

## ■ General Description

The AME8815 family of linear regulators feature low quiescent current (45 $\mu$ A typ.) with low dropout voltage, making them ideal for battery applications. It is available in D<sup>2</sup>PAK and TO-220 packages. The space-efficient SOT-223 and DPAK package are attractive for "Pocket" and "Hand Held" applications.

Output voltages are set at the factory and trimmed to 1.5% accuracy.

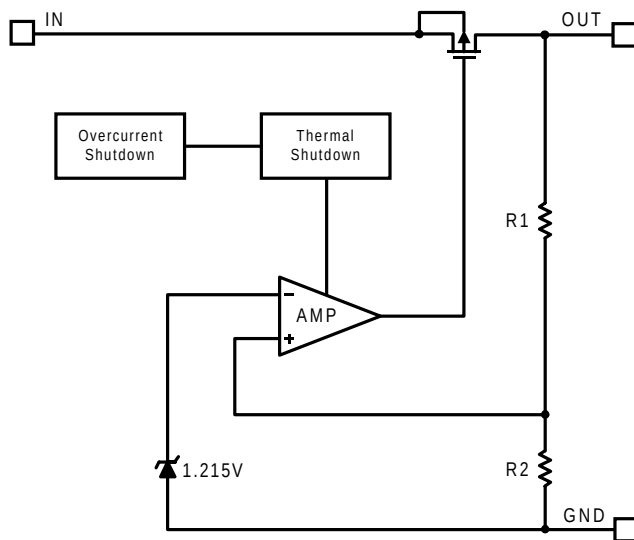
These rugged devices have both Thermal Shutdown, and Current Fold-back to prevent device failure under the "Worst" of operating conditions.

The AME8815 is stable with an output capacitance of 4.7 $\mu$ F or greater.

## ■ Features

- Very Low Dropout Voltage
- Guaranteed 1.5A Output
- Accurate to within 1.5%
- 45 $\mu$ A Quiescent Current Typically
- Over-Temperature Shutdown
- Current Limiting
- Short Circuit Current Fold-back
- Space-Efficient DPAK or SOT223 Package
- Low Temperature Coefficient

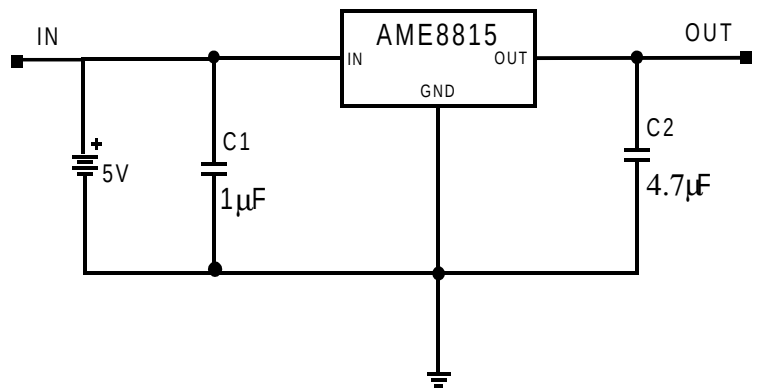
## ■ Functional Block Diagram



## ■ Applications

- Instrumentation
- Portable Electronics
- Wireless Devices
- PC Peripherals
- Battery Powered Widgets

