

■ General Description

The AME8815 family of linear regulators feature low quiescent current (45 μ A typ.) with low dropout voltage, making them ideal for battery applications. It is available in TO-252 and SOT-223 packages.

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" operating conditions.

The AME8815 is stable with an output capacitance of 4.7 μ F or greater.

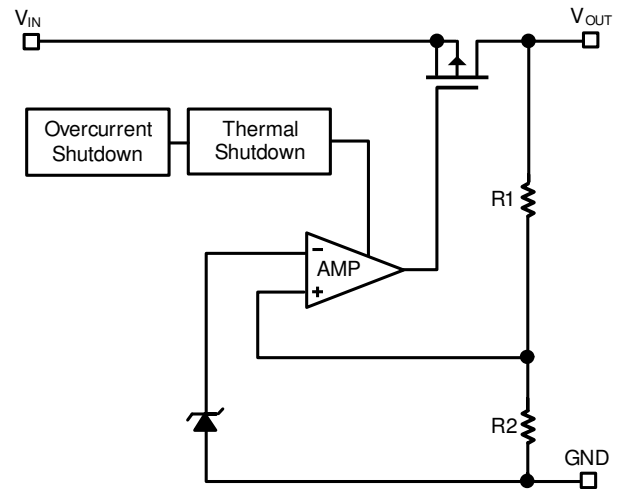
■ Features

- Very Low Dropout Voltage
- Guaranteed 1.5A Output
- Accurate to within 1.5%
- 45 μ A Quiescent Current Typically
- Over-Temperature Shutdown
- Current Limiting
- Short Circuit Current Fold-back
- Low Temperature Coefficient
- All AME's Lead Free Products Meet RoHS Standards

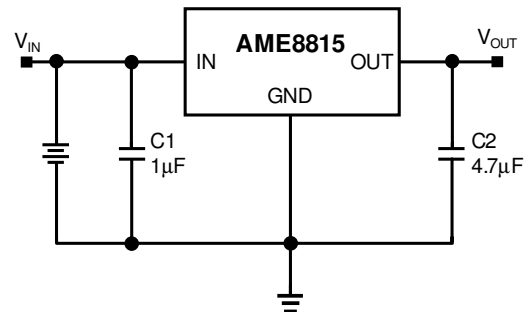
■ Applications

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

■ Functional Block Diagram



■ Typical Application



■ Pin Configuration

AME8815AEGTxxx

1. IN
2. GND(TAB)
3. OUT

*** Die Attach:**
Conductive Epoxy


AME8815BEGTxxx

1. GND
2. OUT(TAB)
3. IN

*** Die Attach:**
Non-Conductive Epoxy


AME8815AECSxxx

1. IN
2. GND(TAB)
3. OUT

*** Die Attach:**
Conductive Epoxy

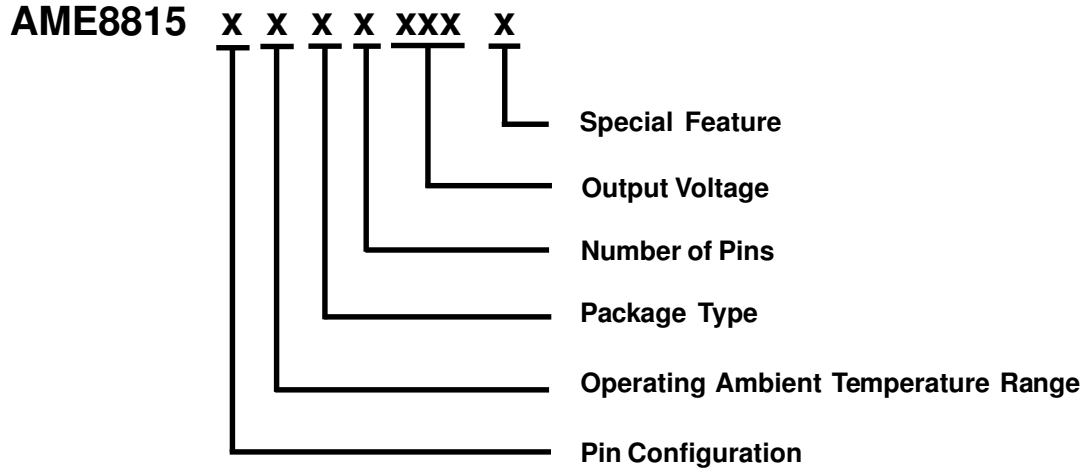

AME8815BECSxxx

1. GND
2. OUT(TAB)
3. IN

*** Die Attach:**
Non-Conductive Epoxy

■ Pin Description

| Pin Name | Pin Description |
|----------|--|
| IN | Input voltage pin. It should be decoupled with 1 μ F or greater capacitor. |
| GND | Ground connection pin. |
| OUT | LDO voltage regulator output pin. It should be decoupled with a 4.7 μ F or greater value low ESR ceramic capacitor. |

