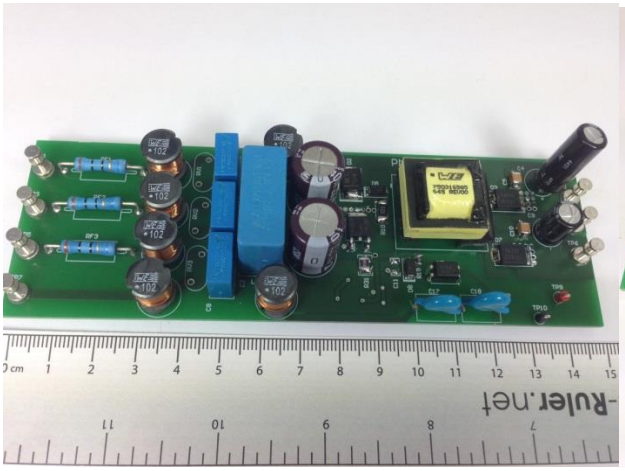
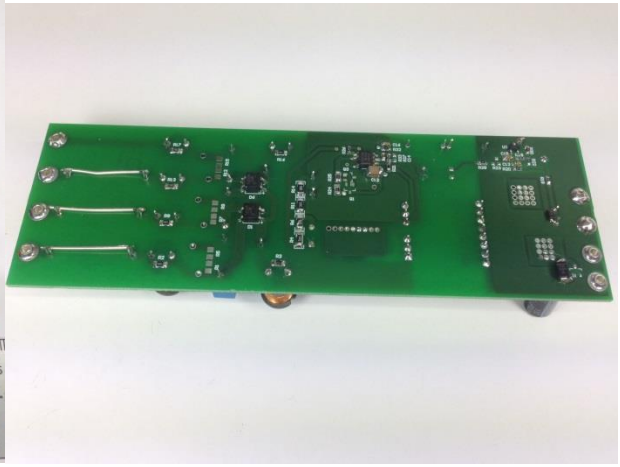
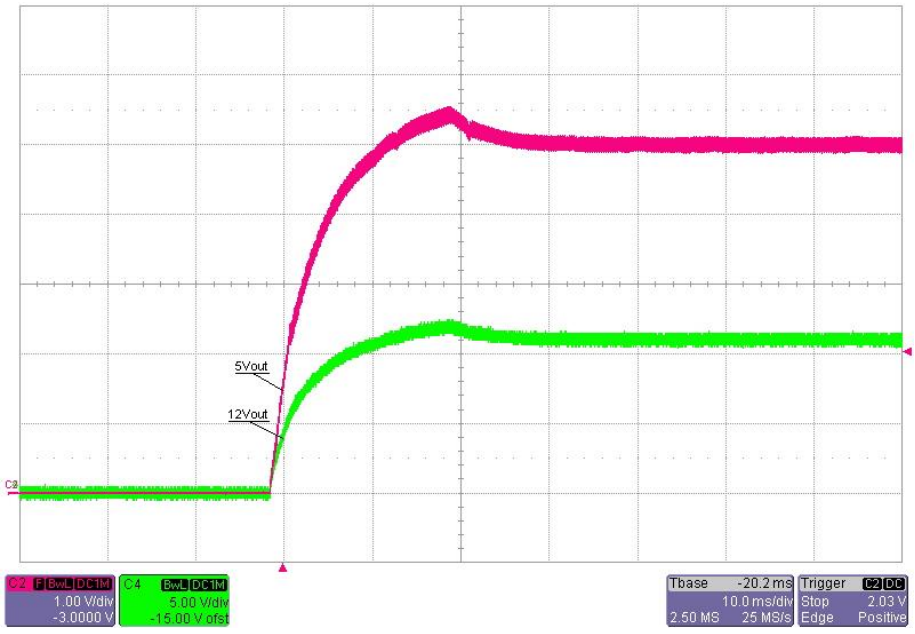




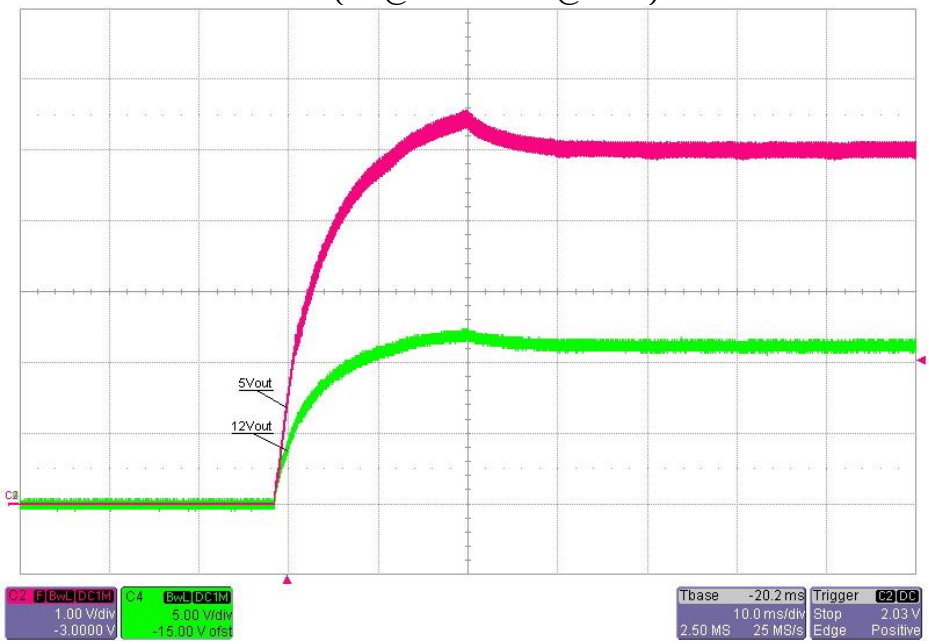
1 Startup

1.1 Without optional secondary softstart circuit

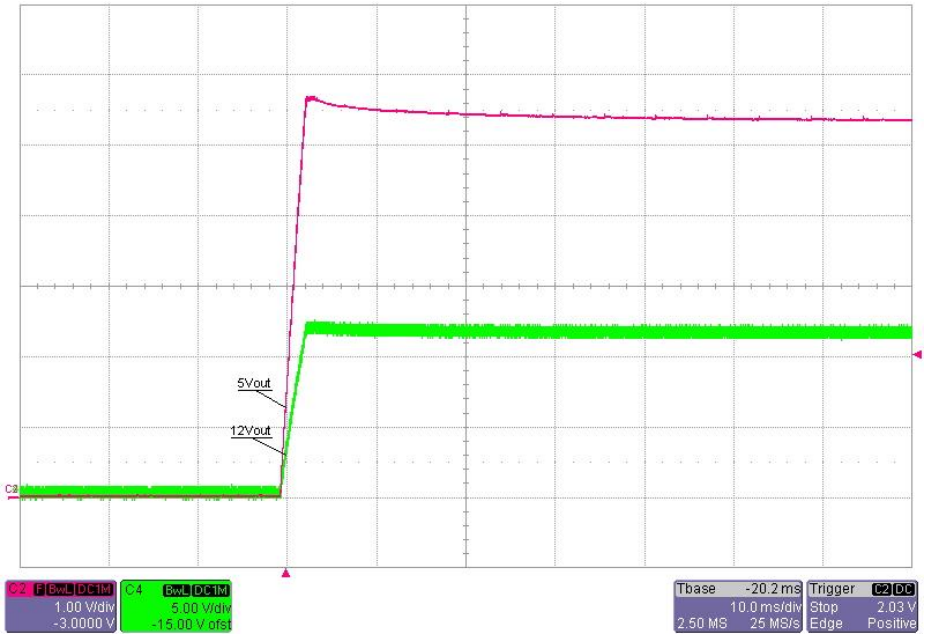
Input voltage = 140VAC
Load current = full load (5V@2.0A / 12V@1.5A)



Input voltage = 230VAC
Load current = full load (5V@2.0A / 12V@1.5A)



