AME8841 600mA CMOS LDO

■ General Description

The AME8841 linear regulator features low quiescent current (30μA typ.) with low dropout voltage, making it ideal for battery applications. The space-saving SO-8 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.

The AME8841 is stable with an output capacitance of 2.2μF or greater.

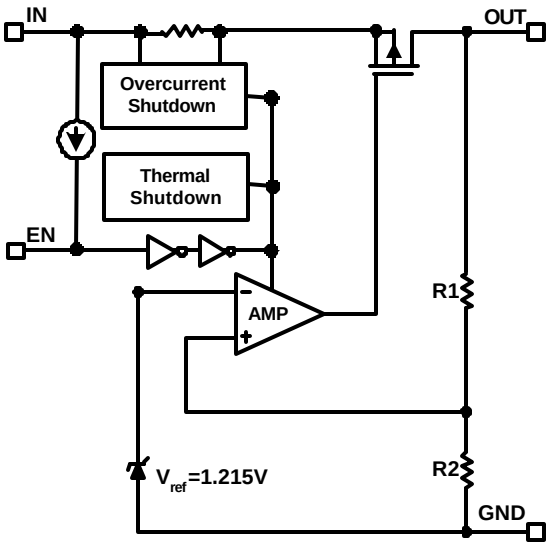
■ Features

- Very Low Dropout Voltage
- Guaranteed 600mA Output
- Accurate to within 1.5%
- 30μA Quiescent Current
- Over-Temperature Shutdown
- Current Limiting
- Short Circuit Current Fold-back
- Power-Saving Shutdown Mode
- Space-Saving SO-8 Package
- Many fixed output voltages available
- Low Temperature Coefficient
- All AME's Lead Free Products Meet RoHS Standards

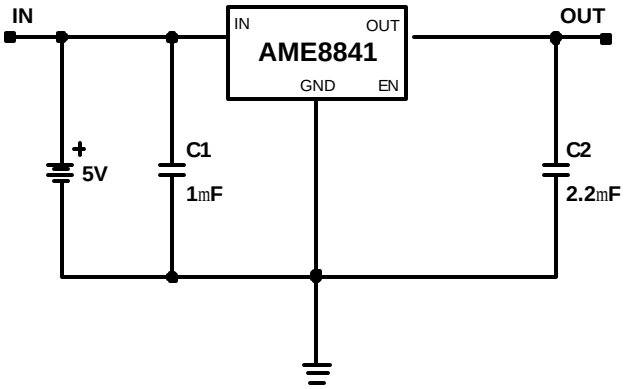
■ Applications

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

■ Functional Block Diagram

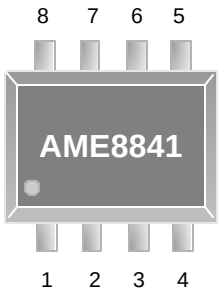


■ Typical Application



■ Pin Configuration

SO-8
Top View



AME8841

1. OUT
2. IN
3. GND
4. OUT
5. NC
6. NC
7. EN
8. NC

*** Die Attach:**
Non-Conductive Epoxy

■ Ordering Information

AME8841 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 B: 3.0V C: 2.8V D: 2.5V 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 1: 1.3V 2: 2.0V 3: 4.2V 4: 4.0V	E: -40°C to 85°C	H: SO-8	A: 8	Z: Lead Free

■ Ordering Information (contd.)

Part Number	Marking*	Output Voltage	Package	Operating Ambient Temperature Range
AME8841AEHA	8841 AEHA yyww	3.3V	SO-8	- 40°C to + 85°C
AME8841AEHAZ	8841 AEHA yyww	3.3V	SO-8	- 40°C to + 85°C
AME8841BEHA	8841 BEHA yyww	3.0V	SO-8	- 40°C to + 85°C
AME8841BEHAZ	8841 BEHA yyww	3.0V	SO-8	- 40°C to + 85°C
AME8841CEHA	8841 CEHA yyww	2.8V	SO-8	- 40°C to + 85°C
AME8841CEHAZ	8841 CEHA yyww	2.8V	SO-8	- 40°C to + 85°C
AME8841DEHA	8841 DEHA yyww	2.5V	SO-8	- 40°C to + 85°C
AME8841DEHAZ	8841 DEHA yyww	2.5V	SO-8	- 40°C to + 85°C
AME8841EEHA	8841 EEHA yyww	3.8V	SO-8	- 40°C to + 85°C
AME8841EEHAZ	8841 EEHA yyww	3.8V	SO-8	- 40°C to + 85°C
AME8841FEHA	8841 FEHA yyww	3.6V	SO-8	- 40°C to + 85°C
AME8841FEHAZ	8841 FEHA yyww	3.6V	SO-8	- 40°C to + 85°C

Note: yyww represents the date code

* A line on top of the first character represents lead free plating such as $\overline{8841}$

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

■ Ordering Information (contd.)

