1.0A Adjustable Voltage High Speed LDO Regulators ME1117 Series

General Description

ME1117 series are highly accurate, low noise, LDO Voltage Regulators that are capable of providing an output current that is in excess of 1.0A with a maximum dropout voltage of 1.3V at 1.0A. This series contains six fixed output voltages of 1.2 V, 1.5V,1.8 V, 2.5 V, 3.3 V, and 5.0 V that have no minimum load requirement to maintain regulation. Also included is an adjustable output version that can be programmed from 1.25 V to 20 V with two external resistors. On chip trimming adjusts the reference/output voltage to within ±2.0% accuracy. Internal protection features consist of output current limiting, safe operating area compensation, and thermal shutdown. The ME1117 series can operate with up to 20 V input.

Features

- Output Current in Excess of 1.0A
- Dropout Voltage：1.07V@ I_{OUT} =100mA
- Operating Voltage Range：
  4.8V～20V（ME1117A33）
- Highly Accuracy： ±2％
- Adjustable Output Voltage Option
- Standby Current：3.3mA（TPY.）
- High Ripple Rejection：60dB@1KHz
  （ME1117A33）
- Line Regulation: 0.1％（TYP.）
- Temperature Stability≤0.5%
- Current Limit（1.3A）
- Thermal Shutdown Protection（160℃）

Typical Application

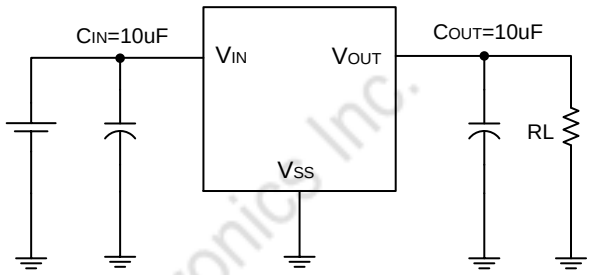
- Consumer and Industrial Equipment Point of Regulation
- Switching Power Supply Post Regulation
- Hard Drive Controllers
- Battery Chargers

Package

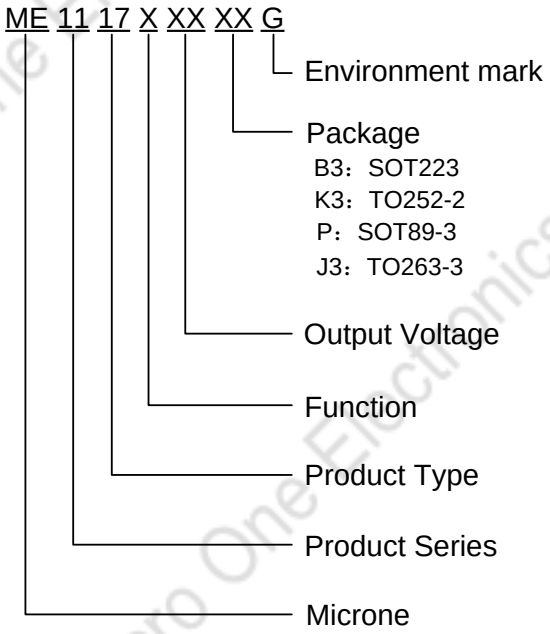
- 3-pin SOT223、TO252-2、SOT89-3、TO263-3

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Typical Application Circuit



Selection Guide



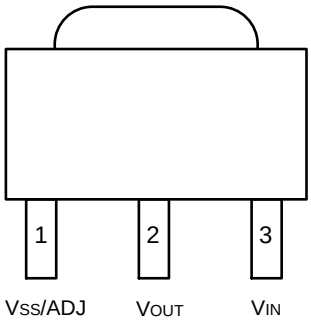
product series	product description
ME1117A12B3G	V_{OUT} =1.2V； Package：SOT223
ME1117A15B3G	V_{OUT} =1.5V； Package：SOT223
ME1117A18B3G	V_{OUT} =1.8V； Package：SOT223
ME1117A25B3G	V_{OUT} =2.5V； Package：SOT223
ME1117A33B3G	V_{OUT} =3.3V； Package：SOT223
ME1117A33K3G	V_{OUT} =3.3V； Package：TO252-2
ME1117A33PG	V_{OUT} =3.3V； Package：SOT89-3
ME1117A50B3G	V_{OUT} =5.0V； Package：SOT223
ME1117A50K3G	V_{OUT} =5.0V； Package：TO252-2
ME1117FB3G	V_{FB} =1.25V； Package：SOT223
ME1117FJ3G	V_{FB} =1.25V； Package：TO263-3
ME1117FK3G	V_{FB} =1.25V； Package：TO252-2

NOTE: At present ,there are seven kinds of voltage value:1.2V、1.25V（VFB）、1.5V、1.8V、2.5V、3.3V、5.0V。

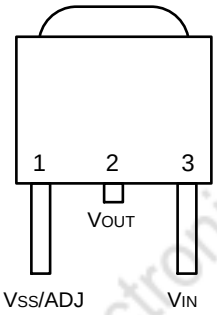
If you need other voltage and package, please contact our sales staff。

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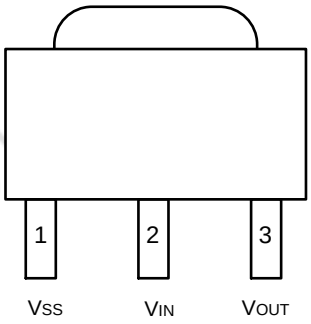
Pin Configuration



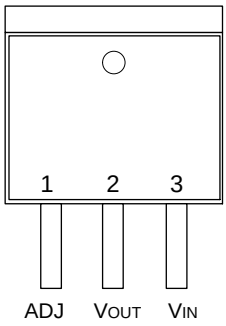
SOT223



TO252-2



SOT89-3



TO263-3

Pin Assignment

ME1117A

Pin Number		Pin Name	Functions
SOT223、TO252-2	SOT89-3		
1	1	V_{SS}	Ground
2	3	V_{OUT}	Output
3	2	V_{IN}	Power Input

ME1117F

Pin Number	Pin Name	Functions
SOT223、TO252-2、TO263-3		
1	ADJ	Adjustable Output
2	V_{OUT}	Output
3	V_{IN}	Power Input

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Absolute Maximum Ratings

Parameter		Symbol	Ratings	Units
Input Voltage		V_{IN}	20	V
Output Current		I_{OUT}	1.3	A
Output Voltage		V_{OUT}	Vss-0.3～V_{IN} +0.3	V
Power Dissipation	SOT223	P_D	1.8	W
	TO252-2		2.23	W
	SOT89-3		1.25	W
	TO263-3		2.98	W
Operating Temperature Range		T_{OPR}	-40~+125	℃
Storage Temperature Range		T_{STG}	-55~+150	℃
Junction Temperature Range		T_J	-40~+150	℃
Lead Temperature	SOT223	T_{solder}	260℃，4sec	
	TO252-2	T_{solder}	260℃，10sec	
	SOT89-3	T_{solder}	260℃，10sec	
	TO263-3	T_{solder}	260℃，10sec	
Thermal Resistance Junction-to-Ambient (No heat sink;No air flow)	SOT223	θ_{JA}	70	°C/W
	TO252-2	θ_{JA}	56	°C/W
	SOT89-3	θ_{JA}	100	°C/W
	TO263-3	θ_{JA}	42	°C/W