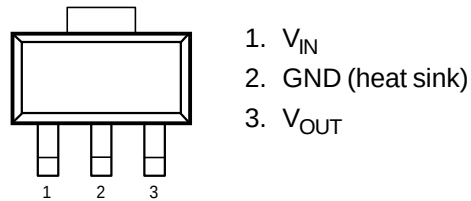
## ■ Typical Application





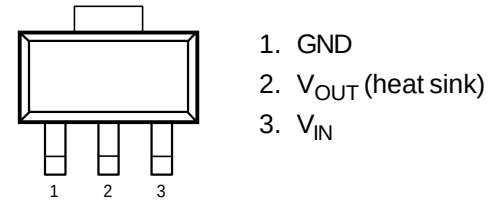
## ■ Pin Configuration

SOT-223 Top View



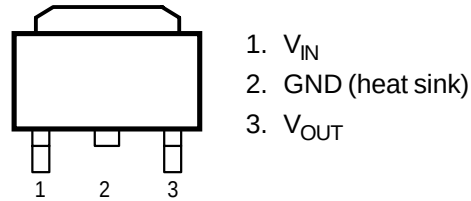
AME8815AEGTXXX

SOT-223 Top View



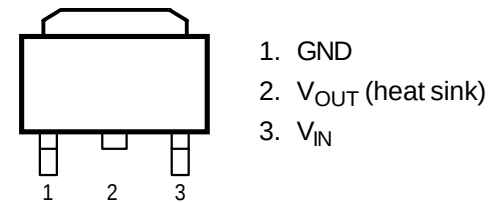
AME8815BEGTXXX

TO-252 (DPAK-2) Top View



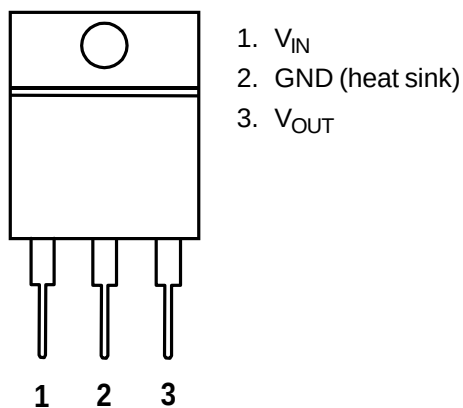
AME8815AECSXXX

TO-252 (DPAK-2) Top View



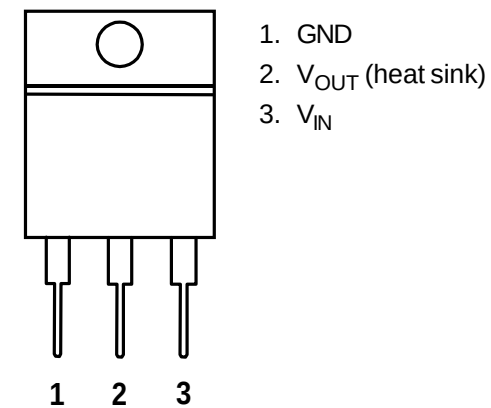
AME8815BECSXXX

TO-220 Top View



AME8815AEBTXXX

TO-220 Top View



AME8815BEBTXXX



## ■ Ordering Information

| AME8815 | X | X | X | X | XXX  |                              |
|---------|---|---|---|---|------|------------------------------|
|         |   |   |   |   |      | <b>Voltage</b>               |
|         |   |   |   |   | 150: | V=1.5V                       |
|         |   |   |   |   | 180: | V=1.8V                       |
|         |   |   |   |   | 250: | V=2.5V                       |
|         |   |   |   |   | 330: | V=3.3V                       |
|         |   |   |   |   | 475: | V=4.75V                      |
|         |   |   |   |   | 500: | V=5.0V                       |
|         |   |   |   |   |      | <b>Number of Pin</b>         |
|         |   |   |   |   | S:   | 2                            |
|         |   |   |   |   | T:   | 3                            |
|         |   |   |   |   |      | <b>Package</b>               |
|         |   |   |   |   | B:   | TO-220                       |
|         |   |   |   |   | C:   | TO-252                       |
|         |   |   |   |   | D:   | TO-263                       |
|         |   |   |   |   | G:   | SOT-223                      |
|         |   |   |   |   |      | <b>Operating Temperature</b> |
|         |   |   |   |   | C:   | 0°C to 70°C                  |
|         |   |   |   |   | E:   | -40°C to 85°C                |
|         |   |   |   |   | M:   | -40°C to 125°C               |
|         |   |   |   |   |      | <b>Pin Configuration</b>     |

Please consult AME sales office or authorized Rep./Distr. For other output voltage and package type availability.

## ■ Ordering Information

| Part Number    | Marking                    | Output | Package | Operating Temp. |
|----------------|----------------------------|--------|---------|-----------------|
| AME8815AEBT150 | AME8815<br>AEBT150<br>yyww | 1.50   | TO-220  | -40°C to +85°C  |
| AME8815AEBT180 | AME8815<br>AEBT180<br>yyww | 1.80   | TO-220  | -40°C to +85°C  |
| AME8815AEBT250 | AME8815<br>AEBT250<br>yyww | 2.50   | TO-220  | -40°C to +85°C  |
| AME8815AEBT330 | AME8815<br>AEBT330<br>yyww | 3.30   | TO-220  | -40°C to +85°C  |
| AME8815AEBT475 | AME8815<br>AEBT475<br>yyww | 4.75   | TO-220  | -40°C to +85°C  |
| AME8815AEBT500 | AME8815<br>AEBT500<br>yyww | 5.00   | TO-220  | -40°C to +85°C  |
| AME8815AECS150 | AME8815<br>AECS150<br>yyww | 1.50   | TO-252  | -40°C to +85°C  |
| AME8815AECS180 | AME8815<br>AECS180<br>yyww | 1.80   | TO-252  | -40°C to +85°C  |
| AME8815AECS250 | AME8815<br>AECS250<br>yyww | 2.50   | TO-252  | -40°C to +85°C  |
| AME8815AECS330 | AME8815<br>AECS330<br>yyww | 3.30   | TO-252  | -40°C to +85°C  |
| AME8815AECS475 | AME8815<br>AECS475<br>yyww | 4.75   | TO-252  | -40°C to +85°C  |
| AME8815AECS500 | AME8815<br>AECS500<br>yyww | 5.00   | TO-252  | -40°C to +85°C  |

## ■ Ordering Information

| Part Number    | Marking                     | Output | Package | Operating Temp. |
|----------------|-----------------------------|--------|---------|-----------------|
| AME8815AEDS150 | AME8815<br>AEDS150<br>yywww | 1.50   | TO-263  | -40°C to +85°C  |
| AME8815AEDS180 | AME8815<br>AEDS180<br>yywww | 1.80   | TO-263  | -40°C to +85°C  |
| AME8815AEDS250 | AME8815<br>AEDS250<br>yywww | 2.50   | TO-263  | -40°C to +85°C  |
| AME8815AEDS330 | AME8815<br>AEDS330<br>yywww | 3.30   | TO-263  | -40°C to +85°C  |
| AME8815AEDS475 | AME8815<br>AEDS475<br>yywww | 4.75   | TO-263  | -40°C to +85°C  |
| AME8815AEDS500 | AME8815<br>AEDS500<br>yywww | 5.00   | TO-263  | -40°C to +85°C  |
| AME8815AEGT150 | ASPww                       | 1.50   | SOT-223 | -40°C to +85°C  |
| AME8815AEGT180 | AQUww                       | 1.80   | SOT-223 | -40°C to +85°C  |
| AME8815AEGT250 | APRww                       | 2.50   | SOT-223 | -40°C to +85°C  |
| AME8815AEGT330 | AKCww                       | 3.30   | SOT-223 | -40°C to +85°C  |
| AME8815AEGT475 | AQRww                       | 4.75   | SOT-223 | -40°C to +85°C  |
| AME8815AEGT500 | AQSww                       | 5.00   | SOT-223 | -40°C to +85°C  |