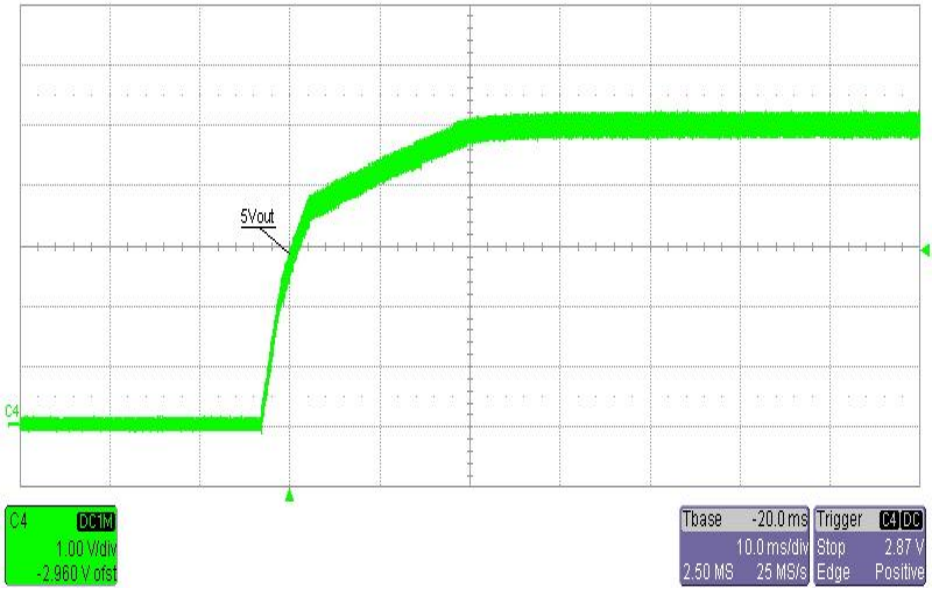
Input voltage = 230VAC
Load current = no load



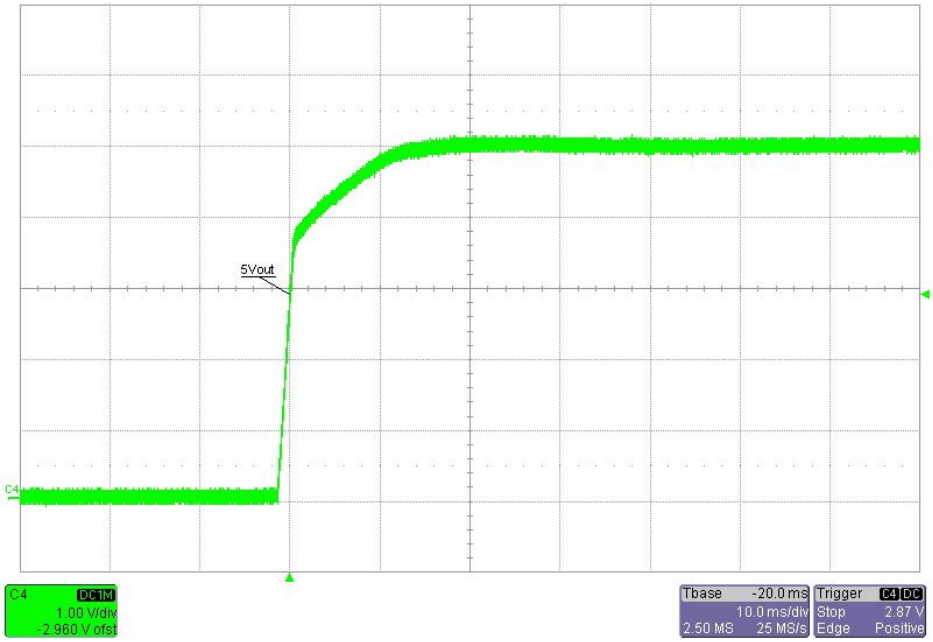
1.2 With optional secondary softstart circuit

1.2.1 5Vout:

Input voltage = 230VAC
Load current = full load (5V@2.0A / 12V@1.5A)

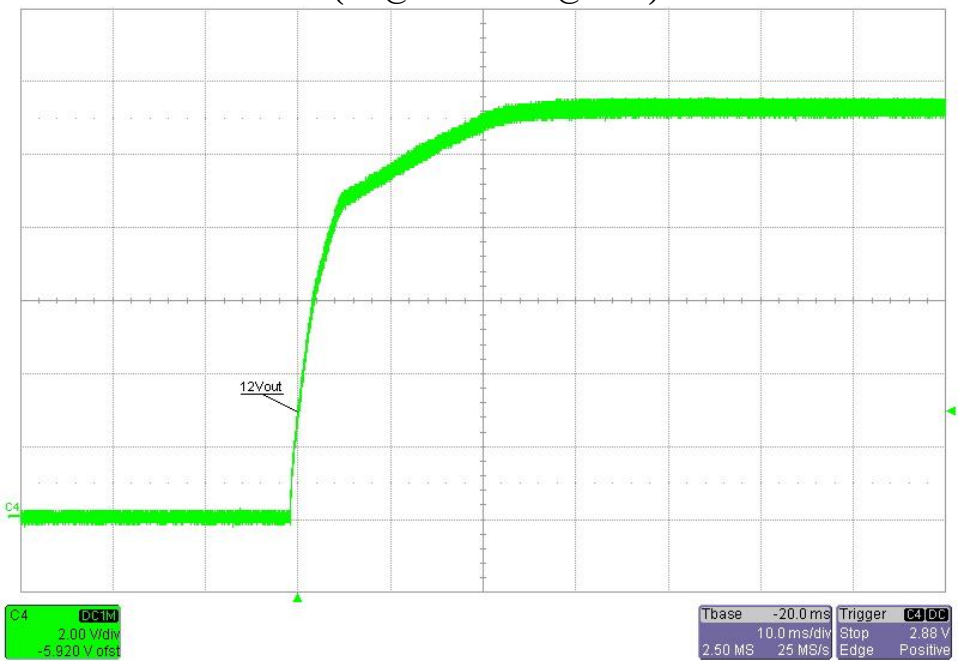


Input voltage = 230VAC
Load current = no load

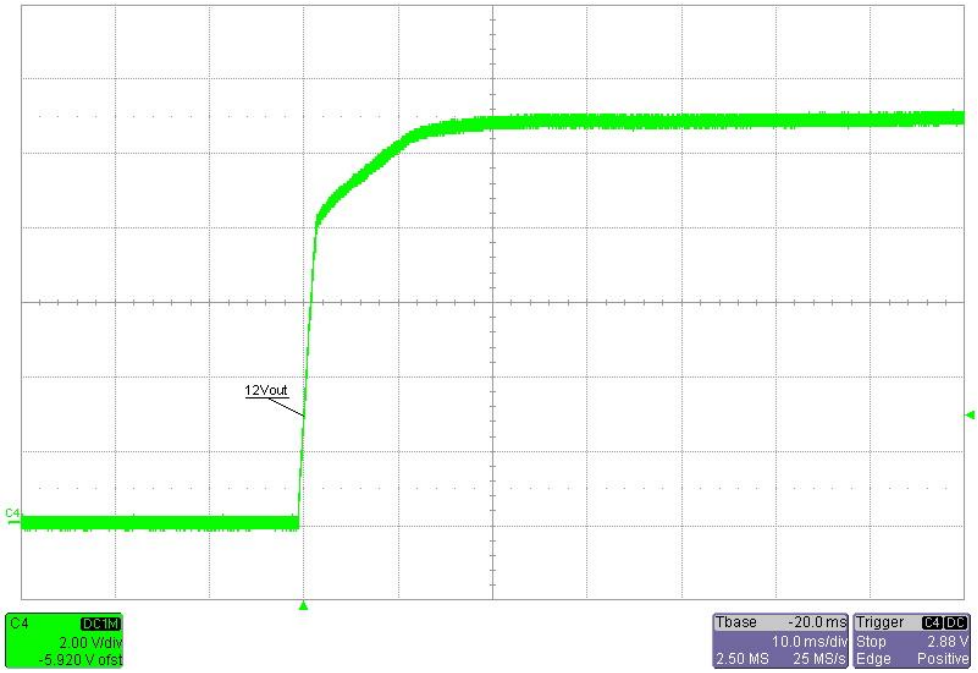


1.2.2 12Vout:

Input voltage = 230VAC
Load current = full load (5V@2.0A / 12V@1.5A)

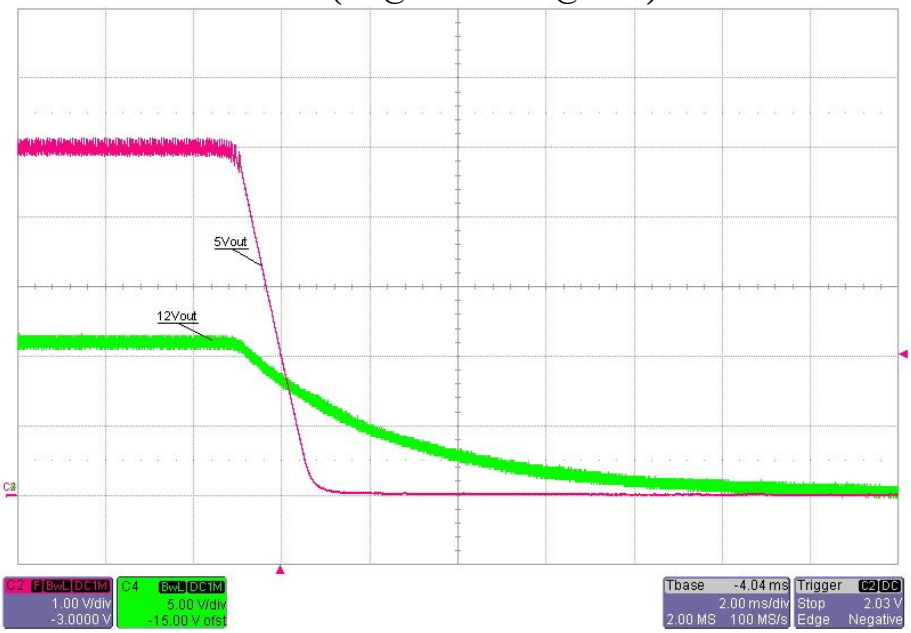


Input voltage = 230VAC
Load current = no load

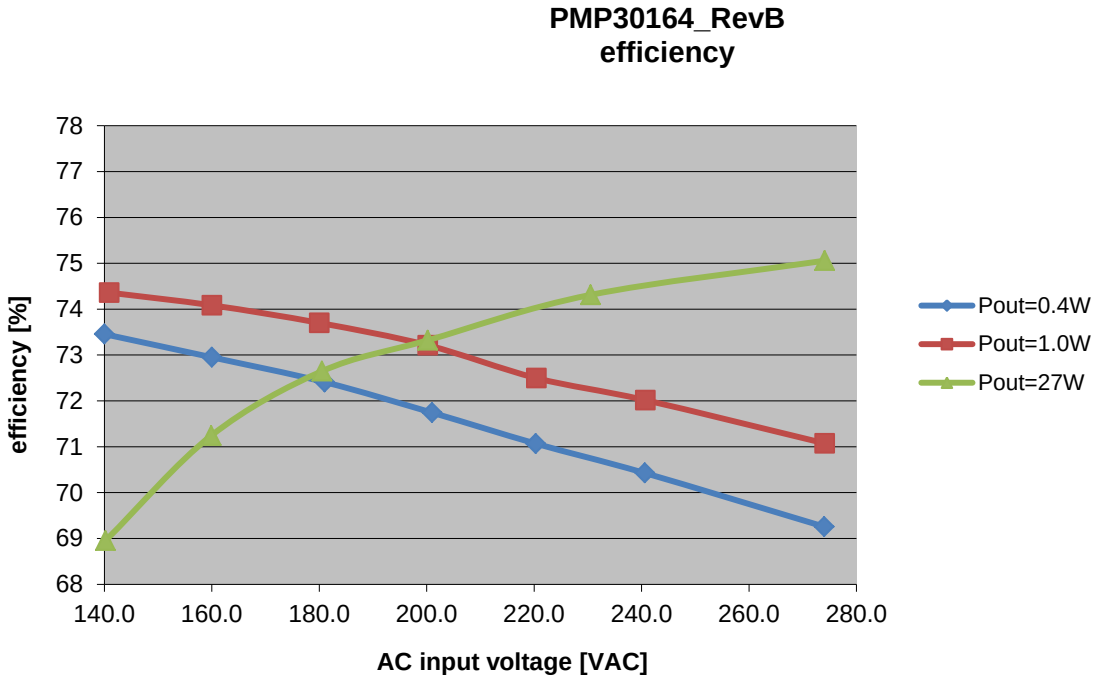


2 Shutdown

Input voltage = 230V
Load current = full load (5V@2.0A / 12V@1.5A)