Part Number	Marking*	Output Voltage	Package	Operating Ambient Temperature Range
AME8841GEHA	8841 GEHA yyww	3.5V	SO-8	- 40°C to + 85°C
AME8841GEHAZ	8841 GEHA yyww	3.5V	SO-8	- 40°C to + 85°C
AME8841HEHA	8841 HEHA yyww	2.7V	SO-8	- 40°C to + 85°C
AME8841HEHAZ	8841 HEHA yyww	2.7V	SO-8	- 40°C to + 85°C
AME8841IEHA	8841 IEHA yyww	3.4V	SO-8	- 40°C to + 85°C
AME8841IEHAZ	8841 IEHA yyww	3.4V	SO-8	- 40°C to + 85°C
AME8841JEHA	8841 JEHA yyww	2.85V	SO-8	- 40°C to + 85°C
AME8841JEHAZ	8841 JEHA yyww	2.85V	SO-8	- 40°C to + 85°C
AME8841KEHA	8841 KEHA yyww	3.7V	SO-8	- 40°C to + 85°C
AME8841KEHAZ	8841 KEHA yyww	3.7V	SO-8	- 40°C to + 85°C
AME8841LEHA	8841 LEHA yyww	1.5V	SO-8	- 40°C to + 85°C
AME8841LEHAZ	8841 LEHA yyww	1.5V	SO-8	- 40°C to + 85°C

■ Ordering Information

Part Number	Marking*	Output Voltage	Package	Operating Ambient Temperature Range
AME8841MEHA	8841 MEHA yyww	1.8V	SO-8	- 40°C to + 85°C
AME8841MEHAZ	8841 MEHA yyww	1.8V	SO-8	- 40°C to + 85°C
AME8841NEHA	8841 NEHA yyww	2.9V	SO-8	- 40°C to + 85°C
AME8841NEHAZ	8841 NEHA yyww	2.9V	SO-8	- 40°C to + 85°C
AME8841OEHA	8841 OEHA yyww	3.1V	SO-8	- 40°C to + 85°C
AME8841OEHAZ	8841 OEHA yyww	3.1V	SO-8	- 40°C to + 85°C
AME8841REHA	8841 REHA yyww	2.65V	SO-8	- 40°C to + 85°C
AME8841REHAZ	8841 REHA yyww	2.65V	SO-8	- 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.
* HBM B:2000V~3999V

■ Recommended Operating Conditions

Parameter	Symbol	Rating	Unit
Ambient Temperature Range	T_A	- 40 to +85	^oC
Junction Temperature Range	T_J	- 40 to +125	^oC

■ Thermal Information

Parameter	Maximum	Unit
Maximum Junction Temperature	150	^oC
Solder Iron(10 Sec)*	350	^oC

* 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=600mA V_O=$V_{O(NOM)}$ -2.0%	1.3V<=$V_{O(NOM)}$<=1.4V		See chart	1900	mV
			1.4V<$V_{O(NOM)}$<=2.0V			1400	
			2.0V<$V_{O(NOM)}$<=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	µA
Ground Pin Current	I_{GND}	I_O=1mA to 600mA			30	50	µA
Line Regulation	REG_{LINE}	I_O=1mA V_{IN}=V_O+1 to V_O+2	1.3V <= 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	
			V_O >= 4.0V	-0.4	0.2	0.4	
Load Regulation	REG_{LOAD}	I_O=1mA to 600mA		-1	0.2	1	%
Over Temperature Shutdown	OTS				150		°C
Over Temperature 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,C_{BYP}=0µF	Co=2.2µF		30		mVrms
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

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 AME8841 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^{o}C, or the current exceeds 600mA. During thermal shutdown, the output voltage remains low. Normal operation is restored when the junction temperature drops below 110^{o}C.

The AME8841 switches from voltage mode to current mode when the load exceeds the rated output current. This prevents over-stress. The AME8841 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 AME8841 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.

