

■ General Description

The AME8802 family of positive, linear regulators feature low quiescent current (30 μ A typ.) with low dropout voltage, making them ideal for battery applications. The space-saving SOT-25 package is attractive for "Pocket" and "Hand Held" applications.

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

An additional feature is a "Power Good" detector, which pulls low when the output is out of regulation.

The AME8802 is stable with an output capacitance of 2.2 μ F or greater.

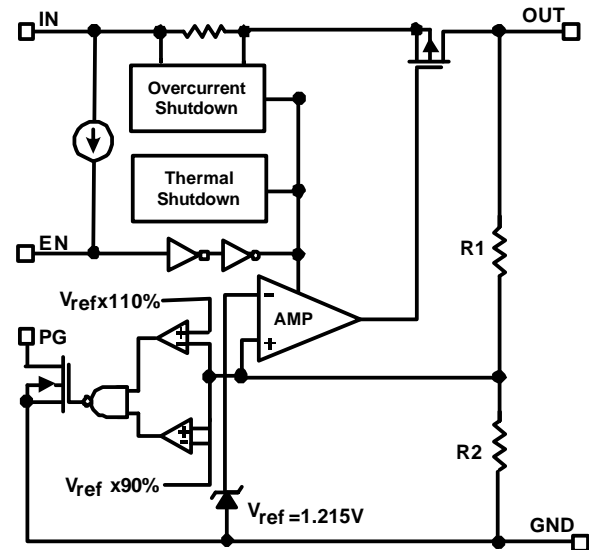
■ Features

- Very Low Dropout Voltage
- Guaranteed 300mA Output
- Accurate to within 1.5%
- 30 μ A Quiescent Current
- Over-Temperature Shutdown
- Current Limiting
- Short Circuit Current Fold-back
- Power Good Output Function
- Power-Saving Shutdown Mode
- Space-Saving SOT-25
- Factory Pre-set Output Voltages
- Low Temperature Coefficient
- All AME's Lead Free Products Meet RoHS Standards

■ Applications

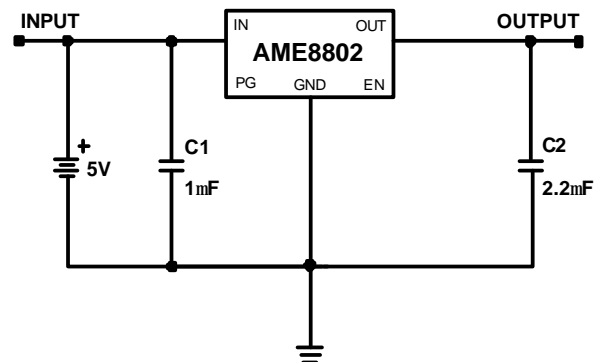
- Instrumentation
- Portable Electronics
- Wireless Devices
- Cordless Phones
- PC Peripherals
- Battery Powered Widgets
- Electronic Scales

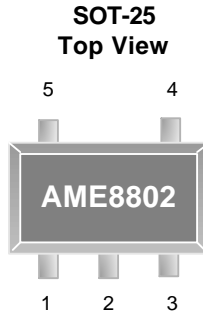
■ Functional Block Diagram



Note: If output voltage specification is lower than 1.215V, Vref will be trimmed to 1.2V

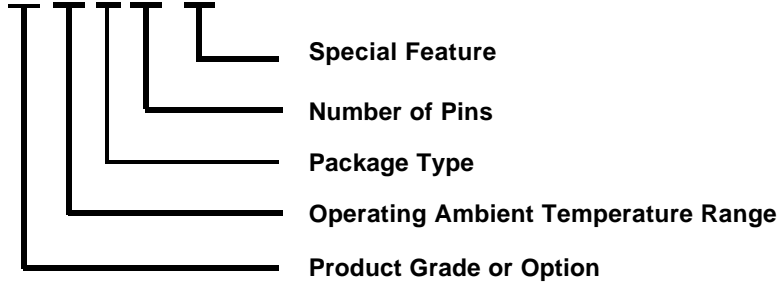
■ Typical Application



■ Pin Configuration

AME8802

1. V_{IN}
2. GND
3. EN
4. PG
5. V_{OUT}

* Die Attach:
Conductive Epoxy

■ Ordering Information
AME8802
X X X X X


| Product Grade or Option | Operating Ambient Temperature Range | Package Type | Number of Pins | Special Feature |
|--|-------------------------------------|--------------|----------------|--|
| A: 3.3V 1: 1.3V B: 3.0V 2: 2.0V C: 2.8V 3: 4.2V D: 2.5V 4: 4.0V E: 3.8V F: 3.6V G: 3.5V H: 2.7V I: 3.4V J: 2.85V K: 3.7V L: 1.5V M: 1.8V N: 2.9V O: 3.1V P: 4.1V Q: 4.75V R: 2.65V S: 5.0V U: 3.2V V: 3.15V W: 2.3V Y: 1.9V Z: 1.7V | E: -40°C to 85°C | E: SOT-2X | V: 5 | L: Low Profile Y: Lead Free & Low Profile Z: Lead Free |

■ Ordering Information (contd.)

