TL-AMS1117

1A Bipolar Linear Regulator

Features

- Output current is 1A
- Range of operation input voltage:18V
- Line regulation: 0.03%/V (typ.)
- Standby current: 2mA (typ.)
- Load regulation: 0.2%/A (typ.)
- Environment Temperature: -20℃~85℃

Applications

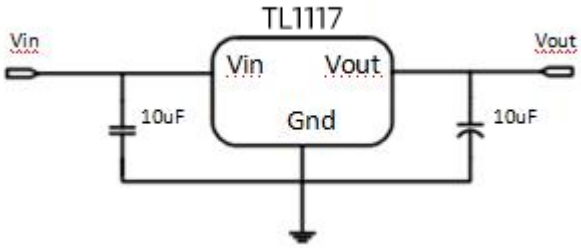
- Power Management for Computer Mother Board, Graphic Card
- LCD Monitor and LCD TV
- DVD Decode Board
- ADSL Modem
- Post Regulators for Switching Supplies

General Description

TL-AMS1117 is a series of low dropout three-terminal regulatorswith a dropout of 1.3V at 1A load current. featuresaverylow standby current 2mA compared to 5mA ofcompetitor.Other than a fixed version, Vout = 1.2V, 1.5V, 1.8V, 2.5V,2.85V， 3.3V, and 5V, TL-AMS1117 has an adjustable version,which can provide an output voltagefrom 1.25 to 12Vwithonly two external resistors.

TL-AMS1117 offers thermal shut down function, to assurethestability of chip and power system. And it usestrimmingtechnique to guarantee output voltage accuracywithin2%. Other output voltage accuracy can becustomized ondemand, such as 1%.TL-AMS1117 isavailablein SOT-223, TO-252 and SOT89power package.

Typical Application



Application circuit of TL-AMS1117 fixed version

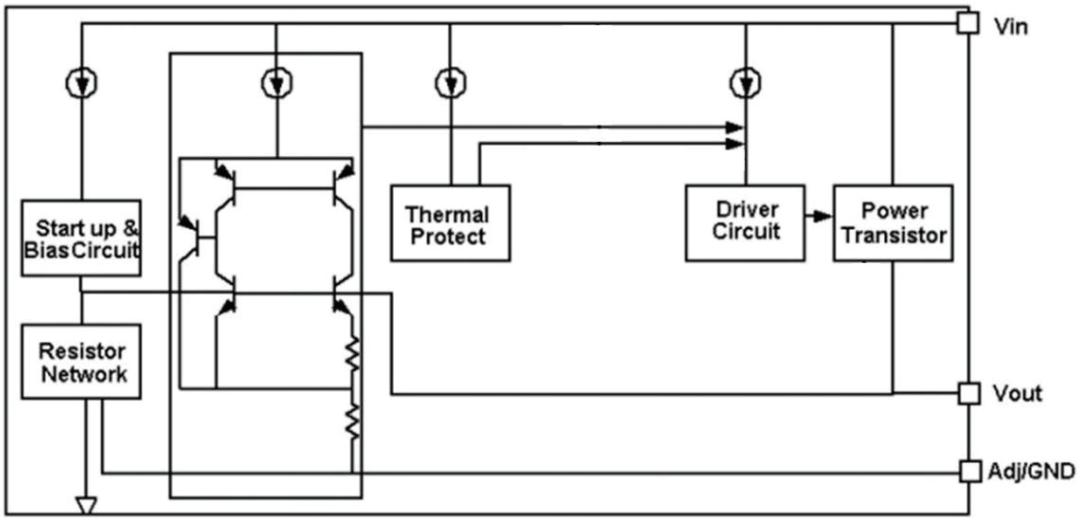
Selection Table

Marking	Part No.	Output Voltage	Package
1117 XX YYWW	XX=12	1.2V	SOT-223 TO-252 SOT89
	XX=15	1.5V	
	XX=18	1.8V	
	XX=285	2.85V	
	XX=25	2.5V	
	XX=33	3.3V	
	XX=50	5.0V	
	XX=ADJ	Adj	

Ordering Information

Marking	Designator	Description
1117 XX SYWW	1117	Product code
	XX	Output Voltage(1.2~12.0V)
	S	Order NO
	YWW	DATE CODE

Block Diagram



Pin Configuration

SOT223 (Top View)

Table1: TL-AMS1117 series (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)

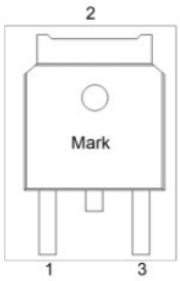


Table2: TL-AMS1117 series (TO252 PKG)

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

SOT89 (Top View)

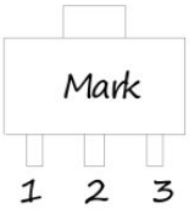


Table3: TL-AMS1117 series (SOT89 PKG)

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

Absolute Maximum Ratings

Max Input Voltage····· ·· 18V
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.

