

■ General Description

The AME8844 family of positive, linear regulators feature low quiescent current (45 μ A typ.) with low dropout voltage, making them ideal for battery applications.

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" of operating conditions.

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

The AME8844 is stable with an output capacitance of 4.7 μ F or greater.

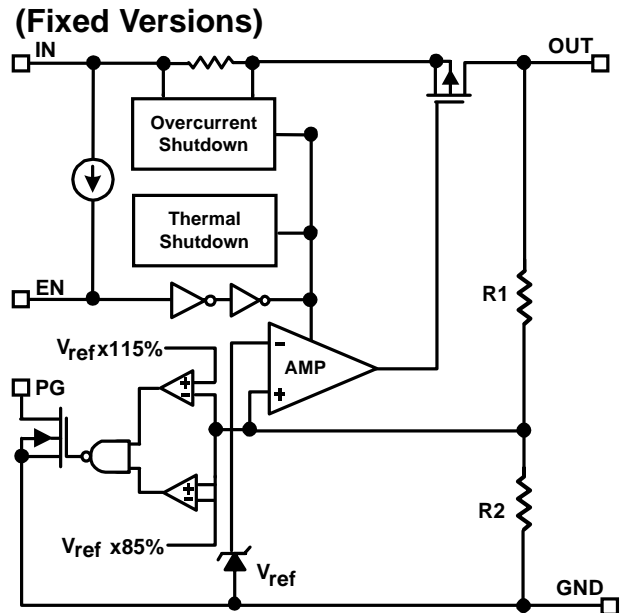
■ Features

- Very Low Dropout Voltage
- Guaranteed 750mA Output
- Accurate to within 1.5%
- 45 μ A Quiescent Current Typically
- Over-Temperature Shutdown
- Current Limiting
- Short Circuit Current Fold-back
- Noise Reduction Bypass Capacitor (Fixed Versions)
- Power-Saving Shutdown Mode
- Space-Saving MSOP-8 Package
- 6 Factory Pre-set Output Voltages
- Low Temperature Coefficient
- Adjustable Version
- Power Good Output Function.

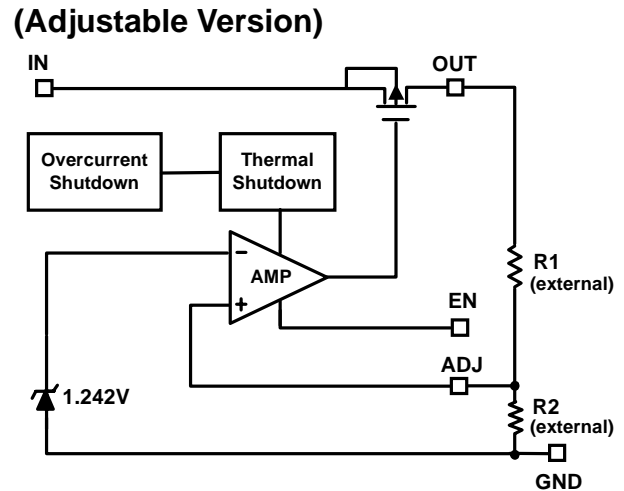
■ Applications

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

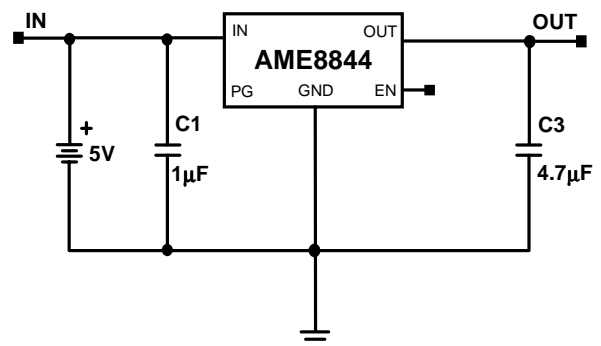
■ Functional Block Diagram

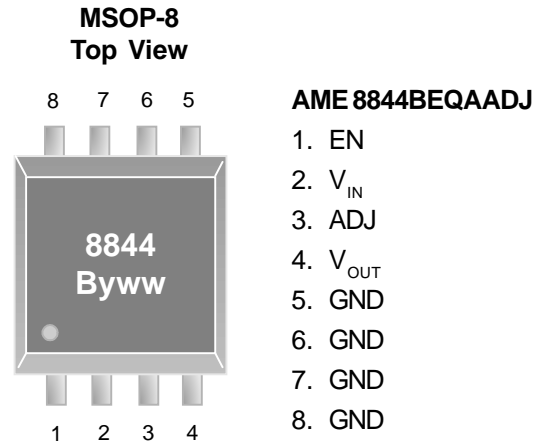
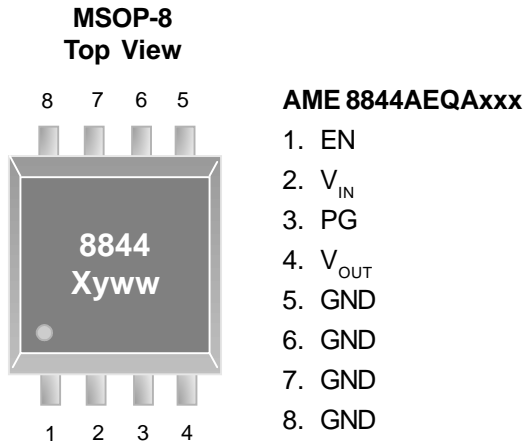