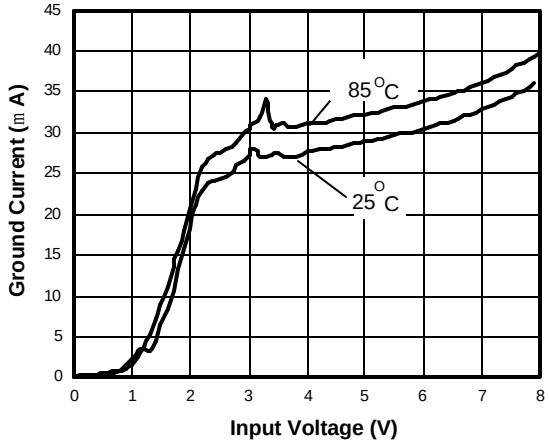
A second capacitor is recommended between the input and ground to stabilize Vin. The input capacitor should be at least 0.1µF to have a beneficial effect.

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.

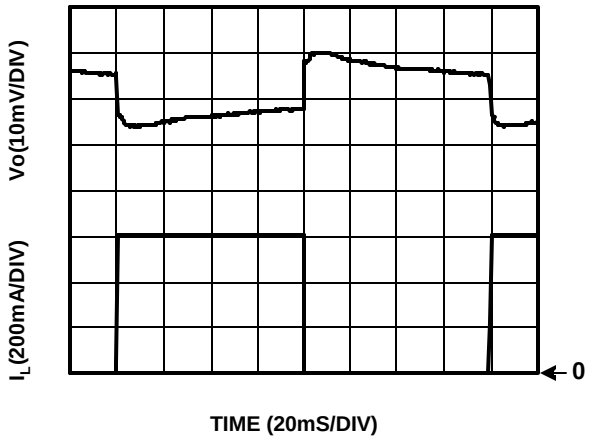
■ Enable

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.

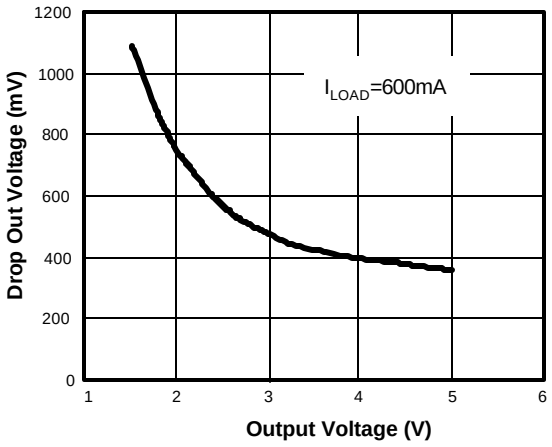
Ground Current vs. Input Voltage



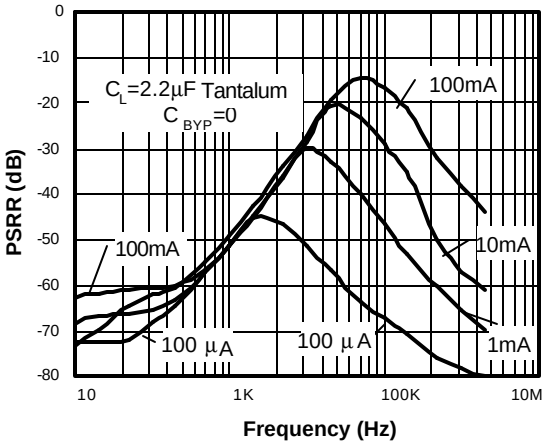
Load Step (1mA-600mA)



