ADD MICROTECH CORP.®

AMC8877

LOW NOISE 300mA LOW DROPOUT REGULATOR

DESCRIPTION

The AMC8877 product is a low noise, low dropout linear regulator operating from 2.5V to 6.5V input. An external capacitor can be connected to the bypass pin to lower the output noise level to 30μV_{RMS}.

Designed with a P-channel MOSFET output transistor, the AMC8877 consume a low supply current, independent of the load current and dropout voltage. The internal thermal shut down circuit will limits the junction temperature to below 150°C. Other features include thermal protection, reverse battery protection and output current limit. The AMC8877 come in a miniature 5-pin SOT-23 package.

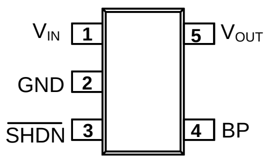
FEATURES

- **Low output noise: 30μV_{RMS}**
- **Industry standard'2982 pin assignment (AMC8877)**
- **Output voltage precision of ±1.4% accuracy**
- **Very low dropout voltage: 50mV/50mA, 165mV/150mA & 450mV/300mA**
- **On/Off control**
- **Low I_Q: 1.6μA**
- Short circuit protection
- Internal thermal overload protection
- Available in surface mount 5-pin SOT-23 package.
- Enhanced pin-to-pin Compatible to the MAX8878 (AMC8877).

APPLICATIONS

- Cellular Telephones
- Battery Powered Systems
- Hand-Held Instruments
- Pagers
- Personal Data Assistance (PDA)
- PCMCIA Cards

PACKAGE PIN OUT



AMC8877

5-Pin Plastic SOT-23
Surface Mount
(Top View)

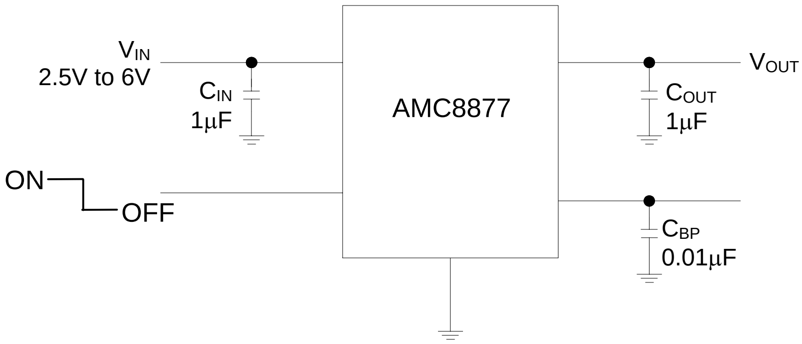
ORDER INFORMATION

Temperature Range	DBT: Plastic SOT-23 5-pin
$0^oC \le T_A \le 70^oC$	**AMC8877-X.XDBT**
$0^oC \le T_A \le 70^oC$	**AMC8877-X.XDBTF(Lead Free)**

EXPANDED ORDER INFORMATION

Device Name	Output Voltage	Symbolization AMC8877
AMC887□-1.8DBT	1.8V	CG18
AMC887□-2.0DBT	2.0V	CG20
AMC887□-2.5DBT	2.5V	CG25
AMC887□-2.8DBT	2.8V	CG28
AMC887□-2.85DBT	2.85V	CG2U
AMC887□-3.0DBT	3.0V	CG30
AMC887□-3.2DBT	3.2V	CG32
AMC887□-3.3DBT	3.3V	CG33
AMC887□-5.0DBT	5.0V	CG50

TYPICAL APPLICATION



ABSOLUTE MAXIMUM RATINGS (Note)	
Input Voltage, V_{IN}	12V
Operating Junction Temperature, T_J	150 °C
Storage Temperature Range	-65 °C to +150 °C
Lead Temperature (soldering, 10 seconds)	+260 °C
Power Dissipation, P_D @ T_A = 70 °C	150 mW

Note: Exceeding these ratings could cause damage to the device. All voltages are with respect to Ground. Currents are positive into, negative out of the specified terminal.

