General Description

HL1117 is a series of low dropout three-terminal regulators with a dropout of 1.1V at 1A load current.

HL1117 features a very low standby current 2mA compared to 5mA of competitor.

Other than a fixed version, Vout = 1.2V, 1.5V, 1.8V, 2.5V, 3.3V, and 5V, HL1117 has an adjustable version, which can provide an output voltage from 1.25 to 12V with only two external resistors.

HL1117 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%.

HL1117 is available in SOT89,SOT-223 and TO-252 packages.

Features

♦ Output current is 1A

♦ Range of operation input voltage: 15V

♦ Line regulation: 0.03%/V (typ.)

♦ Standby current: 2mA (typ.)

♦ Load regulation: 0.2%/A (typ.)

♦ Environment Temperature: -40℃~125℃

Applications

♦ Power Management for Computer Mother Board Graphic Card

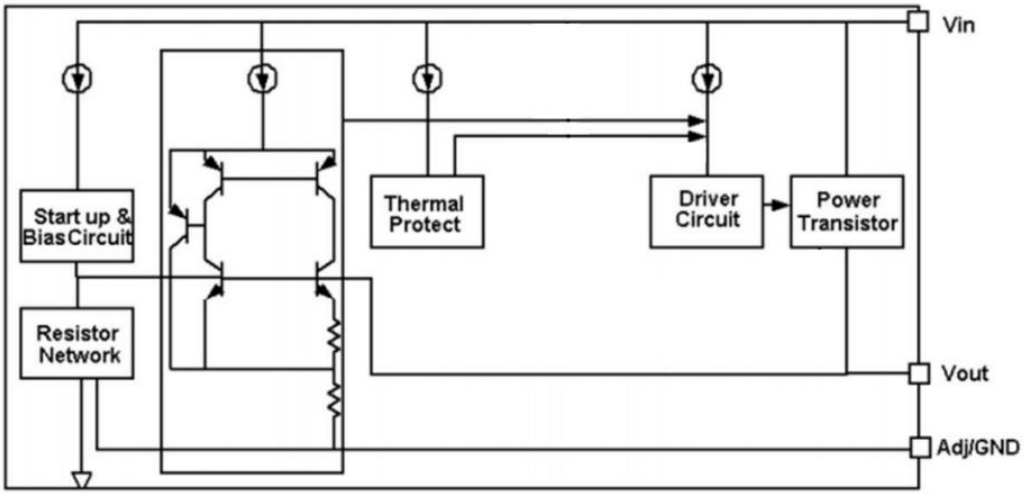
♦ LCD Monitor and LCD TV

♦ DVD Decode Board

♦ ADSL Modem

♦ Post Regulators for Switching Supplies

Block Diagram



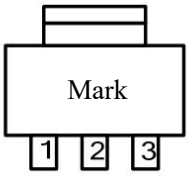
Selection Table

Part No	Symbol	Output Voltage	Package
HL1117	xx=12	1.2V	SOT89 SOT-223 TO-252
	xx=15	1.5V	
	xx=18	1.8V	
	xx=25	2.5V	
	xx=33	3.3V	
	xx=50	5.0V	
	xx=adj	adj	

Order Information

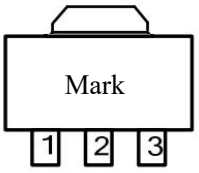
Part No	Symbol	Output Voltage
HL1117-xx	SOT89	1000 Tae&Reel
HL1117-xx	SOT-223	2500 Tae&Reel
HL1117-xx	TO-252	2500 Tae&Reel

Pin Configuration



SOT-223

TO-252



SOT-89

Package Dimensions

SOT-223

Fix Pin No	Pin Name	Definition
1	VSS/ADJ	VSS/ADJ Pin
2	VOUT	Output voltage Pin
3	VIN	Input voltage Pin
4	VOUT	Output voltage Pin

SOT-252

Fix Pin No	Pin Name	Definition
1	VSS/ADJ	VSS/ADJ Pin
2	VOUT	Output voltage Pin
3	VIN	Input voltage Pin

SOT-89

Fix Pin No	Pin Name	Definition
1	VSS/ADJ	VSS/ADJ Pin
2	VOUT	Output voltage Pin
3	VIN	Input voltage Pin

Absolute Maximum Ratings

Max Input Voltage……V
Max Operating Junction Temperture（T_J）……150℃
Storage Temperature（T_S）……-55℃ ~ 150℃
Lead Temperature & Time……260℃ 10S
Caution:Exceed these limits to damage to the device. Exposure to absolute maximum rating conditions may affect device reliability.

