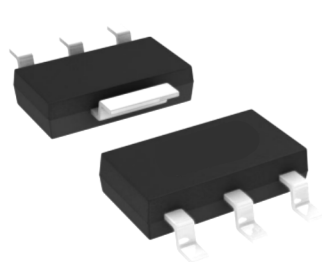


## Descriptions

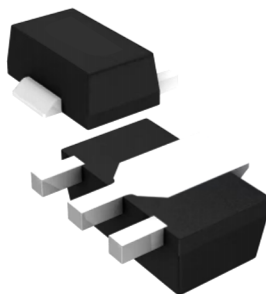
The XBL1117 series of low-dropout positive voltage regulators with an output current capability of 1.0A. The series consists of fixed output voltage version and adjustable output voltage version with  $\pm 1.5\%$  accuracy.

The XBL1117 offers thermal shutdown and current limit functions in order to ensure the stability of chip and power system, and it uses trimming technique to guarantee output voltage accuracy within  $\pm 1.5\%$ .

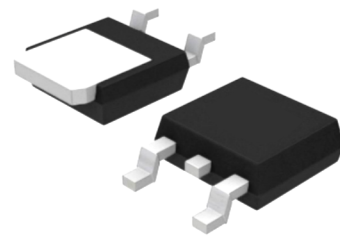
The XBL1117 is available in SOT-223, SOT-89-3L and TO-252-2L package.



SOT-223



SOT-89-3



TO-252-2L

## Feature

- Output Current Capability of 1.0A
- Output Voltage Accuracy within  $\pm 1.5\%$
- Operation Input Voltage up to 15V
- $V_{IN}-V_{OUT}<5V$  has short circuit protection function
- Less than 0.2 % Line Regulation
- Less than 0.4 % Load Regulation
- Fixed Output Voltage of 1.2V, 1.5V, 1.8V, 2.5V, 2.85V, 3.3V and 5.0V
- Adjustable Output Voltage from 1.25 to 13.8V with Only Two External Resistors

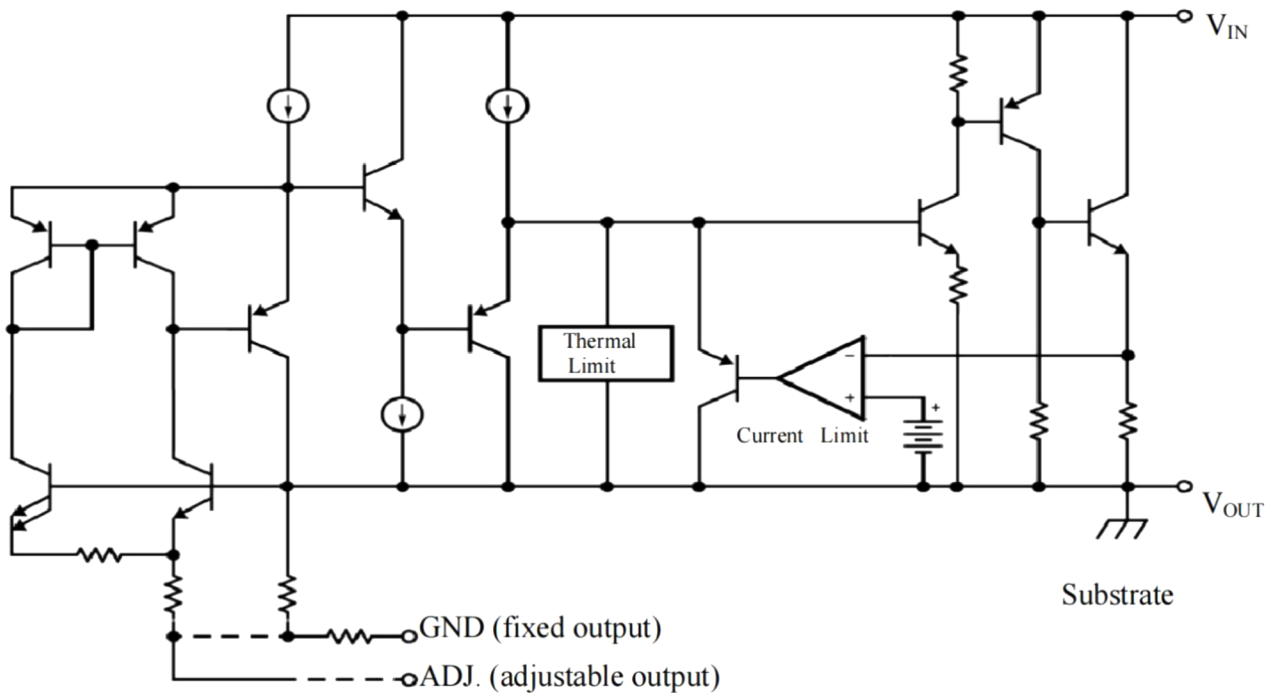
## Applications

- LCD Monitor and LCD TV
- DVD Decode Board
- ADSL Modem
- Post Regulators for Switching Supplies
- AC drive power stage modules
- Merchant network and server PSU
- Industrial AC/DC
- Ultrasound scanners
- Servo drive control modules
- Power Management for Computer Mother Board and Graphic Card

