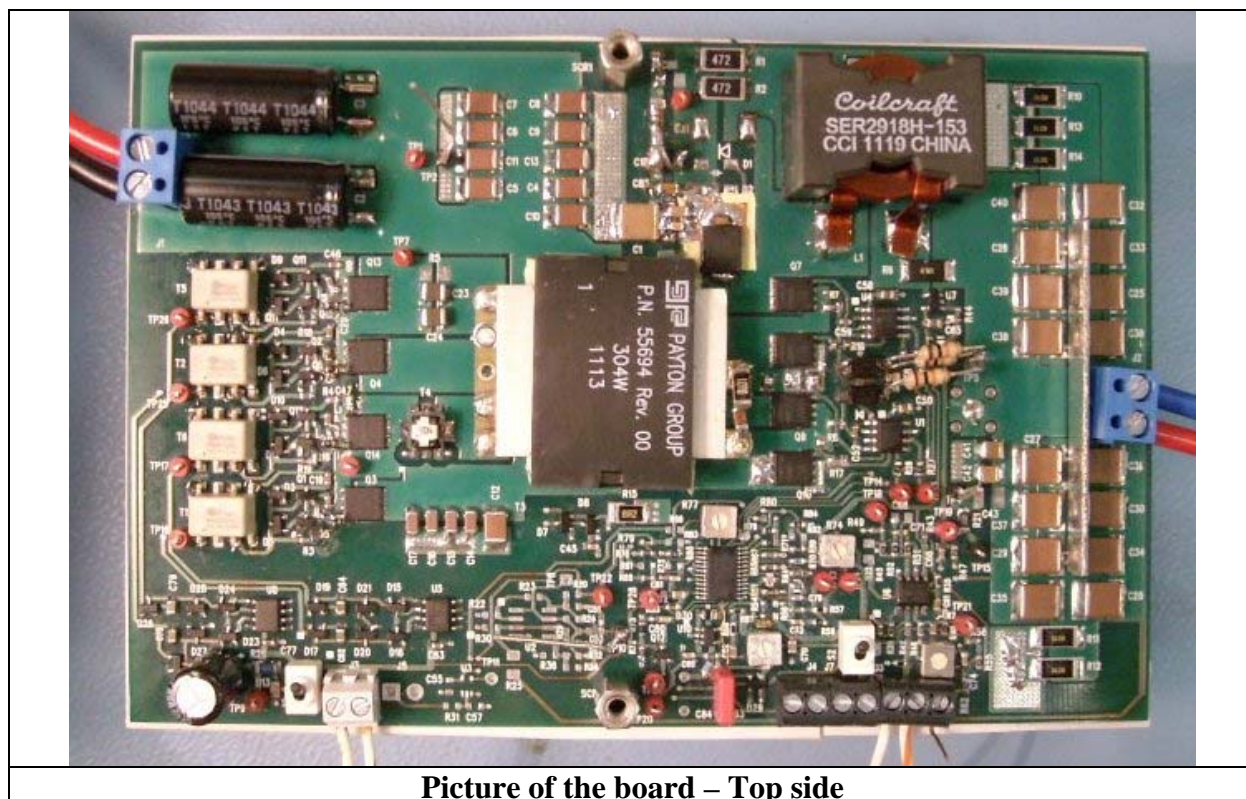


PMP5726 Rev.F Test Results

The PMP5726 is 350W High Speed_Full Bridge Phase Shift ZVT – Galvanic Isolated_Full Bridge Synchronous Rectification DC/DC reference design. It is built for telecom applications to supply a RF PA stage.

The converter is two quadrant converter, working forward in voltage mode control and working backward in average current mode limitation. This limitation is adjustable. Control input has a slope limitation, adjustable as well.



Picture of the board – Top side

This board has been tested, according to the test report, @ 36V, 48V, 60Vin, full load, with a cooling fan with 32 cfm placed at 10cm distance. Connected load described in the specification document (100nH + 20×10uF X7R ceramic capacitors).

PMP5726 Rev.F Test Results

1 Power supply description

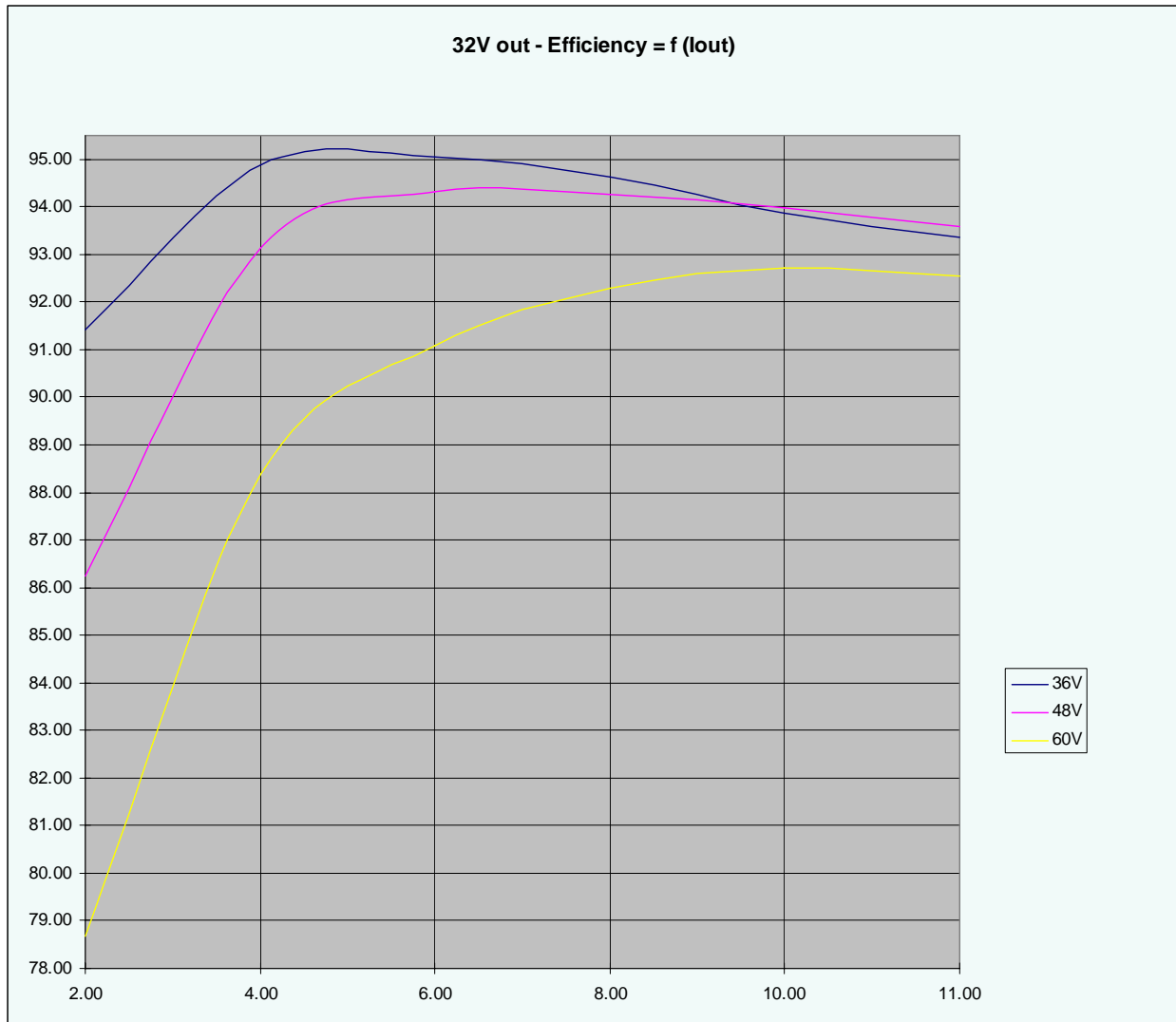
Nr.	Description	Capability	Remarks	Comments
1	Minimum Input voltage	36V		
2	Maximum Input voltage	60V		
3	Output voltage	20V to 32V		Adjustable
4	Isolation Primary - secondary	500Vdc		
5	DC accuracy/tolerance for the output voltage	+/- 2%.		
6	Output voltage ripple	100mVpp	(20MHz BW)	see the measurements
7	Maximum continuous output current	11.5A		Transformer need an other isolation for higher temperatures
8	Efficiency	>91%	for currents 2A -11A	see the measurements
9	Efficiency	>85%	for currents 1A -2A	see the measurements
10	Transient performance			see the measurements
11	Overshoot	<1.5V	output current 0A-11A	see the measurements
12	Undershoot	<1.5V	output current 0A-11A	see the measurements
13	Settling time of the output voltage to +/-2%	<200us	@ constant output current 1A	see the measurements
14	Analog control input	50 Ohm input impedance	1Vpp maximum	
15	Output voltage overshoot or undershoot when tuning the output voltage	<1.5%		see the measurements
16	ON/OFF function	active low/active high		
17	Power good (PGOOD)	active high	Output voltage in range 20V-32V	
18	Board size	100mmX150mm		
19	Absolute maximum components height - top side	15mm		
20	Absolute maximum components height - bottom side	3mm		
21	Component placement	Top side		
22	Power MOSFETs package	PowerPAK SO8		
23	Operating temperature range	-10 to +90 deg C.		

