

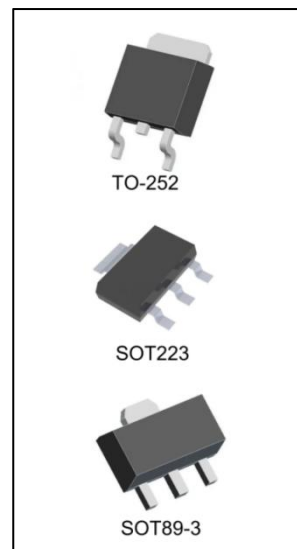
1A Bipolar Linear Regulator

SSP1117

General Description

SSP1117 is a series of low dropout three-terminal regulators with a dropout of 1.3V at 1A load current. SSP1117 features a very low standby current 2mA compared to 5mA of competitor. Other than a fixed version, $V_{out}=1.2V, 1.5V, 1.8V, 2.5V, 2.85V, 3.3V$ and 5V, SSP1117 has an adjustable version, which can provide an output voltage from 1.25 to 12V with only two external resistors.

SSP1117 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%. SSP1117 is available in SOT-223, TO-252, SOT89-3 power package.



Features

- Maximum output current is 1.0A
- Range of operation input voltage: Max 24V
- Line regulation: 0.03%/V (typ.)
- Standby current: 2mA (typ.)
- Load regulation: 0.2%/A (typ.)
- SOT-223, TO-252, SOT89-3 package

Applications

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

Order information

Product model	Package	Manner of packing	Minimum packing quantity
SSP1117-XX-SOT223	SOT223	Reel	2500
SSP1117-XX-TO-252	TO-252	Reel	2500
SSP1117-XX-SOT89-3	SOT89-3	Reel	1000

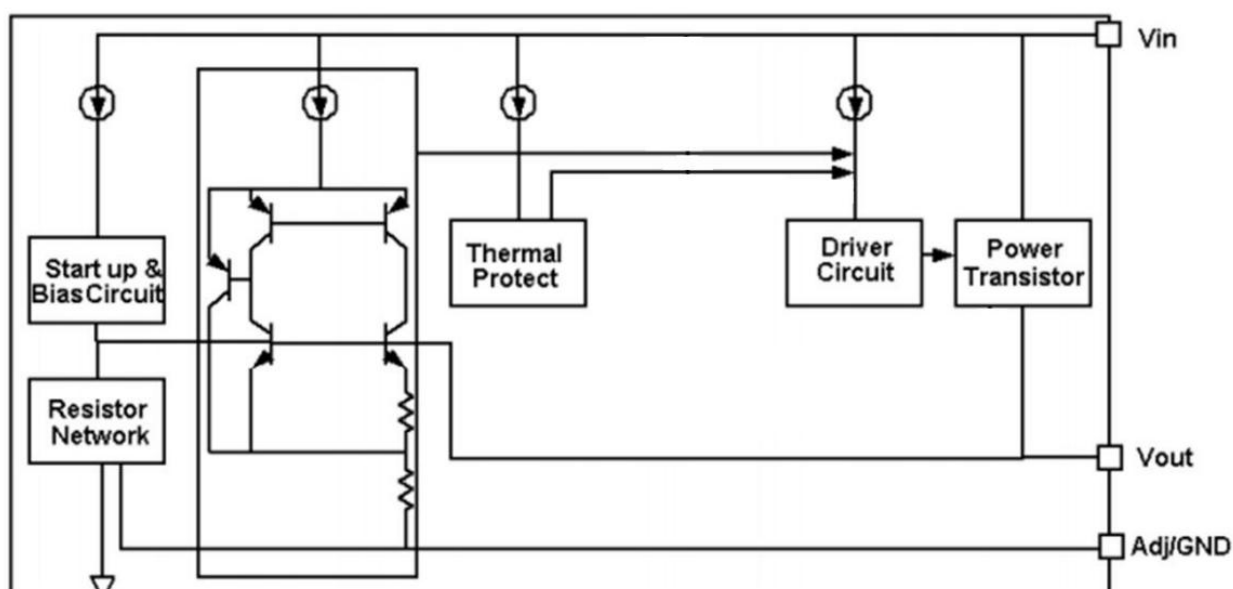
Selection Table

Marking	Part No.	Output Voltage	Package
1117 XX YYWW	XX=12	1.2V	SOT-223 TO-252 SOT89-3
	XX=15	1.5V	
	XX=18	1.8V	
	XX=28	2.85V	
	XX=25	2.5V	
	XX=33	3.3V	
	XX=50	5.0V	
	XX=ADJ	Adj	

