

Title	Eng Report – DC-DC CONVERTER 5V, 2A, 10W prototype board with TOP414G
Recipients	
Customer	
Author	Gwen Zhao
Date	18 May 99

Abstract

This document describes the specification and performance for a prototype of 10W DC-DC converter using TOP414G.

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Introduction

This document describes the specification and performance for the prototype of a 10W DC-DC Converter.

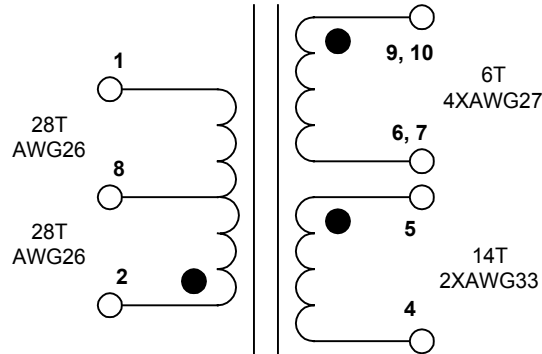
2.0 Power Supply Requirements Specification

Connect or pin	Description	Symbol	Min	Max	Unit	Comment
VTA, Neutral	Input					
	Input Voltage	Vdc	36	72	Vdc	
5 Vout	Output					
	Output Voltage	Vout	4.75	5.25	V	5V+-5%
	Output Ripple Voltage	Vout_ripple		50	mVp-p	@ full load (20MHz BW)
	Output Current	Iout	0	2	A	
	Total Power Output					
	Continuous Output Power	Pout_total		10	W	
	Power Supply Efficiency	η	78		%	@ full load & 36Vdc
	Load Transient					See typical waveforms.



4.0 Transformer Drawing

SCHEMATICS:



ELLECTRICAL SPECIFICATIONS:

Primary Inductance	All windings open	614 $\mu\text{H} \pm 10\%$
Resonant Frequency	All windings open	1.8 MHz (Min.)
Primary leakage inductance	Pins 6-10 shorted	< 8 μH

Note: Primary inductance should be measured between Pins 1 and 2 at 120KHz.

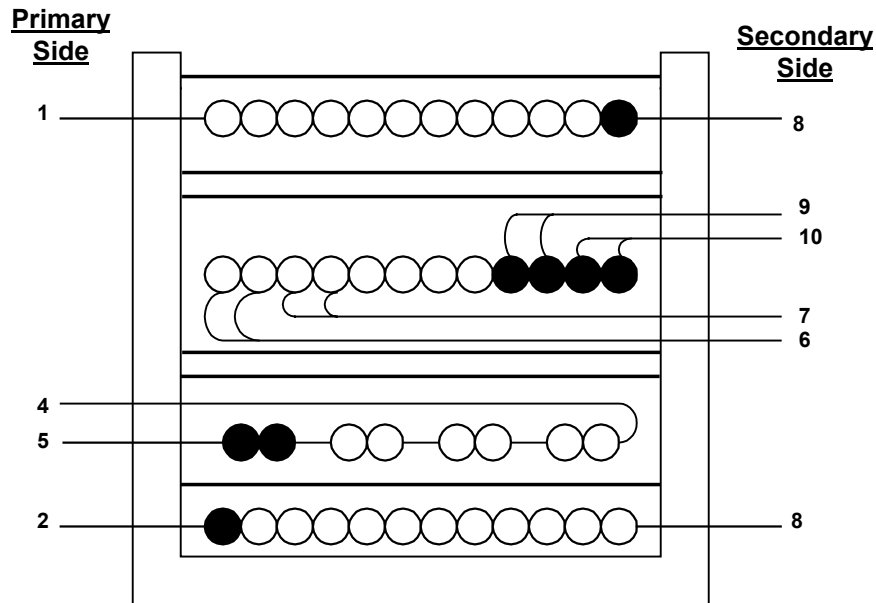
MATERIALS:

Item	Description
[1]	Core: FEET-20C
[2]	Bobbin: B-052
[3]	Magnet Wire: #26 AWG Heavy Nyleze
[4]	Magnet Wire: #25 AWG Heavy Nyleze
[5]	Magnet Wire: #33 AWG Heavy Nyleze
[6]	Tape: 3M 1298 Polyester Film (white) 13.6mm wide by 2.2 mils thick
[7]	Vanish

Design Notes:

Power Integrations Device	TOP414G
Frequency of Operation	120 KHz
Mode	Continuous
Peak Primary Current	0.70A
Reflected Voltage (Secondary to Primary)	50V
Maximum DC Input	72V
Minimum DC Input	36V



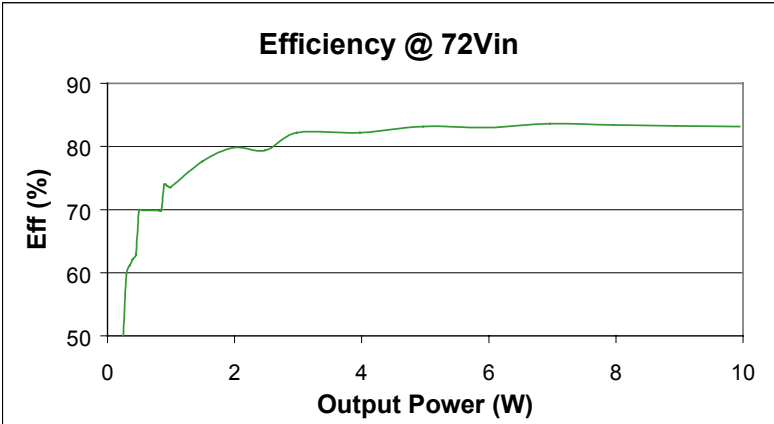
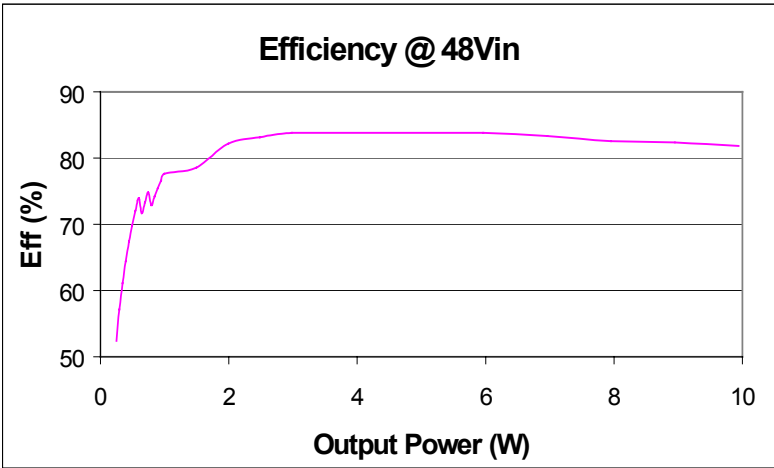
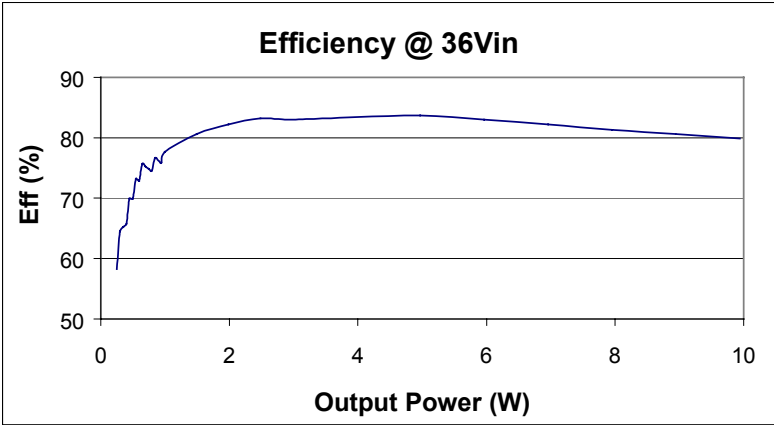
TRANSFORMER CONSTRUCTION:**WINDING INSTRUCTIONS:**

