PMP7207RevB Test Results

Topology: Inverting Buck-Boost
Device: TPS40200
Fsw measured 284kHz
Ilim measured 1.1A at min. input voltage 8V
DCM < 100mA, CCM > 100mA

1 Startup

The startup waveform is shown in the Figure 1. The input voltage was set at 12V, with 1A load at the output.

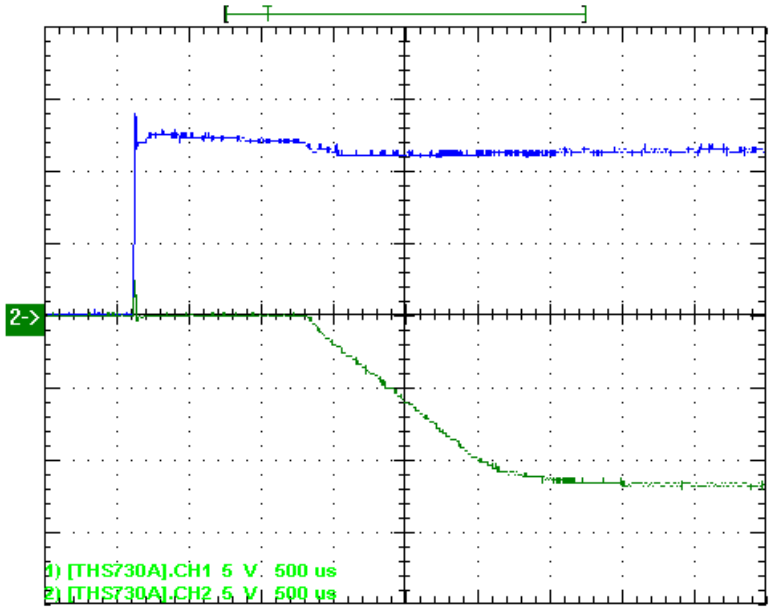


Figure 1

Ch1=> input voltage 5V/div

Ch2=> output voltage 5V/div

500µs/div

20MHz bw

Figure 2 shows the same with a different time base.

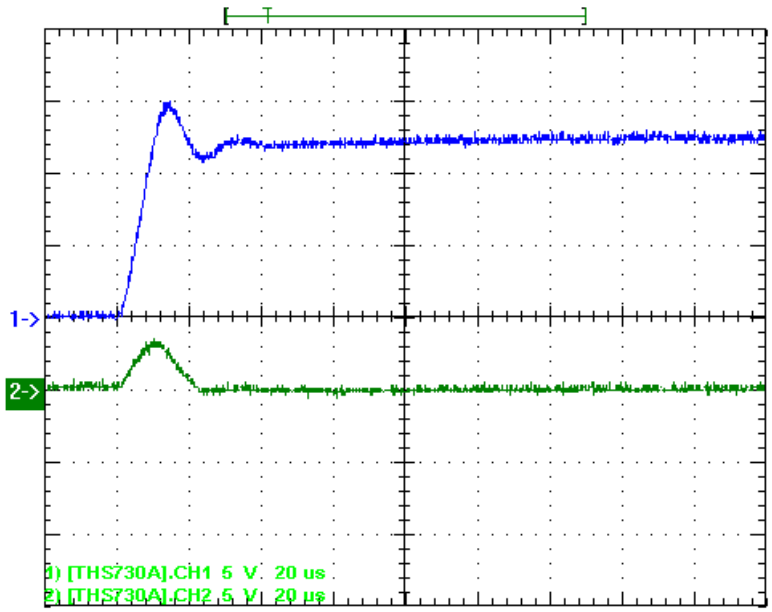


Figure 2

Ch1=> input voltage 5V/div

Ch2=> output voltage 5V/div

20µs/div

20MHz bw

PMP7207RevB Test Results

The startup waveform is shown in the Figure 3. The input voltage was set at 12V, with 0A load at the output.

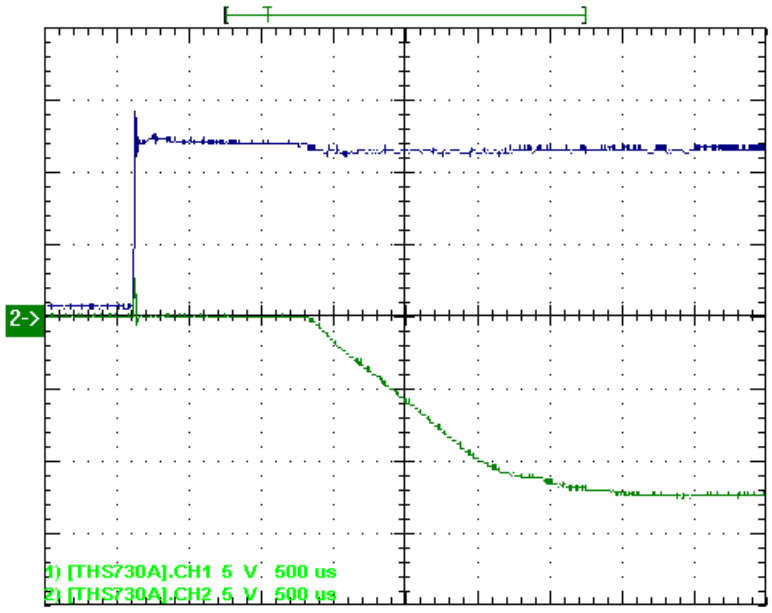


Figure 3

Ch1=> input voltage 5V/div

Ch2=> output voltage 5V/div

500µs/div

20MHz bw

2 Shutdown

The shutdown waveform is shown in the Figure 4. The input voltage was set at 12V, with 1A load on the output. The circuit was disconnected from the power supply.

