

## *A Modular High-Power Pulsed IV Generator*

**Abstract – Focus Microwaves’ Modular High-Power Pulsed IV Generator (MPIV) is designed for pulsed I-V (current, voltage) characterization of semiconductor devices. The MPIV consists of a high power drain pulse module (DPM), a low power gate pulse module (GPM,) two high power DC supplies, a high speed oscilloscope for data acquisition and system software running on a Windows™ compatible computer.**

The MPIV pulse generator is designed for pulsed I-V (current, voltage) characterization of semiconductor devices. It is also well suited for applications requiring high current and precision current and voltage pulses. The Drain Pulse Module (DMP) uses an external high-current supply while the Gate Pulse Module (GPM) has an internal high-precision voltage supply. Additionally, the MPIV can be synchronized with an external or internal trigger.

The DPM is the core of the system. Its internal microcontroller uses precision Pulse Width Modulation (PWM) modules with complementary outputs and programmable dead-time in order to generate and synchronize the pulses for both drain and gate bias. The pulse width is adjustable from 200ns to 2ms; pulse repetition rate from 500Hz to 1MHz, with a maximum duty cycle of 50%. Two internal N-channel MOSFETs within the drain module support voltages up to 200V and currents up to 17A. Both the pulse and quiescent bias voltages are delivered via external DC power supplies thereby making the MPIV a customizable modular solution. The DPM is controlled via USB interface.

The GPM operates as a slave module controlled by the DPM. Internal precision Digital Analog Converters (DAC) are used to adjust the gate voltage in the range of  $\pm 10V$ , with a 5mV resolution. The output buffer amplifier delivers up to 100mA.

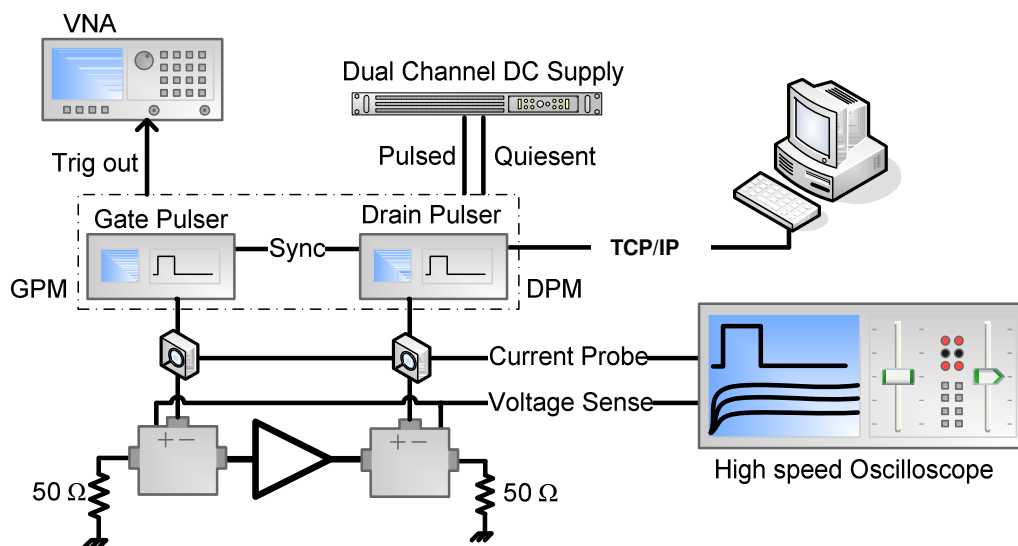


Figure 1: Block Diagram MPIV (Modular Pulsed I-V)

Voltage and current measurements are performed using a high speed 4-channel digital oscilloscope. Voltages are sampled directly on the gate and drain bias-tee sense terminals; the drain current is measured using a high speed high sensitivity current probe.

Features

- High power capability: +/- 200V, 17A.
- Minimum pulse width: 200ns.
- Modular design which enables multiple configurations.
- Shared library. The MPIV can be used as a standalone instrument using an ActiveX library, which easily integrates into existing test software.
- Flexible Input/Output. Choose between high power and high precision pulse modules to create a customized setup for your specific application.
- Compatible with Focus Microwaves’ device characterization software (Load Pull Explorer, **LPEx**).

<u>Drain/Collector Pulse supply</u>			<u>Gate/Base Pulse Supply</u>		
<u>Pulse Voltage</u>	Max Voltage	200V	<u>Pulse Voltage</u>	Max Voltage	±10V
	Resolution	150mV		Resolution	5mV
	Max Current	17A		Max Current	100mA
	Max Error	5%		Max Error	5%
<u>Pulse Width</u>	Min. Pulse	200ns	<u>Pulse Width</u>	Min. Pulse	200ns
	Resolution	33ns		Resolution	33ns
<u>Duty Cycle</u>	Min. Duty Cycle	0.01%	<u>Duty Cycle</u>	Min. Duty Cycle	0.01%
	Max. Duty Cycle	100%		Max. Duty Cycle	50%
<u>Quiescent</u>	Max. Voltage	200V	<u>Quiescent</u>	Max. Voltage	±10V
	Resolution	150mV		Resolution	5mV
	Max. Current	17A		Max. Current	100mA
	Max. Error	5%		Max. Error	5%

Table 1: MPIV Specifications



Figure 2: Gate and Drain Pulse Module of the MPIV