THERMAL DATA	
DB PACKAGE:	
Thermal Resistance from Junction to Ambient, θ_{JA}	220 °C /W

Junction Temperature Calculation: $T_J = T_A + (P_D \times \theta_{JA})$.
The θ_{JA} numbers are guidelines for the thermal performance of the device/pc-board system.
Connect the ground pin to ground using a large pad or ground plane for better heat dissipation.
All of the above assume no ambient airflow.

Maximum Power Calculation:

$$P_{D(MAX)} = \frac{T_{J(MAX)} - T_{A(MAX)}}{\theta_{JA}}$$

T_J(°C): Maximum recommended junction temperature

T_A(°C): Ambient temperature of the application

θ_{JA}(°C /W): Junction-to-junction temperature thermal resistance of the package, and other heat dissipating materials.

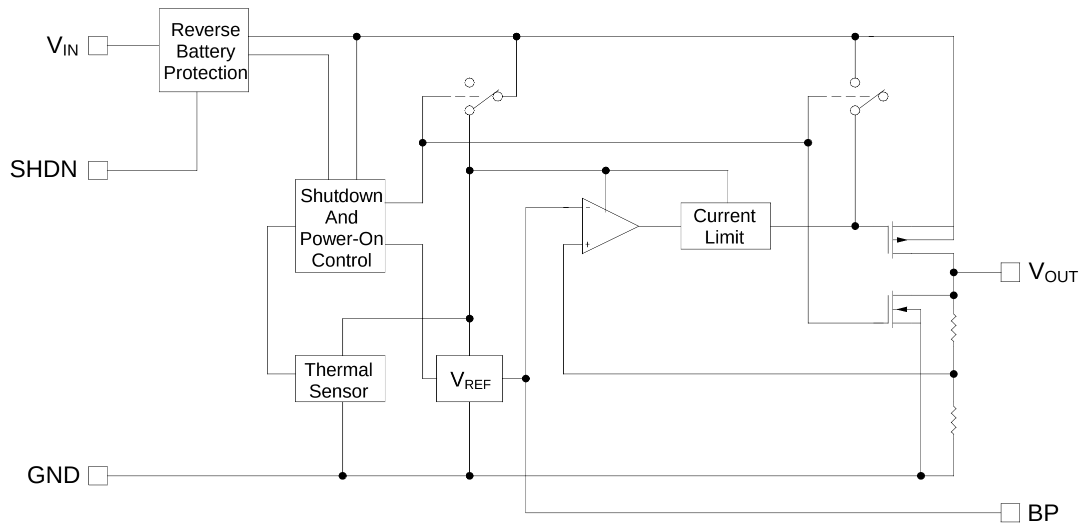
The maximum power dissipation for a single-output regulator is :

$$P_{D(MAX)} = [(V_{IN(MAX)} - V_{OUT(NOM)})] \times I_{OUT(NOM)} + V_{IN(MAX)} \times I_Q$$

Where: $V_{OUT(NOM)}$ = the nominal output voltage
$I_{OUT(NOM)}$ = the nominal output current, and
I_Q = the quiescent current the regulator consumes at $I_{OUT(MAX)}$
$V_{IN(MAX)}$ = the maximum input voltage

Then $\theta_{JA} = (+150\,^{\circ}C - T_A)/P_D$

BLOCK DIAGRAM



PIN DESCRIPTION

Pin Number		Pin Name	Pin Function
AMC8878	AMC8879		
1	5	V_{IN}	Input
2	2	GND	Ground
3	1	$\overline{SHDN}$	Logic control shutdown pin; HI: Device is ON, LO: Device is OFF
4	3	BP	Noise bypass pin; The output noise level can be reduced to 30μV_{RMS} by connecting external capacitors
5	4	V_{OUT}	Output

RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	Recommended Operating Conditions			Units
		Min.	Typ.	Max.	
Input Voltage	V_{IN}	2.5		6.5	V
Load Current	I_o	5		300	mA
Input Capacitor (V_{IN} to GND)		1.0			µF
Output Capacitor with ESR of 10Ω max., (V_{OUT} to GND)		1.0			µF

