



DESCRIPTION

A1116 is a series of low dropout three-terminal regulators with a typical dropout of 1.3V at 800mA.

Besides fixed voltage version ($V_{OUT} = 1.2V, 1.5, 1.8V, 2.5V, 3.3V, 5V, 12V$), A1116 has an adjustable version that can provide an output voltage from 1.25 to 12V with two external resistors.

A1116 offers thermal shut down functions to assure stability of chip and power system. Trimming technique is used to guarantee output voltage accuracy within 2%.

The A1116 is available in SOT89-3 package.

FEATURES

- Maximum output current is 800mA
- Range of operation input voltage: Max 18V
- Line regulation: 0.1%/V (typ.)
- Load regulation: 10mV (typ.)
- Environment Temperature: $-40^{\circ}C \sim 85^{\circ}C$
- Available in SOT89-3 package

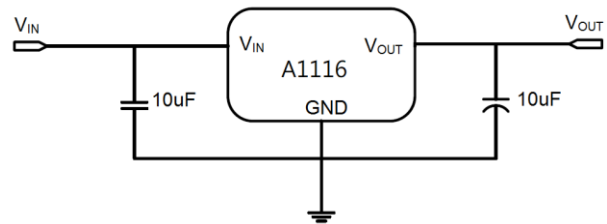
APPLICATION

- DVB
- Computer Mother Board, Graphic Card
- LCD Monitor and LCD TV
- DVD Decode Board
- ADSL Modem
- Post Regulators for Switching Supplies

ORDERING INFORMATION

| Package Type | Part Number | |
|--------------------------------|--|--------------|
| SOT89-3 SPQ: 1,000pcs/Reel | K3 | A1116K3R-XX |
| | | A1116K3VR-XX |
| Note | XX: Output Voltage, 12=1.2V, 18=1.8V, ADJ: Adjustable V: Halogen free Package R: Tape & Reel | |
| AiT provides all RoHS products | | |

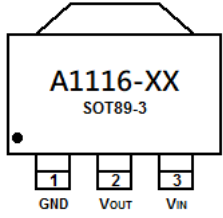
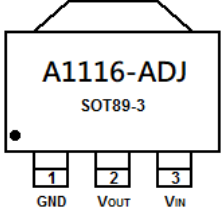
TYPICAL APPLICATION



Application circuit of A1116 fixed version



PIN DESCRIPTION

|  <p>A1116-XX SOT89-3</p> <p>1 2 3 GND VOUT VIN</p> <p>Top View</p> |  <p>A1116-ADJ SOT89-3</p> <p>1 2 3 GND VOUT VIN</p> <p>Top View</p> | |
|---|--|------------------|
| Pin # | A1116-XX | A1116-ADJ |
| 1 | GND | ADJ |
| 2 | V _{OUT} | V _{OUT} |
| 3 | V _{IN} | V _{IN} |

ABSOLUTE MAXIMUM RATINGS

| | |
|---|---------------|
| Max Input Voltage | 18V |
| T _J , Max Operating Junction Temperature | 150°C |
| T _A , Ambient Temperature | -40°C ~ 85°C |
| Power Dissipation SOT89-3 | 500mW |
| T _S , Storage Temperature | -40°C ~ 150°C |
| Lead Temperature & Time | 260°C, 10s |

Stress beyond above listed "Absolute Maximum Ratings" may lead permanent damage to the device. These are stress ratings only and operations of the device at these or any other conditions beyond those indicated in the operational sections of the specifications are not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

RECOMMENDED WORKING CONDITIONS

| Parameter | Symbol | Value | Units |
|--------------------------------|----------------|----------|-------|
| Input Voltage Range | | Max. 16 | V |
| Operating Junction Temperature | T _J | -40 ~ 85 | °C |



