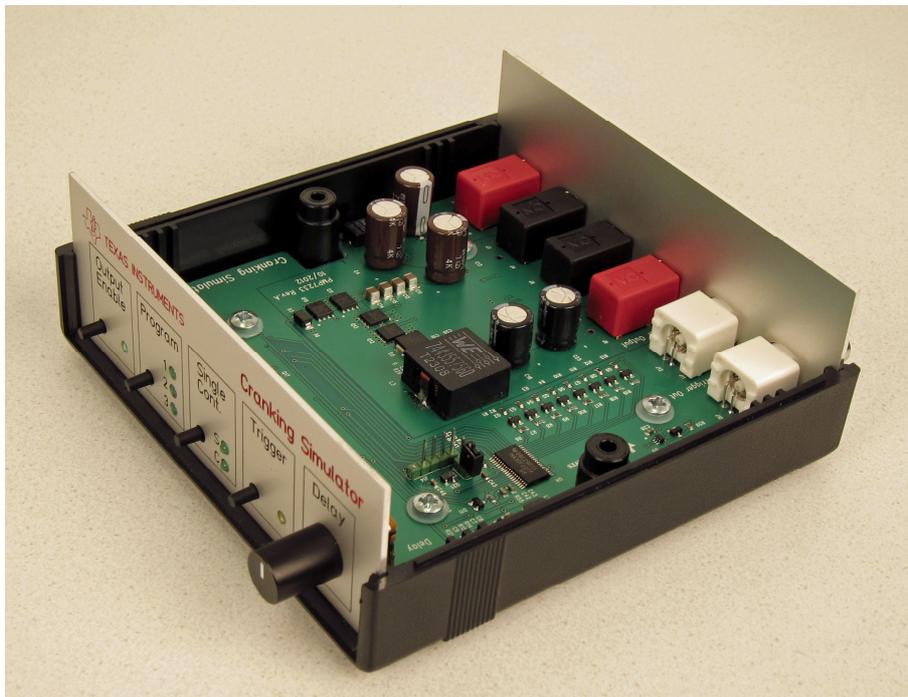


Cranking Simulator for Automotive Applications

- Input 24V DC
- Output Adjustable by Microcontroller between 2..15V @ 50W
3 Cranking Pulses programmed:
 - DaimlerChrysler Engine Cranking Test Pulse DC-10615
 - Volkswagen Cold Start Test Pulse VW80000
 - Volkswagen Warm Start Test Pulse VW80000
- Switching Frequency 250 kHz nominal



1 Startup

The startup waveform with an output voltage of 12.6V and no load attached is shown in Figure 1.

The converter is started by the enable input.

