AMC DOC. #:AMC8878_D (LF)
March 2004

ADD MICROTECH CORP.

AMC8878/8879

LOW NOISE 150mA LOW DROPOUT REGULATOR

DESCRIPTION

The AMC8878/8879 series 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 AMC8878/8879 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. Both AMC8878 and AMC8879 come in a miniature 5-pin SOT-23 package.

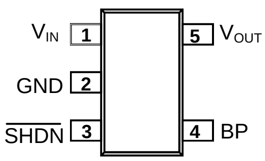
FEATURES

- **Low output noise: 30μV_{RMS}**
- **Industry standard'2982 pin assignment (AMC8878)**
- **Output voltage precision of ±1.4% accuracy**
- **Very low dropout voltage: 50mV/50mA and 165mV/150mA**
- **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 (AMC8878) and TK111xxS (AMC8879) series.

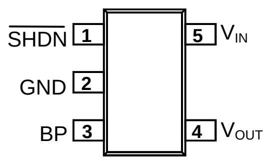
APPLICATIONS

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

PACKAGE PIN OUT



AMC8878



AMC8879

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

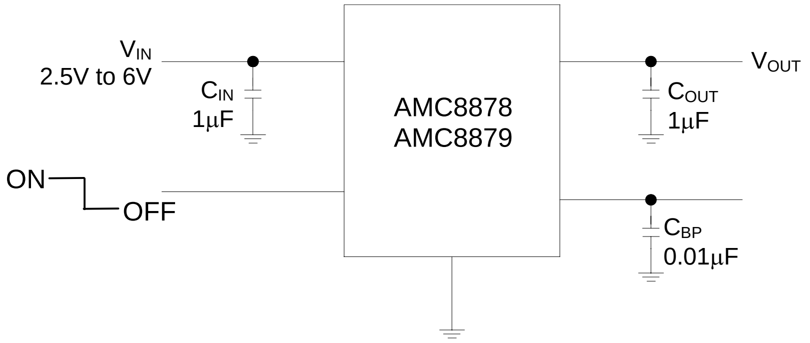
ORDER INFORMATION

Temperature Range	DBT Plastic SOT-23 5-pin	DBT Plastic SOT-23 5-pin
0°C ≤ T_A ≤ 70°C	**AMC8878-X.XDBT**	**AMC8879-X.XDBT**
0°C ≤ T_A ≤ 70°C	**AMC8878-X.XDBTF(Lead Free)**	**AMC8879-X.XDBTF(Lead Free)**

EXPANDED ORDER INFORMATION

Device Name	Output Voltage	Symbolization	
		AMC8878	AMC8879
AMC887□-2.0DBT	2.0V	AB20	AC20
AMC887□-2.5DBT	2.5V	AB25	AC25
AMC887□-2.8DBT	2.8V	AB28	AC28
AMC887□-2.85DBT	2.85V	AB2U	AC2U
AMC887□-3.0DBT	3.0V	AB30	AC30
AMC887□-3.2DBT	3.2V	AB32	AC32
AMC887□-3.3DBT	3.3V	AB33	AC33
AMC887□-5.0DBT	5.0V	AB50	AC50

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:

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

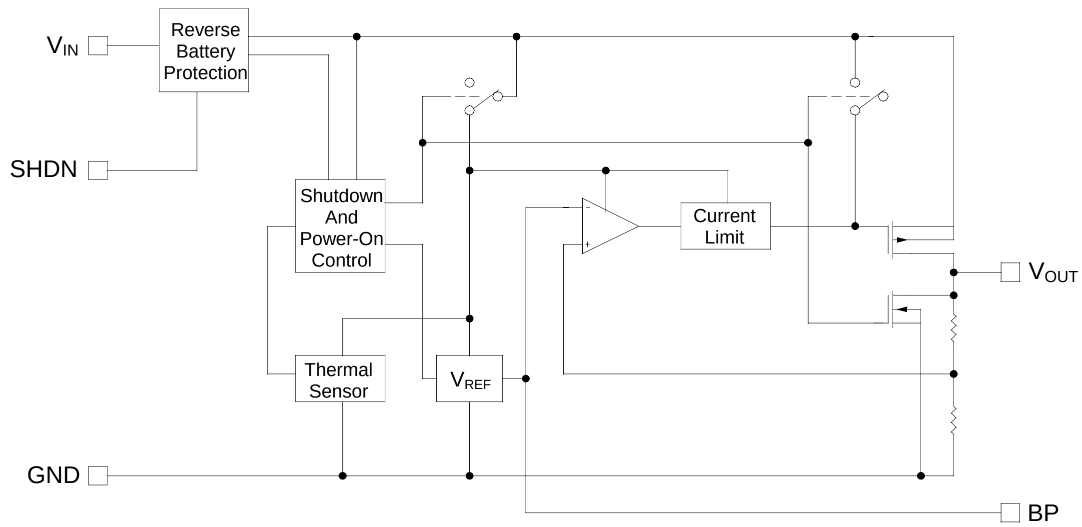
T_J(°C): Maximum recommended junction temperature
T_A(°C): Ambient temperature of the application
θ_{JA}(°C /W): Junction-to-junction temperature thermal resistance of the package, and other heat dissipating materials.

