

**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
- Low Supply Current: 0.5mA
- Operating Temperature Range: -40 to 105°C

Applications

- Adapters
- Battery Chargers

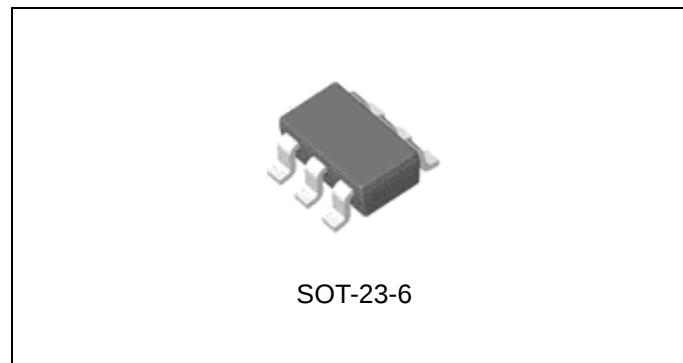


Figure 1. Package Type of AP4313

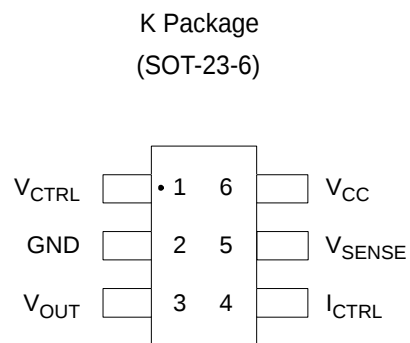
**CONSTANT VOLTAGE AND CONSTANT CURRENT CONTROLLER AP4313****Pin Configuration**

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



CONSTANT VOLTAGE AND CONSTANT CURRENT CONTROLLER AP4313

Functional Block Diagram

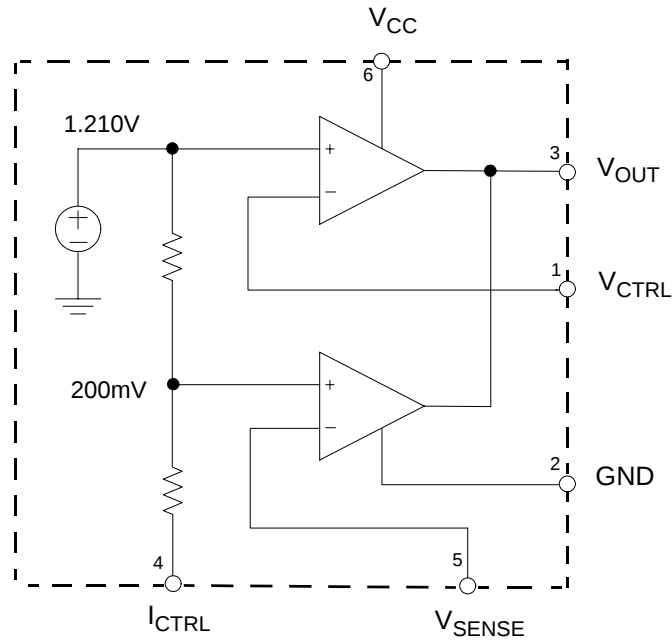
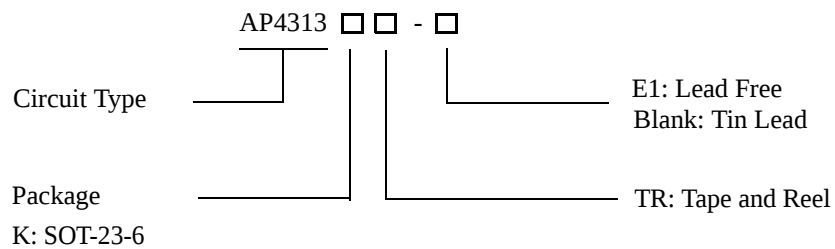


Figure 3. Functional Block Diagram of AP4313

Ordering Information



Package	Temperature Range	Part Number		Marking ID		Packing Type
		Tin Lead	Lead Free	Tin Lead	Lead Free	
SOT-23-6	-40 to 105°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.

