# PMP7156RevB Test Results



Topology: "Two switch" Buck-Boost with single gate pulse generator (non inverter)
Device: TPS40200

# 1 Startup

The startup waveform is shown in the Figure 1. The input voltage was set at 8V, with 0.92A load at the output.

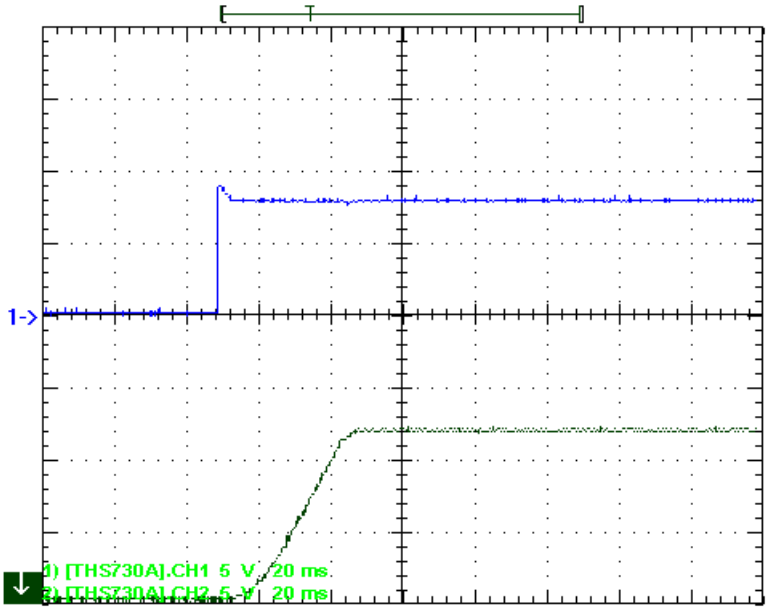



Figure 1

Ch1=> input voltage 5V/div

Ch2=> output voltage 5V/div

20ms/div

The startup waveform is shown in the Figure 2. The input voltage was set at 12V, with 1A load at the output.

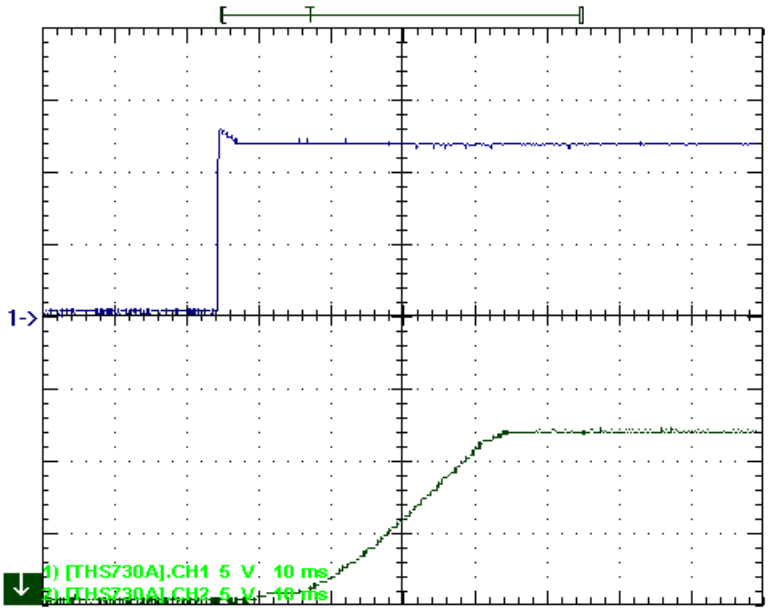



Figure 2

Ch1=> input voltage 5V/div

Ch2=> output voltage 5V/div

10ms/div

# PMP7156RevB Test Results

The startup waveform is shown in the Figure 3. The input voltage was set at 16V, with 1A load at the output.

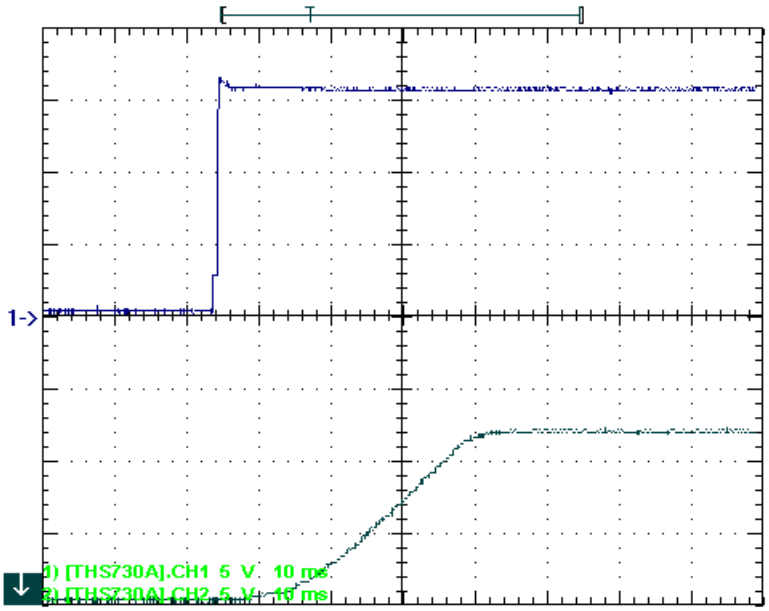



**Figure 3**

Ch1=> input voltage 5V/div

Ch2=> output voltage 5V/div

10ms/div

## 2 Shutdown

The shutdown waveform is shown in the Figure 4. The input voltage was set at 9V, with 0.92A load on the output.

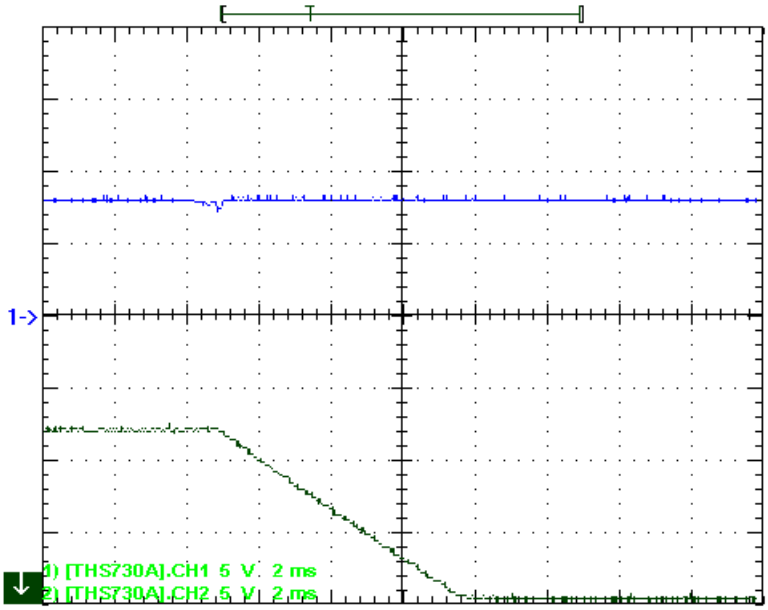



**Figure 4**

Ch1=> input voltage 5V/div

Ch2=> output voltage 5V/div

2ms/div

The shutdown waveform is shown in the Figure 5. The input voltage was set at 12V, with 1A load on the output.

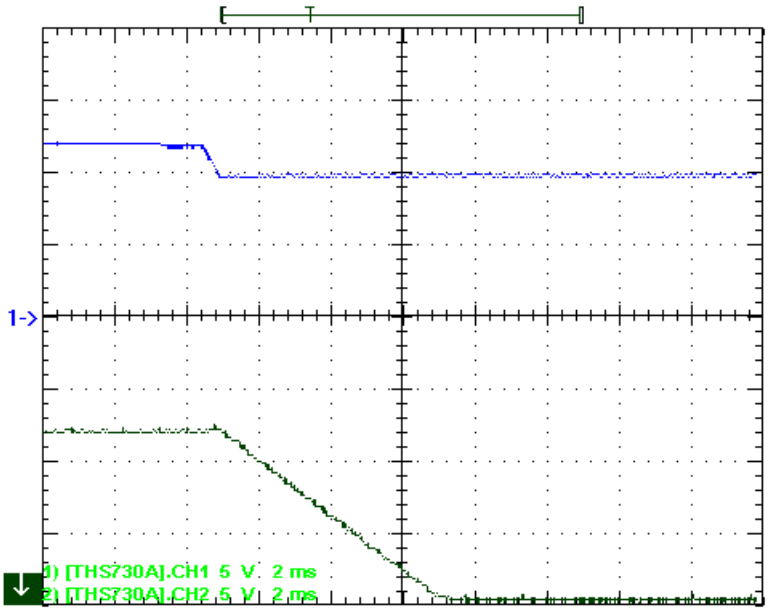



**Figure 5**

Ch1=> input voltage 5V/div

Ch2=> output voltage 5V/div

2ms/div

The shutdown waveform is shown in the Figure 6. The input voltage was set at 40V, with 2.5A load on the output.

