Test & Measurement Solutions for Power Electronics Design

Contributed by Siglent Technologies

The importance of power electronics has increased significantly in recent years and will continue to do so. What are the reasons for that? A look at the current market trends shows that the availability and efficient use of electrical energy is an important component for almost all of them. Driven by global challenges such as global warming and environmental pollution, technical topics such as renewable energy and alternative drives are gaining importance. In addition, the ever increasing mobility and the exploding number of wirelessly communicating IoT devices are leading to more and more battery-powered devices. The criteria of the magic square of development are efficiency, EMC conformity, size weight and cost.

To determine and optimize the parameters of the magic square, the use of high-performance measurement instruments is indispensable. In addition, new technologies are changing the requirements for the measurement equipment. Both of these lead to a rapidly growing demand for measurement technology for the analysis of converter and inverter circuits.

The minimum equipment of a typical development lab consists of an oscilloscope with differential probes and a current clamp, a digital multimeter, a benchtop power supply (AC or DC) and an electronic load (AC or DC). A spectrum analyzer with near-field probes for checking the radiated emissions during development should also not be missing.

Siglent has greatly expanded its range of measurement technology in recent years, so that today a large selection of measurement devices is available for use in power electronics.

In addition to the very extensive standard configuration, the oscilloscopes of the SDS2000X Plus and SDS5000X series offer many other options that make them powerful and flexible tools for all general tasks in the laboratory. With a bandwidth of up to 500 MHz (SDS2000X plus) or 1 GHz (SDS5000X), all applications in the field of power electronics can be covered. Both series have an integrated Bode plot function. Bode diagrams are typically used to measure

Figure 1: Bode diagrams are typically used to measure the phase and gain margin of feedback systems.

Figure 2: The Siglent series of loads are designed for input voltages up to 150 V.

Figure 3: With the optional EMC measurement package, spectrum analyzers from Siglent are ideally suited for radiation measurements during development.

the phase and gain margin of feedback systems and thus to determine the stability of the design (**Figure 1**). Both series also have a power analysis option. This option supports the developer by automating the measurements with which, all common parameters are determined. Coupled with the range of Siglent current clamps and differential voltage probes, this option is a must-have for optimizing SMPS designs.

To analyze the load step response, the load current is configured to jump between two steps. Typically, 10% and 90% of the maximum current is used. In parallel the regulation process of the power supply is captured with the oscilloscope. These jumps can easily be generated with an electronic DC load. The Siglent series of loads (SDL1000X) are designed for input voltages or currents up to 150 V or 30 A and are available in a 200 and 300 watt version (**Figure 2**). The loads can also be used in the context of battery tests and help determine the performance of these.

The spectrum analyzers from Siglent (SSA3000X plus) score with a strong price-performance ratio and, with the optional EMC measurement package, are ideally suited for radiation measurements during development (**Figure 3**).

Within less than 20 years since its founding, SIGLENT TECHNOLOGIES has become one of the world's leading providers of electronic test and measurement equipment. The products combine innovative features and functionalities with a commitment to quality and performance.

In terms of Power Electronics, it can be summarized that Siglent offers an almost complete range of products to conquer the challenges of power electronics design.

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