A Robust One-Shot Switch for High Power Pulse Applications

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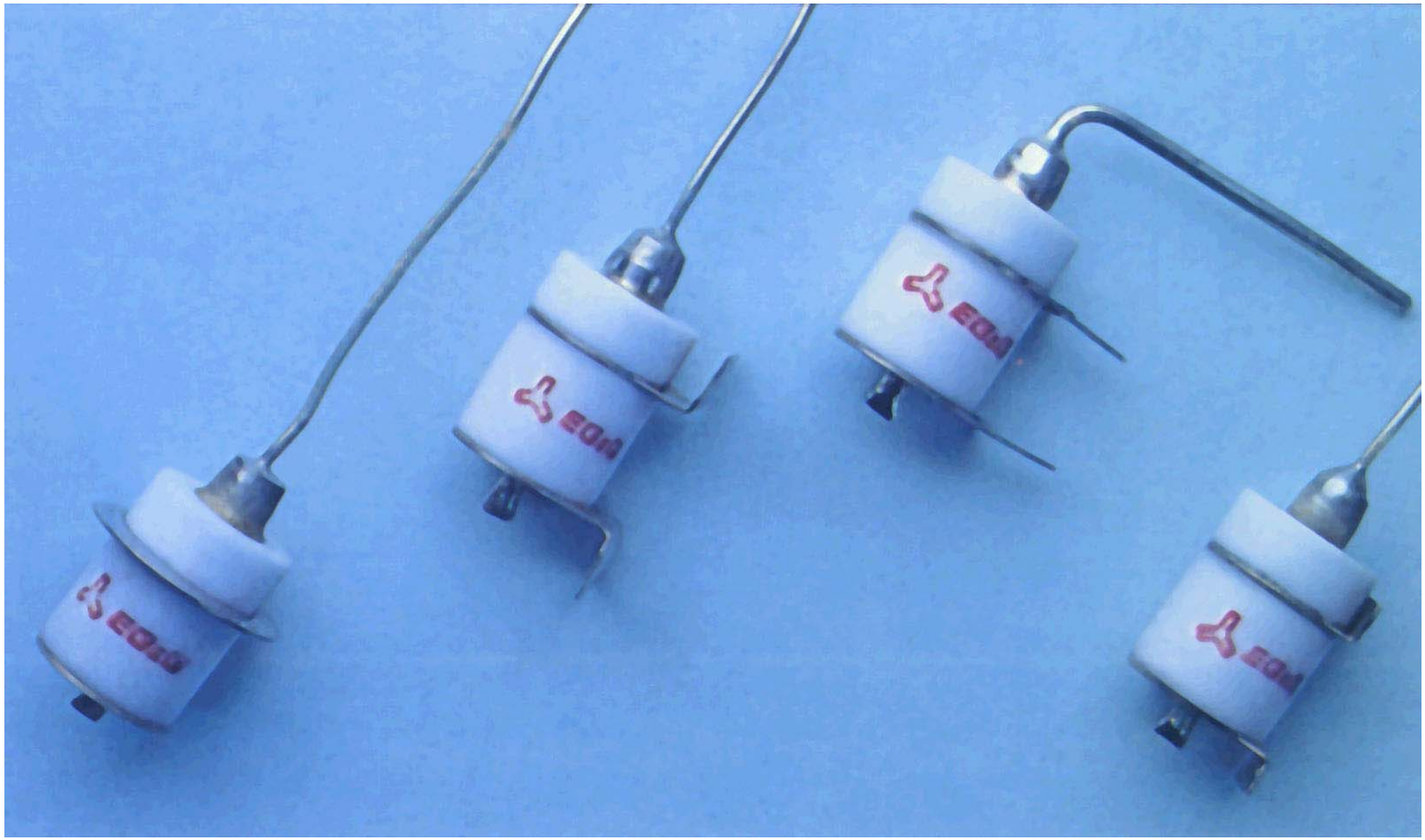
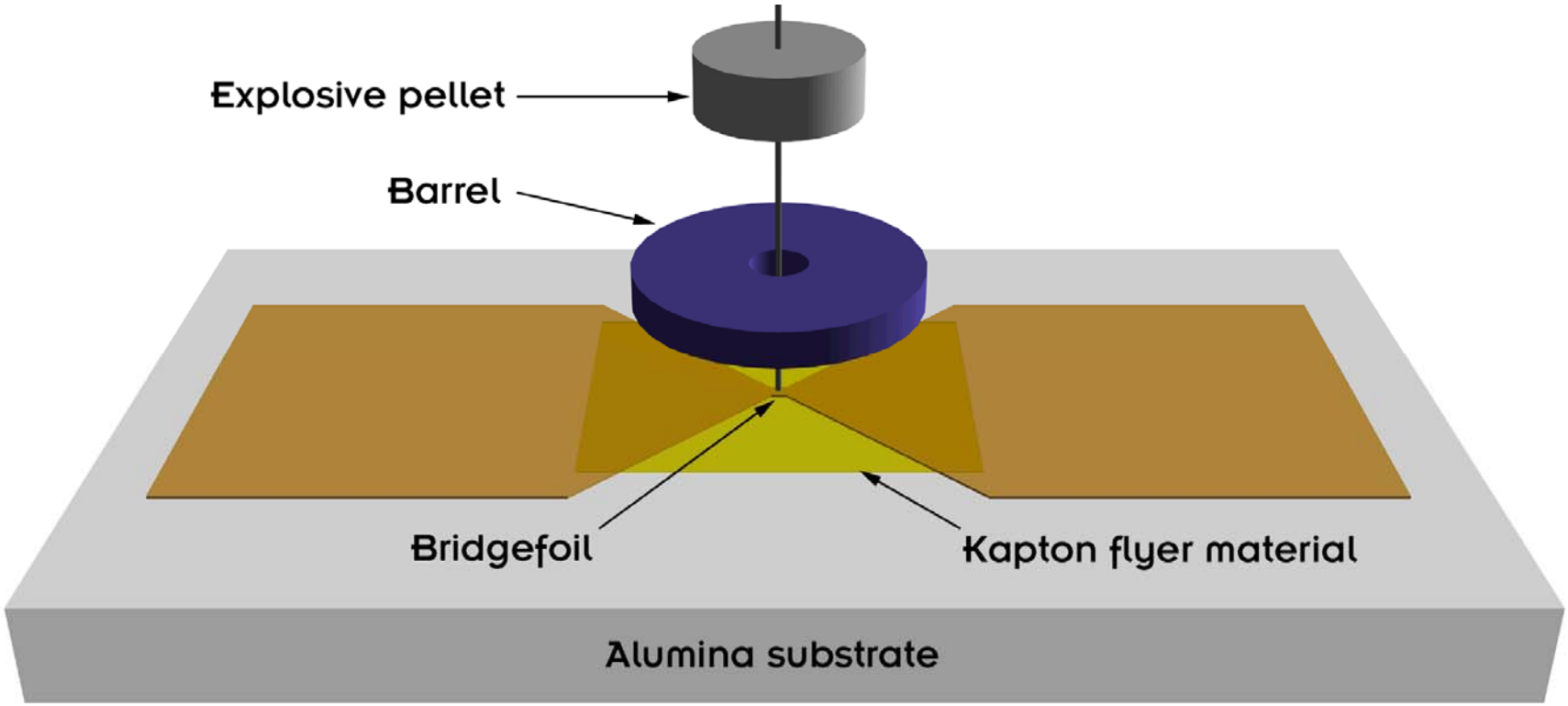
Examples of triggered spark gaps. (courtesy of EG&G).