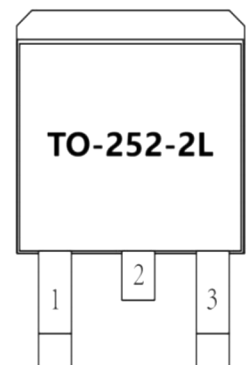
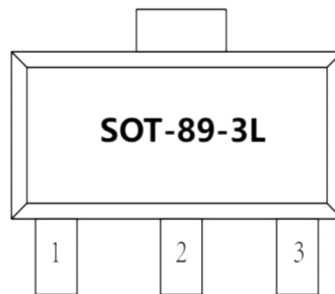
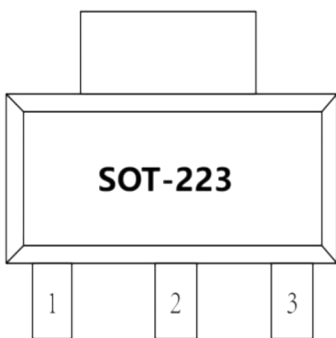
## Ordering Information

Product Model	Package Type	Marking	Packing	Packing Qty
XBL1117-1.2	SOT-223	1117-1.2	Tape	2500Pcs/Reel
XBL1117-1.5	SOT-223	1117-1.5	Tape	2500Pcs/Reel
XBL1117-1.8	SOT-223	1117-1.8	Tape	2500Pcs/Reel
XBL1117-2.5	SOT-223	1117-2.5	Tape	2500Pcs/Reel
XBL1117-2.85	SOT-223	1117-2.85	Tape	2500Pcs/Reel
XBL1117-3.3	SOT-223	1117-3.3	Tape	2500Pcs/Reel
XBL1117-5.0	SOT-223	1117-5.0	Tape	2500Pcs/Reel
XBL1117-ADJ	SOT-223	1117-ADJ	Tape	2500Pcs/Reel
XBL1117-1.2/STR	SOT-89-3L	1117-1.2	Tape	1000Pcs/Reel
XBL1117-1.5/STR	SOT-89-3L	1117-1.5	Tape	1000Pcs/Reel
XBL1117-1.8/STR	SOT-89-3L	1117-1.8	Tape	1000Pcs/Reel
XBL1117-2.5/STR	SOT-89-3L	1117-2.5	Tape	1000Pcs/Reel
XBL1117-2.85/STR	SOT-89-3L	1117-2.85	Tape	1000Pcs/Reel
XBL1117-3.3/STR	SOT-89-3L	1117-3.3	Tape	1000Pcs/Reel
XBL1117-5.0/STR	SOT-89-3L	1117-5.0	Tape	1000Pcs/Reel
XBL1117-ADJ/STR	SOT-89-3L	1117-ADJ	Tape	1000Pcs/Reel
XBL1117-1.2/MTR	TO-252-2L	1117-1.2	Tape	2500Pcs/Reel
XBL1117-1.5/MTR	TO-252-2L	1117-1.5	Tape	2500Pcs/Reel
XBL1117-1.8/MTR	TO-252-2L	1117-1.8	Tape	2500Pcs/Reel
XBL1117-2.5/MTR	TO-252-2L	1117-2.5	Tape	2500Pcs/Reel
XBL1117-2.85/MTR	TO-252-2L	1117-2.85	Tape	2500Pcs/Reel
XBL1117-3.3/MTR	TO-252-2L	1117-3.3	Tape	2500Pcs/Reel
XBL1117-5.0/MTR	TO-252-2L	1117-5.0	Tape	2500Pcs/Reel
XBL1117-ADJ/MTR	TO-252-2L	1117-ADJ	Tape	2500Pcs/Reel

### Functional Block Diagram



### Pin Configuration



### Pin Description

Pin Number	Pin Name	Function Description
1	GND	Ground
2	Vout	Output
3	Vin	Input

Fixed Version

Pin Number	Pin Name	Function Description
1	Adj.	Adjustable
2	Vout	Output
3	Vin	Input

