■ General Description

The AME8802 family of positive, linear regulators feature low quiescent current (30μA 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 2.2μF or greater.

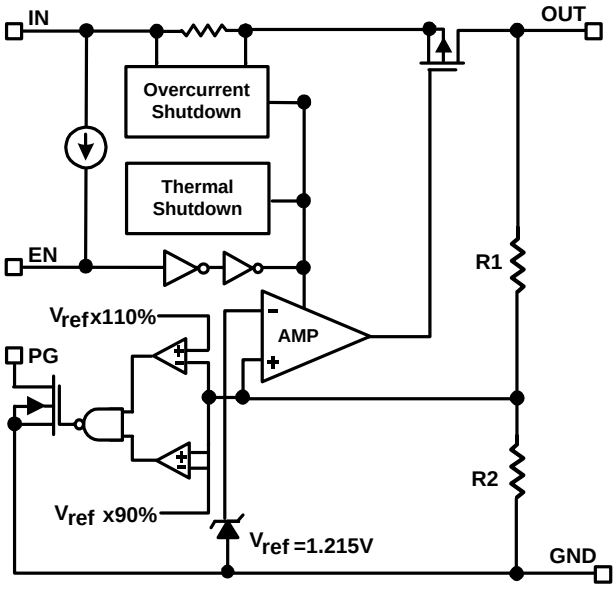
■ Features

- Very Low Dropout Voltage
- Guaranteed 300mA Output
- Accurate to within 1.5%
- 30μA 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

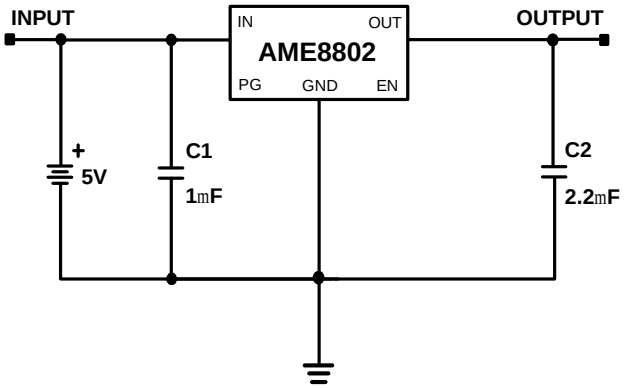
- Instrumentation
- Portable Electronics
- Wireless Devices
- Cordless Phones
- PC Peripherals
- Battery Powered Widgets
- Electronic Scales

■ Functional Block Diagram



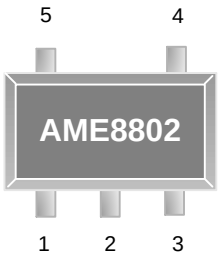
Note: If output voltage specification is lower than 1.215V, Vref will be trimmed to 1.2V

■ Typical Application



■ Pin Configuration

SOT-25
Top View



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

- **Special Feature**
- **Number of Pins**
- **Package Type**
- **Operating Ambient Temperature Range**
- **Product Grade or Option**

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

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
AME8802EEEV	AAOww	3.8V	SOT-25	- 40°C to +85°C
AME8802EEEVL	AAOww	3.8V	TSOT-25	- 40°C to +85°C
AME8802EEEVY	AAOww	3.8V	TSOT-25	- 40°C to +85°C
AME8802EEEVZ	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<=$V_{O(NOM)}$<=2.0V		See chart	1300	mV
			2.0V<$V_{O(NOM)}$<=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 <= V_O <= 1.4V	-0.2		0.2	%
			1.4V < V_O <= 2.0V	-0.15		0.15	
			2.0V< V_O < 4.0V	-0.1	0.02	0.1	
			4.0V <= Vo	-0.4	0.2	0.4	
Load Regulation	REG_{LOAD}	I_O=1mA to 300mA		-1	0.2	1	%
Over Temerature Shutdown	OTS				150		°C
Over Temerature Hysterisis	OTH				30		°C
V_O Temperature Coefficient	TC				30		ppm/°C
Power Supply Rejection	PSRR	I_O=100mA C_O=2.2µF	f =100Hz		60		dB
			f =1kHz		50		
			f =10kHz		20		
Output Voltage Noise	eN	f=10Hz to 100kHz I_O=10mA	Co=2.2µF		30		µVrms
EN Input Threshold	V_{EH}	V_{IN}=2.7V to 7V		2.0		Vin	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 <= $V_{O(NOM)}$ <= 5.0V				85	%$V_{O(NOM)}$
		1.2V <= $V_{O(NOM)}$ < 2.5V				75	
Output Over Voltage	V_{OV}	2.5V <= $V_{O(NOM)}$ <= 5.0V		115			%$V_{O(NOM)}$
		1.2V <= $V_{O(NOM)}$ < 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 2.2μF 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.