**CONSTANT VOLTAGE AND CONSTANT CURRENT CONTROLLER AP4313****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)	$R_{\theta JC}$	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	-40	105	°C

**CONSTANT VOLTAGE AND CONSTANT CURRENT CONTROLLER AP4313****Electrical Characteristics**(V_{CC}=5V, T_A=25°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	G _{mv}		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}).	G _{mi}		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



CONSTANT VOLTAGE AND CONSTANT CURRENT CONTROLLER AP4313

Typical Performance Characteristics

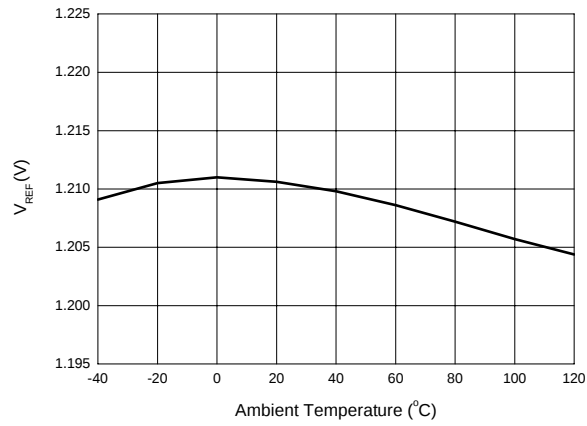