## ■ Ordering Information

| Part Number    | Marking                    | Output | Package | Operating Temp. |
|----------------|----------------------------|--------|---------|-----------------|
| AME8815BEBT150 | AME8815<br>BEBT150<br>yyww | 1.50   | TO-220  | -40°C to +85°C  |
| AME8815BEBT180 | AME8815<br>BEBT180<br>yyww | 1.80   | TO-220  | -40°C to +85°C  |
| AME8815BEBT250 | AME8815<br>BEBT250<br>yyww | 2.50   | TO-220  | -40°C to +85°C  |
| AME8815BEBT330 | AME8815<br>BEBT330<br>yyww | 3.30   | TO-220  | -40°C to +85°C  |
| AME8815BEBT475 | AME8815<br>BEBT475<br>yyww | 4.75   | TO-220  | -40°C to +85°C  |
| AME8815BEBT500 | AME8815<br>BEBT500<br>yyww | 5.00   | TO-220  | -40°C to +85°C  |
| AME8815BECS150 | AME8815<br>BECS150<br>yyww | 1.50   | TO-252  | -40°C to +85°C  |
| AME8815BECS180 | AME8815<br>BECS180<br>yyww | 1.80   | TO-252  | -40°C to +85°C  |
| AME8815BECS250 | AME8815<br>BECS250<br>yyww | 2.50   | TO-252  | -40°C to +85°C  |
| AME8815BECS330 | AME8815<br>BECS330<br>yyww | 3.30   | TO-252  | -40°C to +85°C  |
| AME8815BECS475 | AME8815<br>BECS475<br>yyww | 4.75   | TO-252  | -40°C to +85°C  |
| AME8815BECS500 | AME8815<br>BECS500<br>yyww | 5.00   | TO-252  | -40°C to +85°C  |

## ■ Ordering Information

| Part Number    | Marking                    | Output | Package | Operating Temp. |
|----------------|----------------------------|--------|---------|-----------------|
| AME8815BEDS150 | AME8815<br>BEDS150<br>yyww | 1.50   | TO-263  | -40°C to +85°C  |
| AME8815BEDS180 | AME8815<br>BEDS180<br>yyww | 1.80   | TO-263  | -40°C to +85°C  |
| AME8815BEDS250 | AME8815<br>BEDS250<br>yyww | 2.50   | TO-263  | -40°C to +85°C  |
| AME8815BEDS330 | AME8815<br>BEDS330<br>yyww | 3.30   | TO-263  | -40°C to +85°C  |
| AME8815BEDS475 | AME8815<br>BEDS475<br>yyww | 4.75   | TO-263  | -40°C to +85°C  |
| AME8815BEDS500 | AME8815<br>BEDS500<br>yyww | 5.00   | TO-263  | -40°C to +85°C  |
| AME8815BEGT150 | AJYww                      | 1.50   | SOT-223 | -40°C to +85°C  |
| AME8815BEGT180 | AJZww                      | 1.80   | SOT-223 | -40°C to +85°C  |
| AME8815BEGT250 | AKBww                      | 2.50   | SOT-223 | -40°C to +85°C  |
| AME8815BEGT330 | AKDww                      | 3.30   | SOT-223 | -40°C to +85°C  |
| AME8815BEGT475 | AMNww                      | 4.75   | SOT-223 | -40°C to +85°C  |
| AME8815BEGT500 | AQTww                      | 5.00   | SOT-223 | -40°C to +85°C  |

### ■ Absolute Maximum Ratings:

| Parameter          | Maximum                     | Unit |
|--------------------|-----------------------------|------|
| Input Voltage      | 8                           | V    |
| Output Current     | $P_D / (V_{IN} - V_O)$      | mA   |
| Output Voltage     | GND - 0.3 to $V_{IN} + 0.3$ | V    |
| ESD Classification | B                           |      |

*Caution: Stress above the listed absolute maximum rating may cause permanent damage to the device.*

### ■ Recommended operating Conditions:

| Parameter                 | Rating      | Unit |
|---------------------------|-------------|------|
| Ambient Temperature Range | -40 to +85  | °C   |
| Junction Temperature      | -40 to +125 | °C   |

### ■ Thermal Information

| Parameter                                                                  |                    | Maximum | Unit   |
|----------------------------------------------------------------------------|--------------------|---------|--------|
| Thermal Resistance ( $\theta_{ja}$ )                                       | SOT-223            | 160     | °C / W |
|                                                                            | TO-252 (DPAK)      | 90      |        |
|                                                                            | D <sup>2</sup> PAK | 60      |        |
|                                                                            | TO-220             | 50      |        |
| Internal Power Dissipation ( $P_D$ )<br>( $\Delta T = 100^\circ\text{C}$ ) | SOT-223            | 625     | mW     |
|                                                                            | TO-252 (DPAK)      | 1200    |        |
|                                                                            | D <sup>2</sup> PAK | 2800    |        |
|                                                                            | TO-220             | 3000    |        |
| Maximum Junction Temperature                                               |                    | 150     | °C     |
| Maximum Lead Temperature ( 10 Sec)                                         |                    | 300     | °C     |





