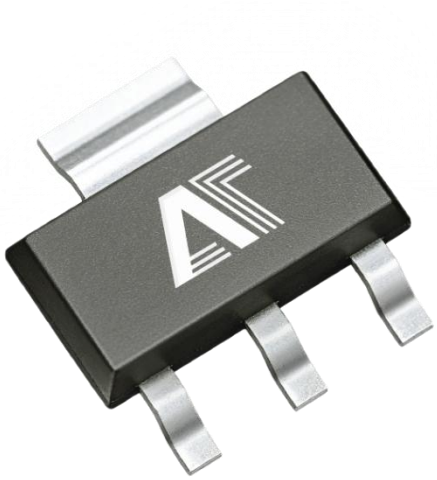
AOTE SEMICONDUCTOR



Low voltage differential linear regulator

AMS1117-3.3(AT)

Product Data Sheet

AOTE DCC
RELEASE

Summary :

AMS1117 is a low dropout linear regulator circuit with an output current capability of 1.0A. This series of circuits includes a fixed output voltage version and an adjustable output voltage version, with an output voltage accuracy of ±1.5%.

In order to ensure the stability of the chip and power system, AMS1117 has built-in thermal protection and current limiting protection functions. At the same time, the product adopts correction technology to ensure that the output voltage accuracy is controlled within ±1.5%.

AMS1117 is packaged in SOT223 and SOT89-3 packaging forms.

Product features

- Only two external resistors are needed, and the adjustable output voltage can be adjusted from 1.25V to 13.8V
- Fixed voltage output 1.2V, 1.8V, 2.5V, 2.85V, 3.3V, and 5.0V
- Output current capability 1.0A
- Output voltage accuracy ±1.5%
- Working voltage up to 15V
- Voltage linearity less than 0.2%
- Load adjustment rate less than 0.4%

Applications

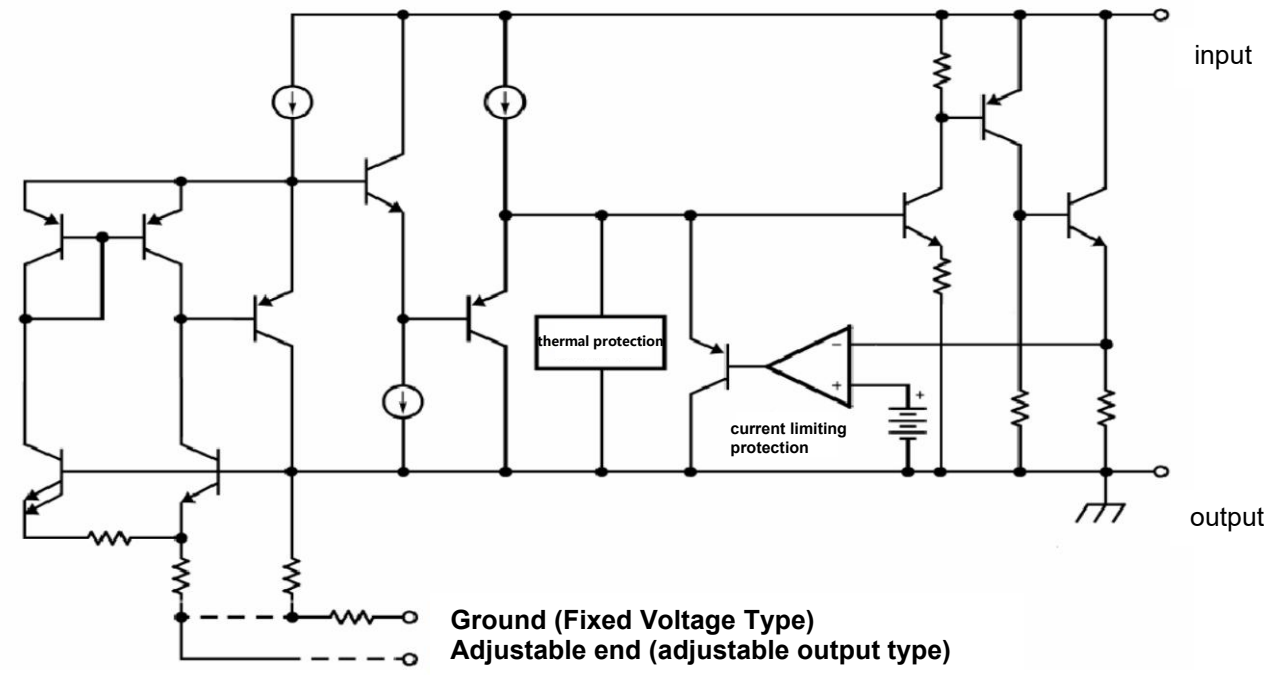
- Computer motherboard and graphics card power management
- LCD monitor and LCD TV
- DVD decoding board
- ADSL modem
- Switching power supply post regulator