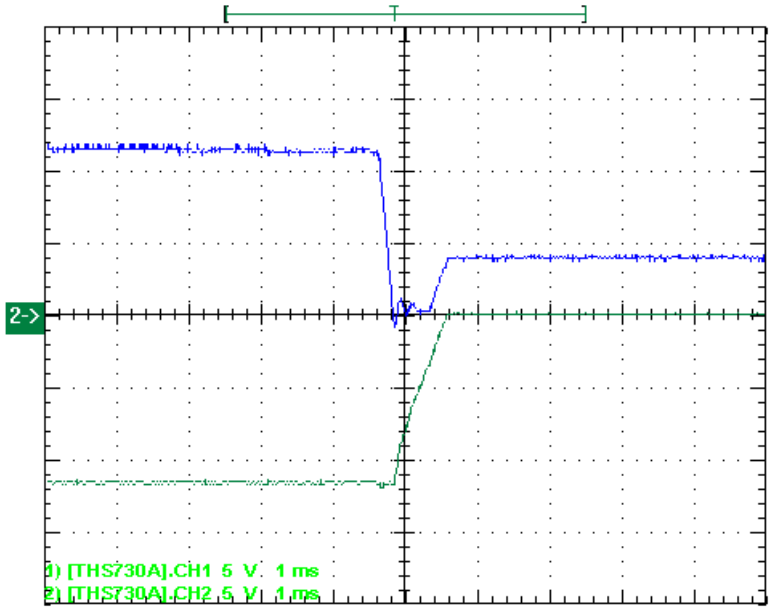


Figure 4

Ch1=> input voltage 5V/div

Ch2=> output voltage 5V/div

1ms/div

20MHz bw

The shutdown waveform is shown in the Figure 5. The input voltage was set at 12V, with 1A load on the output. The power supply was switched off (short).

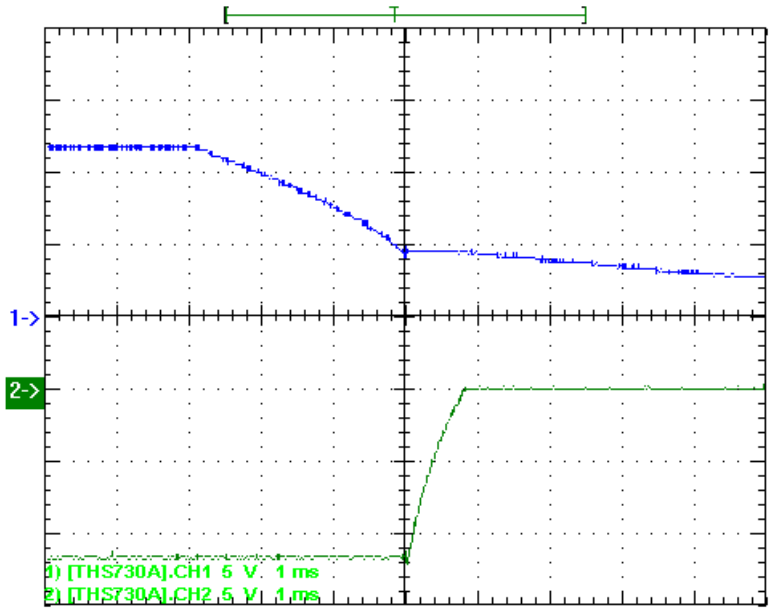


Figure 5

Ch1=> input voltage 5V/div

Ch2=> output voltage 5V/div

1ms/div

20MHz bw

3 Efficiency

The efficiency is shown in the Figure 6 below. The input voltage was set to12V.

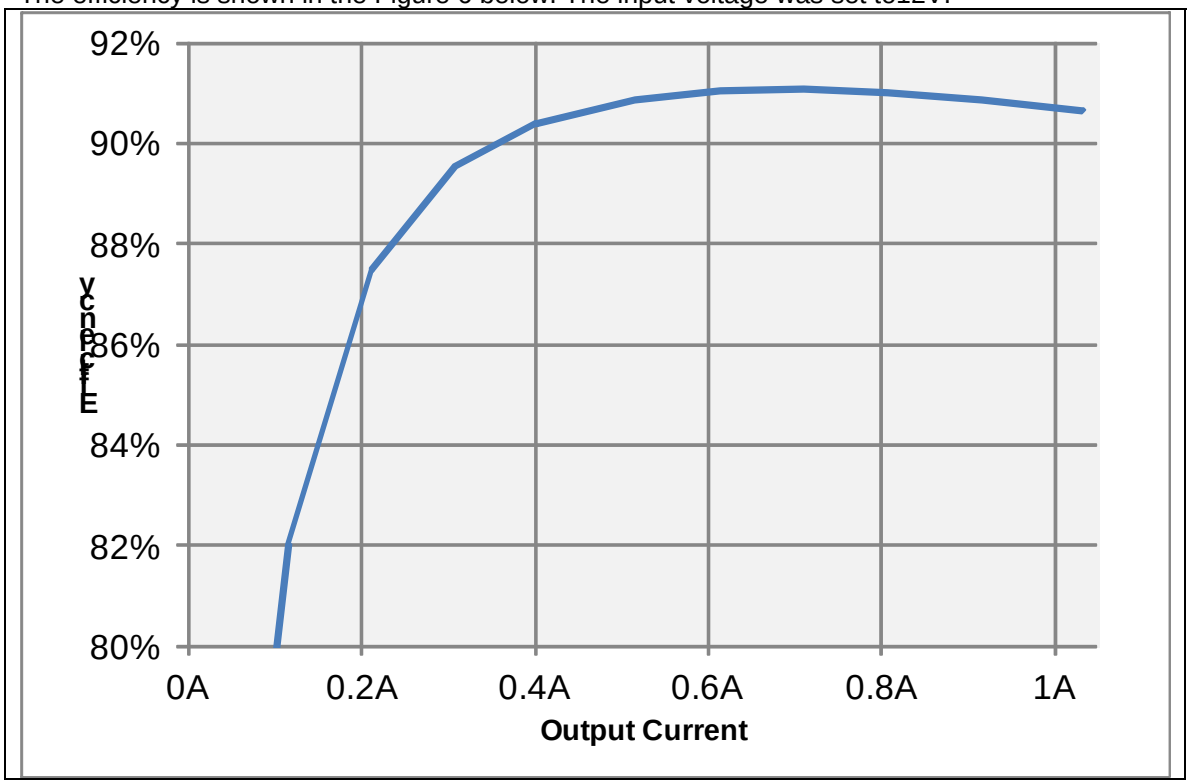


Figure 6

4 Load Regulation

The load regulation of the output is shown in the Figure 7 below. The input voltage was set to 12V.