Notes：

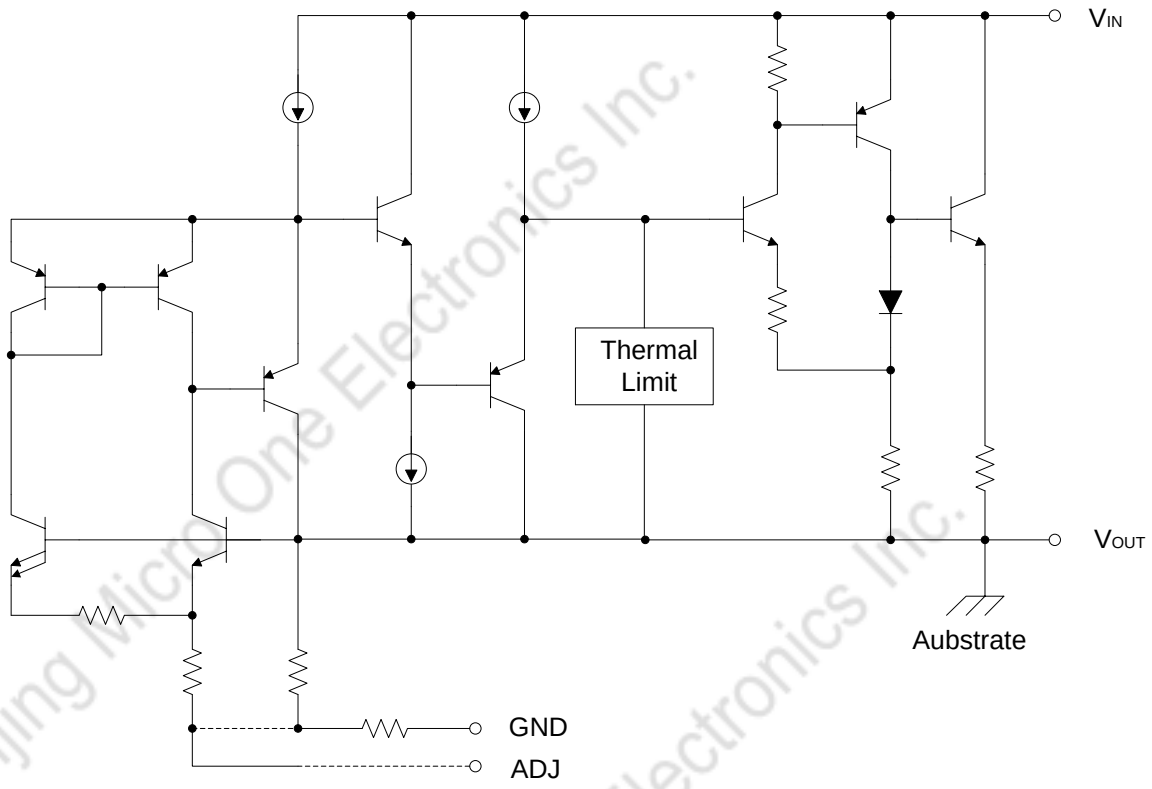
1) Stresses at or above those listed under Absolute Maximum Ratings may cause permanent damage to the product.

2) The maximum allowable power dissipation is a function of the maximum junction temperature $T_{J\,(MAX)}$, the junction-to- ambient thermal resistance θ_{JA}, and the ambient temperature T_A. The maximum allowable continuous power dissipation at any ambient temperature is calculated by $P_{D(MAX)}=(T_{J(MAX)}-T_A)/\theta_{JA}$.

3) Chip is soldered to 100mm^2 (10mm*10mm) copper (top side solder mask) on 2oz.2 layers FR-4 PCB.

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Block Diagram



Electrical Characteristics

ME1117F (V_{IN}= V_{OUT}+1.5V，C_{IN}=C_L=10uF，Ta=25^{O}C ,unless otherwise noted)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Reference Voltage	V_{REF}	V_{IN}= V_{OUT}+1.5V，I_{OUT} =10mA 10mA≤I_{OUT}≤1A ， V_{OUT}+1.5V ≤V_{IN}≤20V	×0.98	1.25	×1.02	V
Maximum Output Current	I_{OUTMAX}	V_{IN}= V_{OUT}+1.5V		1000		mA
Minimum Output Current	I_{OUTMIN}	V_{IN}= V_{OUT}+1.5V		2		mA
Line Regulation	$\Delta V_{REF-LINE}$	I_{OUT} =10mA V_{OUT}+1.5V ≤V_{IN}≤20V		0.03	0.2	%
Load Regulation	$\Delta V_{REF-LOAD}$	V_{IN}= V_{OUT}+1.5V ,0mA≤I_{OUT}≤1A		9	13	mV
Adjustment Pin Current	I_{ADJ}	V_{IN}= V_{OUT}+1.5V		12	30	uA
Adjust Pin CurrentChange		10mA≤ I_{OUT}≤ 1A, 1.5V ≤ V_{IN}-V_{OUT} ≤ 20V		0.2	5	uA
Thermal Shutdown		Junction Temperature		160		℃

ME1117A12 (V_{IN}= V_{OUT}+1.5V，C_{IN}=C_L=10uF，Ta=25 ^{O}C ,unless otherwise noted)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Output Voltage	V_{OUT}	I_{OUT}=10mA,V_{IN}= V_{OUT}+1.5V 10mA≤I_{OUT}≤1A， V_{OUT}+1.5V ≤V_{IN}≤20V	×0.98	1.2	×1.02	V

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Maximum Output Current	I_{OUTMAX}	V_{IN}= V_{OUT}+1.5V		1000		mA
Load Regulation	$\Delta V_{OUT-LOAD}$	V_{IN}= V_{OUT}+1.5V , 0mA≤I_{OUT}≤1A		19	25	mV
Dropout Voltage (Note 1)	V_{DIF1}	I_{OUT} =100mA		1.05	1.10	V
	V_{DIF2}	I_{OUT} =500mA		1.20	1.30	V
	V_{DIF3}	I_{OUT} =1A		1.30	1.40	V
Quiescent Current	I_{SS}	V_{IN}= V_{OUT}+1.5V		3.3	8	mA
Line Regulation	$\Delta V_{OUT-LINE}$	I_{OUT} =10mA， V_{OUT}+1.5V ≤V_{IN}≤20V		1	6	mV
Ripple Rejection Rate	PSRR	V_{IN} = 12V +1Vp-pAC	I_{OUT}=10mA,1kHZ	65		dB
			I_{OUT}=100mA,1kHZ	60		
Thermal Shutdown	TJ	Junction Temperature		160		℃

ME1117A15 (V_{IN}= V_{OUT}+1.5V，C_{IN}=C_L=10uF，Ta=25 ^{O}C ,unless otherwise noted)