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

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		150	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. The part may oscillate without the capacitor. Any type of capacitor can be used, but not Aluminum electrolytics when operating below -25^oC, 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.)

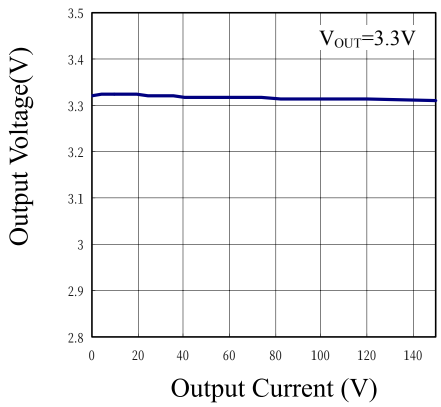
Parameter	Symbol	Test Conditions		AMC8878/8879			Units
				Min	Typ.	Max	
Output Voltage Accuracy	ΔV_{OUT}	I_{OUT} = 0mA, T_A = +25^oC		-1.4		+1.4	%
		I_{OUT} = 0 to 150mA		-3		+2	
Maximum Output Current	I_{OUT}			150			mA
Current Limit	I_{LIMIT}			160			mA
Ground Pin Current	I_Q	I_{OUT} = 0mA			1.6	10	μA
		I_{OUT} = 150mA			1.7		
Dropout Voltage		I_{OUT} = 1mA			1.1		mV
		I_{OUT} = 50mA			50	120	
		I_{OUT} = 150mA			165		
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} = 0 to 120mA, C_{OUT} = 1μF			0.01	0.04	%/mA
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^oC		0.01	1	μA
			T_A = +85^oC		0.2		
Shutdown Input Bias Current	I_{SHDN}	$V_{\overline{SHDN}} = V_{IN}$	T_A = +25^oC		0.01	100	nA
			T_A = +85^oC		0.5		
Shutdown Exit Delay	t_{delay}	C_{BP} = 0.1μF, C_{OUT} = 1μF, No load	T_A = +25^oC		6		ms
			T_A = +85^oC		6		
Thermal Shutdown Temperature	T_{SHDN}				+150		^oC

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.

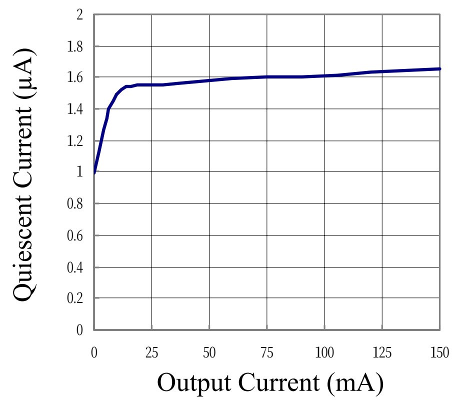
Characterization Curves

$V_{IN}=V_{OUT(NOMINAL)}$ + 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.

