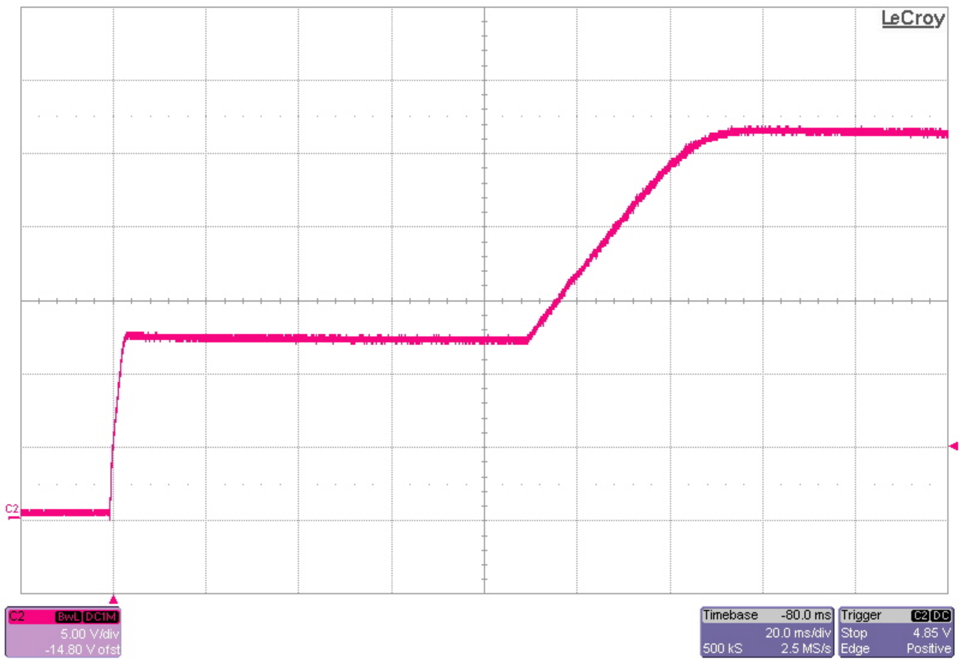
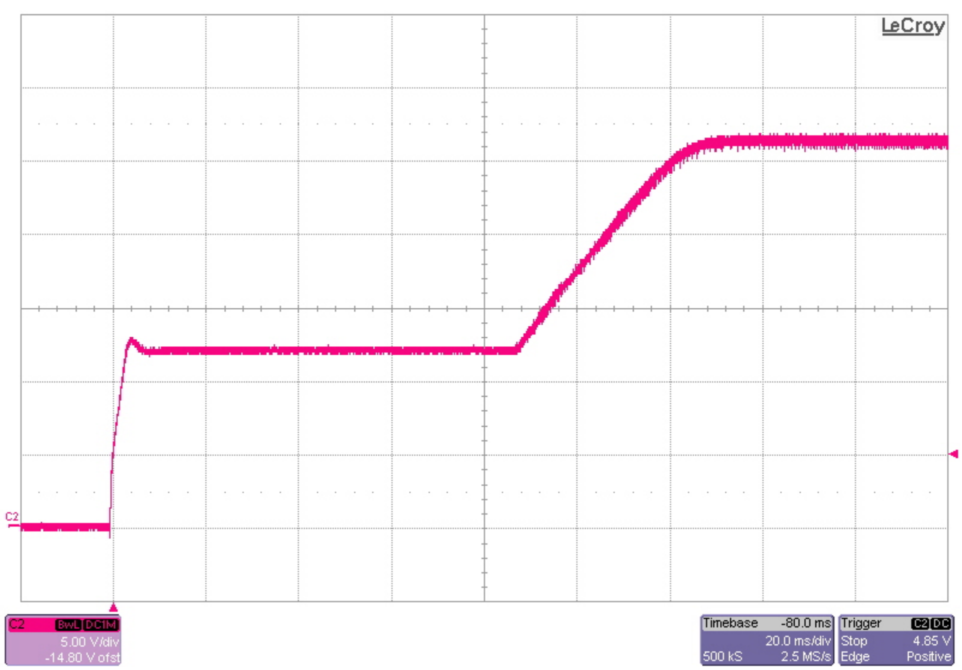
Startup (TPS40210 Boost Converter)

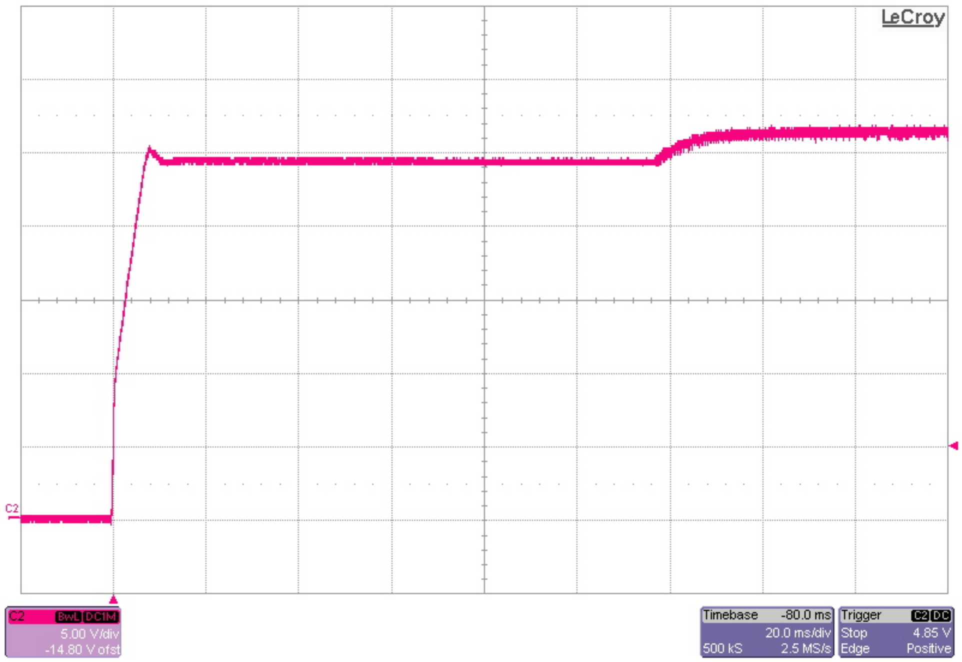
The figure below shows the 26.2V output voltage startup waveform after an input voltage of 12V is applied. Iout = 0A. (5V/DIV, 20ms/DIV)



