



**THE DATASHEET OF  
AP1115BYG-13**



## Description

The AP1115 is a low dropout positive adjustable or fixed mode regulator with 0.6A output current capability. The product is specifically designed to provide a well-regulated supply for low-voltage IC applications such as high-speed bus termination and low-current 3.3V logic supply. AP1115 is also well suited for other applications such as VGA cards. AP1115 is guaranteed to have <1.3V dropout at full load current, making it ideal to provide well regulated outputs of 1.25V to 5V with up to 18V input supply.

## Features

- 1.3V Maximum Dropout at Full Load Current
- Fast Transient Response
- Output Current Limiting
- Built-in Thermal Shutdown
- Good Noise Rejection
- 3-Terminal Adjustable or Fixed 1.5V / 1.8V / 2.5V / 2.8V / 3.0V / 3.3V / 3.5V / 5.0V
- Lead Free Package: SOT89-3L
  - **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- SOT89-3L: Available in "Green" Molding Compound (No Br, Sb)
  - **Halogen and Antimony Free. "Green" Device (Note 3)**

## Applications

- PC Peripheral
- Communication

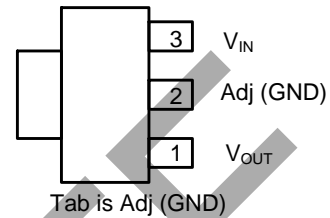
Notes:

1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
2. See [http://www.diodes.com/quality/lead\\_free.html](http://www.diodes.com/quality/lead_free.html) for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.

## Pin Assignments

### AP1115A

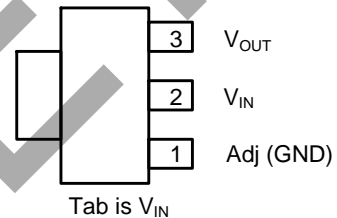
(Top View)



SOT89-3

### AP1115B

(Top View)

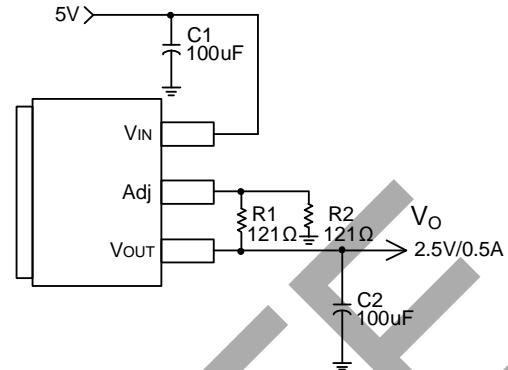


SOT89-3

**Typical Applications Circuit**



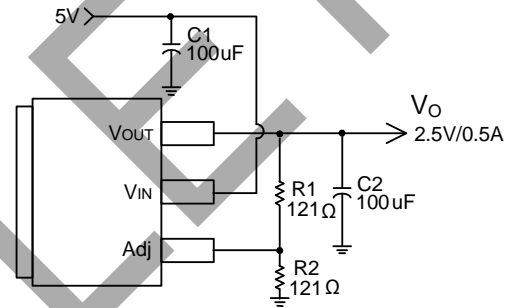
AP1115 A (5V/3.3V Fixed Output)



AP1115 A (5V/2.5V Adj Output)



AP1115 B (5V/3.3V Fixed Output)



AP1115 B (5V/2.5V Adj Output)

Note:  $V_o = V_{REF} \times (1 + \frac{R_2}{R_1})$

**Pin Descriptions**

| Pin Name         | I/O | Function                                                                                                                                                                                                                                                                                                                                             |
|------------------|-----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Adj (GND)        | I   | A resistor divider from this pin to the V <sub>OUT</sub> pin and ground sets the output voltage (Ground only for Fixed-Mode).                                                                                                                                                                                                                        |
| V <sub>OUT</sub> | O   | The output of the regulator. A minimum of 10uF capacitor (0.15Ω ≤ ESR ≤ 20Ω) must be connected from this pin to ground to insure stability.                                                                                                                                                                                                          |
| V <sub>IN</sub>  | I   | The input pin of regulator. Typically a large storage capacitor (0.15Ω ≤ ESR ≤ 20Ω) is connected from this pin to ground to insure that the input voltage does not sag below the minimum dropout voltage during the load transient response. This pin must always be 1.3V higher than V <sub>OUT</sub> in order for the device to regulate properly. |