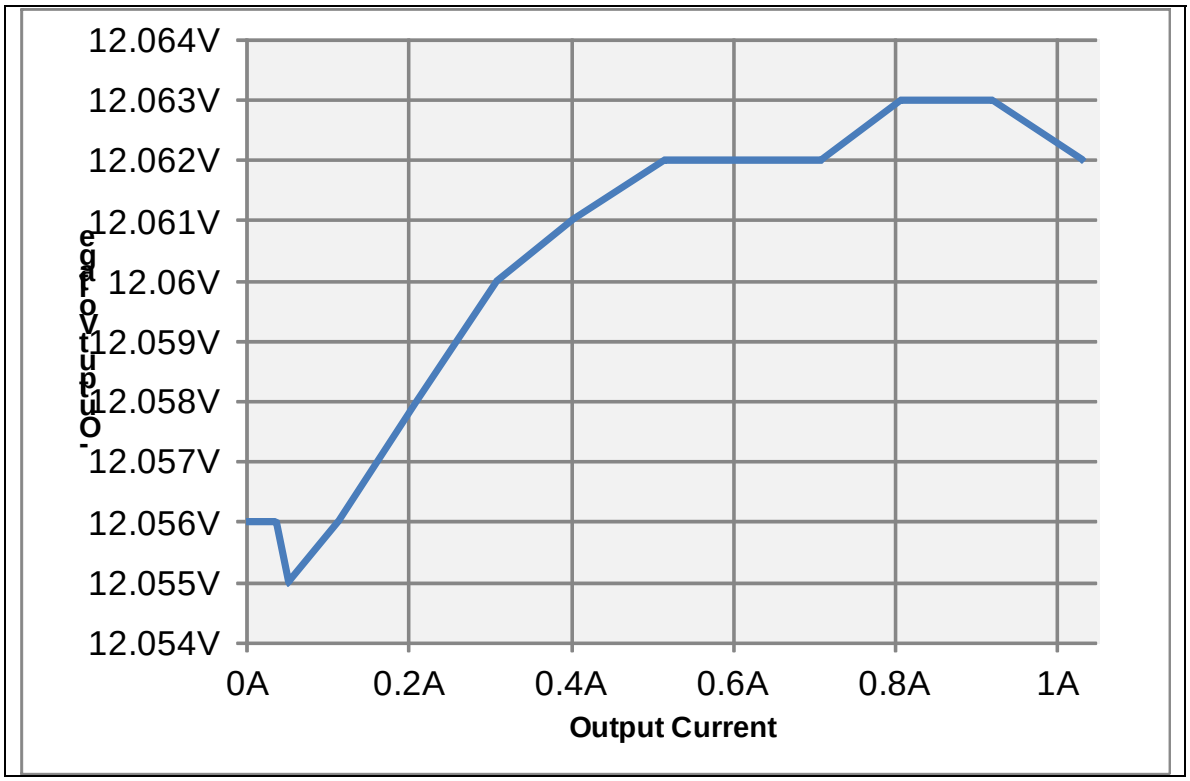


Figure 7

5 Line Regulation

The line regulation at 1A output current is shown at Figure 8.

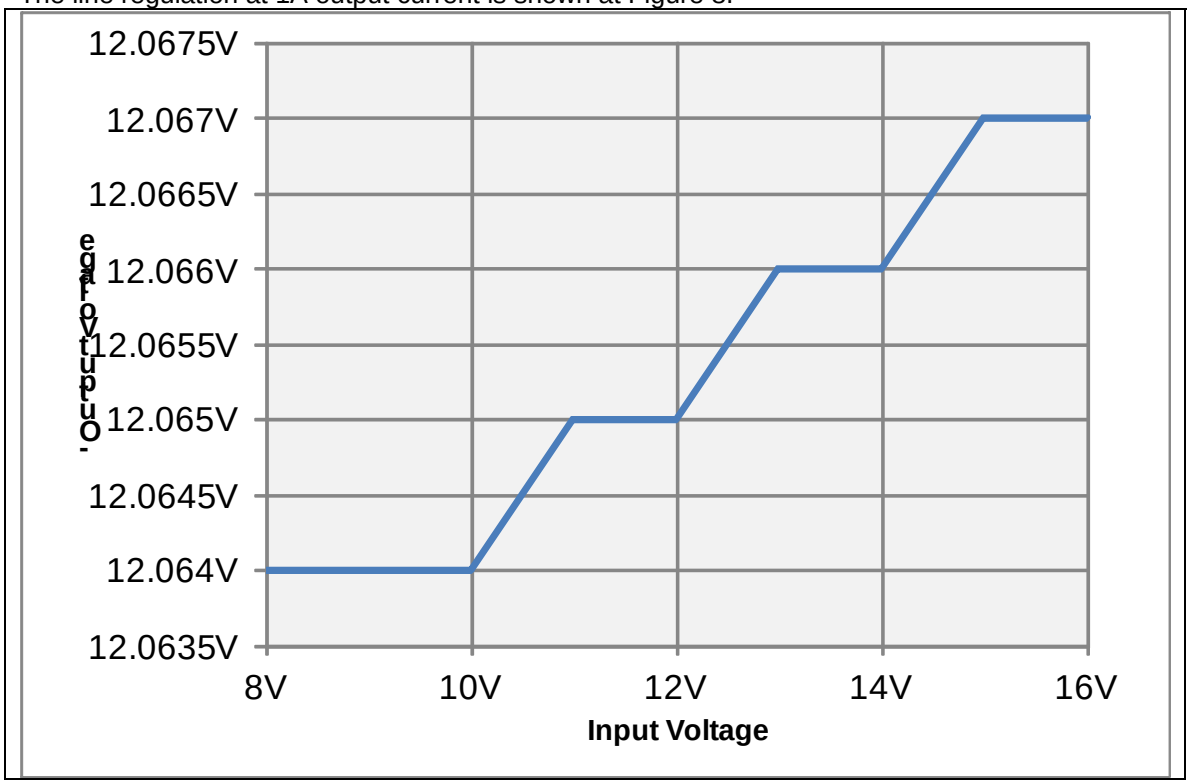


Figure 8

With the same setup also the efficiency were calculated. This is shown in Figure 9.

