PMP30210RevB Test Results

TEXAS INSTRUMENTS

Topology: SEPIC
Device: LM5122
Switching frequency 301kHz
On 5V
Off 3.8V
On 4V (from VIN > ~1.7V)
 Unless otherwise mentioned the output current was set to 1A (with resistor) and the mode was set to forced PWM
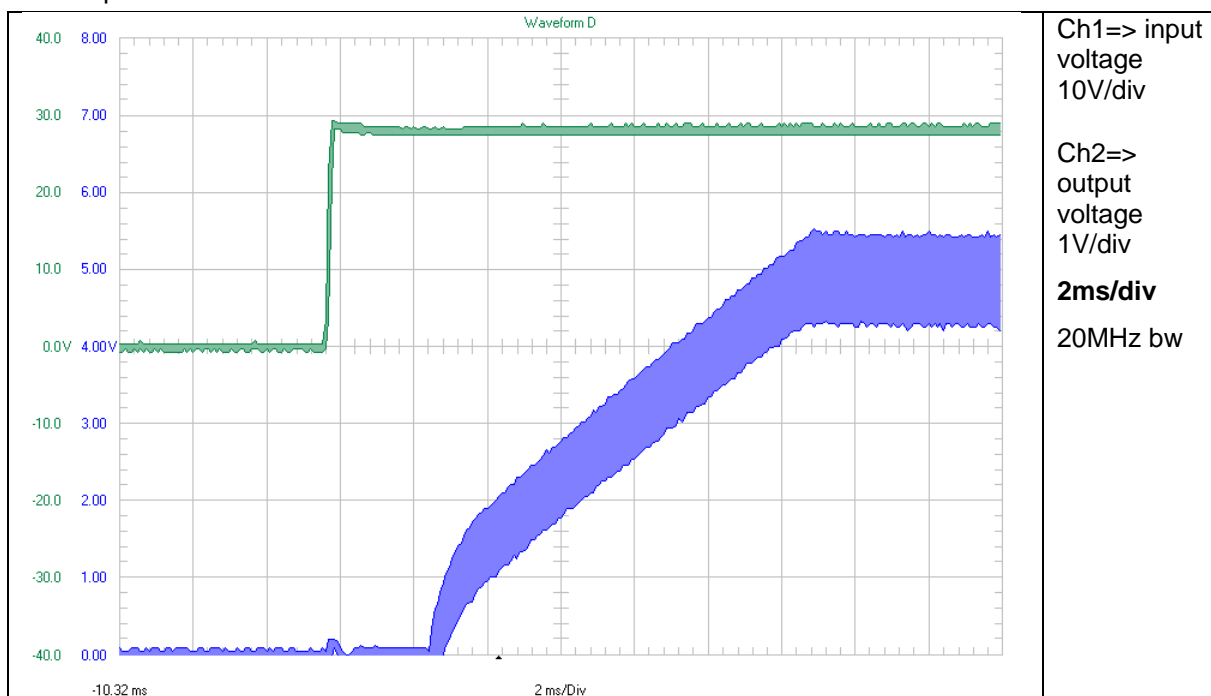
PMP30210RevB Test Results

TEXAS
INSTRUMENTS

1   Startup

The startup waveform is shown in the Figure 1. The input voltage was set to 14V, with 1A load (resistor) at the output.

Ch1=> input voltage 5V/div

Ch2=> output voltage 1V/div

2ms/div

20MHz bw
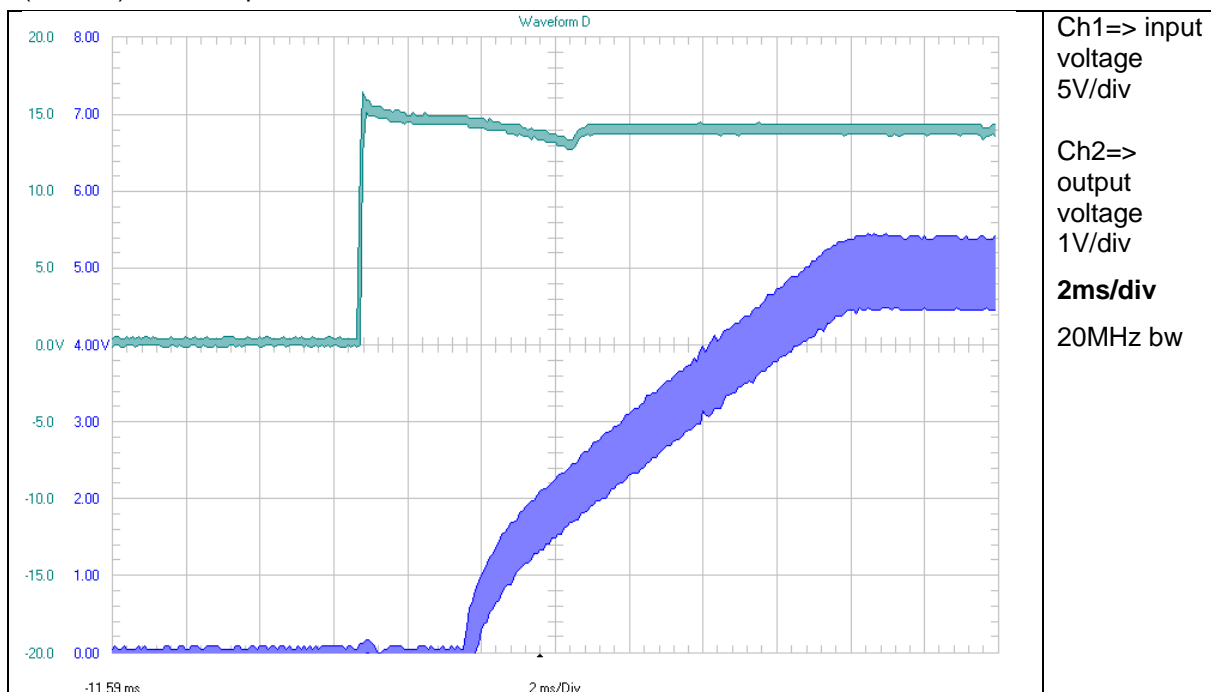
Figure 1

The startup waveform is shown in the Figure 2. The input voltage was set to 28V, with 1A load at the output.

Ch1=> input voltage 10V/div

Ch2=> output voltage 1V/div

2ms/div

20MHz bw

Figure 2

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2 Shutdown

The shutdown waveform is shown in the Figure 3. The input voltage was set to 14 V, with 1A load on the output. The power supply was disconnected**.**
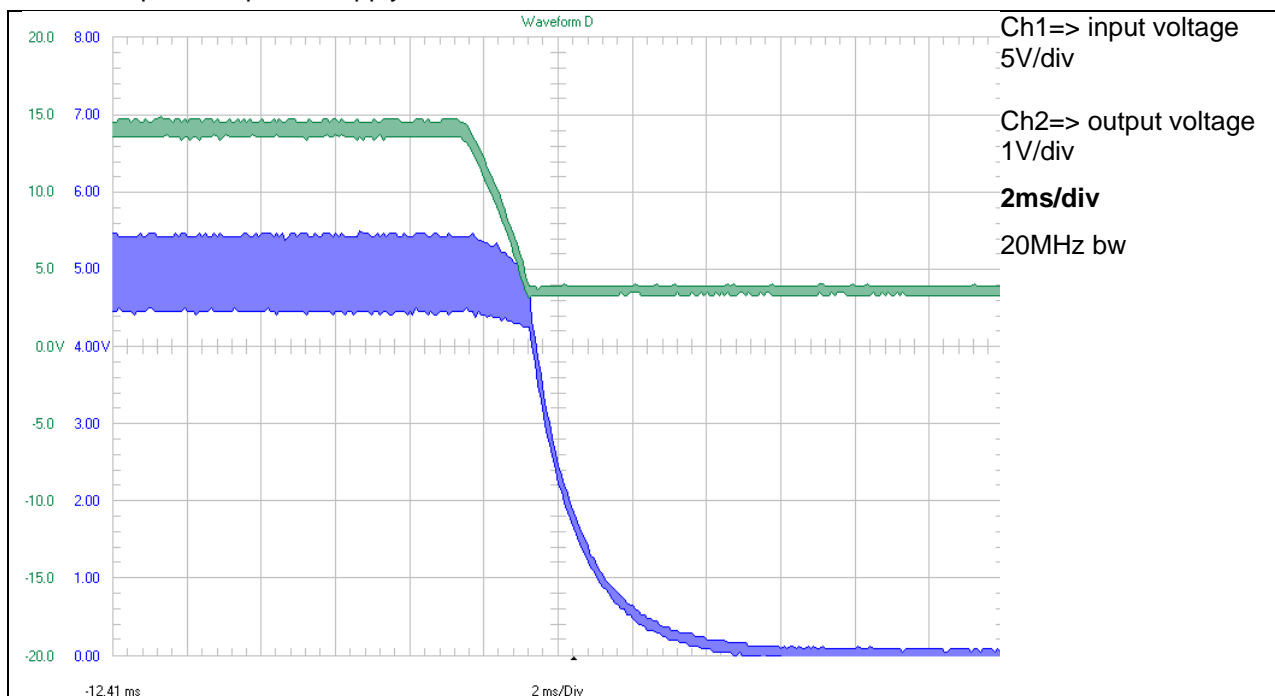

Ch1=> input voltage 5V/div

Ch2=> output voltage 1V/div

2ms/div

20MHz bw

Figure 3

The shutdown waveform is shown in the Figure 4. The input voltage was set to 28V, with 1A load on the output. The power supply was disconnected.
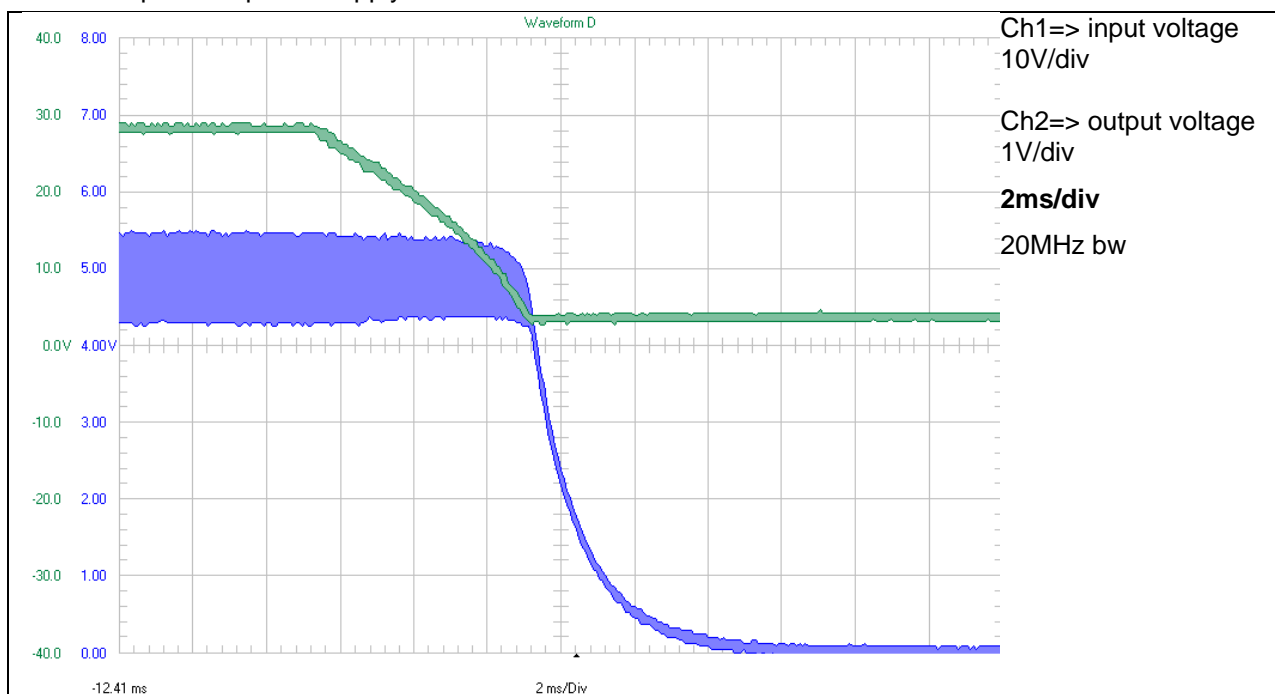

