Enterprise SSD Backup Power Supply

- **Input**: 5.0V or 12V
- **Output**: 3.3V @ 2.5A, Backup Boost at 28V, Backup Buck 5V @ 2.5A
- Free-Running-Switching Frequency for TPS62130 2.5 MHz, for TPS61170 1.2MHz, for LM43603 500 kHz
1. **Startup**

The startup waveform at 5.0V input voltage and no load on the output is shown in Figure 1.

- **Channel Ch1**: 5.0V Input Voltage
  - 5V/div, 2ms/div

- **Channel Ch2**: 3.3V Output Voltage
  - 2V/div, 2ms/div

- **Channel Ch3**: 28.0V Output Voltage
  - 20V/div, 2ms/div

- **Channel Ch4**: V Output Voltage
  - 1V/div, 2ms/div

![Figure 1](image-url)
The startup waveform at 12.0V input voltage and no load on the output is shown in Figure 2.

Channel Ch1  **12.0V Input Voltage**  
2V/div, 2ms/div

Channel Ch2  **3.3V Output Voltage**  
2V/div, 2ms/div

Channel Ch3  **28.0V Output Voltage**  
20V/div, 2ms/div

Channel Ch4  **3.3V Output Voltage**  
1V/div, 2ms/div

![Figure 2](image-url)
2. Shutdown

The shutdown waveform at 5.0V input voltage and 2.5A load on the 5V LM43603 output is shown in Figure 3.

Channel Ch1  **5.0V Input Voltage**
5V/div, 10ms/div

Channel Ch2  **3.3V Output Voltage**
2V/div, 10ms/div

Channel Ch3  **28.0V Output Voltage**
20V/div, 10ms/div

Channel Ch4  **LM43603 Switch Node**
20V/div, 10ms/div

![Figure 3](image-url)
3. Efficiency

The efficiency and load regulation of the 3.3V TPS62130 Buck converter are shown in Figure 4 and Figure 5.

![Figure 4](image-url)
Figure 5

PMP30046 Rev.C - Load Regulation

Output Voltage [V]

Output Current [A]
The efficiency and load regulation of the 5.0V LM43603 Buck converter are shown in Figure 6 and Figure 7.

![Figure 6](image-url)
Figure 7
4. Transient Response

The response to a load step at 5.0V input voltage is shown in Figure 8.

Channel Ch3  **Output Current**, Load Step 1.25A to 2.5A  
1A/div, 200µs/div

Channel Ch1  **Output Voltage**, -24.8mV undershoot, 16mV overshoot  
20mV/div, 200µs/div, AC coupled

![Figure 8](image-url)
The response to a load step at 28.0V input voltage is shown in Figure 9.

Channel Ch3  **Output Current**, Load Step 0A to 2.5A  
2A/div, 200µs/div

Channel Ch1  **Output Voltage**, -120mV undershoot, 88mV overshoot  
200mV/div, 200µs/div, AC coupled

![Figure 9](image-url)
5. Frequency Response

The frequency response of the TPS62130 at 2.5A load is shown in Figure 10.

5.0V Input 21.2 kHz Bandwidth, 80 deg Phase Margin, -24 dB Gain Margin

12.0V Input 21.5 kHz Bandwidth, 80 deg Phase Margin, -25 dB Gain Margin

![Fig 10: Frequency Response of TPS62130](image-url)
The frequency response of the TPS61170 at 0.07A load is shown in Figure 11.

3.3V Input  
57.8 Hz Bandwidth, 75 deg Phase Margin, < -50 dB Gain Margin
The frequency response at 16.0A load is shown in Figure 10.

8.0V Input  27.3 kHz Bandwidth, 81 deg Phase Margin, -14 dB Gain Margin  
16.0V Input  25.1 kHz Bandwidth, 80 deg Phase Margin, -14 dB Gain Margin  
28.0V Input  24.4 kHz Bandwidth, 79 deg Phase Margin, -15 dB Gain Margin
6. Output Ripple

The TPS62130 output ripple voltage at 2.5A load is shown in Figure 13.

Channel M1  **Output Voltage @ 5.0V Input**, 192mV peak-peak  
200mV/div, 1us/div

Channel M2  **Output Voltage @ 12.0V Input**, 264mV peak-peak  
200mV/div, 1us/div

![Figure 13](image-url)
The LM43603 output ripple voltage at 2.5A load is shown in Figure 14.

Channel R1  **Output Voltage @ 8.0V Input**, 47.2mV peak-peak
50mV/div, 4μs/div

Channel R2  **Output Voltage @ 16.0V Input**, 40.8mV peak-peak
50mV/div, 4μs/div

Channel R3  **Output Voltage @ 28.0V Input**, 35.2mV peak-peak
50mV/div, 4μs/div

![Figure 14](image-url)
7. Switching Node

The drain-source voltage of the TPS62130 low-side FET at 12.0V input voltage and 2.5A load on the output is shown in Figure 15.

Channel Ch1  **Drain-Source Voltage**, -0.8V minimum, 13.4V maximum
5V/div, 80ns/div

![Figure 15](image-url)
The drain-source voltage of the low-side FET at 28.0V input voltage and 2.5A load on the output is shown in Figure 16.

Channel Ch1  **Drain-Source Voltage**, -1.8V minimum, 29.0V maximum
5V/div, 400ns/div

![Figure 16](image-url)
8. Thermal Image

The thermal image (Figure 17) shows the circuit at an ambient temperature of 20°C with an input voltage of 12.0V and 2.5A load on the 3.3V output.

![Thermal Image](image-url)
The thermal image (Figure 18) shows the circuit at an ambient temperature of 20°C with an input voltage of 5.0V and 2.5A load on the 3.3V output.

![Thermal Image](image.png)

**Figure 18**
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