



## 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.)
- 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

## General Description

HS1117C is a series of low dropout three-terminal regulators with a dropout of 1.3V at 1 A load current. HS1117C features a very low standby current 2mA compared to 5mA of competitor.

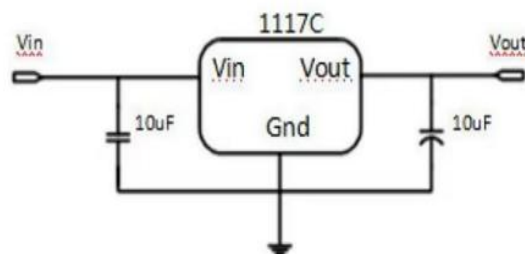
Other than a fixed version,  $V_{out} = 1.2V, 1.8V, 2.5V, 2.85V, 3.3V, \text{ and } 5V$ , HS1117C has an adjustable version, which can provide an output voltage from 1.25 to 12V with only two external resistors.

HS1117C offers thermal shutdown 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%.

HS1117C is available in SOT-223, TO-252, SOT-89 power package

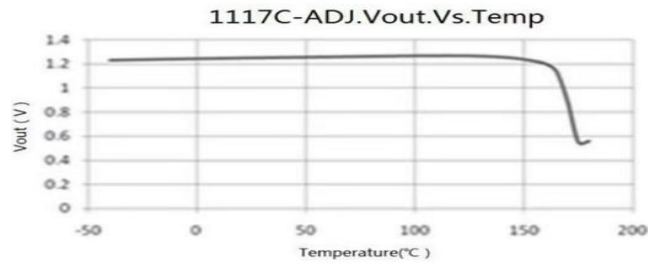
## Typical Application





Application circuit of HS1117C fixed version

### Typical Electrical Characteristic



### Selection Table

Marking	Part No.	Output Voltage	Package
1117 C XX YYWW	XX=12	1.2V	SOT-223 TO-252 SOT-89
	XX=18	1.8V	
	XX=28	2.85V	
	XX=25	2.5V	
	XX=33	3.3V	
	XX=50	5.0V	
	XX=AD	Adj	

### Ordering Information

Marking	Designator	Description
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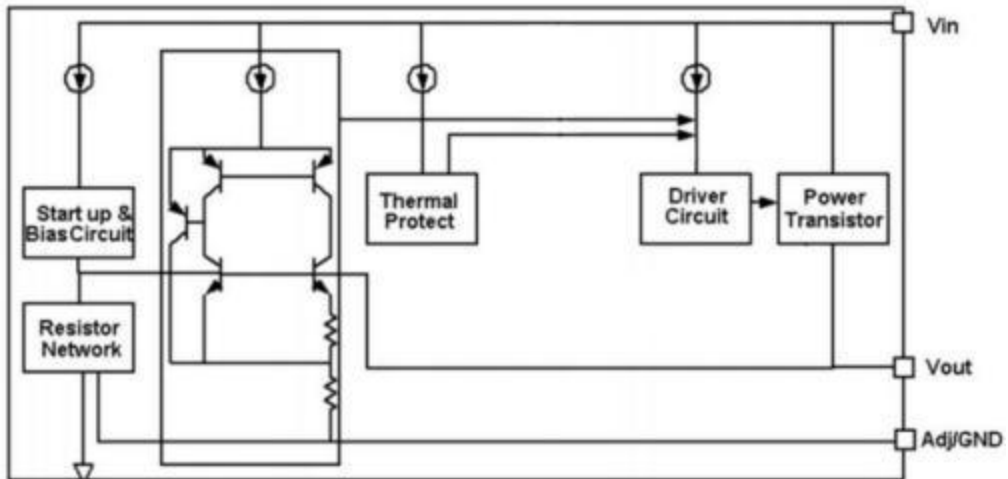
1A Bipolar Linear Regulator