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Units
Output Voltage	V_{OUT}	I_{OUT}=10mA,V_{IN}= V_{OUT}+1.5V 10mA≤I_{OUT}≤1A， V_{OUT}+1.5V ≤V_{IN}≤20V		×0.98	1.5	×1.02	V
Maximum Output Current	I_{OUTMAX}	V_{IN}= V_{OUT}+1.5V			1000		mA
Load Regulation	$\Delta V_{OUT-LOAD}$	V_{IN}= V_{OUT}+1.5V , 0mA≤I_{OUT}≤1A			12	16	mV
Dropout Voltage (Note 1)	V_{DIF1}	I_{OUT} =100mA			1.05	1.10	V
	V_{DIF2}	I_{OUT} =500mA			1.20	1.30	V
	V_{DIF3}	I_{OUT} =1A			1.30	1.40	V
Quiescent Current	I_{SS}	V_{IN}= V_{OUT}+1.5V			3.3	8	mA
Line Regulation	$\Delta V_{OUT-LINE}$	I_{OUT} =10mA， V_{OUT}+1.5V ≤V_{IN}≤20V			1	6	mV
Ripple Rejection Rate	PSRR	V_{IN} = 12V +1Vp-pAC	I_{OUT}=10mA,1kHZ		65		dB
			I_{OUT}=100mA,1kHZ		60		
Thermal Shutdown	TJ	Junction Temperature			160		℃

ME1117A18 (V_{IN}= V_{OUT}+1.5V，C_{IN}=C_L=10uF，Ta=25 ^{O}C ,unless otherwise noted)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Output Voltage	V_{OUT}	I_{OUT}=10mA,V_{IN}= V_{OUT}+1.5V 10mA≤I_{OUT}≤1A， V_{OUT}+1.5V ≤V_{IN}≤20V	×0.98	1.8	×1.02	V
Maximum Output Current	I_{OUTMAX}	V_{IN}= V_{OUT}+1.5V		1000		mA
Load Regulation	$\Delta V_{OUT-LOAD}$	V_{IN}= V_{OUT}+1.5V , 0mA≤I_{OUT}≤1A		13	18	mV
Dropout Voltage	V_{DIF1}	I_{OUT} =100mA		1.05	1.10	V

(Note 1)	V_{DIF2}	I_{OUT} =500mA		1.20	1.30	V
	V_{DIF3}	I_{OUT} =1A		1.30	1.40	V
Quiescent Current	I_{SS}	V_{IN}= V_{OUT}+1.5V		3.3	8	mA
Line Regulation	$\Delta V_{OUT-LINE}$	I_{OUT} =10mA， V_{OUT}+1.5V ≤V_{IN}≤20V		1	6	mV
Ripple Rejection Rate	PSRR	V_{IN} = 12V +1Vp-pAC	I_{OUT}=10mA,1kHZ	65		dB
			I_{OUT}=100mA,1kHZ	60		
Thermal Shutdown		Junction Temperature		160		℃

ME1117A25 (V_{IN}= V_{OUT}+1.5V，C_{IN}=C_L=10uF，Ta=25 °C, unless otherwise noted)

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Units
Output Voltage	V_{OUT}	I_{OUT}=10mA,V_{IN}= V_{OUT}+1.5V 10mA≤I_{OUT}≤1A， V_{OUT}+1.5V ≤V_{IN}≤20V		×0.98	2.5	×1.02	V
Maximum Output Current	I_{OUTMAX}	V_{IN}= V_{OUT}+1.5V			1000		mA
Load Regulation	$\Delta V_{OUT-LOAD}$	V_{IN}=V_{OUT}+1.5V ， 0mA≤I_{OUT}≤1000mA			17	25	mV
Dropout Voltage (Note 1)	V_{DIF1}	I_{OUT} =100mA			1.05	1.10	V
	V_{DIF2}	I_{OUT} =800mA			1.20	1.30	V
	V_{DIF3}	I_{OUT} =1A			1.30	1.40	V
Quiescent Current	I_{SS}	V_{IN}= V_{OUT}+1.5V			3.3	8	mA
Line Regulation	$\Delta V_{OUT-LINE}$	I_{OUT} =10mA， V_{OUT}+1.5V ≤V_{IN}≤20V			2	6	mV
Ripple Rejection Rate	PSRR	V_{IN} = 12V +1Vp-pAC	I_{OUT}=10mA,1kHZ		65		dB
			I_{OUT}=100mA,1kHZ		60		
Thermal Shutdown		Junction Temperature			160		℃

ME1117A33 (V_{IN}= V_{OUT}+1.5V，C_{IN}=C_L=10uF，Ta=25 °C, unless otherwise noted)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Output Voltage	V_{OUT}	I_{OUT}=10mA,V_{IN}= V_{OUT}+1.5V 10mA≤I_{OUT}≤1A， V_{OUT}+1.5V ≤V_{IN}≤20V	×0.98	3.3	×1.02	V
Maximum Output Current	I_{OUTMAX}	V_{IN}= V_{OUT}+1.5V		1000		mA
Load Regulation	$\Delta V_{OUT-LOAD}$	V_{IN}= V_{OUT}+1.5V , 0mA≤I_{OUT}≤1A		24	33	mV
Dropout Voltage (Note 1)	V_{DIF1}	I_{OUT} =100mA		1.07	1.10	V
	V_{DIF2}	I_{OUT} =800mA		1.20	1.30	V
	V_{DIF3}	I_{OUT} =1A		1.30	1.40	V
Quiescent Current	I_{SS}	V_{IN}= V_{OUT}+1.5V		3.3	8	mA
Line Regulation	$\Delta V_{OUT-LINE}$	I_{OUT} =10mA，		2	6	mV

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		V_{OUT}+1.5V ≤V_{IN}≤20V					
Ripple Rejection Rate	PSRR	V_{IN} = 12V +1Vp-pAC	I_{OUT}=10mA,1kHZ		65		dB
			I_{OUT}=100mA,1kHZ		60		
Thermal Shutdown		Junction Temperature			160		℃

ME1117A50 (V_{IN}= V_{OUT}+1.5V，C_{IN}=C_L=10uF，Ta=25 ^{O}C, unless otherwise noted)

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Units
Output Voltage	V_{OUT}	I_{OUT}=10mA,V_{IN}= V_{OUT}+1.5V 10mA≤I_{OUT}≤1A， V_{OUT}+1.5V ≤V_{IN}≤20V		×0.98	5.0	×1.02	V
Maximum Output Current	I_{OUTMAX}	V_{IN}= V_{OUT}+1.5V			1000		mA
Load Regulation	$\Delta V_{OUT-LOAD}$	V_{IN}= V_{OUT}+1.5V , 0mA≤I_{OUT}≤1A			35	50	mV
Dropout Voltage (Note 1)	V_{DIF1}	I_{OUT} =100mA			1.05	1.10	V
	V_{DIF2}	I_{OUT} =800mA			1.20	1.30	V
	V_{DIF3}	I_{OUT} =1A			1.30	1.40	V
Quiescent Current	I_{SS}	V_{IN}= V_{OUT}+1.5V			3.3	8	mA
Line Regulation	$\Delta V_{OUT-LINE}$	I_{OUT} =10mA V_{OUT}+1.5V ≤V_{IN}≤20V			2	10	mV
Ripple Rejection Rate	PSRR	V_{IN} = 12V +1Vp-pAC	I_{OUT}=10mA,1kHZ		65		dB
			I_{OUT}=100mA,1kHZ		60		
Thermal Shutdown		Junction Temperature			160		℃

Note ： 1 .V_{DIF}： V_{IN1} –V_{OUT} (E)’

V_{IN1} ： The input voltage when V_{OUT}(E)’ appears as input voltage is gradually decreased.

