

Boost with 300V @ 10mA

- Input 18..30V DC
- Output 300V @ 10mA
- Controller TPS40210
- Free-Running switching frequency of 300 kHz
- Built on PCB “PMP8621 Rev.B”



1 Startup

The startup waveform is shown in Figure 1. The input voltage is set at 24V, with no load on the 300V output.

Channel C1: **Input voltage**
5V/div, 20ms/div

Channel C2: **Output voltage**
50V/div, 20ms/div



Figure 1

2 Shutdown

The shutdown waveform is shown in Figure 2. The input voltage is set at 24V with a 10mA load on the 300V output.

Channel C1: **Input voltage**
5V/div, 20ms/div

Channel C2: **Output voltage**
50V/div, 20ms/div

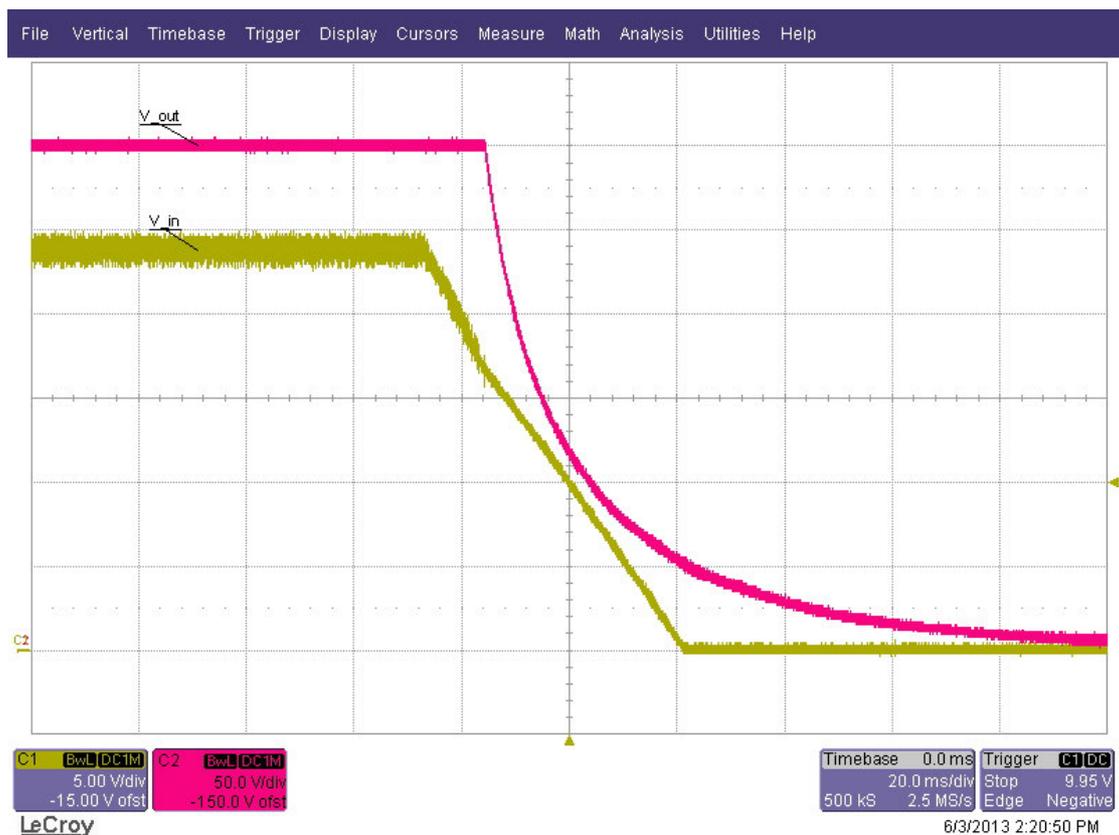


Figure 2

3 Efficiency

The efficiency 18V, 24V and 30V at 10mA is shown in the table below.

Input Voltage [V]	Input Current [A]	Output Voltage [V]	Output Current [A]	Efficiency [%]
17.99	0.2062	299.9	0.0100	80.8
24.01	0.1558	300.3	0.0100	80.3
30.13	0.1247	300.4	0.0100	80.0

4 Output ripple voltage

The output ripple voltage at 18V, 24V and 30V input voltage are shown in Figure 3.

