

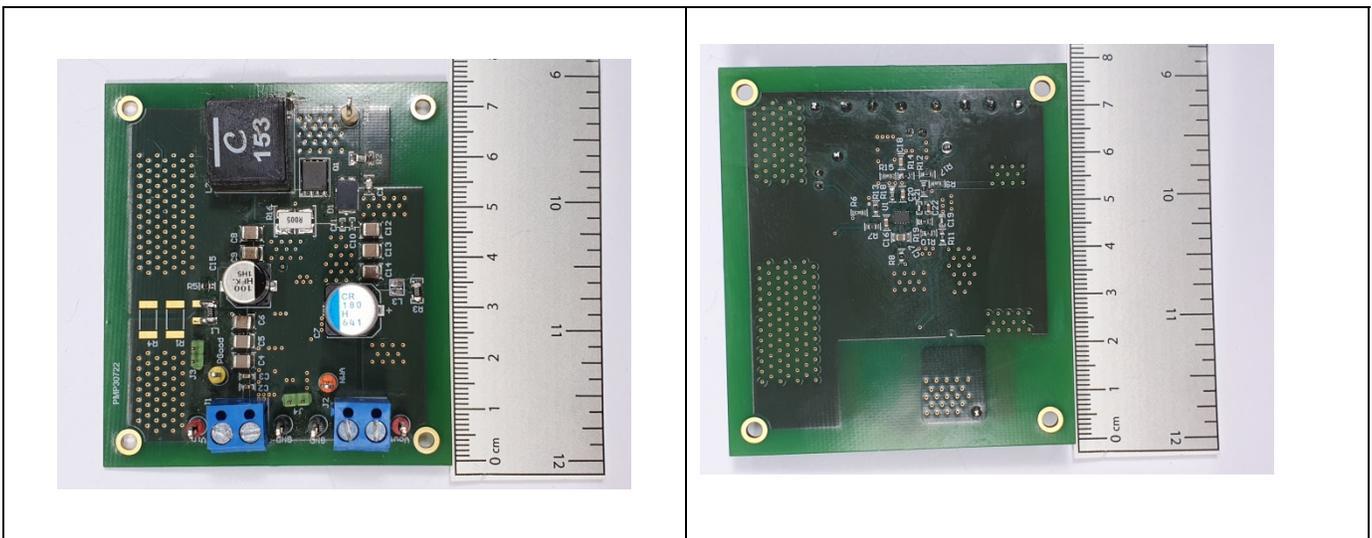
Test Report: PMP30722

Automotive Non-Synchronous Boost Converter With Dynamic Output Voltage Scaling Reference Design



Description

This reference design showcases a non-synchronous boost converter with a 6V-18V, 36V input. The output voltage is programmable to 20V-36V using a 0-3.3V PWM signal generated by a signal generator or MCU.



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1 Test Prerequisites

1.1 Voltage and Current Requirements

Table 1. Voltage and Current Requirements

PARAMETER	SPECIFICATIONS
V_{IN}	6.0V-16.0V, 36V peak
V_{OUT}	20V-36V
I_{OUT}	2.0A
Nominal switching frequency	400kHz

1.2 Measurement

Oscilloscope: 20-MHz bandwidth and AC coupling. Measure the output voltage ripple directly across an output capacitor with a short ground lead. It is not recommended to use a long-leaded ground connection due to the possibility of noise being coupled into the signal. To measure other waveforms, adjust the oscilloscope as needed.

1.3 Considerations

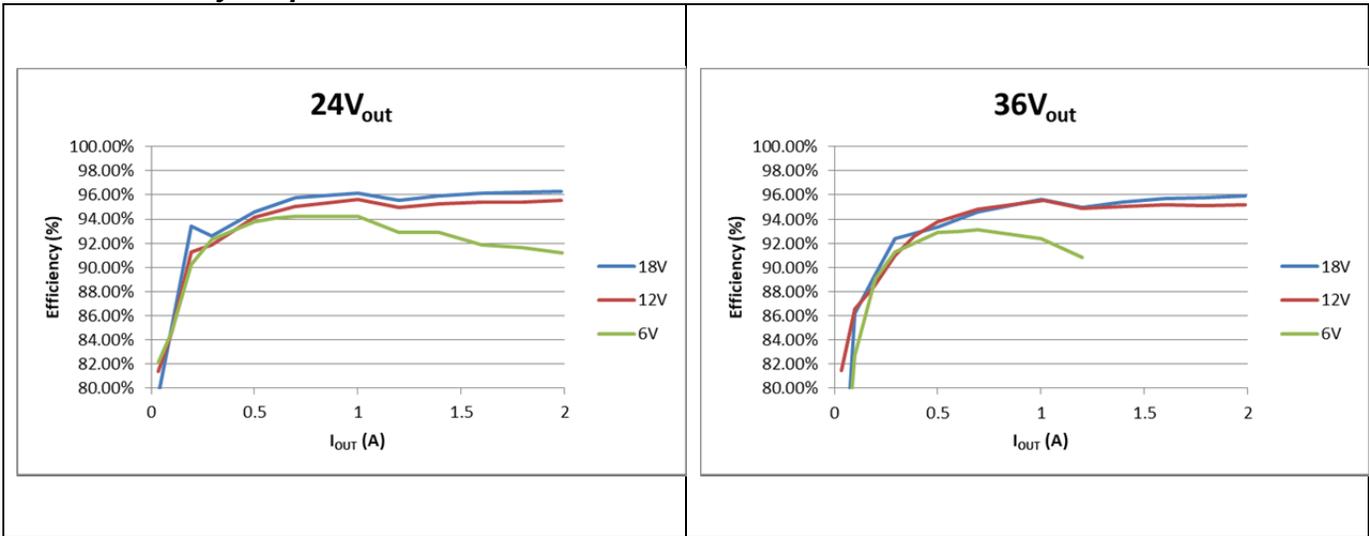
For 36V output voltage and 6V input a maximum load of 1.25A can be handled before thermal runaway starts. The thermal dissipation can be improved by increasing the copper area of the switch node in all layers. With a cooling fan the device can handle full load but the MOSFET reaches temperatures above 150 degrees Celsius.

