PMP10091RevA Test Results

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Topology: Boost with +VOUT and -VOUT

Device: TPS40210

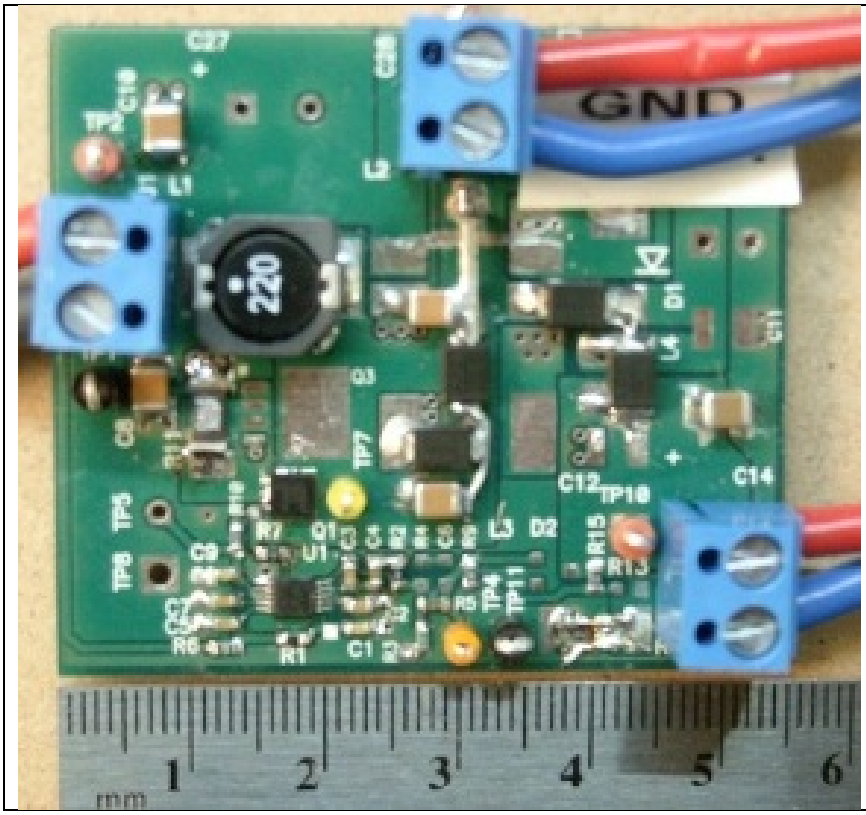
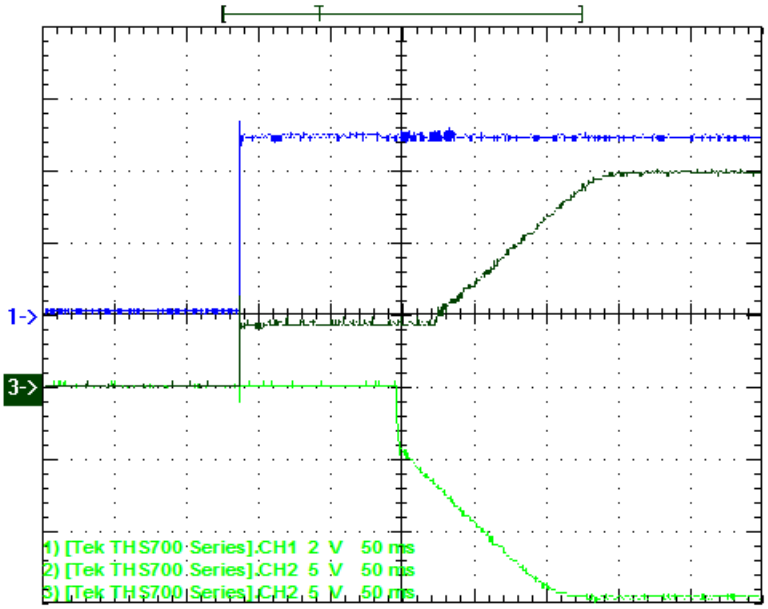


Figure 1

1 Startup

The startup waveform is shown in the Figure 2. The input voltage was set at 5V, with 250mA load at the outputs.



