

## 0.5A Low Dropout Positive Adjustable or Fixed-Mode Regulator

### ■ Features

- 1.3V maximum dropout at full load current
- Fast transient response
- Output current limiting
- Built-in thermal shutdown
- Packages: SOT89
- Good noise rejection
- 3-Terminal Adjustable or Fixed 1.5V / 1.8V / 2.5V / 3.3V / 5.0V

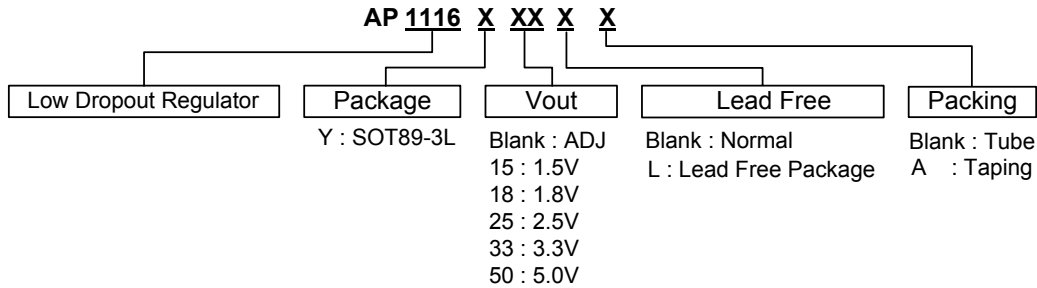
### ■ Applications

- PC peripheral
- Communication

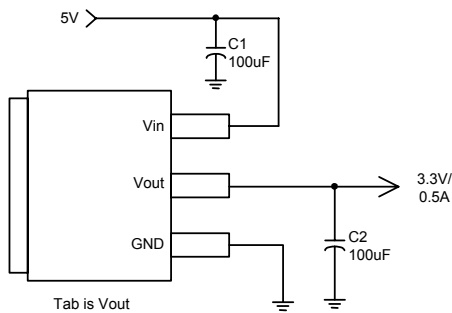
### ■ General Description

AP1116 is a low dropout positive adjustable or fixed-mode regulator with minimum of 0.5A output current capability. The product is specifically designed to provide well-regulated supply for low voltage IC applications such as high-speed bus termination and low current 3.3V logic supply. AP1116 is also well suited for other applications such as VGA cards. AP1116 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.

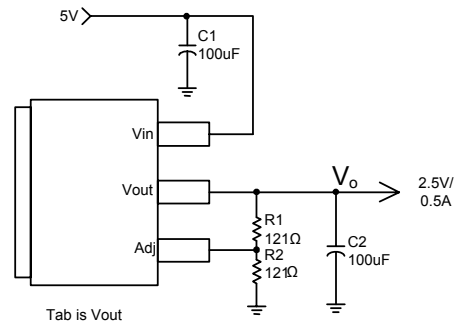
### ■ Ordering Information



### ■ Typical Circuit



( 5V/3.3V fixed output )



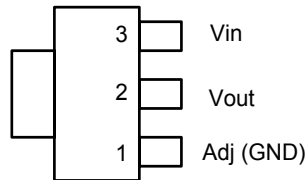
( 5V/2.5V ADJ output )

$$\text{Note: } V_o = V_{\text{REF}} * \left(1 + \frac{R_2}{R_1}\right)$$

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### ■ Connection Diagram

3 PIN SOT89



Tab is Vout

### ■ Pin Descriptions

| NAME      | I/O | PIN # | FUNCTION  |
|-----------|-----|-------|---|
| Adj (GND) | I   | 1     | A resistor divider from this pin to the Vout pin and ground sets the output voltage. (Ground only for Fixed-Mode)   |
| Vout      | O   | 2     | The output of the regulator. A minimum of 10uF capacitor ( $0.15\Omega \leq \text{ESR} \leq 20\Omega$ ) must be connected from this pin to ground to insure stability.  |
| Vin       | I   | 3     | The input pin of regulator. Typically a large storage capacitor ( $0.15\Omega \leq \text{ESR} \leq 20\Omega$ ) 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 Vout in order for the device to regulate properly. |