| Part Number | Marking* | Output Voltage | Package | Operating Ambient Temperature Range |
|---------------|----------|----------------|---------|-------------------------------------|
| AME8802AEEV | AAKww | 3.3V | SOT-25 | - 40°C to + 85°C |
| AME8802AEEVL | AAKww | 3.3V | TSOT-25 | - 40°C to + 85°C |
| AME8802AEEVY | AAKww | 3.3V | TSOT-25 | - 40°C to + 85°C |
| AME8802AEEVZ | AAKww | 3.3V | SOT-25 | - 40°C to + 85°C |
| AME8802BEEV | AALww | 3.0V | SOT-25 | - 40°C to + 85°C |
| AME8802BEEVL | AALww | 3.0V | TSOT-25 | - 40°C to + 85°C |
| AME8802BEEVY | AALww | 3.0V | TSOT-25 | - 40°C to + 85°C |
| AME8802BEEVZ | AALww | 3.0V | SOT-25 | - 40°C to + 85°C |
| AME8802CEEV | AAMww | 2.8V | SOT-25 | - 40°C to + 85°C |
| AME8802CEEVL | AAMww | 2.8V | TSOT-25 | - 40°C to + 85°C |
| AME8802CEEVY | AAMww | 2.8V | TSOT-25 | - 40°C to + 85°C |
| AME8802CEEVZ | AAMww | 2.8V | SOT-25 | - 40°C to + 85°C |
| AME8802DEEV | AANww | 2.5V | SOT-25 | - 40°C to + 85°C |
| AME8802DEEVL | AANww | 2.5V | TSOT-25 | - 40°C to + 85°C |
| AME8802DEEVY | AANww | 2.5V | TSOT-25 | - 40°C to + 85°C |
| AME8802DEEVZ | AANww | 2.5V | SOT-25 | - 40°C to + 85°C |
| AME8802EEEEV | AAOww | 3.8V | SOT-25 | - 40°C to + 85°C |
| AME8802EEEEVL | AAOww | 3.8V | TSOT-25 | - 40°C to + 85°C |
| AME8802EEEEVY | AAOww | 3.8V | TSOT-25 | - 40°C to + 85°C |
| AME8802EEEEVZ | AAOww | 3.8V | SOT-25 | - 40°C to + 85°C |
| AME8802FEEV | ABPww | 3.6V | SOT-25 | - 40°C to + 85°C |
| AME8802FEEVL | ABPww | 3.6V | TSOT-25 | - 40°C to + 85°C |
| AME8802FEEVY | ABPww | 3.6V | TSOT-25 | - 40°C to + 85°C |
| AME8802FEEVZ | ABPww | 3.6V | SOT-25 | - 40°C to + 85°C |

Note: ww represents the date code and pls refer to Date Code Rule before Package Dimension.

* A line on top of the first character represents lead free plating such as \overline{A} AKww.

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

■ Ordering Information (contd.)

| Part Number | Marking* | Output Voltage | Package | Operating Ambient Temperature Range |
|--------------|----------|----------------|---------|-------------------------------------|
| AME8802GEEV | ACGww | 3.5V | SOT-25 | - 40°C to + 85°C |
| AME8802GEEVL | ACGww | 3.5V | TSOT-25 | - 40°C to + 85°C |
| AME8802GEEVY | ACGww | 3.5V | TSOT-25 | - 40°C to + 85°C |
| AME8802GEEVZ | ACGww | 3.5V | SOT-25 | - 40°C to + 85°C |
| AME8802HEEV | AEHww | 2.7V | SOT-25 | - 40°C to + 85°C |
| AME8802HEEVL | AEHww | 2.7V | TSOT-25 | - 40°C to + 85°C |
| AME8802HEEVY | AEHww | 2.7V | TSOT-25 | - 40°C to + 85°C |
| AME8802HEEVZ | AEHww | 2.7V | SOT-25 | - 40°C to + 85°C |
| AME8802IEEV | AEPww | 3.4V | SOT-25 | - 40°C to + 85°C |
| AME8802IEEVL | AEPww | 3.4V | TSOT-25 | - 40°C to + 85°C |
| AME8802IEEVY | AEPww | 3.4V | TSOT-25 | - 40°C to + 85°C |
| AME8802IEEVZ | AEPww | 3.4V | SOT-25 | - 40°C to + 85°C |
| AME8802JEEV | AGRww | 2.85V | SOT-25 | - 40°C to + 85°C |
| AME8802JEEVL | AGRww | 2.85V | TSOT-25 | - 40°C to + 85°C |
| AME8802JEEVY | AGRww | 2.85V | TSOT-25 | - 40°C to + 85°C |
| AME8802JEEVZ | AGRww | 2.85V | SOT-25 | - 40°C to + 85°C |
| AME8802KEEV | AHTww | 3.7V | SOT-25 | - 40°C to + 85°C |
| AME8802KEEVL | AHTww | 3.7V | TSOT-25 | - 40°C to + 85°C |
| AME8802KEEVY | AHTww | 3.7V | TSOT-25 | - 40°C to + 85°C |
| AME8802KEEVZ | AHTww | 3.7V | SOT-25 | - 40°C to + 85°C |
| AME8802LEEV | AJMww | 1.5V | SOT-25 | - 40°C to + 85°C |
| AME8802LEEVL | AJMww | 1.5V | TSOT-25 | - 40°C to + 85°C |
| AME8802LEEVY | AJMww | 1.5V | TSOT-25 | - 40°C to + 85°C |
| AME8802LEEVZ | AJMww | 1.5V | SOT-25 | - 40°C to + 85°C |