Ch1=> input voltage 10V/div

Ch2=> output voltage 1V/div

2ms/div

20MHz bw

Figure 4

Power Management Solutions

3   Efficiency

3.1   Diode Emulation

The efficiency and loss (PIN-POUT) is shown in the Figure 5 below. The input voltage was set to 4V, 14V and 28V. The mode was set to **diode emulation**.
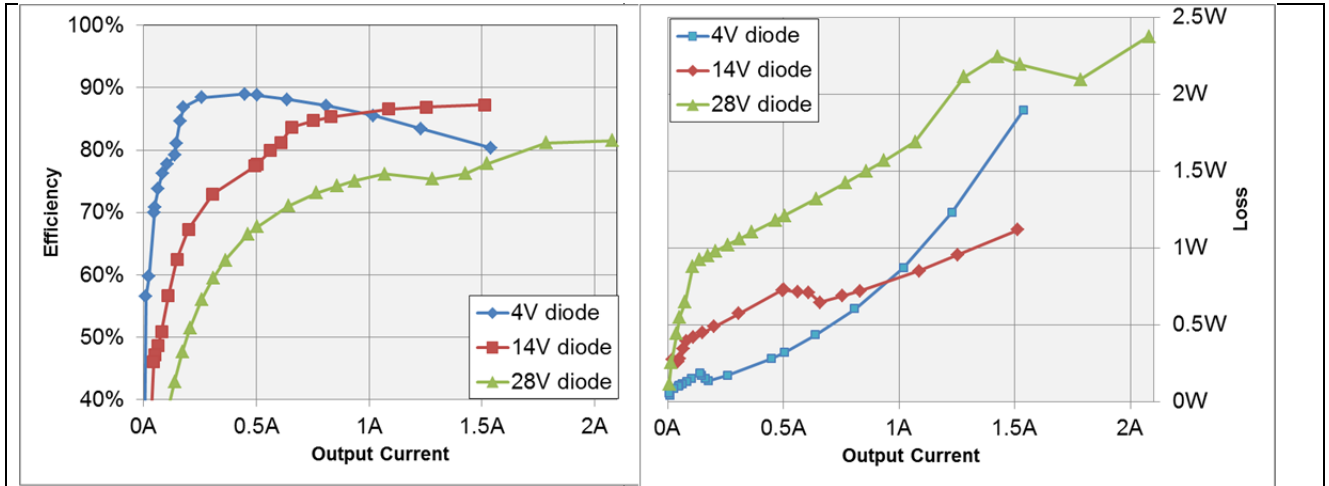

Figure 5

The efficiency and loss (PIN-POUT) is shown in the Figure 6 below. The input voltage was set to 4V, 14V and 28V. The mode was set to **forced PWM**.
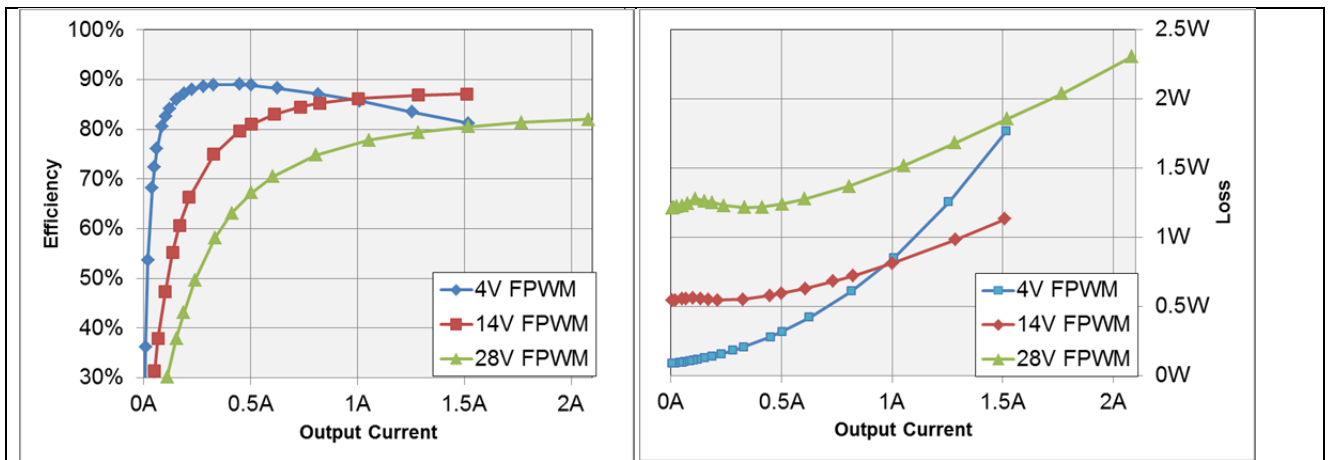

Figure 6

4 Load Regulation

The load regulation of the output is shown in the Figure 7 below. The input voltage was set to 4V, 14V and 28V.

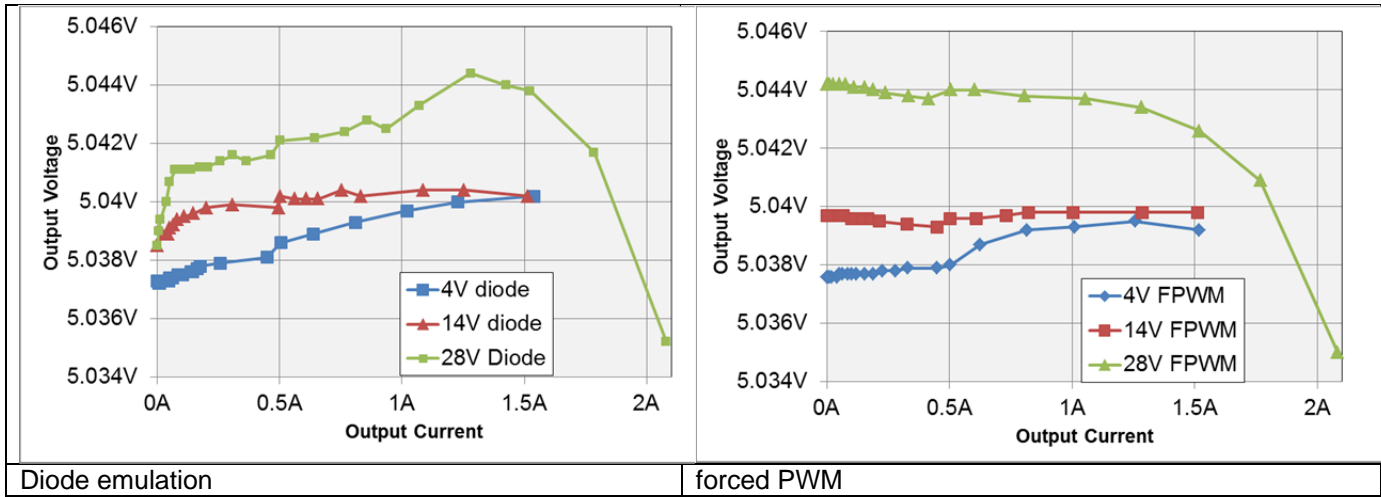| Diode emulation | forced PWM |

Figure 7

5 Line Regulation

The line regulation is shown in Figure 8. The output current was set about 1A.
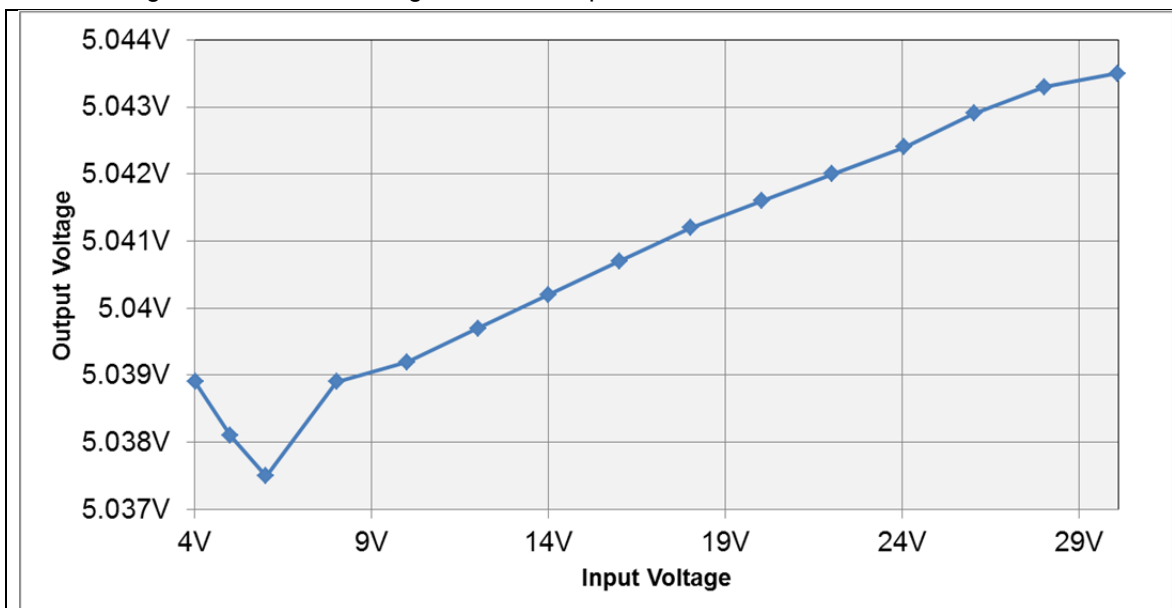
Figure 8