Adjustable Version

**Absolute Maximum Ratings(Ta=25°C)**

Parameter Name	Symbol	Rating	Unit
Maximum Input Voltage	V <sub>in</sub>	18	V
Junction Temperature	T <sub>J</sub>	150	°C
Environment Temperature	T <sub>A</sub>	140	°C
Storage Temperature	T <sub>S</sub>	-65 ~ +150	°C
Lead Temperature and Time		300°C, 10s	

**Thermal Data**

Parameter Name	Symbol	Condition	SOT-89-3L	SOT-223	TO-252-2L	Unit
Thermal Resistance Junction-ambient	θ-JA	No heat sink	225	120	100	°C/W

**Recommended Operating Conditions(Ta=25°C)**

Parameter Name	Min.	Max.	Unit
Input Voltage Range		15	V
Environment Temperature	-40	125	°C

## Electrical Characteristics (Unless otherwise specified: $T_a=25^{\circ}\text{C}$ )

Parameter Name	Symbol	Test Conditions	Min	Typ	Max	Unit
Reference Voltage	Vref	$I_{out}=10\text{mA}$ , $V_{in}-V_{out}=2\text{V}$ $10\text{mA}\leq I_{out}\leq 1\text{A}$ , $1.4\text{V}\leq V_{in}-V_{out}\leq 12\text{V}$	1.231 1.225	1.250 1.250	1.269 1.275	V
Output Voltage	Vout	XBL1117-1.2 $I_{out}=10\text{mA}$ , $V_{in}=3.2\text{V}$ $0\leq I_{out}\leq 1.0\text{A}$ , $3.0\text{V}\leq V_{in}\leq 12\text{V}$	1.182 1.176	1.200 1.200	1.218 1.224	V
		XBL1117-1.5 $I_{out}=10\text{mA}$ , $V_{in}=3.5\text{V}$ $0\leq I_{out}\leq 1.0\text{A}$ , $3.0\text{V}\leq V_{in}\leq 12\text{V}$	1.477 1.470	1.500 1.500	1.523 1.530	V
		XBL1117-1.8 $I_{out}=10\text{mA}$ , $V_{in}=3.8\text{V}$ $0\leq I_{out}\leq 1.0\text{A}$ , $3.2\text{V}\leq V_{in}\leq 12\text{V}$	1.773 1.764	1.800 1.800	1.827 1.836	V
		XBL1117-2.5 $I_{out}=10\text{mA}$ , $V_{in}=4.5\text{V}$ $0\leq I_{out}\leq 1.0\text{A}$ , $3.9\text{V}\leq V_{in}\leq 12\text{V}$	2.463 2.450	2.500 2.500	2.537 2.550	V
		XBL1117-2.85 $I_{out}=10\text{mA}$ , $V_{in}=4.85\text{V}$ $0\leq I_{out}\leq 1.0\text{A}$ , $4.25\text{V}\leq V_{in}\leq 12\text{V}$	2.807 2.793	2.85 2.85	2.893 2.907	V
		XBL1117-3.3 $I_{out}=10\text{mA}$ , $V_{in}=5\text{V}$ $0\leq I_{out}\leq 1.0\text{A}$ , $4.75\text{V}\leq V_{in}\leq 12\text{V}$	3.250 3.234	3.300 3.300	3.350 3.366	V
		XBL1117-5.0 $I_{out}=10\text{mA}$ , $V_{in}=7\text{V}$ $0\leq I_{out}\leq 1.0\text{A}$ , $6.5\text{V}\leq V_{in}\leq 12\text{V}$	4.925 4.900	5.000 5.000	5.075 5.100	V
Line Regulation (Note1)	LNR	XBL1117-ADJ $I_{out}=10\text{mA}$ , $1.4\text{V}\leq V_{in}-V_{out}\leq 10.75\text{V}$		0.035	0.2	%
		XBL1117 Fixed Version $I_{out}=10\text{mA}$ , $V_{out}+1.4\text{V}\leq V_{in}\leq 12\text{V}$		4	12	mV
Load Regulation (Note1,2)	LDR	XBL1117-ADJ $V_{in}-V_{out}=3\text{V}$ , $10\text{mA}\leq I_{out}\leq 1.0\text{A}$		0.2	0.4	%
		XBL1117 Fixed Version $V_{in}=V_{out}+1.4\text{V}$ , $0\leq I_{out}\leq 1.0\text{A}$		6	12	mV
Dropout Voltage (Note3)	Vin-Vout	$\Delta V_{out}$ , $\Delta V_{ref}=1\%$ , $I_{out}=100\text{mA}$		1.0	1.2	V
		$\Delta V_{out}$ , $\Delta V_{ref}=1\%$ , $I_{out}=500\text{mA}$		1.05	1.25	V
		$\Delta V_{out}$ , $\Delta V_{ref}=1\%$ , $I_{out}=1.0\text{A}$		1.1	1.3	V
Current Limit	Ilimit	$V_{in}-V_{out}=2\text{V}$ , $T_j=25^{\circ}\text{C}$	1.0	1.4		A
Minimum Load Current (Note4)				5	10	mA
Quiescent Current	Iq	XBL1117 Fixed Version, $V_{in}-V_{out}=1.25\text{V}$		4	8	mA
Adjust Pin Current	Iadj	Adjustable Version		55	120	$\mu\text{A}$
Adjust Pin Current Change	Ichange			0.2	5	$\mu\text{A}$
Temperature Stability	Ts				0.5	%