■ Ordering Information

| Part Number | Marking* | Output Voltage | Package | Operating Ambient Temperature Range |
|--------------|----------|----------------|---------|-------------------------------------|
| AME8802MEEV | AJNww | 1.8V | SOT-25 | - 40°C to + 85°C |
| AME8802MEEVL | AJNww | 1.8V | TSOT-25 | - 40°C to + 85°C |
| AME8802MEEVY | AJNww | 1.8V | TSOT-25 | - 40°C to + 85°C |
| AME8802MEEVZ | AJNww | 1.8V | SOT-25 | - 40°C to + 85°C |
| AME8802NEEV | AKQww | 2.9V | SOT-25 | - 40°C to + 85°C |
| AME8802NEEVL | AKQww | 2.9V | TSOT-25 | - 40°C to + 85°C |
| AME8802NEEVY | AKQww | 2.9V | TSOT-25 | - 40°C to + 85°C |
| AME8802NEEVZ | AKQww | 2.9V | SOT-25 | - 40°C to + 85°C |
| AME8802OEEV | AKRww | 3.1V | SOT-25 | - 40°C to + 85°C |
| AME8802OEEVL | AKRww | 3.1V | TSOT-25 | - 40°C to + 85°C |
| AME8802OEEVY | AKRww | 3.1V | TSOT-25 | - 40°C to + 85°C |
| AME8802OEEVZ | AKRww | 3.1V | SOT-25 | - 40°C to + 85°C |
| AME8802SEEV | AQYww | 5.0V | SOT-25 | - 40°C to + 85°C |
| AME8802SEEVL | AQYww | 5.0V | TSOT-25 | - 40°C to + 85°C |
| AME8802SEEVY | AQYww | 5.0V | TSOT-25 | - 40°C to + 85°C |
| AME8802SEEVZ | AQYww | 5.0V | SOT-25 | - 40°C to + 85°C |
| AME8802UEEV | ASDww | 3.2V | SOT-25 | - 40°C to + 85°C |
| AME8802UEEVL | ASDww | 3.2V | TSOT-25 | - 40°C to + 85°C |
| AME8802UEEVY | ASDww | 3.2V | TSOT-25 | - 40°C to + 85°C |
| AME8802UEEVZ | ASDww | 3.2V | SOT-25 | - 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 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 |

■ Thermal Information

| Parameter | Package | Die Attach | Symbol | Maximum | Unit |
|---|---------|------------------|---------------|---------|--------|
| Thermal Resistance * (Junction to Case) | SOT-25 | Conductive Epoxy | θ_{JC} | 81 | °C / W |
| Thermal Resistance (Junction to Ambient) | | | θ_{JA} | 260 | |
| Internal Power Dissipation | | | P_D | 400 | mW |
| Maximum Junction Temperature | | | | 150 | °C |
| Solder Iron (10Sec)** | | | | 350 | °C |

* Measure θ_{JC} on center of molding compound if IC has no tab.

** MIL-STD-202G 210F

■ Electrical Specifications

TA = 25°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 | $V_{DROPOUT}$ | $I_O=300mA$ $V_O=V_{O(NOM)}-2.0\%$ | $1.2V \leq V_{O(NOM)} \leq 2.0V$ | See chart | 1300 | mV | |
| | | | $2.0V < V_{O(NOM)} \leq 2.8V$ | | 400 | | |
| | | | $2.8V < V_{O(NOM)}$ | | 300 | | |
| Output Current | I_O | $V_O > 1.2V$ | 300 | | | mA | |
| Current Limit | I_{LIM} | $V_O > 1.2V$ | 300 | 450 | | mA | |
| Short Circuit Current | I_{SC} | $V_O < 0.8V$ | | 150 | 300 | mA | |
| Quiescent Current | I_Q | $I_O=0mA$ | | 30 | 50 | μA | |
| Ground Pin Current | I_{GND} | $I_O=1mA$ to 300mA | | 35 | | μA | |
| Line Regulation | REG_{LINE} | $I_O=1mA$ $V_{IN}=V_O+1$ to V_O+2 | $1.2V \leq V_O \leq 1.4V$ | -0.2 | | 0.2 | % |
| | | | $1.4V < V_O \leq 2.0V$ | -0.15 | | 0.15 | |
| | | | $2.0V < V_O < 4.0V$ | -0.1 | 0.02 | 0.1 | |
| | | | $4.0V \leq V_O$ | -0.4 | 0.2 | 0.4 | |
| Load Regulation | REG_{LOAD} | $I_O=1mA$ to 300mA | -1 | 0.2 | 1 | % | |
| Over Temperature Shutdown | OTS | | | 150 | | °C | |
| Over Temperature Hysteresis | OTH | | | 30 | | °C | |
| V_O Temperature Coefficient | TC | | | 30 | | ppm/°C | |
| Power Supply Rejection | PSRR | $I_O=100mA$ $C_O=2.2\mu F$ | $f=100Hz$ | | 60 | dB | |
| | | | $f=1kHz$ | | 50 | | |
| | | | $f=10kHz$ | | 20 | | |
| Output Voltage Noise | eN | $f=10Hz$ to 100kHz $I_O=10mA$ | | | 30 | μV_{rms} | |
| EN Input Threshold | V_{EH} | $V_{IN}=2.7V$ to 7V | 2.0 | | V_{in} | V | |
| | V_{EL} | $V_{IN}=2.7V$ to 7V | 0 | | 0.4 | V | |
| EN Input Bias Current | I_{EH} | $V_{EN}=V_{IN}$, $V_{IN}=2.7V$ to 7V | | | 0.1 | μA | |
| | I_{EL} | $V_{EN}=0V$, $V_{IN}=2.7V$ to 7V | | | 0.5 | μA | |
| Shutdown Supply Current | I_{SD} | $V_{IN}=5V$, $V_O=0V$, $V_{EN}<V_{EL}$ | | 0.5 | 1 | μA | |
| Shutdown Output Voltage | $V_{O,SD}$ | $I_O=0.4mA$, $V_{EN}<V_{EL}$ | 0 | | 0.4 | V | |
| Output Under Voltage | V_{UV} | $2.5V \leq V_{O(NOM)} \leq 5.0V$ | | | 85 | % $V_{O(NOM)}$ | |
| | | $1.2V \leq V_{O(NOM)} < 2.5V$ | | | 75 | | |
| Output Over Voltage | V_{OV} | $2.5V \leq V_{O(NOM)} \leq 5.0V$ | 115 | | | % $V_{O(NOM)}$ | |
| | | $1.2V \leq V_{O(NOM)} < 2.5V$ | 125 | | | | |
| PG Leakage Current | I_{LC} | $V_{PG}=7V$ | | | 1 | μA | |
| PG Voltage Rating | V_{PG} | V_O in regulation | | | 7 | V | |
| PG Voltage Low | V_{OL} | $I_{SINK}=0.4mA$ | | | 0.4 | V | |

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



■ Detailed Description

The AME8802 family of CMOS regulators contain a PMOS pass transistor, voltage reference, error amplifier, over-current protection, thermal shutdown, and power good function.

