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Efficiency & Losses:

Model t4 of first PMP10364 build (TDK VLB10090-B2 330nH)
tested Sept. 30 & Oct. 2, 2014
Cin is 4x22uF size 1210 with 470uF in series with 0.22 ohms
Inductor on top of TPS544C20 with R8 changed from 17.8k to 27.4k for 400 kHz target:
Tested without fan thru 20A and with fan (~200LFM) from 15A to full 30A load
12Vin, Vout set at 1.00V frequency set at 400kHz target Close in Vin (TP8-TP9) & Vout (TP7-TP11) senses FLIR EX320 thermal camera with emissivity set at 0.94
Meters at Fluke 87V cal. Due March 2015; except for output shunt 3.991454mOhms

Vin Volts DVM	Iin A DVM	Vout Volts DVM	Iout A	% Effi ciency	Losses in W	Actual freq. kHz	Fan? /max temp / thermal image#
12.041	0.0435	0.9994	0	N/A	0.524	337	N /29/IR665
12.040	0.4923	0.9995	5.072	85.5	0.858	386	N
12.030	0.9482	0.9997	10.075	88.3	1.335	391	N
12.059	1.4144	1.0000	15.011	88.0	2.045	394	N/46/ir669
12.060	1.4101	0.9994	15.012	88.2	2.003	394	Y/32/ir670
12.067	1.9111	1.0006	20.010	86.8	3.039	397	N/55/ir668
12.068	1.8996	0.9997	20.005	87.2	2.925	398	Y/37/ir667
12.022	2.434	1.0010	25.066	85.7	4.170	400	Y
12.063	2.969	1.0028	30.062	84.2	5.669	403	Y/48/ir666

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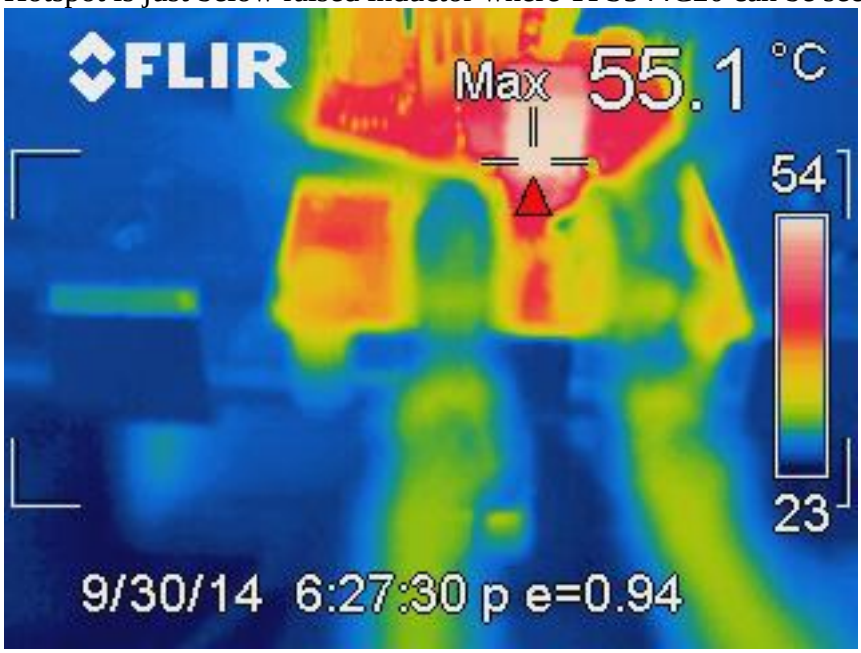
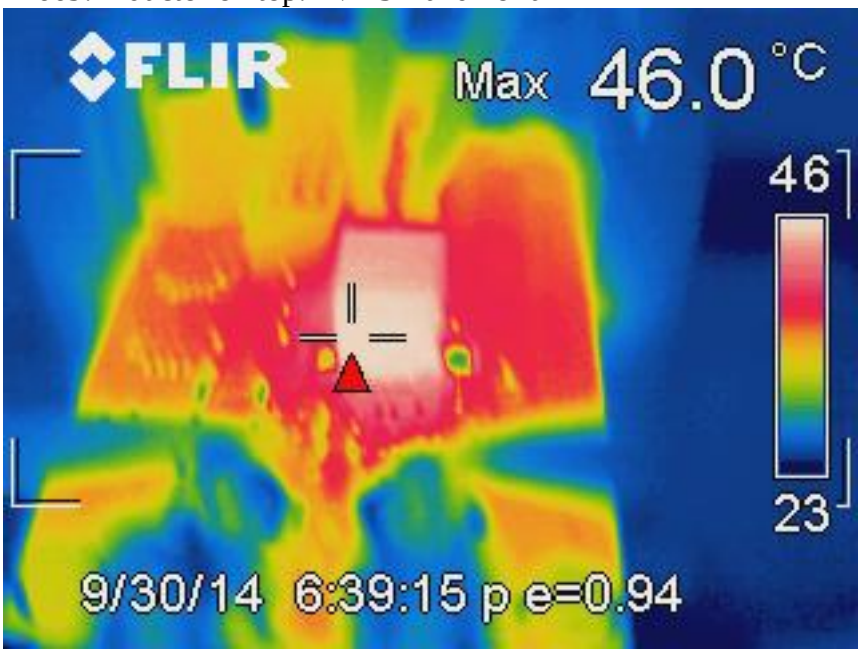
IR668 Inductor on top: 1V 20A and no fan
Hotspot is just below raised inductor where TPS544C20 can be seen



