Double Pulse Test for Power Electronic Designs

Switching Losses Matter Even in the New SiC and GaN World

As GaN and SiC enable smaller, faster, and more efficient semiconductor designs, regulatory and economic pressures are driving new demands for energy efficiency in power electronics. Minimizing switching losses through design optimization is paramount in maintaining power efficiency throughout the generation, transmission, and consumption chain. Design parameters related to power converter efficiency must be rigorously measured.

Double Pulse Testing Challenges

Double pulse test is the preferred method to measure switching parameters of MOSFETs or IGBTs. This test is generally performed to guarantee specifications of power devices, confirm actual value or deviation of the power devices or power modules, and to measure switching parameters under various load conditions and validate performance across many devices.

However, double pulse test has historically been difficult and incredibly time consuming to create pulses with the correct variation of pulse widths. Traditional function generators only send continuous pulses requiring engineers to create waveforms on a PC and then upload them to the function generator or use microcontrollers that require a lot of effort and time to program. Others have lamented having to toggle back and forth between channels or 'trick' their instruments to have the necessary control over the duration and distance of the pulses.

Double Pulse Test - What's Changed

All of that has changed with the introduction of Tektronix' new Double Pulse Test application, created especially for our touchscreen AFG31000 arbitrary function generator, which makes it quick and easy to create pulses with varying pulse widths with a few simple taps of a finger. Now engineers can setup and output pulses within sixty seconds, enabling power efficiency testing in both R&D and production environments at a fraction of the time and cost.

AFG31000 arbitrary function generator with built-in double pulse test functionality

Double Pulse Test Software Configuration

The Double Pulse Test Application Window on the AFG31000

Like the AFG31000 arbitrary function generator, double pulse test is intuitive and quick to setup. Engineers adjust the first pulse width to get the desired switching current value and then quickly tap to set the second pulse parameters and the time delay between pulses. You also have easy control over a variety of features, including:

• Number of Pulses: 2 to 30 pulses

• High and Low voltage magnitude (V)

• Trigger Delay (s)

• Trigger Source - Manual, External, or Timer

• Load - 50 Ω or High Z

Equipment Setup – Rounding it Out
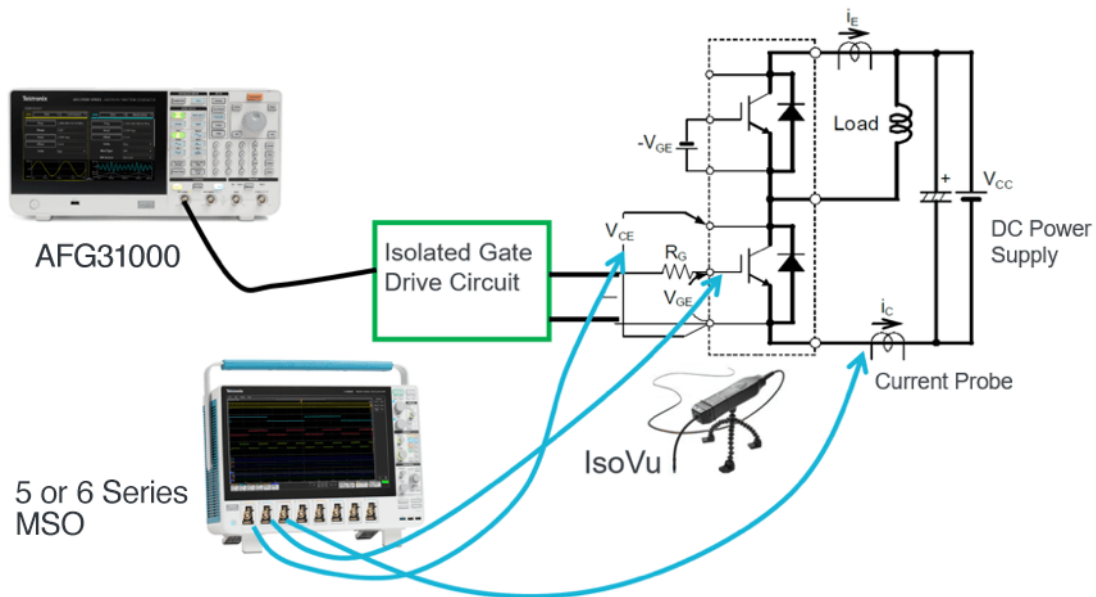
Recommended double pulse test bench set up

Tektronix offers an industry-leading solution for double pulse testing in fast-switching and wideband gap environments. For the most accurate results over a broad range of test parameters, Tek suggests the following equipment setup:

- The AFG31000 (touchscreen arbitrary function generator that connects to the isolated gate driver to 'turn on' the MOSFET and drives the double pulse test software)
- The 5 Series MSO Mixed Signal Oscilloscope (which measures V_{ds}, V_{gs} and I_d)
- The IsoVu Isolated Probe (a high-common mode rejection probe with high bandwidth and high common mode voltage)
- A 2470 SMU (source measure unit) or 2280S power supply to supply the load voltage

Download Double Pulse Test Software for FREE on your AFG31000

Tektronix is delighted to introduce Double Pulse Test on the AFG31000 because it makes it easier for engineers to perform the tasks needed to deliver highly-efficient power designs, fast. The double pulse test application can be downloaded at no charge directly from the tek.com website and installed onto the AFG31000 with a free firmware upgrade. For more information on this exciting new technology, download the double pulse test application note.