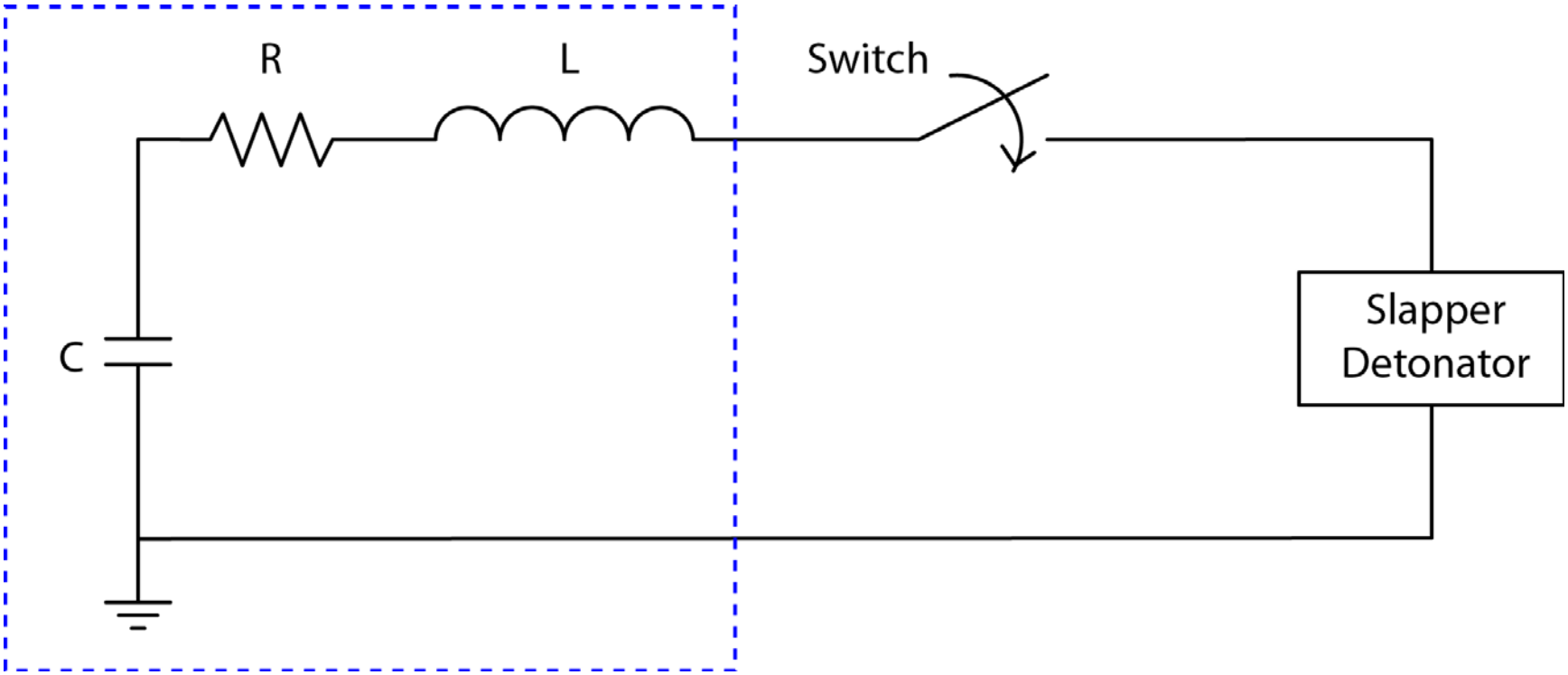
Switch Requirements

- **Standoff voltage greater than 1500V**
- **Switch should allow fast discharge of a high voltage capacitor with a discharge time (τ) less than 100 ns.**
- **The switch should be capable of being actuated with a low voltage signal (i.e. <50V trigger pulse).**
- **Fabrication should employ a simple layout that allows direct integration into strip-line geometries (minimize parasitic impedances).**
- **Monolithic construction should be employed using conventional micro-electronic fabrication techniques to make the switch mechanically robust.**
- **No energetic compounds can be used in the construction of the switch.**
- **Reliable one-shot capability.**