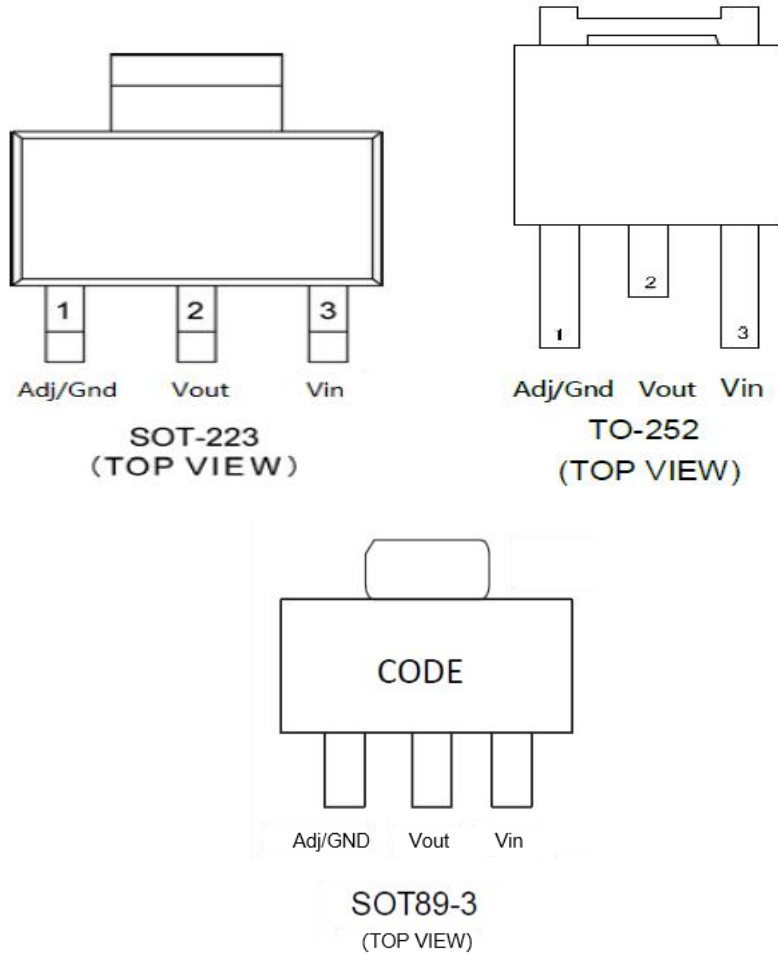
Marking	Designator	Description
1117 XXYYWW	1117	Product code
	XX	Output Voltage(1.2~12.0V)
	YYWW	DATE CODE

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

Block Diagram



Pin Configuration



Absolute Maximum Ratings

Parameter	Symbol	Ratings	Units
Max Input Voltage	V_{IN}	24	V
Max Operating Junction Temperature(T_j)	θ_{Tj}	150	°C
Ambient Temperature(T_a)	T_{opr}	-40~+85	°C
Storage Temperature(T_s)	T_{stg}	-40~+150	°C
Lead Temperature & Time	TSOLD, R	260°C 10S	

Note: Exceed these limits to damage to the device. Exposure to absolute maximum rating conditions may affect device reliability.

Thermal Information

Parameter	Package	Rating	Unit
Package thermal resistance	SOT-223	20	°C/W
	TO-252	12.5	°C/W
	SOT89-3	67	°C/W

Electrical Characteristics

($T_{amb}=25^{\circ}\text{C}$, unless otherwise noted)