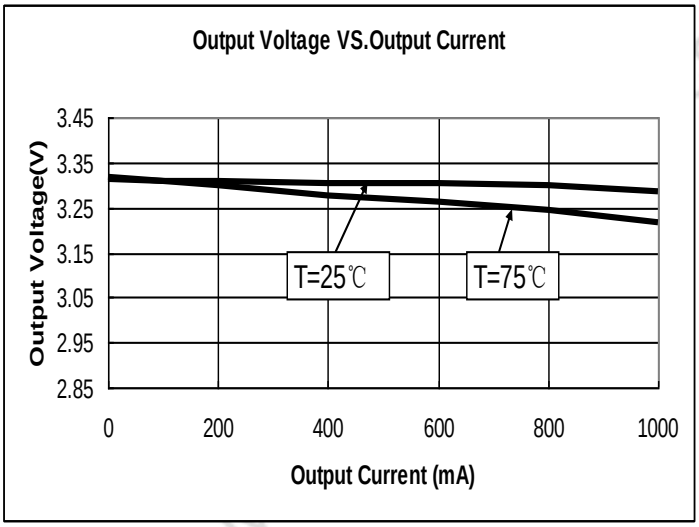
V_{OUT} (E)’=A voltage equal to 99% of the output voltage whenever an amply stabilized Iout and {V_{OUT} (T)+1.5V} is input.

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Type Characteristics

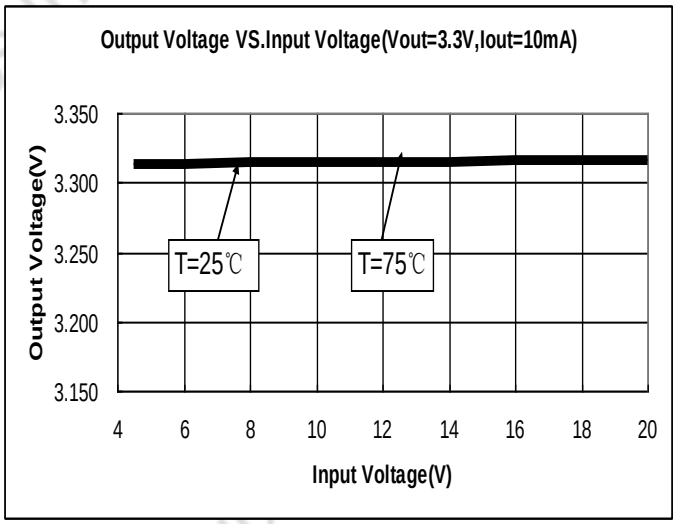
（1） Output Voltage VS. Output Current
（V_{IN}=V_{OUT}+1.5V）

ME1117A33



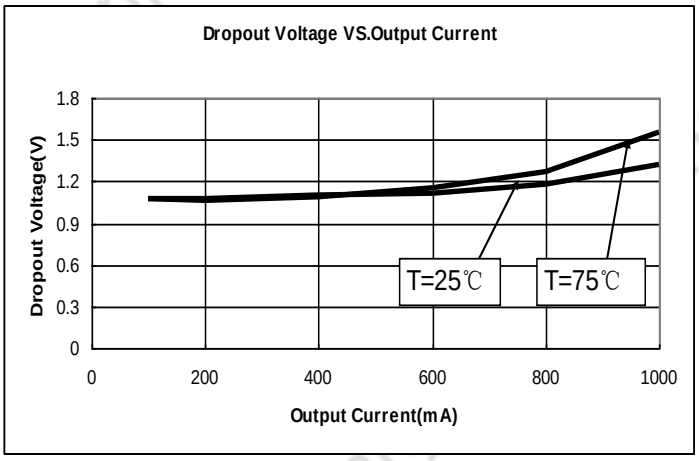
（2） Output Voltage VS. Input Voltage
（V_{OUT}=3.3V , I_{OUT}=10mA）

ME1117A33



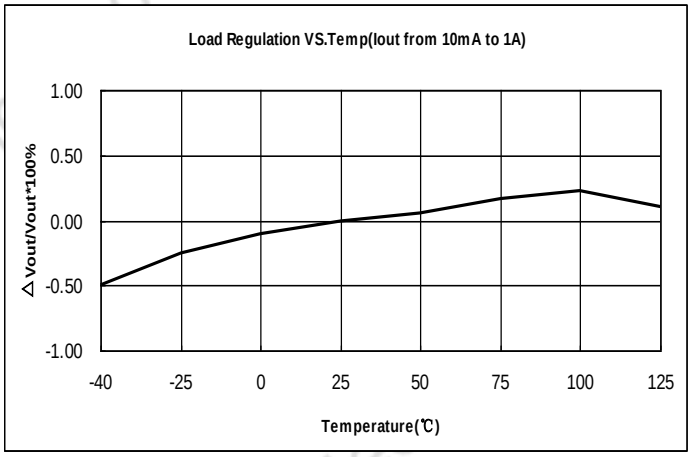
（3） Dropout Voltage VS. Output Current

ME1117A33



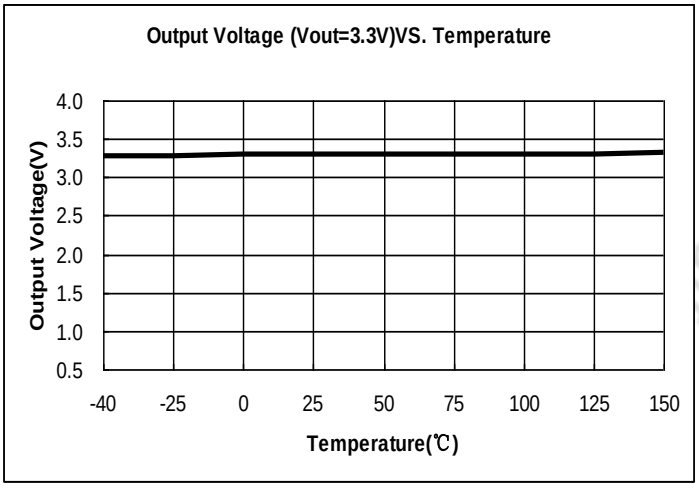
（4）Load Regulation VS.Temp(Iout from 10mA to 1A)