■ Functional Block Diagram

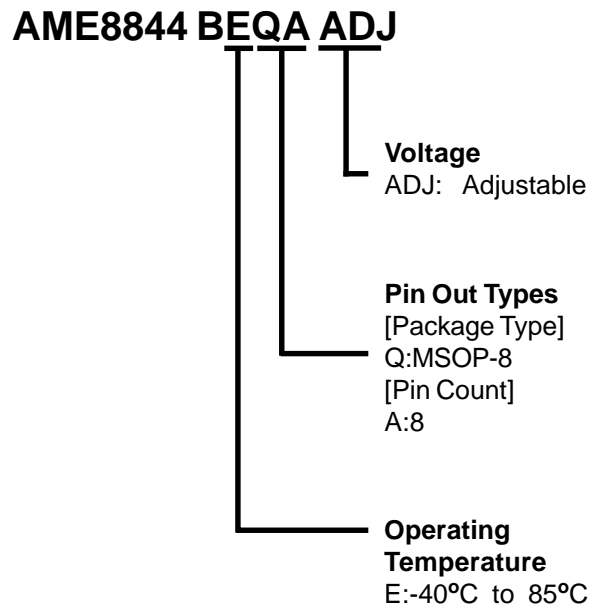
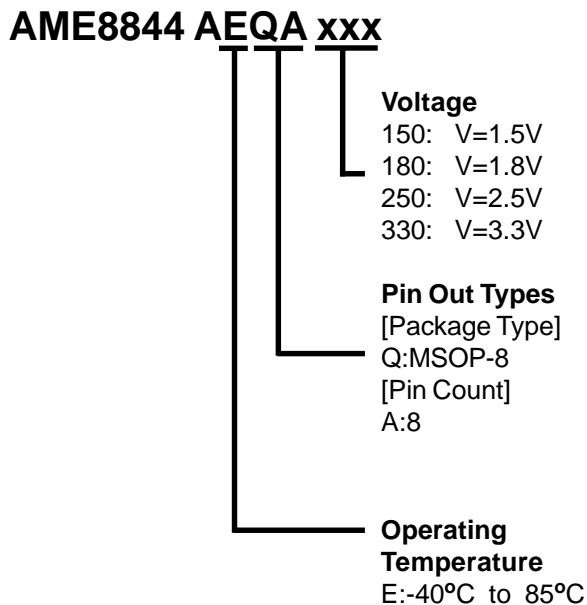


■ Typical Applications



■ Pin Configuration


Note:
 X: represents the regulator output voltage.
 yww: represents the date code.
 Please contact AME for details.

■ Ordering Information




■ Ordering Information (contd.)

Part Number	Marking	Output Voltage	Package	Operating Temp. Range
AME8844AEQA150	8844 Lyww	1.50	MSOP-8	- 40°C to + 85°C
AME8844AEQA180	8844 Myww	1.80	MSOP-8	- 40°C to + 85°C
AME8844AEQA250	8844 Dyww	2.50	MSOP-8	- 40°C to + 85°C
AME8844AEQA330	8844 Ayww	3.30	MSOP-8	- 40°C to + 85°C
AME8844BEQAADJ	8844 Byww	ADJ	MSOP-8	- 40°C to + 85°C

Note: ww represents the date code

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



■ 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 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_{jc})	MSOP-8	80	°C / W
Internal Power Dissipation (P_D) ($\Delta T = 100^\circ\text{C}$)*	MSOP-8		W
Maximum Junction Temperature		150	°C
Maximum Lead Temperature (10 Sec)		300	°C

* Assuming a heat sink capable of twice times (θ_{jc})