1 st Primary Layer	Start at Pin 2. Wind 28 turns of item [3] from right to left, in a single layer. End at Pin 8.
Basic Insulation	1 Layer of tape [6] for basic insulation
Bias Winding	Start at Pin 5. Wind bifilar 14 turns of item [5] from left to right. Wind uniformly in a single layer, across entire width of bobbin. Finish on Pin 4.
Basic Insulation	2 Layer of tape [6] for insulation
Secondary Winding	Start at Pins 9, 10. Wind 6 qual-filar turns of item [4] in parallel from right to left. Wind uniformly in a single layer, across entire width of bobbin. Finish on Pins 6, 7.
Basic Insulation	2 Layer of tape [6] for insulation
2 nd Primary Layer	Start at Pin 8. Wind 28 turns of item [3] from left to right, in a single layer. End at Pin 1.
Outer Insulation	1 Layer of tape [6] for insulation

Note: Transformer's height should not be higher than 10mm.

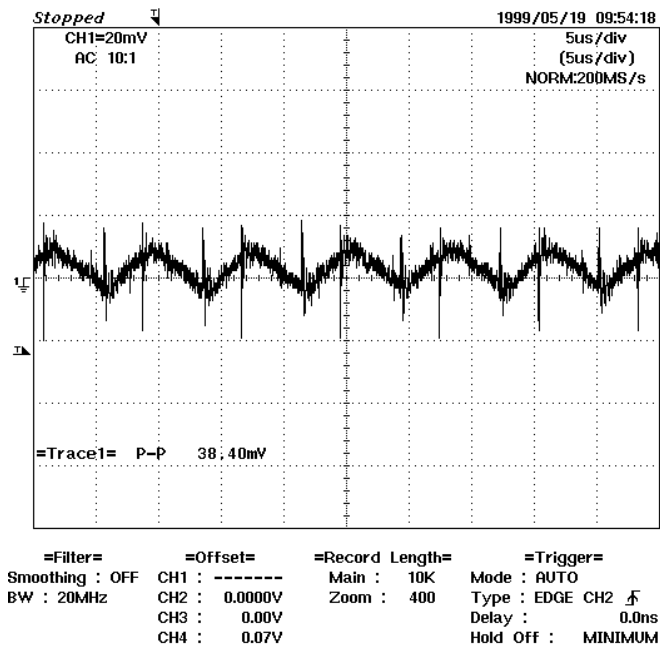
5.0 Test Results

5.01 Typical Power Efficiencies

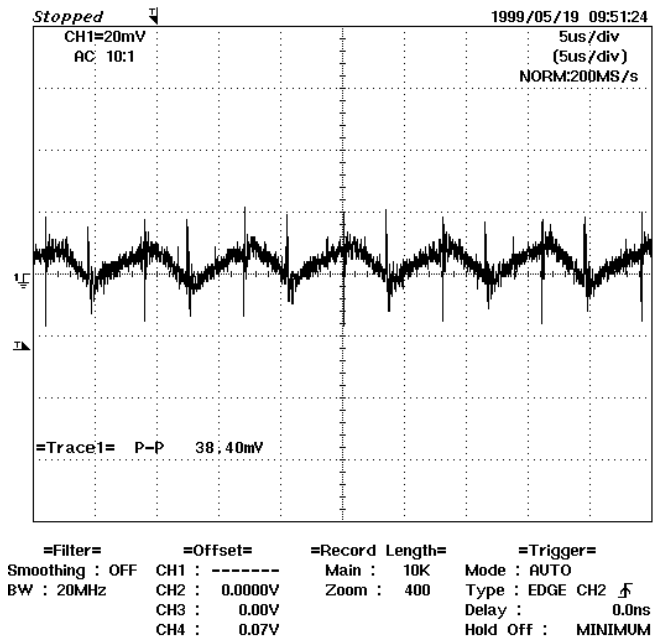


5.02 Typical Waveforms

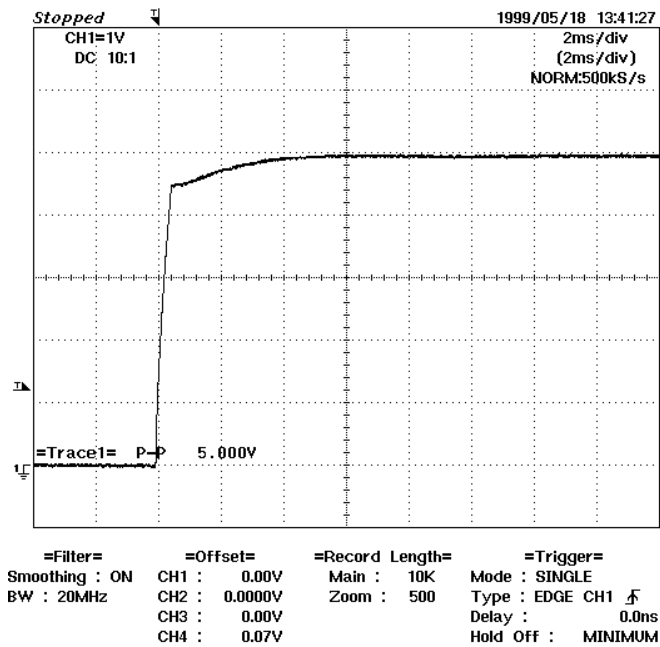
Output ripple @ 36Vin, 2A load



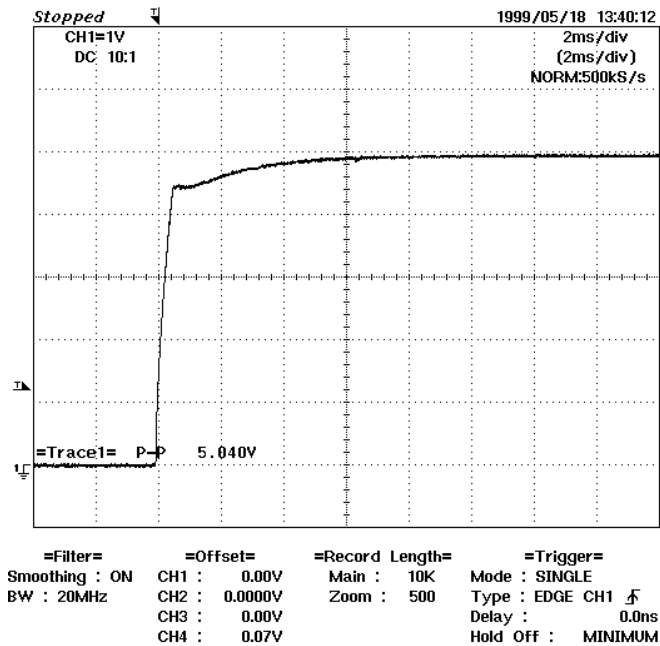
Output ripple @ 72Vin, 2A load



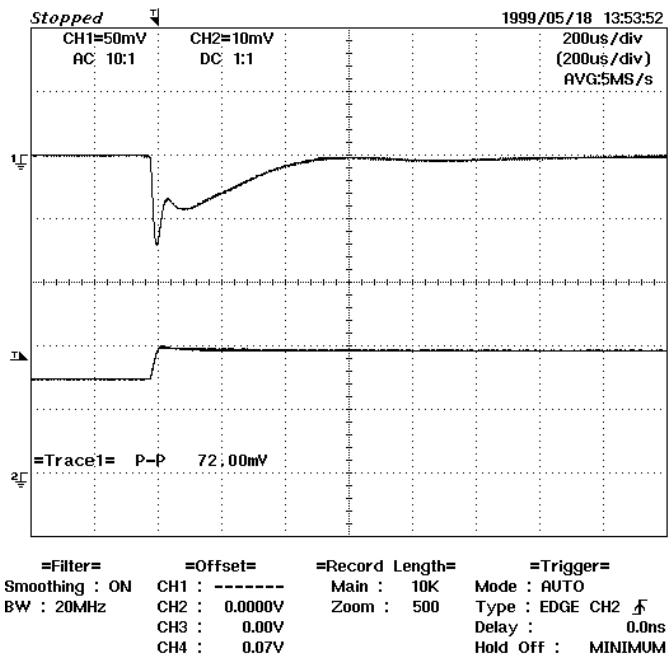
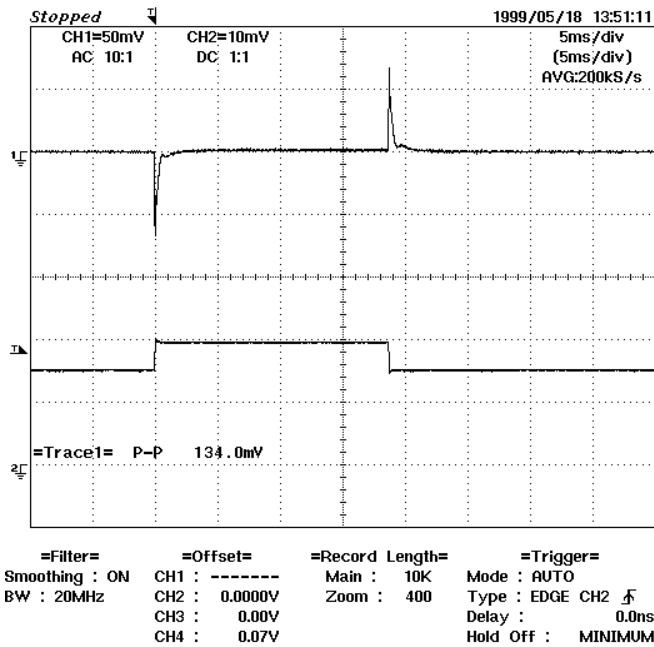
Turn-on transient @ 48Vin, no load