### ■ Absolute Maximum Ratings

| Symbol   | Parameter                            | Rating             | Unit |
|----------|--------------------------------------|--------------------|------|
| $V_{IN}$ | DC Supply Voltage                    | -0.3 to 18 V       | V    |
| $P_D$    | Power Dissipation                    | Internally Limited |      |
| $T_{ST}$ | Storage Temperature                  | -65 to +150        | °C   |
| $T_{OP}$ | Operating Junction Temperature Range | 0 to +150          | °C   |



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### ■ Electrical Characteristics (Under Operating Conditions)

| PARAMETER                               | CONDITIONS   |  | MIN   | TYP   | MAX   | UNIT                        |
|---|--|--|-------|-------|-------|-----------------------------|
| Reference Voltage                       | AP1116-ADJ   | $T_J=25^{\circ}\text{C}, (V_{IN}-V_{OUT})=1.5\text{V}$<br>$I_O=10\text{mA}$                          | 1.225 | 1.250 | 1.275 | V                           |
| Output Voltage                          | AP1116-1.5   | $I_{OUT} = 10\text{mA}, T_J = 25^{\circ}\text{C},$<br>$3\text{V} \leq V_{IN} \leq 12\text{V}$        | 1.470 | 1.500 | 1.530 | V                           |
|   | AP1116-1.8   | $I_{OUT} = 10\text{mA}, T_J = 25^{\circ}\text{C},$<br>$3.3\text{V} \leq V_{IN} \leq 12\text{V}$      | 1.764 | 1.800 | 1.836 | V                           |
|   | AP1116-2.5   | $I_{OUT} = 10\text{mA}, T_J = 25^{\circ}\text{C},$<br>$4\text{V} \leq V_{IN} \leq 12\text{V}$        | 2.450 | 2.500 | 2.550 | V                           |
|   | AP1116-3.3   | $I_{OUT} = 10\text{mA}, T_J = 25^{\circ}\text{C},$<br>$4.8\text{V} \leq V_{IN} \leq 12\text{V}$      | 3.235 | 3.300 | 3.365 | V                           |
|   | AP1116-5.0   | $I_{OUT} = 10\text{mA}, T_J = 25^{\circ}\text{C},$<br>$6.5\text{V} \leq V_{IN} \leq 12\text{V}$      | 4.900 | 5.000 | 5.100 | V                           |
| Line Regulation                         | AP1116-XXX   | $I_O=10\text{mA}, V_{OUT}+1.5\text{V}<V_{IN}<15\text{V},$<br>$T_J=25^{\circ}\text{C}$                |       |       | 0.2   | %                           |
| Load Regulation                         | AP1116-ADJ   | $V_{IN}=3.3\text{V}, V_{adj}=0, 0\text{mA}<I_O<0.5$<br>$\text{A}, T_J=25^{\circ}\text{C}$ (Note 1,2) |       |       | 1     | %                           |
|   | AP1116-1.5   | $V_{IN}=3\text{V}, 0\text{mA}<I_O<0.5\text{A},$<br>$T_J=25^{\circ}\text{C}$ (Note 1,2)               |       | 12    | 15    | mV                          |
|   | AP1116-1.8   | $V_{IN}=3.3\text{V}, 0\text{mA}<I_O<0.5\text{A},$<br>$T_J=25^{\circ}\text{C}$ (Note 1,2)             |       | 15    | 18    | mV                          |
|   | AP1116-2.5   | $V_{IN}=4\text{V}, 0\text{mA}<I_O<0.5\text{A},$<br>$T_J=25^{\circ}\text{C}$ (Note 1,2)               |       | 20    | 25    | mV                          |
|   | AP1116-3.3   | $V_{IN} = 5\text{V}, 0 \leq I_{OUT} \leq 0.5\text{A},$<br>$T_J=25^{\circ}\text{C}$ (Note 1,2)        |       | 26    | 33    | mV                          |
|   | AP1116-5.0   | $V_{IN} = 8\text{V}, 0 \leq I_{OUT} \leq 0.5\text{A},$<br>$T_J=25^{\circ}\text{C}$ (Note 1,2)        |       | 40    | 50    | mV                          |
| Dropout Voltage<br>( $V_{IN}-V_{OUT}$ ) | AP1116-ADJ/1.5/<br>1.82.5/3.3/5.0  | $I_{OUT} = 0.5\text{A}, \Delta V_{OUT}=0.1\%V_{OUT}$   |       | 1.1   | 1.3   | V                           |
| Current Limit                           | AP1116-ADJ/1.5/<br>1.82.5/3.3/5.0  | $(V_{IN}-V_{OUT}) = 5\text{V}$   | 0.6   |       |       | A                           |
| Minimum Load<br>Current                 | AP1116-XXX   | $0^{\circ}\text{C} \leq T_J \leq 125^{\circ}\text{C}$  |       | 5     | 10    | mA                          |
| Thermal Regulation                      | $T_A=25^{\circ}\text{C}, 30\text{ms}$ pulse                                      |  |       | 0.008 | 0.04  | %/W                         |
| Ripple Rejection                        | F=120Hz, $C_{OUT}=25\mu\text{F}$ Tantalum, $I_{OUT}=0.5\text{A}$                 |  |       |       |       |                             |
|   | AP1116-XXX   | $V_{IN}=V_{OUT}+3\text{V}$   |       | 60    | 70    | dB                          |
| Temperature Stability                   | $I_O=10\text{mA}$  |  |       | 0.5   |       | %                           |
| $\theta_{JA}$                           | SOT89 Thermal Resistance Junction-to-Ambient<br>(No heat sink; No air flow)      |  |       | 300   |       | $^{\circ}\text{C}/\text{W}$ |
| $\theta_{JC}$                           | SOT89: Control Circuitry/Power Transistor<br>Thermal Resistance Junction-to-Case |  |       | 100   |       | $^{\circ}\text{C}/\text{W}$ |

