General Description

The AME8803 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-23-6 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. In applications requiring a low noise, regulated supply, place a 1000pF capacitor between Bypass and ground.

The AME8803 is stable with an output capacitance of 2.2µF or greater.

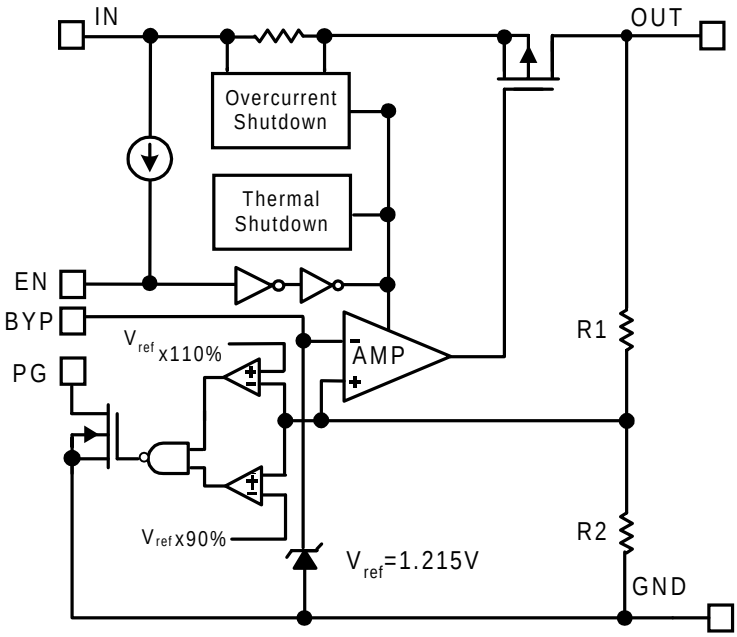
Features

- 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
- Noise Reduction Bypass Capacitor
- Power Good Detector
- Power-Saving Shutdown Mode
- Space-Saving SOT-26 (SOT-23-6)
- Factory Pre-set Output Voltages
- Low Temperature Coefficient

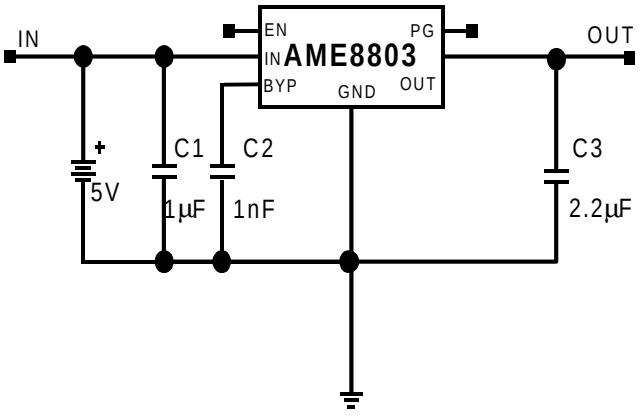
Applications

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

Functional Block Diagram

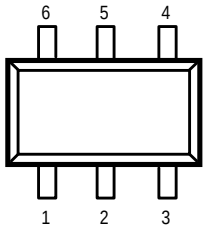


Typical Application



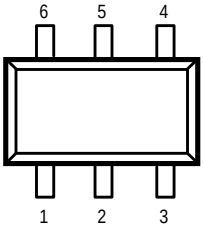
■ Pin Configuration

AME8803
SOT-26 Top View



1. V_{IN}
2. GND
3. EN
4. PG
5. BYP
6. V_{OUT}

AME8814
SOT-26 W Top View



1. EN
2. GND
3. BYP
4. V_{OUT}
5. GND
6. V_{IN}

■ Ordering Information

Part Number	Marking	Output	Package	Operating Temp.
AME8803AEEY	AAPww	3.3V	SOT-26	-40^{O}C to +85^{O}C
AME8803BEEY	AAQww	3.0V	SOT-26	-40^{O}C to +85^{O}C
AME8803CEEY	AARww	2.8V	SOT-26	-40^{O}C to +85^{O}C
AME8803DEEY	AASww	2.5V	SOT-26	-40^{O}C to +85^{O}C
AME8803EEEY	AATww	3.8V	SOT-26	-40^{O}C to +85^{O}C
AME8803FEEY	ABQww	3.6V	SOT-26	-40^{O}C to +85^{O}C
AME8803GEEY	ACHww	3.5V	SOT-26	-40^{O}C to +85^{O}C
AME8803HEEY	AGKww	2.7V	SOT-26	-40^{O}C to +85^{O}C
AME8803IEEY	AEQww	3.4V	SOT-26	-40^{O}C to +85^{O}C
AME8803JEEY	AGSww	2.85V	SOT-26	-40^{O}C to +85^{O}C
AME8803KEEY	AHUww	3.7V	SOT-26	-40^{O}C to +85^{O}C
AME8803LEEY	AJKww	1.5V	SOT-26	-40^{O}C to +85^{O}C
AME8803MEEY	AJLww	1.8V	SOT-26	-40^{O}C to +85^{O}C
AME8803NEEY	ALAww	2.9V	SOT-26	-40^{O}C to +85^{O}C
AME8803OEEY	ALBww	3.1V	SOT-26	-40^{O}C to +85^{O}C