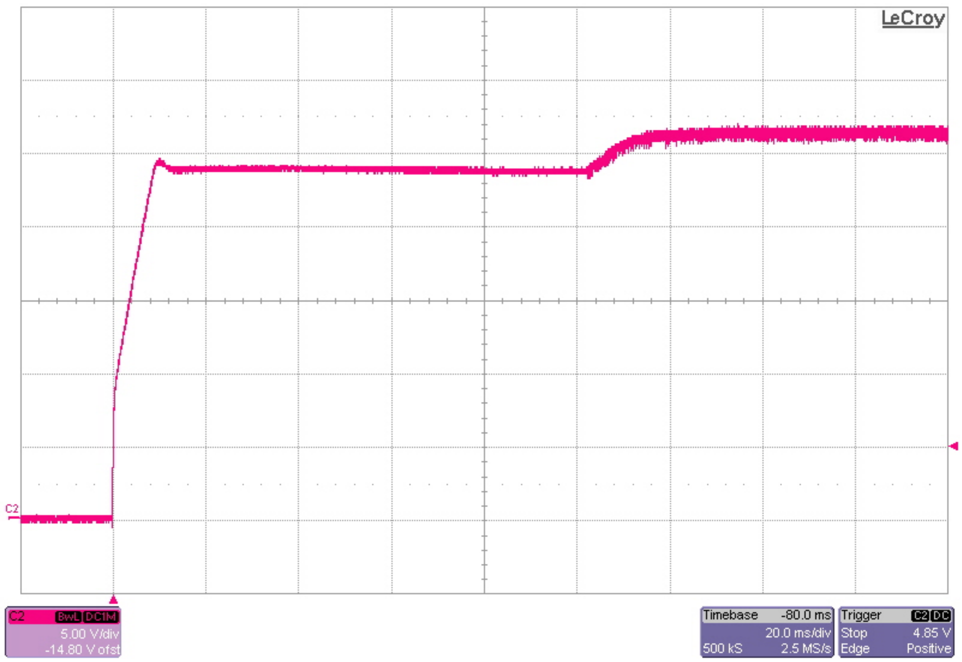
The figure below shows the 26.2V output voltage startup waveform after an input voltage of 12V is applied. Iout = 10A. (5V/DIV, 20ms/DIV)



The figure below shows the 26.2V output voltage startup waveform after an input voltage of 25V is applied.   Iout = 6A.   (5V/DIV, 20ms/DIV)

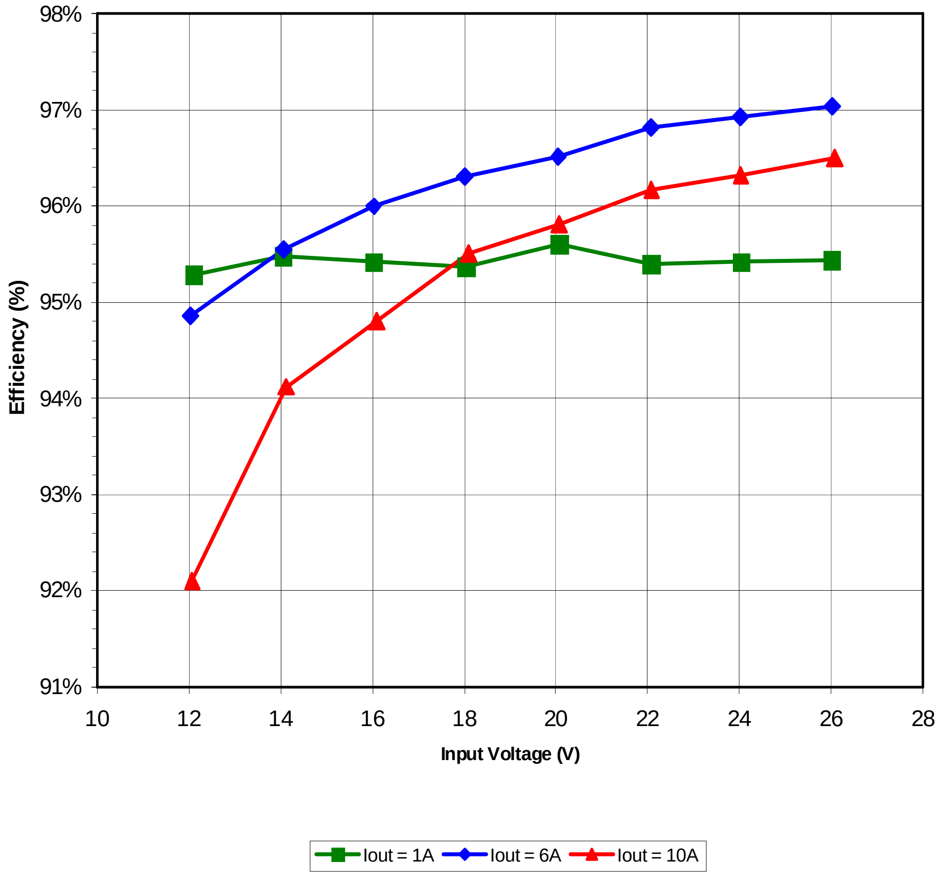


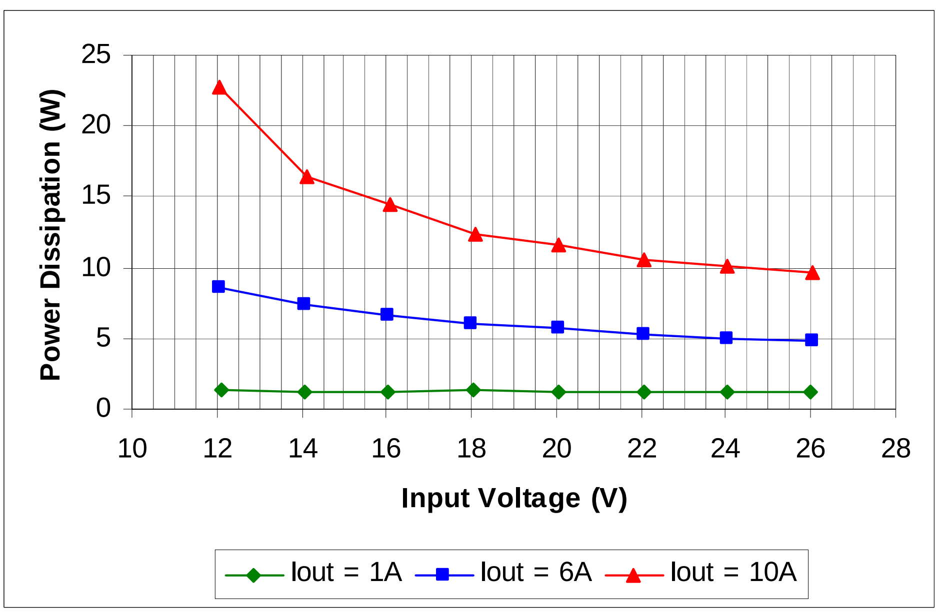
The figure below shows the 26.2V output voltage startup waveform after an input voltage of 25V is applied.   Iout = 10A.   (5V/DIV, 20ms/DIV)



Efficiency (TPS40210 Boost Converter)

The boost converter's efficiency is shown in the figure below. Vout = 26.2V





Output Ripple Voltage (TPS40210 Boost Converter)