The low-pass filter of the dynamic voltage regulator is set to 500Hz.

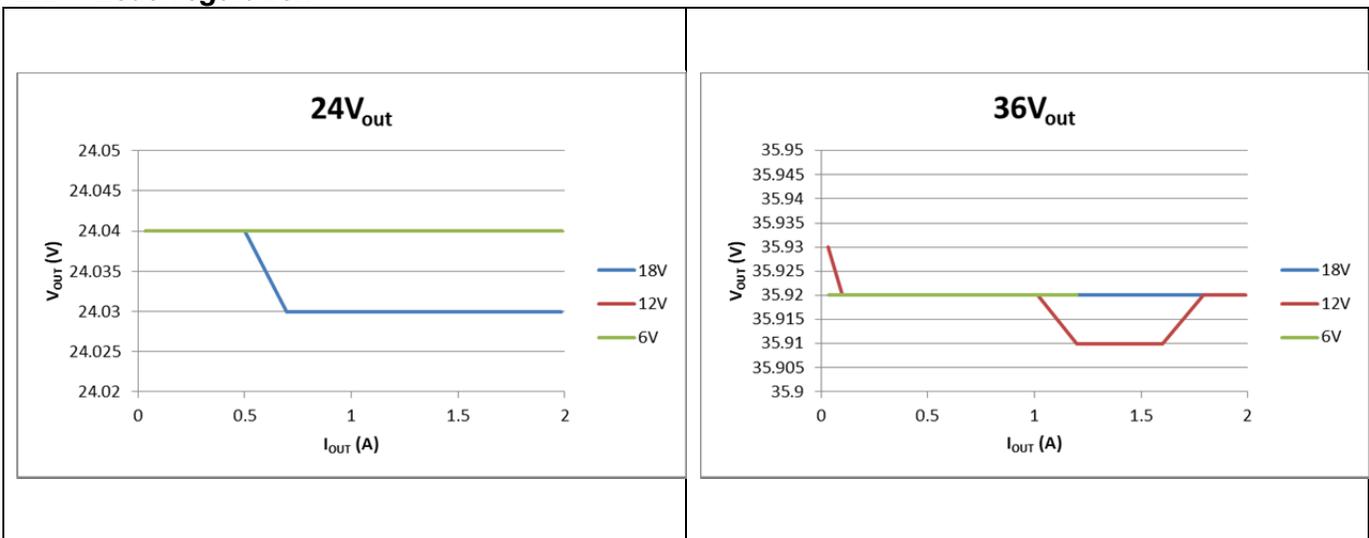
A place for an LC filter is available but not used in this particular design.