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 300mA. During thermal shutdown, the output voltage remains low. Normal operation is restored when the junction temperature drops below 120°C.

The AME8802 switches from voltage mode to current mode when the load exceeds the rated output current. This prevents over-stress. The AME8802 also incorporates current foldback to reduce power dissipation when the output is short circuited. This feature becomes active when the output drops below 0.8volts, and reduces the current flow by 65%. Full current is restored when the voltage exceeds 0.8 volts.

■ External Capacitors

The AME8802 is stable with an output capacitor to ground of 2.2 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.

■ Enable

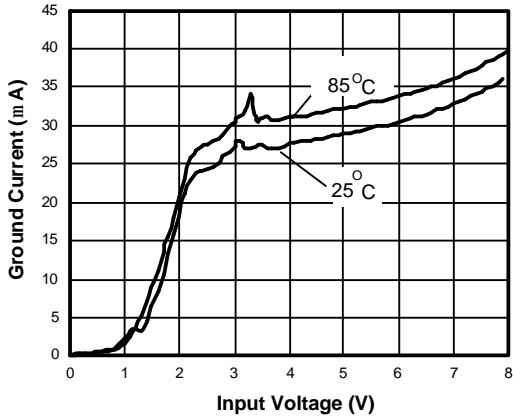
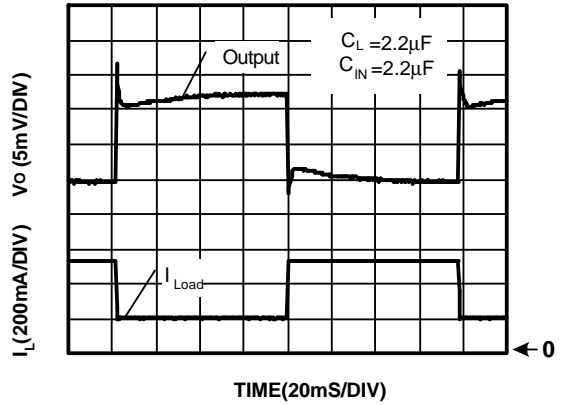
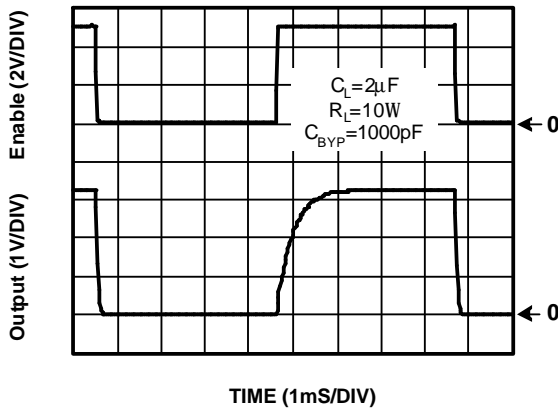
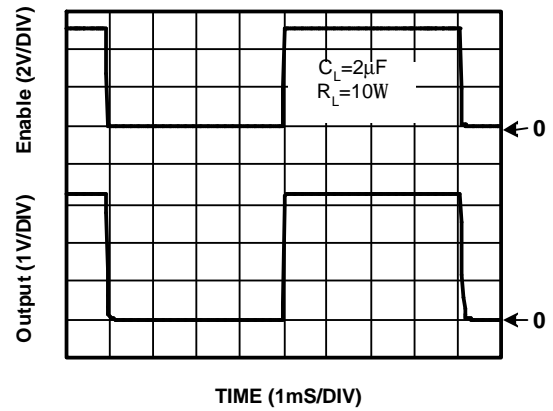
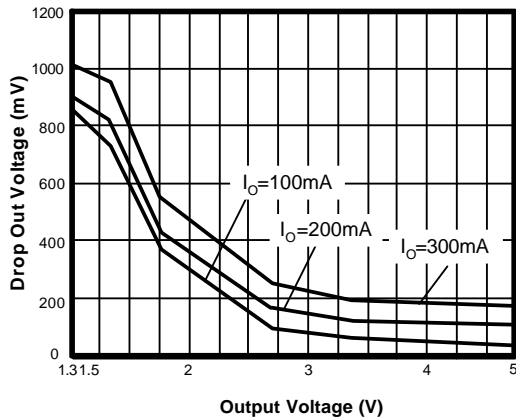
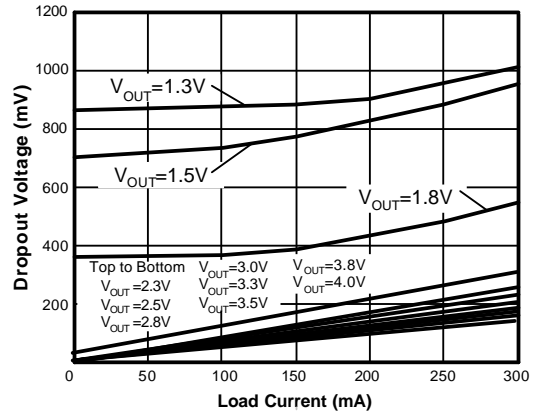
The Enable pin normally floats high. When actively, pulled low, the PMOS pass transistor shuts off, and all internal circuits are powered down. In this state, the quiescent current is less than 1 μ A. This pin behaves much like an electronic switch.