## ■ Electrical Specifications

$V_{IN} = V_{O(nom)} + 2V$ ,  $T_A = 25^{\circ}C$  unless otherwise noted

| Parameter                     | Symbol        | Test Condition                                 |                               | Min    | Typ       | Max  | Units            |
|-------------------------------|---------------|------------------------------------------------|-------------------------------|--------|-----------|------|------------------|
| Input Voltage                 | $V_{IN}$      |                                                |                               | Note 1 |           | 7    | V                |
| Output Voltage Accuracy       | $V_O$         | $I_O = 1mA$                                    |                               | -1.5   |           | 1.5  | %                |
| Dropout Voltage               | $V_{DROPOUT}$ | $I_O = 1.5A$<br>$V_O = V_{ONOM} - 2.0\%$       | $1.4V < V_{O(NOM)} \leq 2.0V$ |        | See chart | 1300 | mV               |
|                               |               |                                                | $2.0V < V_{O(NOM)} \leq 2.8V$ |        |           | 800  |                  |
|                               |               |                                                | $2.8V < V_{O(NOM)}$           |        |           | 600  |                  |
| Output Current                | $I_O$         | $V_O > 1.2V$                                   |                               | 1500   |           |      | mA               |
| Current Limit                 | $I_{LIM}$     | $V_O > 1.2V$                                   |                               | 1500   | 2000      |      | mA               |
| Short Circuit Current         | $I_{SC}$      | $V_O < 0.4V$                                   |                               |        | 750       |      | mA               |
| Quiescent Current             | $I_Q$         | $I_O = 0mA$                                    |                               |        | 45        | 70   | $\mu A$          |
| Ground Pin Current            | $I_{GND}$     | $I_O = 1mA$ to $1500mA$                        |                               |        | 45        |      | $\mu A$          |
| Line Regulation               | $REG_{LINE}$  | $I_O = 1mA$<br>$V_{IN} = V_O + 1$ to $V_O + 2$ | $V_O < 2.0V$                  | -0.15  |           | 0.15 | %                |
|                               |               |                                                | $4.0V > V_O \geq 2.0V$        | -0.1   | 0.02      | 0.1  | %                |
|                               |               |                                                | $4.0V \leq V_O$               | -0.4   |           | 0.4  | %                |
| Load Regulation               | $REG_{LOAD}$  | $I_O = 1mA$ to $1500mA$                        |                               | -1     | 0.2       | 1    | %                |
| Over Temperature Shutdown     | OTS           |                                                |                               |        | 150       |      | $^{\circ}C$      |
| Over Temperature Hysteresis   | OTH           |                                                |                               |        | 30        |      | $^{\circ}C$      |
| $V_O$ Temperature Coefficient | TC            |                                                |                               |        | 30        |      | ppm/ $^{\circ}C$ |
| Power Supply Rejection        | PSRR          | $I_O = 100mA$<br>$C_O = 4.7\mu F$              | $f = 1kHz$                    |        | 50        |      | dB               |
|                               |               |                                                | $f = 10kHz$                   |        | 20        |      |                  |
|                               |               |                                                | $f = 100kHz$                  |        | 15        |      |                  |
| Output Voltage Noise          | eN            | $f = 10Hz$ to $100kHz$<br>$I_O = 10mA$         | $C_O = 4.7\mu F$              |        | 30        |      | $\mu V_{rms}$    |

Note1:  $V_{IN(min)} = V_{OUT} + V_{DROPOUT}$



## ■ Detailed Description

The AME8815 family of CMOS regulators contain a PMOS pass transistor, voltage reference, error amplifier, over-current protection, and thermal shutdown.

The P-channel pass transistor receives data from the error amplifier, over-current shutdown, and thermal protection circuits. During normal operation, the error amplifier compares the output voltage to a precision reference. Over-current and Thermal shutdown circuits become active when the junction temperature exceeds 150°C, or the current exceeds 2.2A. During thermal shutdown, the output voltage remains low. Normal operation is restored when the junction temperature drops below 120°C.