2 Testing and Results

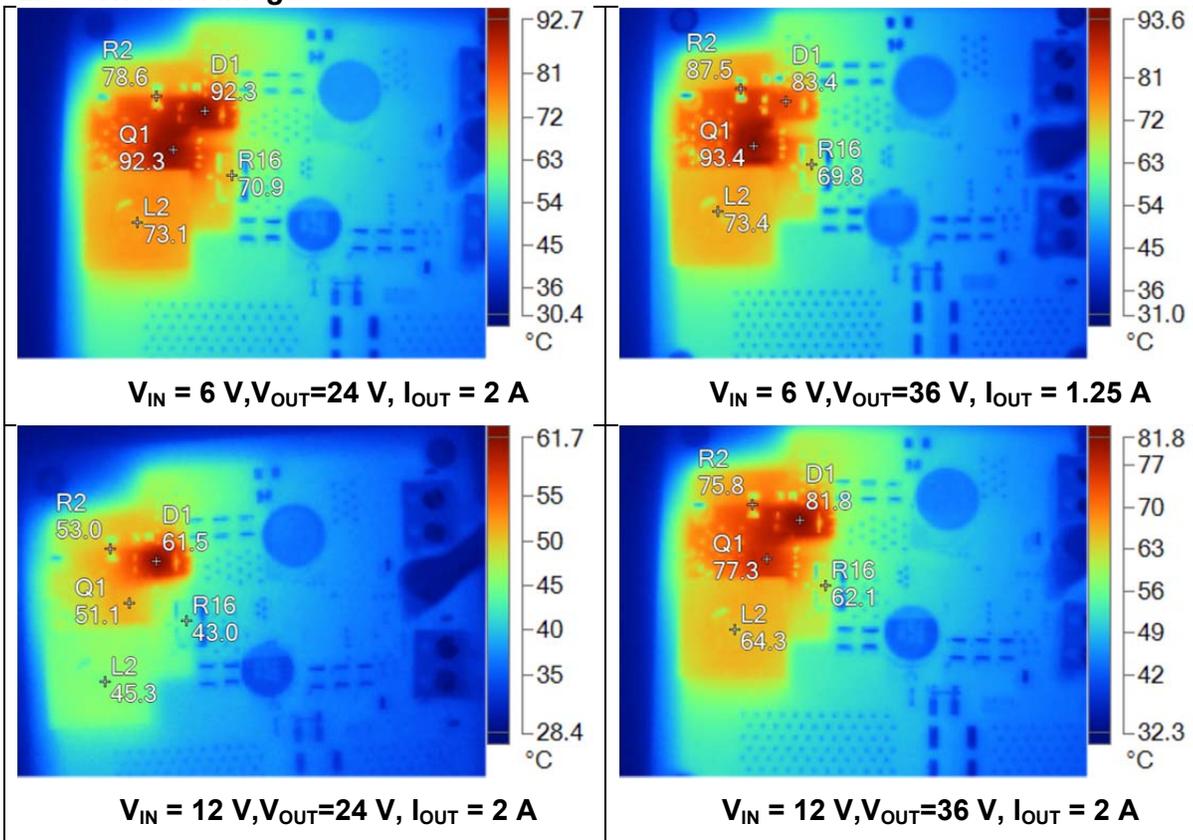
2.1 Efficiency Graphs



2.2 Load regulation



2.3 Thermal Images

