1 +10.0V Boost Converter

1.1 Output voltage ripple

The output ripple of the 10.0V boost converter with a 1A load is shown in Figure 1. The input voltage is set to 3.0V, 5.0V and 7.0V.

Channel M1: **3.0V input voltage**, 189mV peak-peak
100mV/div, 5us/div

Channel M2: **5.0V input voltage**, 154mV peak-peak
100mV/div, 5us/div

Channel M3: **7.0V input voltage**, 139mV peak-peak
100mV/div, 5us/div

![Figure 1](image-url)
1.2 Switching node (10.0V Boost Converter)

The switching node is shown in Figure 2.
The input voltage is set to 3.0V with a 1.0A load on the 10.0V output.

Channel C2: **Switching node**, -1.2V min, 21.6V max
5V/div, 2us/div

![Figure 2](image-url)
1.3 Transient response (10.0V Boost Converter)

The response to a load step is shown in Figure 3.

Channel C2: **Output voltage**, -72mV undershoot, 110mV overshoot
100mV/div, 1ms/div, AC coupled

Channel C1: **Load current**, load step 0.5A to 1.0A and vice versa
1A/div, 1ms/div

![Figure 3](image-url)
1.4 Frequency response (10.0V Boost Converter)

Figure 4 shows the loop response of the boost converter at a load of 0.5A.

3.0V input
- 63 deg phase margin @ crossover frequency of 1.2 kHz
- -23 db gain margin

5.0V input
- 63 deg phase margin @ crossover frequency of 3.1 kHz
- -23 db gain margin

7.0V input
- 53 deg phase margin @ crossover frequency of 6.2 kHz
- -20 dB gain margin

Figure 4
1.5 Efficiency (10.0V Boost Converter)

The efficiency at 3.0V and 7.0V input voltage is shown in Figure 5. The 7.5V buck converter was running to supply the IC.

![Graph of Efficiency - Boost @ +10.0V](image)

**Figure 5**
1.6 Load regulation (10.0V Boost Converter)

The load regulation of the boost converter is shown in Figure 6.

![Load regulation - Boost @ +10.0V](image)

Figure 6
2 +3.3V Buck Converter

2.1 Output voltage ripple (3.3V Buck Converter)

The output ripple of the 3.3V buck converter with a 5A load is shown in Figure 7. The input voltage is set to 12.0V.

Channel C2: 12.0V input voltage, 17mV peak-peak
20mV/div, 5us/div

Figure 7
2.2 Switching node (3.3V Buck Converter)

The switching node is shown in Figure 8.
The input voltage is set to 12.0V with a 5.0A load on the 3.3V output.

Channel C2: **Switching node**, -1.4V min, 38.0V max
10V/div, 1us/div

![Figure 8](image-url)
2.3 Transient response (3.3V Buck Converter)

The response to a load step is shown in Figure 9.

Channel C2: **Output voltage**, -162mV undershoot, 146mV overshoot
100mV/div, 1ms/div, AC coupled

Channel C1: **Load current**, load step 2.5A to 5.0A and vice versa
2A/div, 1ms/div

![Figure 9](image-url)
2.4 Frequency response (3.3V Buck Converter)

Figure 10 shows the loop response of the 3.3V buck converter at a load of 2.5A.

10.0V input
- 67 deg phase margin @ crossover frequency of 9.5 kHz
- -19 db gain margin

14.0V input
- 72 deg phase margin @ crossover frequency of 10.6 kHz
- -18 db gain margin

30.0V input
- 72 deg phase margin @ crossover frequency of 10.4 kHz
- -18 dB gain margin

**Figure 10**
2.5 Efficiency (3.3V Buck Converter)

The efficiency at 12.0V input voltage is shown in Figure 11. The 7.5V buck converter and the boost converter were disabled.

![Efficiency - Buck @ +3.3V](image-url)

**Figure 11**
2.6 Load regulation (3.3V Buck Converter)

The load regulation of the 3.3V buck converter is shown in Figure 12.

![Load regulation - Buck @ 3.3V](image)

Figure 12
2.7 Startup (3.3V Buck Converter)

The startup of the 3.3V buck with no load on the output is shown in Figure 13.

Figure 13
2.8 Shutdown (3.3V Buck Converter)

The shutdown of the 3.3V buck with 5.0A load on the output is shown in Figure 14.

![Figure 14](image-url)
3 +7.5V Buck Converter

3.1 Output voltage ripple (7.5V Buck Converter)

The output ripple of the 7.5V buck converter with a 2A load is shown in Figure 15. The input voltage is set to 12.0V.

Channel C2: **12.0V input voltage**, 5mV peak-peak
20mV/div, 5us/div

![Figure 15]({{image_url}})
3.2 Switching node (7.5V Buck Converter)

The switching node is shown in Figure 16. The input voltage is set to 12.0V with a 2.0A load on the 7.5V output.

Channel C2: **Switching node, -1.2V min, 29.7V max**

5V/div, 1us/div

![Figure 16](image-url)
3.3 Transient response (7.5V Buck Converter)

The response to a load step is shown in Figure 17.

Channel C2: **Output voltage**, -79mV undershoot, 74mV overshoot
50mV/div, 1ms/div, AC coupled

Channel C1: **Load current**, load step 1.0A to 2.0A and vice versa
1A/div, 1ms/div

![Figure 17](image-url)
3.4 Frequency response (7.5V Buck Converter)

Figure 18 shows the loop response of the 7.5V buck converter at a load of 1.0A.

10.0V input
- 96 deg phase margin @ crossover frequency of 9.1 kHz
- -11 db gain margin

14.0V input
- 99 deg phase margin @ crossover frequency of 9.9 kHz
- -11 db gain margin

30.0V input
- 105 deg phase margin @ crossover frequency of 11.2 kHz
- -10 dB gain margin
3.5 Efficiency (7.8V Buck Converter)

The efficiency at 12.0V input voltage is shown in Figure 19. The 3.3V buck converter and the boost converter were disabled.

![Efficiency - Buck @ +7.5V](image_url)
3.6 Load regulation (7.5V Buck Converter)

The load regulation of the 7.5V buck converter is shown in Figure 20.

![Graph showing load regulation of 7.5V buck converter](attachment:image.png)
3.7 Startup (5.0V Buck Converter)

The startup of the 7.5V buck with no load on the output is shown in Figure 21.

Figure 21
3.8 Shutdown (5.0V Buck Converter)

The shutdown of the 7.5V buck with 2.0A load on the output is shown in Figure 22.

Figure 22
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