PMP11791RevB Test Results

![Texas Instruments logo]

Topology: inverting BuckBoost, built on buck PCB PMP2763 RevA
Device: TPS54040**A**

Unless otherwise mentioned, the measurements were done with 200mA output current and 16V input voltage.
Unless otherwise mentioned variable resistor load were used.

PMP11791RevB Test Results

1 Startup

The startup waveform is shown in the Figure 1.

Ch1=> input voltage 5V/div

Ch2=> output voltage 5V/div

10ms/div

20MHz bw
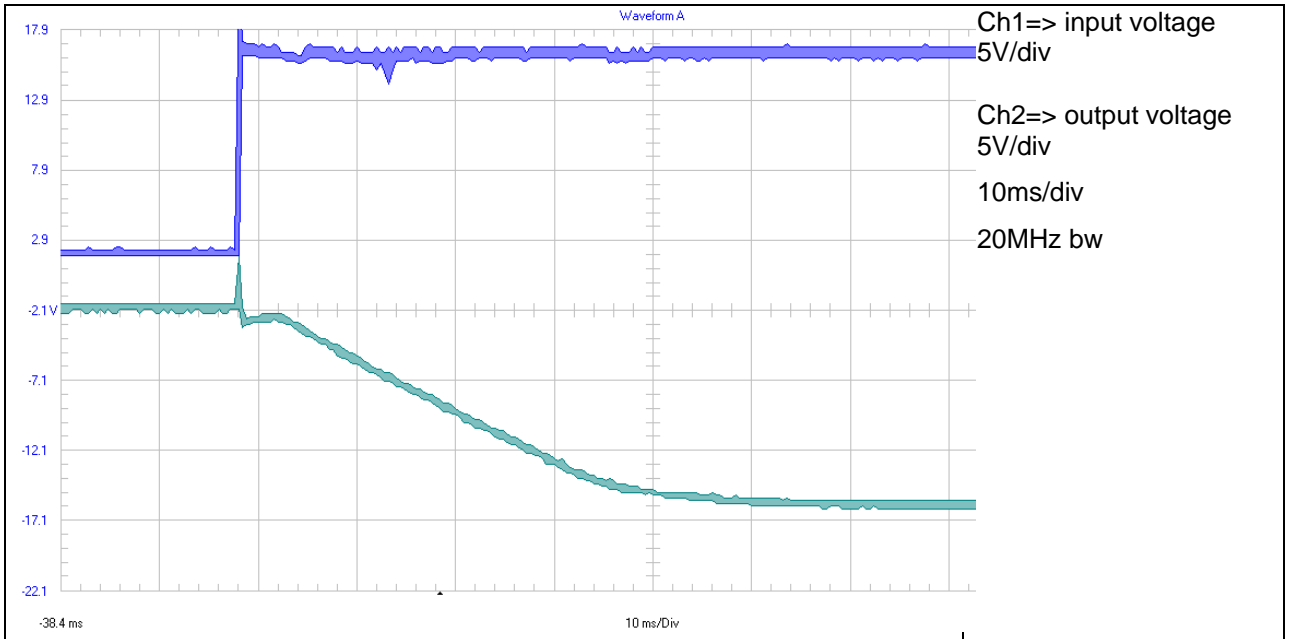
Figure 1

2 Shutdown

The shutdown waveform is shown in the Figure 2..
The power supply was disconnected.