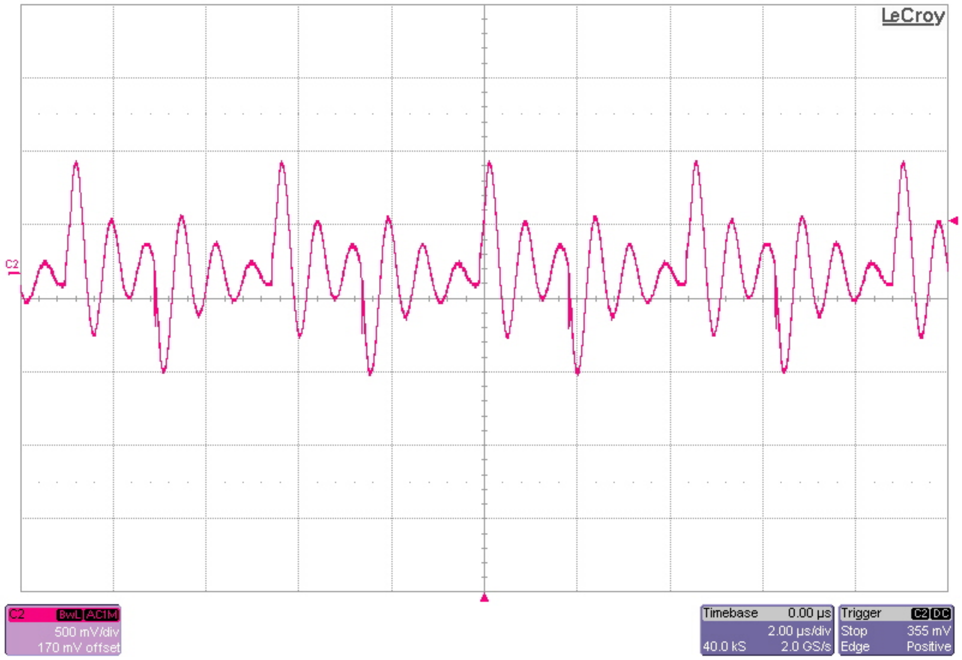
The 26.2V output ripple voltage is shown in the figure below. The image was taken with the output loaded to 10A and the input voltage set to 26Vdc. (500mV/DIV, 2us/DIV)

The 26.2V output ripple voltage is shown in the figure below. The image was taken with the output loaded to 6A and the input voltage set to 26Vdc. (500mV/DIV, 2us/DIV)

The 26.2V output ripple voltage is shown in the figure below. The image was taken with the output loaded to 10A and the input voltage set to 20Vdc. (500mV/DIV, 2us/DIV)

The 26.2V output ripple voltage is shown in the figure below. The image was taken with the output loaded to 6A and the input voltage set to 20Vdc. (500mV/DIV, 2us/DIV)

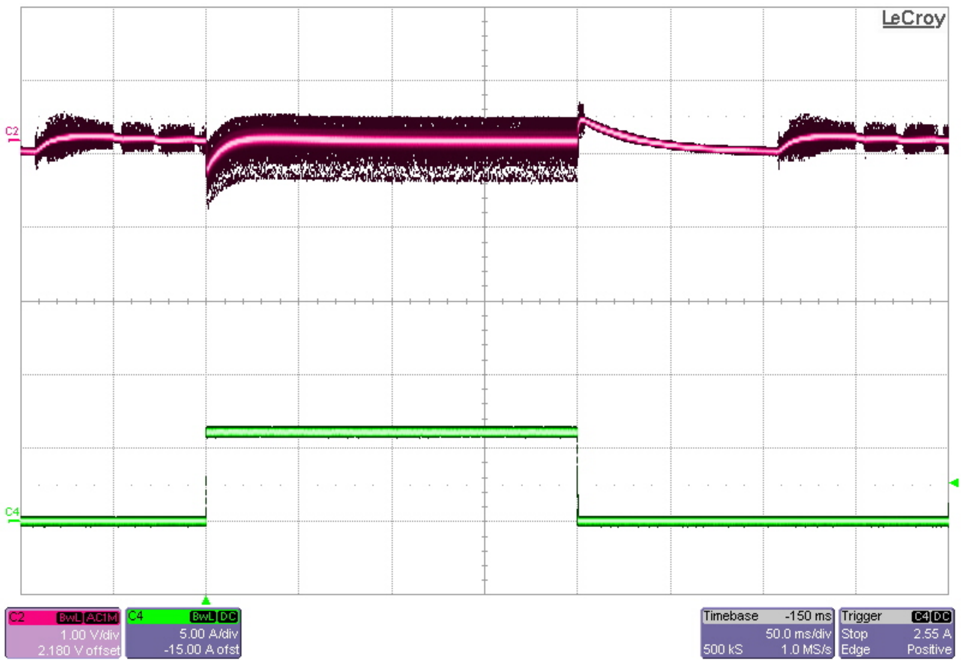
The 26.2V output ripple voltage is shown in the figure below. The image was taken with the output loaded to 10A and the input voltage set to 12Vdc.   (500mV/DIV, 2us/DIV)



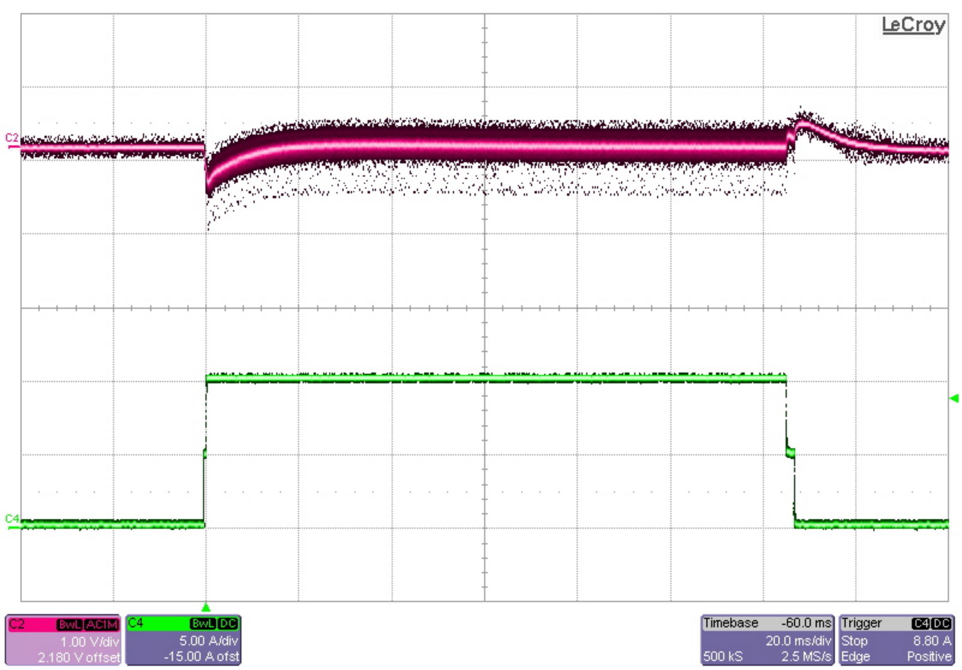
The 26.2V output ripple voltage is shown in the figure below. The image was taken with the output loaded to 6A and the input voltage set to 12Vdc.   (500mV/DIV, 2us/DIV)

Load Transients (TPS40210 Boost Converter)

The photo below shows the 26.2V output voltage (AC coupled) when the load current is switched between 0A and 6A. Vin= 20V (1V/DIV, 5A/DIV, 50ms/DIV)