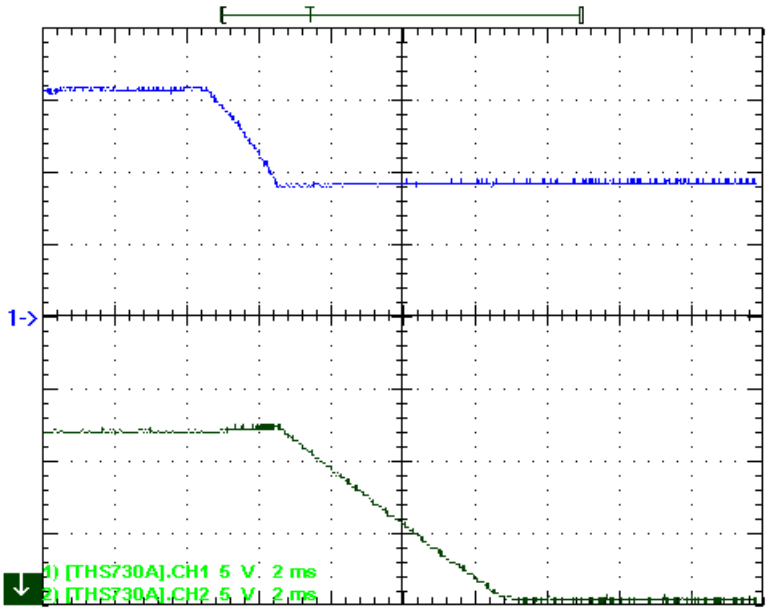



**Figure 6**

Ch1=> input voltage 5V/div

Ch2=> output voltage 5V/div

2ms/div

## 3 Efficiency

The efficiency is shown in the Figure 7 below.

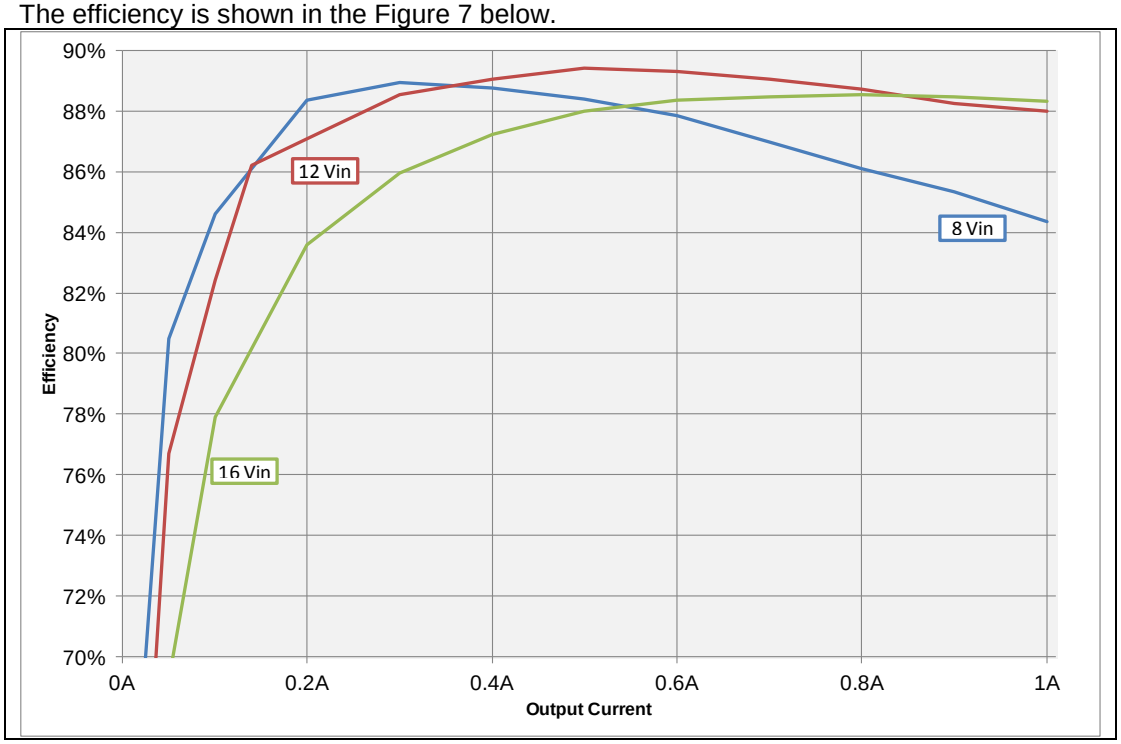



**Figure 7**

## 4 Load Regulation

The load regulation of the output is shown in the Figure 8 below.

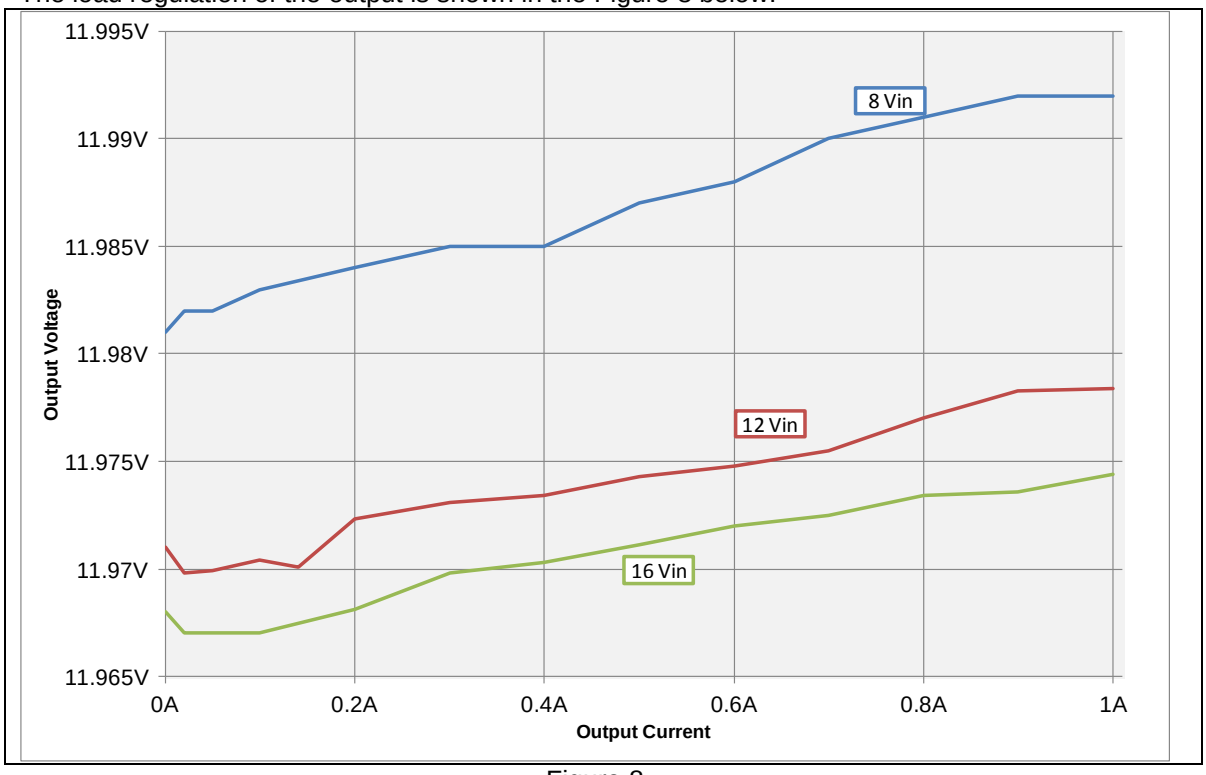



Figure 8

## 5 Line Regulation

Figure 9 shows the line regulation at 1A load.