Ch1=> input voltage 5V/div

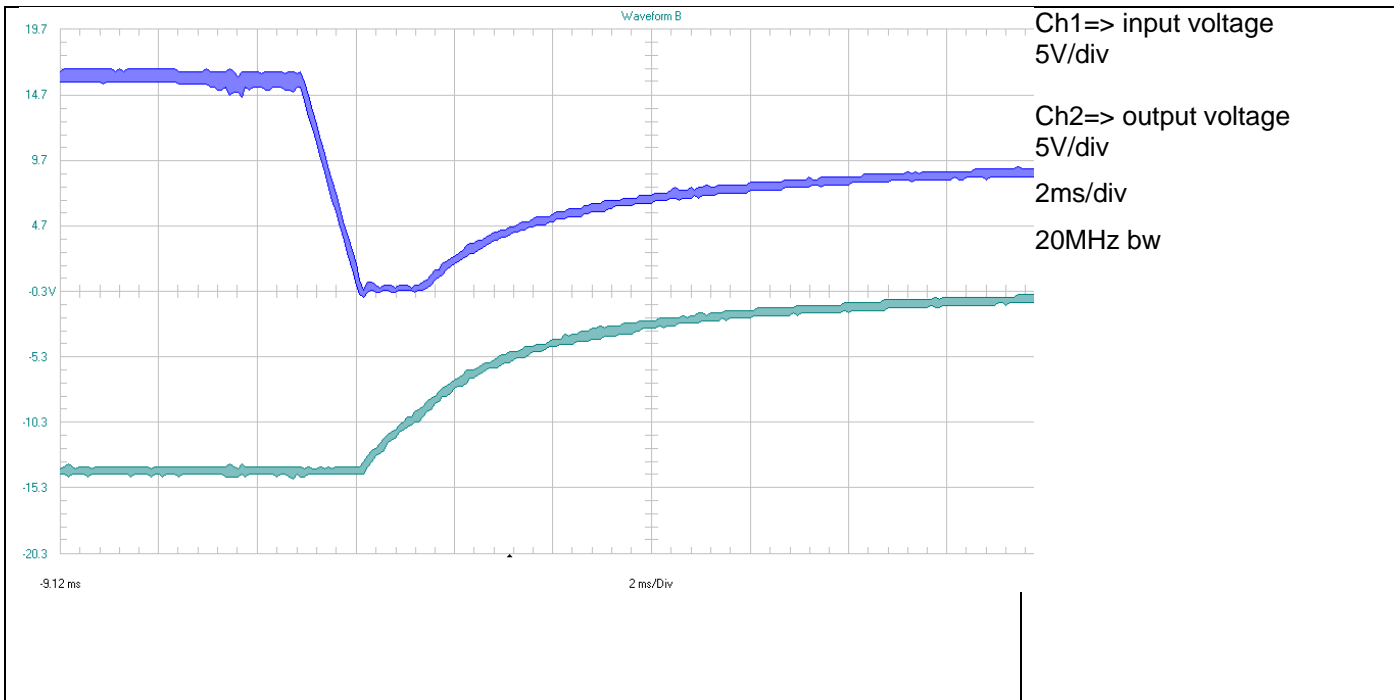Ch2=> output voltage 5V/div

2ms/div

20MHz bw

Figure 2

3 Efficiency

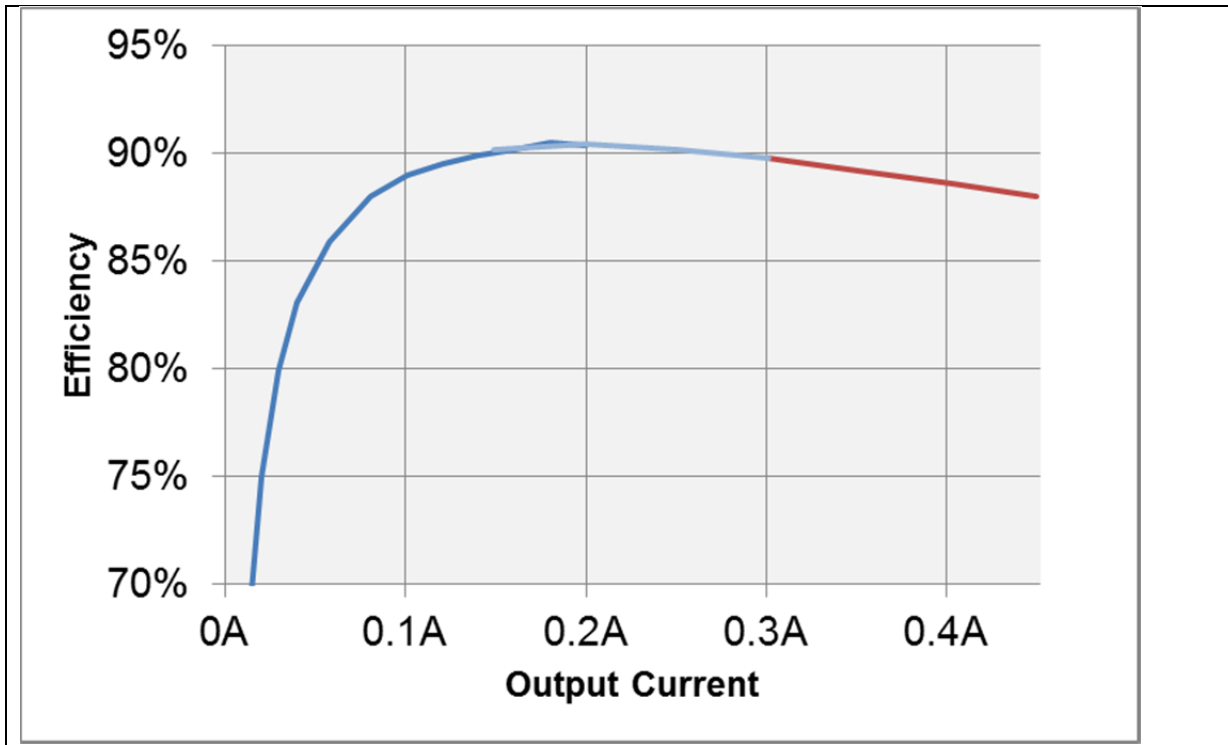The efficiency is shown in the Figure 3 below.