Ch1=> input voltage 2V/div

Ch2=> output voltage (+VOUT) (dark green) 5V/div

Ch3=> output voltage (-VOUT) (light green) 5V/div

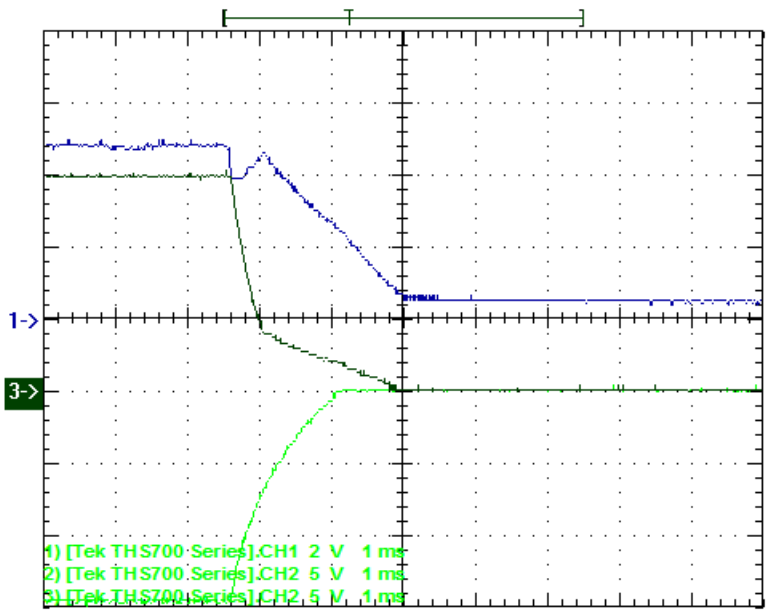
50ms/div

20MHz bw

Figure 2

2 Shutdown

The shutdown waveform is shown in the Figure 3. The input voltage was set at 5V, with 250mA load on the outputs. The power supply was disconnected**.**



Ch1=> input voltage 2V/div

Ch2=> output voltage (+VOUT) (dark green) 5V/div

Ch3=> output voltage (-VOUT) (light green) 5V/div

1ms/div

20MHz bw

Figure 3

3 Efficiency

The efficiency is shown in the Figure 4 below. The input voltage was set 5V.

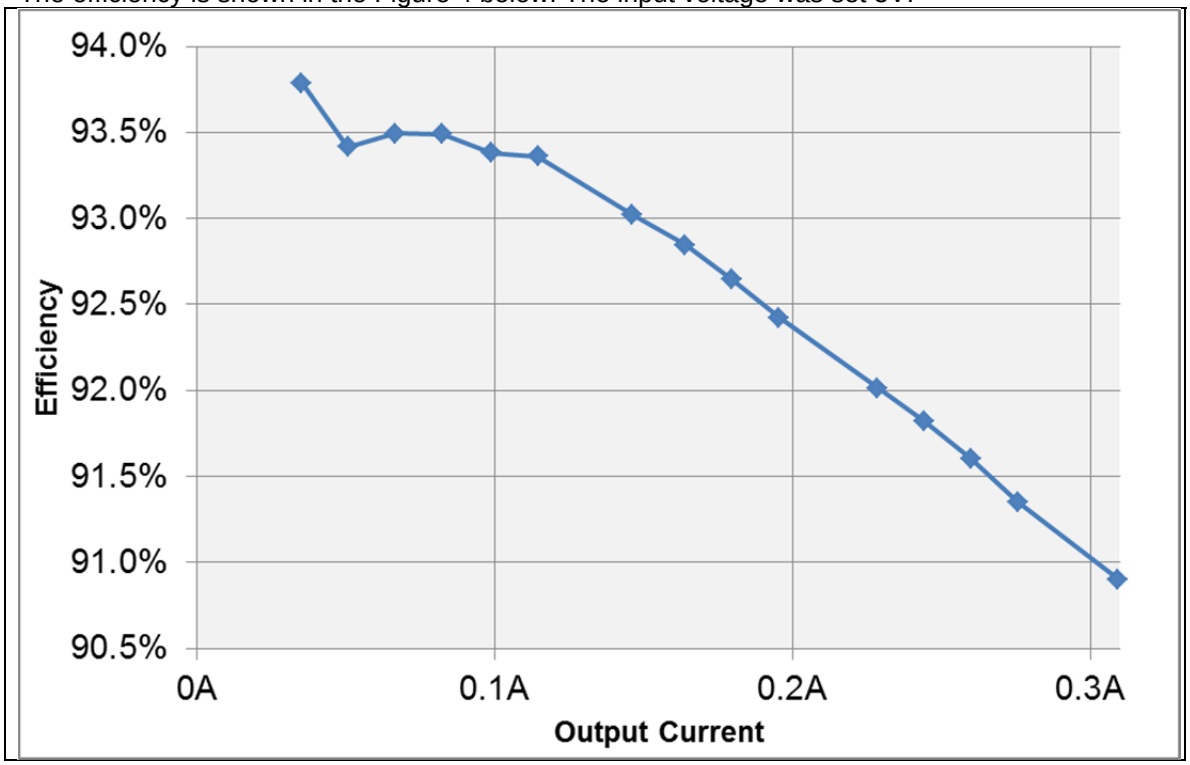


Figure 4

4 Load Regulation

The load regulation of the output is shown in the Figure 5 below. The input voltage was set to 5V.

