数据手册

Datasheet

MG1117

线性稳压电路

版本：V1.0

版本变更记录

版本号	日期	变更描述
1.0	2023 年 7 月 13 日	MG1117 芯片数据手册初稿

MG1117

1. General Description

MG1117 is a series of low dropout three-terminal regulators with a dropout of 1.1V at 1A load current. MG1117 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,2.85V,3.3V and 5V,MG1117 has an adjustable version,which can provide an output voltage from 1.25 to 12V With only two external resistors.

2. 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℃

3. Applications

● Power Management for Computer Mother Board, Graphic Card

● LCD Monitor and LCD TV

● DVD Decode Board

● ADSL Modem

● Post Regulators for Switching Supplies

## 4. Block Diagram
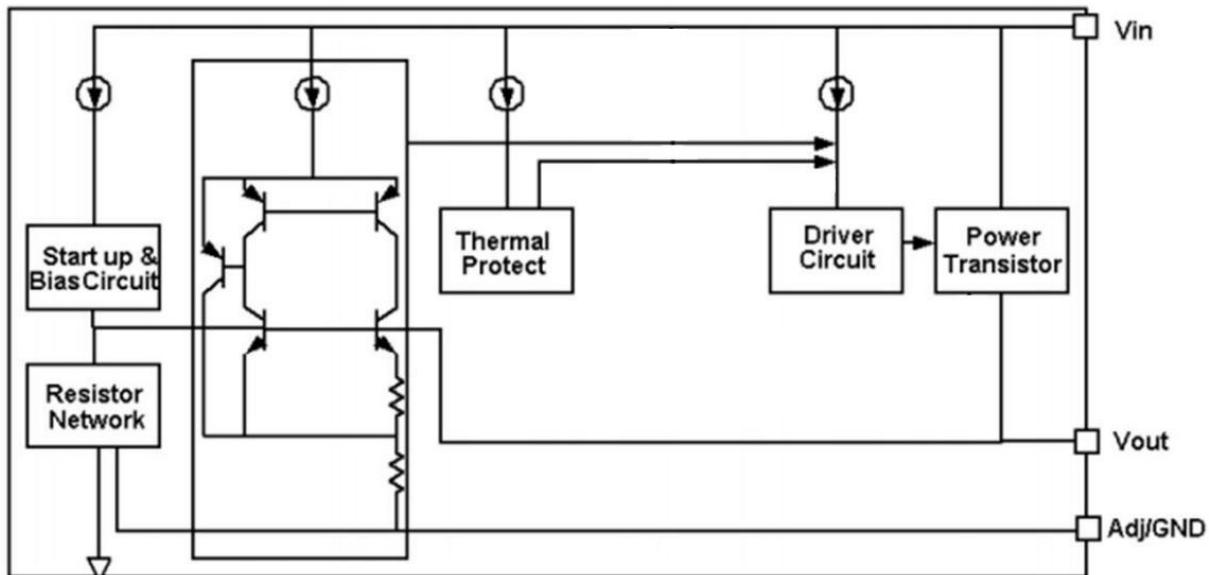
5. Pin Configuration

SOT223 (Top View)
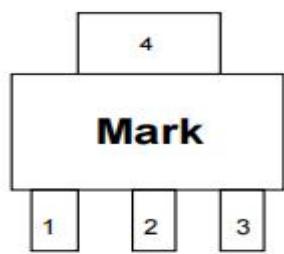
Table1: MG1117 series (SOT223 PKG)

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: MG1117 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)
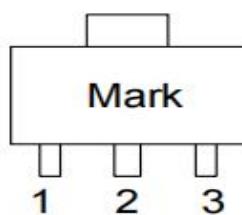
Table3: MG1117 series (SOT89 PKG)

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：V

Max Operating Junction Temperature(Tj)：150℃

Storage Temperature(Ts)：-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.