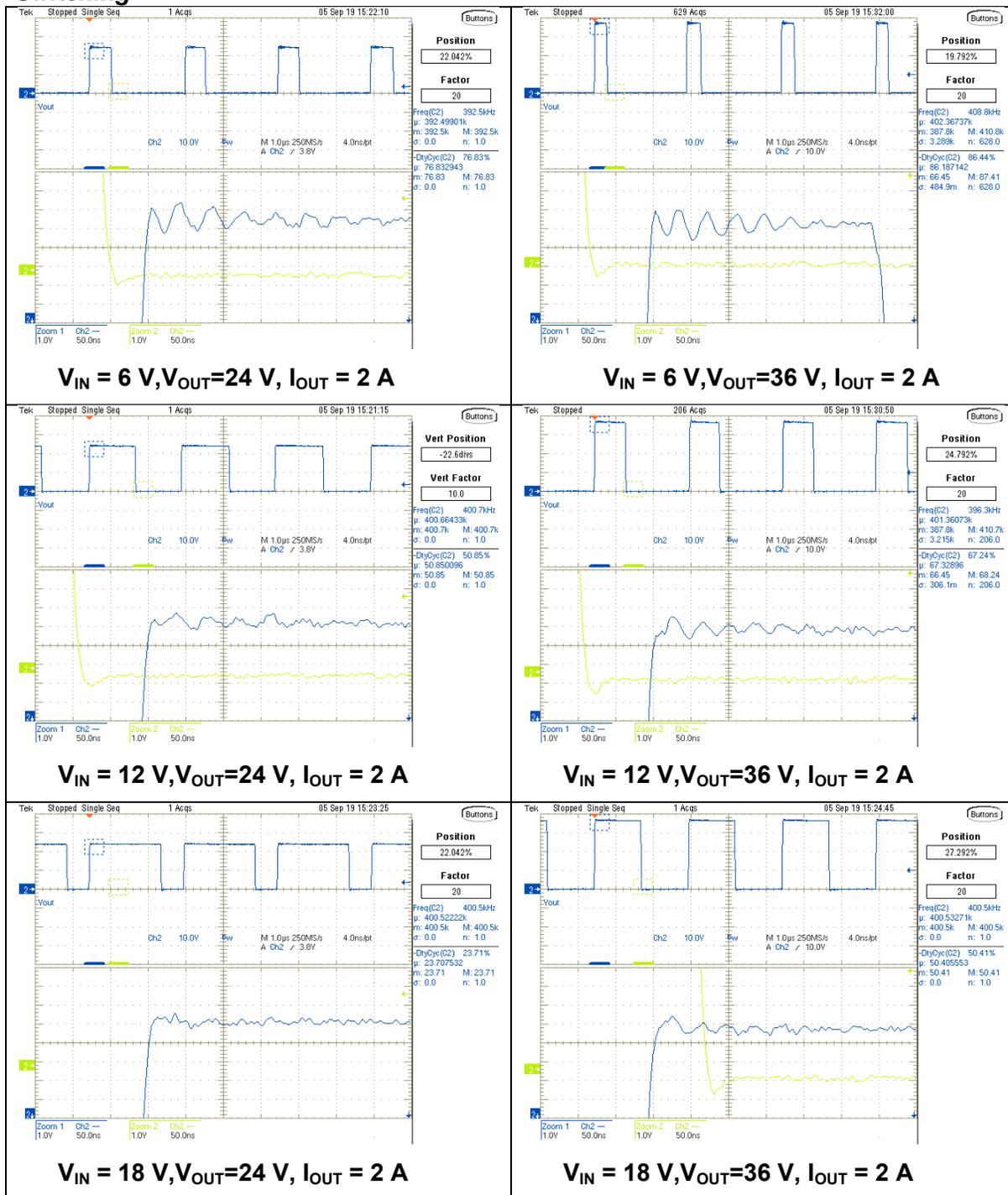


2.4 Dimensions

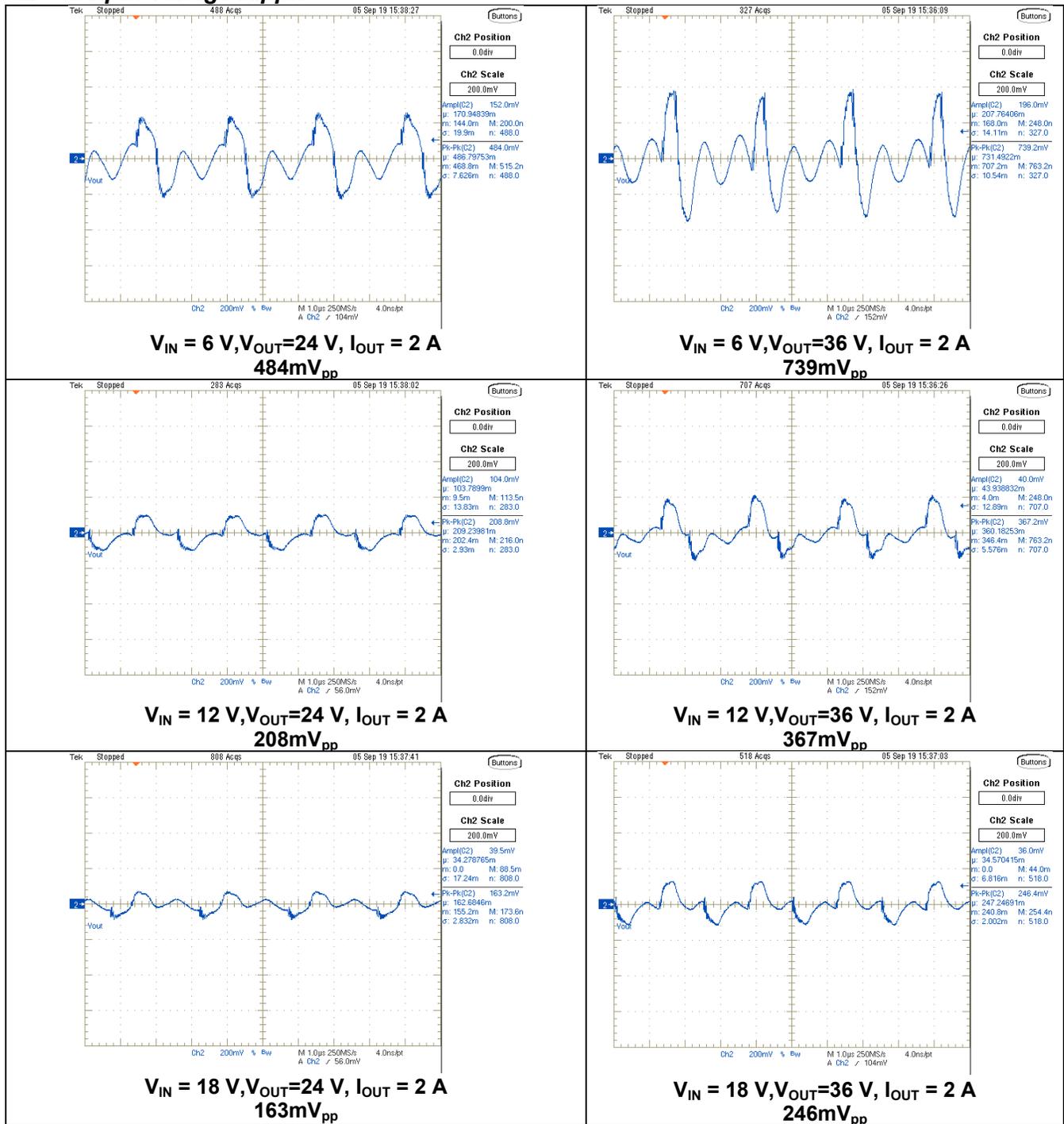
PCB: 63.5 mm x 50.2 mm

3 Waveforms

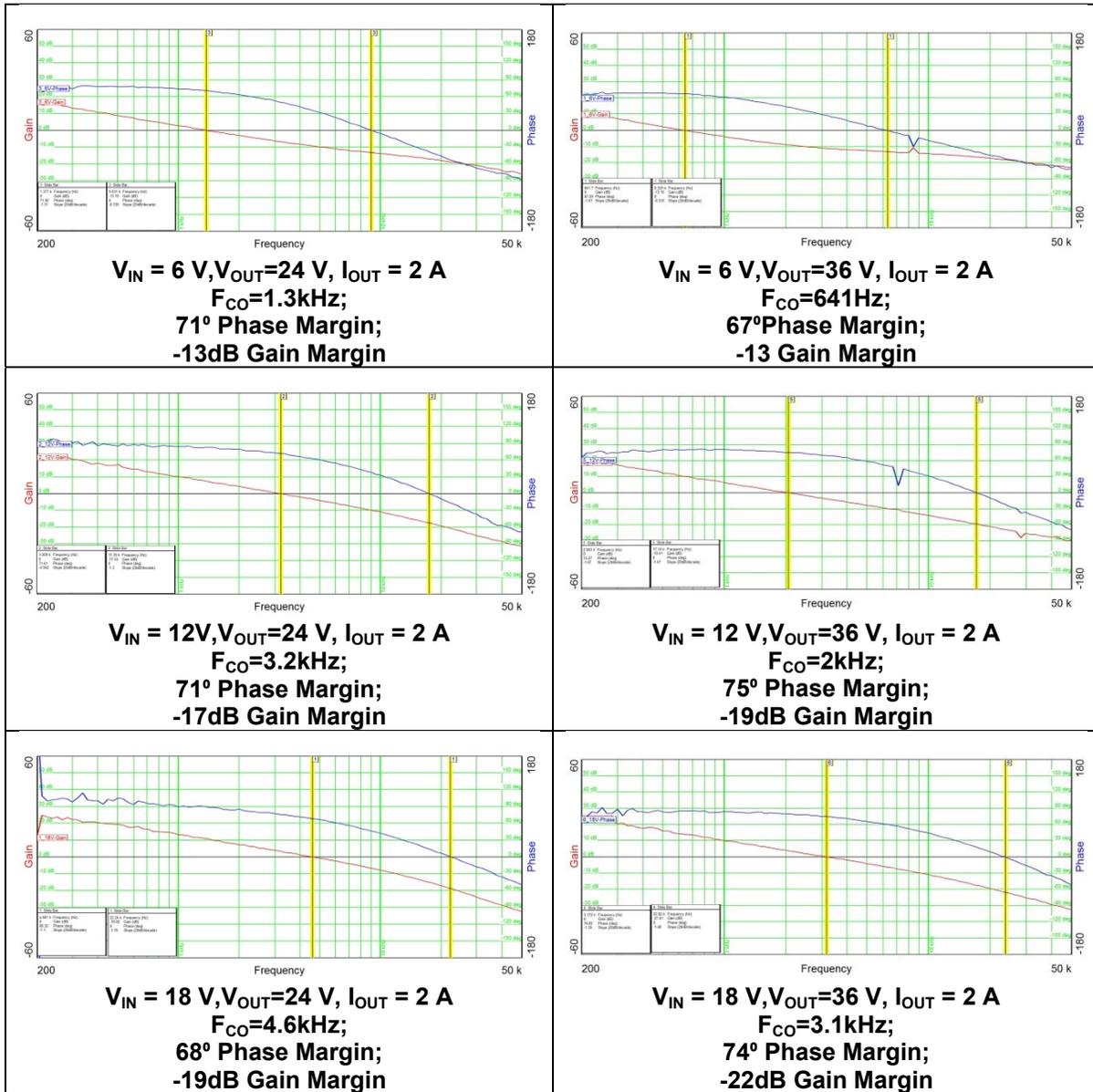