■ Ordering Information

Part Number	Marking	Output	Package	Operating Temp.
AME8814AEEY	AIEww	3.3V	SOT-26	-40°C to +85°C
AME8814BEEY	AIFww	3.0V	SOT-26	-40°C to +85°C
AME8814CEEY	AIGww	2.8V	SOT-26	-40°C to +85°C
AME8814DEEY	AIHww	2.5V	SOT-26	-40°C to +85°C
AME8814EEEY	AIIww	3.8V	SOT-26	-40°C to +85°C
AME8814FEEY	AIJww	3.6V	SOT-26	-40°C to +85°C
AME8814GEEY	AIKww	3.5V	SOT-26	-40°C to +85°C
AME8814HEEY	AILww	2.7V	SOT-26	-40°C to +85°C
AME8814IEEY	AIMww	3.4V	SOT-26	-40°C to +85°C
AME8814JEEY	AINww	2.85V	SOT-26	-40°C to +85°C
AME8814KEEY	AIOww	3.7V	SOT-26	-40°C to +85°C
AME8814LEEY	AJDww	1.5V	SOT-26	-40°C to +85°C
AME8814MEEY	AJEww	1.8V	SOT-26	-40°C to +85°C
AME8814NEEY	AKYww	2.9V	SOT-26	-40°C to +85°C
AME8814OEEY	AKZww	3.1V	SOT-26	-40°C to +85°C

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	

■ Recommended operating Conditions:

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

■ Thermal Information

Parameter	Package	Maximum	Unit
Thermal Resistance (θ_{ja})	SOT-26	260	^oC / W
Thermal Resistance (θ_{ja})	SOT-26W	260	
Internal Power Dissipation (P_D) ($\Delta T = 100^oC$)	SOT-26	380	mW
Internal Power Dissipation (P_D) ($\Delta T = 100^oC$)	SOT-26W	380	
Maximum Junction Temperature		150	^oC
Maximum Lead Temperature (10 Sec)		300	

Caution: Stress above the listed absolute rating may cause permanent damage to the device

■ 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_{ONOM} -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	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=1kHz		50		dB
			f=10kHz		20		
			f=100kHz		15		
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 <=Vo <= 5.0V				85	%$V_{O(NOM)}$
		1.2V <= Vo < 2.5V				75	
Output Over Voltage	V_{OV}	2.5V <=Vo <= 5.0V		115			%$V_{O(NOM)}$
		1.2V <= Vo < 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 AME8803 family of CMOS regulators contain a PMOS pass transistor, voltage reference, error amplifier, over-current protection, thermal shutdown, and Power Good detection circuitry.

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 AME8803 switches from voltage mode to current mode when the load exceeds the rated output current. This prevents over-stress. The AME8803 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 AME8803 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.

A third capacitor can be connected between the BYPASS pin and GND. This capacitor can be a low cost Polyester Film variety between the value of 0.001 ~ 0.01µF. 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.

