



Sandia  
National  
Laboratories

# TWO-SENSOR SYSTEM FOR ABSOLUTE AGE AND TEMPERATURE HISTORY

SAND2013-8590P



**TECHNOLOGY READINESS LEVEL: 3**

**BASIC CONCEPTS HAVE BEEN DEMONSTRATED ANALYTICALLY**

**US PATENT PENDING**

## TECHNOLOGY SUMMARY

Numerous commercial and military applications require knowing the absolute age and/or temperature history of a device or system starting from the time it is assembled or commissioned. Ideally this information could be obtained simply and without power. The Sandia-developed age and temperature history sensor is a physical materials system solution to address this need.

Sandia's passive sensor is based on diffusion of one metal into another, or into a semiconductor, as a function of time and temperature. This new technology leverages two similar sensors with different activation energies, as illustrated in Figure 1. Sensors can be conductive, capacitive, optical, visual or crystalline. Devices can be created using standard metal deposition techniques on common semiconductor and micro-device substrates, including sputter coating, chemical vapor deposition and electrochemical methods.

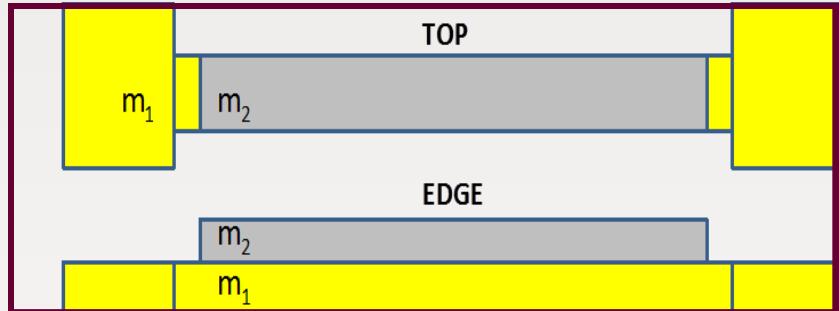


Figure 1. Schematic of Two-Component Age Sensor.

### Examples:

M<sub>1</sub>=gold

M<sub>2</sub>=tungsten

M<sub>1</sub>=silicon

M<sub>2</sub>=copper

### POTENTIAL APPLICATIONS

Removal/Replacement of Systems Exposed to Extreme Environments

Verification/Invalidation of Warranty Claims

### TECHNOLOGICAL BENEFITS

Does not require power during the aging period

Can determine absolute age independently of temperature history

Suitable for emplacement on circuit boards

### TECHNOLOGY INQUIRY?

For more information or licensing opportunities contact us at

[ip@sandia.gov](mailto:ip@sandia.gov)

Refer to SD # 11622

or visit

<https://ip.sandia.gov>



Sandia National Laboratories is a multi-program laboratory managed and operated by Sandia Corporation, a wholly owned subsidiary of Lockheed Martin Corporation, for the U.S. Department of Energy's National Nuclear Security Administration. SAND # xxxx-xxxx

