

■ General Description

The AME8890 is a fixed 1.2V of positive, linear regulator feature low quiescent current (60 μ A typ.) with low dropout voltage, making them ideal for battery applications. The space-saving SOT-23-5 package is attractive for "Pocket" and "Hand Held" applications.

This rugged device has 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 AME8890 is stable with an output capacitor of 2.2 μ F or greater.

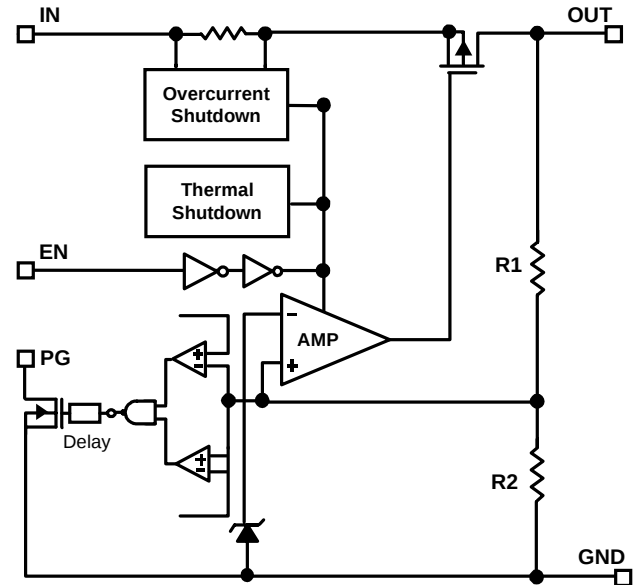
■ Features

- Very Low Dropout Voltage
- Guaranteed 150mA Output
- Accurate to within 3%
- 60 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 (SOT-23-5)
- Low Temperature Coefficient

■ Applications

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

■ Functional Block Diagram



■ Typical Application

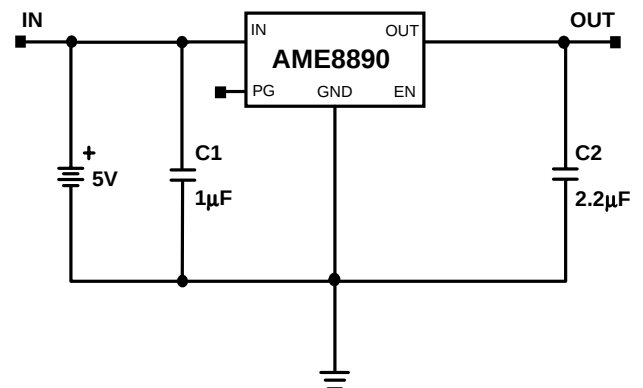


Figure 1. Typical Application Schematic

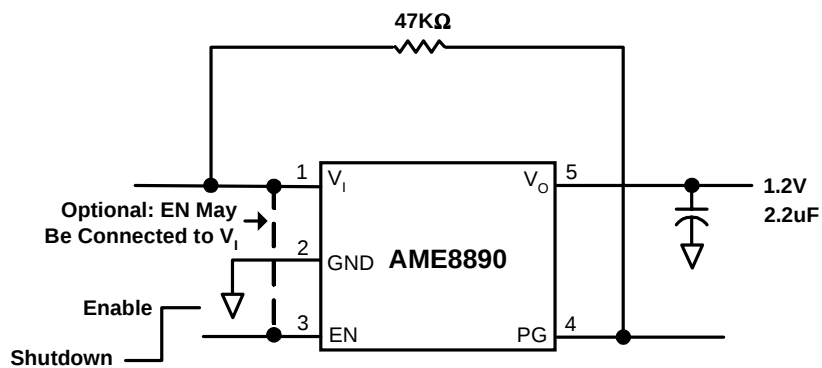
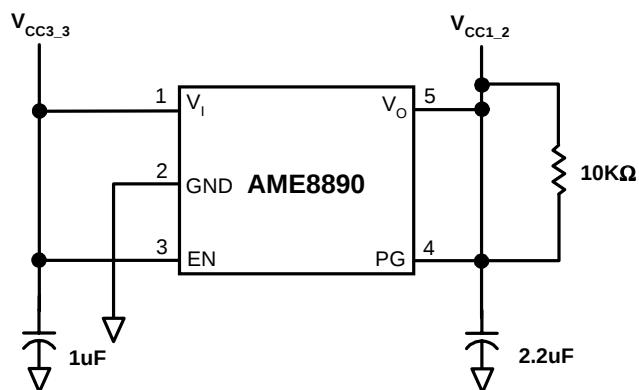
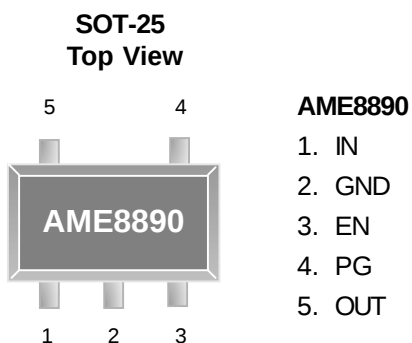


