

Constant Voltage and Constant Current Controller for Adaptors and Battery Chargers

IK3052A

Description

IK3052A is a highly integrated solution for SMPS applications requiring constant voltage and constant current mode.

IK3052A 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.

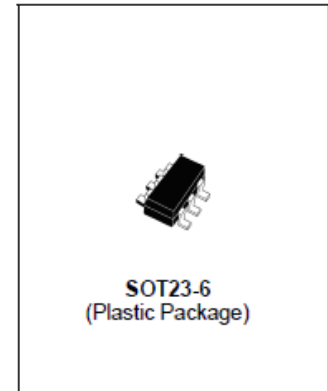
The current threshold is fixed and precise.

The only external components are:

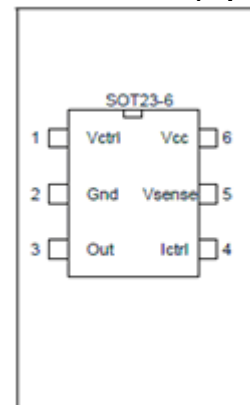
- A resistor bridge to be connected to the output of the power supply (adapter, battery charger) to set the voltage regulation by dividing the desired output voltage to match the internal voltage reference value.
 - A sense resistor having a value and allowable dissipation power which need to be chosen according to the internal voltage threshold.
 - Optional compensation components (R and C).
- IK3052A, is ideal for smallest package available, is ideal for space shrunk applications such as adapters 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



PIN CONNECTION (top view)



ORDERING INFORMATION

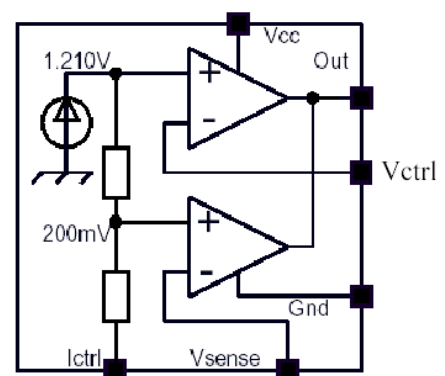
Device	Operating Temperature Range	Package	Shipping
IK3052AS2T	T _A = 0° to 85° C for all packages	Plastic SOT23-6	Tape& Reel

Pin Definitions and Functions

SOT23-6 Pin out

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

INTERNAL SCHEMATIC



Absolute Maximum Ratings

Symbol	Parameter	Value	Unit
V _{cc}	DC Supply Voltage	20	V
V _i	Input Voltage	-0.3 to V _{cc}	V
Top	Operating Free Air Temperature Range	0 to 85	°C
T _j	Maximum Junction Temperature	150	°C

* Stresses beyond 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-rated conditions for extended periods may affect device reliability.

Operation Conditions

Symbol	Parameter	Value	Unit
V _{cc}	DC Supply Conditions	2.5 to 18	V

Electrical Characteristics

T_{amb} = 25°C and V_{cc} = +5V (unless otherwise specified)

Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
Total Current Consumption						
I _{cc}	Total Supply Current – not taking the output sinking current into account	T _{amb} 0 < T _{amb} < 85°C		1.1 1.2	2	mA
Voltage Control Loop						
G _{mv}	Transconduction Gain (V _{ctrl}). Sink Current Only ¹⁾	T _{amb} 0 < T _{amb} < 85°C	1	3.5 2.5		mA/mV
V _{ref}	Voltage Control Loop Reference ²⁾	T _{amb} 0 < T _{amb} < 85°C	1.204 1.186	1.21	1.216 1.234	V
I _{ibv}	Input Bias Current (V _{ctrl})	T _{amb} 0 < T _{amb} < 85°C		50 100		nA
Current Control Loop						
G _{mi}	Transconduction Gain (I _{ctrl}). Sink Current Only ³⁾	T _{amb} 0 < T _{amb} < 85°C	1.5	7		mA/mV
V _{sense}	Current Control Loop Reference ⁴⁾	I _{out} = 2.5 mA T _{amb} 0 < T _{amb} < 85°C	196 192	200	204 208	mV
I _{ibi}	Current out of pin I _{ctrl} at -200mV	T _{amb} 0 < T _{amb} < 85°C		25 50		μA
Output Stage						
V _{ol}	Low output voltage at 10 mA sinking current	T _{amb} 0 < T _{amb} < 85°C		200		mV
I _{os}	Output Short Circuit Current. Output to V _{cc} . Sink Current Only	T _{amb} 0 < T _{amb} < 85°C		27 35	50	mA