2 Efficiency

The efficiency data are shown in the graph below.

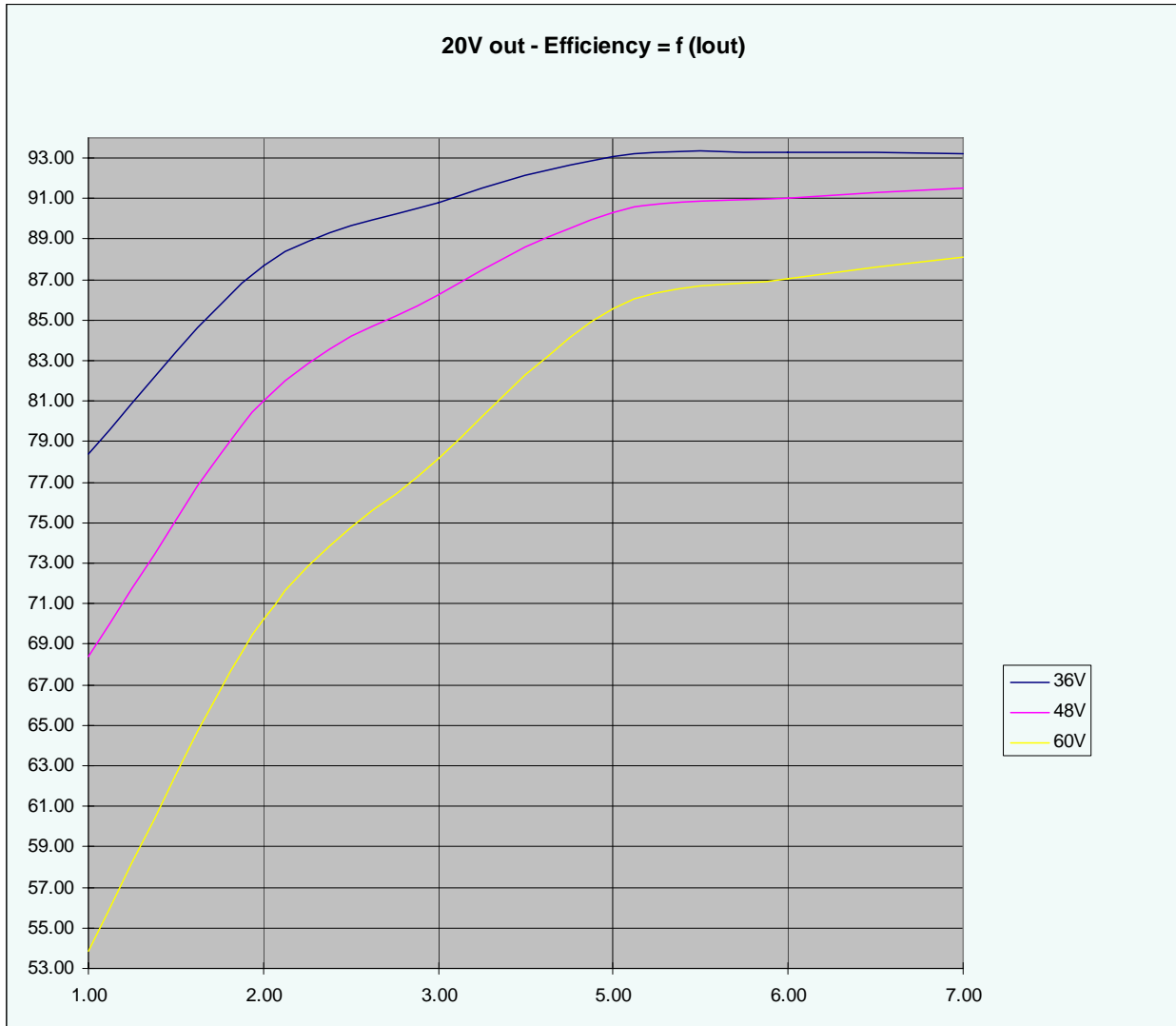
The load consisted of an electronic load, manually adjusted; the power supply is able to deliver a maximum current of 55A.