Note1: The Parameters of Line Regulation and Load Regulation in Table are tested under constant junction temperature. The Curve of Load Regulation vs. Temperature is shown in typical parameter curve that follows.

Note2: When  $I_{out}$  varies from 0 to 1.0A,  $V_{in}-V_{out}$  varies from 1.4V to 12V under constant junction temperature, the parameter is satisfied the criterion in table. If temperature varies between  $-40^{\circ}\text{C}$  and  $125^{\circ}\text{C}$ , it needs output current to be larger than 10mA to satisfy the criterion.

Note3: Dropout Voltage is specified over the full output current range of the device, and it is tested under following testing conditions: First step is to find out the Vout value(Vout1) when  $V_{in1}=V_{out}+1.3\text{V}$ , second step is to decrease  $V_{in}$ ( $V_{in2}$ ) until Vout value is equal to  $99\%*V_{out1}$ (Vout2).  $V_{drop\_out}=V_{in2}-V_{out2}$ .

Note4: Minimum Load Current is defined as the minimum output current required to maintain regulation. When  $V_{in}-V_{out}$  value between 1.4V and 12V, the device is guaranteed to regulate if the output current is greater than 10mA.

## Application Information

XBL1117 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 and current limit modules can assure chip and its application system working safety when the junction temperature is larger than  $125^{\circ}\text{C}$  or output current is larger than 1.2A.

The bandgap module provides stable reference voltage, whose temperature coefficient is compensated by careful design considerations. The temperature coefficient is under  $100\text{ppm}/^{\circ}\text{C}$  and the accuracy of output voltage is guaranteed by trimming technique.

## Typical Application

XBL1117 has fixed versions and an adjustable version.

### Output Voltage of Fixed Version

Chart 1 is its fixed version typical application.

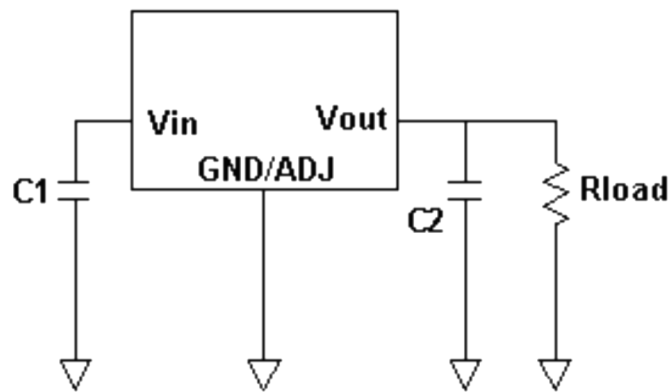


Figure 1 : Application circuit of XBL1117 fixed version

### Output Voltage of Adjustable Version

The XBL1117 adjustable version provides 1.25V Reference Voltage. Any output voltage between 1.25V and 13.8V can be available by choosing two external resistors, connection method of R1 and R2 two external resistors is shown in chart 2.

