PMP7094RevB Test Results

Topology: Active Clamp Forward
Device: UCC2897A, TLV431A

1 Startup

The startup waveform is shown in the Figure 1. The input voltage was set at 48V, with 15A load at the output.

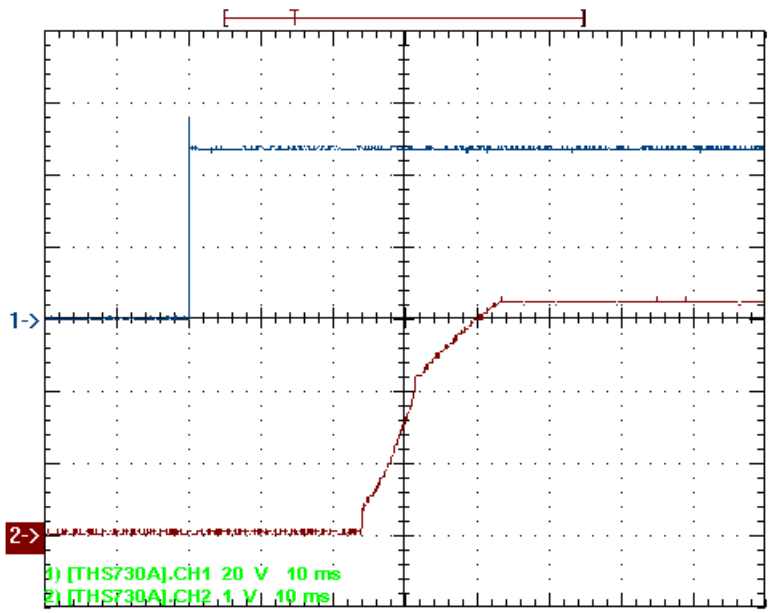


Figure 1

Ch1=> input voltage 20V/div

Ch2=> output voltage 1V/div

10ms/div

2 Shutdown

The shutdown waveform is shown in the Figure 2. The input voltage was set at 48V, with 15A load on the output.

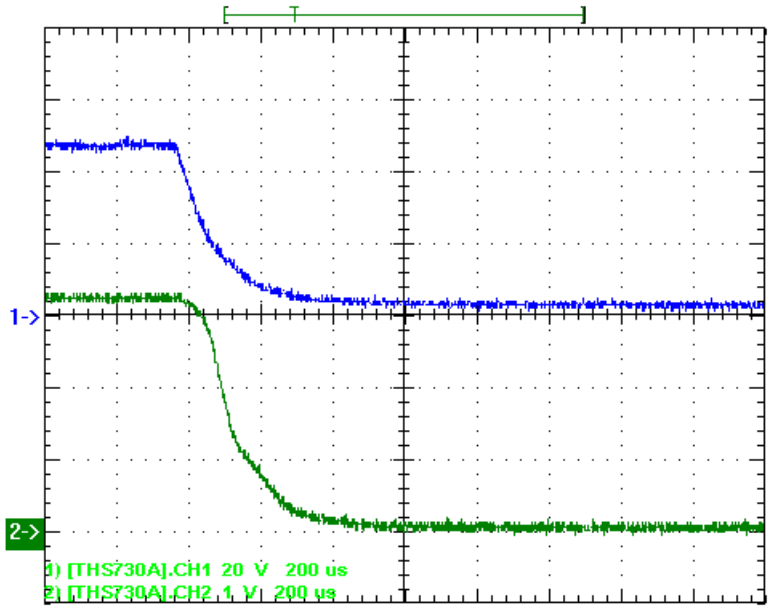


Figure 2

Ch1=> input voltage 20V/div

Ch2=> output voltage @ 15A Iout 1V/div

200µs/div

3 Efficiency

The efficiency is shown in the Figure 3 below. The curves represent different input voltages.

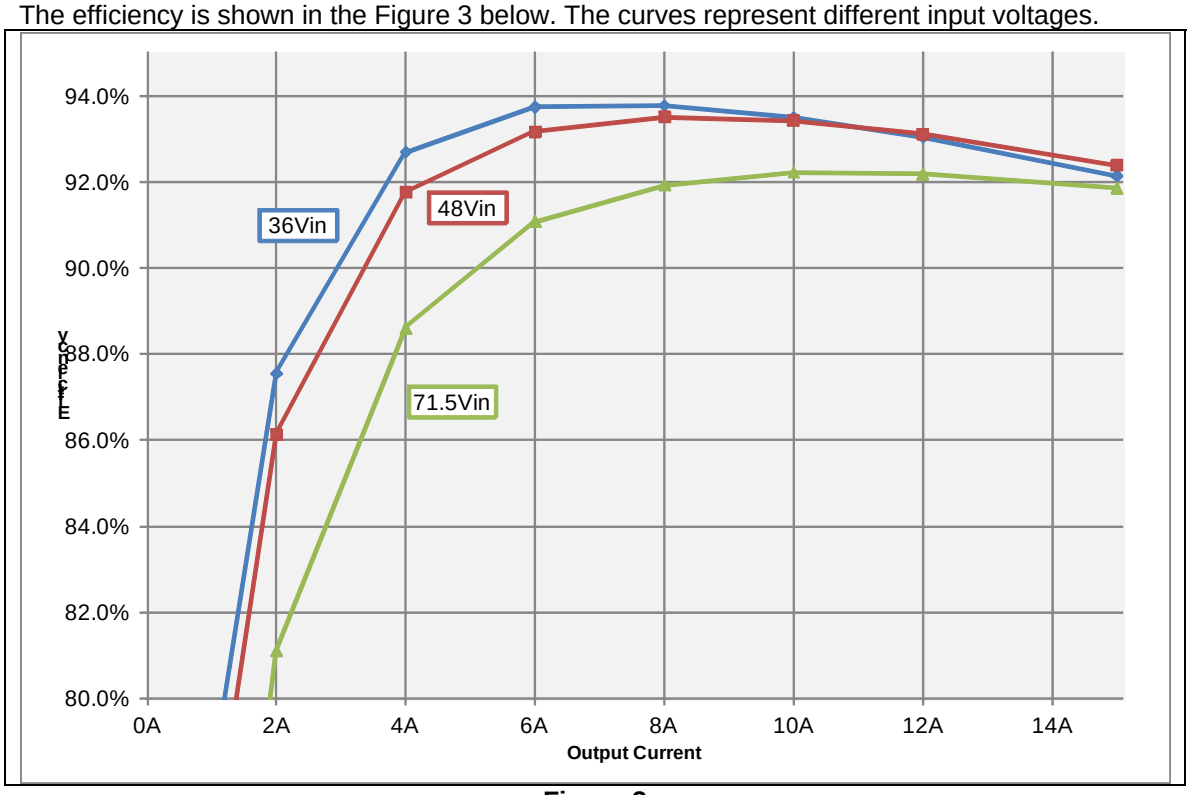


Figure 3

4 Load Regulation

The load regulation of the output is shown in the Figure 4 below. The curves represent different input voltages.

