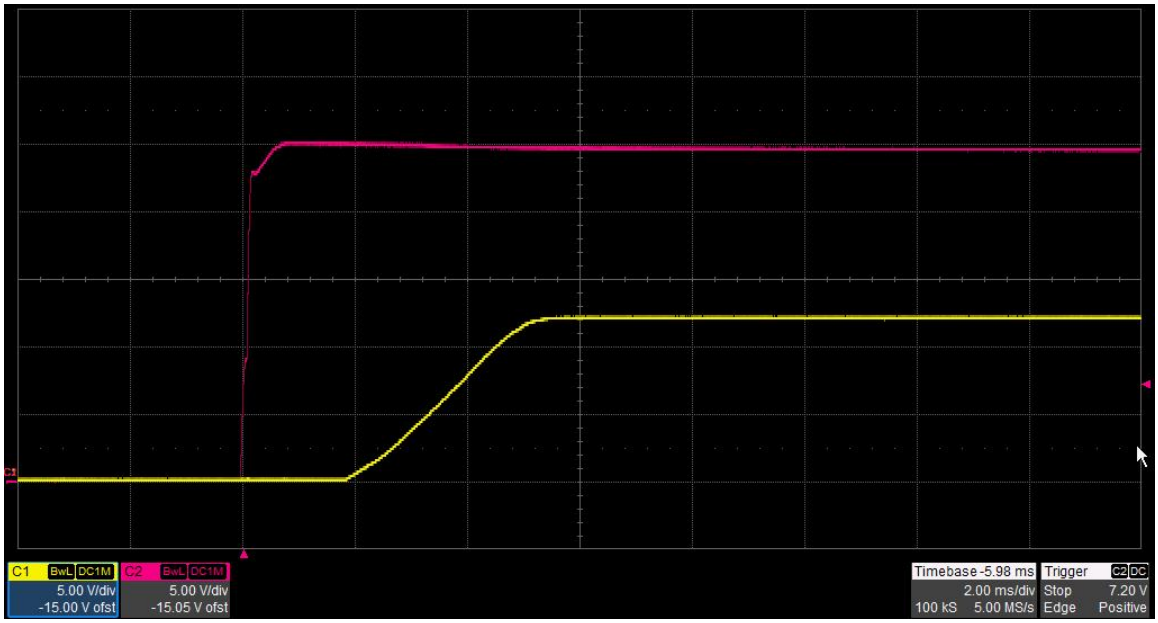
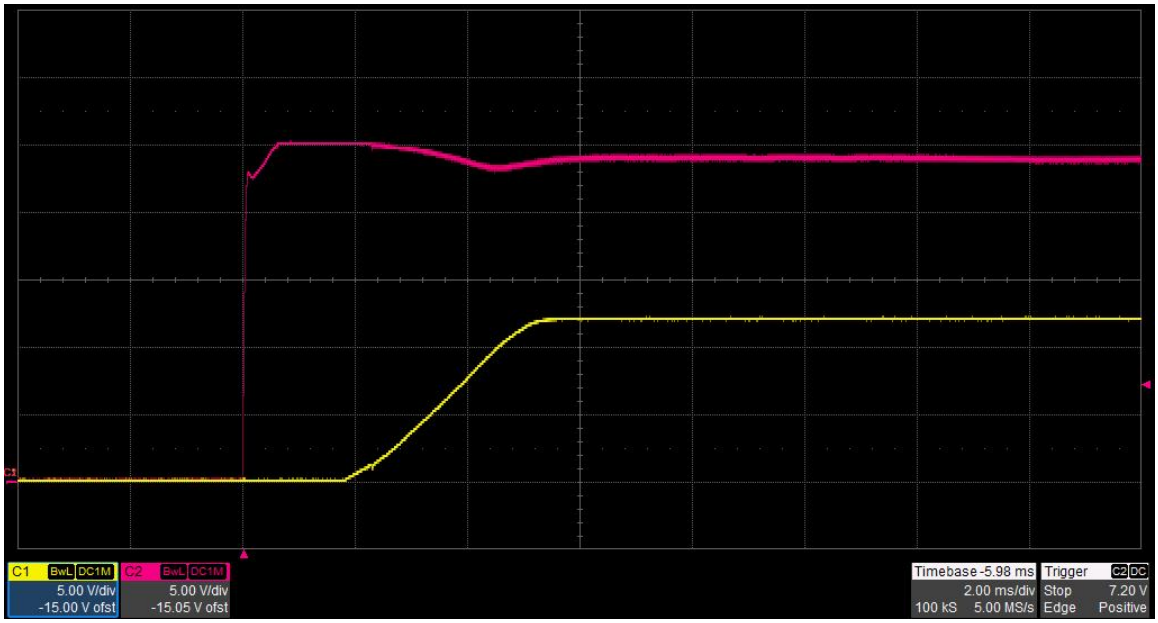
1 Startup

The photo below shows the output voltage startup waveform after the application of 24V in with the 12V output loaded to 0A. (5V/DIV, 2mS/DIV)