Q

IR669: Inductor on top: 1V 15A and no fan



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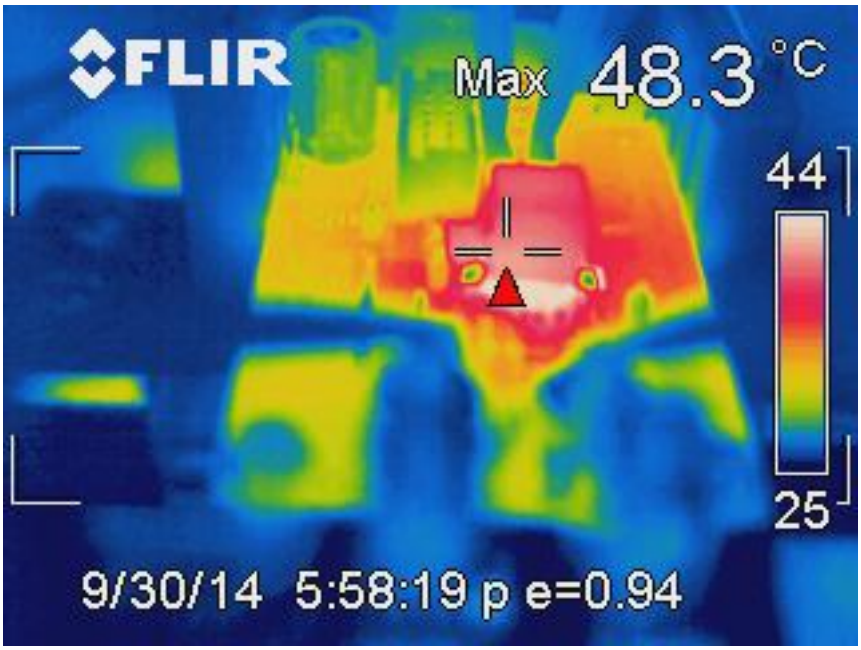
Now full 30A load with ~200 LFM fan:



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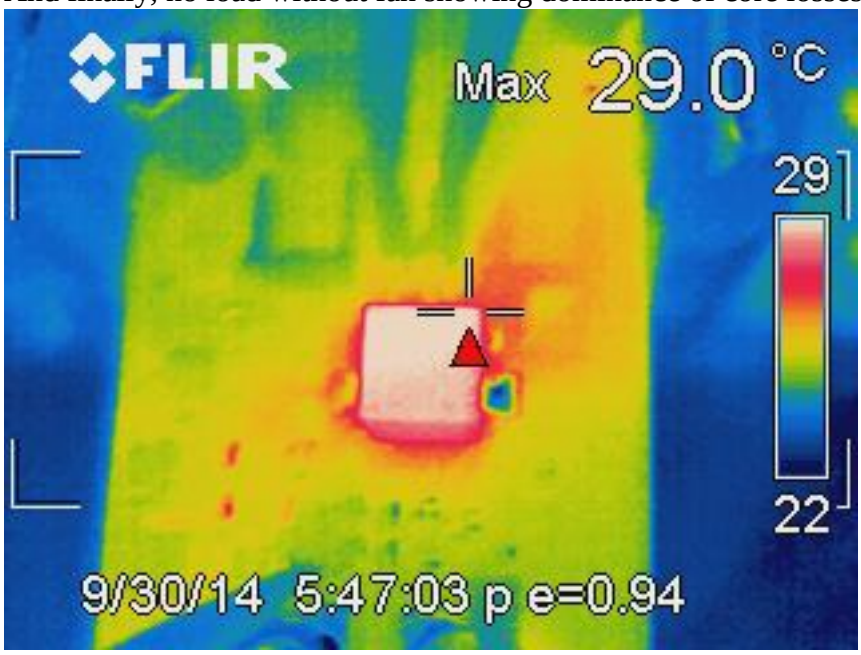
And finally, no load without fan showing dominance of core losses at no load:



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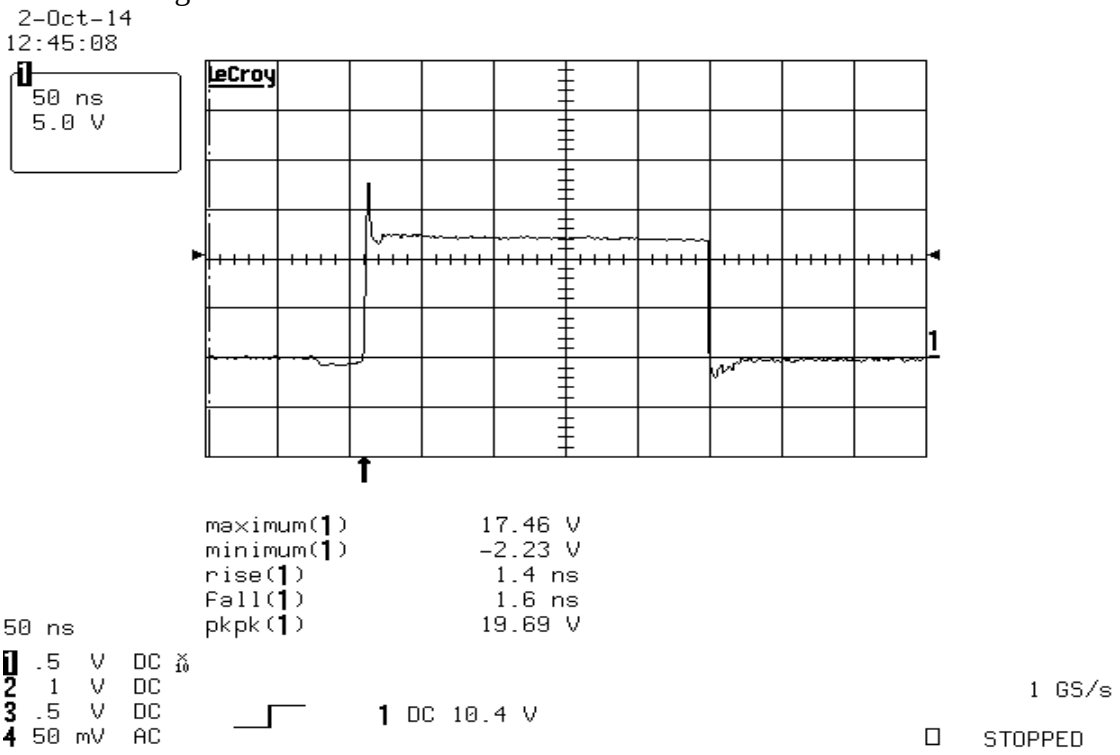
Main waveform at full 30A load: 12Vin 1vout 30A 404kHz operation:
scope calculated rise & fall times are for 10% to 90%. Hence full rise & fall times are about 25% higher.