Figure 4. V_{REF} vs. Ambient Temperature

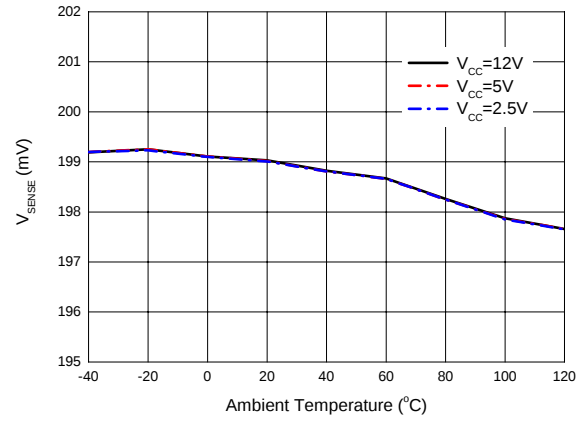


Figure 5. V_{SENSE} vs. Ambient Temperature

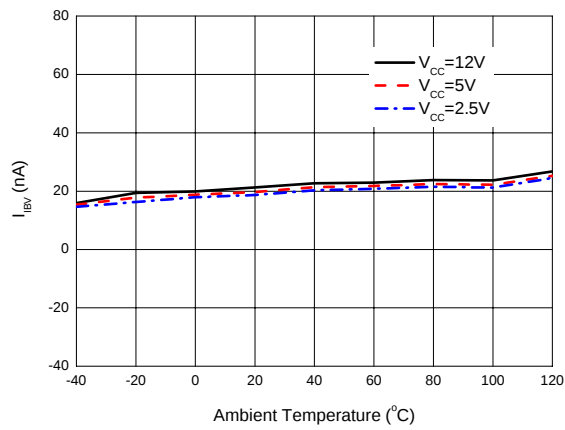


Figure 6. V_{CTRL} Pin Input Bias Current vs. Ambient Temperature

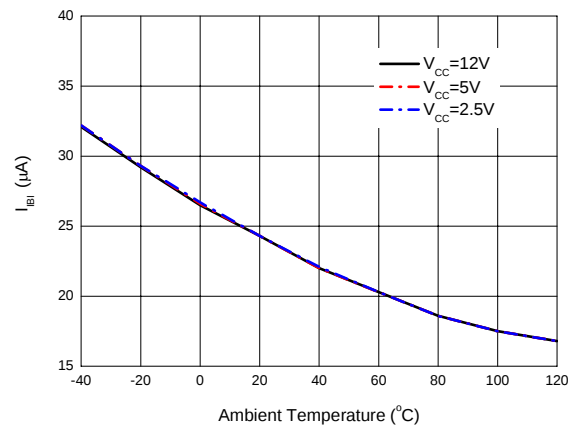


Figure 7. I_{CTRL} Pin Input Bias Current vs. Ambient Temperature

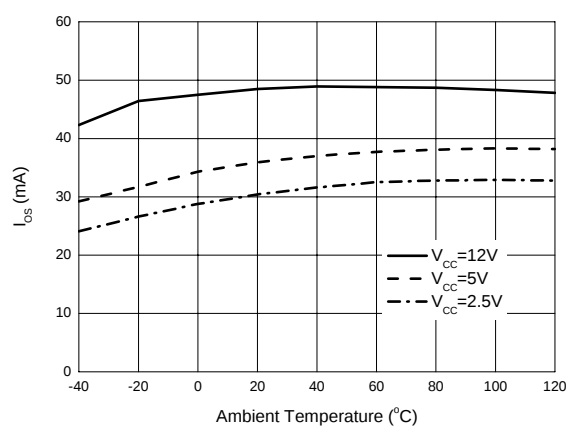
**CONSTANT VOLTAGE AND CONSTANT CURRENT CONTROLLER AP4313****Typical Performance Characteristics (Continued)**

Figure 8. Output Short Circuit Current vs. Ambient Temperature

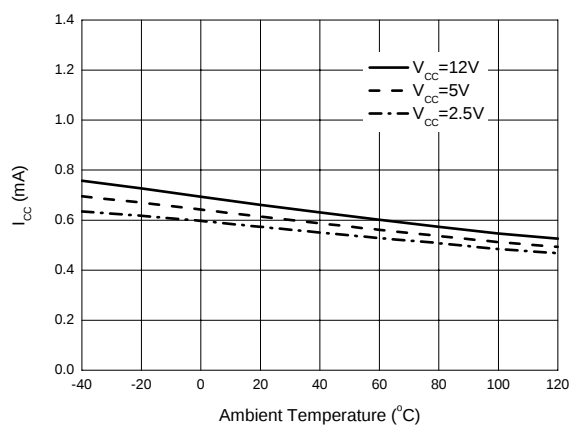
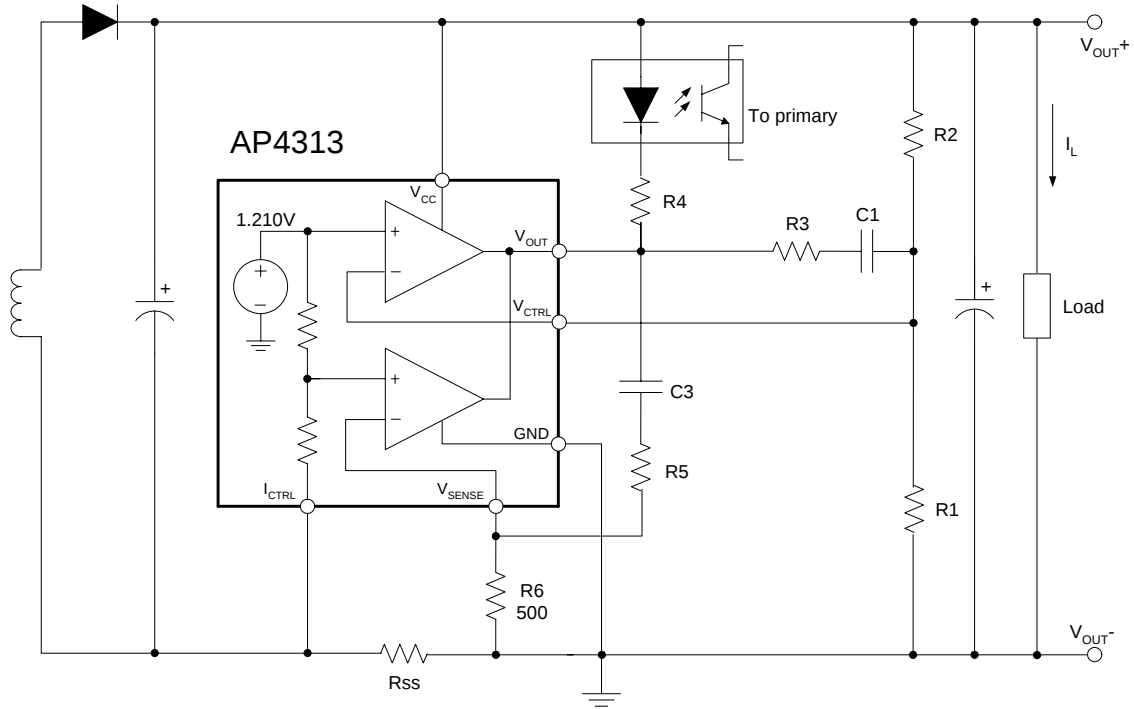


