

Datasheet

# FS1117

1.0A Adjustable & Fixed Voltage LDO Linear Regulator

FORTUNE,  
Properties  
For Reference Only

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### 1. General Description

The FS1117 is a series of low-dropout three-terminal regulators with a dropout of 1.4V at 1A output current.

The FS1117 series provides current limiting and thermal shutdown. Its circuit includes a trimmed bandgap reference to assure output voltage accuracy to be within  $\pm 2\%$  for 1.8V, 3.3V and adjustable versions. Current limit is trimmed to ensure specified output current and controlled short-circuit current. On-chip thermal shutdown provides protection against any combination of overload and ambient temperature that would create excessive junction temperature.

The FS1117 has an adjustable version that can provide the output voltage from 1.25V to 12V with only two external resistors.

The FS1117 series is available in the industry standard SOT223 power package.

### 2. Features

- 1.4V maximum dropout at full load current
- Fast transient response
- Output current limiting
- Built-in thermal shutdown
- Good noise rejection
- Low ESR Ceramic Capacitor(MICC) Required for Stability

### 3. Applications

- PC Motherboard
- LCD Monitor
- Graphic Card
- DVD-video player
- NIC/Switch
- Telecom Equipment
- ADSL Modem
- Printer and other Peripheral Equipment

### 4. Ordering Information

FS1117-xx x x

Package Pin Out  
 J : SOT-223 1.GND 2.OUT 3.IN  
 Note : For the adjustable voltage types, the GND pin is replaced with the ADJ pin

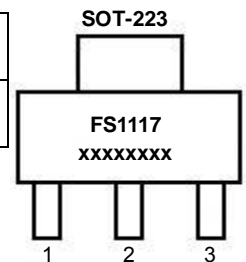
Package Type  
 G : G stands for Green-Package

Output Voltage  
 12 : 1.2V 18 : 1.8V  
 25 : 2.5V 33 : 3.3V  
 50 : 5.0  
 VR : Adjustable Output

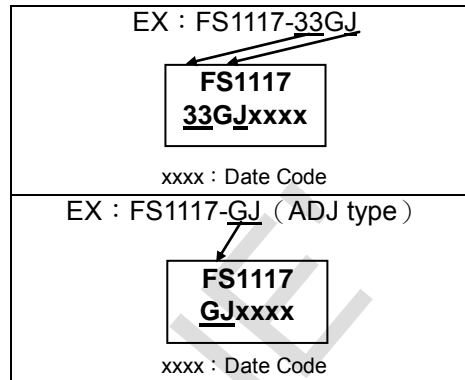
Note: The output voltages other than the preset values are available by order only.

### 5. Pin Configurations

Part No.	Pin 1	Pin 2	Pin 3
FS1117-xxGJ	GND/ADJ	OUT (TAP)	IN



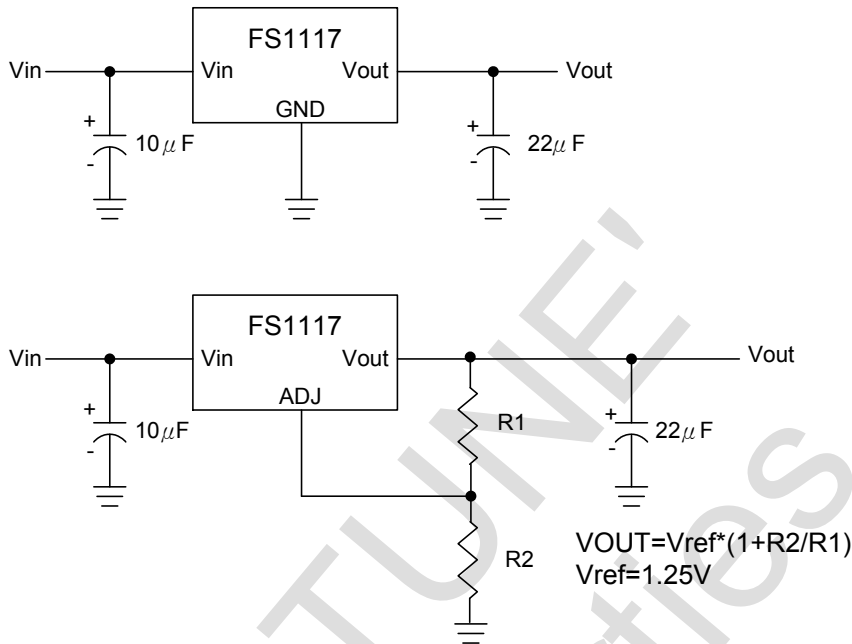
**6. Package Marking Information**



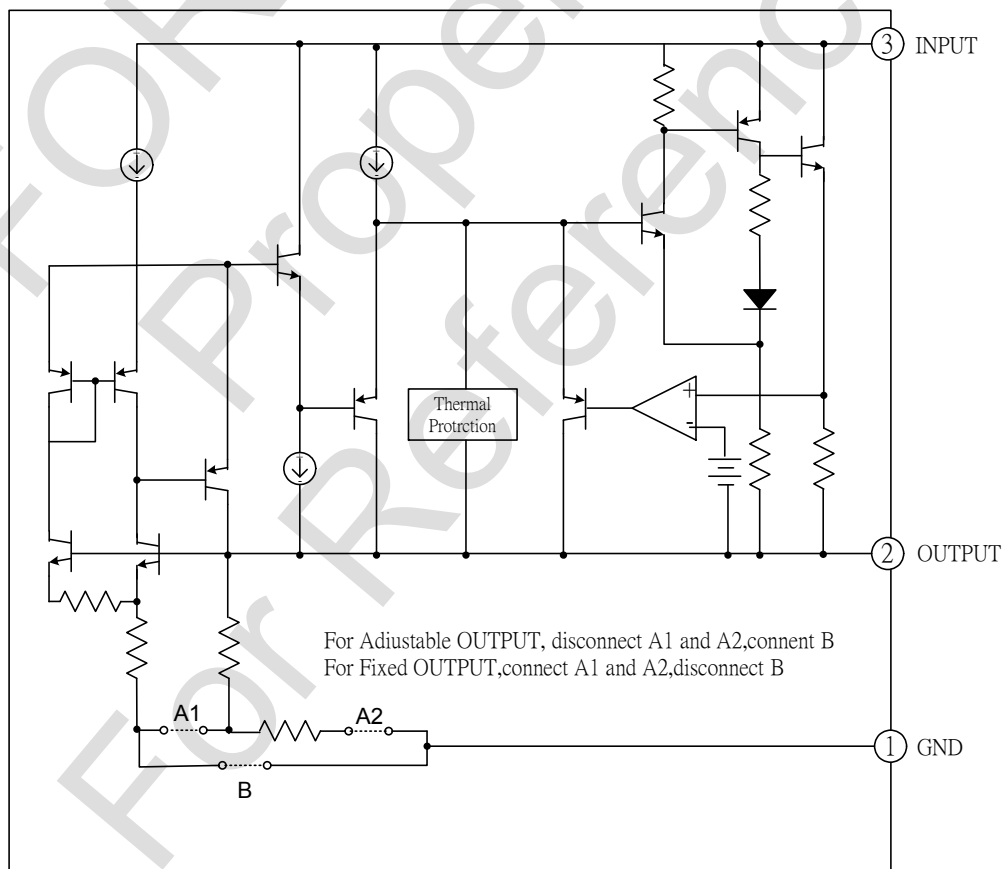
**7. Pin Description**

Part NO.	Symbol	Description
FS1117-xxGJ	GND/ADJ	Ground pin or adjust terminal pin.
	IN	Regulator input pin.
	OUT	Regulator output pin.

8. Typical Application Circuit



9. Functional Block Diagrams



### 10. Absolute Maximum Ratings

Symbol	Parameter	Rating	Unit
V <sub>IN</sub>	Input Voltage	23	V
T <sub>J</sub>	Maximum Junction Temperature	150	°C
T <sub>s</sub>	Storage Temperature	-65~150	°C
T <sub>LEAD</sub>	Lead Temperature(10SEC)	300	°C

\* Stresses greater than those listed under "Absolute Maximum Ratings" may cause Permanent damage to the device. These are stress rating only, and functional operation of the device at these or any other conditions beyond those indicated under "Recommended Operating Conditions" is not implied. Exposure to "Absolute Maximum Ratings" for extended periods may affect device reliability.

### 11. Recommended Operating Conditions

Symbol	Parameter	Rating	Unit
V <sub>IN</sub>	Input Voltage	18	V
T <sub>J</sub>	Operating Junction Temperature Range	-20~125	°C

### 12. Electrical Characteristics

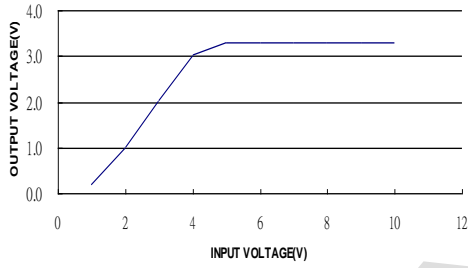
(C<sub>IN</sub>=10μF, C<sub>OUT</sub>=22μF, T<sub>A</sub>=25°C, unless otherwise noted.)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
V <sub>ref</sub>	Reference Voltage	FS1117-Adj I <sub>o</sub> =10mA, V <sub>IN</sub> -V <sub>out</sub> =1.5V	1.225	1.250	1.275	V
		I <sub>o</sub> =10mA, 1.5V ≤ V <sub>IN</sub> -V <sub>out</sub> ≤ 8V	1.225	1.250	1.275	V
V <sub>OUT</sub>	Output Voltage	FS1117-1.8V I <sub>o</sub> =10mA, 3.3V ≤ V <sub>IN</sub> ≤ 10V	1.764	1.8	1.836	V
		FS1117-3.3V I <sub>o</sub> =10mA, 4.8V ≤ V <sub>IN</sub> ≤ 10V	3.235	3.3	3.365	V
I <sub>LIMIT</sub>	Current Limit	FS1117-XXX V <sub>IN</sub> -V <sub>OUT</sub> =3V	1.1			A
I <sub>Q</sub>	Ground Pin Current	FS1117-XXX V <sub>IN</sub> =V <sub>OUT</sub> +1.25V		5	10	mA
I <sub>ADJ</sub>	ADJ Pin Current	FS1117-Ad I <sub>o</sub> =10mA~1A, 1.5V ≤ V <sub>IN</sub> -V <sub>OUT</sub> ≤ 10V		60	120	μA
V <sub>DROP</sub>	Dropout Voltage	FS1117-XXX I <sub>OUT</sub> =1A, ΔV <sub>OUT</sub> =1%V <sub>OUT</sub>		1.4	1.5	V
ΔV <sub>LINE</sub>	Line Regulation	FS1117-XXX I <sub>OUT</sub> =10mA, 1.5V ≤ V <sub>IN</sub> -V <sub>OUT</sub> ≤ 10V		0.1	0.5	%
ΔV <sub>LOAD</sub>	Load Regulation	FS1117-1.8V V <sub>IN</sub> =3.3V, 10mA < I <sub>o</sub> < 1A		15	18	mV
		FS1117-3.3V V <sub>IN</sub> =5V, 10mA < I <sub>o</sub> < 1A		26	33	mV
e <sub>N</sub>	Output Noise	FS1117-XXX F=10Hz to 10KHz,		0.003		%
PSRR	Ripple Rejection	FS1117-XXX F=120Hz, C <sub>OUT</sub> =25μF Tantalum, V <sub>IN</sub> -V <sub>OUT</sub> =3V		60		dB
TSD	Thermal Shutdown Temperature	FS1117-XXX Junction Temperature		150		°C
THYS	Thermal Shutdown Hysteresis	FS1117-XXX		25		°C
θ <sub>JA</sub>	Thermal Resistance ( No heat-sink, No air flow)	FS1117-XXX SOT-223		117		°C/W

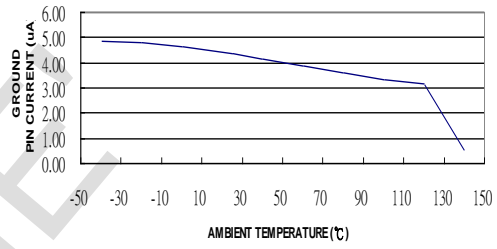
### 13. Typical Operating Characteristics

(FS1117-3.3V CIN=10μF, COU=22μF, TA=+25°C, unless otherwise noted.)

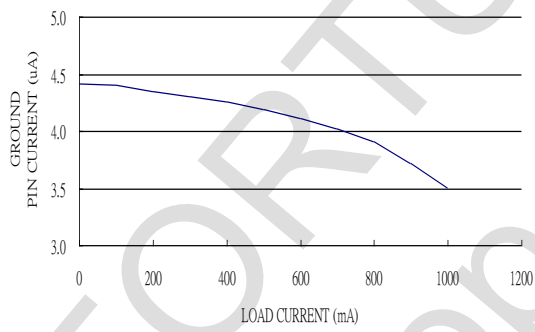
OUTPUT VOLTAGE vs. INPUT VOLTAGE



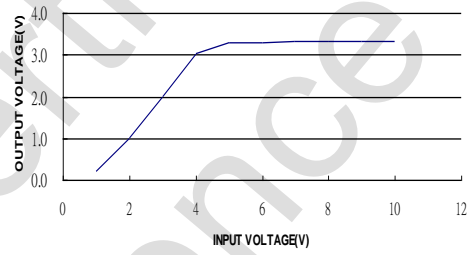
GROUND PIN CURRENT vs. AMBIENT TEMPERATURE



GROUND PIN CURRENT vs. LOAD CURRENT



OUTPUT VOLTAGE vs. INPUT VOLTAGE



## 14. Application Description

The FS1117 keeps a constant 1.25V between the output pin and the adjust pin. By placing a resistor R1 across these two pins a constant current flows through R1, assign to the  $I_{adj}$  current and into the R2 resistor producing a voltage equal to the  $(1.25/R1)*R2+I_{adj}*R2$  which will be added to the 1.25V to set the output voltage. This is summarized in the above equation. Since the minimum load current requirement of the FS1117 is 10mA, R1 is typically selected to be 121Ω resistor so that it automatically satisfies the minimum current requirement. Notice that since  $I_{adj}$  is typically in the range and should only be considered when a very precise output voltage setting is required. For example, in a typical 3.3V application where  $R1=121\Omega$  and  $R2=220\Omega$  the error due to  $I_{adj}$  is only 0.3% of the nominal set point.

### Stability

The FS1117 requires the use of an output capacitor as part of the frequency compensation in order to make the regulator stable. For most applications a minimum of 10μ F aluminum electrolytic capacitor insures both stability and good transient response.

### Thermal Design

The FS1117 incorporates an internal thermal shutdown that protects the device when the junction temperature exceeds the maximum allowable junction temperature. Although this device can operate with junction temperatures in the range of 150°C, it is recommended that the selected heat sink be chosen such that during maximum continuous load operation the junction temperature is kept below the temperature.

$$P_d = V_{OUT} \times I_{OUT}$$

$$T_J = T_A + P_d \times \theta_{JA} < 150^\circ\text{C}$$

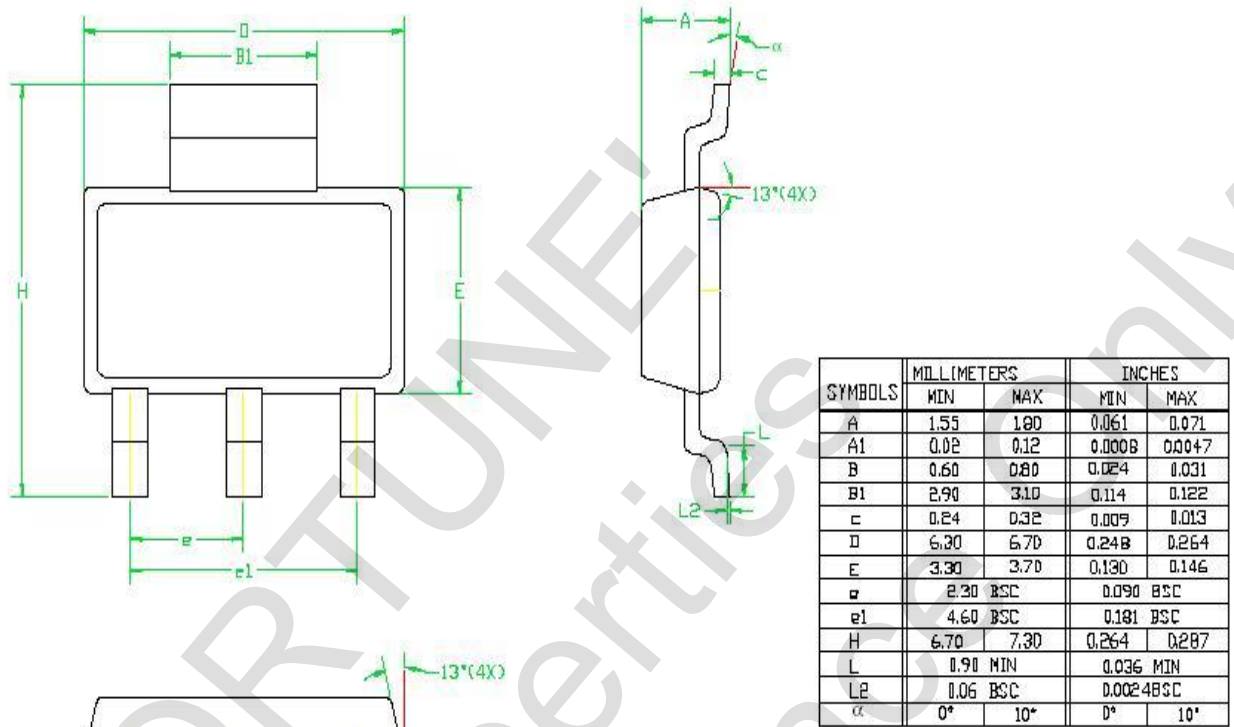
### Layout Consideration

The output capacitors must be located as close to the VOUT terminal of the device as possible. It is recommended to use a section of a layer of the PC board as a plane to connect the VOUT pin to the output capacitors that may result due to excessive trace inductance.



15. Package Outline

SOT-223



16. Revision History

Version	Date	Page	Description
1.0	2009/06/24	ALL	New release
1.1	2010/09/20	6	Add Vref Test Conditions : $I_o=10mA$ , $V_{IN}-V_{out}=1.5V$
1.2	2010/10/20	6	Revise Vref Test Conditions : $I_o=10mA$ , $1.5V \leq V_{IN}-V_{out} \leq 8V$
1.3	2011/01/31	3	Add Output 1.2V, 2.5, 5.0V