** Estimated

■ Electrical Specifications

 $V_{IN} = V_{O(NOM)} + 2V$, $V_{EN} = V_{IN}$, $T_A = 25^\circ C$ 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	$V_{DROPOUT}$	$I_O = 750mA$ $V_O = V_{O(NOM)} - 2.0\%$	$V_{O(NOM)} = 1.5V$	See chart	1000	mV	
			$V_{O(NOM)} = 1.8V$		650		
			$V_{O(NOM)} \geq 2.0V$		500		
Output Current	I_O	$V_O > 1.2V$	750			mA	
Current Limit	I_{LIM}	$V_O > 1.2V$	750			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 750mA		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	%
			$4.0 > V_O \geq 2.0V$	-0.1	0.02	0.1	%
			$4.0V \leq V_O$	-0.4		0.4	%
Load Regulation	REG_{LOAD}	$I_O = 1mA$ to 750mA	-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/ $^\circ C$	
ADJ Input Bias Current	I_{ADJ}			1		μA	
Minimum Load Current	I_{load}	$V_{in} = 2.5V$			70	μA	
ADJ Reference Voltage	V_{REF}		1.221	1.240	1.26	V	
Power Supply Rejection	PSRR	$I_O = 100mA$ $C_O = 4.7\mu F$ ceramic	$f = 1kHz$		75	dB	
			$f = 10kHz$		55		
			$f = 100kHz$		30		
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			1	μA	
	I_{EL}	$V_{EN} = 0V$, $V_{IN} = 2.7V$ to 7V			1	μA	
Shutdown Supply Current	I_{SD}	$V_{IN} = 5V$, $V_O = 0V$, $V_{EN} < V_{EL}$		0.5	2	μA	
Output Under Voltage	V_{UV}	PG goes Low when V_{OUT} too Low			84	% $V_{O(NOM)}$	
Output Over Voltage	V_{OV}	PG goes Low when V_{OUT} too High	105			% $V_{O(NOM)}$	
PG Leakage Current	I_{LC}	$V_{PG} = 7V$			1	μA	
PG Voltage Low	V_{OL}	$I_{SINK} = 0.25mA$			0.4	V	

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



■ Detailed Description

The AME8844 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 140°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 AME8844 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 AME8844 is stable with an output capacitor to ground of 4.7µF 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

When EN pin is pulled low, the PMOS pass transistor shuts off, and all internal circuits are powered down. In this state, the quiescent current is less than 2µA. This pin behaves much like an electronic switch.

100K Ohm resistor is necessary between V_{EN} source and EN pin when V_{EN} is higher than V_{IN} .

(Note: There is no internal pull-up for EN pin. It can not be floating)

■ Adjustable Version

The adjustable version uses external feedback resistors to generate an output voltage anywhere from 1.5V to 5.0V. V_{adj} is trimmed to 1.24V and V_{OUT} is given by the equation:

$$V_{OUT} = V_{adj} (1 + R1 / R2)$$

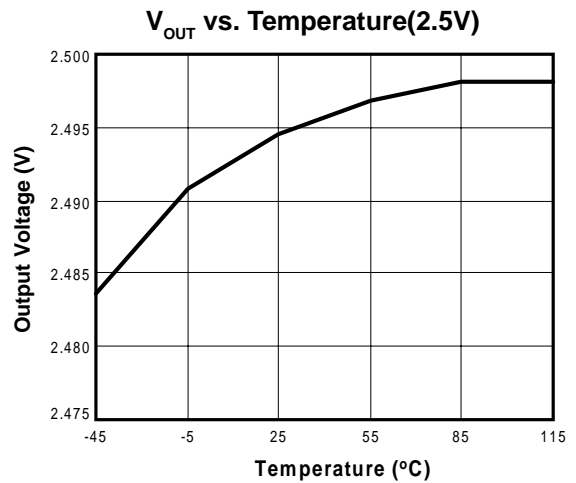
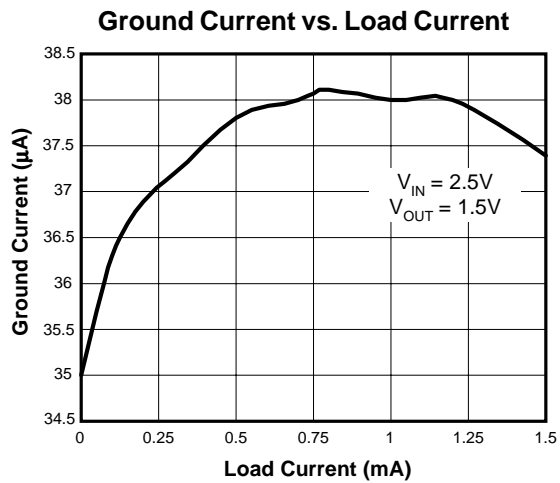
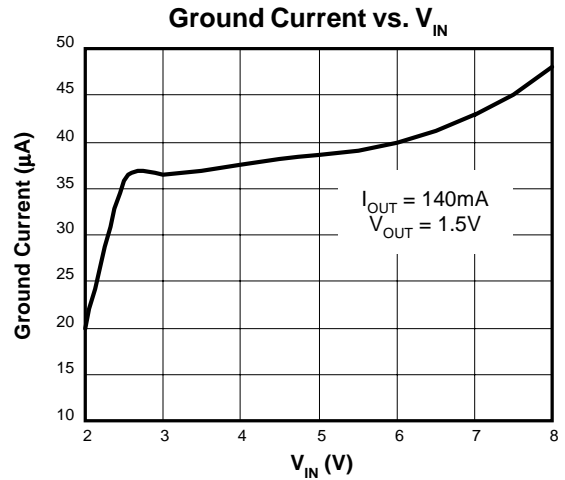
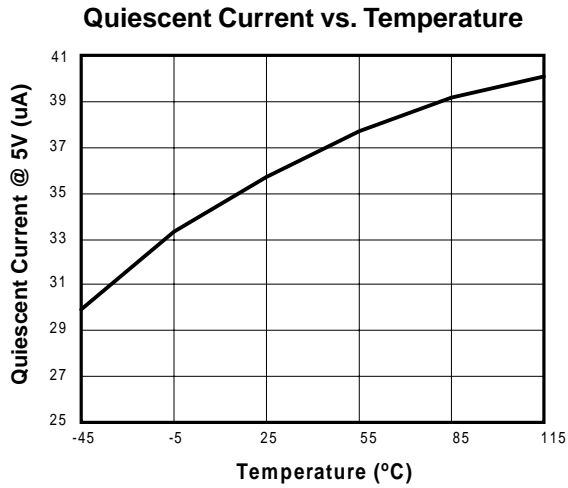
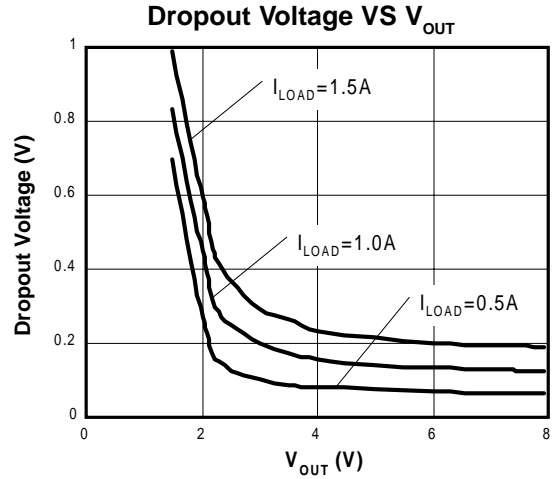
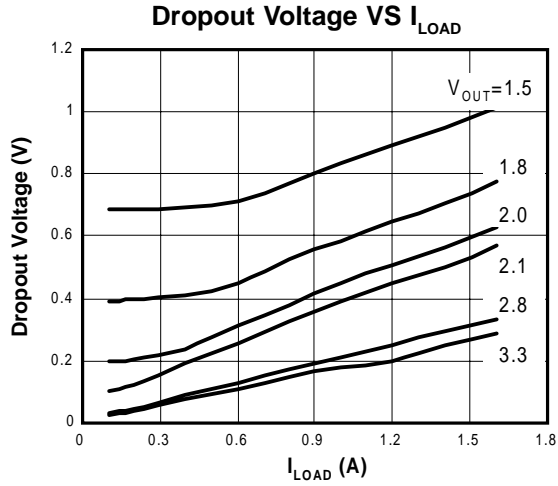
Feedback resistors R1 and R2 should be high enough to keep quiescent current low, but increasing $R1 + R2$ will reduce stability. In general, R1 and R2 in the 10's of kΩ will produce adequate stability, given reasonable layout precautions. To improve stability characteristics, keep parasitics on the ADJ pin to a minimum, and lower R1 and R2 values.

