



# ADP1864 and ADP1611 Reference Power Design

Preliminary Technical Data

FCDC 00047

## FEATURES

**Input Voltage 5V +/- 5%**

**Generates two voltages: An adjustable negative voltage that tracks an adjustable positive voltage**

**Output Voltage: -7V to -12V and +7 to +12V**

**Single resistor value change for each supply will adjust the output voltages**

**Both Voltages capable of providing 150mA of output current**

## ADP1864 AND ADP1611 REFERENCE POWER DESIGN DESCRIPTION

The ADP1611 and ADP1864 switching power controllers generate positive and negative voltage rails respectively, which is ideal for powering multiple ADC and OpAmps. With the feedback configuration the negative rail will track the positive rail, so as the positive rail becomes more positive, the negative rail will become more negative at the same rate. The tracking is also active during startup.

This ADP1864 a current mode controller used in the inverting boost topology. The ADP1864 switches at 580kHz with a duty cycle of 58% and 70% when generating -7V, and -12V respectively. A single small IC integrates the PFET and power diode offering a compact solution. Only a single small MLCC output capacitor is necessary to provide adequate capacitance and ripple current handling. The output voltage of this circuit is adjustable from -7V to -12V via a single resistor value change.

The ADP1611 is used in the boost topology and switches at 1.2MHz nominally. The circuit operates at 58% and 29% when generating +12 and +7 respectively. The ADP1611 is a current mode controller with integrated power switch to provide a compact solution. This output voltage of this circuit is adjustable from +7V to +12V via a single resistor value change. Only a single small 4.7uF MLCC output capacitor is necessary to provide adequate capacitance and ripple current handling.

### Rev. 0

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## REVISION HISTORY

07/11/2007—Revision 0: Initial Version

## GENERAL DESCRIPTION

### ADP1611

The ADP1611 is a step-up dc-to-dc switching converter with an integrated 1.2 A, 0.23  $\Omega$  power switch capable of providing an output voltage as high as 20 V. With a package height of less than 1.1 mm, the ADP1611 is optimal for space-constrained applications such as portable devices or thin film transistor (TFT) liquid crystal displays (LCDs).

The ADP1611 operates in pulse-width modulation (PWM) current mode with up to 90% efficiency. Adjustable soft start prevents inrush currents at startup. The pin-selectable switching frequency and PWM current-mode architecture allow excellent transient response, easy noise filtering, and the use of small, cost-saving external inductors and capacitors.

The ADP1611 is offered in the Pb-free 8-lead MSOP and operates over the temperature range of  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$ .

### ADP1864

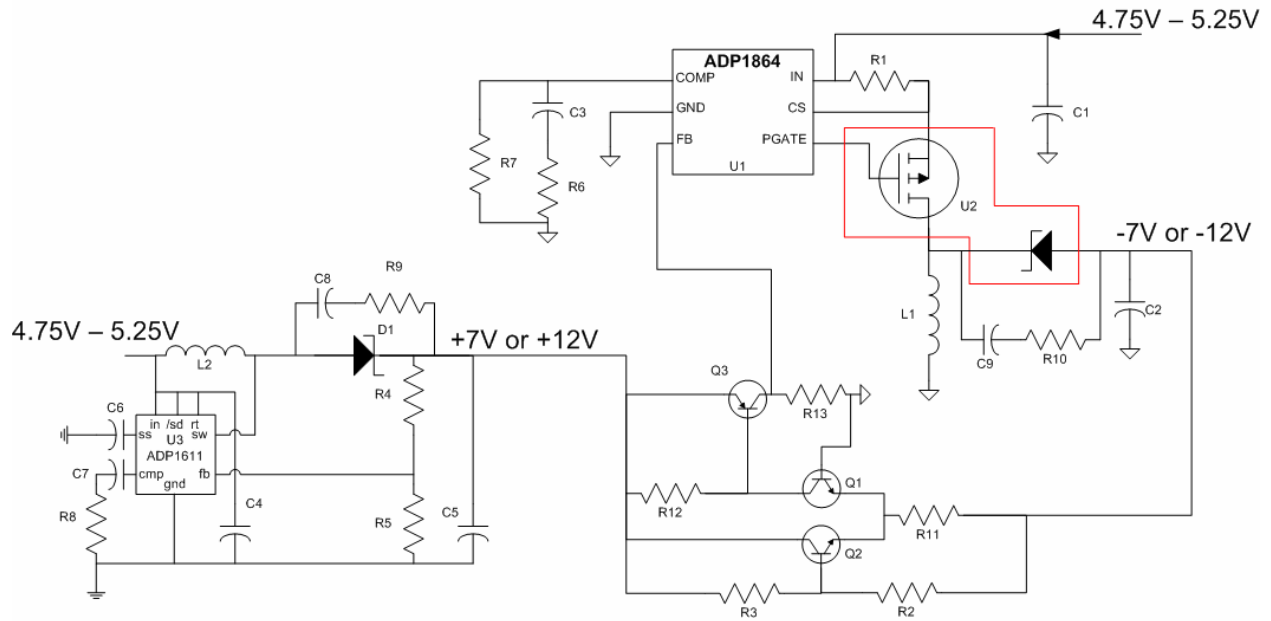
The ADP1864 is a compact, inexpensive, constant-frequency current-mode DC-to-DC controller. The ADP1864 drives a P-channel MOSFET that regulates an output voltage as low as 0.8 V with  $\pm 2\%$  accuracy, for up to 10 A load currents, from input voltages as high as 14 V.

