1A Bipolar Linear Regulator
AMS1117A

Features

- Maximum output current is 1A
- Range of operation input voltage: 25V
- Line regulation: 0.03%/V (typ.)
- ESD HBM:8KV
- Standby current: 1.5mA (typ.)
- Environment Temperature: -20℃~85℃

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

AMS1117A is a series of low dropout three-terminal regulators with a dropout of 1.3V at 1A load current. AMS1117A has a very low standby current 1.5mA. Other than a fixed version, Vout=1.2V, 1.5V, 1.8V, 2.5V,3.3V and 5V, AMS1117A has an adjustable version, which can provide an output voltage from 1.25 to 12V with only two external resistors.

AMS1117A have thermal shut down function to assure the stability of chip and power system. By using trimming technique to guarantee output voltage accuracy within 2%.

AMS1117A is available in SOT-223, TO-252 power package.

Part No.	Output Voltage	Package
AMS1117A-1.2	1.2V	SOT-223 TO-252
AMS1117A-1.5	1.5V	
AMS1117A-1.8	1.8V	
AMS1117A-2.5	2.5V	
AMS1117A-3.3	3.3V	
AMS1117A-5.0	5.0V	
AMS1117A-ADJ	ADJ	

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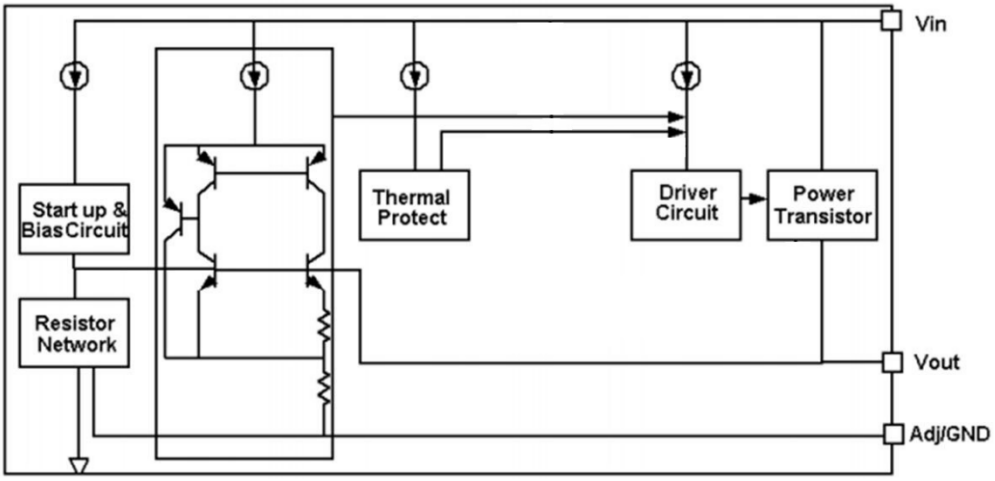
■ Block Diagram



■ Pin Configuration

SOT223 (Top View)

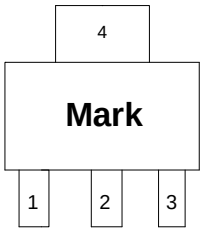


Table1: (SOT223 PKG)

PIN NO.	PIN NAME	FUNCTION
1	VSS/ADJ	VSS/ADJ pin
2	VOUT	Output voltage pin
3	VIN	Input voltage pin
4	VOUT	Output voltage pin

TO252 (Top View)

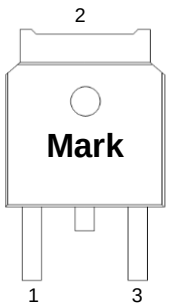


Table2: (TO252 PKG)

PIN NO.	PIN NAME	FUNCTION
1	VSS/ADJ	VSS/ADJ pin
2	VOUT	Output voltage pin
3	VIN	Input voltage pin

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■ Absolute Maximum Ratings

Max Input Voltage ····· ··30V

Max Operating Junction Temperature(Tj) ····· ··150℃

Ambient Temperature(Ta) ····· ···-20℃~ 125℃

Storage Temperature(Ts) ····· ···-40℃~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.