3.1 Switching



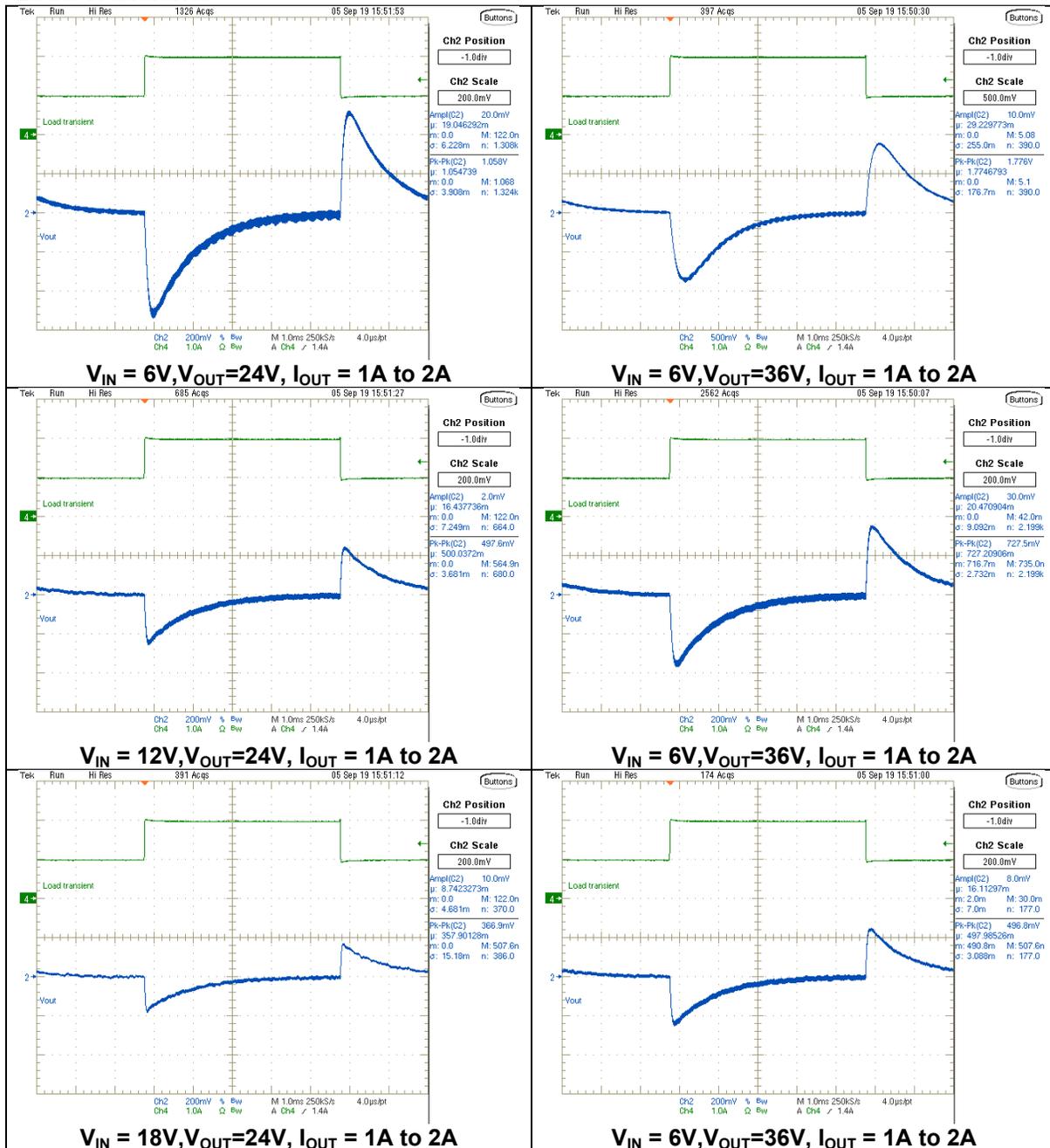
3.2 Output Voltage Ripple



3.3 Bode Plot



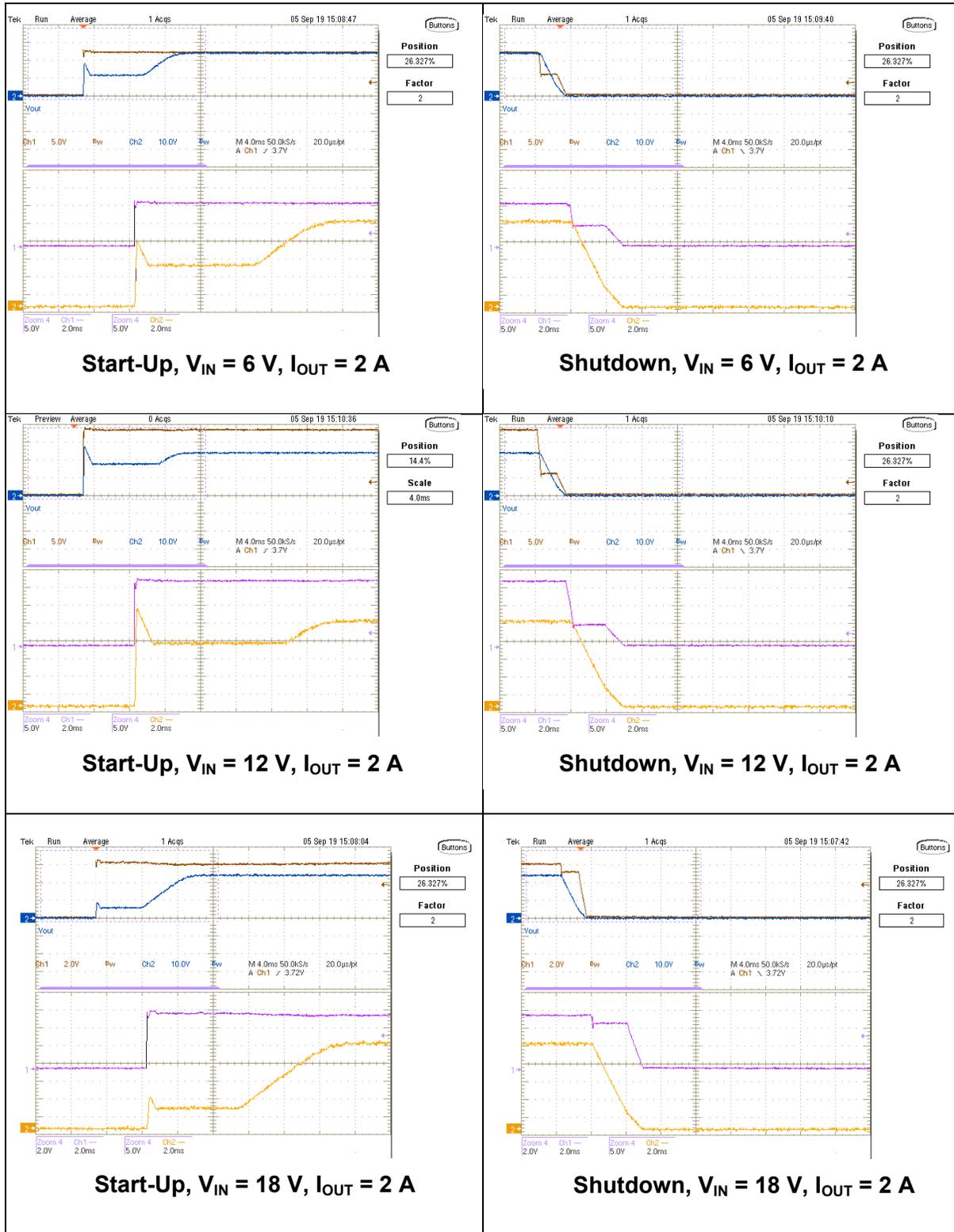