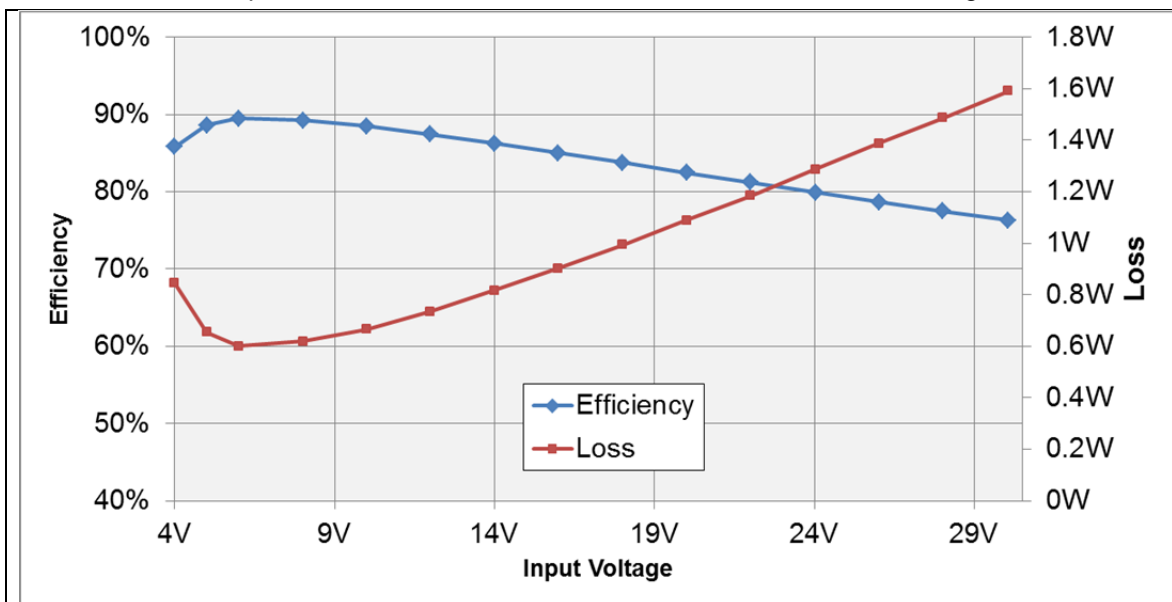With the same setup efficiencies and losses were calculated. This is shown in Figure 9

Figure 9

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6   Output Ripple Voltage

The output ripple voltage is shown in Figure 10. Input voltage was set to 14V
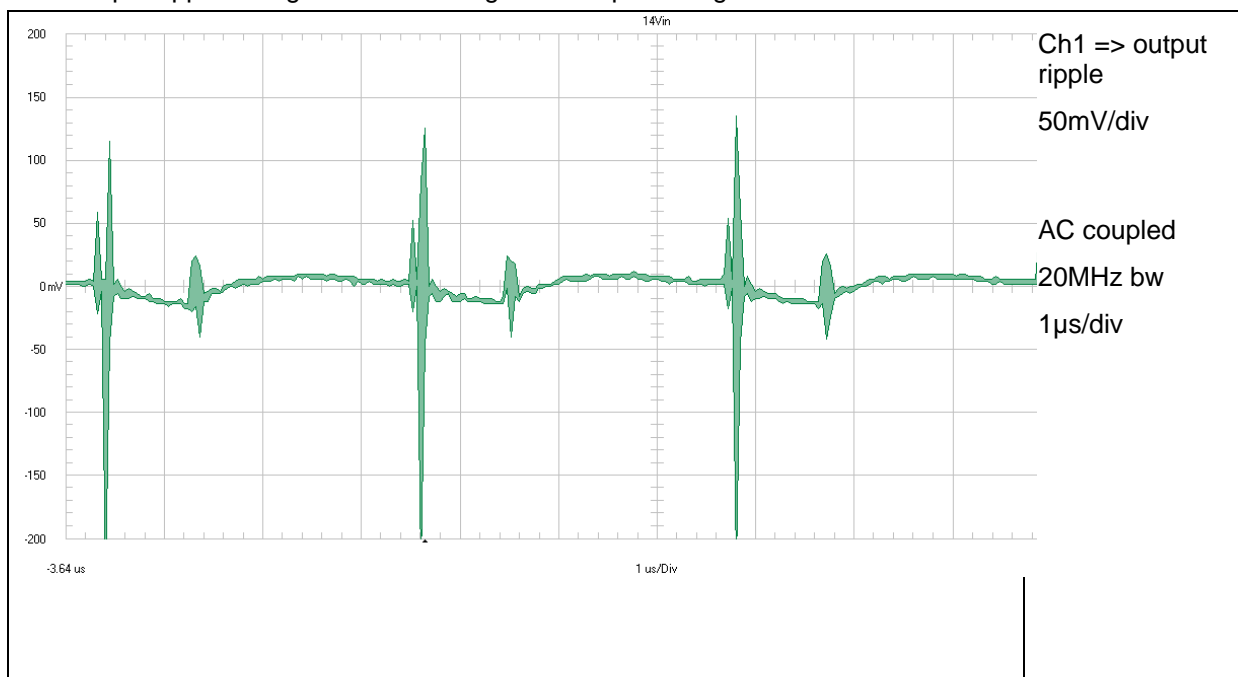

Figure 10

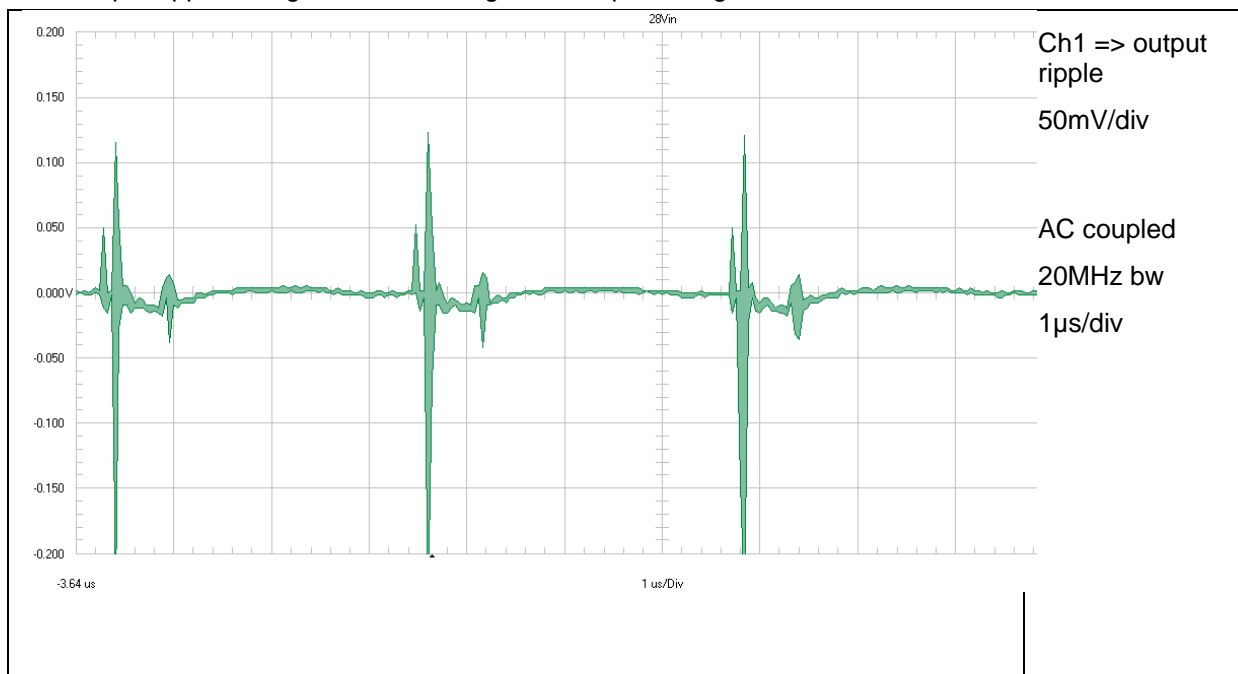The output ripple voltage is shown in Figure 11. Input voltage was set to 28V

Figure 11

7   Input Ripple Voltage

The input ripple voltage is shown in Figure 12.
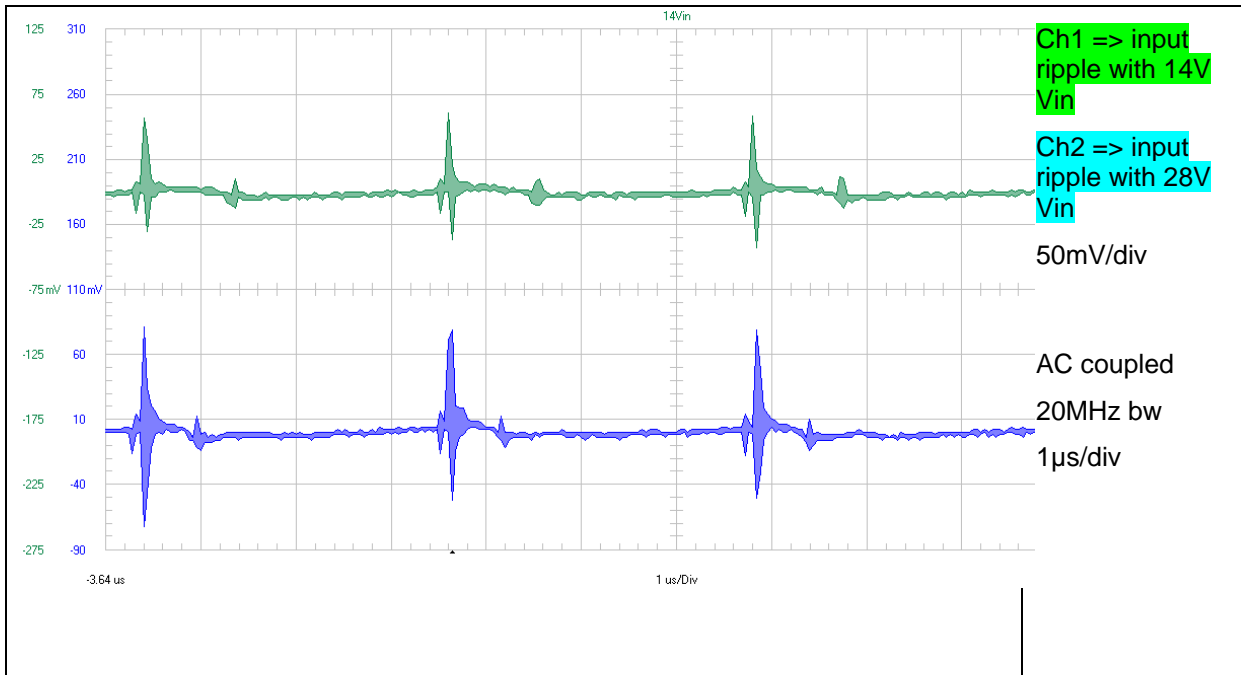

