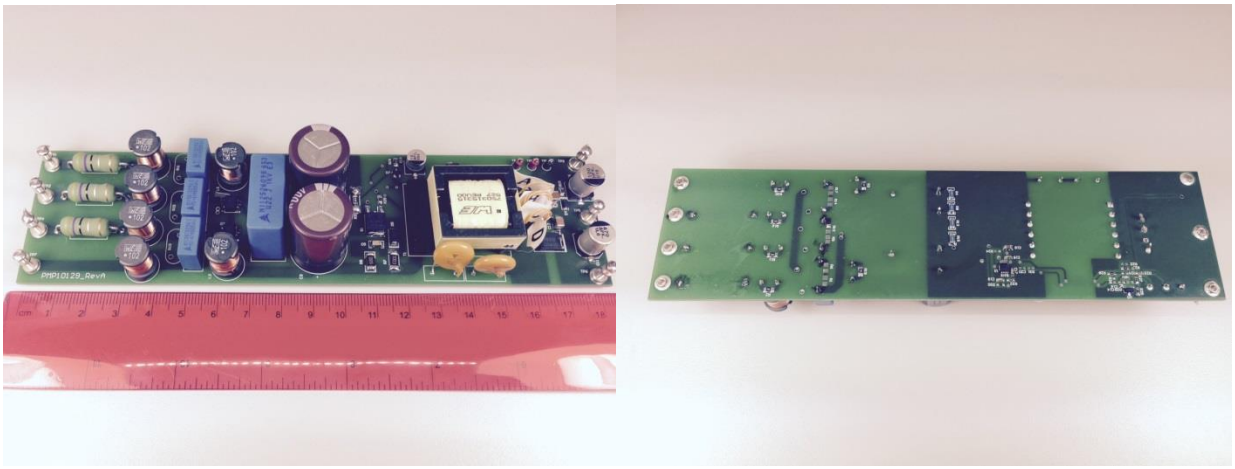
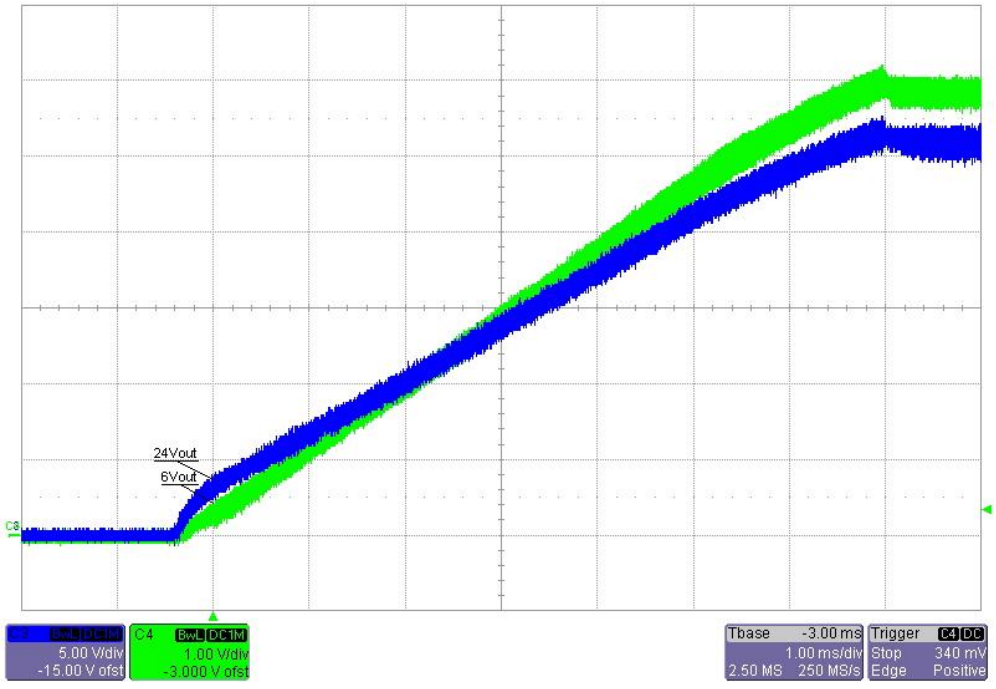


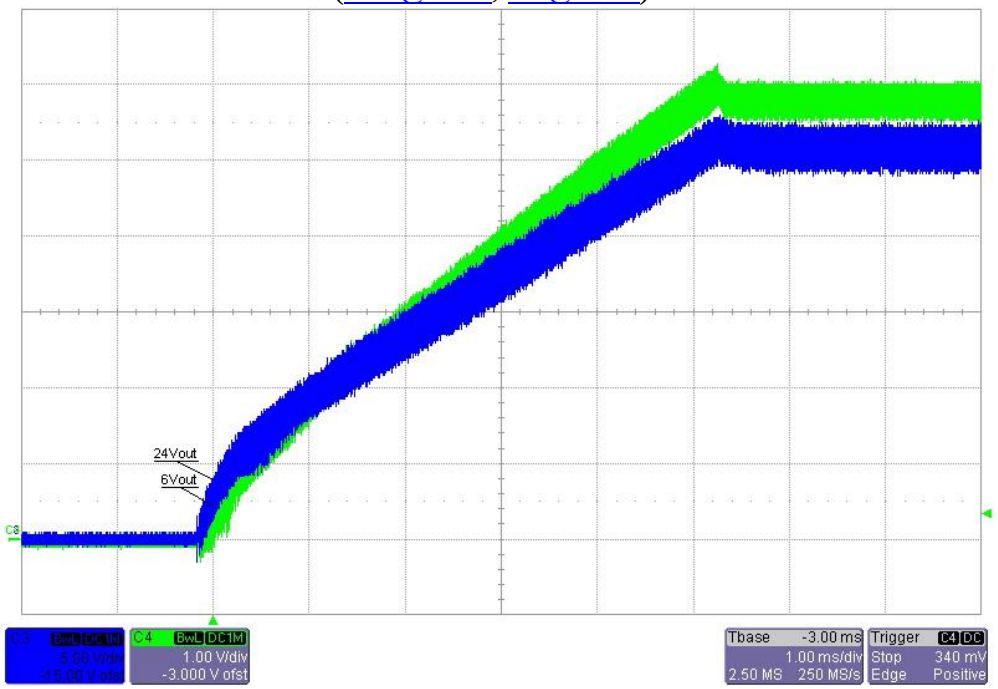
All Measurements are done for 1phase input operation