Electrical Characteristics

TA=25℃, unless otherwise noted.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Vin	Input voltage		--	15	18	V
Vref	Reference voltage	TL-AMS1117-Adj 10mA≤Iout≤1A ,Vin=3.25V	1.225	1.25	1.275	V
Vout	Output voltage	TL-AMS1117-1.2V 0≤Iout≤1A ,Vin=2.7V	1.176	1.2	1.224	V
		TL-AMS1117-1.5V 0≤Iout≤1A , Vin=3.0V	1.47	1.5	1.53	V
		TL-AMS1117-1.8V 0≤Iout≤1A ,Vin=3.3V	1.764	1.8	1.836	V
		TL-AMS1117-2.5V 0≤Iout≤1A ,Vin=4.0V	2.45	2.5	2.55	V
		TL-AMS1117-2.85V 0≤Iout≤1A ,Vin=4.35V	2.793	2.85	2.907	V
		TL-AMS1117-3.3V 0≤Iout≤1A ,Vin=4.8V	3.234	3.3	3.366	V
		TL-AMS1117-5.0V 0≤Iout≤1A ,Vin=6.5V	4.9	5	5.1	V

△Vout	Line regulation	TL-AMS1117-1.2VIout=10mA,2.7V≤Vin≤1V		4	19	mV
		TL-AMS1117-1.5V Iout=10mA,3.0V≤Vin≤1V		5	26	mV
		TL-AMS1117-ADJ Iout=10mA,2.75V≤Vin≤12V		5	24	mV
		TL-AMS1117-1.8V Iout=10mA,3.3V≤Vin≤12V		5	32	mV
		TL-AMS1117-2.5V		8	41	mV

		Iout=10mA, 4.0V≤Vin≤12V				
		TL-AMS1117-2.85 VIout=10mA, 4.35V≤Vin≤12V		8	46	mV
		TL-AMS1117-3.3V Iout=10mA,4.8V≤Vin≤12V		9	49	mV
		TL-AMS1117-5.0V Iout=10mA,6.5V≤Vin≤12V		10	56	mV

△Vout	Load regulation	TL-AMS1117-1.2V Vin =2.7V,10mA≤Iout≤1A		10	40	mV
		TL-AMS1117-1.5V Vin =3.0V,10mA≤Iout≤1A		10	40	mV
		TL-AMS1117-ADJ Vin =2.75V,10mA≤Iout≤1A		10	40	mV
		TL-AMS1117-1.8V Vin =3.3V,10mA≤Iout≤1A		10	40	mV
		TL-AMS1117-2.5V Vin =4.0V,10mA≤Iout≤1A		10	40	mV
		TL-AMS1117-2.85V Vin =4.35V,10mA≤Iout≤1A		10	40	mV
		TL-AMS1117-3.3 Vin =4.8V,10mA≤Iout≤1A		10	40	mV
		TL-AMS1117-5.0 Vin =6.5V,10mA≤Iout≤1A		10	40	mV
Vdrop	Dropout voltage	Iout =100mA		1.15	1.3	V
		Iout=1A		1.3	1.5	V
Imin	Minimum load current	TL-AMS1117-ADJ		2	10	mA
Iq	Quiescent Current	TL-AMS1117-1.2V,Vin=10V		2	5	mA
		TL-AMS1117-1.5V,Vin=10V		2	5	mA
		TL-AMS1117-1.8V,Vin=12V		2	5	mA
		TL-AMS1117-2.5V,Vin=12V		2	5	mA
		TL-AMS1117-2.85V,Vin=12V		2	5	mA
		TL-AMS1117-3.3V,Vin=12V		2	5	mA
		TL-AMS1117-5.0V,Vin=12V		2	5	mA
Iadj	Adjust pin current	TL-AMS1117-ADJ Vin=5V,10mA≤Iout≤1A		55	120	uA
Ichange	Iadj change	TL-AMS1117-ADJ Vin=5V,10mA≤Iout≤1A		0.2	10	uA

OTP	Thermal Shutdown	Junction Temperature		+200		℃
	Thermal Shutdown Hysteresis	Junction Temperature		+30		℃
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 20msNote2: Load current smaller than minimum load current of TL-AMS1117-ADJ will lead to unstable or oscillation output.