Note:
1. C_{IN}: A 1.0 µF capacitor (or larger) should be placed between V_{IN} to GND.
2. C_{OUT}: A 1.0 µF (or larger) capacitor is recommended between V_{OUT} and GND for stability and improving the regulator's transient response. The ESR (Effective Series Resistance.) of this capacitor has no effect on regulator stability, but low ESR capacitors improve high frequency transient response. The value of this capacitor may be increased without limit, but values larger than 10uF tend to increase the settling time after a step change in input voltage or output current. The part may oscillate without the capacitor. Any type of capacitor can be used, but not Aluminum electrolytics when operating below -25 °C, The capacitance may be increased without limit.

ELECTRICAL CHARACTERISTICS

Unless otherwise specified, these specifications apply over the operating ambient temperature of 0°C to +70 °C with $V_{IN} = V_{OUT(NOMIAL)} + 0.5V$, and are for DC characteristics only. (Low duty cycle pulse testing techniques are used which maintains junction and case temperatures equal to the ambient temperature.)

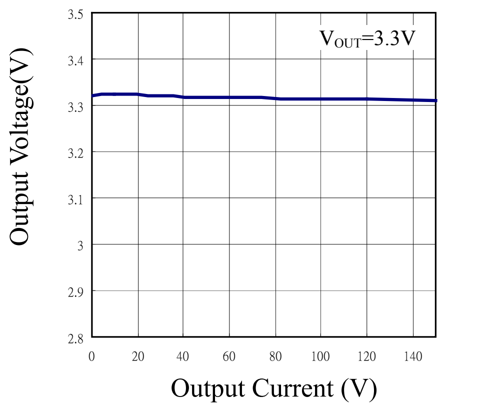
Parameter	Symbol	Test Conditions		AMC8877			Units
				Min	Typ.	Max	
Output Voltage Accuracy	ΔV_{OUT}	I_{OUT} = 10mA, T_A = +25 °C		-1.4		+1.4	%
		I_{OUT} = 10 to 300mA		-3		+2	
Maximum Output Current	I_{OUT}				300		mA
Current Limit	I_{LIMIT}			330			mA
Ground Pin Current	I_Q	I_{OUT} = 10mA			1.6	9	µA
		I_{OUT} = 300mA			1.7	9	
Dropout Voltage	VDROP	I_{OUT} = 50mA			50	120	mV
		I_{OUT} = 150mA			165	300	
		I_{OUT} = 300mA			450	650	
Line Regulation	ΔV_{OI}	V_{IN} = (V_{OUT} + 0.1V) to 6.5V, I_{OUT} = 1mA		-0.15	0	0.15	%/V
Load Regulation	ΔV_{OL}	I_{OUT} = 10 to 300mA, C_{OUT} = 10µF			40	80	mV
Ripple Rejection	PSRR	f=100Hz, IL=100uA			50		dB
Output Voltage Noise	e_n	f = 10Hz - 100KHz, C_{BP} = 0.01µF	C_{OUT} = 10µF		30		μV_{RMS}
			C_{OUT} = 100µF		20		
Shutdown Input Threshold High	V_{SIH}	V_{IN} = 2.5V to 5.5V		2.0			V
Shutdown Input Threshold Low	V_{SIL}	V_{IN} = 2.5V to 5.5V				0.4	V
Shutdown Supply Current	$I_{Q(SHDN)}$	V_{OUT} = 0V	T_A = +25 °C		0.01	1	µA
			T_A = +85 °C		0.2		
Shutdown Input Bias Current	I_{SHDN}	$V_{\overline{SHDN}} = V_{IN}$	T_A = +25 °C		0.01	100	nA
			T_A = +85 °C		0.5		
Shutdown Exit Delay	t_{delay}	C_{BP} = 0.1µF, C_{OUT} = 1µF, No load	T_A = +25 °C		6		ms
			T_A = +85 °C		6		
Thermal Shutdown Temperature	T_{SHDN}				+150		°C

Note:
1. Current limit is measured at constant junction temperature, using pulse ON time.
2. Dropout is measured at constant junction temperature, using pulse ON time, and criterion is V_{OUT} inside target value ± 2 %.
3. Regulation is measured at constant junction temperature, using pulsed ON time.