■ Recommended Work Conditions

Recommended maximum input voltage ····· ····· 15V

Recommended operating junction temperature(Tj) ····· ····· -20~125℃

■ Thermal Information

Parameter	Package	Rating	Unit
Package thermal resistance	SOT-223	20	℃/W
	TO-252	12.5	℃/W

■ Electrical Characteristics

T_A=25℃, unless otherwise noted.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Vref	Reference Voltage	AMS1117A-ADJ 10mA≤Iout≤1A , Vin=2.55V	1.225	1.25	1.275	V
Vout	Output voltage	AMS1117A-1.2 0≤Iout≤1A , Vin=2.5V	1.176	1.2	1.224	V
		AMS1117A-1.5 0≤Iout≤1A , Vin=2.8V	1.47	1.5	1.53	V
		AMS1117A-1.8 0≤Iout≤1A , Vin=3.1V	1.764	1.8	1.836	V
		AMS1117A-2.5 0≤Iout≤1A , Vin=3.8V	2.45	2.5	2.55	V
		AMS1117A-3.3 0≤Iout≤1A , Vin=4.5V	3.234	3.3	3.366	V
		AMS1117A-5.0 0≤Iout≤1A , Vin=6.3V	4.9	5	5.1	V

		AMS1117A-ADJ Iout=10mA, 2.55V≤Vin≤10V		0.03	0.2	%/V

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△Vout	Line regulation	AMS1117A-1.2 Iout=10mA, 2.7V≤Vin≤10V		0.03	0.2	%/V
		AMS1117A-1.5 Iout=10mA, 3.0V≤Vin≤10V		0.03	0.2	%/V
		AMS1117A-1.8 Iout=10mA, 3.3V≤Vin≤12V		0.03	0.2	%/V
		AMS1117A-2.5 Iout=10mA, 4.0V≤Vin≤12V		0.03	0.2	%/V
		AMS1117A-3.3 Iout=10mA, 4.8V≤Vin≤12V		0.03	0.2	%/V
		AMS1117A-5.0 Iout=10mA, 6.5V≤Vin≤12V		0.03	0.2	%/V

△Vout	Load regulation	AMS1117A-1.2 Vin =2.5V, 10mA≤Iout≤1A		10	40	mV
		AMS1117A-1.5 Vin =2.8V, 10mA≤Iout≤1A		10	40	mV
		AMS1117A-1.8 Vin =3.1V, 10mA≤Iout≤1A		10	40	mV
		AMS1117A-2.5 Vin =3.8V, 10mA≤Iout≤1A		10	40	mV
		AMS1117A-3.3 Vin =4.6V, 10mA≤Iout≤1A		10	40	mV
		AMS1117A-5.0 Vin =6.3V, 10mA≤Iout≤1A		10	40	mV
		AMS1117A-ADJ Vin =2.55V, 10mA≤Iout≤1A		10	40	mV
Vdrop	Dropout voltage	Iout =100mA		1.1	--	V
		Iout=1A		1.3	--	V
Imin	Minimum load current	AMS1117A-ADJ		2	10	mA
Iq	Quiescent Current	AMS1117A-1.2, Vin=10V		1.5	5	mA
		AMS1117A-1.5, Vin=10V		1.5	5	mA
		AMS1117A-1.8, Vin=12V		1.5	5	mA
		AMS1117A-2.5, Vin=12V		1.5	5	mA
		AMS1117A-2.85, Vin=12V		1.5	5	mA
		AMS1117A-3.3, Vin=12V		1.5	5	mA
		AMS1117A-5.0, Vin=12V		1.5	5	mA
Iadj	Adjust pin	AMS1117A-ADJ		55	120	uA

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	current	Vin=5V,10mA≤Iout≤1A				
Ichange	Iadj change	AMS1117A-ADJ Vin=5V,10mA≤Iout≤1A		0.2	10	uA
ΔV/ΔT	Temperature coefficien			±100		ppm
PSRR	Power Supply Rejection Rate	AMS1117A-3.3, F=1KHz		60		dB
		AMS1117A-3.3, F=10KHz		55		dB
θ_{JC}	Thermal resistance	SOT-223		20		℃/W
		TO-252		10		
PD	Power Dissipation			1		W

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 AMS1117A-ADJ will lead to unstable or oscillation output.

