

Agilent
U2531A USB Simultaneous Sampling DAQ in
Power Measurement Unit Monitoring

Application Note



Introduction

Mobile devices are getting more and more popular. The mobile phone in the market now has become a pocket media center. It contains at least a digital still camera, video conference functionality, an MP3 player with simulated surround sound, and a color Internet browser coupled with 3-D gaming capability. Mobile phones are continuously equipped with an increasing number of functions, and newer phones will come with higher resolution cameras, adding various kinds of storage attachment, mobile television and personal security devices such as thumbprint sensors. Mobile phone power management thus, becomes one of the most significant engineering challenges. Other than mobile phones, the other portable devices like handheld devices, Personal Digital Assistants (PDAs), Smart Phones, Portable Multimedia Players (PMPs), MP3 players, Gaming, and Global Positioning System (GPS) also present increasingly sophisticated functionality and application requirements.

With increasing demands of functionality and application requirements, there will also be an increasing power management complexity of the overall system. The drive for these portable device manufacturers is then moving towards a power management solution that is lower in total system cost, and is flexible and scalable enough to manage these demanding power requirements. The power management unit (PMU) would be expected to have different voltage and current outputs as well to interface to the different functionality blocks. This voltage range could range from millivolts to up to 3.3 V. The current could be in the range of milliamperes.

To achieve seamless playing of music, gaming, and voice and video call on the mobile phones, it is necessary that the power outputs from the power management unit remain stable. This will ensure a good customer experience arising out of using the mobile devices.

For this reason, it is necessary to have a quick and easy design validation of the power management unit by monitoring the stability of the power inputs and outputs while switching between the functions of the PMU. The PMU typically has an input and a few outputs. The parameters to be measured of each channel will be both the voltage and current. In this particular application, the PMU has an input and four output ports. Thus, if both voltage and current are to be monitored for each port, then a total of ten measurement channels are needed.

PMU Monitoring

In the following sections, this application note focuses on how a PMU (in this case a PMU with one input port and four output ports) can be monitored. The purpose of this application is to monitor the channels to determine if the outputs of the PMU are sending out stable signals when the different functions of the PMU are executed during design validation. This can be seen easily by detecting if spikes are present, as shown in Figure 1.

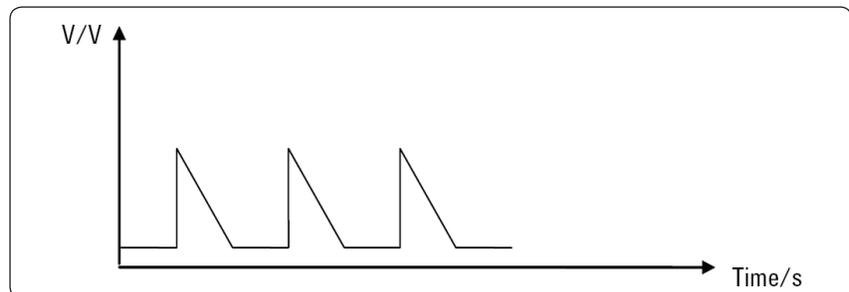


Figure 1. Graph indicated a transient signal detected.

To simulate an aging process and to run through all the functionality of the PMU, the duration of the test will take several hours. Since both voltage and current measurements need to be made for each port, the total number of channels needed would be ten. In this particular test, three data acquisition (DAQ) devices like the U2531A 2 MSa/s, 4-channel simultaneous sampling multifunction DAQ device and the U2781A 6-Slot USB modular instrument chassis will be most suitable. Since the maximum voltage output for this particular PMU is 3.3 V, it can be connected directly to the input of the DAQ device. The current can be easily measured by measuring the voltage across a resistor. The block diagram in Figure 2 illustrates how this test is conducted.

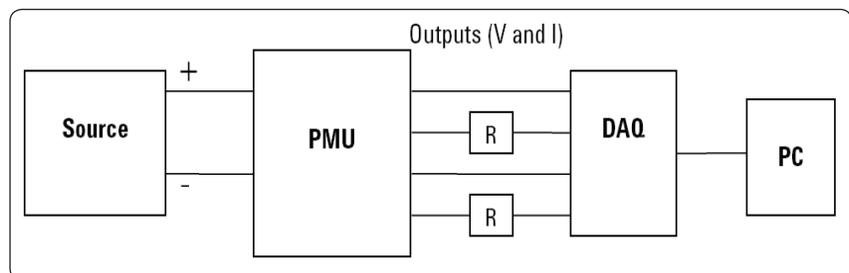


Figure 2. Block diagram shows the test setup of PMU monitoring.