Efficiency curve measured at 36V, 48Vin, 60Vin and 32Vout; the graph shows the efficiency versus output current (maximum 32V*11A)



PMP5726 Rev.F Test Results

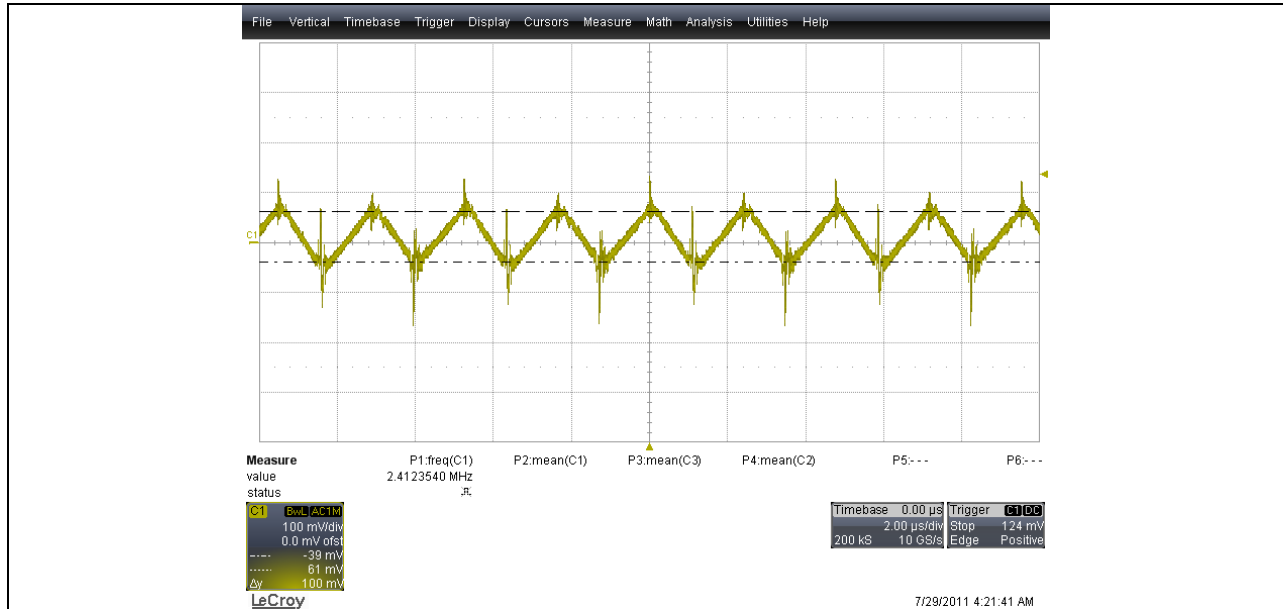
Efficiency curve measured at 36V, 48V, 60Vin and 20V out; the graph shows the efficiency versus output current (maximum 20V * 7A).



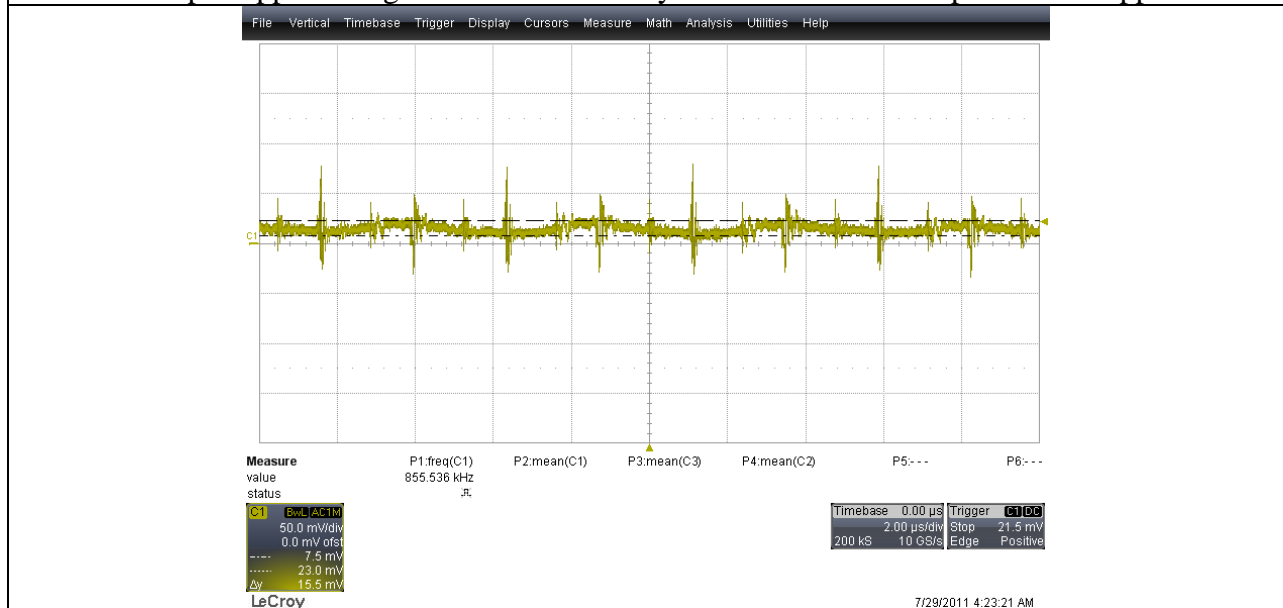
3 Output voltage regulation

The output voltage regulation versus output power: No changes.