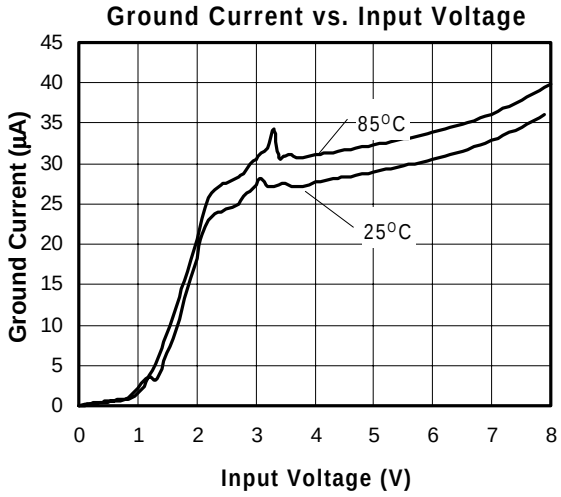
■ Enable

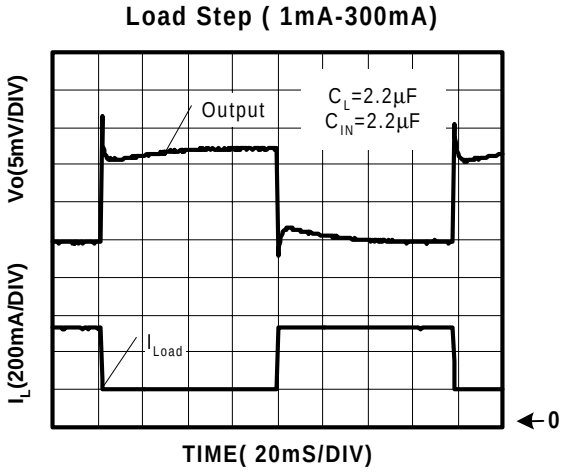
The Enable pin normally floats high. When actively, pulled low, the PMOS pass transistor shuts off, and all internal circuits are powered down. In this state, the quiescent current is less than 1µA. This pin behaves much like an electronic switch.

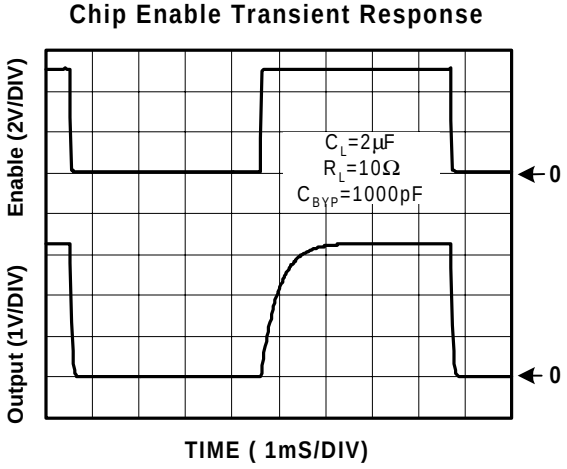
■ Power Good

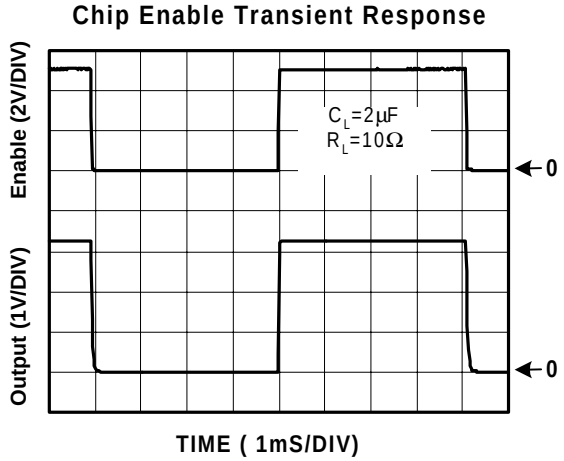
The AME8803 includes the Power Good feature. Normally, Pin 4 is "Floating", however, when the output is not within ±10% of the specified voltage, it pulls low. This can occur under the following conditions:

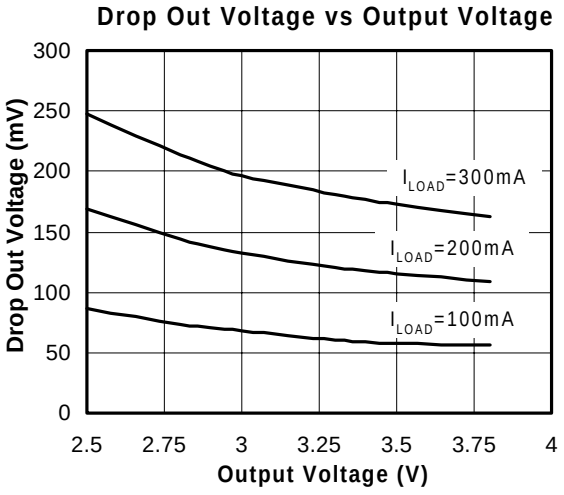
1) Input Voltage too low.
2) During Over-Temperature.
3) During Over-Current.
4) If output is pulled up.