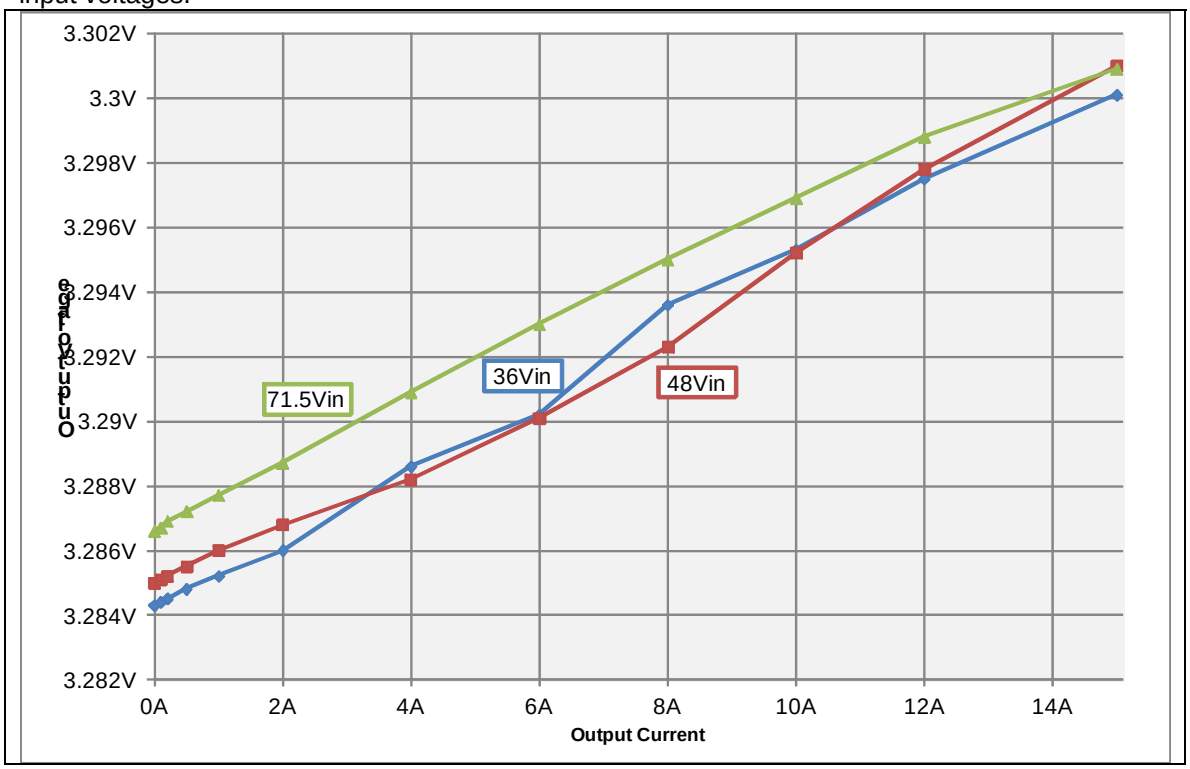


Figure 4

5 Line Regulation

The dependency of the output voltage to the input voltage shows Figure 5. The current was set to 15A.

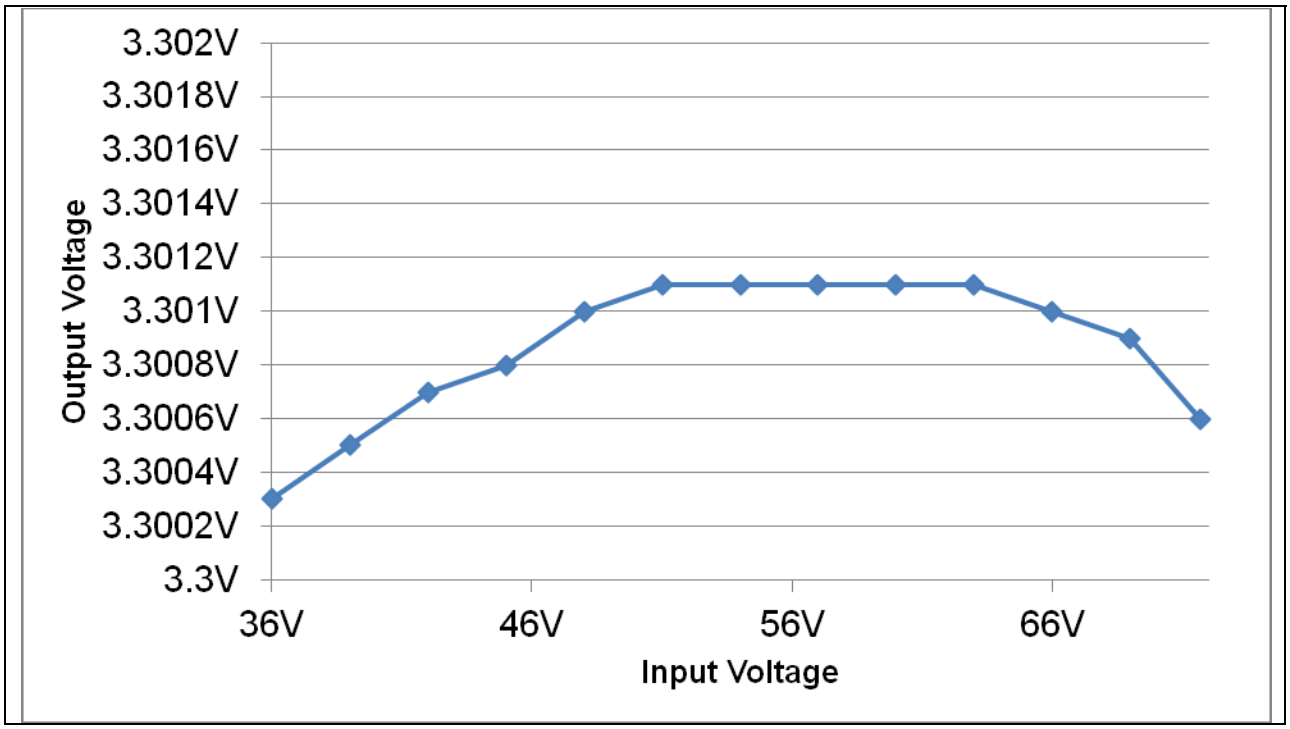


Figure 5

With the measurement above also the efficiencies were calculated.