6. Electrical Characteristics

TA=25℃, unless otherwise noted.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Vin	Input voltage		--	15	18	V
Vref	Reference voltage	MG1117-Adj 10mA≤Iout≤1A , Vin=2.55V	1.225	1.25	1.275	V
Vout	Output voltage	MG1117-1.2V 0≤Iout≤1A , Vin=2.5V	1.176	1.2	1.224	V
		MG1117-1.5V 0≤Iout≤1A , Vin=2.8V	1.47	1.5	1.53	V
		MG1117-1.8V 0≤Iout≤1A , Vin=3.1V	1.764	1.8	1.836	V
		MG1117-2.5V 0≤Iout≤1A , Vin=3.8V	2.45	2.5	2.55	V
		MG1117-2.85V 0≤Iout≤1A , Vin=4.15V	2.793	2.85	2.907	V
		MG1117-3.3V 0≤Iout≤1A , Vin=4.6V	3.234	3.3	3.366	V
		MG1117-5.0V 0≤Iout≤1A , Vin=6.3V	4.9	5	5.1	V

△Vout	Line regulation	MG1117-1.2V Iout=10mA, 2.5V≤Vin≤10V		4	19	mV
		MG1117-1.5V Iout=10mA, 2.8V≤Vin≤10V		5	26	mV
		MG1117-ADJ Iout=10mA, 2.55V≤Vin≤12V		5	24	mV
		MG1117-1.8V Iout=10mA, 3.1V≤Vin≤12V		5	32	mV
		MG1117-2.5V Iout=10mA, 3.8V≤Vin≤12V		8	41	mV
		MG1117-2.85V Iout=10mA, 4.15V≤Vin≤12V		8	46	mV
		MG1117-2.85V Iout=10mA, 4.15V≤Vin≤12V		9	49	mV
		MG1117-5.0V Iout=10mA, 6.3V≤Vin≤12V		10	56	mV

△Vout	Load regulation	MG1117-1.2V Vin =2.5V, 10mA≤Iout≤1A		10	40	mV
		MG1117-1.5V Vin =2.8V, 10mA≤Iout≤1A		10	40	mV
		MG1117-ADJ Vin =2.55V, 10mA≤Iout≤1A		10	40	mV
		MG1117-1.8V Vin =3.1V, 10mA≤Iout≤1A		10	40	mV
		MG1117-2.5V Vin =2.8V, 10mA≤Iout≤1A		10	40	mV
		MG1117-2.85V Vin =4.15V, 10mA≤Iout≤1A		10	40	mV
		MG1117-3.3 Vin =4.6V, 10mA≤Iout≤1A		10	40	mV
		MG1117-5.0 Vin =6.3V, 10mA≤Iout≤1A		10	40	mV
Vdrop	Dropout voltage	Iout =100mA		1.05	1.2	V
		Iout=1A		1.1	1.3	V
Imin	Minimum load current	MG1117-ADJ		2	10	mA
		MG1117-1.2V, Vin=10V		2	5	mA

Iq	Quiescent Current	MG1117-1.5V, Vin=10V		2	5	mA
		MG1117-1.8V, Vin=12V		2	5	mA
		MG1117-2.5V, Vin=12V		2	5	mA
		MG1117-2.85V, Vin=12V		2	5	mA
		MG1117-3.3V, Vin=12V		2	5	mA
		MG1117-5.0V, Vin=12V		2	5	mA
Iadj	Adjust pin current	MG1117-ADJ Vin=5V,10mA≤Iout≤1A		55	120	uA
Ichange	Iadj change	MG1117-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
θC	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 MG1117-ADJ will lead to unstable or oscillation output.

7. Detailed Description

MG1117 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 shut down modules can assure chip and its application system working safety when the temperature is larger than 200°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.

