

## GENERAL DESCRIPTION

The BM9164 family of a linear voltage linear regulators developed utilizing BM unique BiCMOS technology featured low quiescent current (90uA), low dropout voltage, high output voltage accuracy. The space-efficient SOT223, TO252 package is attractive for "Pocket" and "Hand Held" applications.

Output voltages are set at the factory and trimmed to 1.5% accuracy. Voltages from 3.3V to 5.0V are available.

These rugged devices have both Thermal Shutdown, and Current Fold-back to prevent device failure under the "Worst" of operating conditions.

The BM9164 is stable with an output capacitance of 10µF or greater.

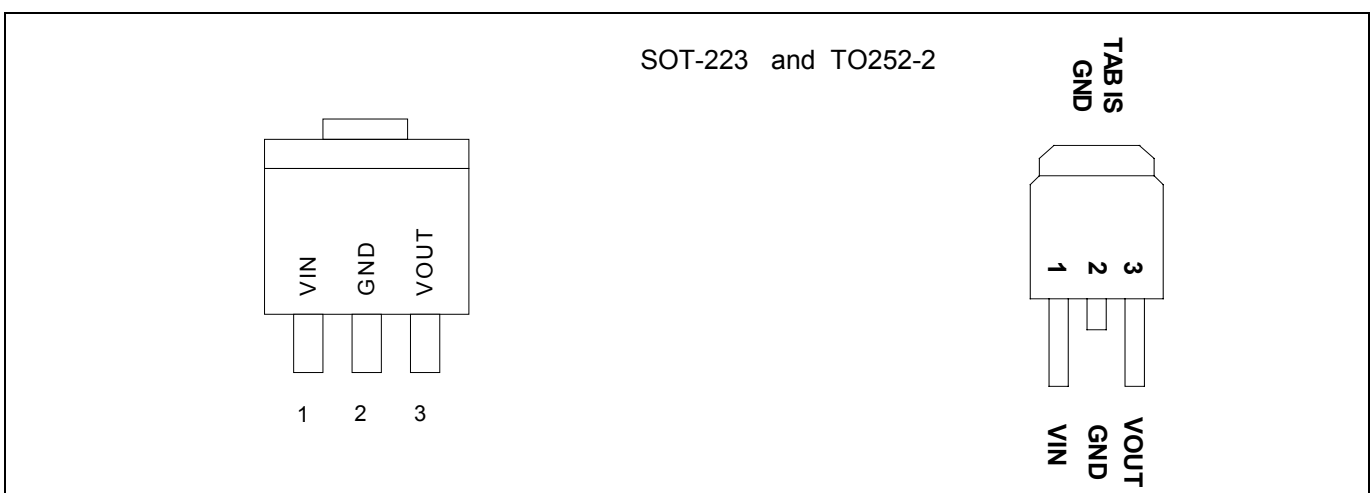
## APPLICATIONS

- ◆ Battery-powered devices
- ◆ Personal communication devices
- ◆ Home electric/electronic appliances
- ◆ PC peripherals , hard-disk

