An Implantable Release-on-Demand CMOS Drug Delivery SoC Using Electrothermal Activation Technique

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An implantable system-on-a-chip (SoC) integrating controller/actuation circuitry and 8 individually addressable drug reservoirs is proposed for on-demand drug delivery. It is implemented by standard 0.35-μm CMOS technology and post-IC processing. The post-IC processing includes deposition of metallic membranes (200Å Pt/3000Å Ti/200Å Pt) to cap the drug reservoirs, deep dry etching to carve drug reservoirs in silicon as drug containers, and PDMS layer bonding to enlarge the drug storage. Based on electrothermal activation technique, drug releases can be precisely controlled by wireless signals. The wireless controller/actuation circuits including on-off keying (OOK) receiver, microcontroller unit, clock generator, power-on-reset circuit, and switch array are integrated on the same chip, providing patients the ability of remote drug activation and noninvasive therapy modification. Implanted by minimally invasive surgery, this SoC can be used for the precise drug dosing of localized treatment, such as the cancer therapy, or the immediate medication to some emergent diseases, such as heart attack. In vitro experimental results show that the reservoir content can be released successfully through the rupture of the membrane which is appointed by received wireless commands.

Categories and Subject Descriptors: B.7.m [**Integrated Circuits**]: Miscellaneous

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Additional Key Words and Phrases: Biocompatibility, CMOS SoC, drug delivery, electrothermal, implantable, post-IC

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