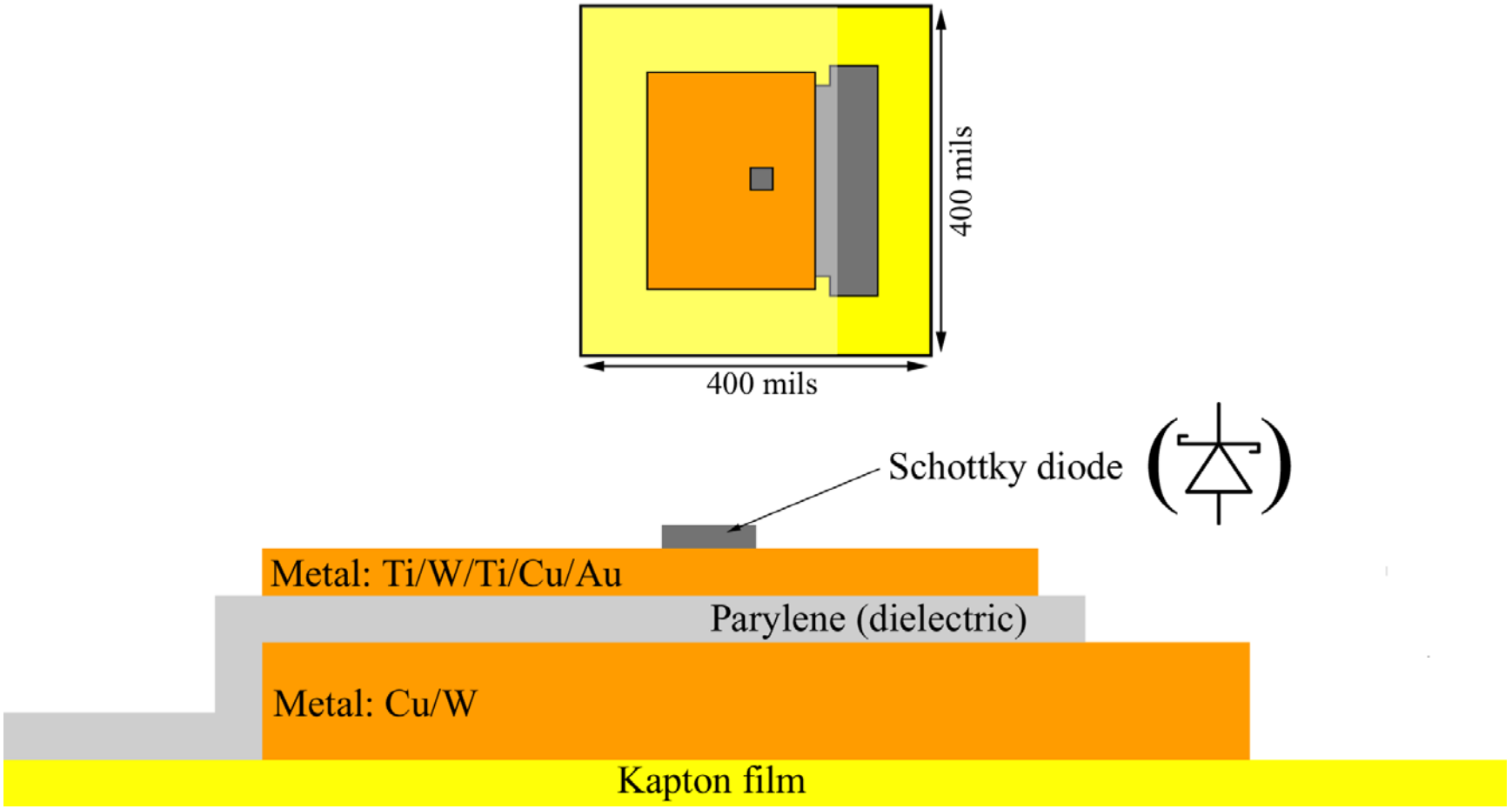
3-D illustration of slapper components



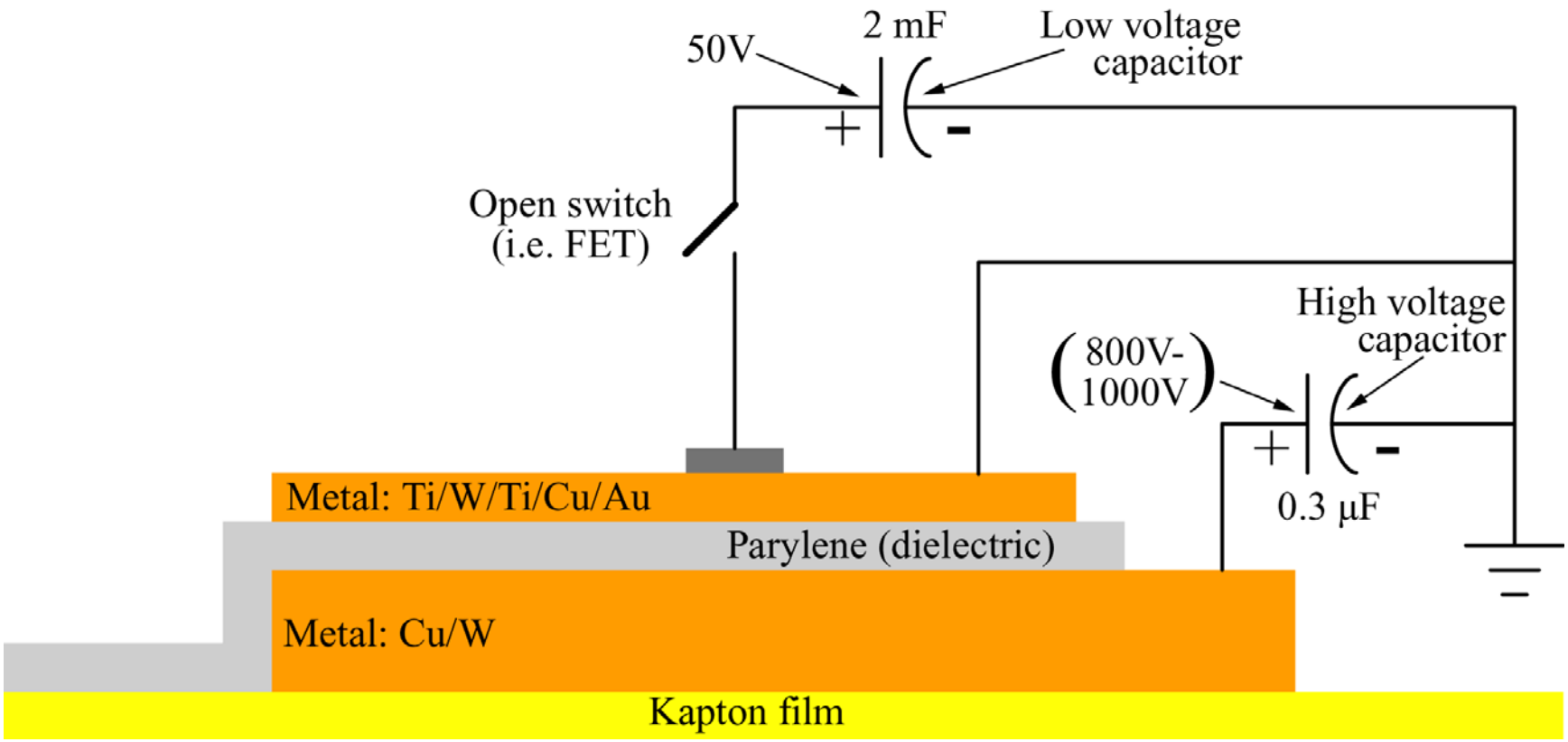
Schematic representation of a capacitive discharge unit (CDU) connected to a slapper and switch