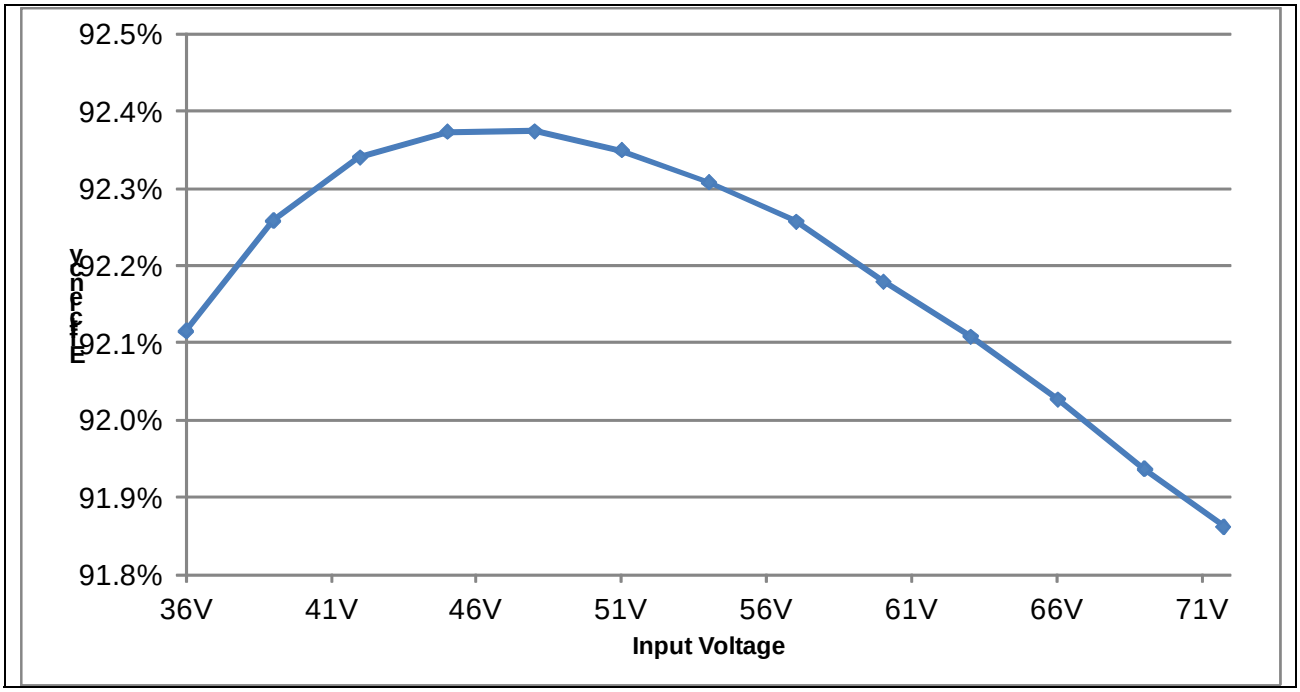


Figure 6

6 Ripple Voltage

The output ripple voltage is shown in Figure 7. The image was taken with a 15 A load and 36, 48V and 72V at the input. Curves were captured separately.

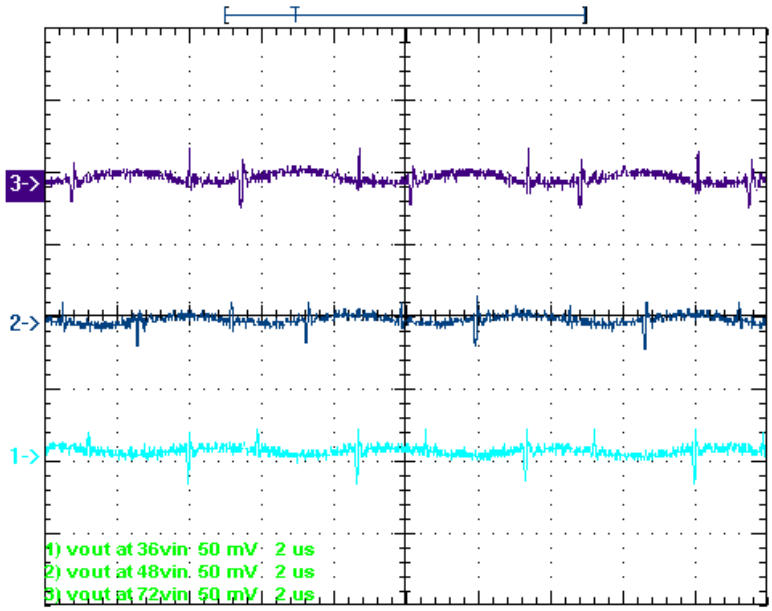


Figure 7

Ch3 => output voltage @72V input

Ch2 => output voltage @48V input

Ch1 => output voltage @ 36V input

50mV/div
AC coupled

20MHz bandwidth setting

2µs/div

The input ripple voltage is shown in Figure 8. The image was taken with a 15 A load and 36, 48V and 72V at the input. Curves were captured separately – no additional bulk cap.

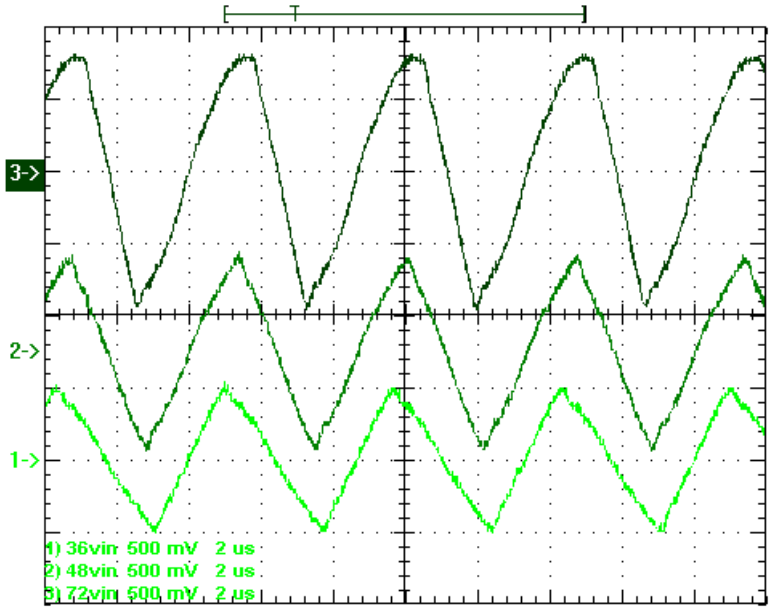


Figure 8

Ch3 => input voltage @72V input

Ch2 => output voltage @48V input

Ch1 => output voltage @ 36V input

50mV/div

20MHz bandwidth setting
2µs/div

7 Control Loop Frequency Response

Figure 9 shows the loop response with 15A load and 48V input.