Electrical Characteristics

T_A=25℃，unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Vin	Input Voltage		-	15	18	V
Vref	Reference Voltage	HL1117-Adj 10mA≤Iout≤1A,Vin=2.5V	1.225	1.25	1.275	V
Vout	Output Voltage	HL1117-1.2V 0≤Iout≤1A , Vin=2.5V	1.176	1.20	1.220	V
		HL11117-1.5V 0≤Iout≤1A , Vin=2.8V	1.470	1.50	1.530	
		HL11117-1.8V 0≤Iout≤1A , Vin=3.1V	1.764	1.80	1.836	
		HL11117-2.5V 0≤Iout≤1A , Vin=3.8V	2.450	2.50	2.55	
		HL11117-3.3V 0≤Iout≤1A , Vin=4.6V	3.234	3.30	3.366	
		HL1117-5.0V 0≤Iout≤1A , Vin=6.3V	4.900	5.00	5.100	

△Vout	Line regulation	HL1117-1.2V Iout=10mA, 2.5V≤Vin≤10V	-	4	19	mV
		HL1117-1.5V Iout=10mA, 2.8V≤Vin≤10V	-	5	26	
		HL1117-ADJ Iout=10mA, 2.55V≤Vin≤12V	-	5	24	
		HL1117-1.8V Iout=10mA, 3.1V≤Vin≤12V	-	5	32	
		HL1117-2.5V Iout=10mA, 3.8V≤Vin≤12V	-	8	41	
		HL1117-3.3V Iout=10mA, 4.6V≤Vin≤12V	-	9	49	
		HL1117-5.0V Iout=10mA, 6.3V≤Vin≤12V	-	10	56	
△Vout	Load regulation	HL1117-1.2V Vin =2.5V, 10mA≤Iout≤1A	-	10	40	mV
		HL 1117-1.5V Vin =2.8V, 10mA≤Iout≤1A	-	10	40	
		HL1117-ADJ Vin =2.55V, 10mA≤Iout≤1A	-	10	40	
		HL1117-1.8V Vin =3.1V, 10mA≤Iout≤1A	-	10	40	
		HL1117-2.5V Vin =2.8V, 10mA≤Iout≤1A	-	10	40	
		HL1117-3.3 Vin =4.6V, 10mA≤Iout≤1A	-	10	40	
		HL1117-5.0 Vin =6.3V, 10mA≤Iout≤1A	-	10	40	
Vdrop	Dropout voltage	Iout =100mA	-	1.05	1.2	V
		Iout=1A	-	1.10	1.3	
Imin	Minimum load current	HL1117-ADJ	-	2	10	mA
Iq	Quiescent Current	HL1117-1.2V, Vin=10V	-	2	5	mA
		HL1117-1.5V, Vin=10V	-	2	5	
		HL1117-1.8V, Vin=12V	-	2	5	
		HL1117-2.5V, Vin=12V	-	2	5	
		HL1117-3.3V, Vin=12V	-	2	5	
		HL1117-5.0V, Vin=12V	-	2	5	
Iadj	Adjust pin current	HL1117-ADJ	-	55	120	uA

		Vin=5V,10mA≤Iout≤1A				
Ichange	Iadj change	HL1117-ADJ Vin=5V,10mA≤Iout≤1A	-	0.2	10	uA
ΔVout	Temperature coefficient	Vin=4.5V, Iout=10mA VOUT=3.3V 20℃≤Ta≤120℃	-	30	-	mV
θ_{JC}	Thermal resistance	SOT-223	-	20	-	℃/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 HL1117-ADJ will lead to unstable or oscillation output.

Detailed Description

HL1117 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, band-gap, thermal shutdown, power transistors and its driver circuit and so on.