8. Typical Application

MG1117 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
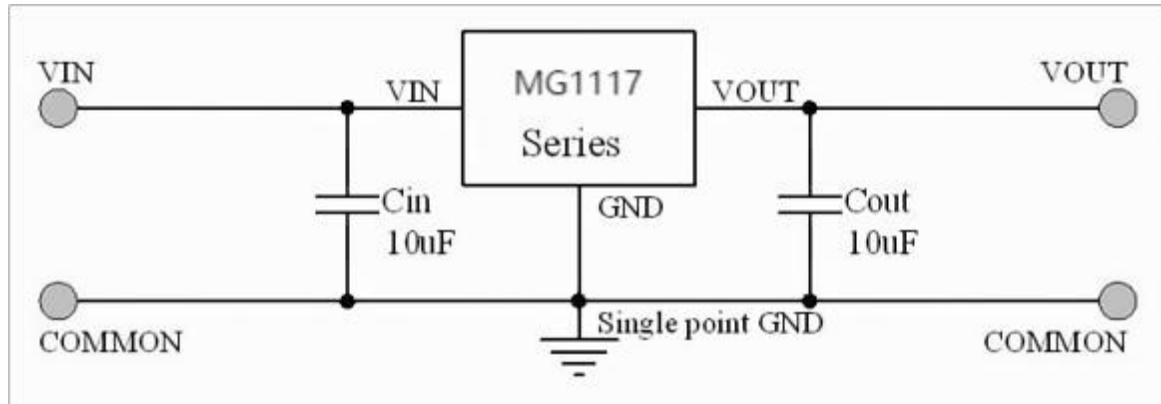
Application circuit of MG1117 fixed version

1) Recommend using 10uF tan capacitor as bypass capacitor (C1) for all application circuit.

2) Recommend using 10uF tan capacitor to assure circuit stability.

9. Adjustable Output Voltage Version
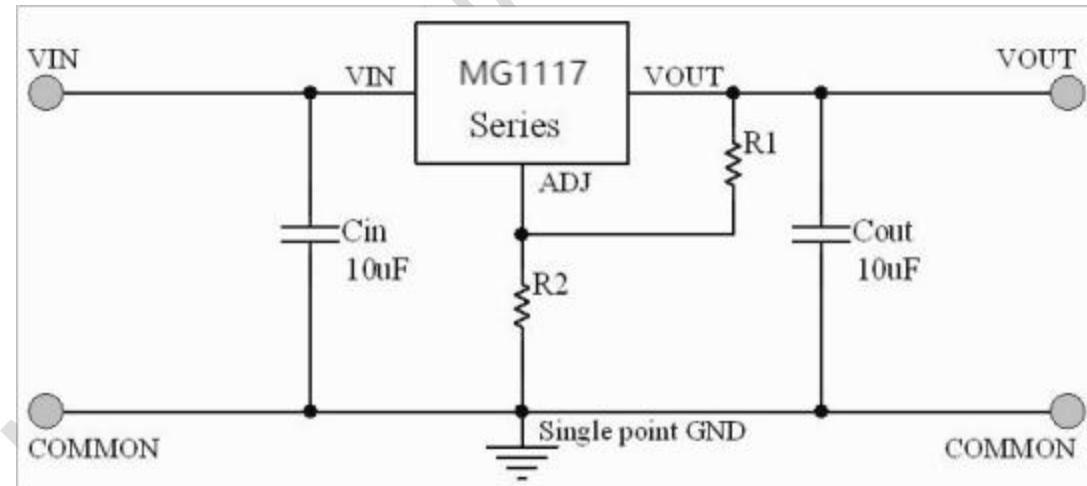
Application Circuit of MG1117-ADJ

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 MG1117- 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 CADJ should be less than R1 to prevent ripple from being amplified. As R1 is normally in the range of 100Ω~500Ω, the value of CADJ should satisfy this equation: $1/(2\pi \times f_{ripple} \times CADJ) < R1$.

10. 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 MG1117 is very large. MG1117 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 MG1117 could allow on itself is less than 1W. And furthermore, MG1117 will work at junction temperature higher than 125°C under such condition and no lifetime is guaranteed.

