Neuro-stimulus chip with telemetry unit for retinal prosthetic device

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Abstract: In this retinal prosthesis project, a rehabilitative device is designed to replace the functionality of defective photoreceptors in patients suffering from retinitis pigmentosa (RP) and age-related macular degeneration (AMD). The device consists of an extraocular and an intraocular unit. The implantable component receives power and a data signal via a telemetric inductive link between the two units. The extraocular unit includes a video camera and video processing board, a telemetry protocol encoder chip, and an RF amplifier and primary coil. The intraocular unit consists of a secondary coil, a rectifier and regulator, a retinal chip with a telemetry protocol decoder, a stimulus signal generator, and an electrode array. This paper focuses on the design, fabrication, and testing of a microchip which serves as the telemetry protocol decoder and stimulus signal generator. It is fabricated by MOSIS with 1.2-mm CMOS technology and was demonstrated to provide the desired biphasic current stimulus pulses for an array of 100 retinal electrodes at video frame rates.

Index Keywords: CMOS integrated circuits; Electronic equipment testing; Integrated circuit layout; Integrated circuit testing; Microelectrodes; Photodetectors; Prosthetics; Signal generators; Telemetering equipment; Age related macular degeneration; Biomedical telemetry; Neuro stimulus chip; Photoreceptors; Retinal prosthetic device; Retinitis pigmentosa; Telemetry protocol decoder; Microprocessor chips

Year: 2000
Source title: IEEE Journal of Solid-State Circuits
Volume: 35
Issue: 10
Page: 1487-1497
Cited by: 179
Link: Scopus Link
Correspondence Address: Liu, Wentai; North Carolina State Univ, Raleigh, United States
Publisher: IEEE, Piscataway, NJ, United States
Document Type: Article
Source: Scopus

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