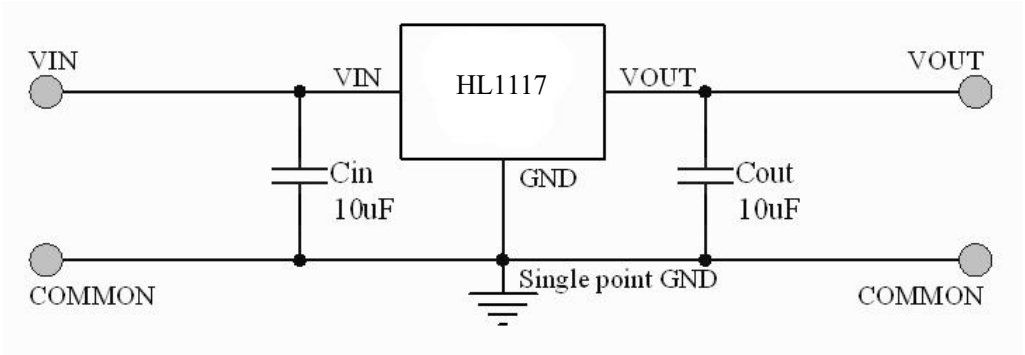
The thermal shut down modules can assure chip and its application system working safety when the temperature is larger than 200°C.

The band-gap 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

HL1117 has an adjustable version and six fixed versions （1.2V, 1.5V,1.8V, 2.5V, 2.85V, 3.3V and 5V）

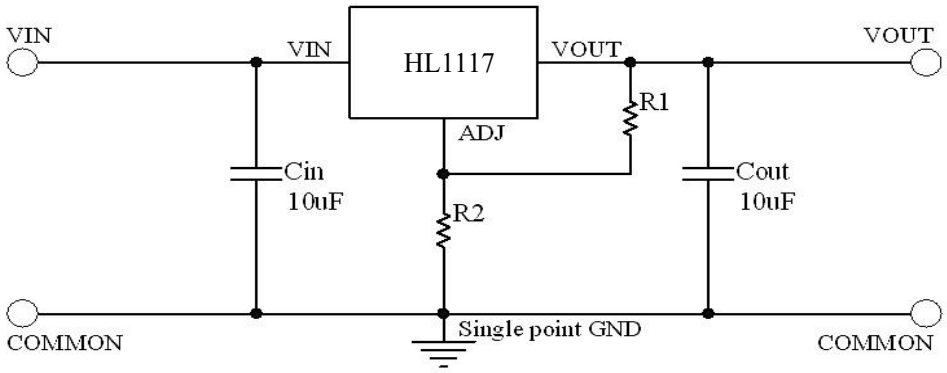
Fixed output Voltage Version



Application circuit of HL1117 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 HL1117-ADJ

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 HL1117- 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 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 HL1117 is very large.

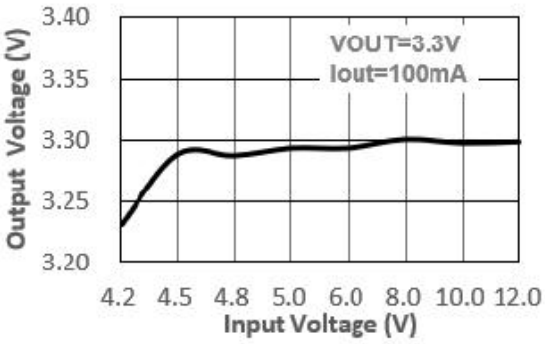
HL1117 series uses SOT- 223 package type and its thermal resistance is about 20°C/W. And the copper area of application board can affect the total thermal resistance. If copper area is 5cm*5cm (two sides), the resistance is about 30°C/W.

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 HL1117 could allow on itself is less than 1W. And furthermore, HL1117 will work at junction temperature higher than 125°C under such condition and no lifetime is guaranteed.

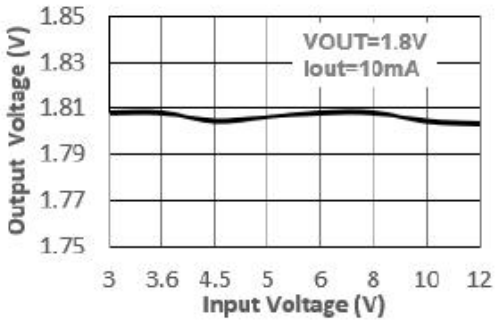
Typical Performance Characteristics

T_A=25℃, unless otherwise noted

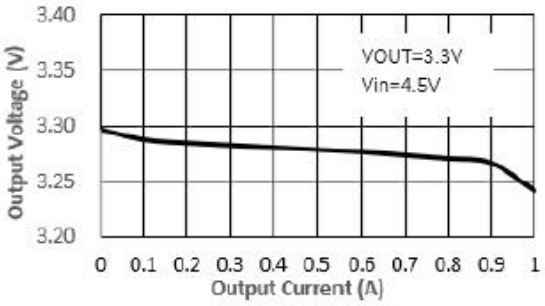
Output Voltage vs. Input Voltage (VOUT=3.3V)