■ 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 1μA. This pin behaves much like an electronic switch.

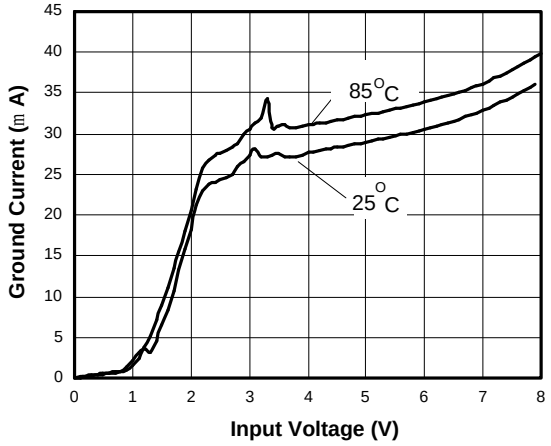
■ Power Good

The AME8802 includes the Power Good feature. When the output is not within ±15% of the specified voltage, it pulls low. This can occur under the following conditions:

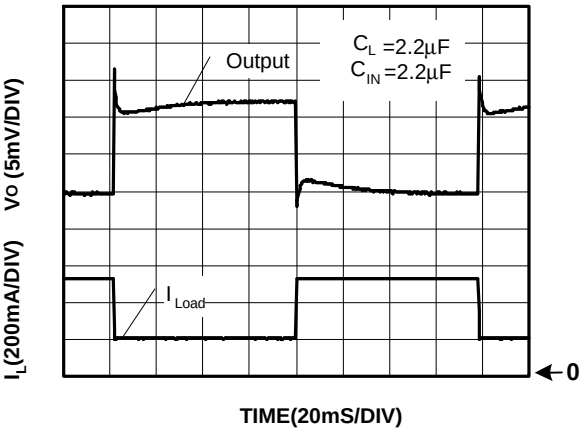
1) Input Voltage too low.
2) During Over-Temperature.
3) During Over-Current.
4) If output is pulled up.

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

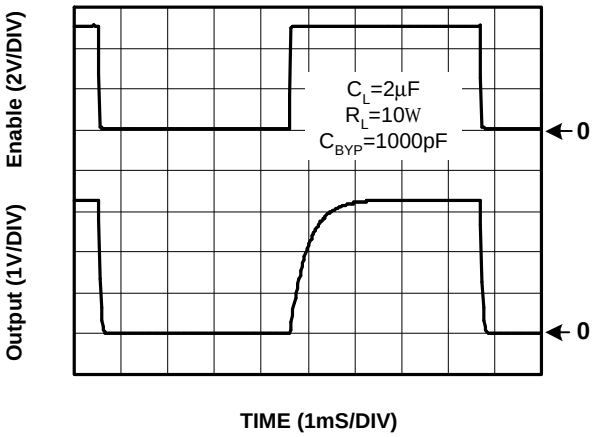
Ground Current vs. Input Voltage



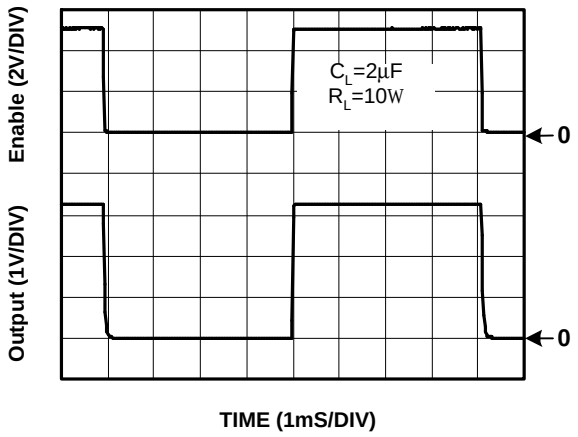
Load Step (1mA-300mA)