Channel M1: **Output voltage**, AC coupled, 269mV peak-peak @ 18V input voltage
200mV/div, 5us/div

Channel M2: **Output voltage**, AC coupled, 256mV peak-peak @ 24V input voltage
200mV/div, 5us/div

Channel M3: **Output voltage**, AC coupled, 262mV peak-peak @ 30V input voltage
200mV/div, 5us/div

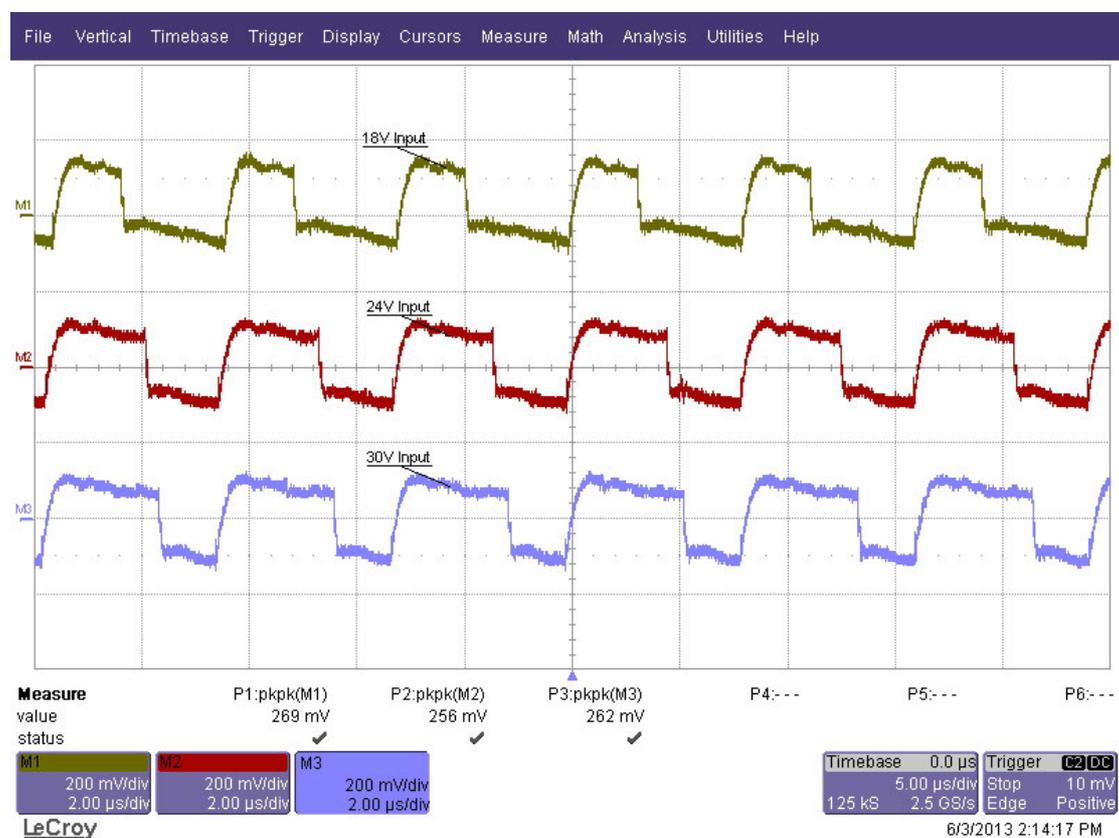


Figure 3

5 Load step

The response to a load step and a load dump at an input voltage of 24V is shown in Figure 4.