Figure 12

8   Load Transients

The Figure 13 shows the response to load transients for 14V input voltage. The load is switching from 0.5A to 1A (100Hz)
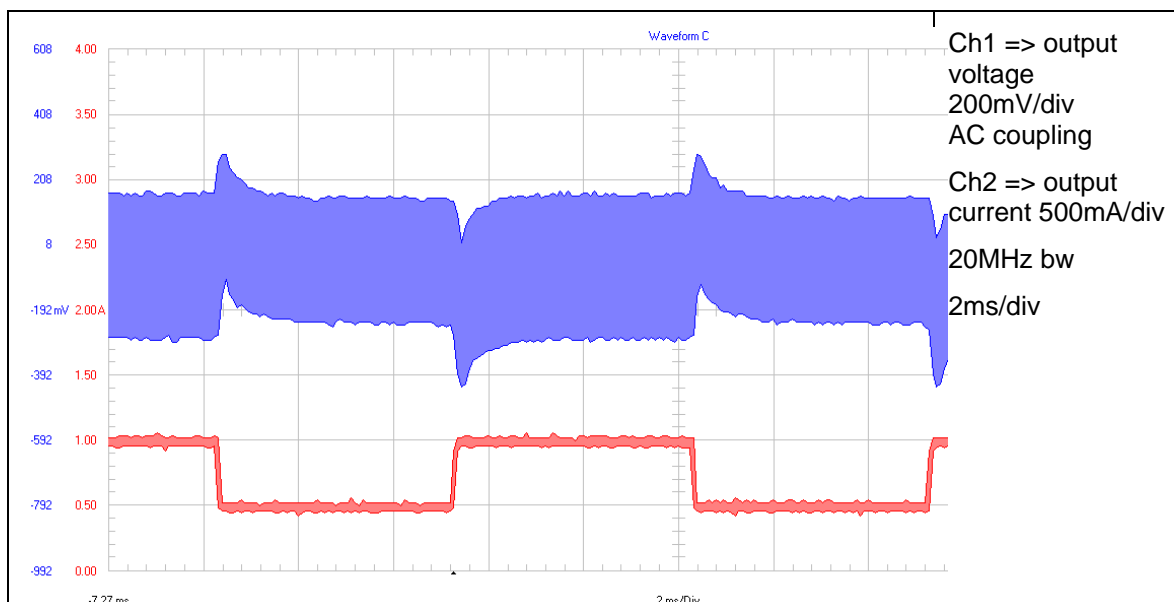Electronic load was used

Ch1 => output voltage 200mV/div AC coupling

Ch2 => output current 500mA/div

20MHz bw

2ms/div

Figure 13

The Figure 14 shows the response to load transients for 28V input voltage. The load is switching from 0.5A to 1A,
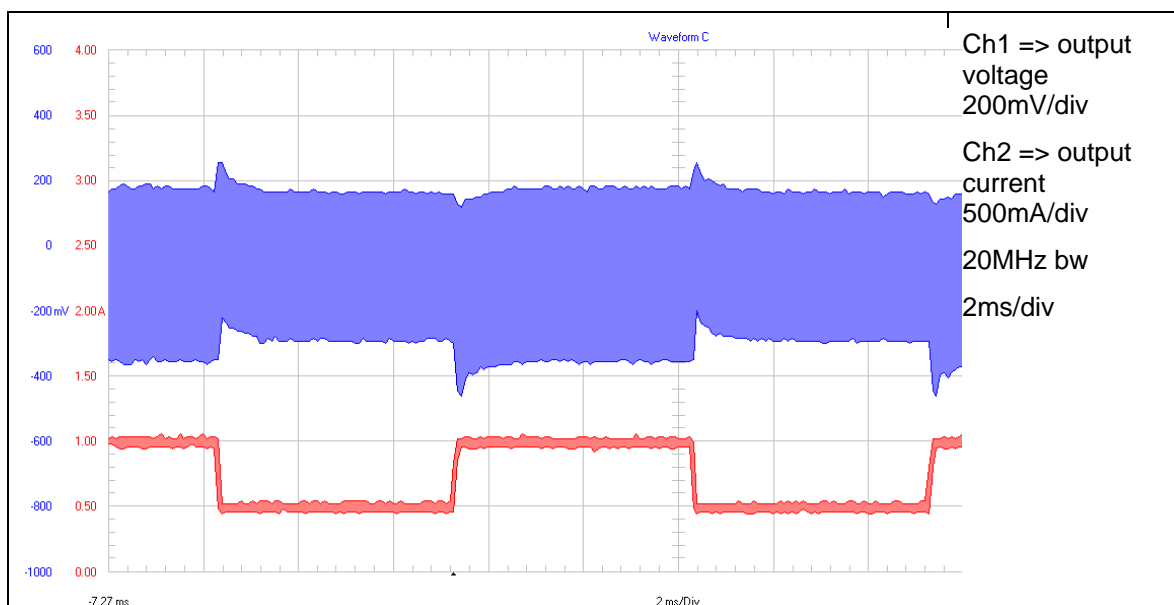Electronic load was used

Ch1 => output voltage 200mV/div

Ch2 => output current 500mA/div

20MHz bw

2ms/div

Figure 14

9 Control Loop Frequency Response

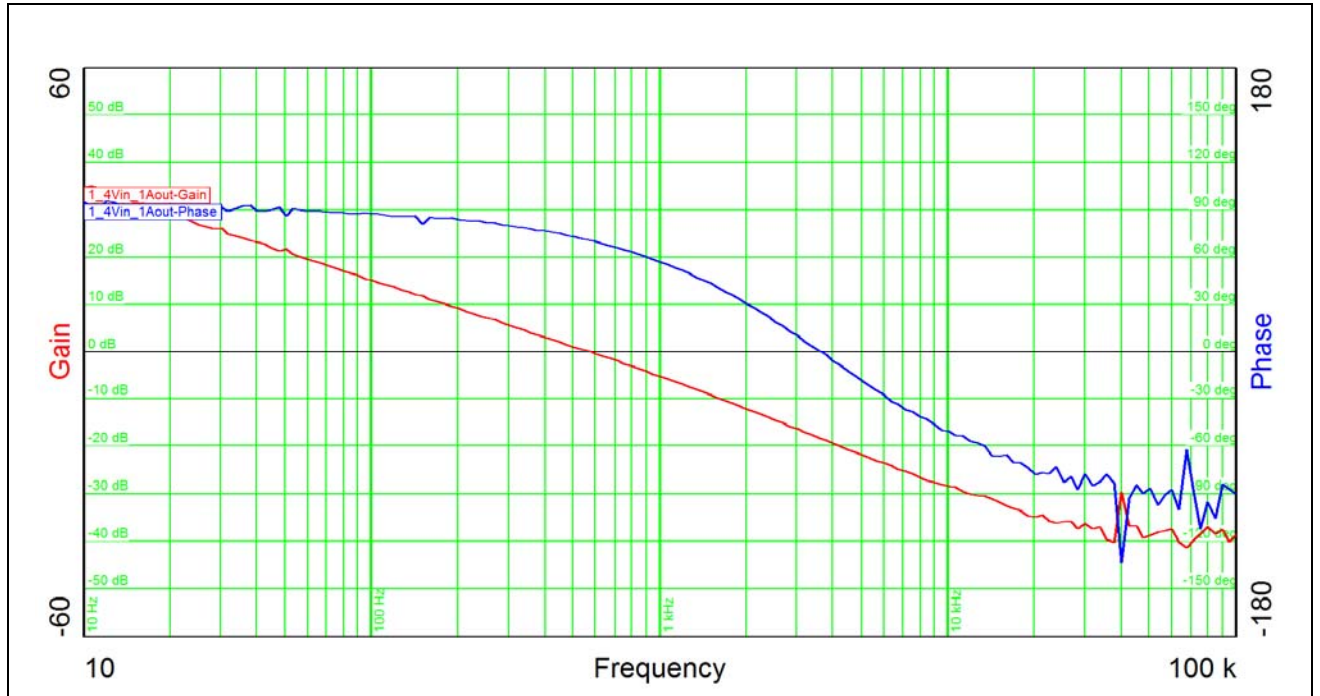Figure 15 shows the loop response for 4V. Load is 1A (resistor).

Figure 15

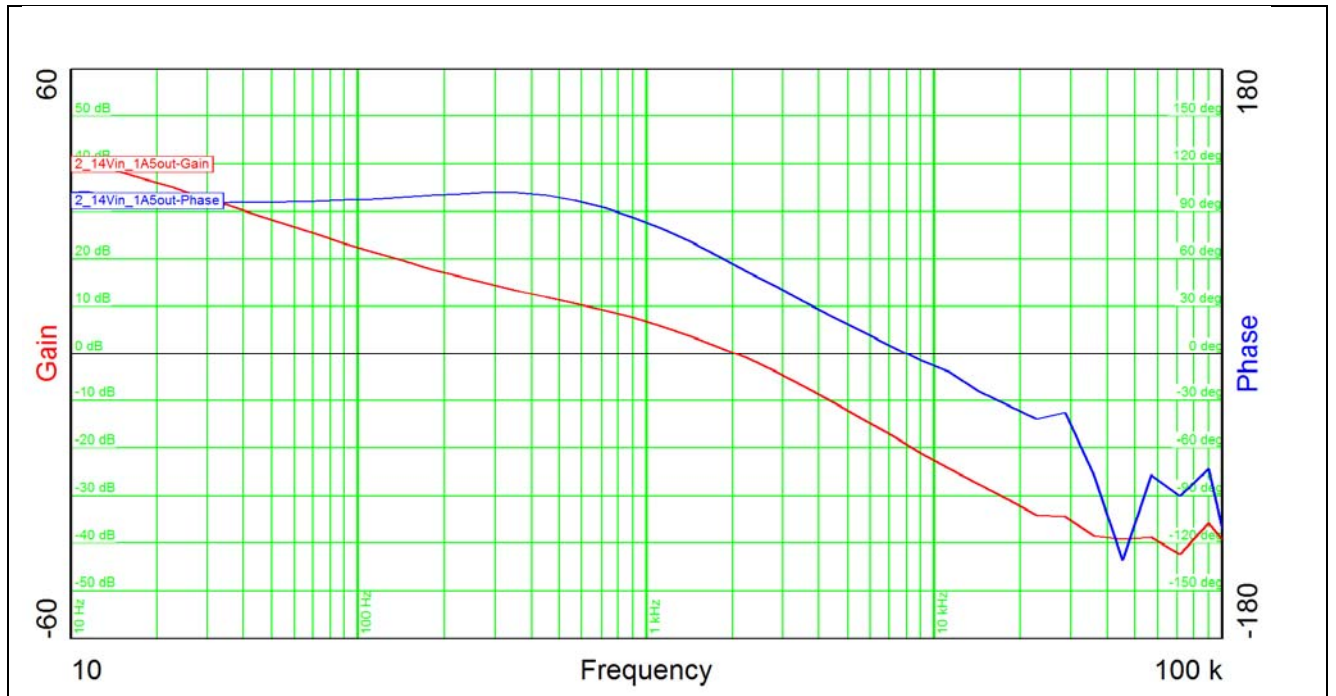Figure 16 shows the loop response for 14V. Load is 1.5A.