Figure 2. Typical Application For Processor VID Code Power Sequencing Schematic



■ Pin Configuration



■ Pin Description

Pin Number	Pin Name	Pin Function
1	IN	Supply Input
2	GND	Ground
3	EN	Enable/Shutdown (Input) : CMOS compatible input. Logic high = enable; logic low = shutdown. Do not leave open.
4	PG	Power Good Output
5	OUT	Regulator Output

■ Ordering Information

Part Number	Marking	Output Voltage	Package	Operating Temp. Range
AME8890TEEV	ATBww	1.2V	SOT-25	- 40°C to + 85°C
AME8890TEEVZ	ATBww	1.2V	SOT-25	- 40°C to + 85°C

ww: represents the date code

Please consult AME sales office or authorized Rep./Distributor for other package type availability.

**■ Absolute Maximum Ratings**

Parameter	Maximum	Unit
Input Voltage	7	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 (θ_{JA})	SOT-25	260	°C / W
Internal Power Dissipation (P_D) ($\Delta T = 100^\circ\text{C}$)	SOT-25	380	mW
Maximum Junction Temperature		150	°C
Maximum Lead Temperature (10 Sec)		300	°C

■ Electrical Specifications

$V_{IN} = 2.7V$, $V_{EN} = V_{IN}$, $I_{OUT} = 100\mu A$, $T_A = 25^\circ C$ unless otherwise noted

Parameter	Symbol	Test Condition		Min	Typ	Max	Units
Input Voltage	V_{IN}			2.7		6	V
Output Voltage Accuracy	V_O	$I_O = 0.1mA$		-3		3	%
Dropout Voltage	$V_{DROPOUT}$	$I_O = 150mA$ $V_{OUT} = V_O - 2.0\%$	$1.0V < V_{O(NOM)} \leq 2.0V$			1300	mV
			$2.0V < V_{O(NOM)} \leq 2.8V$			N/A	
			$2.8V < V_{O(NOM)}$			N/A	
Current Limit	I_{LIM}	$V_O < 0.1V$		150	350		mA
Quiescent Current	I_Q	$V_{IN} = 6V$, $I_O = 0mA$, $V_O = V_O(nom)$			60	80	μA
Ground Pin Current	I_{GND}	$V_{IN} = 6V$, $I_O = 1mA$ to $150mA$			65		μA
Line Regulation	REG_{LINE}	$I_O = 100\mu A$ $V_{IN} = 2.7V$ to $6V$	$1.0 \leq V_O \leq 2.0V$	-0.3		0.3	%
Load Regulation	REG_{LOAD}	$I_O = 100\mu A$ to $150mA$		-4	1	4	%
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	$I_O = 100mA$ $C_O = 2.2\mu F$	$f = 1kHz$		50		
			$f = 10kHz$		20		dB
			$f = 100kHz$		15		
Output Voltage Noise	eN	$f = 10Hz$ to $100kHz$ $I_O = 10mA$	$C_O = 2.2\mu F$		30		μV_{rms}
EN Input Threshold	V_{EH}			1.6		V_{IN}	V
	V_{EL}			0		0.4	V
EN Input Bias Current	I_{EH}	$V_{EN} = V_{IN}$			0.1		μA
	I_{EL}	$V_{EN} = 0V$			0.1		μA
Shutdown Supply Current	I_{SD}	$V_{IN} = 5V$, $V_O = 0V$, $V_{EN} = 0V$			0.5	1	μA
Shutdown Output Voltage	$V_{O,SD}$	Output Loading $\leq 1200\Omega$, $V_{EN} = 0V$		0		0.4	V
Output Under Voltage	V_{UV}	PG ON @ % of V_{OUT}				95	% $V_{O(NOM)}$
PG Leakage Current	I_{LC}	$V_{PG} = 6V$, PG is off			0.1		μA
PG Voltage Low	V_{OL}	$I_{SINK} = 0.1mA$				0.1	V
V_{PG} Delay	T_{PGD}	See Timing Diagram on page 98		1.5		5	ms