■ Ordering Information


| Pin Configuration | Operating Ambient Temperature Range | Package Type | Number of Pins | Output Voltage | Special Feature |
|--|-------------------------------------|-------------------------|----------------|--|-----------------|
| A: 1. IN <small>(TO-252-2)</small> 2. GND <small>(SOT-223)</small> 3. OUT B: 1. GND <small>(TO-252-2)</small> 2. OUT <small>(SOT-223)</small> 3. IN | E: -40°C to +85°C | C: TO-252 G: SOT-223 | T: 3 S: 2 | 150: V=1.5V 180: V=1.8V 190: V=1.9V 250: V=2.5V 310: V=3.1V 330: V=3.3V 390: V=3.9V 475: V=4.75V 500: V=5.0V | Z: Lead Free |

■ Ordering Information (Contd.)

| Part Number | Marking* | Output Voltage | Package | Operating Ambient Temperature Range |
|-----------------|----------------------------|----------------|----------|-------------------------------------|
| AME8815AECS150 | AME8815 AECS150 yyww | 1.50 | TO-252-2 | - 40°C to +85°C |
| AME8815AECS150Z | AME8815 AECS150 yyww | 1.50 | TO-252-2 | - 40°C to +85°C |
| AME8815AECS180 | AME8815 AECS180 yyww | 1.80 | TO-252-2 | - 40°C to +85°C |
| AME8815AECS180Z | AME8815 AECS180 yyww | 1.80 | TO-252-2 | - 40°C to +85°C |
| AME8815AECS190 | AME8815 AECS190 yyww | 1.90 | TO-252-2 | - 40°C to +85°C |
| AME8815AECS190Z | AME8815 AECS190 yyww | 1.90 | TO-252-2 | - 40°C to +85°C |
| AME8815AECS250 | AME8815 AECS250 yyww | 2.50 | TO-252-2 | - 40°C to +85°C |
| AME8815AECS250Z | AME8815 AECS250 yyww | 2.50 | TO-252-2 | - 40°C to +85°C |
| AME8815AECS330 | AME8815 AECS330 yyww | 3.30 | TO-252-2 | - 40°C to +85°C |
| AME8815AECS330Z | AME8815 AECS330 yyww | 3.30 | TO-252-2 | - 40°C to +85°C |
| AME8815AECS475 | AME8815 AECS475 yyww | 4.75 | TO-252-2 | - 40°C to +85°C |
| AME8815AECS475Z | AME8815 AECS475 yyww | 4.75 | TO-252-2 | - 40°C to +85°C |
| AME8815AECS500 | AME8815 AECS500 yyww | 5.00 | TO-252-2 | - 40°C to +85°C |

■ Ordering Information (Contd.)

| Part Number | Marking* | Output Voltage | Package | Operating Ambient Temperature Range |
|-----------------|----------------------------|----------------|----------|-------------------------------------|
| AME8815AECS500Z | AME8815 AECS500 yyww | 5.00 | TO-252-2 | - 40°C to +85°C |
| AME8815BECS150 | AME8815 BECS150 yyww | 1.50 | TO-252-2 | - 40°C to +85°C |
| AME8815BECS150Z | AME8815 BECS150 yyww | 1.50 | TO-252-2 | - 40°C to +85°C |
| AME8815BECS180 | AME8815 BECS180 yyww | 1.80 | TO-252-2 | - 40°C to +85°C |
| AME8815BECS180Z | AME8815 BECS180 yyww | 1.80 | TO-252-2 | - 40°C to +85°C |
| AME8815BECS190 | AME8815 BECS190 yyww | 1.90 | TO-252-2 | - 40°C to +85°C |
| AME8815BECS190Z | AME8815 BECS190 yyww | 1.90 | TO-252-2 | - 40°C to +85°C |
| AME8815BECS250 | AME8815 BECS250 yyww | 2.50 | TO-252-2 | - 40°C to +85°C |
| AME8815BECS250Z | AME8815 BECS250 yyww | 2.50 | TO-252-2 | - 40°C to +85°C |
| AME8815BECS330 | AME8815 BECS330 yyww | 3.30 | TO-252-2 | - 40°C to +85°C |
| AME8815BECS330Z | AME8815 BECS330 yyww | 3.30 | TO-252-2 | - 40°C to +85°C |
| AME8815BECS475 | AME8815 BECS475 yyww | 4.75 | TO-252-2 | - 40°C to +85°C |
| AME8815BECS475Z | AME8815 BECS475 yyww | 4.75 | TO-252-2 | - 40°C to +85°C |

■ Ordering Information (Contd.)

