PMP7051RevD Test Results

topology: buck
device: TPS40055

RevD: board is for 7Amps load continuous and 10Amps peak;
RevC: board is up to 10Amps continuous.

Due to outstanding effcy up to 98.5% of RevC we doubled switching frequency to reduce inductor size from SER2900 series to SER2000 series at RevD.

1 Efficiency

The efficiency is shown in the Figure 1 below. The input voltage was adjusted to 24V

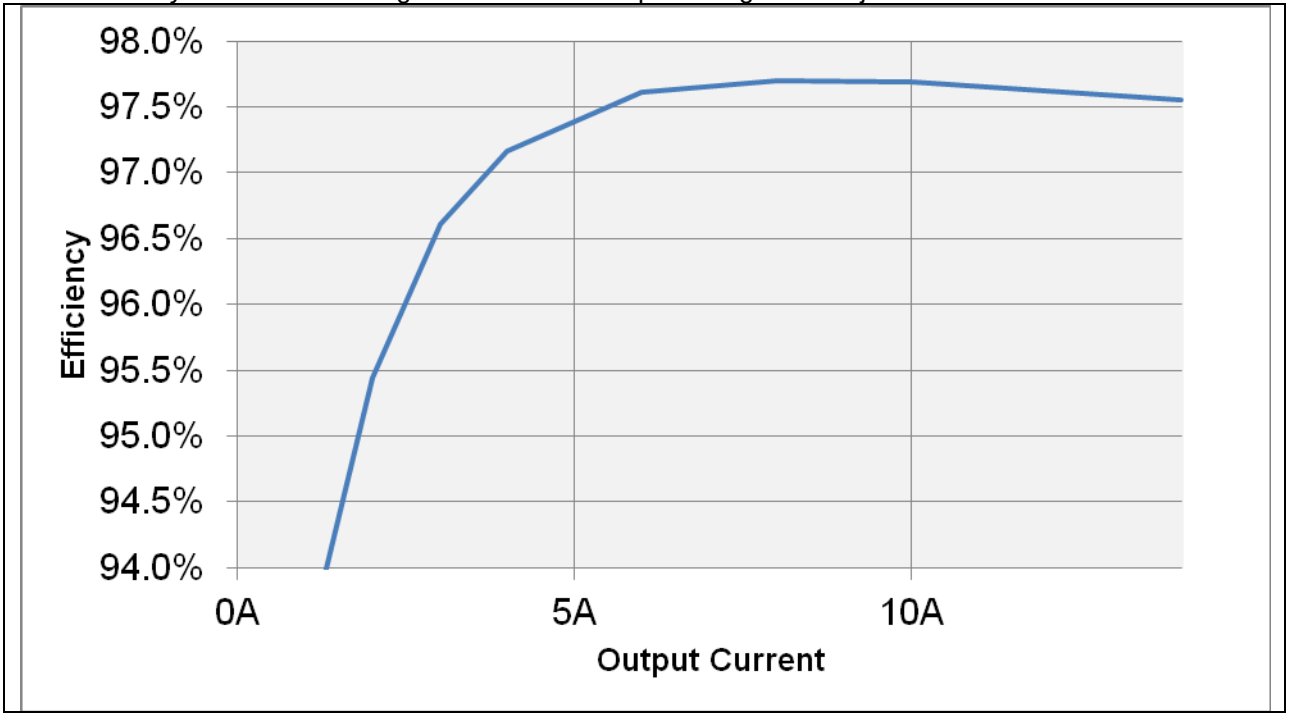


Figure 1

2 Load regulation

The load regulation for 24V input voltage is shown in Figure 2.