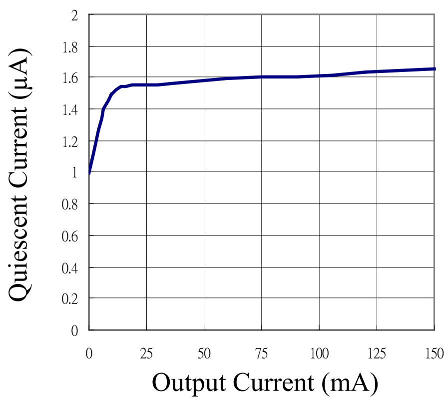
Characterization Curves

$V_{IN}=V_{OUT(NOMINAL)}$ + 0.5V or 2.5V(whichever is greater), C_{IN}=1uF, C_{OUT}=1uF,C_{BP}=0.01uF, T_A=+25 °C, ,Using plused ON time,unless otherwise noted.

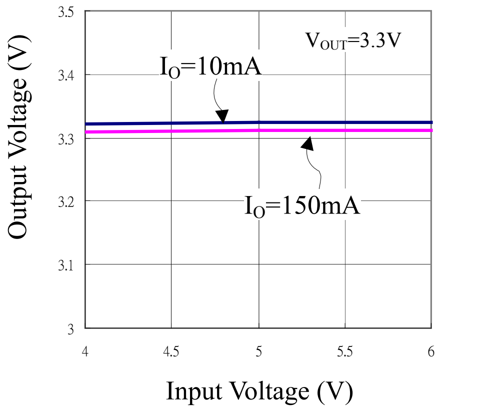
Output Voltage v.s. Output Current



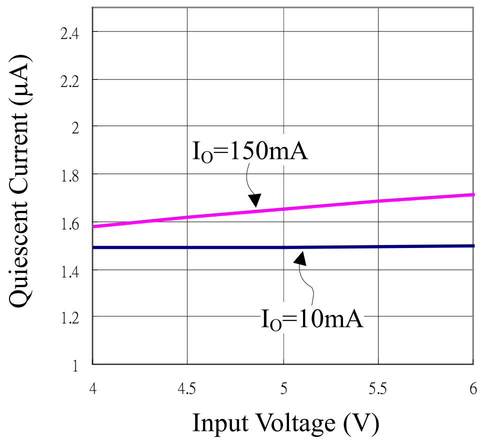
Quiescent Current v.s. Output Current



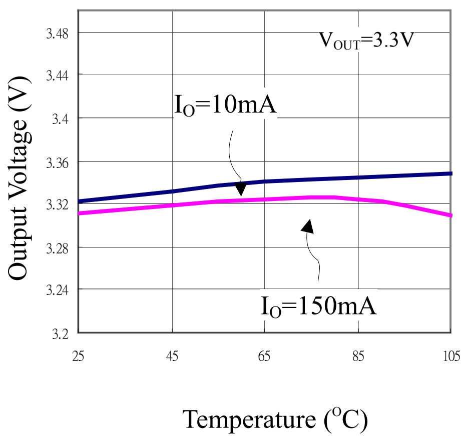
Output Voltage v.s. Input Voltage



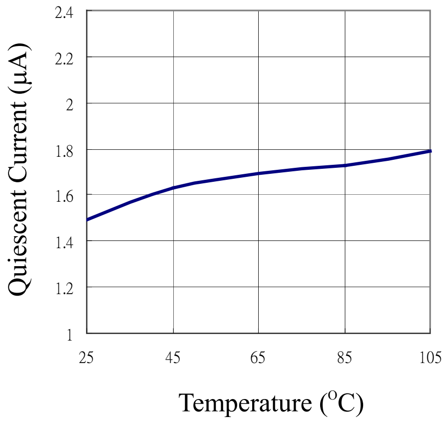
Quiescent Current v.s. Input Voltage



Output Voltage v.s. Temperature



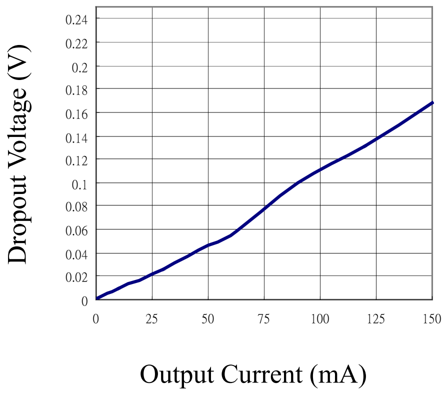
Quiescent Current v.s. Temperature



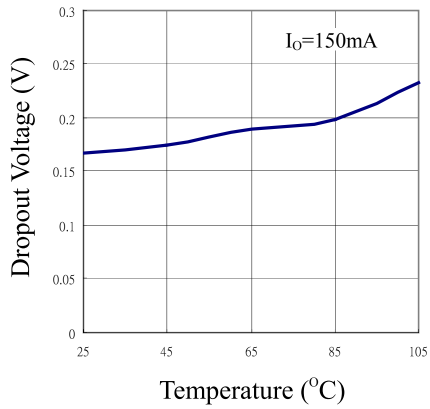
Characterization Curves (Continued))

$V_{IN}=V_{OUT(NOMINAL)}$ + 0.5V or 2.5V(whichever is greater), C_{IN}=1uF, C_{OUT}=1uF,C_{BP}=0.01uF, T_A=+25 °C, ,Using plused ON time,unless otherwise noted.