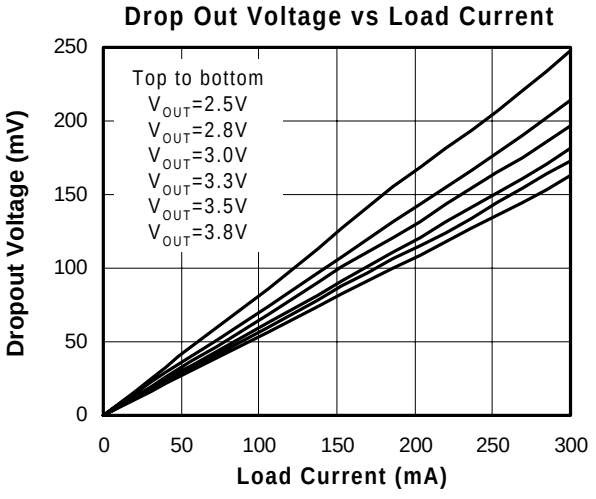

Ground Current vs. Input Voltage
Ground Current (μA)
Input Voltage (V)
85°C
25°C
0
5
10
15
20
25
30
35
40
45
0
1
2
3
4
5
6
7
8


Load Step (1mA-300mA)
Vo(5mV/DIV)
IL(200mA/DIV)
Output
CL=2.2μF
CIN=2.2μF
ILoad
0
TIME(20mS/DIV)

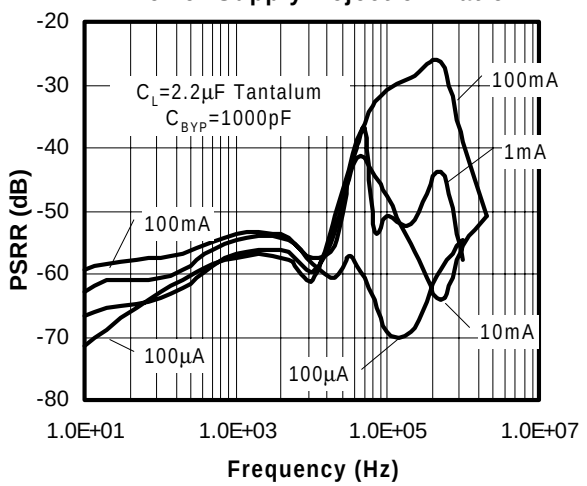

Chip Enable Transient Response
Enable (2V/DIV)
Output (1V/DIV)
CL=2μF
RL=10Ω
CBYP=1000pF
0
0
TIME (1mS/DIV)


Chip Enable Transient Response
Enable (2V/DIV)
Output (1V/DIV)
CL=2μF
RL=10Ω
0
0
TIME (1mS/DIV)

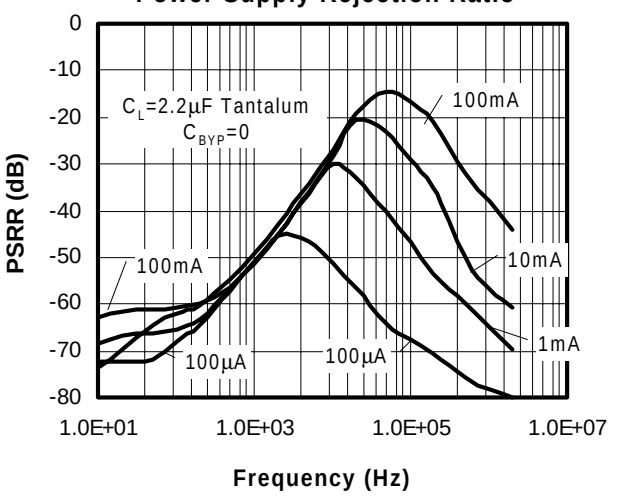

Drop Out Voltage vs Output Voltage
Drop Out Voltage (mV)
Output Voltage (V)
ILOAD=300mA
ILOAD=200mA
ILOAD=100mA
0
50
100
150
200
250
300
2.5
2.75
3
3.25
3.5
3.75
4


Drop Out Voltage vs Load Current
Dropout Voltage (mV)
Load Current (mA)
Top to bottom
VOUT=2.5V
VOUT=2.8V
VOUT=3.0V
VOUT=3.3V
VOUT=3.5V
VOUT=3.8V
0
50
100
150
200
250
300