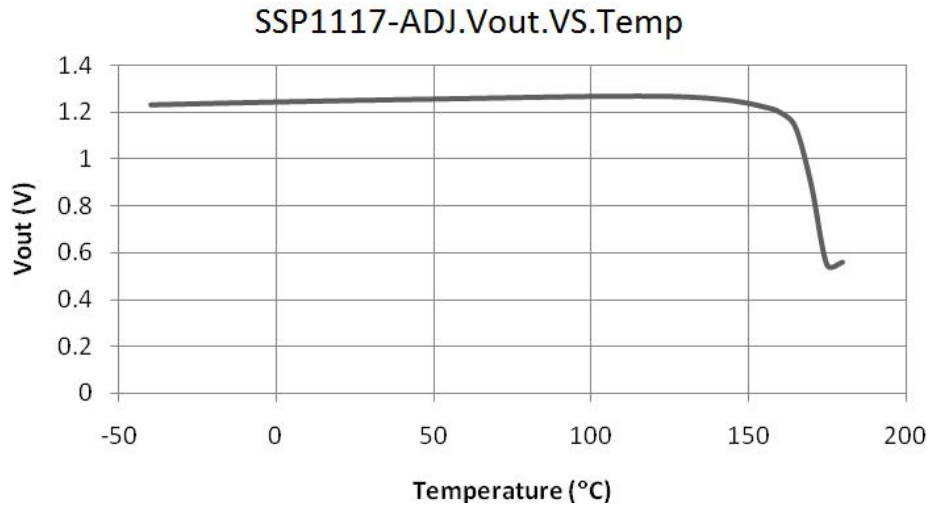
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Reference Voltage	V_{ref}	SSP1117-Adj $10\text{mA} \leq I_{out} \leq 1\text{A}$, $V_{in}=3.25\text{V}$	1.225	1.25	1.275	V
Output Voltage	V_{out}	SSP1117-1.2V $0 \leq I_{out} \leq 1\text{A}$, $V_{in}=3.2\text{V}$	1.176	1.2	1.224	V
		SSP1117-1.5V $0 \leq I_{out} \leq 1\text{A}$, $V_{in}=3.5\text{V}$	1.47	1.5	1.53	V
		SSP1117-1.8V $0 \leq I_{out} \leq 1\text{A}$, $V_{in}=3.8\text{V}$	1.764	1.8	1.836	V
		SSP1117-2.5V $0 \leq I_{out} \leq 1\text{A}$, $V_{in}=4.5\text{V}$	2.45	2.5	2.55	V
		SSP1117-2.85V $0 \leq I_{out} \leq 1\text{A}$, $V_{in}=4.85\text{V}$	2.793	2.85	2.907	V
		SSP1117-3.3V $0 \leq I_{out} \leq 1\text{A}$, $V_{in}=5.3\text{V}$	3.234	3.3	3.366	V
		SSP1117-5.0V $0 \leq I_{out} \leq 1\text{A}$, $V_{in}=7.0\text{V}$	4.9	5	5.1	V
Line Regulation	$\frac{\Delta V_{OUT}}{V_{OUT} \times \Delta V_{IN}}$	SSP1117-1.2V $I_{out}=10\text{mA}$, $2.7\text{V} \leq V_{in} \leq 10\text{V}$		0.03	0.2	%/V
		SSP1117-1.5V $I_{out}=10\text{mA}$, $3.0\text{V} \leq V_{in} \leq 12\text{V}$		0.03	0.2	%/V
		SSP1117-1.8V $I_{out}=10\text{mA}$, $3.3\text{V} \leq V_{in} \leq 12\text{V}$		0.03	0.2	%/V
		SSP1117-2.5V $I_{out}=10\text{mA}$, $4.0\text{V} \leq V_{in} \leq 12\text{V}$		0.03	0.2	%/V
		SSP1117-2.85V $I_{out}=10\text{mA}$, $4.35\text{V} \leq V_{in} \leq 12\text{V}$		0.03	0.2	%/V
		SSP1117-3.3V $I_{out}=10\text{mA}$, $4.8\text{V} \leq V_{in} \leq 12\text{V}$		0.03	0.2	%/V
		SSP1117-5.0V $I_{out}=10\text{mA}$, $6.5\text{V} \leq V_{in} \leq 12\text{V}$		0.03	0.2	%/V
		SSP1117-ADJ $I_{out}=10\text{mA}$, $2.75\text{V} \leq V_{in} \leq 12\text{V}$		0.03	0.2	%/V
		SSP1117-1.2V $V_{in}=2.7\text{V}$, $10\text{mA} \leq I_{out} \leq 1\text{A}$		2	8	mV

