



Southern Illinois University System

### Applications

- Integrated circuit design
- Complex threshold logic circuits
- Circuit design software

### Inventor(s)

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## Bi-Stable Device with Negative Delay

Bi-stable devices are used routinely in electrical and optical circuits to reduce signal noise. Such devices are typically hysteretic, meaning they require an electrical or optical signal to exceed a given threshold level before switching from one output level to another. This post-threshold switching requires redundant traversal of a given signal (see figure below), leading to intrinsic time delays that limit the modulation rates of conventional bi-stable devices.

### Invention

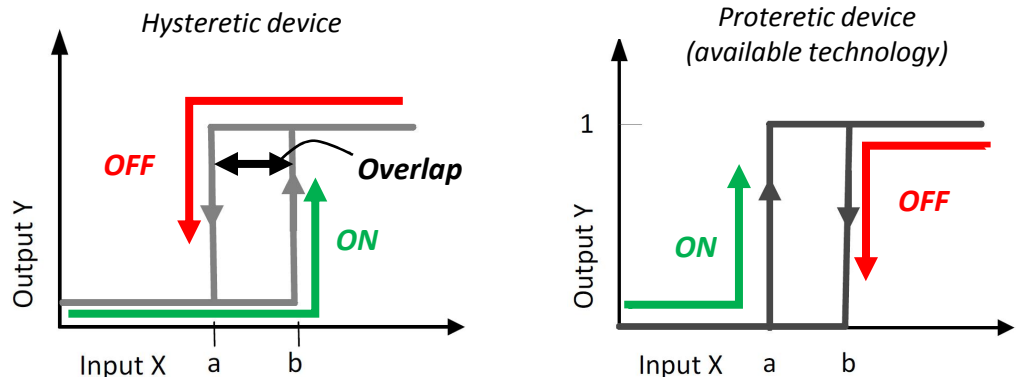
SIU researchers have developed a proteretic bi-stable device for electronic and photonic integrated circuits that utilizes proteresis—that is, reversed hysteresis—to reduce switching-induced latency. Instead of switching after a given threshold has been exceeded, the proteretic device switches prior to reaching a threshold value to reduce feedback delay. This device has been simulated via VPIphotonics™ and implemented in a proof-of-concept device.

### Key Advantages

- Improves electrical and optical switching speed for particular applicability in sub-nanosecond applications
- Maintains noise immunity
- Increases oscillation rate without increasing integration speed
- Can eliminate unwanted hysteretic (memory) behavior

### Status

U.S. patent #9,806,697 issued October 31, 2017. The technology is available for license.



*Other opportunities related to this technology, included but not limited to sponsored and/or collaborative research, may be available. Please reach out to the designated contact identified at left for more information.*