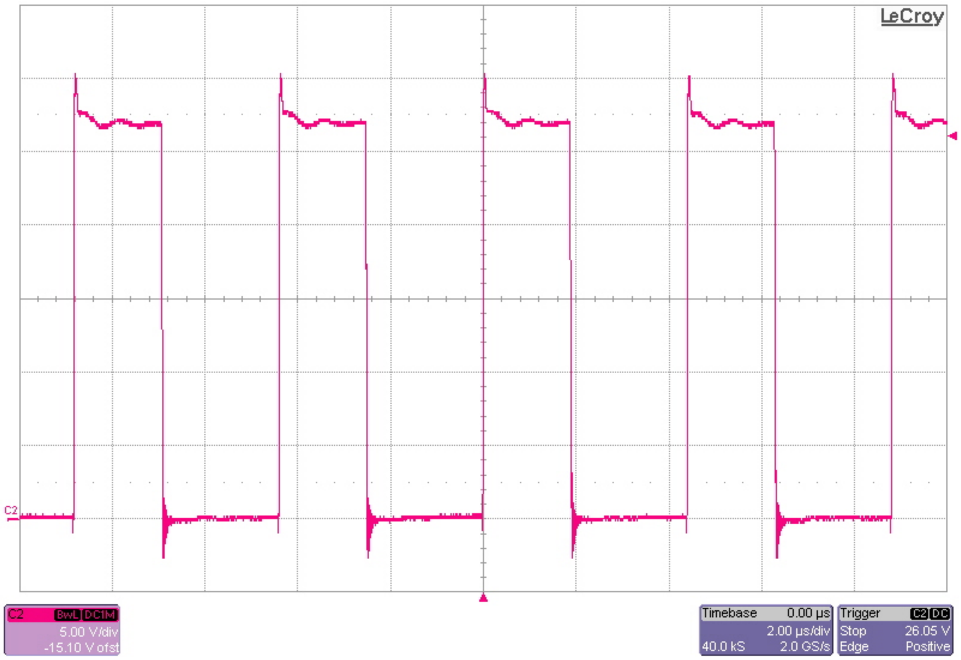


The photo below shows the 26.2V output voltage (AC coupled) when the load current is switched between 0A and 10A. Vin= 20V (1V/DIV, 5A/DIV, 50ms/DIV)

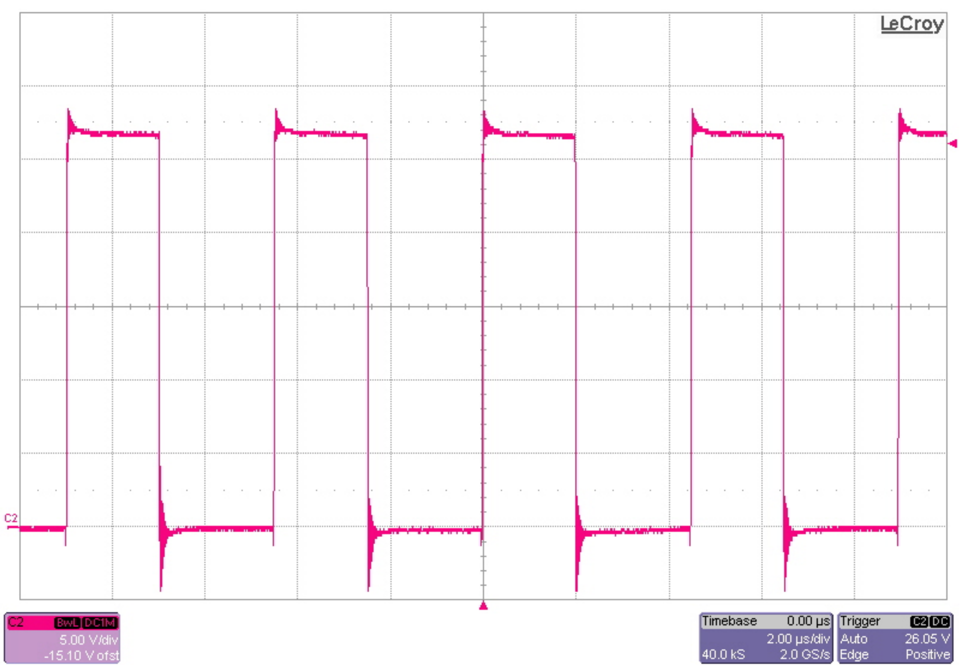


Switch Node Waveforms (TPS40210 Boost Converter)

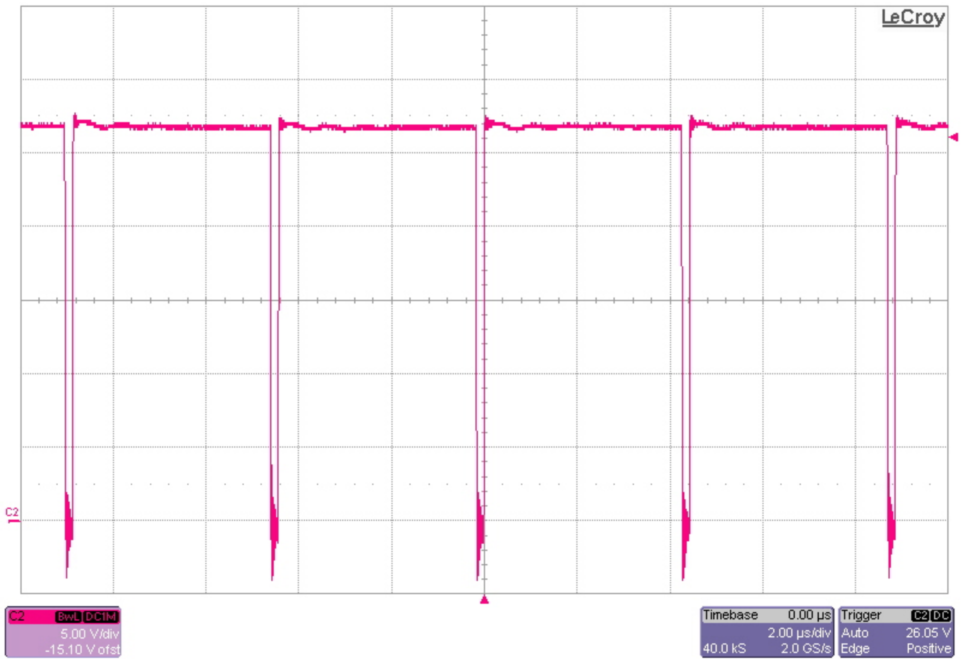
The photo below is of the FET switch node voltage at TP7. The input voltage is 12Vand the output is loaded to 10A. (5V/DIV, 2us/DIV)