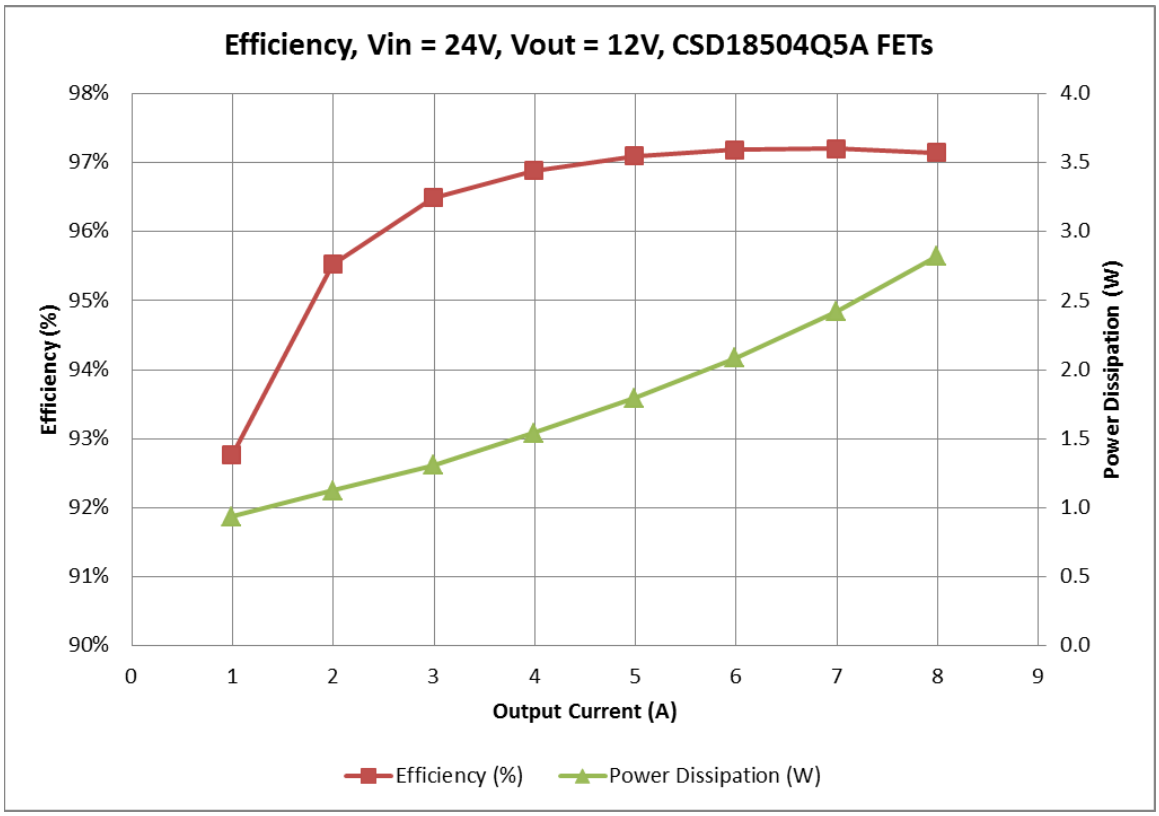


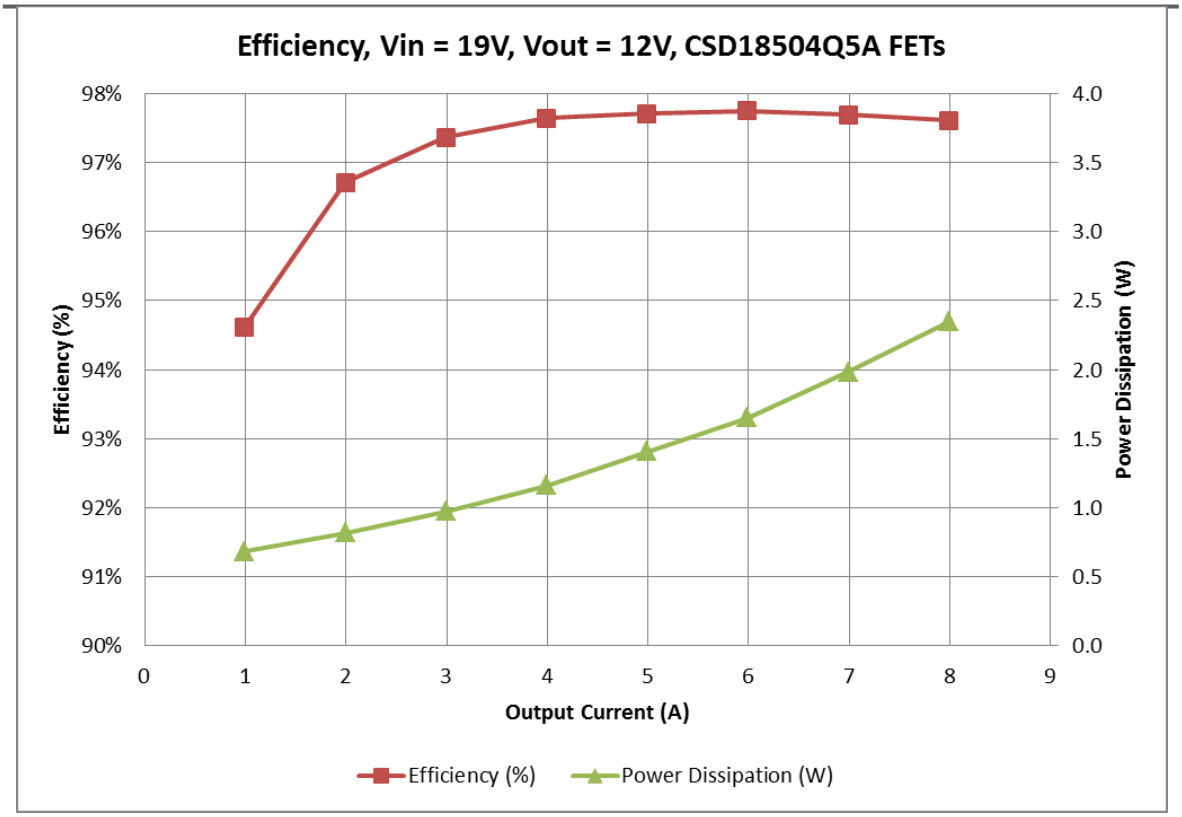
The photo below shows the output voltage startup waveform after the application of 24V in with the 12V output loaded to 8A. (5V/DIV, 2mS/DIV)