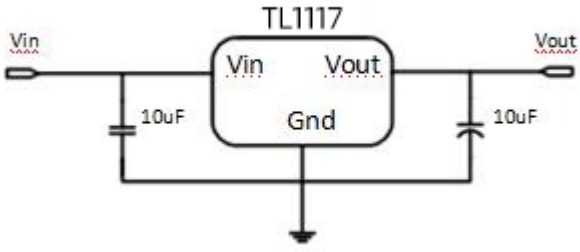
Detailed Description

TL-AMS1117 is a series of low dropout voltage, three terminal regulators. Its application circuit is very simple: the fixedversiononlyneeds two capacitors and the adjustable version only needs two resistors and two capacitors to work. It iscomposedof somemodulesincluding start-up circuit, bias circuit, bandgap, thermal shutdown, power transistors and its drivercircuitand so on.The thermalshut down modules can assure chip and its application system working safety when the junctiontemperatureis largerthan140°C.The bandgap module provides stable reference voltage, whose temperature coefficient iscompensated by carefuldesignconsider-ations. The temperature coefficient is under 100 ppm/°C. And the accuracy of outputvoltage is guaranteedbytrimming technique.

Typical Application

TL-AMS1117 has an adjustable version and six fixed versions (1.2V, 1.5V,1.8V, 2.5V, 2.85V , 3.3V and 5V)

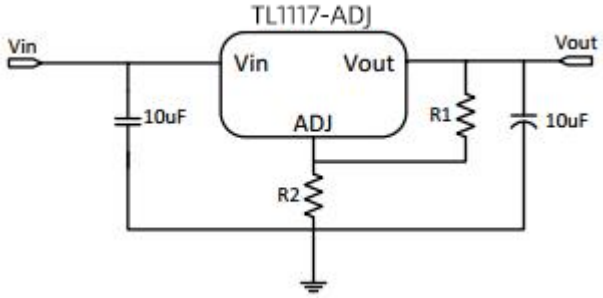
Fixed Output Voltage Version



Application circuit of TL-AMS1117 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 TL-AMS1117-ADJ

The output voltage of adjustable version follows the equation: Vout=1.25×(1+R2/R1)+IAdj×R2. We can ignoreI-Adj 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.AsTL-AMS1117--ADJ can keep itself stable at load current about 2mA, R1 is not allowed to be higher than 625ohm.

2) Using a bypass capacitor (CADJ) 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 CADJshouldbe less than R1 to prevent ripple from being amplified. As R1 is normally in the range of 100Ω~500Ω, the valueofCADJ shouldsatisfy this equation: 1/(2π×fripple×CADJ)<R1.

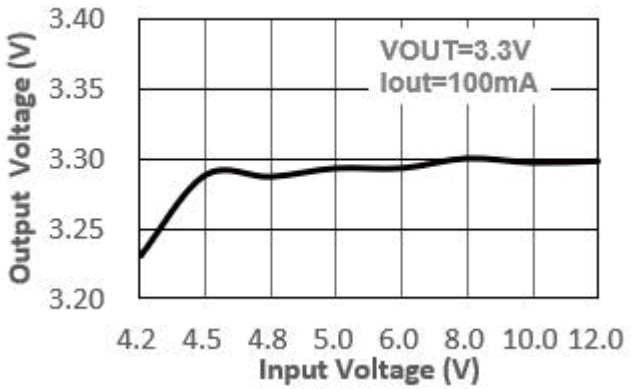
Thermal Considerations

We have to take heat dissipation into great consideration when output current or differential voltage of input and outputvoltage is large. Because in such cases, the power dissipation consumed by TL-AMS1117 is very large. TL-AMS1117series usesSOT-223 package type and its thermal resistance is about 20°C/W. And the copper areaofapplicationboard can affect thetotal thermal resistance. If copper area is 5cm*5cm (two sides), the resistanceisabout 30°C/W.So the total thermalresistance is about 20°C/W + 30°C/W. We can decrease total thermal resistanceby increasingcopper area in applicationboard. When there is no good heat dissipation copper are in PCB, the total thermalresistance will be as high as 120°C/W,then the power dissipation of TL-AMS1117 could allow on itself islessthan1W.And furthermore, TL-AMS1117 will work at junctiontemperature higher than 125°C under such conditionandnolifetime is guaranteed.