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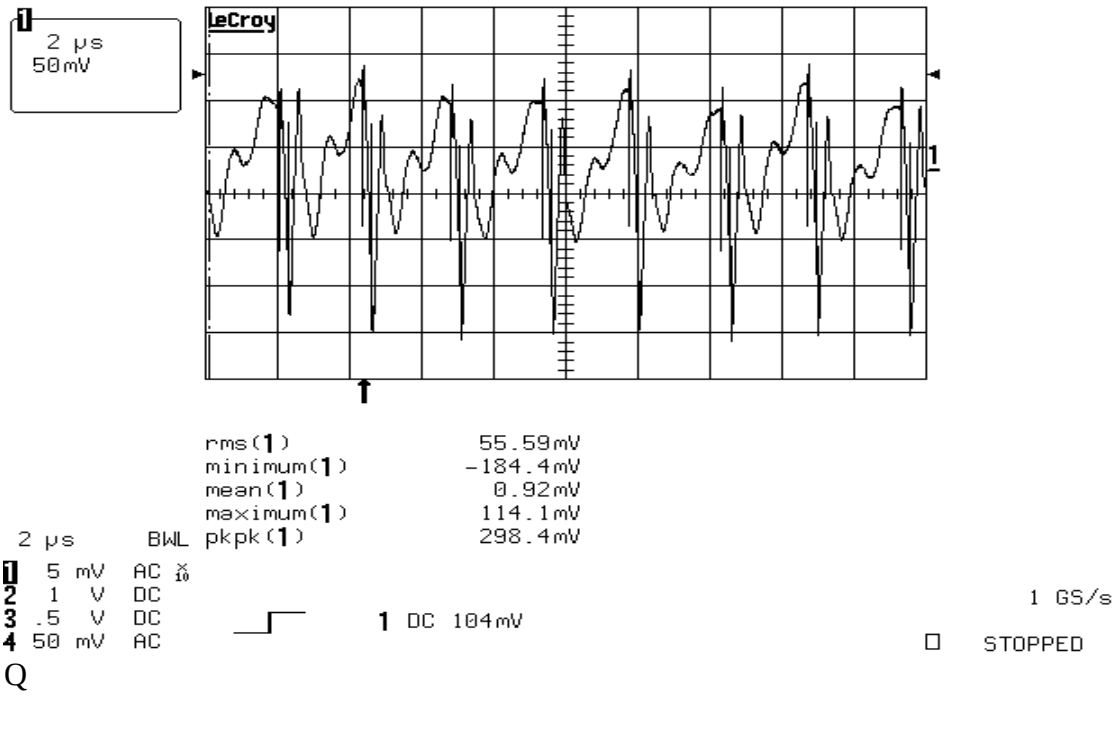
Input ripple at C14, same conditions as above full 30A load



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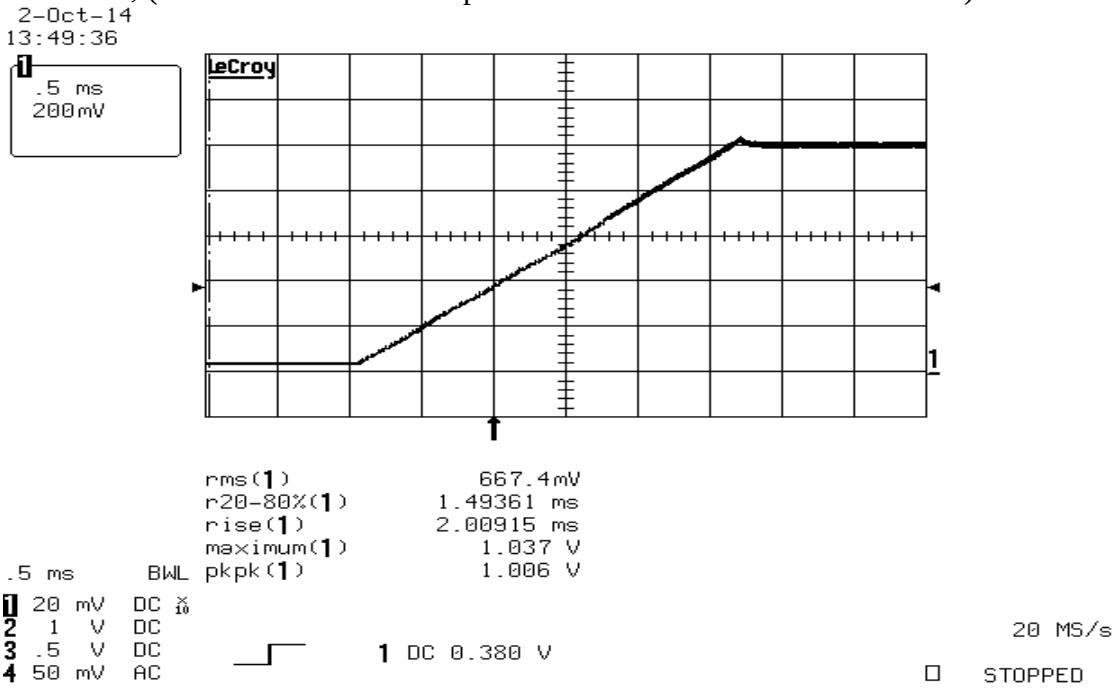
Start up at no load: with control pin going high: Rise time is ~2.55msec with ~30mV overshoot; (rise times shown on scope are for 10 to 90% and for 20 to 80%)