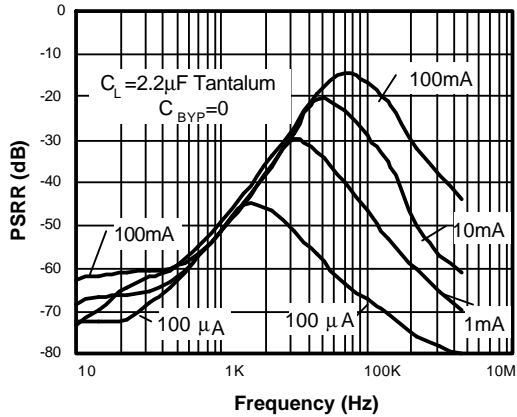
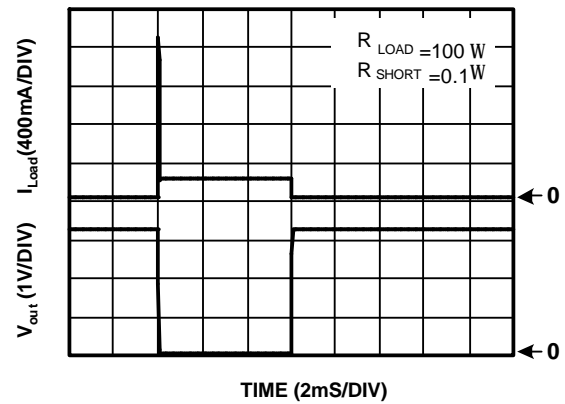
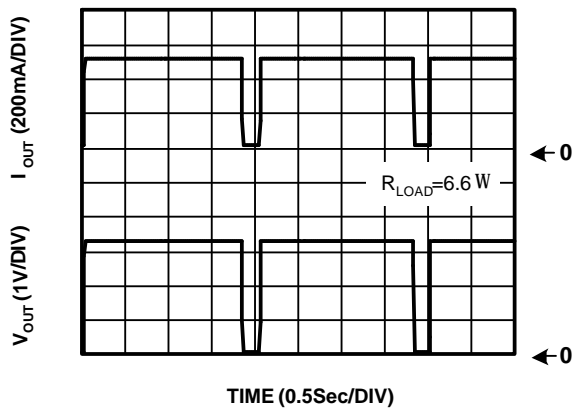
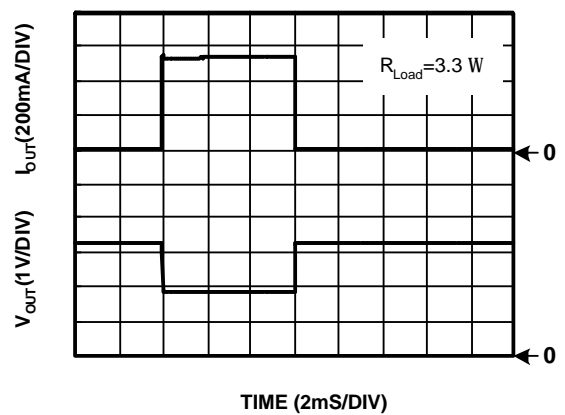
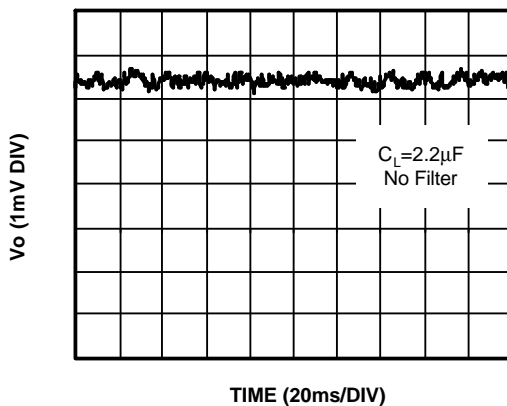
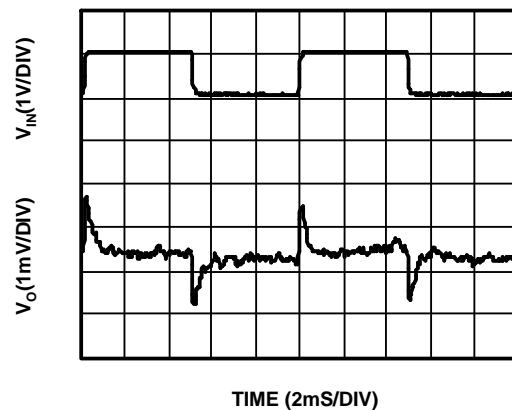
■ Power Good