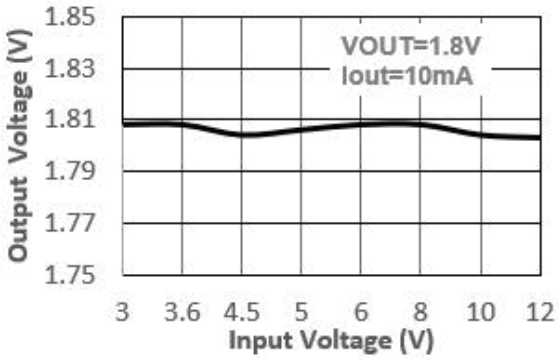
Typical Performance Characteristics

TA=25℃, unless otherwise noted

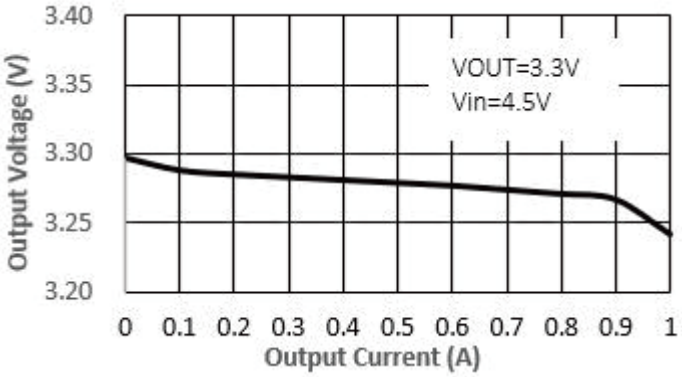
Output Voltage vs. Input Voltage (VOUT=3.3V)



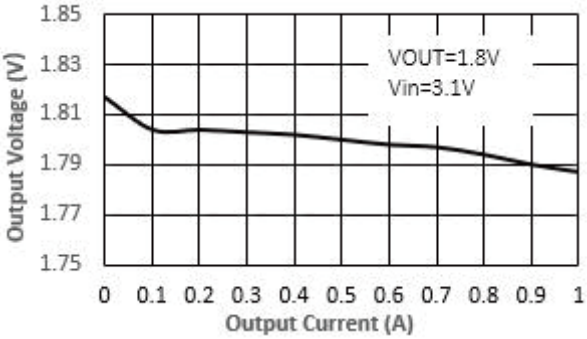
Output Voltage vs. Input Voltage (VOUT=1.8V)



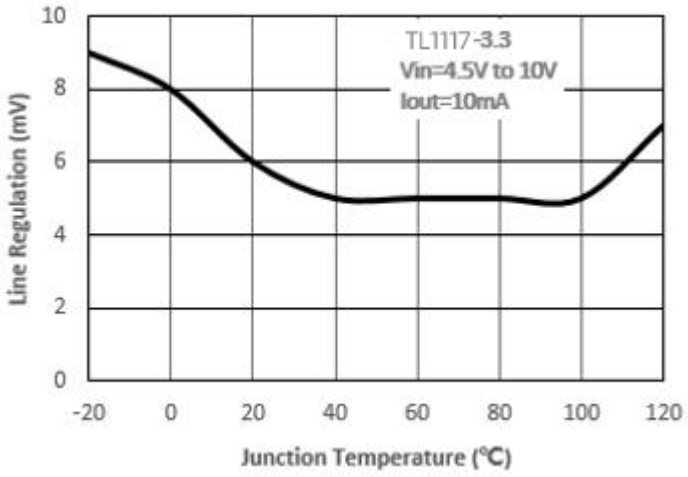
Output Voltage vs. Output Current (VOUT=3.3V)



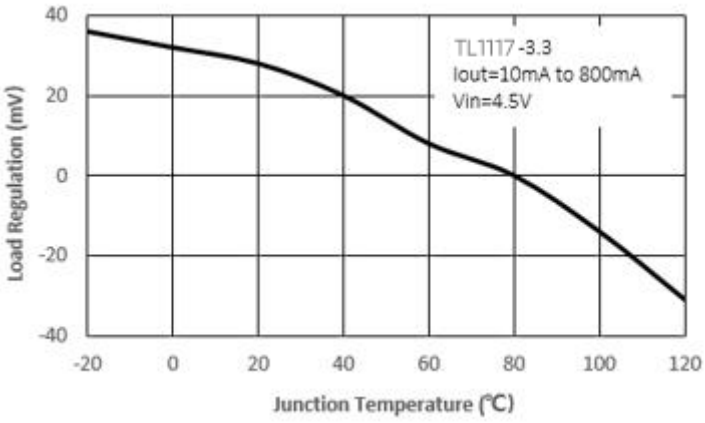
Output Voltage vs. Output Current (VOUT=1.8V)