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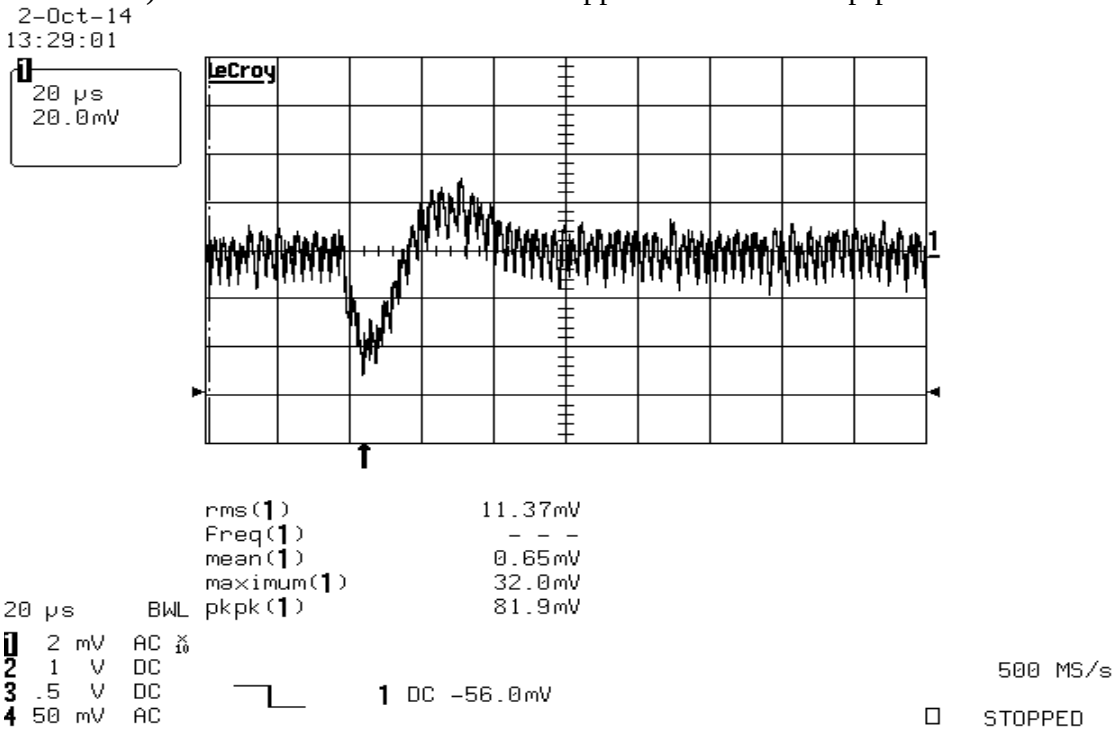
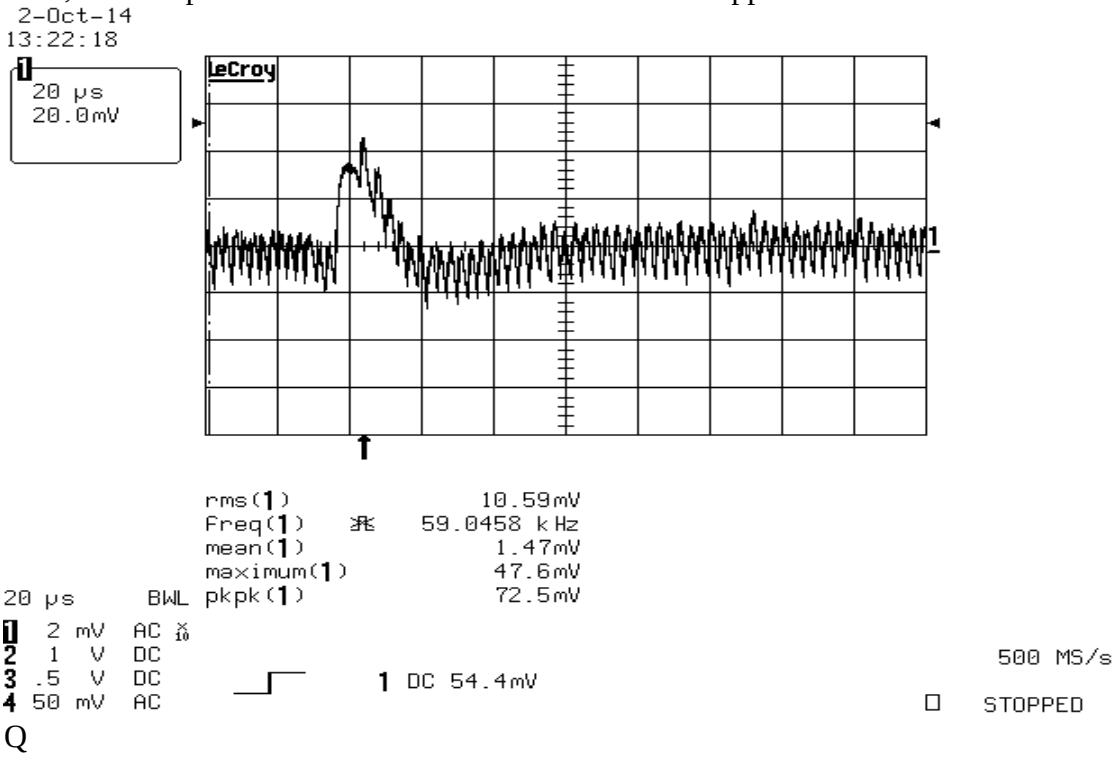
Output ripple at no load and near full load is seen from the step load and load dump responses below and is about 20mV p-p.