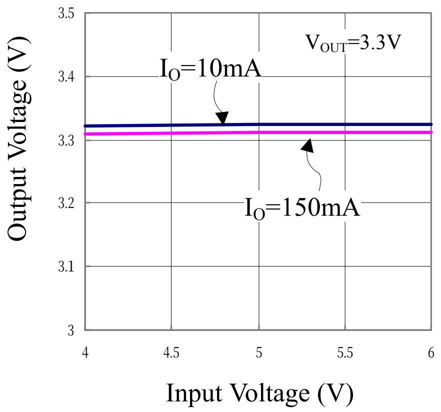
Output Voltage v.s. Output Current



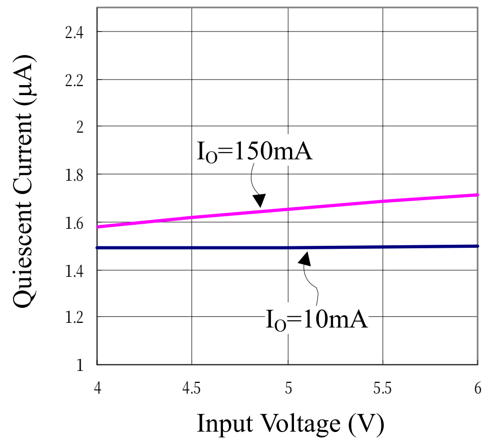
Quiescent Current v.s. Output Current



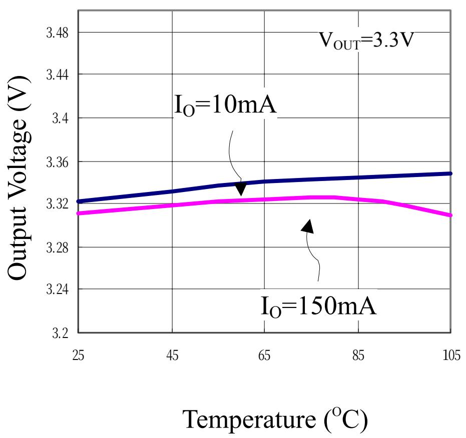
Output Voltage v.s. Input Voltage



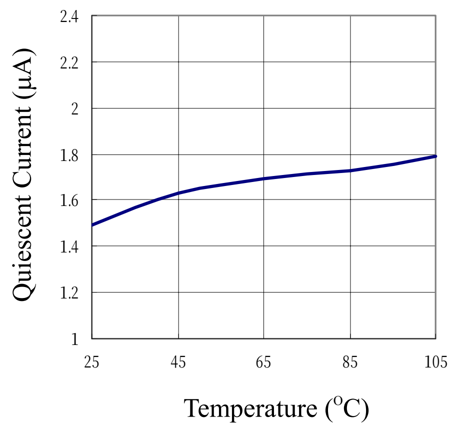
Quiescent Current v.s. Input Voltage



Output Voltage v.s. Temperature



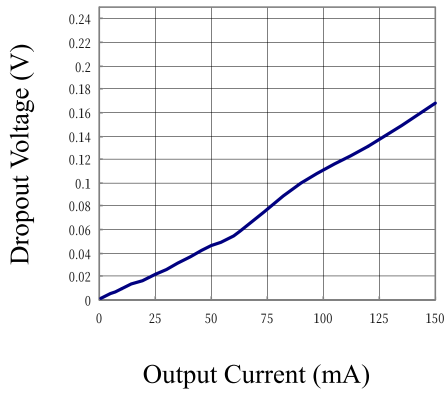
Quiescent Current v.s. Temperature



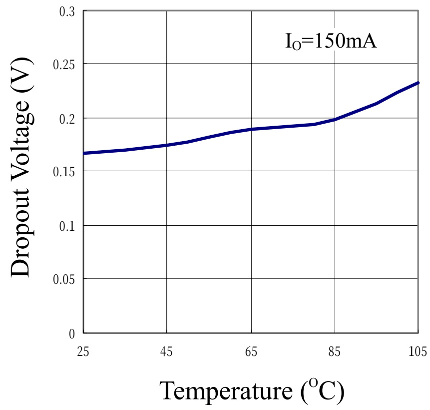
Characterization Curves (Continued))