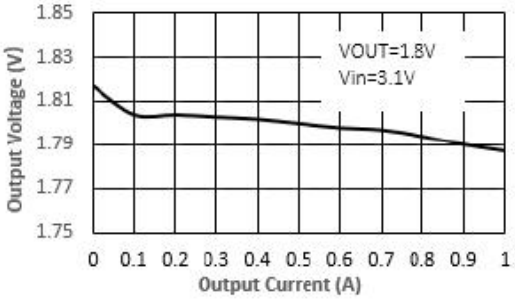
Output Voltage vs. Input Voltage (VOUT=1.8V)



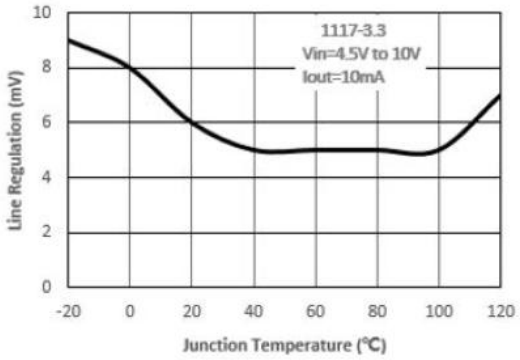
Output Voltage vs. Output Current (VOUT=3.3V)



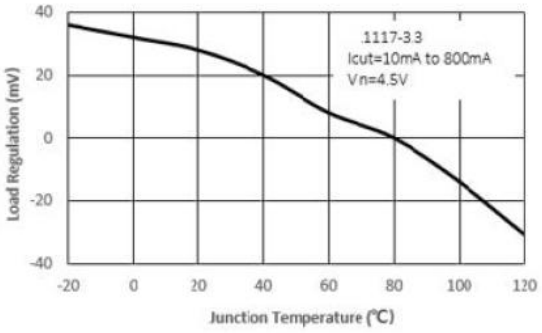
Output Voltage vs. Output Current (VOUT=1.8V)



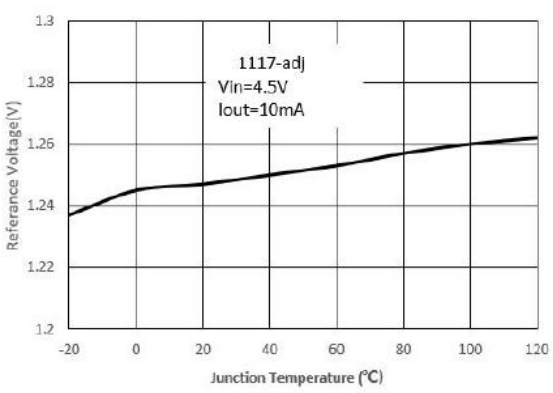
Line Regulation vs . Junction Temperature



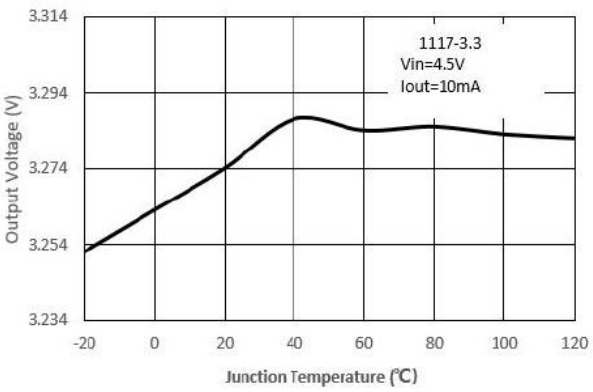
Load Regulation vs . Junction Temperature



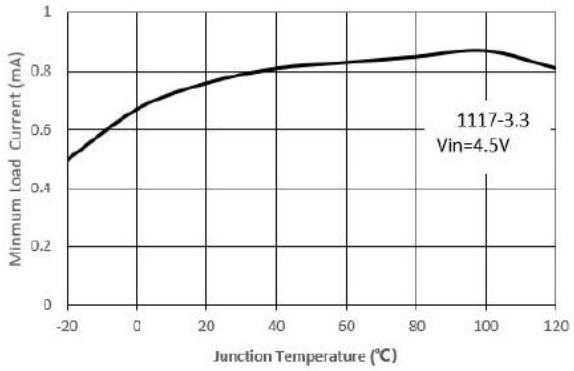
Reference Voltage vs . Junction Temperature