Channel C2: **Output voltage**
2V/div, 2ms/div

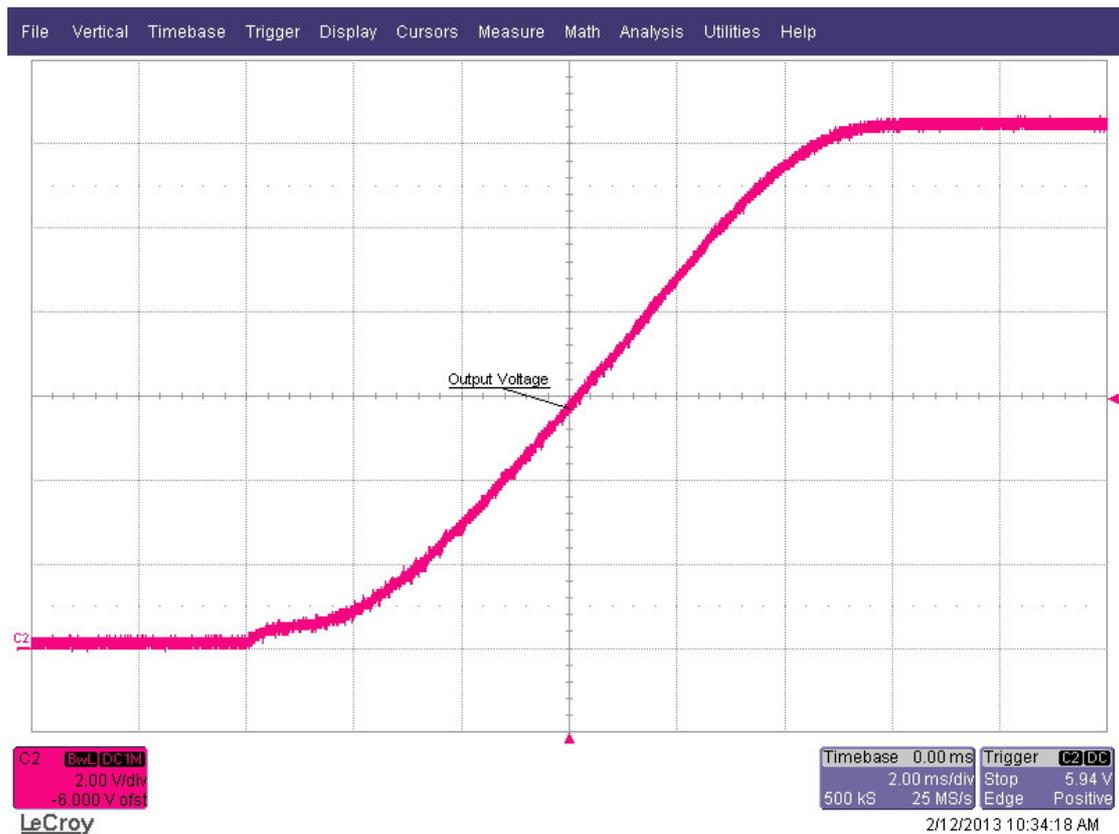


Figure 1

2 Switching Node

The switching node with an output voltage of 12.6V and a load of 4.0A is shown in Figure 2.

Channel C2: **Switching node**, -1.2V min. voltage / 28.3V max. voltage
5V/div, 2us/div