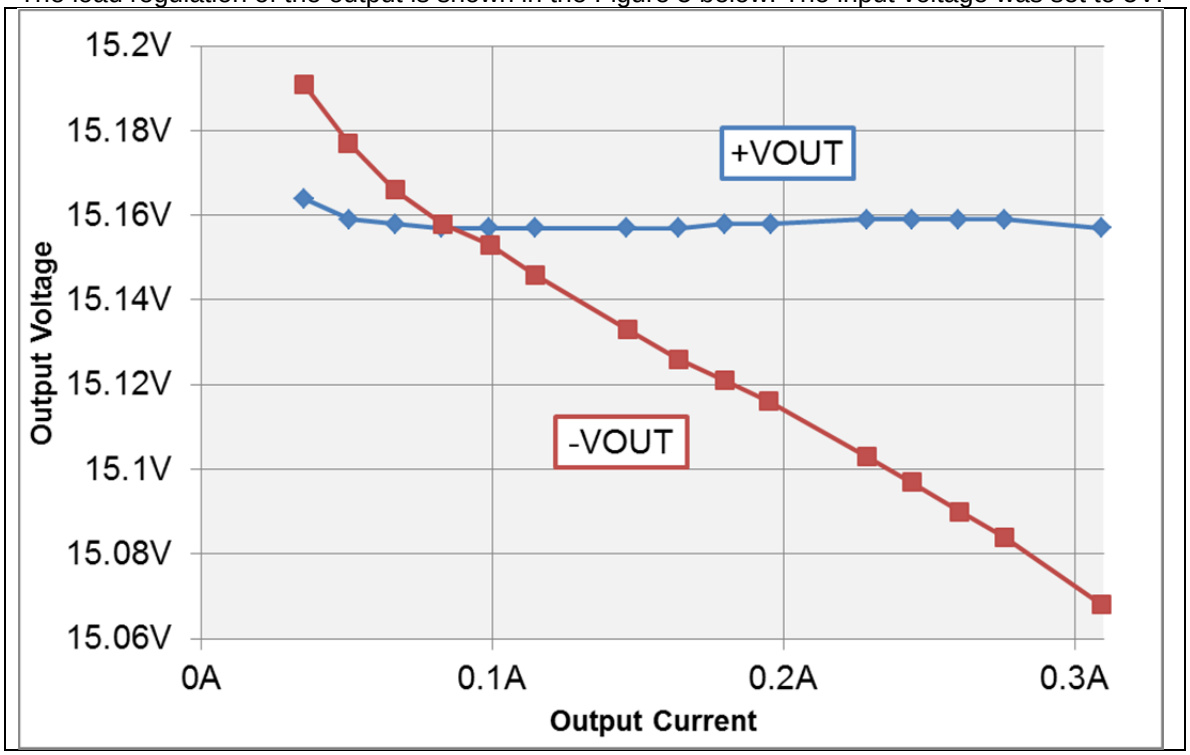
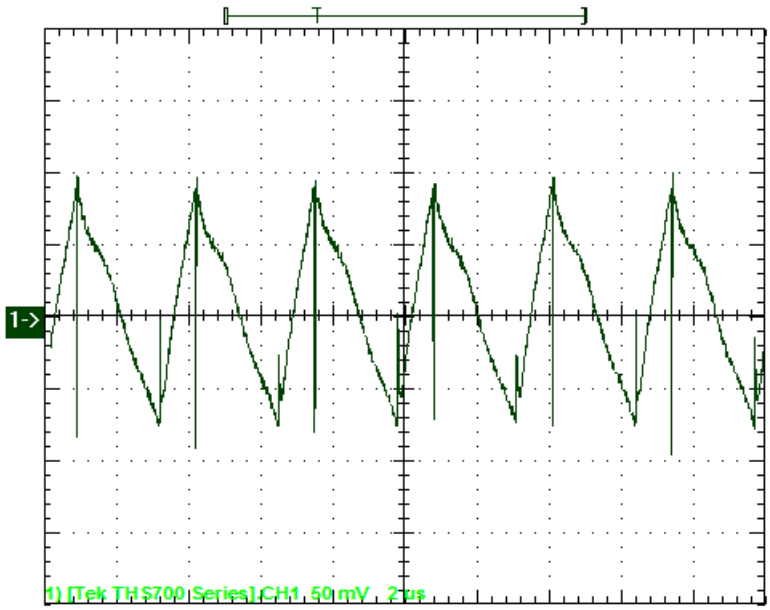


Figure 5

With no loads on the output the output voltages were +15.163V and -16.012V.

5 Output Ripple Voltage

The ripple voltage of the positive output is shown in Figure 6 (5V input, 2x300mA load).



Ch1 => output voltage +VOUT

Ch2 => output

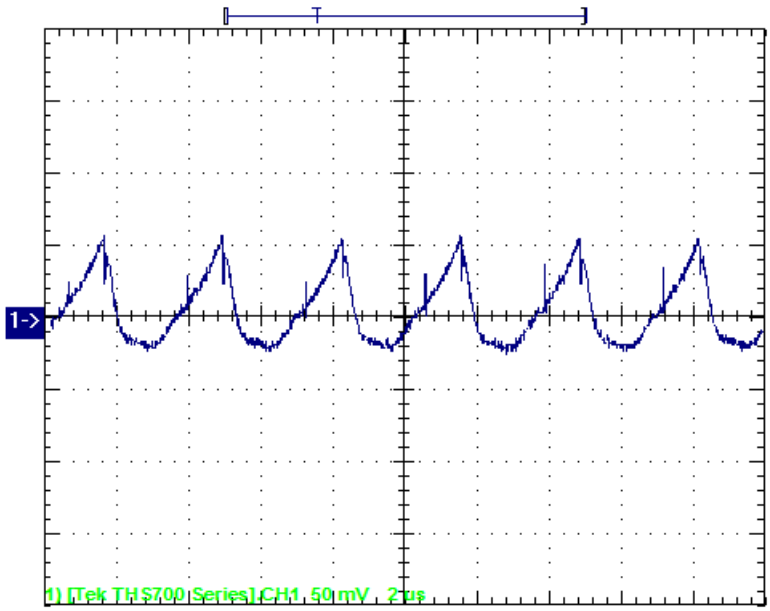
AC coupled

20MHz bw

2µs/div

Figure 6

The ripple voltage of the negative output is shown in Figure 7 (5V input; 2x300mA output).



