

PMP10037 Test Results

1	Start-up.....	3
2	Shut down.....	4
3	Load transient.....	5
4	Output ripple and noise.....	6
5	Efficiency	7
6	Line regulation and load regulation	8
7	Loop stability	9
8	SW-node waveforms	10
9	Differential voltage over transformer primary.....	11
10	Thermal performance.....	12

General:

Topology: Two-switch Flyback

Device: LM5015 (<http://www.ti.com/product/lm5015>)

Specifications:

Output voltage: 12V

Output current: 0.6A

Input voltage range: 36V-72V

Nominal input voltage: 48V

Switching frequency: 300kHz

Operation mode: CCM

Requirements for performance:

Load step: <3% from output voltage

Output ripple: <1% from output voltage

Efficiency: >90% with full load

Requirements for feedback loop:

Phase margin: >60°

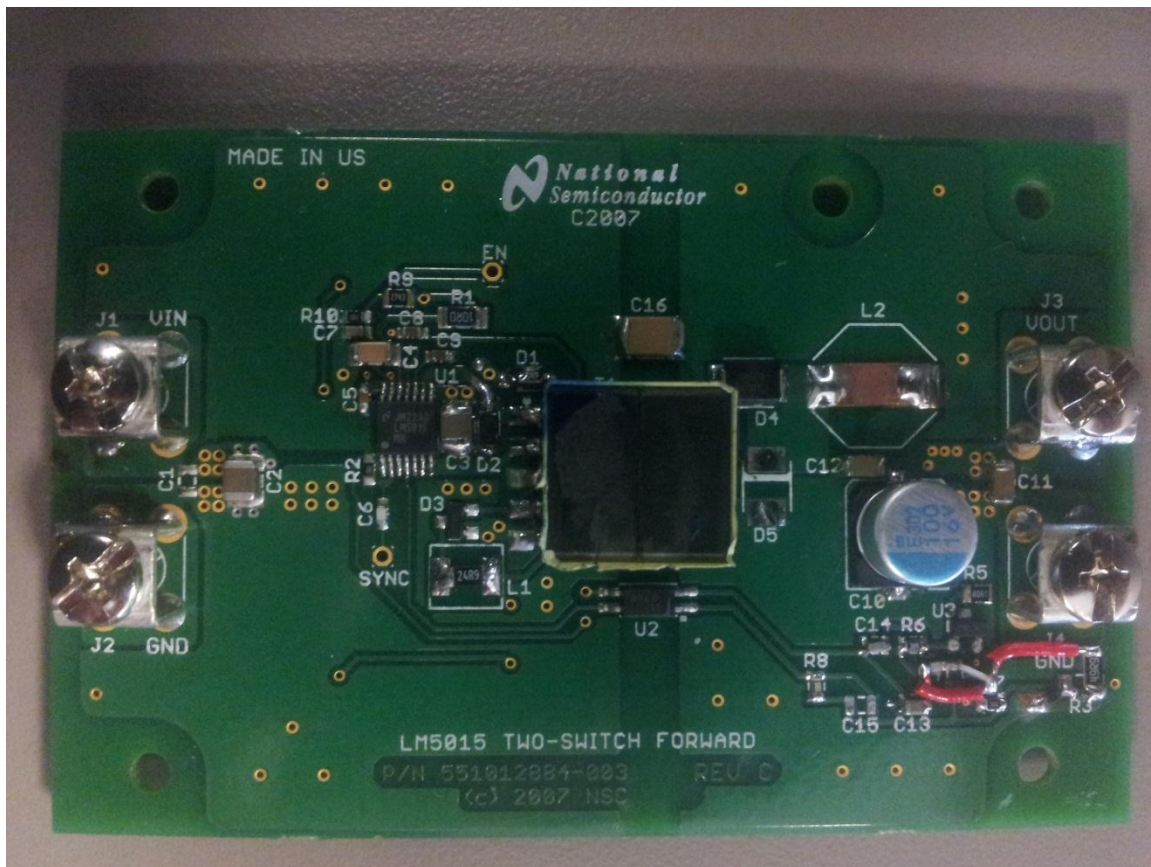


Figure 1. Design implemented on LM5015ISOEVAL.