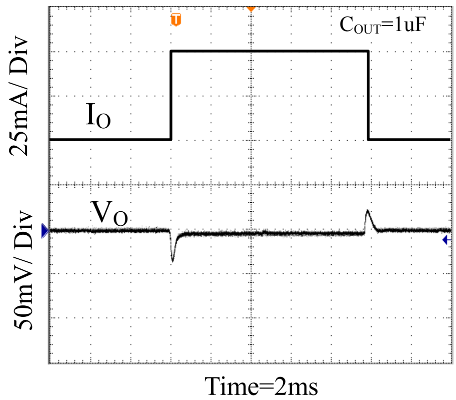
Dropout Voltage v.s. Output Current



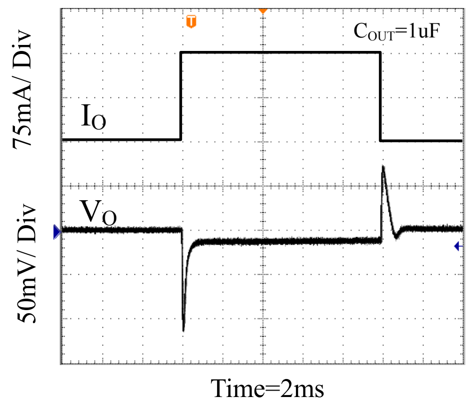
Dropout Voltage v.s. Temperature



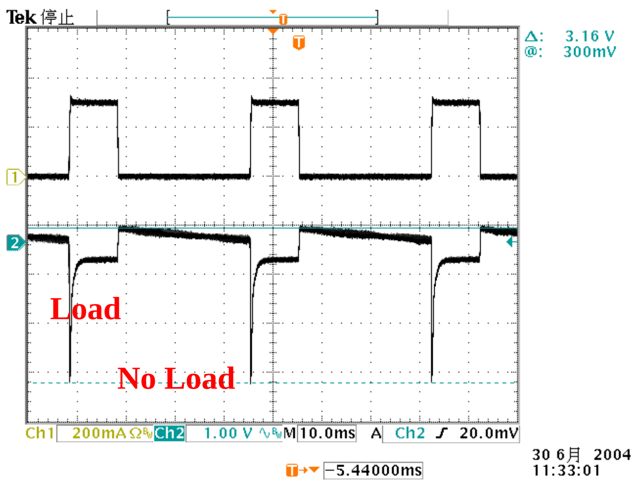
Load Transient Response with I_O=50mA

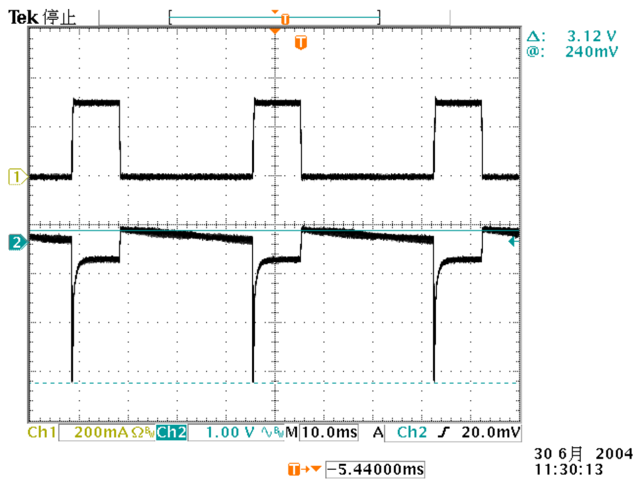


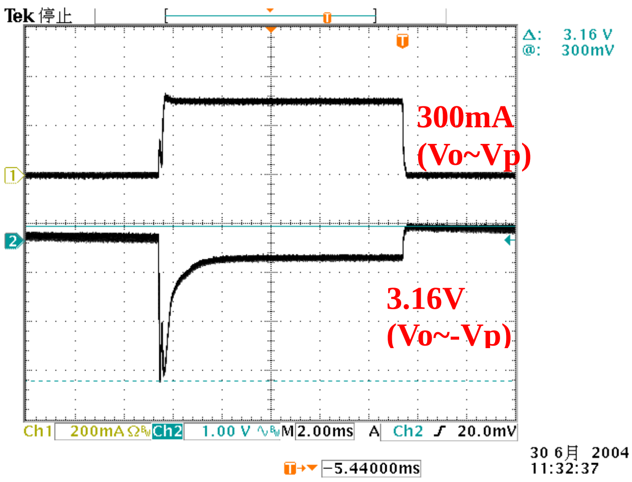
Load Transient Response with I_O=150mA

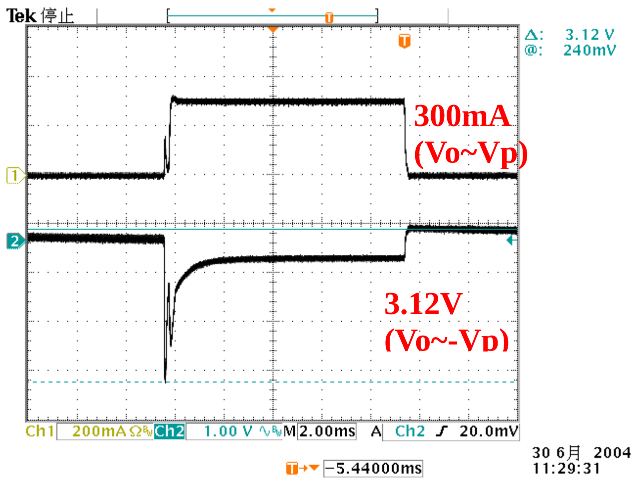


I_{LOAD} = 300mA V_{IN} = 3V