Ch1 => output voltage -VOUT

AC coupled

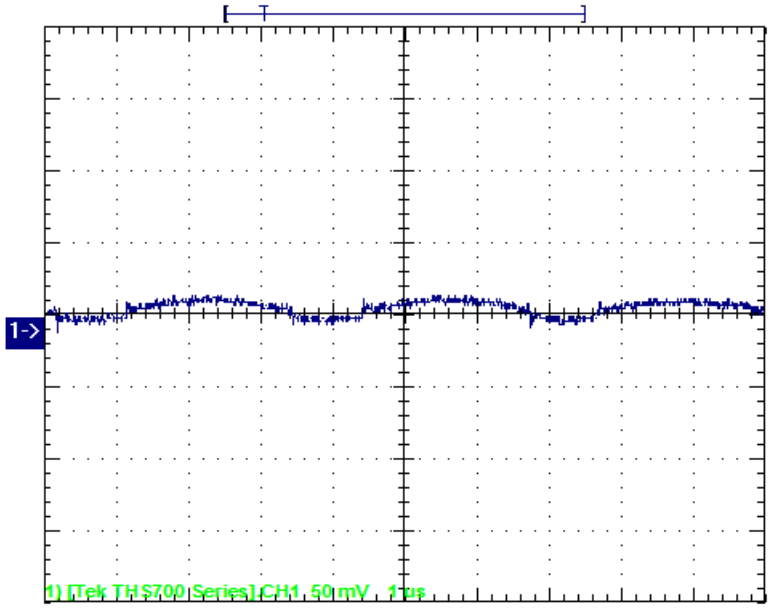
20MHz bw

2µs/div

Figure 7

6 Input Ripple Voltage

The input ripple voltage is shown in Figure 8. (5V input; 2x300mA output).



Ch1 => input voltage

50mV/div

AC coupled

20MHz bw

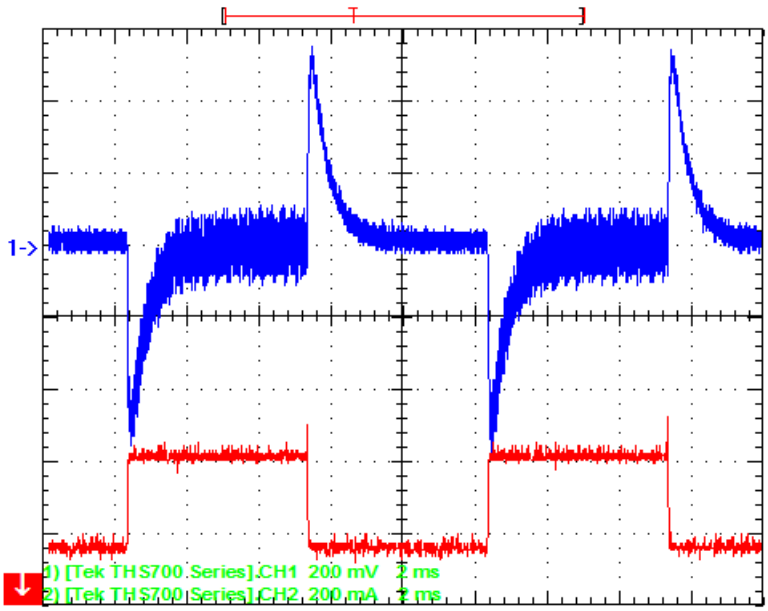
1µs/div

Figure 8

7 Load Transients

7.1 Transient at the positive output

The Figure 9 shows the response to load transients. The load is switching from 140mA to 410mA with a frequency of 100Hz. The input voltage was set to 5V