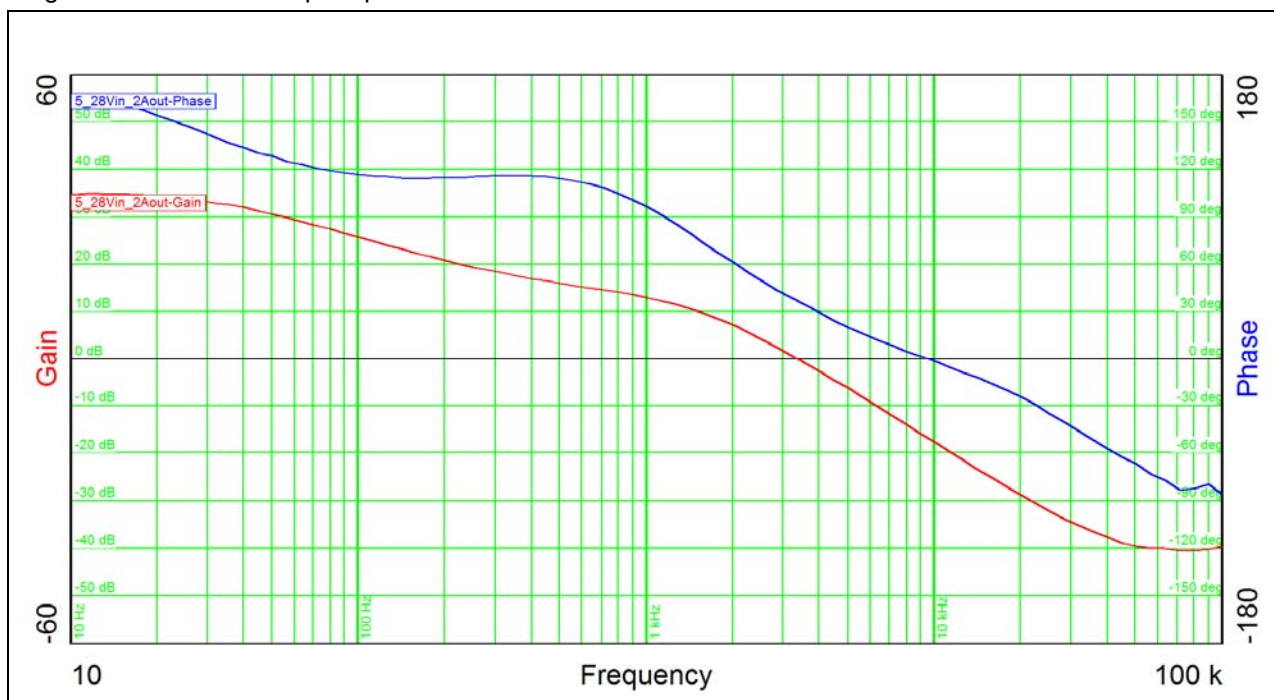**Figure 16**

Figure 17 shows the loop response for 28V. Load is 2A.

Figure 17

Table 1 summarizes the results of the above measurements

Vin	4V	14V	28V
Bandwidth (Hz)	568	2040	3342
Phase margin	71°	56°	36.9°
slope (20dB/decade)	-1	-1.29	-1.7
gain margin (dB)	-18.3	-19.2	-16.6
slope (20dB/decade)	-1.17	-1.83	-1.9
freq (kHz)	3.6	19.2	9.39

Table 1

10 Miscellaneous Waveforms

10.1 Q1 Switch Node (source-VOUT)

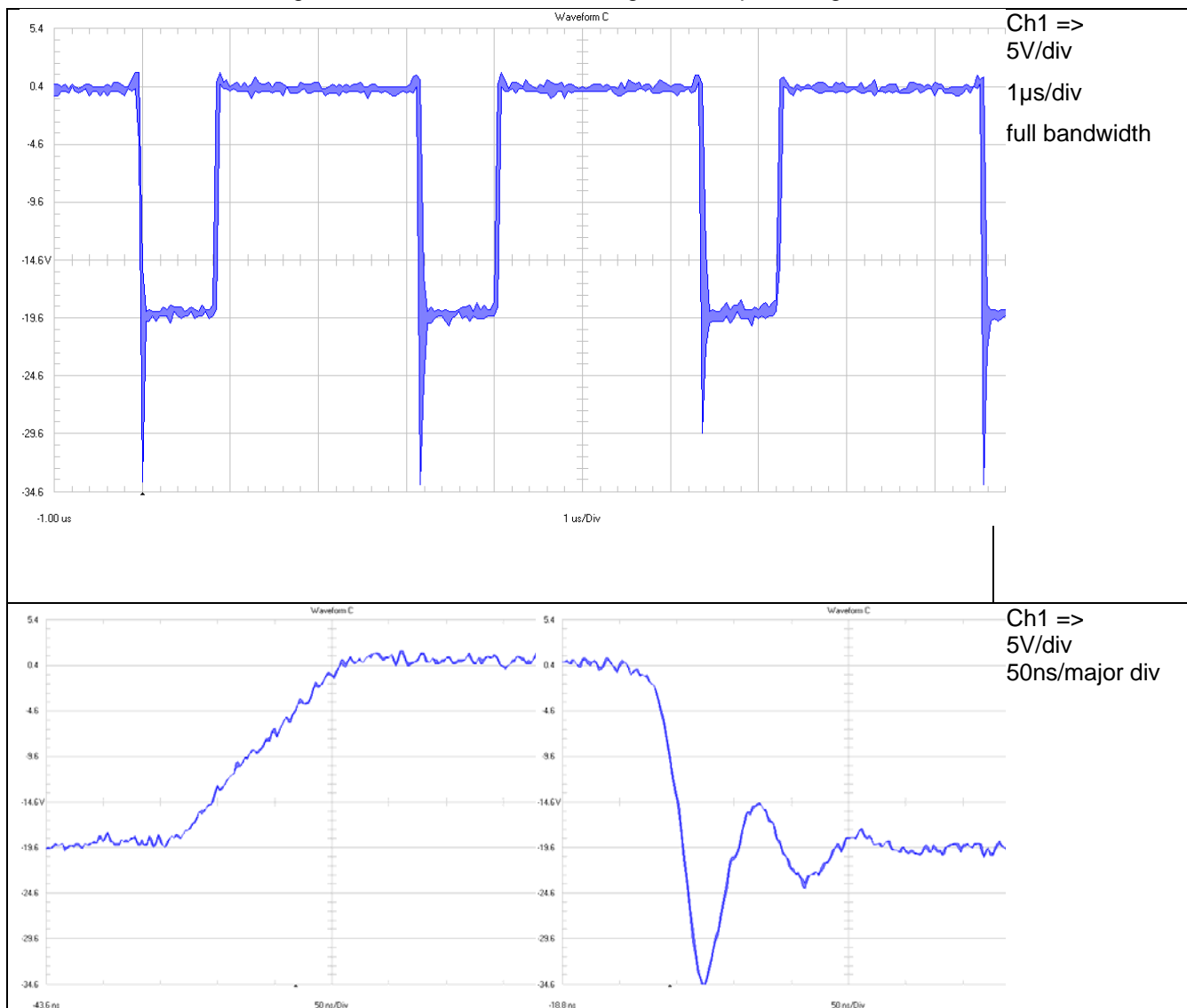The waveform of the voltage on switchnode is shown in Figure 18. Input voltage was set to 14V.

Figure 18

The waveform of the voltage on the switchnode is shown in Figure 19. Input voltage was set to 28V.

