BOOKLY MICRO

BM1509HV

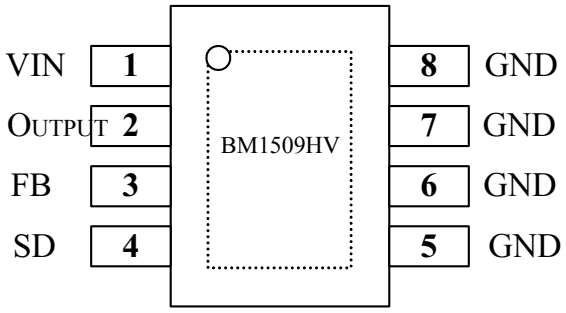
150KHz, 2A PWM BUCK DC/DC CONVERTER

Description

The BM1509HV are monolithic IC designed for a step-down DC/DC converter, and own the ability of driving a 2A load without additional transistor. It saves board space. The external shutdown function can be controlled by logic level and then come into standby mode. The internal compensation makes feedback control having good line and load regulation without external design. Regarding protected function, thermal shutdown is to prevent over temperature operating from damage, and current limit is against over current operating of the output switch. If current limit function occurs and V_{FB} is down below 0.5V, the switching frequency will be reduced. The BM1509HV operates at a switching frequency of 150KHz thus allow smaller sized filter components than what would be needed with lower frequency switching regulators. Other features include a guaranteed ±4% tolerance on output voltage under specified input voltage and output load conditions, and ±15% on the oscillator frequency. The output version included fixed 3.3V, 5V, 12V, and an adjustable type. The chips are available in a standard 8-lead SOP-8 package.

Pin Assignments

TOP VIEW



Features

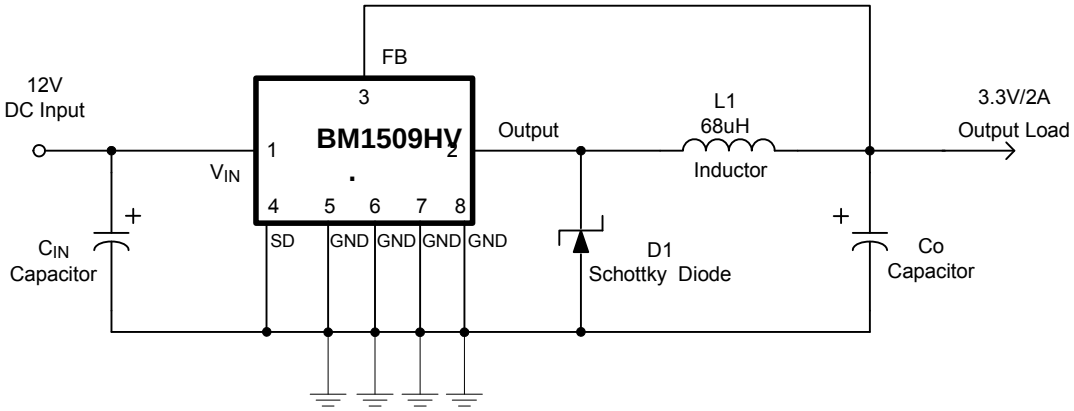
- Output Voltage: 3.3V, 5V, 12V and Adjustable Output Version
- Adjustable Version Output Voltage Range, 1.23V to 18V+4%
- 150KHz +15% Fixed Switching Frequency
- Voltage Mode Non-Synchronous PWM Control
- Thermal-Shutdown and Current-Limit Protection
- ON/OFF Shutdown Control Input
- Operating Voltage can be up to 48V
- Output Load Current: 2A
- SOP-8 Packages
- Low Power Standby Mode
- Built-in Switching Transistor On Chip
- SOP-8: Available in “Green” Molding Compound (No Br, Sb)
- Lead Free Finish/ RoHS Compliant (Note 1)