| Part Number | Marking* | Output Voltage | Package | Operating Ambient Temperature Range |
|-----------------|----------------------------|----------------|----------|-------------------------------------|
| AME8815BECS500 | AME8815 BECS500 yyww | 5.00 | TO-252-2 | - 40°C to +85°C |
| AME8815BECS500Z | AME8815 BECS500 yyww | 5.00 | TO-252-2 | - 40°C to +85°C |
| AME8815AEGT150 | ASPyww | 1.50 | SOT-223 | - 40°C to +85°C |
| AME8815AEGT150Z | ASPyww | 1.50 | SOT-223 | - 40°C to +85°C |
| AME8815AEGT180 | AQUyww | 1.80 | SOT-223 | - 40°C to +85°C |
| AME8815AEGT180Z | AQUyww | 1.80 | SOT-223 | - 40°C to +85°C |
| AME8815AEGT190 | BAYyww | 1.90 | SOT-223 | - 40°C to +85°C |
| AME8815AEGT190Z | BAYyww | 1.90 | SOT-223 | - 40°C to +85°C |
| AME8815AEGT250 | APRyww | 2.50 | SOT-223 | - 40°C to +85°C |
| AME8815AEGT250Z | APRyww | 2.50 | SOT-223 | - 40°C to +85°C |
| AME8815AEGT330 | AKCyww | 3.30 | SOT-223 | - 40°C to +85°C |
| AME8815AEGT330Z | AKCyww | 3.30 | SOT-223 | - 40°C to +85°C |
| AME8815AEGT475 | AQRyww | 4.75 | SOT-223 | - 40°C to +85°C |
| AME8815AEGT475Z | AQRyww | 4.75 | SOT-223 | - 40°C to +85°C |
| AME8815AEGT500 | AQSyww | 5.00 | SOT-223 | - 40°C to +85°C |
| AME8815AEGT500Z | AQSyww | 5.00 | SOT-223 | - 40°C to +85°C |
| AME8815BEGT150 | AJYyww | 1.50 | SOT-223 | - 40°C to +85°C |
| AME8815BEGT150Z | AJYyww | 1.50 | SOT-223 | - 40°C to +85°C |
| AME8815BEGT180 | AJZyww | 1.80 | SOT-223 | - 40°C to +85°C |
| AME8815BEGT180Z | AJZyww | 1.80 | SOT-223 | - 40°C to +85°C |
| AME8815BEGT250 | AKByww | 2.50 | SOT-223 | - 40°C to +85°C |
| AME8815BEGT250Z | AKByww | 2.50 | SOT-223 | - 40°C to +85°C |
| AME8815BEGT330 | AKDyww | 3.30 | SOT-223 | - 40°C to +85°C |
| AME8815BEGT330Z | AKDyww | 3.30 | SOT-223 | - 40°C to +85°C |
| AME8815BEGT390 | AQQyww | 3.90 | SOT-223 | - 40°C to +85°C |
| AME8815BEGT390Z | AQQyww | 3.90 | SOT-223 | - 40°C to +85°C |



AME8815

1.5A CMOS LDO

■ Ordering Information (Contd.)

| Part Number | Marking* | Output Voltage | Package | Operating Ambient Temperature Range |
|-----------------|----------|----------------|---------|-------------------------------------|
| AME8815BEGT475 | AMNyww | 4.75 | SOT-223 | - 40°C to +85°C |
| AME8815BEGT475Z | AMNyww | 4.75 | SOT-223 | - 40°C to +85°C |
| AME8815BEGT500 | AQTyww | 5.00 | SOT-223 | - 40°C to +85°C |
| AME8815BEGT500Z | AQTyww | 5.00 | SOT-223 | - 40°C to +85°C |
| AME8815BEGT190Z | CAGyww | 1.90 | SOT-223 | - 40°C to +85°C |

Note: yyww & yww represents the date code

* A line on top of the first letter represents lead free plating such as \bar{A} ME8815

Please consult AME sales office or authorized Rep./Distributor for the availability of output voltage and package type.

■ Absolute Maximum Ratings

| Parameter | Maximum | Unit |
|--------------------|-----------------------------|------|
| Input Voltage | -0.3 to +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.

* HBM B:2000V~3999V

■ Recommended Operating Conditions

| Parameter | Symbol | Rating | Unit |
|----------------------------|-----------|--------------|------|
| Ambient Temperature Range | T_A | - 40 to +85 | °C |
| Junction Temperature Range | T_J | - 40 to +125 | °C |
| Storage Temperature Range | T_{STG} | - 65 to +150 | °C |

■ Thermal Information

| Parameter | Package | Die Attach | Symbol | Maximum | Unit |
|---|-----------|----------------------|---------------|---------|--------|
| Thermal Resistance (Junction to Case) | *SOT-223 | Conductive Epoxy | θ_{JC} | 25 | °C / W |
| | | Non-Conductive Epoxy | | 31 | |
| | *TO-252-2 | Conductive Epoxy | | 5 | |
| | | Non-Conductive Epoxy | | 30 | |
| Thermal Resistance (Junction to Ambient) | SOT-223 | Conductive Epoxy | θ_{JA} | 120 | |
| | | Non-Conductive Epoxy | | 135 | |
| | TO-252-2 | Conductive Epoxy | | 90 | |
| | | Non-Conductive Epoxy | | 140 | |
| Internal Power Dissipation | SOT-223 | Conductive Epoxy | P_D | 900 | mW |
| | | Non-Conductive Epoxy | | 800 | |
| | TO-252-2 | Conductive Epoxy | | 1200 | |
| | | Non-Conductive Epoxy | | 1000 | |
| Maximum Junction Temperature | | | | 150 | °C |
| Solder Iron (10 Sec)** | | | | 350 | |

* Measure θ_{JC} on backside center of tab.