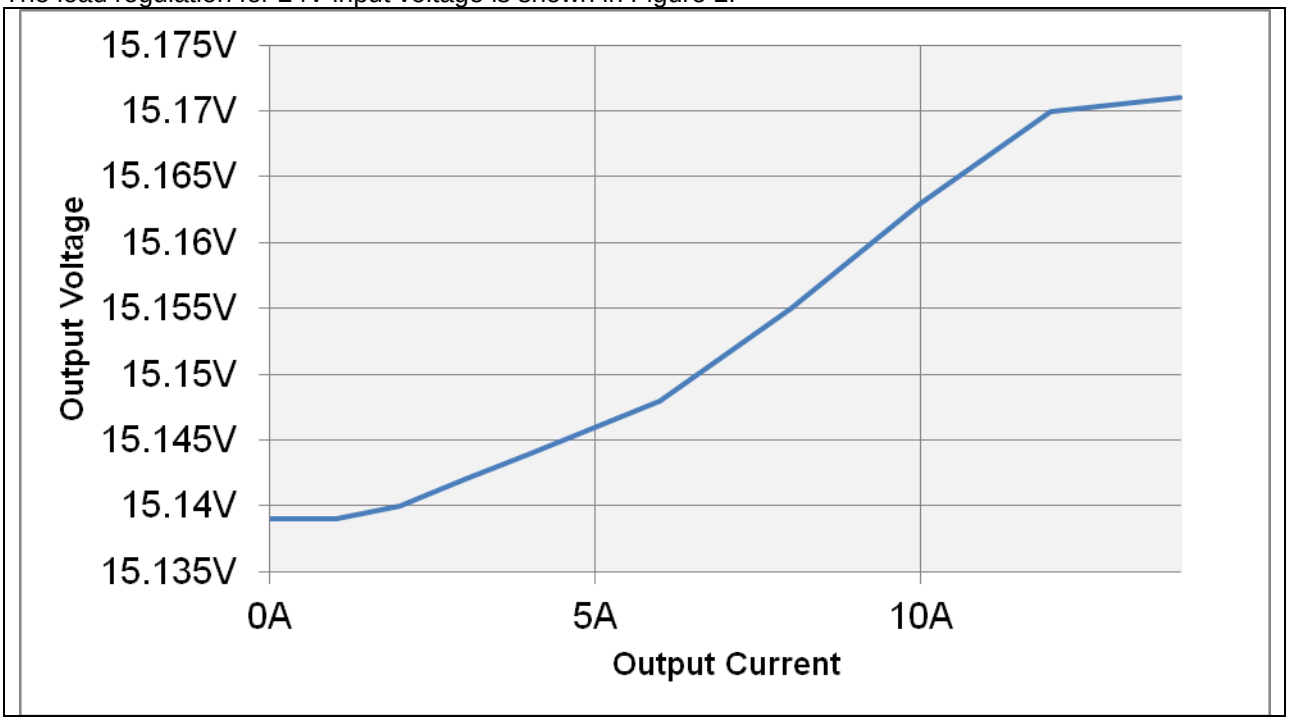


Figure 2

3 Control Loop Frequency Response

Figure 3 shows the loop response. 10A-load applied. The input voltage was set to 24V.