Applications

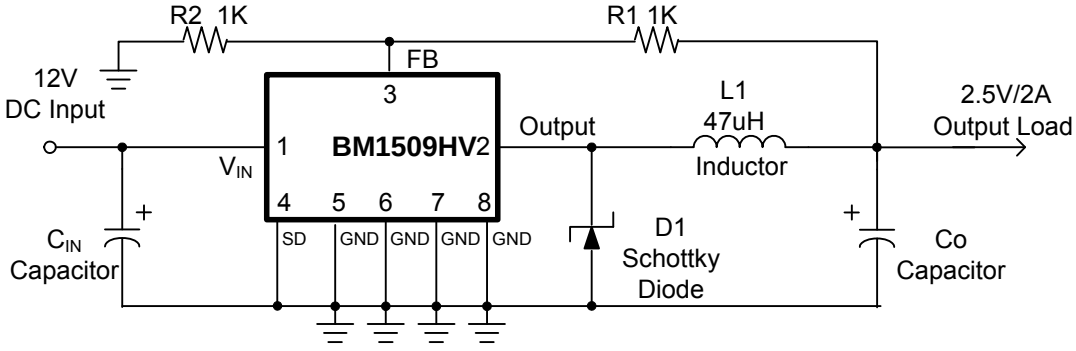
- Simple High-Efficiency Step-Down Regulator
- On-Card Switching Regulators
- Positive to Negative Converter