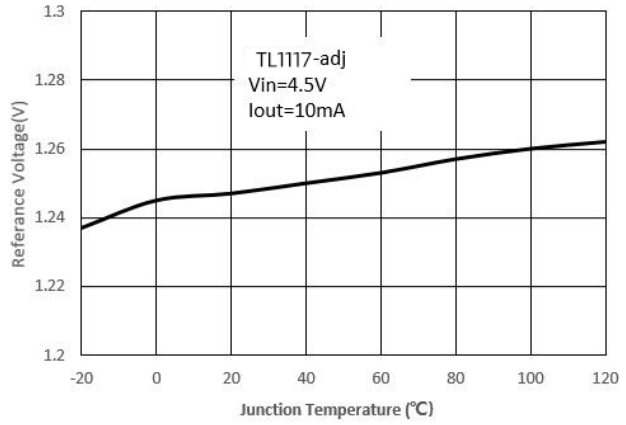
Line Regulation vs. Junction Temperature



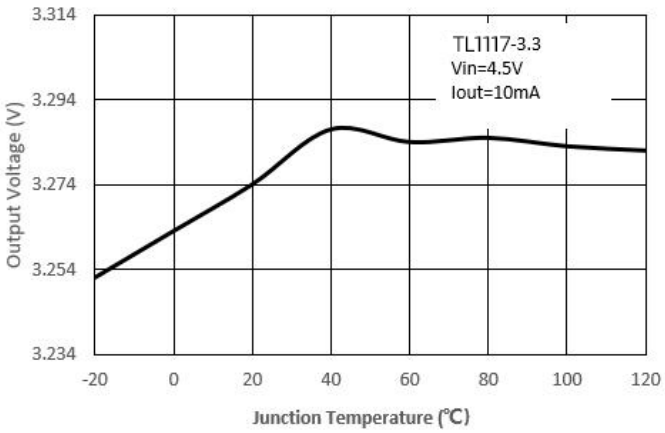
Load Regulation vs. Junction Temperature



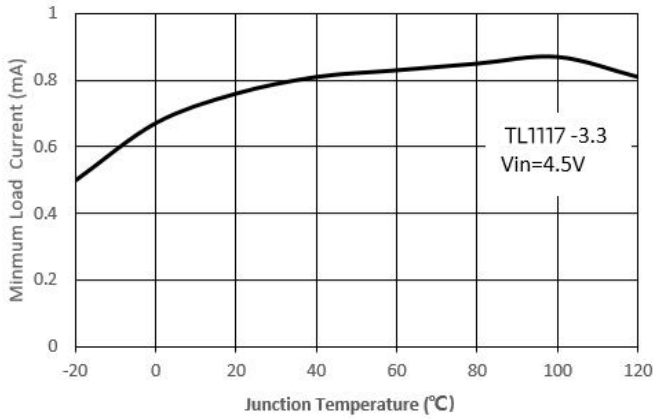
Reference Voltage vs. Junction Temperature