4 Output ripple voltage



Output ripple voltage – measured directly on the converters output – 100mVpp

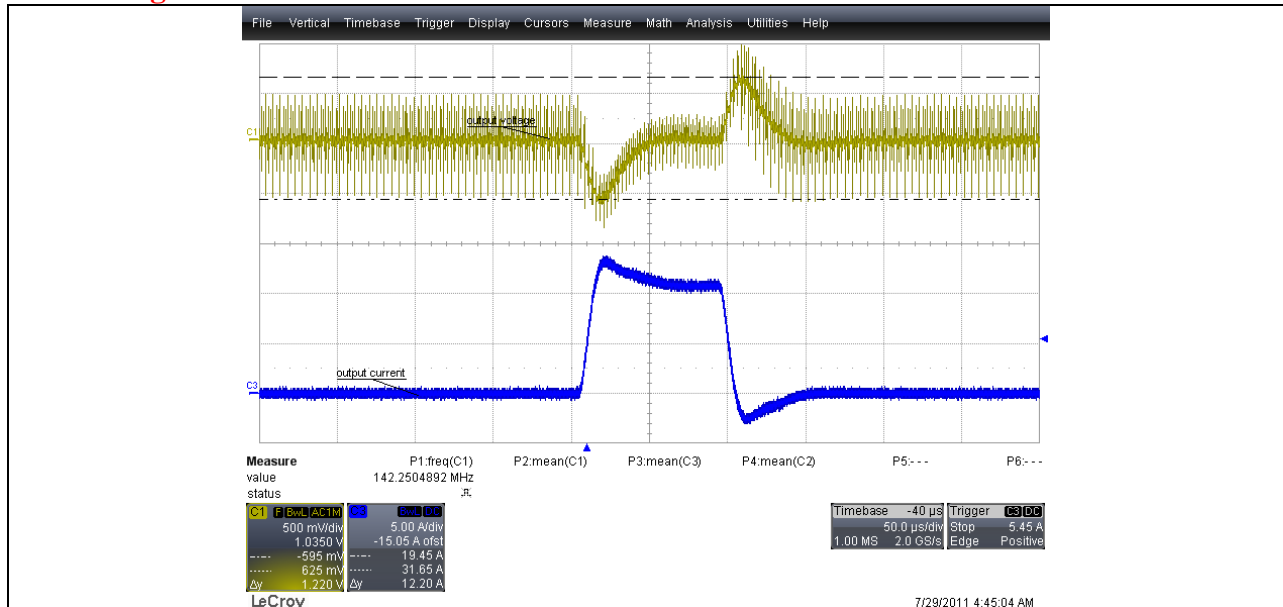


Output ripple voltage – measured directly on the 200uF (RF Amplifier) – 15mVpp

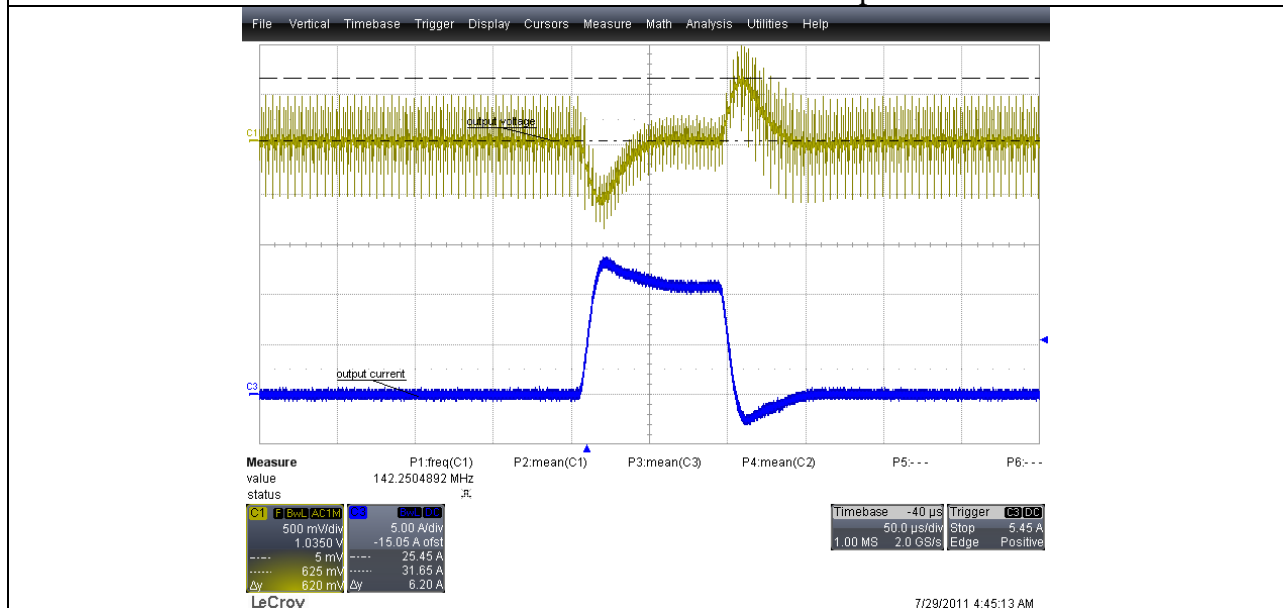
PMP5726 Rev.F Test Results

5 Transient response (load current switched)

The fast transient load step current was produced with a 2.9Ohm. Switching time ON & OFF is in the **range of 100ns**.

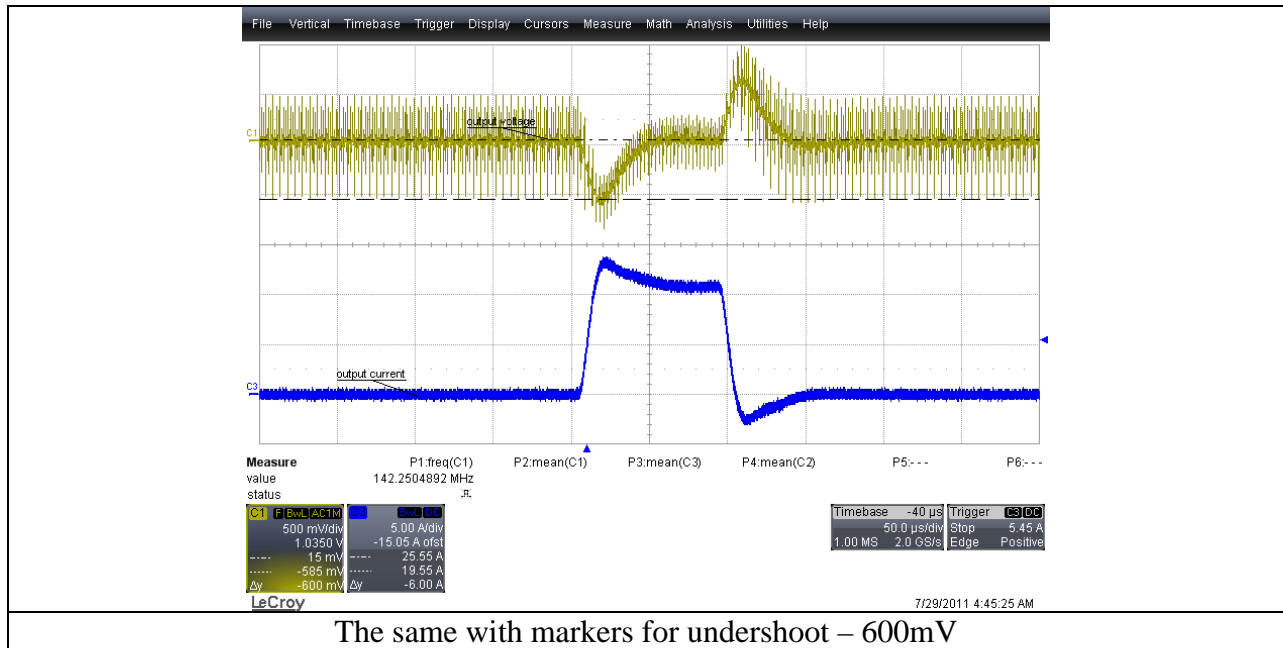


Yellow – Output voltage AC coupled 200MHz band with – 1.2V
 Blue – Current on the converters output