1 Start-up

Load current: 600mA

Input voltage: 48V

Yellow curve: output voltage

Blue curve: load current

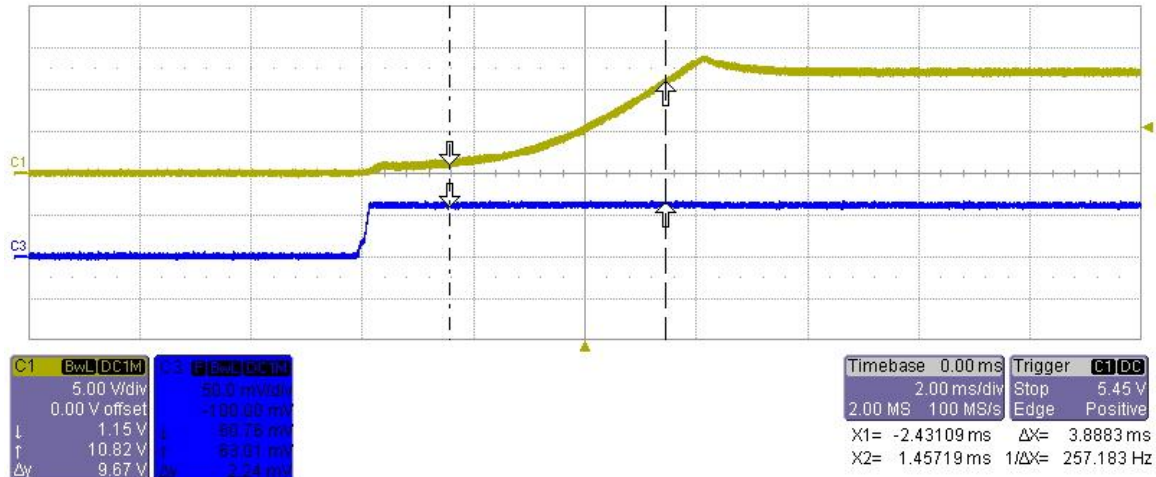


Figure 2. Start-up.