Ch1 => output voltage (**+VOUT**) 200mV/div

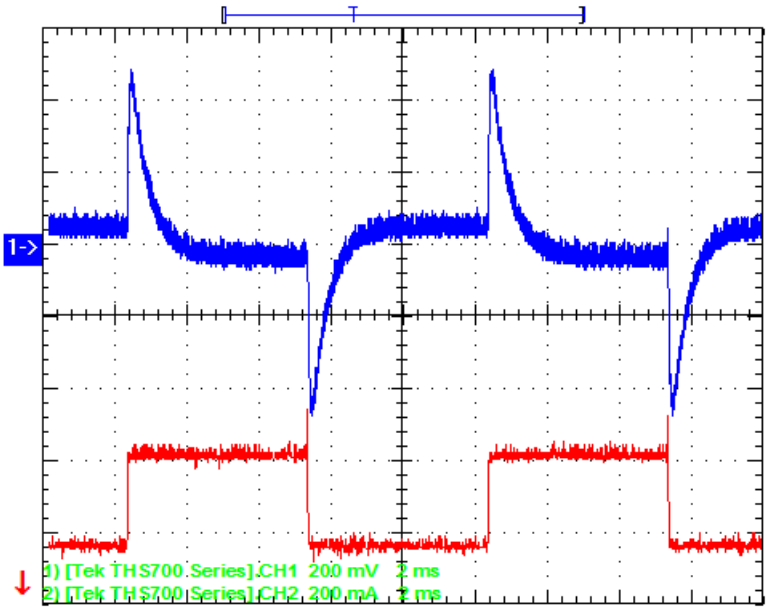
20MHz bandwidth setting

Ch2 => output current 200mA/div

2ms/div

Figure 9

The Figure 10 shows the effect of a load transient at the positive output. The load is switching from 140mA to 410mA with a frequency of 100Hz. The input voltage was set to 5V



Ch1 => output voltage (**-VOUT**) 200mV/div

20MHz bandwidth setting

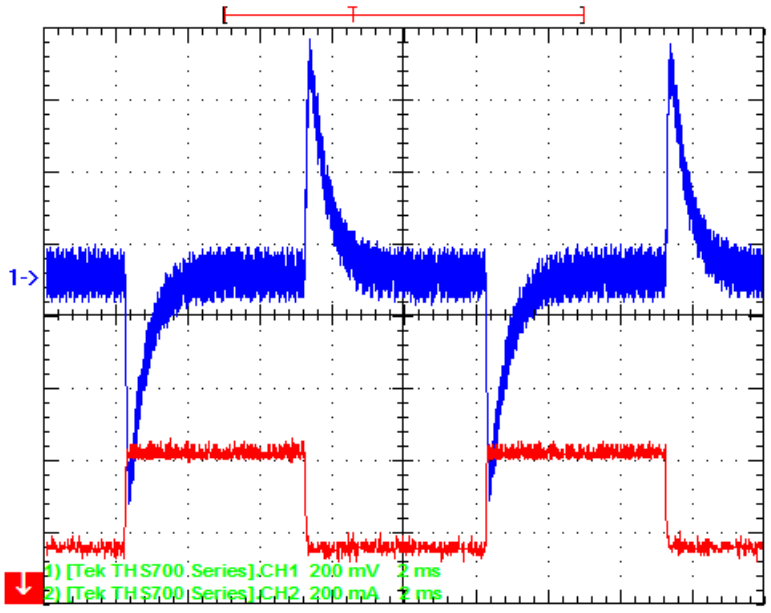
Ch2 => output current 200mA/div

2ms/div

Figure 10

7.2 Transient at the negative output

The Figure 11 shows the effect of a load transients at the negative output. The load is switching from 140mA to 410mA with a frequency of 100Hz. The input voltage was set to 5V



Ch1 => output voltage (**+VOUT**) 200mV/div

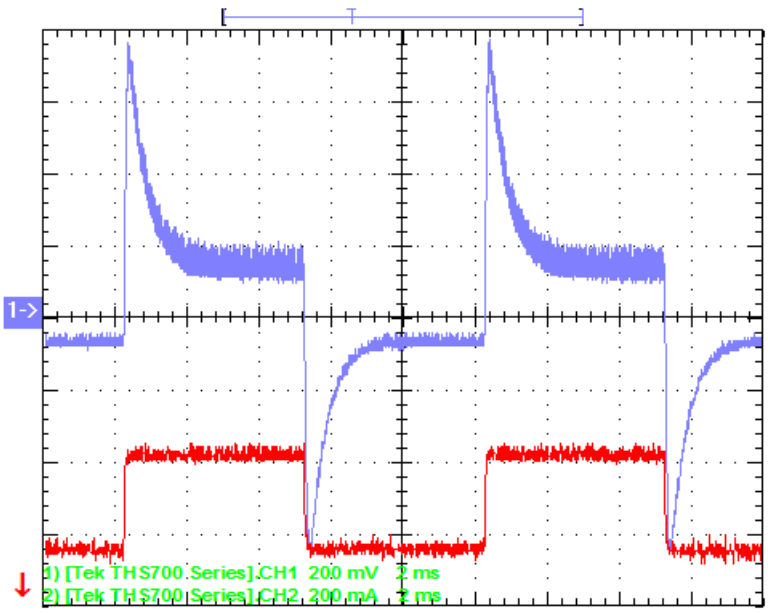
20MHz bandwidth setting

Ch2 => output current 200mA/div

2ms/div

Figure 11

The Figure 12 shows the response to load transients. The load is switching from 140A to 410A with a frequency of 100Hz. The input voltage was set to 5V



Ch1 => output voltage (**-VOUT**) **200mV/div**

20MHz bandwidth setting

Ch2 => output current 500mA/div

2ms/div

Figure 12

8 Control Loop Frequency Response

Figure 13 shows the loop response. 2x 300mA-load applied. The input voltage was set to 4.5V worst case.

