In 2013, the US economy incurred $215B in damages from counterfeiting and piracy. Since then, it has been growing relentlessly, stifling innovation and revenues. A wide-range of counterfeited integrated circuits (ICs) exist but current detection systems can only distinguish one type. Therefore, an all-inclusive, yet cost-efficient, detection solution is needed to lower the detrimental impacts of counterfeiting and piracy.

**Brief Description:**
UCR researchers have developed an innovative multifunctional on-chip sensor for comprehensive detection of counterfeited ICs. Their original on-chip invention could measure usage age via electromigration, but they have improved upon the accuracy of this readout by implementing antifuse memory block and combining two aging sensors: RO-based and EM-based. To enhance security even further, they applied corresponding post-fabrication methods of registering ICs with unique IDs so that activation can only occur once matched up to the ID embedded in the antifuse memory component.

**Advantages:**
- Detects the following types of counterfeited chips: remarked, recycled, out-of-spec, cloned, overproduced
- Incorporates antifuse memory block – stores unique chip ID, time stamp of activation, and other chip assets, encrypted against tampering
- Enhances usage time estimation range and accuracy by combining 2 types of sensors – differentiates between short-term and long-term aging effects

**Applications:**
- Central on-chip security hardware IP
- On-chip timer
- Post-fabrication authentication/activation module for ICs

**Keywords:**
integrated circuits, IC, counterfeited IC, piracy, electromigration, aging sensors, antifuse memory, RO-based, EM-based, chip ID, chip identification, encryption, recycled chips, remarked chips, cloned chips, overproduced chips, chip authentication, on-chip security hardware IP, on-chip timer, post-fabrication authentication, chip activation

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