1117 C  XX YYWW	1117 C	Product code
	XX	Output Voltage(1.2~12.0V)
	YYWW	DATE CODE

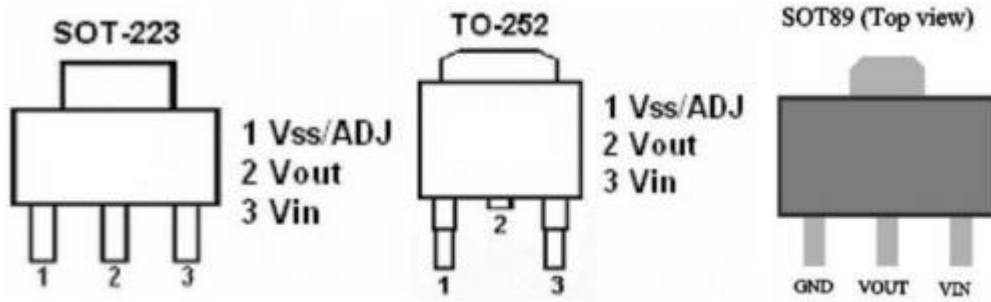
Note: "XX" stands for output voltages. Other voltages can be specially customized

Parameters	Description
Temperature & Rohs	C:-40~85°C , Pb Free Rohs Std.
Package type	L:SOT-223 O:TO-252
Packing type:	TR: Tape & Reel (Standard)
Voltage accuracy	2%(Customized)

Block Diagram



Pin Configuration



### Absolute Maximum Ratings

Max Input Voltage	.....	30V
Max Operating Junction Temperature(Tj)	.....	150°C
Ambient Temperature(Ta)	.....	-40°C~ 85°C
Storage Temperature(Ts)	.....	-40°C~ 150°C
Lead Temperature & Time	.....	260°C 10S

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	.....	15V
Recommended operating junction temperature(Tj)	.....	-20~125°C

### Thermal Information

Parameter	Package	Rating	Unit
Package thermal resistance	SOT-223	20	°C/W
	TO-252	12.5	°C/W
	SOT89	200	°C/W

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V <sub>ref</sub>	Reference voltage	HS1117C-Adj 10mA ≤ I <sub>out</sub> ≤ 1A, V <sub>in</sub> = 3.25V	1.225	1.25	1.275	V
V <sub>out</sub>	Output voltage	HS1117C-1.2V 0 ≤ I <sub>out</sub> ≤ 1A, V <sub>in</sub> = 3.2V	1.176	1.2	1.224	V
		HS1117C-1.8V 0 ≤ I <sub>out</sub> ≤ 1A, V <sub>in</sub> = 3.8V	1.764	1.8	1.836	V
		HS1117C-2.5V 0 ≤ I <sub>out</sub> ≤ 1A, V <sub>in</sub> = 4.5V	2.45	2.5	2.55	V
		HS1117C-2.85V 0 ≤ I <sub>out</sub> ≤ 1A, V <sub>in</sub> = 4.85V	2.793	2.85	2.907	V
		HS1117C-3.3V 0 ≤ I <sub>out</sub> ≤ 1A, V <sub>in</sub> = 5.3V	3.234	3.3	3.366	V
		HS1117C-5.0V 0 ≤ I <sub>out</sub> ≤ 1A, V <sub>in</sub> = 7.0V	4.9	5	5.1	V

		HS1117C-1.2V I <sub>out</sub> = 10mA, 2.7V ≤ V <sub>in</sub> ≤ 10V		0.03	0.2	%V
		HS1117C-ADJ I <sub>out</sub> = 10mA, 2.75V ≤ V <sub>in</sub> ≤ 12V		0.03	0.2	%V
		HS1117C-1.8V I <sub>out</sub> = 10mA, 3.3V ≤ V <sub>in</sub> ≤ 12V		0.03	0.2	%V