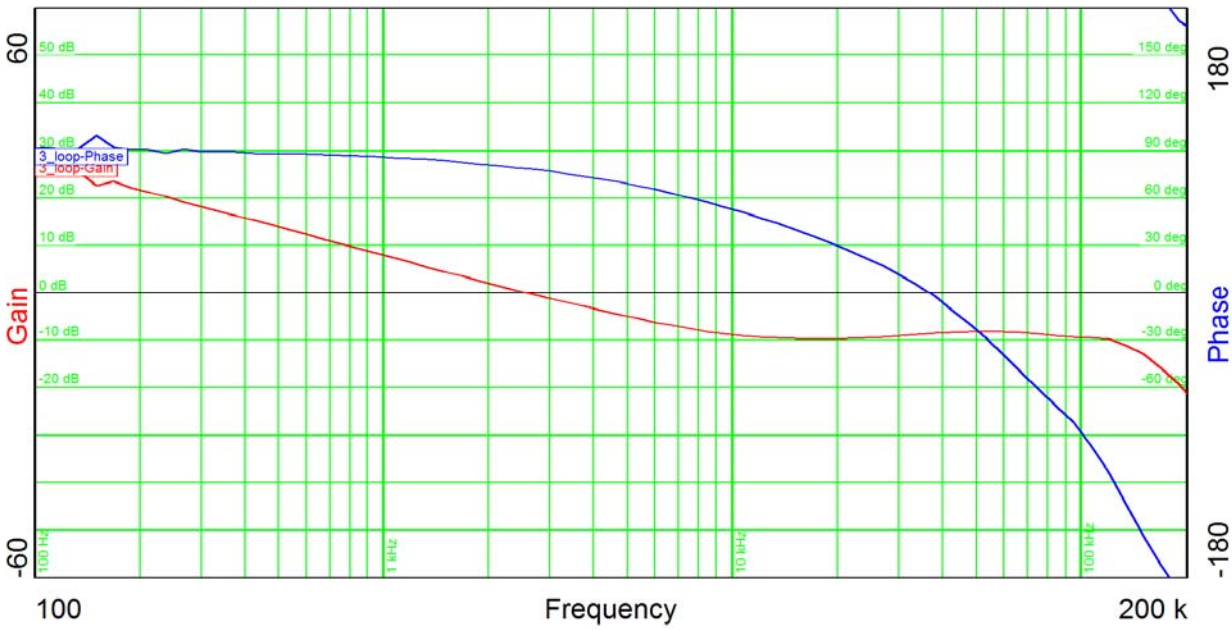


Figure 13

Table 1 summarizes the results from Figure 13.

Vin	4.5V
Bandwidth (kHz)	2.58
Phase margin	78.6°
slope (20dB/decade)	-0.97
gain margin (dB)	-8.69
slope (20dB/decade)	+0.31
freq (kHz)	36.4

Table 1

9 Miscellaneous Waveforms

The waveform of the voltage on switchnode (drain to source) is shown in Figure 14. Input voltage was set to 5V and output current to 2 x 300mA.