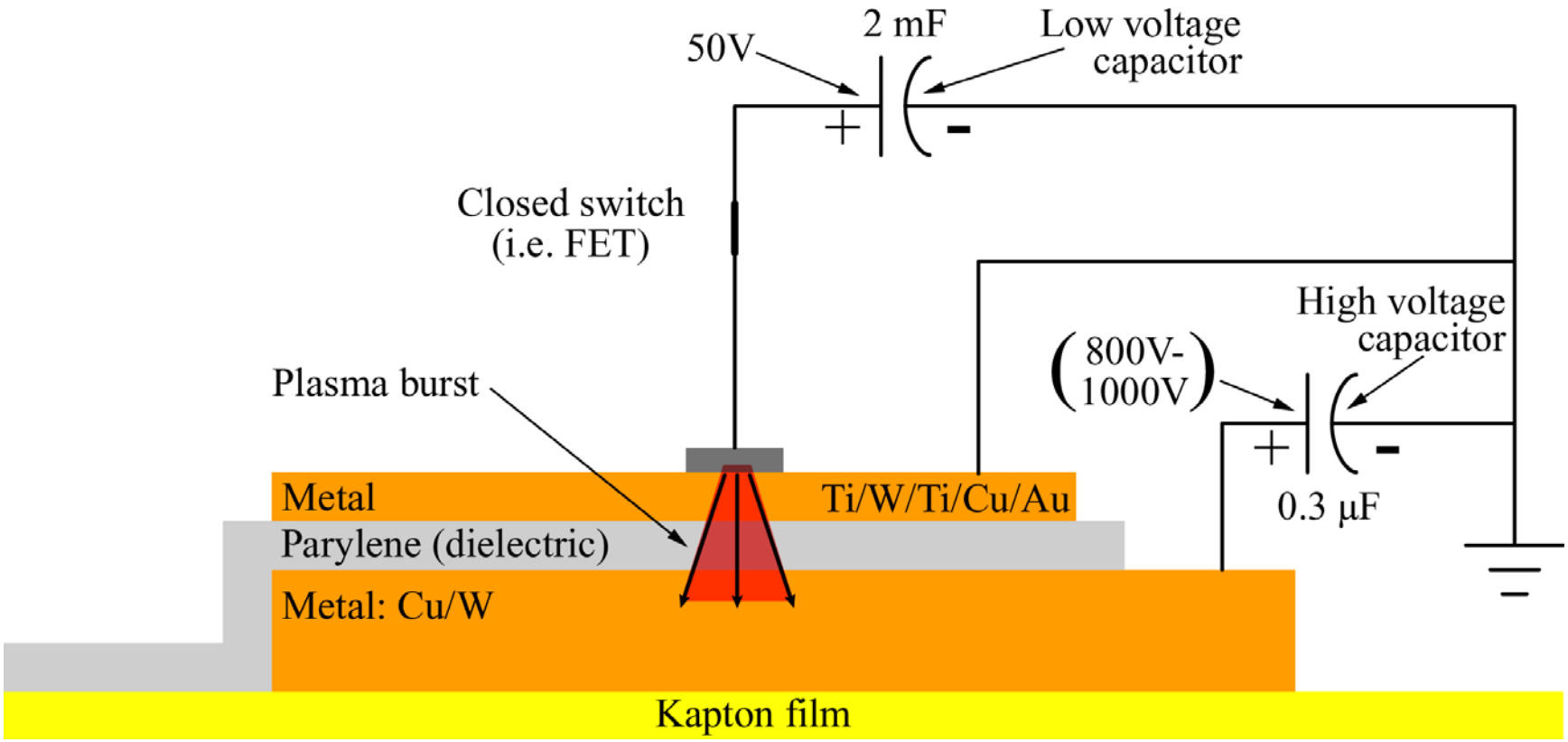
Schematic representation of shock switch.



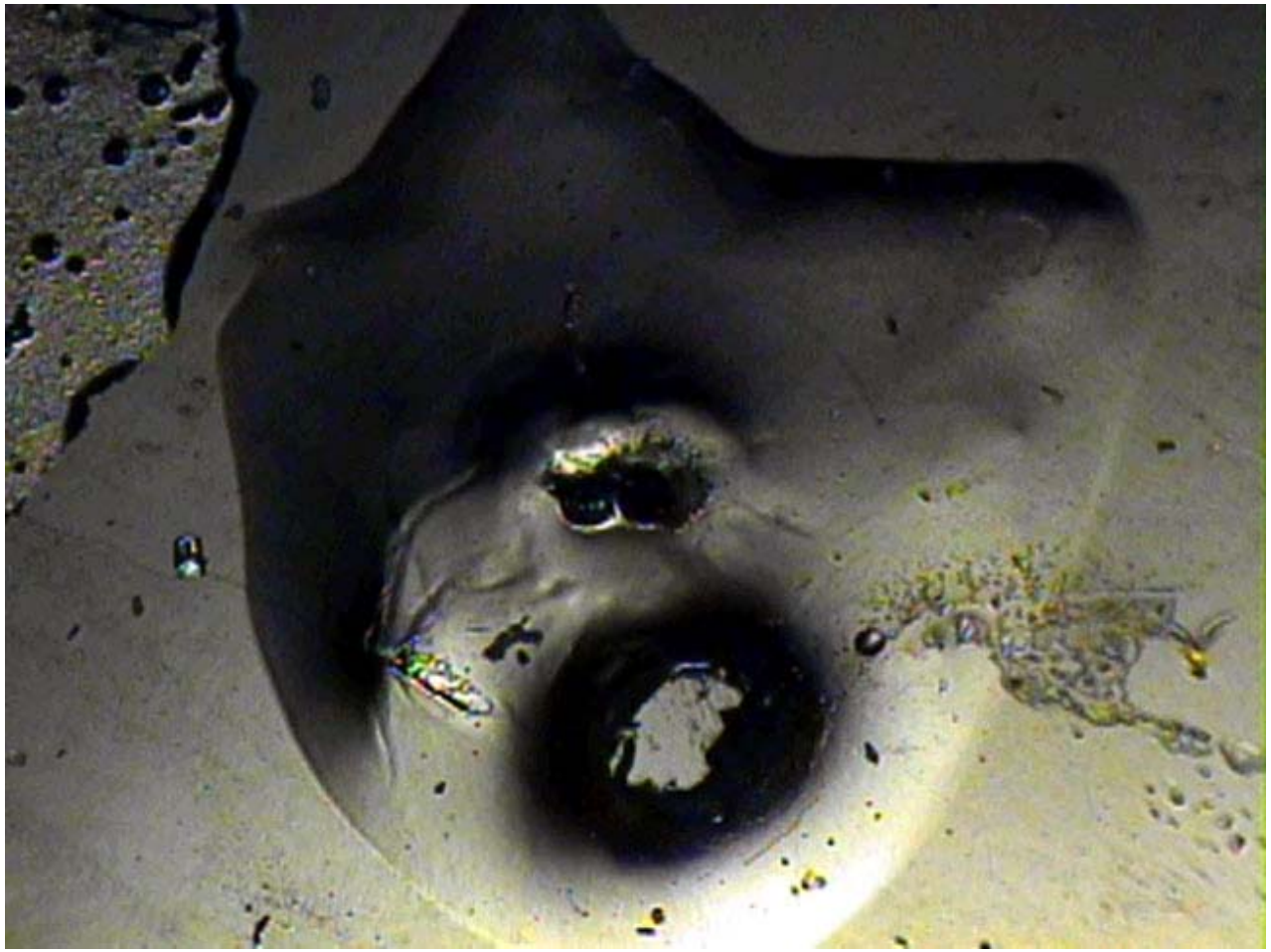
Schematic representation of fireset.