Packaging Information

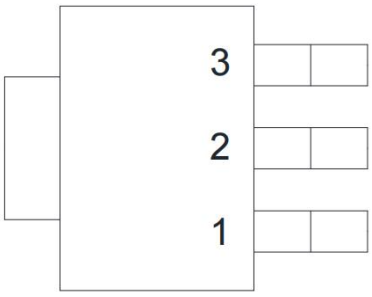
Part No	Package Description	Package Marking	Package Option
AMS1117-XX	SOT223	AMS1117	2500 pieces per tray
AMS1117-XX	SOT89-3	AMS1117	1000 pieces per tray
AMS1117-ADJ	SOT223	AMS1117	2500 pieces per tray
AMS1117-ADJ	SOT89-3	AMS1117	1000 pieces per tray

AMS1117 is the product name, XXX/XXXX/SXXXX is the week number, XX: 12 (1.2V)/18 (1.8V)/25 (2.5V)/285 (2.85V)/33 (3.3V)/50 (5.0V), ADC/ADJ: ADJ is the voltage version.

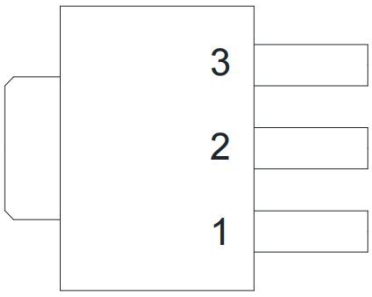
◆ Functional Block Diagram



◆ Pin arrangement diagram



SOT223



SOT89-3

◆ Pin description

Adjustable voltage type

Pin number	pin name	Functional Description
1	Adj	Adjustable end
2	Vout	output end
3	Vin	input terminal

Fixed voltage type

Pin number	pin name	Functional Description
1	GND	ground
2	Vout	output end
3	Vin	input terminal

◆ Limit parameter (Ta=25 ℃)

parameter name	symbol	numerical value	unit
Maximum input voltage	Vin	18	V
junction temperature	T_J	150	℃
ambient temperature	T_A	140	℃
Storage temperature	T_S	-65~+150	℃
Welding temperature and time	-	300℃,10S	-

◆ Thermal resistance value

parameter name	symbol	condition	SOT223	SOT89-3	unit
Thermal resistance (junction environment)	θ-JA	No heat sink	120	165	℃/W

◆ Recommended working conditions (Ta=25 ℃)

parameter name	MIN	MAX	unit
Input voltage range	-	15	V
ambient temperature	-40	125	℃

◆ **Electrical characteristics** (Ta=25 ℃ unless otherwise specified)