3.4 Load Transients



BLUE – Output voltage
GREEN – Load current

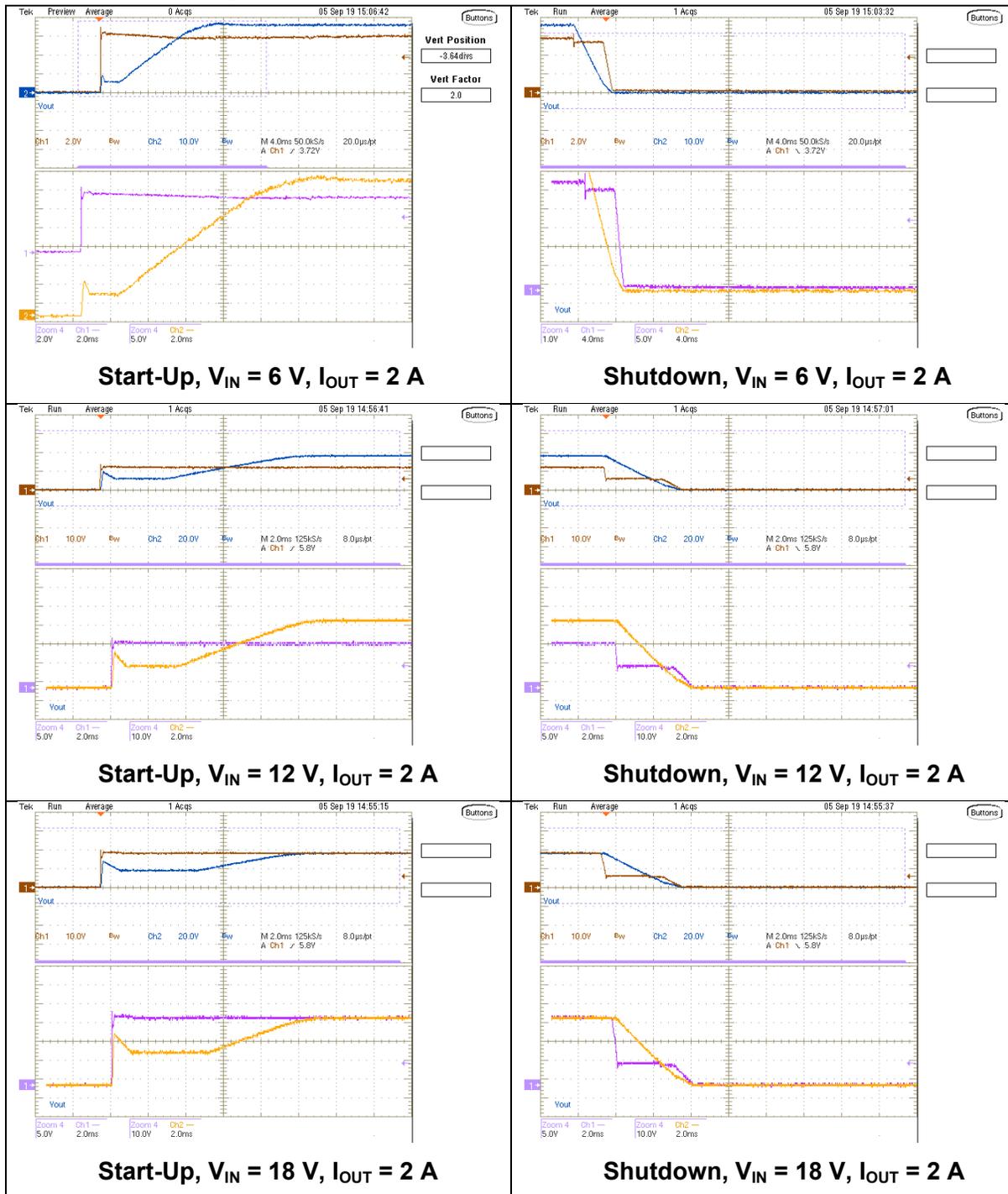
3.5 Start-up Sequence