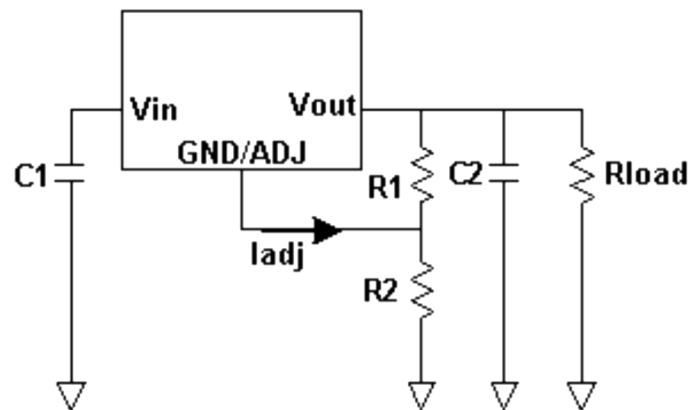


Figure 2. Application Circuit of XBL1117 adjustable version

## Application Hints

1. Recommend using 10 $\mu$ F tantalum capacitor of C1 as bypass capacitor for all application circuit.
2. Recommend using 22 $\mu$ F tantalum capacitor of C2 to assure circuit stability.
3. Using a Cadj bypass capacitor between the adjust terminal and ground can improve ripple rejection ratio, This bypass capacitor prevents ripple from being amplified as the output voltage is increased. The impedance of Cadj should be less than R1 resistor which is between output and adjust pins to prevent ripple from being amplified at any ripple frequency. As R1 is normally in the range 200 $\Omega$  from 350 $\Omega$ , the value of Cadj should satisfy this equation:  $2 \cdot \text{Fripple} \cdot \text{Cadj} < R1$ . Recommend using 10 $\mu$ F tantalum capacitors.

## Explanation

The output voltage of adjustable version satisfies this followed equation:

$V_{out} = V_{ref} \cdot (1 + R2/R1) + I_{adj} \cdot R2$ . We can ignore  $I_{adj}$  because  $I_{adj}$  (about 50 $\mu$ A) is much less than the current of R1 (about 4mA).

How to choose R1:

The value of R1 should be in the range 200 $\Omega$  from 350 $\Omega$  to assure chip working normally without any load. To assure the electrical performance showed in table, the output current should be larger than 5mA. If R1 is too large, the minimum output current should be larger than 4mA, The best working condition is to assure that the output current exceeds 10mA.

## Thermal Considerations

We have to take heat dissipation into consideration when output current or differential voltage of input and output voltage is large. Because in such cases, the power dissipation consumed by XBL1117 is very large. XBL1117 series uses SOT-223 package type and its thermal resistance is about 120  $^{\circ}\text{C}/\text{W}$ . 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  $^{\circ}\text{C}/\text{W}$ . So total thermal resistance is about 30  $^{\circ}\text{C}/\text{W}$  to 120  $^{\circ}\text{C}/\text{W}$ . We can decrease total thermal resistance by increasing copper area in application board.