ME1117A33



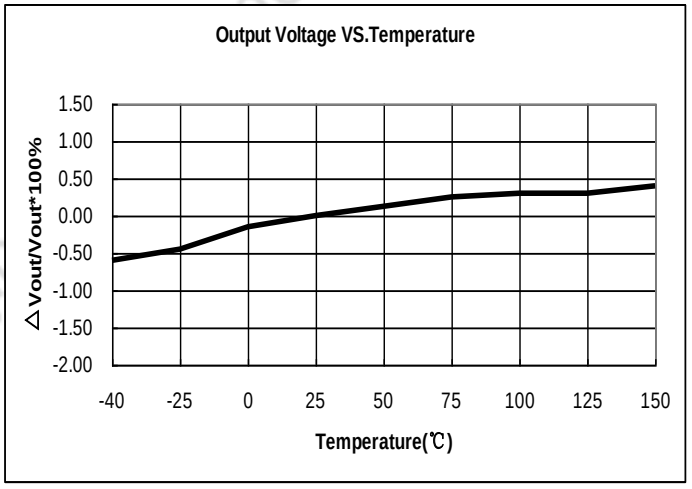
（5）Output Voltage VS. Temperature

ME1117A33



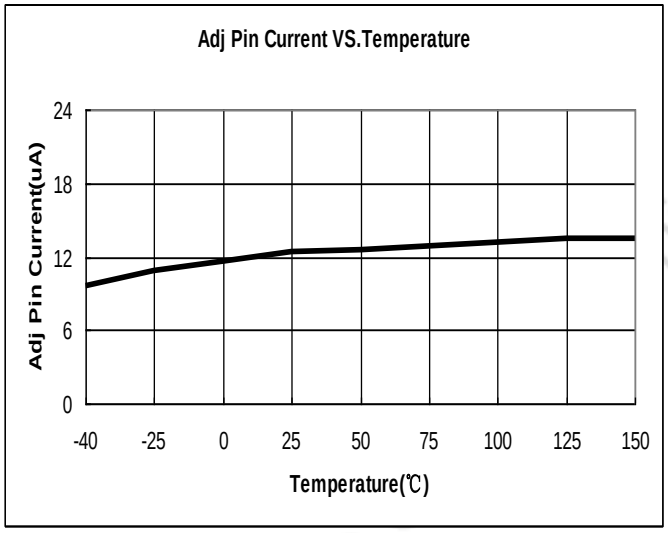
（6）Output Voltage Change VS. Temperature

ME1117A33



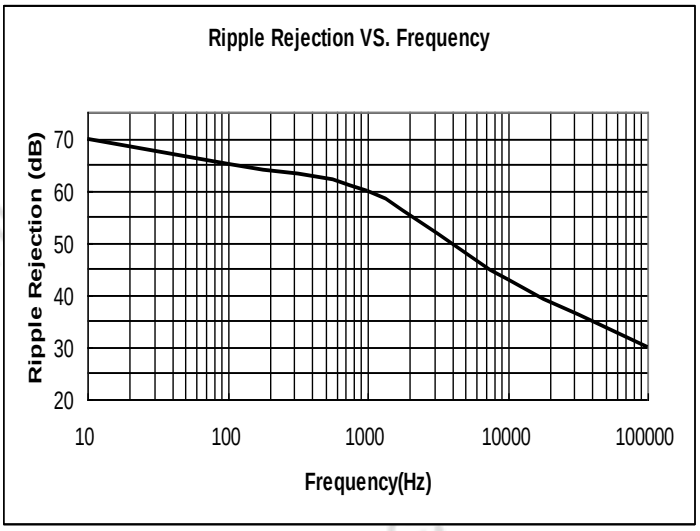
（7）Adj Pin Current VS.Temperature

ME1117F



（8）Ripple Rejection vs. Frequency

ME1117A33

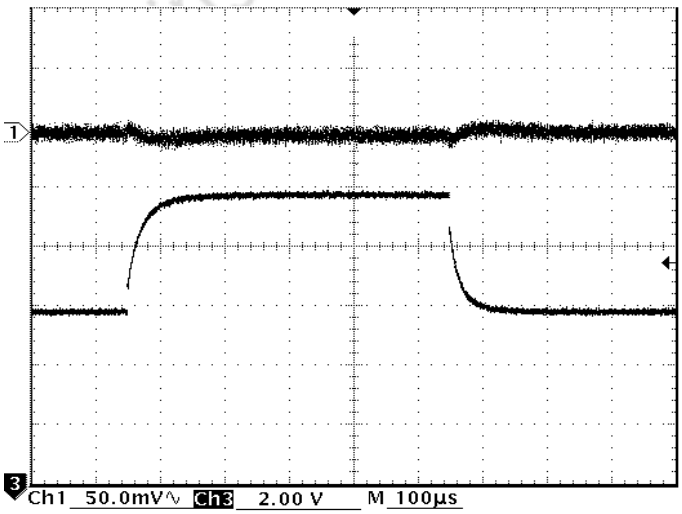


（9）Line Transient Response

ME1117A33

Ch1：Output Voltage　Ch3：Input Voltage

V_{IN}=8V～12V,I_{OUT}=0mA,Ta = 25 °C

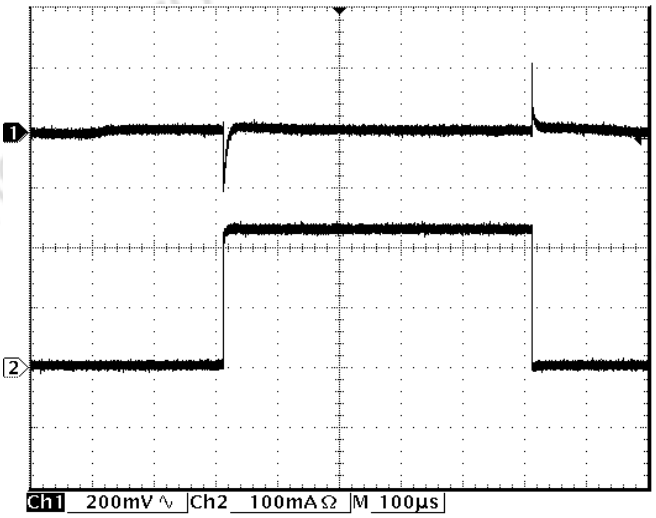


（10）Load Transient Response

ME1117A33

Ch1：Output Voltage　Ch2：Load Current

V_{IN}=4.8V, I_{OUT}=0mA ～240mA,Ta = 25 °C



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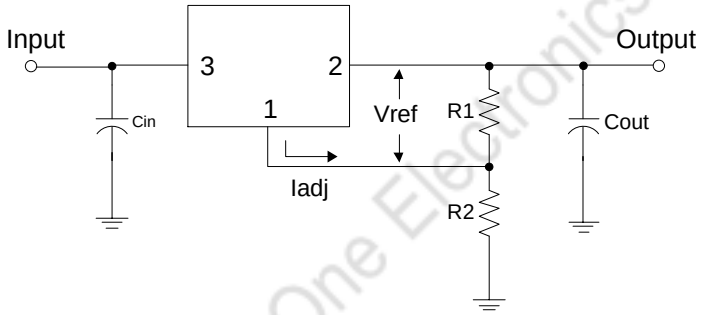
Applications Information

➢ **Introduction**

The ME1117 features a significant reduction in dropout voltage along with enhanced output voltage accuracy and temperature stability when compared to older industry standard three−terminal adjustable regulators.

