

## ■ General Description

The AME8861 family of positive, linear regulators feature low quiescent current (30 $\mu$ 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.

In applications requiring a low noise, regulated supply, place a 1000 pF capacitor between Bypass and ground.

The AME8861 is stable with an output capacitance of 2.2 $\mu$ F or greater.

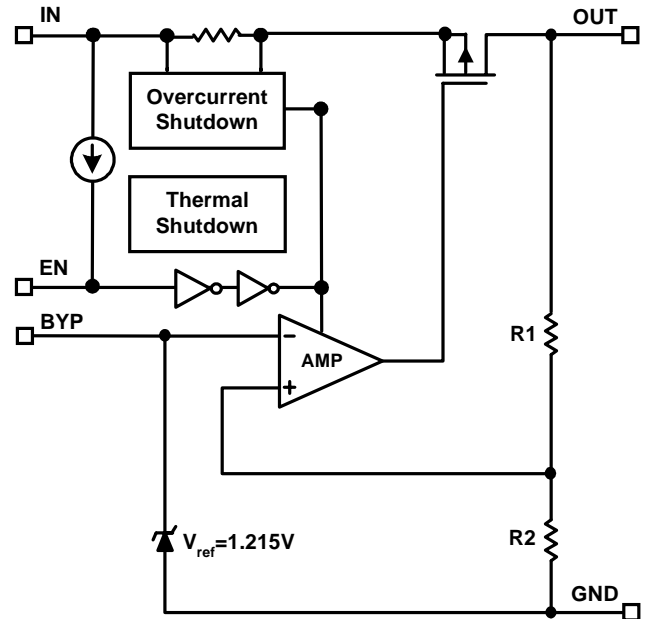
## ■ Features

- Very Low Dropout Voltage
- 600mA Output
- Accurate to within 1.5%
- 30 $\mu$ A Quiescent Current
- Over-Temperature Shutdown
- Current Limiting
- Short Circuit Current Fold-back
- Noise Reduction Bypass Capacitor
- Power-Saving Shutdown Mode
- Space-Saving SOT-25 Package
- Factory Pre-set Output Voltages
- Low Temperature Coefficient