## 11. Typical Performance Characteristics

TA=25℃, unless otherwise noted

Output Voltage vs. Input Voltage (VOUT=3.3V)
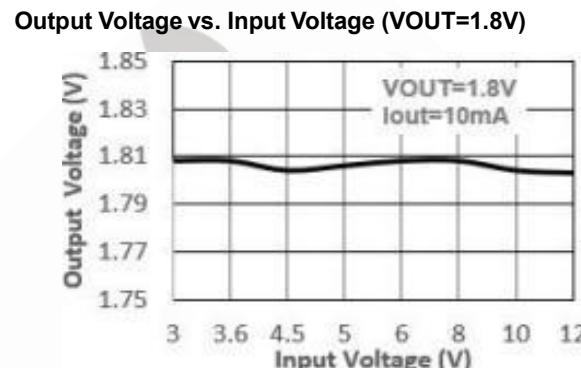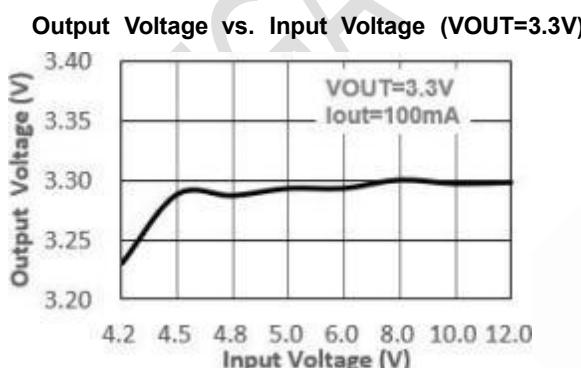
Output Voltage vs. Input Voltage (VOUT=1.8V)

**Output Voltage vs. Output Current (VOUT=3.3V)**
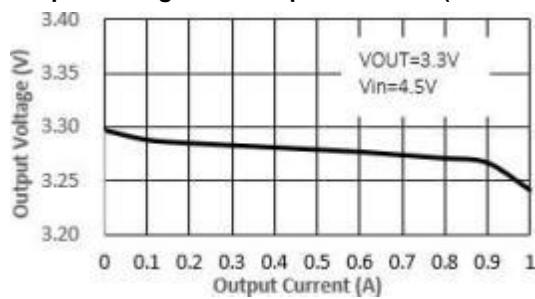
Output Voltage vs. Output Current (VOUT=1.8V)
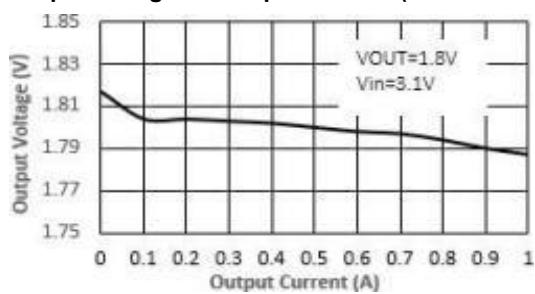