3 Efficiency

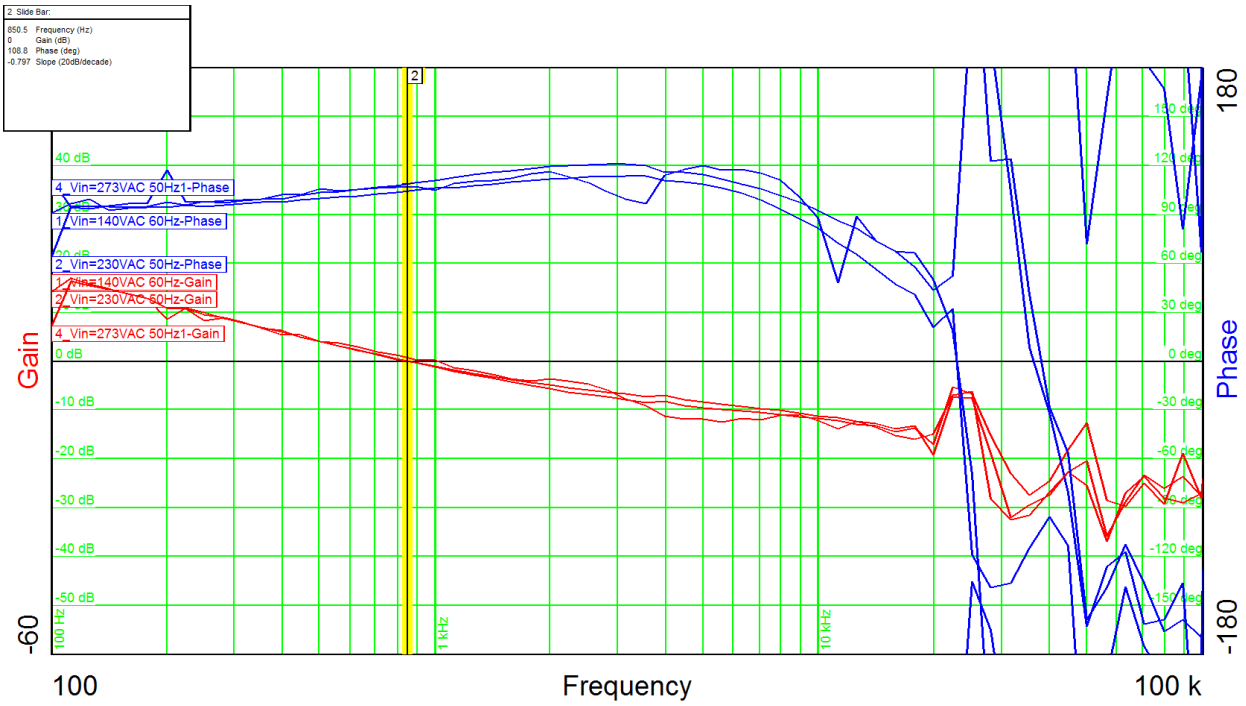


4 Load Regulation

INPUT			OUTPUT						efficiency
voltage [VAC]	power [W]		5Vout [V]	I_5Vout [A]	12Vout [V]	I_12Vout [A]	power [W]		[%]
230.0	0.081		6.067	0.000	15.090	0.000	0.000		0.0
230.4	0.083		6.031	0.005	15.080	0.000	0.028		34.2
230.4	0.245		5.723	0.005	12.030	0.012	0.171		69.9
230.5	0.308		5.282	0.016	11.760	0.012	0.221		71.6
230.5	1.167		4.950	0.116	11.940	0.022	0.839		71.9
230.5	2.074		4.948	0.205	11.900	0.041	1.500		72.3
230.5	4.360		4.946	0.404	11.710	0.104	3.218		73.8
230.5	8.810		4.944	0.707	11.450	0.279	6.694		76.0
230.4	14.280		4.943	0.907	11.140	0.587	11.021		77.2
230.4	19.238		4.941	1.204	11.120	0.795	14.792		76.9
230.4	23.756		4.939	1.404	11.050	1.023	18.234		76.8
230.4	27.660		4.938	1.603	11.030	1.193	21.072		76.2
230.4	32.410		4.937	1.803	11.030	1.339	23.671		73.0
230.5	36.004		4.936	2.003	11.010	1.528	26.710		74.2

5 Control Loop Frequency Response

5.1 AC Input Voltage

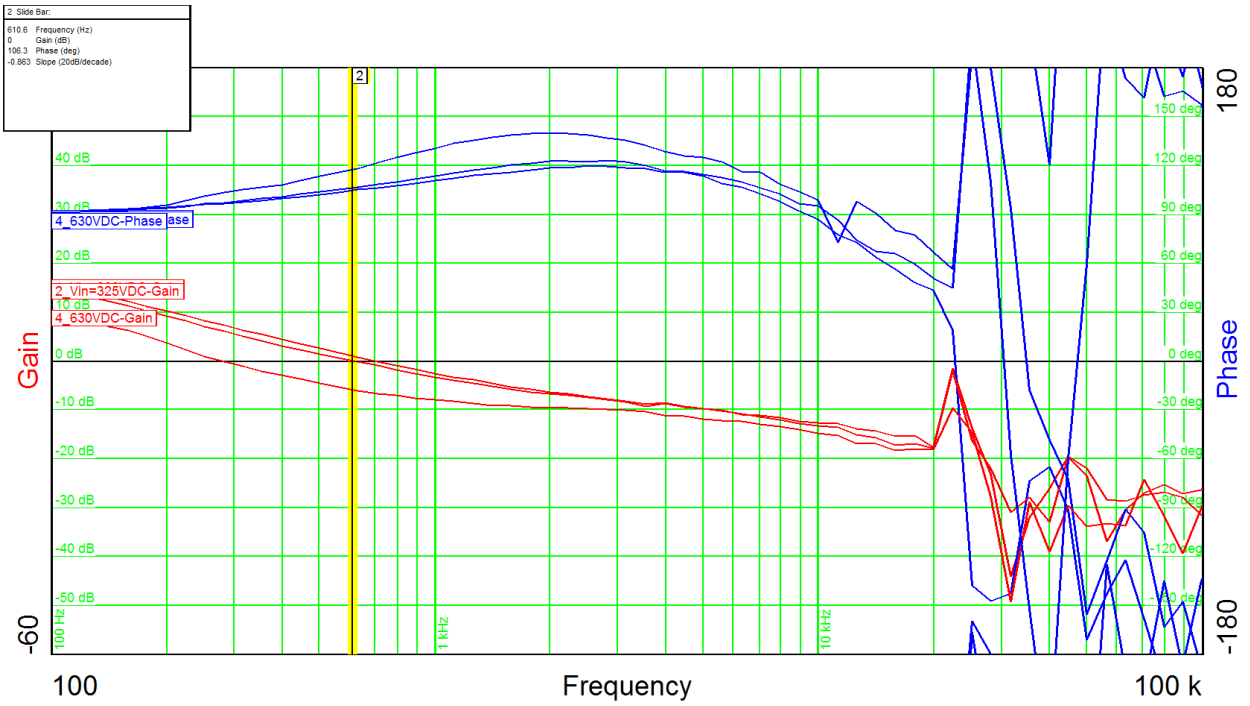


Output power = full load (5V@2.0A / 12V@1.5A)
Input voltage = 140VAC
Phase margin = 104°
Bandwidth = 0.84kHz

Output power = full load (5V@2.0A / 12V@1.5A)
Input voltage = 230VAC
Phase margin = 109°
Bandwidth = 0.85kHz

Output power = full load (5V@2.0A / 12V@1.5A)
Input voltage = 270VAC
Phase margin = 105°
Bandwidth = 1.01kHz

5.2 DC Input Voltage



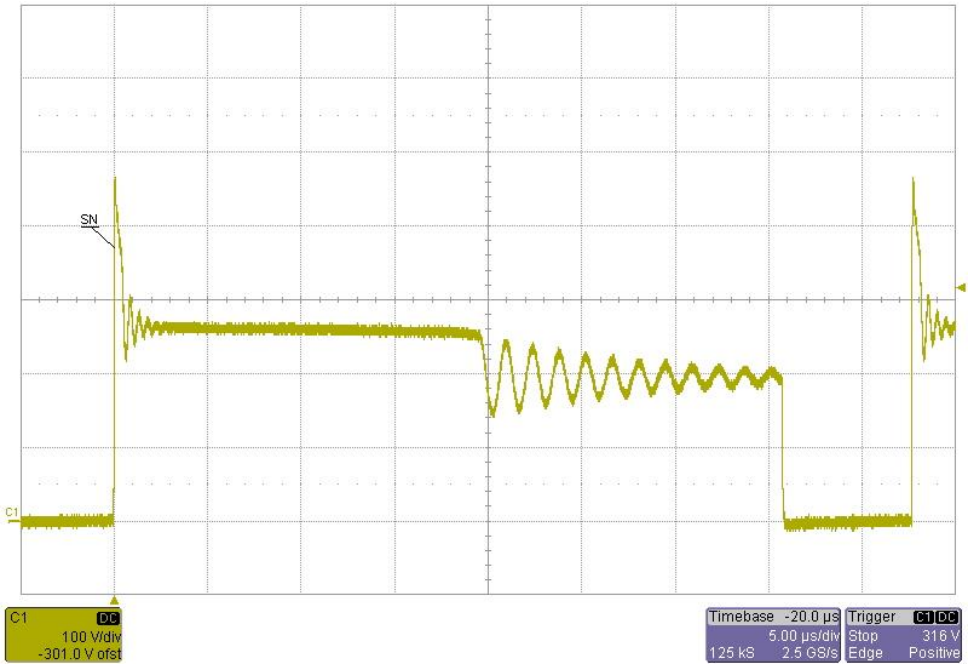
Output power = full load (5V@2.0A / 12V@1.5A)
Input voltage = 200VDC
Phase margin = 106°
Bandwidth = 0.88kHz

Output power = full load (5V@2.0A / 12V@1.5A)
Input voltage = 325VDC
Phase margin = 106°
Bandwidth = 0.86kHz