The same with markers for overshoot – 620mV

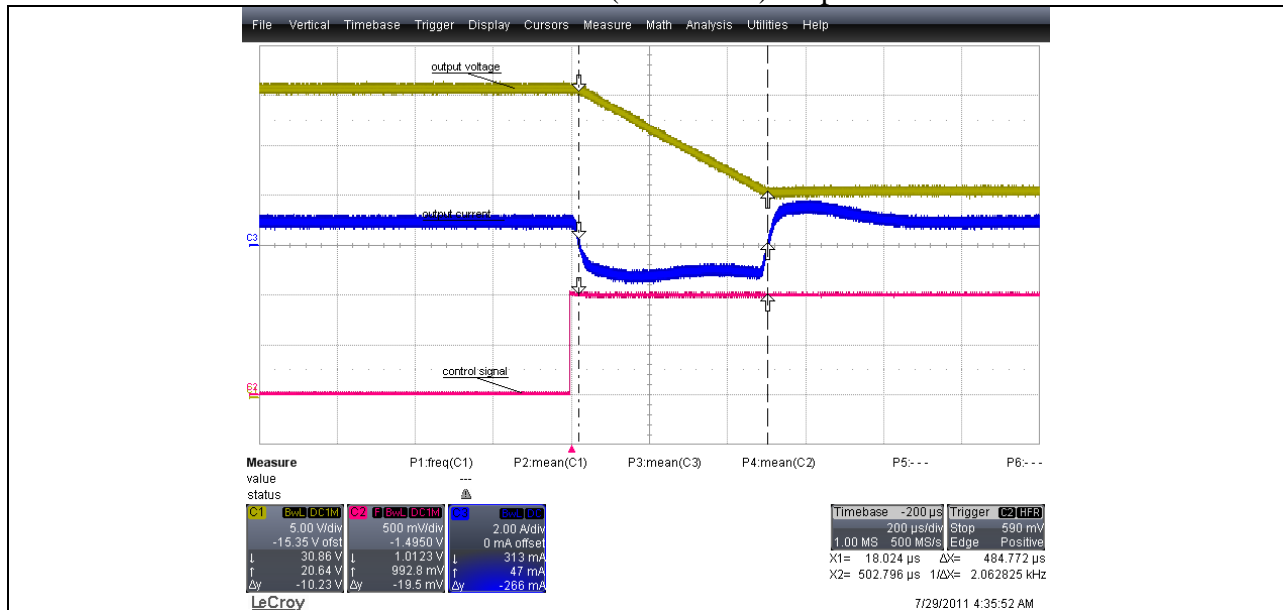
PMP5726 Rev.F Test Results



The same with markers for undershoot – 600mV

6 Slow Drain Modulation (SDM)

For this test, a waveform function generator was set to provide the rectangular waveform, shown in the graphs below. The input voltage was set to 48V and the output swings between 20V and 32V. The load was set to 1A constant current (worse case). Repetition rate 50Hz.



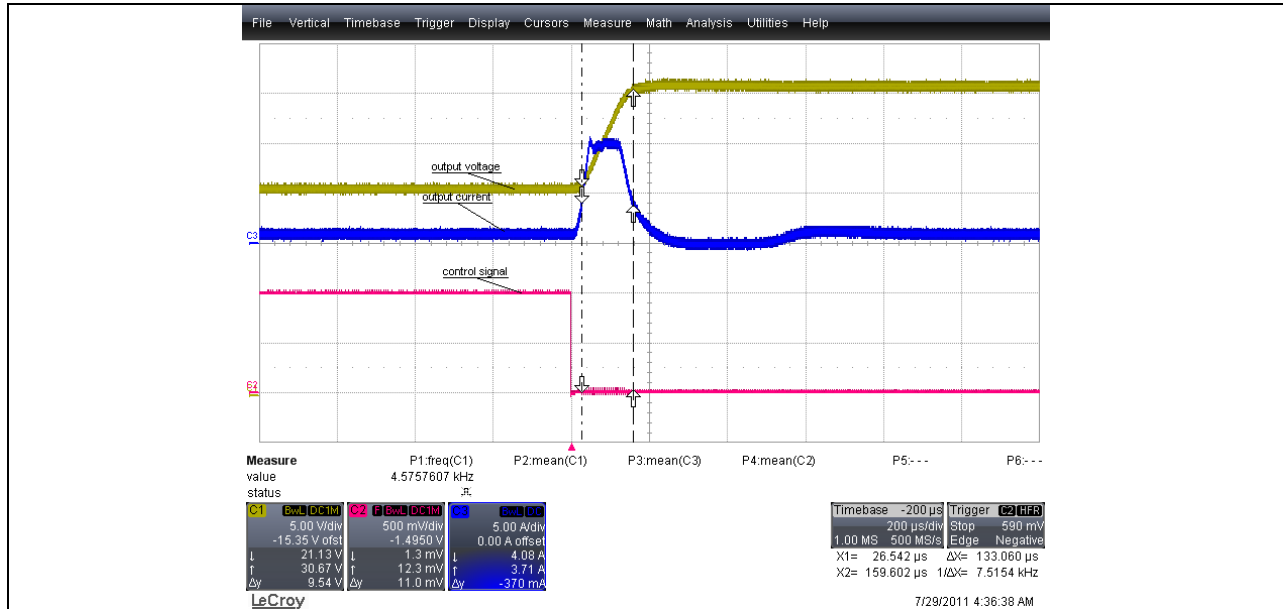
Load = 1A, 32Vout to 20Vout (maximal down slope limited internally to 500us)