Step load response: 12Vin, 1.00Vout 11 to 26A in 4usec (0 to 15A in 4 usec had same undershoot). This also shows near full load ripple of about 20mV p-p.



Load dump response: 1.0Vout 15A to 0A (in 4usec) shown (26A to 11A very similar) Also, ~40mV peak overshoot. This also shows no load ripple.



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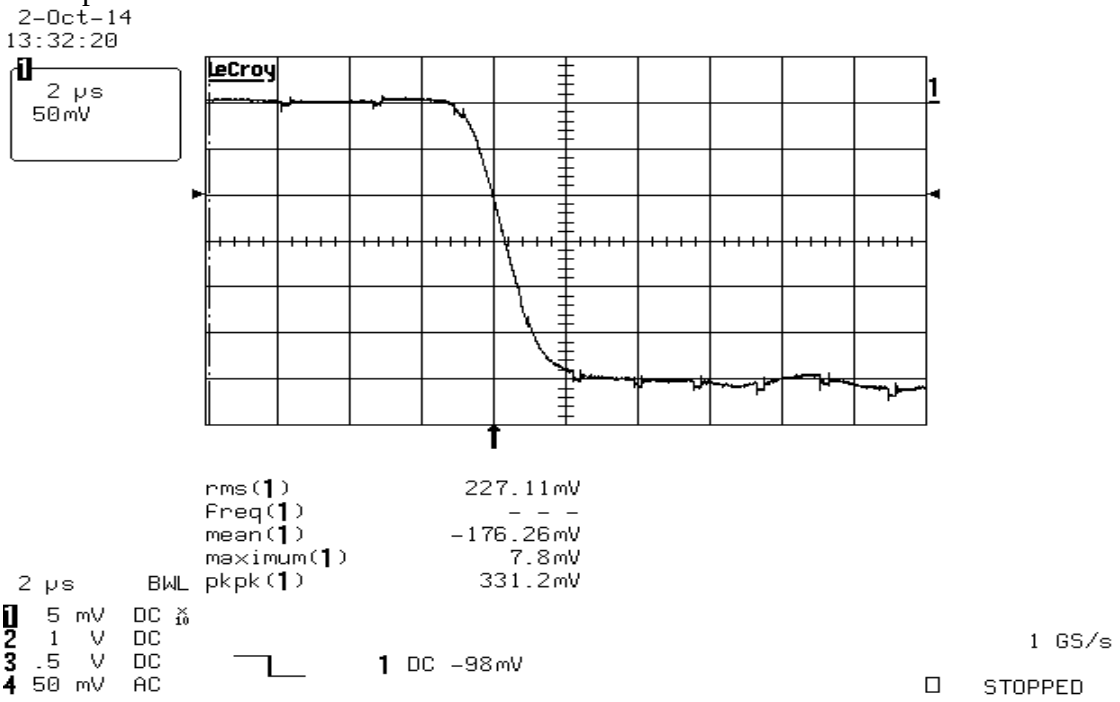
Details of step load across 20mOhms R18 tied to Vout: ~300mV (or 15A) in 3-4 usec. Scope ground on Vout side of R18, hence negative going voltage corresponds to current at 1A per 20mV.