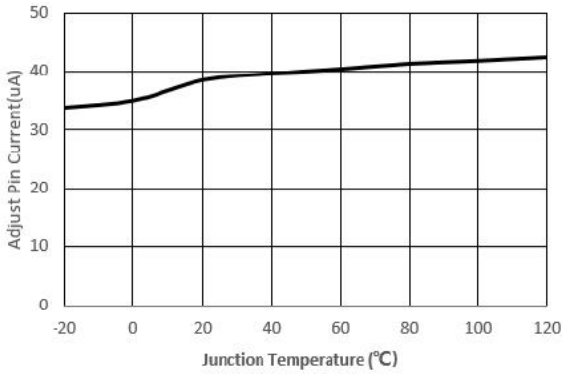
Output Voltage vs . Junction Temperature



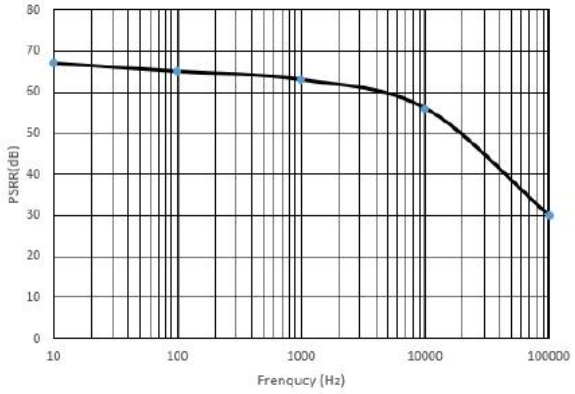
Minimum Load Current vs . Junction Temperature



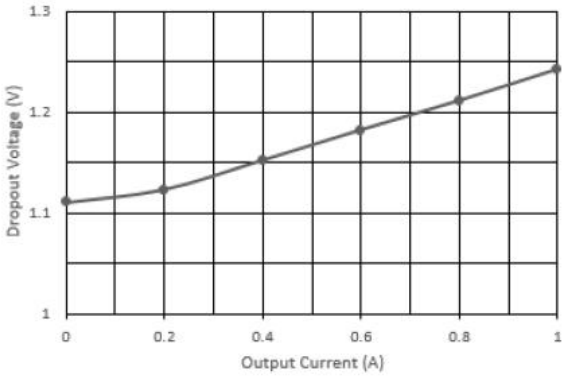
Adjust Pin Current vs . Junction Temperature