### Typical Performance Characteristics

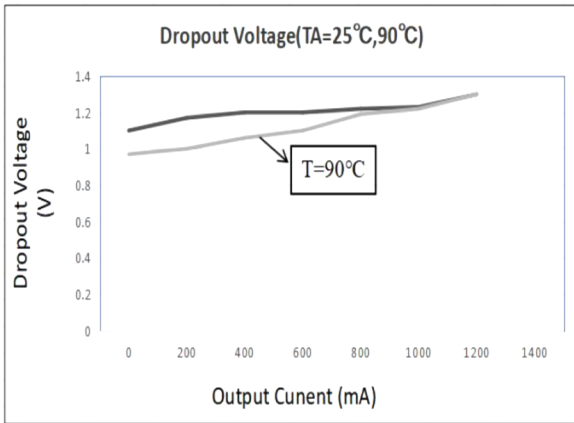


Figure 3. Dropout Voltage

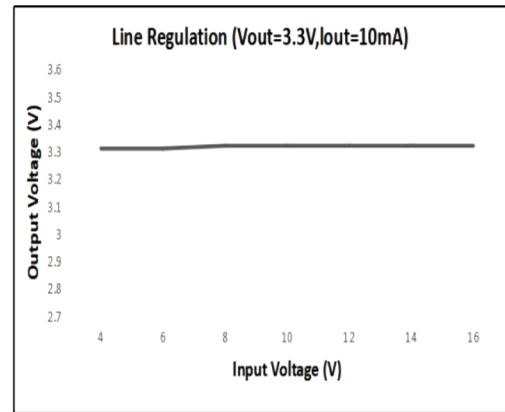


Figure 4. Line Regulation

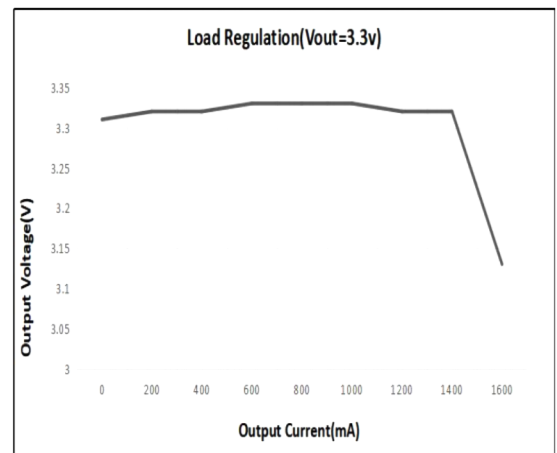
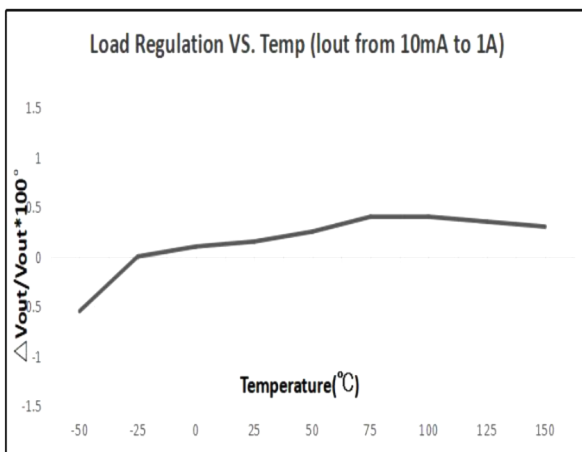


Figure 5. Load Regulation

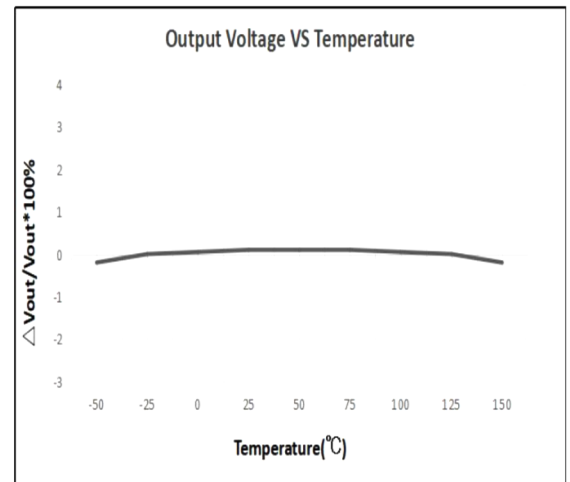
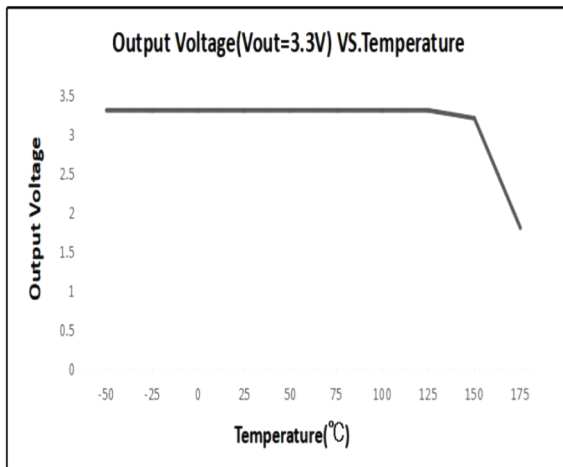