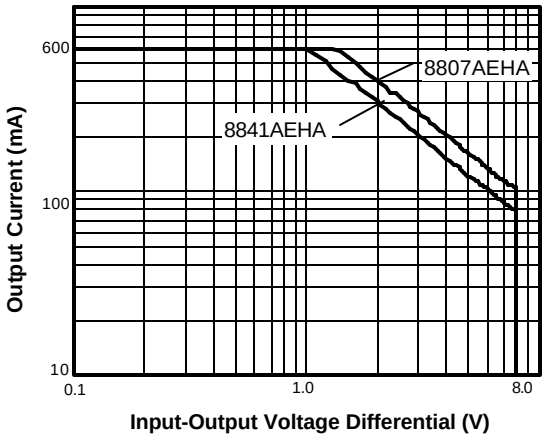
Drop Out Voltage vs. Output Voltage



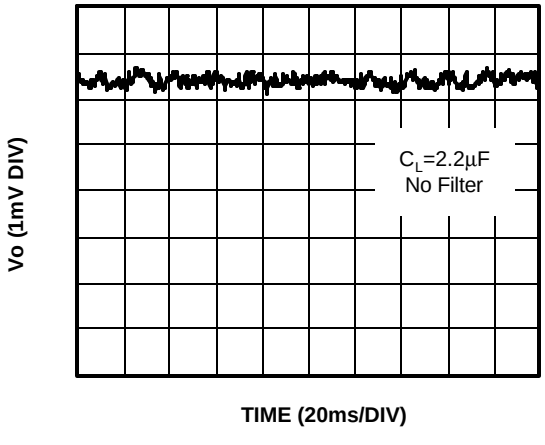
Power Supply Rejection Ratio



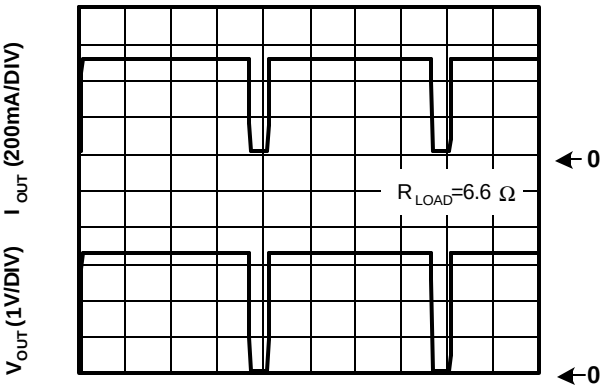
Safe Operating Area



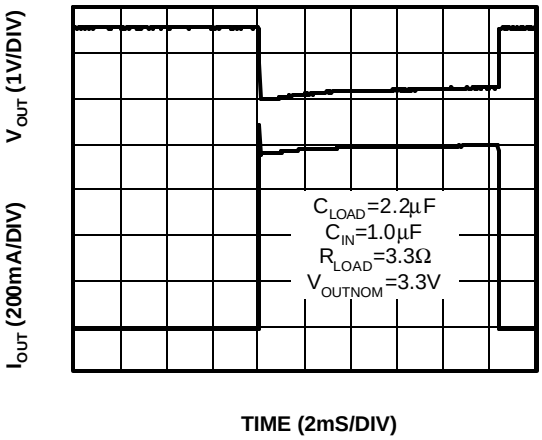
Noise Measurement



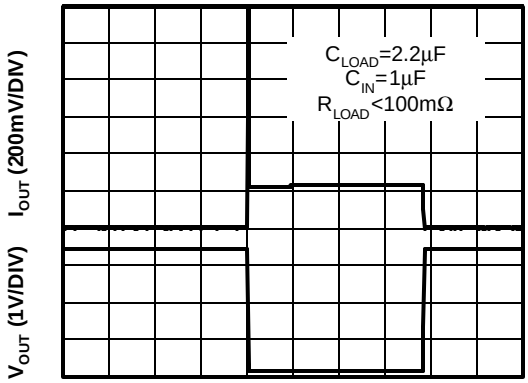
Overtemperature Shutdown



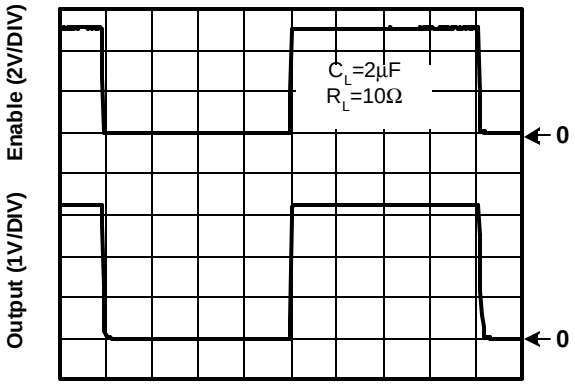
Current Limit Response