OBSOLETE - PART DISCONTINUED

**Absolute Maximum Ratings** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)

| Symbol   | Parameter                    | Rating             | Unit             |
|----------|------------------------------|--------------------|------------------|
| $V_{IN}$ | DC Supply Voltage            | -0.3 to +18        | V                |
| $P_D$    | Power Dissipation            | Internally Limited | mW               |
| $T_{ST}$ | Storage Temperature          | -65 to +150        | $^\circ\text{C}$ |
| $T_{MJ}$ | Maximum Junction Temperature | +150               | $^\circ\text{C}$ |

Stresses greater than the 'Absolute Maximum Ratings' specified above, may cause permanent damage to the device. These are stress ratings only; functional operation of the device at these or any other conditions exceeding those indicated in this specification is not implied. Device reliability may be affected by exposure to absolute maximum rating conditions for extended periods of time.

**Recommended Operating Conditions**

| Symbol   | Parameter                            | Min | Max  | Unit             |
|----------|--------------------------------------|-----|------|------------------|
| $T_{OP}$ | Operating Junction Temperature Range | 0   | +125 | $^\circ\text{C}$ |

**Electrical Characteristics** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)

| Parameter         | Conditions                                                                                                                 | Min   | Typ   | Max   | Unit |
|-------------------|----------------------------------------------------------------------------------------------------------------------------|-------|-------|-------|------|
| Reference Voltage | AP1115-ADJ $T_A = +25^\circ\text{C}$ , ( $V_{IN-OUT} = 1.5\text{V}$ , $I_O = 10\text{mA}$ )                                | 1.225 | 1.250 | 1.275 | V    |
| Output Voltage    | AP1115-1.5 $I_{OUT} = 10\text{mA}$ , $T_A = +25^\circ\text{C}$ , $3\text{V} \leq V_{IN} \leq 12\text{V}$                   | 1.470 | 1.500 | 1.530 | V    |
|                   | AP1115-1.8 $I_{OUT} = 10\text{mA}$ , $T_A = +25^\circ\text{C}$ , $3.3\text{V} \leq V_{IN} \leq 12\text{V}$                 | 1.764 | 1.800 | 1.836 | V    |
|                   | AP1115-2.5 $I_{OUT} = 10\text{mA}$ , $T_A = +25^\circ\text{C}$ , $4\text{V} \leq V_{IN} \leq 12\text{V}$                   | 2.450 | 2.500 | 2.550 | V    |
|                   | AP1115-2.8 $I_{OUT} = 10\text{mA}$ , $T_A = +25^\circ\text{C}$ , $4.3\text{V} \leq V_{IN} \leq 12\text{V}$                 | 2.744 | 2.800 | 2.856 | V    |
|                   | AP1115-3.0 $I_{OUT} = 10\text{mA}$ , $T_A = +25^\circ\text{C}$ , $4.5\text{V} \leq V_{IN} \leq 12\text{V}$                 | 2.940 | 3.000 | 3.060 | V    |
|                   | AP1115-3.3 $I_{OUT} = 10\text{mA}$ , $T_A = +25^\circ\text{C}$ , $4.8\text{V} \leq V_{IN} \leq 12\text{V}$                 | 3.235 | 3.300 | 3.365 | V    |
|                   | AP1115-3.5 $I_{OUT} = 10\text{mA}$ , $T_A = +25^\circ\text{C}$ , $5\text{V} \leq V_{IN} \leq 12\text{V}$                   | 3.430 | 3.500 | 3.570 | V    |
|                   | AP1115-5.0 $I_{OUT} = 10\text{mA}$ , $T_A = +25^\circ\text{C}$ , $6.5\text{V} \leq V_{IN} \leq 12\text{V}$                 | 4.900 | 5.000 | 5.100 | V    |
| Line Regulation   | AP1115-XXX $I_O = 10\text{mA}$ , $V_{OUT} + 1.5\text{V} < V_{IN} < 15\text{V}$ , $T_A = +25^\circ\text{C}$                 | —     | —     | 0.2   | %    |
| Load Regulation   | AP1115-ADJ $V_{IN} = 3.3\text{V}$ , $V_{ADJ} = 0.0\text{mA} < I_O < 0.6\text{A}$ , $T_A = +25^\circ\text{C}$ (Notes 4 & 5) | —     | —     | 1     | %    |
|                   | AP1115-1.5 $V_{IN} = 3\text{V}$ , $0\text{mA} < I_O < 0.6\text{A}$ , $T_A = +25^\circ\text{C}$ (Notes 4 & 5)               | —     | 12    | 15    | mV   |
|                   | AP1115-1.8 $V_{IN} = 3.3\text{V}$ , $0\text{mA} < I_O < 0.6\text{A}$ , $T_A = +25^\circ\text{C}$ (Notes 4 & 5)             | —     | 15    | 18    | mV   |
|                   | AP1115-2.5 $V_{IN} = 4\text{V}$ , $0\text{mA} < I_O < 0.6\text{A}$ , $T_A = +25^\circ\text{C}$ (Notes 4 & 5)               | —     | 20    | 25    | mV   |
|                   | AP1115-2.8 $V_{IN} = 4.3\text{V}$ , $0\text{mA} < I_O < 0.6\text{A}$ , $T_A = +25^\circ\text{C}$ (Notes 4 & 5)             | —     | 22    | 28    | mV   |
|                   | AP1115-3.0 $V_{IN} = 5\text{V}$ , $0 \leq I_{OUT} \leq 0.6\text{A}$ , $T_A = +25^\circ\text{C}$ (Notes 4 & 5)              | —     | 23    | 30    | mV   |
|                   | AP1115-3.3 $V_{IN} = 5\text{V}$ , $0 \leq I_{OUT} \leq 0.6\text{A}$ , $T_A = +25^\circ\text{C}$ (Notes 4 & 5)              | —     | 26    | 33    | mV   |
|                   | AP1115-3.5 $V_{IN} = 5\text{V}$ , $0 \leq I_{OUT} \leq 0.6\text{A}$ , $T_A = +25^\circ\text{C}$ (Notes 4 & 5)              | —     | 28    | 35    | mV   |
|                   | AP1115-5.0 $V_{IN} = 8\text{V}$ , $0 \leq I_{OUT} \leq 0.6\text{A}$ , $T_A = +25^\circ\text{C}$ (Notes 4 & 5)              | —     | 40    | 50    | mV   |