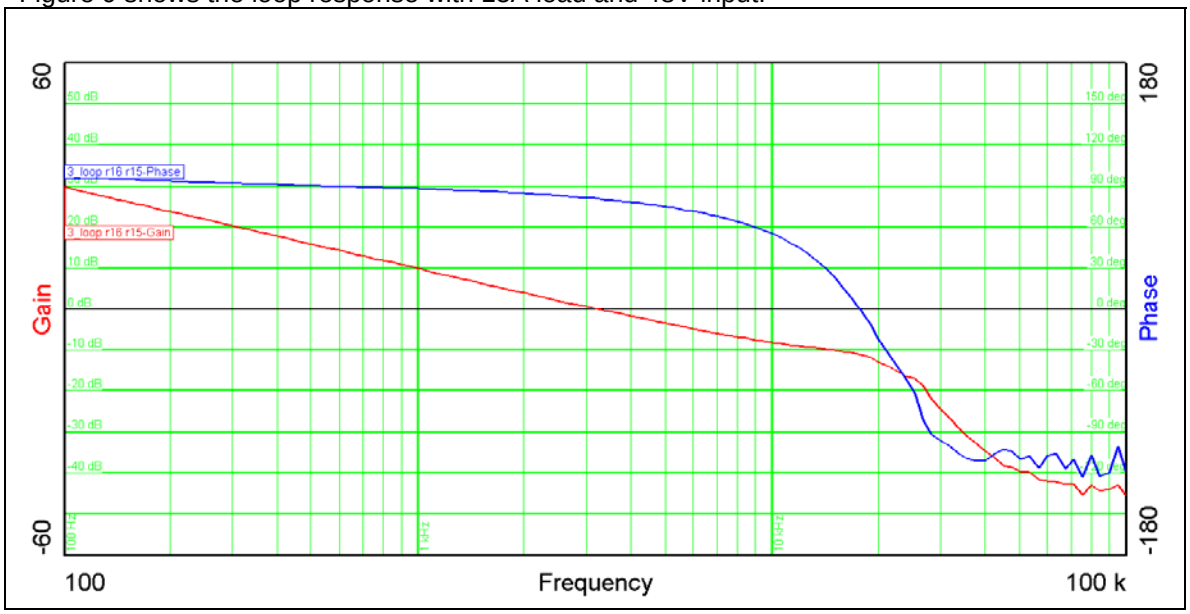


Figure 9

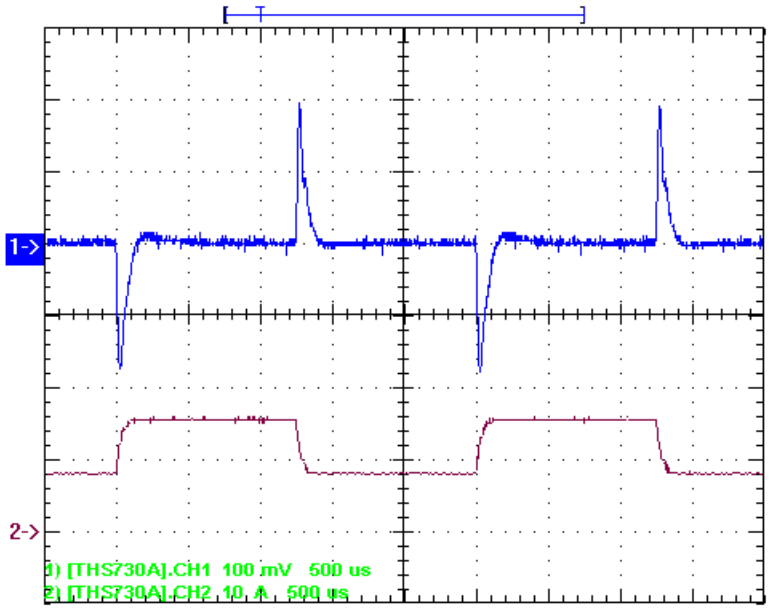
Table 1 summarizes the results from Figure 9

Bandwidth (kHz)	3.2
Phasemargin	80.8
slope (20dB/decade)	-0.95
gain margin (dB)	-11.2
slope (20dB/decade)	-1.11
freq (kHz)	17.7

Table 1

8 Load Transients

The Figure 10 shows the response to load transients. The load is switching from 7.5A to 15A.with 400Hz frequency. The input voltage was set to 48V