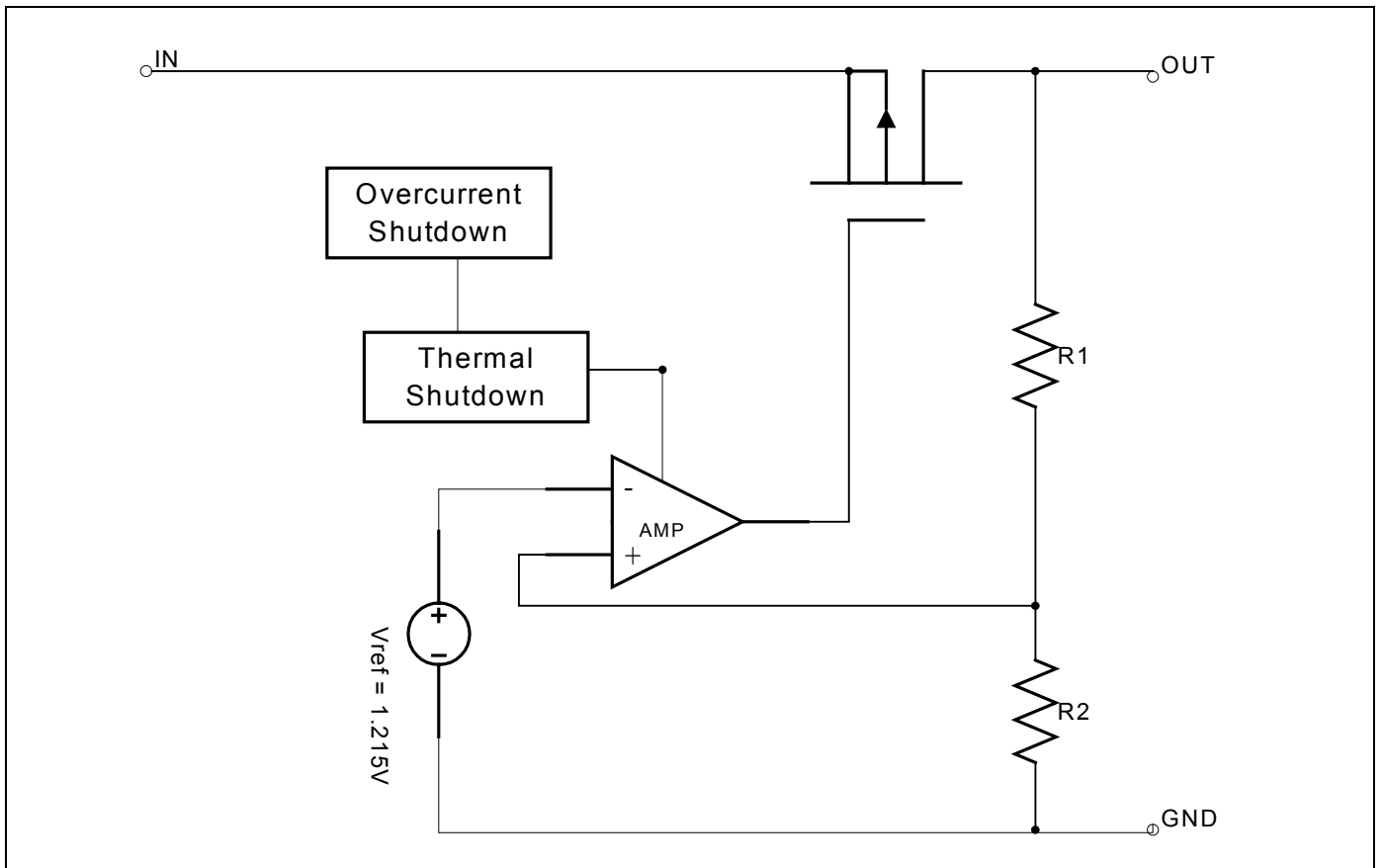
## FEATURES

- ◆ Very Low Dropout Voltage , <400mV when 0.8A
- ◆ Low Current Consumption: Typ. 90uA
- ◆ High Accuracy Output Voltage: +/- 1.5%
- ◆ Guaranteed 0.8A (if Vin-Vout<1700mV in SOT223)
- ◆ Output up to 0.3A if down 12V to +5V in SOT223
- ◆ Output up to 0.5A if down 12V to +5V in TO252
- ◆ Compact Package: SOT-223 and TO252
- ◆ Factory Pre-set Output Voltages
- ◆ Short Circuit Current Fold-Back
- ◆ Low Temperature Coefficient

## PIN CONFIGURATION



**BLOCK DIAGRAM**



**ORDERING INFORMATION**

Part Number	Output Voltage	Temperature Range	Package
BM9164-5.0	5.0V	-20°C ~ +85	SOT223
BM9164-3.3	3.3V	-20°C ~ +85	SOT-223
BM9164A-5.0	5.0V	-20°C ~ +85°C	TO252

**ABSOLUTE MAXIMUM RATINGS**

Input Voltage ..... +18V  
 Output Current ..... 1.2A  
 Output Voltage ..... GND-0.3V to  $V_{IN}+0.3V$   
 ESD Classification ..... B

**OPERATING RATINGS**

Supply Voltage ..... +2V to +16V  
 Ambient Temperature Range ( $T_A$ ) ..... -40°C to +85°C  
 Junction Temperature Range ..... -40°C to +125°C