Schematic representation of switch actuation.



Photograph of exploded junction after switch actuation



Three-dimensional illustration of the parylene shock switch before final packaging is completed.

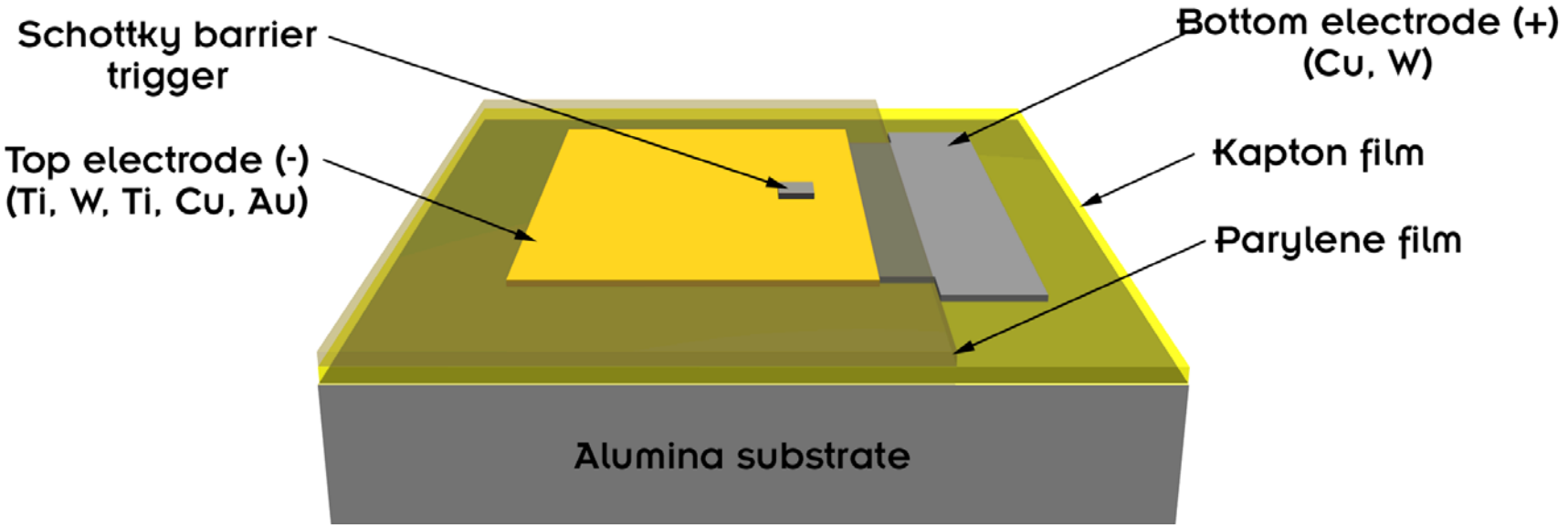


Illustration of the undiced parylene shock switch substrate

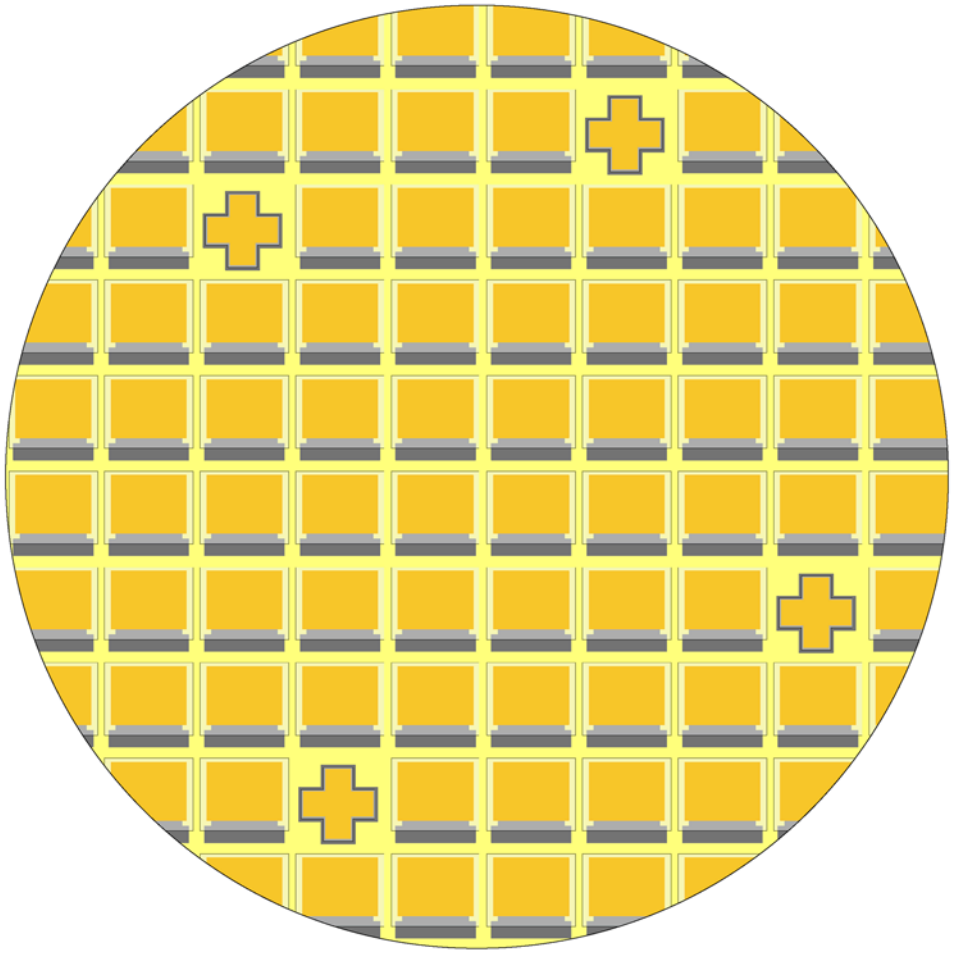
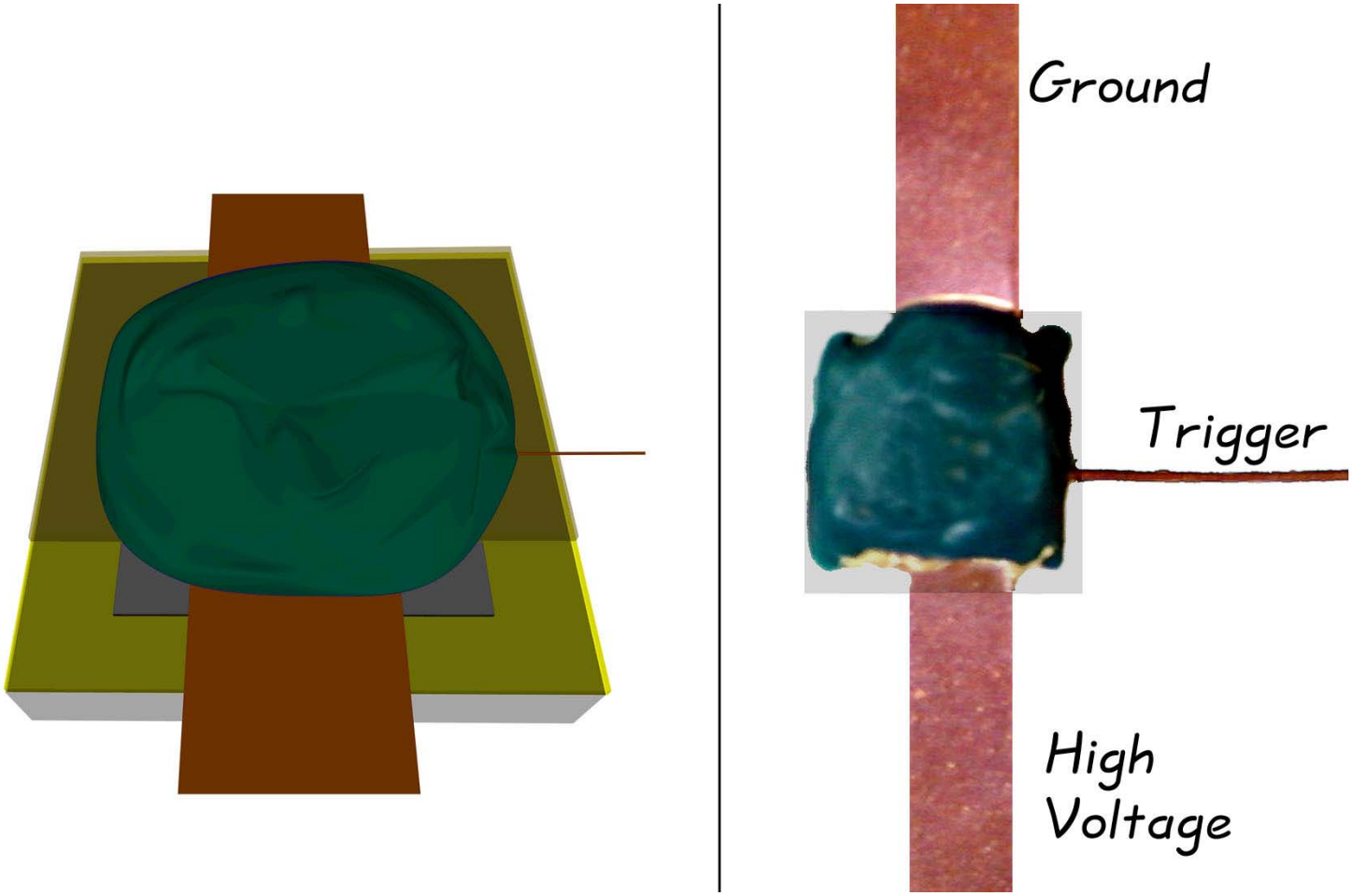
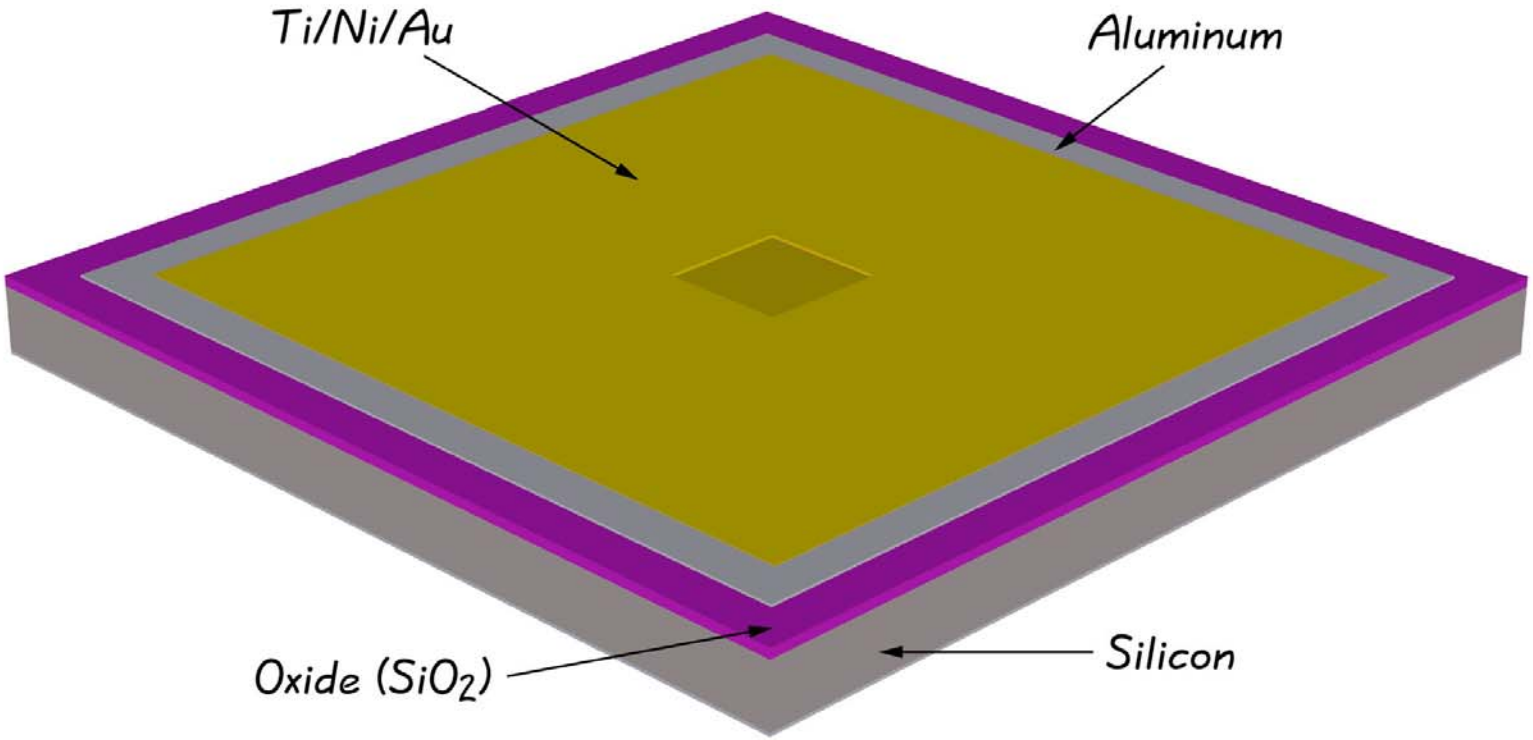