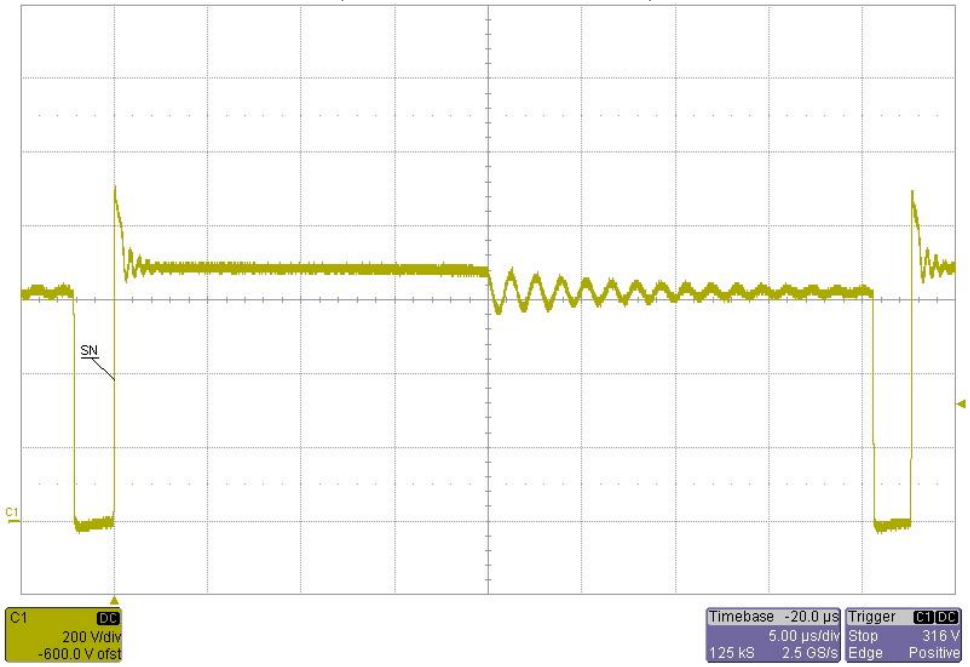
Output power = full load (5V@2.0A / 12V@1.5A)
Input voltage = 630VDC
Phase margin = 103°
Bandwidth = 0.28kHz

6 Switch Node

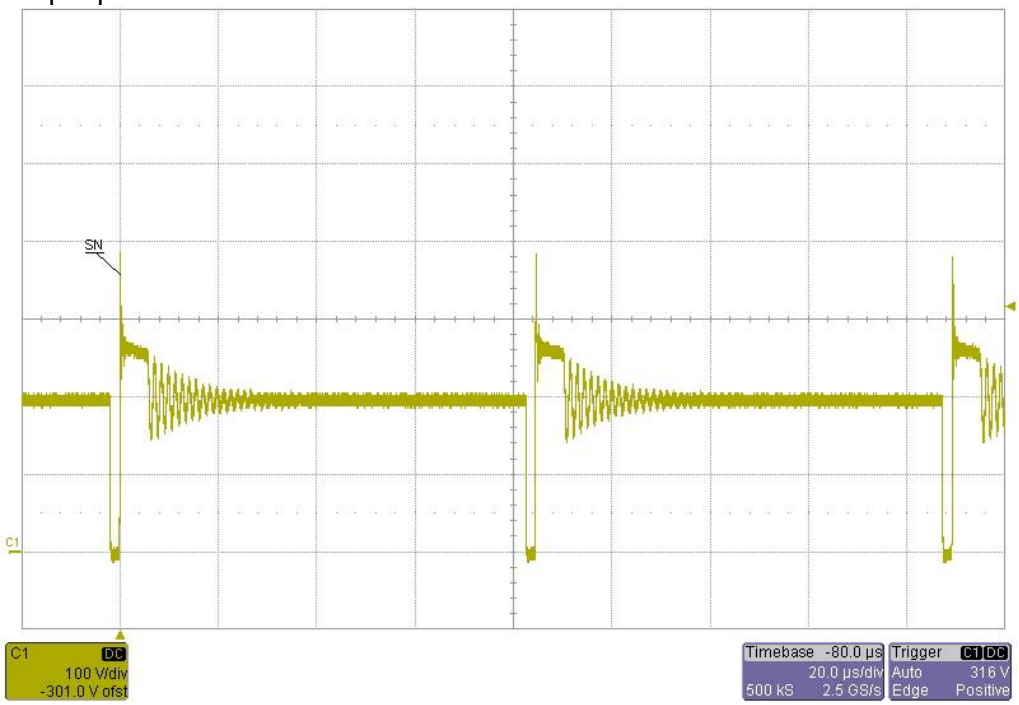
Input voltage = 200VDC
Load current = full load (5V@2.0A / 12V@1.5A)



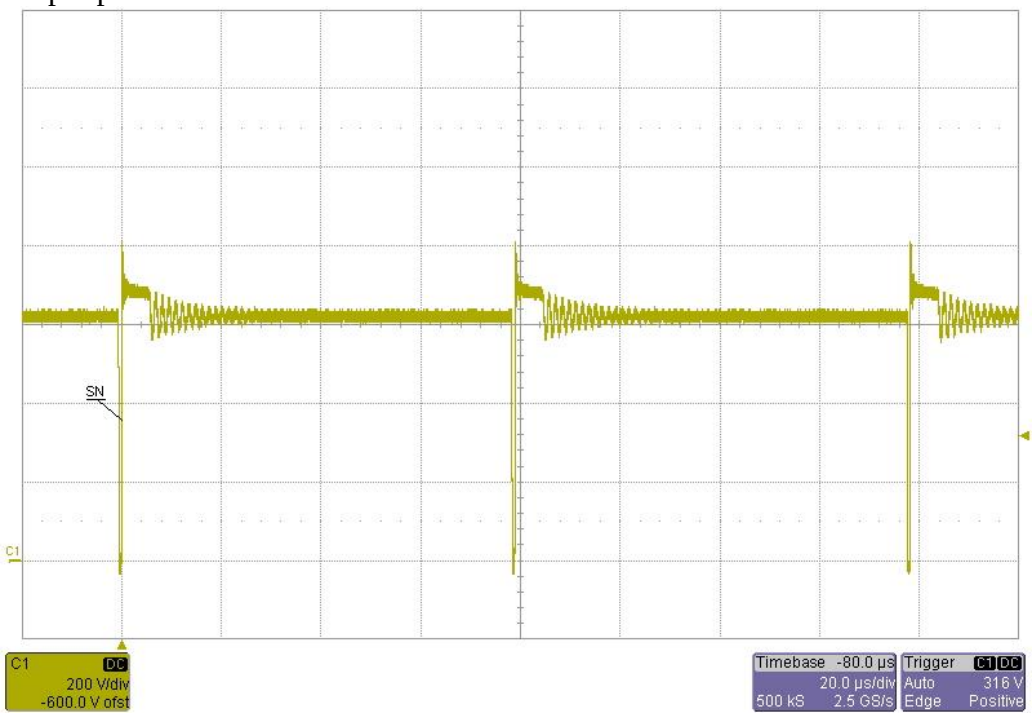
Input voltage = 630VDC
Load current = full load (5V@2.0A / 12V@1.5A)