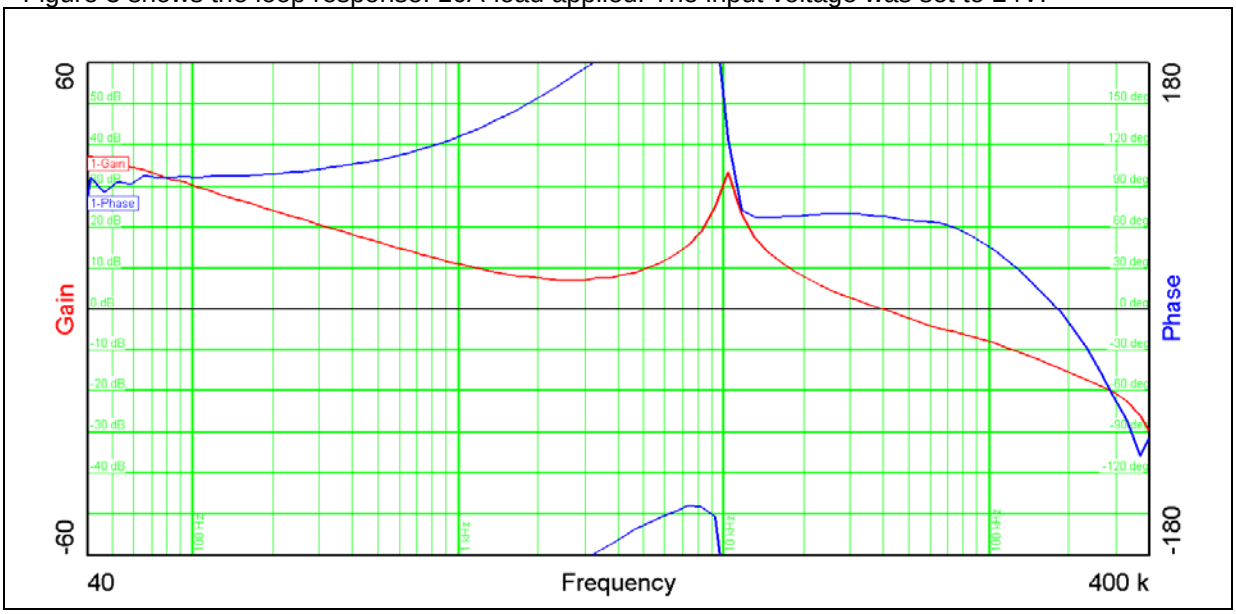


Figure 3

Table 1 summarizes the results from Figure 3

Vin	24V
Bandwidth (kHz)	39.25
Phase margin	67.88°
slope (20dB/decade)	-1.15
gain margin (dB)	-14.4
slope (20dB/decade)	-1.46
freq (kHz)	181

Table 1

4 Switch Node Waveform (Low Side FET)

With 10A load results in the waveforms shown in Figure 4 and Figure 5. 24V were applied to the input.

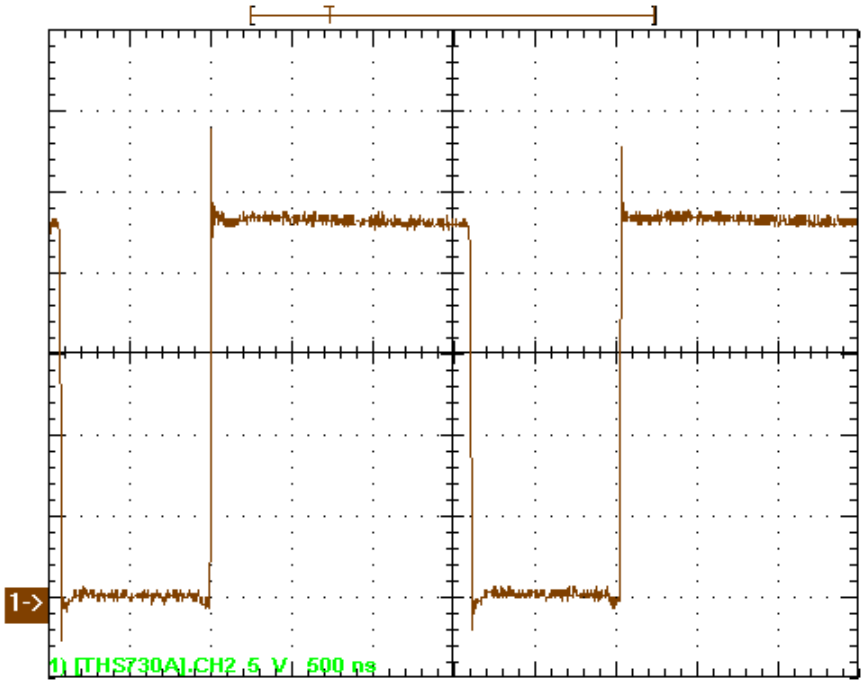
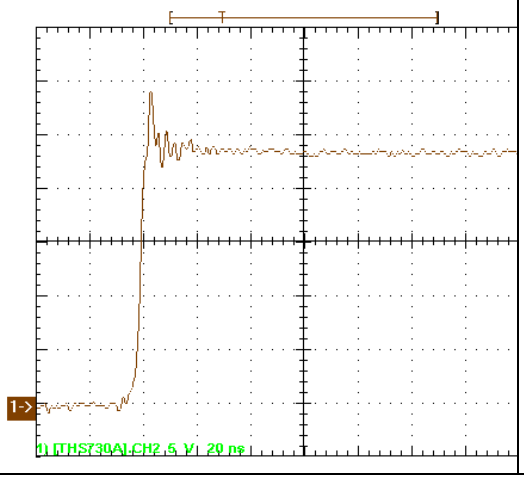