$\Delta V_{out}$	Line regulation	HS1117C-2.5V $I_{out} = 10\text{mA}, 4.0\text{V} \leq V_{in} \leq 12\text{V}$		0.03	0.2	%/V
		HS1117C-2.85V $I_{out} = 10\text{mA}, 4.35\text{V} \leq V_{in} \leq 12\text{V}$		0.03	0.2	%/V
		HS1117C-3.3V $I_{out} = 10\text{mA}, 4.8\text{V} \leq V_{in} \leq 12\text{V}$		0.03	0.2	%/V
		HS1117C-5.0V $I_{out} = 10\text{mA}, 6.5\text{V} \leq V_{in} \leq 12\text{V}$		0.03	0.2	%/V

$\Delta V_{out}$	Load regulation	HS1117C-1.2V $V_{in} = 2.7\text{V}, 10\text{mA} \leq I_{out} \leq 1\text{A}$		2	8	mV
		HS1117C-ADJ $V_{in} = 2.75\text{V}, 10\text{mA} \leq I_{out} \leq 1\text{A}$		2	8	mV
		HS1117C-1.8V $V_{in} = 3.3\text{V}, 10\text{mA} \leq I_{out} \leq 1\text{A}$		3	12	mV
		HS1117C-2.5V $V_{in} = 4.0\text{V}, 10\text{mA} \leq I_{out} \leq 1\text{A}$		4	16	mV
		HS1117C-2.85V $V_{in} = 4.35\text{V}, 10\text{mA} \leq I_{out} \leq 1\text{A}$		5	20	mV
		HS1117C-3.3 $V_{in} = 4.8\text{V}, 10\text{mA} \leq I_{out} \leq 1\text{A}$		6	24	mV
		HS1117C-5.0 $V_{in} = 6.5\text{V}, 10\text{mA} \leq I_{out} \leq 1\text{A}$		9	36	mV
		$V_{drop}$	Dropout voltage	$I_{out} = 100\text{mA}$		1.2



		I <sub>out</sub> =1A		1.3	1.5	V
I <sub>min</sub>	Minimum load current	HS1117C-ADJ		2	10	mA
I <sub>q</sub>	Quiescent Current	HS1117C-1.2V, V <sub>in</sub> = 10V		2	5	mA
		HS1117C-1.8V, V <sub>in</sub> = 12V		2	5	mA
		HS1117C-2.5V, V <sub>in</sub> = 12V		2	5	mA
		HS1117C-2.85V, V <sub>in</sub> =12V		2	5	mA
		HS1117C-3.3V, V <sub>in</sub> = 12V		2	5	mA
		HS1117C-5.0V, V <sub>in</sub> = 12V		2	5	mA
I <sub>Adj</sub>	Adjust pin current	HS1117C-ADJ V <sub>in</sub> =5V, 10mA ≤ I <sub>out</sub> ≤ 1A		55	120	uA
I <sub>change</sub>	I <sub>adj</sub> change	HS1117C-ADJ V <sub>in</sub> =5V, 10mA ≤ I <sub>out</sub> ≤ 1A		0.2	10	uA
ΔV/ΔT	Temperature coefficient			±100		ppm
θ <sub>J</sub>	Thermal resistance	SOT-223		20		°C/W
		TO-252		10		

Note1: All test are conducted under ambient temperature 25°C and within a short period of time 20ms Note2:

Load current smaller than minimum load current of HS1117C will lead to unstable or oscillation output.



## Detailed Description

HS1117C 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.

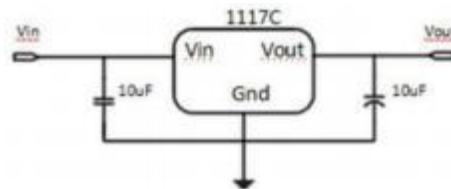
The thermal shutdown modules can assure chip and its application system working safety when the junction temperature is larger than 140°C.