Load Regulation	ΔV_{out}	SSP1117-1.5V $V_{in}=2.7V, 10mA \leq I_{out} \leq 1A$		3	10	mV
		SSP1117-1.8V $V_{in}=3.3V, 10mA \leq I_{out} \leq 1A$		3	12	mV
		SSP1117-2.5V $V_{in}=4.0V, 10mA \leq I_{out} \leq 1A$		4	16	mV
		SSP1117-2.85V $V_{in}=4.35V, 10mA \leq I_{out} \leq 1A$		5	20	mV
		SSP1117-3.3V $V_{in}=4.8V, 10mA \leq I_{out} \leq 1A$		6	24	mV
		SSP1117-5.0V $V_{in}=6.5V, 10mA \leq I_{out} \leq 1A$		9	36	mV
		SSP1117-ADJ $V_{in}=2.75V, 10mA \leq I_{out} \leq 1A$		2	8	mV
Dropout Voltage	V_{drop}	$I_{out}=100mA$		1.15	1.3	V
		$I_{out}=1A$		1.3	1.5	V
Minimum load current	I_{min}	SSP1117-ADJ		2	10	mA
Quiescent Current	I_q	SSP1117-1.2V, $V_{in}=10V$		2	5	mA
		SSP1117-1.5V, $V_{in}=11V$		2	5	mA
		SSP1117-1.8V, $V_{in}=12V$		2	5	mA
		SSP1117-2.5V, $V_{in}=12V$		2	5	mA
		SSP1117-2.85V, $V_{in}=12V$		2	5	mA
		SSP1117-3.3V, $V_{in}=12V$		2	5	mA
		SSP1117-5.0V, $V_{in}=12V$		2	5	mA
Adj Pin Current	I_{Adj}	SSP1117-ADJ $V_{in}=5V, 10mA \leq I_{out} \leq 1A$		55	120	uA
I_{adj} Change	I_{change}	SSP1117-ADJ $V_{in}=5V, 10mA \leq I_{out} \leq 1A$		0.2	10	uA
Temperature Coefficient	$\Delta V/\Delta T$			± 100		ppm
Thermal resistance	θ_{JC}	SOT-223		20		°C/W
		TO-252		10		

Note 1: All the tests were performed at an ambient temperature of 25°C and a short period of 20ms.

Note 2: Load currents smaller than the minimum load current of SSP1117-ADJ will result in output instability or oscillation.

Electrical Characteristic Curve



Detailed Description

SSP1117 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.

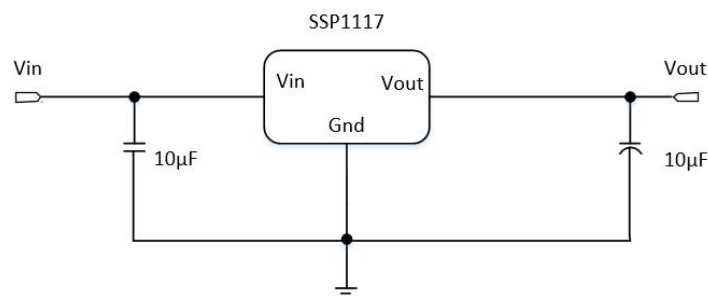
The thermal shutdown modules can assure chip and its application system working safety when the junction temperature is larger than 140°C.

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

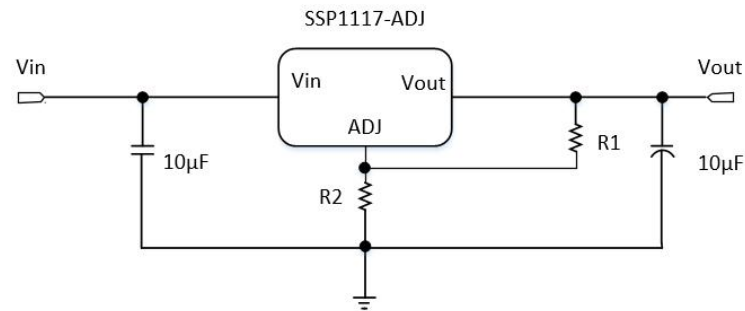
SSP1117 has an adjustable version and six fixed versions (1.2V, 1.5V, 1.8V, 2.5V, 2.85V, 3.3V and 5V)

Fixed Output Voltage Version



- 1) Recommend using 10uF tan capacitor as bypass capacitor for all application circuit.