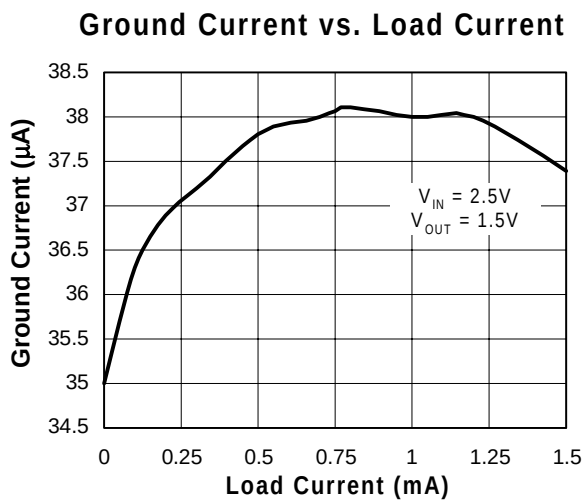
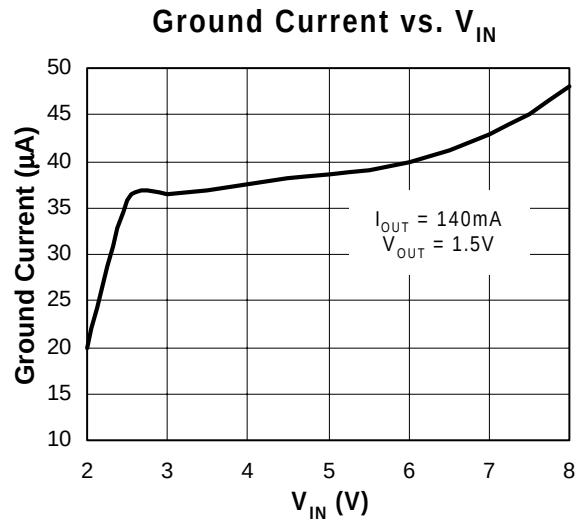
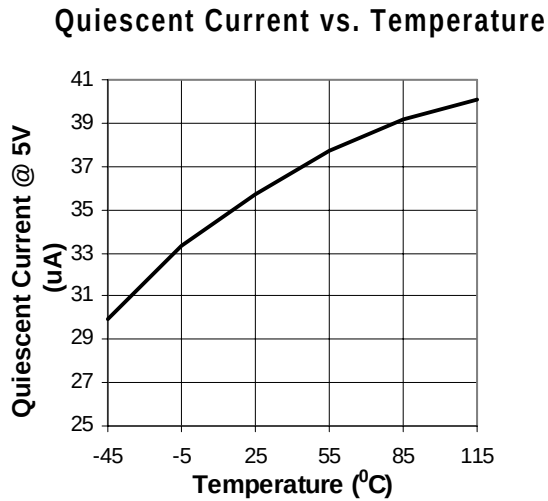
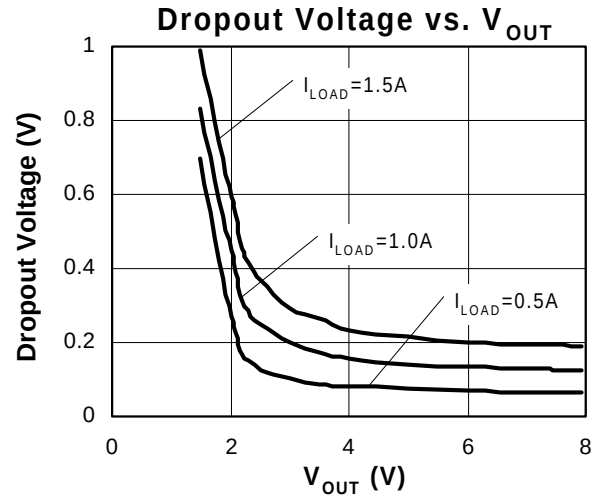
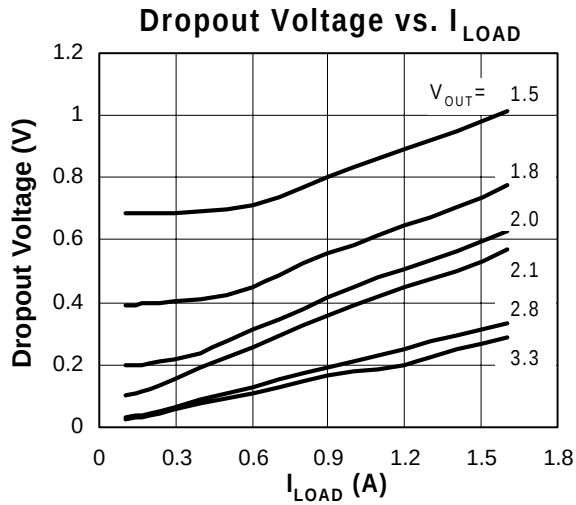
The AME8815 behaves like a current source when the load reaches 2.2A. However, if the load impedance drops below 0.3 ohms, the current drops back to 600mA to prevent excessive power dissipation. Normal operation is restored when the load resistance exceeds 0.75 ohms.

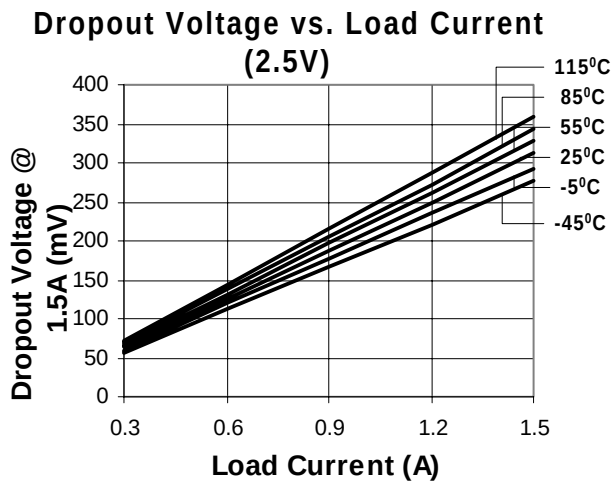
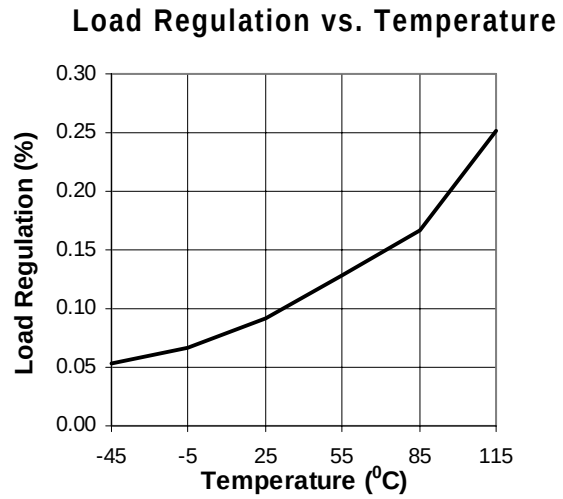
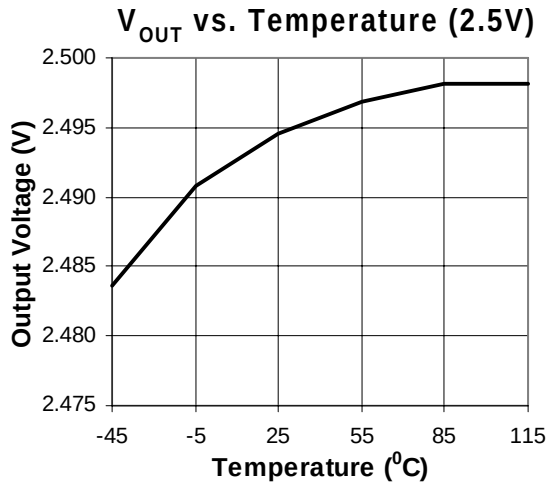
## ■ External Capacitors