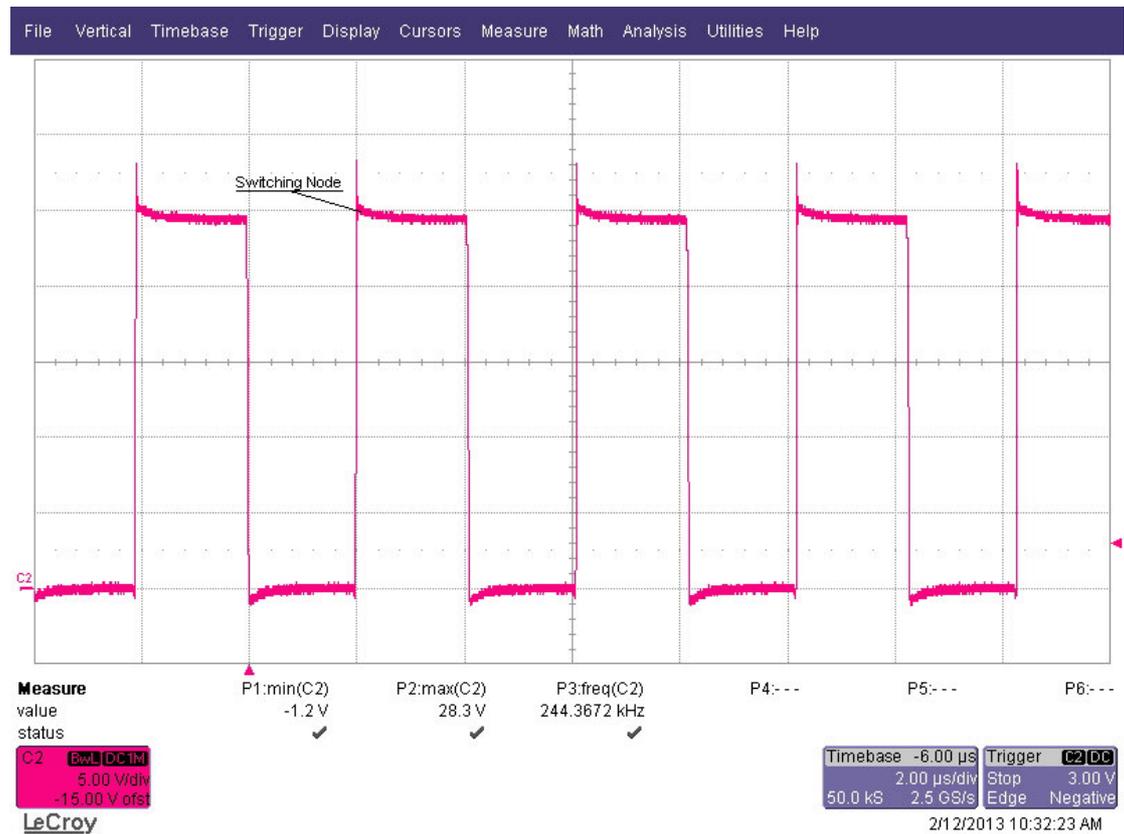


Figure 2

3 Output Ripple

The output ripple voltage at an output voltage of 12.6V and a load of 4.0A is shown in Figure 3.

Channel C2: **Output voltage**, 40mV peak-peak
20mV/div, 2us/div, AC coupled

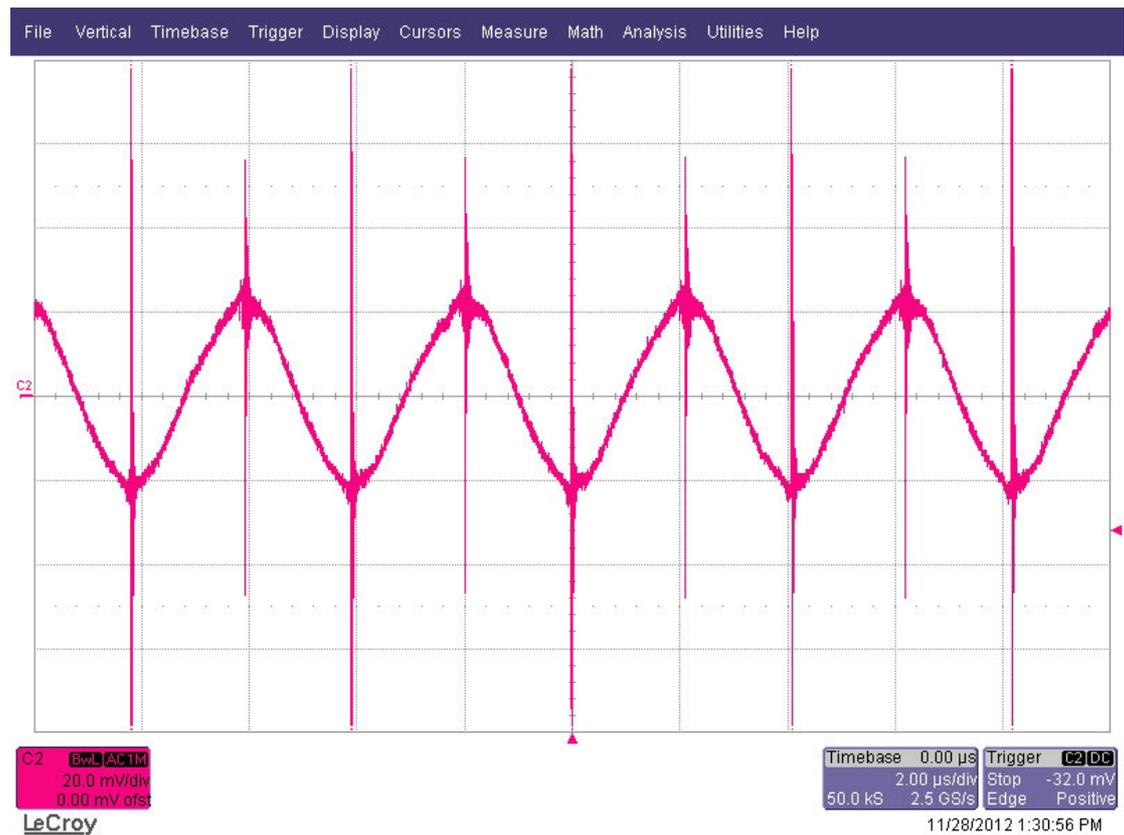


Figure 3

4 Load Step Response

The response to a load step and a load dump at an output voltage of 12.6V is shown in Figure 4.