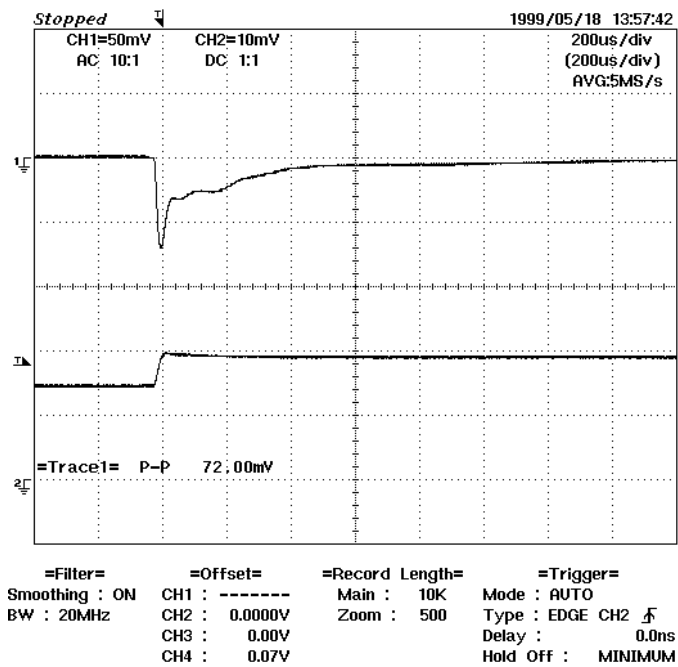
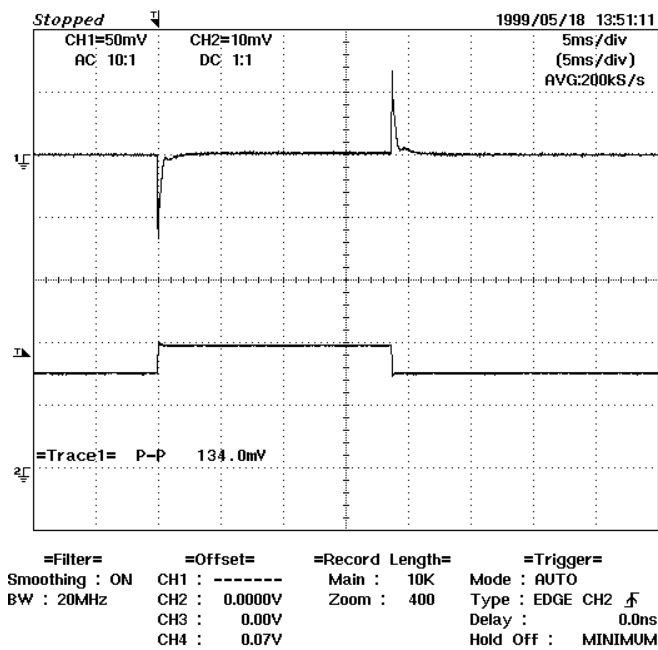
Turn-on transient @ 48Vin, 2A load



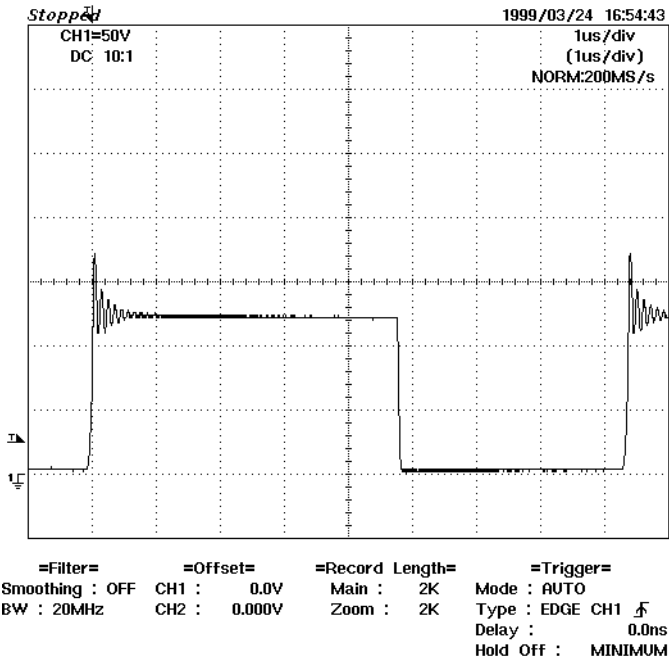
Transient load response @ 36Vin, 75% to 100% of load
(with Kikusui electronic load, slew rate 25mA/uS)



Transient load response @ 72Vin, 75% to 100% of load
(with Kikusui electronic load, slew rate 25mA/uS)