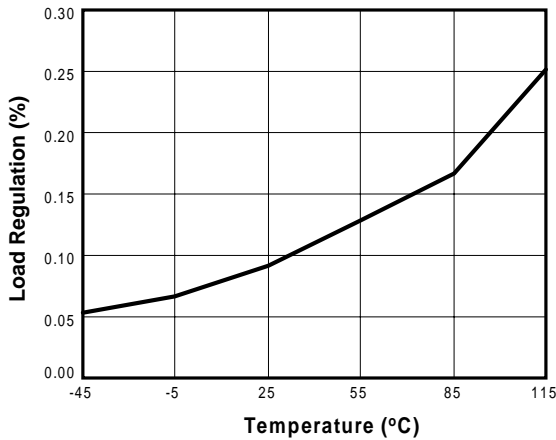
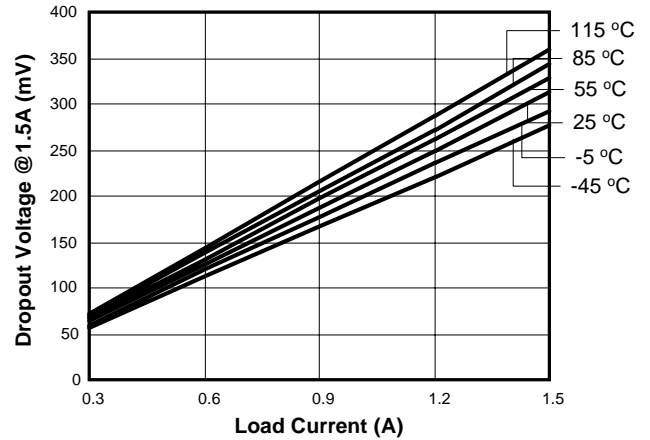
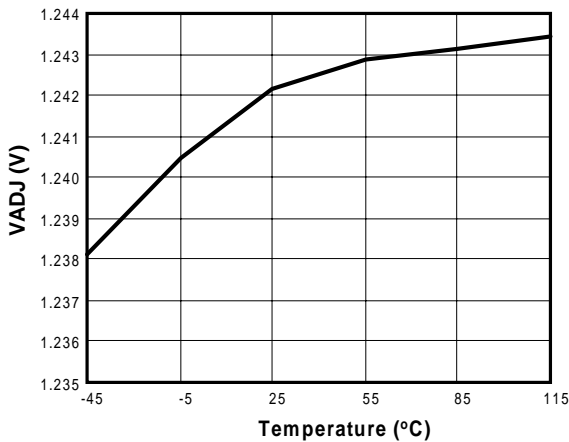
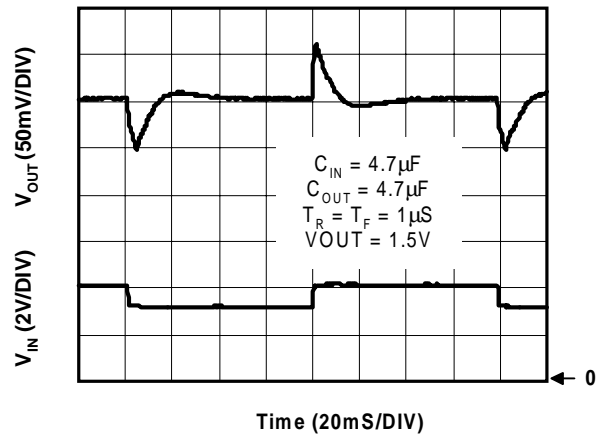
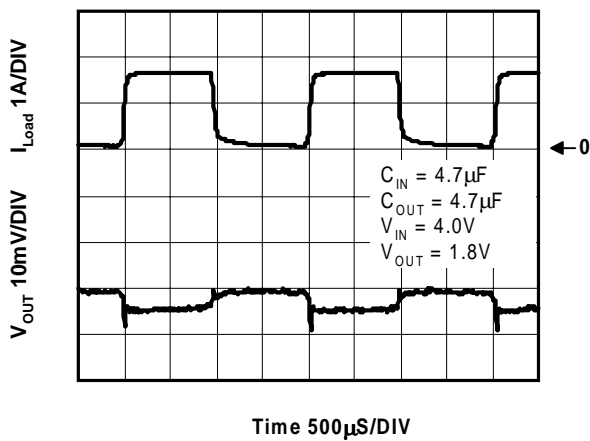
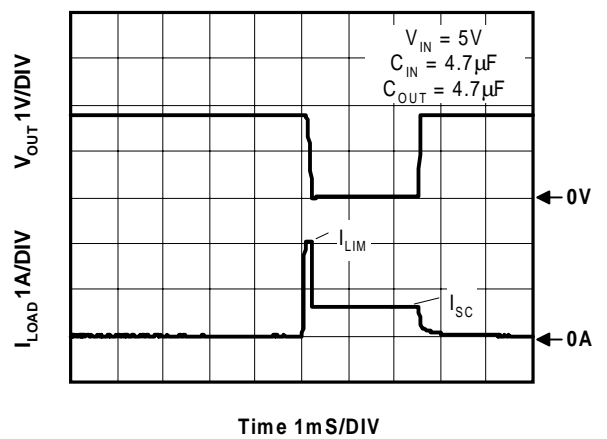
■ Power Good