- Channel C2: **Output voltage**, -117mV undershoot / 92mV overshoot
 50mV/div, 2ms/div, AC coupled
- Channel C1: **Load current**, load step 2.0A to 4.0A and vice versa
 2A/div, 2ms/div

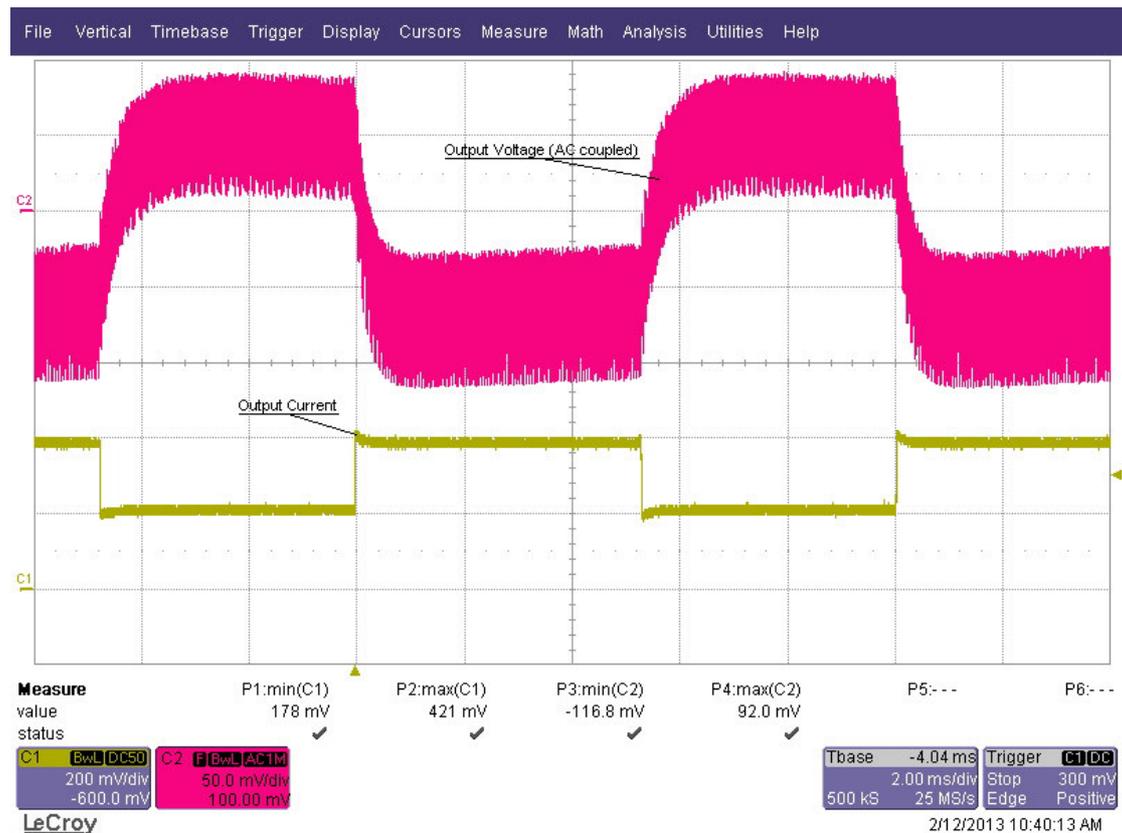


Figure 4

5 Input ripple voltage

The input ripple voltage at an output voltage of 12.6V and a load of 4.0A is shown in Figure 5 and Figure 6.

Figure 5 shows the ripple on the input capacitors of the buck converter; Figure 6 shows the ripple as seen on the plugs in front of the input filter.

Figure 5

Channel C2: **Input voltage**, 120mV peak-peak
50mV/div, 2 μ s/div, AC coupled

Figure 6

Channel C2: **Input voltage**, 4mV peak-peak
20mV/div, 2 μ s/div, AC coupled



Figure 5



Figure 6

6 Frequency Response

Figure 7 shows the closed loop response at an output voltage of 12.6V and a load of 4.0A.