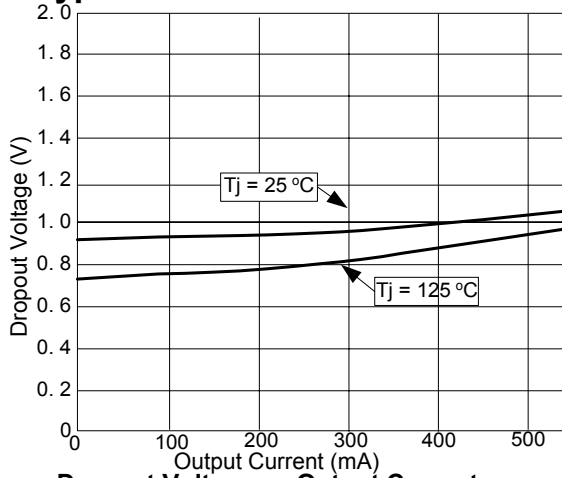
Note1: See thermal regulation specifications for changes in output voltage due to heating effects. Line and load regulation are measured at a constant junction temperature by low duty cycle pulse testing. Load regulation is measured at the output lead = 1/18" from the package.

Note2: 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.

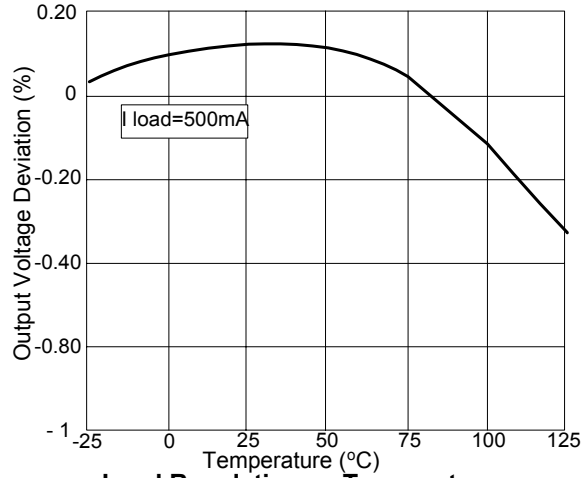
Note3: Quiescent current is defined as the minimum output current required to maintain regulation. At 12V input/output differential the device is guaranteed to regulate if the output current is greater than 10mA.