1 Startup

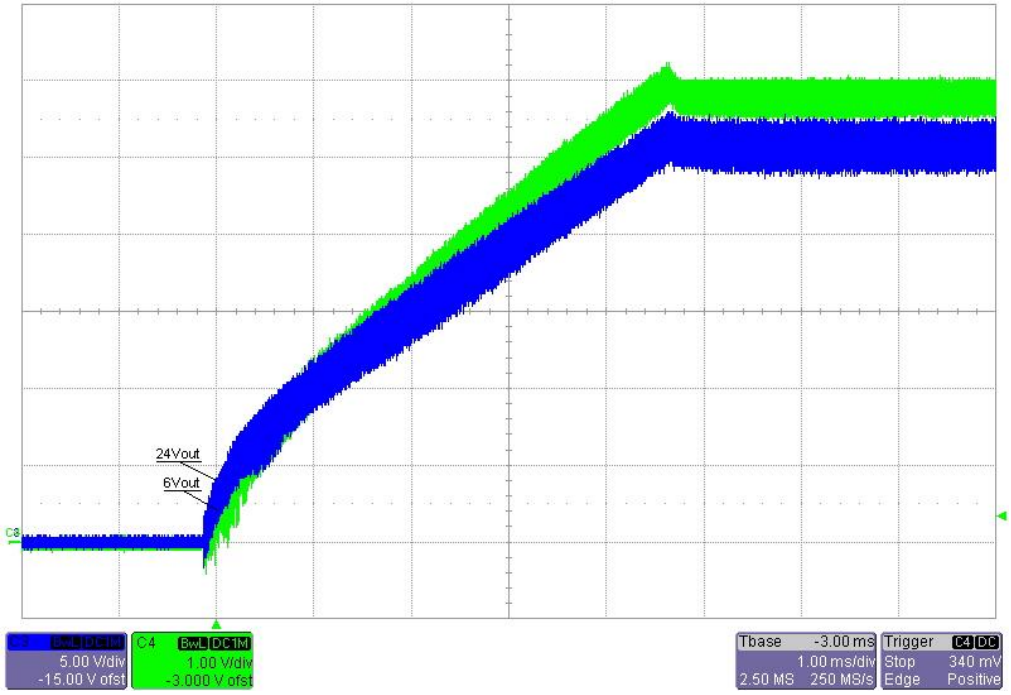
Input voltage = 90VAC
Load current = full load (24V@0.5A, 6V@1.5A)



Input voltage = 230VAC
Load current = full load (24V@0.5A, 6V@1.5A)

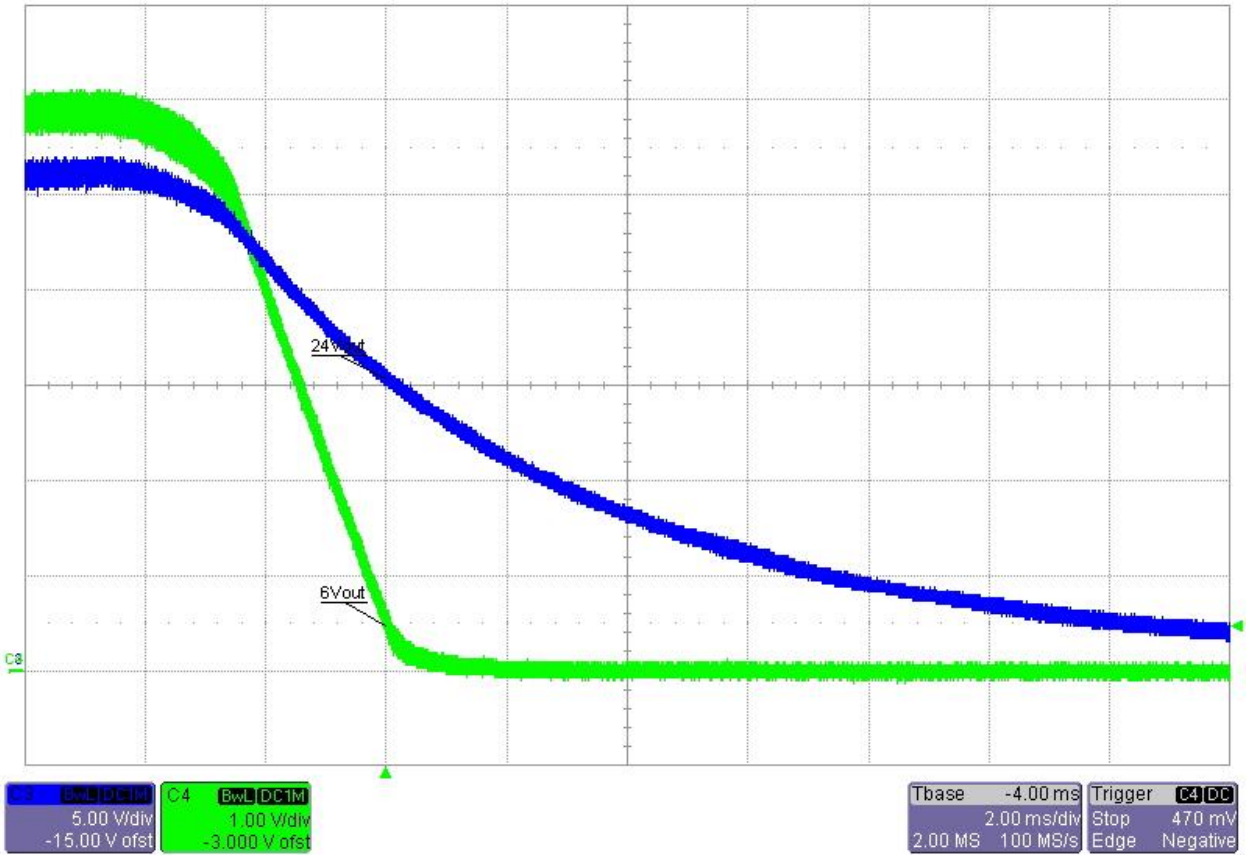


Input voltage = 273VAC
Load current = full load (24V@0.5A, 6V@1.5A)