Figure 3

To demonstrate maximum efficiency the board has been built with inductor
COOPER DR125-221-R, 12.5mm x 12.5mm x 6mm;

For smallest size and max. 200mA load current use:
COOPER DR74-221-R, 7.6mm x 7.6mm x 4.4mm, 560mArms/660mApk or
WE 7345 series, p/n 744777222, 7.3mm x 7.3mm x 4.3mm, 440mArms/540mApk;

Do to the current capability of DR125 inductor (1.2Arms/1.5Apk) we tested maximum load current
up to typical current limitation 940mA, see datasheet. By minimum value 600mA only 300mA
max. load current could be guaranteed. Please see lower table:

load current	inductor peak current	remark
100mA	227mA	
200mA	419mA	customer spec
250mA	515mA (= 481mArms)	+25%, works for DR74
300mA	611mA	**IC min current limitation**
400mA	803mA	
450mA	899mA	
470mA	937mA	**IC typ current limitation**

Measurement 1, maximum current by spec:

VIN	IIN	VOUT	IOUT	PIN	POUT	effcy
16.001	0.195	14.131	0.200	3.123	2.822	0.903
16.002	0.176	14.132	0.180	2.816	2.549	0.905
16.004	0.157	14.132	0.160	2.508	2.261	0.902
16.005	0.138	14.131	0.140	2.207	1.984	0.899
16.007	0.119	14.131	0.120	1.897	1.699	0.895
16.008	0.100	14.130	0.101	1.598	1.421	0.890
16.000	0.081	14.130	0.081	1.298	1.142	0.880
16.002	0.060	14.130	0.058	0.954	0.820	0.859
16.003	0.042	14.130	0.040	0.674	0.560	0.831
16.004	0.033	14.130	0.030	0.525	0.420	0.799
16.005	0.024	14.130	0.020	0.383	0.287	0.750
16.005	0.018	14.130	0.014	0.288	0.201	0.696
16.007	0.002	14.132	0.000	0.029	0.000	0.000

Measurement 2, maximum current by IC design:

16.008	0.452	14.137	0.450	7.229	6.362	0.880
16.001	0.402	14.137	0.404	6.437	5.704	0.886
16.005	0.348	14.137	0.351	5.568	4.968	0.892
16.009	0.296	14.137	0.301	4.742	4.257	0.898
16.005	0.246	14.135	0.251	3.939	3.551	0.901
16.009	0.195	14.135	0.200	3.125	2.826	0.904
16.000	0.146	14.134	0.149	2.336	2.106	0.902

Maximum efficiency +90% is w/in load range 150mA to 250mA.

