3.3 Vin, 200 Vout at 2 mA

Reference Design **PRD1181**

FEATURES

Low cost
Small Size
Simulation results demonstrating stability
Reasonable Efficiency

DESCRIPTION

This design uses a boost converter with quadrupler charge pump. It utilizes an innovative 4 stage charge pump to increase the output voltage of the boost stage by a factor of 4. This enables the use of many parts not rated to the full output voltage. In addition, a cascoded FET (Q1) is used to increase the voltage capability of the ADP1613. This enable us to use a very inexpensive integrated FET boost controller.

Table 1. Basic Specifications

Spec	*Value*	***Units***
Vout	200V	Volts
Iout	0.002	Amps
Tamb	55	degC
Vinmin	3.3	Volts
Vinmax	3.3	Volts

Table 2. Simulation results

Spec	*Value*	***Units***
Vout ripple max	0.043	Volts
Ioutstep	0.001	Apk
Vout step error	0.279	Volts

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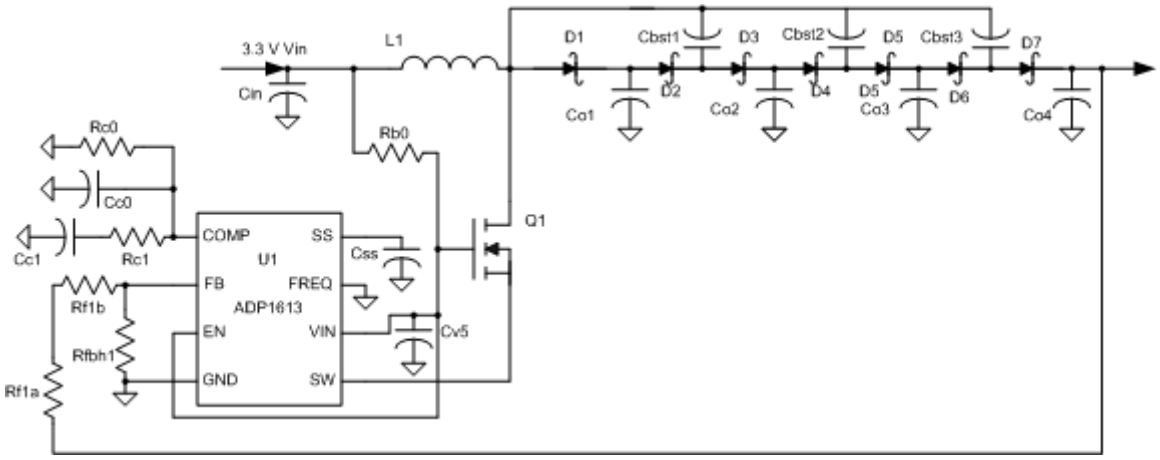
REVISION HISTORY