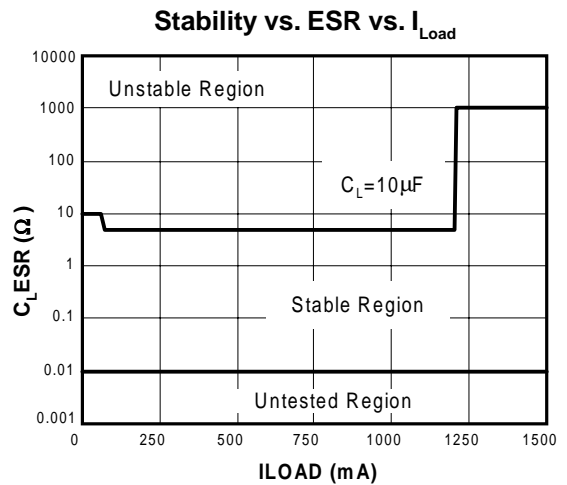
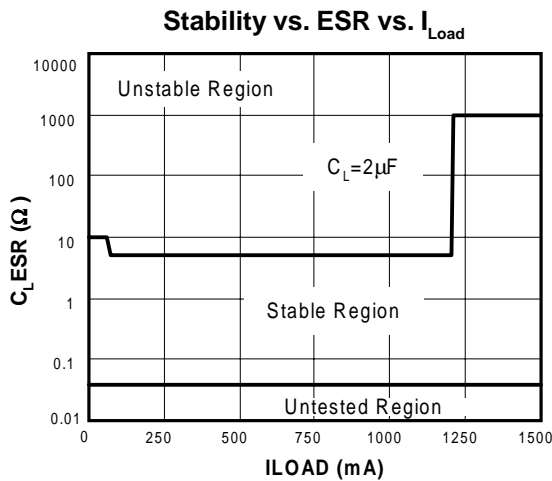
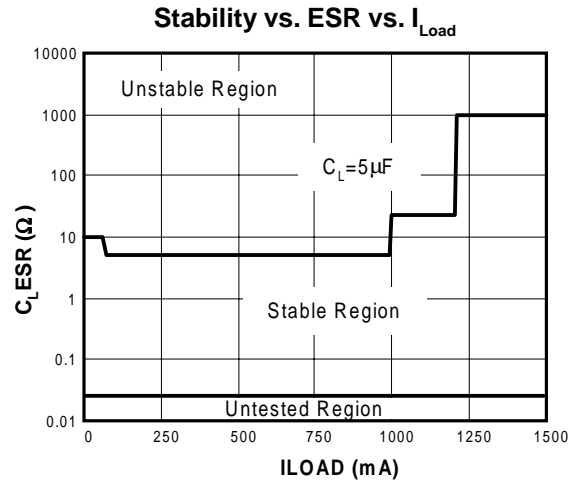
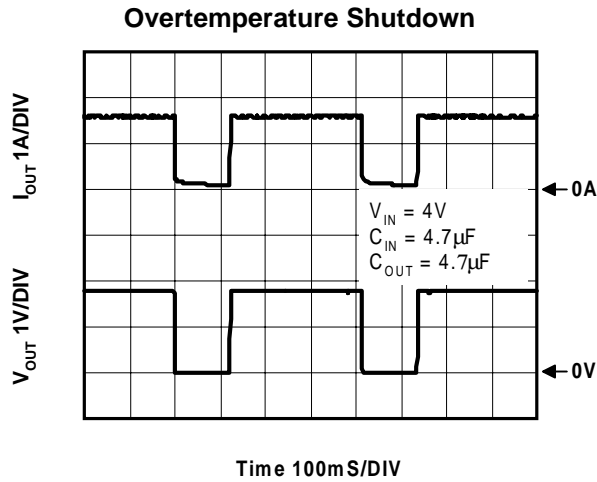
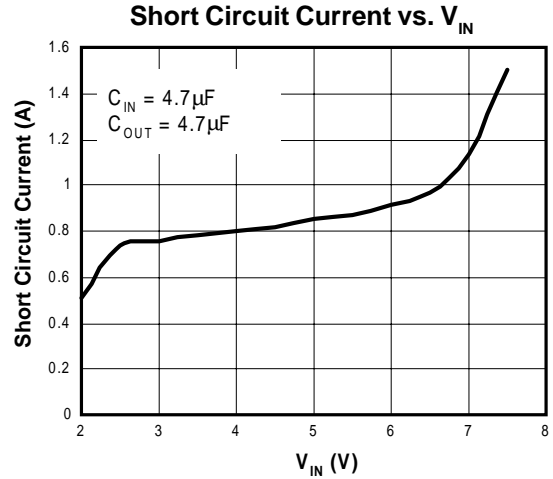
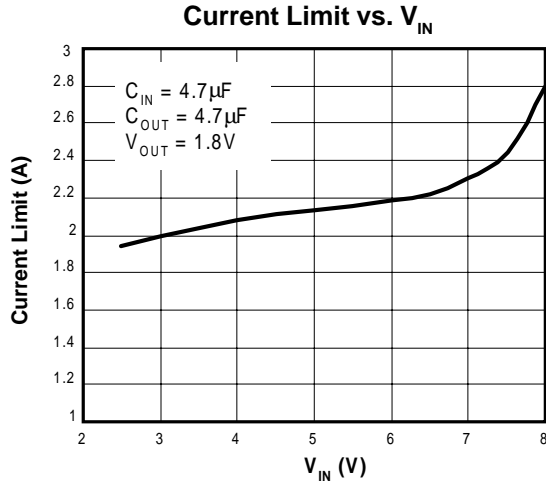
The AME8844 includes the Power Good feature. When the output is not within ±15% of the specified voltage, it pulls low. This can occur under the following conditions:

- 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.)



Load Regulation vs. Temperature

Dropout Voltage vs. Load Current(2.5V)