Start up time: 3.9ms

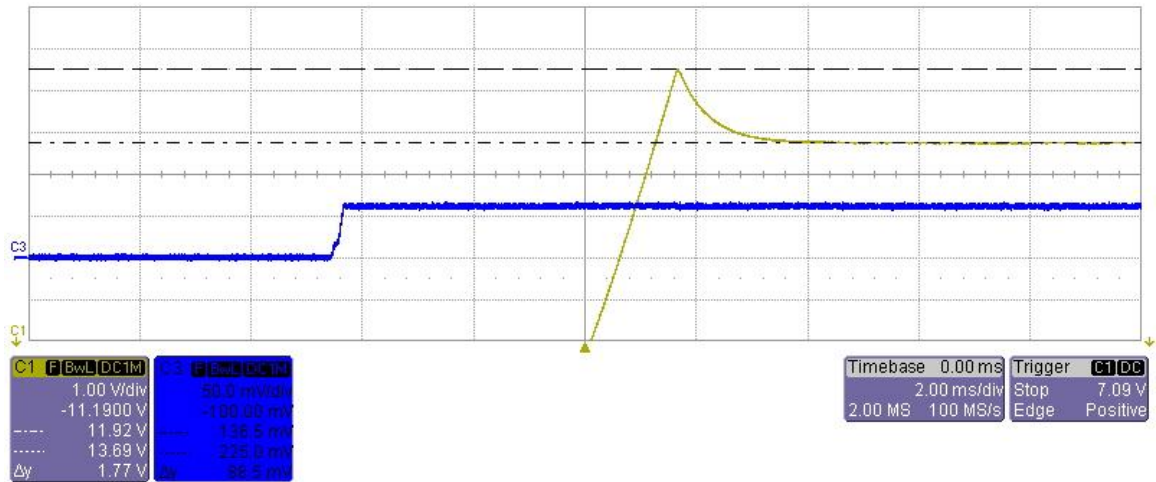


Figure 3. Voltage overshoot during start-up

Overshoot: 1.77V

PMP10037 Test Results

2 Shut down

Load current: 600mA

Input voltage: 48V

Yellow curve: output voltage

Blue curve: load current

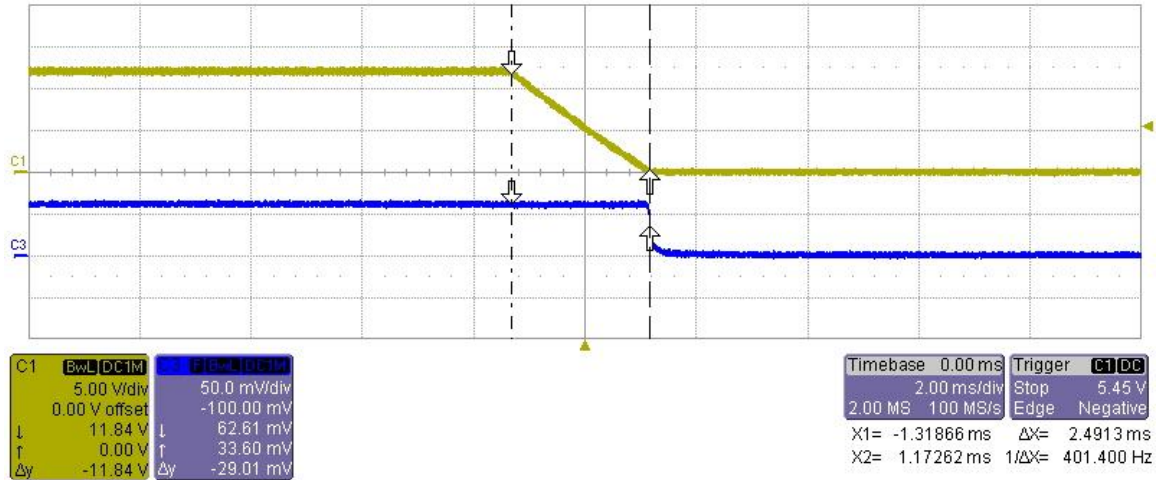


Figure 4. Shut down.