** MIL-STD-202G210F

■ 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 | $V_{DROPOUT}$ | $I_O = 1.5A$ $V_O = V_{O(NOM)} - 2.0\%$ | $1.4V < V_{O(NOM)} \leq 2.0V$ | 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} | $V_{IN} = V_{O(NOM)} + 1V, V_O < 0.4V$ | | 750 | | mA | |
| Quiescent Current | I_Q | $I_O = 0mA$ | | 45 | 70 | μA | |
| Ground Pin Current | I_{GND} | $I_O = 1mA$ to 1500mA | | 45 | | μA | |
| Line Regulation | REG_{LINE} | $I_O = 1mA$ $V_{IN} = V_O + 1$ 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 | $I_O = 100mA$ $C_O = 4.7\mu F$ | $f = 100Hz$ | | 70 | | dB |
| | | | $f = 1kHz$ | | 50 | | |
| | | | $f = 10kHz$ | | 20 | | |
| Output Voltage Noise | eN | $f = 10Hz$ to 100kHz $I_O = 10mA$ | | | 30 | μV_{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.

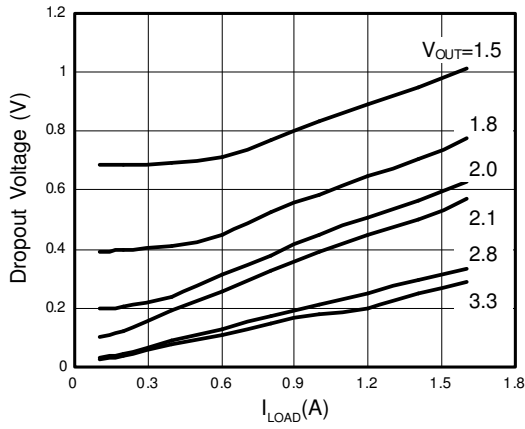
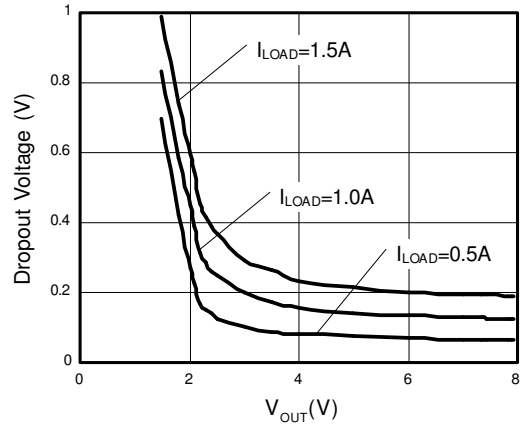
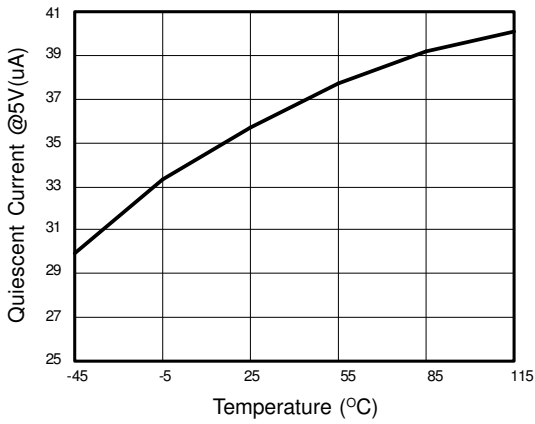
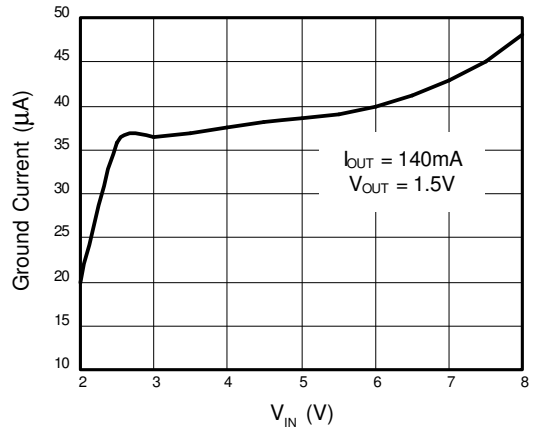
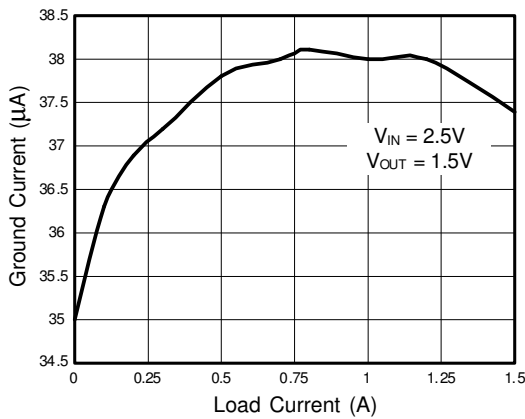
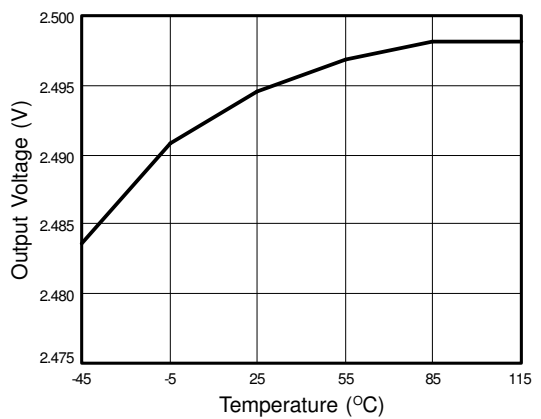
The AME8815 behaves like a current source when the load reaches 2.2A. However, if the load impedance drops below 0.3 ohms, the current drops back to 600mA to prevent excessive power dissipation. Normal operation is restored when the load resistance exceeds 0.75 ohms.