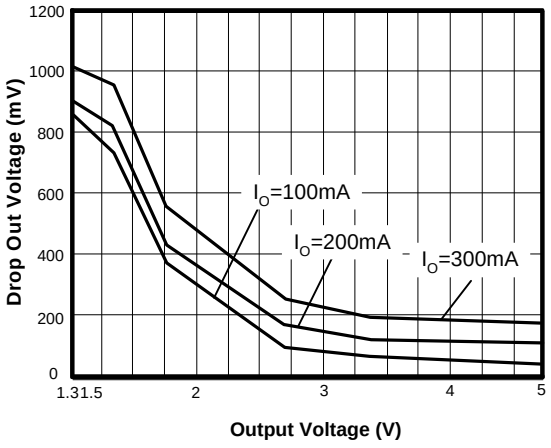
Chip Enable Transient Response



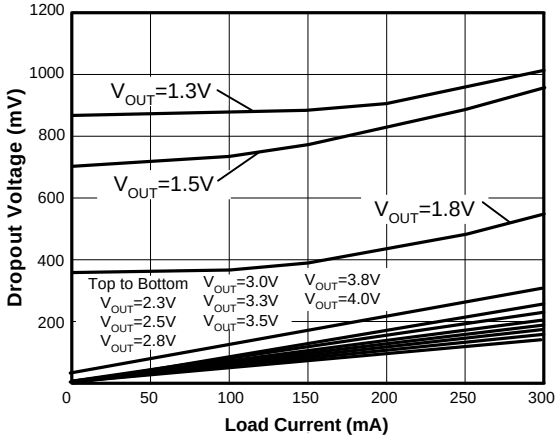
Chip Enable Transient Response



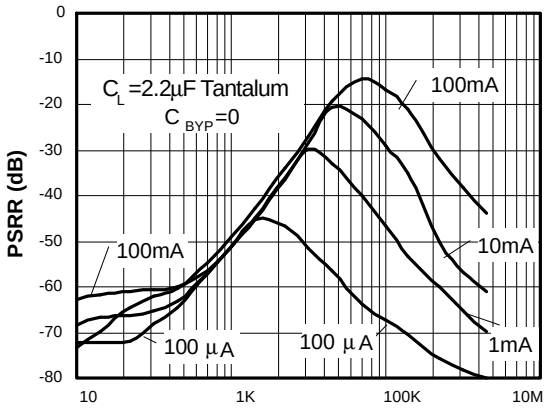
Drop Out Voltage vs. Output Voltage



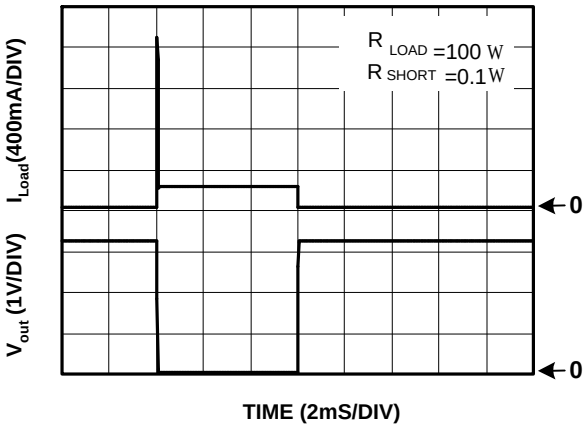
Drop Out Voltage vs. Load Current



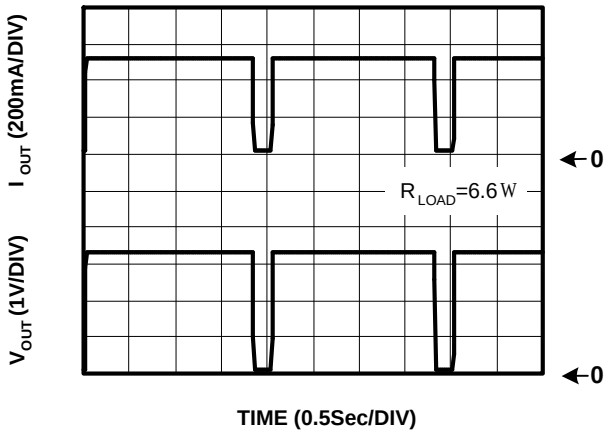
Power Supply Rejection Ratio