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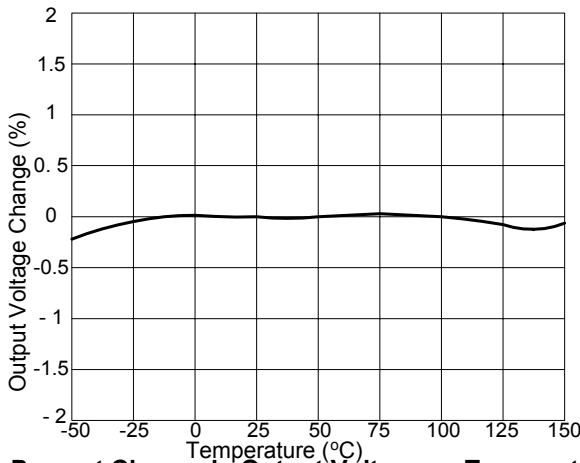
### Typical Performance Characteristics



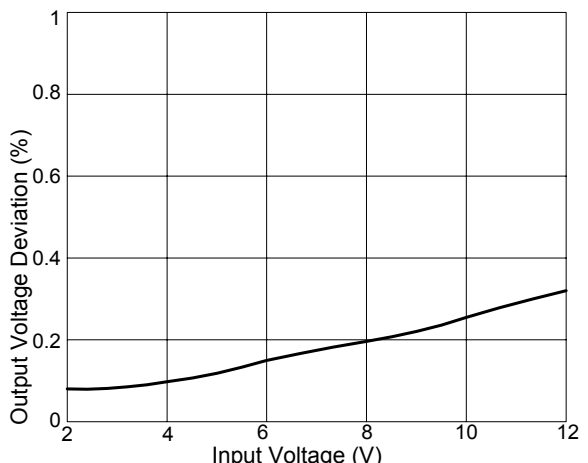
Dropout Voltage vs Output Current



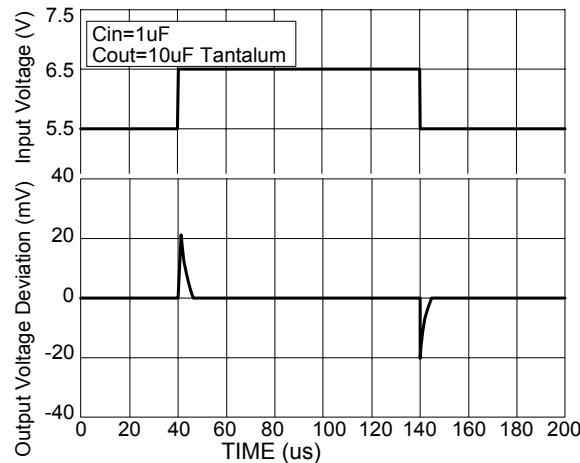
Load Regulation vs Temperature



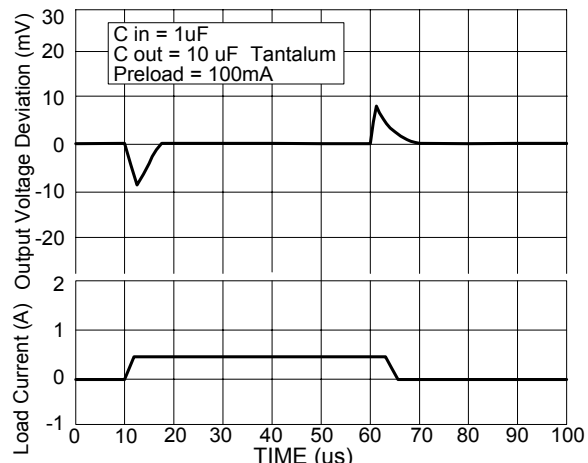
Percent Change in Output Voltage vs Temperature