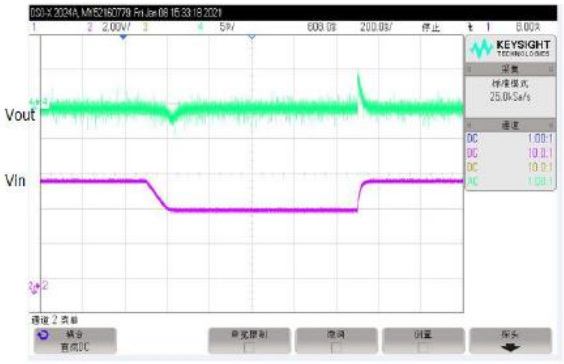
PSRR vs. Frequency



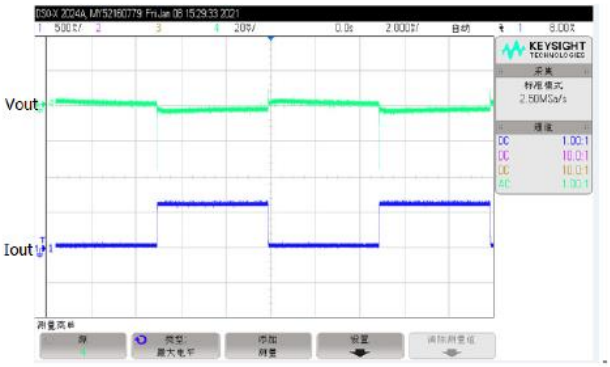
Dropout Voltage vs. Output Current



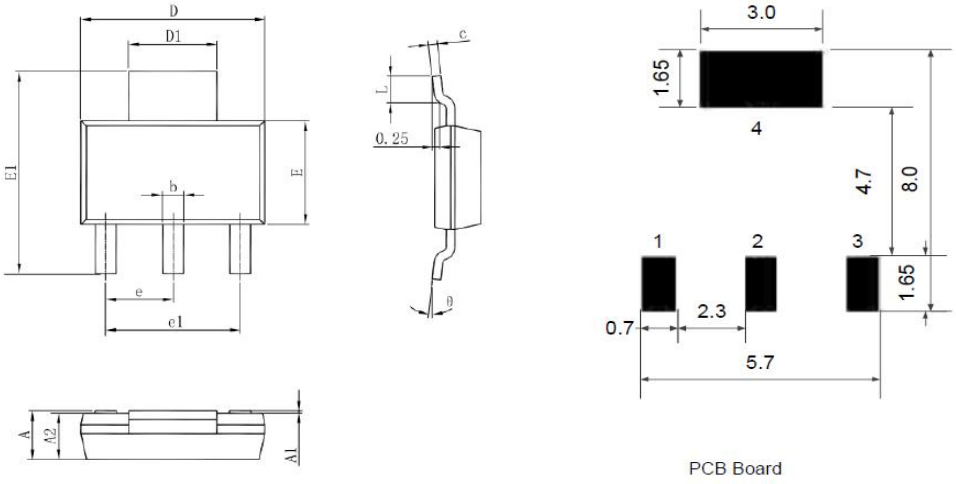
Line Transient Response



Load Transient Response

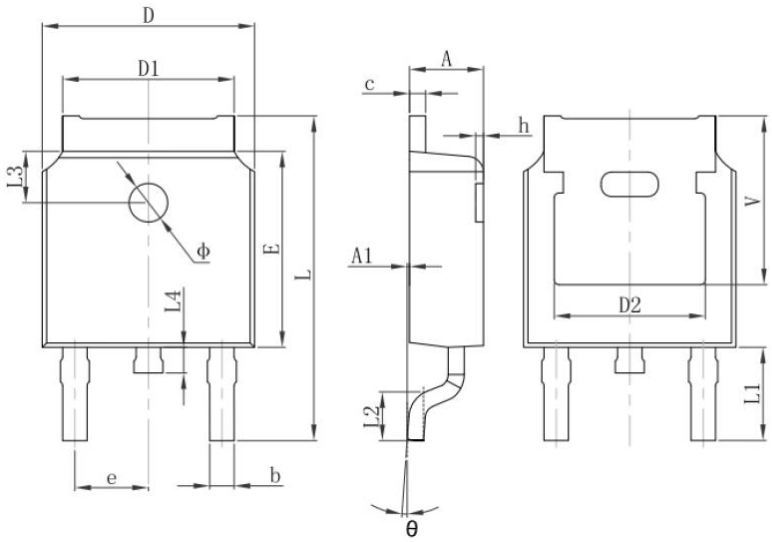


Package Dimensions SOT223



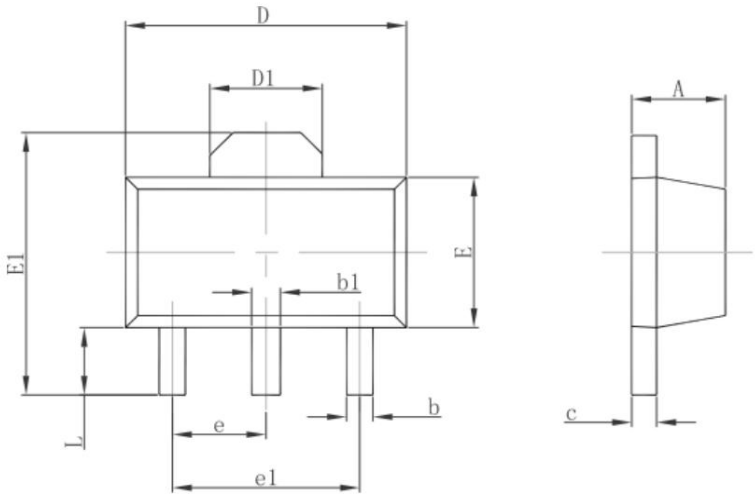
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.520	1.800	0.060	0.071
A1	0.000	0.100	0.000	0.004
A2	1.500	1.700	0.059	0.067
b	0.660	0.820	0.026	0.032
C	0.250	0.350	0.010	0.014
D	6.400	6.600	0.252	0.260
D1	2.900	3.100	0.114	0.122
E	3.300	3.700	0.130	0.146
E1	6.830	7.070	0.269	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
0	0°	10°	0°	10°

Package Dimensions TO-252-2L



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

Package Dimensions SOT89



Symbol	Dimensions In Millimeters		Dimensions Inches	
	Min.	Max.	Min.	Max.
A	1.400	1.600	0.055	0.063
b	0.320	0.520	0.013	0.020
h1	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

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