SOLID STATE THYRATRON REPLACEMENT

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Abstract

This paper describes a solid state alternative to thyratron switching devices. It includes details of the drive electronics and shows a completed prototype assembly. The paper includes a discussion on the choice of appropriate semiconductors for high voltage switching, where the required operating voltages are being achieved by using series connected devices. The techniques used for static and dynamic sharing of voltage across the series stack is also discussed, together with the importance of providing adequate gate drive. Oscillograms showing the effect of gate drive on delay time, rise time and turn-on energy is given, including details of the gate drive circuit used. A photograph of the prototype assembly of the series connected semiconductor switch stack is also shown. Testing of this at the full design voltage has yet to be completed, but results using a voltage scaled equivalent demonstrate that for many applications a solid state switch could offer advantages of low standby power, high average current and longer shot life. Further work is necessary to complete the characterisation of the assembly. Future work could make use of semiconductors that have the ability to turn off, thereby reducing or eliminating PFN components.