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

■ Detailed Description

The AME8890 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 AME8890 switches from voltage mode to current mode when the load exceeds the rated output current. This prevents over-stress. The AME8890 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 AME8890 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 V_{in} . 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

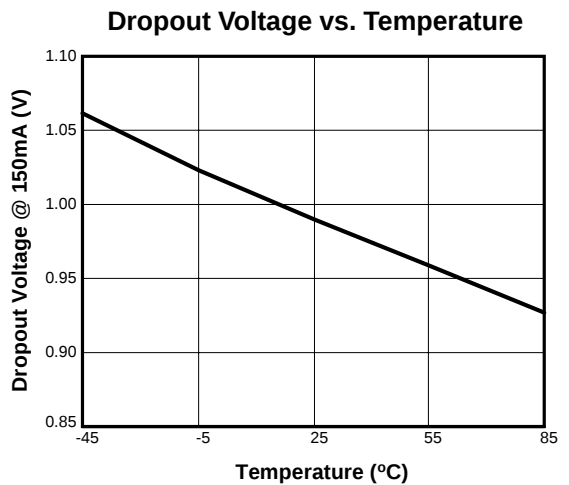
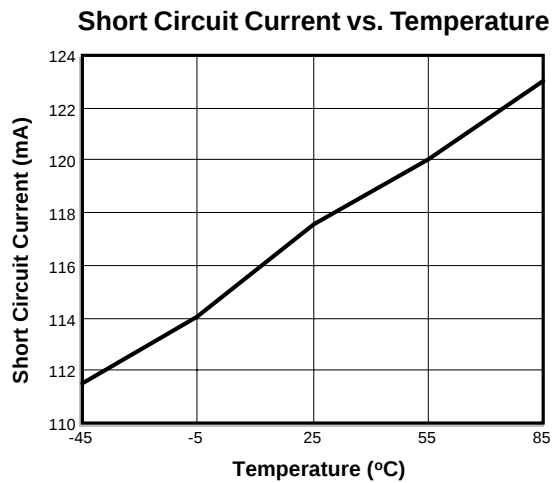
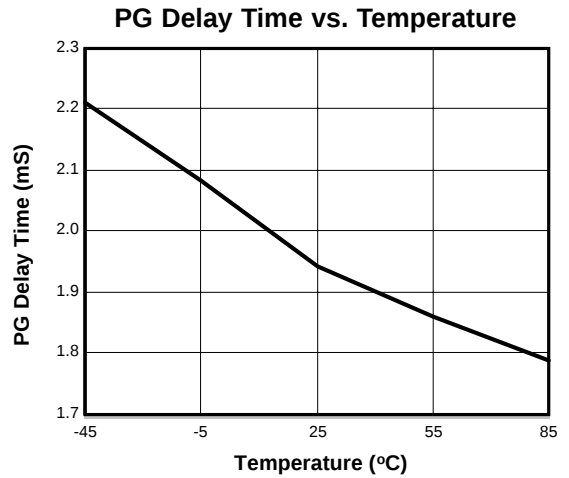