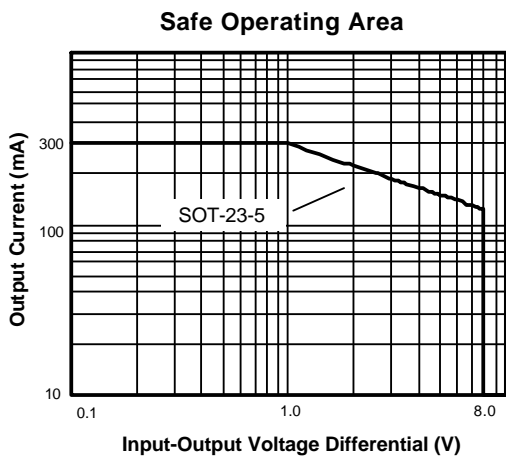
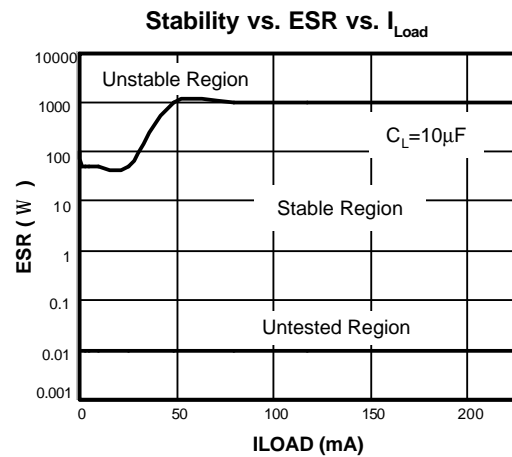
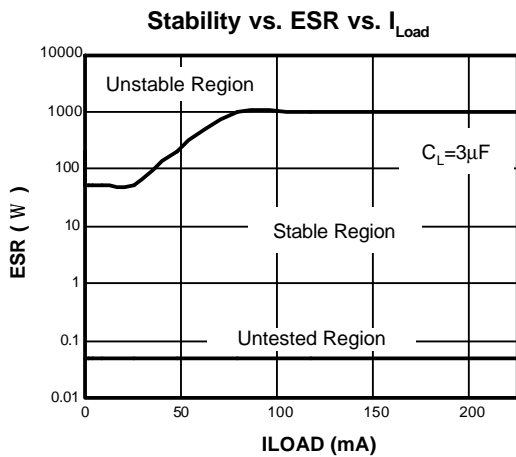
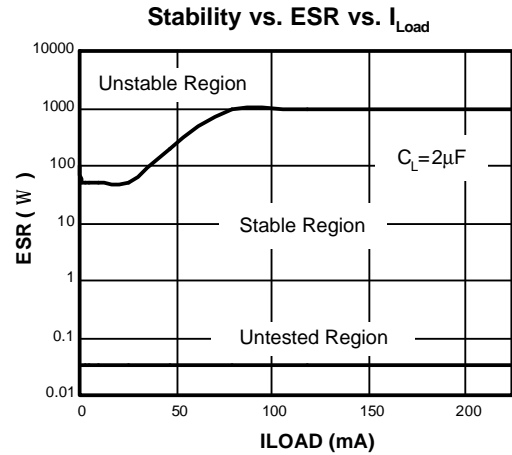
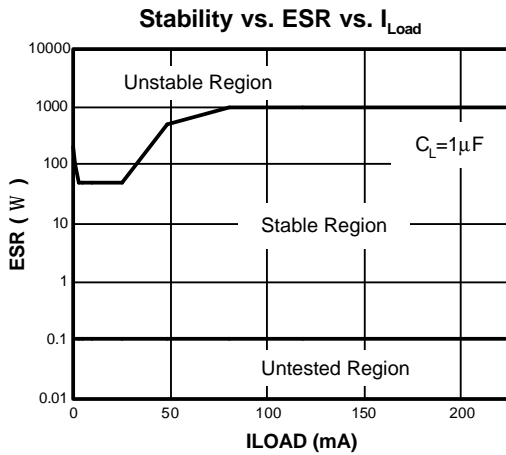
The AME8802 includes the Power Good feature. When the output is not within $\pm 5\%$ of the specified voltage, it pulls low. This can occur under the following conditions:

