

# CONSTANT VOLTAGE AND CONSTANT CURRENT CONTROLLER TJ1051 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

TJ1051 is a highly integrated solution for SMPS applications requiring constant voltage and constant current mode.

TJ1051 integrates one voltage reference, two operational amplifiers (with ORed outputs – common collectors), and a current sensing circuit.

The voltage reference combined with one operational amplifiers 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.

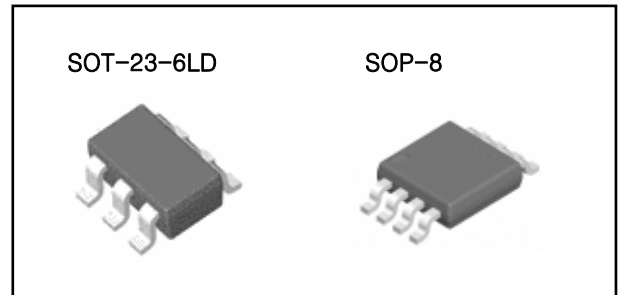
The only external components are :

- A resistor bridge to be connected to the output of the power supply (adaptor, 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).

## APPLICATIONS

- BATTERY CHARGERS
- ADAPTERS

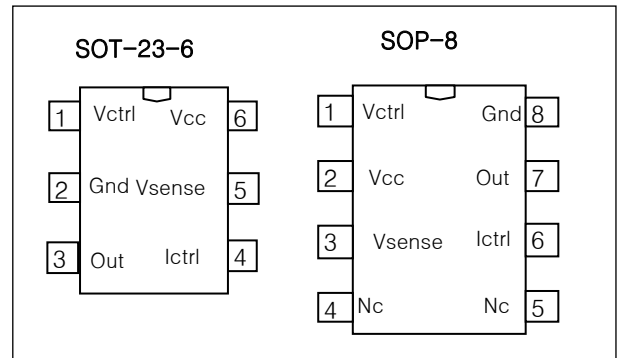
TJ1051, is ideal for smallest package available, is ideal for space shrunk applications such as battery chargers and adaptors.



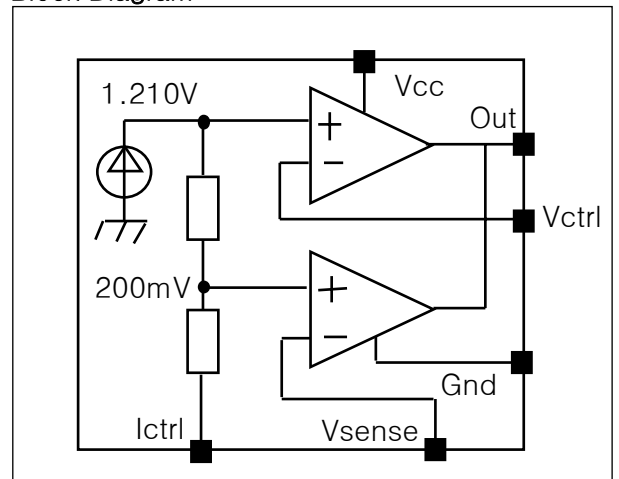
## ORDERING INFORMATION

Device	Marking	Package
TJ1051CL	1051	SOT-23-6LD
TJ1051CD	TJ1051	SOP-8

## PIN CONNECTIONS (TOP VIEW)



## Block Diagram



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## 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

### SOP-8 Pinout

Name	Pin#	Type	Function
Vcc	2	Power Supply	Positive Power Supply Line
GND	8	Power Supply	Ground Line. 0V Reference For All Voltages
Vctrl	1	Analog Input	Input Pin of the Voltage Control Loop
Ictrl	6	Analog Input	Input Pin of the Current Control Loop
Out	7	Current Sink Output	Output Pin. Sinking Current Only
Vsense	3	Analog Input	Input Pin of the Current Control Loop
Nc	5		
Nc	4		

## 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	0 to 85	°C
Tj	Maximum Junction Temperature	150	°C

## OPERATION CONDITIONS

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

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## ELECTRICAL CHARACTERISTICS

