

Self-Protecting Electronic Circuit: self-destructing electronics

Technology marketing summary:

Electronic circuits often contain proprietary, confidential or otherwise sensitive information within the structure, circuitry, layout, design and/or data stored in the memory of the electronic circuit. Current technologies to protect the information on electronic circuits fail to completely protect the circuitry and may be removable by skilled adversaries. Adding energetic material to the electronic circuit would provide an effective means for destruction of the circuit, protecting proprietary information from falling into the wrong hands.

Circuitry to detonate energetic materials is traditionally a separate fireset device, which adds weight and takes up

valuable space. Incorporating initiation circuitry directly onto energetic material would alleviate these concerns, and make the energetic material essentially self-command-initiating.

Researchers at Idaho National Laboratory have designed the patent-pending Self-protecting Electronic Circuit, which contains initiation circuitry integrated into an energetic substrate. Igniting the energetic component of the circuit would result in burning, melting and/or shattering the circuit. This ensures the circuit could not be repaired, data could not be recovered, the circuit could not be reverse engineered, and the original form could not be deciphered, repaired or replicated. And because the energetic material

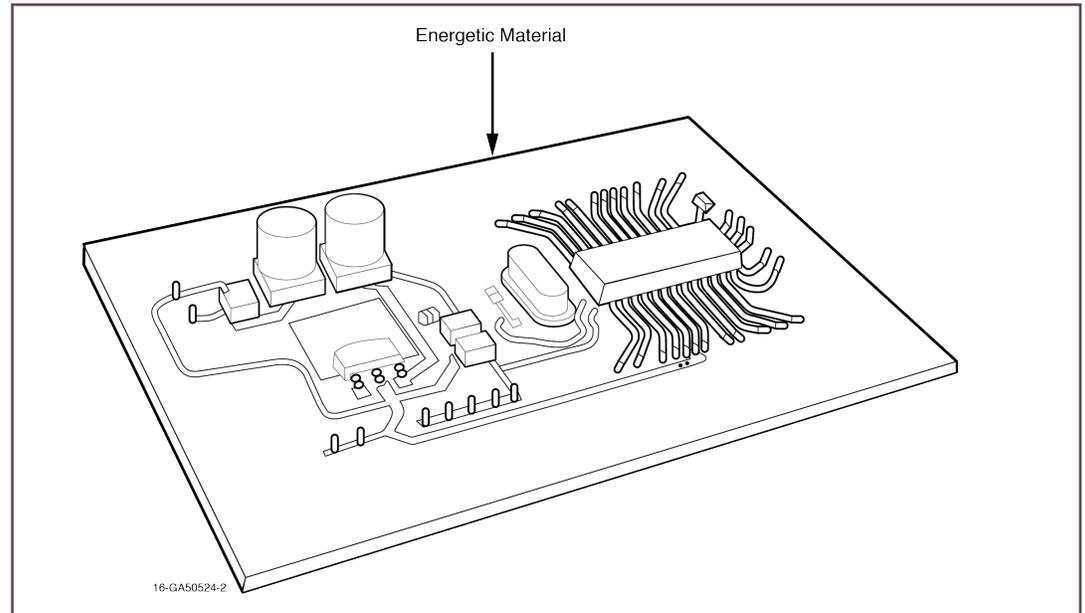
would be part of the substrate, it could not be removed without destroying the circuit.

Technology description:

INL investigators have developed a patented method of combining energetic materials with binders to make flexible energetic substrates that are inert to electrostatic discharge and consistently deliver required localized energy when ignited. Building on this energetic substrate, the Self-protecting Electronic Circuit would place traces and electronic components directly upon these energetic substrates, allowing initiation circuitry to be integrated into the energetic material for fewer components, easier packaging and less parasitic mass.

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**Figure 1: Energetic Materials****For more information**

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Self-protecting Electronic Circuits could be tailored according to application. For instance, a variety of methods may be used for plating traces and attaching surface components onto the substrate. Initiation may be triggered by a variety of devices, such as a blasting cap, bridge wire, fuse, laser ordnance initiator, or an electric voltage or current signal received from the circuit. Initiation may be triggered locally or remotely via Wi-Fi signal, radio signal, cellular telephone signal, Bluetooth signal, optical signal, etc. Built-in ignition triggers such as geofencing components set to initiate if the circuit enters or leaves a specific area, or sensors that detect when the circuit is

removed from a computer or other device, could also be employed. A back plate could be used to direct energy and heat to ensure full destruction.

Self-protecting Electronic Circuits could be used as a component in explosive devices designed for demolition or other functions requiring directed explosive energy. Devices incorporating Self-protecting Electronic Circuits would be less complex and more reliable because potential failure points would be reduced by the direct application of circuitry to the explosive device. And such devices would be more resistant to tampering.

Technology benefits:

- Complete destruction of proprietary information if possession of a device is compromised
- Firesets fully integrated into energetic materials
- Flexible design – can be tailored to need
- Easier packaging, less parasitic mass

Applications:

Personal electronics, unmanned aerial vehicles (computer); explosive devices; defense, oil and gas industries