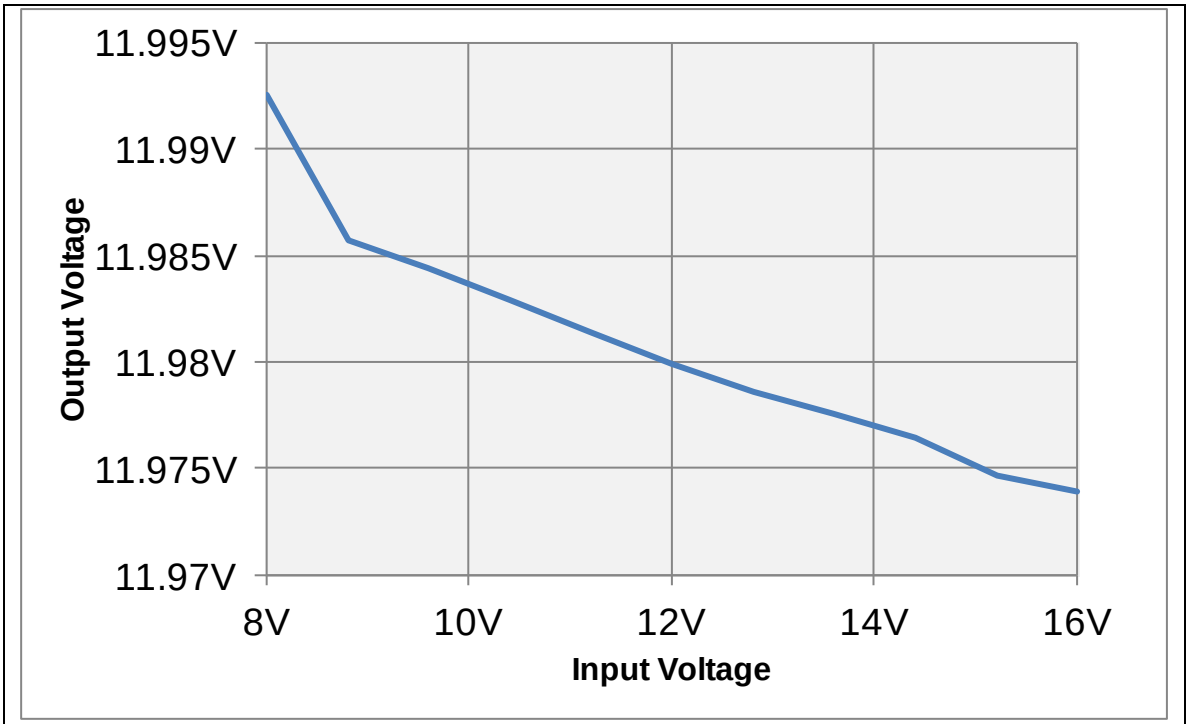



**Figure 9**

With the same measurement setup the also the efficiencies were calculated. This is shown in Figure 10.

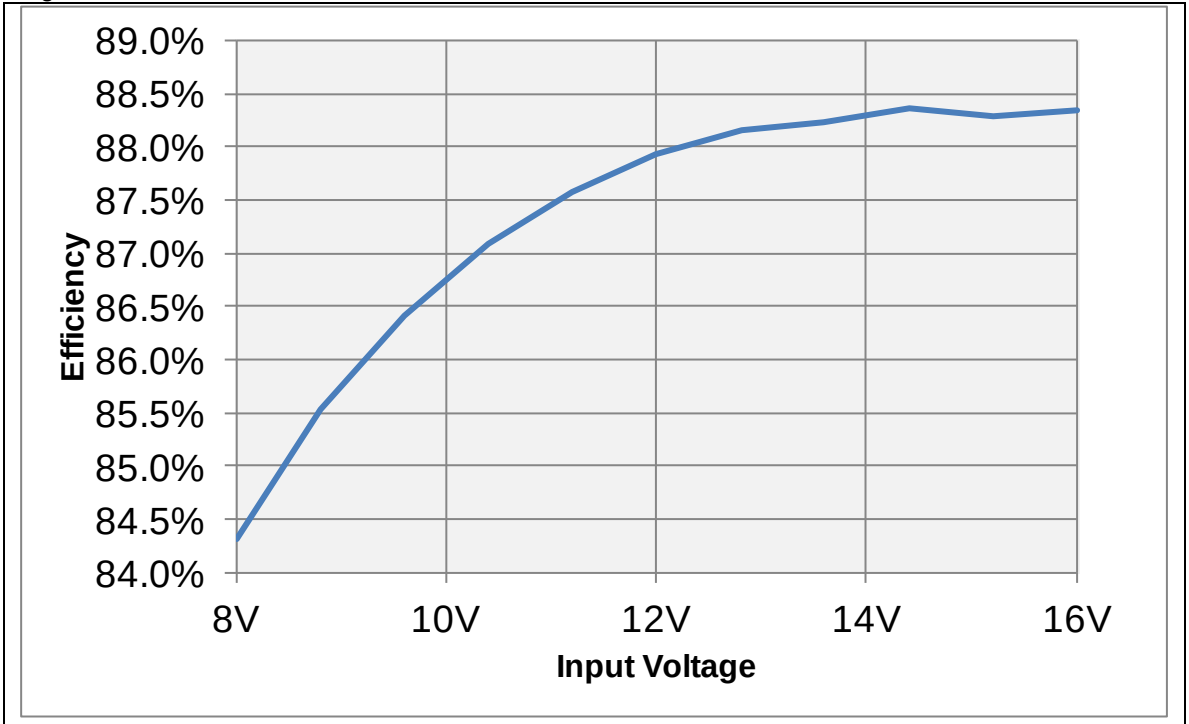



**Figure 10**

## 6 Ripple Voltage

The output ripple voltage is shown in Figure 11. The image was taken with a 1A load.

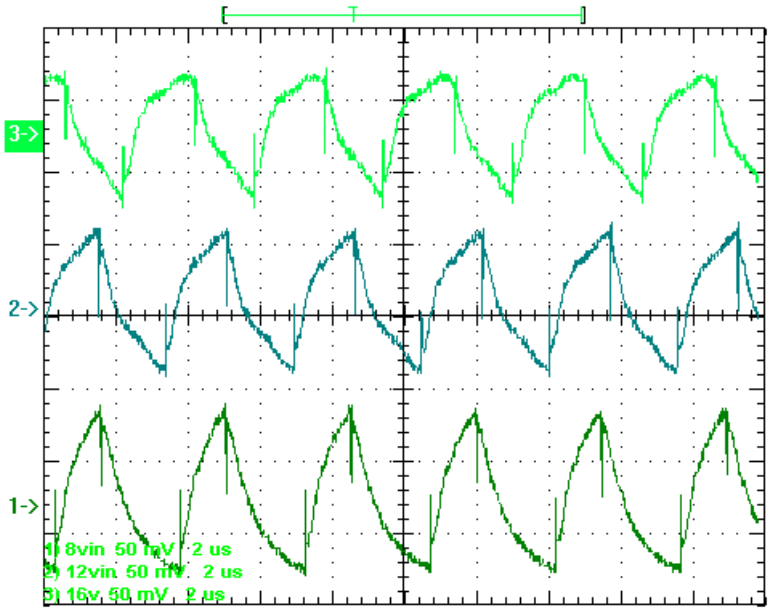



Figure 11

Ch3 => output voltage@16 Vin

Ch2 => output voltage@12 Vin

Ch1 => output voltage@8 Vin

50mV/div
AC coupled

20MHz bandwidth setting

2µs/div

The input ripple voltage is shown in Figure 12. The image was taken with a 1A load.