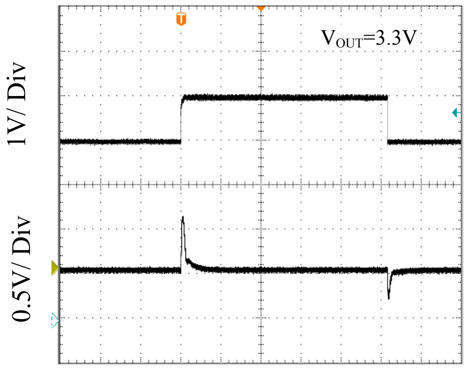






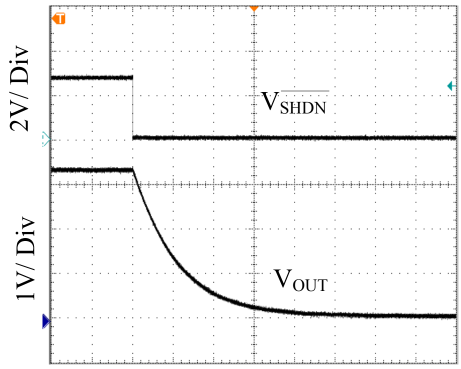


Line Transient Response, With I_O=50mA



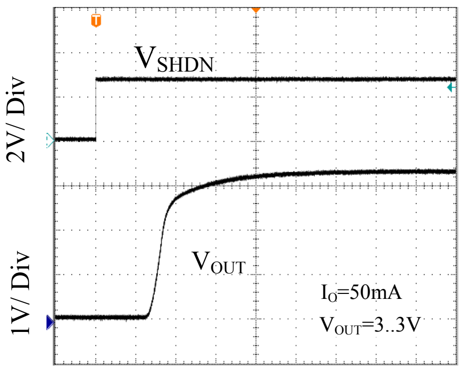
Time=1ms

Entering Shutdown, No Load



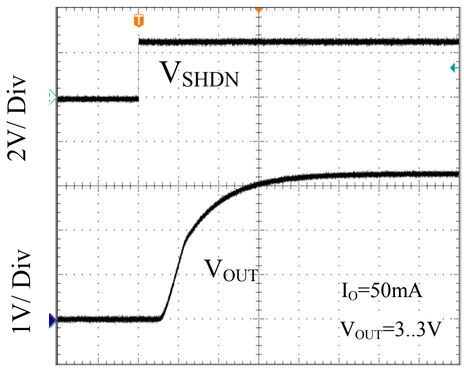
Time=2ms

Shutdown Exit Delay, C_{BP}= 0.1uF



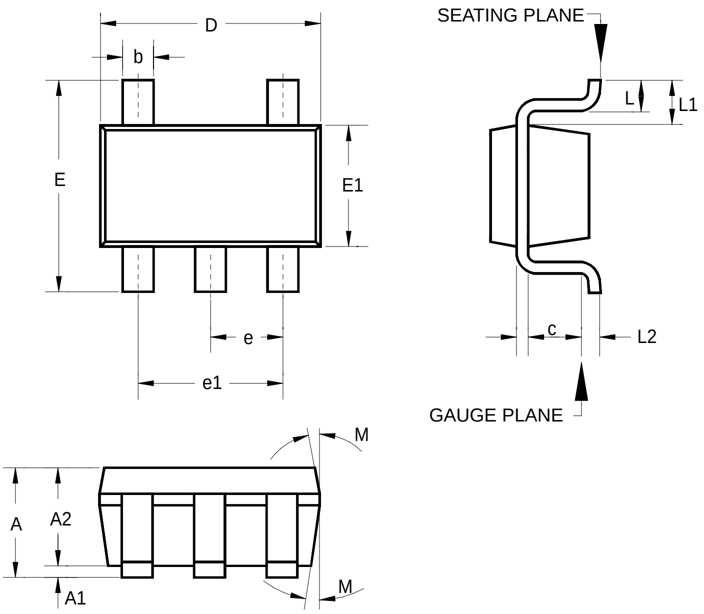
Time=2ms

Shutdown Exit Delay, C_{BP}= 2pF



Time=200us

5-Pin SOT-23



	INCHES			MILLIMETERS		
	MIN	TYP	MAX	MIN	TYP	MAX
A	-	-	0.057	-	-	1.45
A1	-	-	0.006	-	-	0.15
A2	0.035	0.045	0.051	0.90	1.15	1.30
b	0.012	-	0.020	0.30	-	0.50
c	0.003	-	0.009	0.08	-	0.22
D	0.114 BSC			2.90 BSC		
E	0.110 BSC			2.80 BSC		
E1	0.063`BSC			1.60 BSC		
e	0.037 BSC			0.95 BSC		
e1	0.075BSC			1.90 BSC		
L	0.012	0.018	0.024	0.30	0.45	0.60
L1	0.024 REF			0.60 REF		
L2	0.010 BSC			0.25 BSC		
°M	5°	10°	15°	5°	10°	15°

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