AME8844BEQA VADJ vs. Temperature

Line Transient Response

Load Step 40mA to 1.5A

Current Limit Response






External Resistor Divider Table

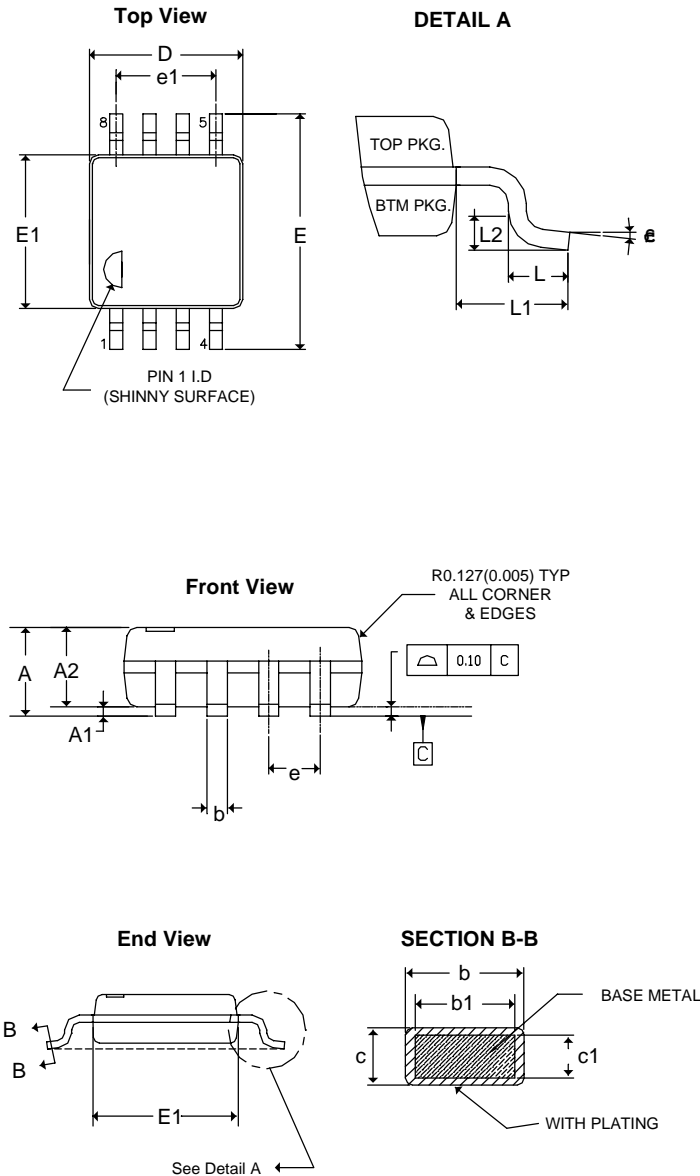
R1 (K Ohm)	1	2	5	10	20
Vout	$R2(kohm)=(1.24*R1(kohm))/(Vout-1.24)$				
1.30	20.67	41.33	103.33	206.67	413.33
1.35	11.27	22.55	56.36	112.73	225.45
1.40	7.75	15.50	38.75	77.50	155.00
1.45	5.90	11.81	29.52	59.05	118.10
1.50	4.77	9.54	23.85	47.69	95.38
1.55	4.00	8.00	20.00	40.00	80.00
1.60	3.44	6.89	17.22	34.44	68.89
1.65	3.02	6.05	15.12	30.24	60.49
1.70	2.70	5.39	13.48	26.96	53.91
1.75	2.43	4.86	12.16	24.31	48.63
1.80	2.21	4.43	11.07	22.14	44.29
1.85	2.03	4.07	10.16	20.33	40.66
1.90	1.88	3.76	9.39	18.79	37.58
1.95	1.75	3.49	8.73	17.46	34.93
2.00	1.63	3.26	8.16	16.32	32.63
2.05	1.53	3.06	7.65	15.31	30.62
2.10	1.44	2.88	7.21	14.42	28.84
2.15	1.36	2.73	6.81	13.63	27.25
2.20	1.29	2.58	6.46	12.92	25.83
2.25	1.23	2.46	6.14	12.28	24.55
2.30	1.17	2.34	5.85	11.70	23.40
2.35	1.12	2.23	5.59	11.17	22.34
2.40	1.07	2.14	5.34	10.69	21.38
2.45	1.02	2.05	5.12	10.25	20.50
2.50	0.98	1.97	4.92	9.84	19.68
2.55	0.95	1.89	4.73	9.47	18.93
2.60	0.91	1.82	4.56	9.12	18.24
2.65	0.88	1.76	4.40	8.79	17.59
2.70	0.85	1.70	4.25	8.49	16.99
2.75	0.82	1.64	4.11	8.21	16.42
2.80	0.79	1.59	3.97	7.95	15.90
2.85	0.77	1.54	3.85	7.70	15.40
2.90	0.75	1.49	3.73	7.47	14.94
2.95	0.73	1.45	3.63	7.25	14.50
3.00	0.70	1.41	3.52	7.05	14.09
3.05	0.69	1.37	3.43	6.85	13.70
3.10	0.67	1.33	3.33	6.67	13.33



■ External Resistor Divider Table (contd.)