Ch1 =>
5V/div

1µs/div

full bandwidth

Ch1 =>
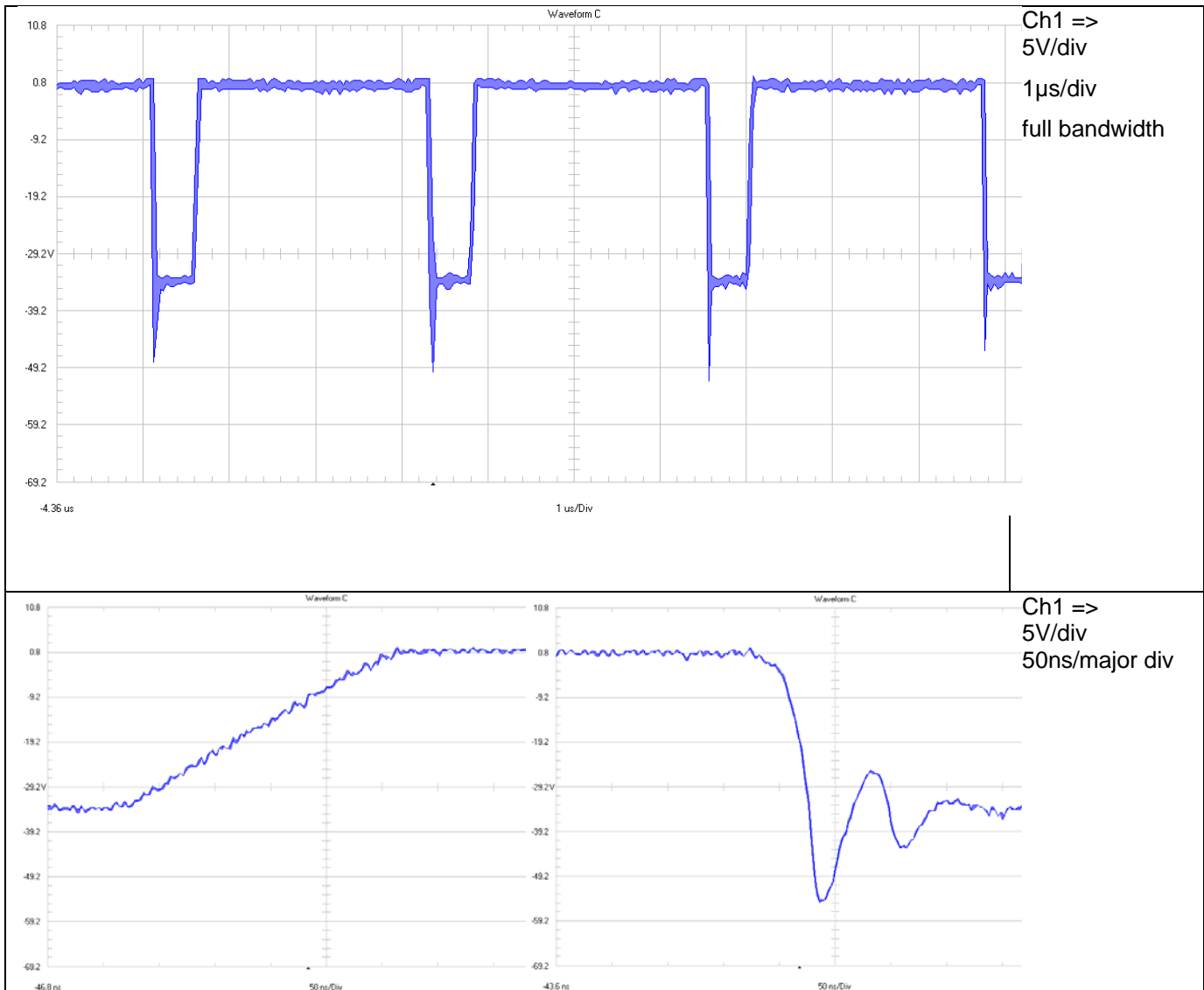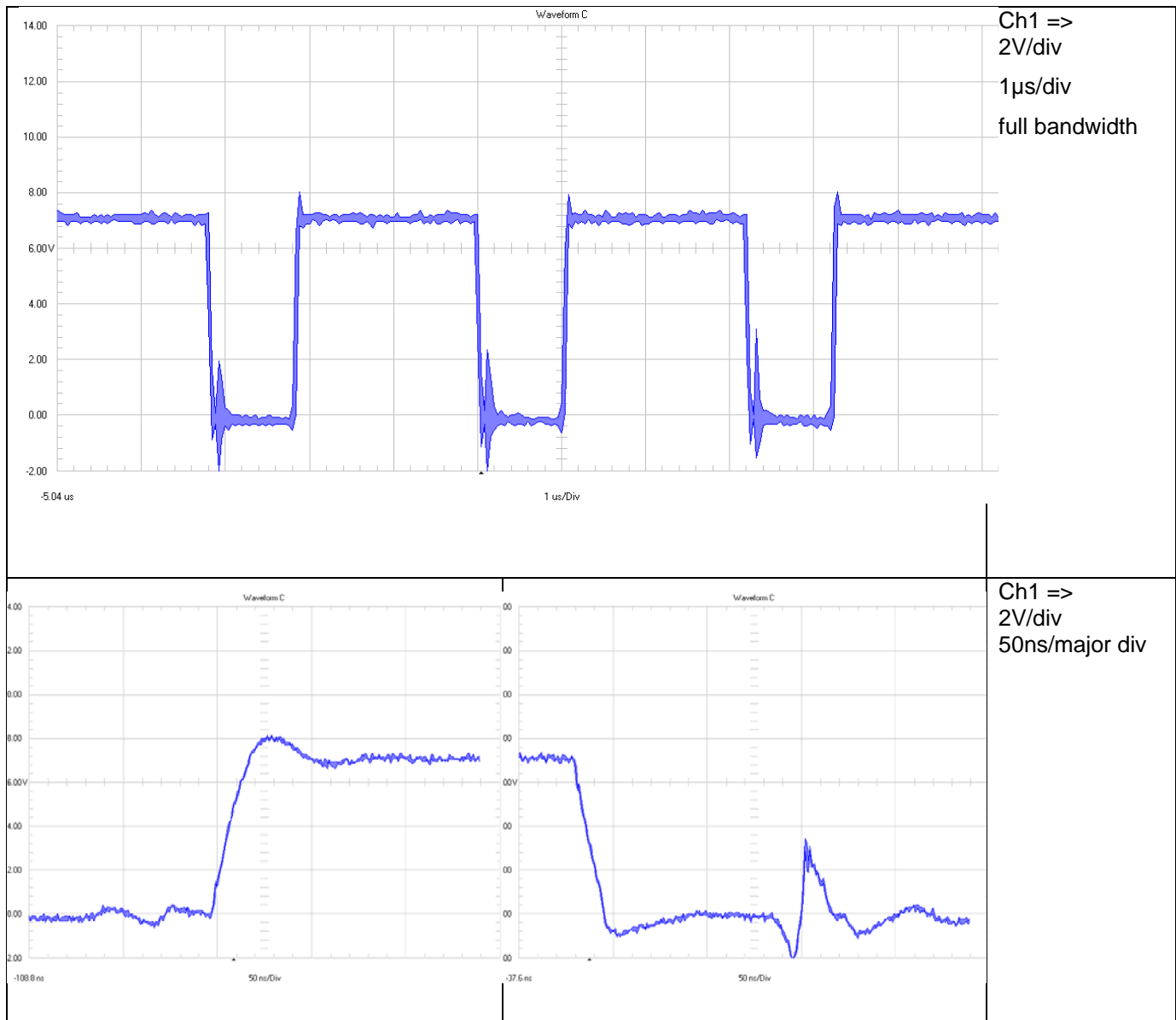5V/div
50ns/major div

Figure 19

10.2 Q1 Gate – Source

The waveform of the voltage on gate to source is shown in Figure 20. Input voltage was set to 14V.

Figure 20

The waveform of the voltage on gate to source is shown in Figure 21. Input voltage was set to 28V.
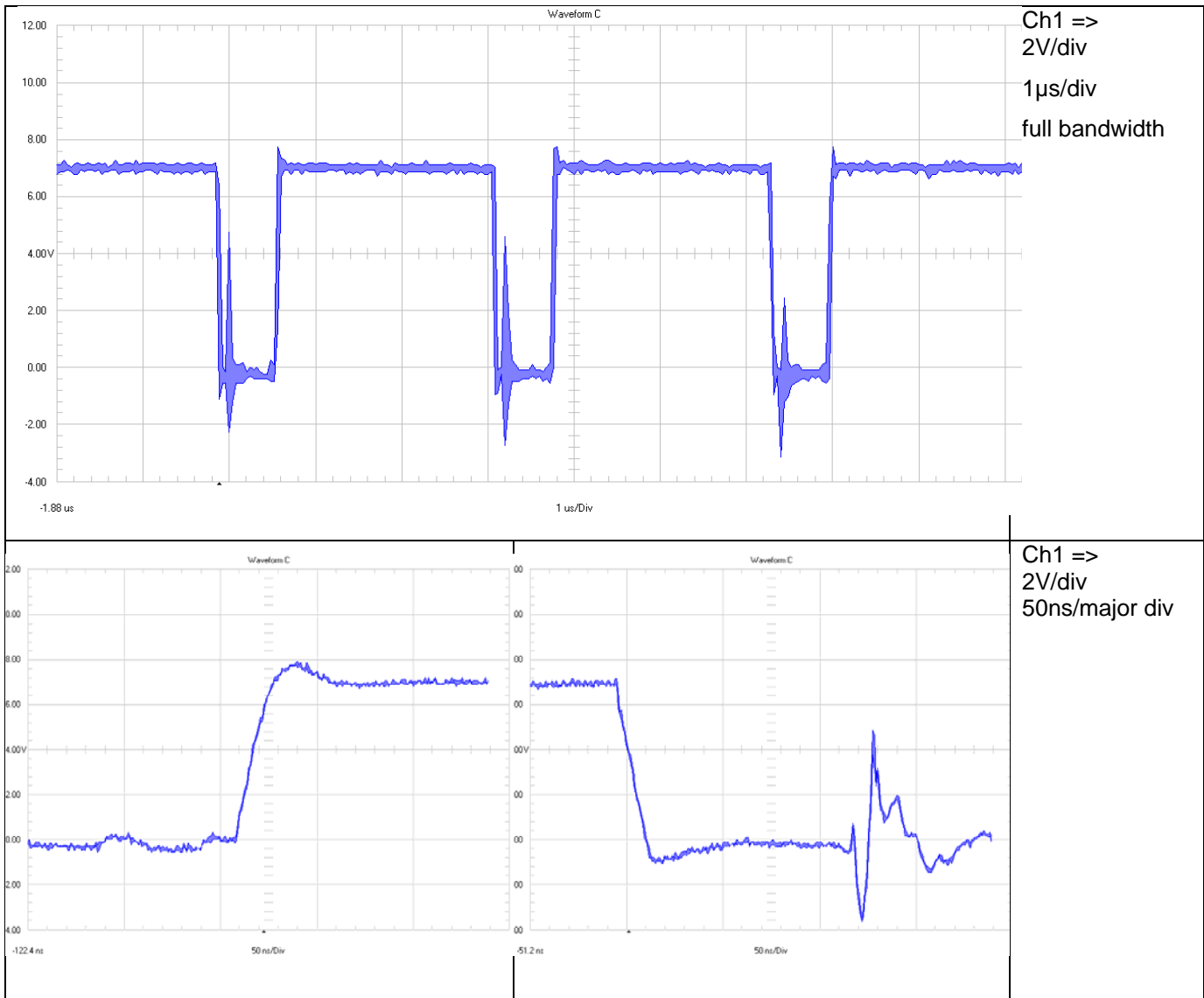