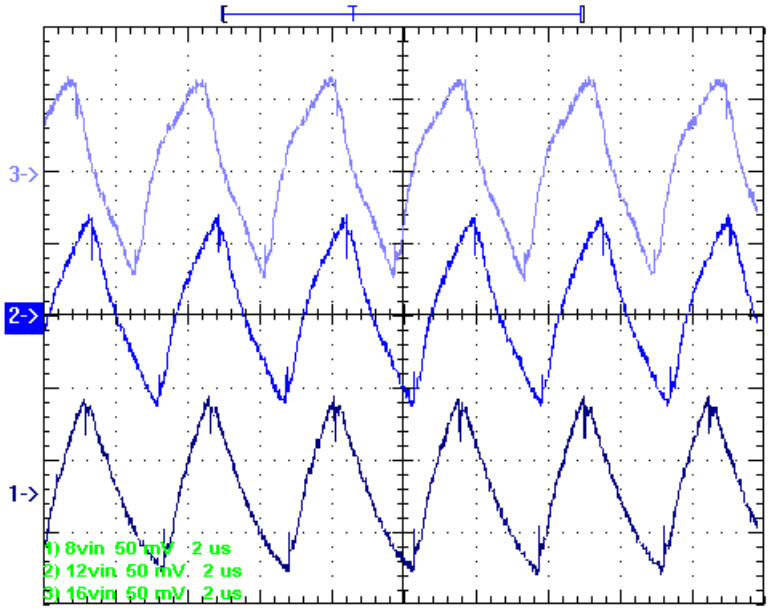



Figure 12

Ch3 => input voltage@16 Vin

Ch2 => input voltage@12 Vin

Ch1 => input voltage@8 Vin

50mV/div
AC coupled

20MHz bandwidth setting

2µs/div

# 7 Control Loop Frequency Response

Figure 13 shows the loop response with 2.5A load and 40V input.

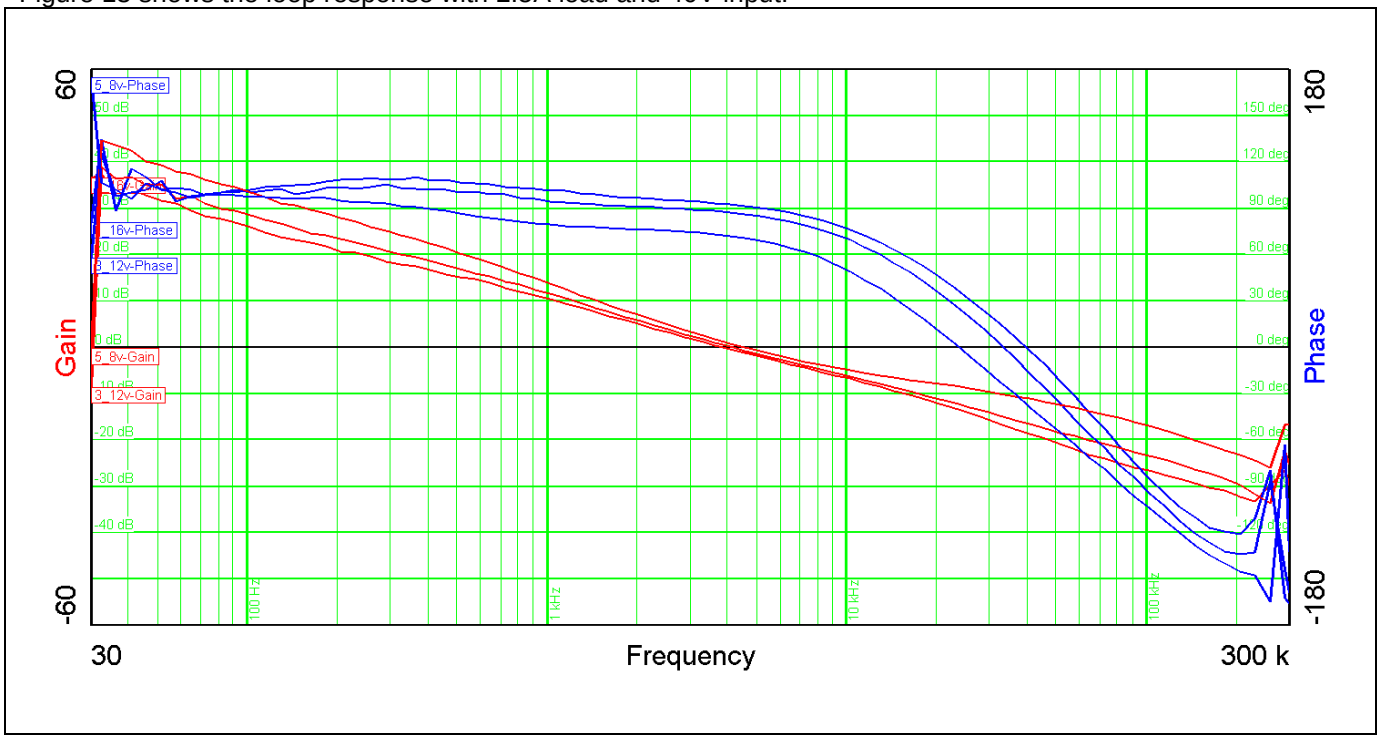



**Figure 13**

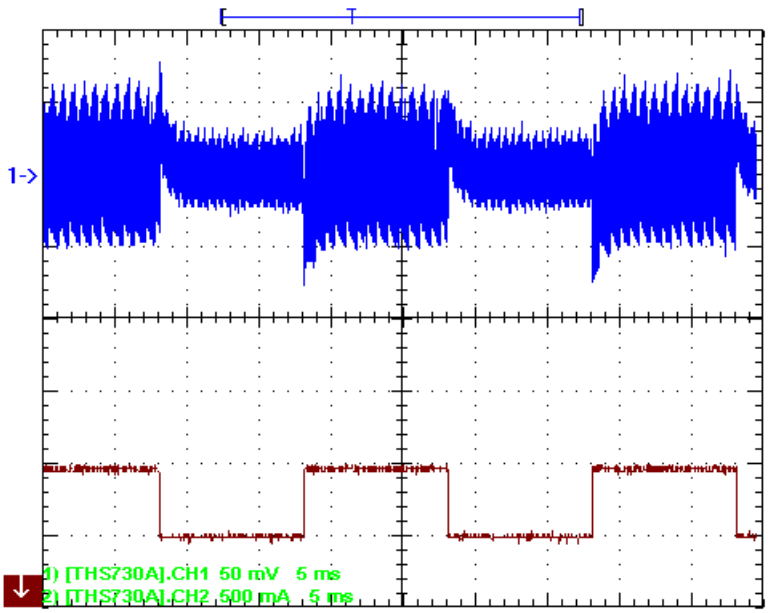
Table 1 summarizes the results from Figure 13

| **Input Voltage (V)** | 8 | 12 | 16 |
|---|---|---|---|
| **Bandwidth (kHz)** | 4.55 | 4.14 | 3.85 |
| **Phasemargin** | 70.6° | 87 | 92.8 |
| **slope (20dB/decade)** | -0.892 | -0.87 | -0.85 |
| | | | |
| **gain margin (dB)** | -8.6 | 15 | -18.5 |
| **slope (20dB/decade)** | -0.49 | -0.87 | -1 |
| **freq (kHz)** | 23.7 | 33.3 | 39.7 |

**Table 1**

# 8 Load Transients

The Figure 14 shows the response to load transients. The load is switching from 0.5A to 1A.with 50Hz frequency. The input voltage was set to 8V




Ch1 => output voltage 50mV/div

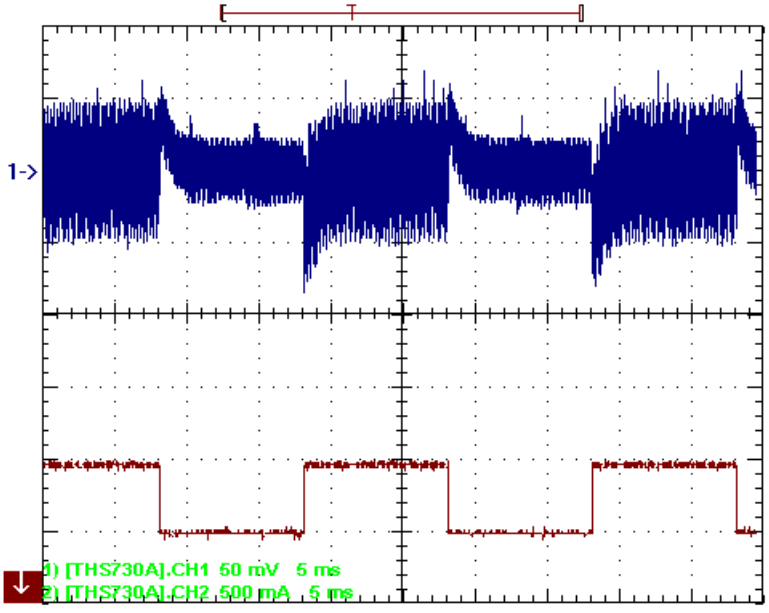
Ch2 => output current 500mA/div

20MHz bandwidth setting

5ms/div

**Figure 14**

The Figure 15 shows the response to load transients. The load is switching from 0.5A to 1A.with 50Hz frequency. The input voltage was set to 12V