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

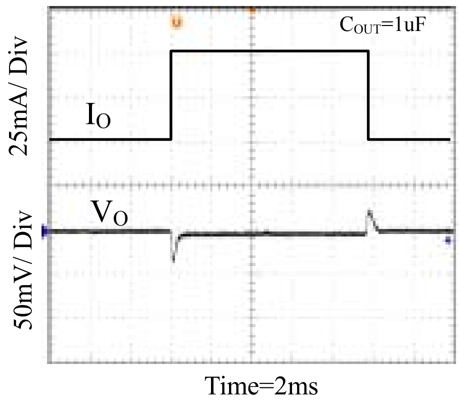
Dropout Voltage v.s. Output Current



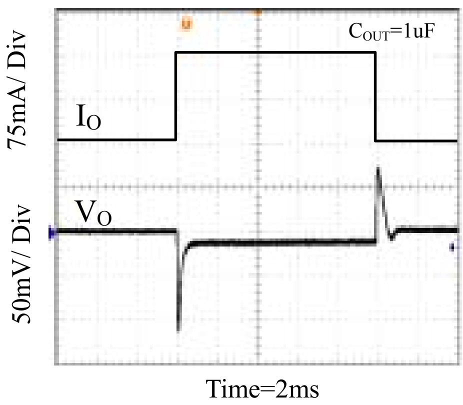
Dropout Voltage v.s. Temperature



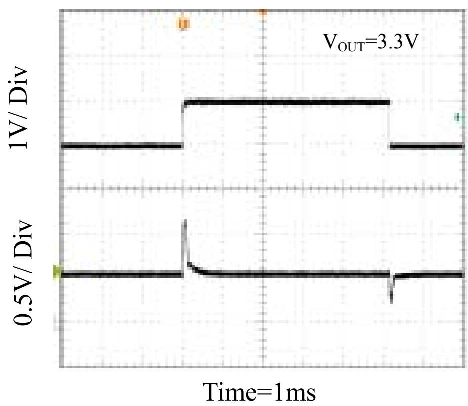
Load Transient Response with I_O=50mA



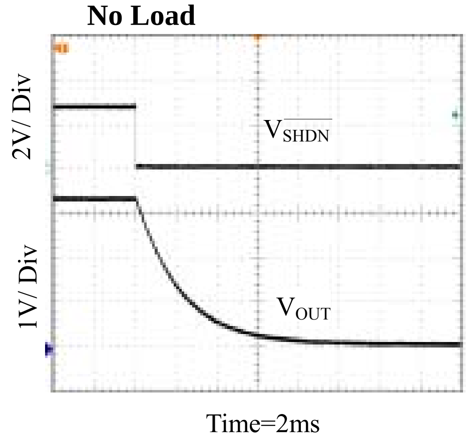
Load Transient Response with I_O=150mA



Line Transient Response, With I_O=50mA



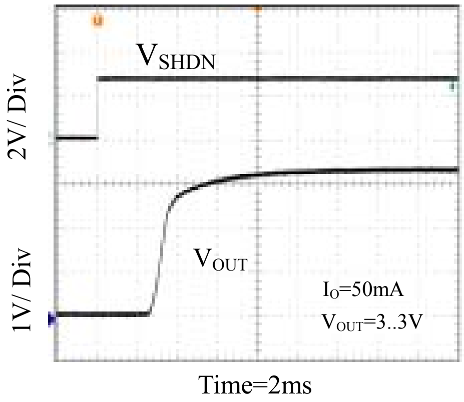
Entering Shutdown, No Load



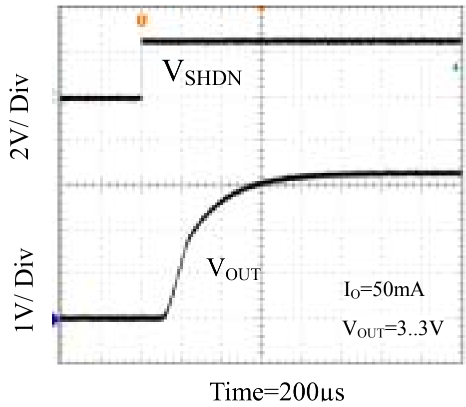
Characterization Curves (Continued))

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.

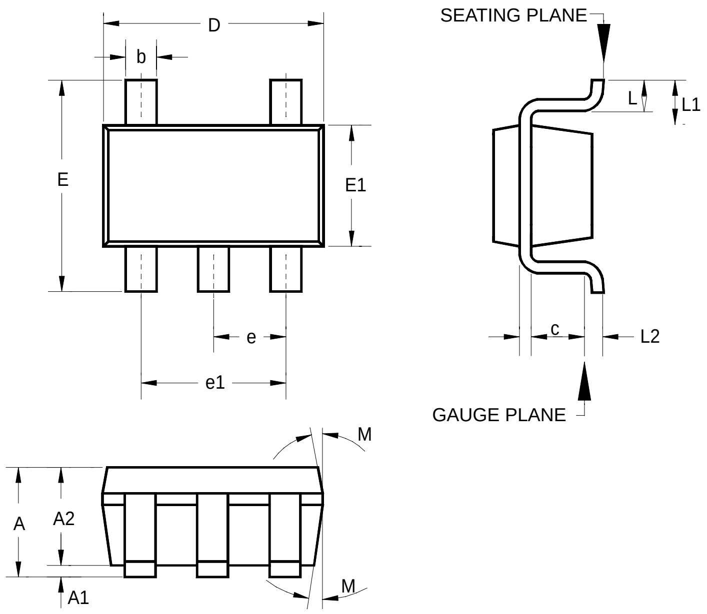
Shutdown Exit Delay, C_{BP}= 0.1uF



Shutdown Exit Delay, C_{BP}= 2pF



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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