Figure 21

10.3 Q2 switchnode (drain-GND)

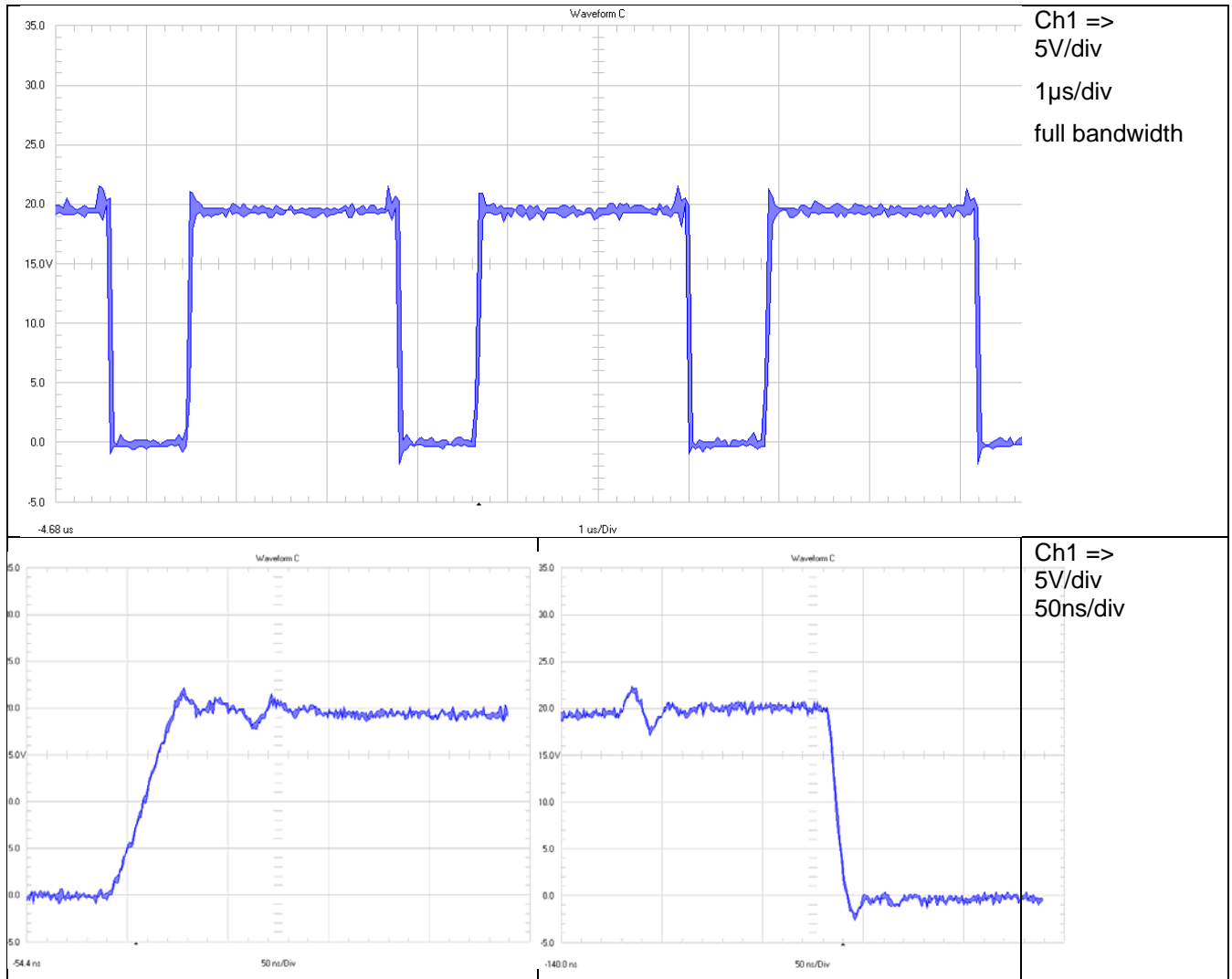The waveform of the voltage is shown in Figure 22. Input voltage was set to 14V.

Figure 22

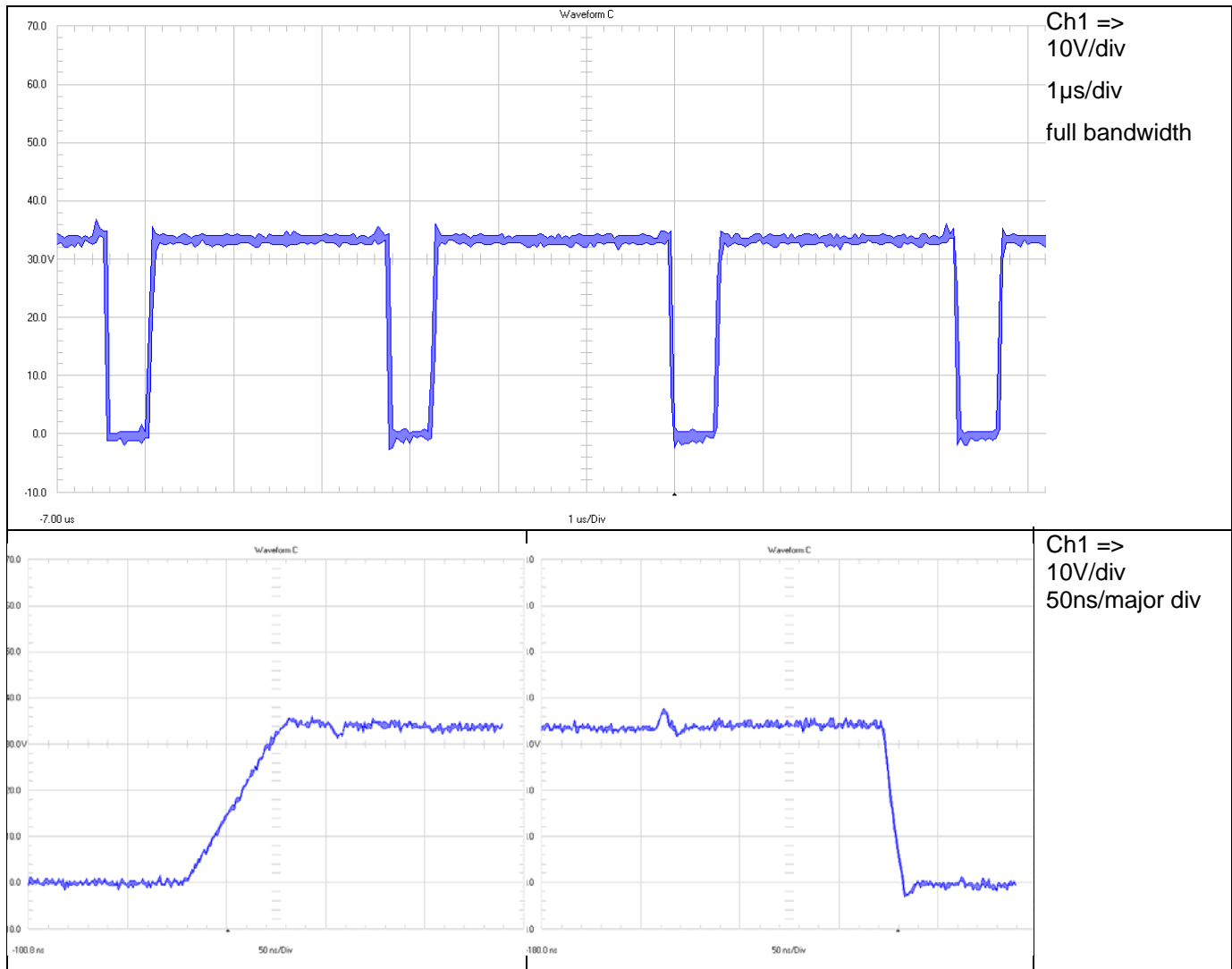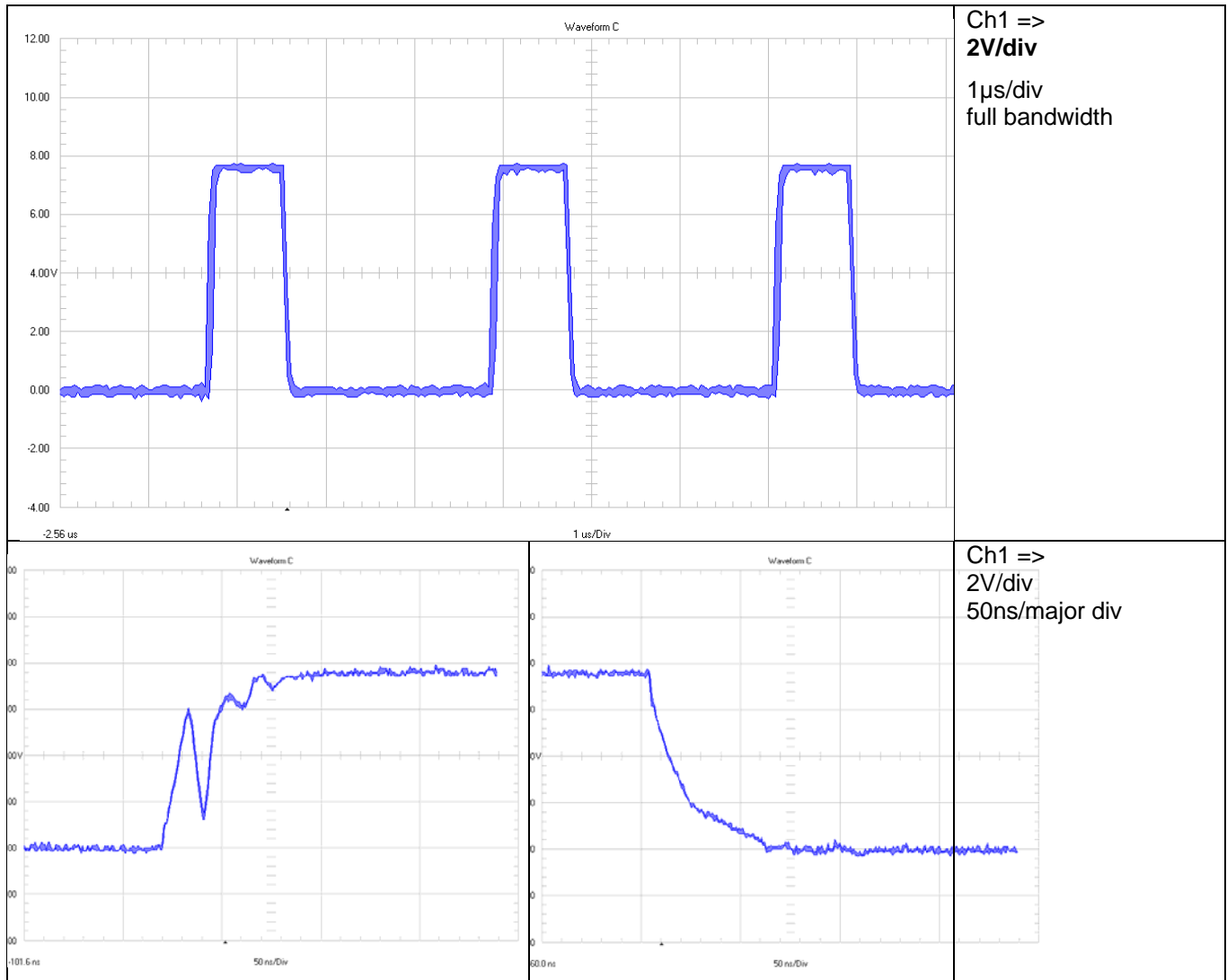The waveform of the voltage is shown in Figure 23. Input voltage was set to 28V.

Figure 23

10.4 Q2 Gate-GND

The waveform of the voltage is shown in Figure 24. Input voltage was set to 14V.

Figure 24

The waveform of the voltage is shown in Figure 25. Input voltage was set to 28V.