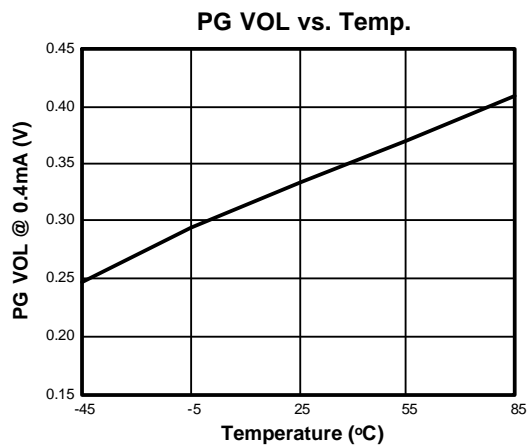
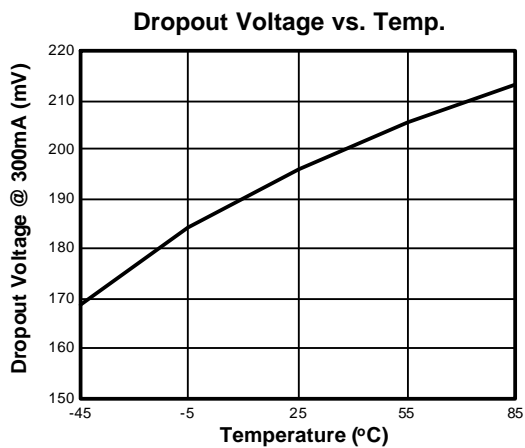
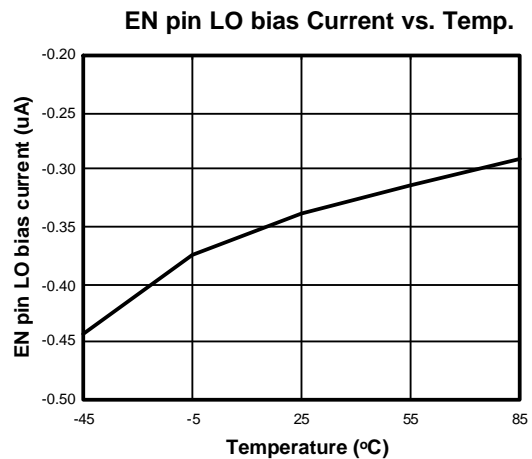
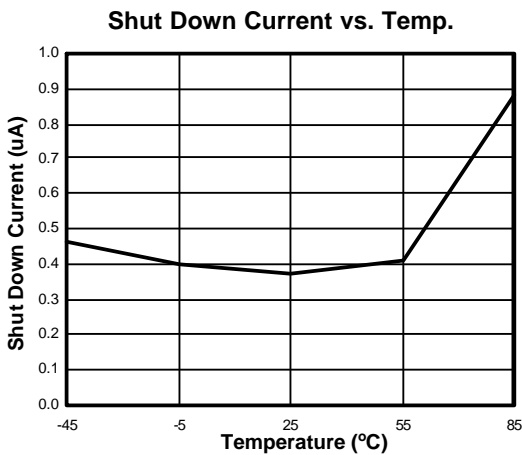
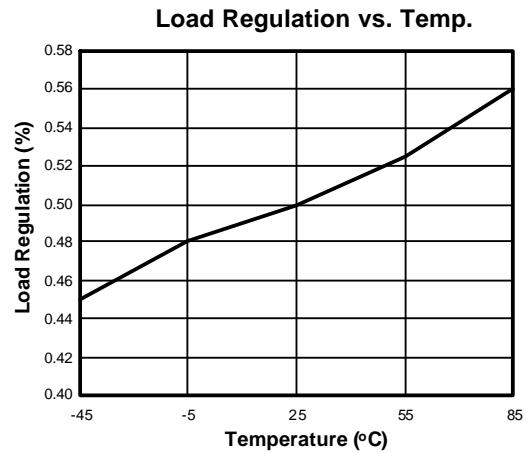
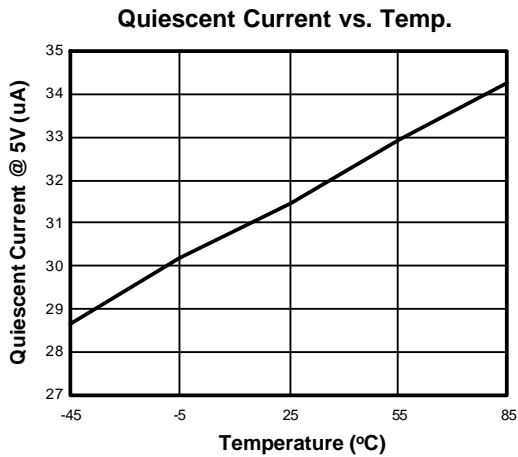
- 1) Input Voltage too low.
- 2) During Over-Temperature.
- 3) During Over-Current.
- 4) If output is pulled up.

(Note: PG pin is an open-drain output.)

Ground Current vs. Input Voltage

Load Step (1mA-300mA)