Typical Application Circuit

(1) Fixed Type Circuit



(2) Adjustable Type Circuit

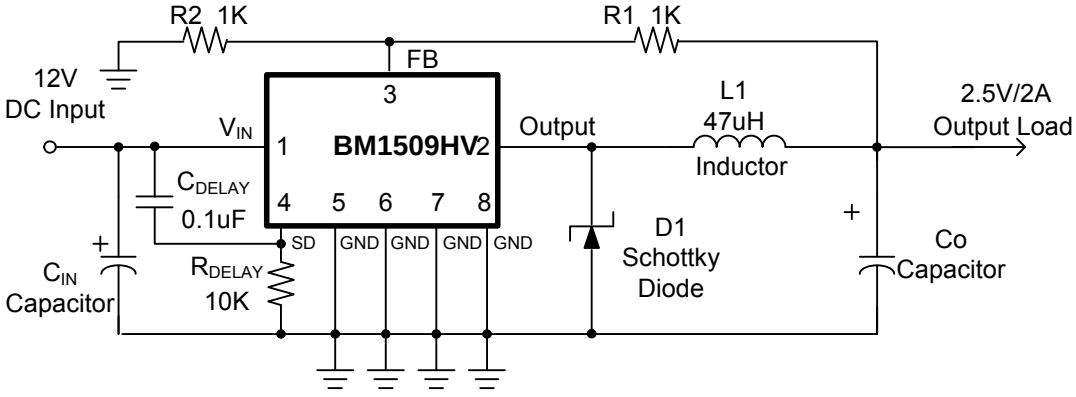


$$V_{OUT} = V_{FB} \times (1 + \frac{R1}{R2})$$

V_{FB} = 1.23V

R2 = 1K ~ 3K

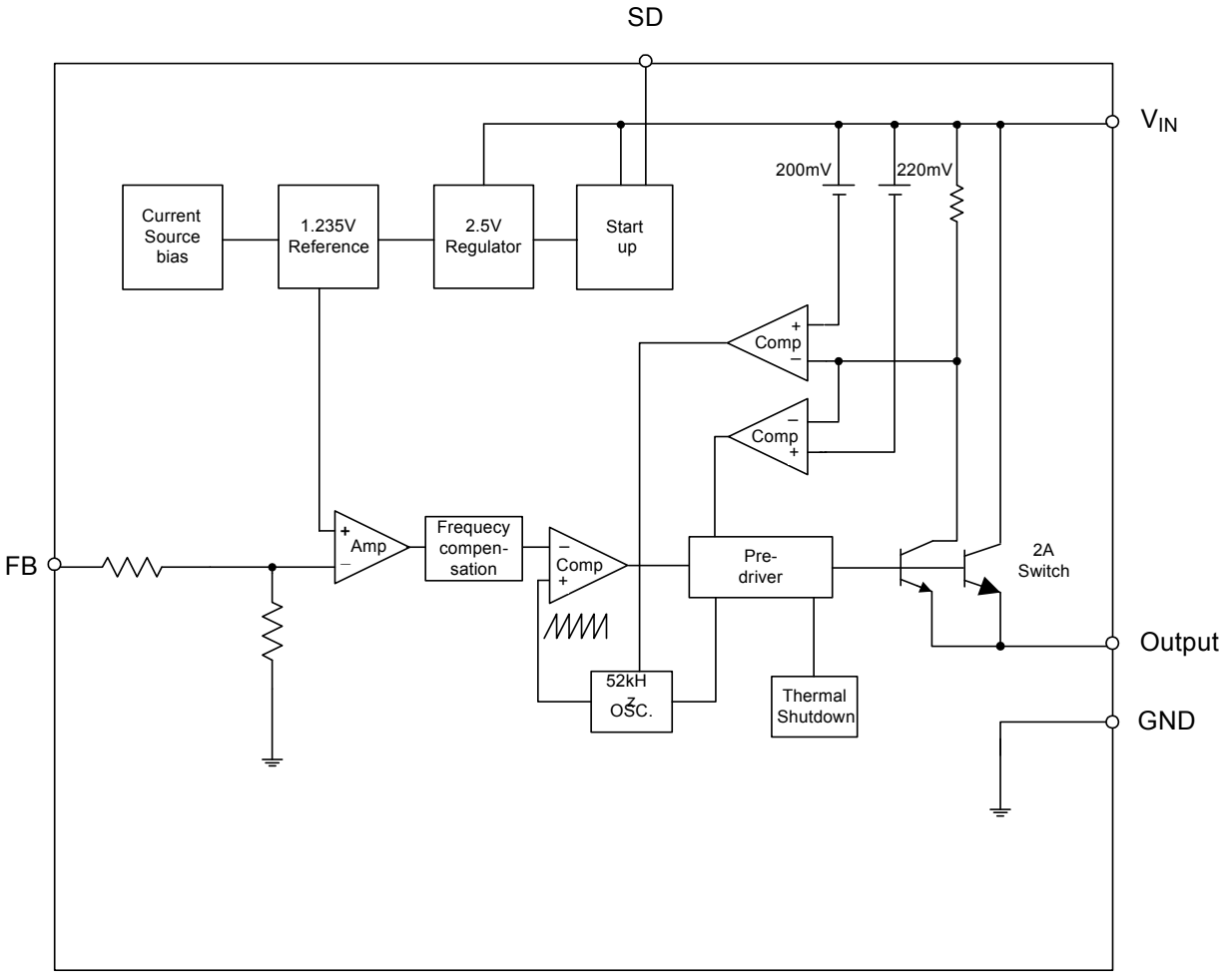
(3) Delay Start Circuit



Pin Descriptions

Pin Name	Description
V_{IN}	Operating voltage input
Output	Switching output
GND	Ground
FB	Output voltage feedback control
SD	ON/OFF Shutdown

Functional Block Diagram



Absolute Maximum Ratings

Symbol	Parameter	Rating	Unit
ESD HBM	Human Body Model ESD Protection	2	KV
ESD MM	Machine Model ESD Protection	200	V
V_{IN}	Supply Voltage	+48	V
V_{SD}	ON/OFF Pin Input Voltage	-0.3 to +18	V
V_{FB}	Feedback Pin Voltage	-0.3 to +18	V
V_{OUT}	Output Voltage to Ground	-1	V
P_D	Power Dissipation	Internally Limited	W
T_{ST}	Storage Temperature	-65 to +150	°C
T_J	Operating Junction Temperature	-40 to +125	°C

Recommended Operating Conditions

Symbol	Parameter	Min	Max	Unit
I_{OUT}	Output Current	0	2	A
V_{OP}	Operating Voltage	4.5	48	V
T_A	Operating Ambient Temperature	-20	85	°C

Electrical Characteristics

Unless otherwise specified, V_{IN} = 12V for 3.3V, 5V, adjustable version and V_{IN} = 18V for the 12V version. I_{LOAD} = 0.5A
Specifications with **boldface type** are for full operating temperature range, the other type are for T_J = 25ºC.