11/09/2009—Revision 1: Initial Version
11/20/2009—Revsion2: Corrected Schematic

SCHEMATIC

Figure 1. Boost Converter with Quadrupler Charge Pump Topology



BILL OF MATERIALS

Table 3. Bill of Materials

Des	MFG	Part Number	Component Specs	Pkg	Qty	Area (mm^2)	Cost*
U1	ADI	ADP1613ARMZ-R7	Integrated Switching Regulator	MSOP-8	1	14.70	$0.700
L1	Coilcraft	ME3220-332	3.3uH, 138mOhms, 1.7 Apk	3mm x 3mm x 2mm	1	8.00	$0.230
D1	Diodes Inc.	1N4148W	150mA ,100V	SOD123	1	6.5	$0.060
D2	Diodes Inc.	1N4148W	150mA ,100V	SOD123	1	6.5	$0.060
D3	Diodes Inc.	1N4148W	150mA ,100V	SOD123	1	6.5	$0.060
D4	Diodes Inc.	1N4148W	150mA ,100V	SOD123	1	6.5	$0.060
D5	Diodes Inc.	1N4148W	150mA ,100V	SOD123	1	6.5	$0.060
D6	Diodes Inc.	1N4148W	150mA ,100V	SOD123	1	6.5	$0.060
D7	Diodes Inc.	1N4148W	150mA ,100V	SOD123	1	6.5	$0.060
Co1	Murata	GRM188R72A104K	0.1uF, 100V, 0603, X7R	0603	1	1.28	$0.031
Co2	TDK	C3216X7R2E104K	0.1uF, 250V, 1206, X7R	1206	1	5.1	$0.063
Co3	TDK	C3216X7R2E104K	0.1uF, 250V, 1206, X7R	1206	1	5.1	$0.063
Co4	TDK	C3216X7R2E104K	0.1uF, 250V, 1206, X7R	1206	1	5.1	$0.063
Cbst1	Murata	GRM188R72A104K	0.1uF, 100V, 0603, X7R	0603	1	1.28	$0.031
Cbst2	Murata	GRM188R72A104K	0.1uF, 100V, 0603, X7R	0603	1	1.28	$0.031
Cbst3	Murata	GRM188R72A104K	0.1uF, 100V, 0603, X7R	0603	1	1.28	$0.031

Des	MFG	Part Number	Component Specs	Pkg	Qty	Area (mm^2)	Cost*
Cin	Taiyo Yuden	LMK212 B7105MG-T	1uF, 10V, 805, X7R	0805	1	2.50	$0.012
Q1	On Semi	NTF3055L108	120 mΩ, 2 Vth,60 V	SOT223	1	50.0	0.187
Cv5	Murata	GRM188R61A105K	1uF,10V,X5R	0603	1	1.30	$0.010
Css	Vishay	10% tolerance	100 nF	0402	1	0.70	$0.005
Rc1	Vishay	5% tolerance	200 kohm	0402	1	0.70	$0.005
Cc1	Vishay	10% tolerance	1.2 nF	0402	1	0.70	$0.005
Cc0	Vishay	10% tolerance	10 pF	0402	1	0.70	$0.005
Rf1a	Vishay	1% tolerance	402 kohm	0805	1	0.70	$0.005
Rf1b	Vishay	1% tolerance	422 kohm	0805	1	0.70	$0.005
Rf2	Vishay	1% tolerance	5.11 kohm	0402	1	0.70	$0.005
Rb0	Vishay	5% tolerance	1 Ohm	0402	1	0.70	$0.005
				Totals	27	148.0	1.91

