ANALOG DEVICES

50 mA Iout SEPIC-Cuk

Reference Design

PRD1175

FEATURES

50 mA Iout
Low Output Ripple (40 mV)
Low Cost
Small Size
High Efficiency

DESCRIPTION

This design is a so called cascoded coupled SEPIC-Cuk converter producing clean ±9 V rails from a 12V input. A SEPIC-Cuk is simply a SEPIC and a Cuk converter designed to share the regulator and power switch. Using coupled inductors for each converter increases the efficiency and improves the frequency response. The "cascode" in the name refers to Q1 which is a FET in series with the internal FET of the ADP1613. This enables us to use this 20 V max rated chip at a higher switch node voltage. This is required because in a SEPIC or a Cuk converter, the switch node goes to Vin + Vout.

Table 1. User Target Specs, Vout

Spec	*Vinmin*	*Vinmax*	***Units***
Vout1	+9V	+9V	Volts
Vout2	-9V	-9V	Volts
Iout	0.050	0.050	Amps
Tamb	55	55	degC
Vinmin	11.6	11.6	Volts
Vinmax	12.4	12.4	Volts
Vout Ripple Max	0.0134	0.0128	Volts

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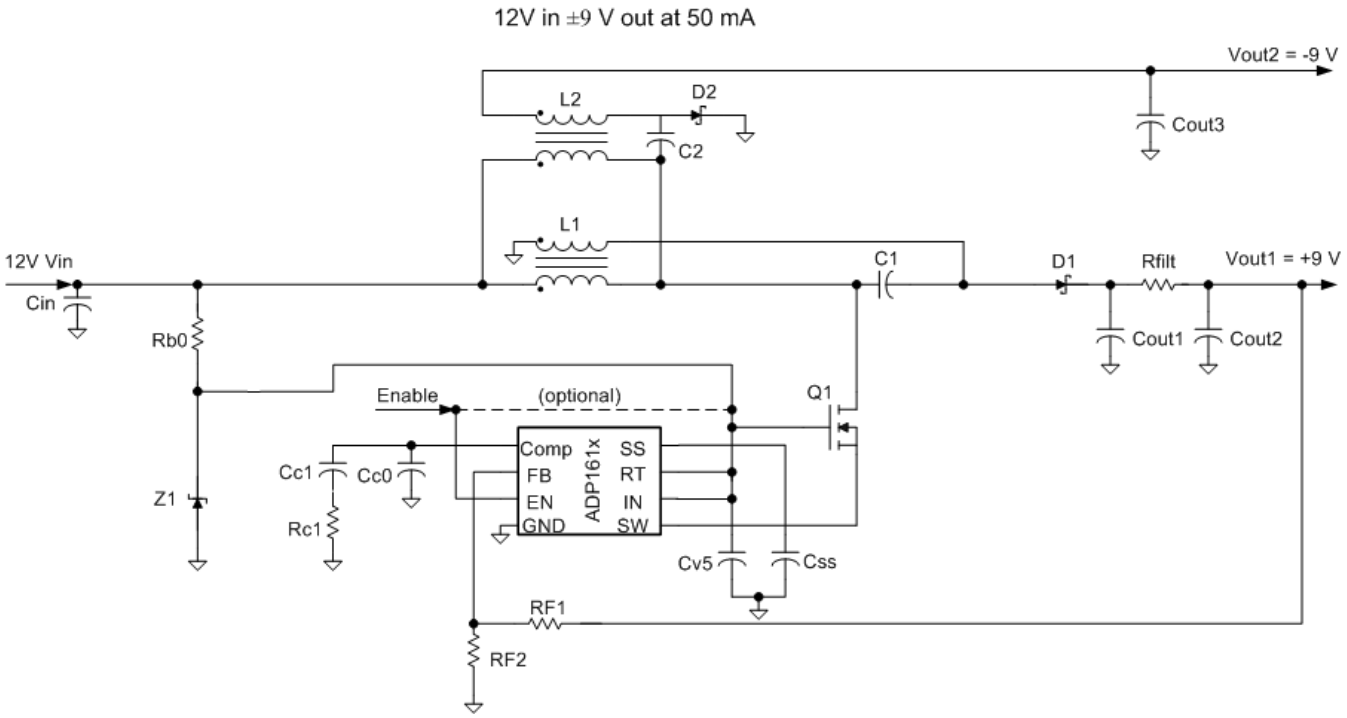
REVISION HISTORY