Channel C2: **Output voltage**, -936mV undershoot, 856mV overshoot
500mV/div, 1ms/div, AC coupled

Channel C1: **Load current**, load step 5mA to 10mA
5mA/div, 1ms/div

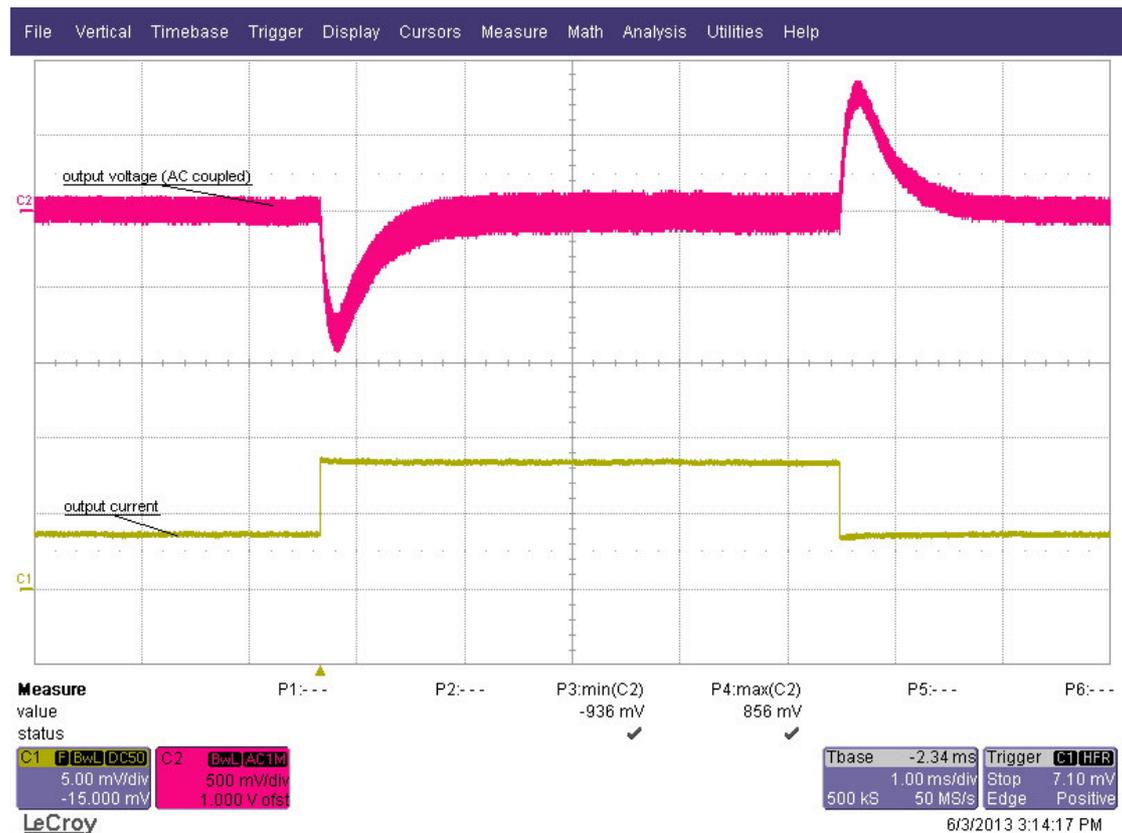


Figure 4

6 Frequency response

Figure 5 shows the loop response of the 300V output at 18V, 24V and 30V V input voltage and a 10mA load.