GRAPHS

Figure 2. Bode Plot

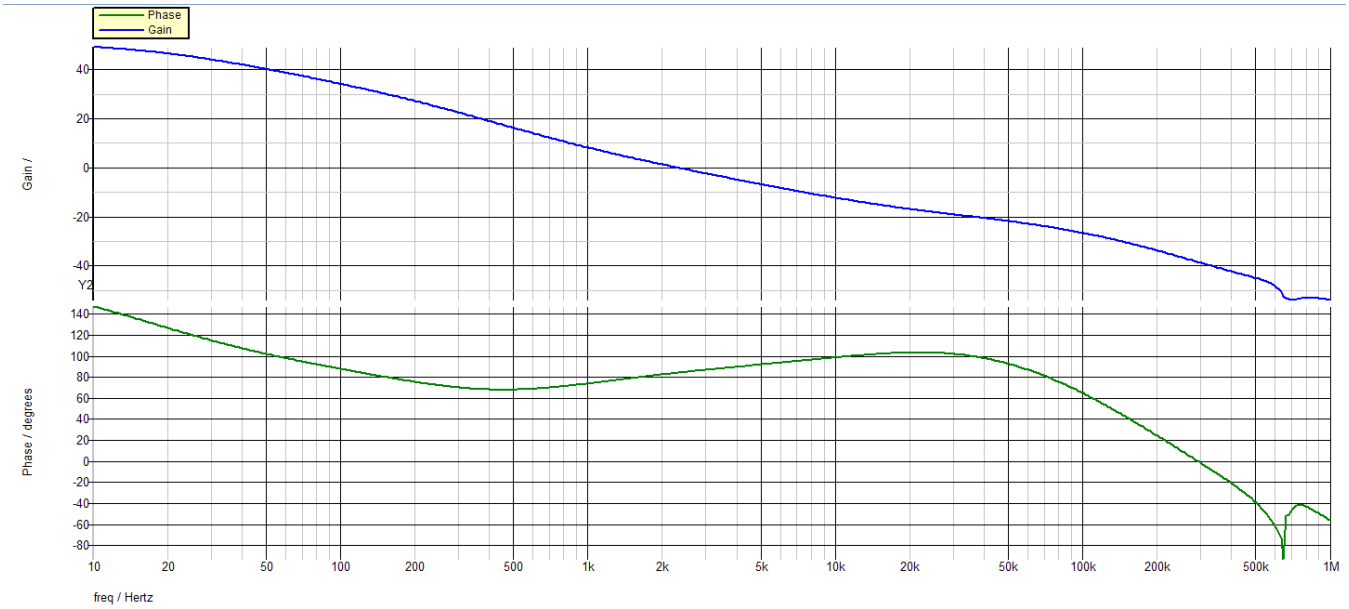
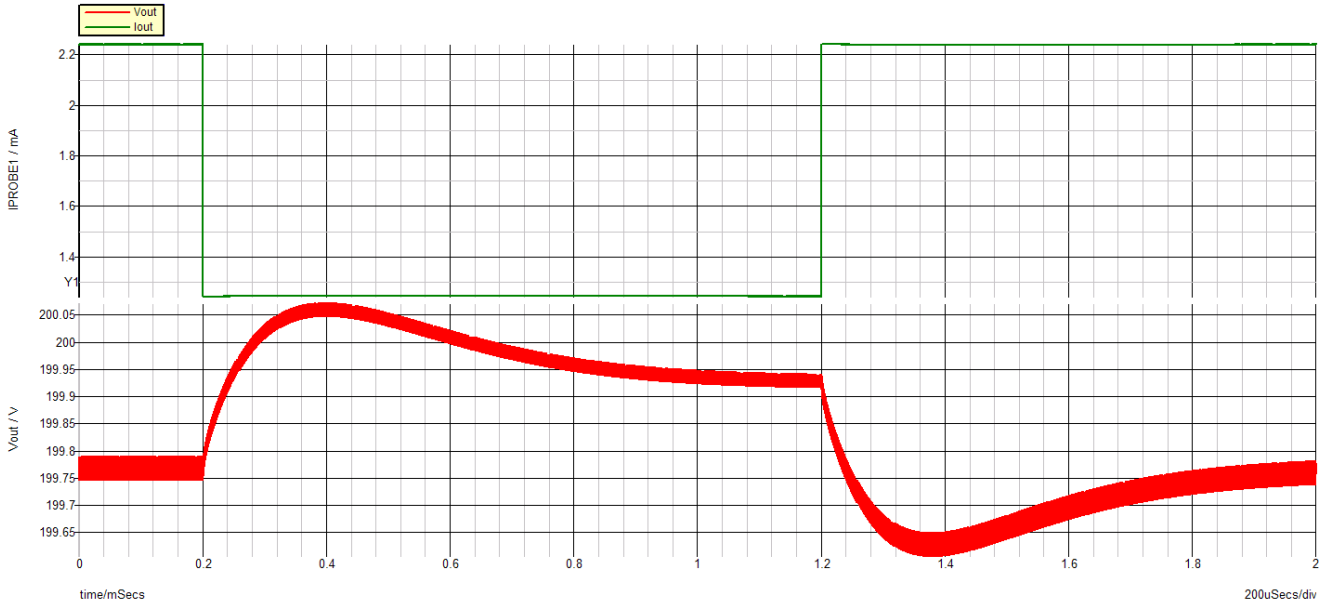


Figure 3. Vout Transient Response



NOTES