



# CMOS Image Sensor with Adaptive Frame Rate and High Dynamic Range

**IP Status:** US Patents Issued: [8,089,522](#) and [8,619,168](#)

## Photographing Fast Moving Images

The CMOS image sensor technology with adaptive frame rate and high dynamic range enables sharp imaging of fast-moving objects as well as improved dynamic range in cameras. The technology results in twice the dynamic range of comparable CMOS chips and allows the photographing of fast moving images.

## High Dynamic Range

The high dynamic range (HDR) is obtained by a combination of in-pixel memory and integration time control. High-illumination pixels are softened by reducing the exposure time of the pixel. This is expressed as analog voltage. Neighboring pixels are then grouped with the saturated pixel in order to reduce the storage requirements. Therefore, the technology can utilize existing capacitors to regulate noise and store image charges. The upgrade cost is low because existing and proven CMOS chips are altered to achieve an improved ability to capture bright and low light conditions and reduce blur in motion captures. The images are on par with charge-coupled device (CCD) chips but are priced at a lower cost.

**Technology ID**

z07093-z08040

## Category

Engineering & Physical Sciences/Design Specifications  
Engineering & Physical Sciences/Instrumentation,  
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Engineering & Physical Sciences/Semiconductor

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## Adaptive Frame Rate

Conventionally, motion detection was done by comparing the frame difference. The frame difference is the difference between the current frame and the previous frame is a good indication of motion. An adaptive frame rate automatically adjusts the frame rate as the image is being recorded to capture fast moving images. This motion detection can be performed without additional circuitry.

## Applications in HDR Cameras, Surveillance Systems and Medical Imaging

CMOS image sensors can be used in many large markets, for example, in HDR cameras, high speed cameras, surveillance camera systems, medical imaging, driver assistance systems, and camera phones.

**BENEFITS AND FEATURES OF CMOS IMAGE SENSOR WITH ADAPTIVE FRAME RATE AND HIGH DYNAMIC RANGE CONTROL:**

- CMOS image sensors with dynamic ranges of 140 dB as opposed to current CMOS chips with dynamic ranges of 60-70 dB
- Motion compensation using an adaptive frame rate allows the CMOS image sensor to be used for less blurry pictures while in motion
- Upgrade is low cost and requires minimal additional power
- Uses existing capacitors to both regulate noise and store image charges in order to provide dynamic ranges for HDR cameras
- CMOS chips using high dynamic range and adaptive frame rate produces images on par with CCD chips at a lower cost

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