4   Load Regulation

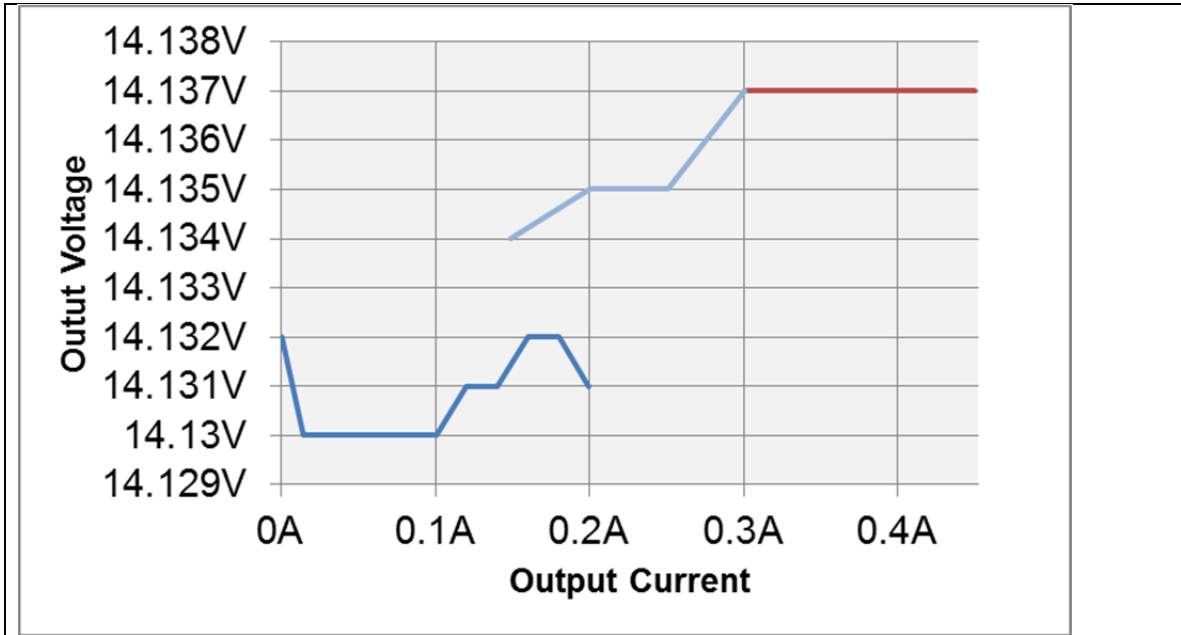The load regulation of the output is shown in the Figure 4 below (two measurements).

Figure 4

Power Management Solutions

5   Output Ripple Voltage

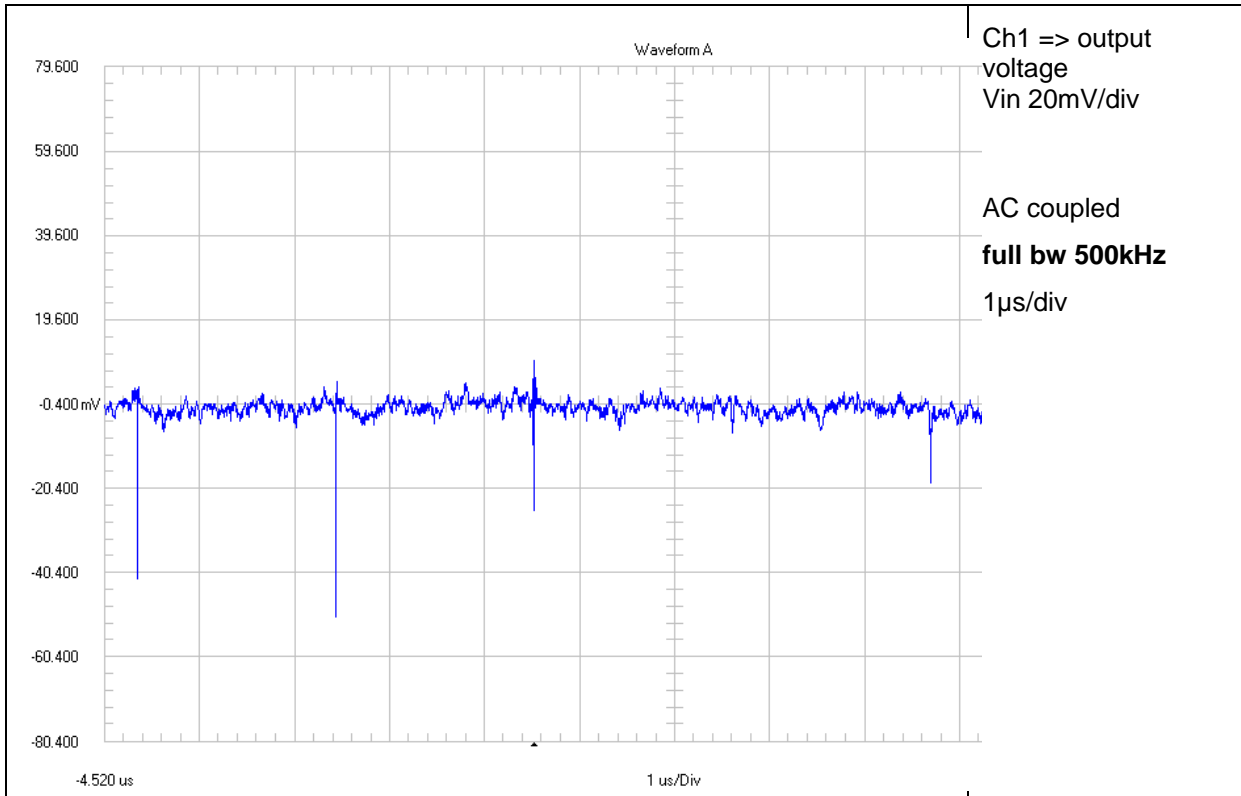The output ripple voltage is shown in Figure 5,