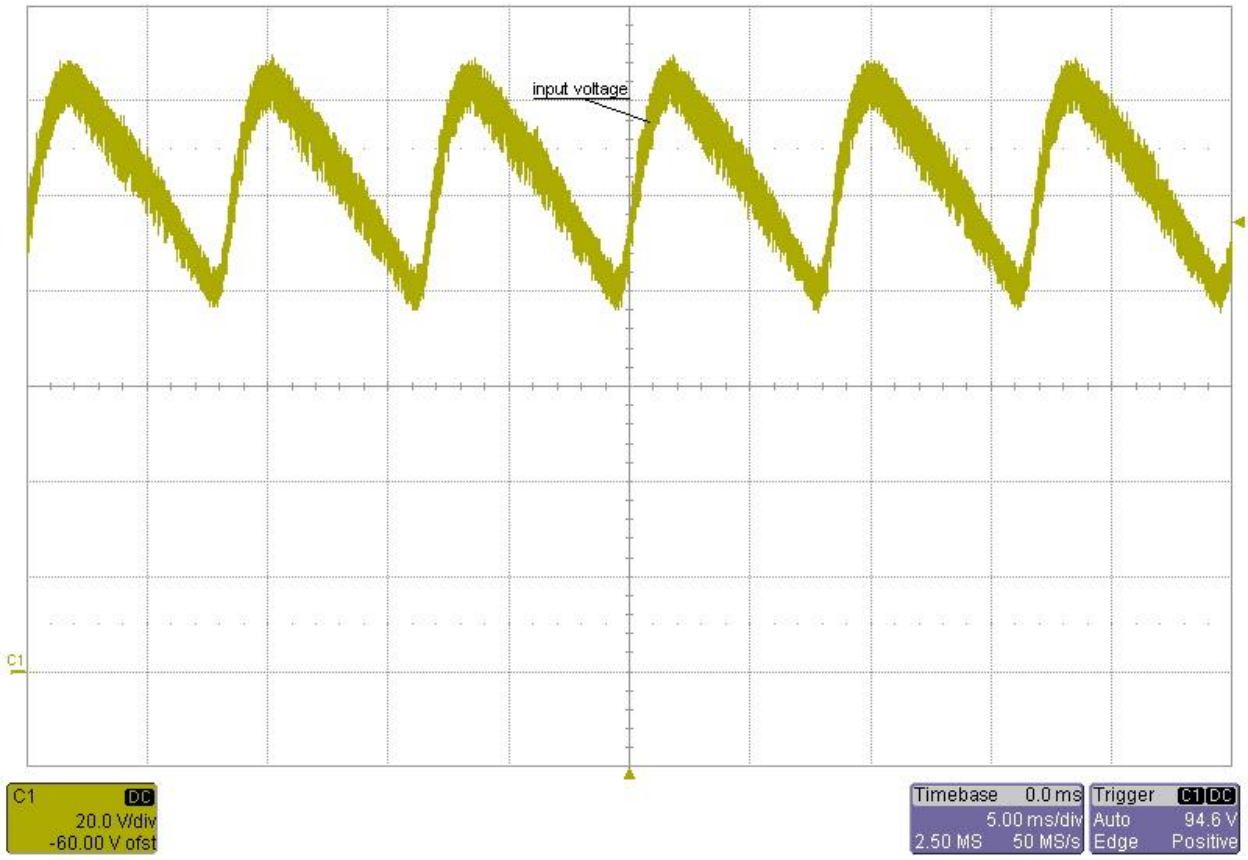
2 Shutdown

Input voltage = 230VAC
Load current = full load (24V@0.5A, 6V@1.5A)

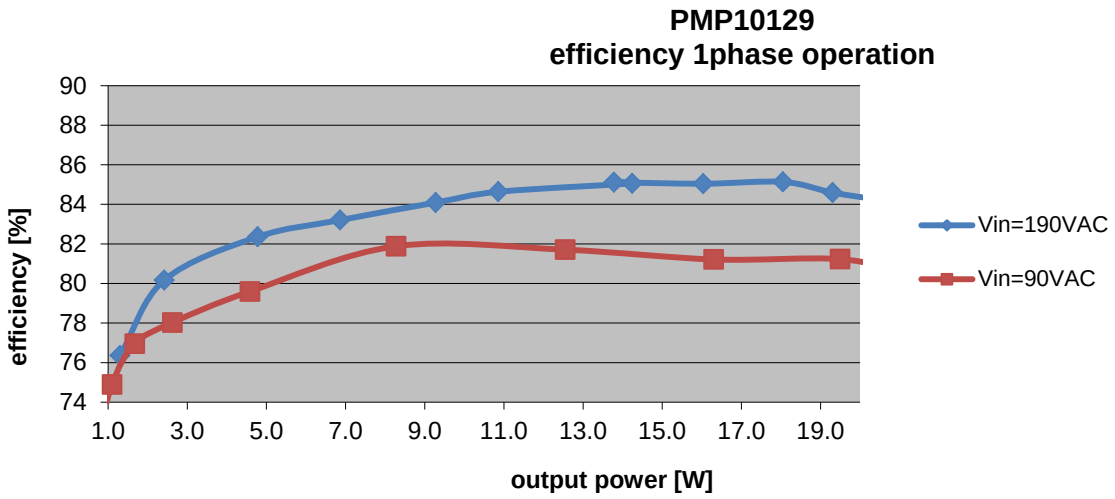


3 Input ripple

Input voltage = 90VAC/60Hz
Load current = full load (24V@0.5A, 6V@1.5A)