Figure 6. Temperature Stability

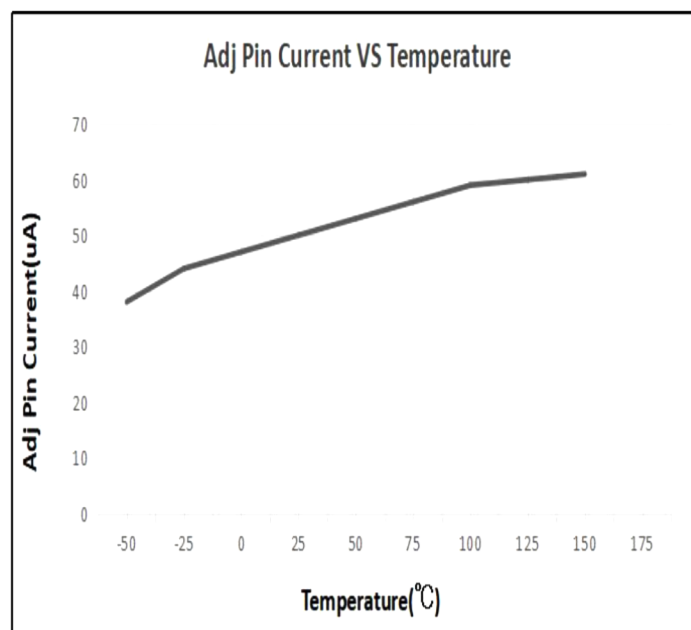
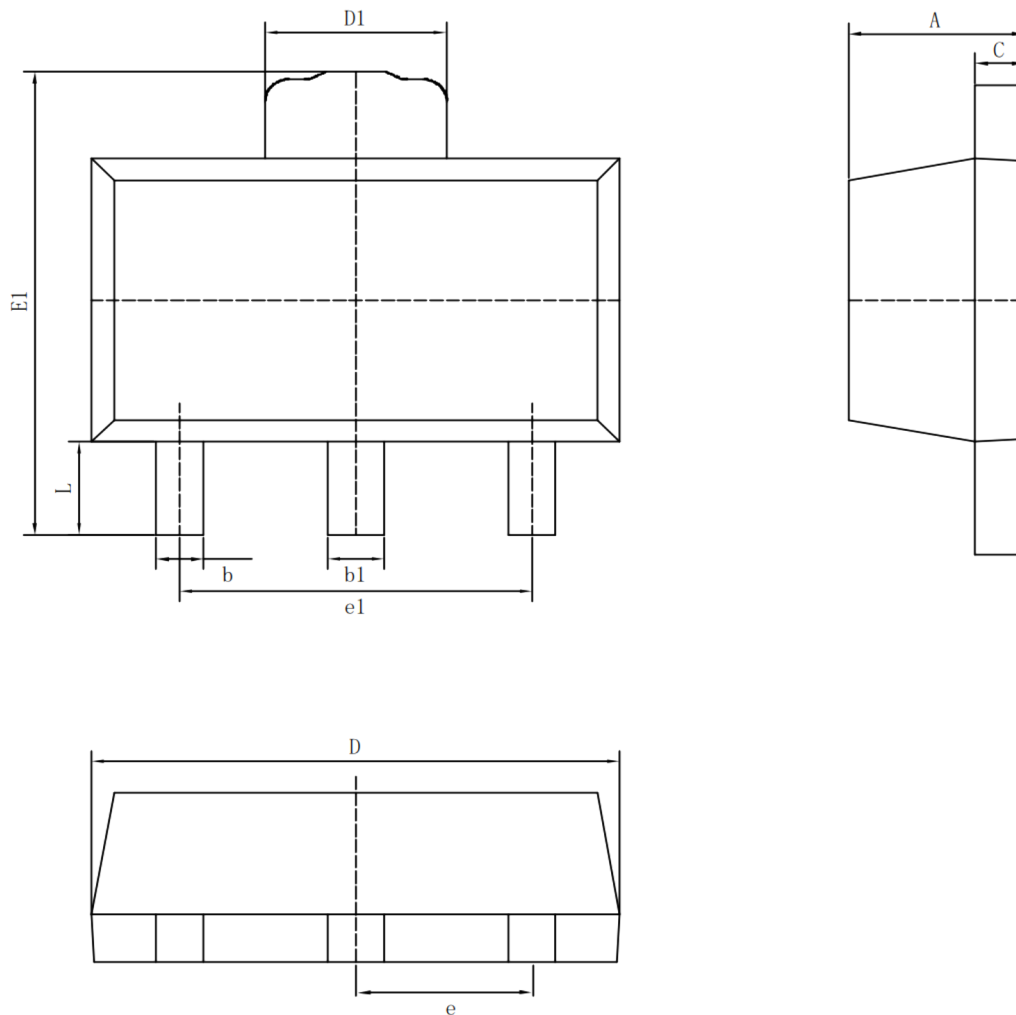