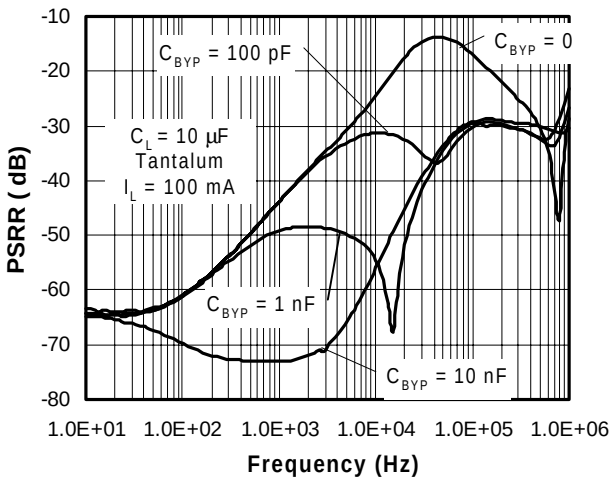
Power Supply Rejection Ratio



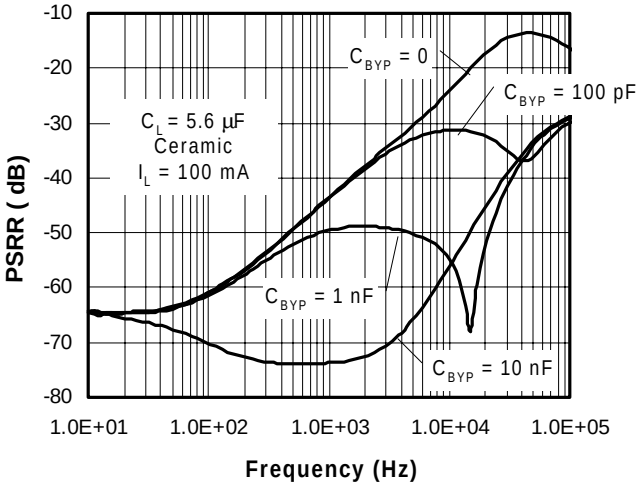
Power Supply Rejection Ratio



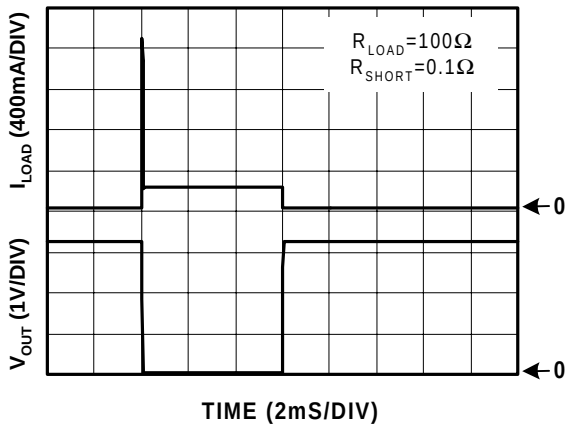
Power Supply Rejection Ratio



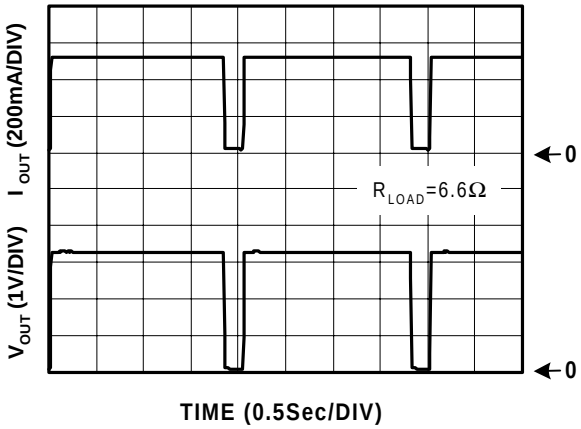
Power Supply Rejection Ratio



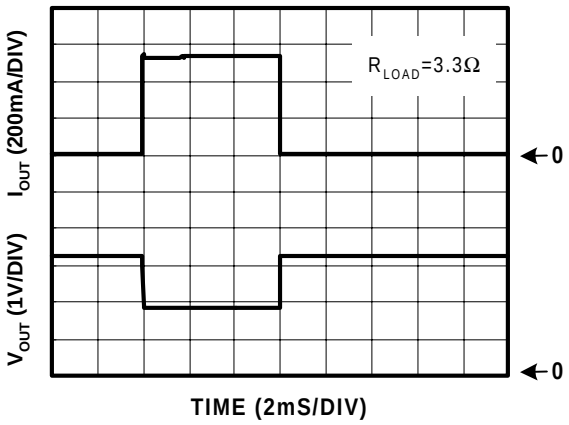
Short Circuit Response



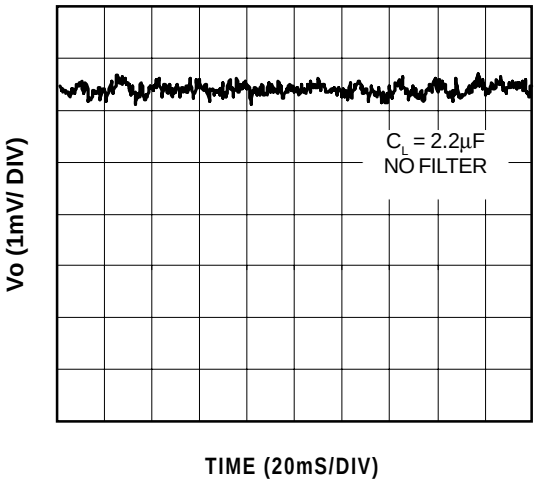
Overtemperature Shutdown



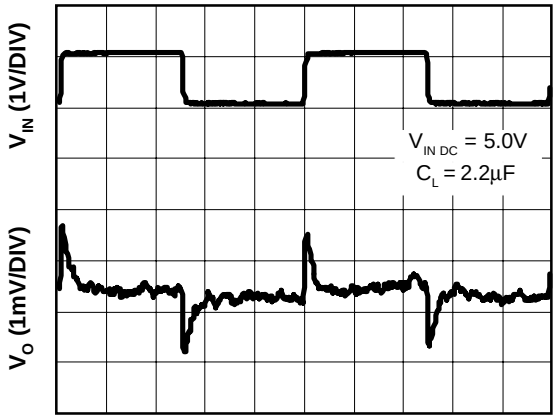
Current Limit Response