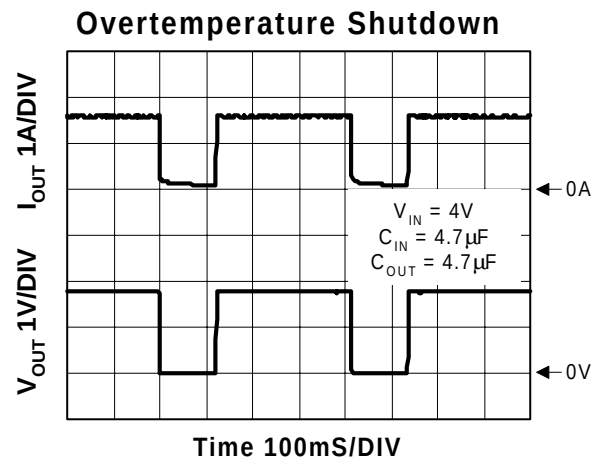
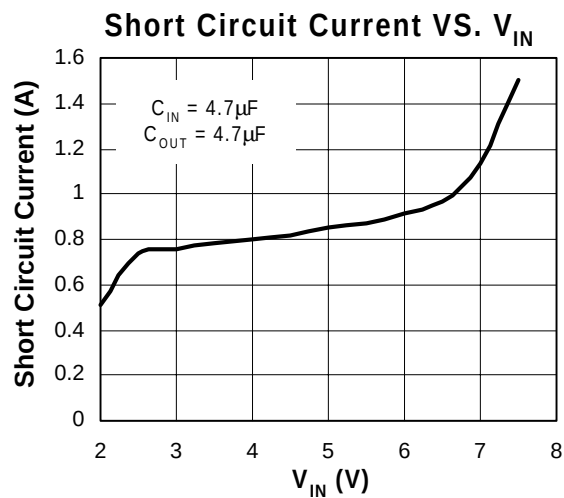
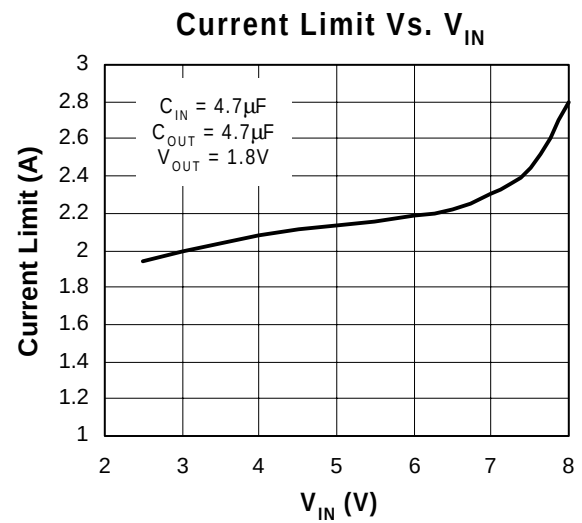
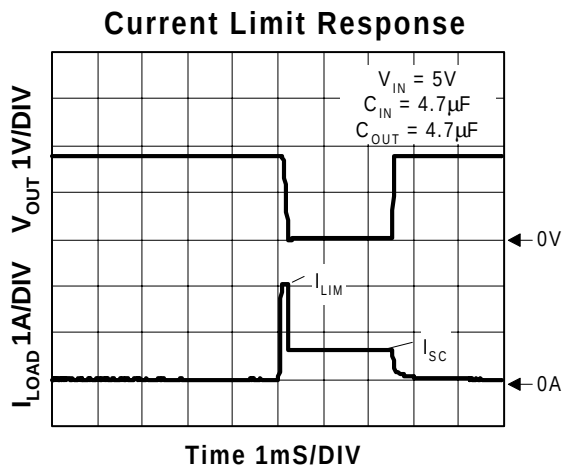
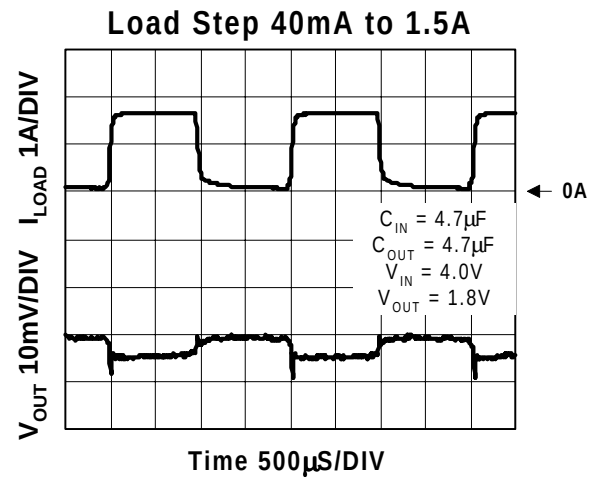
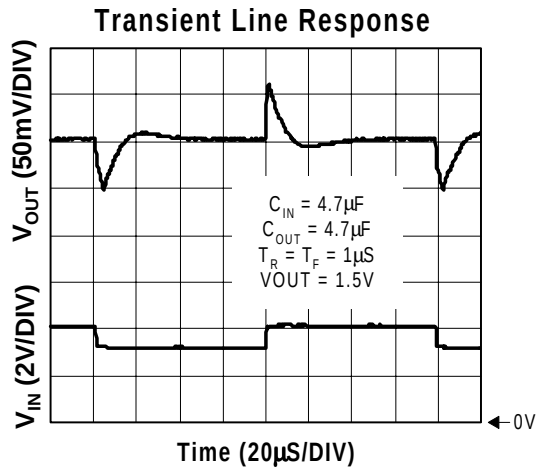
The AME8815 is stable with an output capacitor to ground of 4.7μF or greater. Ceramic capacitors have the lowest ESR, and will offer the best AC performance. Conversely, Aluminum Electrolytic capacitors exhibit the highest ESR, resulting in the poorest AC response. Unfortunately, large value ceramic capacitors are comparatively expensive. One option is to parallel a 0.1μF ceramic capacitor with a 10μF Aluminum Electrolytic. The benefit is low ESR, high capacitance, and low overall cost.