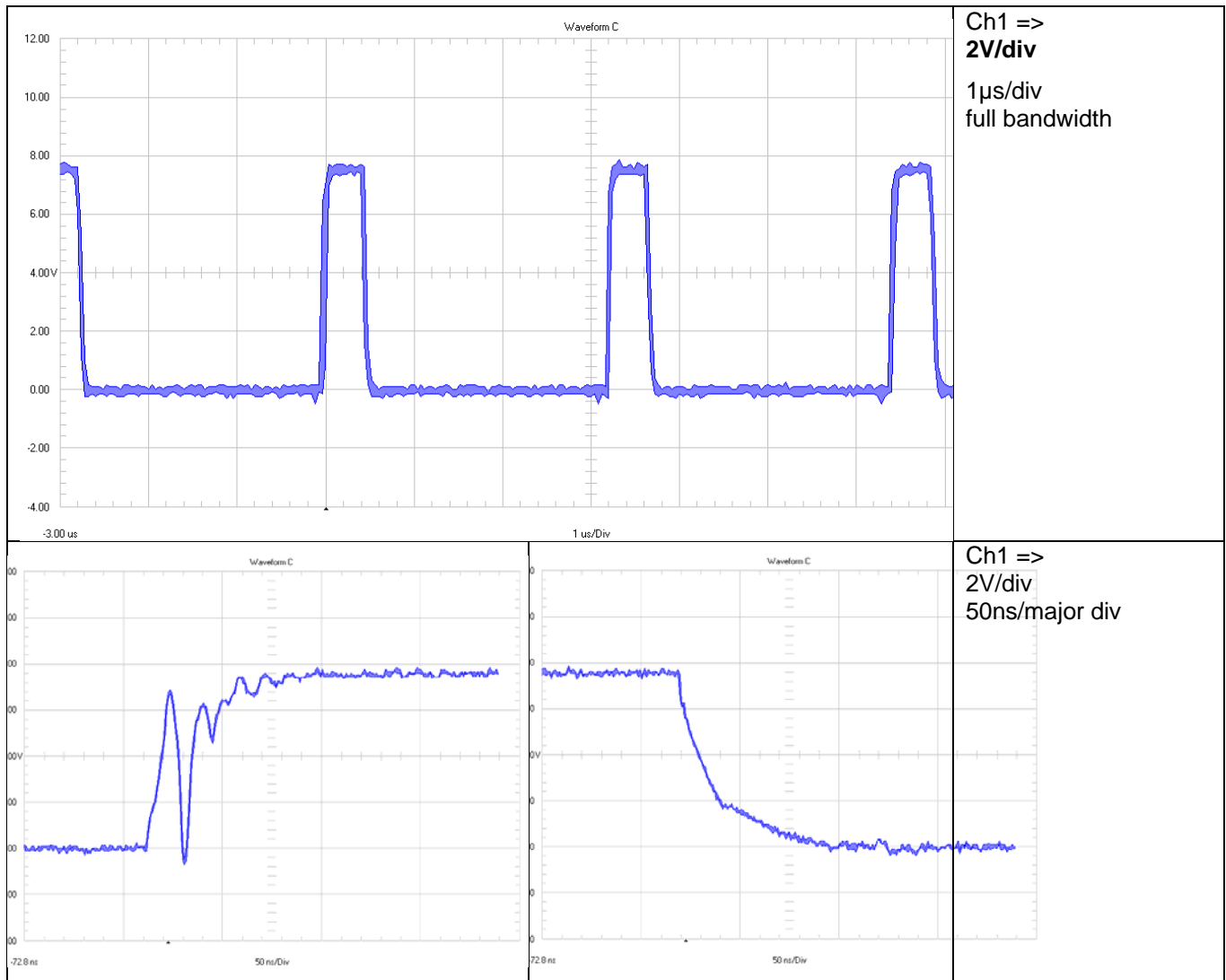**Figure 25**

11 Thermal Image

Figure 26 shows the thermal image at 4V input voltage and 1.5A output current.
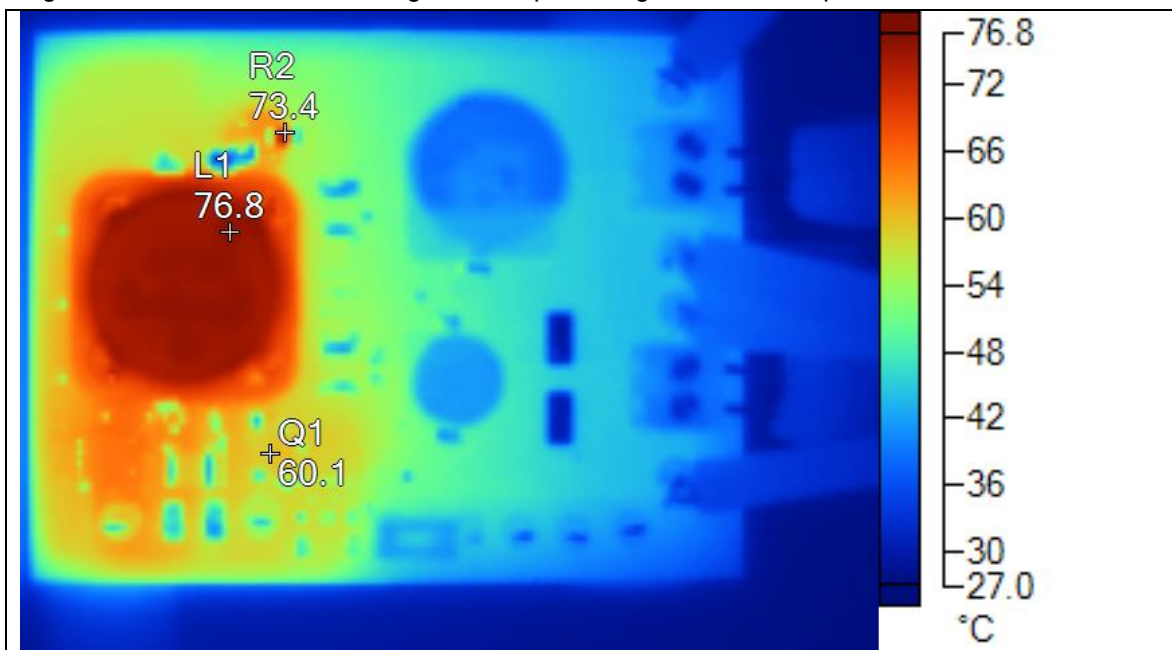
Figure 26

Name	Temperature
L1	76.8°C
R2	73.4°C
Q1	60.1°C

Figure 27 shows the thermal image at 14V input voltage and 2A output current.
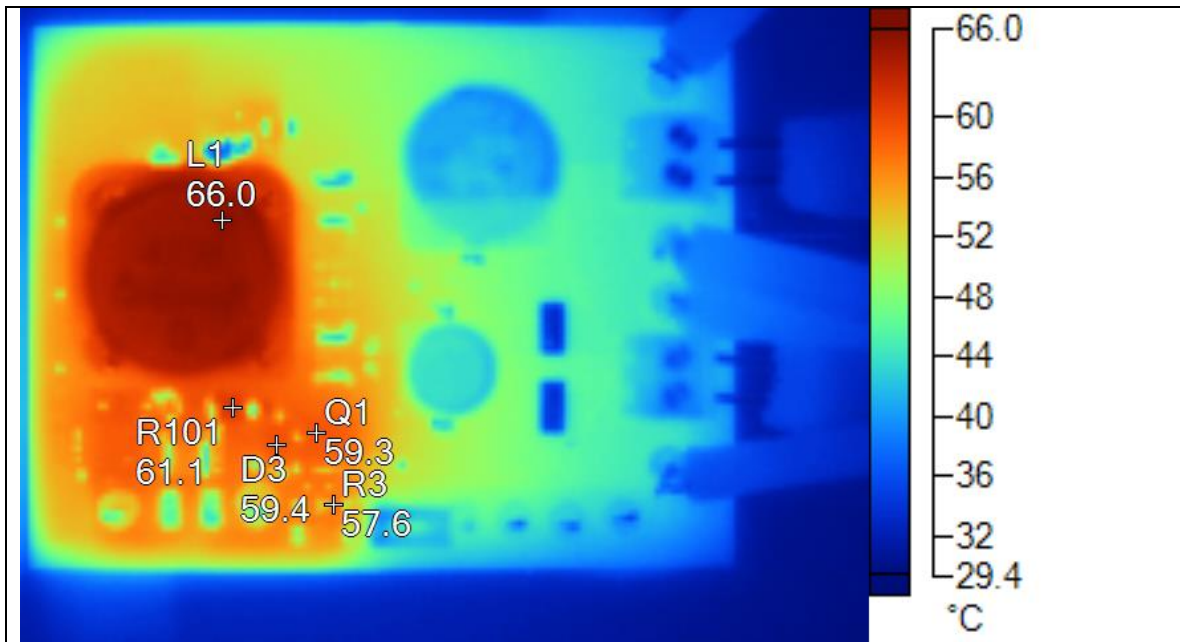
Figure 27

Name	Temperature
L1	66.0°C
R101	61.1°C
Q1	59.3°C
D3	59.4°C
R3	57.6°C

Figure 28 shows the thermal image at 28V input voltage and 2A output current.
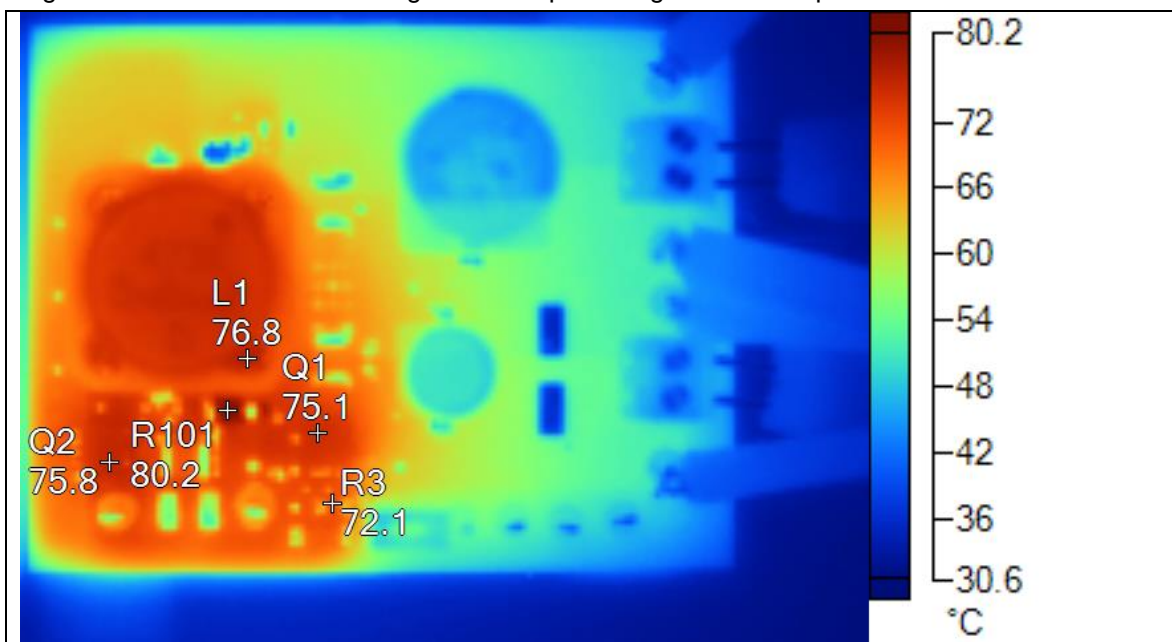
Figure 28

Name	Temperature
R101	80.2°C
L1	76.8°C
Q1	75.1°C
R3	72.1°C
Q2	75.8°C

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