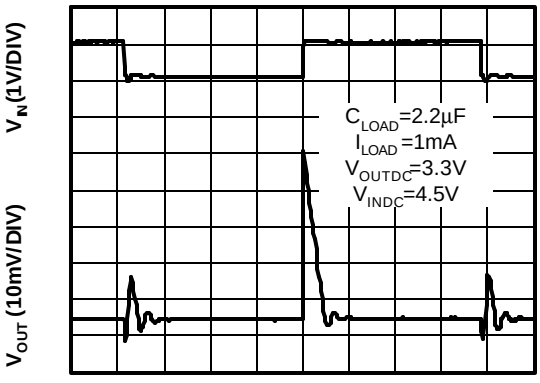
Short Circuit Response



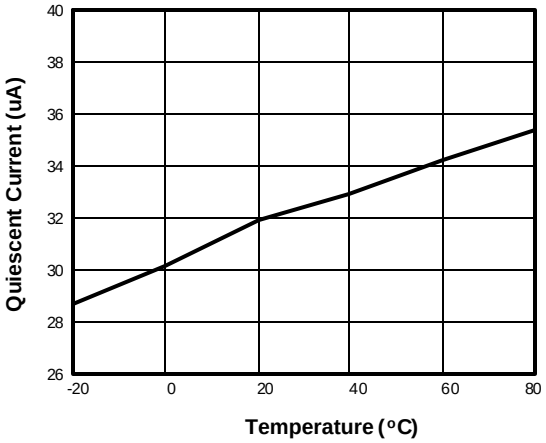
Chip Enable Transient Response



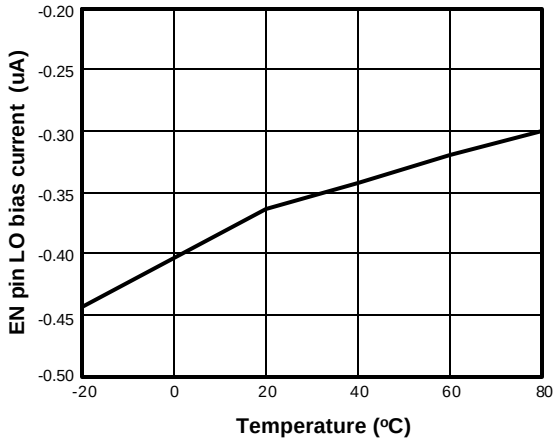
Line Transient Response



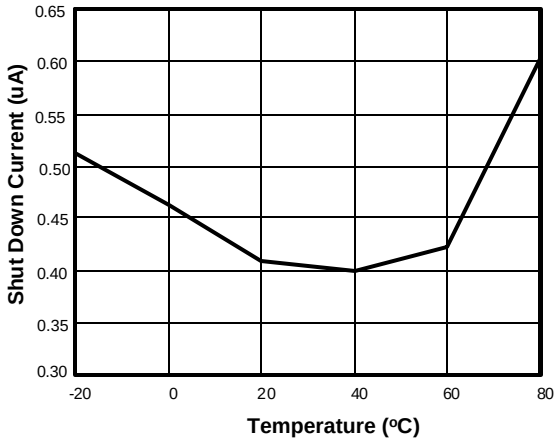
Quiescent Current vs. Temp.



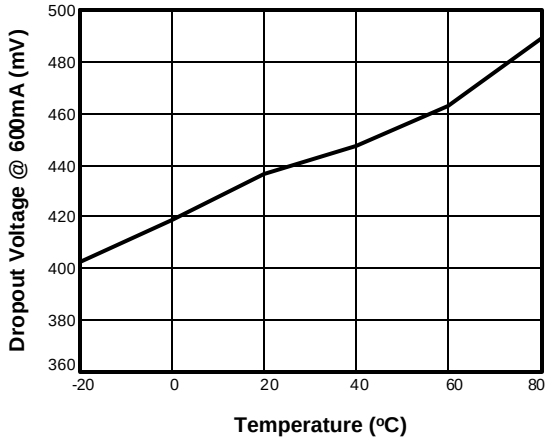
EN pin vs. Temp.



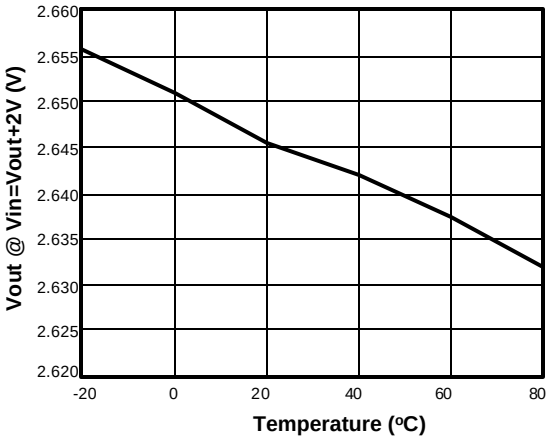
Shut Down Current vs. Temp.