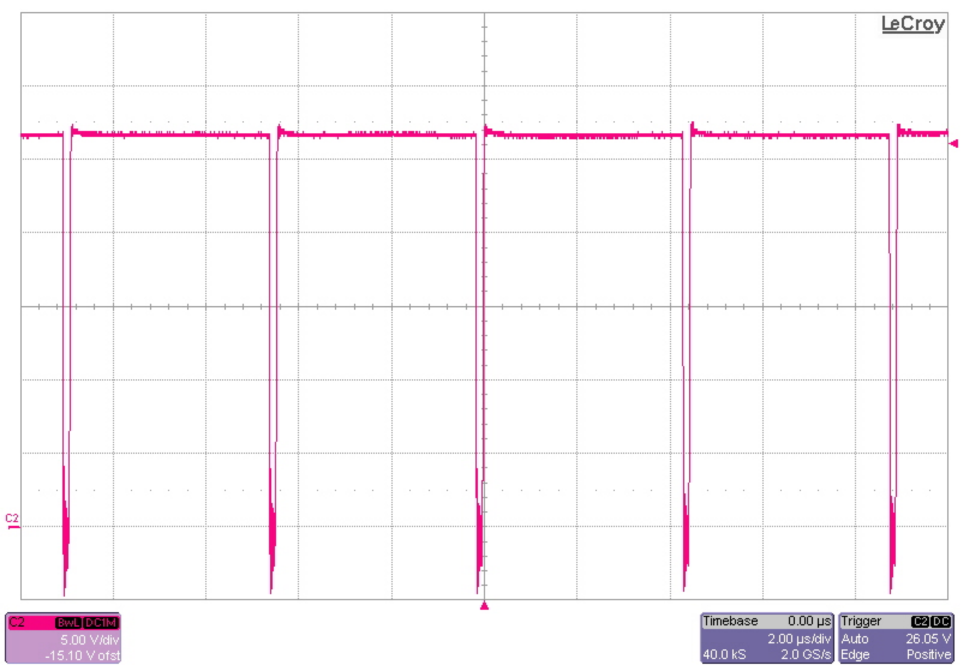
The photo below is of the FET switch node voltage at TP7. The input voltage is 12Vand the output is loaded to 1A. (5V/DIV, 2us/DIV)



The photo below is of the FET switch node voltage at TP7. The input voltage is 26Vand the output is loaded to 10A. (5V/DIV, 2us/DIV)

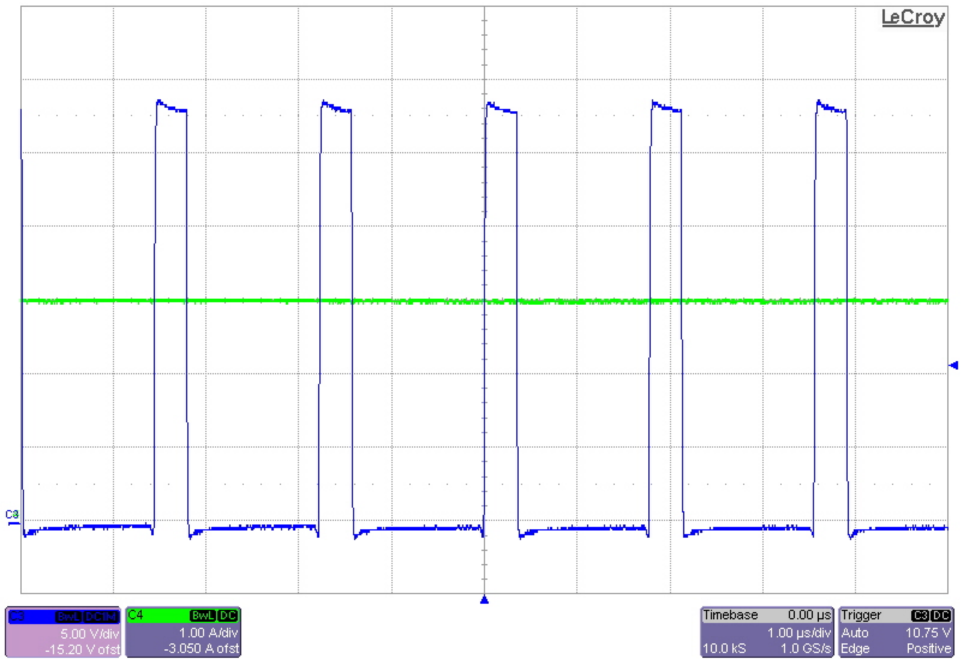


The photo below is of the FET switch node voltage at TP7. The input voltage is 26Vand the output is loaded to 1A. (5V/DIV, 2us/DIV)

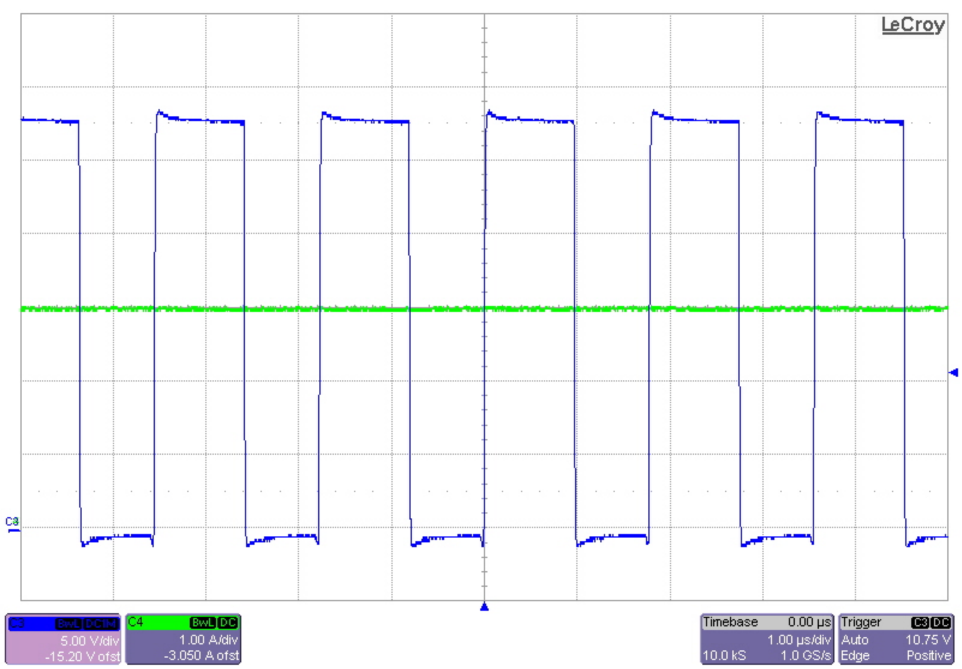


Switch Node Waveforms (BQ24640 Charger)

