

# Charge coupled device theory



## Overview

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A charge-coupled device (CCD) is an integrated circuit containing an array of linked, or coupled, capacitors. CCD sensors are a major technology used in digital. Boyle and George E. In 1970, Boyle and Smith submit-  
ted a paper on their invention of the CCD to the Bell System Technical Journal. Under the control of an external circuit, each capacitor can transfer its electric charge to a neighboring capacitor.

## Charge coupled device theory

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### **An overview of the theory and operation, fabrication, and application**

An overview of the theory and operation, fabrication, and application of charge-coupled devices

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### **Charge-coupled device**

Summary Overview History Basics of operation Detailed physics of operation Architecture Use in astronomy Color cameras

A charge-coupled device (CCD) is an integrated circuit containing an array of linked, or coupled, capacitors. Under the control of an external circuit, each capacitor can transfer its electric charge to a neighboring capacitor. CCD sensors are a major technology used in digital imaging.



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### **Basics of Charge Coupled Devices**

Charge is held by voltage potential until end of integration, then shifted, one pixel at a time, row by row to output. Large CCDs move charge through thousands of pixels (c.f., CTE, multiple

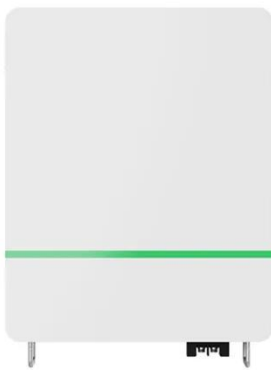
amplifiers)



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## FUNDAMENTALS OF CHARGE-COUPLED DEVICES

The basics of charge-coupled devices - the storage of charge carriers on the capacitor and the charge transfer or transport - are subjects discussed in this chapter.



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## Understanding the Structure and Functionality of CCDs

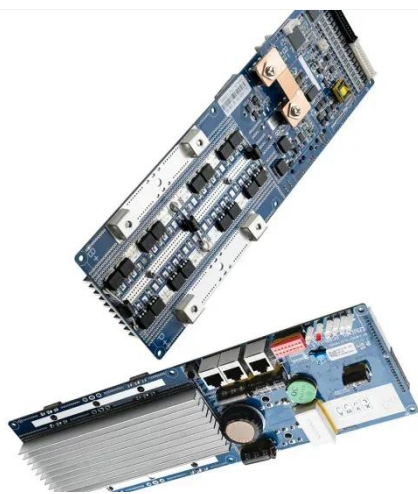
"CCD" stands for "charge-coupled device." A CCD is an integrated semiconductor system that converts photons into electrons and then moves these light-generated packets of electric ...

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## Hamamatsu Learning Center: Anatomy of a Charge-Coupled Device

Charge-coupled devices (CCDs) are silicon-based integrated circuits

consisting of a dense matrix of photodiodes that operate by converting light energy in the form of photons into an electronic charge.



### Anatomy of a Charge-Coupled Device

Explore the steps utilized in the construction of a charge-coupled device (CCD) as a portion of an individual pixel gate is fabricated on a silicon wafer simultaneously with thousands or even millions of ...

### Lecture Notes 2 Charge-Coupled Devices (CCDs) { Part I

Charge-Coupled Devices  
 Basic 4-Phase CCD  
 Frame Transfer CCD Image Sensor  
 Interline Transfer CCD Image Sensor  
 Frame Transfer Versus Interline Transfer  
 Buried Channel CCD Static Characteristics  
 Charge Transfer in CCD  
 Self-Induced Drift Thermal Disruption  
 Charge Transfer Advantage of BCCD  
 Transfer Efficiency Analysis  
 $n + 2Cox q$   
 CCD is a dynamic analog (charge) shift register  
 It consists of a series of MOS capacitors coupled with one another  
 CCD is clocked, and all operations are in transient mode  
 Charge



is coupled from one gate to the next gate by fringing electric potential and carrier density gradient. We first discuss CCD operation using different clocking methods, then see more on [isl.stanford.edu](http://isl.stanford.edu) Springer [PDF]

## FUNDAMENTALS OF CHARGE-COUPLED DEVICES - Springer

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### How a Charge Coupled Device (CCD) Image Sensor Works

A charge coupled device is a highly sensitive photon detector. The CCD is divided up into a large number of light-sensitive small areas (known as pixels) which can be used to build up an ...

### Lecture Notes 2 Charge-Coupled Devices (CCDs) { Part I

We need to relate the CCD gate voltage to the surface potential when there is depletion charge and mobile charge ( $Q_s$  in electrons/cm<sup>2</sup>) under the gate (MOS capacitor)



## Charge-Coupled Devices (CCDs) Explained: Working Principle

Discover the inner workings of Charge-Coupled Devices (CCDs) in digital imaging. Learn about CCD architecture, working principles, advantages, and applications in photography, ...



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