Input voltage = 200VDC
Output power = 1W

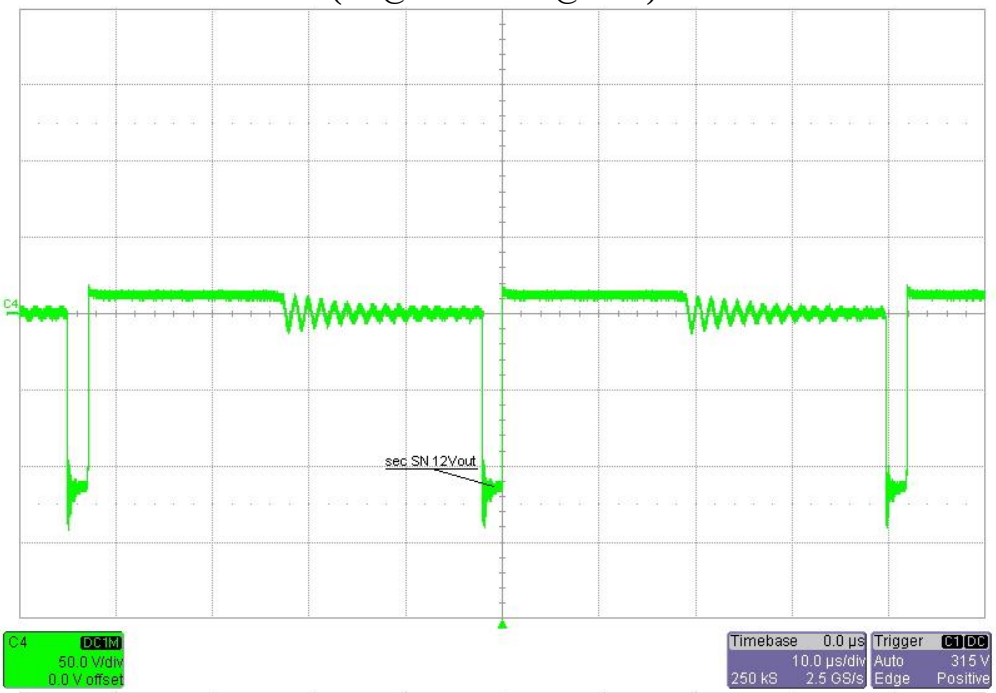


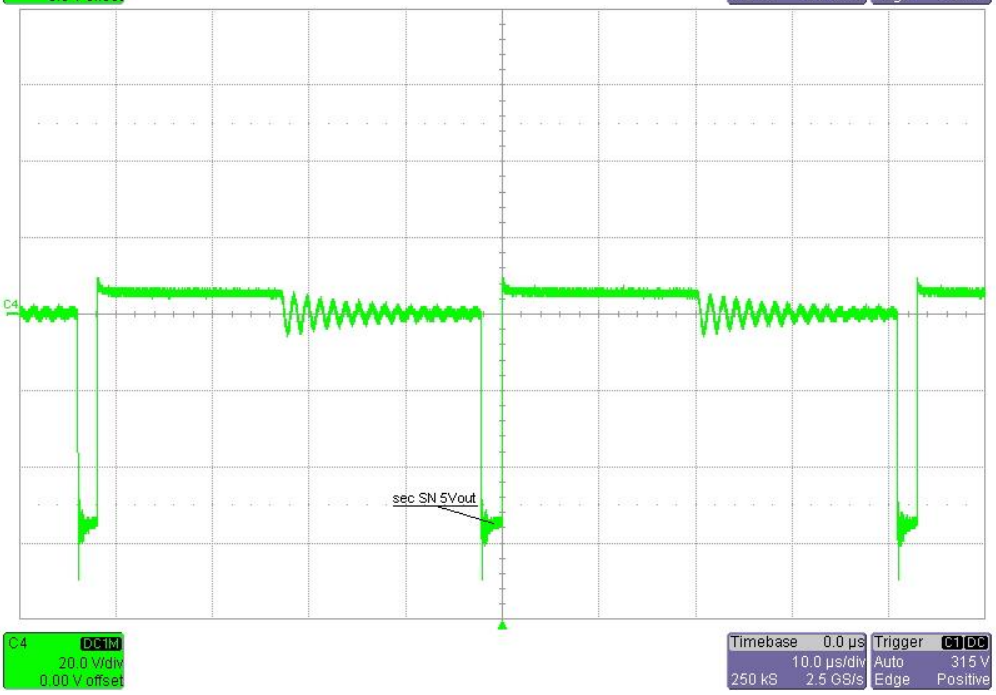
Input voltage = 630VDC
Output power = 1W



7 Secondary Side Switch Node

Input voltage = 630VDC
Load current = full load (5V@2.0A / 12V@1.5A)

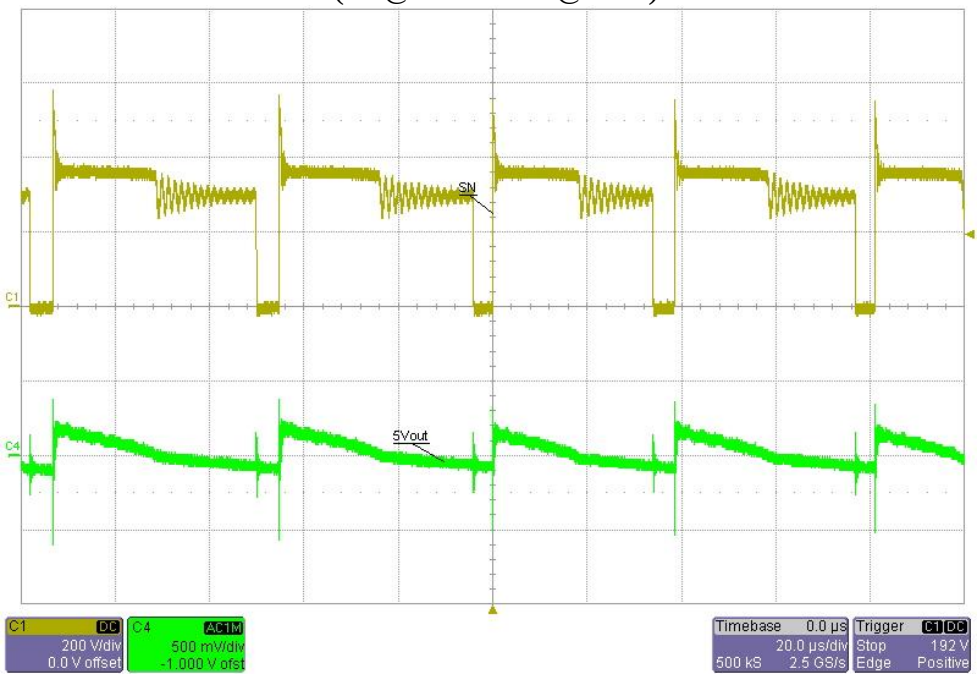




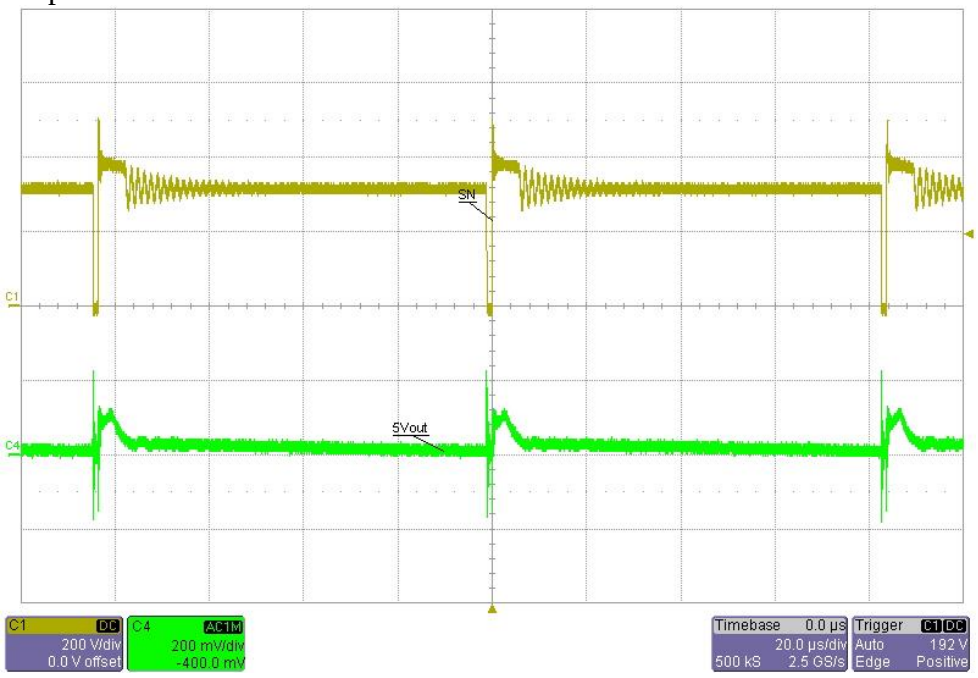
8 Output Ripple

8.1 5Vout:

Input voltage = 230VAC
Load current = full load (5V@2.0A / 12V@1.5A)