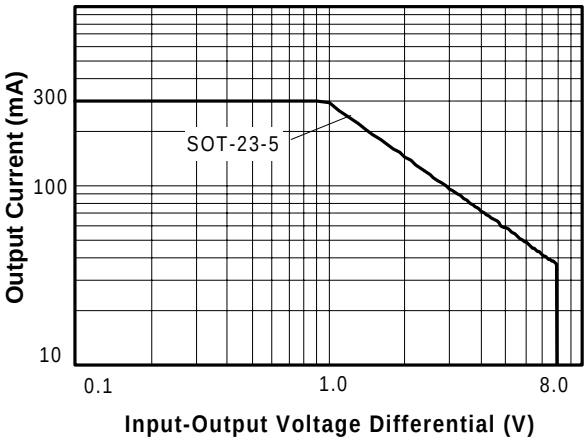
Noise Measurement

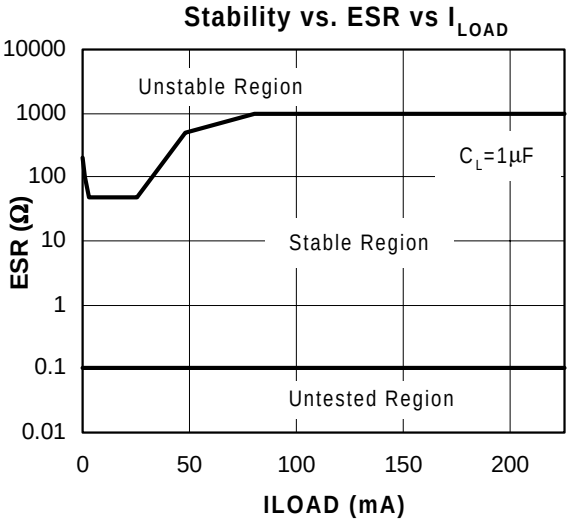


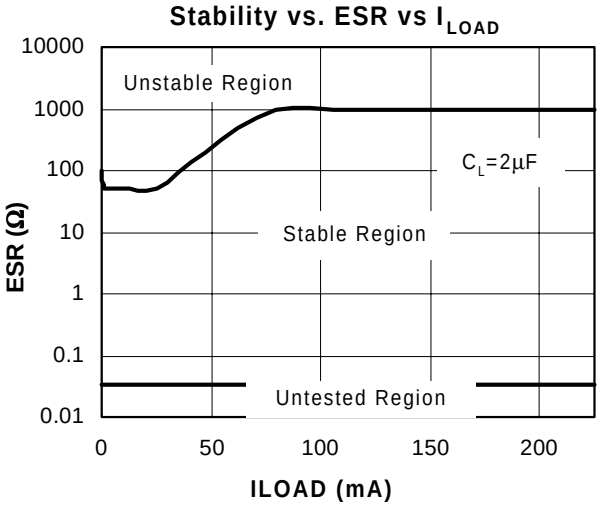
Transient Line Response

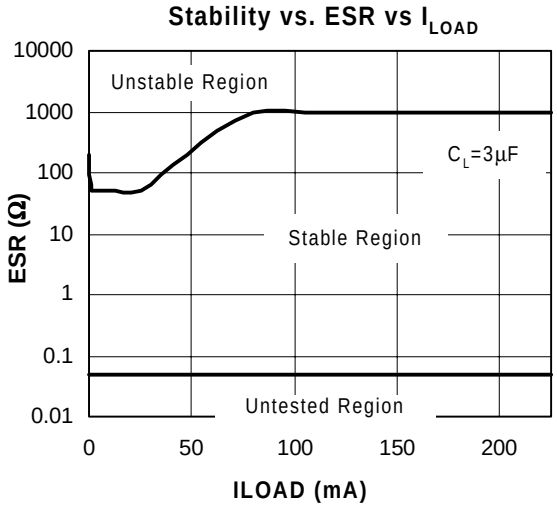


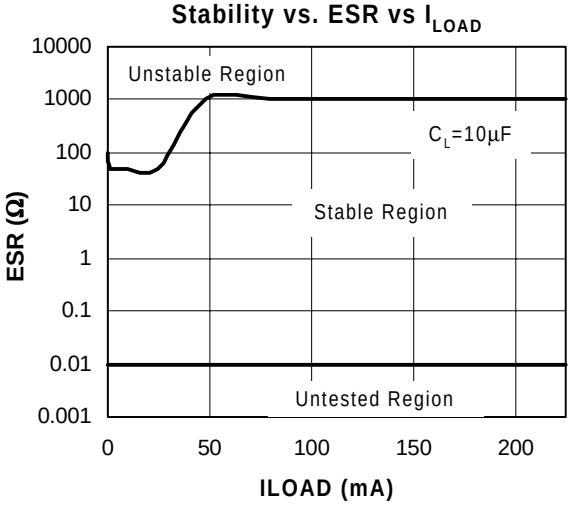
Safe Operating Area



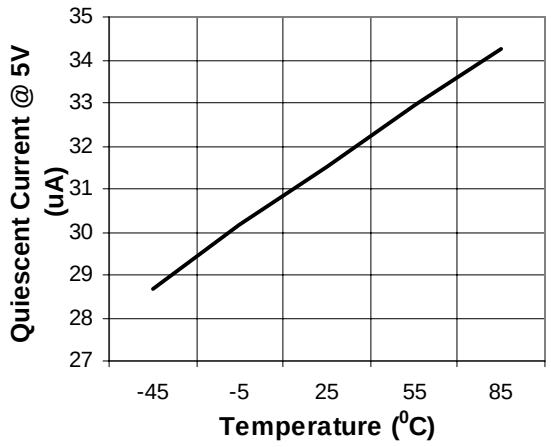

Stability vs. ESR vs I_{LOAD}
10000
1000
100
10
1
0.1
0.01
ESR (Ω)
Unstable Region
C_L=1µF
Stable Region
Untested Region
0
50
100
150
200
ILOAD (mA)


Stability vs. ESR vs I_{LOAD}
10000
1000
100
10
1
0.1
0.01