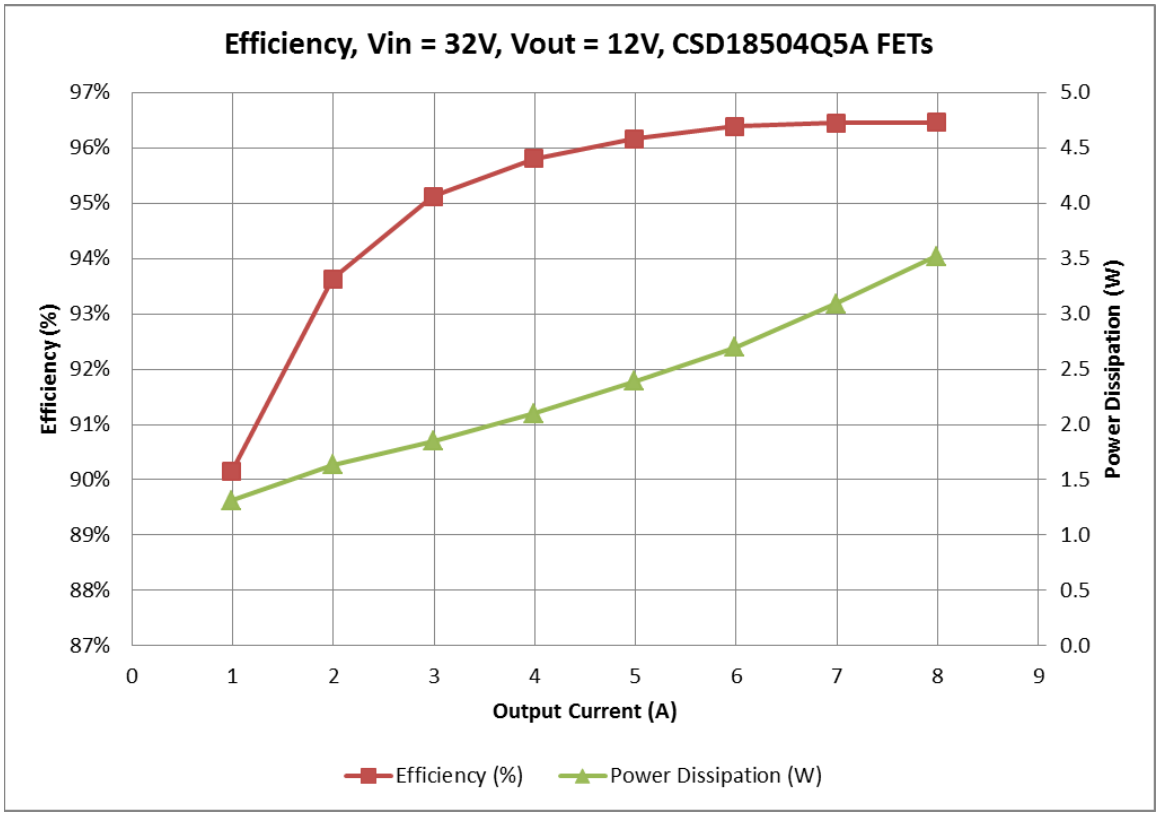


2 Efficiency

The TPS40170 12V converter efficiency is shown in the figure below.

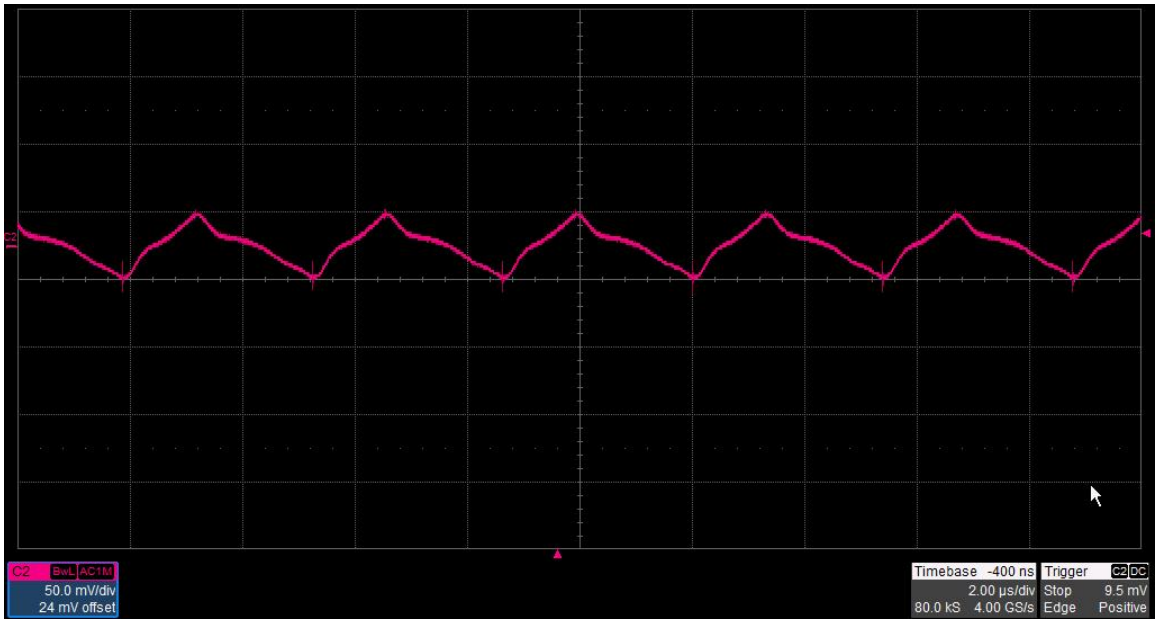



Efficiency, Vin = 19V, Vout = 12V, CSD18504Q5A FETs
Efficiency (%)
Power Dissipation (W)
Output Current (A)
98%
97%
96%
95%
94%
93%
92%
91%
90%
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0
1
2
3
4
5
6
7
8
9
Efficiency (%)
Power Dissipation (W)