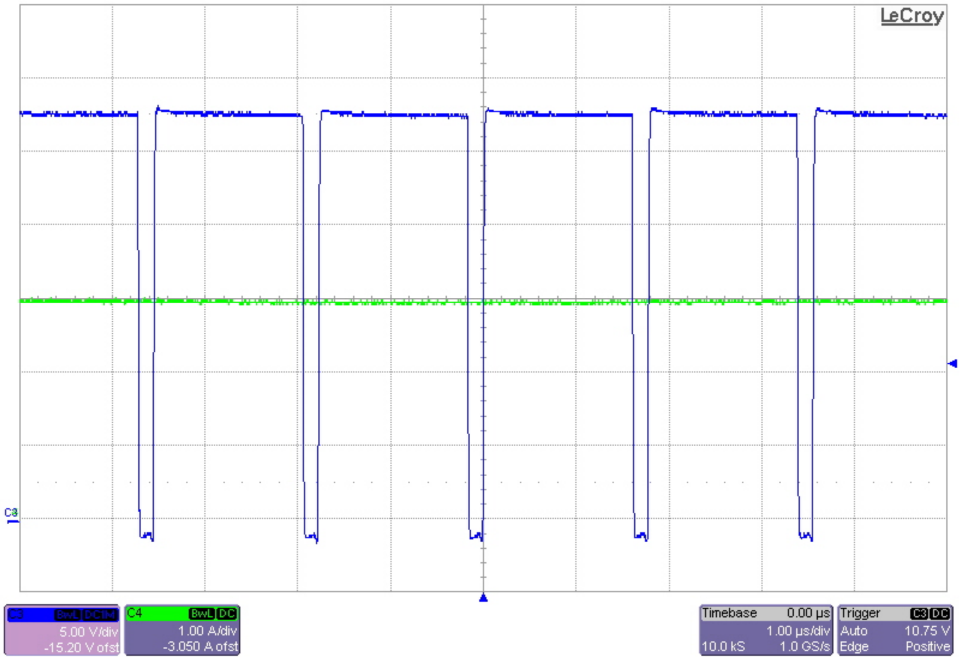
The photo below is of the FET switch node voltage at TP19. The input voltage is 28Vand the output cap bank voltage is at 5V while being charged at 3A. A 28.2F/29.7V cap bank was used.
(5V/DIV, 1A/DIV, 1us/DIV)



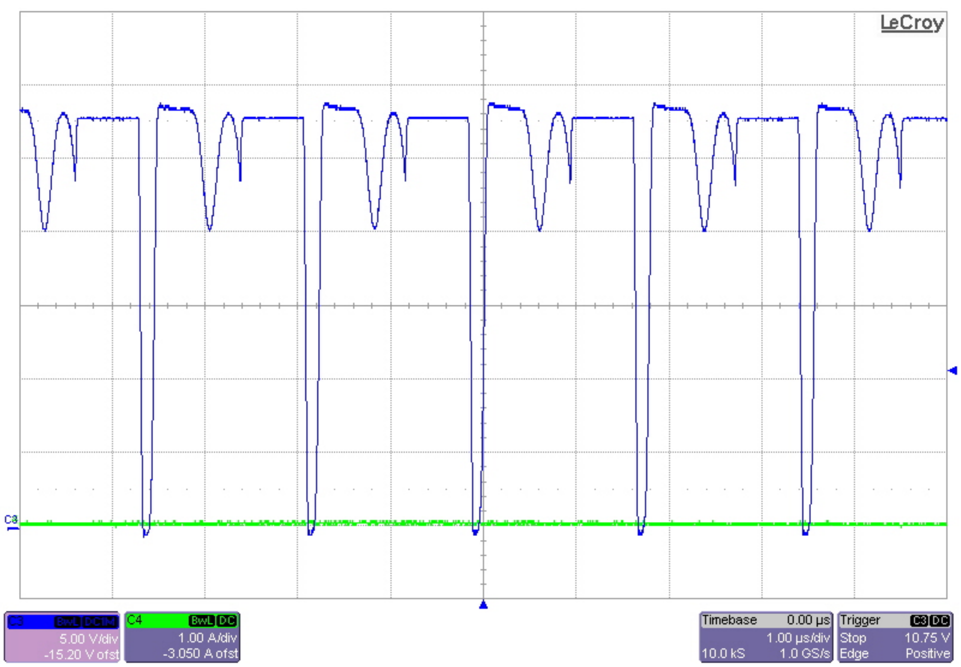
The photo below is of the FET switch node voltage at TP19. The input voltage is 28Vand the output cap bank voltage is at 15V while being charged at 3A. A 28.2F/29.7V cap bank was used.
(5V/DIV, 1A/DIV, 1us/DIV)



The photo below is of the FET switch node voltage at TP19. The input voltage is 28Vand the output cap bank voltage is at 25V while being charged at 3A. A 28.2F/29.7V cap bank was used.
(5V/DIV, 1A/DIV, 1us/DIV)

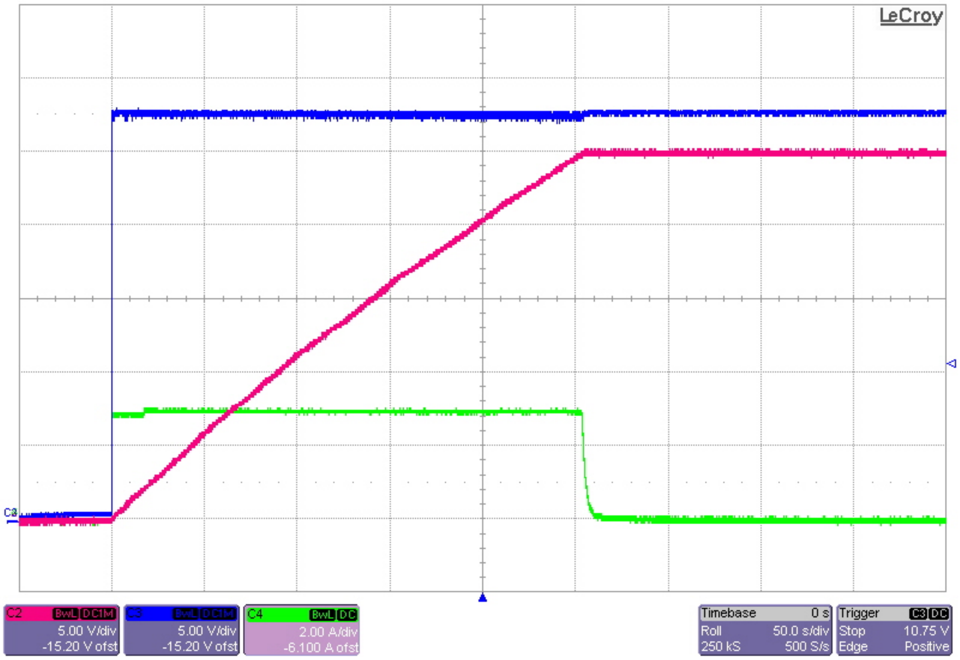


The photo below is of the FET switch node voltage at TP19. The input voltage is 28Vand the output cap bank voltage is being regulated at 25.2V (charge current reduced). A 28.2F/29.7V cap bank was used.
(5V/DIV, 1A/DIV, 1us/DIV)