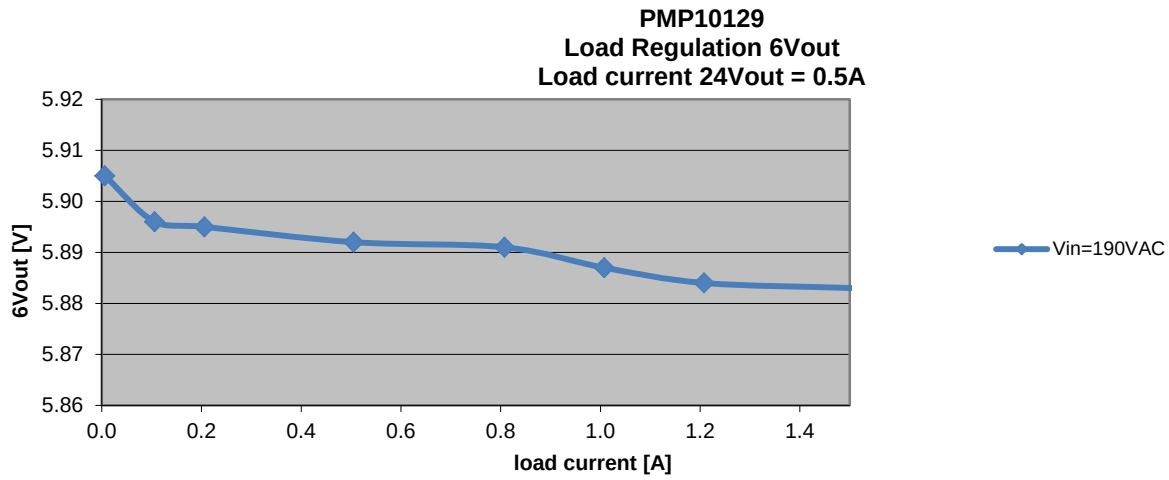
4 Efficiency



5 Load regulation

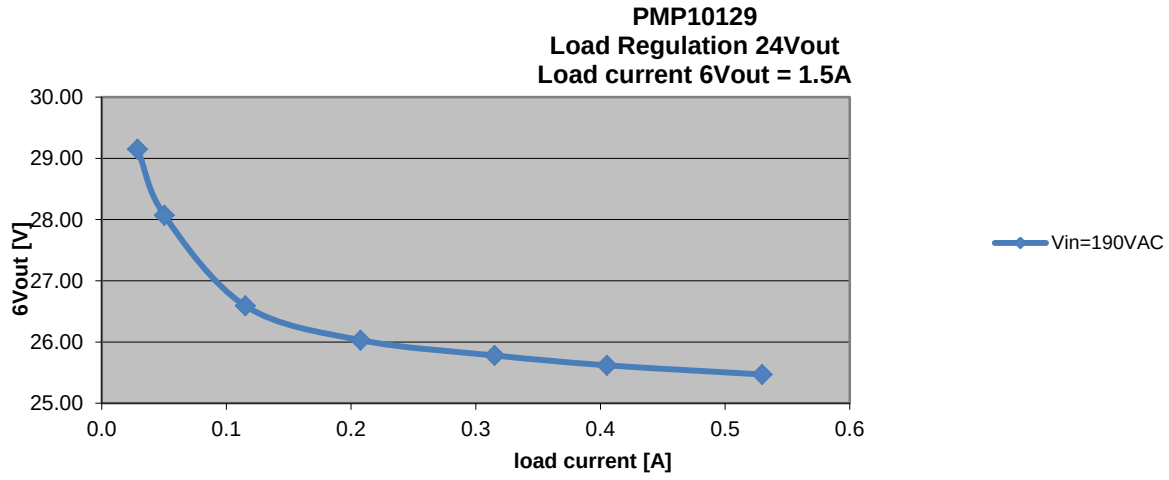
5.1 6Vout:

Input voltage = 190VAC
Load current 24V output = constant = 0.5A

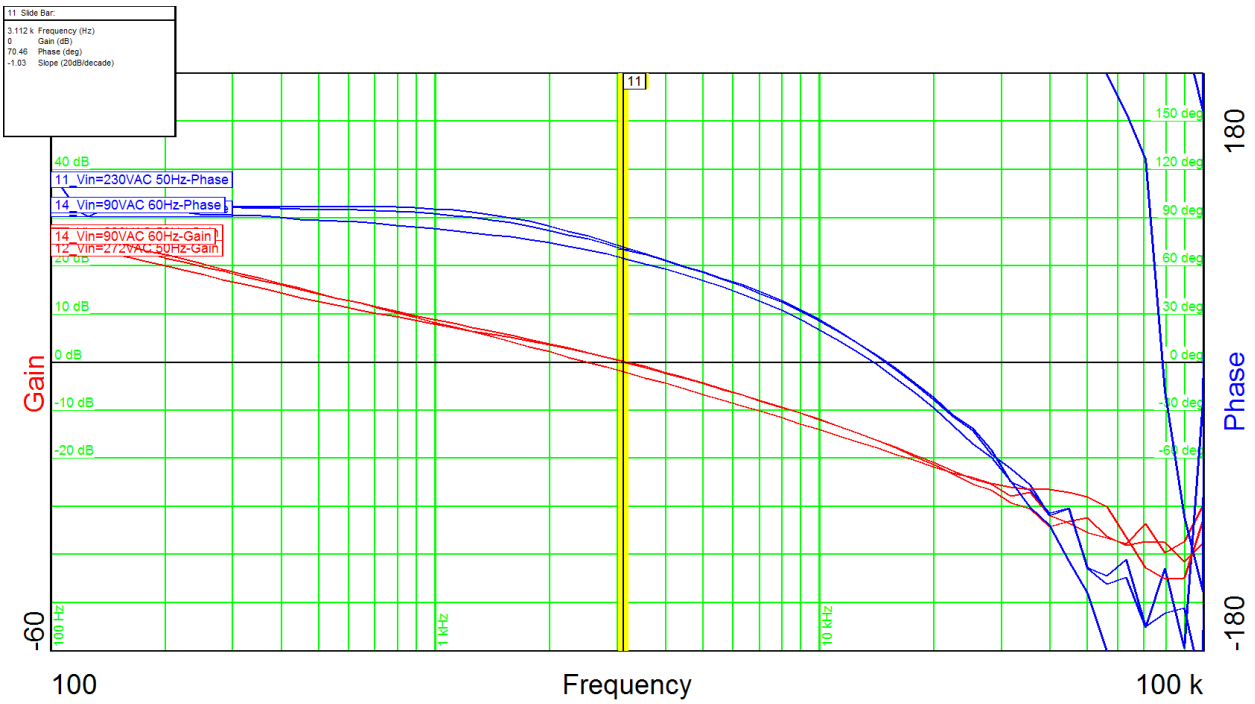


5.2 24Vout:

Input voltage = 190VAC
Load current 6V output = constant = 1.5A



Control Loop Frequency Response



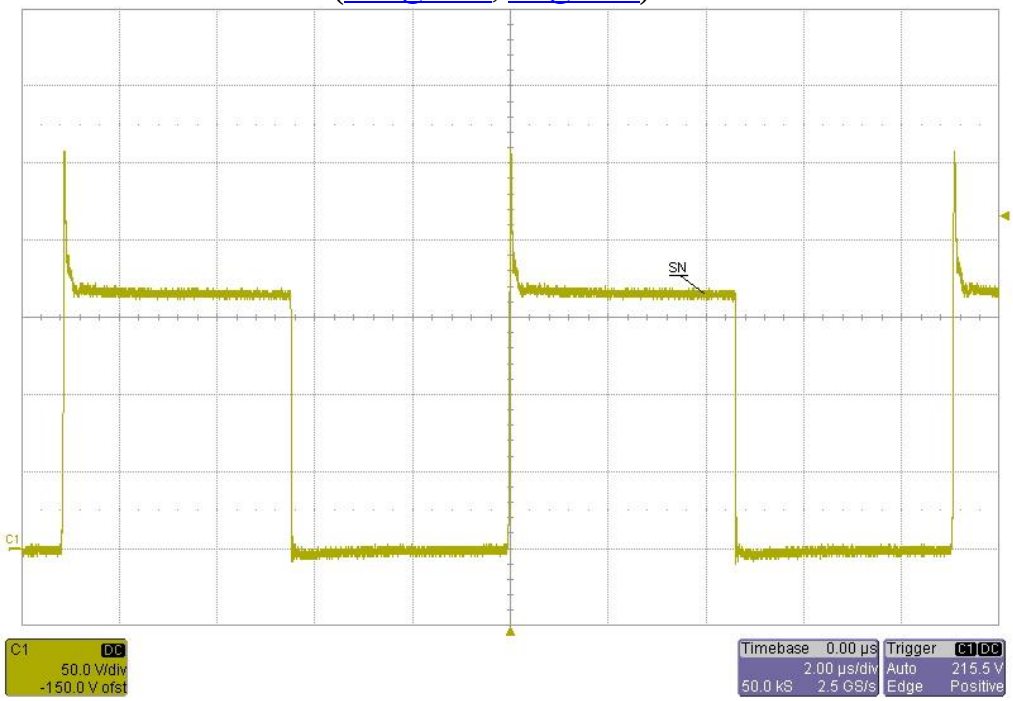
Load current = full load (24V@0.5A, 6V@1.5A)
Input voltage = 90VAC
Phase margin = 70°
Bandwidth = 2.5kHz

Load current = full load (24V@0.5A, 6V@1.5A)
Input voltage = 230VAC
Phase margin = 70°
Bandwidth = 3.1kHz

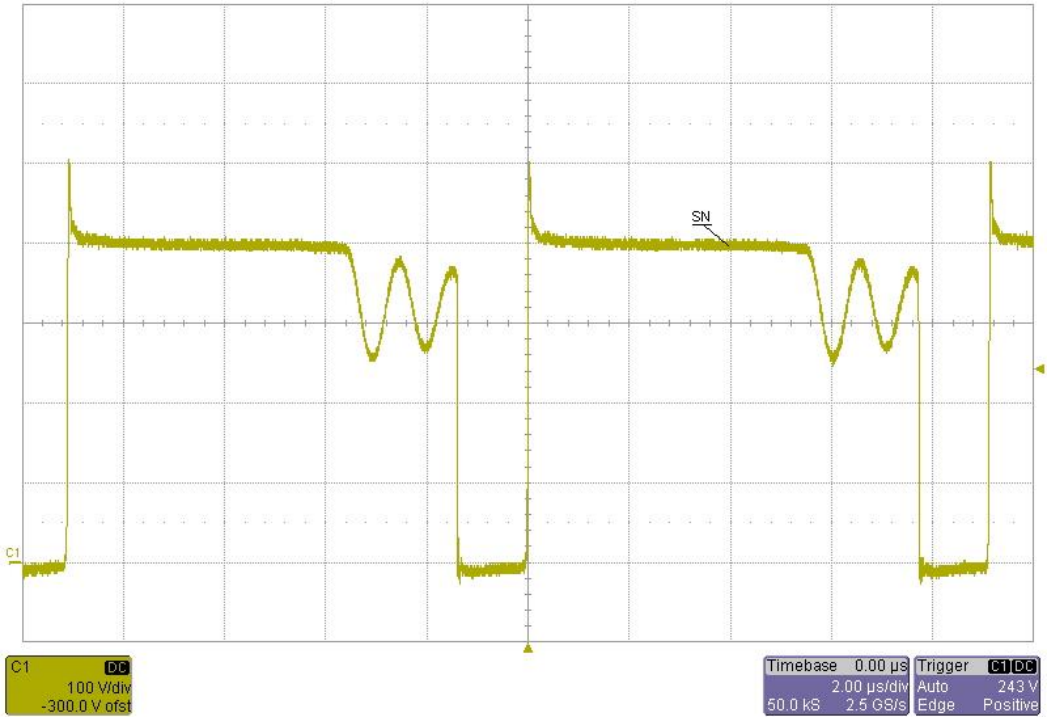
Load current = full load (24V@0.5A, 6V@1.5A)
Input voltage = 273VAC
Phase margin = 71°
Bandwidth = 3.2kHz

6 Switch Node

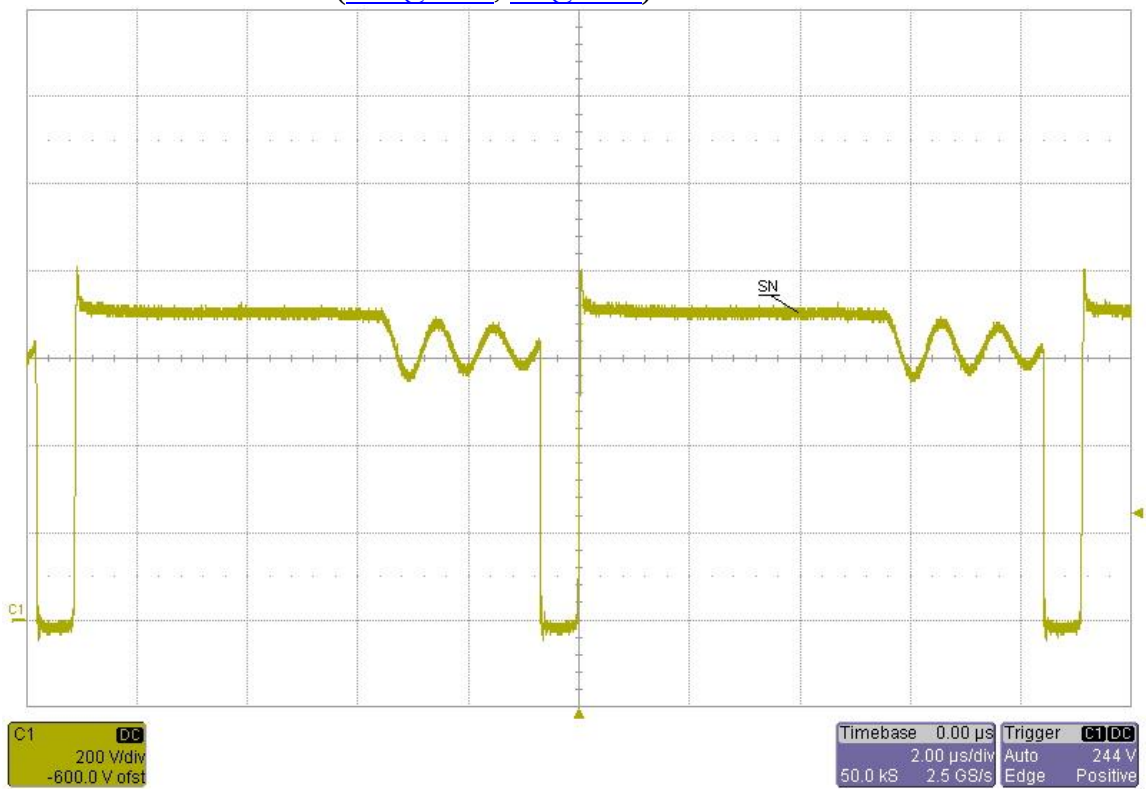
Input voltage = 90VDC
Load current = full load (24V@0.5A, 6V@1.5A)