R1 (K Ohm)	1	2	5	10	20
Vout	$R2(\text{kohm})=(1.242 \cdot R1(\text{kohm})) / (V_{\text{out}} - 1.242)$				
3.15	0.65	1.30	3.25	6.49	12.98
3.20	0.63	1.27	3.16	6.33	12.65
3.25	0.62	1.23	3.08	6.17	12.34
3.30	0.60	1.20	3.01	6.02	12.04
3.35	0.59	1.18	2.94	5.88	11.75
3.40	0.57	1.15	2.87	5.74	11.48
3.45	0.56	1.12	2.81	5.61	11.22
3.50	0.55	1.10	2.74	5.49	10.97
3.55	0.54	1.07	2.68	5.37	10.74
3.60	0.53	1.05	2.63	5.25	10.51
3.65	0.51	1.03	2.57	5.15	10.29
3.70	0.50	1.01	2.52	5.04	10.08
3.75	0.49	0.99	2.47	4.94	9.88
3.80	0.48	0.97	2.42	4.84	9.69
3.85	0.48	0.95	2.38	4.75	9.50
3.90	0.47	0.93	2.33	4.66	9.32
3.95	0.46	0.92	2.29	4.58	9.15
4.00	0.45	0.90	2.25	4.49	8.99
4.05	0.44	0.88	2.21	4.41	8.83
4.10	0.43	0.87	2.17	4.34	8.67
4.15	0.43	0.85	2.13	4.26	8.52
4.20	0.42	0.84	2.09	4.19	8.38
4.25	0.41	0.82	2.06	4.12	8.24
4.30	0.41	0.81	2.03	4.05	8.10
4.35	0.40	0.80	1.99	3.99	7.97
4.40	0.39	0.78	1.96	3.92	7.85
4.45	0.39	0.77	1.93	3.86	7.73
4.50	0.38	0.76	1.90	3.80	7.61
4.55	0.37	0.75	1.87	3.75	7.49
4.60	0.37	0.74	1.85	3.69	7.38
4.65	0.36	0.73	1.82	3.64	7.27
4.70	0.36	0.72	1.79	3.58	7.17
4.75	0.35	0.71	1.77	3.53	7.07
4.80	0.35	0.70	1.74	3.48	6.97
4.85	0.34	0.69	1.72	3.43	6.87
4.90	0.34	0.68	1.69	3.39	6.78
4.95	0.33	0.67	1.67	3.34	6.68
5.00	0.33	0.66	1.65	3.30	6.60

Note: Small load(greater than 2 mA) is necessary as R1 or R2 is larger than 50 K Ohm. Otherwise, outputvoltage probably cannot be pulled down to 0 V on disable mode.

■ Package Dimension
MSOP-8


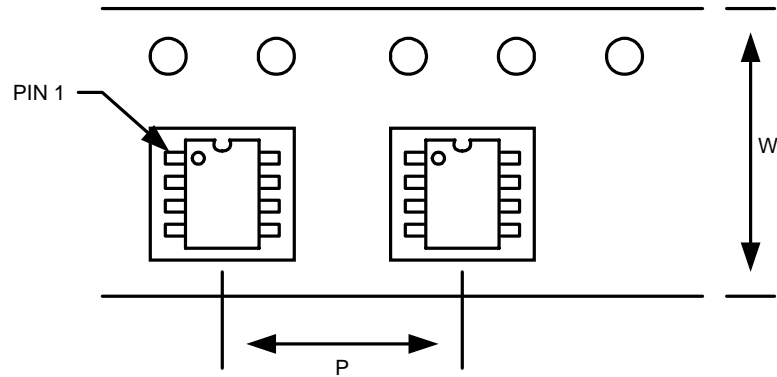
SYMBOLS	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	-	1.07	-	0.04197
A₁	0.05	0.20	0.002	0.008
A₂	0.81	0.92	0.032	0.036
b	0.28	0.38	0.011	0.015
b₁	0.28	0.33	0.011	0.013
c	0.13	0.23	0.005	0.009
c₁	0.13	0.17	0.005	0.006
D	2.90	3.10	0.114	0.122
E	4.77	4.98	0.188	0.196
E₁	2.90	3.10	0.114	0.122
e	0.65 TYP		0.0255 TYP	
e₁	1.95 TYP		0.0767 TYP	
L	0.406	0.686	0.01598	0.02701
L₁	0.94 REF		0.037 REF	
L₂	0.254 TYP		0.010 TYP	
θ	0°	8°	0°	8°

NOTE:

- Controlling dimension : Millimeter, converted inchdimension are not necessarily exact.
- Dimensioning and tolerancing per ansi Y14.5m-1994.
- Dimension "d" does not include mold flash,protrusion or gate burr, mold flash,protrusion and gate burr shall not exceed 0.15mm(0.006") per side. Dimension e1 do not include inter-lead flash or protrusion, inter-lead flash and protrusion shall not exceed 0.15mm(0.006") per side.
- The package top be smaller than the package bottom. Dimension d and e1 are determined at outermost extremes of the plastic body exclusive of mold flash, tie bar burrs, gate burrs and interlead flash, but including any mismatch between the top and bottom of the plastic body.
- Dimension 'b' does not include dambar protrusion. Allowable dambar protrusion shall be 0.08mm(0.0031) total in excess of the "b" dimension at maximum material condition.



■ Tape and Reel Diagram



Carrier Tape, Number of Components Per Reel and Reel Size

Package	Carrier Width (W)	Pitch (P)	Part Per Full Reel	Reel Size
MSOP-8L	12mm	9.1mm	4000	13in



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