Adjustable Output Voltage Version



Application Circuit of SSP1117-ADJ

The output voltage of adjustable version follows the equation:

$$V_{out} = 1.25 \times (1 + R_2/R_1) + I_{Adj} \times R_2.$$

I_{Adj} because I_{Adj} (about $50\mu A$) is much less than the current of R_1 (about $2\sim 10mA$).

1) As SSP1117-ADJ can keep itself stable at load current about $2mA$, R_1 is not allowed to be higher than 625Ω .

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 R_1 to prevent ripple from being amplified. As R_1 is normally in the range of $100\Omega\sim 500\Omega$, the value of C_{adj} should satisfy this equation:

$$C_{adj} > \frac{1}{2\pi f_{ripple} R_1}$$

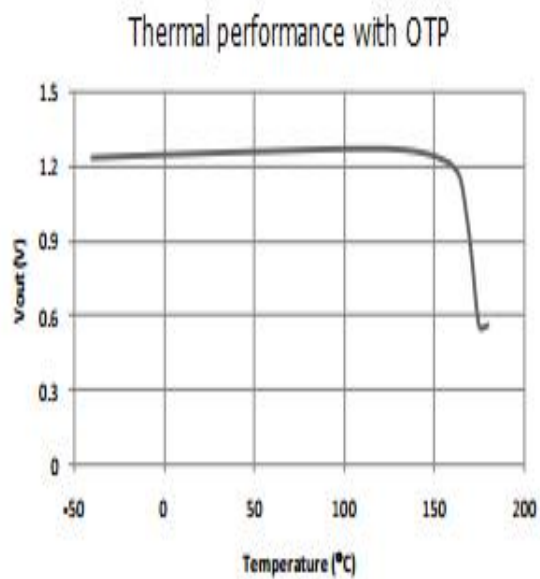
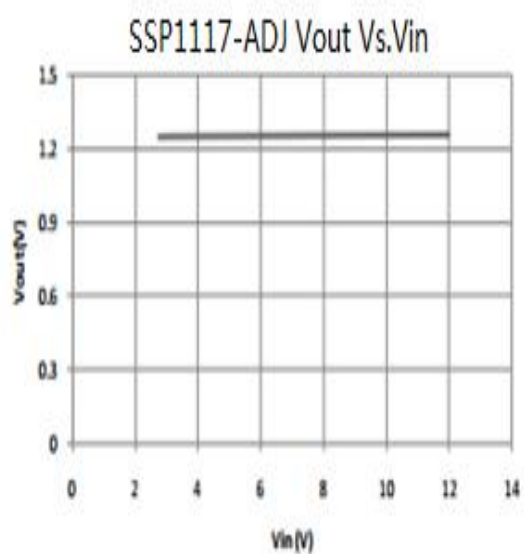
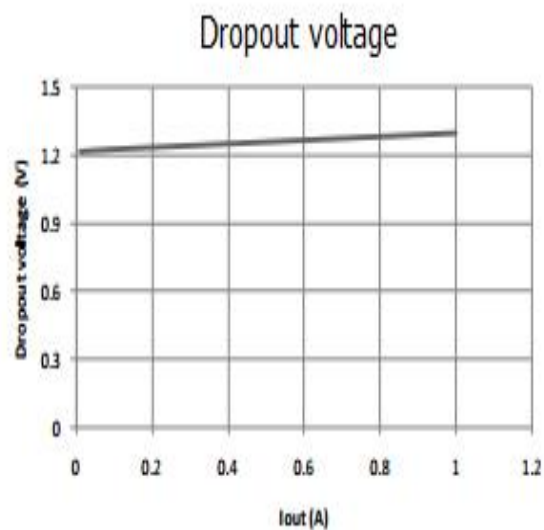
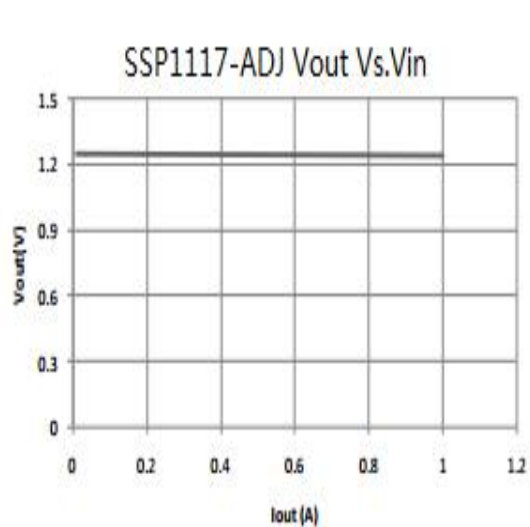
3) Resistors R_1 and R_2 and bypass capacitors are placed as close to the chip as possible.