Shut down time: 2.49ms

PMP10037 Test Results

3 Load transient

Input voltage: 48V

Load pulsating frequency: 100Hz

Current slope speed: 0.833A/ μ s

Load variation: from 100mA to 600mA = 500mA

Current probe scale: 100mV/A

Yellow curve: output voltage

Blue curve: load current

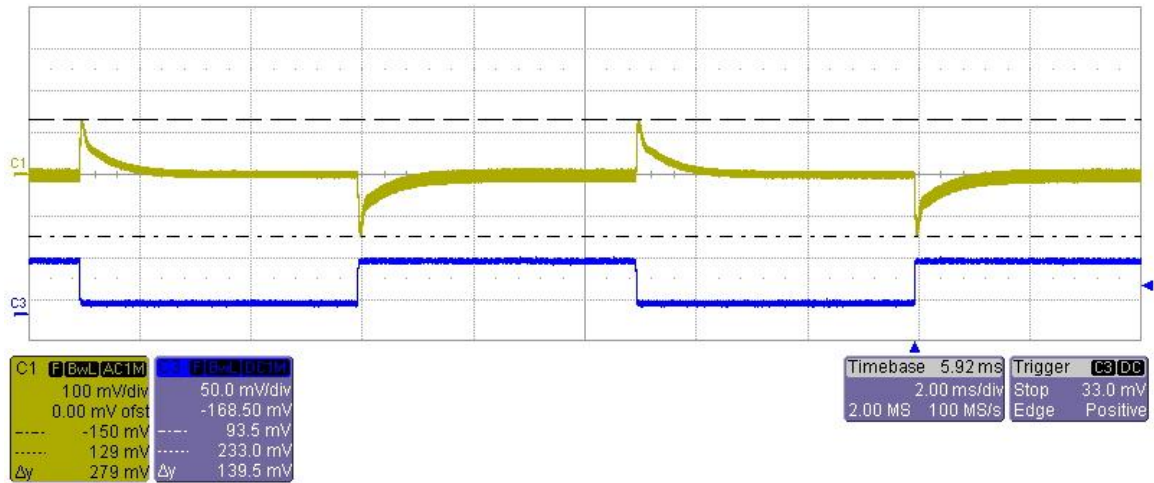


Figure 5. Load transient.

Positive voltage variation: 129mV

Negative voltage variation: 150mV

PMP10037 Test Results

4 Output ripple and noise

Load current: 600mA

Input voltage: 48V

Yellow curve: output voltage

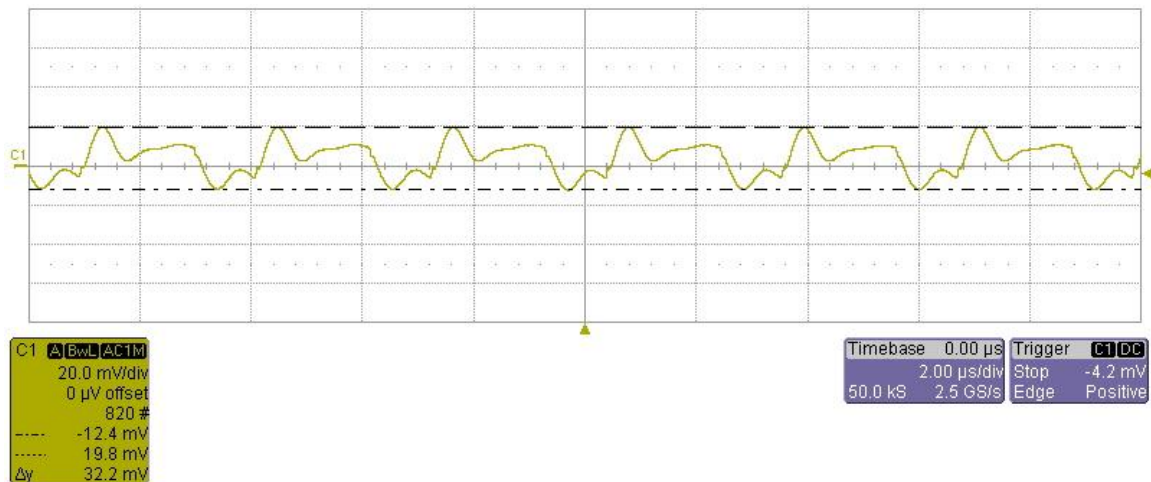


Figure 6. Output ripple.