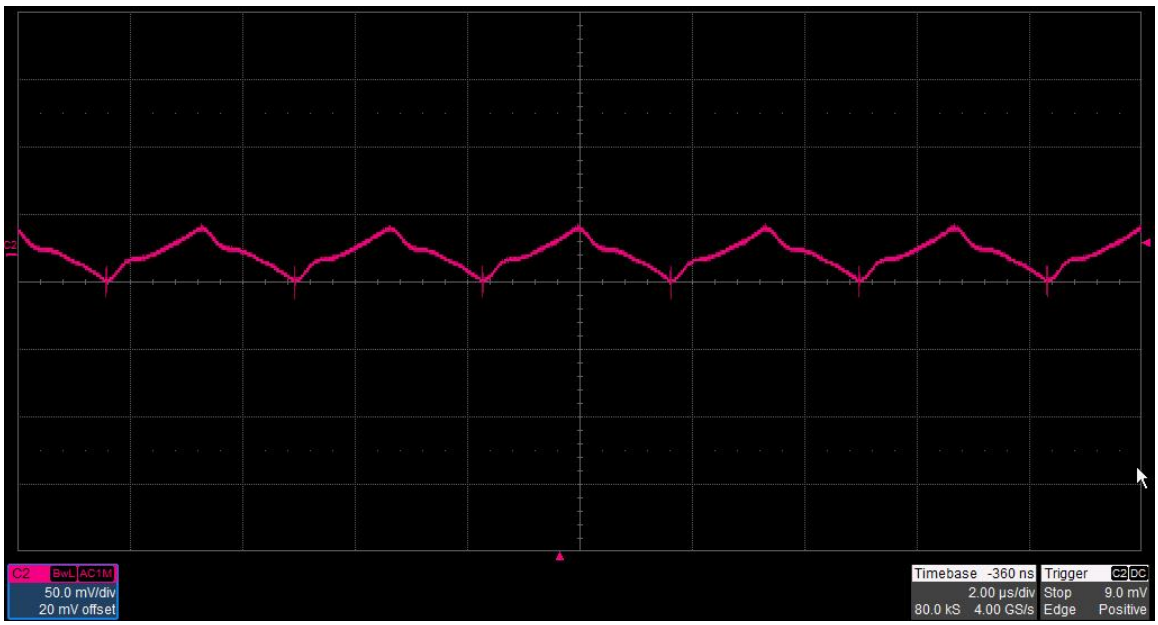

Efficiency, Vin = 32V, Vout = 12V, CSD18504Q5A FETs
Efficiency (%)
Power Dissipation (W)
Output Current (A)
97%
96%
95%
94%
93%
92%
91%
90%
89%
88%
87%
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0
1
2
3
4
5
6
7
8
9
Efficiency (%)
Power Dissipation (W)

3 Output Ripple Voltage

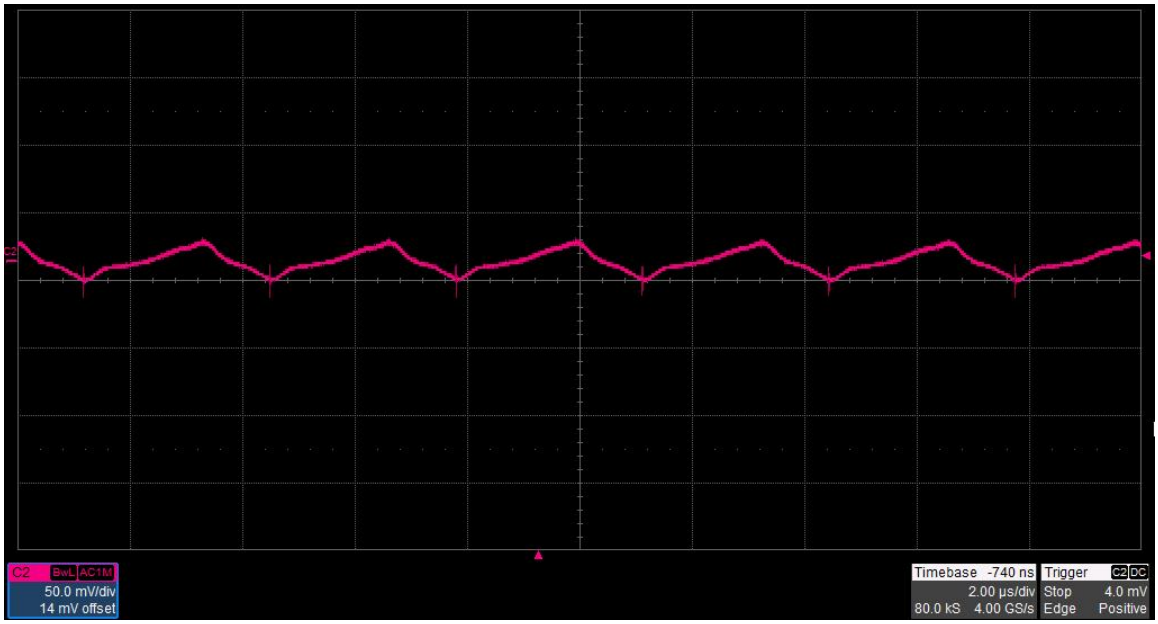
The output ripple voltage is shown in the figure below. The image was taken with the 12V output loaded to 8A and the input voltage set to 32V. (50mV/DIV, 2uS/DIV)



The output ripple voltage is shown in the figure below. The image was taken with the 12V output loaded to 8A and the input voltage set to 24V. (50mV/DIV, 2uS/DIV)

