

Preliminary Data Sheet

June, 2006

Aivaka

AV2110-Adj.

600mA, High Efficiency, Low Input Voltage, Adjustable Synchronous Monolithic Step-Down DC-DC Regulator.

Features

- Input Voltage of as low as **1.3V to 5.5V**
- Output Current of up to 600mA
- Synchronous operation with built-in power transistors (No need for external diodes).
- Adjustable output voltage $\geq 300\text{mV}$
- Low ripple of $< 10\text{mV}$ p-p
- Duty cycle of 0% to 100%
- High Efficiency of Up to 90%
- Output Accuracy of 2%
- Shutdown current of $< 1\mu\text{A}$
- 300mV internal reference voltage
- Built-in soft start
- Small 8 pin DFN package

Application

- Mobile Phones
- Digital Still Camera
- PDA
- Portable Instruments
- Battery Powered Equipment
- Personal Information Appliances
- MP3 Player

Description

The AV2110-Adj is a synchronous monolithic step-down switching regulator. The AV2110-Adj is designed to operate from a wide input voltage range of 1.3V to 5.5V. This enables the system to operate from either 2 or 3 “household” AA or AAA (Alkaline or NiMH) batteries, or from a single Lithium (Li-Ion or Li-Metal) battery. It is capable of producing a 300mV output with an efficiency of up to 90%. It has a built-in soft-start mechanism without the need for any external components, and has a very low AC voltage ripple (less than 10mV peak-to-peak) at the output.

The output of AV2110-Adj can be set to a voltage as low as 300mV with an accuracy of $\pm 2\%$. The integrated switches enable the system designers to reduce total part count, and at the same time maximize power density and efficiency of the regulator. The AV2110-Adj can replace traditional step-up and linear regulator combination to enhance the overall efficiency of regulation, and lower the BOM and board space.

The AV2110-Adj. is designed to operate with widely available passive components and is packaged in a small standard 8-pin DFN package

Typical Setup

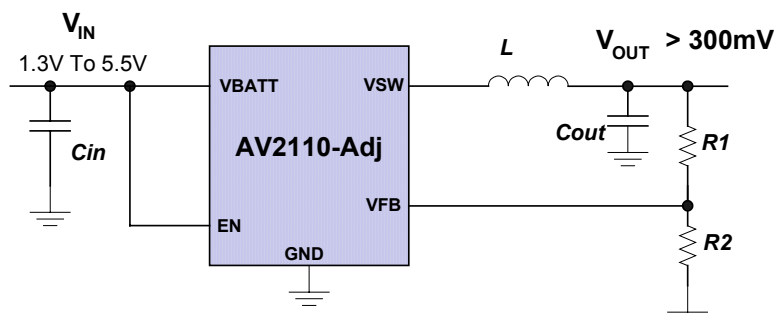


Figure 1. High Efficiency Buck Converter from 1.3V to 5.5V Input.

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Electrical Characteristics

SYMBOL	PARAMETER	CONDITION	MIN	TYP	MAX	UNIT
V _{IN}	Input Voltage Range	(Note 1)	1.3		5.5	V
I _Q	Dynamic Supply Current	I _{load} =0A		2.0		mA
	Shutdown Supply Current	EN = GND (Estimated leakage)			1	μA
I _{OUT}	Output Current				600	mA
V _{FB}	Feedback Voltage		294	300	306	mV
V _{LINEREG}	Output Voltage Line Regulation	V _{IN} Change @ I _{OUT} = 50mA		0.2		%/V
V _{LOADREG}	Output Voltage Load Regulation			0.25		%
V _{RIPPLE}	Output Voltage Ripple				1.5%* V _{out}	V
V _{UVLO}	Under Voltage Lockout	With 150mV Hysteresis.		1.4		V
V _{EN}	Enable Threshold	V _{IN} = 3.0V		1.2		V

Note 1: On power up, the minimum input voltage is 1.4V.

Recommended Operating Conditions

PARAMETER	MIN	TYP	MAX	UNIT
Supply Voltage	1.3		5.5	V
Output Current I _{OUT}			600	mA
Output Voltage	300			mV
Input Capacitor (Ceramic)		4.7		μF
Output Inductor		10		μH
Output Capacitor		22		μF
Operating ambient temperature (T _A)	-40		85	°C

Remark: The information in this preliminary data sheet is subject to change without notice.

Operation

Introduction

The AV2110-Adj is a synchronous monolithic step-down (Buck) DC-DC switching regulator that runs from a wide input voltage of 1.3V to 5.5V and does not require an external diode or power transistor to operate. The AV2110-Adj is designed for applications where low power, low voltage, low noise, and high efficiency regulators are essential. Handheld devices such as DSCs, MP3 players and Cell Phones, which have limited power budgets and significant space constraints, are the main targets for the AV2110-Adj.

The AV2110-Adj is designed to operate from an input voltage of 1.3V and can deliver an output of as low as 300mV with up to 90% efficiency. An ideal application for the AV2110-Adj is a low power device that may need 600mA current and must operate from two AA/AAA (Alkaline or NiMH) batteries with a very small output voltage ripple (~10mV peak-to-peak). Given that the AV2110-Adj is able to operate from an input voltage as high as 5.5V, a single Lithium rechargeable battery can be used as well, making the AV2110-Adj battery independent.

The AV2110-Adj is designed to operate with commonly available, and the least number of external components possible for ease of implementation. Its output can be set to a voltage as low as 300mV by shorting V_{OUT} to VFB (in Figure 1).

Basic Operation

Once EN is set to logic high (EN=1), the part starts functioning.

It has a built in soft-start scheme that eliminates any overshoot voltage at the output for all operating conditions regardless of load conditions.

The AV2110-Adj can start with no (zero) load current without any overshoot and maintains regulation within the needed 2%.

The output voltage (or a fraction of output voltage) is sensed by the VFB pin and is compared to a 300mV internal reference voltage. If VFB is shorted to output ($V_{FB} = V_{OUT}$), then the output voltage is regulated at 300mV. Using a resistor divider network (such as R1 and R2 in Figure 1) value of V_{OUT} can be adjusted to:

$$V_{OUT} = 0.3(1+R1/R2)$$

Hence, for $R1 = R2 = 100k\Omega$, V_{OUT} is set to 600mV. And if $R1 = 200k\Omega$ and $R2 = 100k\Omega$, then $V_{OUT} = 900mV$.

The AV2110-Adj is designed to produce a very low AC ripple at the output while maintaining high efficiency at all conditions. The AC ripple at the output is limited to less than 10mV peak-to-peak. This value can be further reduced by selecting a larger capacitor at the output.

Inductor Selection

For most applications, the inductor can be anywhere from 2.2 μ H to 10 μ H. However, based on the needed ripple voltage, the value of the inductor can be increased.

At the same time, a lower inductance value would result in a higher efficiency. So, depending on the application, needed efficiency and ripple current, the inductor value can be modified.

Capacitor Selection

Depending on the application the value of input capacitor can be varied. However, an input capacitor of 4.7 μ F is suggested for the AV2110-Adj.

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The output capacitor sets the ripple voltage of the output. Hence, depending on the needed ripple voltage, the value of C_{out} (in Figure 1) can be modified. A value of $22\mu\text{F}$ is suggested for the output capacitor for 10mV ripple voltage. If a higher ripple voltage can be tolerated, a value of $10\mu\text{F}$ is recommended.