Peak-to-peak ripple amplitude: 32.2mV

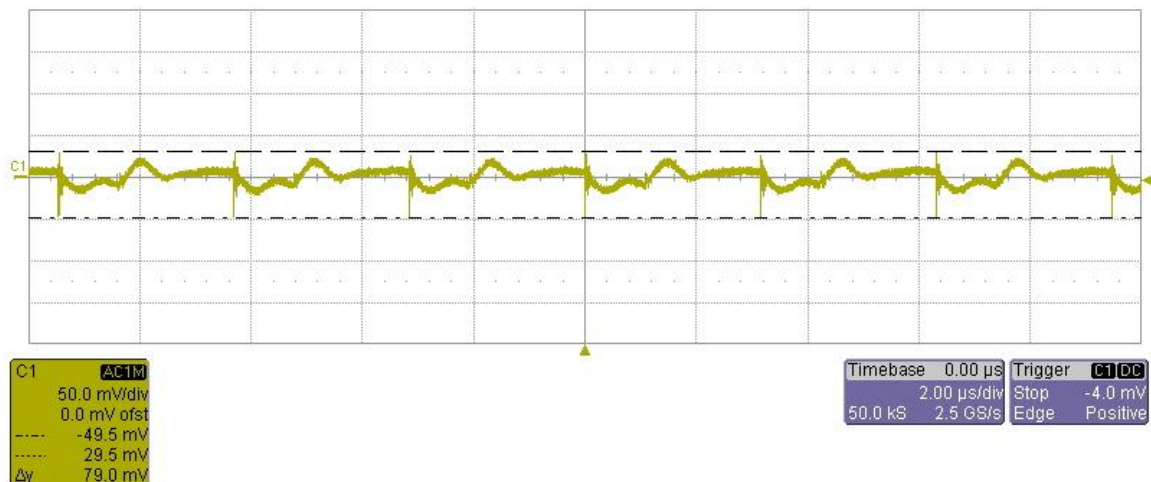


Figure 7. Output noise.

Peak-to-peak noise amplitude: 79mV

5 Efficiency

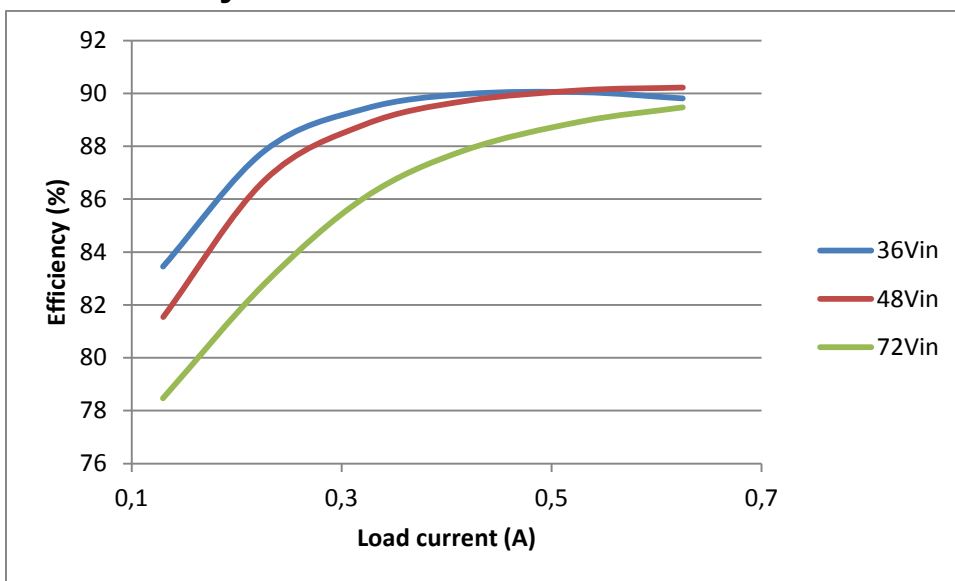


Figure 8. Efficiency as a function of load current.