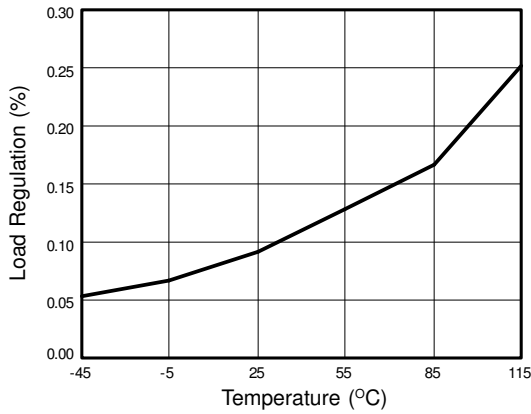
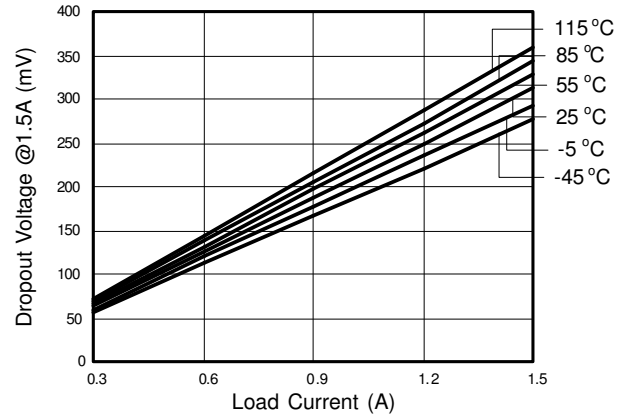
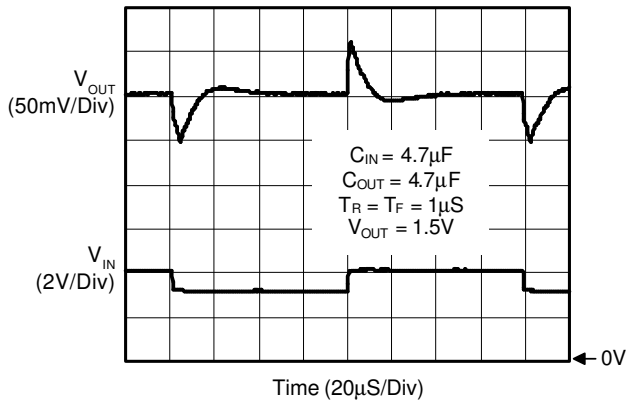
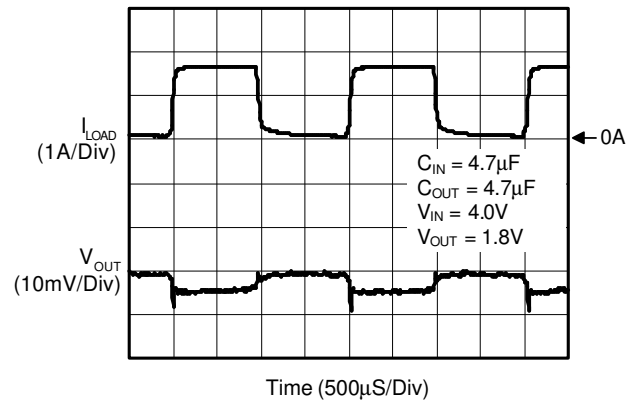
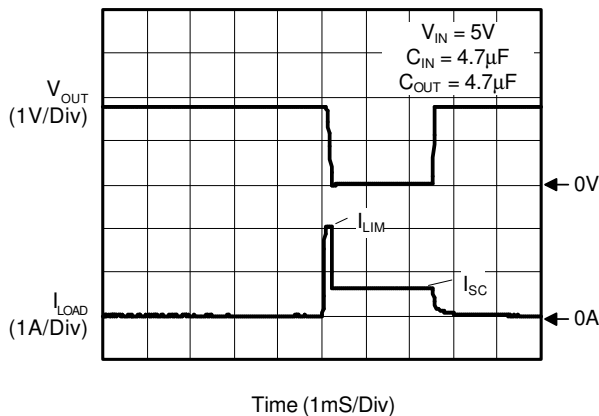
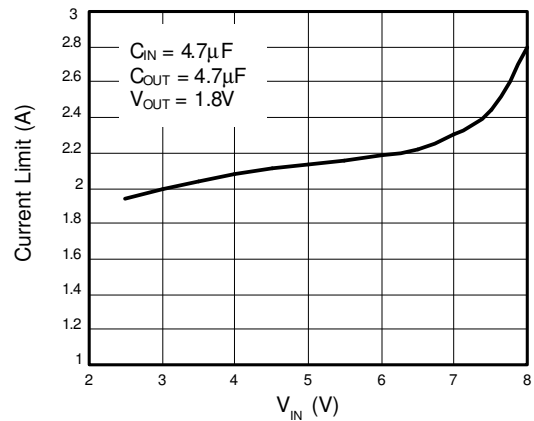
■ External Capacitors