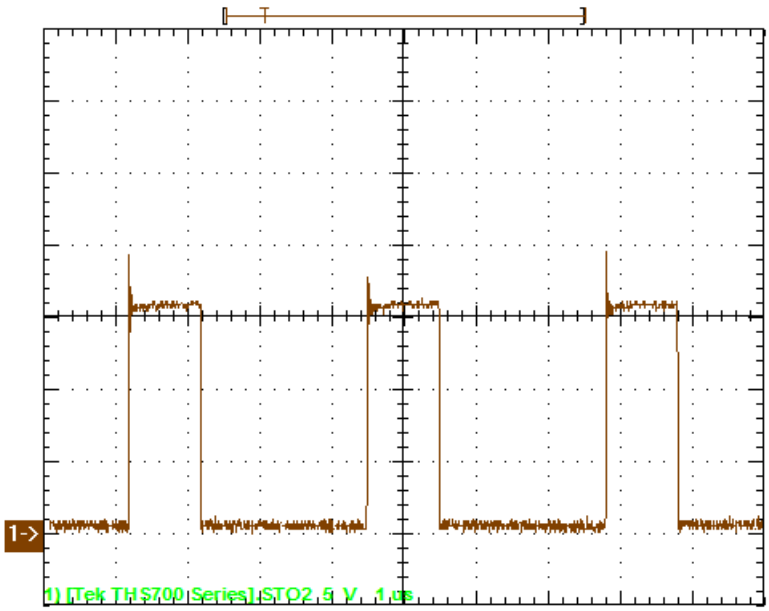
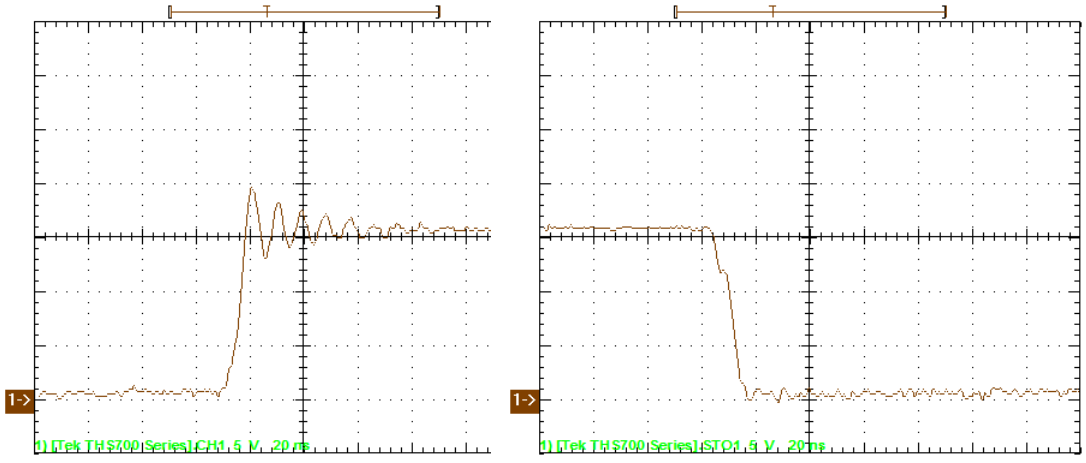
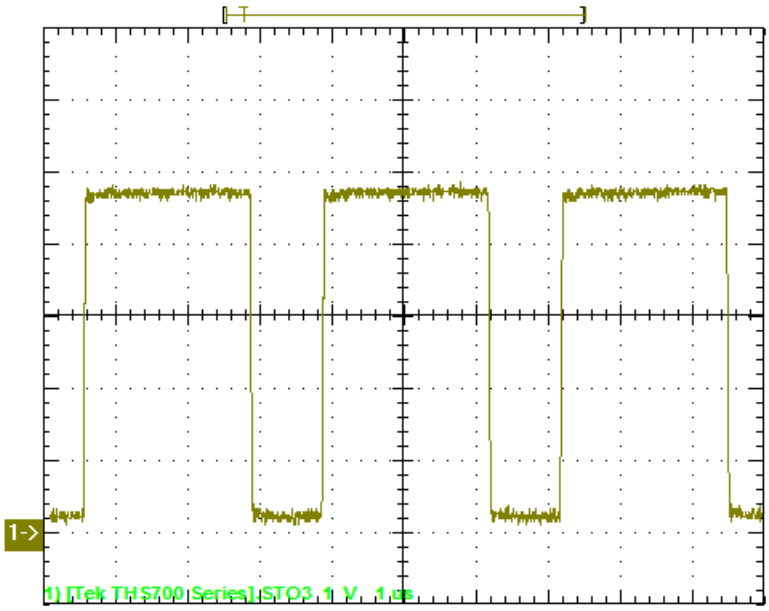
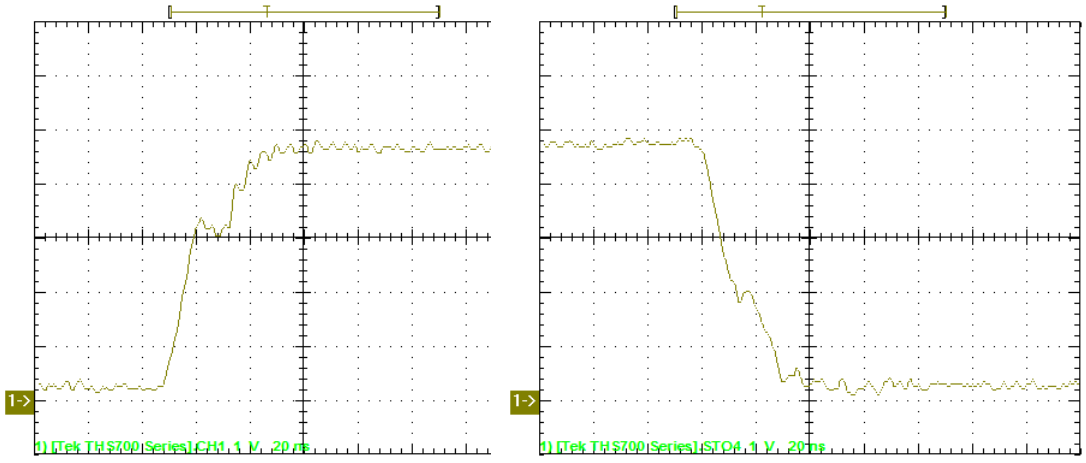
	Ch1 => 2V/div 1µns/div full bandwidth
	Ch1 => 5V/div 20ns/div

Figure 14

The waveform of the voltage on the gate to source is shown in Figure 15. Input voltage was set to 5V and output current to 2x300mA.