Maximum efficiency: >90% with 7.5W of output power

PMP10037 Test Results

6 Line regulation and load regulation

Load current: 600mA

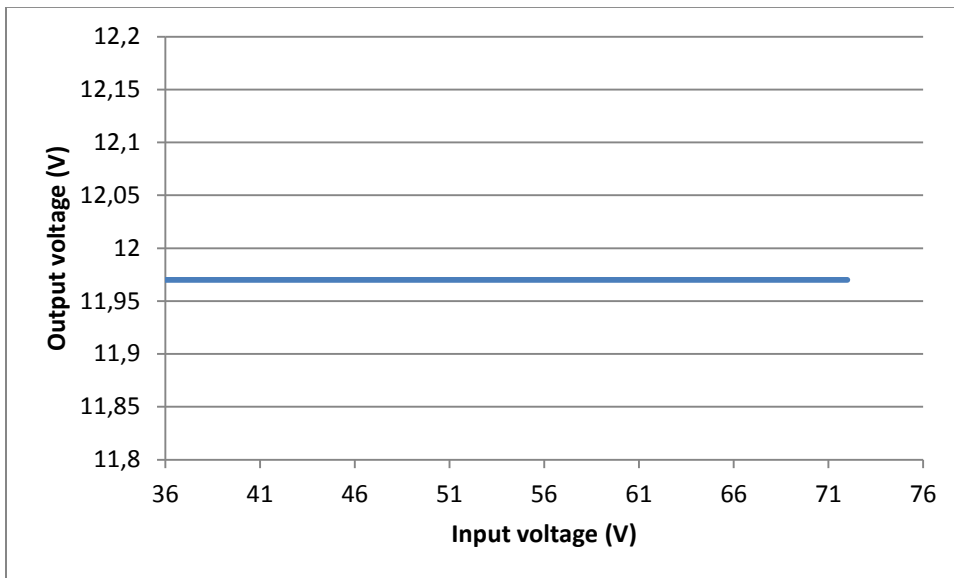


Figure 9. Line regulation.

Input voltage: 48V

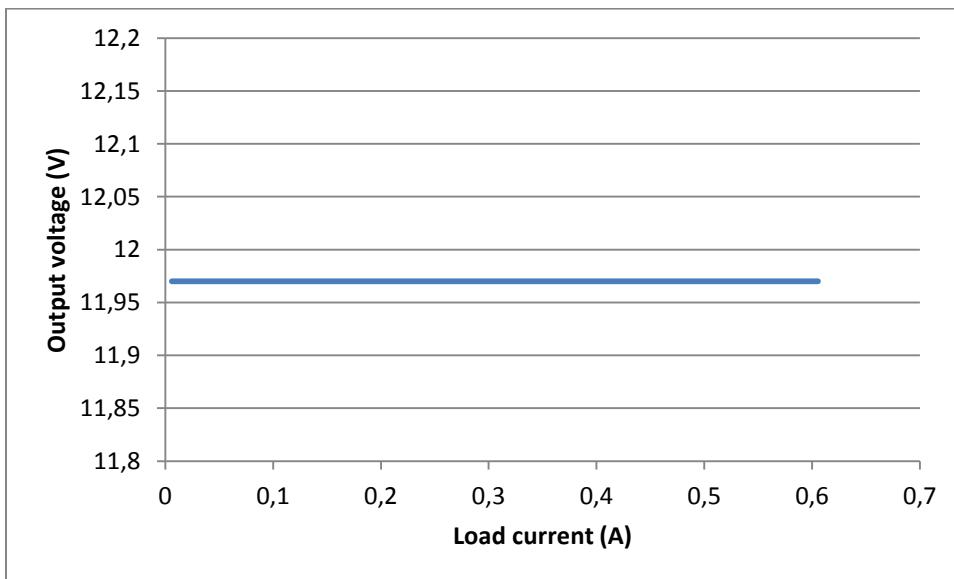


Figure 10. Load regulation.