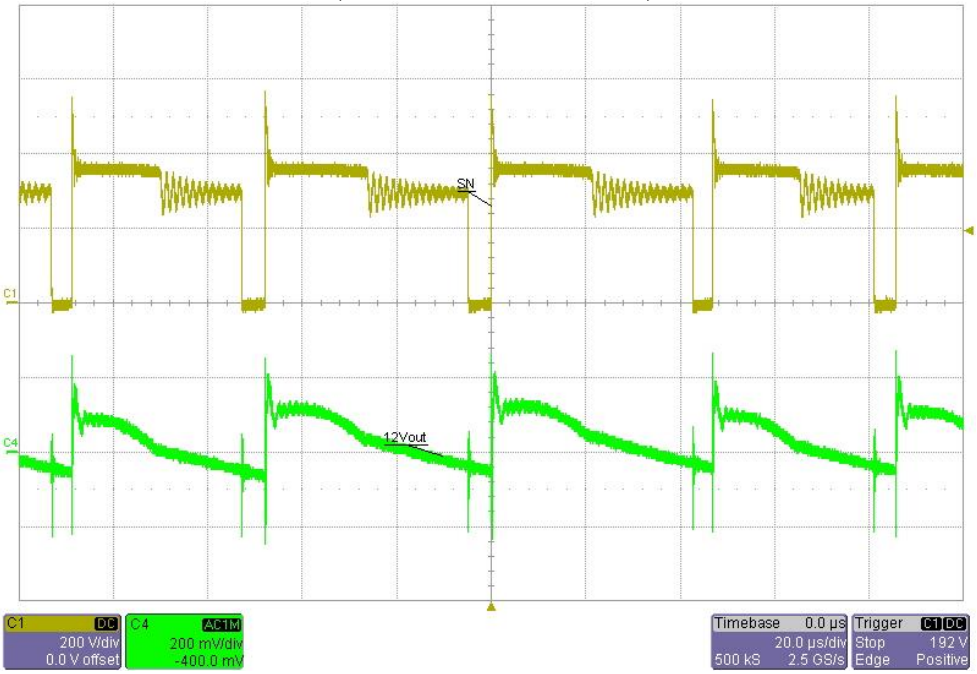


Input voltage = 230VAC
Output Power = 1W

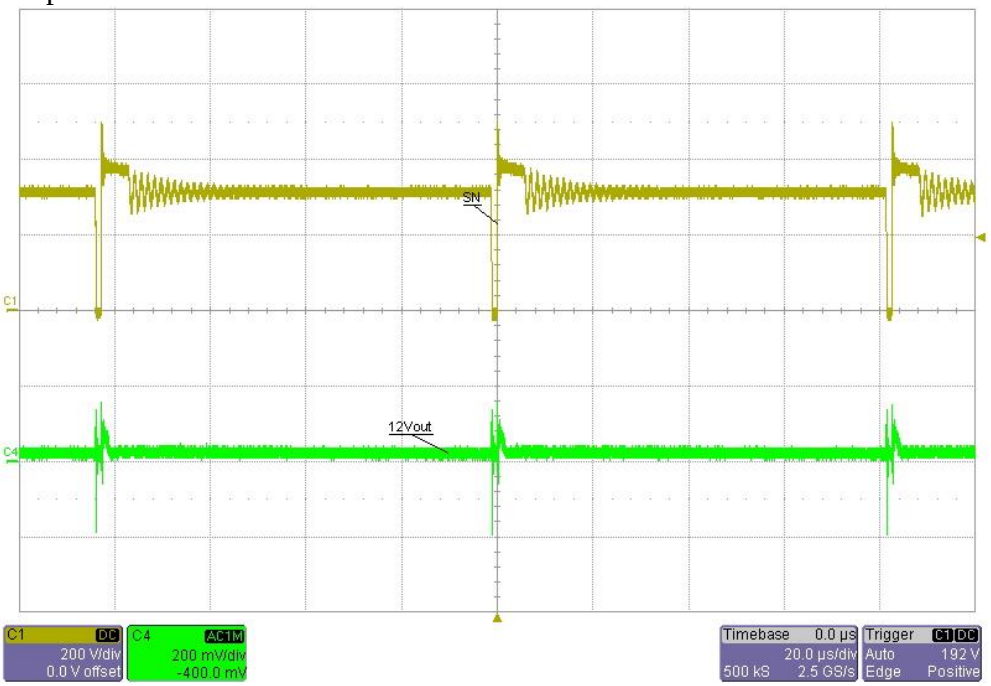


8.2 12Vout:

Input voltage = 230VAC
Load current = full load (5V@2.0A / 12V@1.5A)



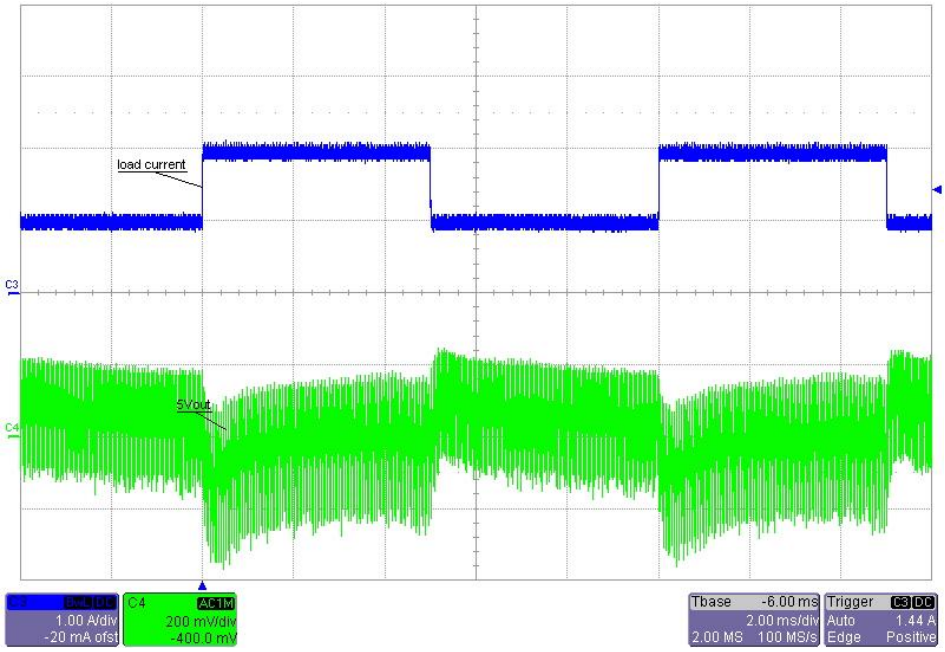
Input voltage = 230VAC
Output Power = 1W



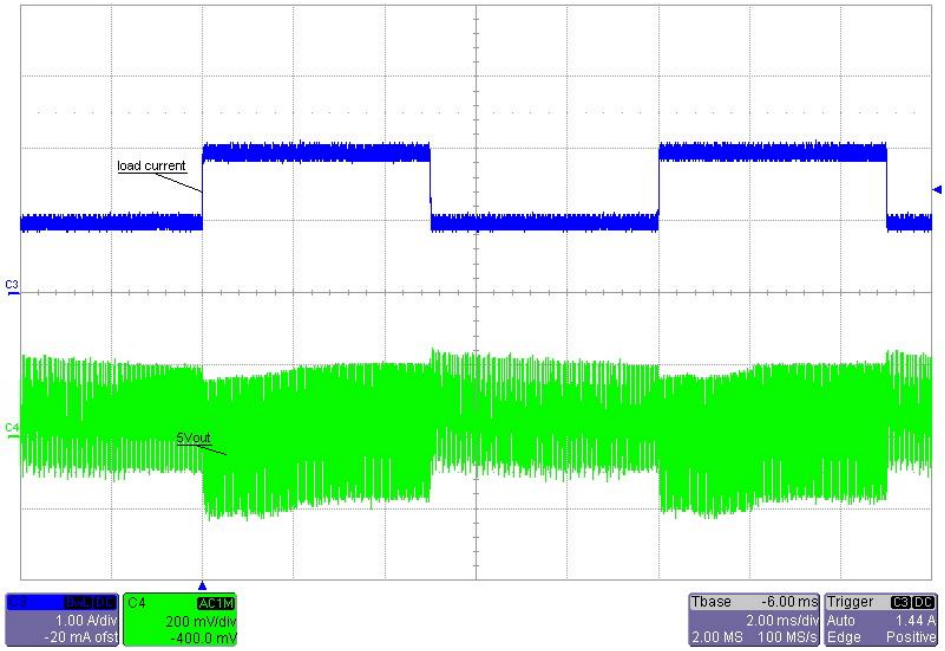
9 Load step

9.1 5Vout:

Input voltage = 230VAC
Load current 5Vout = 1.0A – 2.0A
Load current 12Vout = 1.5A

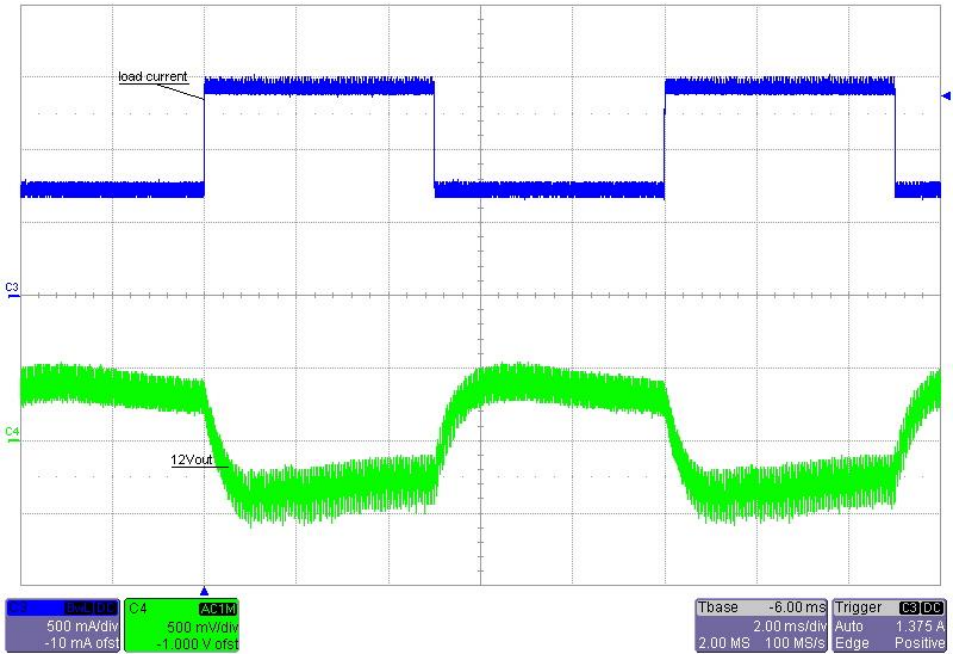


Input voltage = 230VAC
Load current 5Vout = 1.0A – 2.0A
Load current 12Vout = 0A

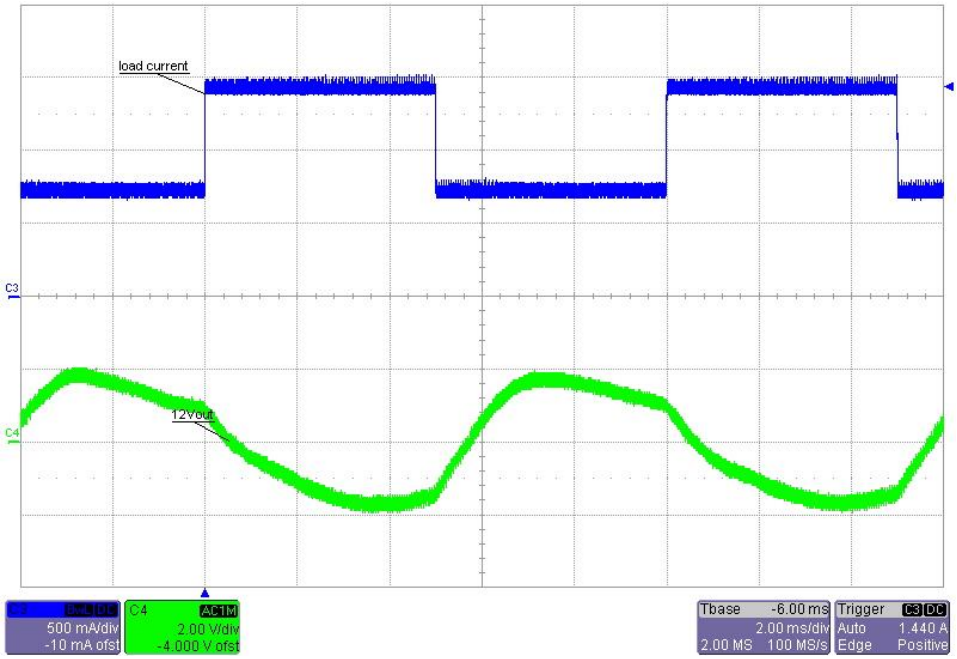


9.2 12Vout:

Input voltage = 230VAC
Load current 5Vout = 2.0A
Load current 12Vout = 0.75A – 1.5A



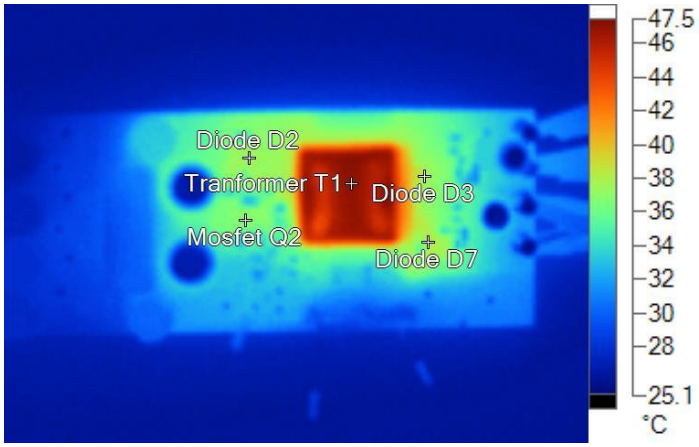
Input voltage = 230VAC
Load current 5Vout = 0.05A
Load current 12Vout = 0.75A – 1.5A



10 Thermal Analysis

The images below show the infrared images taken from the FlexCam after 10min at 1W output power.

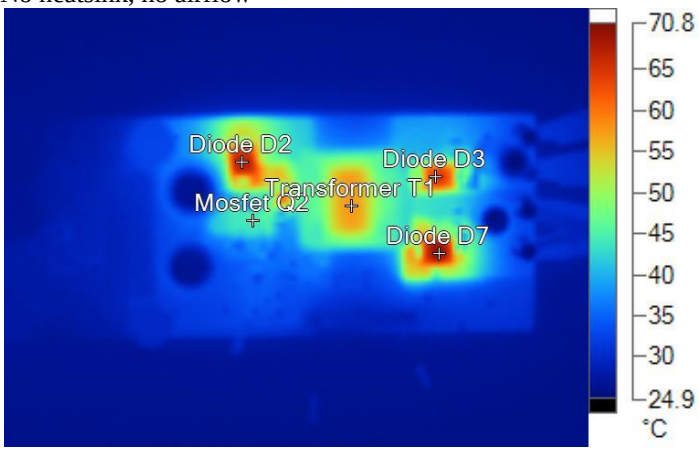
Input voltage = 230VAC
Output power = 1W (4.95V@0.123A; 11.67V@0.0342A)
Ambient temperature = 25°C
No heatsink, no airflow



Name	Temperature	
Tranformer T1	47.2°C	
Diode D3	37.8°C	
Diode D7	38.0°C	
Mosfet Q2	36.5°C	
Diode D2	37.5°C	

The images below show the infrared images taken from the FlexCam after 20seconds at full output power.

Input voltage = 230VAC
Output power = 28W
Ambient temperature = 25°C
No heatsink, no airflow



Name	Temperature	
Diode D2	67.5°C	
Mosfet Q2	44.5°C	
Transformer T1	57.4°C	
Diode D3	64.6°C	
Diode D7	70.8°C	

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