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■ Detailed Description

AMS1117A 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.

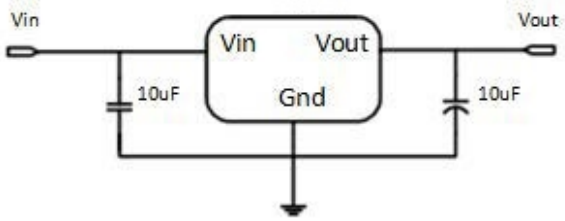
The thermal shut down modules can assure chip and its application system working safety when the junction temperature is larger than 200°C.

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

AMS1117A has an adjustable version and six fixed versions (1.2V, 1.5V,1.8V, 2.5V, 3.3V and 5V)

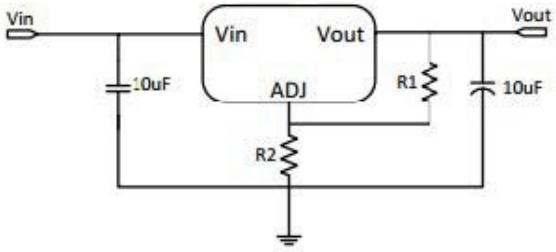
Fixed Output Voltage Version



Application circuit of AMS1117A 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 AMS1117A-ADJ

The output voltage of adjustable version follows the equation: Vout=1.25×(1+R2/R1)+IAdj×R2. We can ignore IAdj because IAdj (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 AMS1117A-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 AMS1117A is very large. AMS1117A 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 AMS1117A could allow on itself is less than 1W. And furthermore, AMS1117A will work at junction temperature higher than 125°C under such condition and no lifetime is guaranteed.

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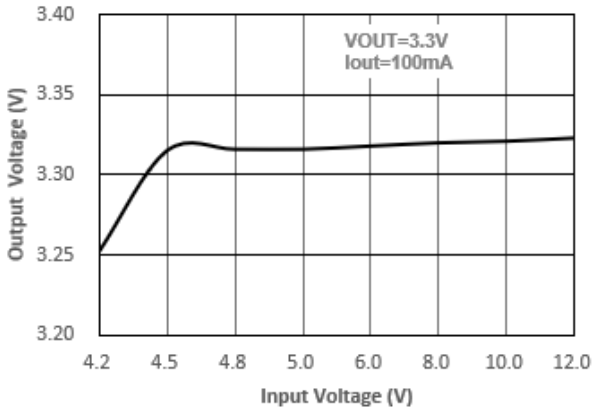
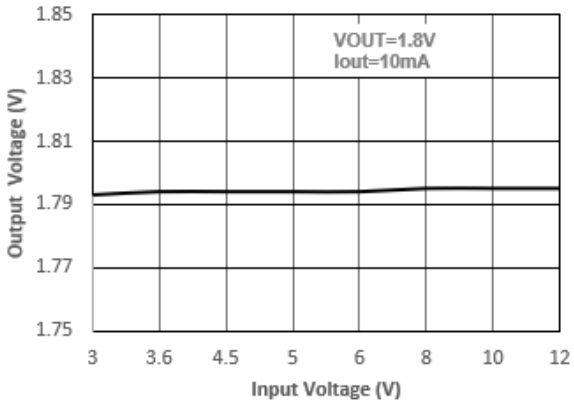
■ Typical Performance Characteristics

T_A=25℃, unless otherwise noted.