Symbol	Parameter	Conditions	Min	Typ.	Max	Unit
I_{FB}	Feedback Bias Current	V_{FB} = 1.3V (Adjustable version only)		-10	-50 **-100**	nA
F_{OSC}	Oscillator Frequency		127 **110**	150	173 **173**	KHz
F_{SCP}	Oscillator Frequency of Short Circuit Protect	When current limit occurred and V_{FB} < 0.5V, T_a = 25 °C	10	30	50	KHz
V_{SAT}	Saturation Voltage	I_{OUT} = 2A No outside circuit V_{FB} = 0V force driver on		1.25	1.4 **1.5**	V
DC	Max. Duty Cycle (ON)	V_{FB} = 0V force driver on		100		%
	Min. Duty Cycle (OFF)	V_{FB} = 12V force driver off		0		
I_{CL}	Current Limit	Peak current No outside circuit V_{FB} = 0V force driver on	3			A
I_L	Output = 0 / Output Leakage Current	No outside circuit V_{FB} = 12V force driver off			-200	uA
	Output = -1 / Output Leakage Current	V_{IN} = 22V		-5		mA
I_Q	Quiescent Current	V_{FB} = 12V force driver off		5	10	mA
I_{STBY}	Standby Quiescent Current	ON/OFF pin = 5V V_{IN} = 22V		70	150 **200**	uA
V_{IL}	ON/OFF Pin Logic Input Threshold Voltage	Low (regulator ON)	-	1.3	0.6	V
V_{IH}		High (regulator OFF)	2.0		-	
I_H	ON/OFF Pin Logic Input Current	V_{LOGIC} = 2.5V (OFF)			-0.01	uA
I_L	ON/OFF Pin Input Current	V_{LOGIC} = 0.5V (ON)		-0.1	-1	
θ_{JA}	Thermal Resistance	SOP-8 Junction to case		15		°C/W
θ_{JC}	Thermal Resistance with a copper area of approximately 3 in^2	SOP-8 Junction to ambient		70		°C/W

Electrical Characteristics

Specifications with **boldface type** are for full operating temperature range, the other type are for T_J = 25ºC.

	Symbol	Parameter	Conditions	V_{Min}	Typ.	V_{Max}	Unit
BM1509HV-ADJ	V_{FB}	Output Feedback	4.5V ≤ V_{IN} ≤ 22V 0.2A ≤ I_{LOAD} ≤ 2A V_{OUT} programmed for 3V	1.193 **1.18**	1.23	1.267 **1.28**	V
	η	Efficiency	V_{IN} = 12V, I_{LOAD}=2A	76	76		%
BM1509HV-3.3V	V_{OUT}	Output Voltage	4.75V ≤ V_{IN} ≤ 22V 0.2A ≤ I_{LOAD} ≤ 2A	3.168 **3.135**	3.3	3.432 **3.465**	V
	η	Efficiency	V_{IN} = 12V, I_{LOAD} = 2A	78	78		%
BM1509HV-5V	V_{OUT}	Output Voltage	7V ≤ V_{IN} ≤ 22V 0.2A ≤ I_{LOAD} ≤ 2A	4.8 **4.75**	5	5.2 **5.25**	V
	η	Efficiency	V_{IN} = 12V, I_{LOAD} = 2A	83	83		%
BM1509HV-12V	V_{OUT}	Output Voltage	15V ≤ V_{IN} ≤ 22V 0.2A ≤ I_{LOAD} ≤ 2A	11.52 **11.4**	12	12.48 **12.6**	V
	η	Efficiency	V_{IN} = 15V, I_{LOAD} = 2A	90	90		%