

GS1117A Series

1A Low Dropout Voltage Regulator

Product Description

The GS1117A is a low dropout three-terminal regulator with 1A output current capability.

The GS1117A provides current limit and thermal shutdown protection functions. On-chip thermal shutdown provides protection against a combination of high current and ambient temperature that would create excessive junction temperature.

The GS1117A is available in 1.2V, 1.5V, 1.8V, 2.5V, 3.3V and 5.0V fixed output voltage versions and ADJ output voltage version. And it is available in three leads SOT-89, SOT-223 and TO-252(A2) surface mount packages.

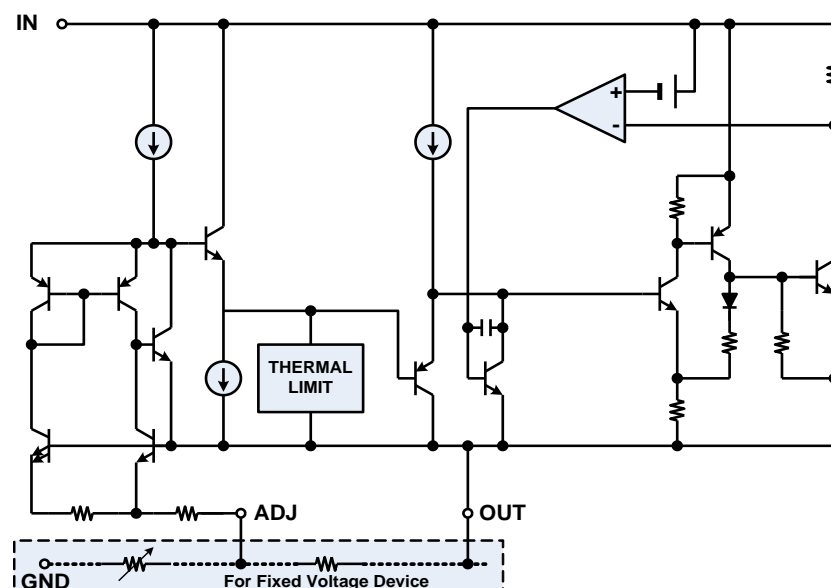
Features

- Adjustable or Fixed Output
- Output Current of 1A
- Output Voltage Accuracy within $\pm 2.0\%$
- RoHS Compliant & Halogen Free

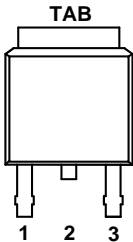
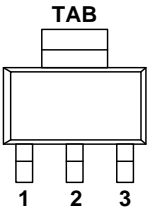
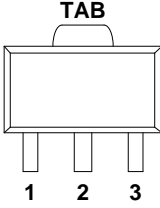
Applications

- Battery-Power Circuitry
- Post Regulator for Switching Power Supply
- Low Voltage Logic Suppliers
- ADSL Modem
- Power Management for Computer Mother Board and Graphic Card

Block Diagram



Packages & Pin Assignments

TO-252(A2)		SOT-223		SOT-89	
					
Pin	GS1117AD	Pin	GS1117AX	Pin	GS1117AY
1	GND/ADJ	1	GND/ADJ	1	GND/ADJ
2	V _{OUT}	2	V _{OUT}	2	V _{OUT}
3	V _{IN}	3	V _{IN}	3	V _{IN}

Ordering and Marking Information

Ordering Information			
TO-252(A2)	SOT-223	SOT-89	Output
GS1117ADF	GS1117AXF	GS1117AYF	ADJ
GS1117AD12F	GS1117AX12F	GS1117AY12F	1.2V
GS1117AD15F	GS1117AX15F	GS1117AY15F	1.5V
GS1117AD18F	GS1117AX18F	GS1117AY18F	1.8V
GS1117AD25F	GS1117AX25F	GS1117AY25F	2.5V
GS1117AD33F	GS1117AX33F	GS1117AY33F	3.3V
GS1117AD50F	GS1117AX50F	GS1117AY50F	5.0V