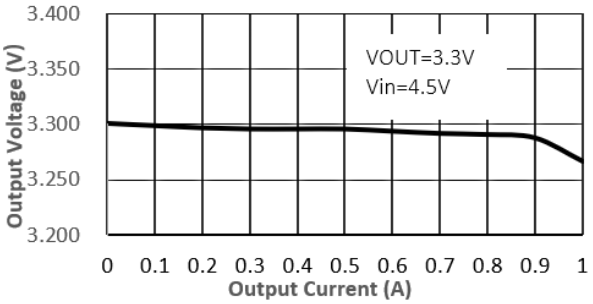
Output Voltage vs. Input Voltage (VOUT=3.3V)



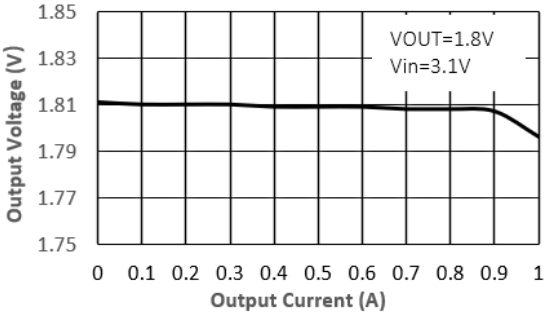
Output Voltage vs. Input Voltage (VOUT=1.8V)



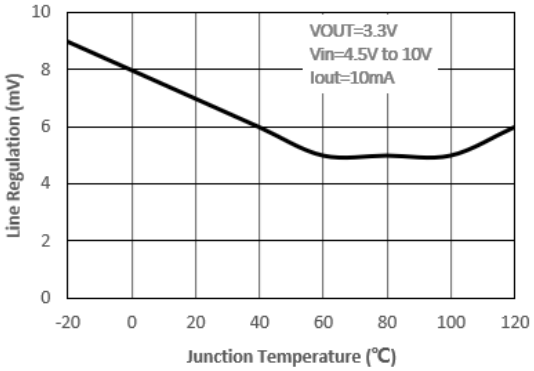
Output Voltage vs. Output Current (VOUT=3.3V)



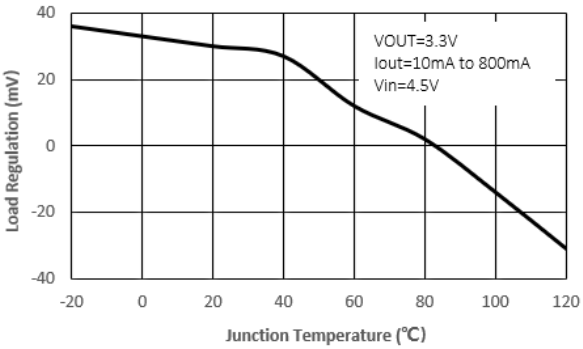
Output Voltage vs. Output Current (VOUT=1.8V)



Line Regulation vs. Junction Temperature



Load Regulation vs. Junction Temperature



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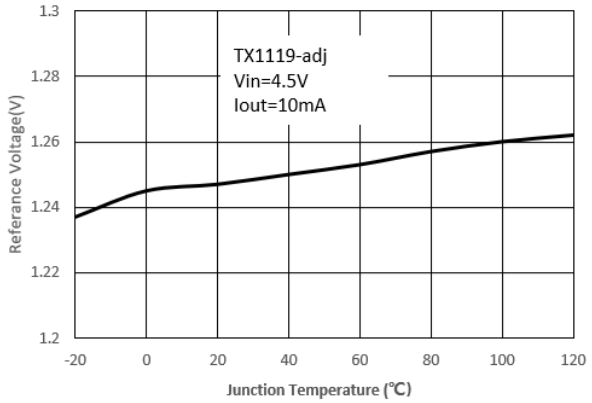
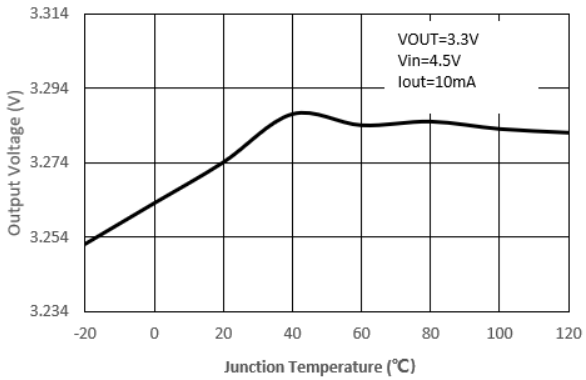
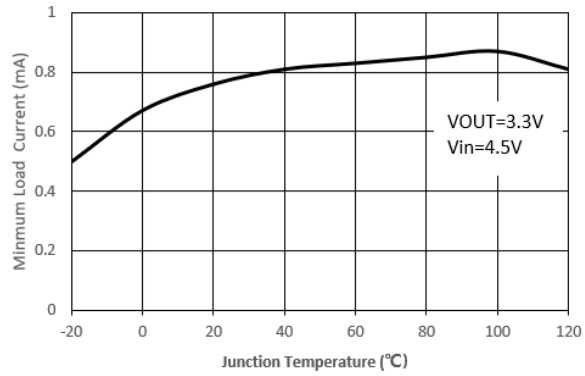
Reference Voltage vs. Junction Temperature