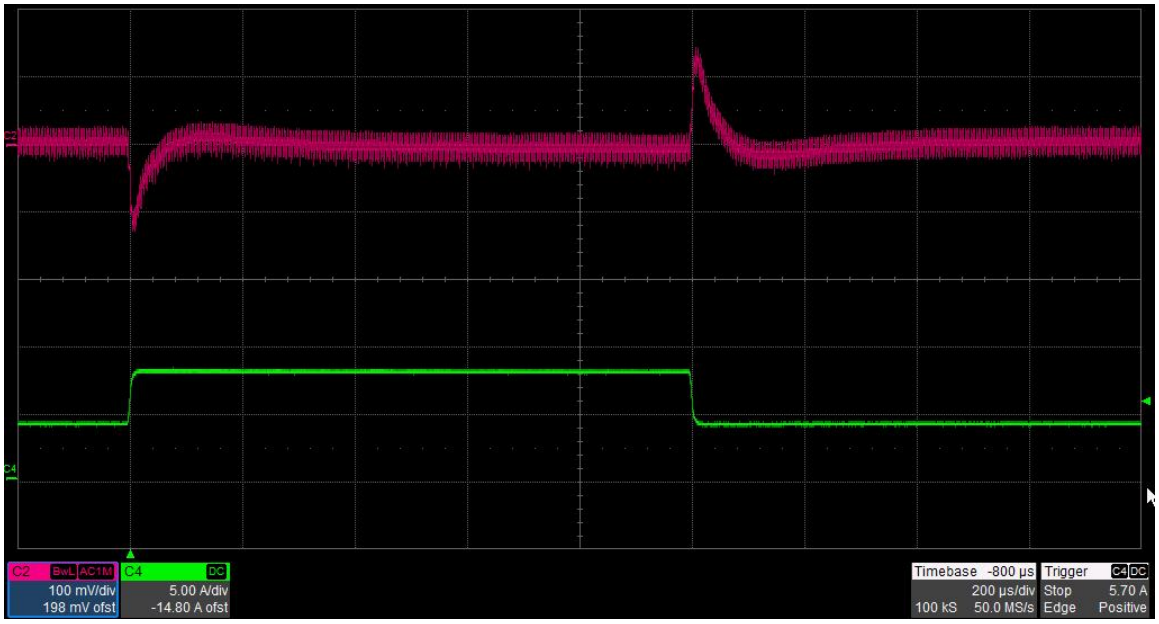


The output ripple voltage is shown in the figure below. The image was taken with the 12V output loaded to 8A and the input voltage set to 19V. (50mV/DIV, 2uS/DIV)

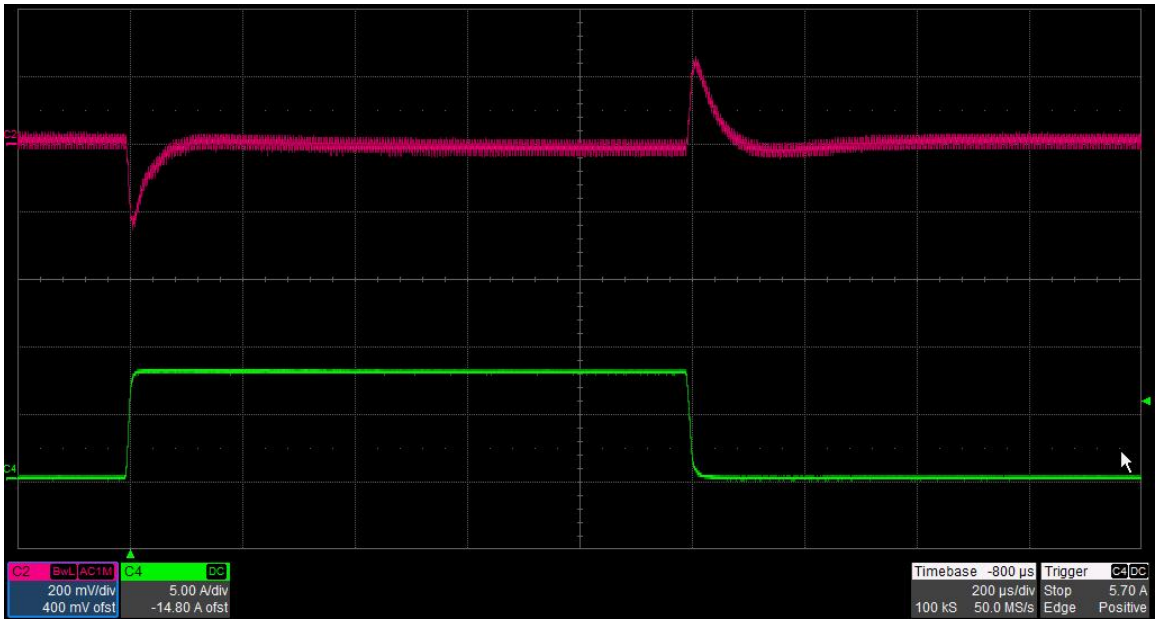


4 Load Transients

The photo below shows the output voltage (ac coupled) when the load current is stepped between 4A and 8A. Vin = 24V. (100mV/DIV, 5A/DIV, 200uS/DIV)