- 55 deg phase margin @ crossover frequency 22.6 kHz
- -25 dB gain margin

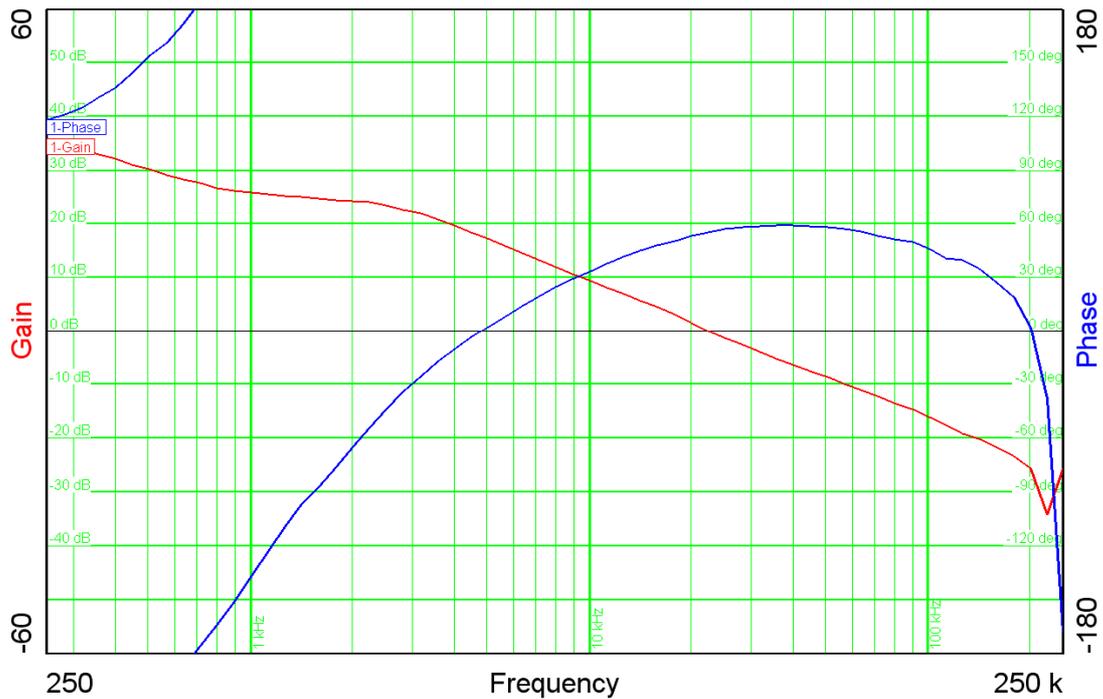


Figure 7

7 Cranking Test Pulses

Figure 8 shows the “Daimler-Chrysler Engine Cranking Test Pulse DC-10615” with a constant load of 50W on the output.