parameter name	symbol	test conditions	standard value			unit
			Min	Type	Max	
reference voltage	Vref	Iout=10mA,Vin-Vout=2V 10mA≤Iout≤1.0A, 1.4V≤Vin-Vout≤12V	1.231 1.225	1.250 1.250	1.269 1.275	V
output voltage	Vout	1117-1.20V,Iout=10mA,Vin=3.2V 0≤Iout≤1.0A,3.0V≤Vin≤12V	1.182 1.176	1.200 1.200	1.218 1.224	V
		1117-1.50V,Iout=10mA,Vin=3.5V 0≤Iout≤1.0A,3.0V≤Vin≤12V	1.477 1.470	1.500 1.500	1.523 1.530	V
		1117-1.80V,Iout=10mA,Vin=3.8V 0≤Iout≤1.0A,3.2V≤Vin≤12V	1.773 1.764	1.800 1.800	1.827 1.836	V
		1117-2.5V,Iout=10mA,Vin=4.5V 0≤Iout≤1.0A,3.9V≤Vin≤12V	2.463 2.450	2.500 2.500	2.537 2.550	V
		1117-2.85V,Iout=10mA,Vin=4.85V 0≤Iout≤1.0A,4.25V≤Vin≤12V	2.807 2.793	2.850 2.850	2.893 2.907	V
		1117-3.3V,Iout=10mA,Vin=5V 0≤Iout≤1.0A,4.75V≤Vin≤12V	3.250 3.234	3.300 3.300	3.350 3.366	V
		1117-5V,Iout=10mA,Vin=7V 0≤Iout≤1.0A,6.5V≤Vin≤12V	4.925 4.900	5.000 5.000	5.075 5.100	V
Compression linearity (Note1)	LNR	Iout=10mA,1.4V≤Vin-Vout≤10.75V 1117 Adjustable Voltage Type	-	0.035	0.2	%
		Iout=10mA,Vout+1.4V≤Vin≤12V 1117 fixed voltage type	-	4	12	mV
Voltage linearity (Note1)	LNR	Iout=10mA,1.4V≤Vin-Vout≤10.75V 1117 Adjustable Voltage Type	-	0.035	0.2	%
		Iout=10mA,Vout+1.4V≤Vin≤12V 1117 fixed voltage type	-	4	12	mV
Load Adjustment Rate (Note1,2)	LDR	Vin-Vout=3V,10mA≤Iout≤1.0A 1117 Adjustable Voltage Type	-	0.2	0.4	%
		Vin=Vout+1.4V,0≤Iout≤1.0A 1117 fixed voltage type	-	6	12	mV
Input output voltage difference (Note3)	Vin-Vout	ΔVout,ΔVref=1%,Iout=100mA	-	1.0	1.2	V
		ΔVout,ΔVref=1%,Iout=500mA	-	1.05	1.25	V
		ΔVout,ΔVref=1%,Iout=1.0A	-	1.1	1.3	V
Maximum load current	Ilimit	Vin-Vout=2V,Tj=25℃	1.0	1.4	-	A
Minimum load current (Note4)		-	-	5	10	mA

quiescent current	Iq	1117 fixed voltage type Vin Vout=1.25V	-	4	8	mA
Adjustable terminal current	Iadj	1117 Adjustable Voltage Type	-	55	120	μA
Current variation	Ichange	-	-	0.2	5	μA
thermal stability	Ts	-	-	-	0.5	%

Note 1: The voltage linearity and load adjustment rate parameters given in the table were tested at room temperature, and the load adjustment rate varied with temperature

Please refer to the typical parameter curve below for the line.

Note 2: At room temperature, when Iout changes from 0 to 1.0A and Vin Vout changes from 1.4V to 12V, the parameters can meet the specifications given in the table.

If the temperature changes from -40 ℃ to 125 ℃, in order to meet the specifications, the circuit needs to output a current greater than 10mA.

Note 3: The input/output voltage difference Vdropout is tested under the following conditions: at various output current values, the output voltage Vout at Vin=Vout+1.3V is used as the output reference voltage value, and the input voltage is reduced. When the value of Vout decreases by 1%, the corresponding input/output voltage difference is Vdropout.

Note 4: The minimum load current refers to the requirement for the output load current to be no less than 10mA to ensure that the variation of Vout is within the specified range when the input voltage changes within the following range (1.4V ≤ Vin Vout ≤ 12V).

◆ Application Overview

AM11117 is a low voltage differential three terminal linear regulator circuit. The peripheral application circuit of this circuit is simple. The fixed voltage version only requires two capacitors for input and output, while the adjustable voltage version only requires two capacitors and two external resistors for input and output to work. The chip consists of modules such as startup circuit, bias circuit, bandgap reference source circuit, overheat protection, current limiting, power transistor and its driving circuit.

When the junction temperature exceeds 125 ℃ or the load current is greater than 1.5A, the overheat protection and current limiting module can ensure the safe operation of the chip and application system.

The bandgap module of AM11117 provides a stable reference voltage, and the temperature coefficient of the reference voltage is carefully considered and compensated during design, resulting in a temperature drift coefficient of less than 100ppm/℃ for the chip. The accuracy of output voltage is ensured by fuse correction technology.