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

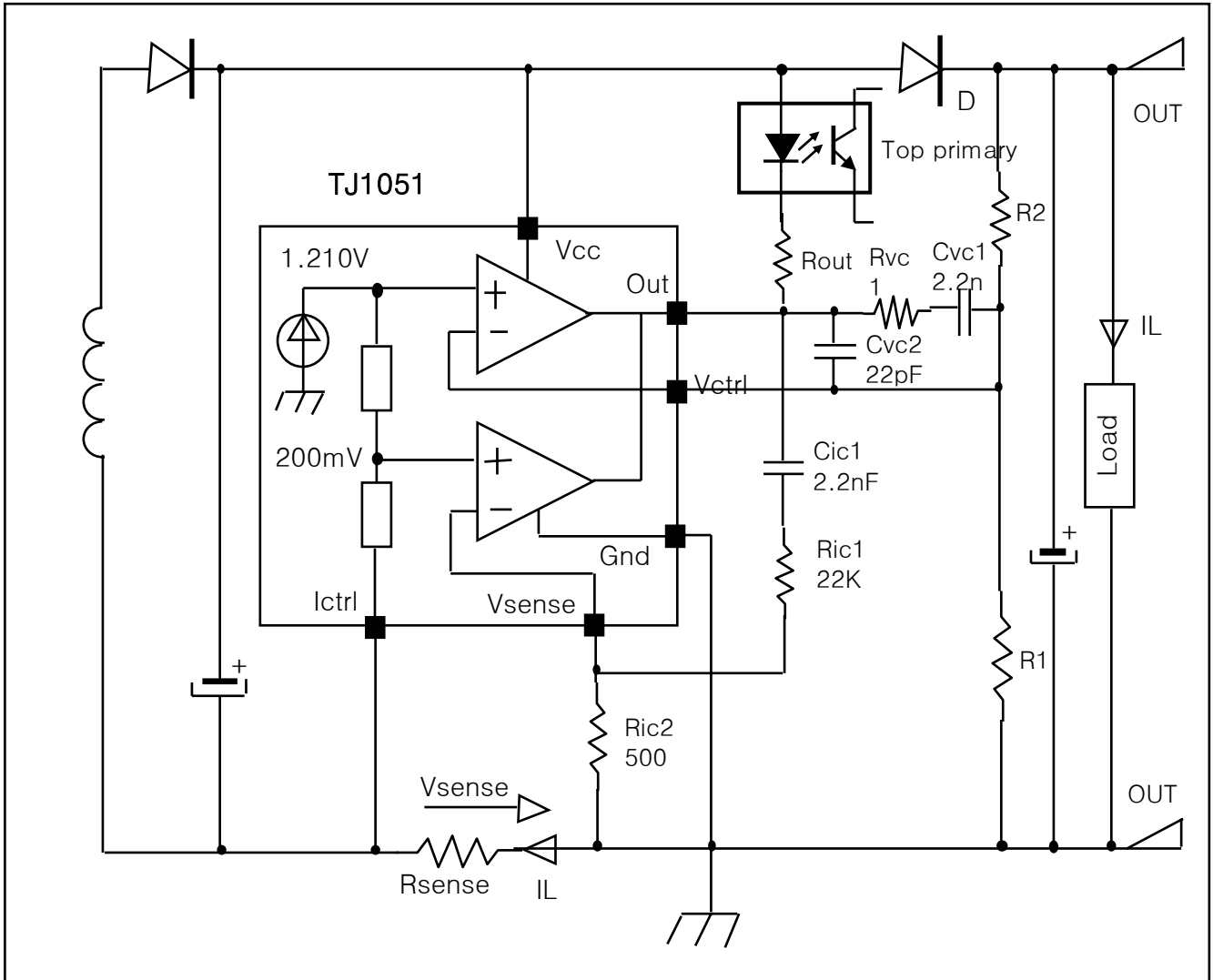
Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
<b>Total Current Consumption</b>						
I <sub>cc</sub>	Total Supply Current – not taking the output sinking current into account	Tamb 0 < Tamb < 85 °C		1.1 1.2	2	mA
<b>Voltage Control Loop</b>						
G <sub>mv</sub>	Transconductance Gain (Vctrl). Sink Current Only <sup>1)</sup>	Tamb 0 < Tamb < 85 °C	1	3.5 2.5		mA/mV
V <sub>ref</sub>	Voltage Control Loop Referenc <sup>2)</sup>	Tamb 0 < Tamb < 85 °C	1.198 1.186	1.21	1.222 1.234	V
I <sub>ibv</sub>	Input Bias Current (Vctrl)	Tamb 0 < Tamb < 85 °C		50 100		nA
<b>Current Control Loop</b>						
G <sub>mi</sub>	Transconductance Gain (Ictrl). Sink Current Only <sup>3)</sup>	Tamb 0 < Tamb < 85 °C	1.5	7		mA/mV
V <sub>sense</sub>	Current Control Loop Referenc <sup>4)</sup>	I <sub>out</sub> = 2.5mA Tamb 0 < Tamb < 85 °C	196 192	200	204 208	mV
I <sub>ibi</sub>	Current out of pin Ictrl at – 200mV	Tamb 0 < Tamb < 85 °C		25 50		μA
<b>Output Stage</b>						
V <sub>ol</sub>	Low output voltage at 10 mA sinking Current	Tamb 0 < Tamb < 85 °C		200		mV
I <sub>os</sub>	Output Short Circuit Current. Output to Vcc. Sink Current Only	Tamb 0 < Tamb < 85 °C		27 35	50	mA

- 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 transconductance operational amplifier. The internal Voltage Reference is fixed by bandgap, and trimmed to 0.5% accuracy 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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TJ1051

Figure 1 : Typical Adaptor or Battery Charger Application Using TJ1051



In the above application schematic, the TJ1051 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.