18V input

- 61 deg phase margin @ crossover frequency 4.1 kHz
- -22 db gain margin

24V input

- 70 deg phase margin @ crossover frequency 3.7 kHz
- -27 db gain margin

30V input

- 76 deg phase margin @ crossover frequency 2.7 kHz
- -31 db gain margin

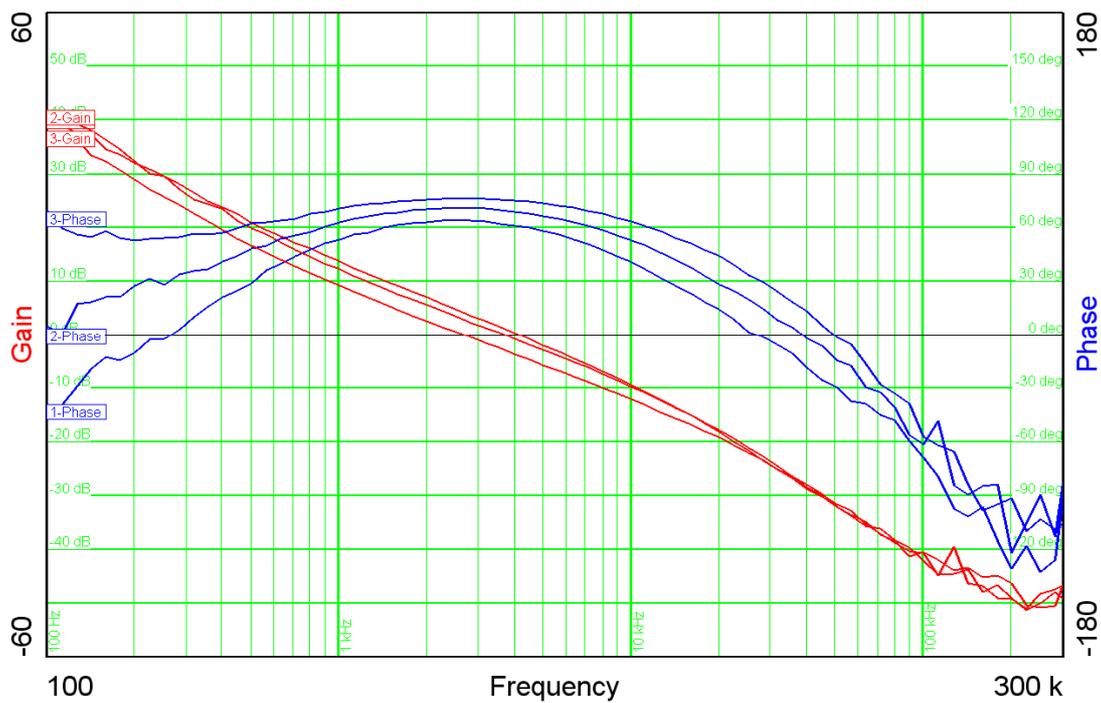


Figure 5

7 Switching Node

The drain-source voltage on the switching node is shown in Figure 6. The image was captured with 30V input and a 10mA load.

Channel C2: **Drain-source voltage**, -2.1V minimum voltage, 83.0V maximum voltage
20V/div, 1 μ s/div