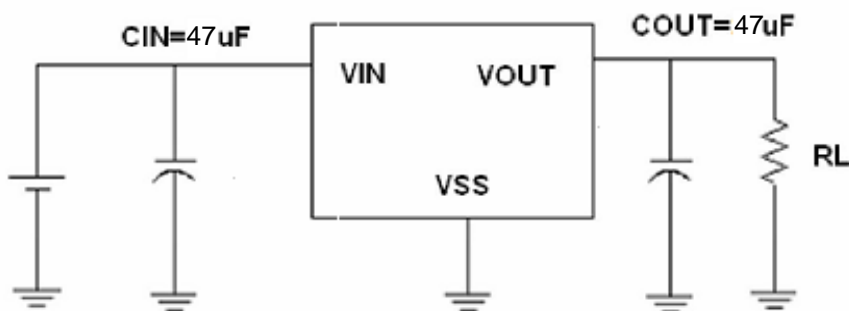
**THERMAL INFORMATION**

Parameter		Maximum	Unit
Thermal Resistance ( $\theta_{jc}$ )	SOT-223	160	°C/W
Internal Power Dissipation ( $P_D$ ) ( $\Delta T = 100^\circ C$ )	SOT-223	625	mW
Maximum Junction Temperature		150	°C
Maximum Lead Temperature (10 Sec)		300	°C

\*With Junction sink capable of twice times of  $\theta_{jc}$

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

**Typical Application Circuit**



**ELECTRICAL CHARACTERISTICS**

T<sub>A</sub> = +25°C; unless otherwise noted

Parameter	Symbol	Test Conditions	BM9164			Unit
			Min.	Typ.	Max.	
Input Voltage	V <sub>IN</sub>		+2		+18	V
Output Voltage Accuracy	V <sub>OUT</sub>	I <sub>O</sub> = 1mA to 1.5A	-1.5		1.5	%
Dropout Voltage	V <sub>DROPOUT</sub>	V <sub>OUT</sub> =V <sub>O(NOM)</sub> -4%,	I <sub>OUT</sub> =0.8A	400		mV
			I <sub>OUT</sub> =600mA		300	
			I <sub>OUT</sub> =100mA		200	
Output Current	I <sub>O</sub>	V <sub>OUT</sub> > 1.5V		800		mA
Current Limit	I <sub>LIM</sub>	V <sub>OUT</sub> > 1.5V		1200		mA
Short Circuit Current	I <sub>SC</sub>	V <sub>OUT</sub> < 0.4V		750	1200	mA
Quiescent Current	I <sub>Q</sub>	I <sub>O</sub> = 0mA		90		uA
Ground Pin Current	I <sub>IGND</sub>	I <sub>O</sub> = 1mA to 1A		90		uA
Line Regulation	REG <sub>LINE</sub>	I <sub>OUT</sub> =5mA	V <sub>OUT</sub> ≤ 4.0V		1.5	%
			V <sub>OUT</sub> > 4.0V		2	%
Load Regulation	REG <sub>LOAD</sub>	I <sub>O</sub> = 0 ~ 0.8A		0.2	1.5	%
Over Temperature Shutdown	OTS			150		°C
Over Temperature Hysteresis	OTH			30		°C
V <sub>OUT</sub> Temperature Coefficient	TC			30		ppm/°C
Power Supply Reject	PSRR	I <sub>O</sub> = 100mA C <sub>O</sub> =22μF ceramic	f=1kHz	72		dB
			f=10kHz	60		
			f=100kHz	45		
Output Voltage Noise	eN	f=10Hz to 100kHz I <sub>O</sub> = 10mA	C <sub>O</sub> =22μF	30		μVrms
			C <sub>O</sub> =47μF	20		

**Note 1.** V<sub>IN(MIN)</sub> = V<sub>OUT</sub> + V<sub>DROPOUT</sub>

**DETAILED DESCRIPTION**

The BM9164 family of BiCMOS regulators contain a pass transistor, voltage reference, error amplifier, over-current protection, thermal shutdown, and short circuit protection.