Figure 4

Ch1 => switchnode
5V/div

500ns/div

full bandwidth



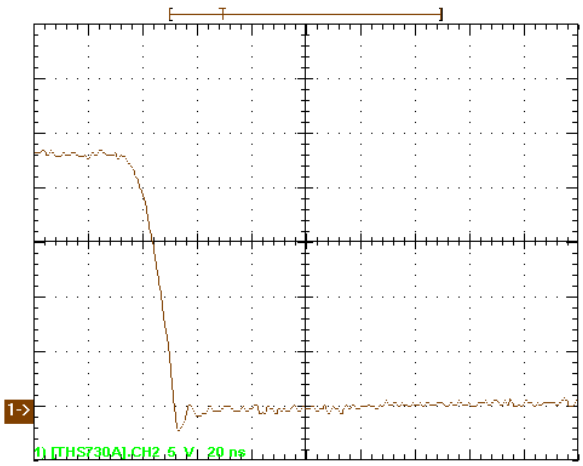


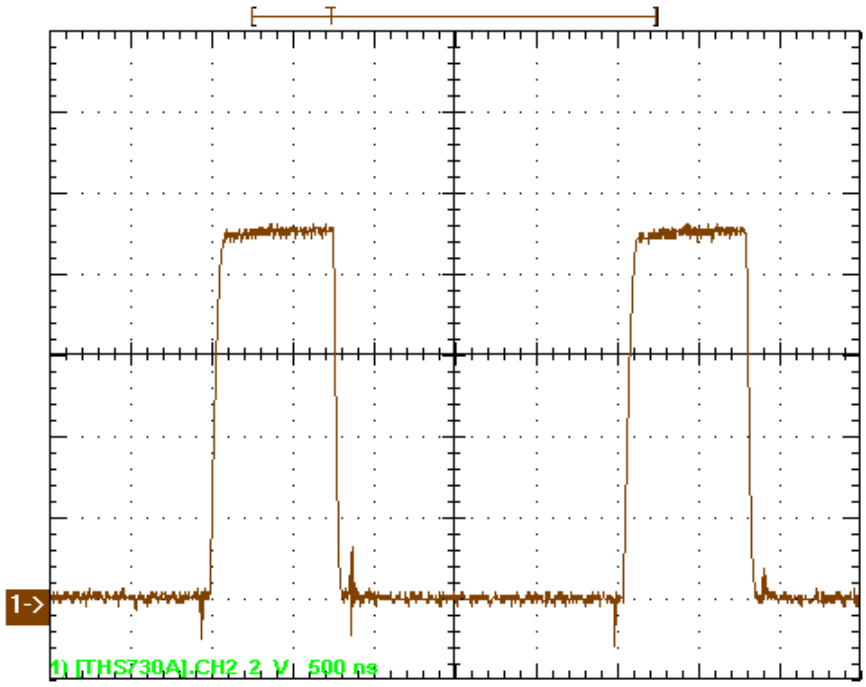
Figure 5

Ch1 => switchnode
5V/div

20ns/div

full bandwidth

Figure 6 shows the waveform at the gate (to gnd)