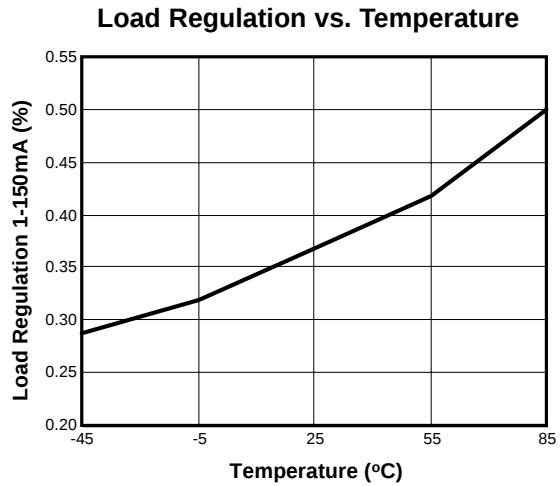
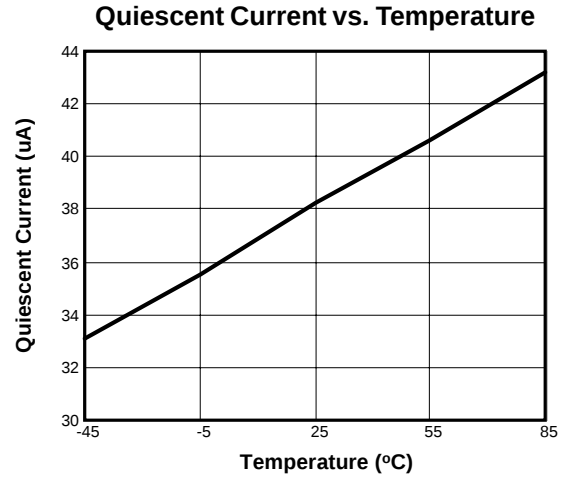
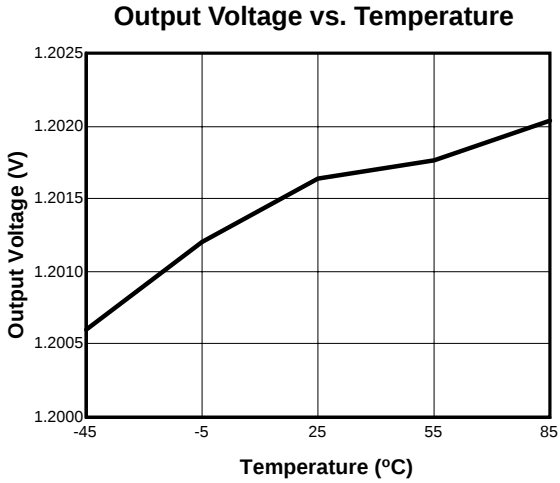
The Enable pin normally floats high. When actively, pulled low, the PMOS pass transistor shuts off, and all internal circuits are powered down. In this state, the quiescent current is less than 1μA. This pin behaves much like an electronic switch.

■ Power Good

The AME8890 includes the Power Good feature. When the output is not within $\pm 15\%$ of the specified voltage, it pulls low. This can occur under the following conditions:

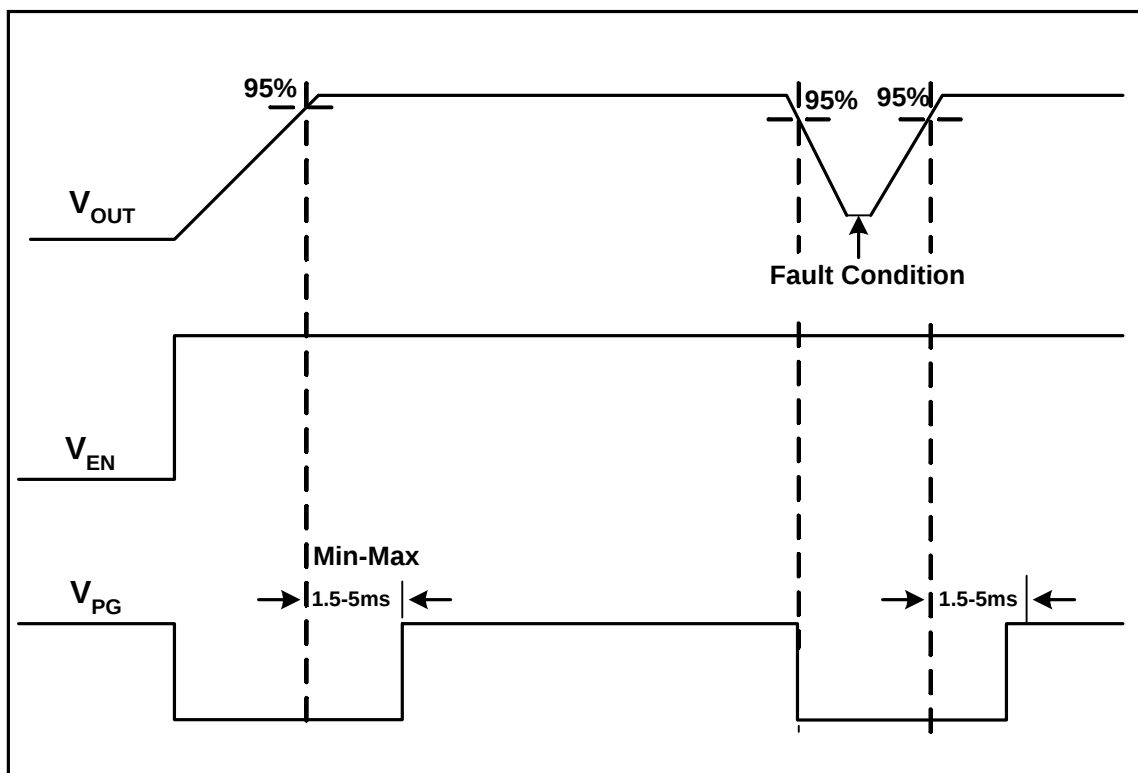
- 1) Input Voltage too low.
- 2) During Over-Temperature.
- 3) During Over-Current.
- 4) If output is pulled up.

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



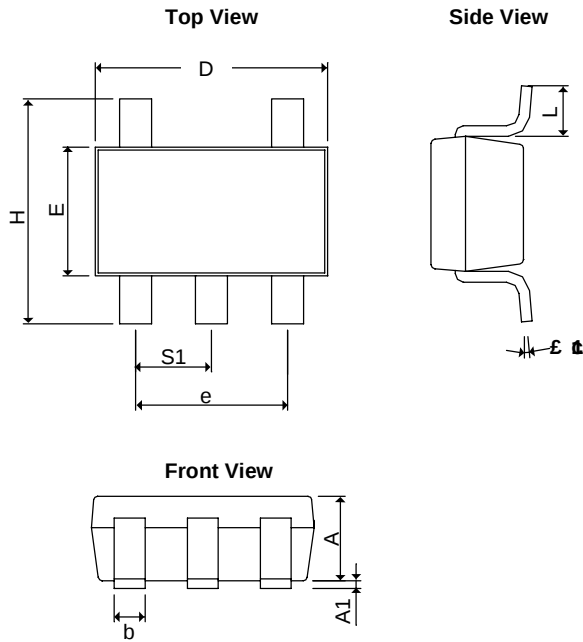


■ Timing Diagram



■ 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	
θ1	0°	10°	0°	10°
S ₁	0.95BSC		0.0374BSC	



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