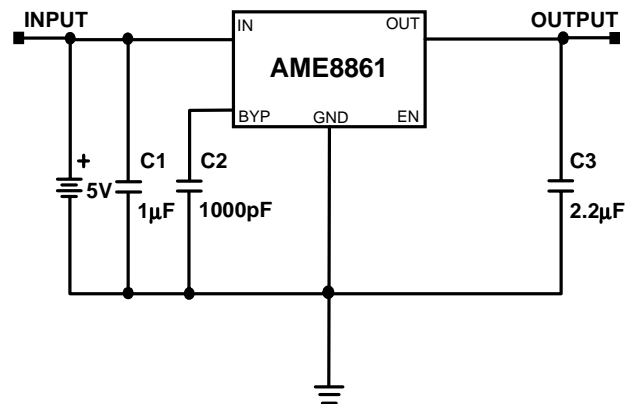
## ■ Applications

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

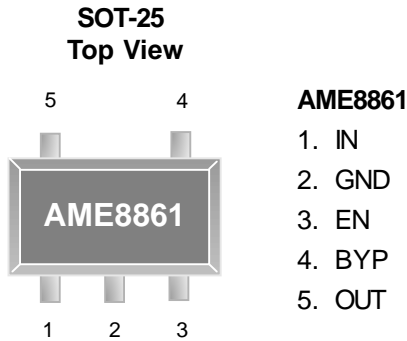
## ■ Functional Block Diagram



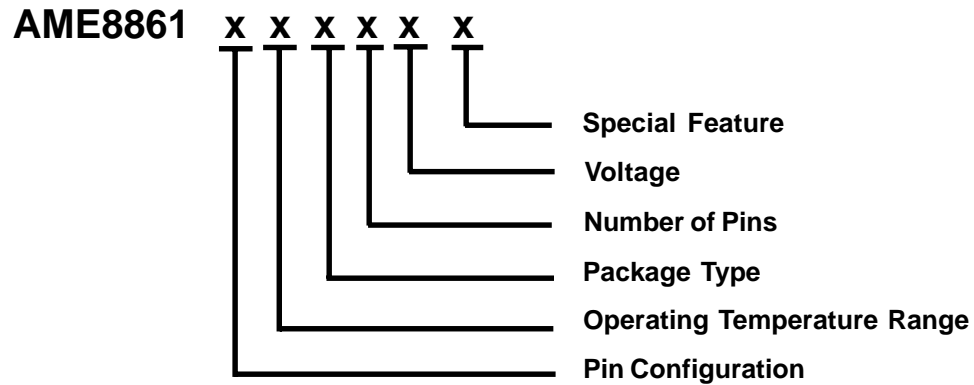
## ■ Typical Application



### ■ Pin Configuration



### ■ Ordering Information



Pin Configuration	Operating Temperature Range	Package Type	Number of Pins	Voltage	Special Feature
A: 1. IN 2. GND 3. EN 4. BYP 5. OUT	E: -40°C to 85°C	E: SOT-2X	V: 5	300: V=3.0V 250: V=2.5V 330: V=3.3V	L: Low Profile Y: Lead Free & Low Profile Z: Lead Free

Part Number	Marking	Output Voltage	Package	Operating Temp. Range
AME8861AEEV250	AXCww	2.5V	SOT-25	- 40°C to + 85°C
AME8861AEEV300	AWGww	3.0V	SOT-25	- 40°C to + 85°C
AME8861AEEV330	AXCww	3.3V	SOT-25	- 40°C to + 85°C



### ■ Absolute Maximum Ratings

Parameter	Maximum	Unit
Input Voltage	8	V
Output Current	$P_D / (V_{IN} - V_O)$	A
Input, 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-25	260	°C / W
Internal Power Dissipation ( $P_D$ ) (DT = 100°C)	SOT-25	380	mW
Maximum Junction Temperature		150	°C
Maximum Lead Temperature (10 Sec)		300	°C

## ■ 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	$V_{DROPOUT}$	$I_O=600mA$ $V_O=V_{O(NOM)}-2.0%$	$1.3V \leq V_{O(NOM)} \leq 1.4V$	See chart	1900	mV	
			$1.4V < V_{O(NOM)} \leq 2.0V$		1400		
			$2.0V < V_{O(NOM)} \leq 2.8V$		800		
			$2.8V < V_{O(NOM)}$		600		
Output Current	$I_O$	$V_O > 1.2V$	600			mA	
Current Limit	$I_{LIM}$	$V_O > 1.2V$	600	800		mA	
Short Circuit Current	$I_{SC}$	$V_O < 0.8V$		300	600	mA	
Quiescent Current	$I_Q$	$I_O=0mA$		30	50	$\mu A$	
Ground Pin Current	$I_{GND}$	$I_O=1mA$ to 600mA		35		$\mu A$	
Line Regulation	$REG_{LINE}$	$I_O=1mA$ $V_{IN}=V_O+1$ to $V_O+2$	$1.3V \leq V_O \leq 1.4V$	-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	
			$V_O \geq 4.0V$	-0.4	0.2	0.4	
Load Regulation	$REG_{LOAD}$	$I_O=1mA$ to 600mA		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	$I_O=100mA$ $C_O=2.2\mu F$ ceramic $C_{BYP}=0.01\mu F$	$f=1kHz$		75	dB	
			$f=10kHz$		55		
			$f=100kHz$		30		
Output Voltage Noise	eN	$f=10Hz$ to 100kHz $I_O=10mA$ , $C_{BYP}=0.01\mu F$		30		$\mu V_{rms}$	
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	$\mu A$	
	$I_{EL}$	$V_{EN}=0V$ , $V_{IN}=2.7V$ to 7V			0.5	$\mu A$	
Shutdown Supply Current	$I_{SD}$	$V_{IN}=5V$ , $V_O=0V$ , $V_{EN}<V_{EL}$		0.5	1	$\mu A$	
PG Leakage Current	$I_{LC}$	$V_{PG}=7V$			1	$\mu A$	

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

Note2: To prevent the Short Circuit Current protection feature from being prematurely activated, the input voltage must be applied before a current source load is applied.



## ■ Detailed Description

The AME8861 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 600mA. During thermal shutdown, the output voltage remains low. Normal operation is restored when the junction temperature drops below 120°C.

The AME8861 switches from voltage mode to current mode when the load exceeds the rated output current. This prevents over-stress. The AME8861 also incorporates current foldback to reduce power dissipation when the output is short circuited. This feature becomes active when the output drops below 0.8 volts, and reduces the current flow by 65%. Full current is restored when the voltage exceeds 0.8 volts.