Ch1 => gate-gnd
2V/div

500ns/div
full bandwidth

Figure 6

5 Waveform at the High Side FET gate

Figure 7 shows the waveform at the gate (to gnd) at the same input voltage. With 24V input 10A load were applied to the output

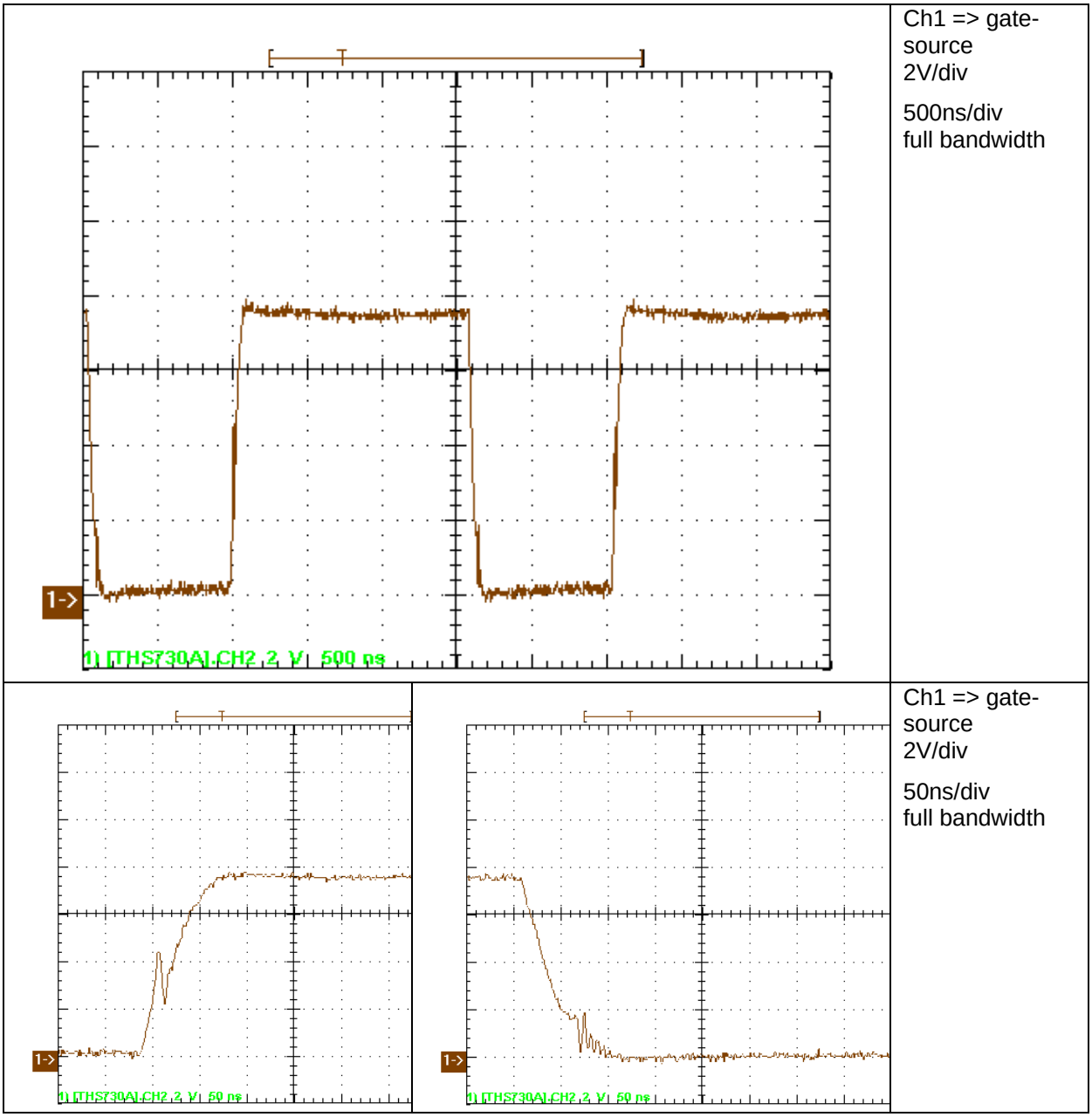
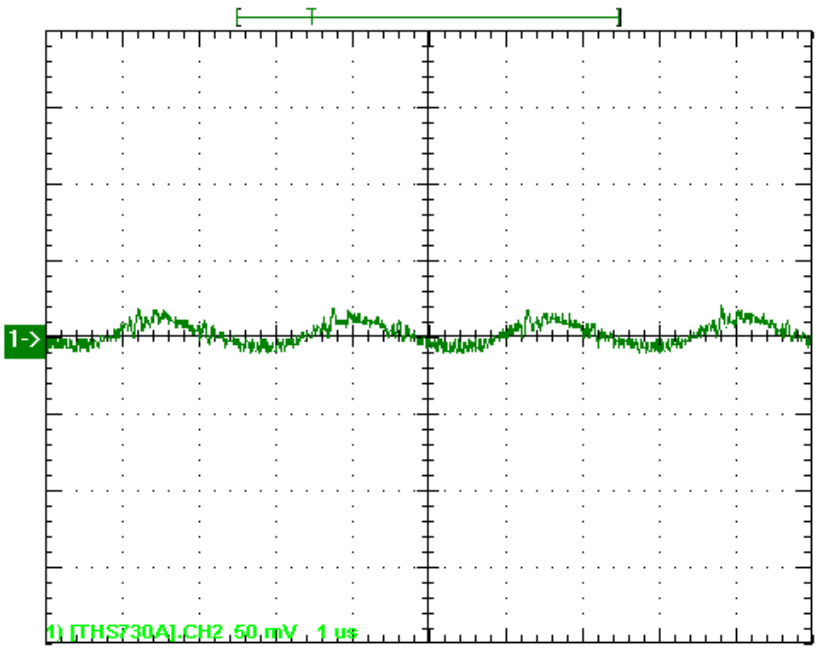