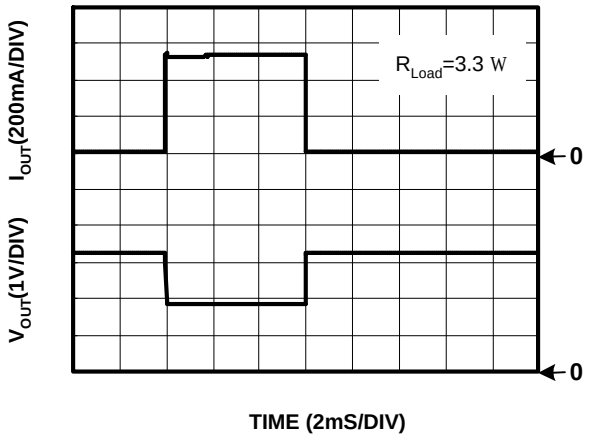
Short Circuit Response



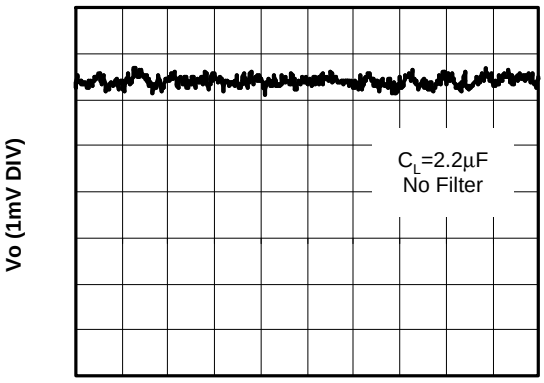
Overtemperature Shutdown



Current Limit Response

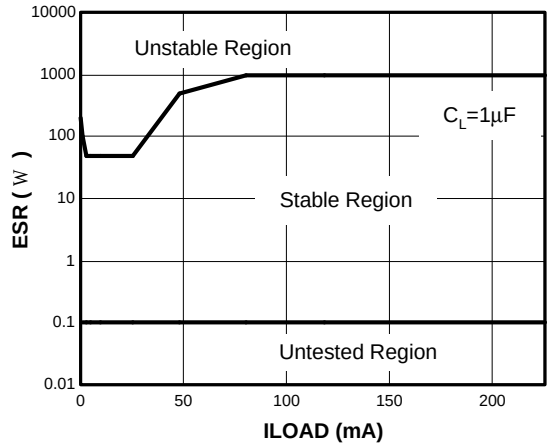


Noise Measurement

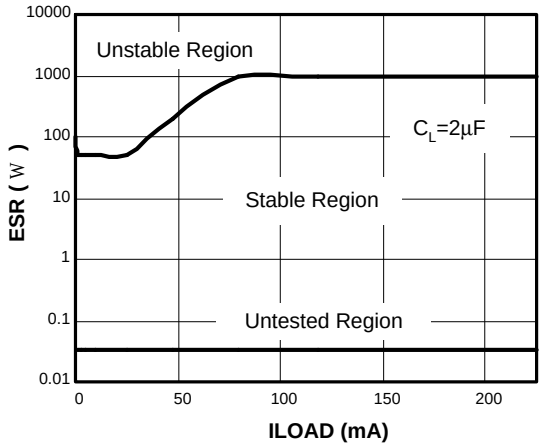


Line Transient Response

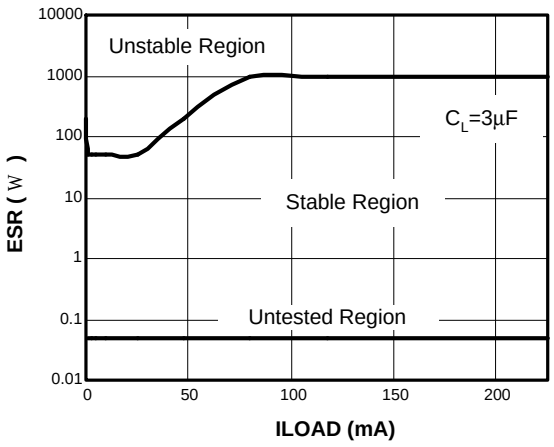
Stability vs. ESR vs. I_{Load}