Input voltage = 325VDC
Load current = full load (24V@0.5A, 6V@1.5A)

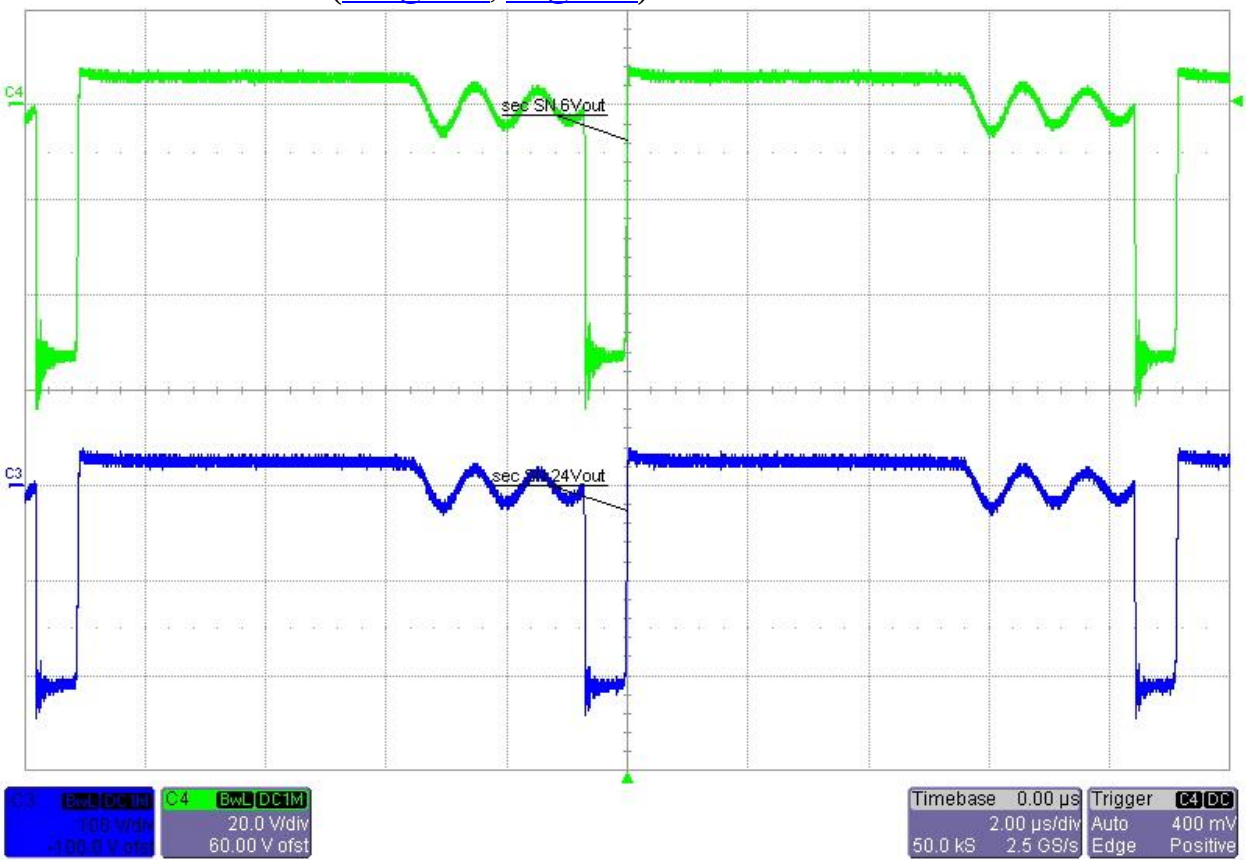


Input voltage = 630VDC
Load current = full load (24V@0.5A, 6V@1.5A)



7 Switch Nodes secondary side

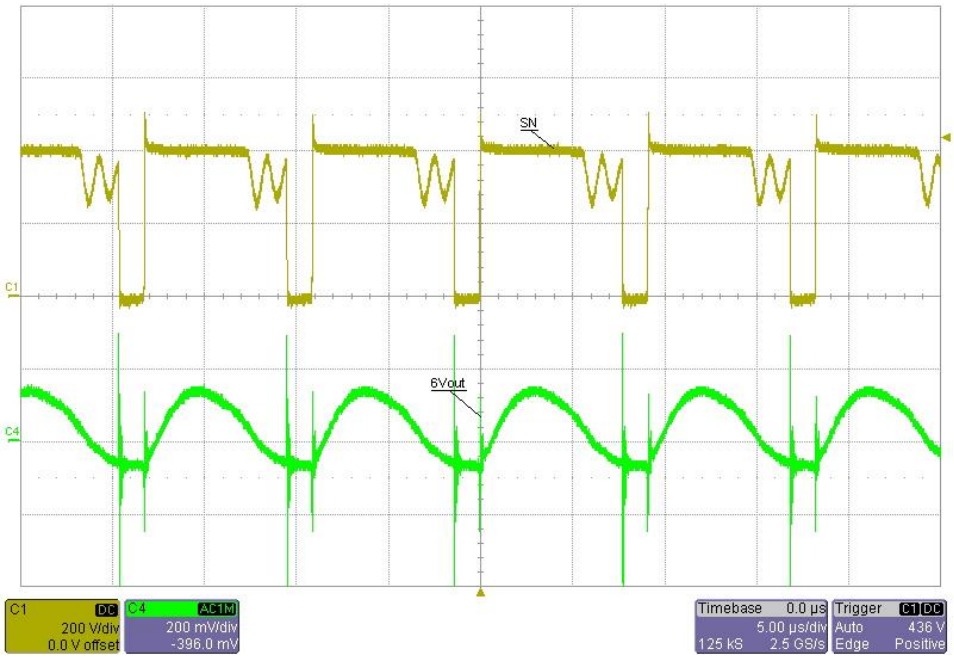
Input voltage = 630VDC
Load current = full load (24V@0.5A, 6V@1.5A)