Figure 7

6 Ripple Voltages

The output ripple voltage is displayed in Figure 8. The input voltage was set to 24V with output current 10A.

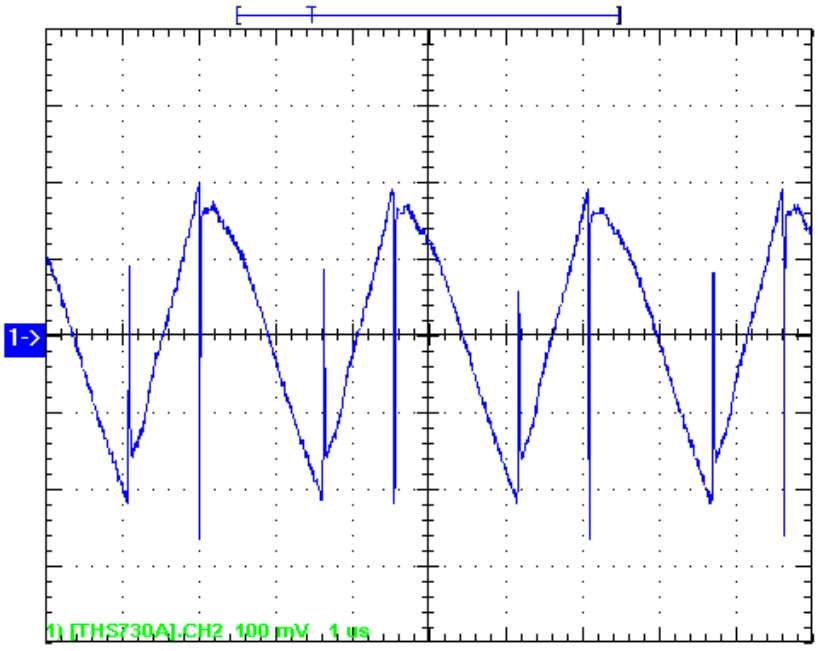


Ch1=> output voltage
50mV/div

1µs/div
AC coupling
20MHz bandwidth

Figure 8

The input ripple voltage is displayed in. The input voltage was set to 24V with output current 10A.



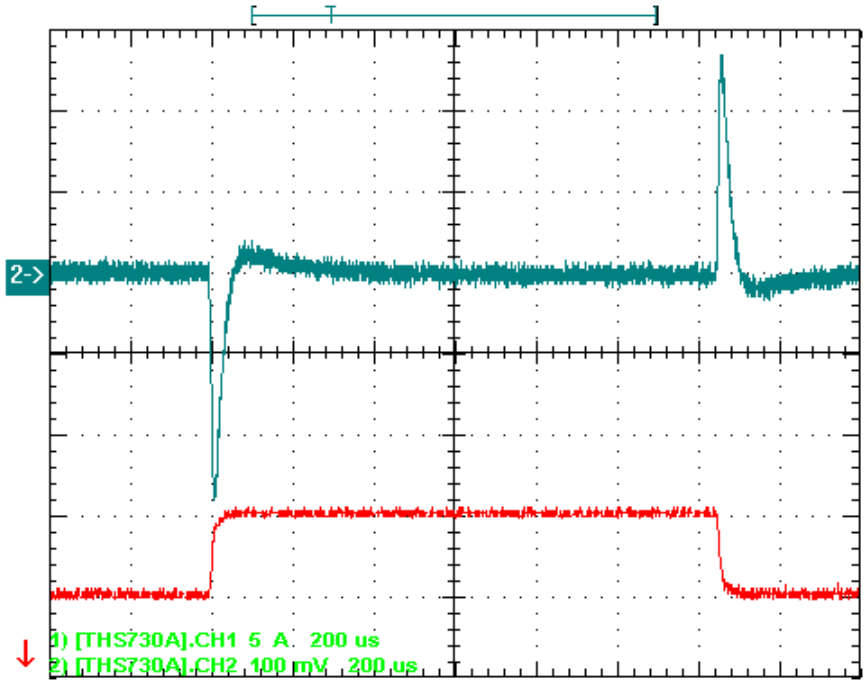
Ch2=> input voltage
100mV/div

1µs/div
AC coupling
20MHz bandwidth

Figure 9

7 Load Transients

A output current change from 5A to 10A (400Hz) results in following Figure 10.The input voltage was set 24V.