ELECTRICAL CHARACTERISTICS

T_J = 25°C

| Parameter | Symbol | Conditions | | Min. | Typ. | Max. | Unit |
|-------------------------|---------------------|--|-------|-------|------|-------|------|
| Reference Voltage | V _{REF} | 10mA ≤ I _{OUT} ≤ 800mA, V _{IN} = 3.25V | ADJ | 1.225 | 1.25 | 1.275 | V |
| Output Voltage | V _{OUT} | 0 ≤ I _{OUT} ≤ 800mA, V _{IN} = 3.2V | 1.2V | 1.176 | 1.2 | 1.224 | V |
| | | 0 ≤ I _{OUT} ≤ 800mA, V _{IN} = 3.8V | 1.8V | 1.764 | 1.8 | 1.836 | |
| | | 0 ≤ I _{OUT} ≤ 800mA, V _{IN} = 4.5V | 2.5V | 2.45 | 2.5 | 2.55 | |
| | | 0 ≤ I _{OUT} ≤ 800mA, V _{IN} = 5.3V | 3.3V | 3.234 | 3.3 | 3.366 | |
| | | 0 ≤ I _{OUT} ≤ 800mA, V _{IN} = 7.0V | 5.0V | 4.9 | 5 | 5.1 | |
| | | 0 ≤ I _{OUT} ≤ 800mA, V _{IN} = 14V | 12.0V | 11.76 | 12 | 12.24 | |
| Line Regulation | ΔV _{OUT} | I _{OUT} = 10mA, 2.75V ≤ V _{IN} ≤ 15V | ADJ | - | 0.1 | 0.2 | %V |
| | | I _{OUT} = 10mA, 2.7V ≤ V _{IN} ≤ 15V | 1.2V | | | | |
| | | I _{OUT} = 10mA, 3.3V ≤ V _{IN} ≤ 15V | 1.8V | | | | |
| | | I _{OUT} = 10mA, 4.0V ≤ V _{IN} ≤ 15V | 2.5V | | | | |
| | | I _{OUT} = 10mA, 4.8V ≤ V _{IN} ≤ 15V | 3.3V | | | | |
| | | I _{OUT} = 10mA, 6.5V ≤ V _{IN} ≤ 15V | 5.0V | | | | |
| | | I _{OUT} = 10mA, 13.5V ≤ V _{IN} ≤ 18V | 12.0V | | | | |
| Load Regulation | ΔV _{OUT} | V _{IN} = 2.75V, 10mA ≤ I _{OUT} ≤ 800mA | ADJ | - | 10 | 30 | mV |
| | | V _{IN} = 2.7V, 10mA ≤ I _{OUT} ≤ 800mA | 1.2V | | | | |
| | | V _{IN} = 3.3V, 10mA ≤ I _{OUT} ≤ 800mA | 1.8V | | | | |
| | | V _{IN} = 4.0V, 10mA ≤ I _{OUT} ≤ 800mA | 2.5V | | | | |
| | | V _{IN} = 4.8V, 10mA ≤ I _{OUT} ≤ 800mA | 3.3V | | | | |
| | | V _{IN} = 6.5V, 10mA ≤ I _{OUT} ≤ 800mA | 5.0V | | | | |
| | | V _{IN} = 13.5V, 10mA ≤ I _{OUT} ≤ 800mA | 12.0V | | | | |
| Dropout Voltage | V _{DROP} | I _{OUT} = 100mA | | - | 1.23 | 1.3 | V |
| | | I _{OUT} = 800mA | | - | 1.3 | 1.5 | |
| Current Limit | I _{limit} | V _{IN} - V _{OUT} = 2V, T _J = 25°C | | 800 | - | - | mA |
| Minimum Load Current | I _{min} | | ADJ | - | 2 | 10 | mA |
| Quiescent Current | I _Q | V _{IN} = 10V | 1.2V | - | 2 | 5 | mA |
| | | V _{IN} = 12V | 1.8V | | | | |
| | | V _{IN} = 12V | 2.5V | | | | |
| | | V _{IN} = 12V | 3.3V | | | | |
| | | V _{IN} = 12V | 5.0V | | | | |
| | | V _{IN} = 18V | 12.0V | | | | |
| Adjust Pin Current | I _{ADJ} | V _{IN} = 5V, 10mA ≤ I _{OUT} ≤ 800mA | ADJ | - | 55 | 120 | μA |
| I _{ADJ} change | I _{CHANGE} | V _{IN} = 5V, 10mA ≤ I _{OUT} ≤ 800mA | ADJ | - | 0.2 | 10 | μA |
| Temperature Coefficient | ΔV/ΔT | | | - | ±100 | - | ppm |
| Thermal Resistor | θ _{JC} | SOT89-3 | | - | 70 | - | °C/W |

NOTE1: All test are conducted under ambient temperature 25°C and within a short period of time 20ms