- Notes:
- See thermal regulation specifications for changes in output voltage due to heating effects. Line and load regulation are measured at a constant junction temperature by low duty cycle pulse testing. Load regulation is measured at the output lead = 1/18" from the package.
  - Line and load regulation are guaranteed up to the maximum power dissipation of 5W. Power dissipation is determined by the input/output differential and the output current. Guaranteed maximum power dissipation will not be available over the full input/output range.

**Electrical Characteristics** (cont.) (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)

| Parameter                            | Conditions                                                                         |                                                         | Min | Typ   | Max  | Unit               |
|--------------------------------------|------------------------------------------------------------------------------------|---------------------------------------------------------|-----|-------|------|--------------------|
| Dropout Voltage ( $V_{IN}-V_{OUT}$ ) | AP1115-ADJ/1.5/1.8<br>2.5/2.8/3.0/3.3/3.5/5.0                                      | $I_{OUT} = 0.6\text{A}$ , $\Delta V_{OUT} = 1\%V_{OUT}$ | —   | 1.1   | 1.3  | V                  |
| Current Limit                        | AP1115-ADJ/1.5/1.8<br>2.5/2.8/3.0/3.3/3.5/5.0                                      | $(V_{IN}-V_{OUT}) = 5\text{V}$                          | 0.7 | —     | —    | A                  |
| Minimum Load Current (Note 6)        | AP1115-XXX                                                                         | $0^\circ\text{C} \leq T_J \leq +125^\circ\text{C}$      | —   | 5     | 10   | mA                 |
| Thermal Regulation                   | $T_A = +25^\circ\text{C}$ , 30ms pulse                                             |                                                         | —   | 0.008 | 0.04 | %/W                |
| Ripple Rejection                     | $f = 120\text{Hz}$ , $C_{OUT} = 25\mu\text{F}$ Tantalum, $I_{OUT} = 0.6\text{A}$   |                                                         |     |       |      |                    |
|                                      | AP1115-XXX                                                                         | $V_{IN} = V_{OUT} + 3\text{V}$                          | —   | 60    | 70   | dB                 |
| Temperature Stability                | $I_O = 10\text{mA}$                                                                |                                                         | —   | 0.6   | —    | %                  |
| $\theta_{JA}$                        | Thermal Resistance Junction-to-Ambient<br>(No heat sink; No air flow) (Note 7)     |                                                         | —   | 164   | —    | $^\circ\text{C/W}$ |
| $\theta_{JC}$                        | Thermal Resistance Junction-to-Case<br>Control Circuitry/Power Transistor (Note 7) |                                                         | —   | 35    | —    | $^\circ\text{C/W}$ |

- Notes:
6. Quiescent current is defined as the minimum output current required to maintain regulation. At 12V input/output differential the device is guaranteed to regulate if the output current is greater than 10mA.
  7. Test conditions for SOT89-3L: Device mounted on FR-4 substrate, 2oz copper, with minimum recommended pad layout.