➢ **Output Voltage**

The typical application circuit for adjustable output regulator is shown in following Figure. They develop and maintain the nominal 1.25 V reference voltage between the output and adjust pins. The reference voltage is programmed to a constant current source by resistor R1, and this current flows through R2 to ground to set the output voltage. The programmed current level is usually selected to be greater than the specified 3.0mA minimum that is required for regulation. Since the adjust pin current, I_{ADJ}, is significantly lower and constant with respect to the programmed load current, it generates a small output voltage error that can usually be ignored.



$$Vout = Vref(1+\frac{R2}{R1}) + Iadj\ R2$$

➢ **External Capacitors**

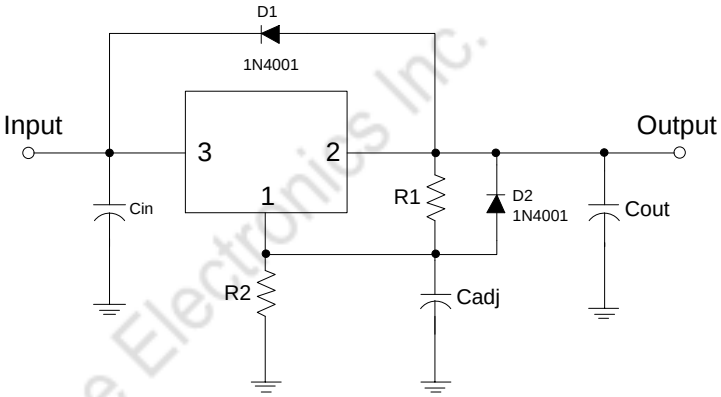
Input bypass capacitor C_{IN} may be required for regulator stability. This capacitor will reduce the circuit's sensitivity when powered from a complex source. A 10uF ceramic or tantalum capacitor should be adequate for most applications. Frequency compensation for the regulator is provided by capacitor C_{OUT} and its use is mandatory to ensure output stability. A minimum capacitance value of 4.7uF with an equivalent series resistance (ESR) that is within the limits of 0.25 ohm to 2.2 ohm is required. Higher values of output capacitance can be used to enhance loop stability and transient response with the additional benefit of reducing output noise. The output ripple will increase linearly for fixed and adjustable devices as the ratio of output voltage to the reference voltage increases.

➢ **Protection Diodes**

The ME1117 has two internal low impedance diode paths that normally do not require protection when used in the typical regulator applications. The first path connects between VOUT and VIN , and it can withstand a peak surge current of about 15 A. Only when VIN is shorted to ground and COUT is greater than 100uF, it becomes possible for device damage to occur. Under these conditions, diode D1 is required to protect the device. The second path

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connects between CADJ and VOUT, and it can withstand a peak surge current of about 150mA. Protection diode D2 is required if the output is shorted to ground and CADJ is greater than 10uF.



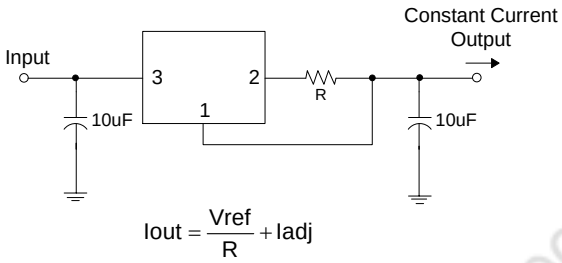
➢ **Thermal Considerations**

This series contains an internal thermal limiting circuit that is designed to protect the regulator in the event that the maximum junction temperature is exceeded. When activated, typically at 175°C, the regulator output switches off and then back on as the die cools.

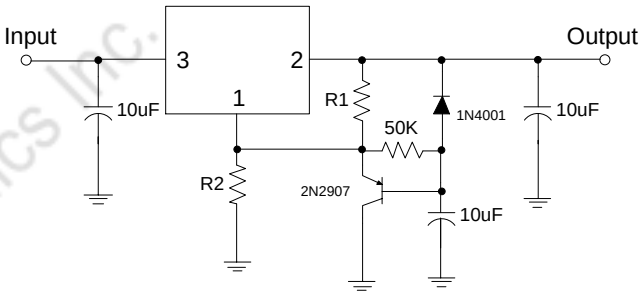
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Other Application Circuit

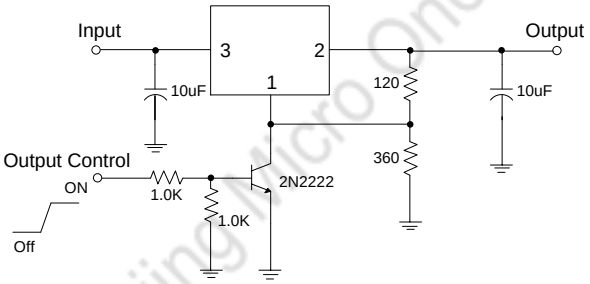
（1） Constant Current Regulator



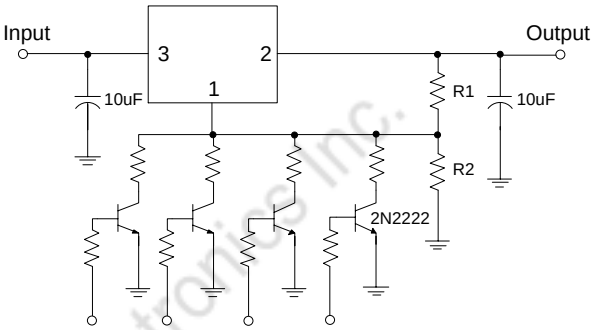
（2）Slow Turn−On Regulator



（3）Regulator with Shutdown

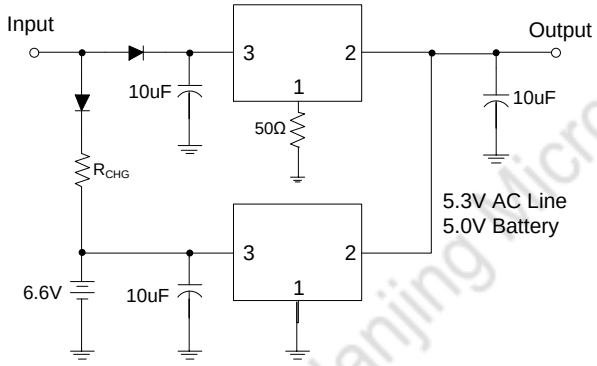


（4）Digitally Controlled Regulator



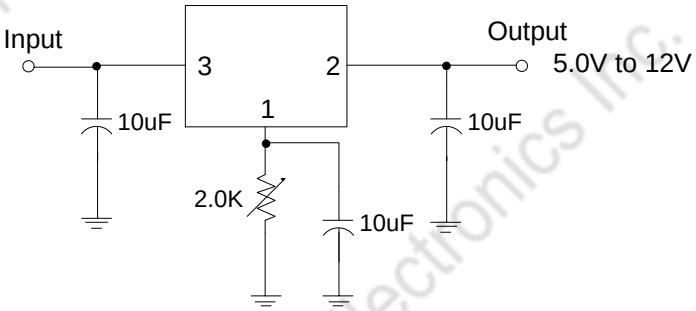
Resistor R2 sets the maximum output voltage. Each transistor reduces the output voltage when turned on.

（5）Battery Backed−Up Power Supply



The 50 ohm resistor that is in series with the ground pin of the upper regulator level shifts its output 300 mV higher than the lower regulator. This keeps the lower regulator off until the input source is removed.