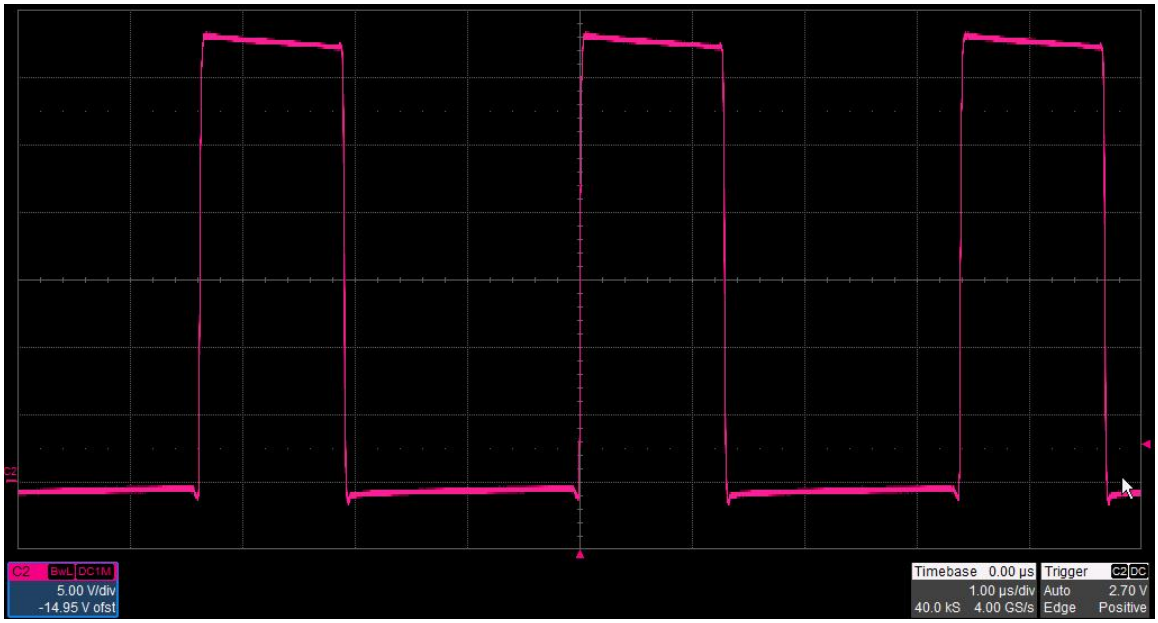


The photo below shows the output voltage (ac coupled) when the load current is stepped between 0A and 8A. Vin = 24V. (200mV/DIV, 5A/DIV, 200uS/DIV)

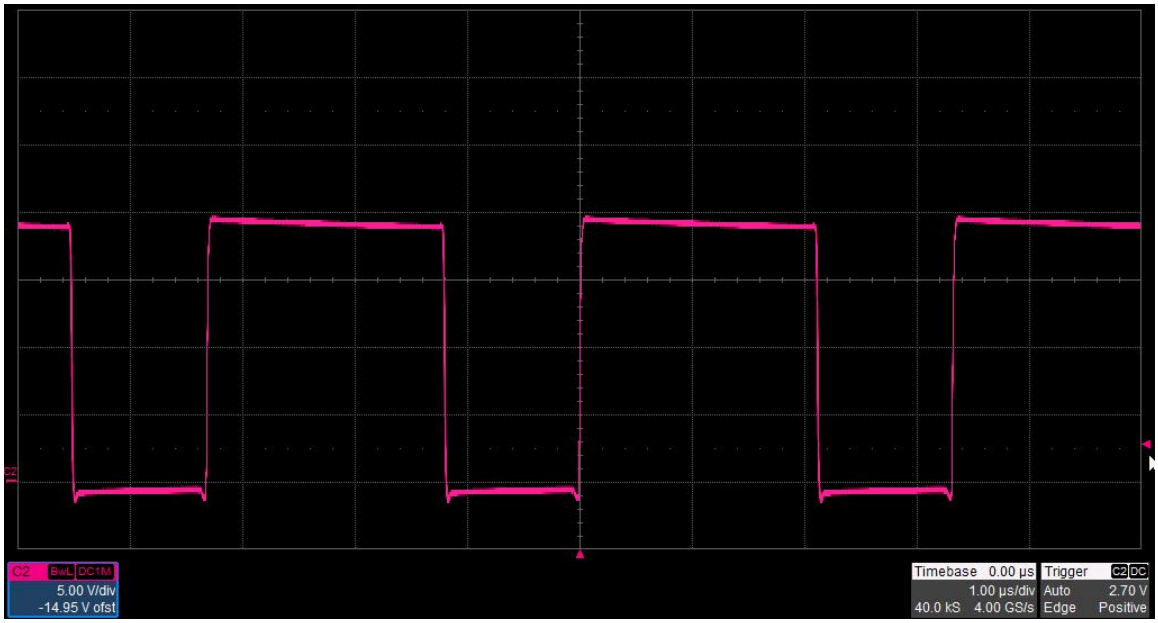


5 Switch Node Waveforms

The photo below shows the switch node voltage (TP4). The input voltage is 32V and the 12V output is loaded to 8A. (5V/DIV, 1uS/DIV)



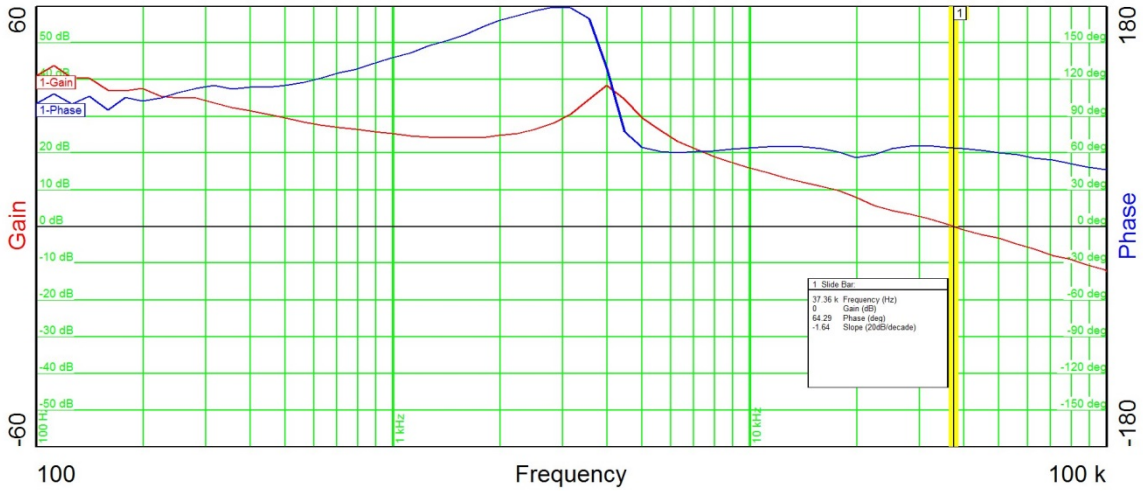
The photo below shows the switch node voltage (TP4). The input voltage is 19V and the 12V output is loaded to 8A. (5V/DIV, 1uS/DIV)