Ch1 => output voltage 50mV/div

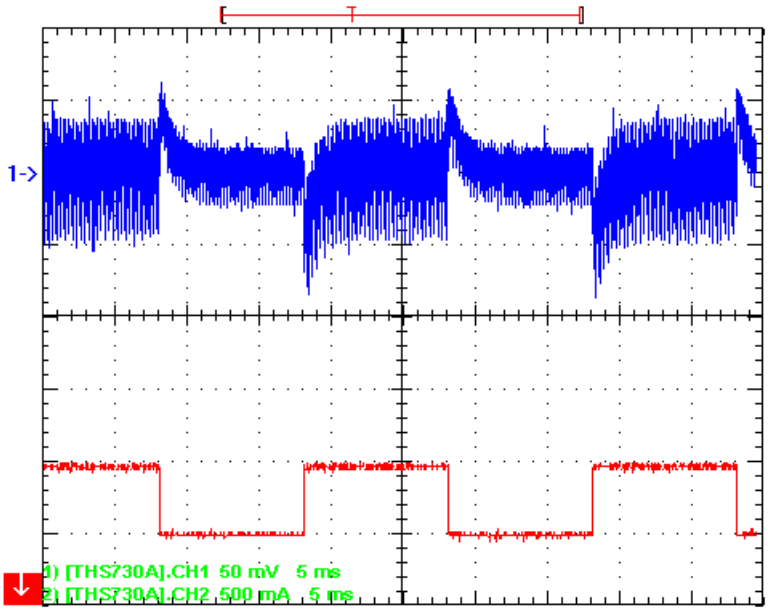
Ch2 => output current 500mA/div

20MHz bandwidth setting

5ms/div

**Figure 15**

The Figure 16 shows the response to load transients. The load is switching from 0.5A to 1A.with 50Hz frequency. The input voltage was set to 16V




Ch1 => output voltage 50mV/div

Ch2 => output current 500mA/div

20MHz bandwidth setting

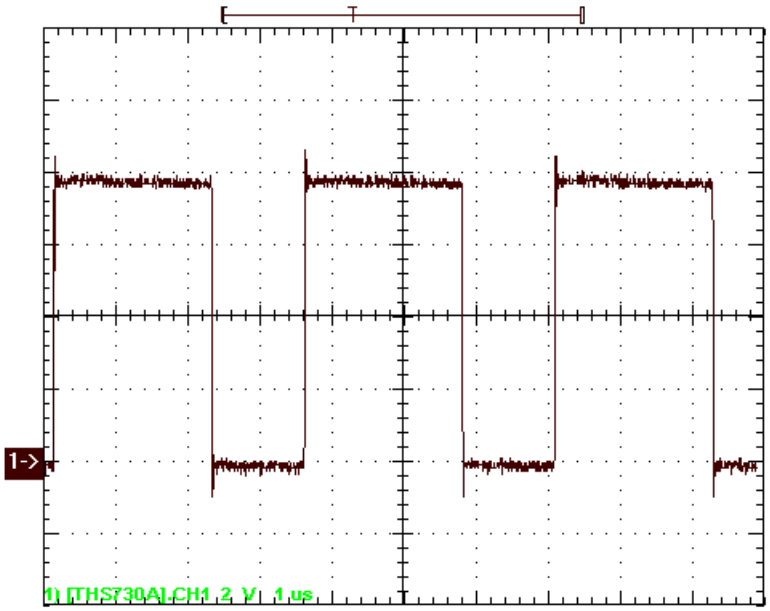
5ms/div

**Figure 16**

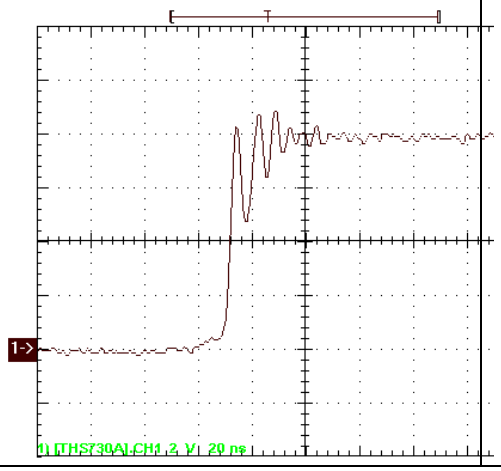
# 9 Miscellaneous Waveforms

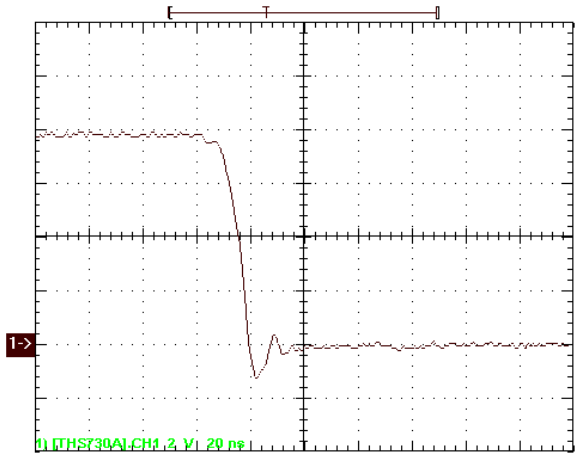
## *9.1 Switch node 1 (D3)*

With input voltage set to 8V and 1A Iout results in the waveform shown in Figure 17