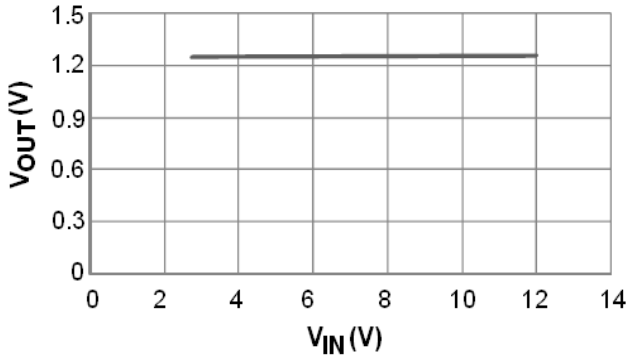
NOTE2: Load current smaller than minimum load current of A1116-ADJ will lead to unstable or oscillation output.



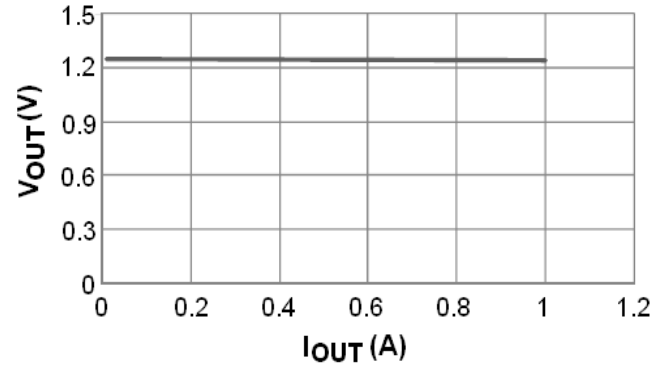
TYPICAL PERFORMANCE CHARACTERISTICS

T=25°C, unless specified.

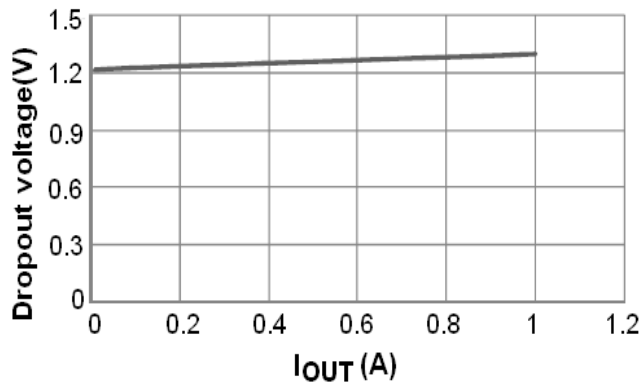
1. Line Regulation
A1116-ADJ V_{OUT} Vs. V_{IN}



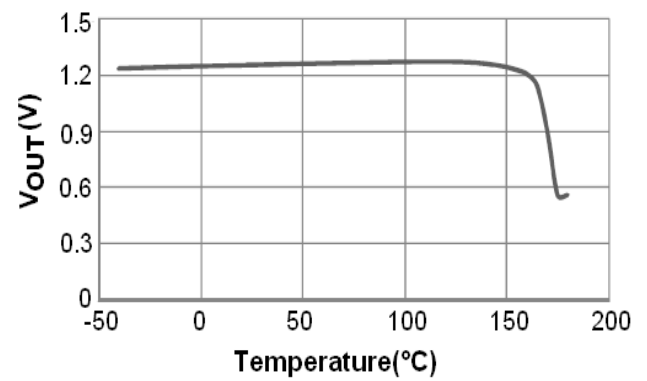
2. Load Regulation
A1116-ADJ V_{OUT} Vs. I_{OUT}