Channel C2: **Output voltage**
2V/div, 2s/div

Channel C1: **Load current**
5A/div, 2s/div

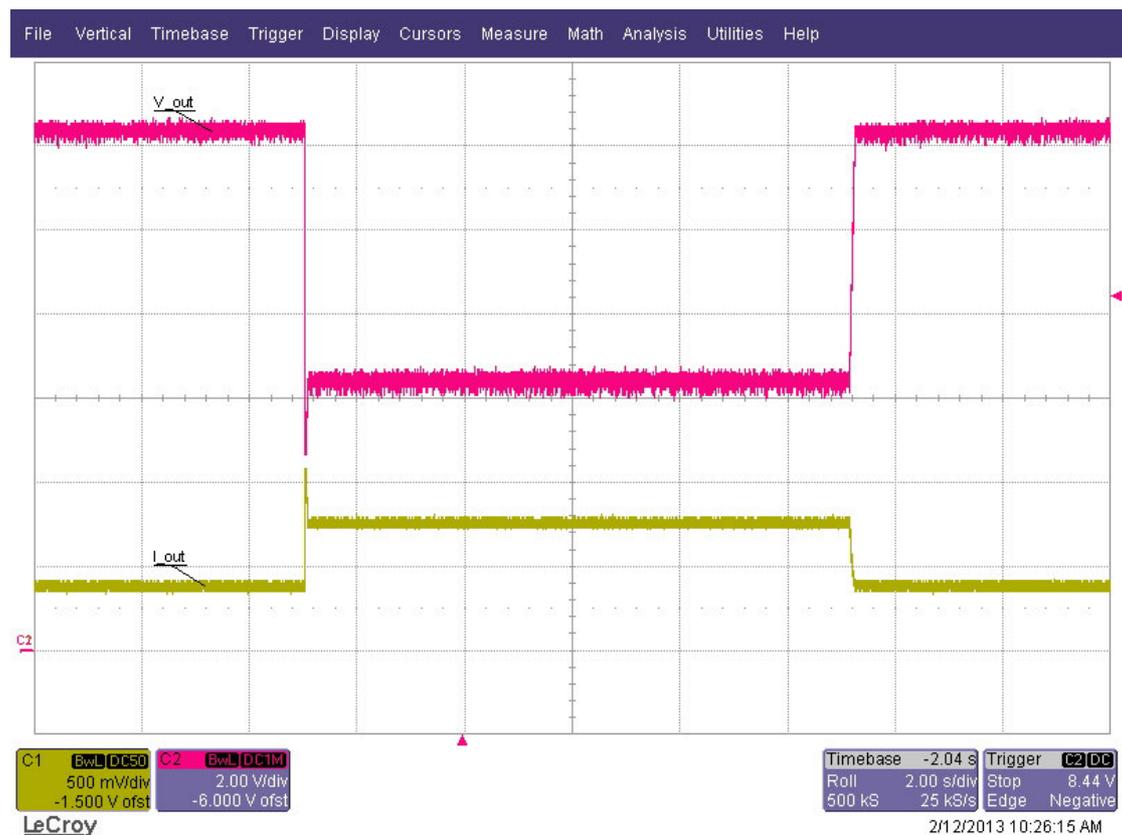


Figure 8

Figure 9 shows the “Volkswagen Cold Start Test Pulse VW80000” with a constant load of 50W on the output.

