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NASA TECH BRIEF

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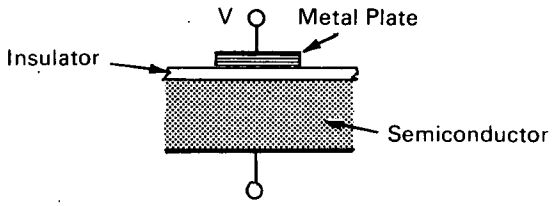
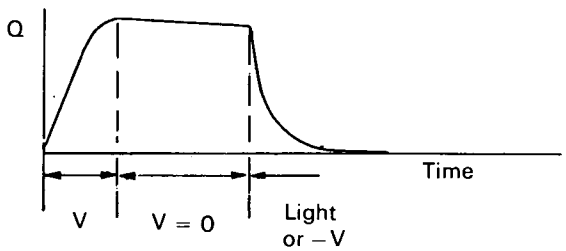
Improved Solid State Electron-Charge-Storage Device





A simple solid state charge-storage device that has been designed should find advantageous application in memory systems and in high-resolution arrays for light-responsive image sensing. The device can be fabricated without the use of diffusion techniques and offers high yield in multiple arrays. It allows charge release with light striking only the edge of a metal electrode, without penetrating to the interface of an insulator. This unique property simplifies electrical contacting. The device is charged by applying a voltage pulse, and discharged by exposure to light or by a voltage pulse of opposite polarity.

As shown in the sketch, the storage device consists of a semiconductor (e.g., n-type silicon) and a metal plate, with an insulator sandwiched between the two components. The semiconductor must have suitable electronic states on its surface, and the insulator must be thin and of high resistivity. When positive charging voltage, V, is applied to the sandwich, electrons are drawn to the surface of n-type silicon (an opposite argument may be used for p-type silicon) and the semiconductor surface states acquire a charge Q. After the charging voltage is turned off (V = 0), the surface states retain their electrons. These electrons are in a metastable state and will discharge when exposed to light or when a suitable −V pulse is applied. Discharge of the unit can be sensed by measuring the current in an external circuit; the current is determined by the amount of charge stored during the application of charging voltage.

Note:

The following documentation may be obtained from:

Clearinghouse for Federal Scientific and Technical Information
Springfield, Virginia 22151
Single document price $3.00
(or microfiche $0.65)

Reference: NASA CR-90046 (N68-10098), Impurities and Interface States in the SiO_2/Si System

Patent status:

Inquiries about obtaining rights for the commercial use of this invention may be made to NASA, Code GP, Washington, D.C. 20546.

Source: A. B. Kuper of
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