Channel 1: Output Voltage, 5V/div, DC coupled, 200usec/div

Channel 2: Control Voltage, 500mV/div

Channel 3: Current on the converters output 2A/div

PMP5726 Rev.F Test Results



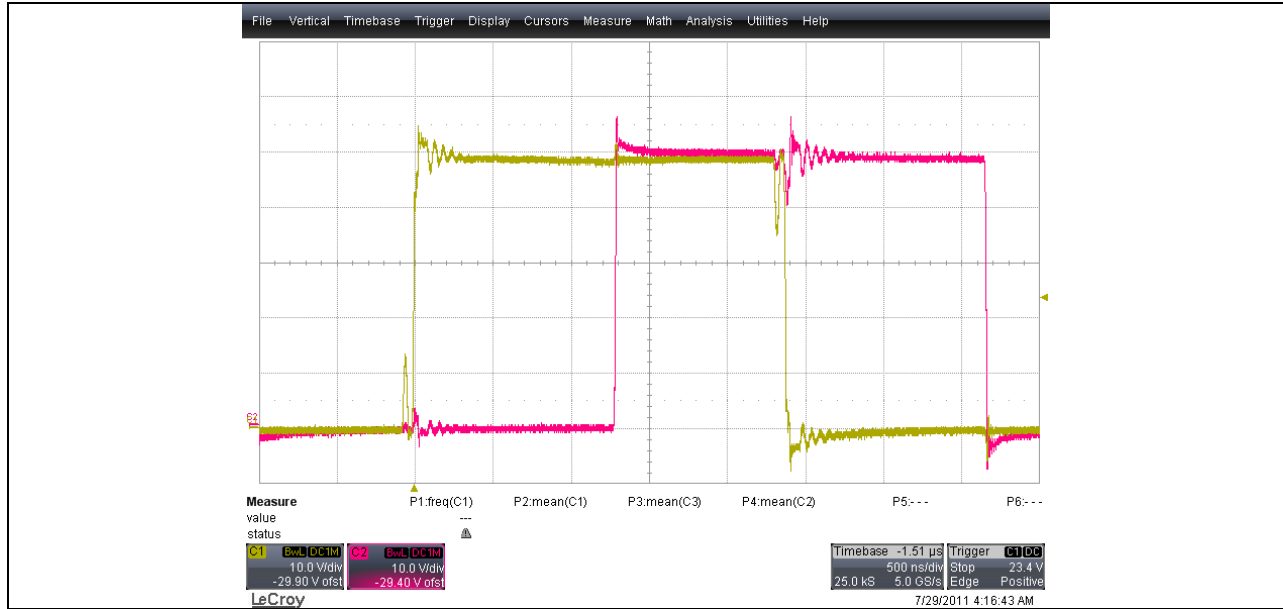
Load = 1A, 20Vout to 32Vout (maximal up slope limited internally ~ 100us)
Channel 1: Output Voltage, 5V/div, DC coupled, 200usec/div
Channel 2: Control Voltage, 500mV/div
Channel 3: Current on the converters output 5A/div

Settling time – no settling time issues. Negligible over shoot/undershoot.

PMP5726 Rev.F Test Results

7 Switching Node Waveform

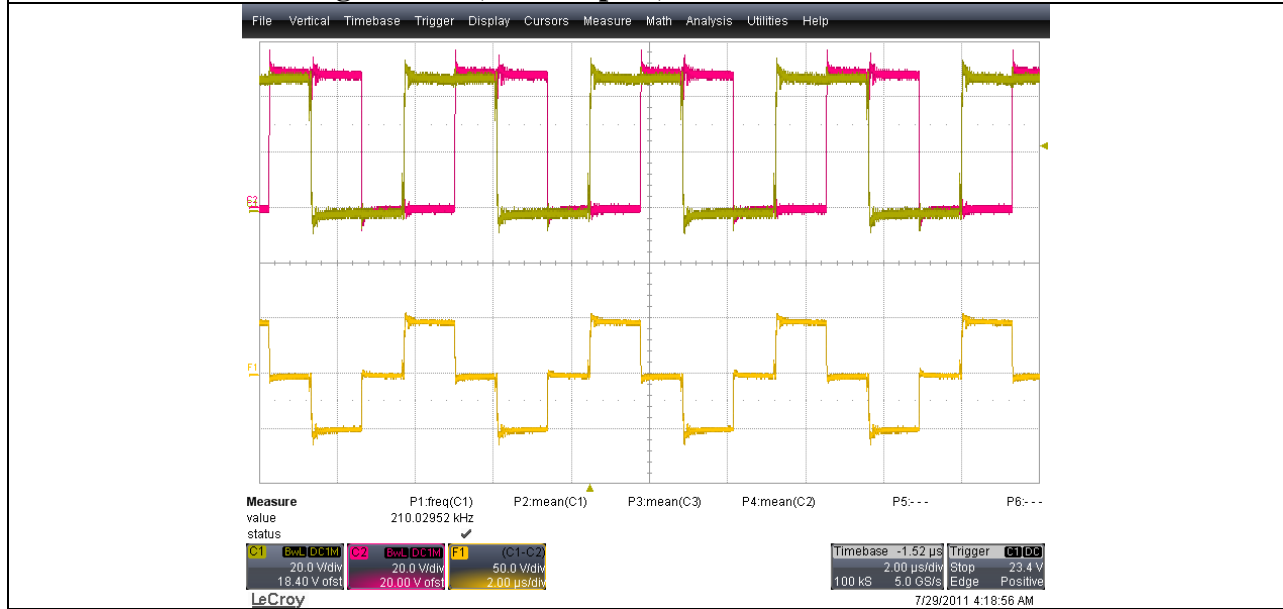
The images below show the voltages behavior of the right (TP6) and left (TP7) full bridge legs, the 48Vin operation, full load conditions.



Load = 11A, 32Vout

Channel 1: Drain voltage 10V/div, DC coupled, 500nsec/div

Channel 2: Drain voltage 10V/div, DC coupled, 500nsec/div

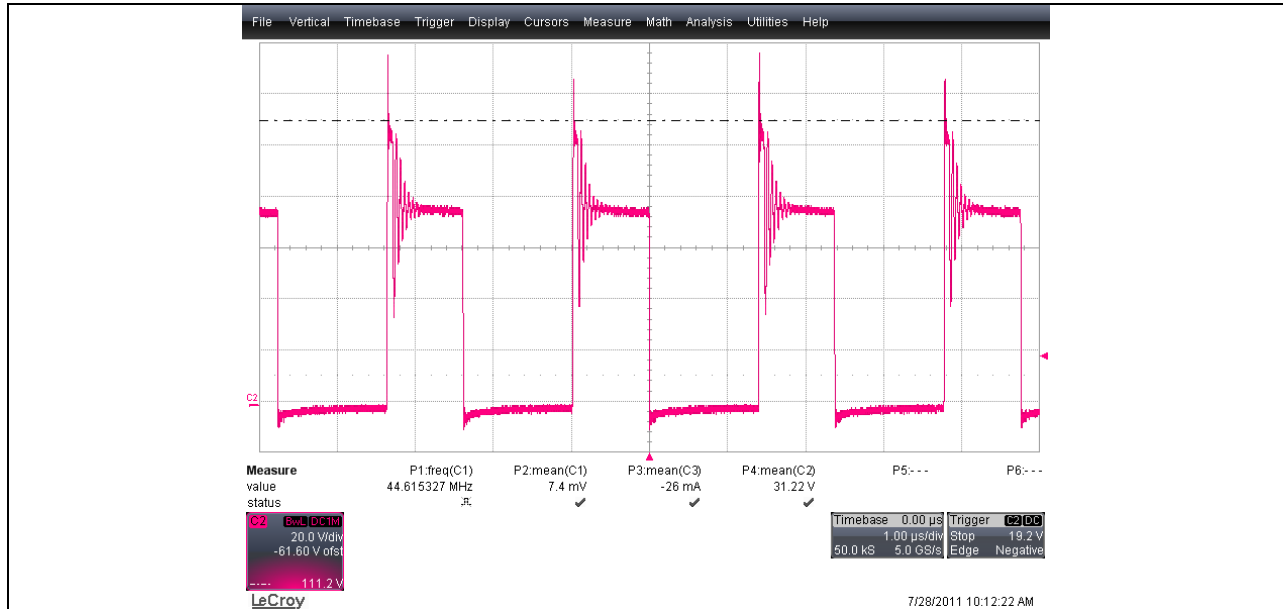


The same, in addition CH1-CH2 (Voltage across the transformer)