ESR (Ω)
Unstable Region
C_L=2µF
Stable Region
Untested Region
0
50
100
150
200
ILOAD (mA)

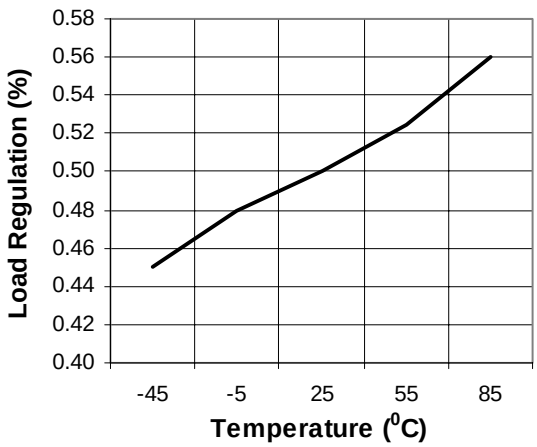

Stability vs. ESR vs I_{LOAD}
10000
1000
100
10
1
0.1
0.01
ESR (Ω)
Unstable Region
C_L=3µF
Stable Region
Untested Region
0
50
100
150
200
ILOAD (mA)


Stability vs. ESR vs I_{LOAD}
10000
1000
100
10
1
0.1
0.01
0.001
ESR (Ω)
Unstable Region
C_L=10µF
Stable Region
Untested Region
0
50
100
150
200
ILOAD (mA)

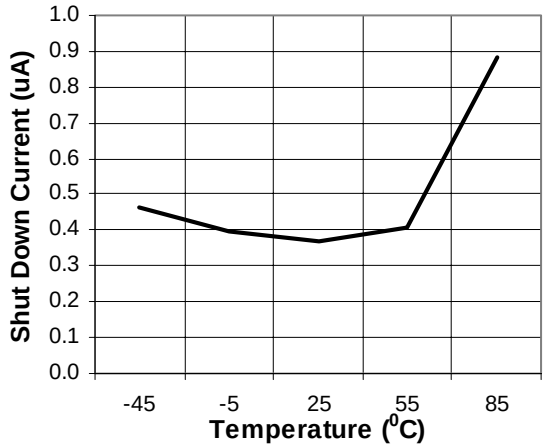
Quiescent Current vs. Temp.