Thermal Considerations

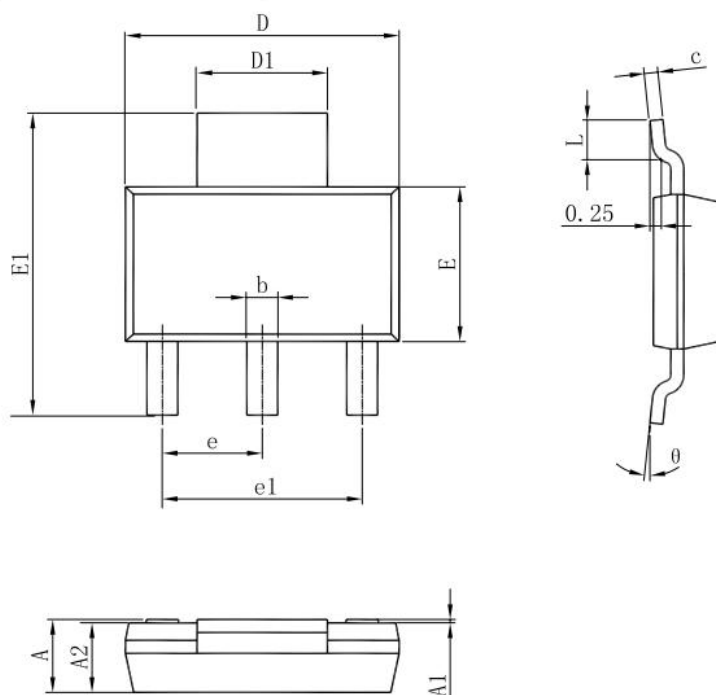
We have to take heat dissipation into great consideration when output current or differential voltage of input and output voltage is large. Because in such cases, the power dissipation consumed by SSP1117 is very large. SSP1117 series uses SOT-223 package type and its thermal resistance is about $20^\circ C/W$. And the copper area of application board can affect the total thermal resistance. If copper area is $5cm \times 5cm$ (two sides), the resistance is about $30^\circ C/W$. So the total thermal resistance is about $20^\circ C/W + 30^\circ C/W$. 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 $120^\circ C/W$, then the power dissipation of SSP1117 could allow on itself is less than $1W$. And furthermore, SSP1117 will work at junction temperature higher than $125^\circ C$ under such condition and no lifetime is guaranteed.