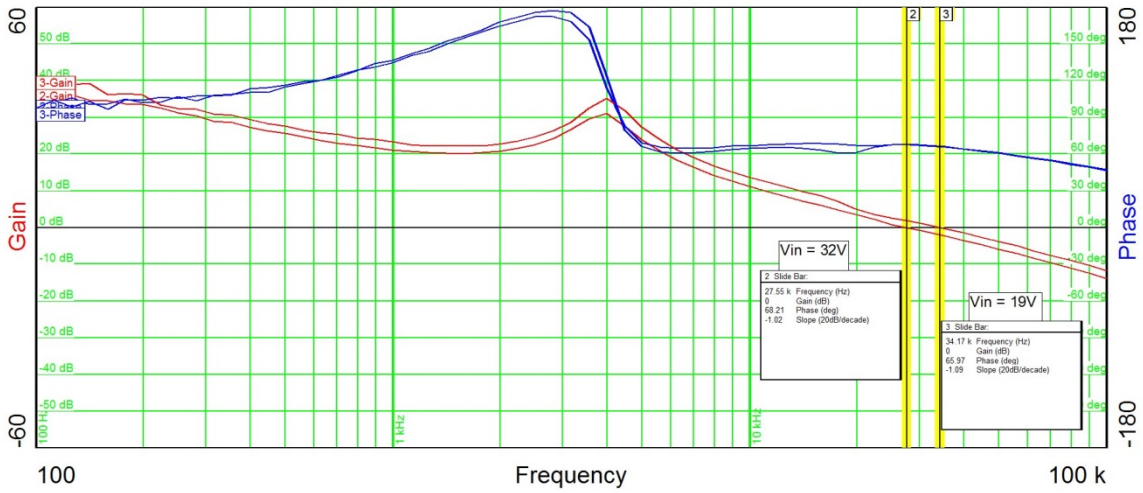
6 Control Loop Gain / Stability

The plot below shows the boost converter's loop gain and phase margin when the 12V output is loaded to 8A.