Ch1 => 2V/div
1µs/div
full bandwidth



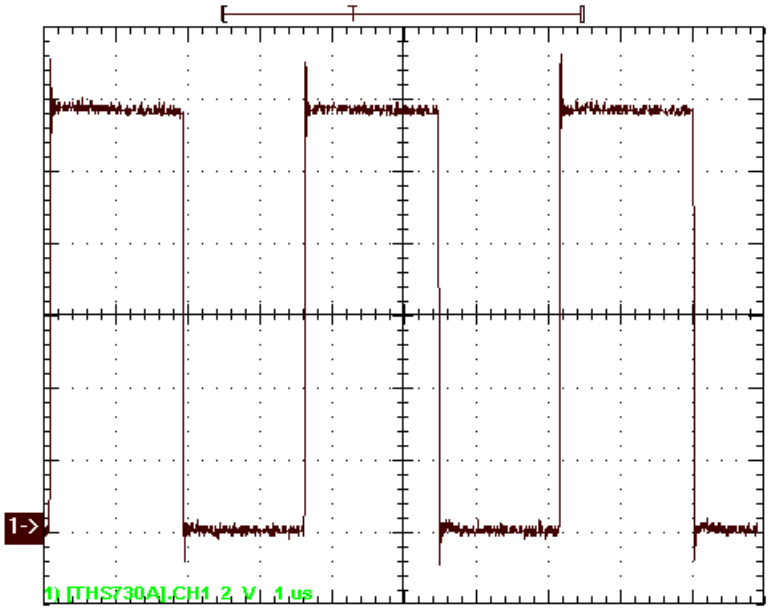




Ch1 => 2V/div
20ns/div
full bandwidth

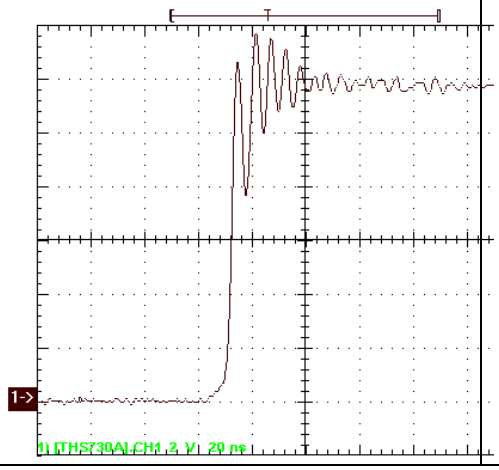
**Figure 17**

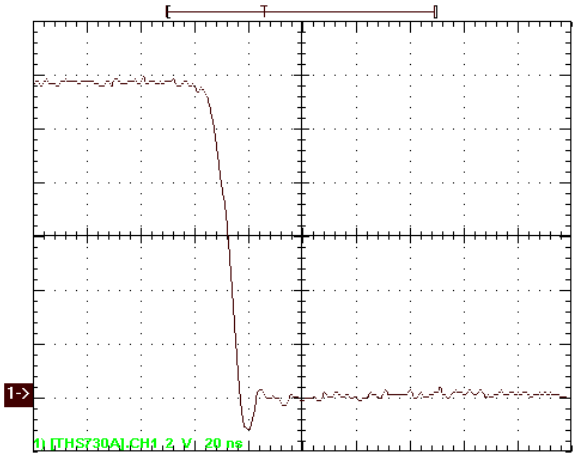
# PMP7156RevB Test Results

With input voltage set to 12V and 1A Iout results in the waveform shown in Figure 18




Ch1 => 2V/div
1µs/div
full bandwidth



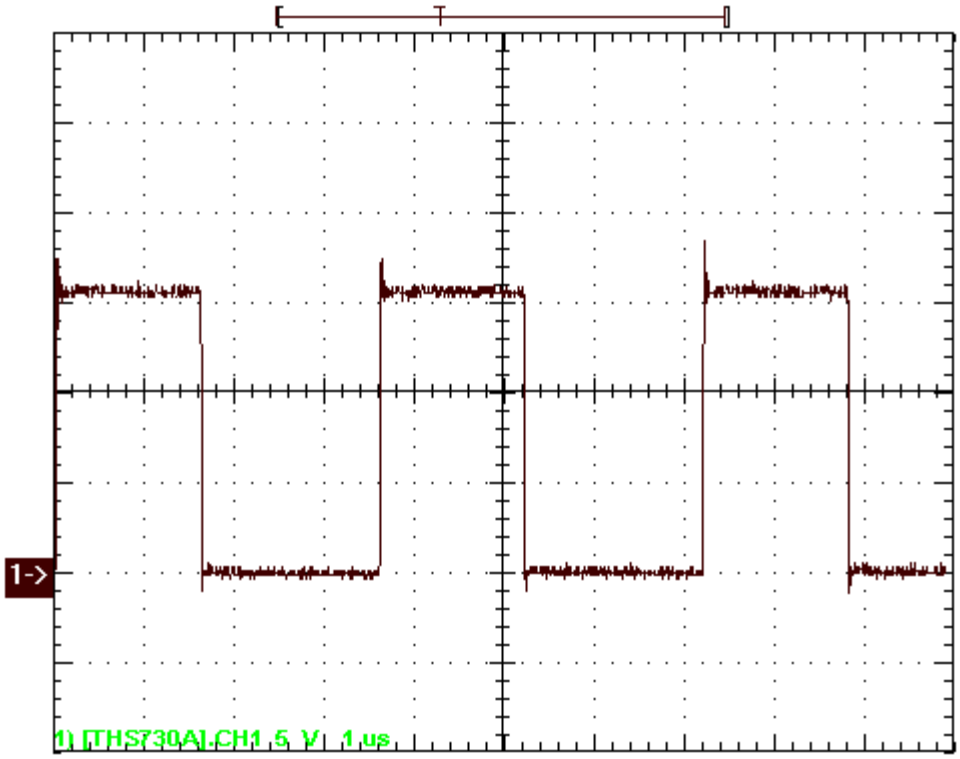




Ch1 => 2V/div
20ns/div
full bandwidth

**Figure 18**

# PMP7156RevB Test Results

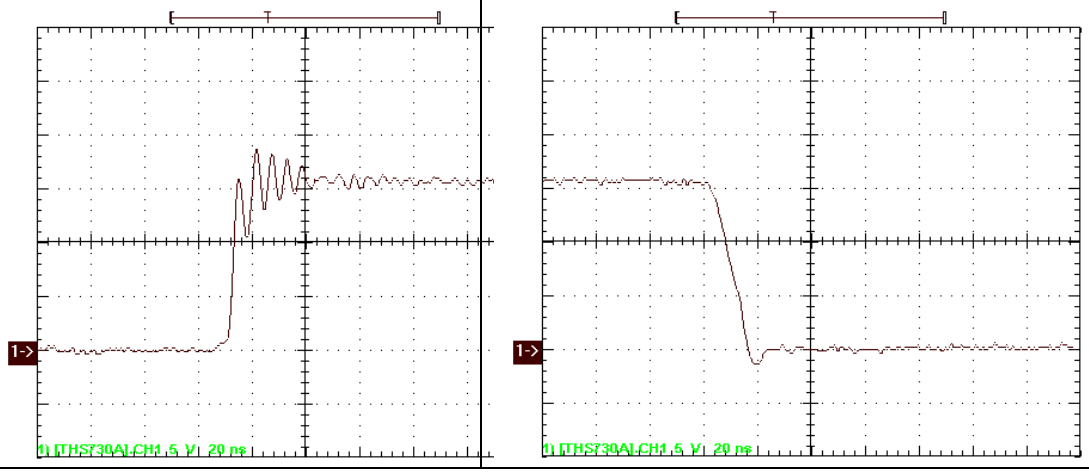
With input voltage set to 16V and 1A Iout results in the waveform shown in Figure 19




Ch1 => 5V/div

1µs/div

full bandwidth




Ch1 => 5V/div

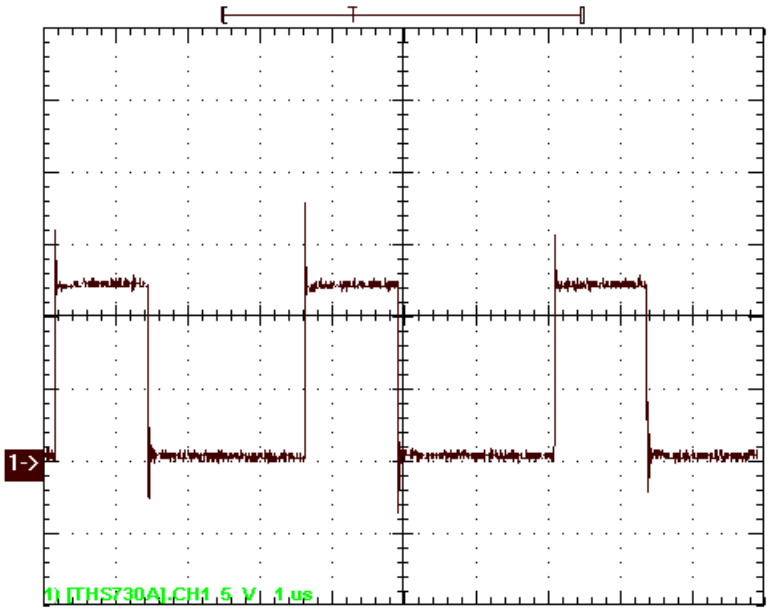
20ns/div

full bandwidth

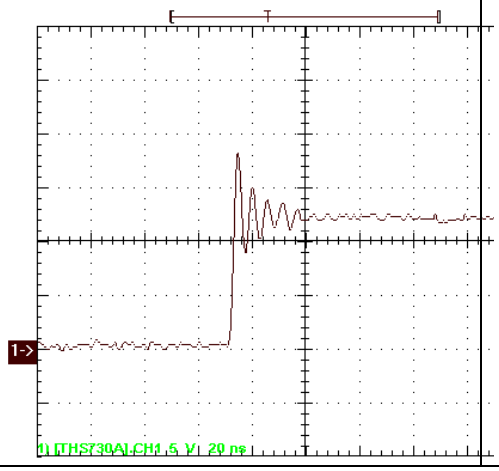
**Figure 19**

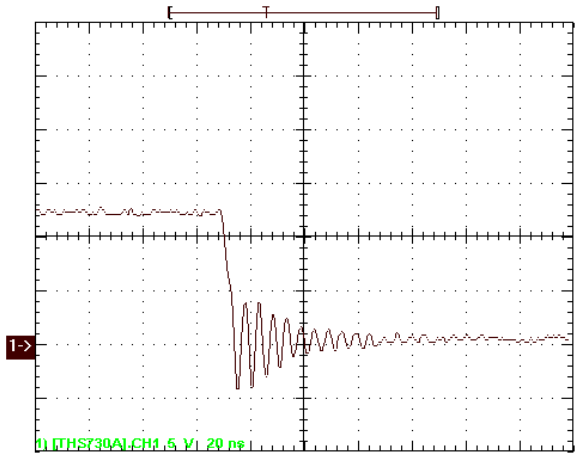
### *9.2 Switchnode 2 (Q3 d/s)*

With input voltage set to 8V and 1A Iout results in the waveform shown in Figure 20