Typical Performance Characteristics

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

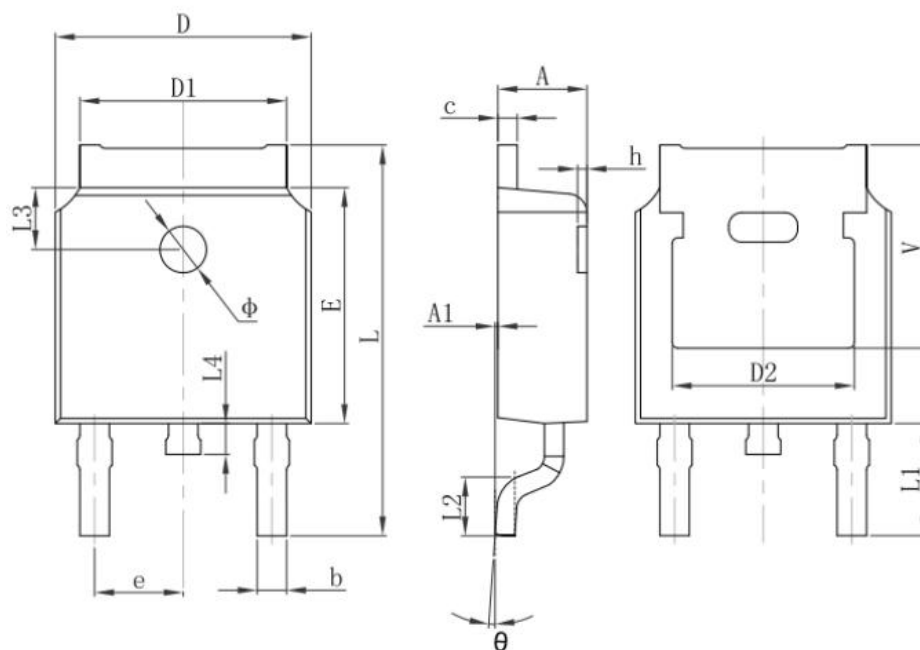


Package Information (SOT223)



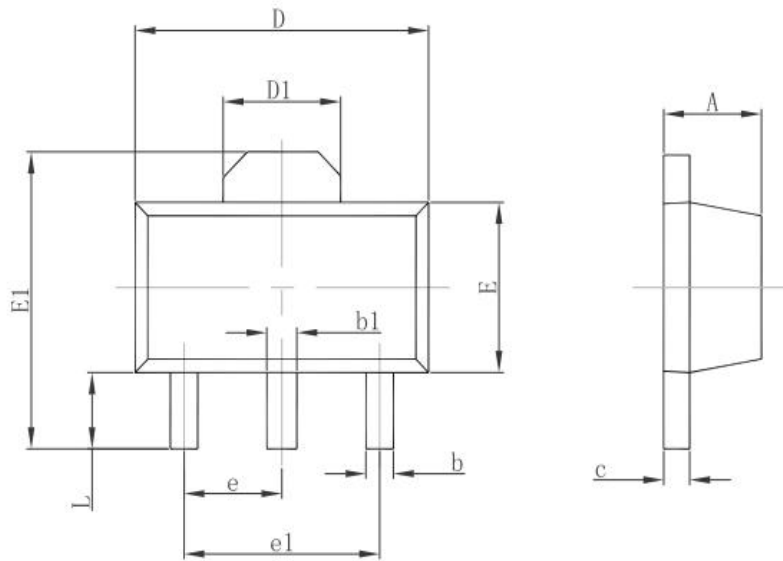
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.520	1.800	0.060	0.071
A1	0.000	0.100	0.000	0.004
A2	1.500	1.700	0.059	0.067
b	0.660	0.820	0.026	0.032
c	0.250	0.350	0.010	0.014
D	6.200	6.400	0.244	0.252
D1	2.900	3.100	0.114	0.122
E	3.300	3.700	0.130	0.146
E1	6.830	7.070	0.269	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°

Package Information (TO-252)



Symbol	Dimensions In Milimeters		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	4.830REF.		0.190REF.	
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	2.900REF.		0.114REF.	
L2	1.400	1.700	0.055	0.067
L3	1.600REF.		0.063REF.	
L4	0.600	1.000	0.024	0.039
Φ	1.100	1.300	0.043	0.051
θ	0°	8°	0°	8°
h	0.000	0.300	0.000	0.012
V	5.350REF.		0.211REF.	

Package Information(SOT89-3)



Symbol	Dimensions In Milimeters		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

Special Version

The company reserves the right of final interpretation of this specification.

Version Change Description

Versions: V1.6	Writer: HangLiu	Time: 2021.10.29
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Amendant record:

1. Re-typesetting the manual and checking some data

Versions: V1.7	Writer: Yang	Time: 2024.7.4
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Amendant record:

1. Update the maximum operating voltage

Versions: V1.8	Writer: Yang	Time: 2024.9.6
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Amendant record:

1. Add the SOT89-3 package
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Statement

The information in the usage specification is correct at the time of publication, Shanghai Siproin Microelectronics Co.,Ltd. has the right to change and interpret the specification, and reserves the right to modify the product without prior notice. Users can obtain the latest version information from our official website or other effective channels before confirmation, and verify whether the relevant information is complete and up to date.

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