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

HS1117C has an adjustable version and six fixed versions (1.2V, 1.8V, 2.5V, 2.85V, 3.3V and 5V)

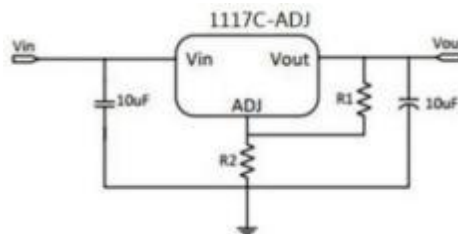
### Fixed Output Voltage Version



Application circuit of HS1117C 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 HS1117C

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 lower. As HS1117C 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 HS1117C is very large. HS1117C 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

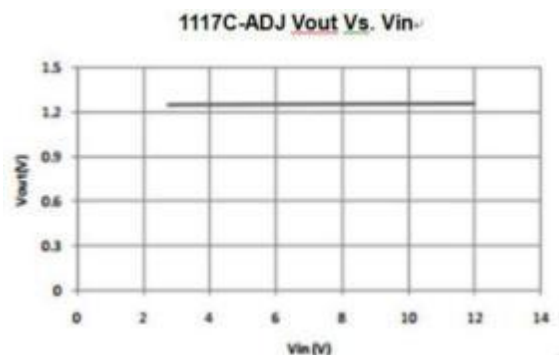
thermal resistance is about 20°C/W + 30°C/W. We can decrease total thermal resistance by increasing copper area in

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 HS1117C could allow on itself is less than 1W. And furthermore, HS1117C will work at junction temperature higher than 125°C under such condition and no lifetime is guaranteed.

### Typical Performance Characteristics

$T_A=25^\circ\text{C}$ , unless otherwise noted.