G S 1 1 1 7 A 1 2 2 F			
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Product Name: GS1117A	Package Code: 1 is D, X or Y - D for TO252(A2) - X for SOT-223 - Y for SOT-89	Voltage Code: 2 2 is Blank or 12, 15, 18... - Blank for ADJ Version - 12 for 1.2V, 33 for 3.3V and so on
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F Suffix:
Stands for RoHS Compliant and Halogen Free

Marking Information

GS 1 1 1 7 1 2
3 3 3 4 5 5 5

1 1 1 7 - 3 3 3
5 5 5 5

Product Code:

1 is Blank or A
 - GS1117, GS1117A
 - 1117 -

Package Code:

2 is D, X or Y
 - D for TO252(A2)
 - X for SOT-223
 - Y for SOT-89

Voltage Code:

3 3 3 is Blank, ADJ or 12, 15, 18...
 - Blank or ADJ for ADJ Version
 - 12 for 1.2V, 33 for 3.3V and so on

Green Level:

4 is F for RoHS Compliant and Halogen Free

GS Code:

5 5 5 5 is GS Code

Absolute Maximum Ratings (T_a=+25 °C, unless otherwise specified.)

Symbol	Parameter	Maximum		Unit
V _{IN}	Input Voltage	18		V
T _J	Junction Temperature	150		°C
T _{STG}	Storage temperature Range	-65 to 150		°C
T _{LEAD}	Lead Temperature (Soldering, 10 sec)	300		°C
θ _{JA}	Thermal Resistance Junction to Ambient (Condition: No heat sink)	SOT-223	120	°C/W
		SOT-89	250	
		TO-252(A2)	100	
P _D	Power Dissipation	SOT-223	0.9	W
		SOT-89	0.5	
		TO-252(A2)	1.2	

Stresses above those listed "Absolute Maximum Ratings" above may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions above those indicated in the operation sections of the specifications is not implied.

Exposure to Absolute Maximum Ratings conditions for extended periods may affect device reliability.

Recommended Operating Conditions

Parameter Name	Min.	Max.	Unit
Input Voltage Range	-	15	V
Junction Temperature	-40	125	°C

Electrical Characteristics (Ta=+25 °C, unless otherwise specified.)

Parameter	Device	Conditions	Min.	Typ.	Max.	Unit
Reference Voltage	GS1117A-Adj	$V_{IN} = 2.75V, I_{OUT} = 10mA$	1.238	1.250	1.262	V
		$1.4V \leq V_{IN}-V_{OUT} \leq 12V, 10mA \leq I_{OUT} \leq 1A$	1.225	1.250	1.270	
Output Voltage	GS1117A-1.2	$V_{IN} = 3.2V, I_{OUT} = 10mA$	1.182	1.200	1.218	V
		$3.0V \leq V_{IN} \leq 12V, 0 \leq I_{OUT} \leq 1.0A$	1.176	1.200	1.224	V
	GS1117A-1.5	$V_{IN} = 3.5V, I_{OUT} = 10mA$	1.477	1.500	1.523	V
		$3.0V \leq V_{IN} \leq 12V, 0 \leq I_{OUT} \leq 1.0A$	1.470	1.500	1.530	V
	GS1117A-1.8	$V_{IN} = 3.8V, I_{OUT} = 10mA$	1.773	1.800	1.827	V
		$3.2V \leq V_{IN} \leq 12V, 0 \leq I_{OUT} \leq 1.0A$	1.764	1.800	1.836	V
	GS1117A-2.5	$V_{IN} = 4.5V, I_{OUT} = 10mA$	2.463	2.500	2.537	V
		$3.9V \leq V_{IN} \leq 12V, 0 \leq I_{OUT} \leq 1.0A$	2.450	2.500	2.550	V
	GS1117A-3.3	$V_{IN} = 5V, I_{OUT} = 10mA$	3.250	3.300	3.350	V
		$4.75V \leq V_{IN} \leq 12V, 0 \leq I_{OUT} \leq 1.0A$	3.234	3.300	3.366	V
Line Regulation (Note 1)	GS1117A-Adj	$1.4V \leq V_{IN}-V_{OUT} \leq 10.75V, I_{OUT} = 10mA$			0.2	%
		$(1.4V+V_{OUT}) \leq V_{IN} \leq 12V, I_{OUT} = 10mA$		5	15	mV
Load Regulation (Note 1 & 2)	GS1117A-Adj	$V_{IN}-V_{OUT}=3V, 10mA \leq I_{OUT} \leq 1A$			1.0	%
	GS1117A-XX	$V_{IN}-V_{OUT} = 1.4V, 0 \leq I_{OUT} \leq 1.0A$		6	15	mV
Dropout Voltage	All	$\Delta V_{out}, \Delta V_{ref} = 1\%, I_{OUT} = 100mA$		1.0	1.2	V
		$\Delta V_{out}, \Delta V_{ref} = 1\%, I_{OUT} = 500mA$		1.05	1.25	V
		$\Delta V_{out}, \Delta V_{ref} = 1\%, I_{OUT} = 1.0A$		1.1	1.3	V
Current Limit	All	$V_{IN} - V_{OUT} = 2.0V, T_J = 25^\circ C$	1	1.4		A
Ground Pin Current	GS1117A-XX	$V_{IN} = V_{OUT} + 1.5V$		4	8	mA
Minimum Load Current (Note 3)	GS1117A-Adj			5	10	mA
Adjust Pin Current	GS1117A-Adj			50	120	μA
Temperature Stability	All			0.5		%