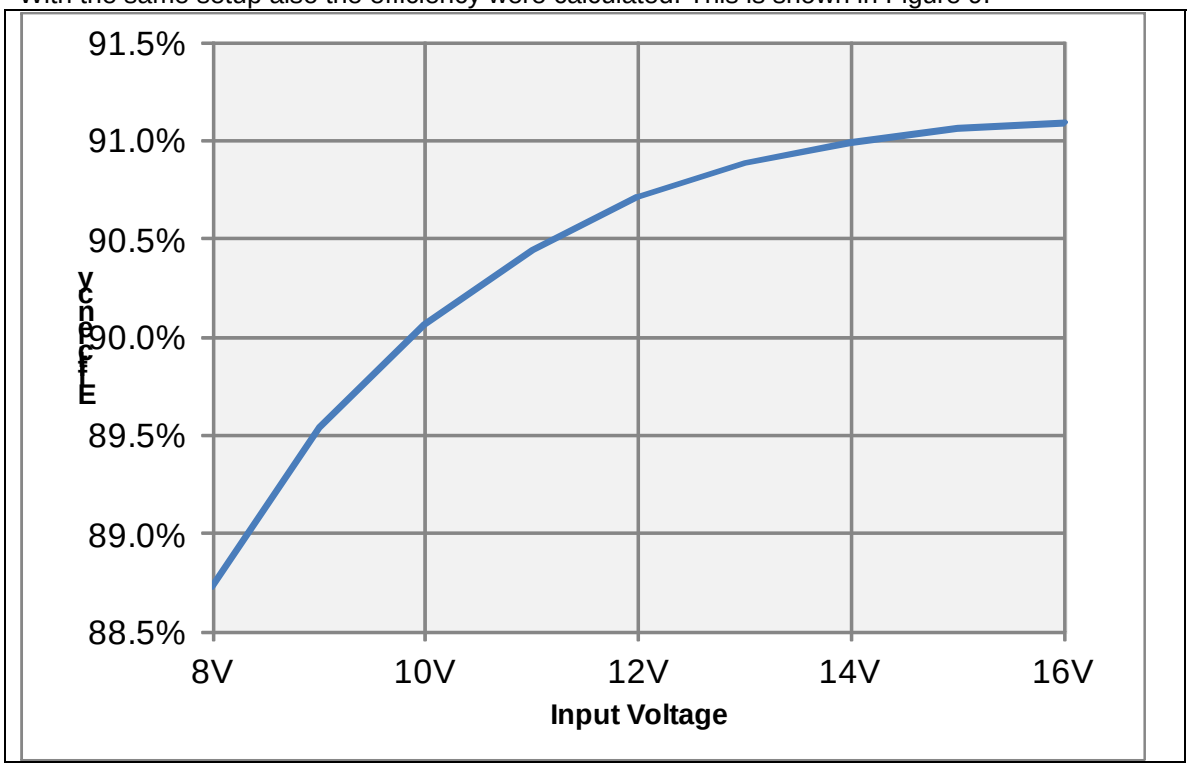
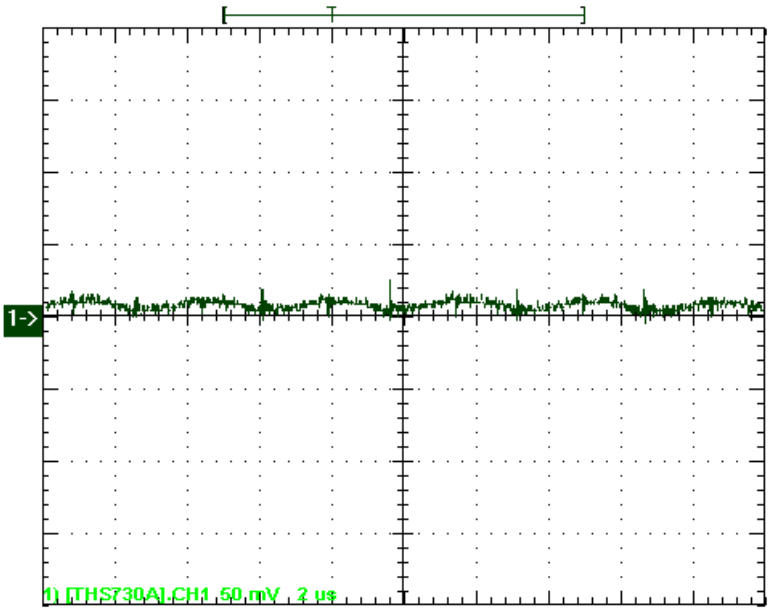


Figure 9

6 Ripple Voltage

The output ripple voltage is shown in Figure 10. The image was taken with 1A load and 12V input.