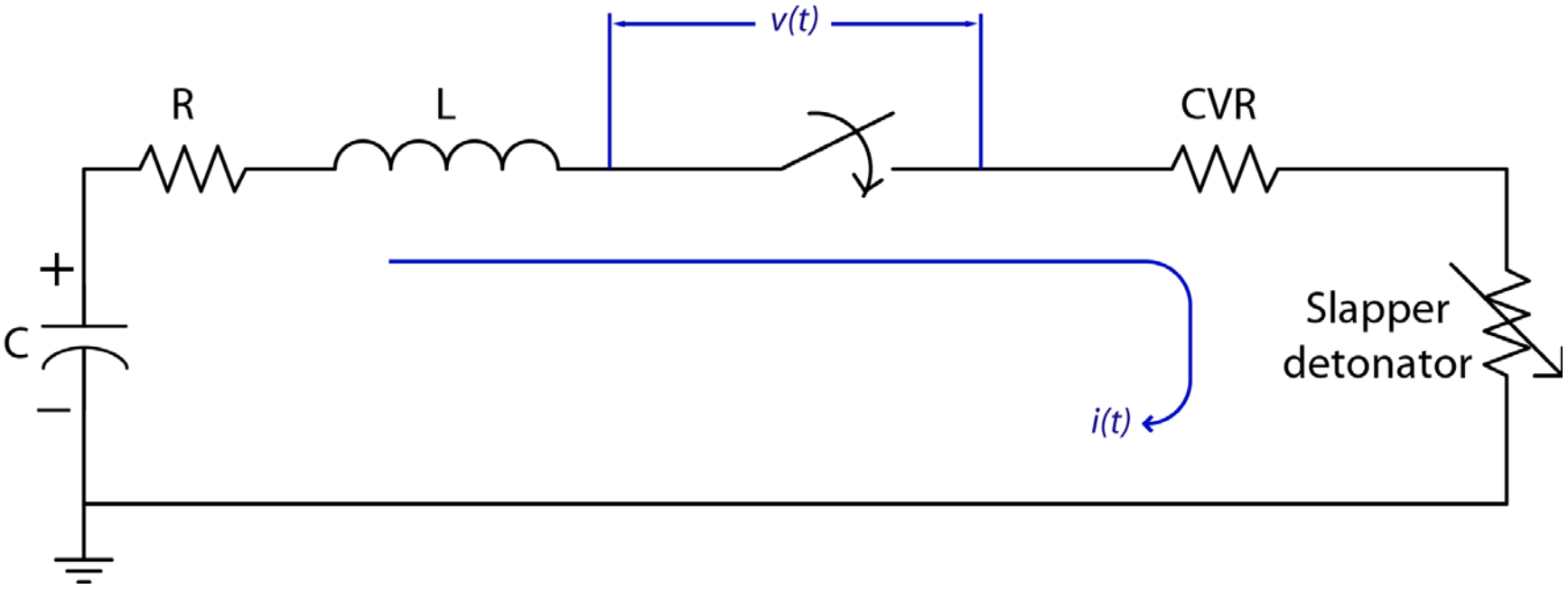
Illustration and photograph of a parylene high voltage switch after packaging.