Figure 5

6   Input Ripple Voltage
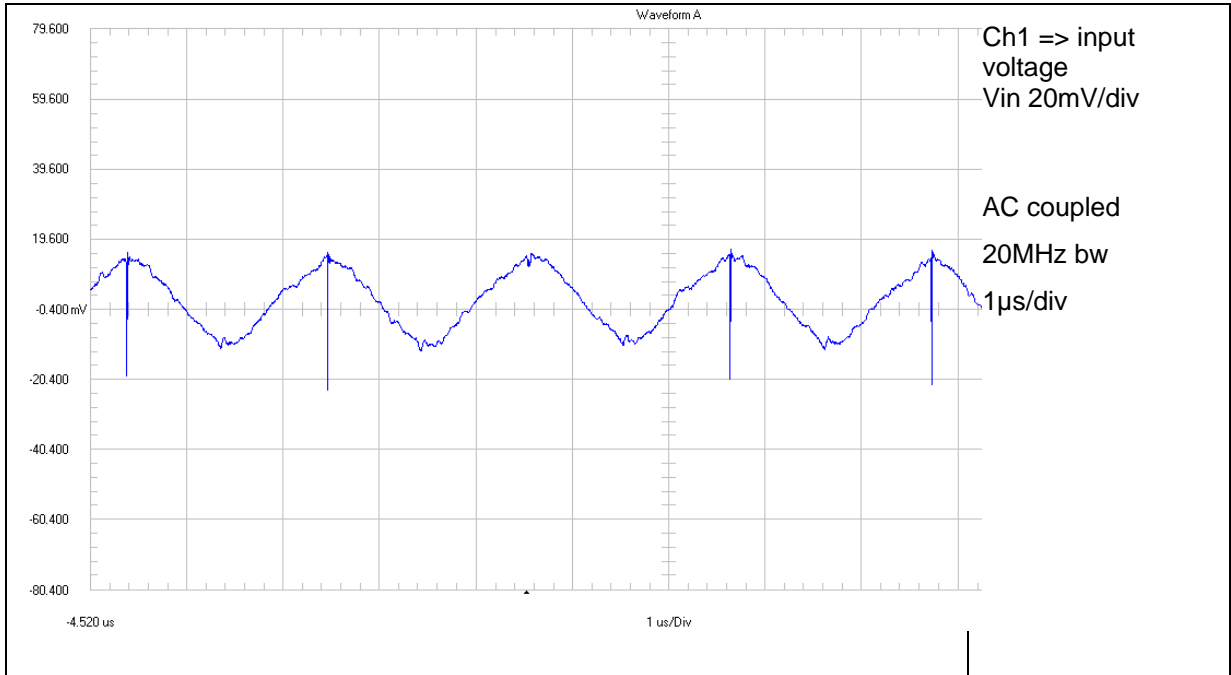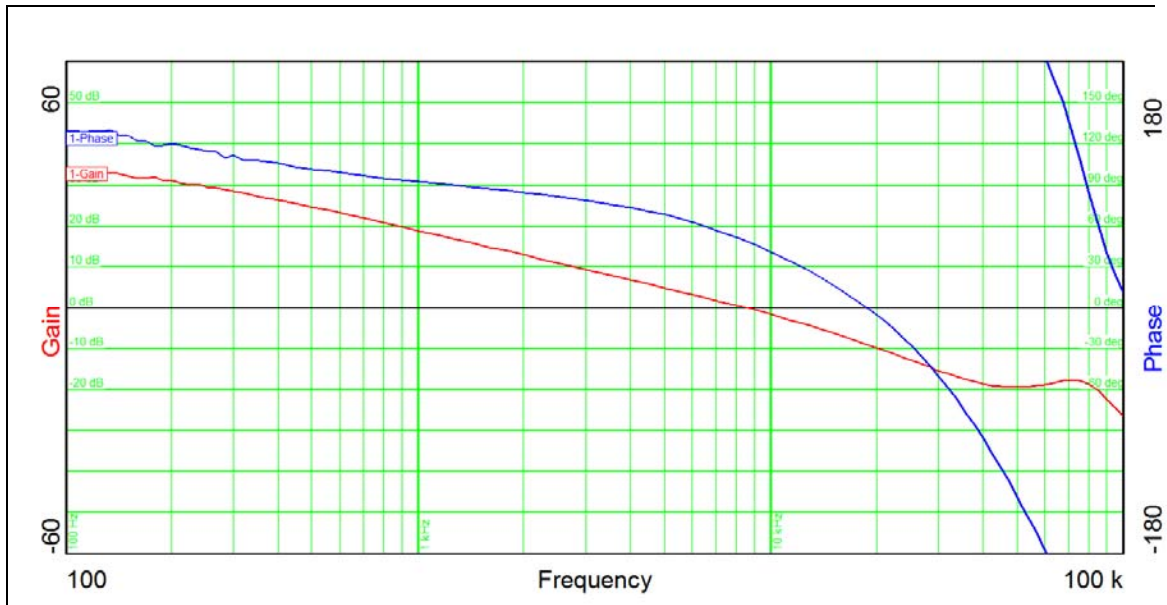
The input ripple voltage is shown in Figure 6.