Ch1 => output voltage @ 12Vin
50mV/div

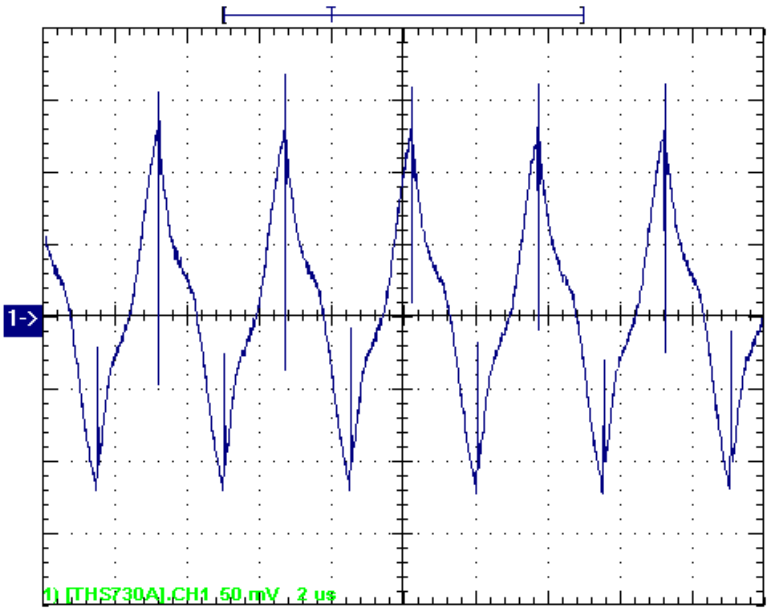
AC coupled

20MHz bw

2µs/div

Figure 10

The input ripple voltage is shown in Figure 11. The image was taken with 1A load 12V at the input. The waveforms were captured timely separate.



Ch1 => input voltage
50mV/div

20MHz bandwidth setting

AC coupled

2µs/div

Figure 11

The input ripple voltage is shown in **Error! Reference source not found.**. The image was taken with 0.5A load 12V at the input. The waveforms were captured timely separate.

7 Control Loop Frequency Response

Figure 12 shows the loop response with 1A load and 12V input.

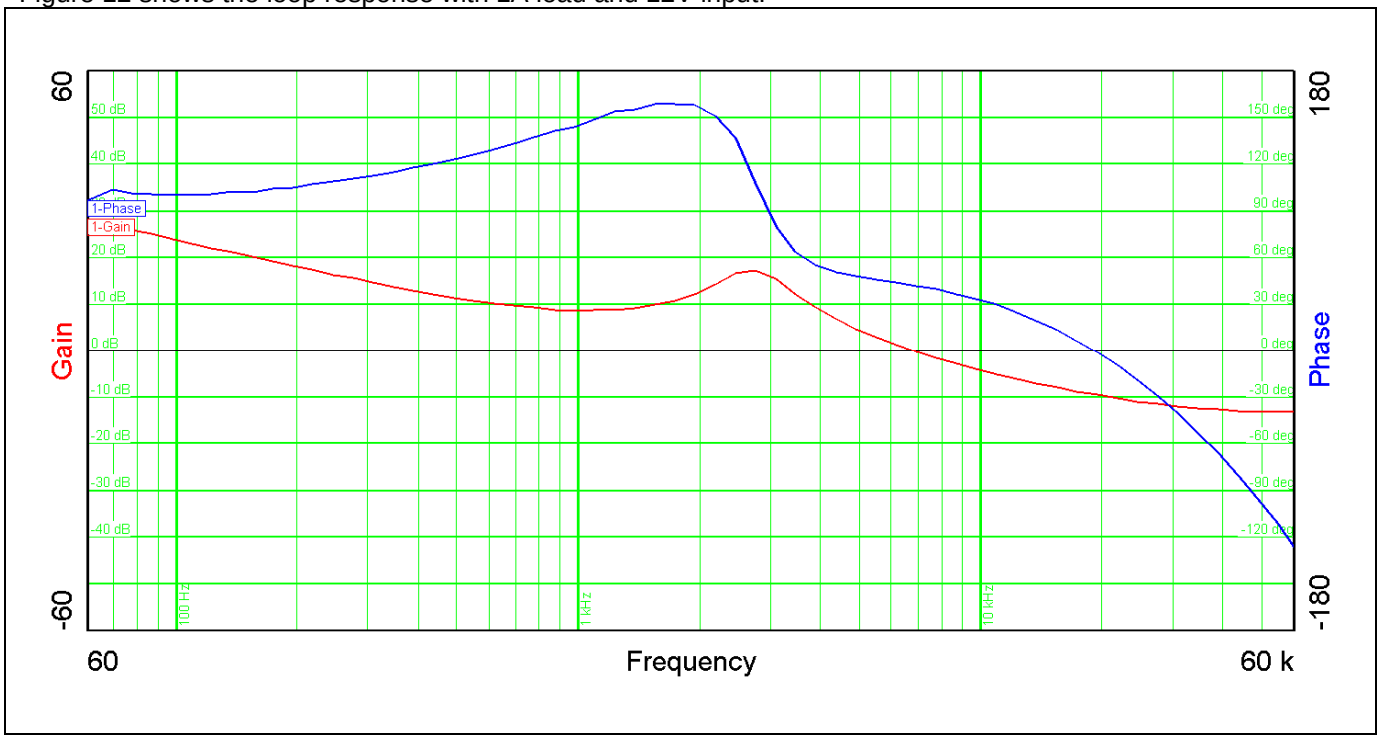


Figure 12

Table 1 summarizes the results from Figure 12

Input Voltage	12V
Bandwidth (kHz)	6.77
Phasemargin	42°
slope (20dB/decade)	-1.45
gain margin (dB)	-9.5
slope (20dB/decade)	-0.759
freq (kHz)	19.2

Table 1

Compensating a voltage mode flyback topology in CCM might need some caution, especially w/ MLCCs at the output.
Could be a benefit using high cap electrolytics, here 220uF.

Or simply use TS54260 working in current mode.