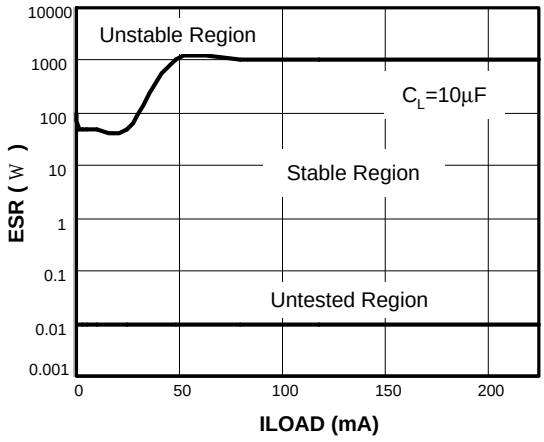
Stability vs. ESR vs. I_{Load}



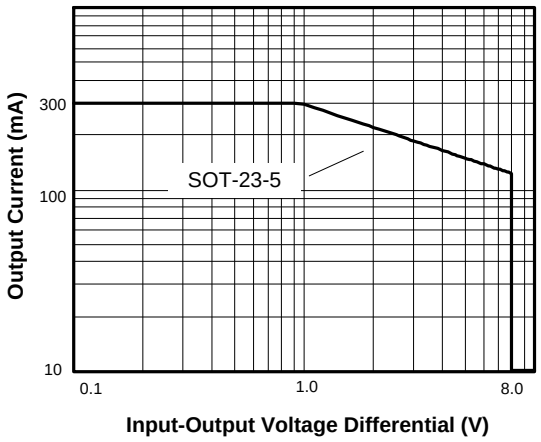
Stability vs. ESR vs. I_{Load}



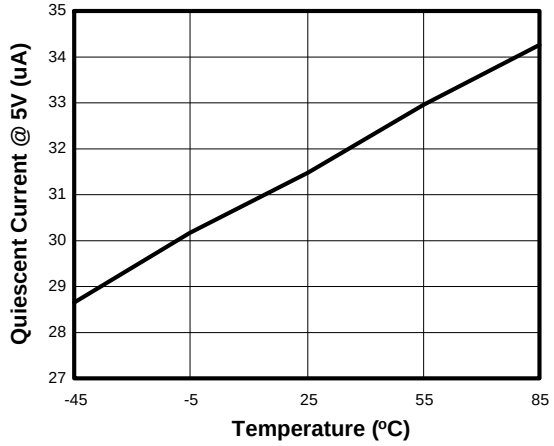
Stability vs. ESR vs. I_{Load}



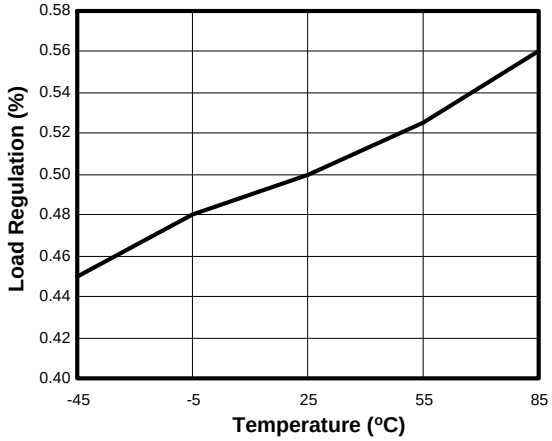
Safe Operating Area



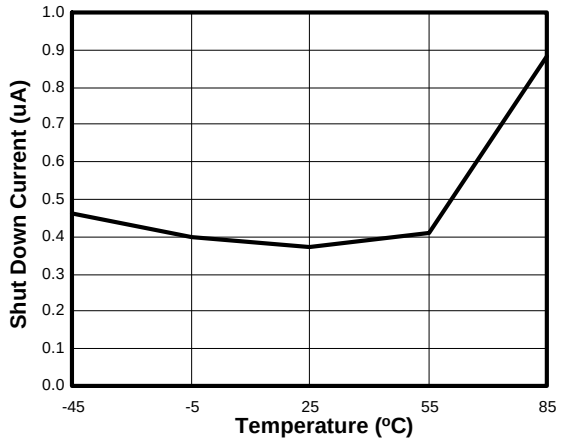
Quiescent Current vs. Temp.