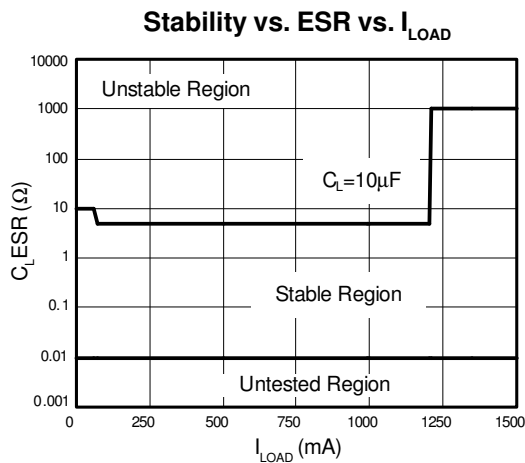
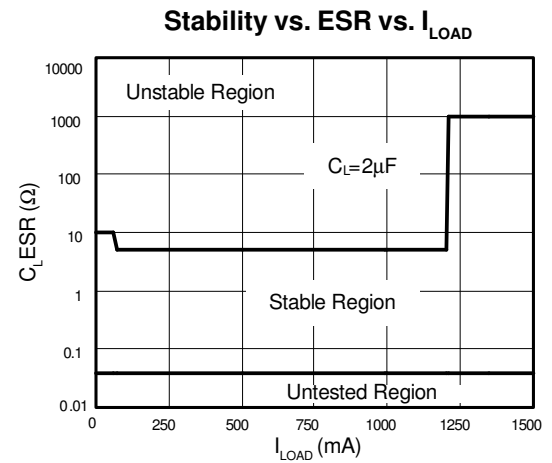
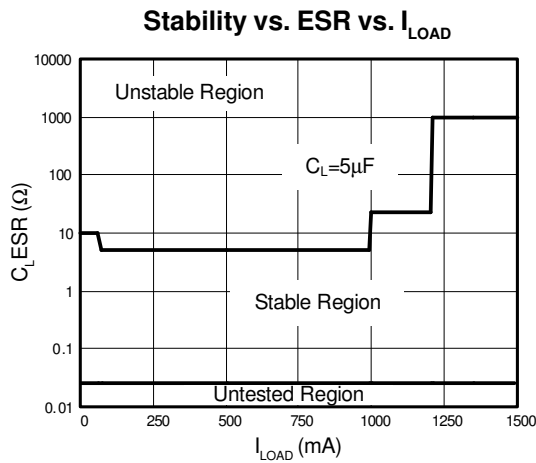
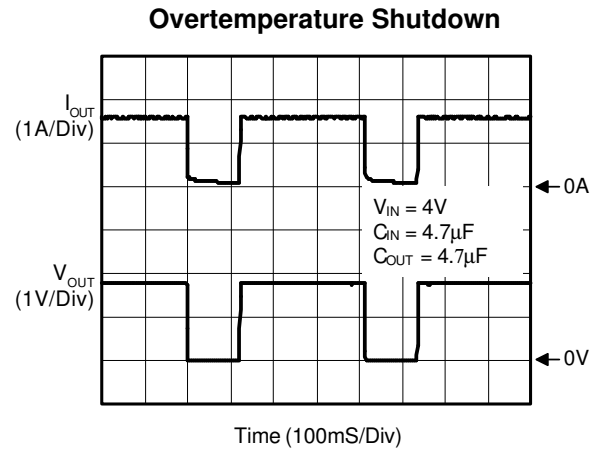
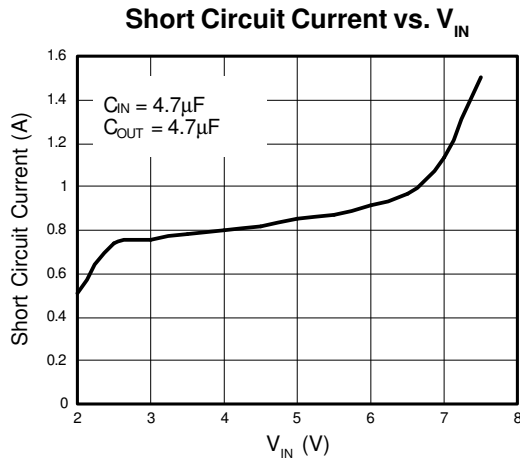
The AME8815 is stable with an output capacitor to ground of 4.7 μ F or greater. Ceramic capacitors have the lowest ESR, and will offer the best AC performance. Conversely, Aluminum Electrolytic capacitors exhibit the highest ESR, resulting in the poorest AC response. Unfortunately, large value ceramic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