8 Load Transients

The Figure 13 shows the response to load transients. The load is switching from 0.5A to 1A.with 400Hz frequency. The input voltage was set to 12V

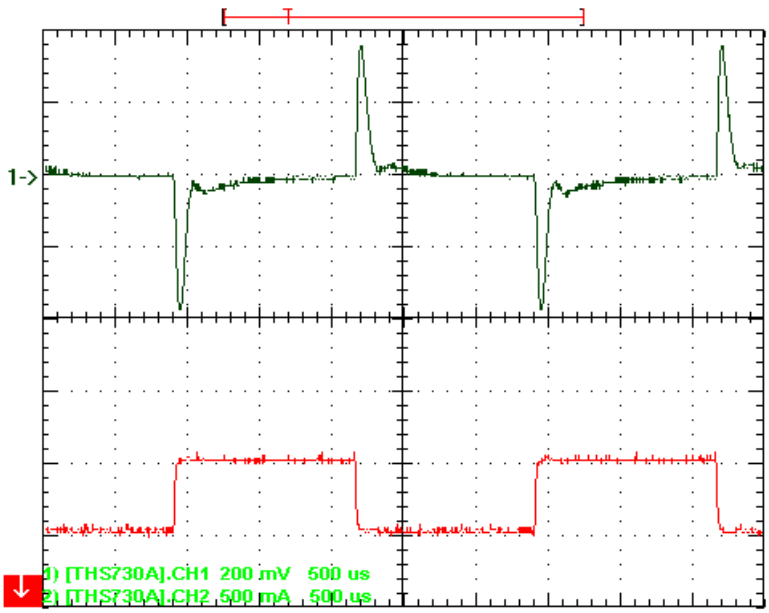


Figure 13

Ch1 => output voltage 200mV/div

20MHz bandwidth setting

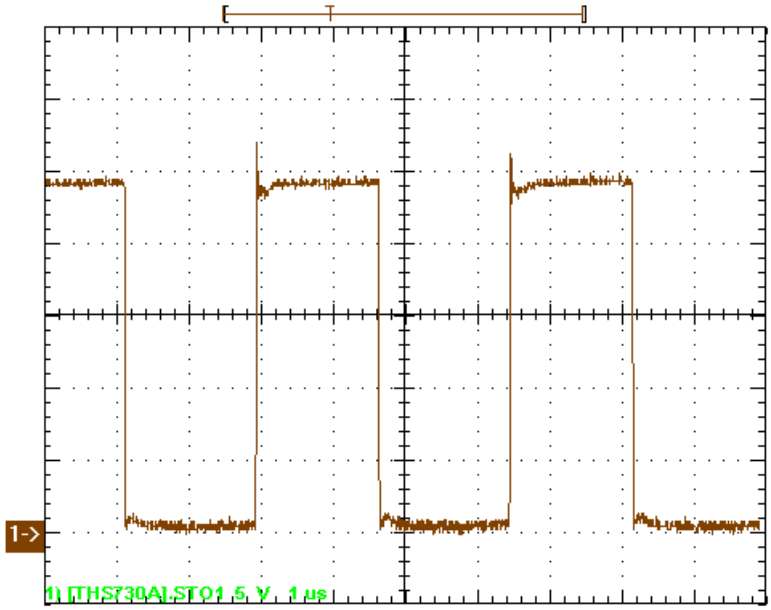
Ch2 => output current 500mA/div

500µs/div

If transient response <3% is needed increase output capacitance

9 Miscellaneous Waveforms

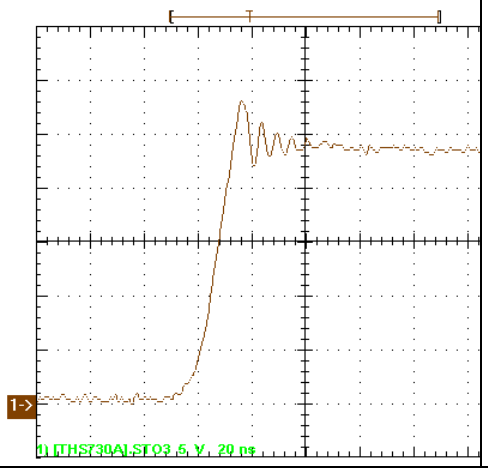
The **drain-source** voltage on Q1 results in the waveform shown in Figure 14. Input voltage was set to 12V and output current to 1A.