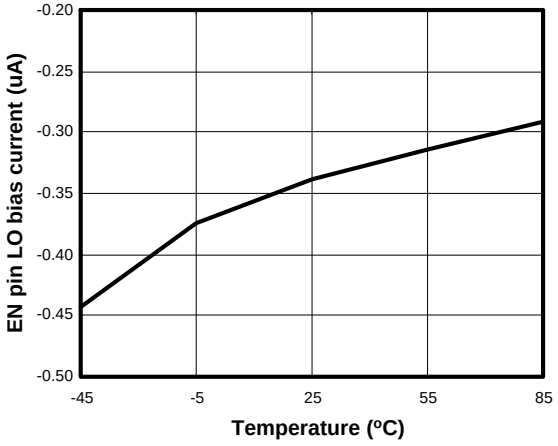
Load Regulation vs. Temp.



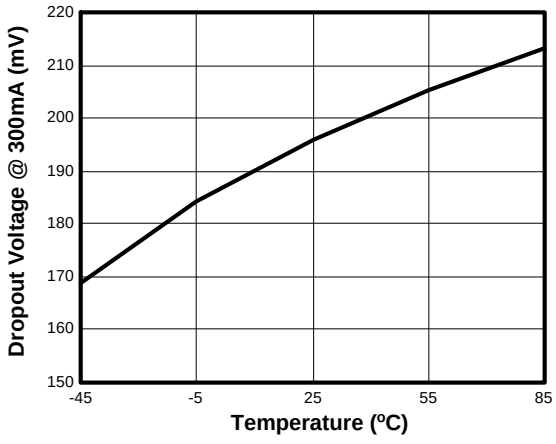
Shut Down Current vs. Temp.



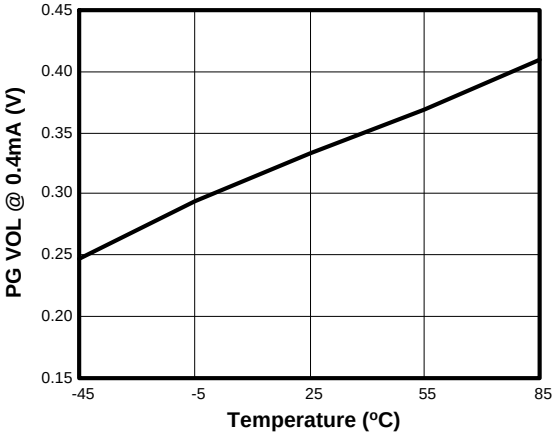
EN pin LO bias Current vs. Temp.



Dropout Voltage vs. Temp.



PG VOL vs. Temp.

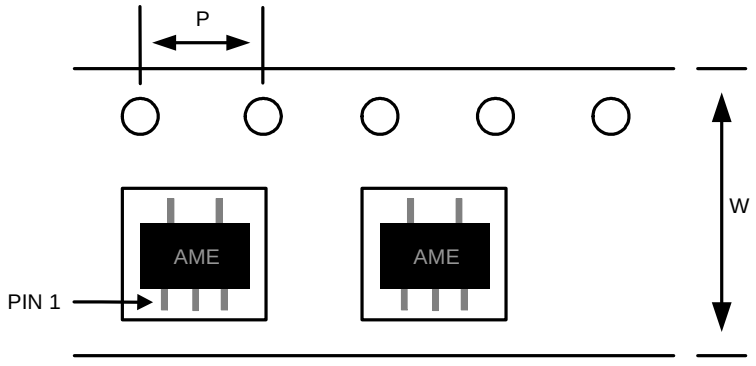


■ Date Code Rule

Marking			Date Code		Year
A	A	A	W	W	xxx0
A	A	A	W	W	xxx1
A	A	A	W	W	xxx2
A	A	A	W	W	xxx3
A	A	A	W	W	xxx4
A	A	A	W	W	xxx5
A	A	A	W	W	xxx6
A	A	A	W	W	xxx7
A	A	A	W	W	xxx8
A	A	A	W	W	xxx9