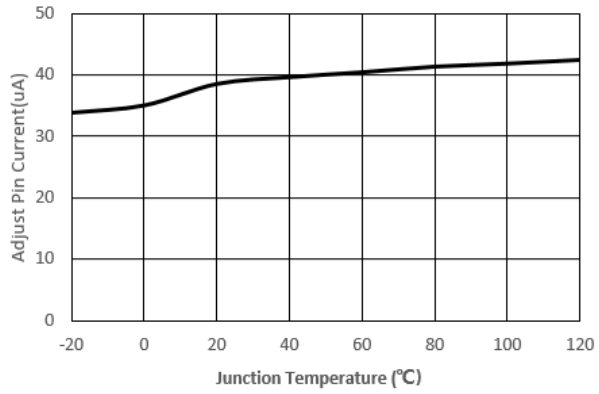
Output Voltage vs. Junction Temperature



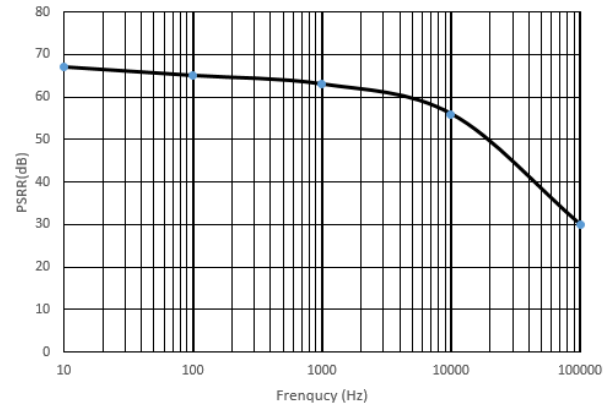
Minimum Load Current vs. Junction Temperature



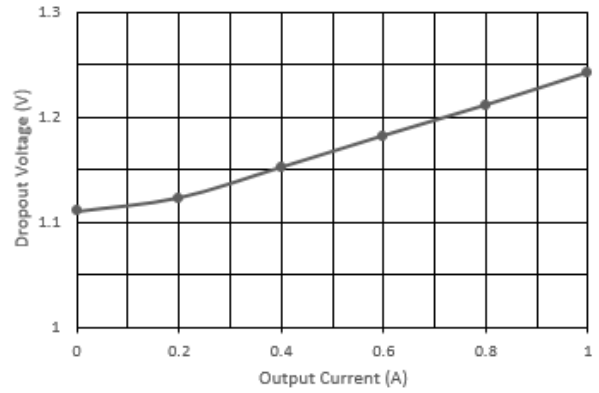
Adjust Pin Current vs. Junction Temperature



