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# Easy Monitoring of Multiple Voltages

## Frederik Dostal Analog Devices, Inc.

Supervisory ICs are small monitoring modules that, with their own voltage references, can monitor voltage supplies in electronic systems. If the monitored voltage is higher or lower than a set value, an alarm is emitted and the system can behave according to a defined pattern. These modules have been used successfully for many years now.

Today's electronics frequently require many different voltages-some for analog and others for digital circuits. Several supervisory ICs are necessary for reliable monitoring. With a multiplicity of different voltages, the question as to whether or not sequencing-that is, ordered rise and fall of the individual voltages-should be implemented arises. A corresponding monitoring system is extremely complex and difficult to implement.

To simplify the monitoring of voltages, there are comprehensive digital solutions that can be easily operated via a simple graphical user interface (GUI). LTpowerPlay® is an example of one.



Figure 1. Block diagram of a digitally controlled voltage supply system.

Figure 1 shows a system configuration illustrating how an arbitrary number of analog dc-to-dc converters can be connected to the digital control system. Monitoring modules, such as the LTC2977, can be controlled and programmed via a PMBus<sup>™</sup> connection. This is done on a computer via a USB interface or in the field with a microcontroller (if present). An LTC2977 monitoring module also functions autonomously without any digital connection after it has been set.



Figure 2. Simple monitoring with graphical dashboard under LTpowerPlay.

Possible functions of this module are the controlled power-up and power-down of a dc-to-dc converter to enable adherence to a specific control sequence. The set output voltages of the dc-to-dc converters can be changed dynamically. This can also be used for more precise adjustment of the respectively generated voltage. For this, the respective output voltage is measured and then a current is impressed via a connection on the respective feedback pin to change the voltage generated by the dc-to-dc converter. If necessary, an additional shunt can be used to enable current measurement.

Figure 2 shows the free LTpowerPlay software and the measured parameters on its user-friendly dashboard. It is installed on a computer and, via a USB interface, can communicate directly with the digital PMBus port on the LTC2977 or with another one of the many power system management (PSM) modules. There are a plethora of dc-to-dc converters with built-in PMBus ports available. They can be directly connected to the PMBus and then also simultaneously controlled via the LTpowerPlay software.

If numerous different voltages have to be monitored, things can quickly get complicated. That's why it is important for setting and monitoring software to maintain a clear overview. If there is a fault in a generated voltage, the last monitored values are saved in an EEPROM to enable subsequent analysis for determining where the problems occurred. This can be very helpful for fault localization in the case of field returns. Device families can also be improved by means of this information.

Digital control and monitoring of a voltage supply system is useful for different applications and opens up a multitude of possibilities that could only be generated with great difficulty with pure analog signals.

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## About the Authors

Frederik Dostal studied microelectronics at the University of Erlangen-Nuremberg, Germany. Starting work in the power management business in 2001, he has been active in various applications positions, including four years in Phoenix, Arizona, working on switch mode power supplies. He joined Analog Devices in 2009 and works as a power management technical expert for Europe. He can be reached at *frederik.dostal@analog.com*.

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