（6）Adjusting Output of Fixed Voltage Regulators

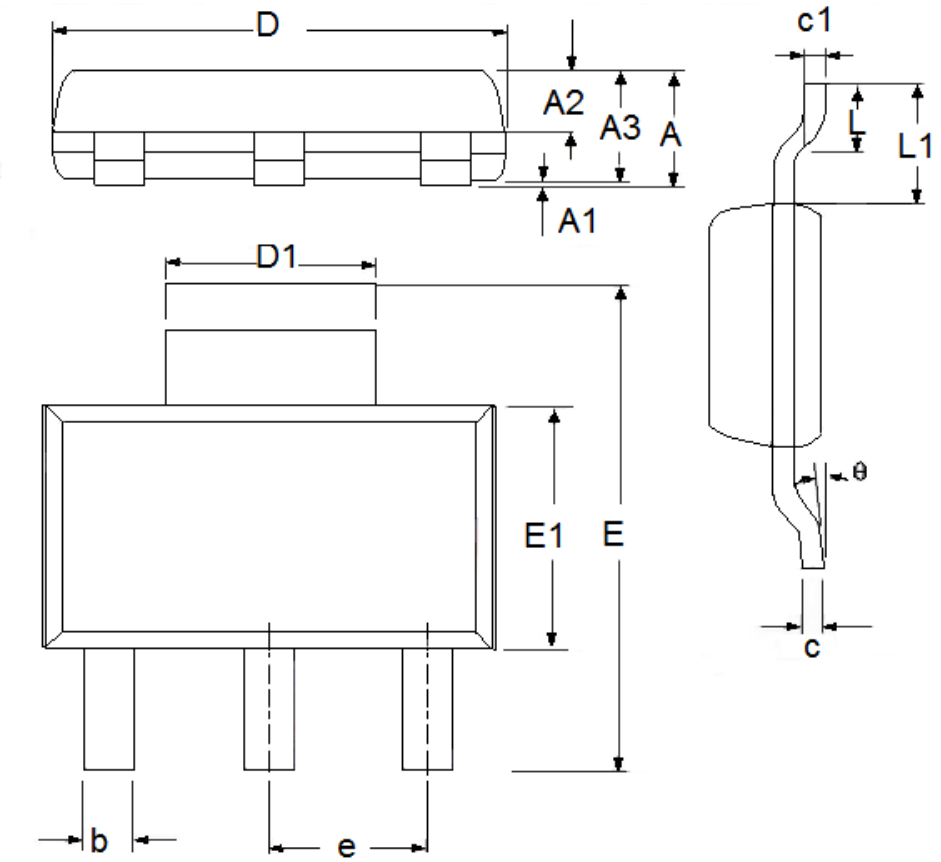


Package Quantity

Package Type	Minimum Packing QTY	UNITS	Small Box	Large BOX
SOT223	3000	Tape & Reel	6K	48K
TO252-2	2500	Tape & Reel	5K	40K
SOT89-3	1000	Tape & Reel	10K	40K
TO263-3	800	Tape & Reel	800	4K

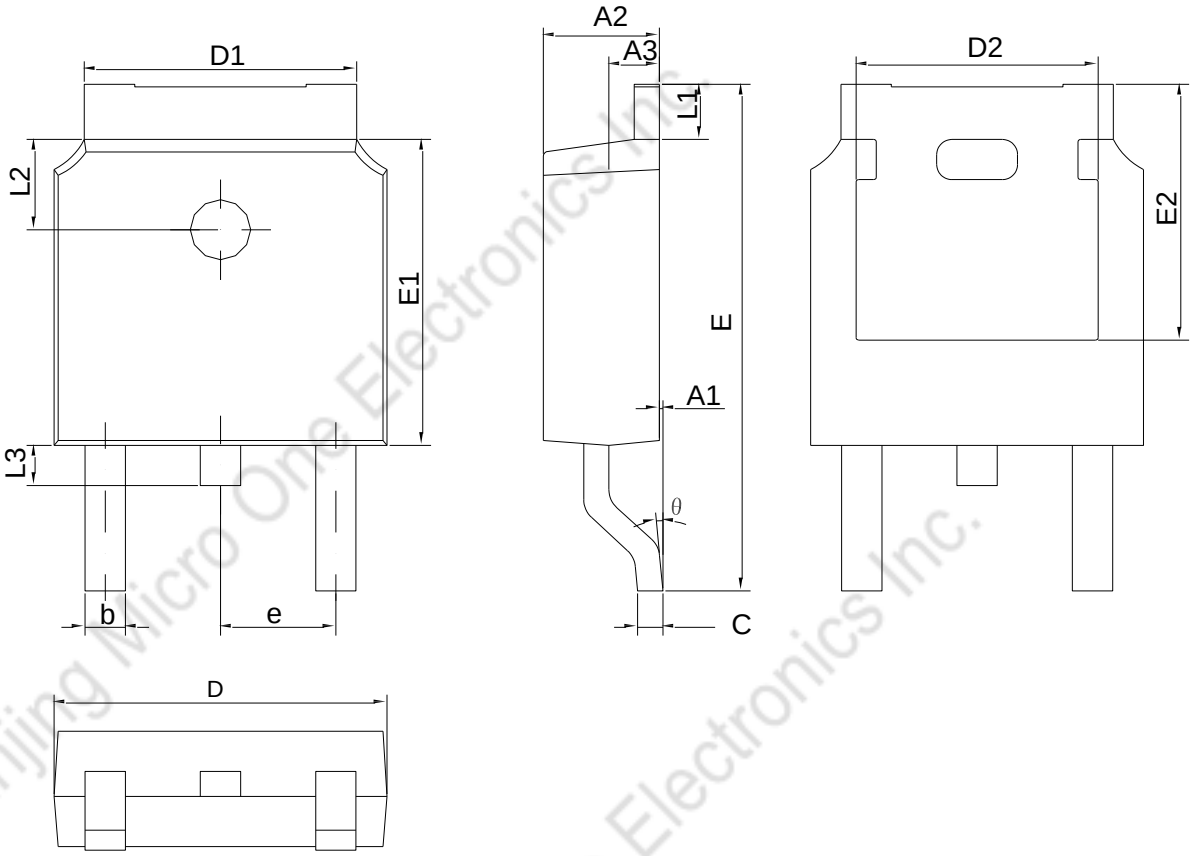
Packaging Information

- **SOT223**



DIM	Millimeters		Inches	
	Min	Max	Min	Max
A	1.48	1.8	0.0583	0.0709
A1	0	0.15	0.0000	0.0059
A2	0.6	0.95	0.0236	0.0374
A3	1.45	1.75	0.0571	0.0689
b	0.6	0.82	0.0236	0.0323
c	0.2	0.35	0.0079	0.0138
D	6.2	6.6	0.2441	0.2598
D1	2.9	3.1	0.1142	0.1220
E	6.7	7.3	0.2638	0.2784
E1	3.3	3.7	0.1299	0.1457
e	2.3(TYP)		0.0906(TYP)	
L	0.76	1.16	0.0299	0.0457
L1	1.75(TYP)		0.0689(TYP)	
θ	0	10°	0.0000	10°
c1	0.25(TYP)		0.0098(TYP)	

