

CONSTANT VOLTAGE AND CONSTANT CURRENT CONTROLLER AP4313

General Description

The AP4313 is a highly integrated solution for a constant voltage/constant current mode SMPS application.

The AP4313 contains one 1.21V voltage reference with $\pm 1\%$ accuracy, one current sensing circuit and two operational amplifiers. Combining the voltage reference with one operational amplifier makes AP4313 an ideal voltage controller for use in adapters and battery chargers. The other low voltage reference combined with the other operational amplifier makes it an ideal current limiter for output low side current sensing.

The AP4313 is available in SOT-23-6 package.

Features

- Constant Voltage and Constant Current Control
- Precision Internal Voltage Reference
- Few External Components
- Easy Compensation

Applications

- Adapters
- Battery Chargers

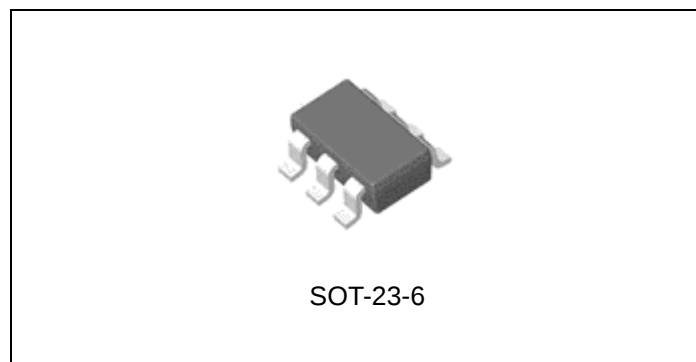


Figure 1. Package Type of AP4313

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Pin Configuration

K Package
(SOT-23-6)

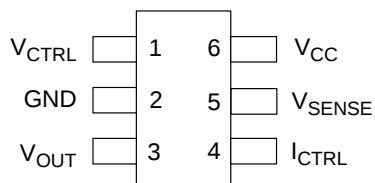


Figure 2. Pin Configuration of AP4313 (Top View)

Pin Description

Pin Number	Pin Name	Function
1	V_{CTRL}	Input pin of the voltage control loop
2	GND	Ground
3	V_{OUT}	Output pin. Sinking current only
4	I_{CTRL}	Input pin of the current control loop
5	V_{SENSE}	Input pin of the current control loop
6	V_{CC}	Power supply

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AP4313

Functional Block Diagram

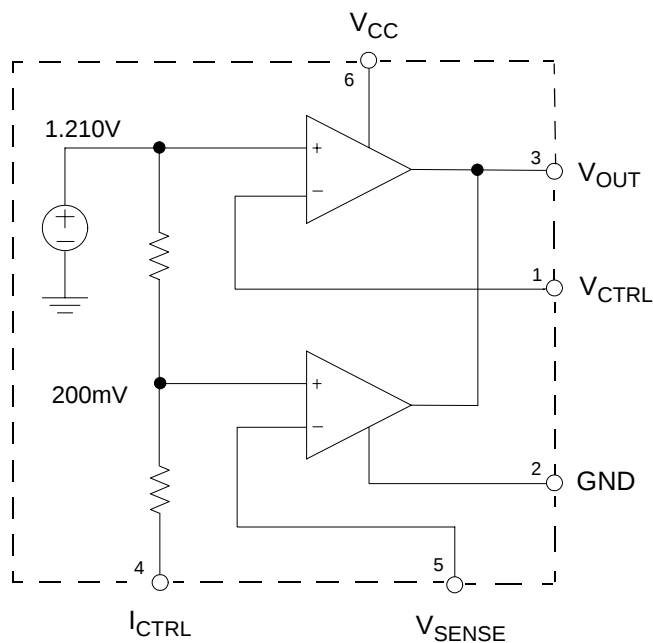
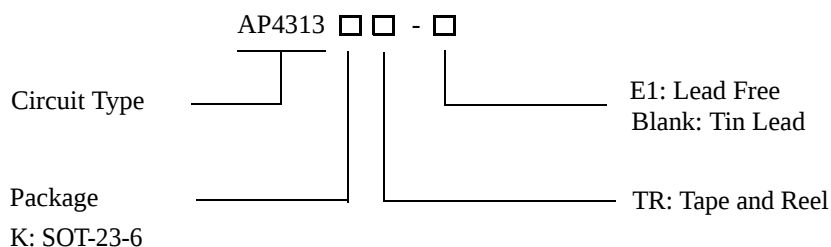


Figure 3. Functional Block Diagram of AP4313

Ordering Information



Package	Temperature Range	Part Number		Marking ID		Packing Type
		Tin Lead	Lead Free	Tin Lead	Lead Free	
SOT-23-6	0 to 70°C	AP4313KTR	AP4313KTR-E1	K6G	E6G	Tape & Reel

BCD Semiconductor's Pb-free products, as designated with "E1" suffix in the part number, are RoHS compliant.