Ch2 => output voltage 100mV/div

20MHz bandwidth setting

Ch1 => output current 10A/div

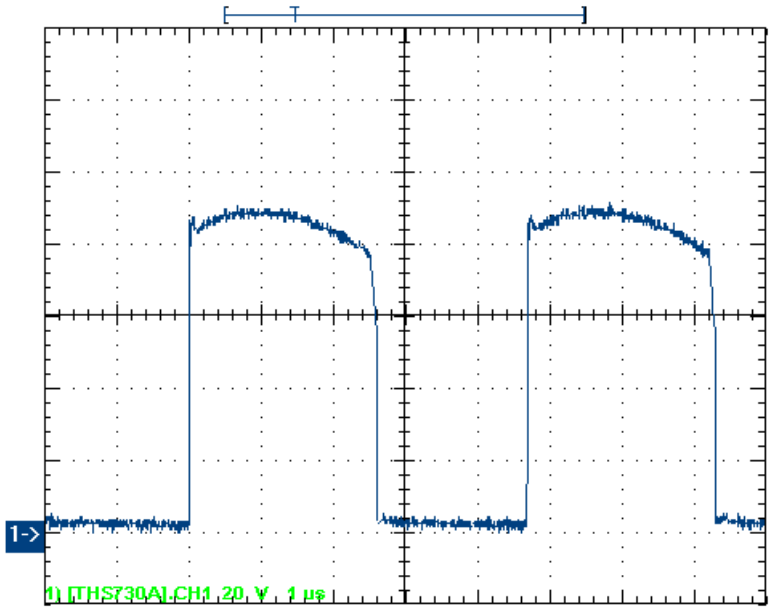
500µs/div

Figure 10

9 Miscellaneous Waveforms

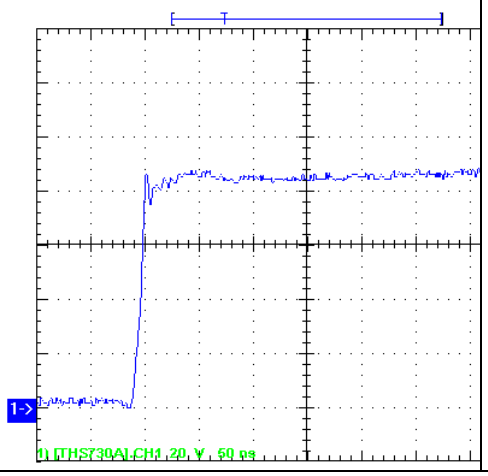
9.1 Switch node primary side

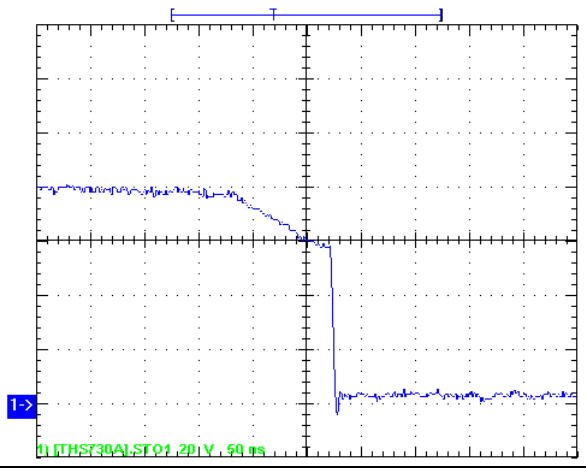
With input voltage set to 48V and 15A Iout results in the waveform shown in Figure 11 (primary side).



Ch1 =>
20V/div

1µs/div



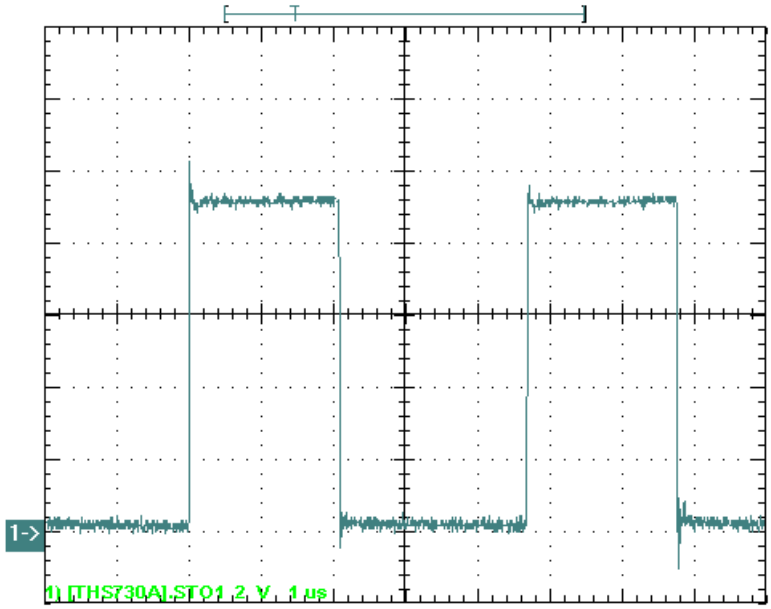


Ch1 =>
20V/div
50ns/div

Figure 11

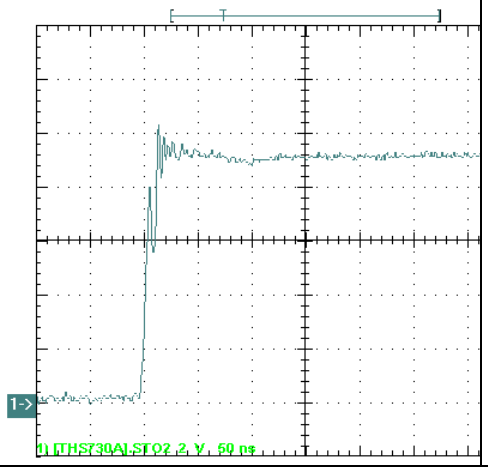
9.2 Gate of primary MOS-FET

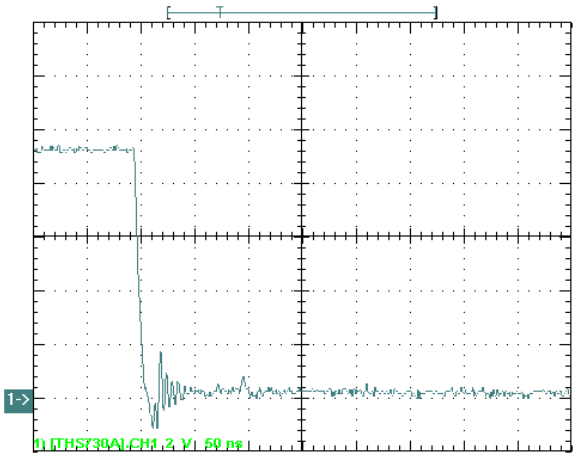
With input voltage set to 48V and 15A Iout results in the waveform shown in Figure 11 (primary side).



Ch1 =>
2V/div

1µs/div





Ch1 =>
20V/div
50ns/div

Figure 12

9.3 Active clamp

The waveform of the active clamp transistor is shown in **Figure 13**.(the same setup as above)