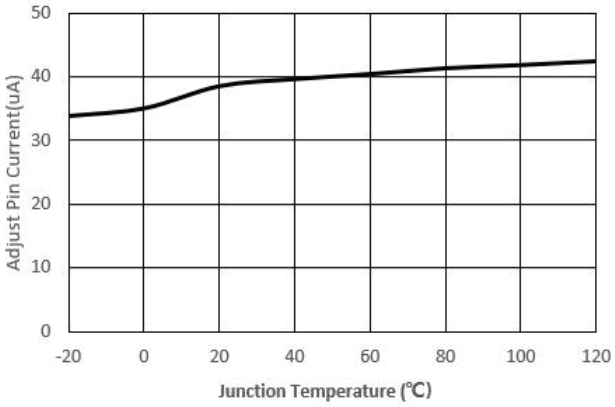
Output Voltage vs. Junction Temperature



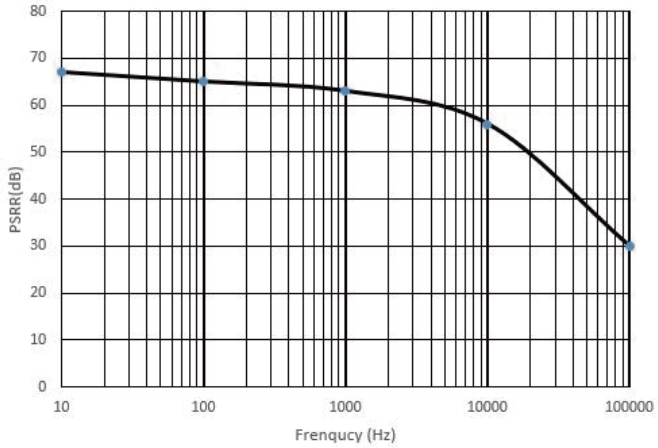
Minimum Load Current vs. Junction Temperature



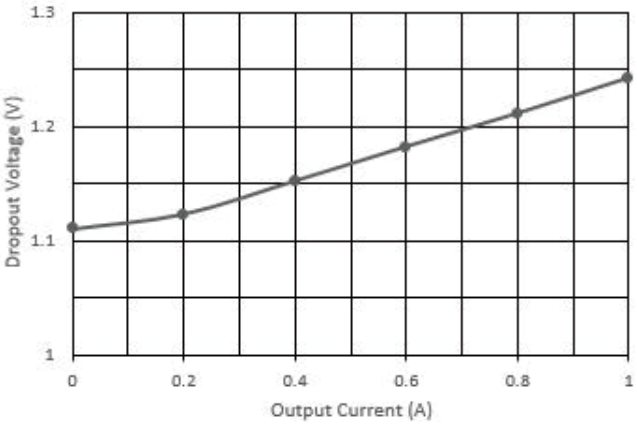
Adjust Pin Current vs. Junction Temperature