**Line Regulation vs. Junction Temperature**
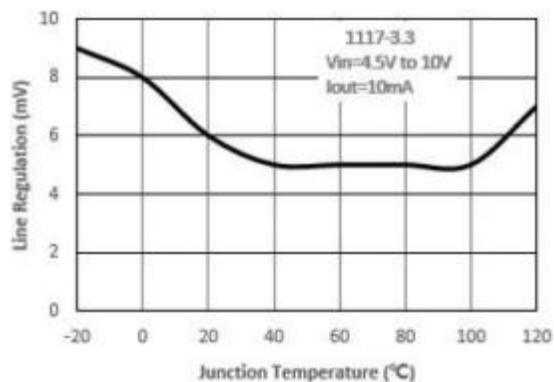
**Load Regulation vs. Junction Temperature**
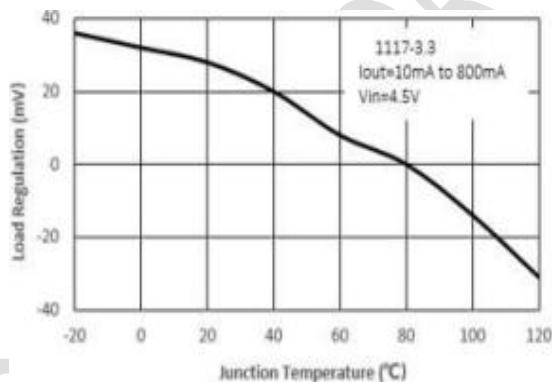
**Reference Voltage vs. Junction Temperature**
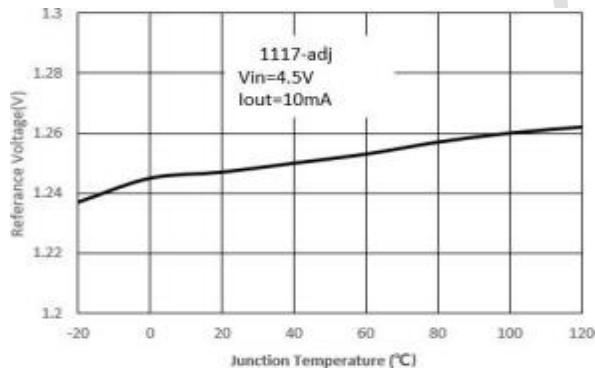
Output Voltage vs. Junction Temperature
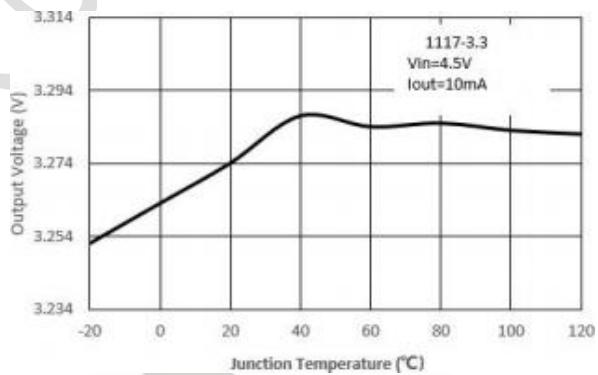

Minimum Load Current vs. Junction Temperature
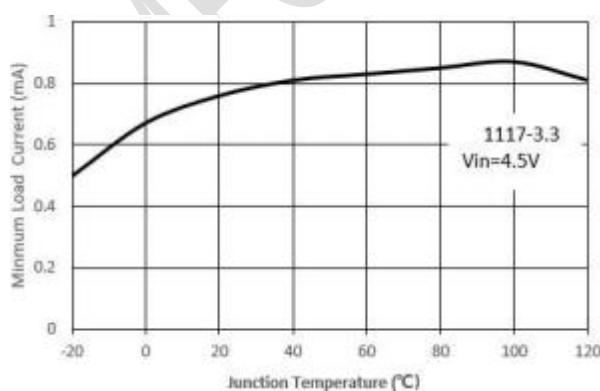

Adjust Pin Current vs. Junction Temperature
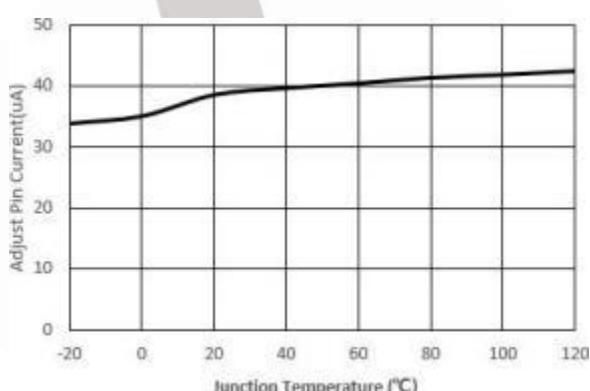
PSRR vs. Frequency
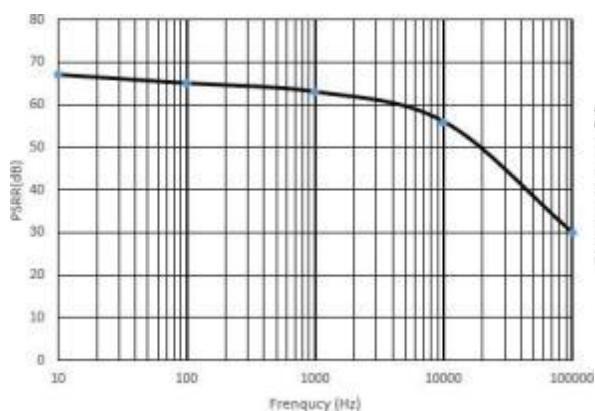
Dropout Voltage vs. Ouput Current
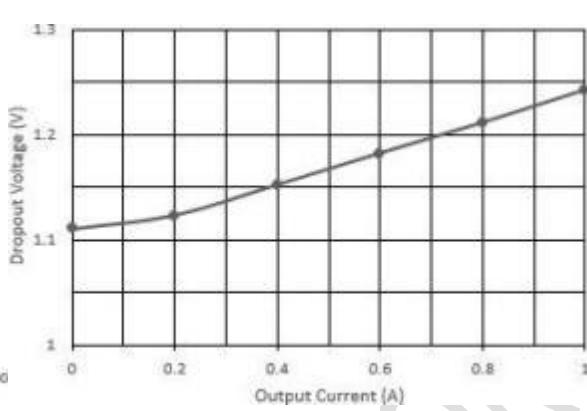
Line Transient Response