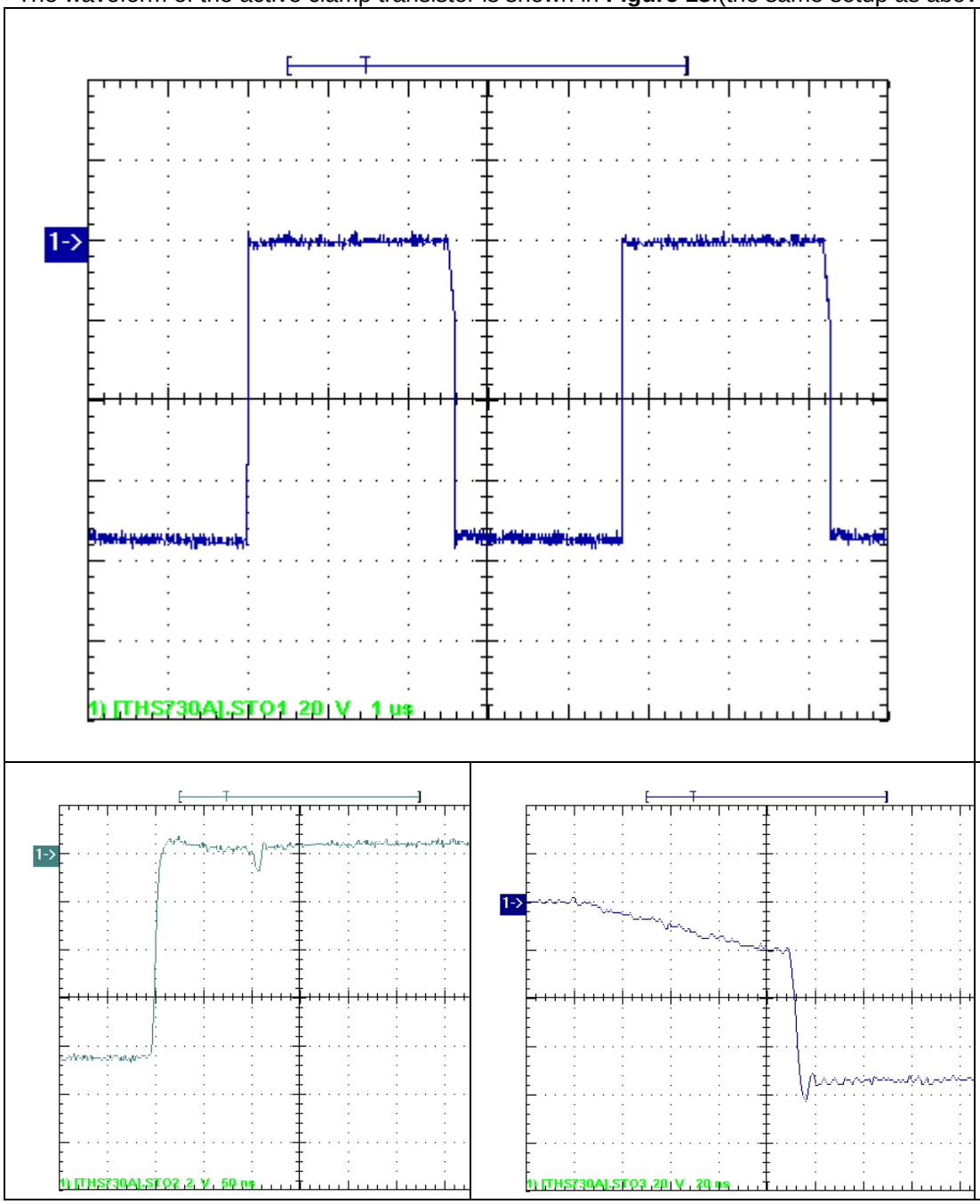
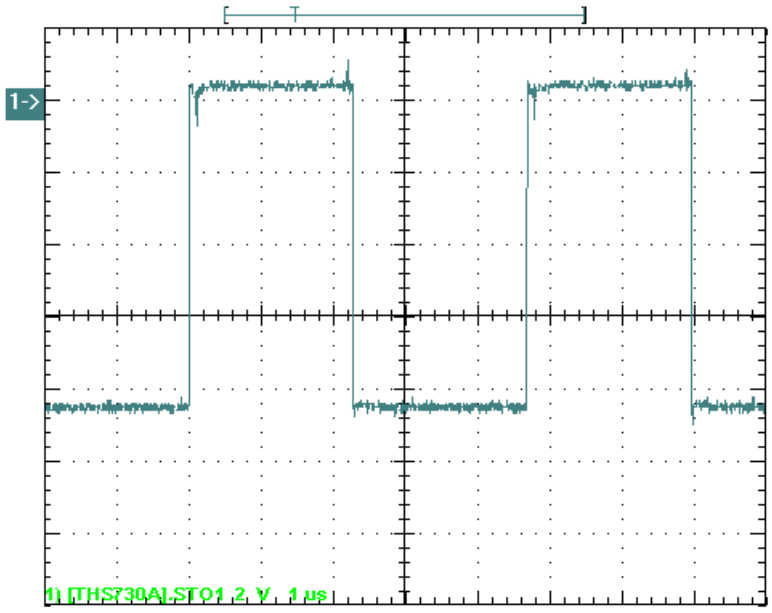


Figure 13

9.4 Active Clamp Gate

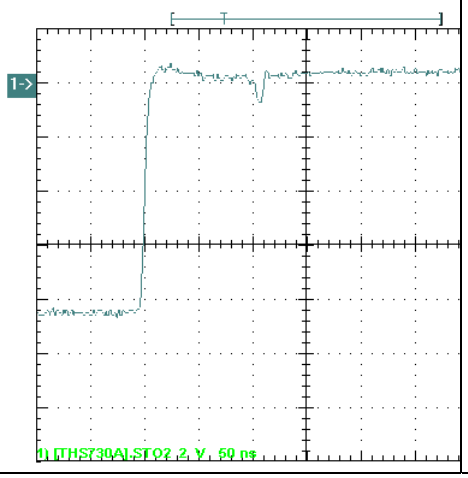
The waveform of the active clamp transistor is shown in Figure 14.