PMP10037 Test Results

7 Loop stability

Load current: 600mA

Input voltage: 48V

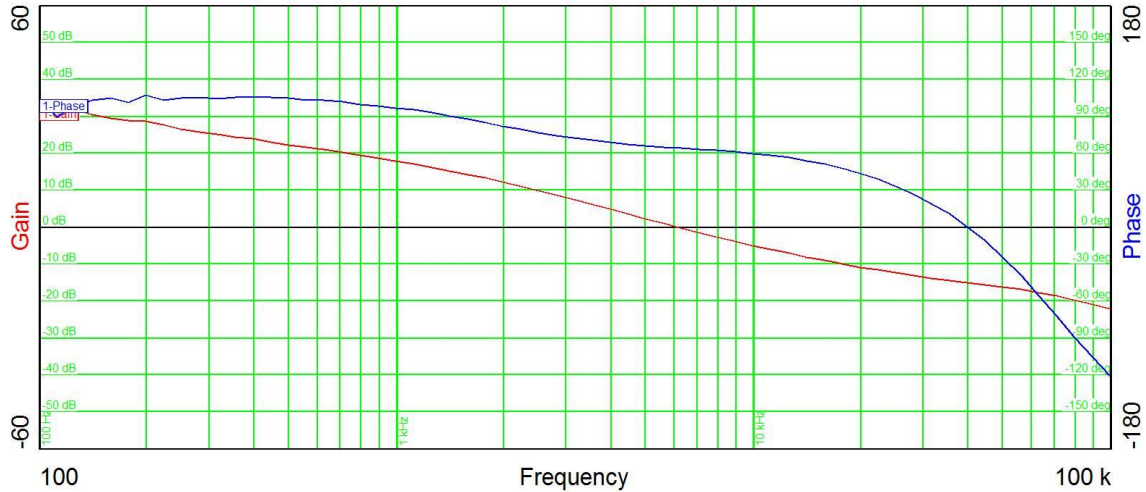


Figure 11. Control loop gain and phase.