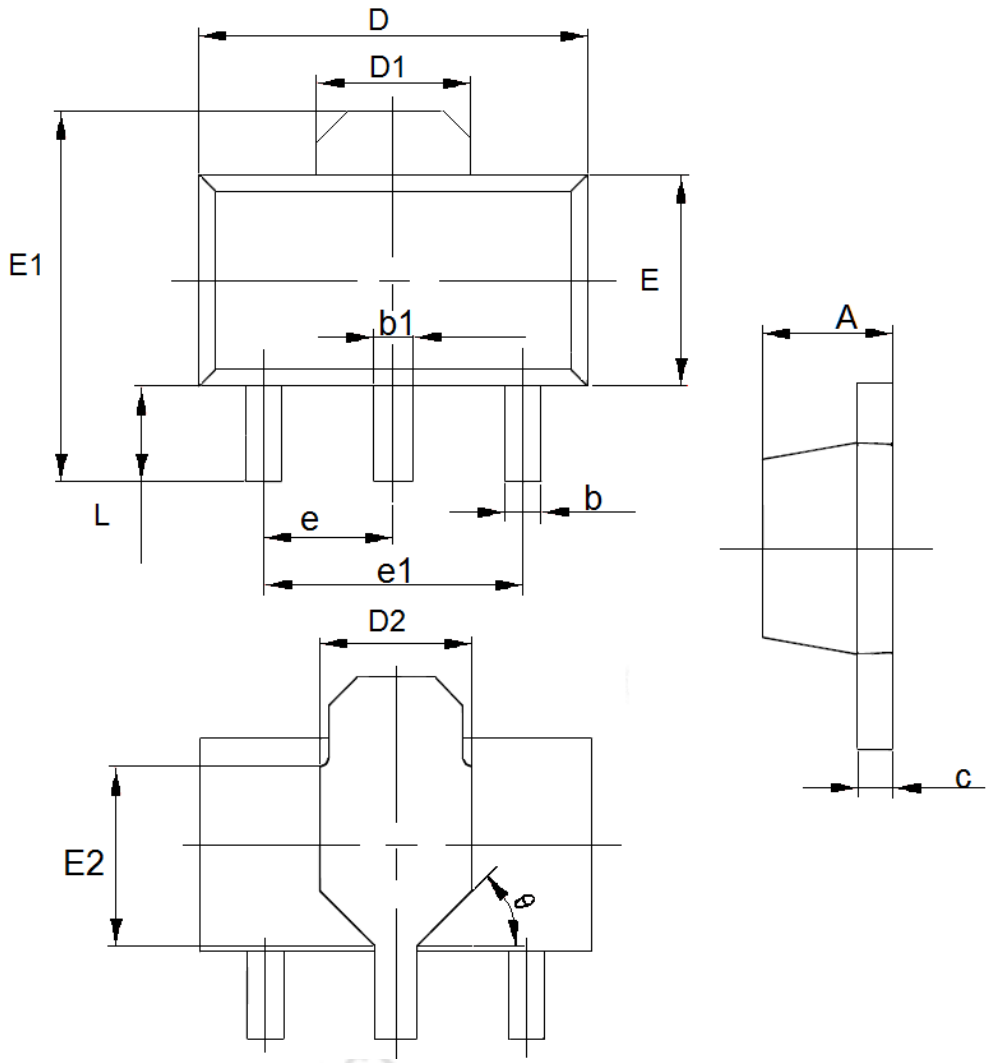
- **TO252-2**



DIM	Millimeters		Inches	
	Min	Max	Min	Max
A1	0	0.13	0.0000	0.0051
A2	2.18	2.39	0.0858	0.0941
A3	0.9	1.1	0.0354	0.0433
b	0.65	0.85	0.0256	0.0335
c	0.46	0.61	0.0181	0.0240
D	6.35	6.73	0.2500	0.2650
D1	4.95	5.46	0.1949	0.2150
D2	4.7	4.9	0.1850	0.1929
E	9.4	10.41	0.3701	0.4098
E1	5.97	6.22	0.2350	0.2449
E2	5.21	5.4	0.2051	0.2126
e	2.286BSC		0.090BSC	
L1	0.89	1.27	0.0350	0.0500
L2	1.7	1.9	0.0669	0.0748
L3	0.6	1	0.0236	0.0394
θ	0°	8°	0°	8°

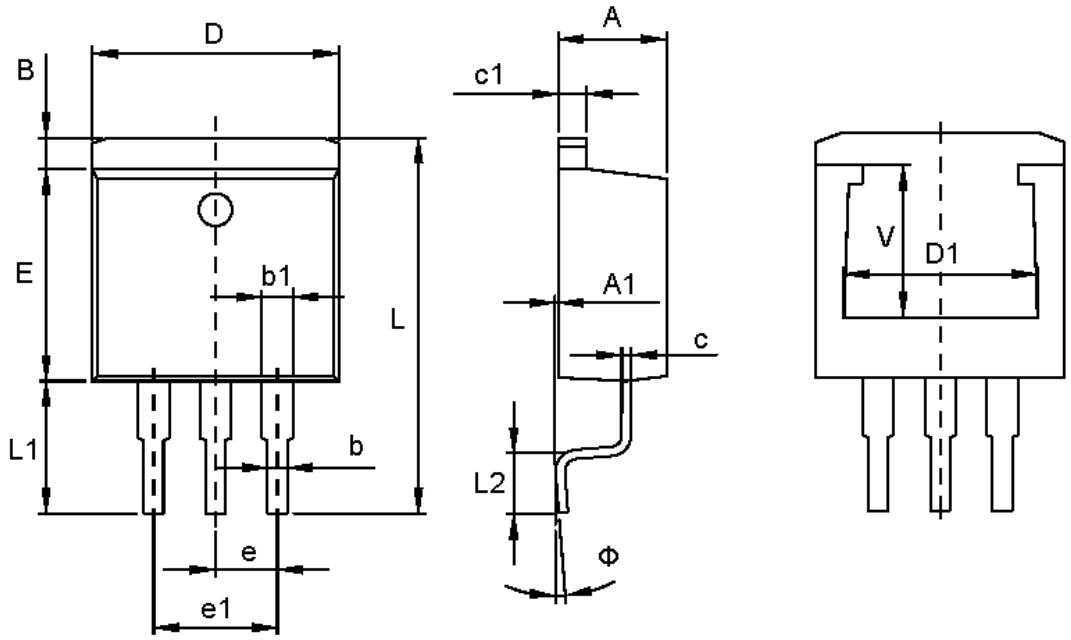
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- **SOT89-3**



DIM	Millimeters		Inches	
	Min	Max	Min	Max
A	1.4	1.6	0.0551	0.0630
b	0.32	0.52	0.0126	0.0205
b1	0.4	0.58	0.0157	0.0228
c	0.35	0.45	0.0138	0.0177
D	4.4	4.6	0.1732	0.1811
D1	1.55(TYP)		0.061(TYP)	
D2	1.75(TYP)		0.0689(TYP)	
e1	3.0(TYP)		0.1181(TYP)	
E	2.3	2.6	0.0906	0.1023
E1	3.94	4.4	0.1551	0.1732
E2	1.9(TYP)		0.0748(TYP)	
e	1.5(TYP)		0.0591(TYP)	
L	0.8	1.2	0.0315	0.0472
θ	45°		45°	

- **TO263-3**



DIM	Millimeters		Inches	
	Min	Max	Min	Max
A	4.47	4.67	0.176	0.184
A1	0	0.15	0.000	0.006
B	1.12	1.42	0.044	0.056
b	0.71	0.91	0.028	0.036
b1	1.17	1.37	0.046	0.054
c	0.31	0.53	0.012	0.021
c1	1.17	1.37	0.046	0.054
D	10.01	10.31	0.394	0.406
E	8.5	8.9	0.335	0.350
e	2.54TYP		0.100	
e1	4.98	5.18	0.196	0.204
L	14.94	15.5	0.588	0.610
L1	4.95	5.45	0.195	0.215
L2	2.34	2.74	0.092	0.108
Φ	0°	8°	0°	8°
D1	7.51	8.51	0.296	0.335
V	4.8	5.8	0.189	0.228

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