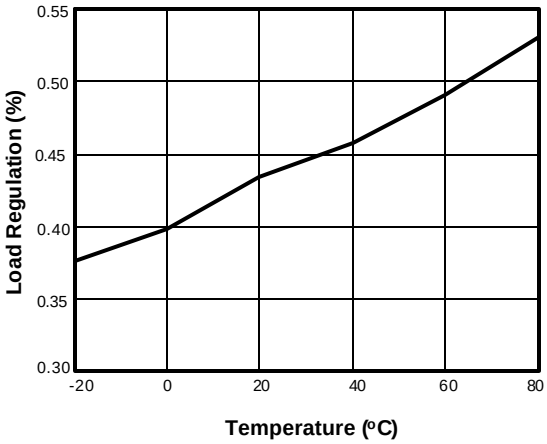
Dropout Voltage vs. Temp.



V_{out} vs. Temp.

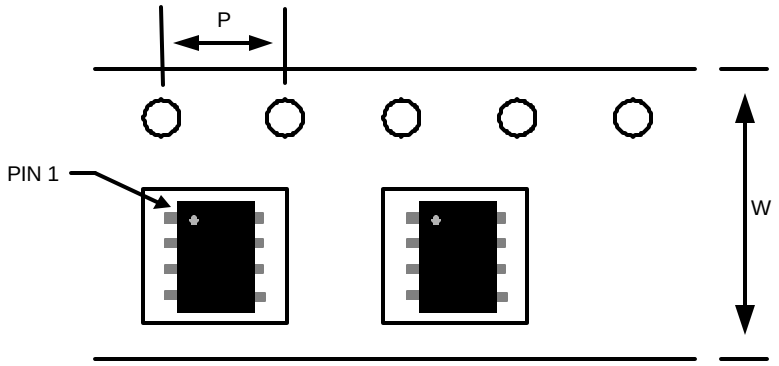


Load Regulation vs. Temp.



■ Tape and Reel Dimension

SO-8

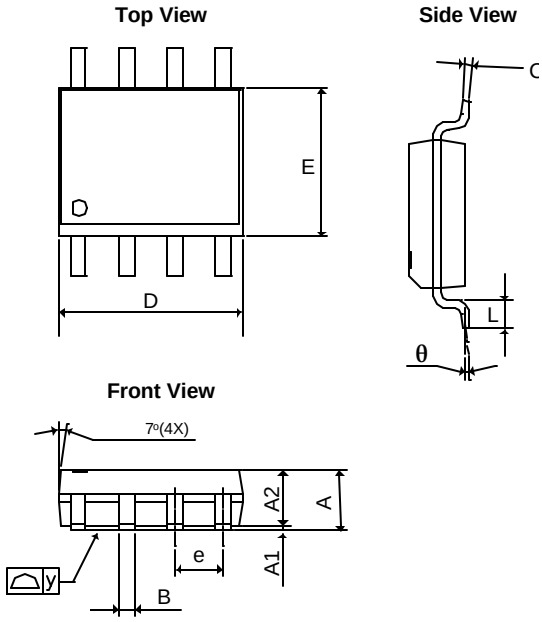


Carrier Tape, Number of Components Per Reel and Reel Size

Package	Carrier Width (W)	Pitch (P)	Part Per Full Reel	Reel Size
SO-8	12.0±0.1 mm	4.0±0.1 mm	2500pcs	330±1 mm

■ Package Dimension

SO-8



SYMBOLS	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	1.35	1.75	0.05315	0.0689
A_1	0.10	0.25	0.00394	0.00984
A2	1.473 REF		0.058 REF	
B	0.33	0.51	0.01299	0.02008
C	0.19	0.25	0.00748	0.00984
D	4.80	5.00	0.18898	0.19685
E	3.80	4.00	0.14961	0.15748
e	1.27 BSC		0.050 BSC	
L	0.40	1.27	0.01575	0.05
y	-	0.10	-	0.004
q	0^o	8^o	0^o	8^o



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-DS8841-H.01

Corporate Headquarter
AME, Inc.
2F, NO. 302 Rui-Guang Road, Nei-Hu Dist.
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