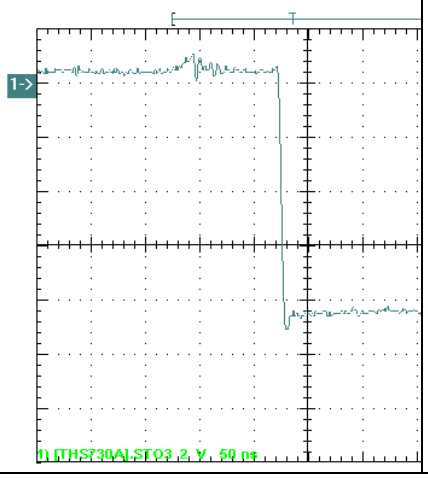


Ch1=>2V/div

1µs/div

full bandwidth





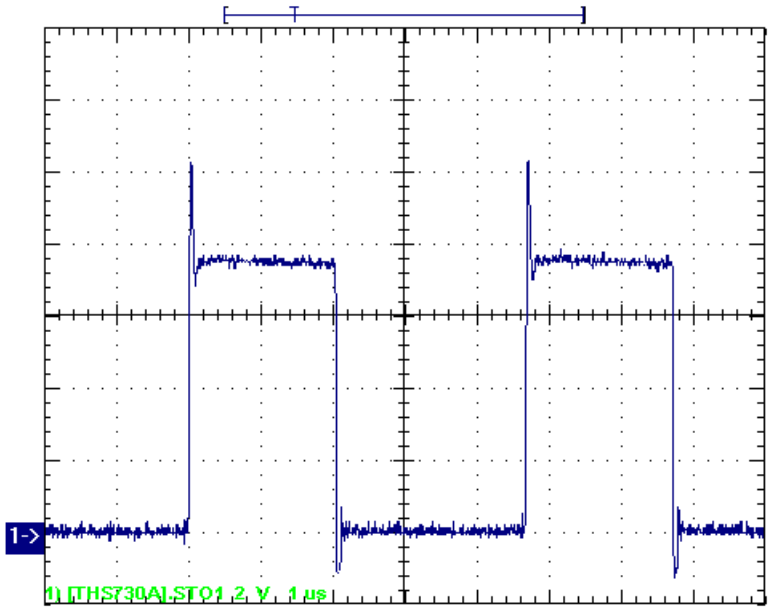
Ch1=>2V/div

50ns/div
full bandwidth

Figure 14

9.5 Secondary Switch node

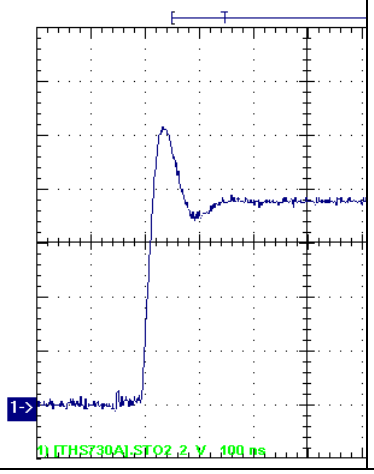
The waveform of the secondary side switchnode is shown in Figure 15.

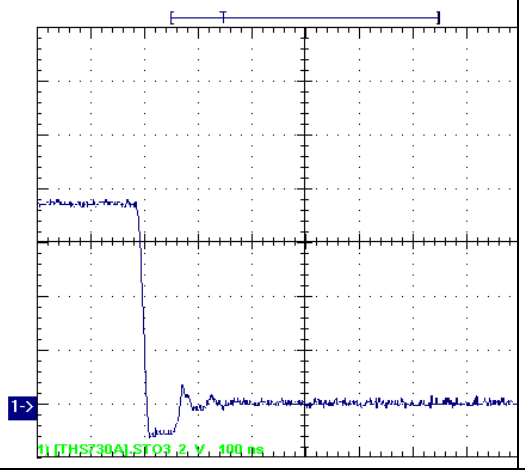


Ch1=>2V/div

1µs/div

full bandwidth





Ch1=>2V/div

100ns/div
full bandwidth

Figure 15

9.6 Q1 gate

The waveform of Q1 gate is shown in Figure 16

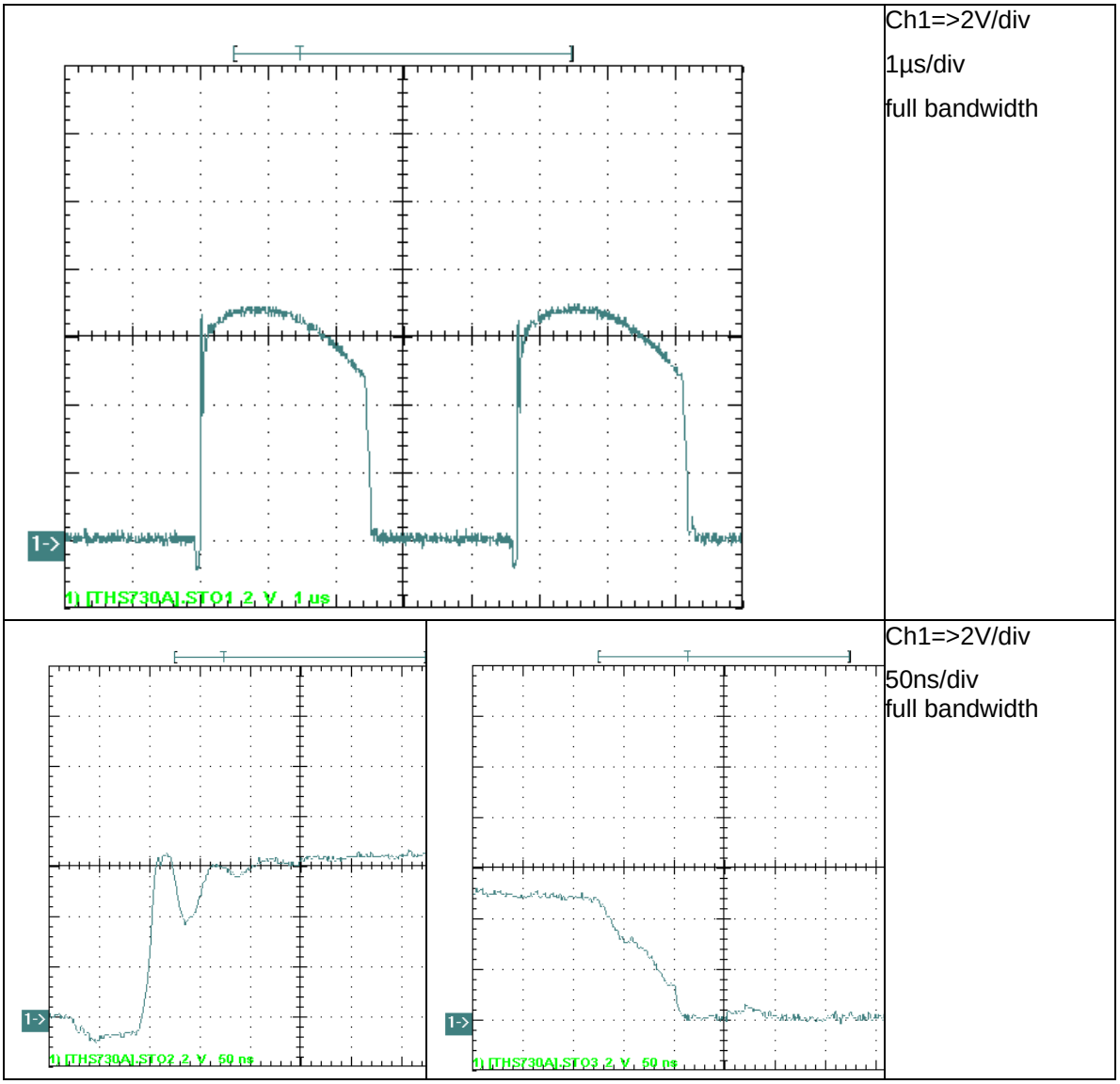
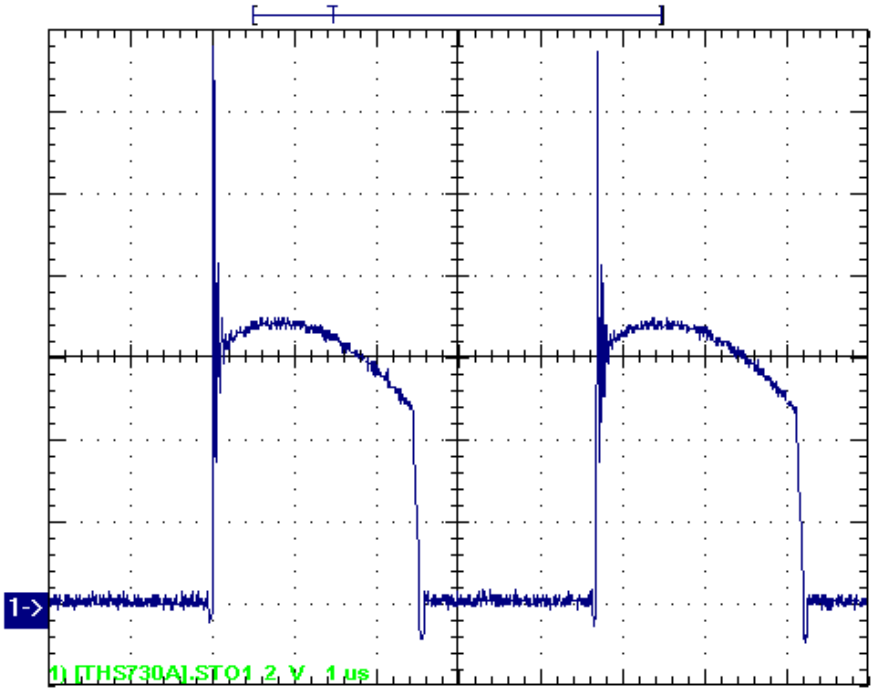