Figure 6

7   Loop Compensation & Transient Response
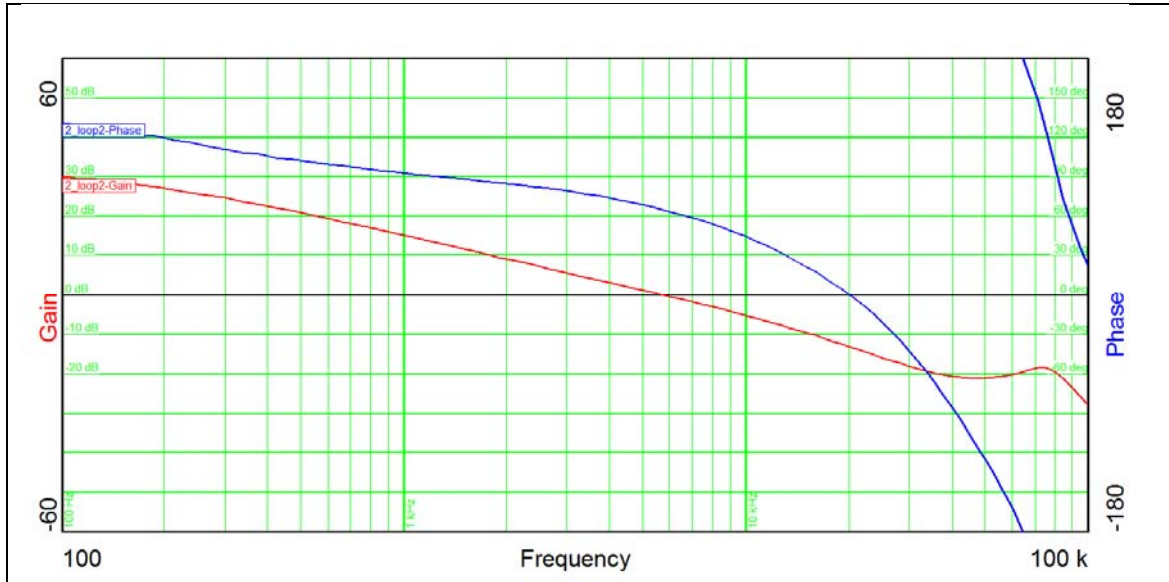
Revision A,

Measured at Vin 16V (0.2A resistor load)

- *crossover frequency 8.5 Hz*
- *49 degs phase margin*
- *-9 dB gain margin*
- *slope -1.5*

For Revision A phase margin and gain margin pushed the edge; for revision B gain has been reduced to achieve bigger phase and gain margin:

Revision B,

Measured at Vin 16V (0.2A resistor load)

crossover frequency 5.73 kHz, 65 degs phase margin, -13dB gain margin, slope -1.4

