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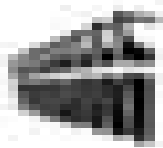
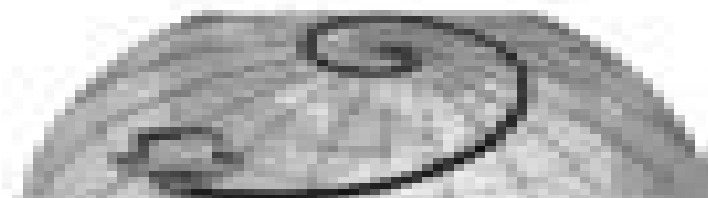
## Optical detection using four-layer semiconductor structures

Moore, David A.

Master's Thesis, Naval Postgraduate School

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# Optical Detection Using Four Layer Semiconductor Structures

**M Lipman**



## **Optical Detection Using Four Layer Semiconductor Structures:**

**Optical Detection Using Four-Layer Semiconductor Structures** ,2005 The application of a thyristor a four layer P1 N1 P2 N2 semiconductor structure as an optical detector is explored Based on laboratory experiments which demonstrated that this device produces a pulse mode output to incident light the thyristor is investigated by comparing the existing theory of static forward biased operation to simulation results obtained using ATLAS by Silvaco Inc The results include identification of the holding point on the IV curve by simulating the junction potential across each junction as a function of current and demonstration that impact ionization is not a critical factor in thyristor operation A series of simulations were performed which show that the thyristor can be optimized for use as a detector by decreasing the emitter efficiencies by decreasing the doping in the P1 and N2 layers or by increasing the doping in the P2 layer the switching voltage can be controlled by selecting the doping and thickness of the N1 layer A detector device was designed to allow further testing of the thyristor detector using the ABN CMOS process from AMI Semiconductor via the MOSIS service The design of this device is discussed and simulated IV curves are presented **Official Gazette of the United States Patent and Trademark Office** United States. Patent and Trademark Office,2001 Scientific and Technical Aerospace Reports ,1970 **Optics Letters** ,2008

**Publications of the National Institute of Standards and Technology ... Catalog** National Institute of Standards and Technology (U.S.),National Institute of Standards and Technology (U.S.). Information Resources and Services Division,1994

**Chemical Abstracts** ,2002 **Journal of the Optical Society of America** ,1986 Second Order Non-linear Optics of Silicon and Silicon Nanostructures O. A. Aktsipetrov,I. M. Baranova,K. N. Evtyukhov,2018-09-03 The theory and practice of the non linear optics of silicon are inextricably linked with a variety of areas of solid state physics particularly semiconductor physics However the current literature linking these fields is scattered across various sources and is lacking in depth Second Order Non linear Optics of Silicon and Silicon Nanostructures describes the physical properties of silicon as they apply to non linear optics while also covering details of the physics of semiconductors The book contains six chapters that focus on The physical properties and linear optics of silicon Basic theoretical concepts of reflected second harmonics RSH The authors theory of the generation of RSH at the non linear medium linear medium interface An analytical review of work on the non linear optics of silicon The results of non linear optical studies of silicon nanostructures A theory of photoinduced electronic processes in semiconductors and their influence on RSH generation The book also includes methodological problems and a significant amount of reference data It not only reflects the current state of research but also provides a single thorough source of introductory information for those who are becoming familiar with non linear optics Second Order Non linear Optics of Silicon and Silicon Nanostructures is a valuable contribution to the fields of non linear optics semiconductor physics and microelectronics as well as a useful resource for a wide range of readers from undergraduates to researchers

**Canadian Journal of Physics** ,1988 *Semiconductors* ,2006 Pulse Mode Light Sensing Using Four-layer

Semiconductor Structures and Their Application in Neural Networks Ioannis Siganos,2008 Existing semiconductor photodetectors produce a steady current or voltage output in response to incident light that depends on the intensity of the light beam In contrast biological vision systems produce a stream of pulses with pulse rate representing the amount of incident light power The goal of this thesis is to explore the use of a four layer PNP semiconductor structure as an optical detector that produces pulses instead of steady current or voltage output The first task of this thesis is to show that the pulse interval distribution is dependent on the intensity of the incident light beam and that the distribution of pulse intervals is described by a renewal process statistical model The second task of this thesis is to use the unique characteristics of the pulse generating circuit along with a neural network to construct a 2D sensor array capable of recognizing visual patterns and thus modeling to some extent the human visual cortex

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