Load Transient Response
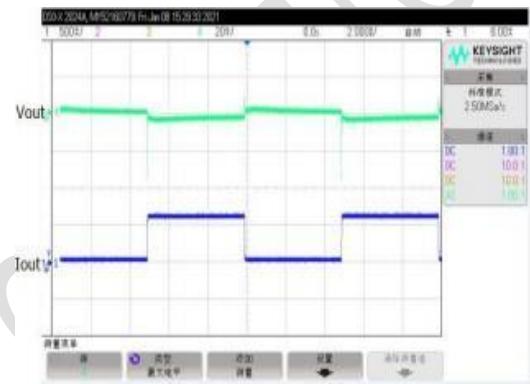
12. Package Information

SOT-223 PACKAGE OUTLINE DIMENSIONS
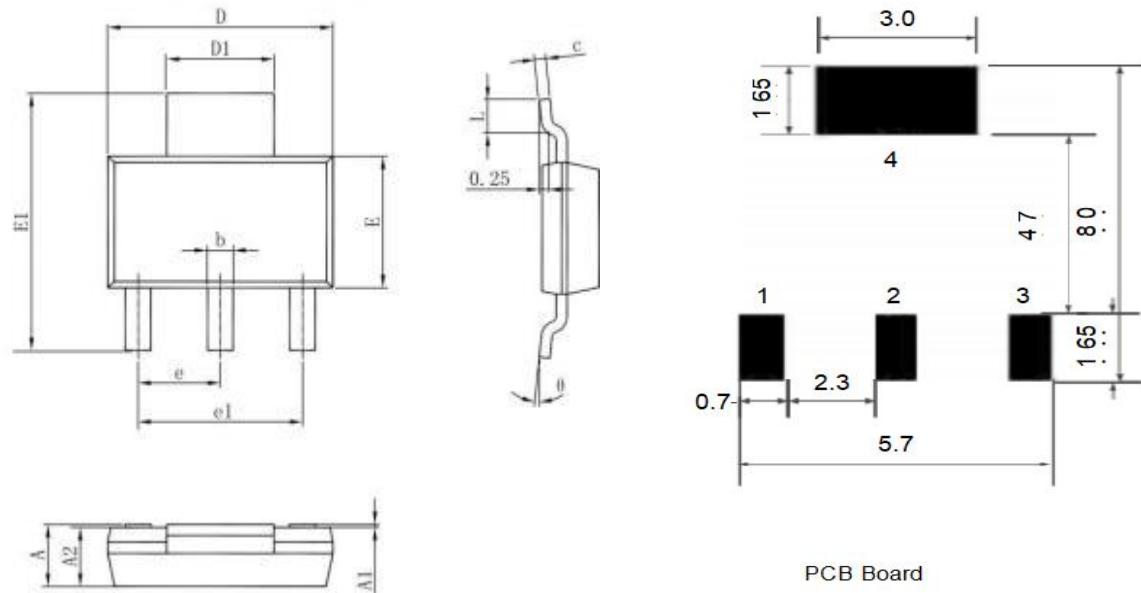
PCB Board