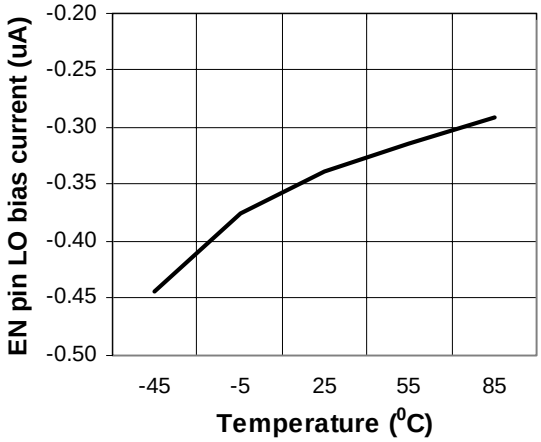
Load Regulation vs. Temp.



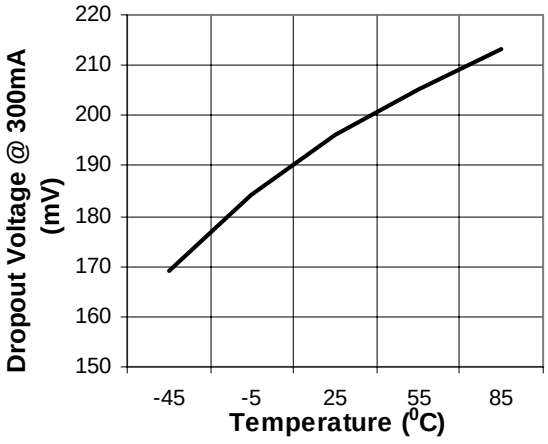
Shut Down Current vs. Temp.



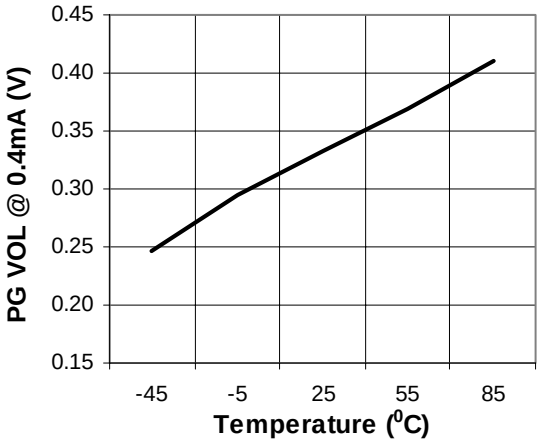
EN pin LO bias Current vs. Temp.



Dropout Voltage vs. Temp.

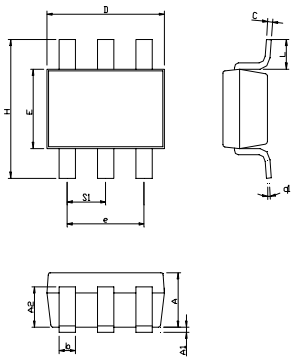


PG VOL vs. Temp.



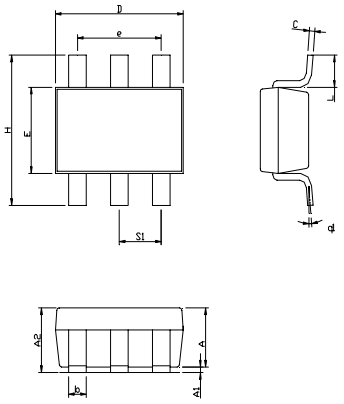
■ Package Dimension

SOT-26



SYMBOLS	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	1.00	1.40	0.0394	0.0551
A_1	0.00	0.15	0.0000	0.0591
A2	0.70	1.25	0.0276	0.0492
b	0.35	0.50	0.0138	0.0197
C	0.08	0.25	0.0031	0.0098
D	2.70	3.10	0.1063	0.1220
E	1.40	1.80	0.0551	0.0709
e	1.90 BSC		0.0748 BSC	
H	2.60	3.00	0.1024	0.1181
L	0.35	-	0.0138	-
θ1	0°	9°	0°	9°
S_1	0.85	1.05	0.0335	0.0413

SOT-26 (Wide)



SYMBOLS	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	1.00	1.30	0.0937	0.0512
A_1	0.00	0.10	0.000	0.0039
A2	1.00	1.40	0.0937	0.0551
b	0.35	0.50	0.0138	0.0197
C	0.10	0.25	0.0039	0.0098
D	2.70	3.10	0.1063	0.1220
E	1.60	2.00	0.0630	0.0787
e	-	-	-	-
H	2.60	3.00	0.1024	0.1181
L	0.37	-	0.0146	-
θ1	1°	9°	1°	9°
S_1	0.85	1.05	0.0335	0.0413

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