

HM4313

CONSTANT VOLTAGE AND CONSTANT CURRENT CONTROLLER FOR ADAPTORS AND BATTERY CHARGERS

FEATURES

- CONSTANT VOLTAGE AND CONSTANT CURRENT CONTROL
- LOW VOLTAGE OPERATION
- PRECISION INTERNAL COMPONENT COUNT
- CURRENT SINK OUTPUT STAGE
- EASY COMPENSATION
- LOW AC MAINS VOLTAGE REJECTION

DESCRIPTION

HM4313 is a highly integrated solution for SMPS applications requiring constant voltage and constant current mode.

HM4313 integrates one voltage reference, two operational amplifiers (with ORed outputs – common collectors), and a current sensing circuit.

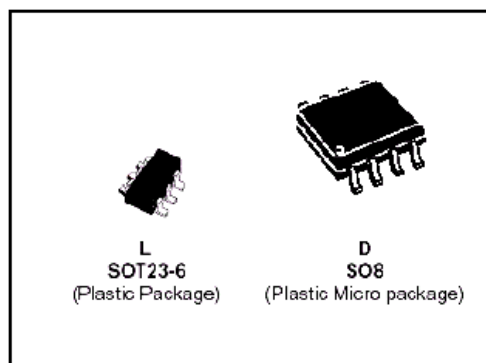
The voltage reference combined with one operational amplifier makes it an ideal voltage controller, and the other low voltage reference combined with the other operational amplifier makes it an ideal current limiter for output low side current sensing.

The current threshold is fixed and precise.

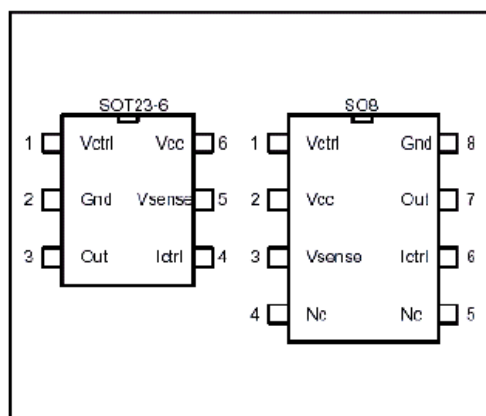
The only external components are:

- A resistor bridge to be connected to the output of the power supply (adapter, battery charger) to set the voltage regulation by dividing the desired output voltage to match the internal voltage reference value.
- A sense resistor having a value and allowable dissipation power which need to be chosen according to the internal voltage threshold.

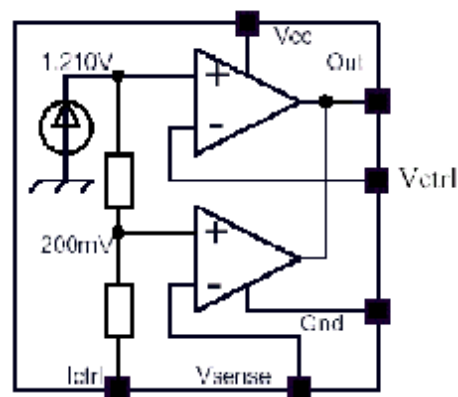
HM4313, is ideal for smallest package available, is ideal for space shrinked applications such as adapters and battery chargers.



PIN CONNECTIONS (top view)



INTERNAL SCHEMATIC



PIN DESCRIPTION

SOT23-6 Pinout

Name	Pin#	Type	Function
Vcc	6	Power Supply	Positive Power Supply Line
GND	2	Power Supply	Ground Line. 0V Reference For All Voltages
Vctrl	1	Analog Input	Input Pin of the Voltage Control Loop
Ictrl	4	Analog Input	Input Pin of the Current Control Loop
Out	3	Current Sink Output	Output Pin. Sinking Current Only
Vsense	5	Analog Input	Input Pin of the Current Control Loop

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ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
Vcc	DC Supply Voltage	14	V
Vi	Input Voltage	-0.3 to Vcc	V
Top	Operating Free Air Temperature Range	-10 to 85	°C
Tj	Maximum Junction Temperature	150	°C

OPERATION CONDITIONS

Symbol	Parameter	Value	Unit
Vcc	DC Supply Conditions	2.5 to 12	V

ELECTRICAL CHARACTERISTICS

Tamb = 25°C and Vcc = +5V (unless otherwise specified)

Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
Total Current Consumption						
Icc	Total Supply Current – not taking the output sinking current into account	Tamb -10°C < Tamb < 85°C		1.1 1.2		mA
Voltage Control Loop						
Gmv	Transconduction Gain (Vctrl). Sink Current Only ¹⁾	Tamb -10°C < Tamb < 85°C	1	3.5 2.5		mA/mV
Vref	Voltage Control Loop Reference ²⁾	Tamb -10°C < Tamb < 85°C	1.198 1.186	1.21	1.222 1.234	V
libv	Input Bias Current (Vctrl)	Tamb -10°C < Tamb < 85°C		50 100		nA
Current Control Loop						
Gmi	Transconduction Gain (Ictrl). Sink Current Only ³⁾	Tamb -10°C < Tamb < 85°C	1.5	7		mA/mV
Vsense	Current Control Loop Reference ⁴⁾	Iout = 2.5 mA Tamb -10°C < Tamb < 85°C	196 192	200	204 208	mV
libi	Current out of pin Ictrl at -200mV	Tamb -10°C < Tamb < 85°C		30 40		μA
Output Stage						
Vol	Low output voltage at 10 mA sinking current	Tamb -10°C < Tamb < 85°C		200		mV
Ios	Output Short Circuit Current. Output to Vcc. Sink Current Only	Tamb -10°C < Tamb < 85°C		27 35	70	mA
Vo	Output Voltage	Vcc= 12V	11			V

1. If the voltage on Vctrl (the negative input of the amplifier) is higher than the positive amplifier input (Vref=1.210V), and it is increased by 1mV, the sinking current at the output OUT will be increased by 3.5mA.

2. The internal Voltage Reference is set at 1.210V (bandgap reference). The voltage control loop precision takes into account the cumulative effects of the internal voltage reference deviation as well as the input offset voltage of the trans-conductance operational amplifier. The internal Voltage Reference is fixed by bandgap, and trimmed to 0.5% accuracy at room temperature.

3. When the positive input at Ictrl is lower than -200mV, and the voltage is decreased by 1mV, the sinking current at the output OUT will be increased by 7mA.

4. The internal current sense threshold is set to -200mV. The current control loop precision takes into account the cumulative effects of the internal voltage reference deviation as well as the input offset voltage of the trans-conduction operational amplifier.

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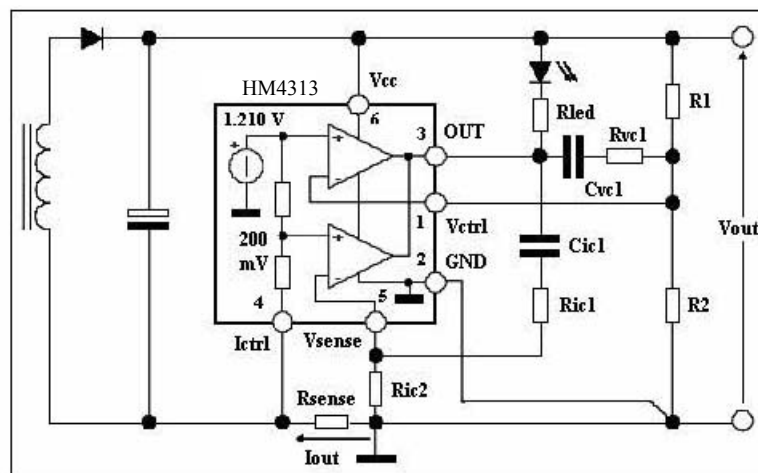
ELECTRICAL CHARACTERISTICS

Tamb = 25°C and Vcc = +5V (unless otherwise specified)

Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
Total Current Consumption						
Icc	Total Supply Current – not taking the output sinking current into account			1.1	2	mA
Voltage Control Loop						
Gmv	Transconduction Gain (Vctrl). Sink Current Only		1	3.5		mA/mV
Vref	Voltage Control Loop Reference		1.198	1.21	1.222	V
libv	Input Bias Current (Vctrl)			50		nA
Current Control Loop						
Gmi	Transconduction Gain (Ictrl). Sink Current Only ³⁾		1.5	7		mA/mV
Vsense	Current Control Loop Reference ⁴⁾	Iout = 2.5 mA	196	200	204	mV
libi	Current out of pin Ictrl at -200mV			30		μA
Output Stage						
Vol	Low output voltage at 10 mA sinking current			200		mV
Ios	Output Short Circuit Current. Output to Vcc. Sink Current Only			27	60	mA
Vo	Output Voltage	Vcc= 12V	11.1			V

TYPICAL APPLICATION CIRCUIT

Typical adaptor or battery charger application using the device



In the above application schematic, the device is used on the secondary side of a flyback adaptor (or battery charger) to provide an accurate control of voltage and current. The above feedback loop is made with an optocoupler.