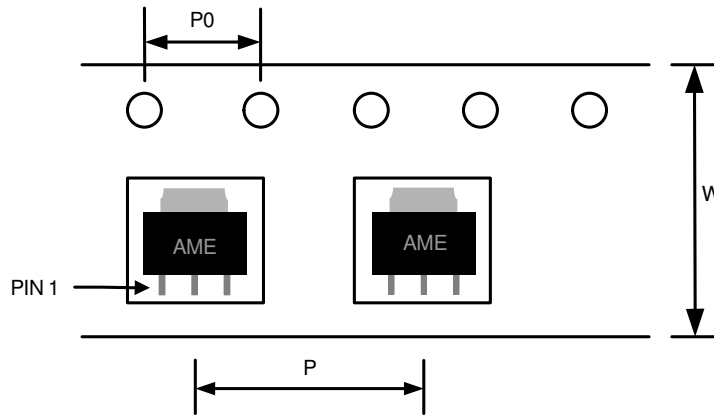
A second capacitor is recommended between the input and ground to stabilize V_{in} . The input capacitor should be at least 0.1 μ F to have a beneficial effect.

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.

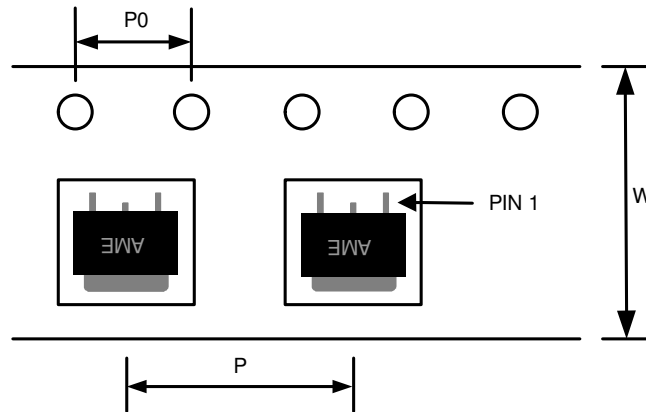
■ Characterization Curve
Dropout Voltage vs. I_{LOAD}

Dropout Voltage vs. V_{OUT}

Quiescent Current vs. Temperature

Ground Current vs. V_{IN}

Ground Current vs. Load Current

 V_{OUT} vs. Temperature (2.5V)


■ Characterization Curve (Contd.)
Load Regulation vs. Temperature

Dropout Voltage vs. Load Current (2.5V)

Line Transient Response

Load Step 40mA to 1.5A

Current Limit Response

Current Limit vs. V_{IN}


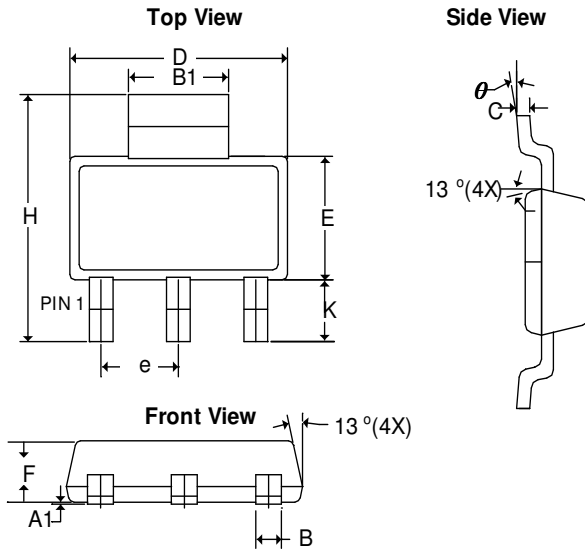
■ Characterization Curve (Contd.)


■ Tape and Reel Dimension
TO-223

Carrier Tape, Number of Components Per Reel and Reel Size

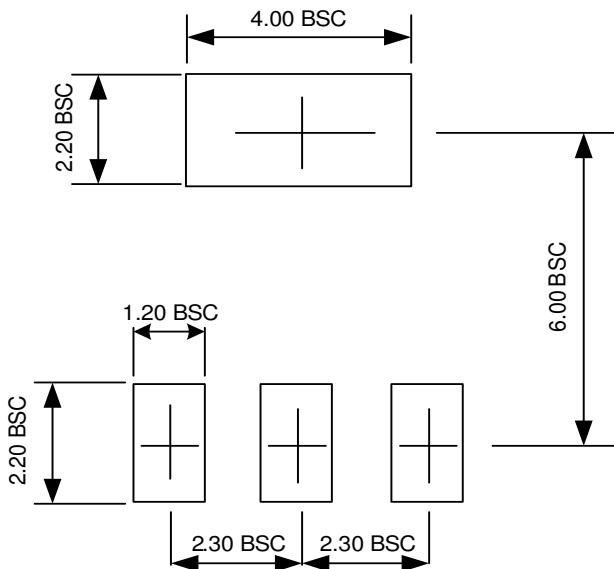
| Package | Carrier Width (W) | Pitch (P) | Pitch (P0) | Part Per Full Reel | Reel Size |
|---------|-------------------|------------|------------|--------------------|-----------|
| SOT-223 | 12.0±0.1 mm | 8.0±0.1 mm | 4.0±0.1 mm | 2500pcs | 330±1 mm |

SOT-252-2

Carrier Tape, Number of Components Per Reel and Reel Size

| Package | Carrier Width (W) | Pitch (P) | Pitch (P0) | Part Per Full Reel | Reel Size |
|----------|-------------------|------------|------------|--------------------|-----------|
| TO-252-2 | 16.0±0.1 mm | 8.0±0.1 mm | 4.0±0.1 mm | 2500pcs | 330±1 mm |