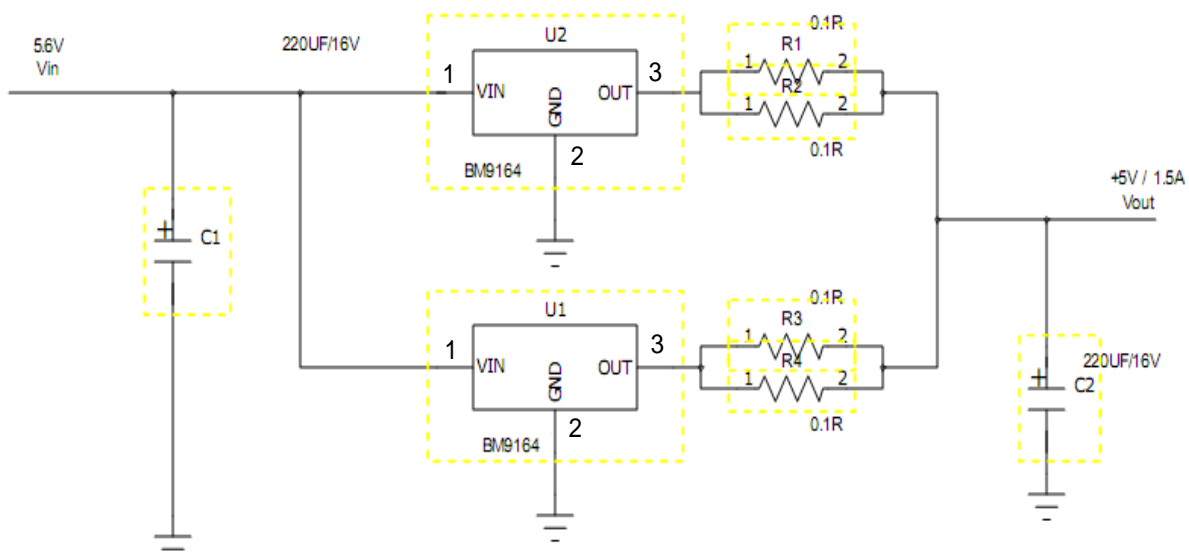
The P-channel pass transistor receives data from the error amplifier, over-current shutdown, short output protection, and thermal protection circuits. During normal operation, the error amplifier compares the output voltage to a precision reference. Over-current and Thermal shutdown circuits become active when the junction temperature exceeds 150°C, or the current exceeds 1.2A. During thermal shutdown, the output voltage remains low. Normal operation is restored when the junction temperature drops below 120°C.

The BM9164 behaves like a current source when the load reaches 1.2A. However, if the load impedance drops below 0.3Ω, the current drops back to 600mA to prevent excessive power dissipation. Normal operation is restored when the load resistance exceeds 0.75Ω.

**EXTERNAL CAPACITOR**

The BM9164 is stable with an output capacitor to ground of 22μF 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 22μF Aluminum Electrolytic. The benefit is low ESR, high capacitance, and low overall cost.

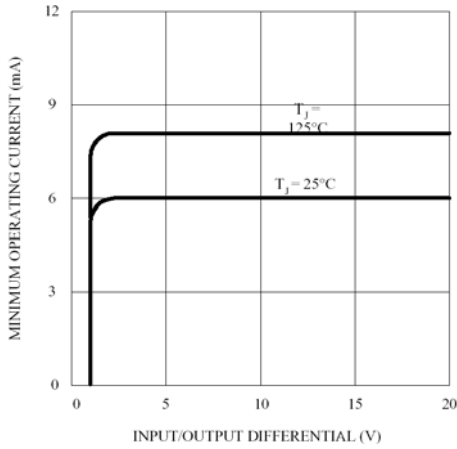
A second capacitor is recommended between the input and ground to stabilize VIN. The input capacitor should be larger than 22μF to have a beneficial effect. All capacitors should be placed in close proximity to the pins. A “quiet” ground termination is desirable.