3.5.1 24V Output voltage



Purple – Input Voltage
 Orange – Output Voltage

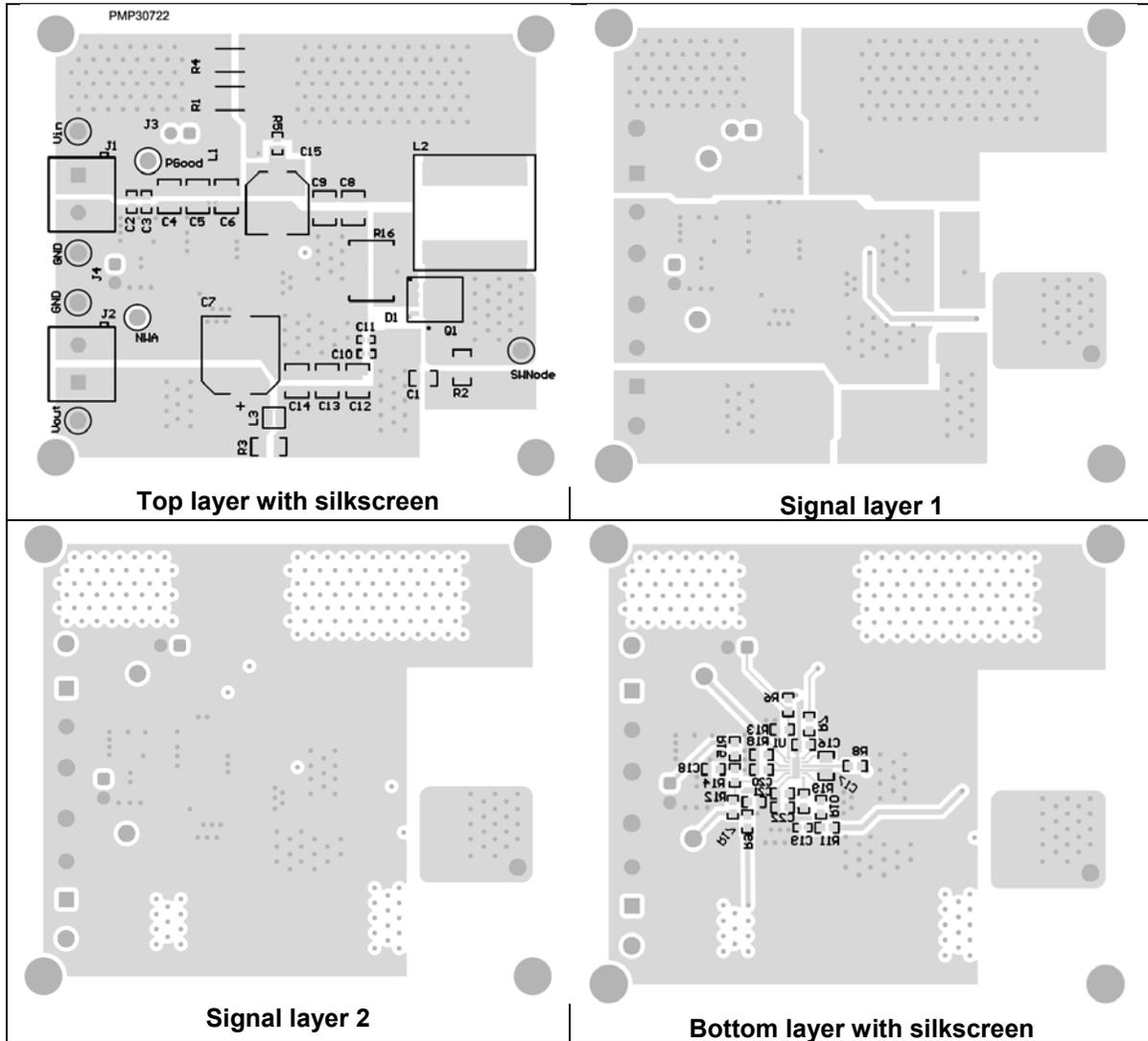
3.5.2 36V Output voltage



Purple – Input Voltage
 Orange – Output Voltage

3.6 Other

3.6.1 Schematic and layout



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