■ Package Dimension
SOT-223


| SYMBOLS | MILLIMETERS | | INCHES | |
|----------------|-------------|-------|------------|--------|
| | MIN | MAX | MIN | MAX |
| A ₁ | 0.01 | 0.10 | 0.0004 | 0.0039 |
| B | 0.60 | 0.84 | 0.0236 | 0.0330 |
| B ₁ | 2.90 | 3.15 | 0.1140 | 0.1240 |
| C | 0.23 | 0.38 | 0.0091 | 0.0150 |
| D | 6.20 | 6.71 | 0.2441 | 0.2640 |
| E | 3.30 | 3.71 | 0.1299 | 0.1460 |
| e | 2.30 BSC | | 0.0906 BSC | |
| F | 1.40 | 1.80 | 0.0551 | 0.0709 |
| H | 6.70 | 7.30 | 0.2638 | 0.2874 |
| K | 1.665 | 1.669 | 0.0656 | 0.0657 |
| θ | 0° | 10° | 0° | 10° |

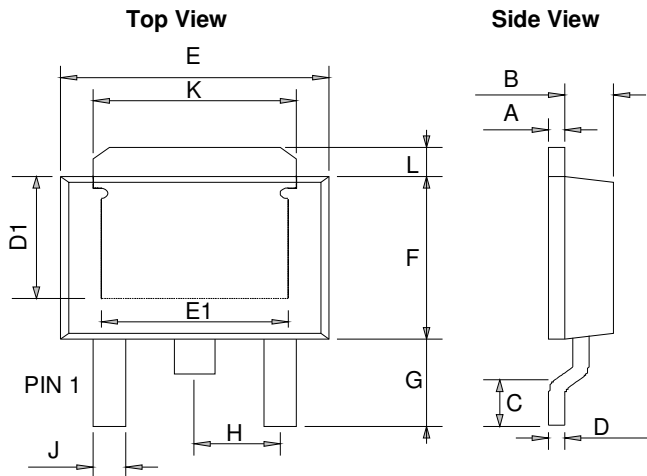
■ Lead Pattern Drawing

Note:

1. Lead pattern unit description:

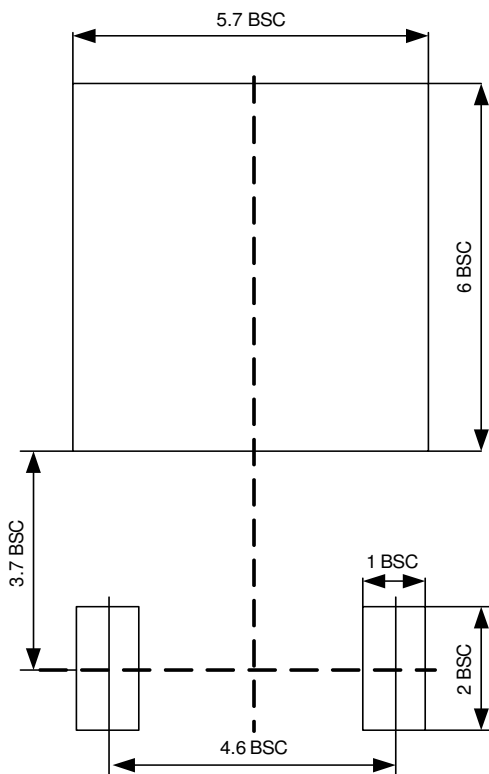
BSC: Basic. Represents theoretical exact dimension or dimension target.

2. Dimensions in Millimeters.

3. General tolerance $\pm 0.05\text{mm}$ unless otherwise specified.

■ Package Dimension (Contd.)
TO-252-2


| SYMBOLS | MILLIMETERS | | INCHES | |
|-----------|-------------|--------|------------|---------|
| | MIN | MAX | MIN | MAX |
| A | 0.43 | 0.58 | 0.0169 | 0.0230 |
| B | 1.60 | 1.95 | 0.0630 | 0.0768 |
| C | 0.51 | 1.78 | 0.0200 | 0.0701 |
| D | 0.43 | 0.60 | 0.0169 | 0.0236 |
| E | 6.35 | 6.80 | 0.2500 | 0.2677 |
| F | 5.36 | 7.20 | 0.2110 | 0.2835 |
| G | 2.20 | 3.00 | 0.0866 | 0.1181 |
| H | - | * 2.30 | - | *0.0906 |
| J | - | 0.97 | - | 0.0380 |
| K | 5.20 | 5.50 | 0.2047 | 0.2165 |
| L | 1.40 REF | | 0.0551 REF | |
| D1 | 3.80 REF | | 0.1496 REF | |
| E1 | 3.81 | 5.10 | 0.1500 | 0.2008 |

■ Lead Pattern Drawing

***: 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.

Note:

1. Lead pattern unit description:
BSC: Basic. Represents theoretical exact dimension or dimension target.
2. Dimensions in Millimeters.
3. General tolerance $\pm 0.05\text{mm}$ unless otherwise specified.



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