

PHOTON INITIATED THYRISTOR SWITCHES

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Compact, reliable solid state pulsed power switches can be an enabling technology for many applications. Compact, high-speed switches are needed to reduce the size and weight and improve the reliability of pulse power modulators and pulse forming networks. Methods for achieving the maximum possible performance are dependent on the fundamental limitations of the material of choice. Many technical challenges exist regarding materials development as well as device design for compact size, weight, long lifetime, fast turn on or turn off time, high efficiency, triggering, and packaging.

Photon Initiated Thyristor Switches (PITS) can be used as compact, reliable and high speed solid state pulsed power switches for many military applications such as radar drive circuits, power modulators for high peak power electrical systems for manned, unmanned air vehicles and narrow band high power microwave systems.

While designing the PITS, one should consider two important areas: triple point field enhancement, and uniform, high quality electrical connections. The triple point is located at the interface between the metal electrode, the silicon device, and the surrounding media. Electric field modeling indicates a field enhancement at the air interface. The triple point field enhancement should be reduced by different techniques. In addition to electric field considerations, we should also consider optically illuminate a large percentage of the surface area uniformly. Using different electrode and silicon-air interface shapes is important to reduce the triple point enhancement. This innovative PITS design research will be initiating an outstanding and promising opportunity to fulfill the near term switching requirements for many applications.