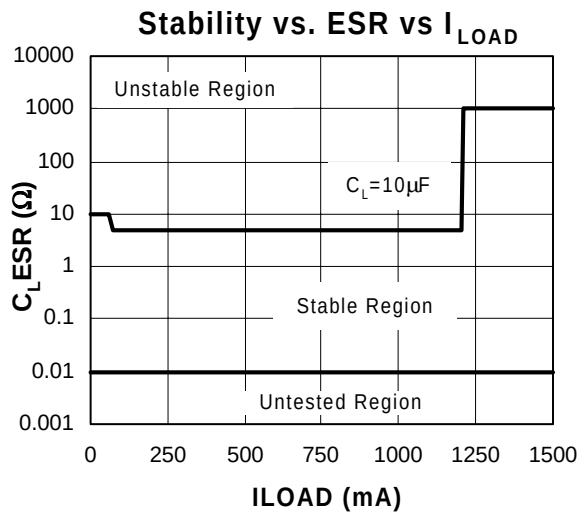
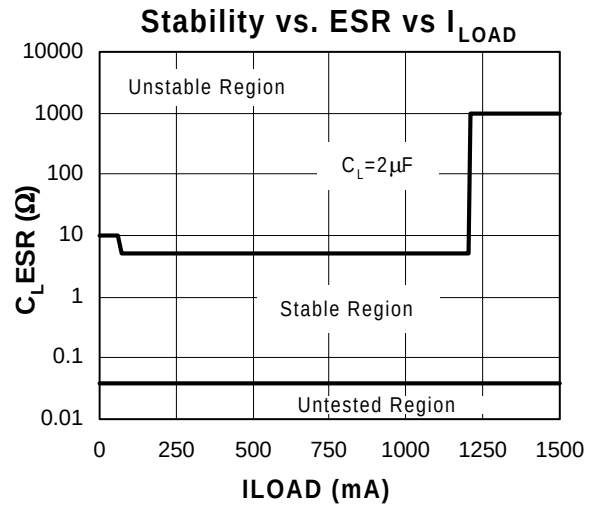
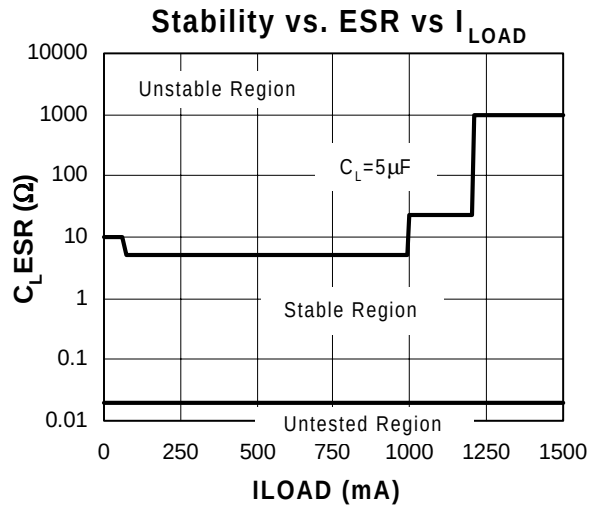
A second capacitor is recommended between the input and ground to stabilize Vin. The input capacitor should be at least 0.1μF to have a beneficial effect.

All capacitors should be placed in close proximity to the pins. A "Quiet" ground termination is desirable. This can be achieved with a "Star" connection.



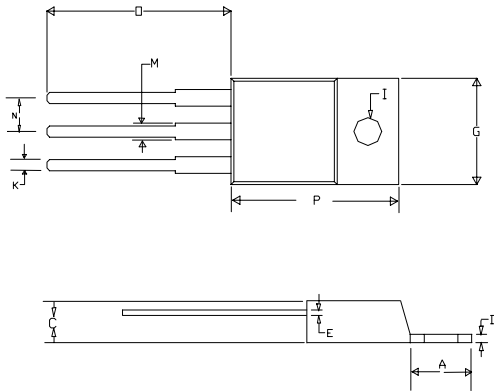






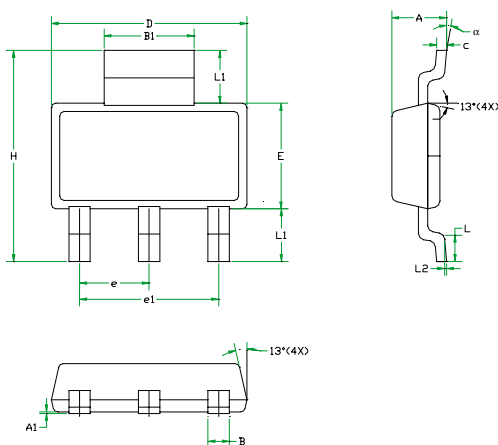
## ■ Package Dimension

### TO-220



| SYMBOLS | MILLIMETERS |       | INCHES |        |
|---------|-------------|-------|--------|--------|
|         | MIN         | MAX   | MIN    | MAX    |
| A       | 5.58        | 7.49  | 0.2197 | 0.2949 |
| C       | 3.56        | 4.83  | 0.1400 | 0.1900 |
| D       | 0.51        | 1.40  | 0.0200 | 0.0550 |
| E       | 0.31        | 1.14  | 0.0120 | 0.0450 |
| G       | 9.65        | 10.67 | 0.3800 | 0.4200 |
| I       | 3.53        | 4.09  | 0.1390 | 0.1610 |
| K       | 0.51        | 1.14  | 0.0200 | 0.0450 |
| M       | 1.14        | 1.78  | 0.0449 | 0.0700 |
| N       | 2.29        | 2.79  | 0.0900 | 0.1100 |
| O       | 12.70       | 14.73 | 0.5000 | 0.5800 |
| P       | 14.22       | 16.51 | 0.5600 | 0.6500 |