Chip Enable Transient Response

Chip Enable Transient Response

Drop Out Voltage vs. Output Voltage

Drop Out Voltage vs. Load Current


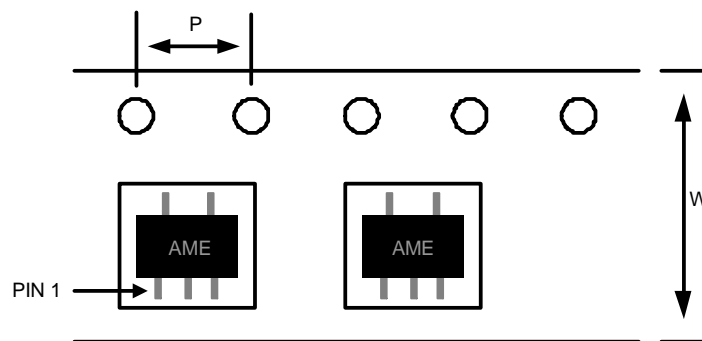
Power Supply Rejection Ratio

Short Circuit Response

Overtemperature Shutdown

Current Limit Response

Noise Measurement

Line Transient Response




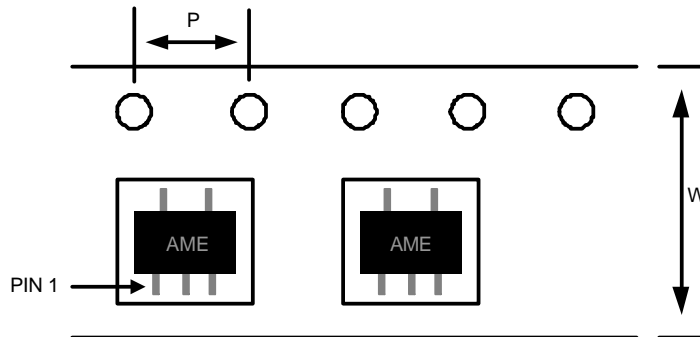


■ Date Code Rule

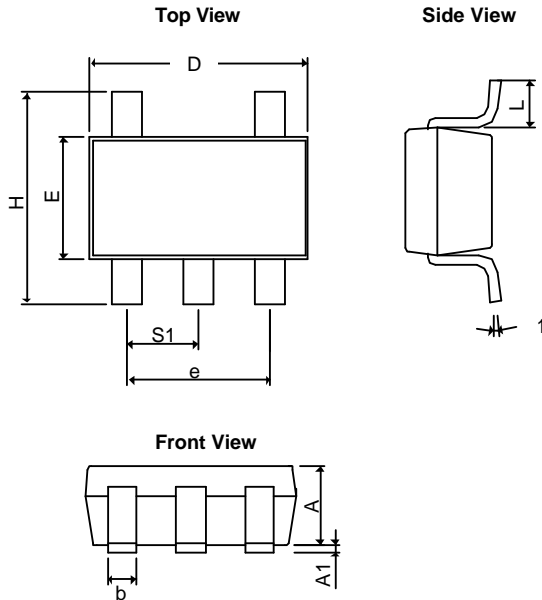
| Marking | | | Date Code | | Year |
|---------|----------|----------|-----------|----------|------|
| A | A | A | W | W | xxx0 |
| A | A | A | W | <u>W</u> | xxx1 |
| A | A | A | <u>W</u> | W | xxx2 |
| A | A | A | <u>W</u> | <u>W</u> | xxx3 |
| A | A | <u>A</u> | W | W | xxx4 |
| A | A | <u>A</u> | W | <u>W</u> | xxx5 |
| A | A | <u>A</u> | <u>W</u> | W | xxx6 |
| A | A | <u>A</u> | <u>W</u> | <u>W</u> | xxx7 |
| A | <u>A</u> | A | W | W | xxx8 |
| A | <u>A</u> | A | W | <u>W</u> | xxx9 |

■ Tape and Reel Dimension
SOT-25

Carrier Tape, Number of Components Per Reel and Reel Size

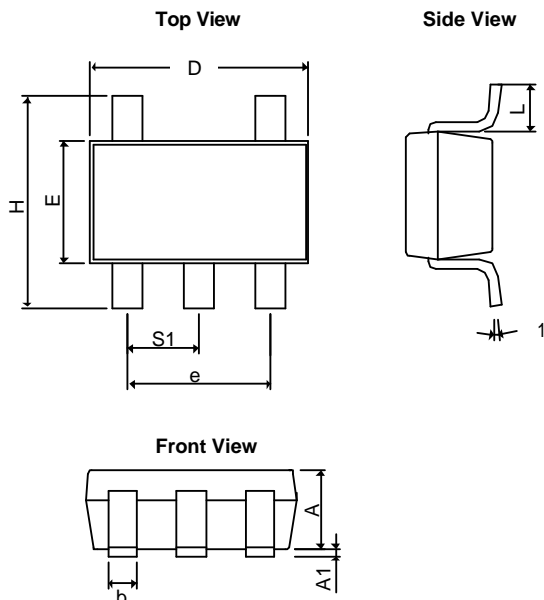
| Package | Carrier Width (W) | Pitch (P) | Part Per Full Reel | Reel Size |
|---------|-------------------|------------|--------------------|-----------|
| SOT-25 | 8.0±0.1 mm | 4.0±0.1 mm | 3000pcs | 180±1 mm |

■ Tape and Reel Dimension
TSOT-25

Carrier Tape, Number of Components Per Reel and Reel Size

| Package | Carrier Width (W) | Pitch (P) | Part Per Full Reel | Reel Size |
|---------|-------------------|------------|--------------------|-----------|
| TSOT-25 | 8.0±0.1 mm | 4.0±0.1 mm | 3000pcs | 180±1 mm |

■ Package Dimension
SOT-25


| SYMBOLS | MILLIMETERS | | INCHES | |
|----------------------|-------------|------|-------------|---------|
| | MIN | MAX | MIN | MAX |
| A | 1.20REF | | 0.0472REF | |
| A₁ | 0.00 | 0.15 | 0.0000 | 0.0059 |
| b | 0.30 | 0.55 | 0.0118 | 0.0217 |
| D | 2.70 | 3.10 | 0.1063 | 0.1220 |
| E | 1.40 | 1.80 | 0.0551 | 0.0709 |
| e | 1.90 BSC | | 0.07480 BSC | |
| H | 2.60 | 3.00 | 0.10236 | 0.11811 |
| L | 0.37BSC | | 0.0146BSC | |
| q₁ | 0° | 10° | 0° | 10° |
| S₁ | 0.95BSC | | 0.0374BSC | |

TSOT-25


| SYMBOLS | MILLIMETERS | | INCHES | |
|------------------------|-------------|------|-------------|---------|
| | MIN | MAX | MIN | MAX |
| A+A₁ | 0.90 | 1.25 | 0.0354 | 0.0492 |
| b | 0.30 | 0.50 | 0.0118 | 0.0197 |
| c | 0.09 | 0.25 | 0.0035 | 0.0098 |
| D | 2.70 | 3.10 | 0.1063 | 0.1220 |
| E | 1.40 | 1.80 | 0.0551 | 0.0709 |
| e | 1.90 BSC | | 0.07480 BSC | |
| H | 2.40 | 3.00 | 0.09449 | 0.11811 |
| L | 0.35BSC | | 0.0138BSC | |
| q₁ | 0° | 10° | 0° | 10° |
| S₁ | 0.95BSC | | 0.0374BSC | |



www.ame.com.tw
E-Mail: sales@ame.com.tw

Life Support Policy:

These products of AME, Inc. are not authorized for use as critical components in life-support devices or systems, without the express written approval of the president of AME, Inc.

AME, Inc. reserves the right to make changes in the circuitry and specifications of its devices and advises its customers to obtain the latest version of relevant information.

© AME, Inc. , March 2006

Document: 2006/2095-DS8802-K.01

Corporate Headquarter
AME, Inc.

2F, 302 Rui-Guang Road, Nei-Hu District
Taipei 114, Taiwan.
Tel: 886 2 2627-8687
Fax: 886 2 2659-2989

U.S.A.(Subsidiary)
Analog Microelectronics, Inc.

3100 De La Cruz Blvd., Suite 201
Santa Clara, CA. 95054-2046
Tel : (408) 988-2388
Fax: (408) 988-2489