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5P67 - Pulsed Power Modulator with Active Pull-Down Using Diode Reverse Recovery Time

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This paper describes a pulsed power modulator with a new structure for an efficient active pull-down function. In some applications where a capacitive load such as plasma reactor is used, the output pulse has slow falling time since the residual energy of the load slowly decreases. Therefore, an effective pull-down performance is required to generate the output pulse in square wave form. The pull-down circuit configuration of the proposed pulsed power modulator utilizes the diode reverse recovery characteristics without using pull-down resistor which is conventionally used. The pull-down diode is forward-biased at pulse discharging mode. When the pulse discharging mode ended, the diode provides a path where the residual energy of the load can be discharged quickly, during the reverse recovery time. Therefore, the proposed modulator can achieve the fast pulse falling time without a large loss problem, which can occur when the pull-down resistor is used, or requirements of the complex control scheme. Through the simulation of conventional system with the pull-down resistor and the proposed system, the performance and superiority of the proposed structure are analyzed. Finally, the proposed modulator is developed and tested for plasma source ion implantation (PSII) application.

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