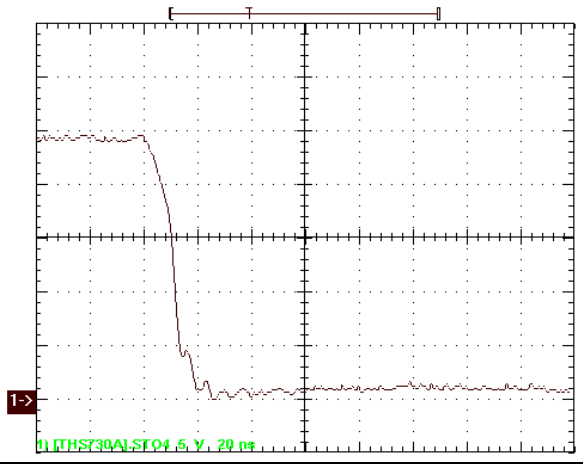


Ch1 =>
5V/div

1µs/div

full bandwidth

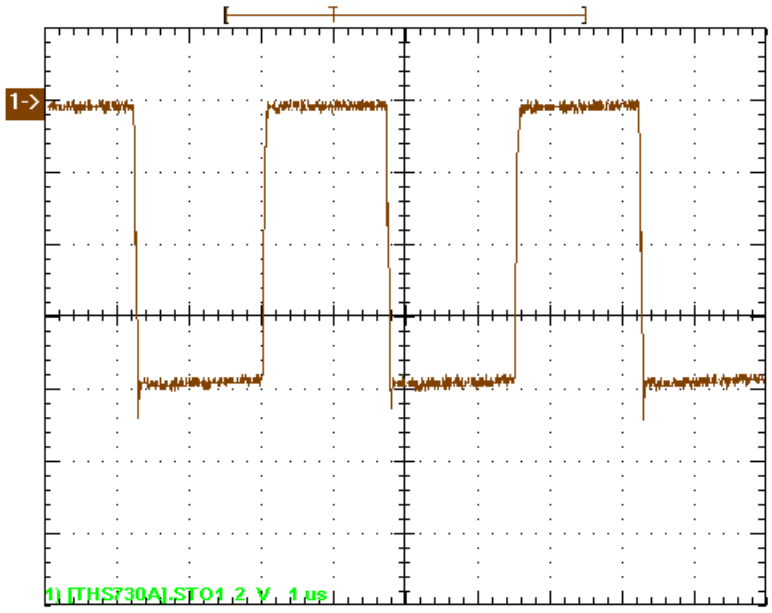




Ch1 =>
5V/div
20ns/div

Figure 14

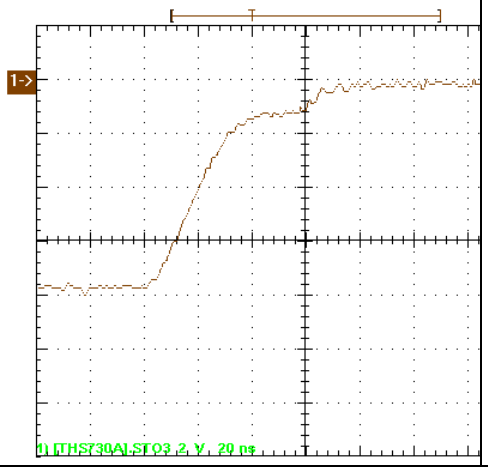
The **gate-source** voltage on Q1 results in the waveform shown in Figure 15. Input voltage was set to 12V and output current to 1A.

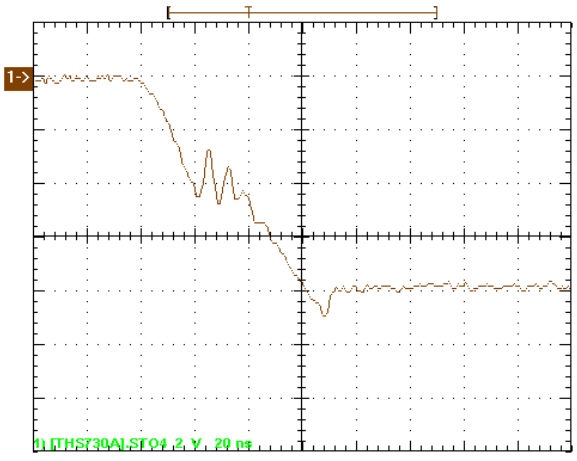


Ch1 =>
2V/div

1µs/div

full bandwidth

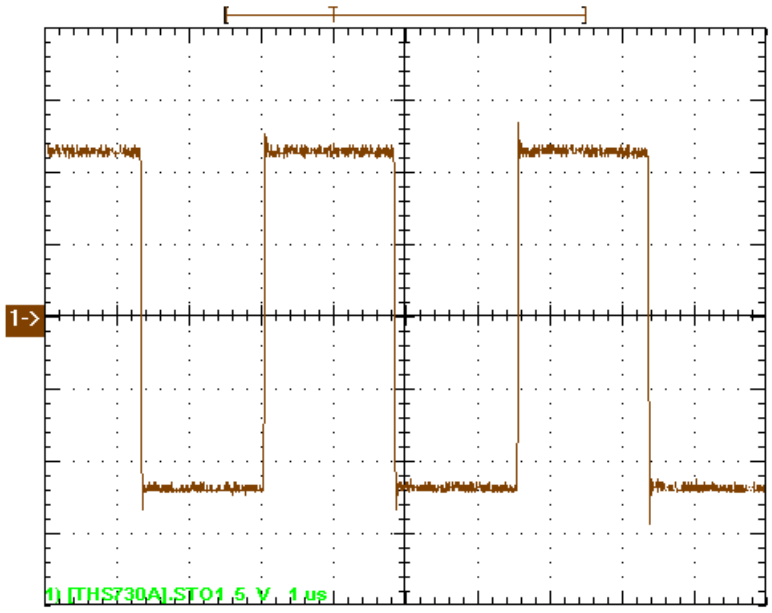




Ch1 =>
2V/div
20ns/div

Figure 15

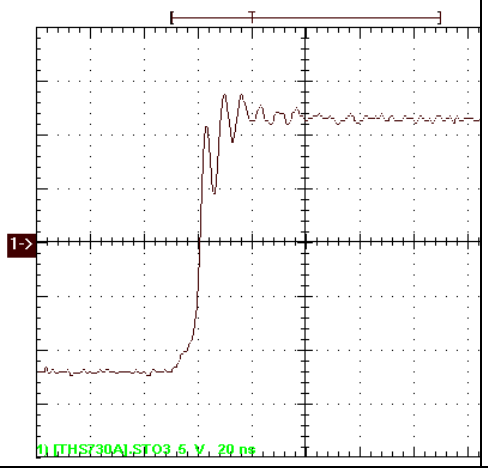
The **switch-node** voltage (L1) results in the waveform shown in Figure 16. Input voltage was set to 12V and output current to 1A.