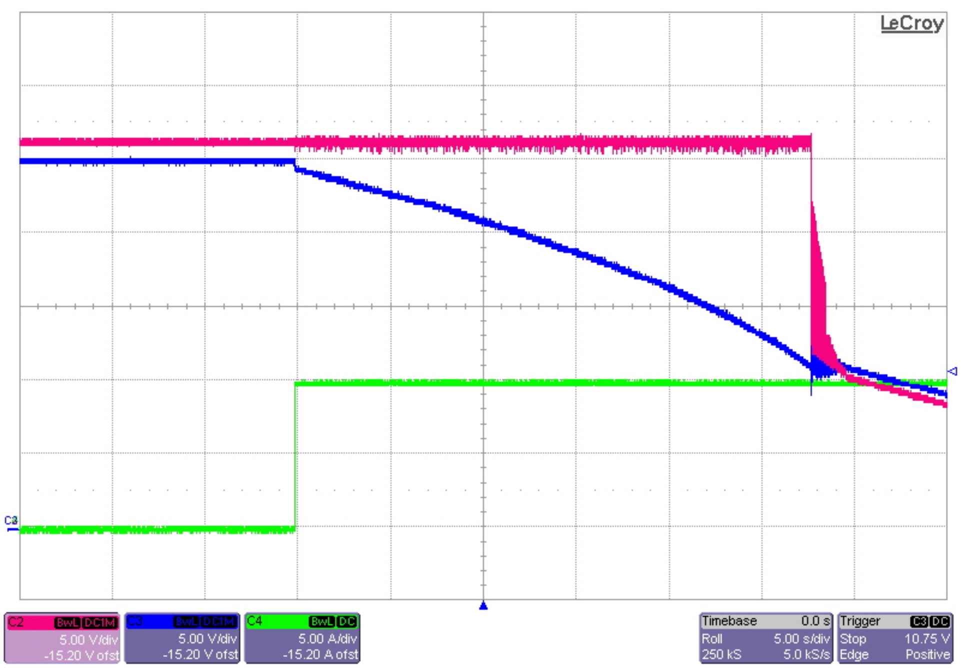


Charging and Discharging Waveforms

The photo below shows the supercap bank being charged. An input voltage of 28Vis applied to the BQ24640 charger and the supercap voltage is shown charging at a regulated 3A. A 28.2F/29.7V cap bank was used. (5V/DIV, 2A/DIV, 50s/DIV)



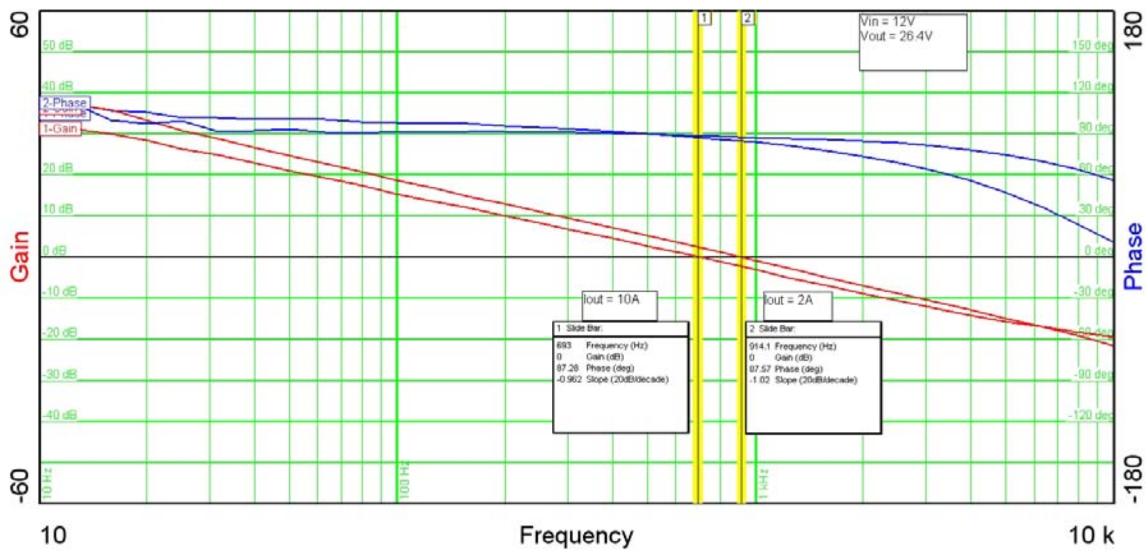
The photo below shows the supercap bank being discharged by the boost converter. A charged supercap (25.2V) is supplying power to the TPS40210 boost converter and loaded to 10A (Vo = 26V) until it shuts off. A 28.2F/29.7V cap bank was used. (5V/DIV, 5A/DIV, 5s/DIV)



Control Loop Gain / Stability (TPS40210 Boost Converter)

The plot below shows the loop gain and phase margin for a 12V input voltage.

Iout = 2A	Loop Gain = 914Hz	Phase Margin = 88 degrees
Iout = 10A	Loop Gain = 693Hz	Phase Margin = 87 degrees



The plot below shows the loop gain and phase margin for a 25V input voltage.

Iout = 1A	Loop Gain = 981Hz	Phase Margin = 94 degrees
Iout = 10A	Loop Gain = 1.03KHz	Phase Margin = 94 degrees

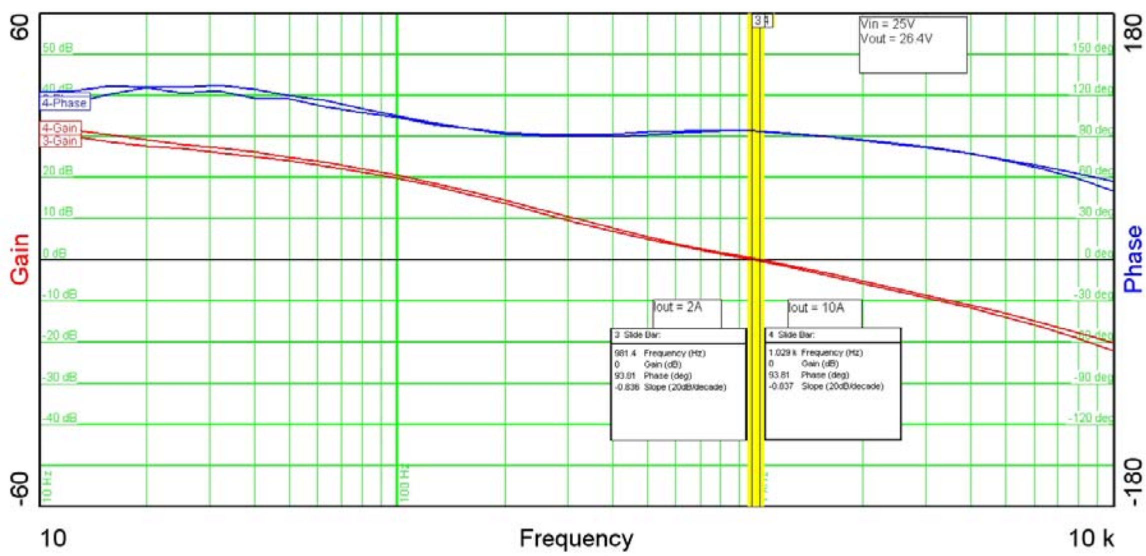


Photo (TPS40210 Boost Converter + BQ24640 Charger)

The photo below is the PMP7327 REVB reference design.