Note 1: The Parameters of Line Regulation and Load Regulation in above are tested under the room temperature. The Curve of Load Regulation vs. Temperature is shown in the section of typical performance characteristics.

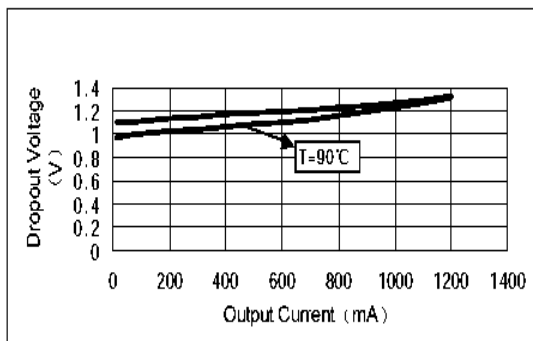
Note 2: The parameter can meet the specs when I_{OUT} varies from 0 to 1.0A, $V_{IN}-V_{OUT}$ varies from 1.4V to 12V at room temperature. It required the output current larger than 10mA to satisfy the criterion once the temperature varies between $-40^\circ C$ and $125^\circ C$.

Note 3: Minimum Load Current is specified for adjustment version and it is the required minimum load current for regulating output voltage within the spec.

Typical Performance Characteristics

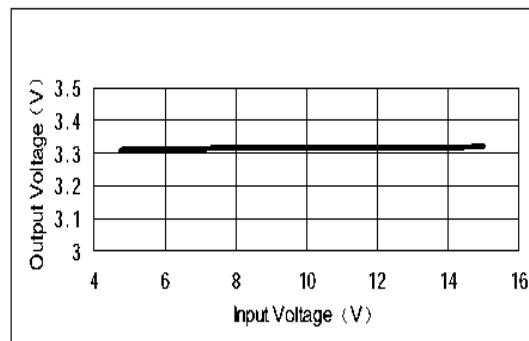
Dropout Voltage ($V_{IN}-V_{OUT}$)