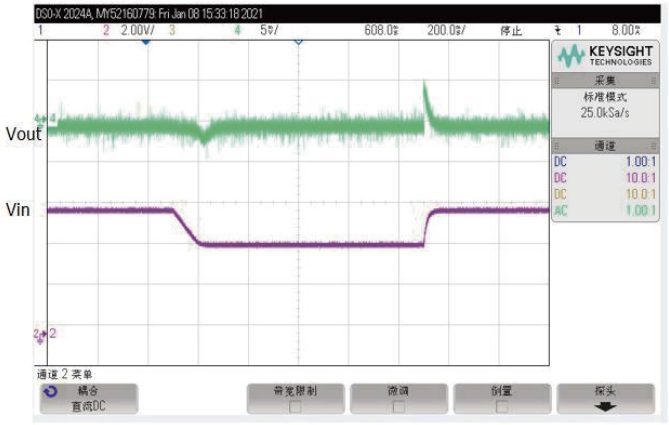
PSRR vs. Frequency



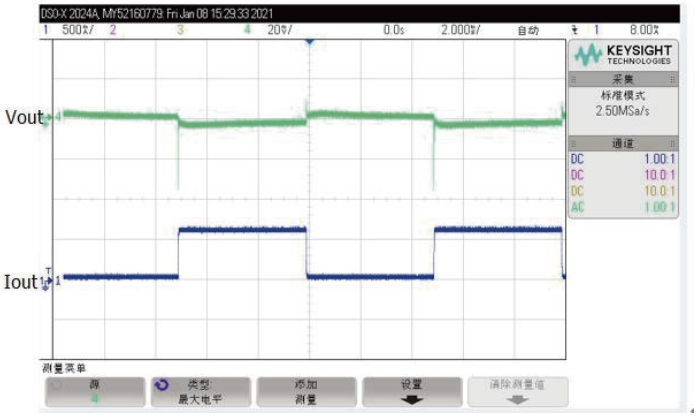
Dropout Voltage vs. Ouput Current



Line Transient Response

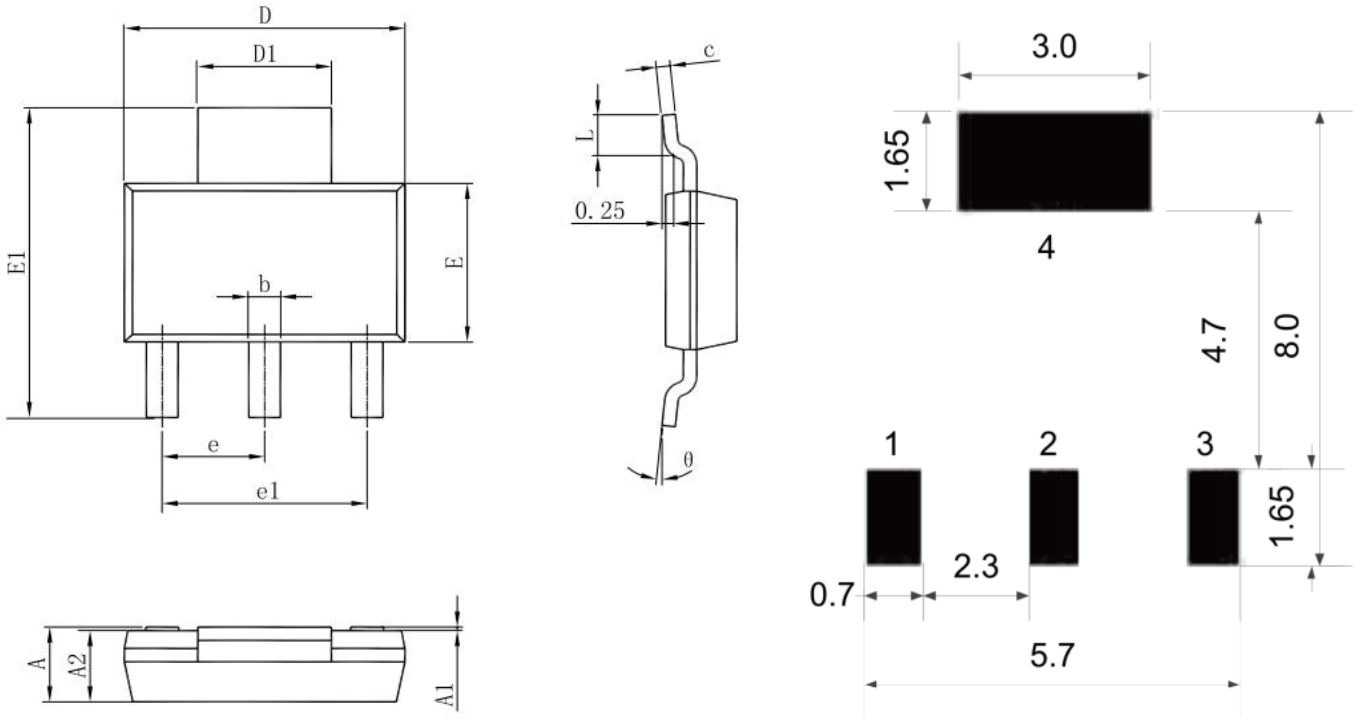


Load Transient Response



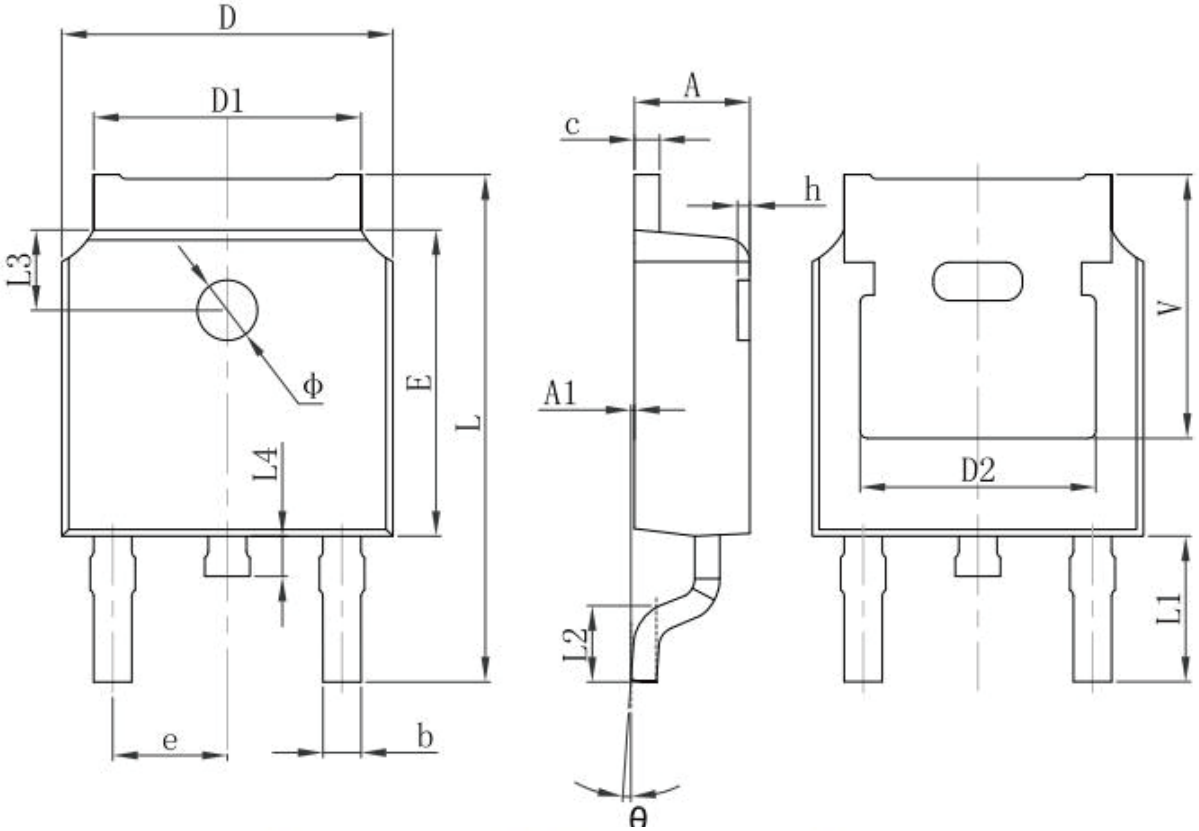
Package Information

SOT-223 PACKAGE OUTLINE DIMENSIONS



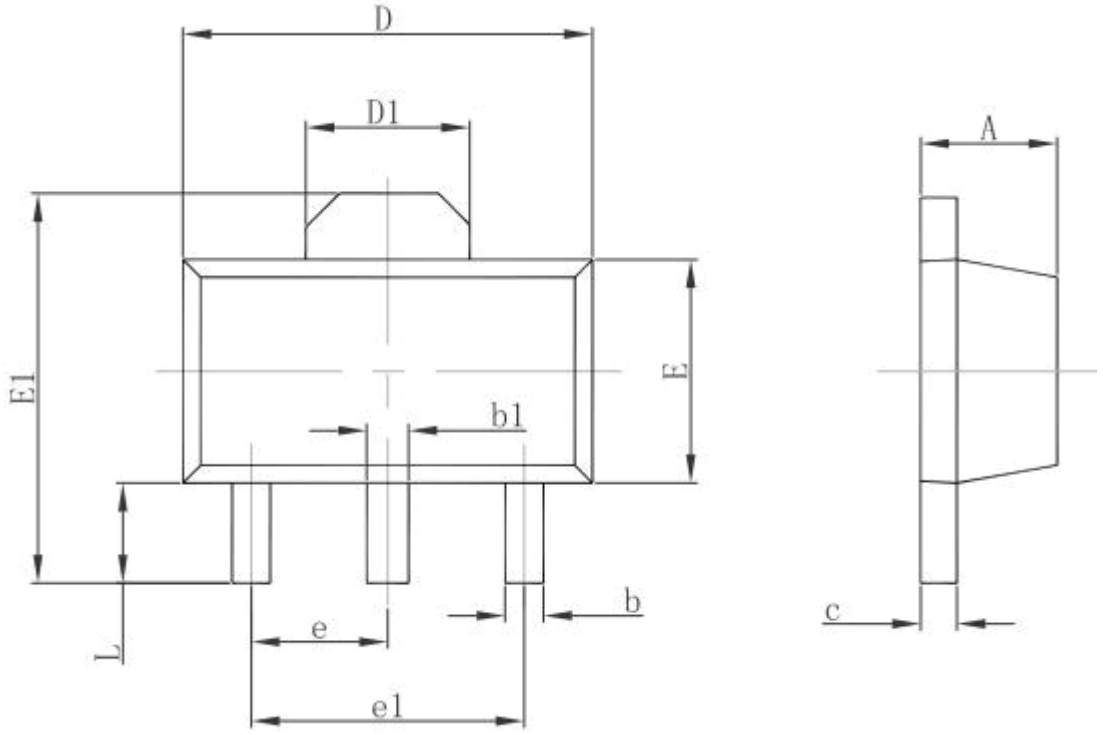
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.520	1.800	0.060	0.071
A1	0.000	0.100	0.000	0.004
A2	1.500	1.700	0.059	0.067
b	0.660	0.820	0.026	0.032
c	0.250	0.350	0.010	0.014
D	6.400	6.600	0.252	0.260
D1	2.900	3.100	0.114	0.122
E	3.300	3.700	0.130	0.146
E1	6.830	7.070	0.269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

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.	

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