Typical Applications

AM11117 has two output voltage versions: fixed version and adjustable version.

Fixed version output voltage

The typical application of fixed version is shown in Figure 1:

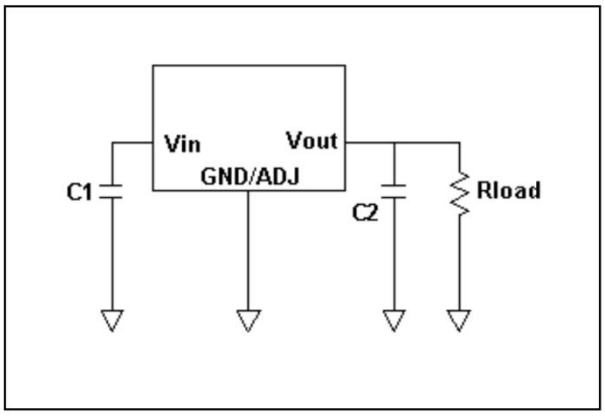


Figure 1 AMS1117 Fixed Voltage Version Application Circuit

Adjustable version of output voltage:

The AM11117 adjustable voltage type provides a reference voltage of 1.25V, and any output voltage between 1.25 and 13.8V can be obtained by selecting two external resistors. The connection method of R1 and R2 external resistors is shown in Figure 2.

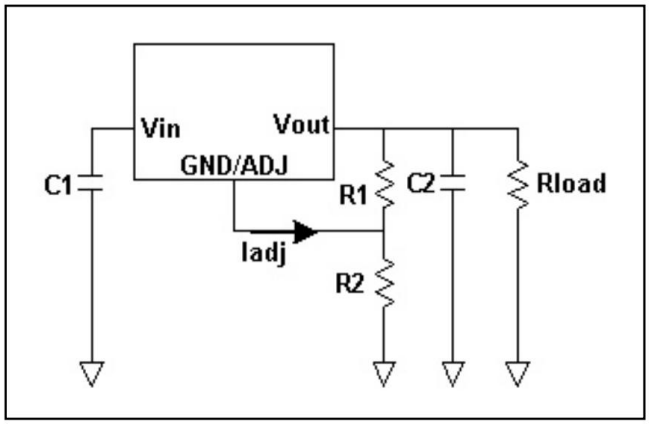


Figure 2 AMS1117 Adjustable Application Circuit

Application Tip:

For all application circuits, it is recommended to use a 10 μ F tantalum capacitor as the input bypass capacitor C1.

To ensure the stability of the circuit, a 22 μ F tantalum capacitor C2 is connected from the output terminal to ground.

3. Connecting a bypass capacitor Cadj between the adjustable terminal and ground can improve the ripple suppression ratio of the circuit. When the output voltage increases, this bypass capacitor can prevent the ripple from being amplified. The impedance of Cadj should be smaller than the resistance of resistor R1 from the output terminal to the adjustment terminal, which can prevent any frequency ripple from being amplified.

The resistance value of R1 is generally between 200 Ω and 350 Ω, and the Cadj capacitance value should satisfy the following formula: 2 * Fripple * Cdj<R1. Recommend using a 10 μ F capacitor.

Instructions:

The output voltage of the adjustable version satisfies the following equation: Vout=Vref * (1+R2/R1)+Iadj * R2. Since Iadj (around 50 μ A) is much smaller than the current flowing through R1 (around 4mA), it can be ignored.

Selection of R1 value:

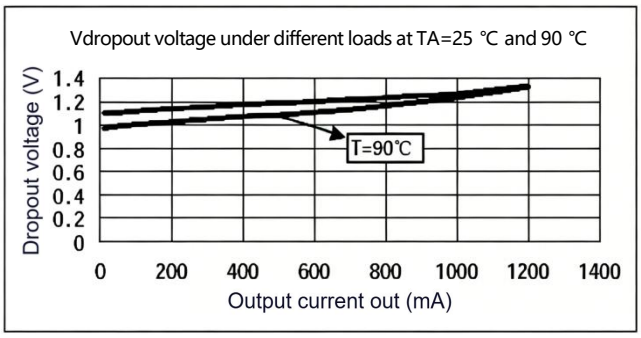
To ensure the normal operation of the adjustable version circuit without load connection, the R1 value should be between 200 and 350 Ω. To ensure the electrical performance listed in the table, the output current of the circuit should be greater than 5mA. If the R1 value is too large, the minimum output current for the circuit to operate normally should be greater than 4mA. To ensure the normal operation of the circuit, the optimal working condition is that the output current of the circuit exceeds 10mA.