## ■ External Capacitors

The AME8861 is stable with an output capacitor to ground of 2.2 $\mu$ 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 $\mu$ F ceramic capacitor with a 10 $\mu$ 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 $\mu$ F to have a beneficial effect.

A third capacitor can be connected between the BY-PASS pin and GND. This capacitor can be a low cost Polyester Film variety between the value of 0.001 ~ 0.01 $\mu$ F. A larger capacitor improves the AC ripple rejection, but also makes the output come up slowly. This "Soft" turn-on is desirable in some applications to limit turn-on surges.

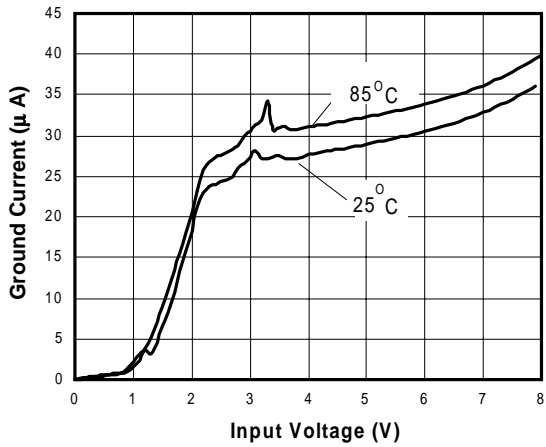
All capacitors should be placed in close proximity to the pins. A "Quiet" ground termination is desirable. This can be achieved with a "Star" connection.

## ■ Enable

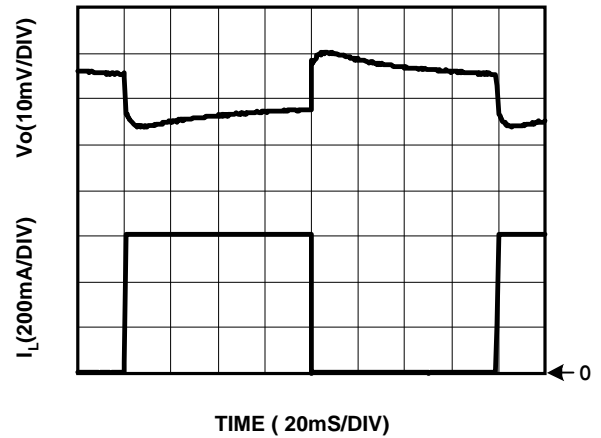
The Enable pin normally floats high. When actively, pulled low, the PMOS pass transistor shuts off, and all internal circuits are powered down. In this state, the quiescent current is less than 1 $\mu$ A. This pin behaves much like an electronic switch.



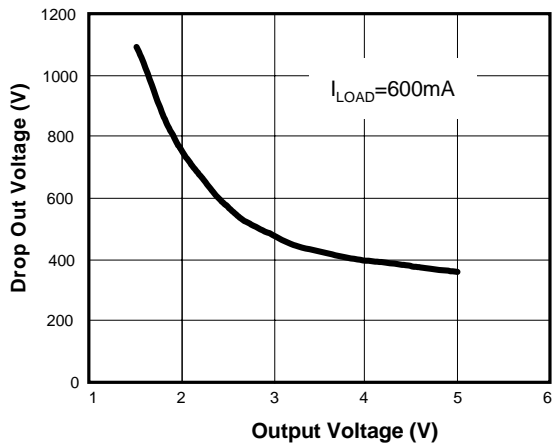
Ground Current vs. Input Voltage



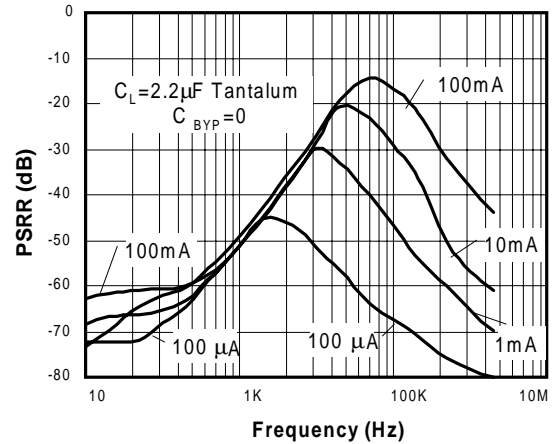
Load Step (1mA-600mA)