■ Tape and Reel Dimension

SOT-25

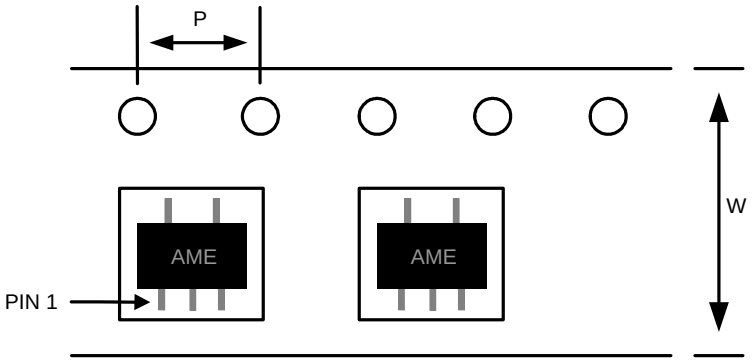


Carrier Tape, Number of Components Per Reel and Reel Size

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

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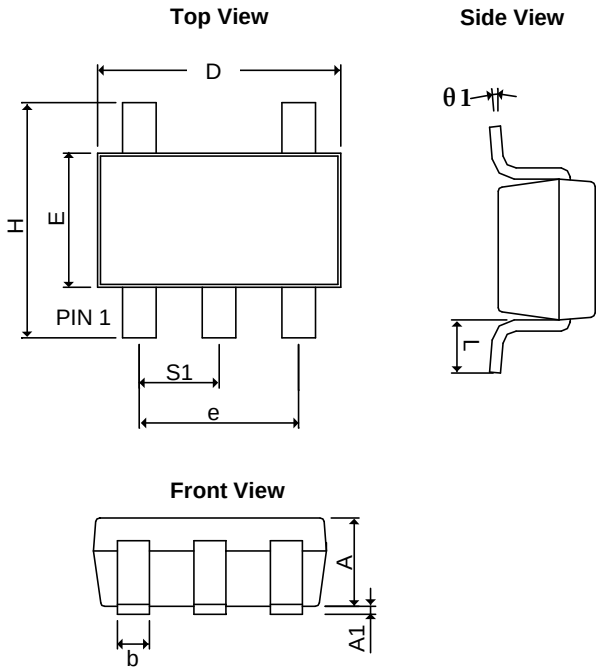
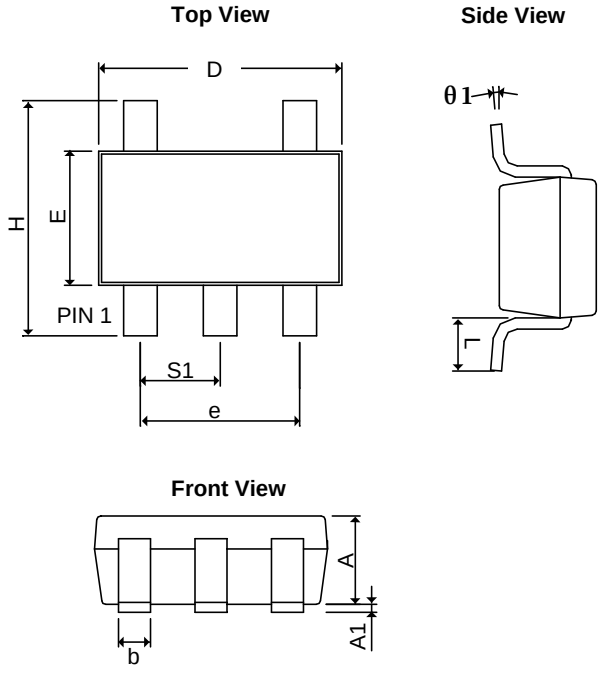
■ Package Dimension

SOT-25



SYMBOLS	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	1.20REF		0.0472REF	
A_1	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^o	10^o	0^o	10^o
S_1	0.95BSC		0.0374BSC	

TSOT-25



SYMBOLS	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
$A+A_1$	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^o	10^o	0^o	10^o
S_1	0.95BSC		0.0374BSC	

www.ame.com.tw
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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