3. Dropout Voltage
A1116-ADJ Dropout Vs. I_{OUT}

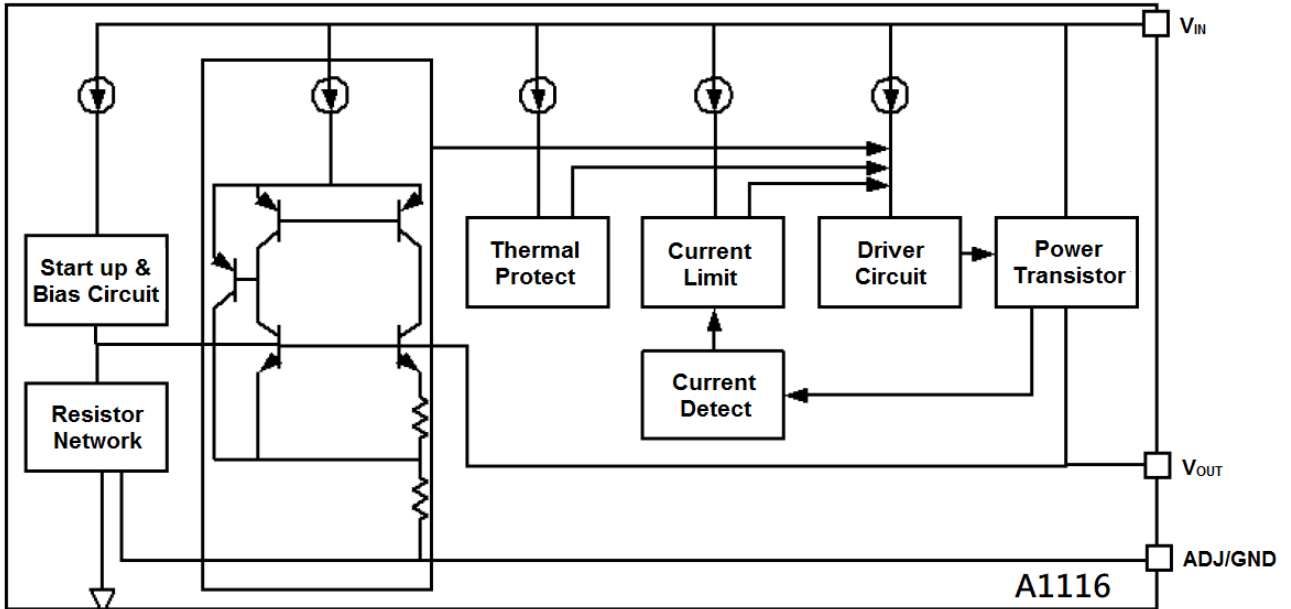


4. Thermal performance with OTP
A1116-ADJ V_{OUT} Vs. Temp





BLOCK DIAGRAM





DETAILED DESCRIPTION

A1116 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.

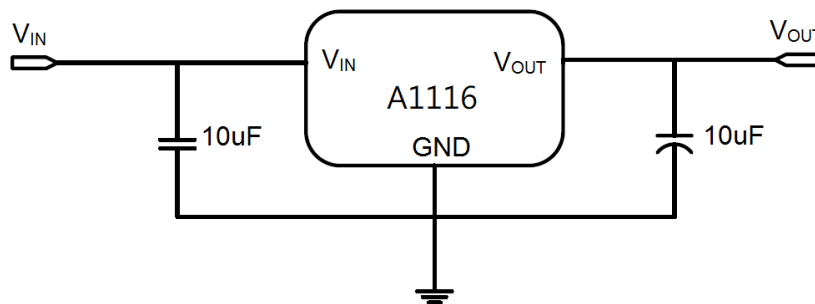
The thermal shut down modules can assure chip and its application system working safety when the junction temperature is larger than 140°C.

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.

TYPICAL APPLICATION

A1116 has an adjustable version and fixed versions (1.2V, 1.8V, 2.5V, 3.3V, 5V and 12V)

Fixed Output Voltage Version



Application circuit of A1116 fixed version

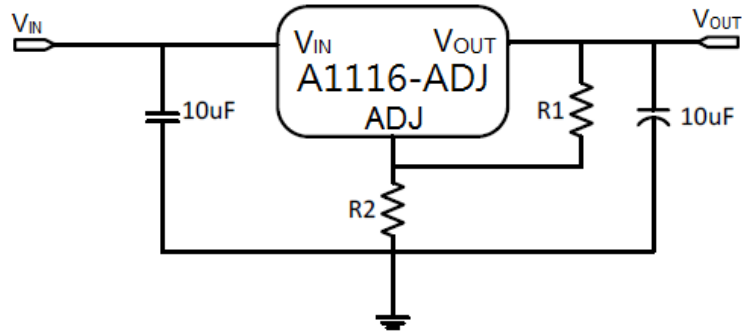
1. Recommend using 10uF tan capacitor as bypass capacitor (C1) for all application circuit.
2. Recommend using 10uF tan capacitor to assure circuit stability.