$T_A=25^{\circ}\text{C}$ and 90°C



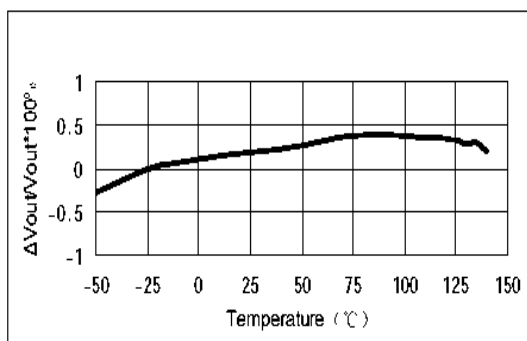
Line Regulation

$V_{OUT}=3.3\text{V}$, $I_{OUT}=10\text{mA}$



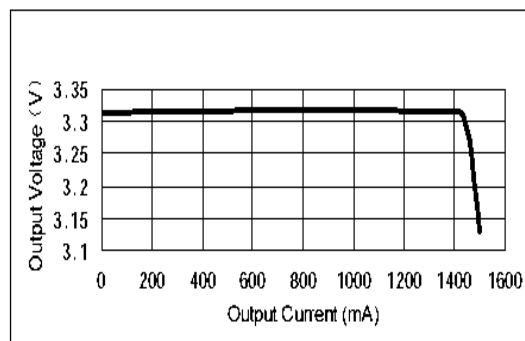
Load Regulation V.S Temperature

I_{OUT} from 10mA to 1A



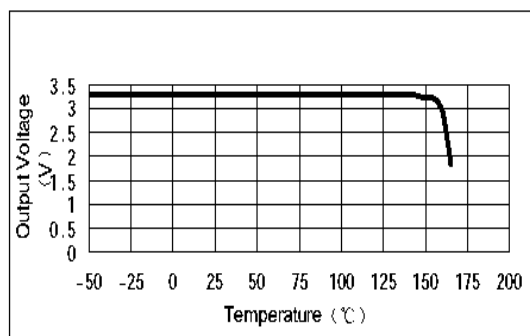
Load Regulation

$V_{OUT}=3.3\text{V}$, $I_{OUT}=10\text{mA}$

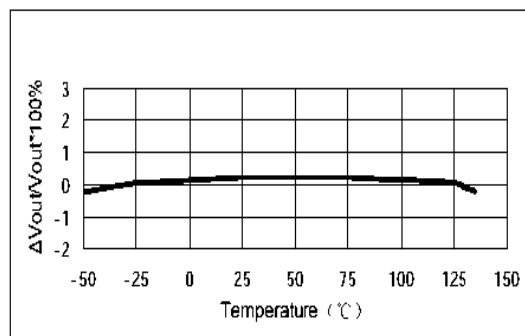


Output Voltage V.S Temperature

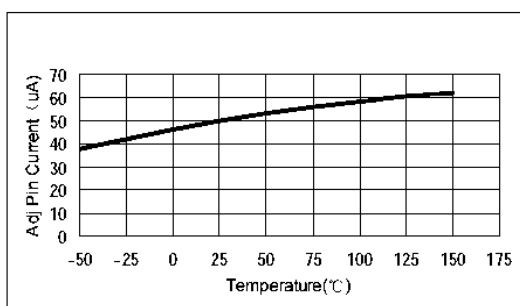
$V_{OUT}=3.3\text{V}$



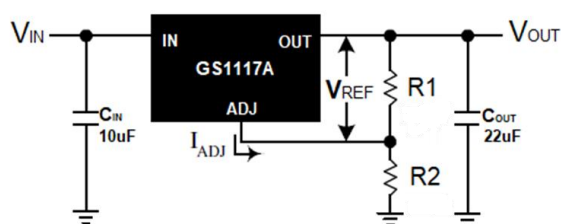
Temperature Stability



Adjust Pin Current



Typical Applications



$$V_{OUT} = V_{REF} (1 + R2/R1) + I_{ADJ} R2$$

Figure 1. Adjustable Voltage Regulator

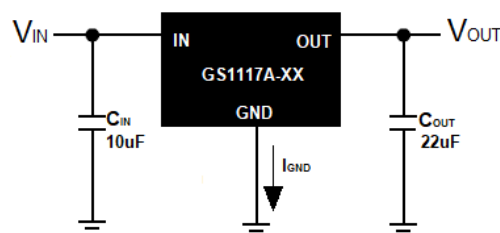


Figure 2. Fixed Voltage Regulator

GS1117A 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, current limit, power transistors and its driver circuit and so on.

The thermal shut down and current limit modules can assure chip and its application system working safety when the junction temperature is larger than 125°C or output current is larger than 1.4A typically.