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Absolute Maximum Ratings (Note 1)

Parameter	Symbol	Value	Unit
Power Supply Voltage	V_{CC}	20	V
Input Voltage	V_{IN}	-0.3 to V_{CC}	V
Junction Temperature	T_J	150	°C
Storage Temperature	T_{STG}	-65 to 150	°C
Lead Temperature (Soldering, 5sec)	T_{LEAD}	260	°C
Package Thermal Resistance (Junction to Case)	θ_{JC}	92	°C/W

Note 1: Stresses greater than those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under "Recommended Operating Conditions" is not implied. Exposure to "Absolute Maximum Ratings" for extended periods may affect device reliability.

Recommended Operating Conditions

Parameter	Symbol	Min	Max	Unit
Power Supply Voltage	V_{CC}	2.5	18	V
Operating Temperature Range	T_A	0	70	°C

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Electrical Characteristics

($V_{CC}=5V$, $T_A=25^{\circ}C$, unless otherwise specified.)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
TOTAL CURRENT CONSUMPTION						
Total Supply Current Not Including the Output Sinking Current	I_{CC}			0.6	1.2	mA
VOLTAGE CONTROL LOOP						
Transconduction Gain (V_{CTRL}). Sink Current Only	Gmv		1	3.5		mA/mV
Voltage Control Loop Reference	V_{REF}		1.198	1.21	1.222	V
Input Bias Current (V_{CTRL})	I_{IBV}			50		nA
CURRENT CONTROL LOOP						
Transconduction Gain (I_{CTRL}).	Gmi		1.5	7		mA/mV
Current Control Loop Reference	V_{SENSE}	$I_{OUT}=2.5mA$	196	200	204	mV
Current Out of Pin I_{CTRL} at -200mV	I_{IBI}			25		μA
OUTPUT STAGE						
Low Output Voltage at 10mA Sinking Current	V_{OL}			200		mV
Output Short Circuit Current. Output to V_{CC} . Sink Current Only	I_{OS}			27	50	mA