Figure 9. Supply Current vs. Ambient Temperature



CONSTANT VOLTAGE AND CONSTANT CURRENT CONTROLLER AP4313

Typical Application



$$V_{OUT} = V_{REF} \times \frac{R1 + R2}{R1} \quad (V)$$

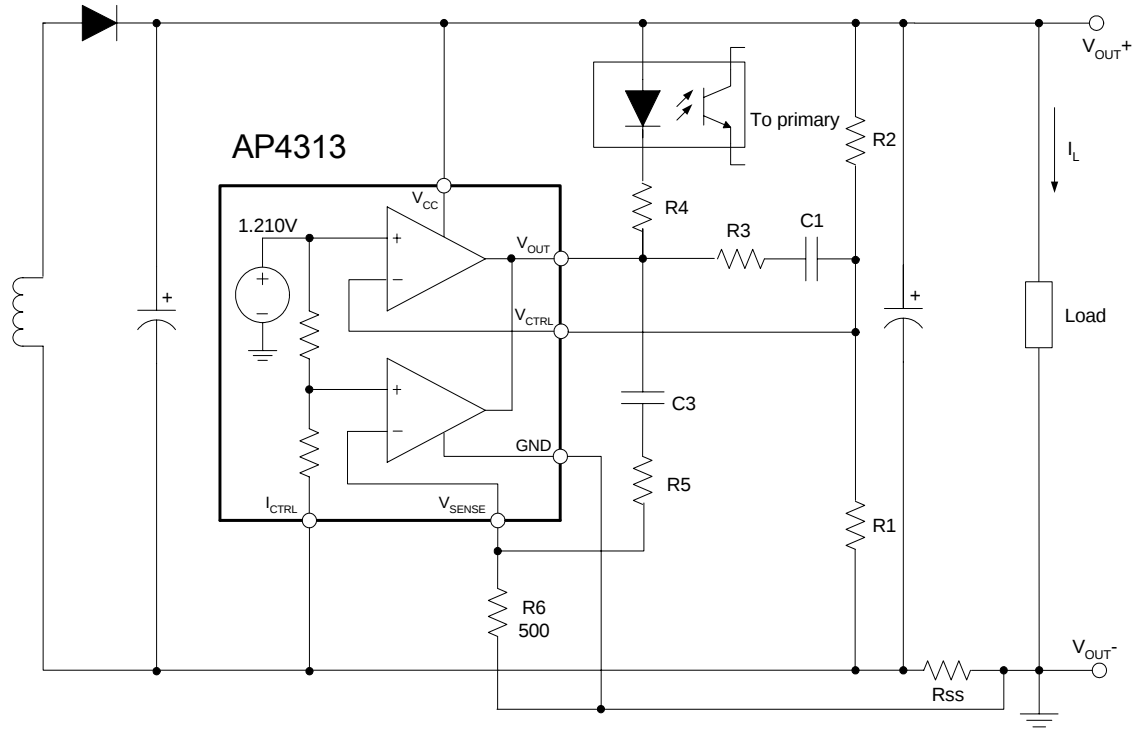
$$CurrentLimit = \frac{V_{SENSE}}{R_{SS}} \quad (A)$$

Figure 10. Typical Application 1 of AP4313



CONSTANT VOLTAGE AND CONSTANT CURRENT CONTROLLER AP4313

Typical Application



$$V_{OUT} = [V_{REF} + (I_L \times R_{SS})] \times \frac{R1 + R2}{R1} - (I_L \times R_{SS}) \quad (V)$$