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°

TO-252-2L PACKAGE OUTLINE DIMENSIONS
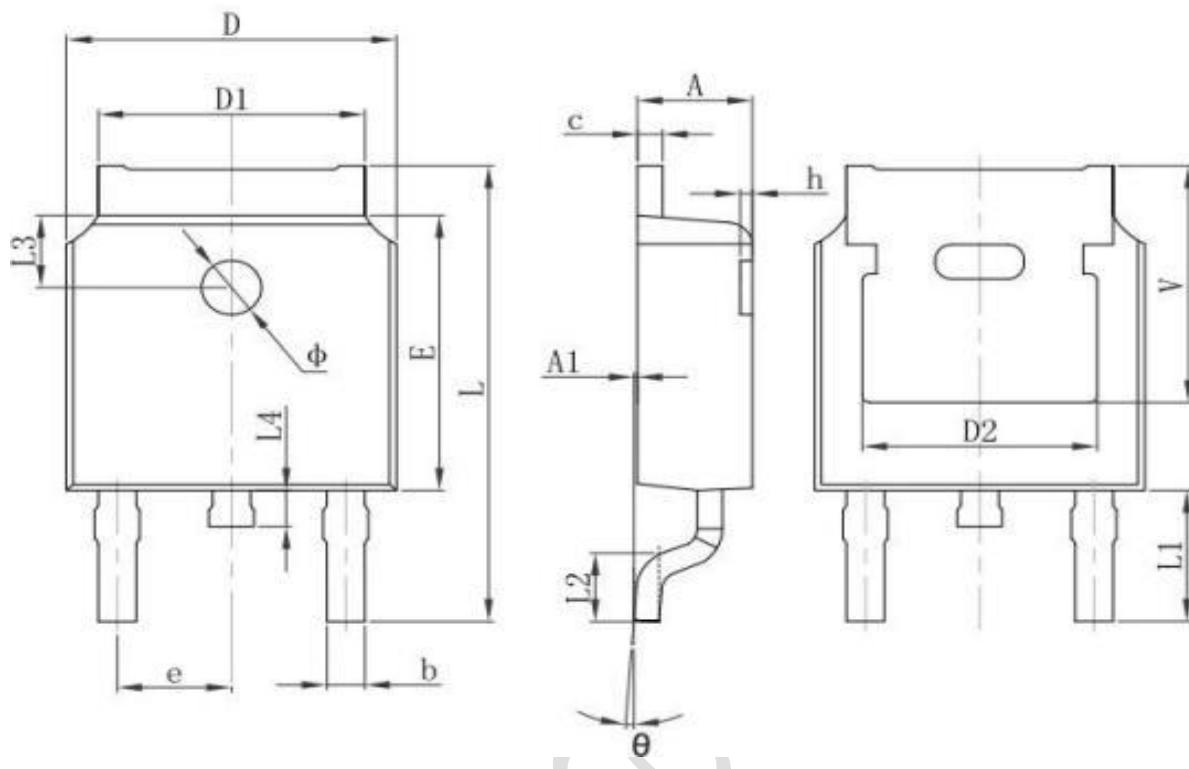
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	2.200	2.400	0.087	0.094
A1	0.000	0.127	0.000	0.005
b	0.660	0.860	0.026	0.034
c	0.460	0.580	0.018	0.023
D	6.500	6.700	0.256	0.264
D1	5.100	5.460	0.201	0.215
D2	4.830 REF.		0.190 REF.	
E	6.000	6.200	0.236	0.244
e	2.186	2.386	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
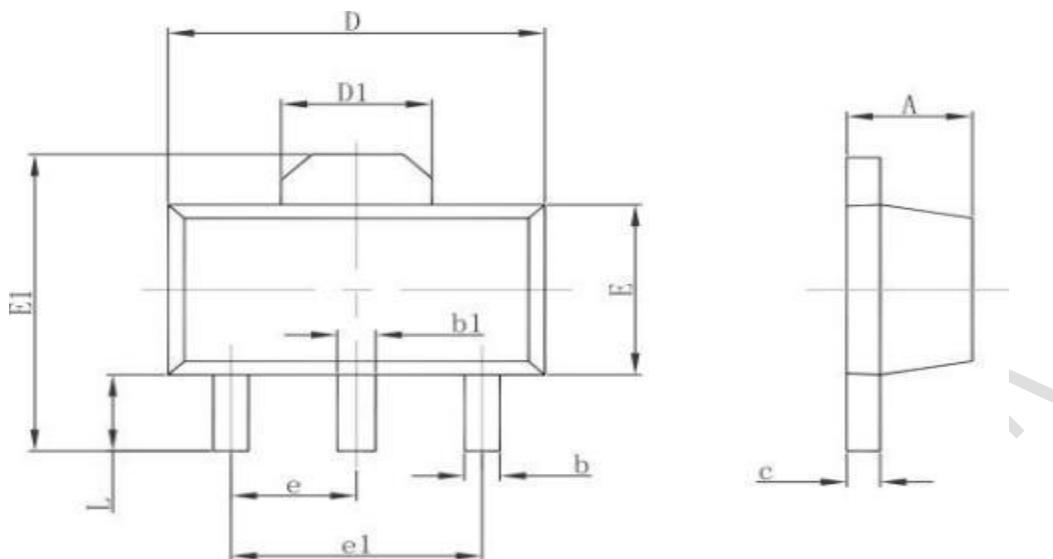
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	1.400	1.600	0.055	0.063
b	0.320	0.520	0.013	0.020
b1	0.400	0.580	0.016	0.023
c	0.350	0.440	0.014	0.017
D	4.400	4.600	0.173	0.181
D1	1.550 REF.		0.061 REF.	
E	2.300	2.600	0.091	0.102
E1	3.940	4.250	0.155	0.167
e	1.500 TYP.		0.060 TYP.	
e1	3.000 TYP.		0.118 TYP.	
L	0.900	1.200	0.035	0.047