Channel C2: **Output voltage**
2V/div, 200ms/div

Channel C1: **Load current**
5A/div, 200ms/div

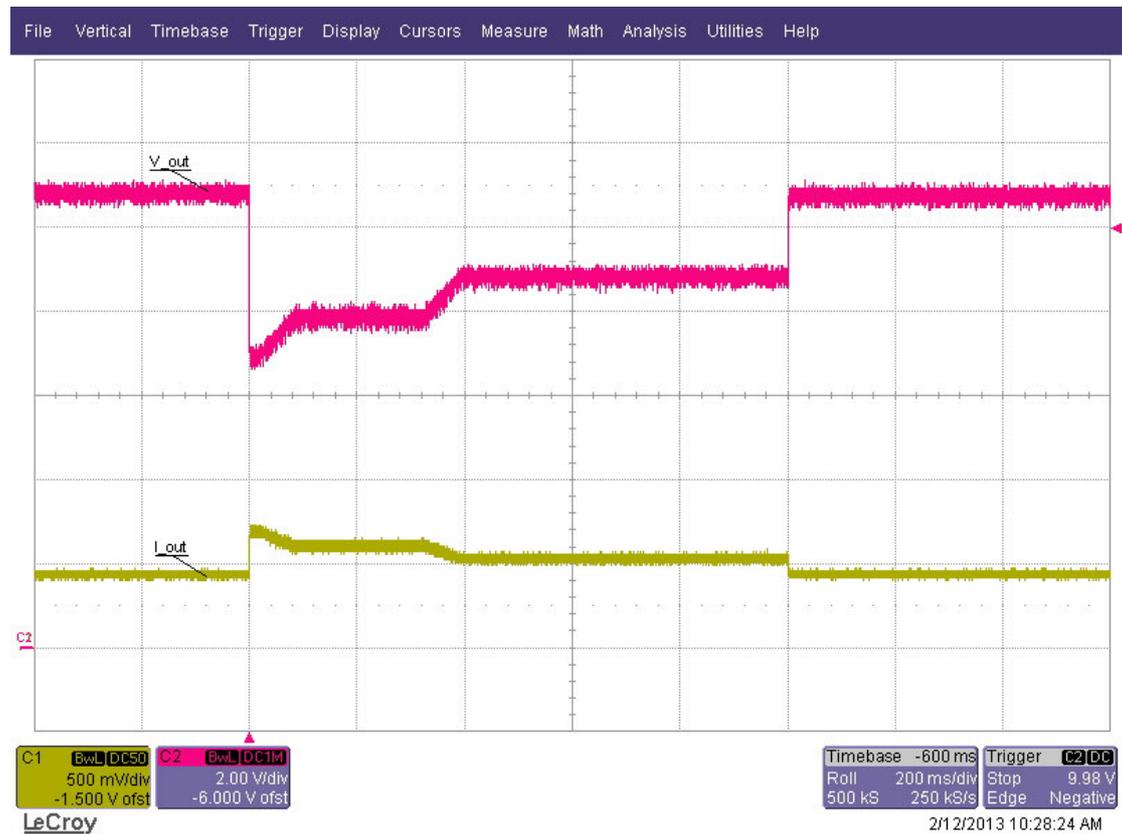


Figure 9

Figure 10 shows the “Volkswagen Warm Start Test Pulse VW80000” with a constant load of 50W on the output.

Channel C2: **Output voltage**
2V/div, 2s/div

Channel C1: **Load current**
5A/div, 2s/div

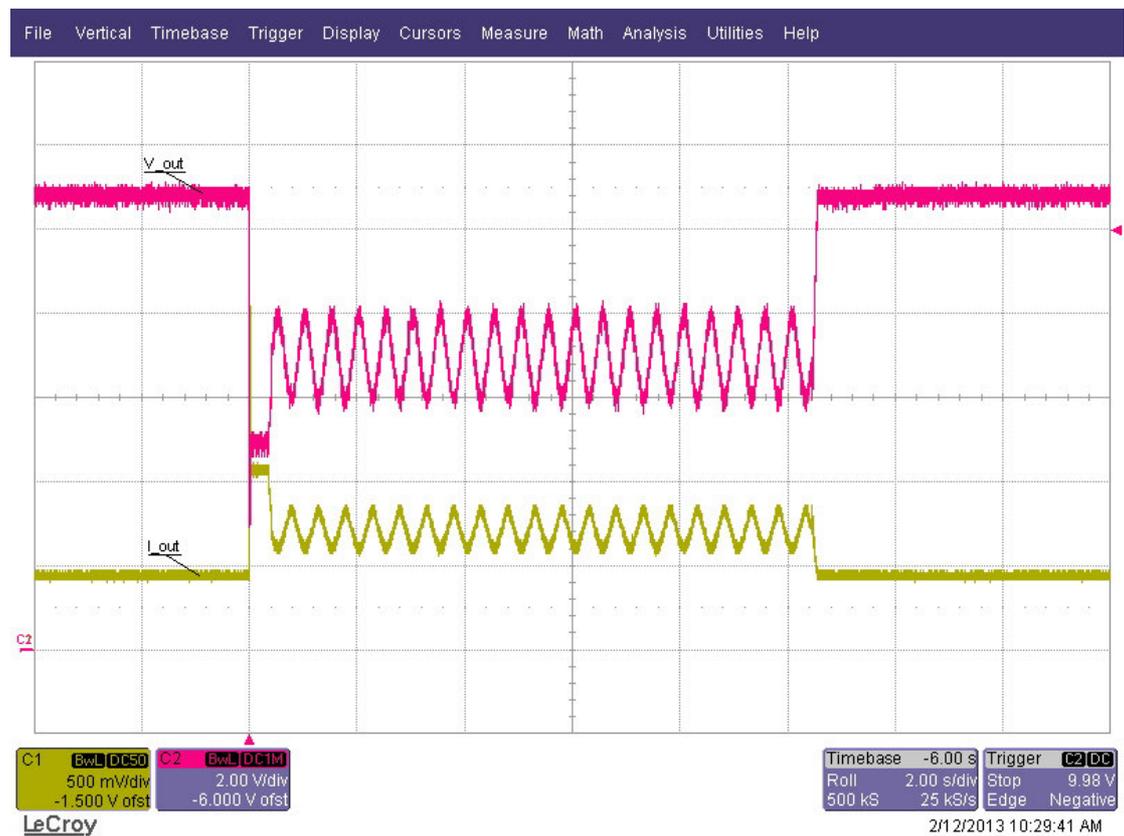


Figure 10

EVALUATION BOARD/KIT/MODULE (EVM) WARNINGS, RESTRICTIONS AND DISCLAIMER
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