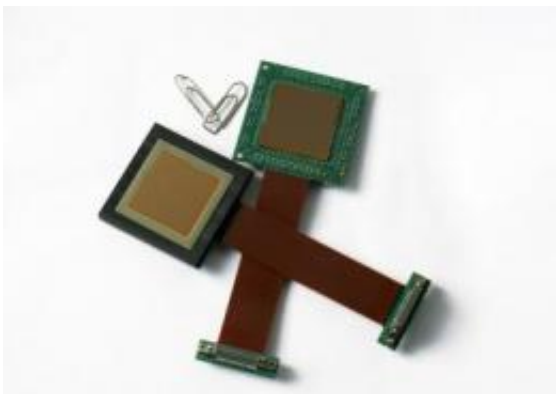


# Image sensors for extreme temperatures

September 20 2010

---



The CMOS sensor can be connected directly to an electronic image intensifier.  
Credit: Fraunhofer IMS

Image sensors which are used as electronic parking aids in cars or for quality control in production systems have to be able to withstand the often very high temperatures that prevail in these environments. Research scientists have produced a CMOS chip which functions even at a temperature of 115 degrees Celsius.

More and more car manufacturers are equipping their vehicles with image sensors - e.g. to register the presence of pedestrians or vehicles in the blind spot or to detect obstacles when parking. The sensors must be able to function in extremely [high temperatures](#) and in blazing sunlight. If they are installed behind the rear view mirror or on the instrument panel, for example, they can get very hot. The Fraunhofer Institute for Microelectronic Circuits and Systems IMS in Duisburg has developed a

CMOS ([complementary metal oxide semiconductor](#)) [image sensor](#) for an industrial customer which can withstand temperatures ranging from -40 to +115 degrees Celsius. The CCD (charged coupled device) image sensors available up to now fail when the temperature goes beyond about 60 degrees. "Our chip is not only heat-resistant, it even functions at arctic temperatures," says Werner Brockherde, head of department at the IMS.

The research scientists have succeeded in developing pixels which exhibit an extremely low dark current. This reduction of residual current, which flows in complete darkness, makes it possible to capture very high-quality images even in [extreme heat](#). »It was not easy to achieve a low dark current. An increase in temperature of just eight degrees doubles the dark current, resulting in image noise and reduced dynamics. Ghosting occurs in the form of artifacts or fuzziness and degrades the image,« explains Brockherde.

A further special feature of the sensor is its image size of 2.5 x 2.5 centimeters. This offers the advantage that for special applications with weak illumination or for capturing images in the infrared or UV range the sensor can be connected directly to an electronic image intensifier. The sensor has a resolution of 256 x 256 pixels. Its high dynamic range or exposure latitude of 90 decibels provides increased contrast and optimized detail accuracy both in shadow as well as in very bright areas. Nuances of light are precisely reproduced. Thanks to its efficient light absorption, the image sensor reacts with high sensitivity even in weak light conditions. It is therefore also suitable for night vision equipment. What's more, the chip supports cameras with synchronous as well as asynchronous shutters. The synchronous shutter prevents motion artifacts, for instance when recording rapid movements, reducing movement fuzziness. The rolling shutter permits a higher image frame rate and continuous image recording. The effect of this is to minimize image noise.

"We produced the sensor in a standard process using 0.5 micrometer CMOS technology in our own semiconductor factory. We also produce special components here for industrial customers," states the scientist, reflecting the expertise of the Institute. In addition to the automotive sector he can see further potential markets: "Our chip is suitable for deployment in chemical and steel production facilities, where it can be used for process and quality control. Very high temperatures prevail, for example, in rolling mills where sheet metal is produced."

The CMOS image sensor will be on show at the Vision trade fair from November 9 to 11, 2010, in Stuttgart (Stand 6 D12).

Provided by Fraunhofer-Gesellschaft

Citation: Image sensors for extreme temperatures (2010, September 20) retrieved 12 May 2024 from <https://phys.org/news/2010-09-image-sensors-extreme-temperatures.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.