The bandgap module provides stable reference voltage, whose temperature coefficient is compensated by careful design considerations. The accuracy of output voltage is guaranteed by trimming technique.

Application Hints

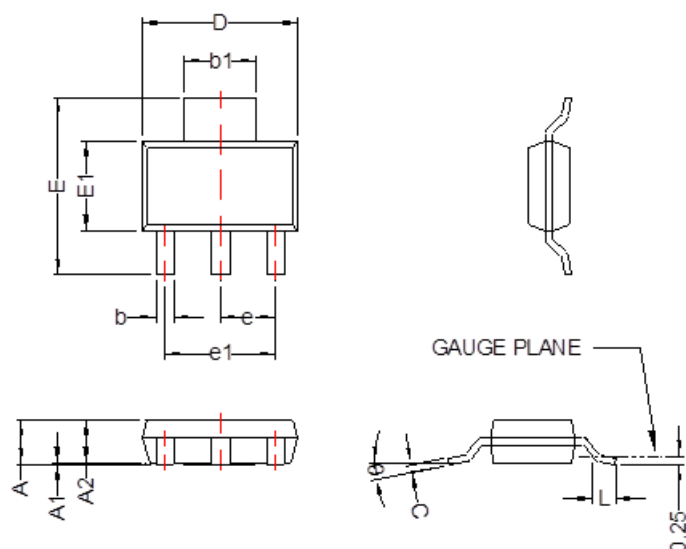
1. Recommend using 10μF tantalum capacitor for input capacitor C_{IN} for all of application circuits.
2. Recommend using 22μF tantalum capacitor for output capacitor C_{OUT} to assure circuit stability.
3. The adjust pin can be bypassed to ground with a bypass capacitor (C_{ADJ}) to improve ripple rejection. This bypass capacitor prevents ripple from being amplified as the output voltage is increased. At any ripple frequency, the impedance of the C_{ADJ} must be less than $R1$ to prevent the ripple from being amplified:

$$1 / (2\pi \times f_{RIPPLE} \times C_{ADJ}) < R1$$

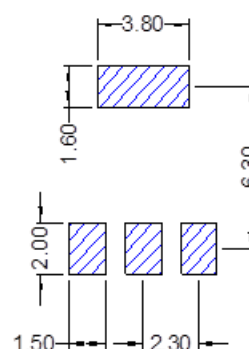
The $R1$ is the resistor between the output and the adjust pin. The value is normally in the range of 100 Ω to 200 Ω. For example, with $R1 = 124 \Omega$ and $f_{RIPPLE} = 120 \text{ Hz}$, the C_{ADJ} must be $> 11\mu\text{F}$.