13. Selection Table

Part No.	Symbol.	Output Voltage	Package
MG1117	XX=12	1.2V	SOT89
	XX=15	1.5V	
	XX=18	1.8V	
	XX=285	2.85V	SOT-223
	XX=25	2.5V	
	XX=33	3.3V	TO-252
	XX=50	5.0V	
	XX=adj	adj	

14.Order Information

Part No.	product number	Package Type	Packing type
MG1117N3A-12	61010326	SOT89	1000 Tape&Reel
MG1117S4A-12	61010327	SOT223	2500 Tape&Reel
MG1117G3A-12	61010328	TO252	2500 Tape&Reel
MG1117N3A-15	61010329	SOT89	1000 Tape&Reel
MG1117S4A-15	61010330	SOT223	2500 Tape&Reel
MG1117G3A-15	61010331	TO252	2500 Tape&Reel
MG1117N3A-18	61010332	SOT89	1000 Tape&Reel
MG1117S4A-18	61010333	SOT223	2500 Tape&Reel
MG1117G3A-18	61010334	TO252	2500 Tape&Reel
MG1117N3A-285	61010335	SOT89	1000 Tape&Reel
MG1117S4A-285	61010336	SOT223	2500 Tape&Reel
MG1117G3A-285	61010337	TO252	2500 Tape&Reel
MG1117N3A-25	61010338	SOT89	1000 Tape&Reel
MG1117S4A-25	61010339	SOT223	2500 Tape&Reel
MG1117G3A-25	61010340	TO252	2500 Tape&Reel
MG1117N3A-33	61010341	SOT89	1000 Tape&Reel
MG1117S4A-33	61010342	SOT223	2500 Tape&Reel
MG1117G3A-33	61010343	TO252	2500 Tape&Reel
MG1117N3A-50	61010344	SOT89	1000 Tape&Reel
MG1117S4A-50	61010345	SOT223	2500 Tape&Reel
MG1117G3A-50	61010346	TO252	2500 Tape&Reel
MG1117N3A-adj	61010347	SOT89	1000 Tape&Reel
MG1117S4A-adj	61010348	SOT223	2500 Tape&Reel
MG1117G3A-adj	61010349	TO252	2500 Tape&Reel