Ch3=> output voltage@16Vin
AC coupled
100mV/div

Ch1=> output current
5A/div

200µs/div

20MHz bandwidth

Figure 10

8 Thermal Image

Figure 11 shows the thermal image with 10A output current and 24V input voltage

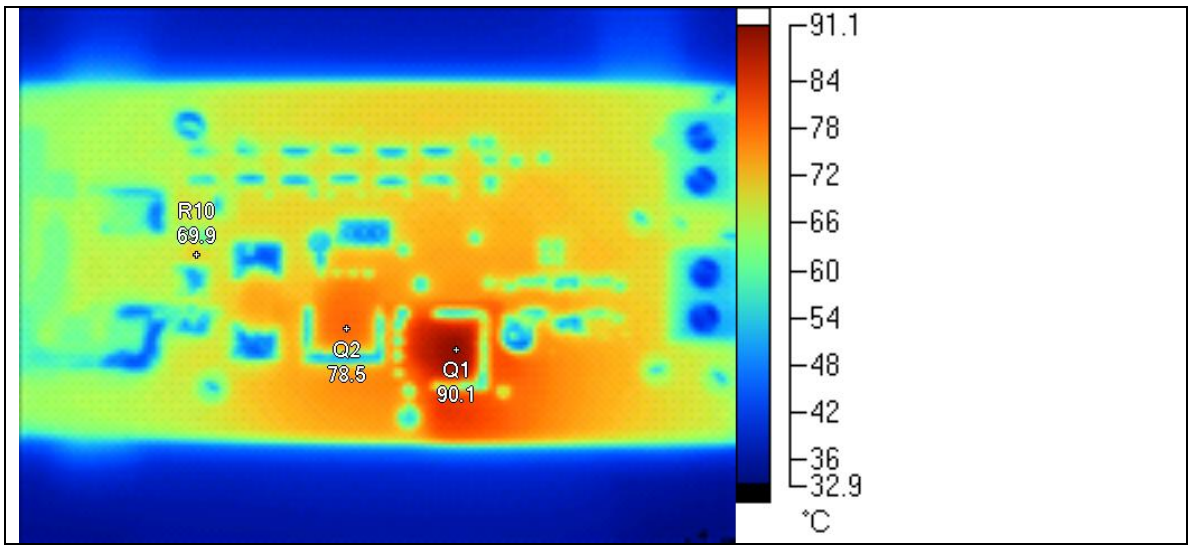


Figure 11 Top side image

Name	Temperature
Q1	90.1°C
Q2	78.5°C
R10	69.9°C

Figure 12 shows the thermal image with 7A output current and 24V input voltage

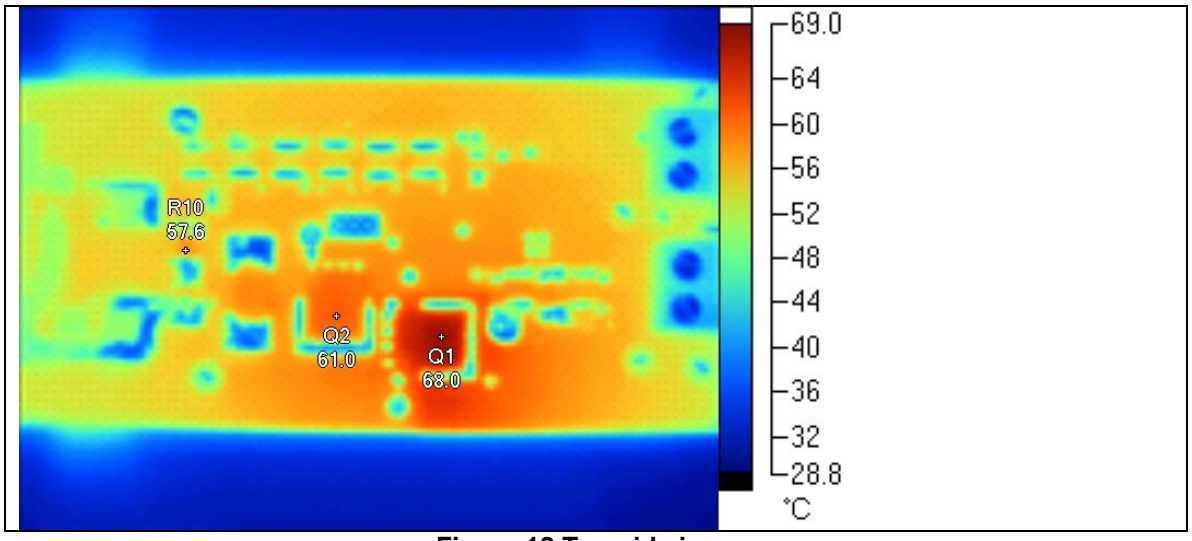


Figure 12 Top side image

Name	Temperature
Q1	68.0°C
Q2	61.0°C
R10	57.6°C

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