load transient 100mA <->200mA (Electronic load N3305 were used)
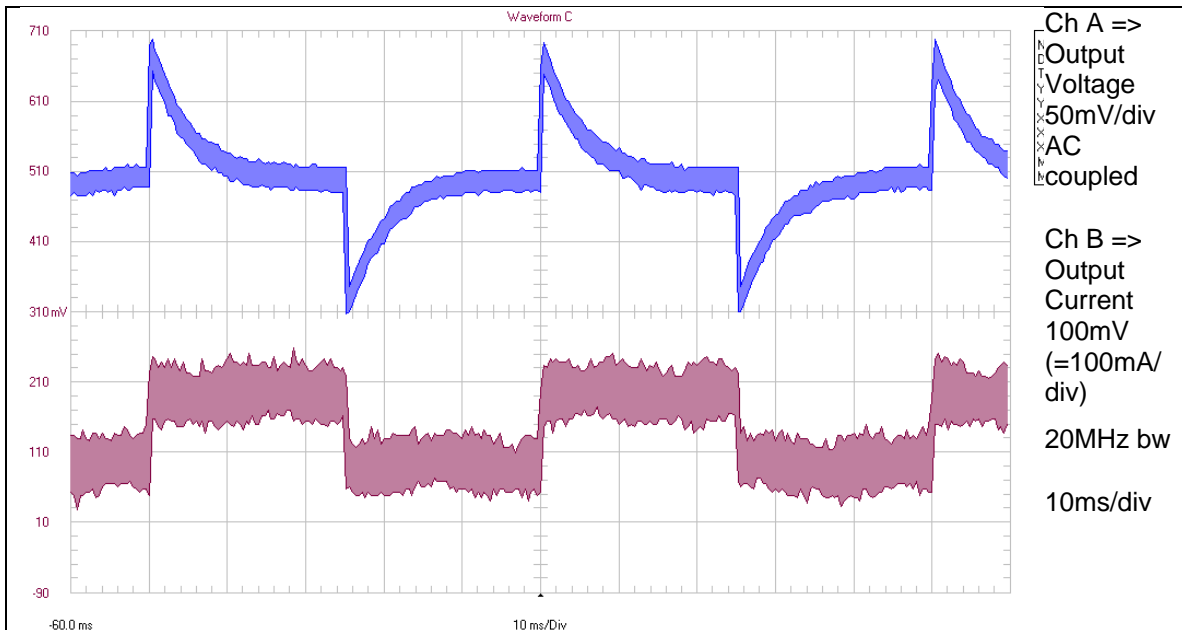
Figure 7

8 Miscellaneous Waveforms

Switch to -VOUT

The waveform of the voltage on switchnode is shown in Figure 8.
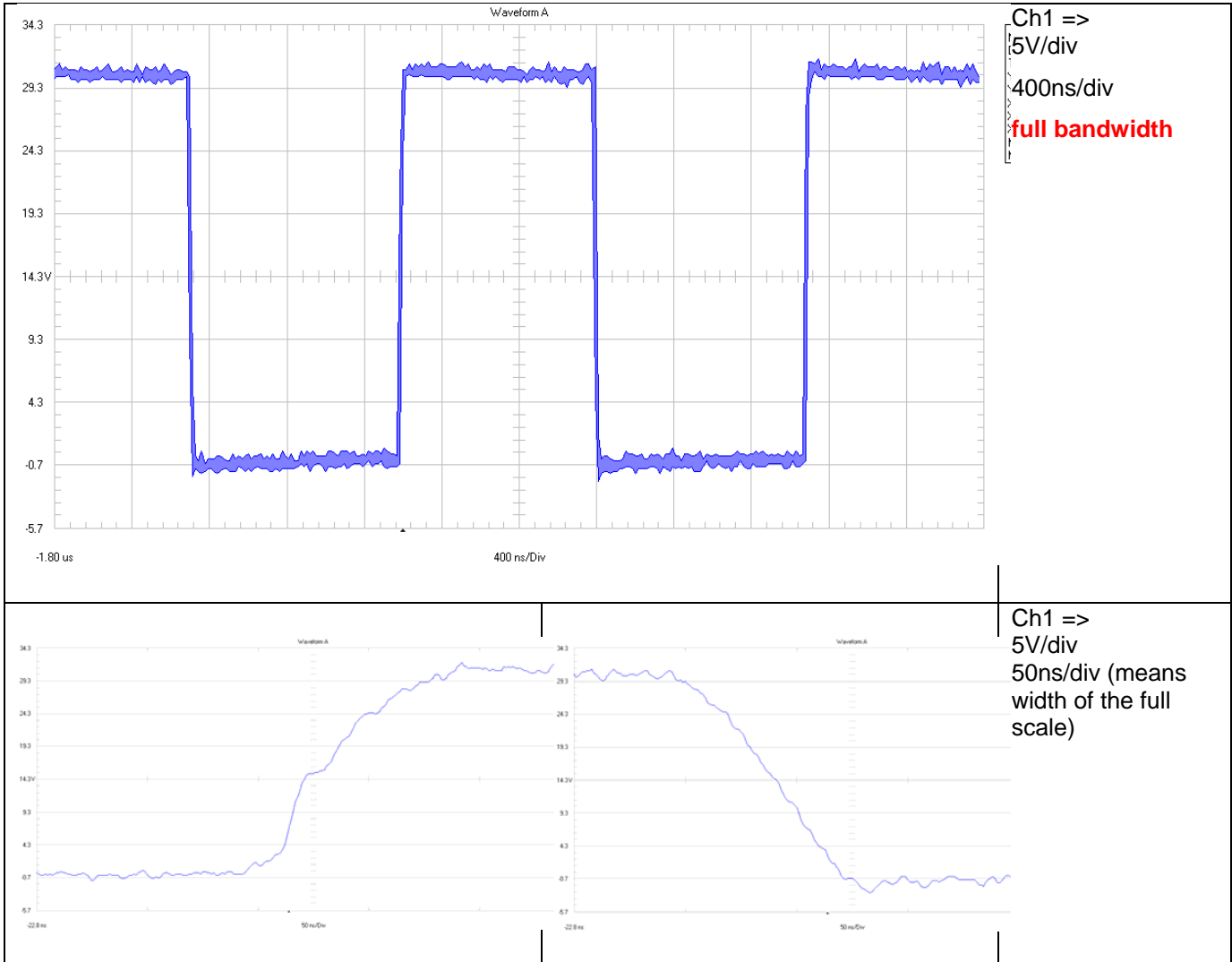
Figure 8