**OBSOLETE**

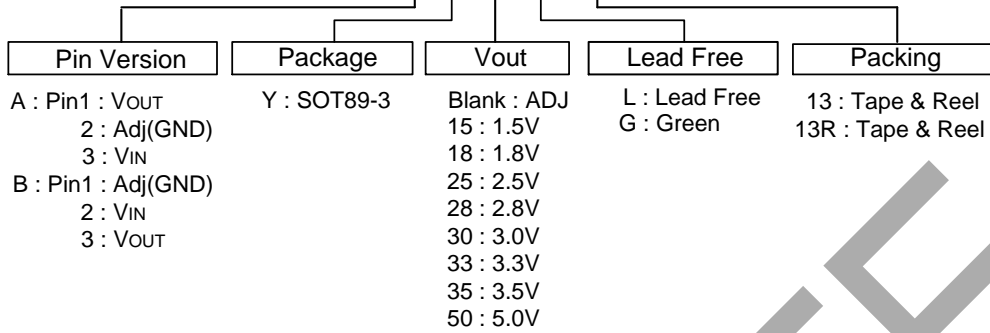
**Typical Performance Characteristics**



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**Ordering Information**

AP1115 X Y XX X - 13X



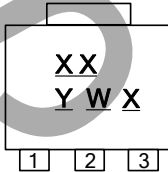
| Device          | Package Code | Packaging (Note 8) | 13" Tape and Reel (Note 9) |                    |
|-----------------|--------------|--------------------|----------------------------|--------------------|
|                 |              |                    | Quantity                   | Part Number Suffix |
| AP1115XYXXL-13  | Y            | SOT89-3            | 2500/Tape & Reel           | -13                |
| AP1115XYXXG-13  | Y            | SOT89-3            | 2500/Tape & Reel           | -13                |
| AP1115XYXXL-13R | Y            | SOT89-3            | 4000/Tape & Reel           | -13R               |
| AP1115XYXXG-13R | Y            | SOT89-3            | 4000/Tape & Reel           | -13R               |

Notes: 8. Pad layout as shown on Diodes Inc. suggested pad layout document AP02001, which can be found on our website at <http://www.diodes.com/datasheets/ap02001.pdf>.  
 9. Find Surface Mount (SMD) Packaging and Reel and Carrier Tape specification in document AP02007.pdf <http://www.diodes.com/datasheets/ap02007.pdf>

**Marking Information**

SOT89-3

( Top View )



XX : Identification code  
 Y : Year : 0~9  
 W : Week : A~Z : 1~26 week;  
 a~z : 27~52 week;  
 z represents 52 and 53 week  
 X : Internal code  
 a~z : Lead Free  
 A~Z : Green

| Output Version | Identification Code |         |
|----------------|---------------------|---------|
|                | AP1115A             | AP1115B |
| ADJ            | JO                  | JU      |
| 1.5V           | JP                  | JV      |
| 1.8V           | JQ                  | JW      |
| 2.5V           | JR                  | JX      |
| 2.8V           | JC                  | JD      |
| 3.0V           | JM                  | JN      |
| 3.3V           | JS                  | JY      |
| 3.5V           | JK                  | JL      |
| 5.0V           | JT                  | JZ      |

**Package Outline Dimensions** (All dimensions in mm.)

Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.



| SOT89-3              |          |      |
|----------------------|----------|------|
| Dim                  | Min      | Max  |
| A                    | 1.40     | 1.60 |
| B                    | 0.44     | 0.62 |
| B1                   | 0.35     | 0.54 |
| C                    | 0.35     | 0.44 |
| D                    | 4.40     | 4.60 |
| D1                   | 1.62     | 1.83 |
| E                    | 2.29     | 2.60 |
| e                    | 1.50 Typ |      |
| H                    | 3.94     | 4.25 |
| H1                   | 2.63     | 2.93 |
| L                    | 0.89     | 1.20 |
| All Dimensions in mm |          |      |

**Suggested Pad Layout**

Please see AP02001 at <http://www.diodes.com/datasheets/ap02001.pdf> for the latest version.



| Dimensions | Value (in mm) |
|------------|---------------|
| X          | 0.900         |
| X1         | 1.733         |
| X2         | 0.416         |
| Y          | 1.300         |
| Y1         | 4.600         |
| Y2         | 1.475         |
| Y3         | 0.950         |
| Y4         | 1.125         |
| C          | 1.500         |

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OBSOLETE

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