Ch1 => 5V/div
1µs/div
full bandwidth

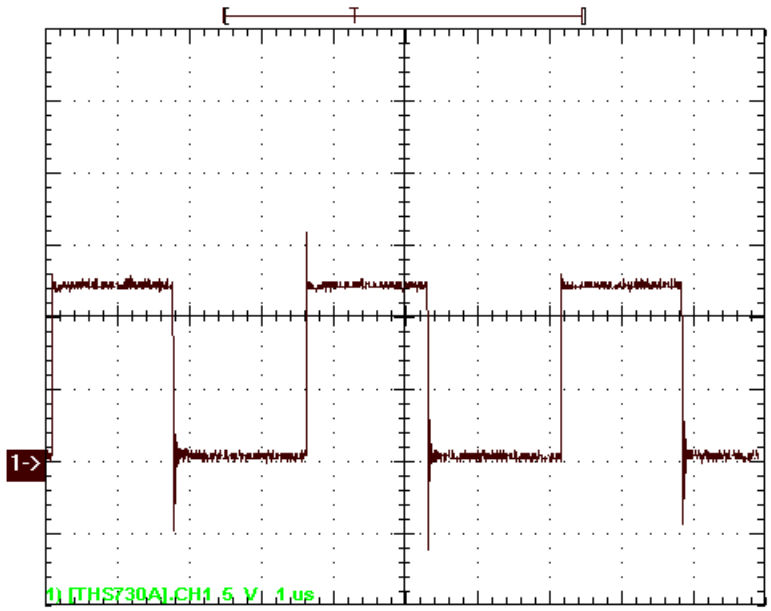


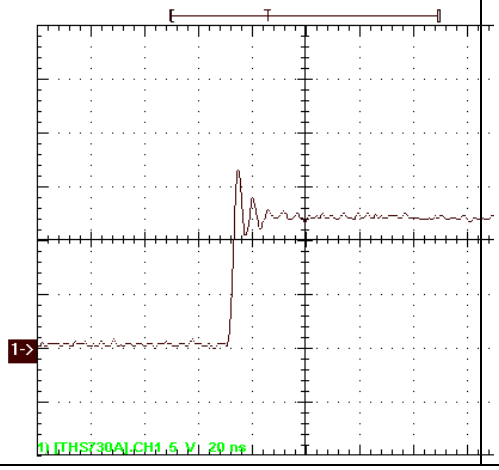

Ch1 => 5V/div
20ns/div
full bandwidth

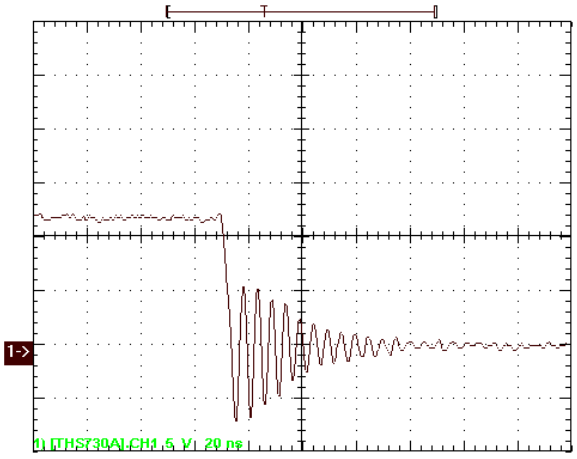
**Figure 20**

With input voltage set to 12V and 1A Iout results in the waveform shown in Figure 21




Ch1 => 5V/div
1µs/div
full bandwidth



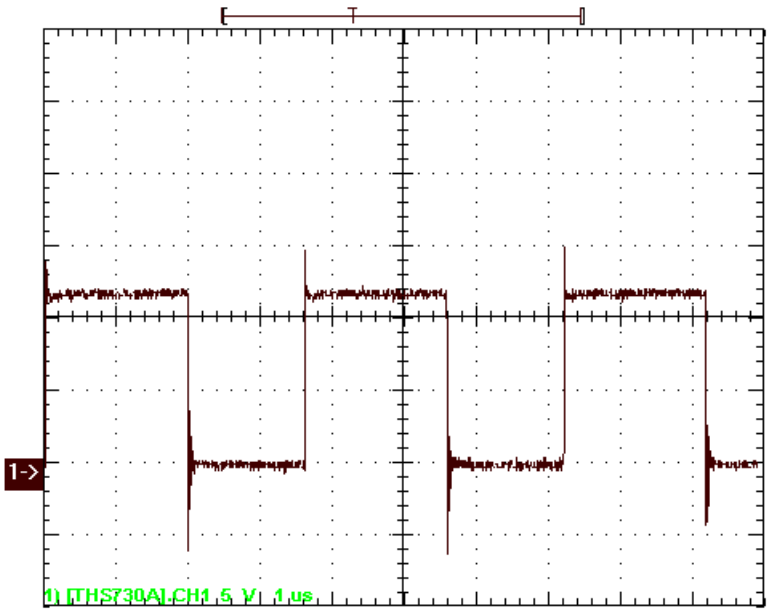




Ch1 => 5V/div
20ns/div
full bandwidth

**Figure 21**

# PMP7156RevB Test Results

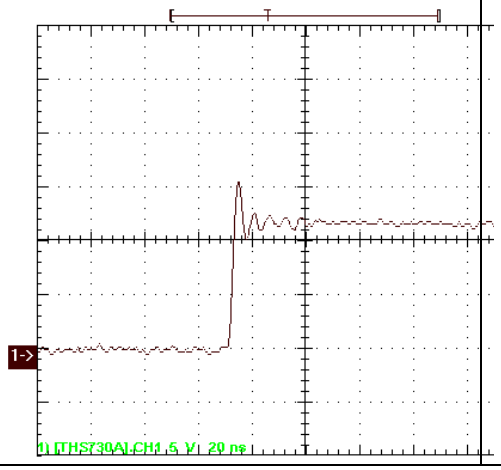
With input voltage set to 16V and 1A Iout results in the waveform shown in Figure 22