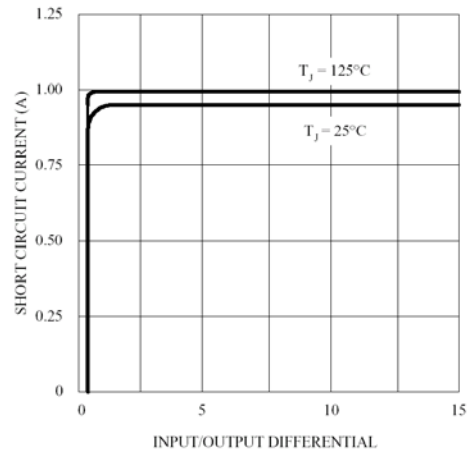
锂电降压式大电流充电典型电路

TYPICAL ELECTRICAL CHARACTERISTICS

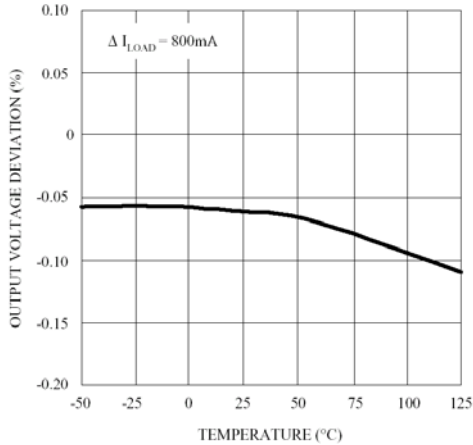
Minimum Operating Current



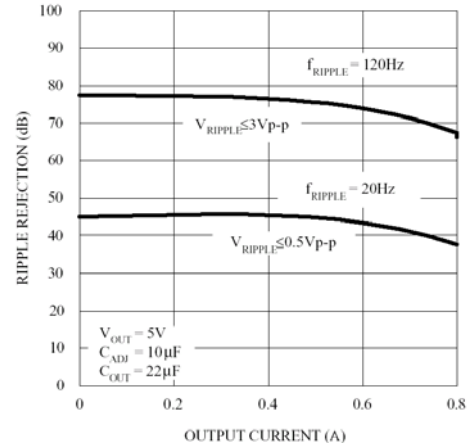
Short-Circuit Current



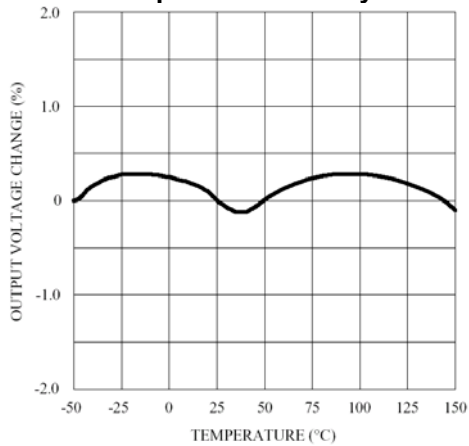
Load Regulation



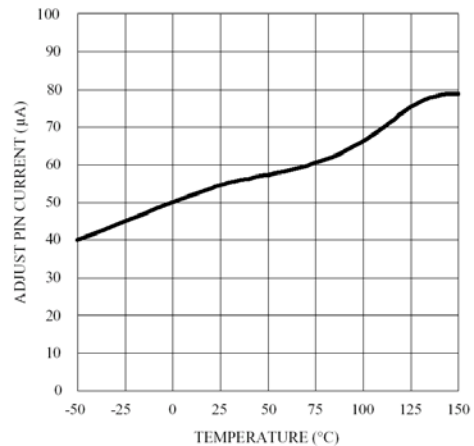
Ripple Rejection vs. Current



Temperature Stability

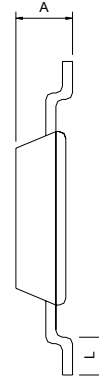
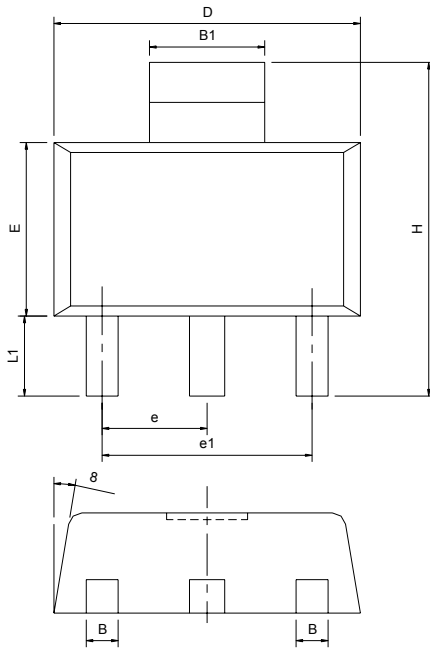


GND Pin Current



PACKAGE DIMENSION

SOT-223 (M223)



SYMBOLS	DIMENSIONS IN MILLIMETERS			DIMENSIONS IN INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	1.50	---	1.80	0.0591	---	0.0709
B	0.60	---	0.838	0.0236	---	0.033
B1	2.895	---	3.15	0.114	---	0.124
D	6.299	---	6.706	0.248	---	0.264
E	3.30	---	3.708	0.1299	---	0.146
e	---	2.30BSC	---	---	0.0908C	---
e1	---	4.80BSC	---	---	0.1888C	---
H	6.70	---	7.30	0.2638	---	0.2874
L	---	0.91MIN	---	---	0.036MIN	---
L1	---	2.00MAX	---	---	0.0787MAX	---
θ	---	---	13°	---	---	13°

TO252-2 (DPAK)