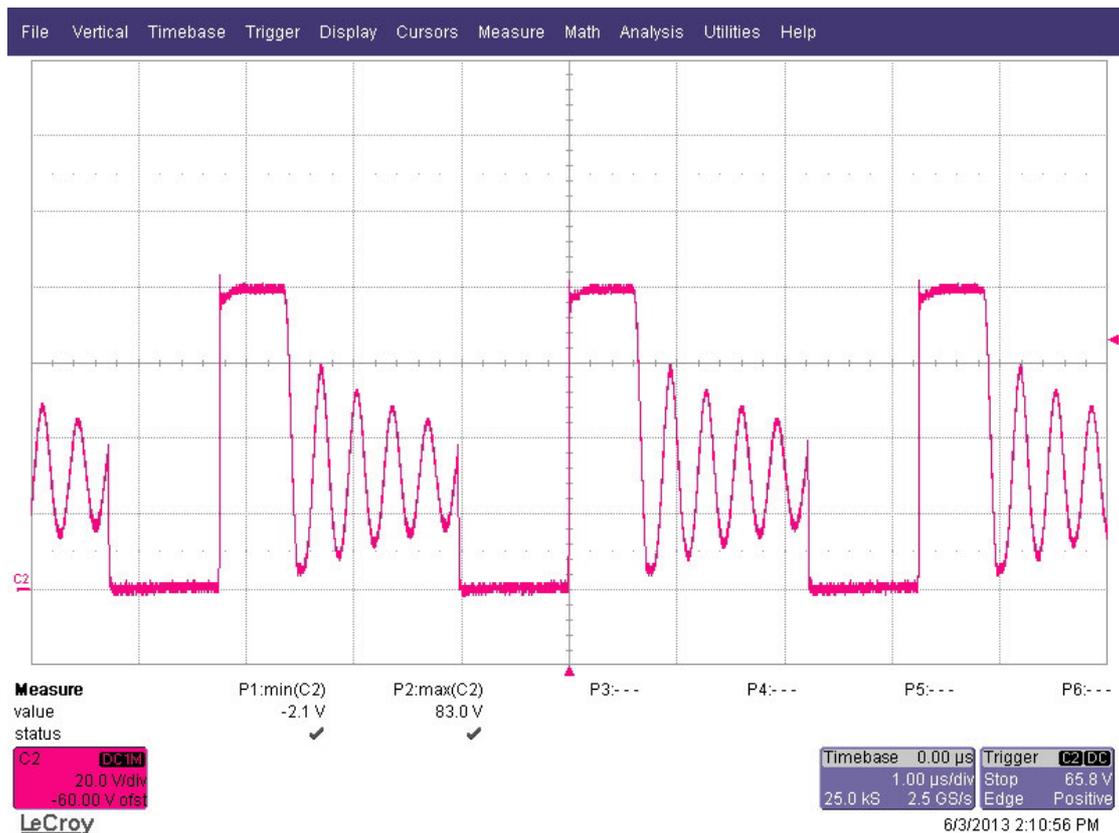


Figure 6

8 Thermal measurement

The thermal image (Figure 7) shows the circuit at an ambient temperature of 21 °C with an input voltage of 24V and a load of 10mA.

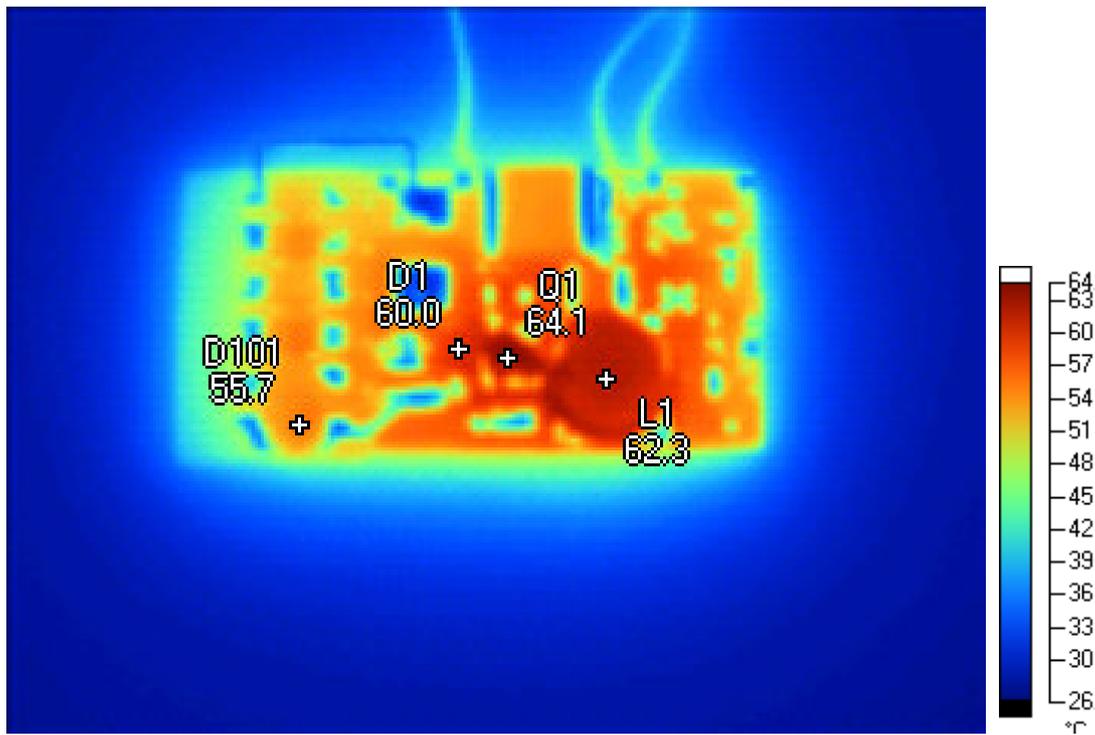


Figure 7

Markers

Label	Temperature	Emissivity	Background
L1	62.3 °C	0.95	21.0 °C
Q1	64.1 °C	0.95	21.0 °C
D1	60.0 °C	0.95	21.0 °C
D101	55.7 °C	0.95	21.0 °C

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