11/02/2009—Revision 1: Initial Version

SCHEMATIC

Figure 1. Schematic



BILL OF MATERIALS

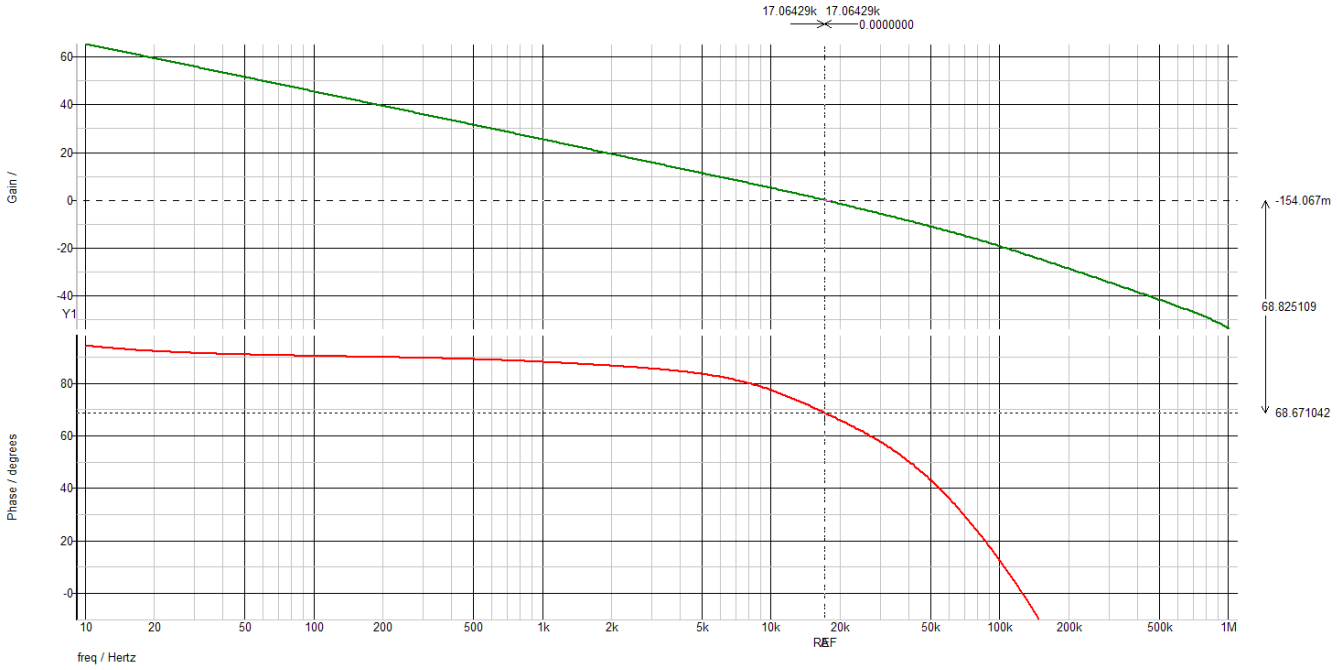
Table 2. Bill of Materials

Des	*MFG*	*Component Specs*	*Part Number*	*Pkg*	*Qty*	*Area (mm²)*	*Height (mm)*	*Cost**
U1	ADI	Integrated Switching Regulator	ADP1613ARMZ-R7	MSOP-8	1	14.7	1.1	0.7
L1	Coilcraft	68uH, 3190mΩ, 0.33Apk	LPD4012-683	4mm x 4mm x 1.2mm	1	16.1	1.2	0.6
L2	Coilcraft	68uH, 3190mΩ, 0.33Apk	LPD4012-683	4mm x 4mm x 1.2mm	1	16.1	1.2	0.6
Q1	ON	35 mΩ, 2.6 Vth,30 V	NTGS4141NG	SOT23-6	1	9.3	1.1	0.16
D1	DiodesInc	0.35 A, 40 V	SD103AW	SOD123	1	6.6	1.4	0.0492
D2	DiodesInc	0.35 A, 40 V	SD103AW	SOD123	1	6.6	1.4	0.0492
Cout1	Murata	1uF, 16V, 4mΩ	GRM21BR71C105K	0805	1	2.5	1.2	0.013

Cout 2	Murata	1uF, 16V, 4mΩ	GRM21BR71C10 5K	0805	1	2.5	1.2	0.013
Cout 3	Murata	1uF, 16V, 4mΩ	GRM21BR71C10 5K	0805	1	2.5	1.2	0.013
Cin	Murata	1uF, 16V, 4mΩ	GRM21BR71C10 5K	0805	1	2.5	1.2	0.013
C1	Murata	1uF, 16V, 4mΩ	GRM21BR71C10 5K	0805	1	2.5	1.2	0.013
C2	Murata	1uF, 16V, 4mΩ	GRM21BR71C10 5K	0805	1	2.5	1.2	0.013
Rc1	Vishay	3.09 kOhms	5% tolerance	0805	1	2.5	0.5	0.005
Cc0	Vishay	10 pF	10% tolerance	0805	1	2.5	0.5	0.005
Cc1	Vishay	22 nF	10% tolerance	0805	1	2.5	0.5	0.005
Rf1	Vishay	102 kohm	1% tolerance	0805	1	2.5	0.5	0.005
Rf2	Vishay	16.2 kohm	1% tolerance	0805	1	2.5	0.5	0.005
Cv5	Murata	1uF,10V,X5R	GRM188R61A10 5K	0603	1	1.3	0.6	0.01
Css	Vishay	10 nF	10% tolerance	0805	1	2.5	0.5	0.005
Rb0	Vishay	1.58 kOhms	5% tolerance	0805	1	2.5	0.5	0.005
Z1	Diodes Inc.	5.1V, 500 mW Zener	DDZ9689	SOD-123	1	3.40	1.35	0.026
Rfilt	Susumu	0.3 Ohms	RL1220S-0R30-G	0805	1	2.5	0.5	0.036
				Totals	**20**	**109.2**	**1.4**	**2.34**

SIMULATION RESULTS

Figure 2. Bode Plot



Legend: / Gain Vout1 (+9 V) / Phase Margin Vout1 (+9V) at Iout = 50 mA for both channels, Vin = 11.4 V

NOTES