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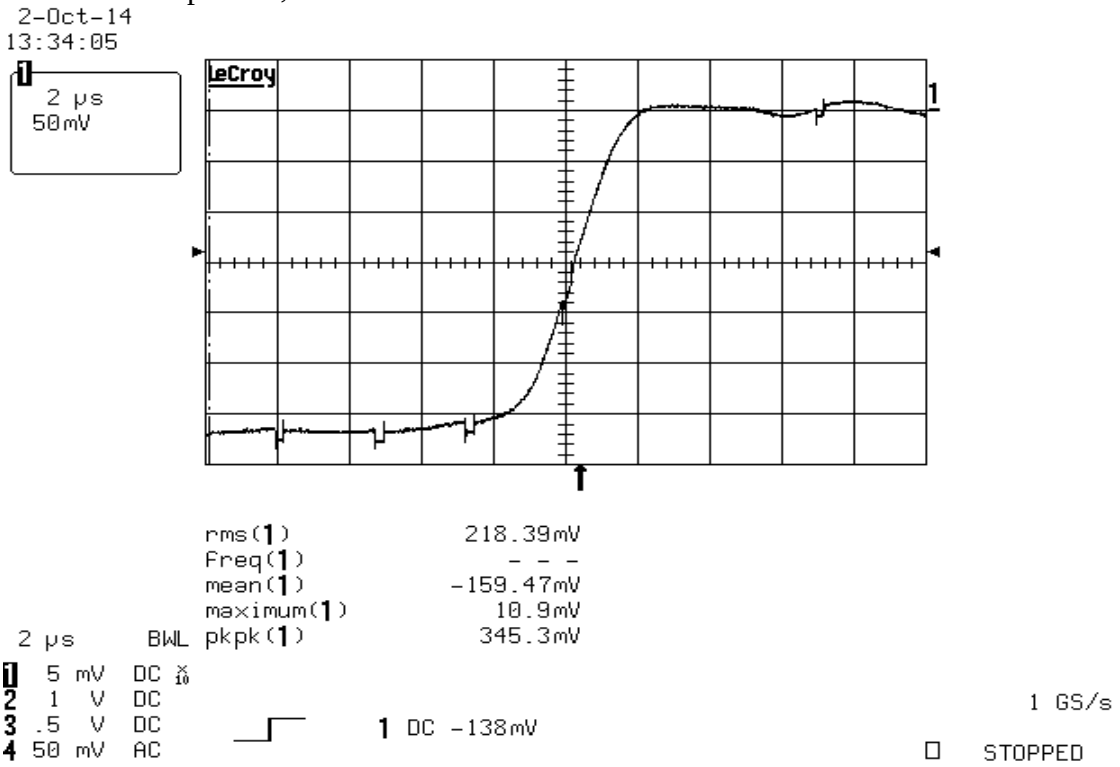
And load dump: Also, about 300mV or 15A in 4usec.



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