In this application, the program is written in Agilent VEE Pro to control the DAQ devices in acquiring the voltage and current as shown in Figure 3.

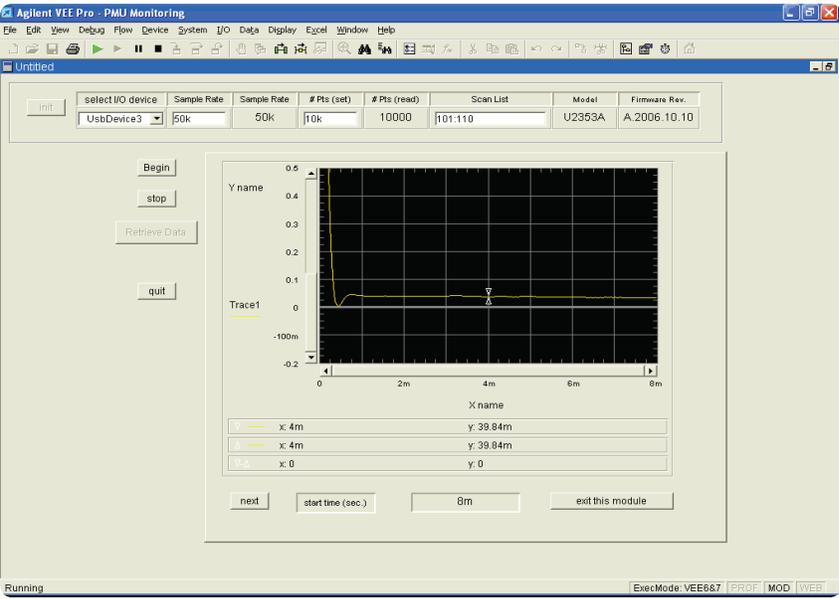


Figure 3. Windows shown is the VEE test program.

The functionality of the PMU is controlled by its firmware. In this particular application, the VEE program is used to control the DAQ devices with regard to the monitoring of the different channels. In addition, a separate routine is written to run through the functionality of the PMU. Alternatively, another routine can be written to control the DAQ and the firmware together and to easily establish a correlation between the DAQ results and the functionality. During channel monitoring in this particular application a glitch is detected in one of the channels, as shown in Figure 4.

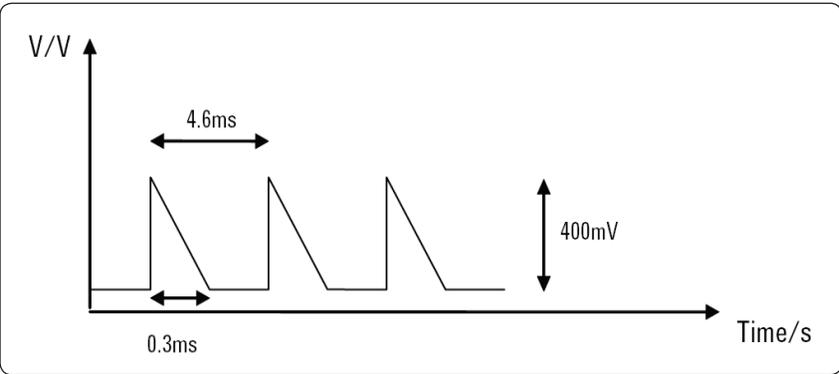


Figure 4. The graph shows an actual glitch detected by the DAQ.

The duration of the spike is 0.3 ms. In fact, with the 2 MSa/s sampling rate DAQ, and the recommendation that the sampling rate employed by the DAQ (or the test system) should be five times the sampling rate of the signal, the maximum glitch that can be detected is 2.5 us. In this application, the absolute voltage is actually not as important since the main purpose of the application is to monitor the presence of spikes. The DAQ measurements and functionality test were carried out at the same time, and since it can be determined when a spike occurs once the data acquisition process has started, it is also possible to easily and quickly determine the actual status and functionality details of the PMU at that point in time. Based on this information, the troubleshooting process can be related to the exact time and situation at which the problem occurred.

Conclusion

With the growing popularity for portable devices, it is necessary to have a quick and easy design validation of the power management unit. The objective of monitoring the PMU for stable input and outputs can be achieved using Agilent's DAQ. This way it is possible to reduce the time required to resolve the problem. This is done through a low cost DAQ solution.

References

- [1] *Agilent U2500A Series USB Simultaneous Multifunction Data Acquisition Devices User's Guide*, Part Number U2351-90002.



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