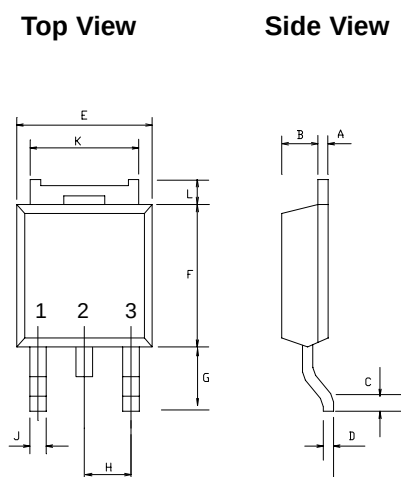
### SOT-223



| SYMBOLS        | MILLIMETERS |      | INCHES     |        |
|----------------|-------------|------|------------|--------|
|                | MIN         | MAX  | MIN        | MAX    |
| A              | 1.50        | 1.80 | 0.0591     | 0.0709 |
| A <sub>1</sub> | 0.02        | 0.10 | 0.0008     | 0.0039 |
| B              | 0.60        | 0.84 | 0.0236     | 0.0330 |
| B <sub>1</sub> | 2.90        | 3.15 | 0.1140     | 0.1240 |
| C              | 0.24        | 0.38 | 0.0094     | 0.0150 |
| D              | 6.30        | 6.71 | 0.2480     | 0.2640 |
| E              | 3.30        | 3.71 | 0.1299     | 0.1460 |
| e              | 2.30 BSC    |      | 0.0906 BSC |        |
| e <sub>1</sub> | 4.60 BSC    |      | 0.1811 BSC |        |
| H              | 6.70        | 7.30 | 0.2638     | 0.2874 |
| L              | 0.91 MIN    |      | 0.0358 MIN |        |
| L <sub>1</sub> | 2.00 MAX    |      | 0.0787 MAX |        |
| L <sub>2</sub> | 0.06 BSC    |      | 0.0024 BSC |        |
| a              | 0°          | 10°  | 0°         | 10°    |

## ■ Package Dimension

### TO-252



| SYMBOLS | MILLIMETERS |      | INCHES |        |
|---------|-------------|------|--------|--------|
|         | MIN         | MAX  | MIN    | MAX    |
| A       | 0.40        | 0.60 | 0.0157 | 0.0236 |
| B       | 1.60        | 2.00 | 0.0630 | 0.0787 |
| C       | 0.50        | -    | 0.0197 | -      |
| D       | 0.40        | 0.60 | 0.0157 | 0.0236 |
| E       | 6.35        | 6.80 | 0.2500 | 0.2677 |
| F       | 5.33        | 6.30 | 0.2098 | 0.2480 |
| G       | 2.20        | 3.00 | 0.0866 | 0.1181 |
| H       | 1.98        | 2.50 | 0.0780 | 0.0984 |
| J       | 0.61        | 0.97 | 0.0240 | 0.0382 |
| K       | 5.04        | 5.64 | 0.1984 | 0.2220 |
| L       | 0.40        | 2.03 | 0.0157 | 0.0799 |

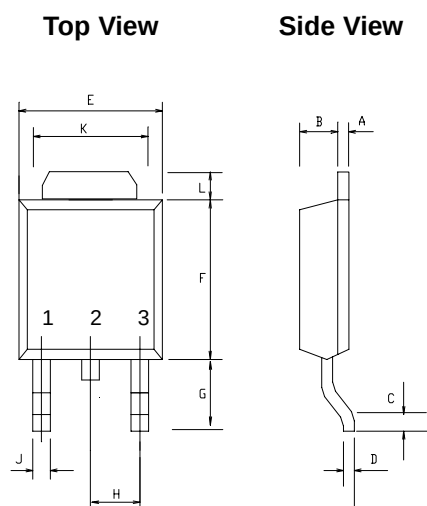
\* : Typical value

#### NOTES :

1. CONTROLLING DIMENSION : MILLIMETERS.
2. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS  
MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.

Or

### TO-252



| SYMBOLS | MILLIMETERS |      | INCHES |        |
|---------|-------------|------|--------|--------|
|         | MIN         | MAX  | MIN    | MAX    |
| A       | 0.40        | 0.60 | 0.0157 | 0.0236 |
| B       | 1.60        | 2.00 | 0.0630 | 0.0787 |
| C       | 0.50        | -    | 0.0197 | -      |
| D       | 0.40        | 0.60 | 0.0157 | 0.0236 |
| E       | 6.35        | 6.80 | 0.2500 | 0.2677 |
| F       | 5.33        | 6.30 | 0.2098 | 0.2480 |
| G       | 2.20        | 3.00 | 0.0866 | 0.1181 |
| H       | 1.98        | 2.50 | 0.0780 | 0.0984 |
| J       | 0.61        | 0.97 | 0.0240 | 0.0382 |
| K       | 5.04        | 5.64 | 0.1984 | 0.2220 |
| L       | 0.40        | 2.03 | 0.0157 | 0.0799 |

\* : Typical value

#### NOTES :

1. CONTROLLING DIMENSION : MILLIMETERS.
2. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS  
MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.





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