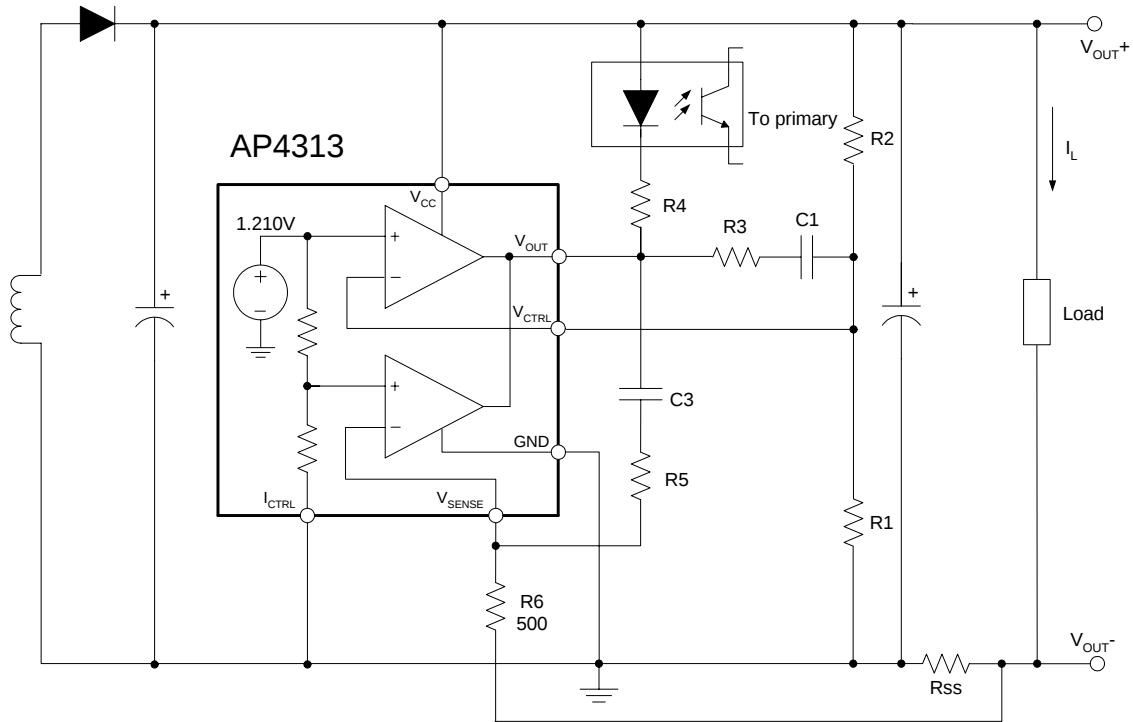
$$CurrentLimit = \frac{V_{SENSE}}{R_{SS}} \quad (A)$$

Figure 11. Typical Application 2 of AP4313



CONSTANT VOLTAGE AND CONSTANT CURRENT CONTROLLER AP4313

Typical Application



$$V_{OUT} = V_{REF} \times \frac{R1 + R2}{R1} - (I_L \times R_{SS}) \quad (V)$$

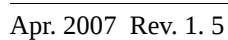
$$CurrentLimit = \frac{V_{SENSE} \times V_{REF}}{(V_{SENSE} + V_{REF}) \times R_{SS}} \quad (A)$$

Figure 12. Typical Application 3 of AP4313



SOT-23-6

Unit: mm(inch)





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MAIN SITE

BCD Semiconductor Manufacturing Limited

- Wafer Fab

Shanghai SIM-BCD Semiconductor Manufacturing Limited

800, Yi Shan Road, Shanghai 200233, China

Tel: +86-21-6485 1491, Fax: +86-21-5450 0008

BCD Semiconductor Manufacturing Limited

- IC Design Group

Advanced Analog Circuits (Shanghai) Corporation

8F, Zone B, 900, Yi Shan Road, Shanghai 200233, China

Tel: +86-21-6495 9539, Fax: +86-21-6485 9673

REGIONAL SALES OFFICE

Shenzhen Office

Shanghai SIM-BCD Semiconductor Manufacturing Co., Ltd. Shenzhen Office

Advanced Analog Circuits (Shanghai) Corporation Shenzhen Office

Room E, 5F, Noble Center, No.1006, 3rd Fuzhong Road, Futian District, Shenzhen 518026, China

Tel: +86-755-8826 7951

Fax: +86-755-8826 7865

Taiwan Office

BCD Semiconductor (Taiwan) Company Limited

4F, 298-1, Rui Guang Road, Nei-Hu District, Taipei,

Taiwan

Tel: +886-2-2656 2808

Fax: +886-2-2656 2806

USA Office

BCD Semiconductor Corporation

30920 Huntwood Ave. Hayward,

CA 94544, U.S.A

Tel : +1-510-324-2988

Fax: +1-510-324-2788