Bandwidth: 6.1kHz

Phase margin: 64.26°

8 SW-node waveforms

Load current: 600mA

Input voltage: 48V

Yellow curve: high side of transformer primary

Pink curve: low side of transformer primary

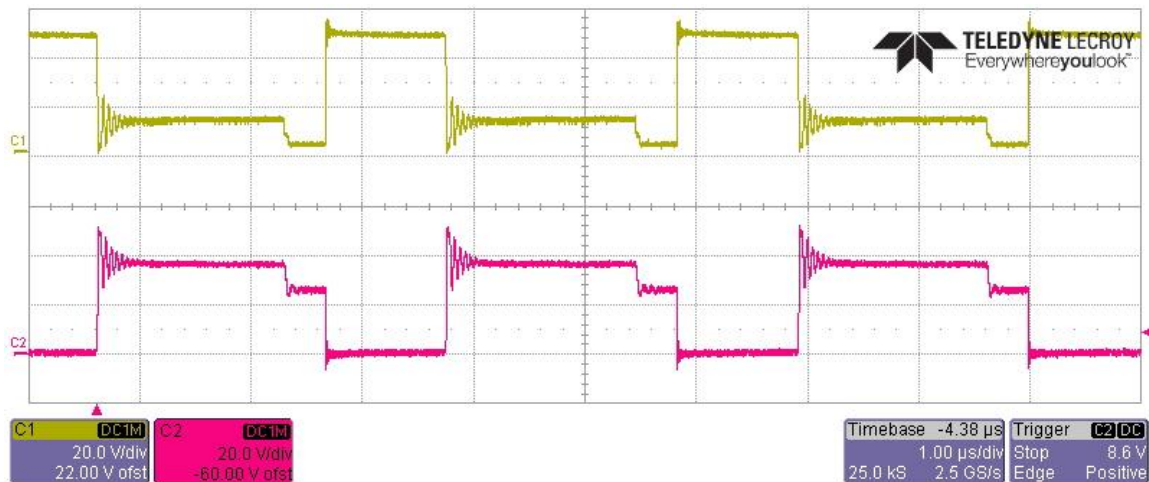


Figure 12. SW-node waveforms

Switching frequency: 3xxkHz

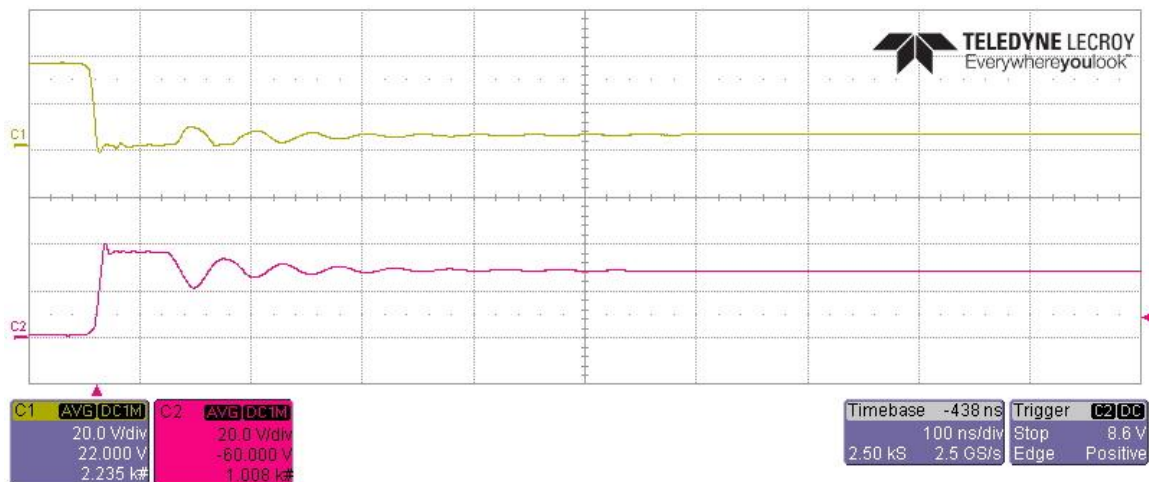


Figure 13. Primary side diode clamping

PMP10037 Test Results

9 Differential voltage over transformer primary

Load current: 600mA

Input voltage: 48V

Orange curve: Transformer primary voltage

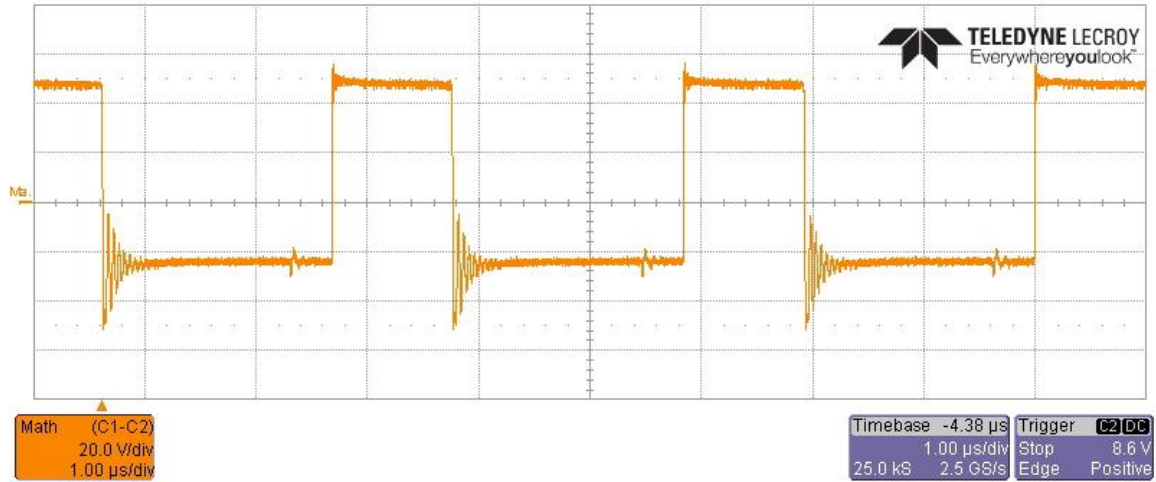


Figure 14. Transformer primary voltage

PMP10037 Test Results

10 Thermal performance

Load current: 600mA

Input voltage: 48V

Time: 30min

No airflow

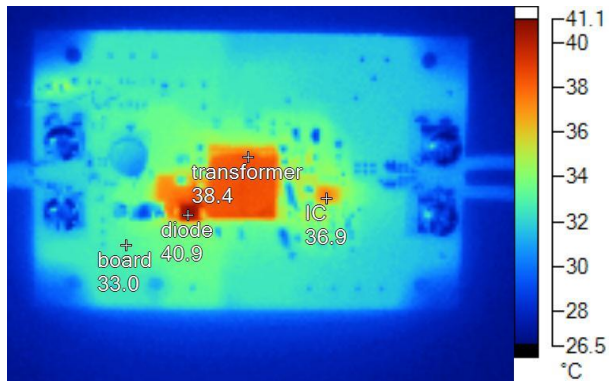


Figure 15. Temperatures on board.

PMP10037 Test Results

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