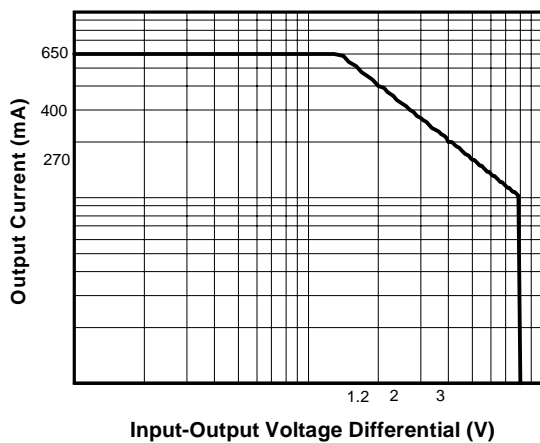
Drop Out Voltage vs. Output Voltage



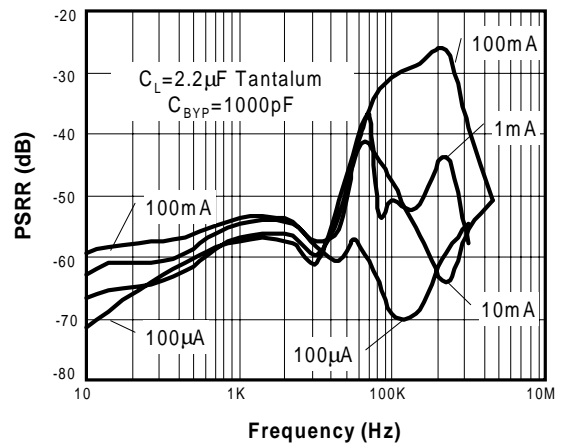
Power Supply Rejection Ratio



Safe Operating Area

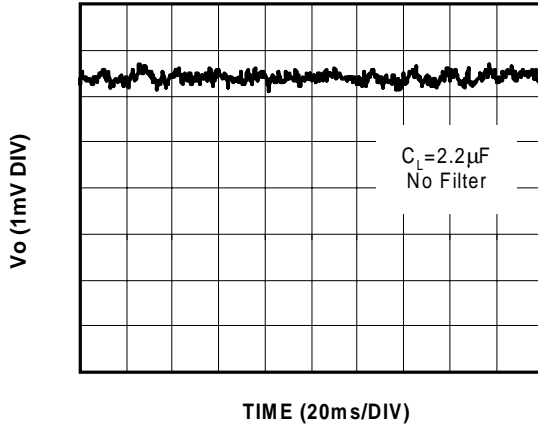


Power Supply Rejection Ratio

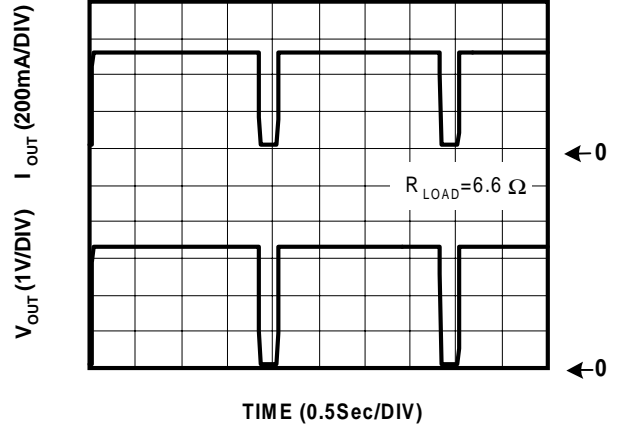




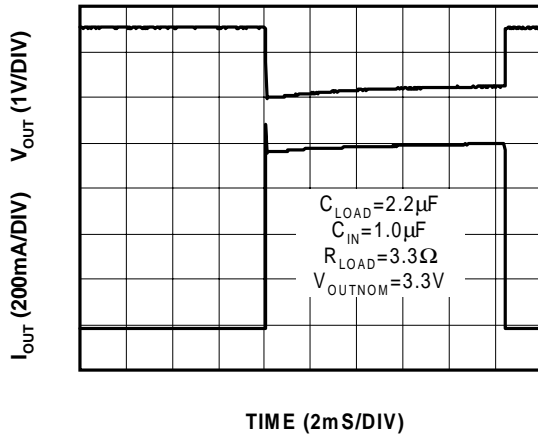
Noise Measurement



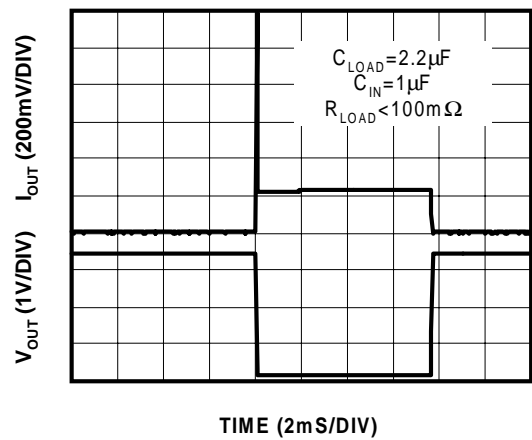
Overtemperature Shutdown



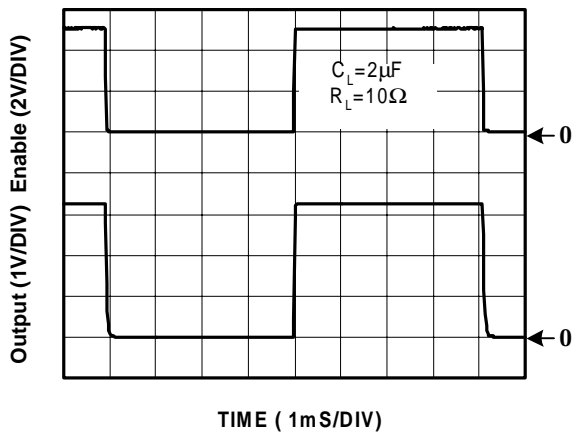
Current Limit Response



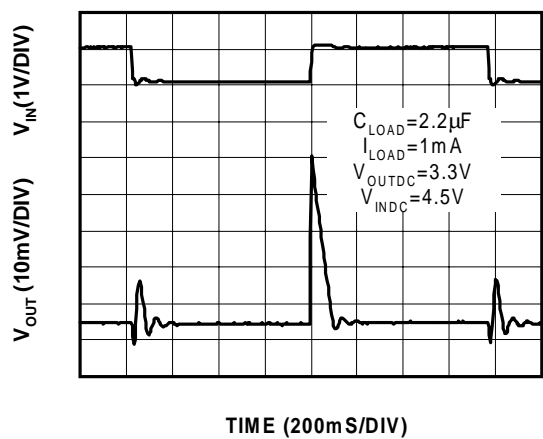
Short Circuit Response

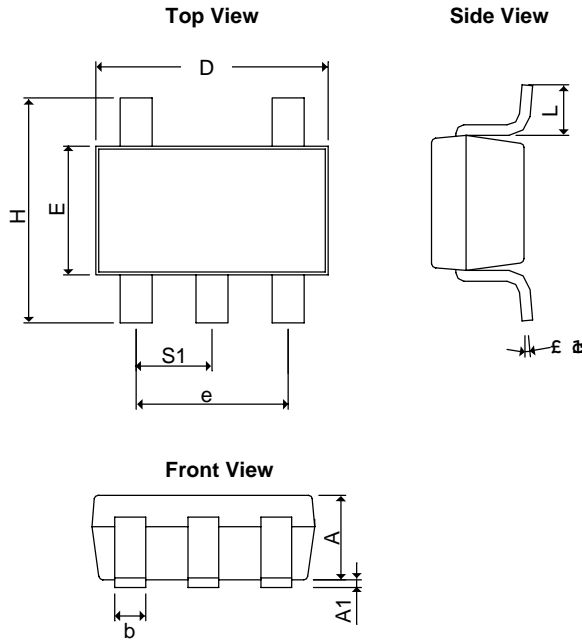


Chip Enable Transient Response



Line Transient Response



**■ Package Dimension**
**SOT-25**


SYMBOLS	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
<b>A</b>	1.20REF		0.0472REF	
<b>A<sub>1</sub></b>	0.00	0.15	0.0000	0.0059
<b>b</b>	0.30	0.55	0.0118	0.0217
<b>D</b>	2.70	3.10	0.1063	0.1220
<b>E</b>	1.40	1.80	0.0551	0.0709
<b>e</b>	1.90 BSC		0.07480 BSC	
<b>H</b>	2.60	3.00	0.10236	0.11811
<b>L</b>	0.37BSC		0.0146BSC	
<b>θ<sub>1</sub></b>	0°	10°	0°	10°
<b>S<sub>1</sub></b>	0.95BSC		0.0374BSC	





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