PMP5726 Rev.F Test Results

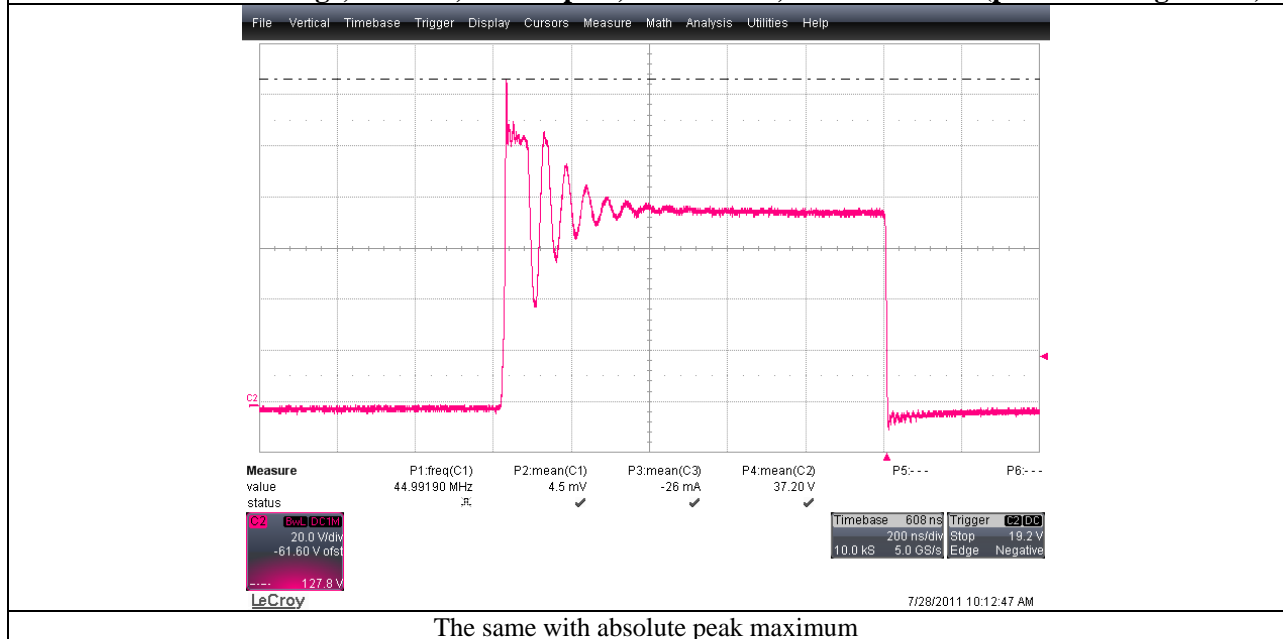
TP3:

Channel 1: Test point Voltage, 10V/div, DC coupled, 2usec/div, 20MHz BWL



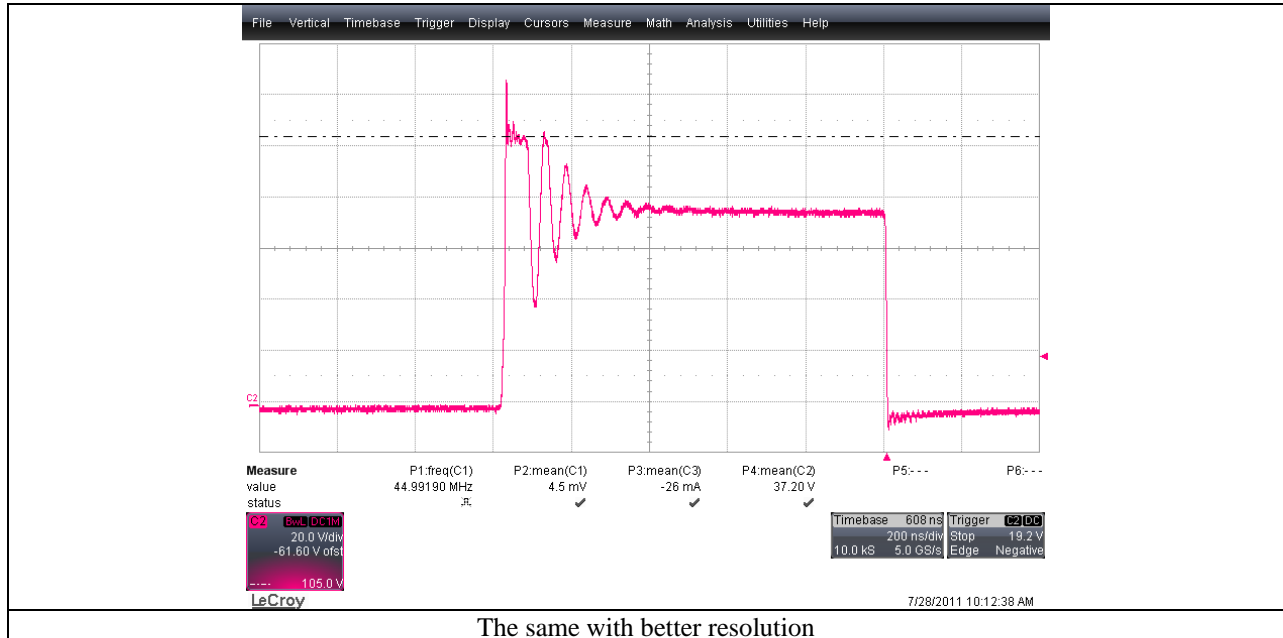
Synchronous rectifier - Drain Voltage $V_{in} = 60V$

Channel 2: Drain voltage, 20V/div, DC coupled, 200nsec/div, 200MHz BWL (plateau voltage 110V)