Typical Performance Characteristics

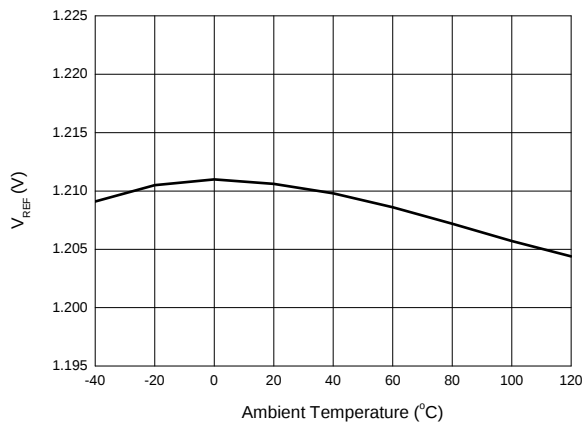


Figure 4. V_{REF} vs. Ambient Temperature

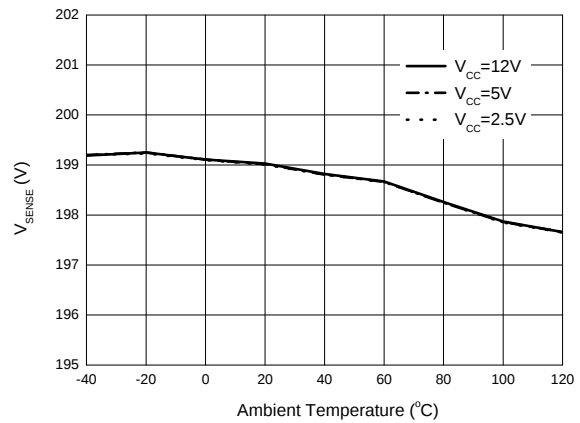


Figure 5. V_{SENSE} vs. Ambient Temperature

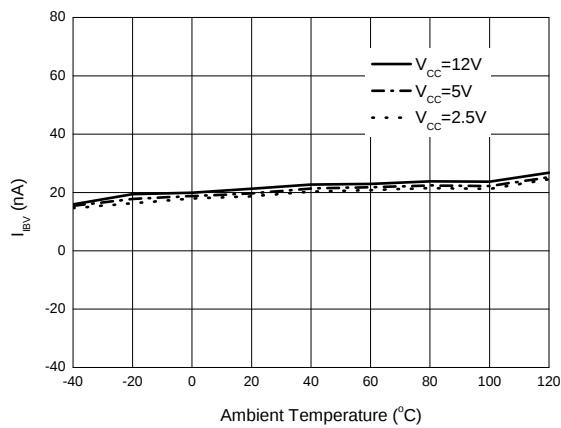


Figure 6. V_{CTRL} Pin Input Bias Current vs. Ambient Temperature

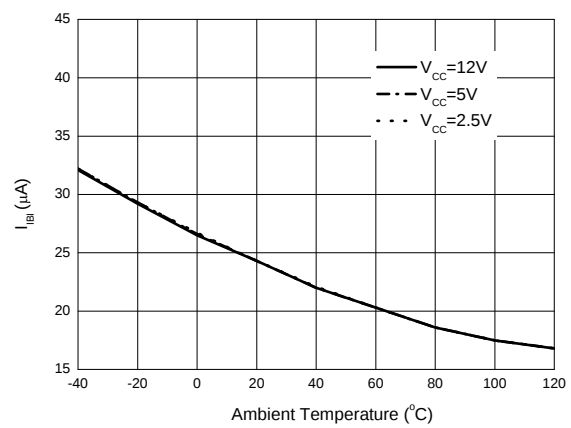


Figure 7. I_{CTRL} Pin Input Bias Current vs. Ambient Temperature

Typical Performance Characteristics (Continued)

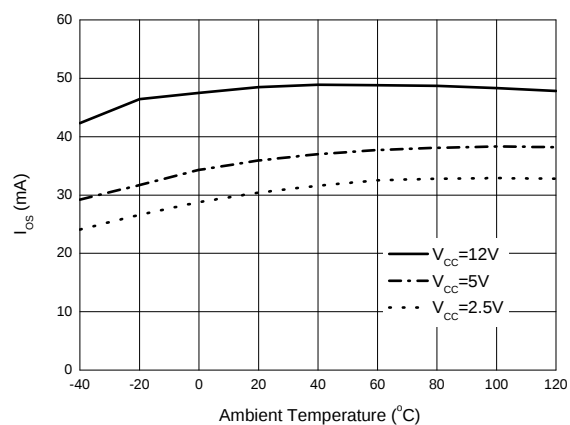


Figure 8. Output Short Circuit Current vs. Ambient Temperature

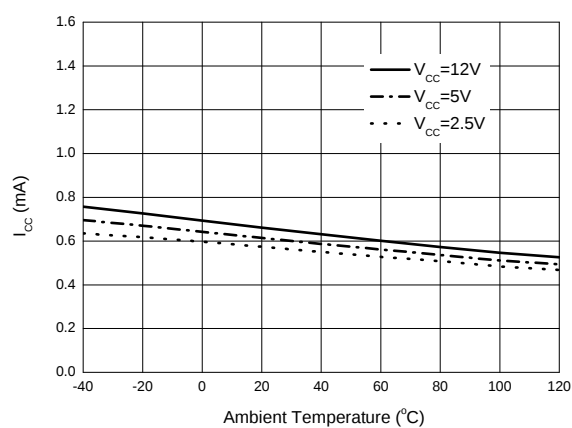


Figure 9. Supply Current vs. Ambient Temperature



The diagram illustrates a precision active current source circuit centered around the AP4313 IC. The circuit is powered by a transformer secondary. The AP4313 is configured with its non-inverting input (+) connected to a 1.210V reference and its inverting input (-) connected to a 200mV sense resistor. The output of the AP4313 is connected to the primary winding of the transformer. The circuit includes several feedback and compensation components: a 470K resistor (R3) and a 2.2nF capacitor (C1) in parallel, a 22pF capacitor (C2) in parallel, and a 2.2nF capacitor (C3) in parallel. The output voltage is labeled V_{OUT} and the output current is labeled I_{CTRL} . The circuit also includes a load resistor (R1) and a feedback resistor (R2). The output is connected to a primary winding (To primary) and a load (Load). The circuit is grounded at GND.

Nov. 2005 Rev. 1.0



SOT-23-6

Unit: mm(inch)