Vin = 24V Band Width = 36.4KHz Phase Margin = 64 degrees

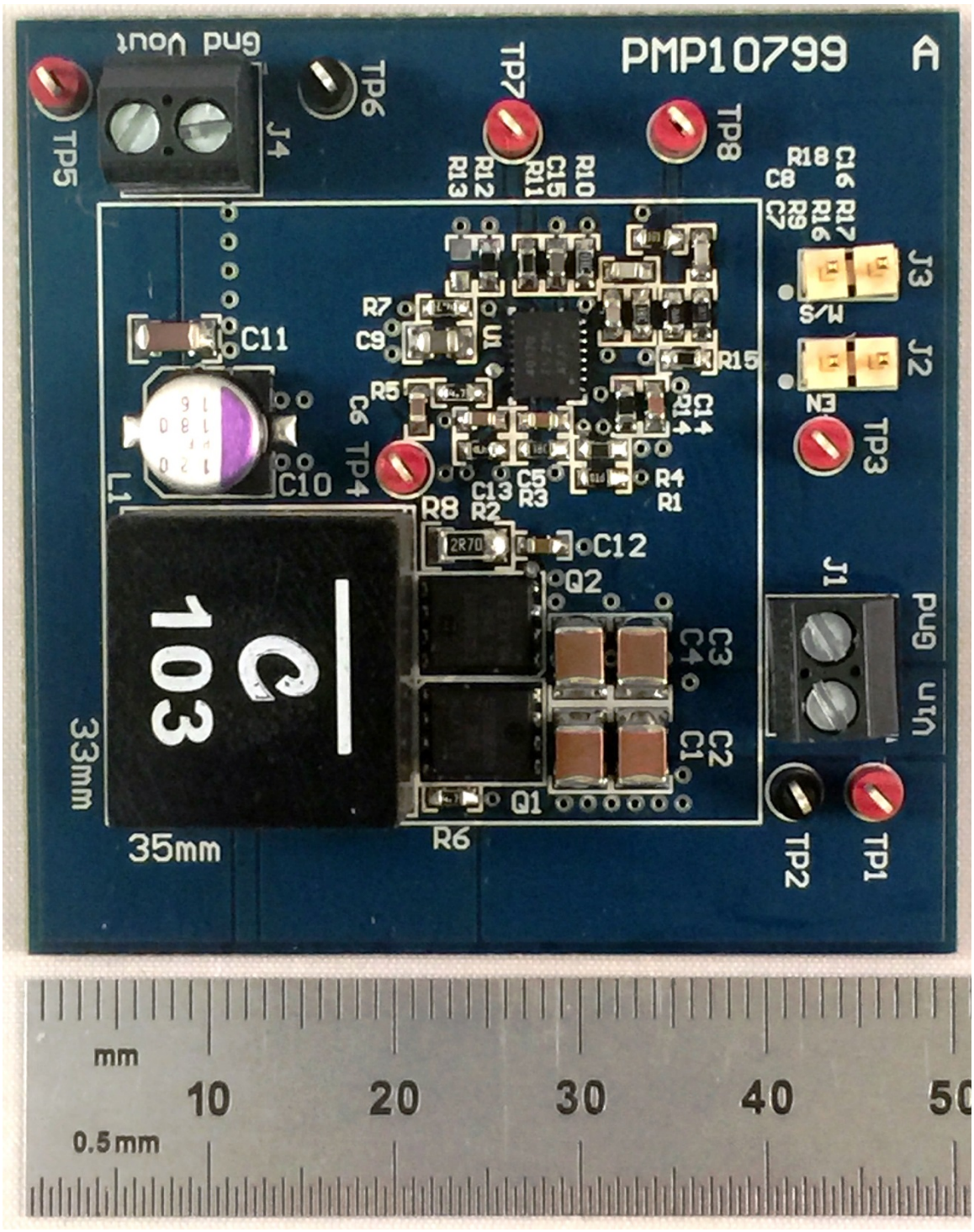


Vin = 32V Band Width = 27.6KHz Phase Margin = 68 degrees
Vin = 19V Band Width = 34.2KHz Phase Margin = 66 degrees



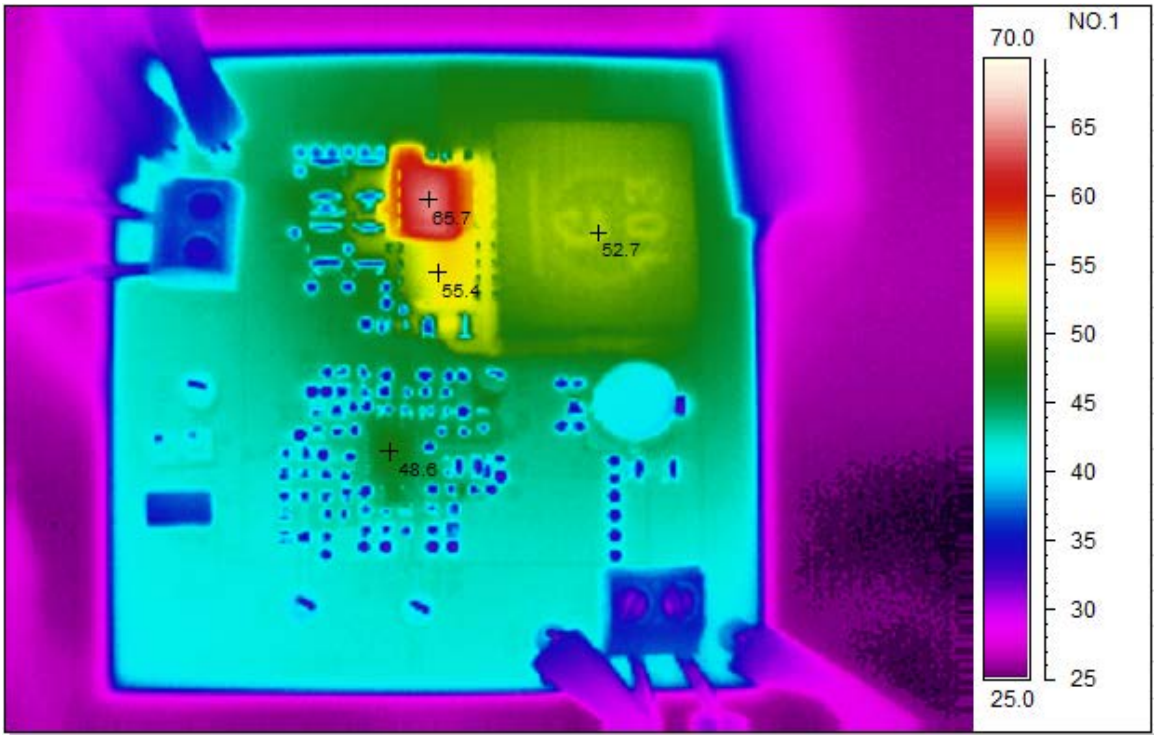
7 Photo

The photo below shows the PMP10799 REVB assy.



8 Thermal Image

The thermal image below shows sustained operation while at 24V input / 8A output, with no airflow.



IMPORTANT NOTICE AND DISCLAIMER

TI PROVIDES TECHNICAL AND RELIABILITY DATA (INCLUDING DATASHEETS), DESIGN RESOURCES (INCLUDING REFERENCE DESIGNS), APPLICATION OR OTHER DESIGN ADVICE, WEB TOOLS, SAFETY INFORMATION, AND OTHER RESOURCES “AS IS” AND WITH ALL FAULTS, AND DISCLAIMS ALL WARRANTIES, EXPRESS AND IMPLIED, INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF THIRD PARTY INTELLECTUAL PROPERTY RIGHTS.

These resources are intended for skilled developers designing with TI products. You are solely responsible for (1) selecting the appropriate TI products for your application, (2) designing, validating and testing your application, and (3) ensuring your application meets applicable standards, and any other safety, security, or other requirements. These resources are subject to change without notice. TI grants you permission to use these resources only for development of an application that uses the TI products described in the resource. Other reproduction and display of these resources is prohibited. No license is granted to any other TI intellectual property right or to any third party intellectual property right. TI disclaims responsibility for, and you will fully indemnify TI and its representatives against, any claims, damages, costs, losses, and liabilities arising out of your use of these resources.

TI’s products are provided subject to TI’s Terms of Sale (https:www.ti.com/legal/termsofsale.html) or other applicable terms available either on ti.com or provided in conjunction with such TI products. TI’s provision of these resources does not expand or otherwise alter TI’s applicable warranties or warranty disclaimers for TI products.

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265