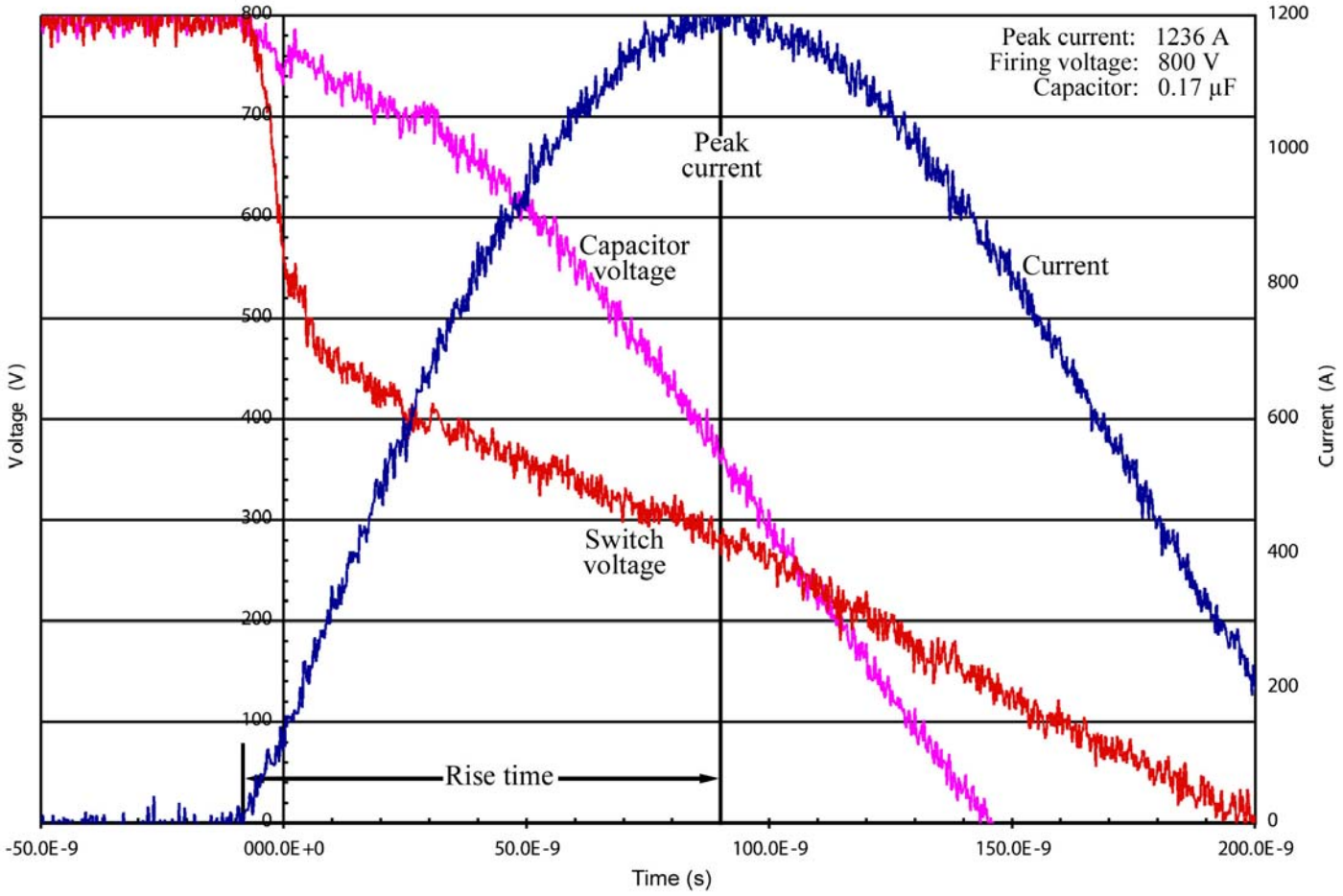
Single Schottky diode after wafer dicing.



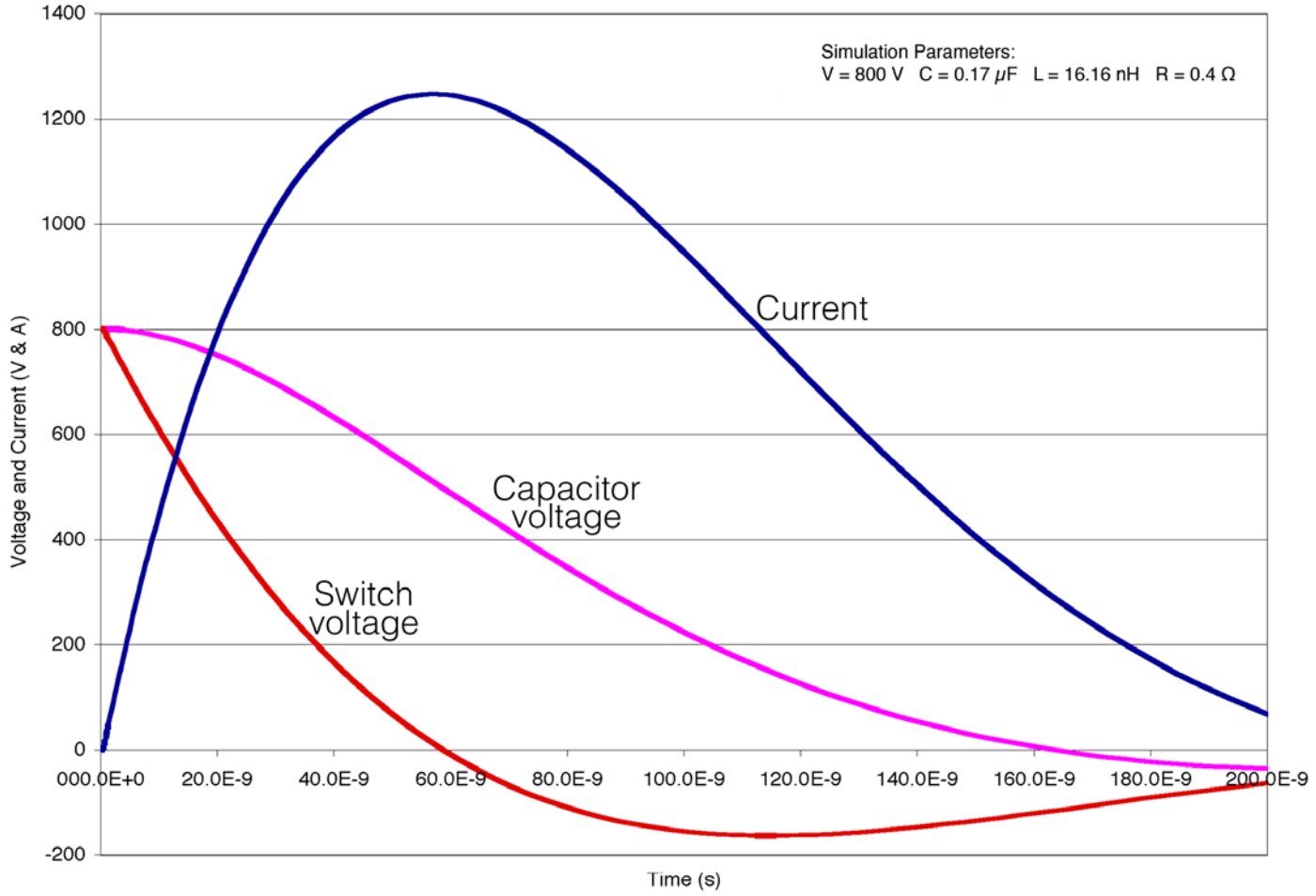
Schematic representation of fireset



High voltage switch firing data.



PSPICE Simulation of the fireset circuit



Conclusion

A novel one-shot switch has been introduced.

The structure is simple to construct using standard microelectronic processing techniques.

The device is easily integrated into flat stripline geometries

Device successfully functioned slapper with HNSIV