The ADP1864 provides system flexibility by allowing accurate setting of the current limit with an external resistor, while the output voltage is easily adjustable using two external resistors. The ADP1864 includes an internal soft start to allow quick power-up while preventing input inrush current. Additional safety features include short-circuit protection, output over-voltage protection, and input under voltage protection. Current-mode control provides fast and stable load transient performance, while the 580 kHz operating frequency allows a small inductor to be used in the system. To further the life of a battery source, the controller turns on the external P-channel MOSFET 100% of the duty cycle in dropout.

The ADP1864 operates over the  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$  temperature range and is available in a small, low profile, 6-lead TSOT package.

**SCHEMATIC**

Figure 1. Generating Negative and Positive Rails with Tracking using ADP1611 and ADP1864



## BILL OF MATERIALS

Designator	Part Number	Manufacturer	Value	Package	Comment
U1	ADP1864	Analog Devices		TSOT-6	Current Mode Controller
U2	sia811dj	Vishay		PowerPAK SC-70-6 Dual	P-Channel and Schotkey Diode
R1	RL0510S-R050-F	Susumu	.05ohms	402	1% Current Sense Resistor
R2	Generic 1%	Vishay	20k	402	Feedback Resistor
R3	Generic 1%	Vishay	20k	402	Feedback Resistor
R13	Generic 1%	Vishay	12k		Feedback Resistor
R12	Generic 1%	Vishay	287ohms	402	Feedback Resistor
R11a	Generic 1%	Vishay	4.6k	402	Feedback Resistor for -12V
R11b	Generic 1%	Vishay	2.6k	402	Feedback Resistor for -7V
R6	Generic 10%	Vishay	225k	402	Compensation Resistor
R7	Generic 10%	Vishay	510k	402	Compensation Resistor
R10			TBD		Snubber - May be unnecessary
C1	grm21br61c475k	Murata	4.7uF	805	Input Capacitor / X5R / 16V
C2	grm32er61c476k	Murata	47uF	1210	Output Capacitor / X5R / 16V
C3	Generic 10%	Vishay	33pF	402	X7R or COG / 50V
C9			TBD		Compensation Capacitor
L1	LPS5015-472ML	Coilcraft	4.7uH	5mm x 5mm x 1.5mm	Snubber - May be unnecessary
U3	ADP1611	Analog Devices		MSOP-8	Current Mode Controller + Power Switch
L2	LPS5015-472ML	Coilcraft	4.7uH	5mm x 5mm x 1.5mm	Power Inductor
D1	PD3S130L	Diodes Inc.		PowerDI™323	Power Diode
C4	grm21br61c475k	Murata	4.7uF	805	Input Capacitor / X5R / 16V
C5	grm21br61c475k	Murata	4.7uF	805	Output Capacitor / X5R / 16V
C6	Generic 10%	Vishay	22nF	402	Soft Start Capacitor / X7R or COG / 50V
C7	Generic 10%	Vishay	8.2nF	402	Compensation Capacitor
C8			TBD	402	Snubber - May be unnecessary
R9			TBD	402	Snubber - May be unnecessary
R4a	Generic 1%	Vishay	87.6k	402	Feedback Resistor for +12V
R4b	Generic 1%	Vishay	46.9k	402	Feedback Resistor for +7V
R5	Generic 10%	Vishay	10k	402	Feedback Resistor
R8	Generic 10%	Vishay	7.5k	402	Compensation Resistor
Q1, Q2	2n2222	Any			NPN small signal transistor
Q3	2n2904	Any			PNP small signal transistor

## NOTES

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