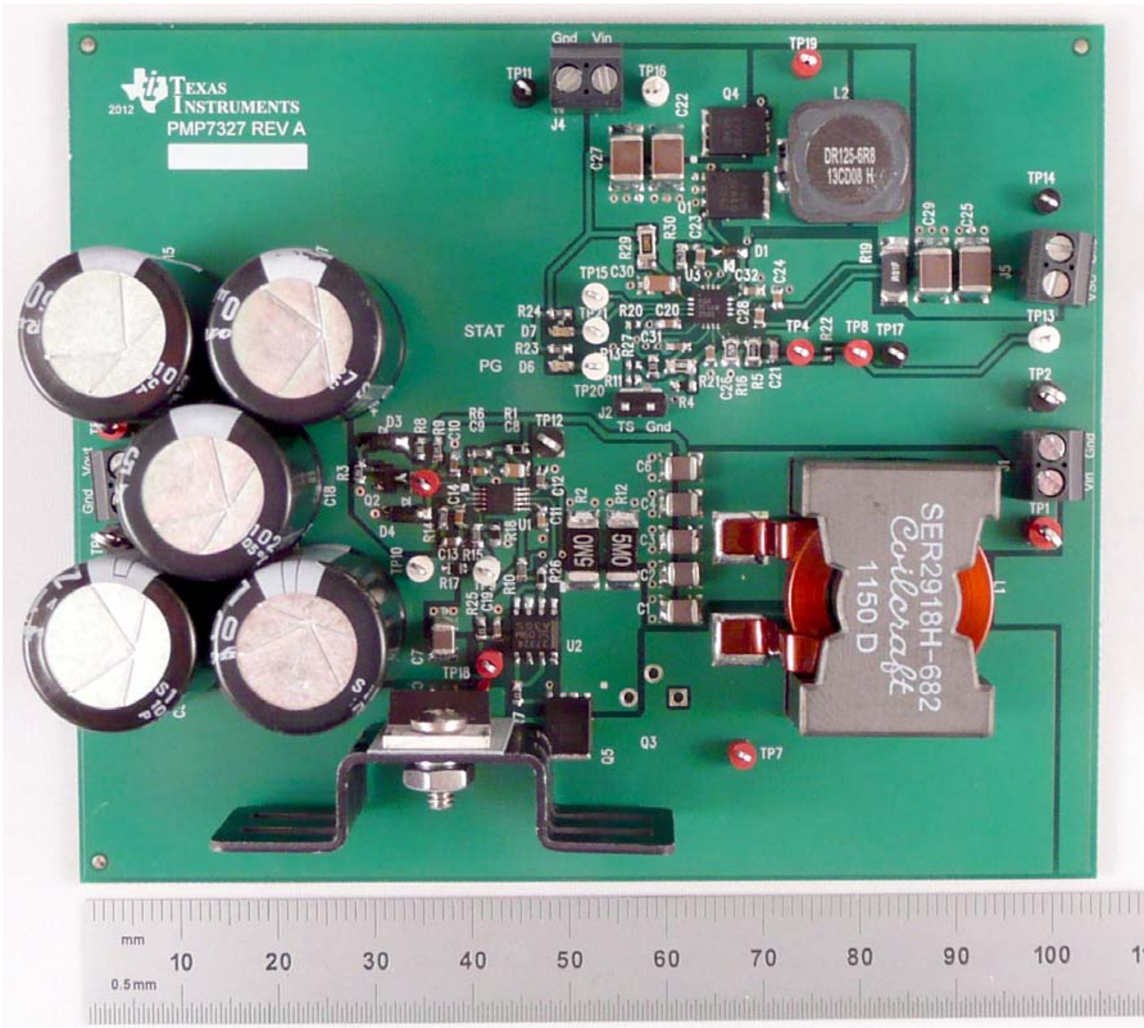
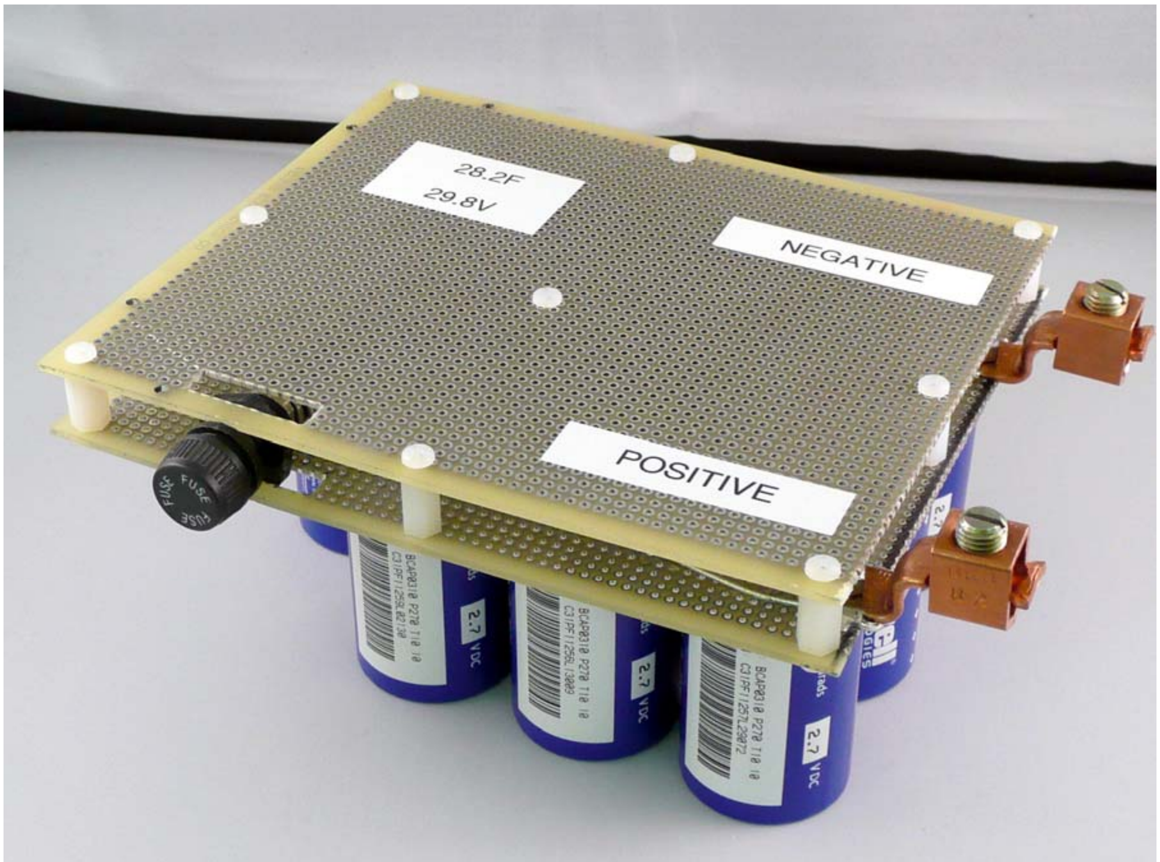


Photo (Supercap Assy)

The photos below shows the supercap assy used to test the BQ24640 charger. It uses 11 series 310F/2.7V/2.2milliohms capacitors, each with a 1K balancing resistor, and a single 20A fuse in series with the positive terminal   Capacitor PN: Maxwell BCAP0310P270T10
(150 x 130 x 80 mm, WxDxH)



Thermal Image (TPS40210 Boost Converter)

The photo below shows the board temperature when operated at 20V input and 26.2V @ 5A output.

The photo below shows the board temperature when operated at 12V input and 26.2V @ 5A output.