 6.5V ≤ Vin ≤ 12V  AMS1117-5.0V 1out=10mA, 6.5V ≤ Vin ≤ 12V  AMS1117-5.0V 1out=10mA, 6.5V ≤ Vin ≤ 12V			AMS1117 -2.5V	2.45	2.5	2.55	V
0 ≤ lout ≤ 1A , Vin=5.3V	Vout	Output voltage	0≤lout≤1A , Vin=4.5V				
AMS1117-5.0V 0≤lout≤1A, Vin=7.0V  AMS1117-1.2V lout=10mA, 2.7V≤Vin≤10V  AMS1117-ADJ lout=10mA, 2.75V≤Vin≤12V  AMS1117-1.8V lout=10mA, 3.3V≤Vin≤12V  AMS1117-2.5V regulation  Iout=10mA, 4.0V≤Vin≤12V  AMS1117-3.3V lout=10mA, 4.8V≤Vin≤12V  AMS1117-5.0V lout=10mA, 4.8V≤Vin≤12V  AMS1117-5.0V lout=10mA, 6.5V≤Vin≤12V			AMS1117-3.3V	3.234	3.3	3.366	V
AMS1117 -1.2V			0≤lout≤1A , Vin=5.3V				
AMS1117 -1.2V			AMS1117-5.0V	4.9	5.0	5.1	V
Iout=10mA, 2.7V ≤ Vin ≤ 10V			0≤lout≤1A , Vin=7.0V				
Iout=10mA, 2.7V≤Vin≤10V							
AMS1117 -ADJ   lout=10mA, 2.75V ≤ Vin≤12V			AMS1117 -1.2V		4	20	mV
Iout=10mA, 2.75V ≤ Vin ≤ 12V			lout=10mA, 2.7V≲Vin≤10V				
AMS1117-1.8V   Iout=10mA, 3.3V ≤ Vin ≤ 12V   AMS1117-2.5V   8   50   m     regulation   Iout=10mA, 4.0V ≤ Vin ≤ 12V   9   60   m     Iout=10mA, 4.8V ≤ Vin ≤ 12V   10   70   m     Iout=10mA, 6.5V ≤ Vin ≤ 12V   10   70   m			AMS1117 -ADJ		5	30	mV
AVout       Line regulation       AMS1117-2.5V AMS1117-2.5V AMS1117-3.3V AMS1117-3.3V AMS1117-3.3V AMS1117-3.3V AMS1117-5.0V			lout=10mA, 2.75V≪Vin≪12V				
△Vout       Line regulation       AMS1117-2.5V   8   50   m         Iout=10mA, 4.0V≪Vin≪12V   AMS1117-3.3V   Iout=10mA, 4.8V≪Vin≪12V   AMS1117-5.0V   Iout=10mA, 6.5V≪Vin≪12V			AMS1117-1.8V		5	40	mV
regulation   Iout=10mA, 4.0V ≤ Vin ≤ 12V   9   60   m   Iout=10mA, 4.8V ≤ Vin ≤ 12V   AMS1117 -5.0V   10   70   m   Iout=10mA, 6.5V ≤ Vin ≤ 12V   Iout=10mA			lout=10mA, 3.3V≲Vin≤12V				
AMS1117-3.3V 9 60 m  lout=10mA, 4.8V≤Vin≤12V  AMS1117-5.0V 10 70 m  lout=10mA, 6.5V≤Vin≤12V	$\triangle$ Vout	Line	AMS1117-2.5V		8	50	mV
lout=10mA, 4.8V ≤ Vin ≤ 12V   AMS1117 -5.0V		regulation	lout=10mA, 4.0V≲Vin≤12V				
AMS1117 -5.0V 10 10 70 m lout=10mA, 6.5V≤Vin≤12V			AMS1117-3.3V		9	60	mV
lout=10mA, 6.5V≤Vin≤12V			lout=10mA, 4.8V≲Vin≤12V				
			AMS1117-5.0V		10	70	mV
AMS1117-1.2V 2 24 m			lout=10mA, 6.5V≲Vin≤12V				
AMS1117-1.2V 2 24 m							
			AMS1117-1.2V		2	24	mV

1	1		1	1
AMS1117-1.2V		2	24	mV

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		Vin =2.7V, 10mA≤lout≤1A			
		AMS1117-ADJ	2	25	mV
		Vin =2.75V, 10mA≤lout≤1A			
		AMS1117-1.8V	3	36	mV
		Vin =3.3V, 10mA≤lout≤1A			
△Vout	Load	AMS1117 -2.5V	4	50	mV
	regulation	Vin =4.0V, 10mA≤lout≤1A			
		AMS1117-3.3	6	66	mV
		Vin =4.8V, 10mA≤lout≤1A			
		AMS1117 -5.0	9	100	mV
		Vin =6.5V, 10mA≤lout≤1A			
Vdrop	Dropout voltage	lout =100mA	1.2	1.3	V
		lout=1A	1.3	1.5	V
lmin	Minimum load	AMS1117-ADJ	2	10	mA
	current				
		AMS1117-1.2V, Vin=10V	2	5	mA
		AMS1117 -1.8V, Vin=12V	2	5	mA
lq	Quiescent	AMS1117 -2.5V, Vin=12V	2	5	mA
	Current	AMS1117 -3.3V, Vin=12V	2	5	mA
		AMS1117-5.0V, Vin=12V	2	5	mA
lAdj	Adjust pin	AMS1117-ADJ	55	120	uA
	current	Vin=5V,10mA≤lout≤1A			
Ichange	ladj change	AMS1117 -ADJ	0.2	10	uA
		Vin=5V,10mA≤lout≤1A			
$\triangle$ V/ $\triangle$ T	Temperature		±100		ppm
	coefficien				
θ JC	Thermal	SOT-223	20		
v JC	resistance	TO-252	10		°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 AMS1117-ADJ will lead to unstable or oscillation output.



#### **Detailed Description**

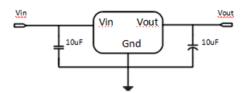
AMS1117 is a series of low dropout voltage, three terminal regulators. Its application circuit is very simple: the fixed version only needs two capacitors and the adjustable version only needs two resistors and two capacitors to work. It is composed of some modules including start-up circuit, bias circuit, bandgap, thermal shutdown, power transistors and its driver circuit and so on.

The 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

TX AMS1117 has an adjustable version and six fixed versions (1.2V, 1.8V, 2.5V, 3.3V and 5V)

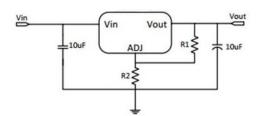
## **Fixed Output Voltage Version**



Application circuit of TXAMS1117 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 AMS1117 - ADJ

The output voltage of adjustable version follows the equation: Vout= $1.25 \times (1+R2/R1)+IAdj \times R2$ . We can ignore IAdj because IAdj (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 AMS1117-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  $100\Omega\sim500\Omega$ , the value of  $C_{ADJ}$  should satisfy this equation:  $1/(2\pi \times f_{fipple} \times C_{ADJ}) < R1$ .

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#### **Thermal Considerations**

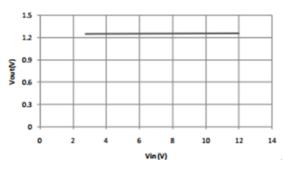
We have to take heat dissipation into great consideration when output current or differential voltage of input and output voltage is large. Because in such cases, the power dissipation consumed by AMS1117 is very large. AMS1117 series uses SOT-223 package type and its thermal resistance is about 20°C/W. 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 AMS1117 could allow on itself is less than 1W. And furthermore, AMS1117 will work at junction temperature higher than 125°C under such condition and no lifetime is guaranteed.

## **Typical Performance Charcteristics**

T<sub>A</sub>=25°C, unless otherwise noted.

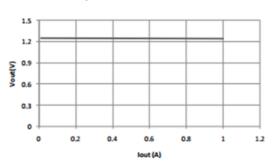
### Line regulation

## AMS1117-ADJ Vout Vs. Vin√

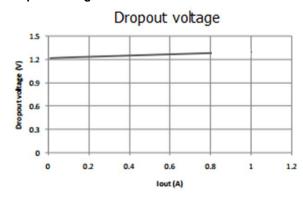


#### Load regulation

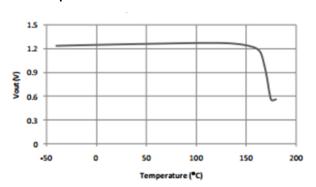
AMS1117 - ADJ Vout Vs. lout



#### **Dropout voltage**



#### Thermal performance with OTP

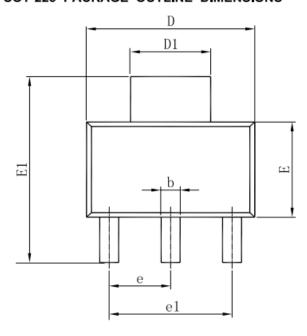


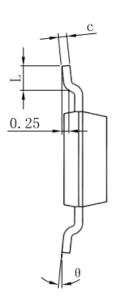
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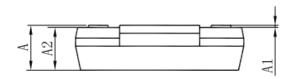


# **Package Information**

## SOT-223 PACKAGE OUTLINE DIMENSIONS





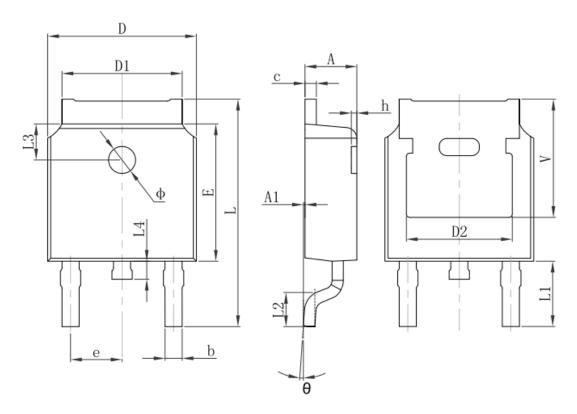


C. mb a l	Dimensions In	Millimeters	Dimensions	In Inches
Symbol	Min	Max	Min	Max
Α	1.520	1.800	0.060	0.071
A1	0.000	0.100	0.000	0.004
A2	1.500	1.700	0.059	0.067
b	0.660	0.820	0.026	0.032
С	0.250	0.350	0.010	0.014
D	6.200	6.400	0.244	0.252
D1	2.900	3.100	0.114	0.122
Е	3.300	3.700	0.130	0.146
E1	6.830	7.070	0.269	0.278
е	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°

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TO-252-2L PACKAGE OUTLINE DIMENSIONS



Cumbal	Dimensions In Millimeters		Dimension	s In Inches	
Symbol	Min.	Max.	Min.	Max.	
Α	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	
С	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	
е	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	
Ф	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.		