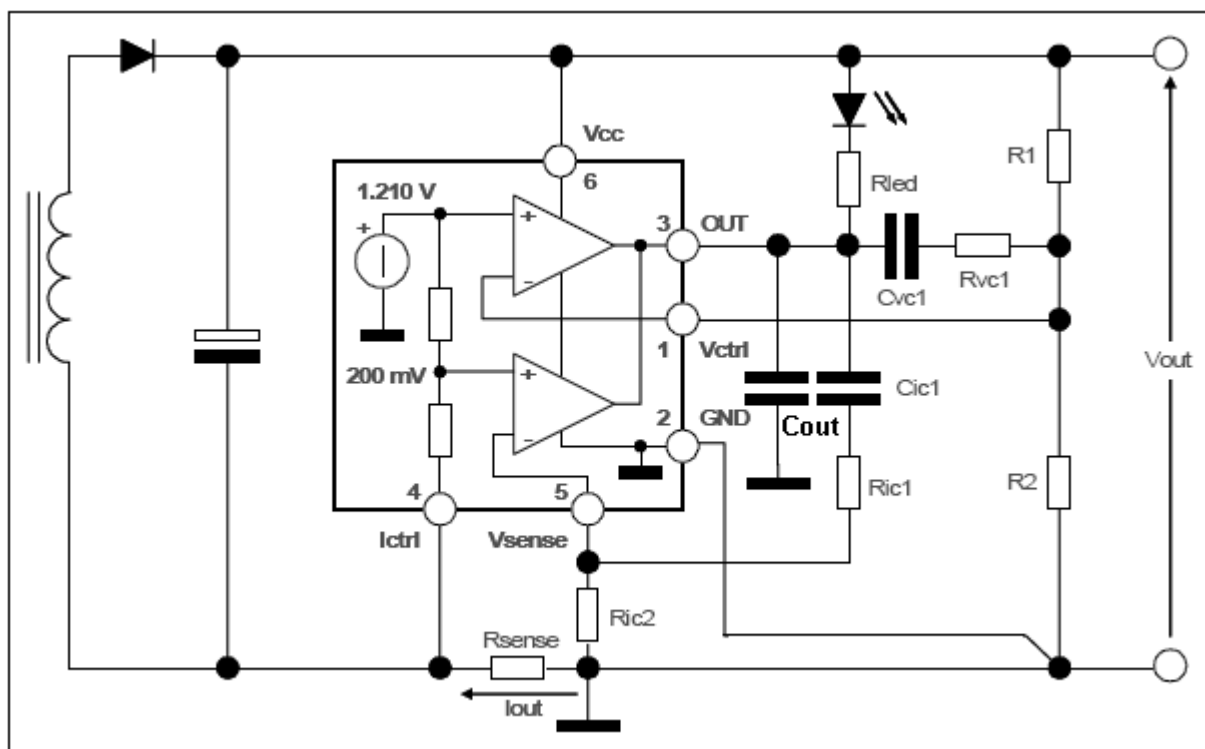
1. If the voltage on V_{ctrl} (the negative input of the amplifier) is higher than the positive amplifier input (V_{ref}=1.210V), and it is increased by 1mV, the sinking current at the output OUT will be increased by 3.5mA.

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 I_{ctrl} 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.

TYPICAL APPLICATION CIRCUIT
 Typical adaptor or battery charger application using the device

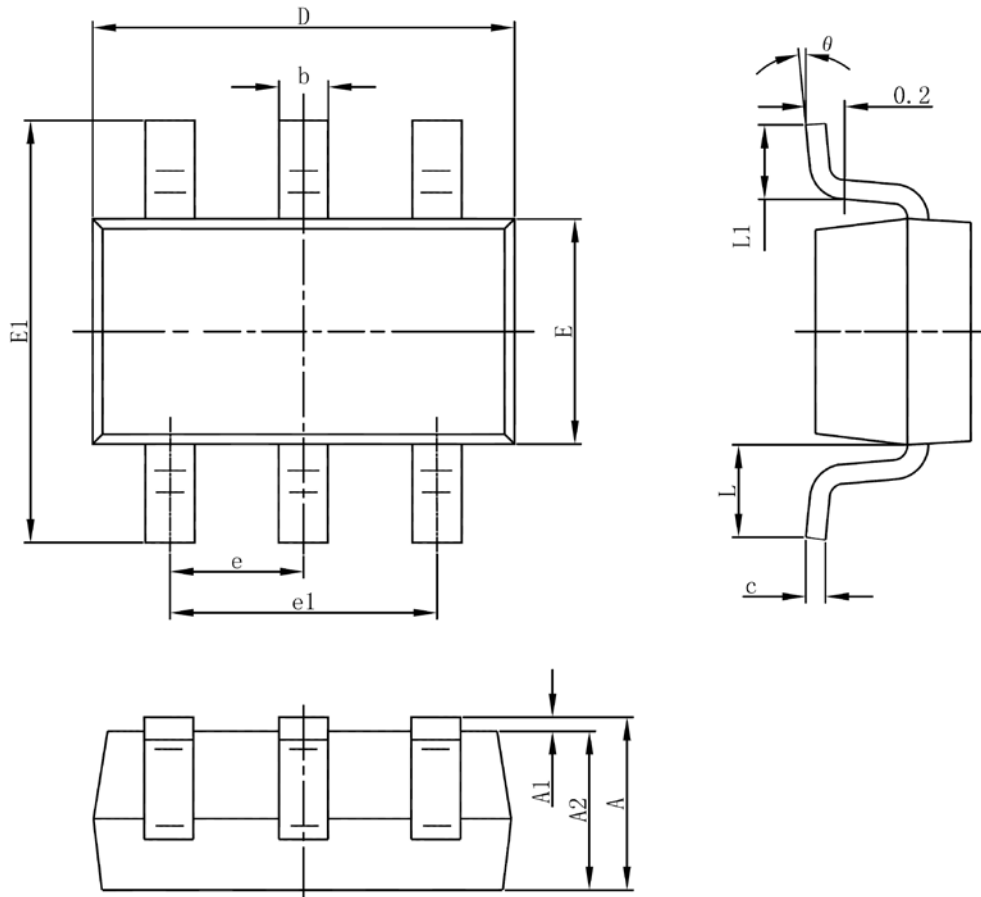


In the above application schematic, the device is used on the secondary side of a flyback adaptor (or battery charger) to provide an accurate control of voltage and current. The above feedback loop is made with an optocoupler.

Attention! For measurements of electrical characteristics of IK3052A and also in field application of the devices in composition of equipment, it is necessary to apply capacitance $C_{out} \geq 0.47 \text{ pF}$ on pin 3 (Out).

PACKAGE DIMENSION

SOT-23-6



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950TYP		0.037TYP	
e1	1.800	2.000	0.071	0.079
L	0.600REF		0.024REF	
L1	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°