Figure 7. Adj Pin Current VS. Temperature

## Package Information

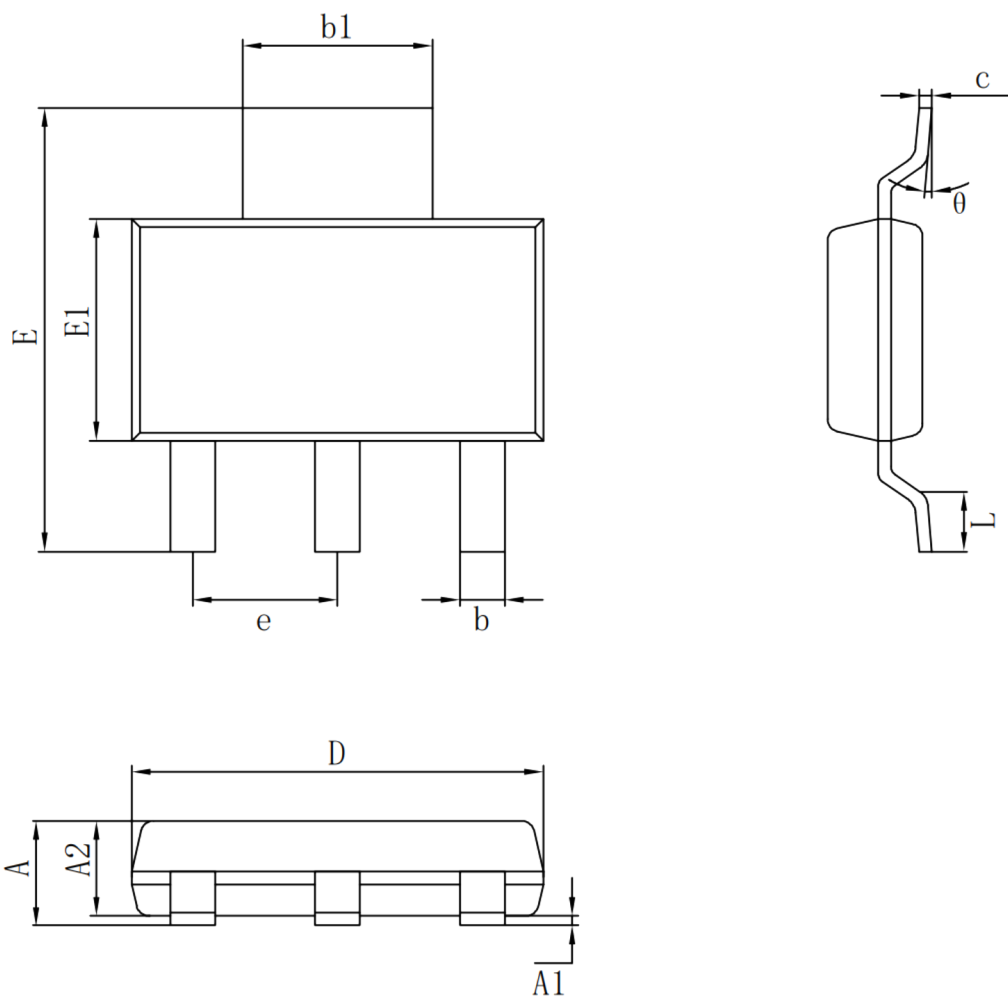
### · SOT-89-3

Size Symbol	Dimensions In Millimeters		Size Symbol	Dimensions In Inches	
	Min (mm)	Max (mm)		Min (in)	Max (in)
A	1.400	1.600	A	0.055	0.063
b	0.320	0.520	b	0.013	0.020
b1	0.400	0.580	b1	0.016	0.023
c	0.350	0.440	c	0.014	0.017
D	4.400	4.600	D	0.173	0.181
D1	1.550 (REF)		D1	0.61 (REF)	
E	2.300	2.600	E	0.091	0.102
E1	3.940	4.250	E1	0.155	0.167
e	1.500 (TYP)		e	0.060 (TYP)	
e1	3.000 (TYP)		e1	0.118 (TYP)	
L	0.900	1.200	L	0.035	0.047



## · SOT-223

Size Symbol	Dimensions In Millimeters		Size Symbol	Dimensions In Inches	
	Min (mm)	Max (mm)		Min (in)	Max (in)
A		1.800	A		0.071
A1	0.020	0.100	A1	0.001	0.004
A2	1.500	1.700	A2	0.059	0.067
b	0.660	0.840	b	0.026	0.033
b1	2.900	3.100	b1	0.114	0.122
c	0.230	0.350	c	0.009	0.014
D	6.300	6.700	D	0.248	0.264
E	6.700	7.300	E	0.264	0.287
E1	3.300	3.700	E1	0.130	0.146
e	2.300 (BSC)		e	0.091 (BSC)	
L	0.750		L	0.030	
$\theta$	0°	10°	$\theta$	0°	10°



### · T0-252-2L

Size Symbol	Dimensions In Millimeters		Size Symbol	Dimensions In Inches	
	Min (mm)	Max (mm)		Min (mm)	Max (mm)
A	2.200	2.400	A	0.087	0.094
A1	0.000	0.127	A1	0.000	0.005
B	1.350	1.650	B	0.053	0.065
b	0.500	0.700	b	0.020	0.028
b1	0.700	0.900	b1	0.028	0.035
c	0.430	0.580	c	0.017	0.023
c1	0.430	0.580	c1	0.017	0.023
D	6.350	6.500	D	0.250	0.262
D1	5.200	5.400	D1	0.205	0.213
E	5.400	5.700	E	0.213	0.224
e	2.300 (TYP)		e	0.091 (TYP)	
e1	4.500	4.700	e1	0.177	0.185
L	9.500	9.900	L	0.374	0.390
L1	2.550	2.900	L1	0.100	0.114
L2	1.400	1.780	L2	0.055	0.070