Figure 16

9.7 Q2

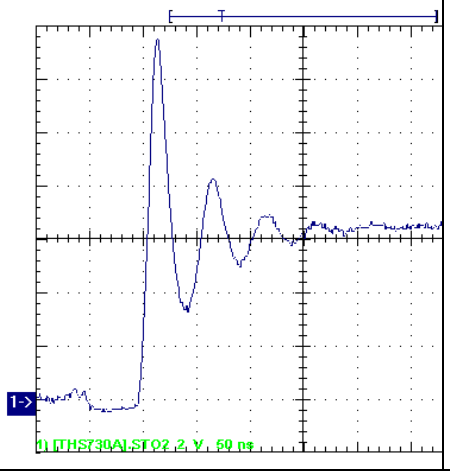
The waveform of the Q2 is shown in Figure 17.

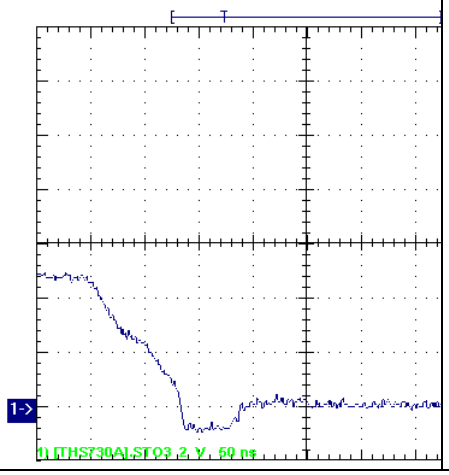


Ch1=>2V/div

1µs/div

full bandwidth



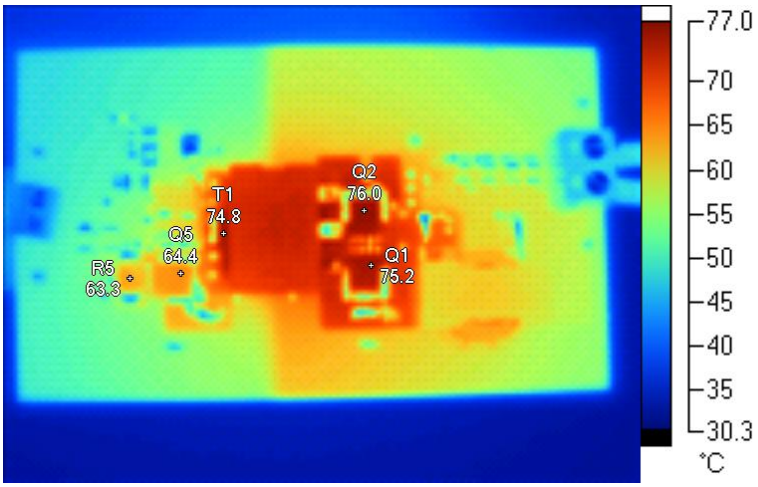


Ch1=>2V/div

50ns/div
full bandwidth

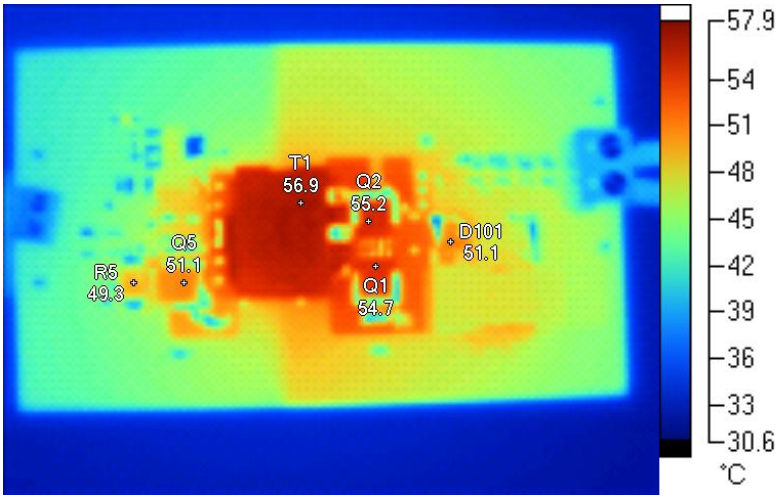
Figure 17

10.1 Thermal Images, here full load 15Amps, natural convection:



Name	Temperature
Q2	76.0°C
Q1	75.2°C
T1	74.8°C
Q5	64.4°C
R5	63.3°C

10.2 Thermal Images, here 10Amps load, natural convection:



Name	Temperature
T1	56.9°C
Q2	55.2°C
Q1	54.7°C
Q5	51.1°C
R5	49.3°C
D101	51.1°C

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