TOP414G Drain to Source voltage waveform @ 72Vin, 2A load



6.0 BILL OF MATERIALS

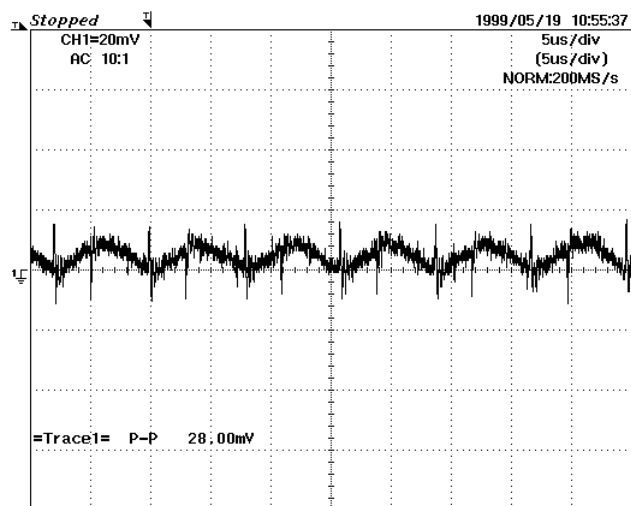
Item	Quantity	Reference	Part
1	1	C1	10uF 100V
2	1	C2	47uF 10V
3	3	C3	330uF 10V Tantalum Lo ESR
		C4	330uF 10V Tantalum Lo ESR
		C5	330uF 10V Tantalum Lo ESR
4	1	C6	330uF 6.3V
5	3	C7	100nF
		C8	100nF
		C11	100nF
6	1	C9	2.2uF
7	1	C10	1nF 500V
8	1	C12	22nF 50V
9	1	C13	1uF
10	1	D1	MURS120T3
11	1	D2	MBRD620CT
12	1	D3	1N4148
13	1	L1	3.3uH 5A
14	1	R1	15 Ohm
15	1	R2	150 Ohm
16	2	R3	10K 1%
		R4	10K 1%
17	1	R5	3.3K
18	1	R6	1K
19	1	T1	Custom
20	1	U1	TOP414G
21	1	U2	PC357N1T
22	1	U3	TL431ACD
23	1	VR1	ZGL41-100



7.0 Appendix

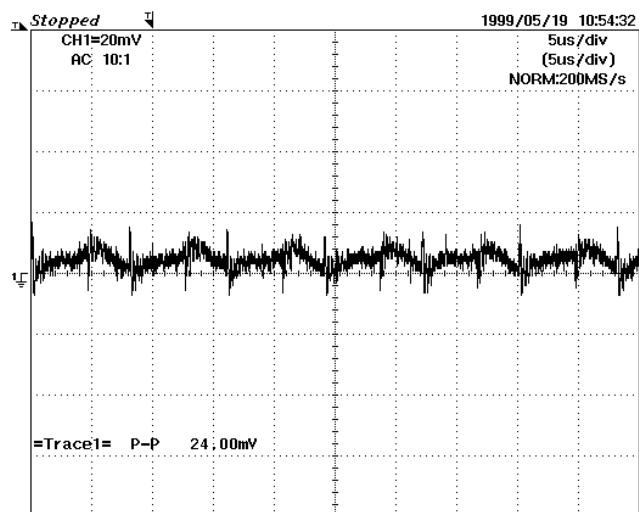
Output ripple was also measured with a 0.1uF ceramic cap and a 10uF Tantalum cap in parallel with the noise probe at full bandwidth.

Output ripple @ 36Vin, 2A load



=Filter= =Offset= =Record Length= =Trigger=
Smoothing : OFF CH1 : ----- Main : 10K Mode : AUTO
BW : FULL CH2 : 0.0000V Zoom : 400 Type : EDGE CH1 $\downarrow$
CH3 : 0.00V Delay : 0.0ns
CH4 : ----- Hold Off : MINIMUM

Output ripple @ 72Vin, 2A load



=Filter= =Offset= =Record Length= =Trigger=
Smoothing : OFF CH1 : ----- Main : 10K Mode : AUTO
BW : FULL CH2 : 0.0000V Zoom : 400 Type : EDGE CH1 $\downarrow$
CH3 : 0.00V Delay : 0.0ns
CH4 : ----- Hold Off : MINIMUM



Author	Date	Description
Gwen Zhao	3/18/99	First Draft