The same with absolute peak maximum

PMP5726 Rev.F Test Results

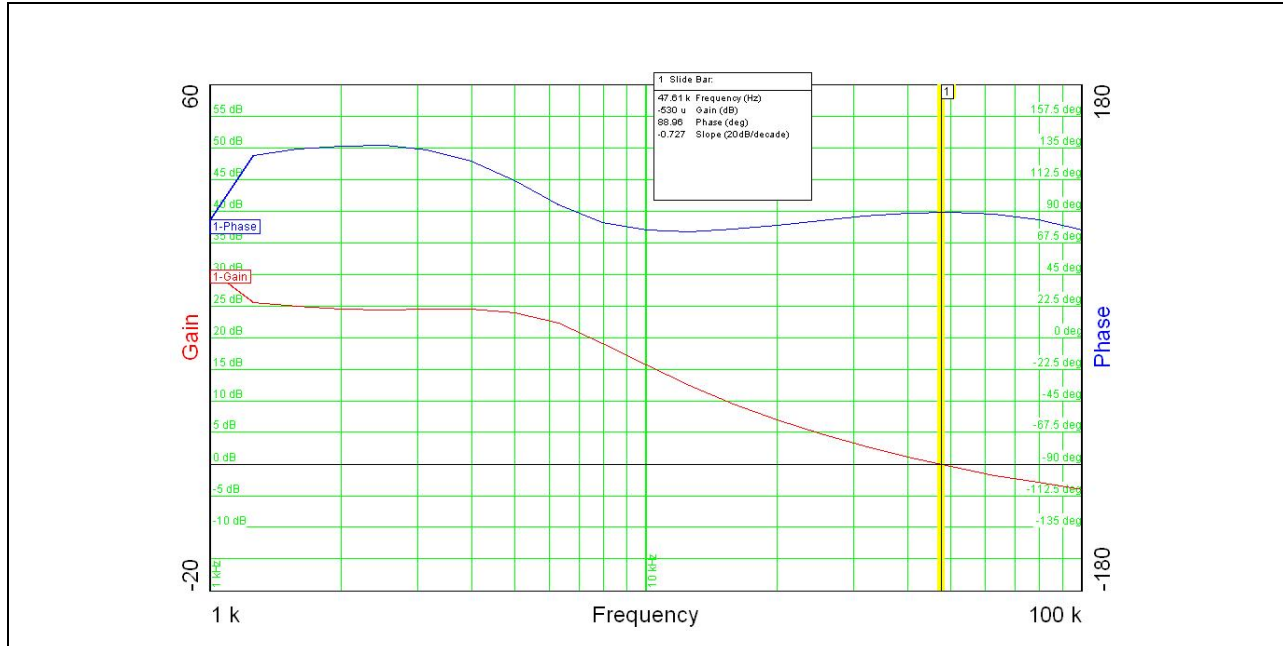


The same with better resolution

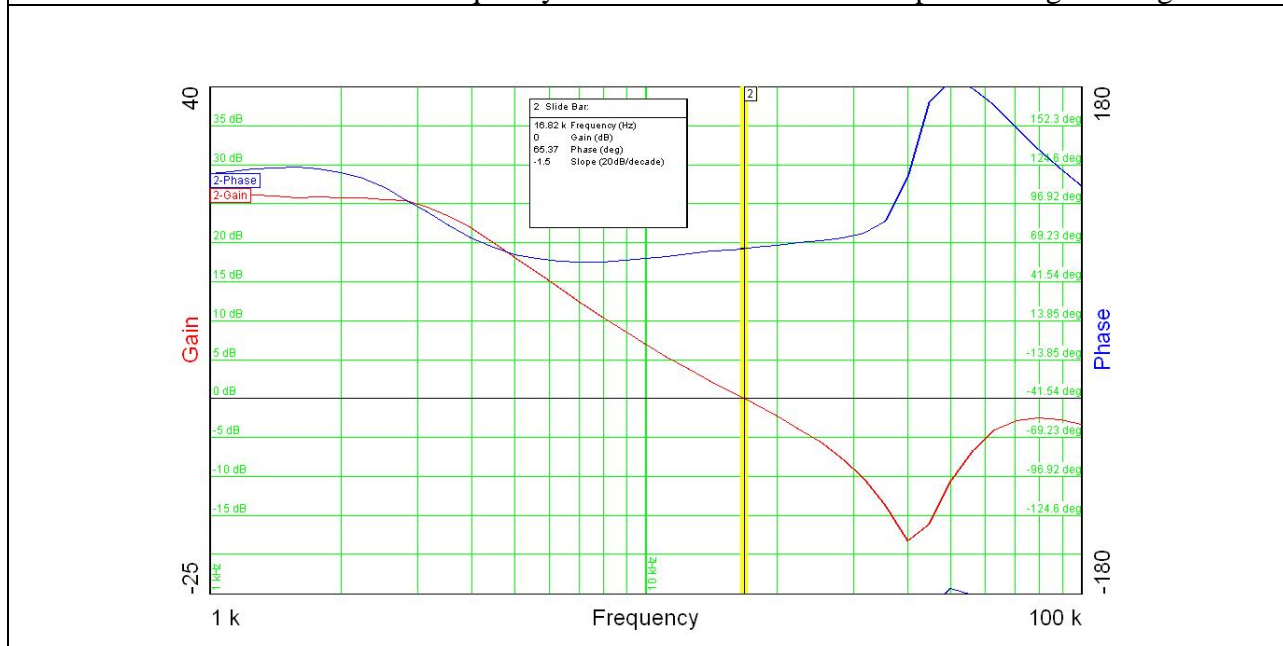
PMP5726 Rev.F Test Results

8 Loop response

Vin = 48V, Vout = 32V, load = 6.8A.



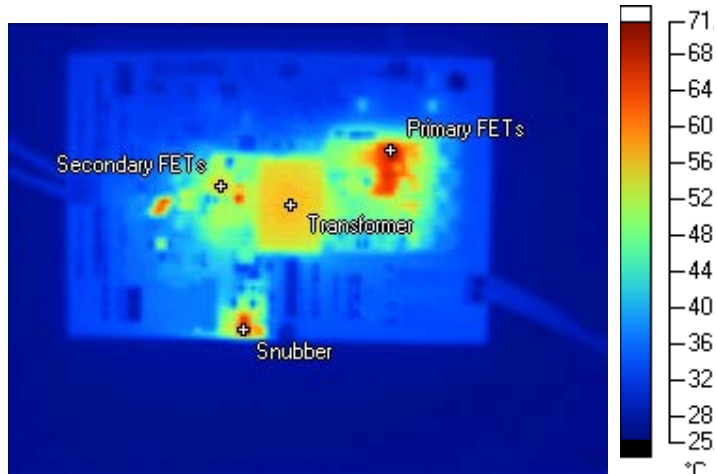
Frequency loop response of the converter – no capacitive load
The measured crossover frequency was around 47 KHz with a phase margin 88deg.



Frequency loop response of the converter – 200uF capacitive load
The measured crossover frequency was around 17 KHz with a phase margin 66deg.

9 Thermal analysis

The thermal analysis has been accomplished by an infrared camera at the following conditions:
 $V_{in} = 48V$, $V_{out} = 32V$, load = 5.5A. No air flow.



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Markers

Label	Temperature	Emissivity	Background
Transformer	56.0 °C	0.95	20.0 °C
Primary FETs	68.9 °C	0.95	20.0 °C
Snubber	70.1 °C	0.95	20.0 °C
Secondary FETs	55.8 °C	0.95	20.0 °C

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