Line Regulation



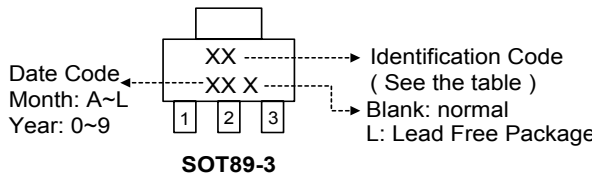
Line Transient Response



Load Transient Response

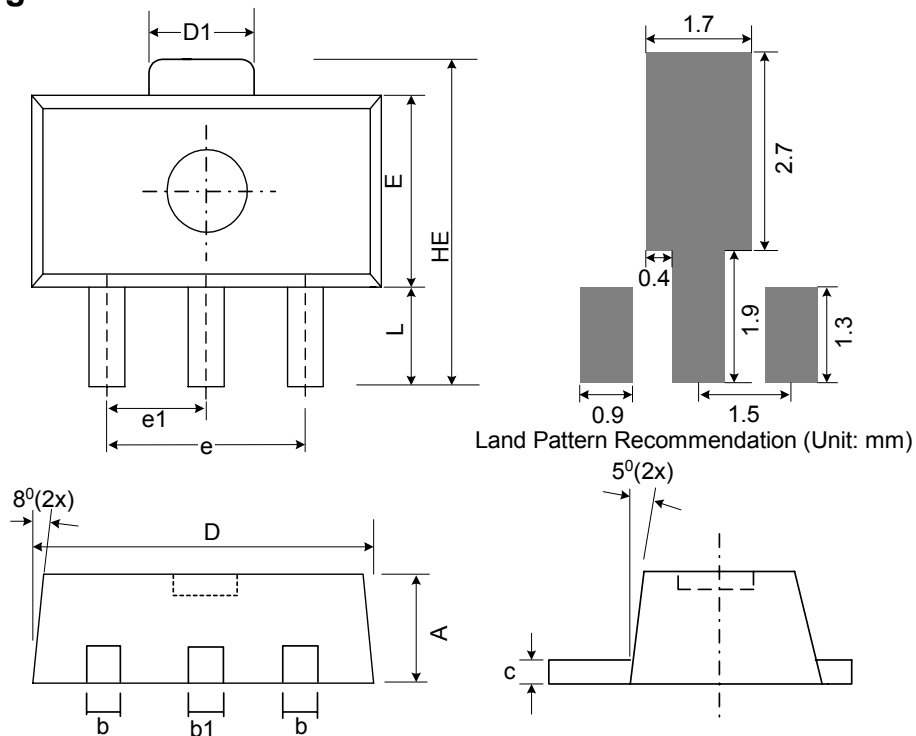
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### ■ Marking Information



| Identification code | Output version |
|---------------------|----------------|
| JE                  | AP1116-ADJ     |
| JF                  | AP1116-1.5V    |
| JG                  | AP1116-1.8V    |
| JH                  | AP1116-2.5V    |
| JI                  | AP1116-3.3V    |
| JJ                  | AP1116-5.0V    |

### ■ Package Dimension



| Symbol | Dimensions In Millimeters |      |      | Dimensions In Inches |       |       |
|--------|---------------------------|------|------|----------------------|-------|-------|
|        | Min.                      | Nom. | Max. | Min.                 | Nom.  | Max.  |
| A      | 1.40                      | 1.50 | 1.60 | 0.055                | 0.059 | 0.063 |
| b      | 0.36                      | 0.42 | 0.48 | 0.014                | 0.016 | 0.018 |
| b1     | 0.41                      | 0.47 | 0.53 | 0.016                | 0.043 | 0.051 |
| C      | 0.35                      | 0.39 | 0.43 | 0.014                | 0.015 | 0.017 |
| D      | 4.40                      | 4.50 | 4.60 | 0.173                | 0.177 | 0.181 |
| D1     | 1.40                      | 1.60 | 1.75 | 0.055                | 0.062 | 0.069 |
| e      | 2.90                      | 3.00 | 3.10 | 0.114                | 0.118 | 0.122 |
| e1     | 1.45                      | 1.50 | 1.55 | 0.057                | 0.059 | 0.061 |
| E      | 2.35                      | 2.48 | 2.60 | 0.093                | 0.098 | 0.102 |
| HE     | 3.94                      | -    | 4.25 | 0.155                | -     | 0.167 |
| L      | 0.80                      | -    | 1.20 | 0.031                | -     | 0.047 |