Hot consideration:

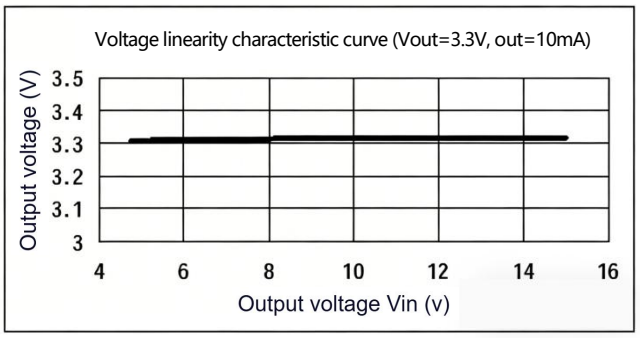
When the circuit operates at high current or with a large input/output voltage difference, we need to consider the heat dissipation problem of the circuit. Because in this situation, the dissipated power consumed by AMS1117 itself is significant. AM11117 is packaged in SOT-223 form, which has a thermal resistance of approximately 120 ℃/W. However, the copper foil area of the PCB board also affects the total thermal resistance. If the copper foil area is equal to 5cm * 5cm (both sides), the thermal resistance is about 30 ℃/W, so the total thermal resistance is between 30 ℃/W and 120 ℃/W. Therefore, we can reduce the total thermal resistance by increasing the copper foil area of the application board.

◆ Characteristic curve

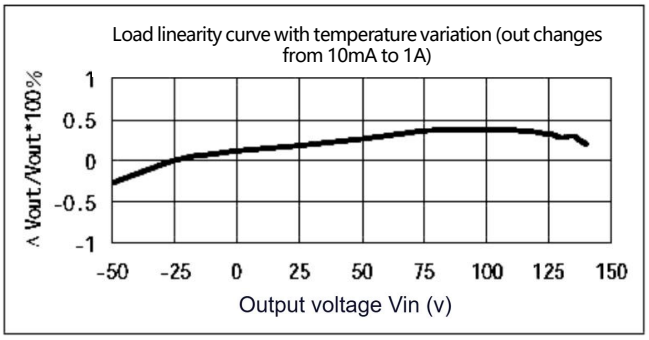
1. Input output voltage difference characteristic curve under different loads