Adjustable Output Voltage Version

A1116-ADJ provides a 1.25V reference voltage. Any output voltage between 1.25V~12V can be achievable



by choosing two external resistors (schematic is shown below), R1 and R2



Application Circuit of A1116-ADJ

The output voltage of adjustable version follows the equation: $V_{OUT} = 1.25 \times (1 + R2/R1) + I_{ADJ} \times R2$. We can ignore I_{ADJ} because I_{ADJ} (about 50 μ A) 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 A1116-ADJ can keep itself stable at load current about 2mA, $R1$ is not allowed to be higher than 625ohm.
2. Using a bypass capacitor (C_{ADJ}) 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 C_{ADJ} should be less than $R1$ to prevent ripple from being amplified. As $R1$ is normally in the range of 100 Ω ~500 Ω , the value of C_{ADJ} should satisfy this equation: $1/(2\pi \times f_{ripple} \times C_{ADJ}) < R1$.

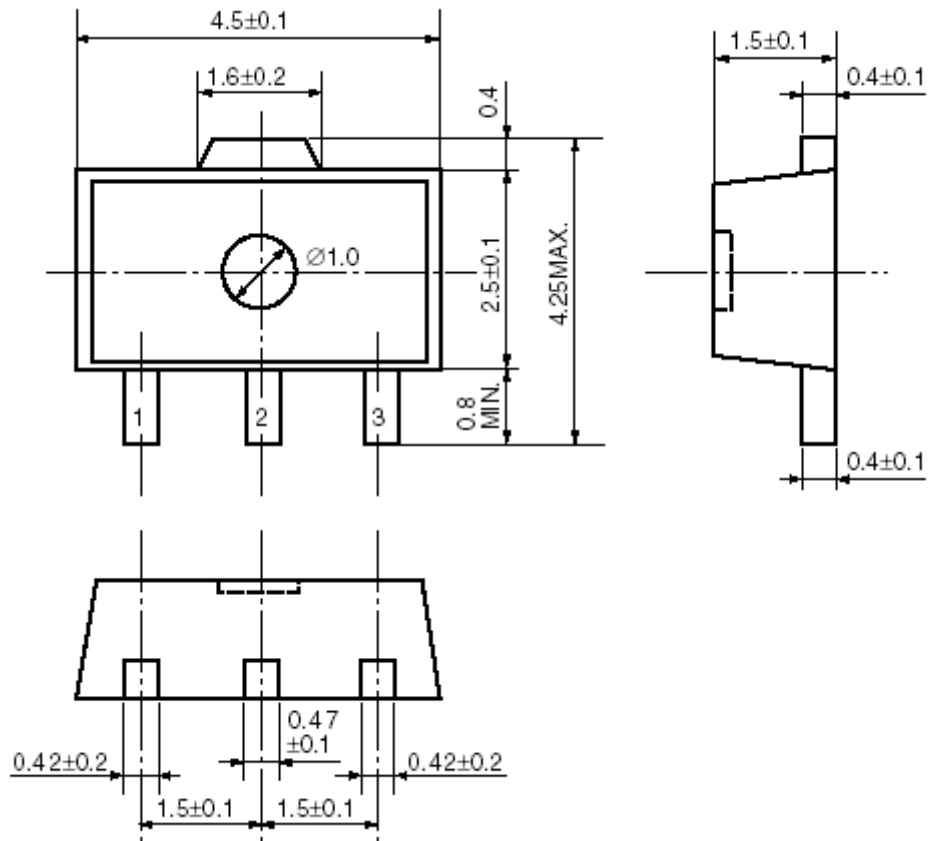
THERMAL CONSIDERATIONS

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 A1116 is very large. A1116 series uses SOT89-3 package type and its thermal resistance is about 70 $^{\circ}$ C/W. And the copper area of application board can affect the total thermal resistance. For Example, If copper area is 5cm*5cm (two sides), the resistance is about 30 $^{\circ}$ C/W. So the total thermal resistance is about 70 $^{\circ}$ C/W + 30 $^{\circ}$ 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 $^{\circ}$ C/W, then the power dissipation of A1116 could allow on itself is less than 1W. And furthermore, A1116 will work at junction temperature higher than 125 $^{\circ}$ C under such condition and no lifetime is guaranteed.



PACKAGE INFORMATION

Dimension in SOT89-3 (Unit: mm)





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