8 Output ripple voltage

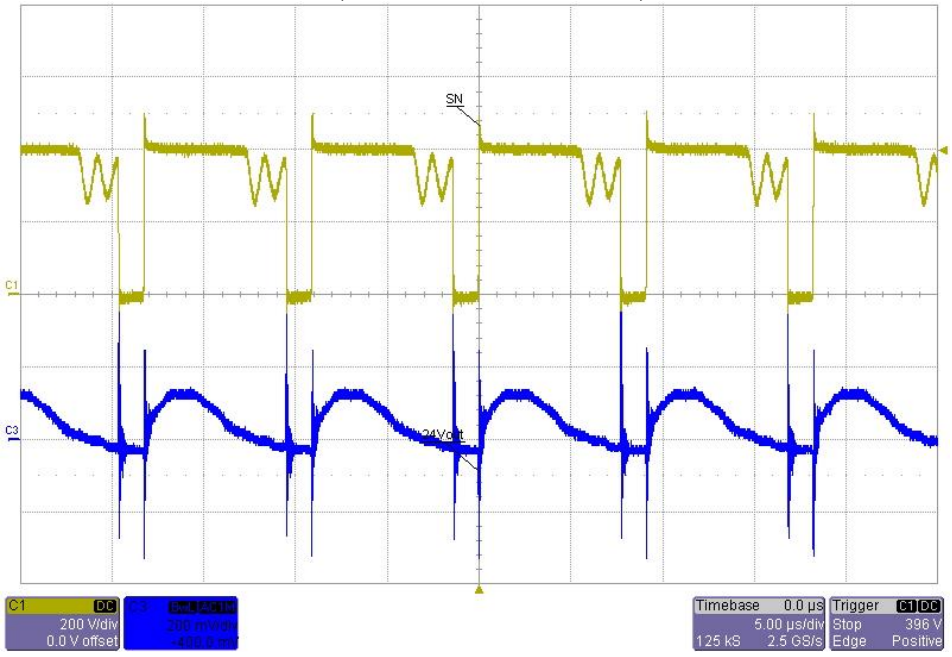
8.1 6Vout:

Input voltage = 230VAC
Load current = full load (24V@0.5A, 6V@1.5A)



8.2 24Vout:

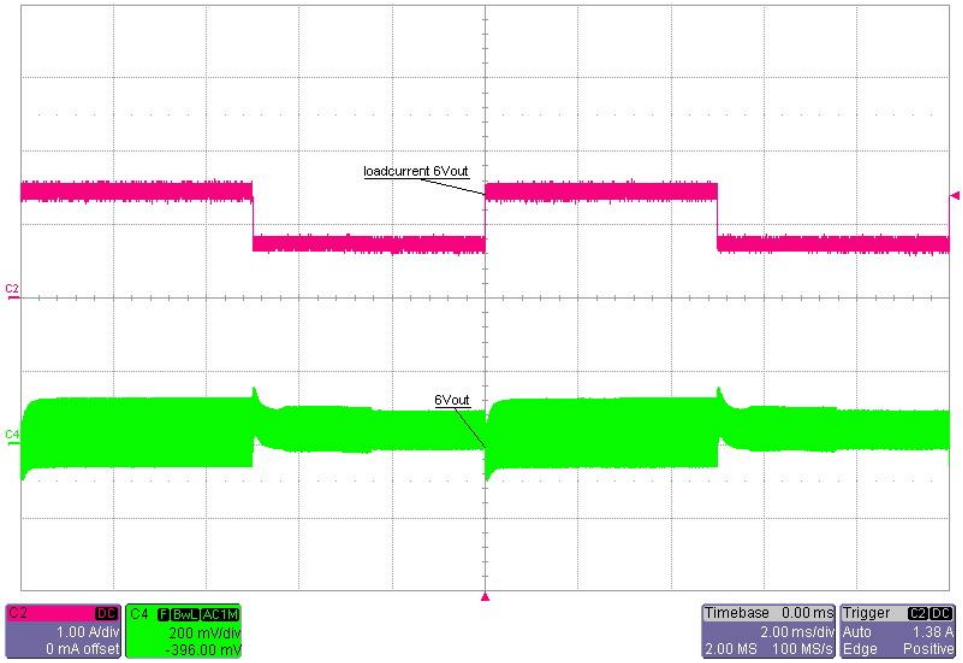
Input voltage = 230VAC
Load current = full load (24V@0.5A, 6V@1.5A)



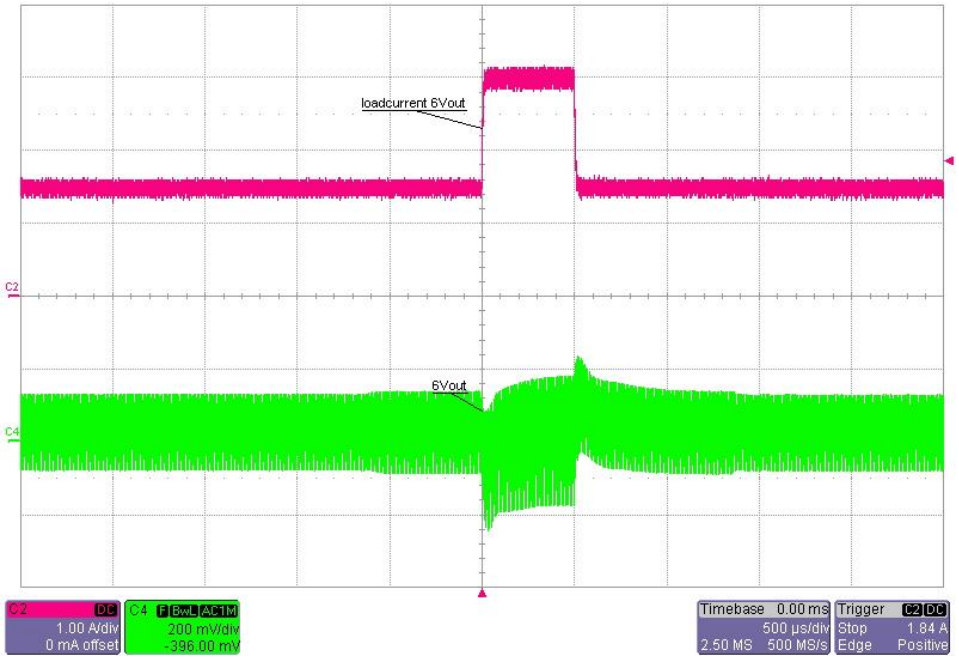
9 Load Transients

9.1 6Vout:

Input voltage = 230VAC
Load current 24Vout = 0.5A
Load current 6Vout = 0.75A to 1.5A

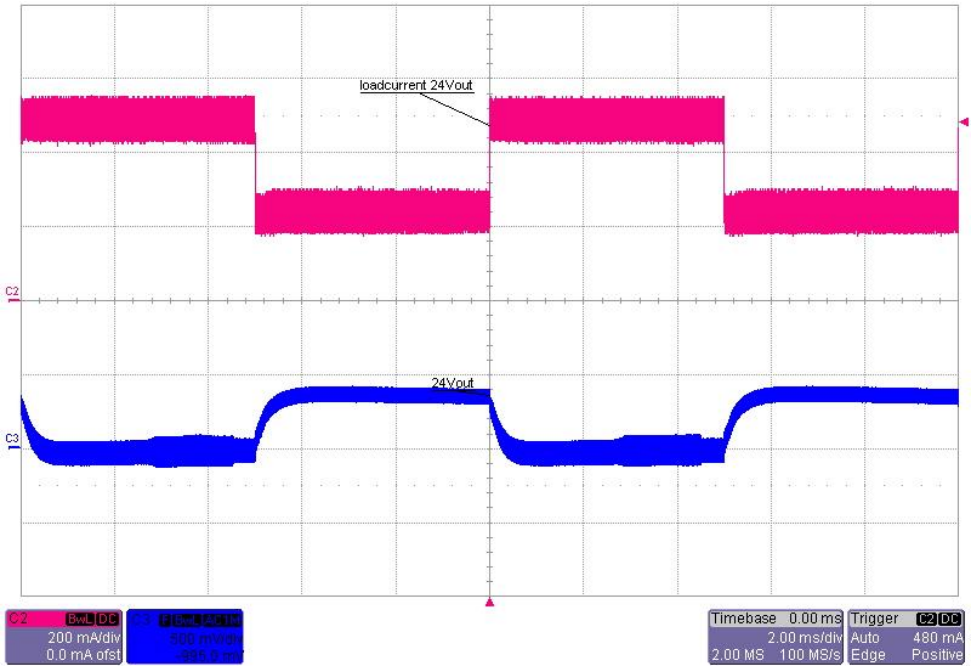


Input voltage = 230VAC
Load current 24Vout = 0.5A
Load current 6Vout = 1.5A to 3A

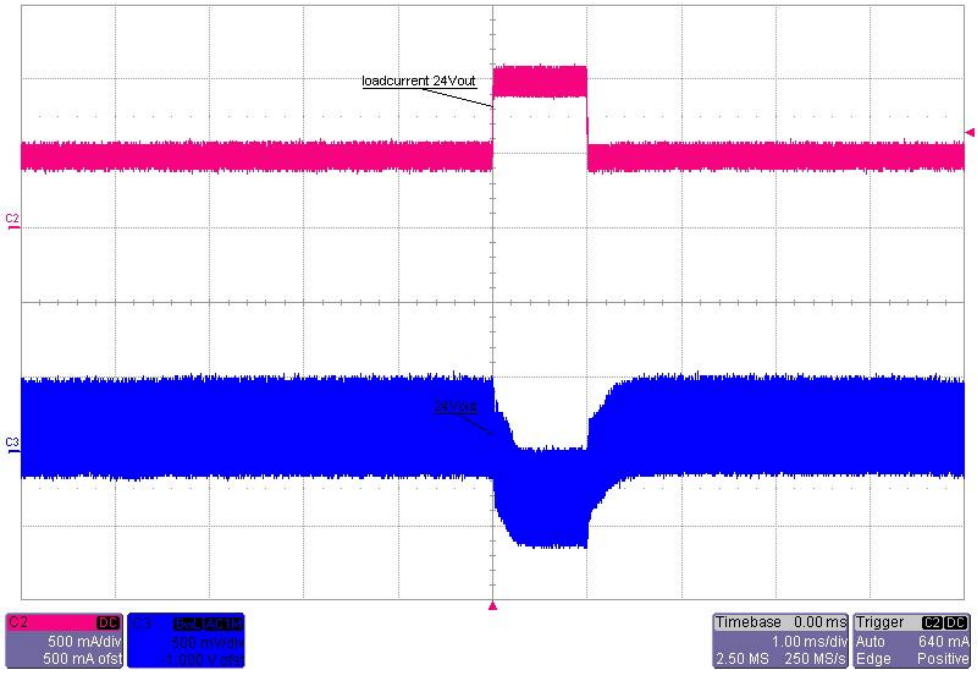


9.2 24Vout:

Input voltage = 230VAC
Load current 6Vout = 1.5A
Load current 24Vout = 0.25A to 0.5A



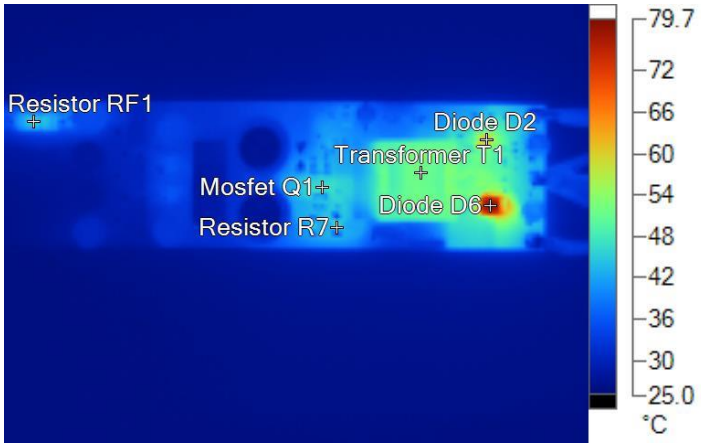
Input voltage = 230VAC
Load current 6Vout = 1.5A
Load current 24Vout = 0.5A to 1A



10 Thermal Analysis

The images below show the infrared images taken from the FlexCam after 15min at 20W output power.

Input voltage = 190VAC
Load current = full load (24V@0.5A, 6V@1.5A)
Ambient temperature = 25°C
No heatsink, no airflow



IR20150910_0639 full load Vin=190VAC.is2

Name	Temperature	
Resistor RF1	44.7°C	
Mosfet Q1	46.6°C	
Resistor R7	45.6°C	
Diode D6	79.7°C	
Diode D2	60.9°C	
Transformer T1	51.5°C	

Worst Case Measurement:

Minimum Input Voltage and just 1 phase is working:
Input voltage = 90VAC
Load current = full load (24V@0.5A, 6V@1.5A)
Ambient temperature = 25°C
No heatsink, 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