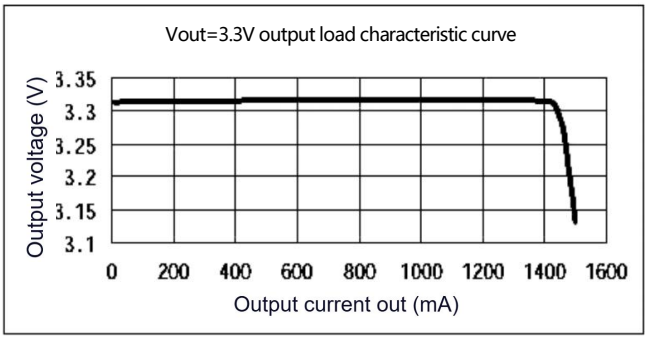


2. Voltage linearity characteristic curve

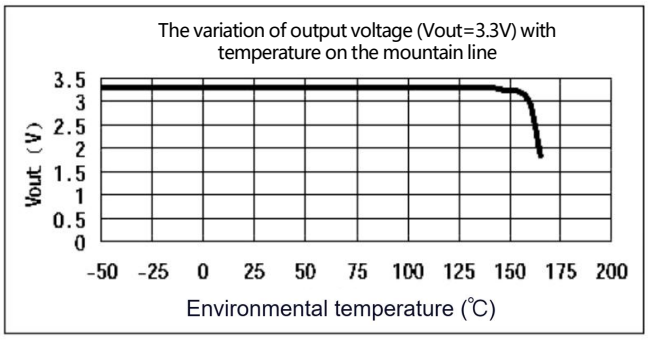


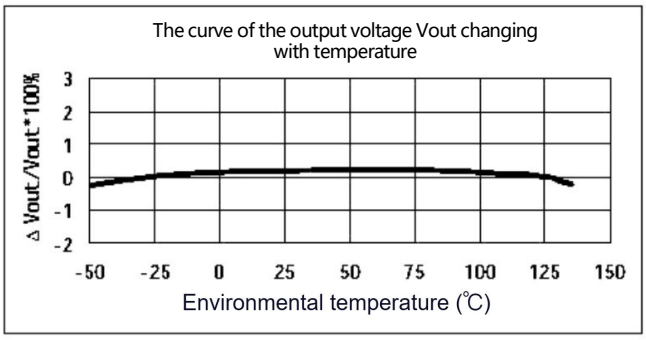
3. Load characteristic curve



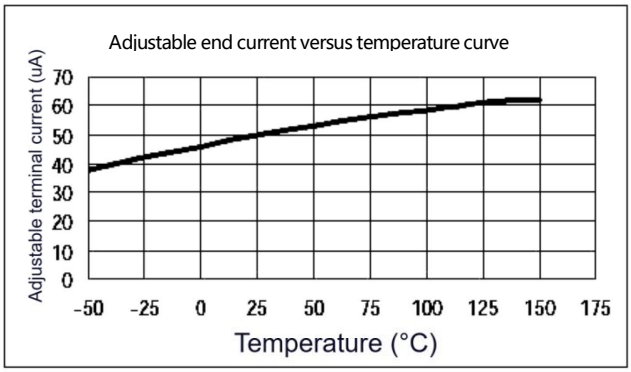


4. Temperature stability curve



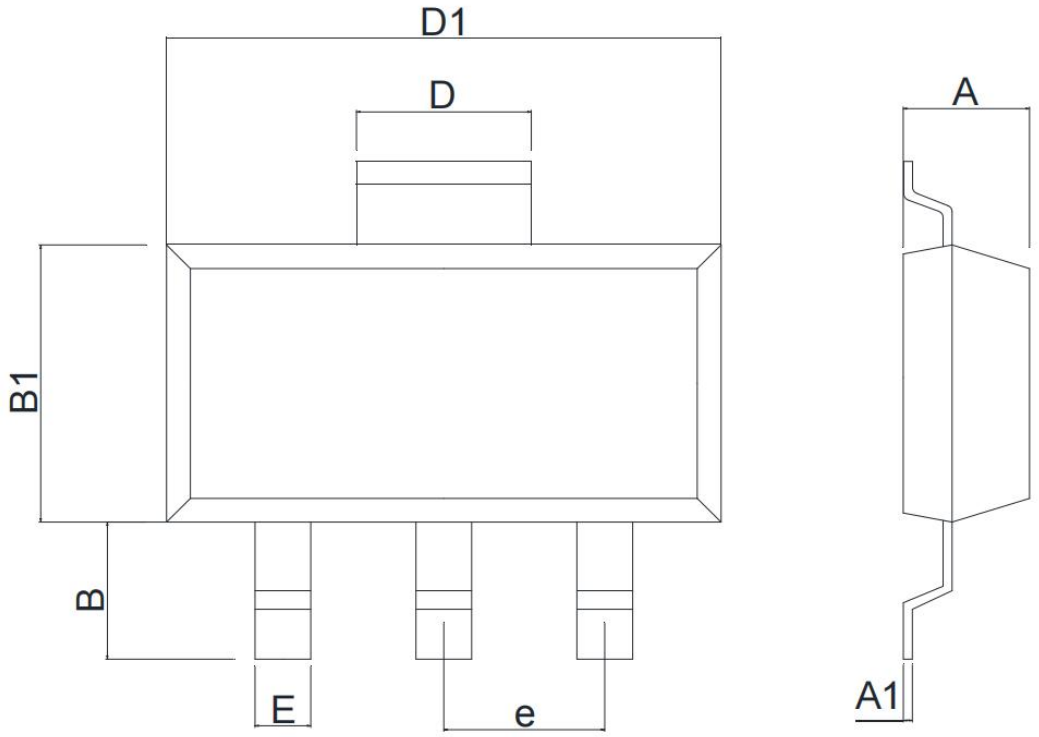


5. Adjustable output current curve with temperature variation



◆ Packaging specifications and dimensions

SOT223

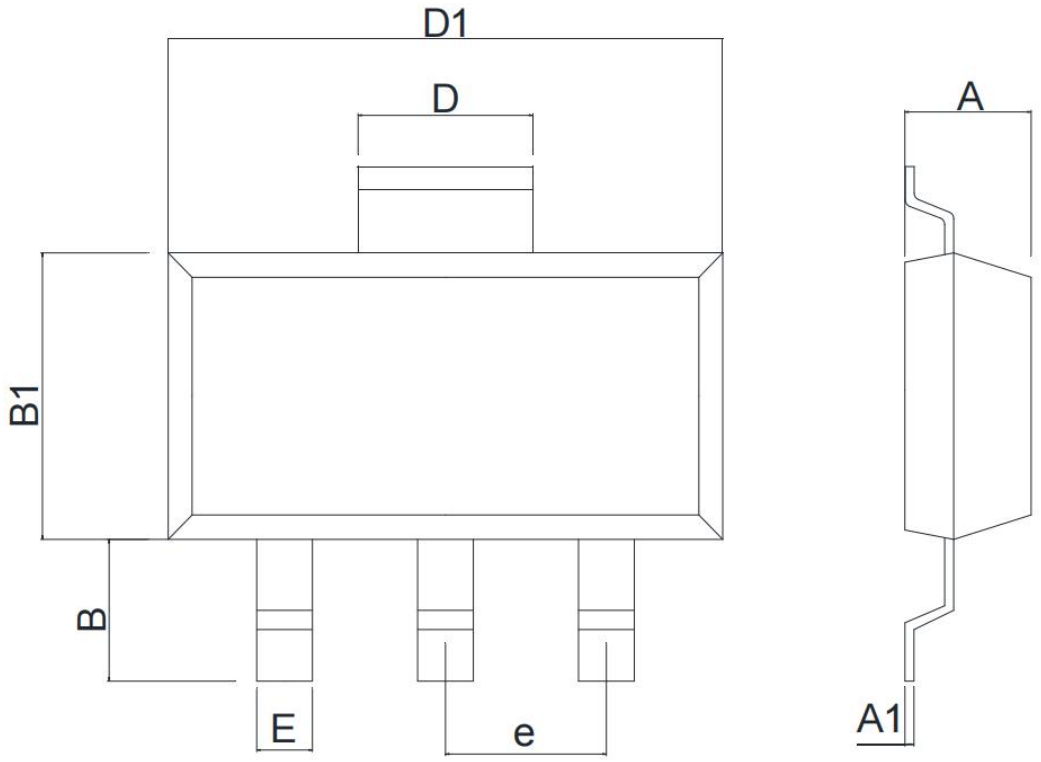


Unit:mm

Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.550	1.650	0.061	0.064
A1	0.280	0.320	0.011	0.012
B	1.750	1.950	0.068	0.076
B1	3.350	3.550	0.131	0.140
E	0.660	0.760	0.025	0.030
D1	6.450	6.550	0.253	0.257
D	2.900	3.000	0.114	0.118
e	2.300（BSC）		0.090（BSC）	

◆ Packaging specifications and dimensions

SOT89-3



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.450	1.550	0.057	0.061
A1	0.390	0.410	0.015	0.016
B	0.950	1.050	0.037	0.041
B1	2.350	2.550	0.092	0.100
E	0.350	0.450	0.013	0.017
D1	4.400	4.600	0.173	0.181
D	1.550REF		0.061REF	
e	1.500（BSC）		0.059（BSC）	

◆ Attention

- AOTE implements dynamic technical updates. Specifications are subject to change. Refer to the official website for the latest version.
- Users must strictly adhere to specified conditions. Failures caused by misuse (overload, high temperature, incompatible circuits) are excluded from warranty.
- Contact technical support for customized validation in critical applications (medical devices, industrial control).
- This document is valid until December 31, 2026. Updates will be notified on the official website.
- For further clarification on technical specifications or application solutions, please contact us through official channels: