

# 1A LOW DROPOUT LINEAR REGULATOR

## GENERAL DESCRIPTION

The 1117 is a series of low dropout three-terminal regulators with a dropout of 1.15V at 1A output current.

The 1117 series provides current limiting and thermal shutdown. Its circuit includes a trimmed bandgap reference to assure output voltage accuracy to be within 1%. 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 1117 has an adjustable version, that can provide the output voltage from 1.25V to 5V with only 2 external resistors.

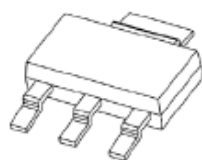
The 1117 series is available in the industry standard SOT-223,SOT-89,TO-220,TO-252 and TO-263 power packages.

## FEATURES

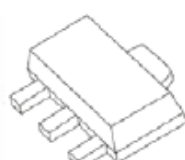
- Low Dropout Voltage: 1.15V at 1A Output Current
- Trimmed Current Limit
- On-Chip Thermal Shutdown
- Three-Terminal Adjustable or Fixed 1.5V, 1.8V, 2.5V, 3.3V, 5V
- Operation junction Temperature: 0 °C to 125°C

## APPLICATIONS

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



SOT-223



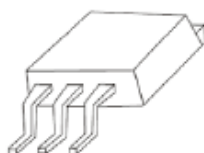
SOT-89-3L



TO-220



TO-252



TO-263



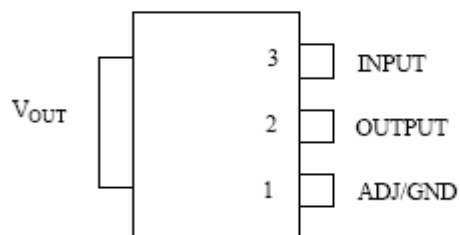
TO-251

Figure 1. Package Types of CJ1117

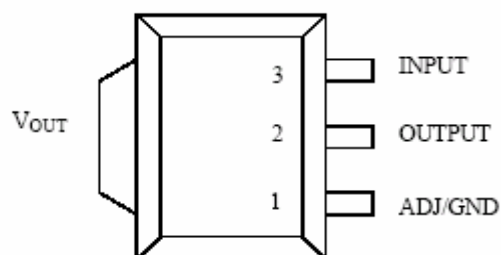
## 1A LOW DROPOUT LINEAR REGULATOR

### PIN CONFIGURATIONS

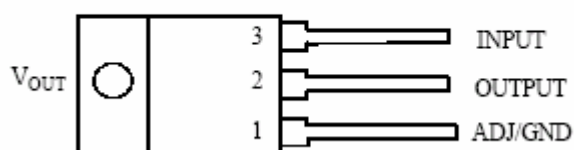
T Package  
(SOT-223)



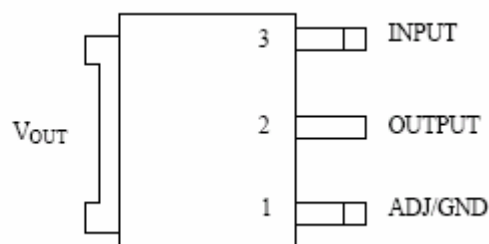
A Package  
(SOT-89)



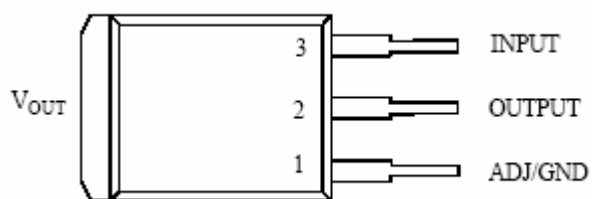
P Package  
(TO-220)



U Package  
(TO-252)



B Package  
(TO-263)



D Package  
(TO-251)

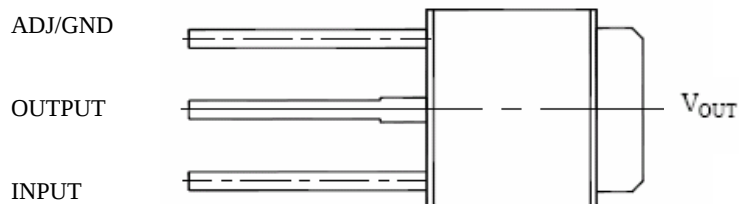


Figure 2. Pin Configurations of 1117

## 1A LOW DROPOUT LINEAR REGULATOR

### FUNCTIONAL BLOCK DIAGRAM

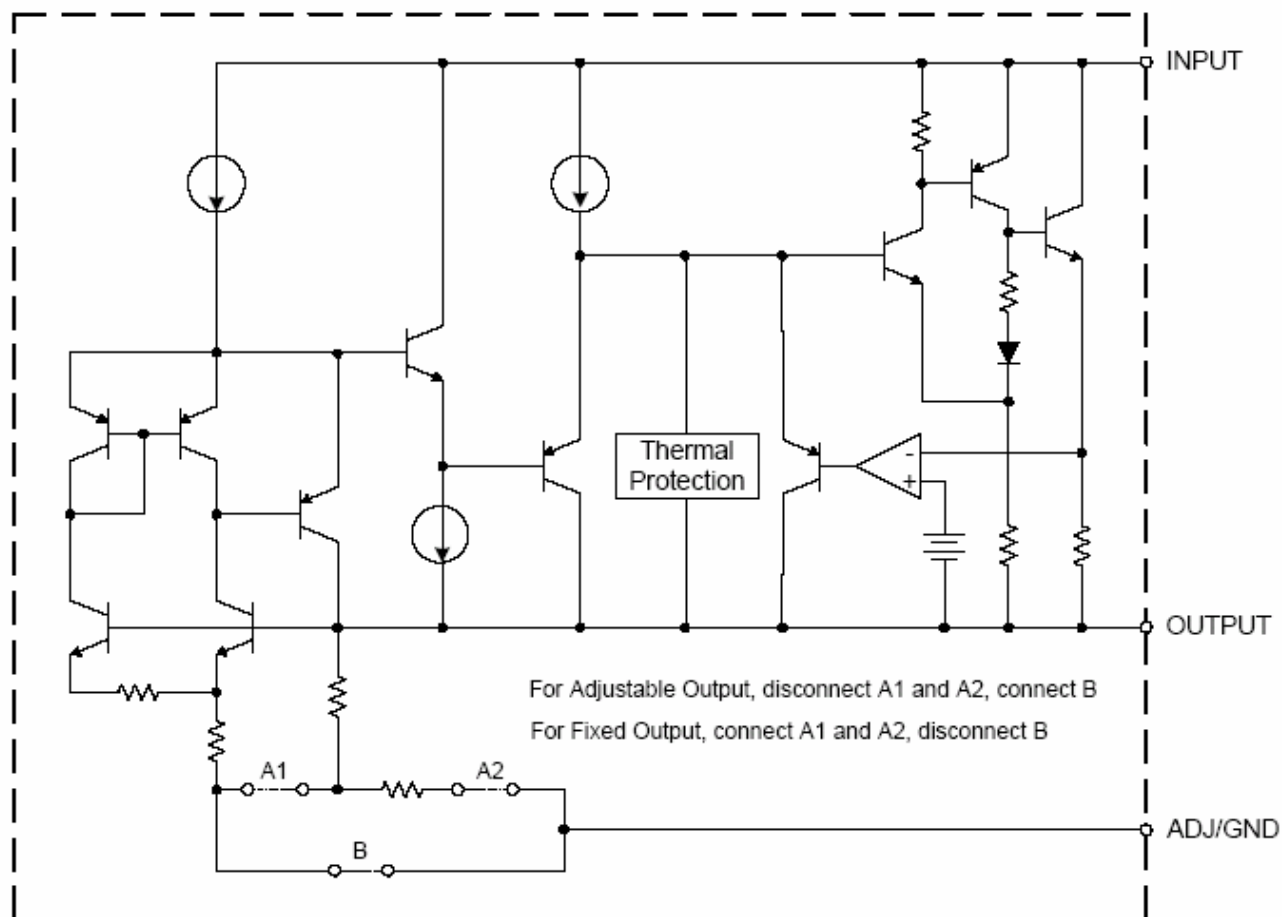


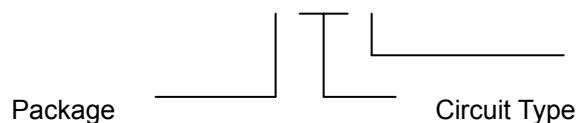
Figure 3. Functional Block Diagram of 1117

# 1A LOW DROPOUT LINEAR REGULATOR

## ORDERING INFORMATION

| Package | Operating Junction Temperature Range | Part Number |
|---------|--------------------------------------|-------------|
| SOT-223 | 0 to 125°C                           | T1117-ADJ   |
|         |                                      | T1117-1.5   |
|         |                                      | T1117-1.8   |
|         |                                      | T1117-2.5   |
|         |                                      | T1117-3.3   |
|         |                                      | T1117-5.0   |
| SOT-89  | 0 to 125°C                           | A1117-ADJ   |
|         |                                      | A1117-1.5   |
|         |                                      | A1117-1.8   |
|         |                                      | A1117-2.5   |
|         |                                      | A1117-3.3   |
|         |                                      | A1117-5.0   |
| TO-220  | 0 to 125°C                           | P1117-ADJ   |
|         |                                      | P1117-1.5   |
|         |                                      | P1117-1.8   |
|         |                                      | P1117-2.5   |
|         |                                      | P1117-3.3   |
|         |                                      | P1117-5.0   |
| TO-252  | 0 to 125°C                           | U1117-ADJ   |
|         |                                      | U1117-1.5   |
|         |                                      | U1117-1.8   |
|         |                                      | U1117-2.5   |
|         |                                      | U1117-3.3   |
|         |                                      | U1117-5.0   |
| TO-263  | 0 to 125°C                           | B1117-ADJ   |
|         |                                      | B1117-1.5   |
|         |                                      | B1117-1.8   |
|         |                                      | B1117-2.5   |
|         |                                      | B1117-3.3   |
|         |                                      | B1117-5.0   |
| TO-251  | 0 to 125°C                           | D1117-ADJ   |
|         |                                      | D1117-1.5   |
|         |                                      | D1117-1.8   |
|         |                                      | D1117-2.5   |
|         |                                      | D1117-3.3   |
|         |                                      | D1117-5.0   |

X 1117-Z



Package

T: SOT-223 U: TO-252

A: SOT-89 B: TO-263

P: TO-220 D: TO-251

ADJ: Adjustable Output

1.5: Fixed Output 1.5V

1.8: Fixed Output 1.8V

2.5: Fixed Output 2.5V

3.3: Fixed Output 3.3V

5.0: Fixed Output 5.0V

## **1A LOW DROPOUT LINEAR REGULATOR**

### **ABSOLUTE MAXIMUM RATINGS (NOTE 1)**

| Parameter                            | Value      | Unit |
|--------------------------------------|------------|------|
| $V_{IN}$                             | 20         | V    |
| Maximum Junction Temperature         | 150        | °C   |
| Storage Temperature Range            | -65 to 150 | °C   |
| Lead Temperature (Soldering, 10sec.) | 300        | °C   |
| ESD (Machine Model)                  | 600        | V    |

Note 1: Stresses greater than those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional 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.

### **RECOMMENDED OPERATING CONDITIONS**

| Parameter                            | Min | Max | Unit |
|--------------------------------------|-----|-----|------|
| $V_{IN}$                             |     | 15  | V    |
| Operating Junction Temperature Range | 0   | 125 | °C   |

# 1A LOW DROPOUT LINEAR REGULATOR

## ELECTRICAL CHARACTERISTICS

Operating Conditions:  $V_{IN} \leq 10V$ ,  $T_J = 25^\circ C$  unless otherwise specified.

| Parameter         | Conditions                                                                                                                                                          | Min            | Typ            | Max            | Unit |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|----------------|----------------|------|
| Reference Voltage | 1117-ADJ $I_{OUT} = 10mA$ , $V_{IN} - V_{OUT} = 2V$ ,<br>$10mA \leq I_{OUT} \leq 1A$ , $1.4V \leq V_{IN} - V_{OUT} \leq 8V$ ,<br>$P \leq$ Maximum power Dissipation | 1.238<br>1.225 | 1.250<br>1.250 | 1.262<br>1.270 | V    |
| Output Voltage    | 1117-1.5, $I_{OUT} = 10mA$ , $V_{IN} = 3.5V$<br>$10mA \leq I_{OUT} \leq 1A$ , $3.0V \leq V_{IN} \leq 10V$                                                           | 1.485<br>1.470 | 1.5<br>1.5     | 1.515<br>1.530 | V    |
|                   | 1117-1.8, $I_{OUT} = 10mA$ , $V_{IN} = 3.8V$<br>$10mA \leq I_{OUT} \leq 1A$ , $3.2V \leq V_{IN} \leq 10V$                                                           | 1.782<br>1.746 | 1.8<br>1.8     | 1.818<br>1.854 | V    |
|                   | 1117-2.5, $I_{OUT} = 10mA$ , $V_{IN} = 4.5V$<br>$10mA \leq I_{OUT} \leq 1A$ , $3.9V \leq V_{IN} \leq 10V$                                                           | 2.475<br>2.450 | 2.5<br>2.5     | 2.525<br>2.550 | V    |
|                   | 1117-3.3, $I_{OUT} = 10mA$ , $V_{IN} = 5.0V$<br>$10mA \leq I_{OUT} \leq 1A$ , $4.75V \leq V_{IN} \leq 10V$                                                          | 3.267<br>3.235 | 3.3<br>3.3     | 3.333<br>3.365 | V    |
|                   | 1117-5.0, $I_{OUT} = 10mA$ , $V_{IN} = 7.0V$<br>$10mA \leq I_{OUT} \leq 1A$ , $6.5V \leq V_{IN} \leq 12V$                                                           | 4.950<br>4.900 | 5.0<br>5.0     | 5.050<br>5.100 | V    |
| Line Regulation   | 1117-ADJ<br>$I_{OUT} = 10mA$ , $1.5V \leq V_{IN} - V_{OUT} \leq 10V$                                                                                                |                | 0.035          | 0.2            | %    |
|                   | 1117-1.5<br>$I_{OUT} = 10mA$ , $1.5V \leq V_{IN} - V_{OUT} \leq 10V$                                                                                                |                | 1              | 6              | mV   |
|                   | 1117-1.8<br>$I_{OUT} = 10mA$ , $1.5V \leq V_{IN} - V_{OUT} \leq 10V$                                                                                                |                | 1              | 6              | mV   |
|                   | 1117-2.5<br>$I_{OUT} = 10mA$ , $1.5V \leq V_{IN} - V_{OUT} \leq 10V$                                                                                                |                | 1              | 6              | mV   |
|                   | 1117-3.3<br>$I_{OUT} = 10mA$ , $1.5V \leq V_{IN} - V_{OUT} \leq 10V$                                                                                                |                | 1              | 6              | mV   |
|                   | 1117-5.0<br>$I_{OUT} = 10mA$ , $1.5V \leq V_{IN} - V_{OUT} \leq 10V$                                                                                                |                | 1              | 10             | mV   |
| Load Regulation   | 1117-ADJ<br>$V_{IN} - V_{OUT} = 2V$ , $10mA \leq I_{OUT} \leq 1A$                                                                                                   |                | 0.2            | 0.4            | %    |
|                   | 1117-1.5<br>$V_{IN} - V_{OUT} = 2V$ , $10mA \leq I_{OUT} \leq 1A$                                                                                                   |                | 1              | 10             | mV   |
|                   | 1117-1.8<br>$V_{IN} - V_{OUT} = 2V$ , $10mA \leq I_{OUT} \leq 1A$                                                                                                   |                | 1              | 10             | mV   |
|                   | 1117-2.5<br>$V_{IN} - V_{OUT} = 2V$ , $10mA \leq I_{OUT} \leq 1A$                                                                                                   |                | 1              | 10             | mV   |
|                   | 1117-3.3<br>$V_{IN} - V_{OUT} = 2V$ , $10mA \leq I_{OUT} \leq 1A$                                                                                                   |                | 1              | 10             | mV   |
|                   | 1117-5.0<br>$V_{IN} - V_{OUT} = 2V$ , $10mA \leq I_{OUT} \leq 1A$                                                                                                   |                | 1              | 15             | mV   |

## 1A LOW DROPOUT LINEAR REGULATOR

### ELECTRICAL CHARACTERISTICS (CONTINUED)

Operating Conditions:  $V_{IN} \leq 10V$ ,  $T_J = 25^\circ C$  unless otherwise specified.

| Parameter                                 | Conditions                                                                              | Min  | Typ                        | Max  | Unit         |
|-------------------------------------------|-----------------------------------------------------------------------------------------|------|----------------------------|------|--------------|
| Dropout Voltage                           | $\Delta V_{REF} = 1\%$ , $I_{OUT} = 0.1A$                                               |      | 1.00                       | 1.1  | V            |
|                                           | $\Delta V_{REF} = 1\%$ , $I_{OUT} = 0.5A$                                               |      | 1.08                       | 1.18 | V            |
|                                           | $\Delta V_{REF} = 1\%$ , $I_{OUT} = 1.0A$                                               |      | 1.15                       | 1.25 | V            |
| Current Limit                             | $V_{IN} - V_{OUT} = 2V$                                                                 | 1.25 | 1.35                       |      | A            |
| Adjust Pin Current                        |                                                                                         |      | 60                         | 120  | $\mu A$      |
| Adjust Pin Current Change                 | $1.4V \leq V_{IN} - V_{OUT} \leq 10V$ , $10mA \leq I_{OUT} \leq 1A$                     |      | 0.2                        | 5    | $\mu A$      |
| Minimum Load Current (ADJ)                | $1.5V \leq V_{IN} - V_{OUT} \leq 10V$ (ADJ only)                                        |      | 1.7                        | 5    | mA           |
| Quiescent Current                         | $V_{IN} = V_{OUT} + 1.25V$                                                              |      | 5                          | 10   | mA           |
| Ripple Rejection                          | $f = 120Hz$ , $C_{OUT} = 22\mu F$ Tantalum,<br>$V_{IN} - V_{OUT} = 3V$ , $I_{OUT} = 1A$ | 60   | 75                         |      | dB           |
| Temperature Stability                     |                                                                                         |      | 0.5                        |      | %            |
| Long-Term Stability                       | $T_A = 125^\circ C$ , 1000hrs                                                           |      | 0.3                        |      | %            |
| RMS Output Noise<br>(% of $V_{OUT}$ )     | $T_A = 25^\circ C$ , $10Hz \leq f \leq 10KHz$                                           |      | 0.003                      |      | %            |
| Thermal Resistance,<br>Junction to Case * | SOT-89<br>SOT-223<br>TO-252/251<br>TO-220<br>TO-263                                     |      | 25<br>15<br>10<br>4.5<br>4 |      | $^\circ C/W$ |
| Thermal Shutdown                          | Junction Temperature                                                                    |      | 150                        |      | $^\circ C$   |
| Thermal Shutdown Hysteresis               |                                                                                         |      | 25                         |      | $^\circ C$   |

\* With package soldering to copper area over backside ground plane or internal power plane  $R_{\theta JA}$  can vary from  $46^\circ C/W$  to  $>90^\circ C/W$  depending on mounting technique and the size of the copper area.