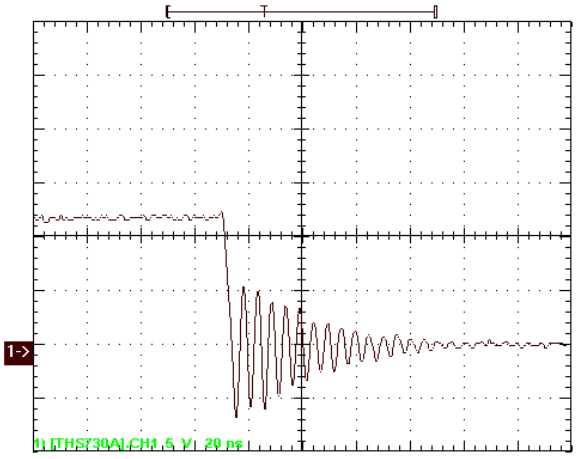



Ch1 =>
5V/div

1µs/div

full bandwidth




Ch1 =>
5V/div
20ns/div
full bandwidth

**Figure 22**

# 10 Thermal Image

## *10.1 0.5A Output Current @ 12V Input*

Figure 23 shows the thermal image at 12V input and 0.5A output

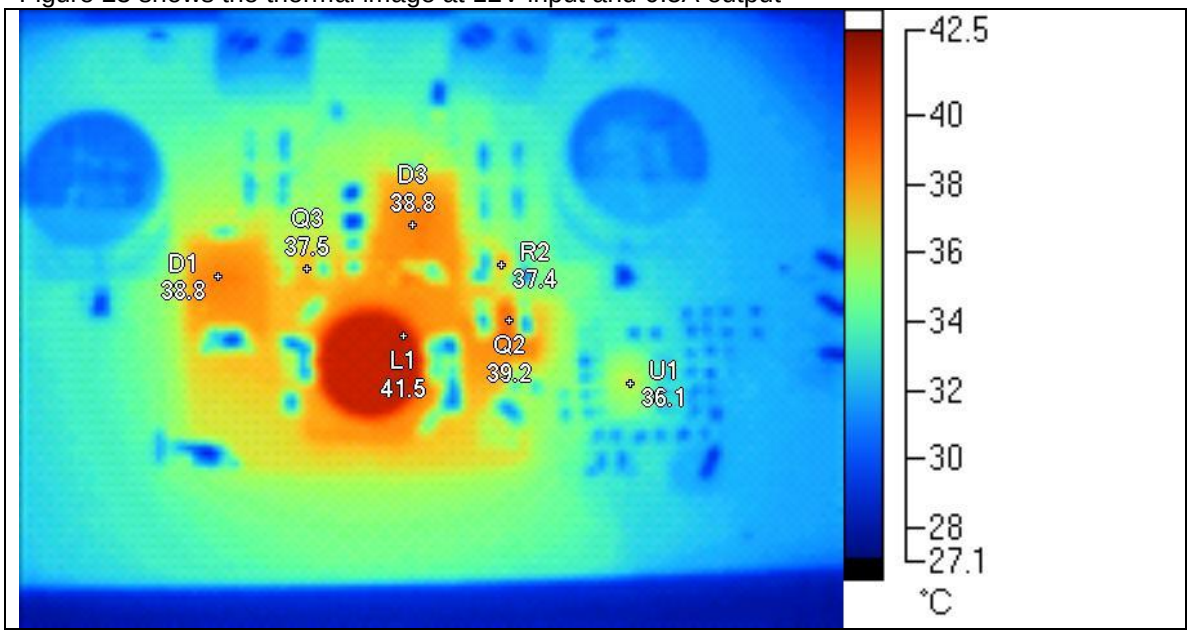



**Figure 23**

| Name | Temperature |
|---|---|
| L1 | 41.5°C |
| D1 | 38.8°C |
| D3 | 38.8°C |
| Q2 | 39.2°C |
| R2 | 37.4°C |
| U1 | 36.1°C |
| Q3 | 37.5°C |

**Table 2**

### *10.2 1A Output Current @ 12V Input*

Figure 24 shows the thermal image at 12V input and 1A output

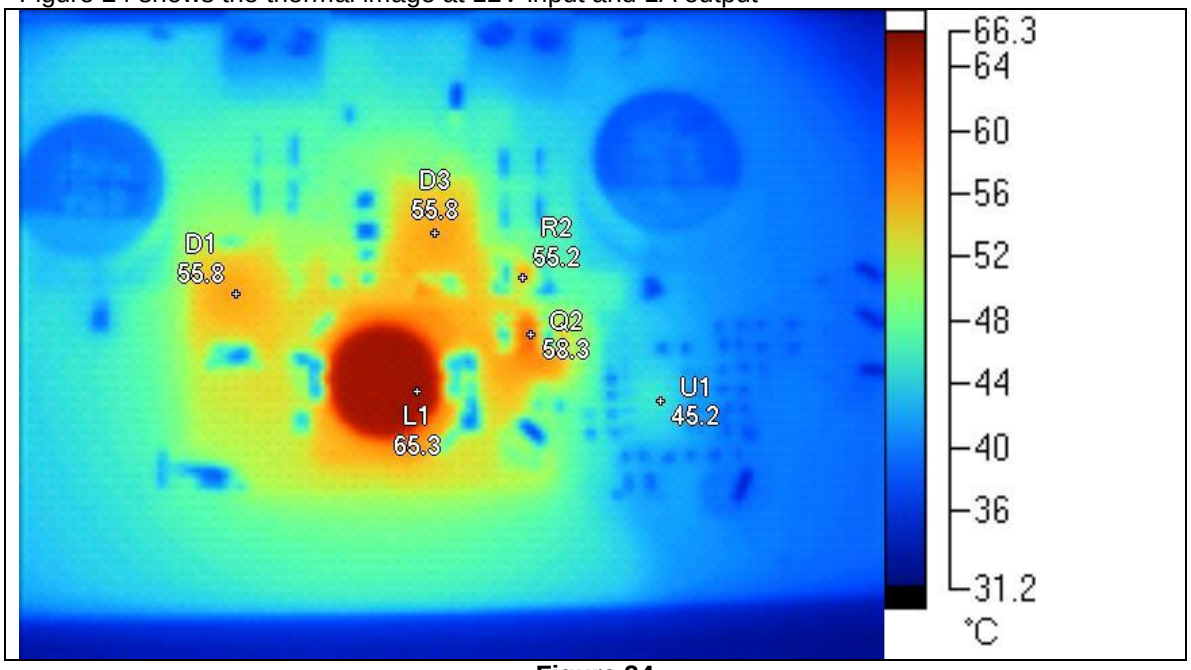



**Figure 24**

| Name | Temperature |
|---|---|
| L1 | 65.3°C |
| Q2 | 58.3°C |
| U1 | 45.2°C |
| R2 | 55.2°C |
| D1 | 55.8°C |
| D3 | 55.8°C |

**Table 3**

### *10.3 bottom side*

Figure 25 shows the thermal image at 40V input and 21A output

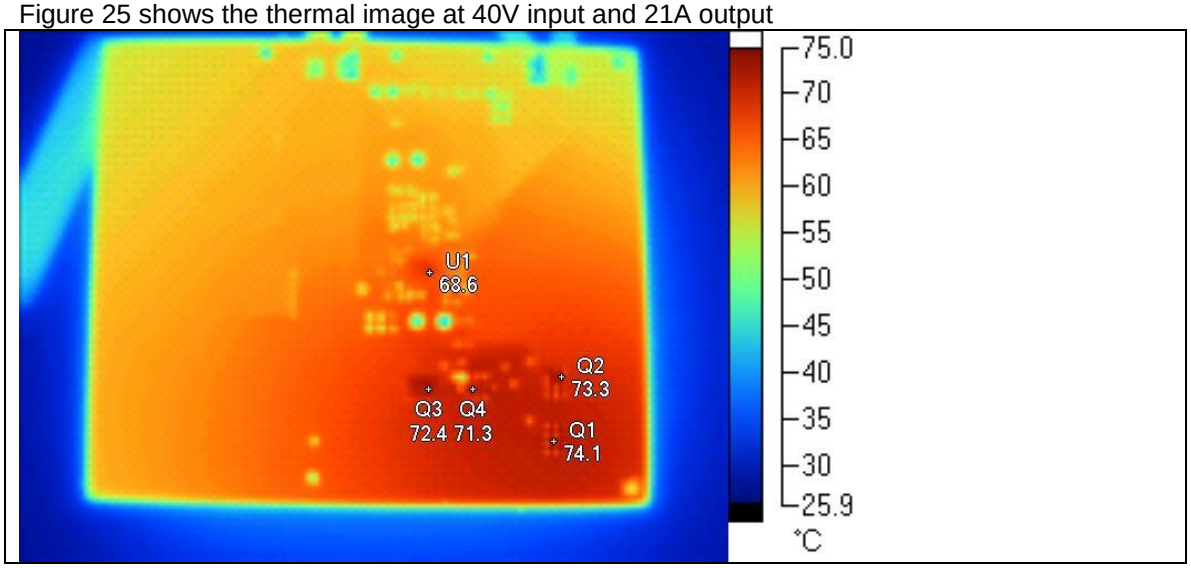



**Figure 25**

| Name | Temperature |
|---|---|
| Q1 | 74.1°C |
| Q2 | 73.3°C |
| Q3 | 72.4°C |
| Q4 | 71.3°C |
| U1 | 68.6°C |

**Table 4**

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