SOT-223

Package Dimension



Recommended Land Pattern



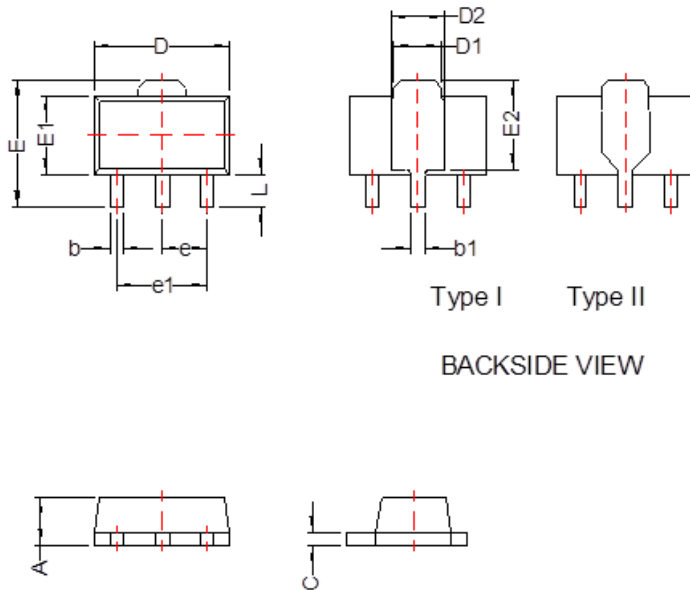
Dimensions

SYMBOL	Millimeters		Inches	
	MIN	MAX	MIN	MAX
A	1.50	1.80	0.059	0.071
A1	0.02	0.12	0.001	0.005
A2	1.45	1.75	0.057	0.069
b	0.60	0.84	0.024	0.033
b1	2.90	3.10	0.114	0.122
c	0.23	0.35	0.009	0.014
D	6.20	6.70	0.244	0.264
E	6.70	7.30	0.264	0.287
E1	3.30	3.70	0.130	0.146
e	2.30 BSC		0.091 BSC	
e1	4.60 BSC		0.181 BSC	
L	0.75	-	0.030	-
θ	0°	10°	0°	10°

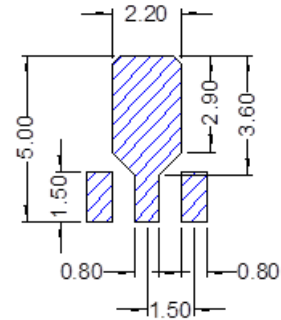
NOTE: Dimensions are exclusive of Burrs, Mold Flash & Tie Bar extrusions.

SOT-89

Package Dimension



Recommended Land Pattern



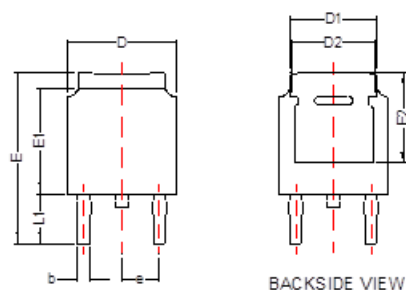
Dimensions

SYMBOL	Millimeters		Inches	
	MIN	MAX	MIN	MAX
A	1.40	1.60	0.055	0.063
b	0.30	0.55	0.012	0.022
b1	0.40	0.60	0.016	0.024
c	0.35	0.44	0.014	0.017
D	4.40	4.60	0.173	0.181
D1	1.40	1.83	0.055	0.072
D2	1.75 REF		0.069 REF	
E	3.94	4.25	0.155	0.167
E1	2.30	2.60	0.091	0.102
E2	2.84 REF		0.112 REF	
e	1.50 BSC		0.059 BSC	
e1	3.00 BSC		0.118 BSC	
L	0.89	1.20	0.035	0.047

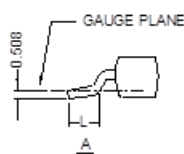
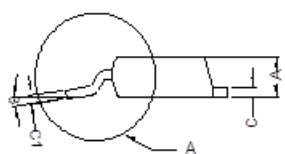
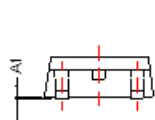
NOTE: Dimensions are exclusive of Burrs, Mold Flash & Tie Bar extrusions.

TO-252(A2)

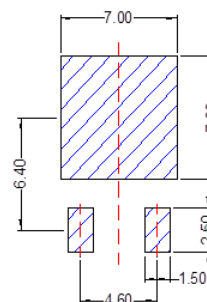
Package Dimension



BACKSIDE VIEW



Recommended Land Pattern







Dimensions				
SYMBOL	Millimeters		Inches	
	MIN	MAX	MIN	MAX
A	2.18	2.40	0.086	0.094
A1	0.00	0.15	0.000	0.006
b	0.64	0.90	0.025	0.035
b1	0.76	1.14	0.030	0.045
c	0.40	0.89	0.016	0.035
c1	0.40	0.61	0.016	0.024
D	6.35	6.73	0.250	0.265
D1	4.95	5.46	0.195	0.215
D2	4.32	-	0.170	-
E	9.40	10.41	0.370	0.410
E1	5.97	6.22	0.235	0.245
E2	4.95	-	0.195	-
e	2.286 BSC		0.090 BSC	
L	1.40	1.77	0.055	0.070
L1	2.67	3.07	0.105	0.121
L2	-	1.20	-	0.047
θ	0°	8°	0°	8°



NOTE: Dimensions are exclusive of Burrs, Mold Flash & Tie Bar extrusions.

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