no ringing, no overshoot

9   Thermal Image

Figure 9 shows the thermal image at 16V input voltage and 0.2A output current. (electronic load)
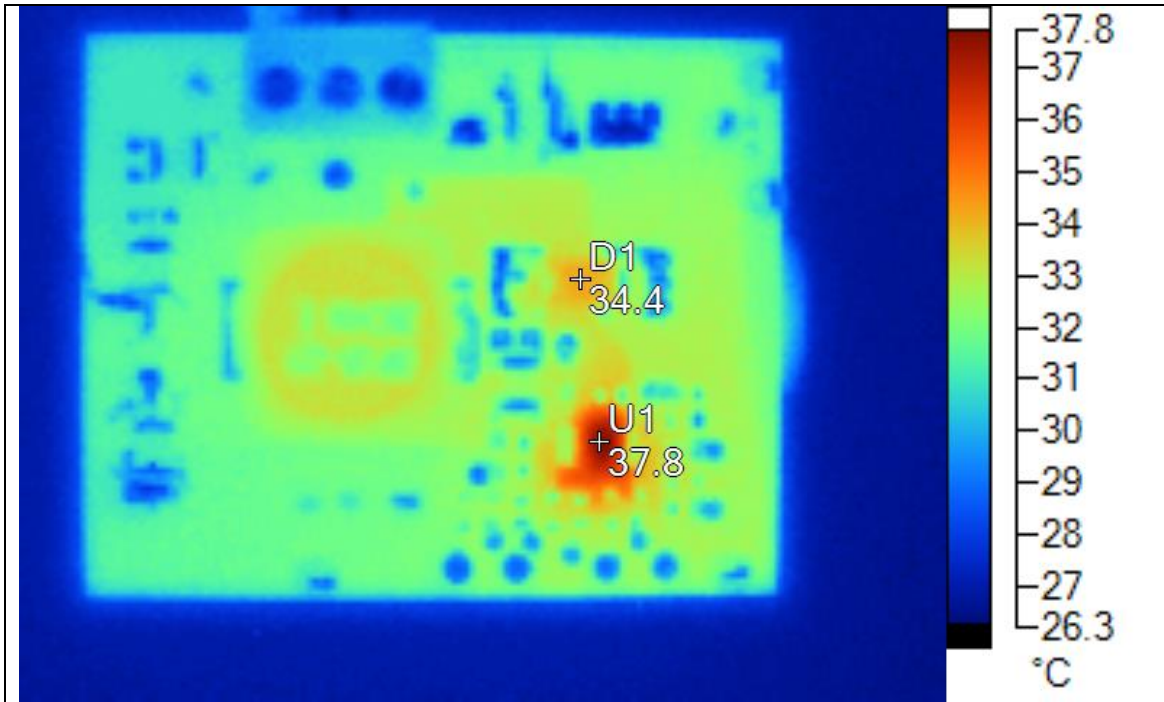
Figure 9

Main Image Markers

Name	Temperature
U1	37.8°C
D1	34.4°C

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