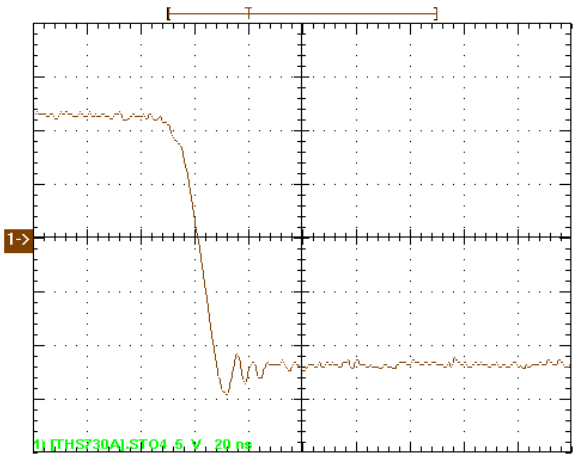


Ch1 =>
5V/div

1µs/div

full bandwidth

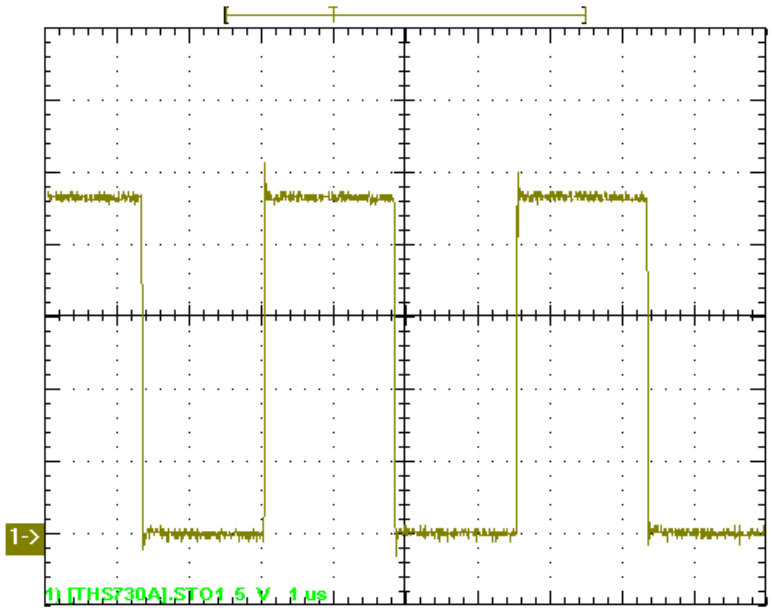




Ch1 =>
5V/div
20ns/div

Figure 16

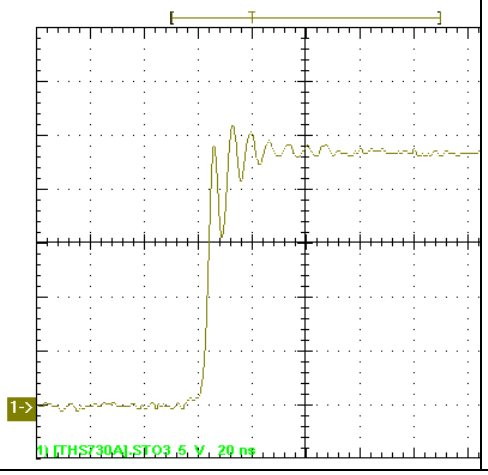
The **voltage on D1** results in the waveform shown in Figure 17. Input voltage was set to 12V and output current to 1A.

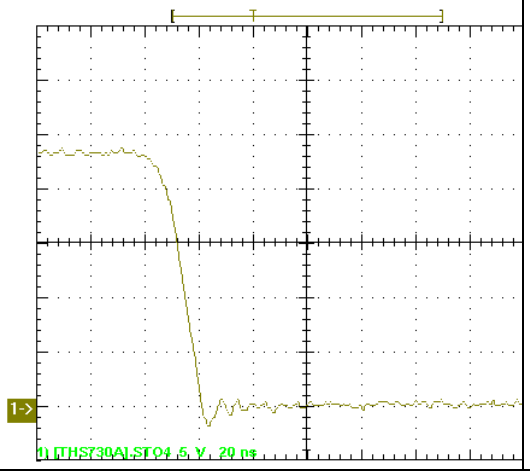


Ch1 =>
5V/div

1µs/div

full bandwidth





Ch1 =>
5V/div
20ns/div

Figure 17

10 Thermal Image

The thermal image is swown in Figure 18. The input voltage was set to 12V and output current 1A.

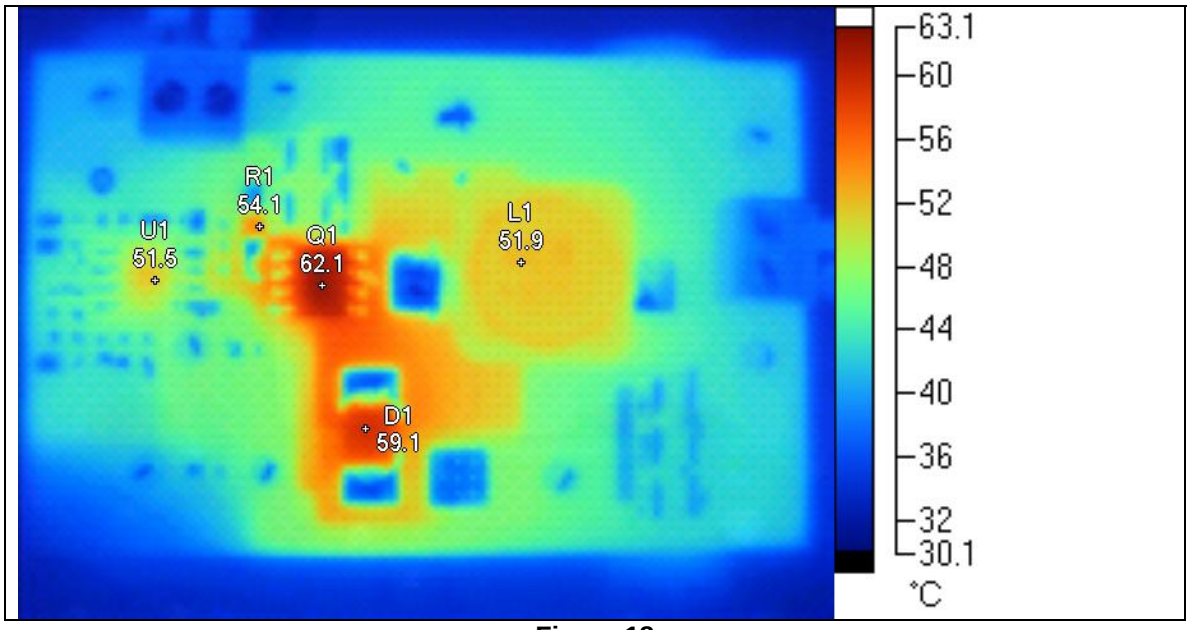


Figure 18

Name	Temperature
Q1	62.1°C
D1	59.1°C
U1	51.5°C
L1	51.9°C
R1	54.1°C

Table 2

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