PSRR vs. Frequency



Dropout Voltage vs. Ouput Current



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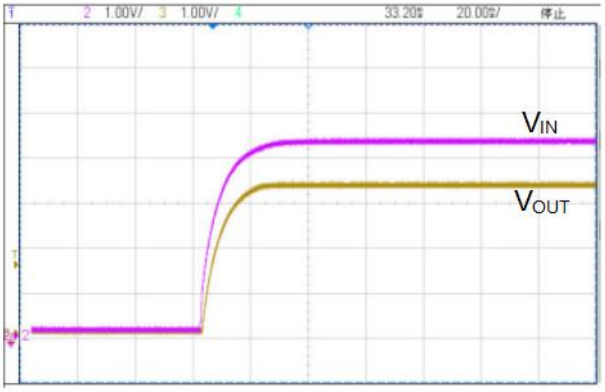
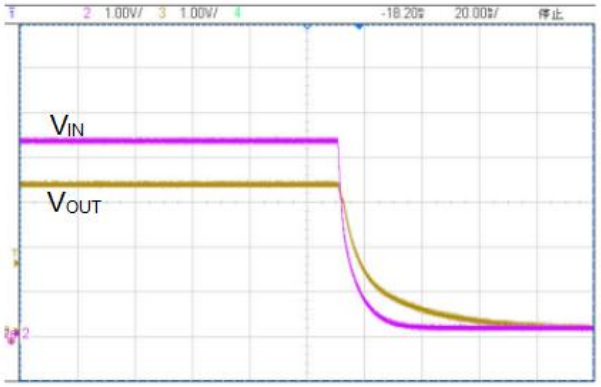
Power ON