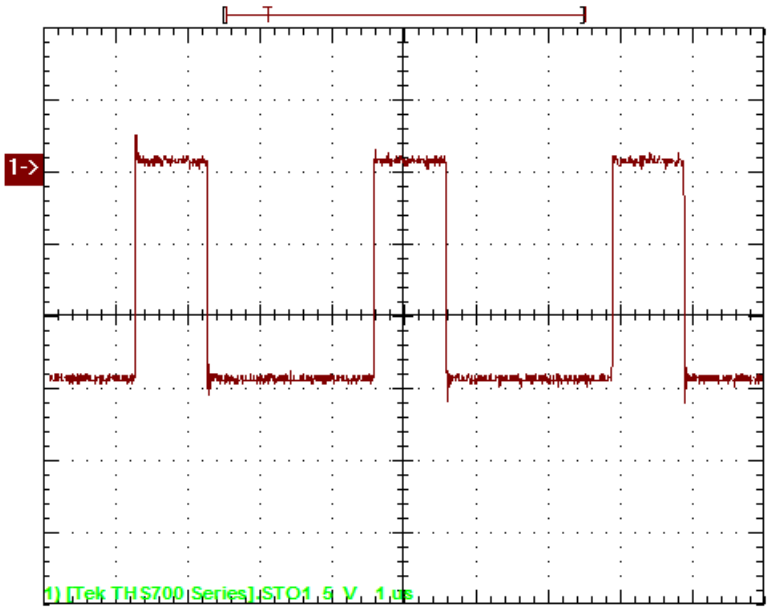
Ch1 =>
1V/div
1µs/div
full bandwidth



Ch1 =>
1V/div
20ns/div

Figure 15

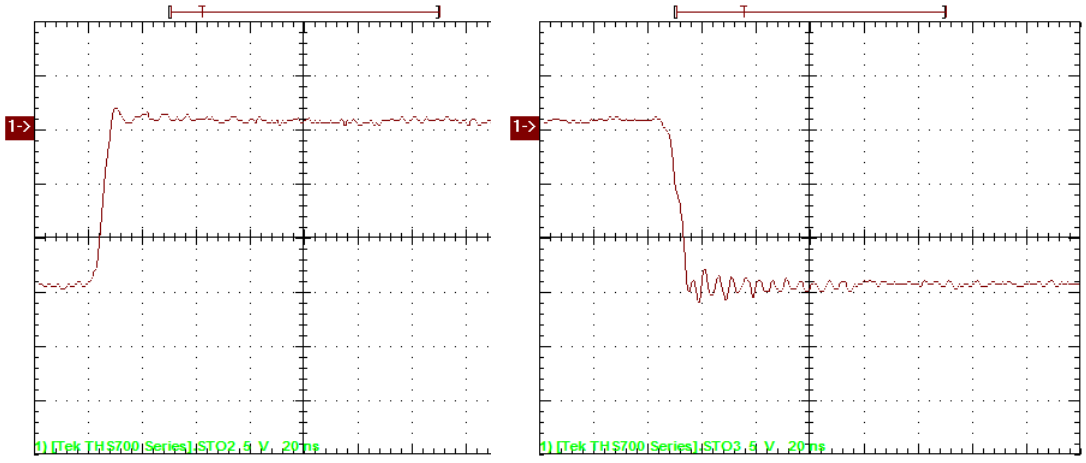
The waveform of the voltage on D103 is shown in Figure 16. Input voltage was set to 5 and output current to 2x300mA.



Ch1 =>
5V/div

500ns/div

full bandwidth



Ch1 =>
5V/div
20ns/div

Figure 16

10 Thermal Image

Figure 17 shows the thermal image at full load, R11 is current sense resistor:

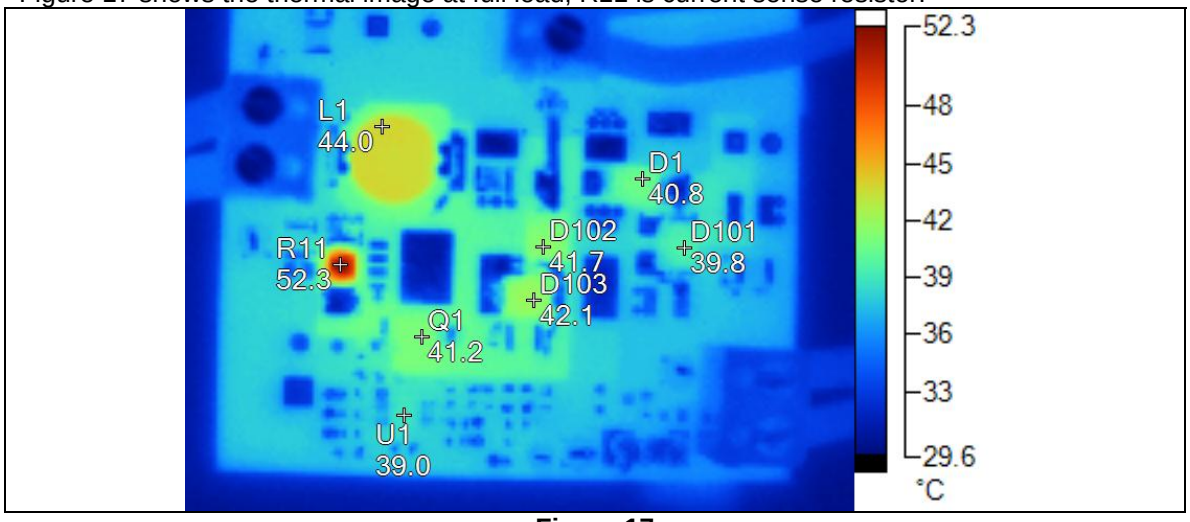


Figure 17

Name	Temperature
R11	52.3°C
L1	44.0°C
D103	42.1°C
D102	41.7°C
Q1	41.2°C
U1	39.0°C
D101	39.8°C
D1	40.8°C

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