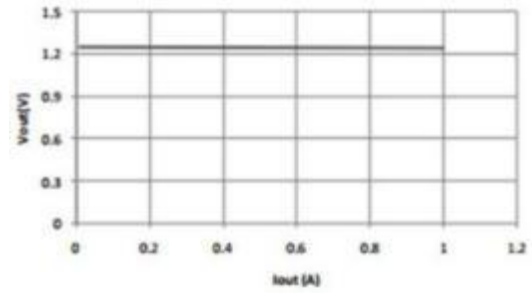
#### Line regulation





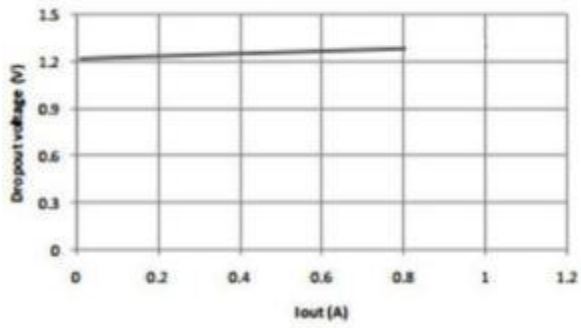
Load regulation

117C-ADJ Vout Vs. Iout

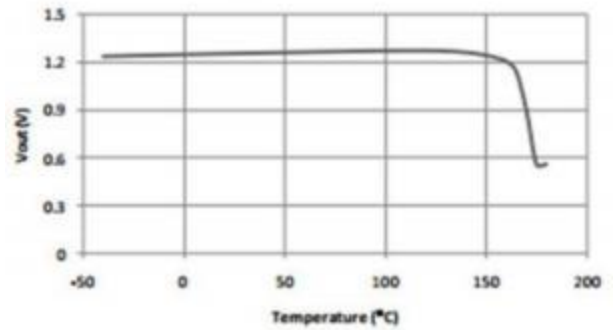


Dropout voltage

Dropout voltage



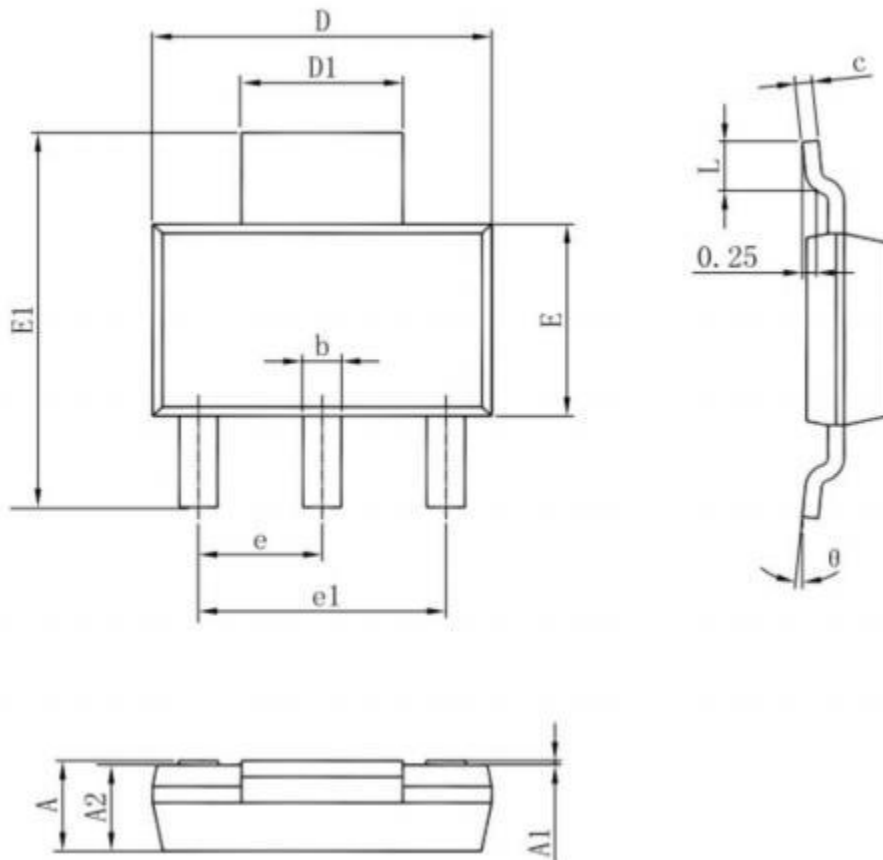
Thermal performance with OTP



Package Information



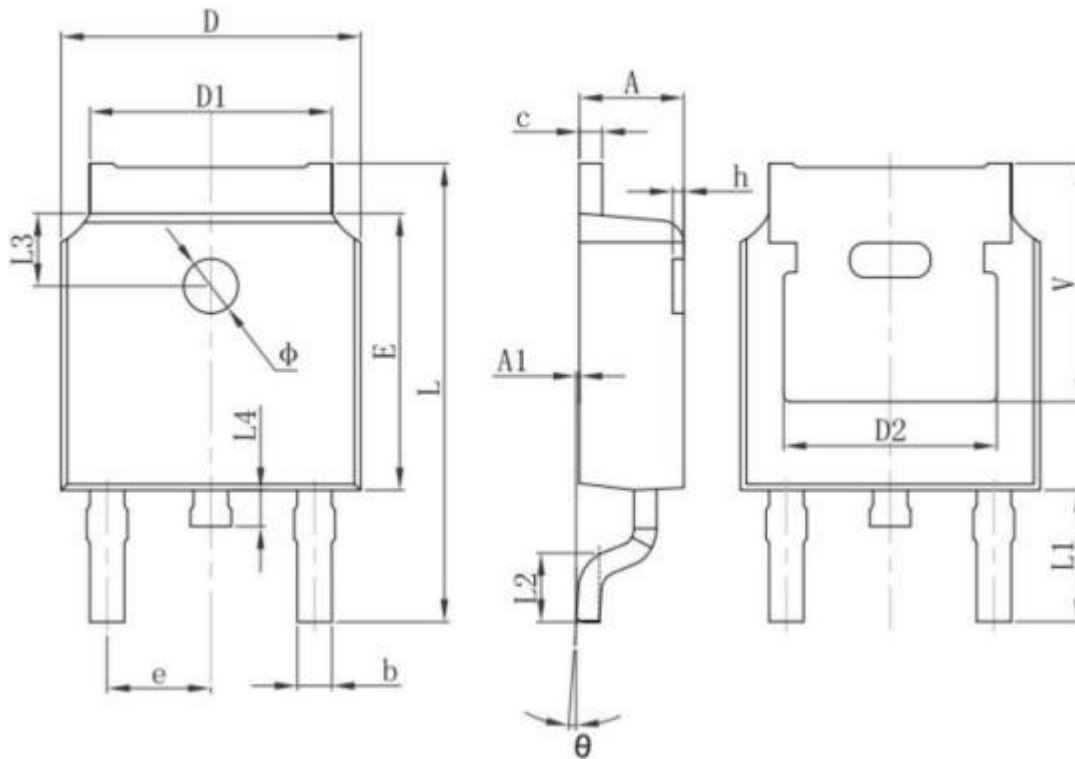
## SOT-223 PACKAGE OUTLINE DIMENSIONS



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°



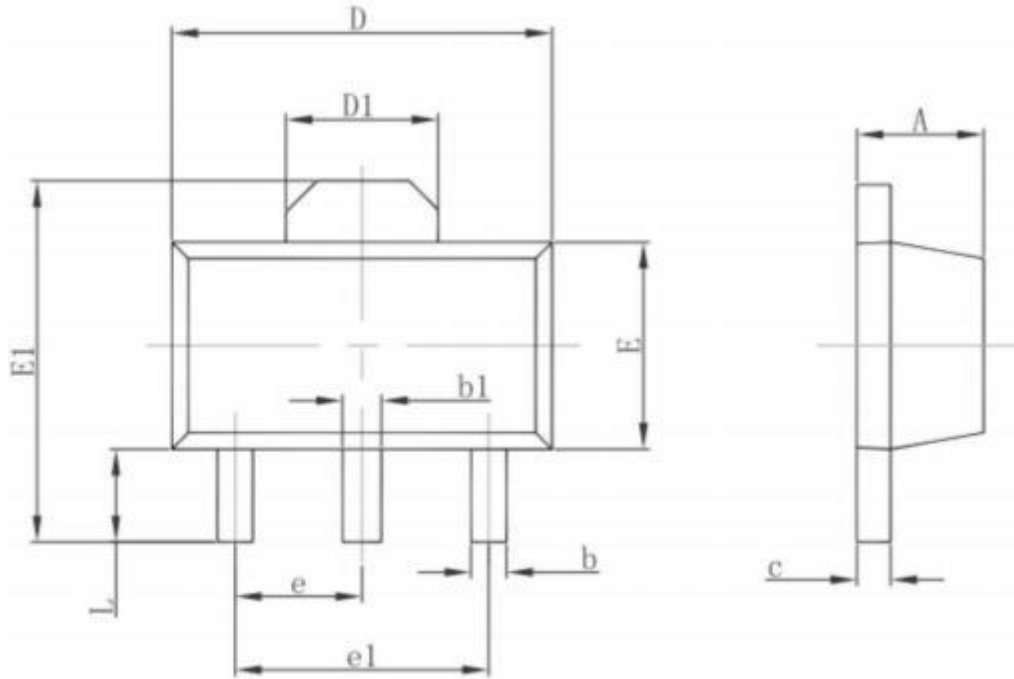
## TO-252-2L PACKAGE OUTLINE DIMENSIONS



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
Phi	1.100	1.300	0.043	0.051
theta	0°	8°	0°	8°
h	0.000	0.300	0.000	0.012
V	5.350 REF.		0.211 REF.	



## 3-pin SOT89 Outline Dimensions



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	1.400	1.600	0.055	0.063
b	0.320	0.520	0.013	0.020
b1	0.400	0.580	0.016	0.023
c	0.350	0.440	0.014	0.017
D	4.400	4.600	0.173	0.181
D1	1.550 REF.		0.061 REF.	
E	2.300	2.600	0.091	0.102
E1	3.940	4.250	0.155	0.167
e	1.500 TYP.		0.060 TYP.	
e1	3.000 TYP.		0.118 TYP.	
L	0.900	1.200	0.035	0.047