VIN=0 to 5.0V　Iout=10mA



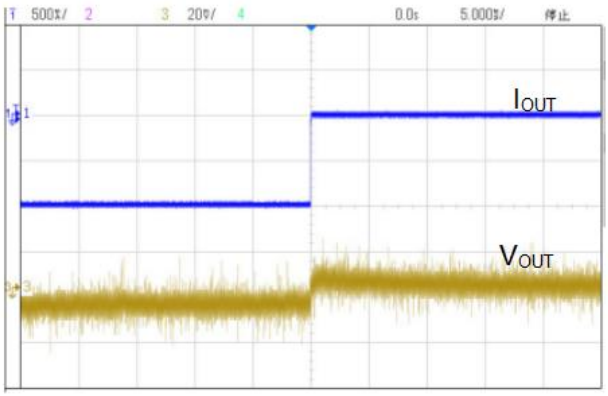
Power OFF

VIN=5.0V to 0V　Iout=10mA

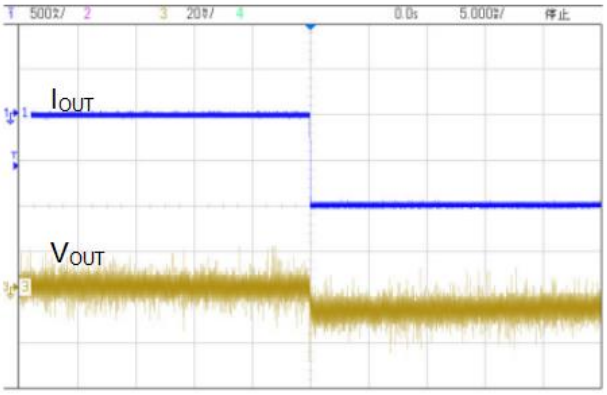


Load Transient Response

IOUT=1mA to 1A



IOUT=1A to 1mA



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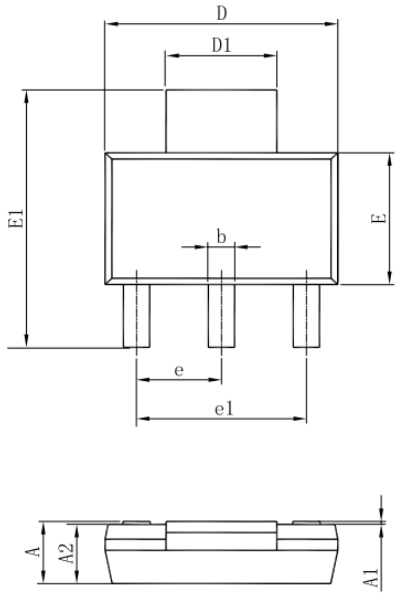
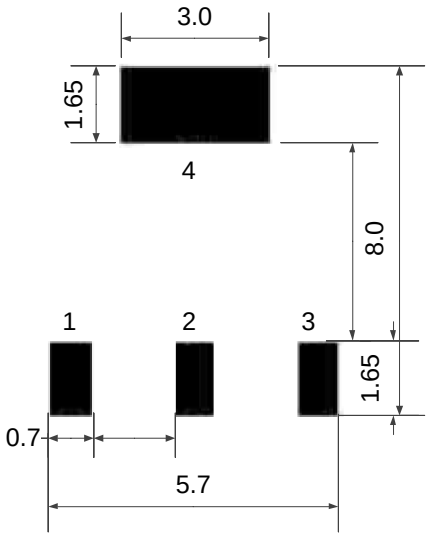
■ Package Information

SOT-223 PACKAGE OUTLINE DIMENSIONS





PCB Board

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
θ	0°	10°	0°	10°

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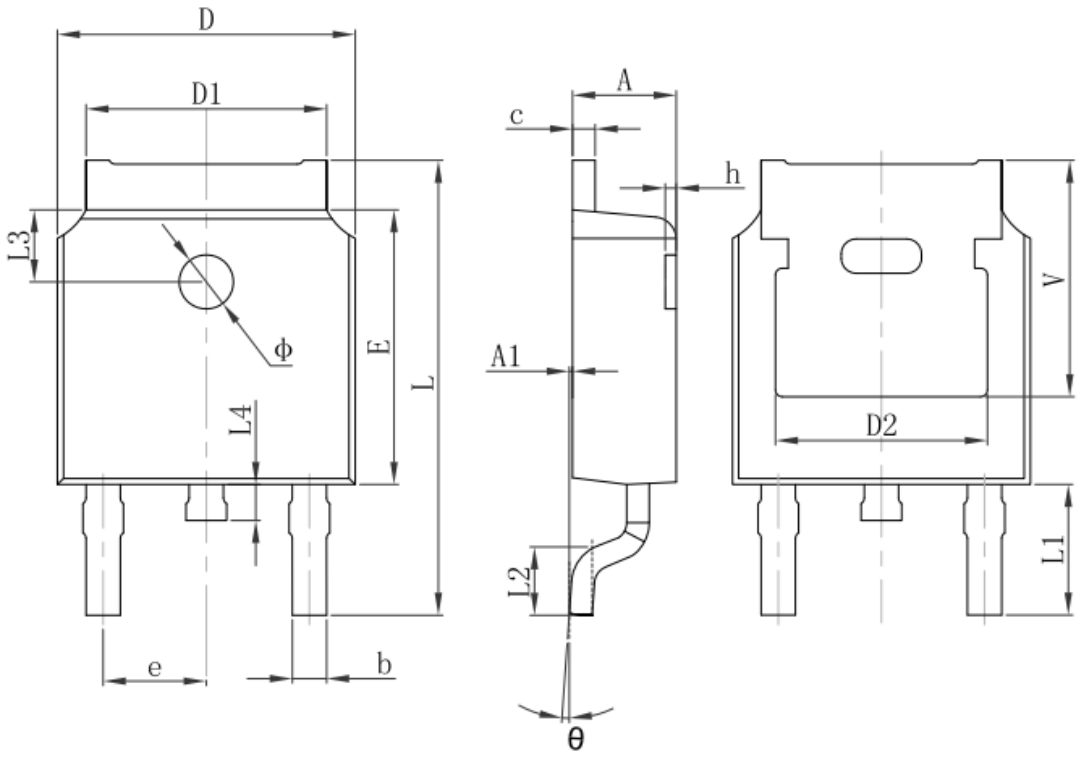
TO-252-2L PACKAGE OUTLINE DIMENSIONS



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
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.	