Isolated, High Voltage Arbitrary Pulse Generator

EAGLE HARBOR TECHNOLOGIES

K.E. Miller*; T.M. Ziemba; J.R. Prager; I. Slobodov; J. Picard
*kemiller@eagleharbortech.com

Introduction
Eagle Harbor Technologies, Inc. has developed an Arbitrary Pulse Generator (APG) with isolated high voltage output. The EHT APG can produce output pulses with voltages up to 10 kV and fast rise time (100 ns) at high pulse repetition frequency (up to 100 kHz) with a user-adjustable duty cycle from 0 – 100%. The isolated output allows the pulse generator to be connected to loads that need to be biased. These pulser generators utilize modern silicon carbide (SiC) MOSFETs, which offer lower switching and conduction losses while allowing for higher switching frequency capabilities compared to IGBTs. This pulse generator has applications for RF plasma heating; inductive and arc plasma sources; magnetron driving; and generation of arbitrary pulses at high voltage, high current, and high pulse repetition frequency in the semiconductor processing, non-equilibrium plasma source, and material processing communities.

Arbitrary Pulse Generator
The EHT APG can be operated in a unipolar configuration, which can output pulses from single shot to hundreds of kilohertz with adjustable duty cycle. In the bipolar configuration, the pulser is limited to pulse widths of tens of microseconds, but can both source and sink current.

Pre-Pulse Technology
Many loads, even those generally considered pure resistive loads, have stray inductance and capacitance. These stray elements can cause ringing on the output waveform. EHT has developed a precision gate drive technique (patent pending) that can be used to significantly reduce or eliminate the ringing on the waveforms. EHT has tested this technique over a wide range of stray capacitance values (100 pF - 10 nF) and stray inductance values (100 nH - 100 µH).

Fast Magnet PWM Control
EHT tested the APG for fast magnet driving. The pulser, operating at 250 kHz drove a magnet coil with an inductance of 85 µH. The pulse width was fixed during the initial current rise, but this could easily be changed for a faster rise.

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