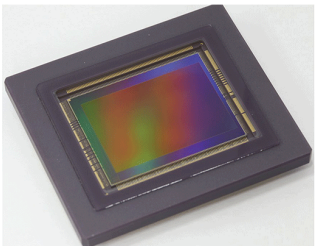
PROSTECH
Specialty materials and manufacturing solutions

EMI Shielding for Camera Module

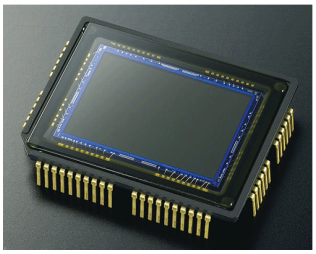
For crystal-clear memories

About Image Sensor

Digital image sensing based upon solid state technology is known. The two most common types of image sensors currently may be charge coupled devices (CCDs) and complementary metal oxide semiconductor (CMOS) image sensors. Digital image sensors may be incorporated within a wide variety of devices throughout the consumer, industrial, defence, and other sectors.



Charge Coupled Devices (CCDs)



Complementary Metal Oxide Semiconductor (CMOS)

Configuration

An image sensor is a device that may comprise one or more radiation sensitive elements having an electrical property that changes when radiation is incident upon them, together with circuitry for converting the changed electrical property into a signal. As an example, an image sensor may comprise a photodetector that generates a charge when radiation is incident upon it. The photodetector may be sensitive to electromagnetic radiation in the range of (human) visible wave lengths, or other neighboring wavelength ranges, such as, infra-red or ultra-violet, for example. Circuitry may be provided that collects and carries the charge from the radiation sensitive element for conversion to a value representing the intensity of incident radiation. Typically, more than one radiation sensitive element may be provided in an array.

The term pixel is used as a shorthand for picture element. In the context of a digital image sensor, a pixel may refer to that portion of the image sensor that contributes one value representative of the radiation intensity at that point on the array. These pixel values may be combined to reproduce a scene that is to be imaged by the sensor. A plurality of pixel values may be referred to collectively as image data. Pixels may usually be formed on and/or within a semiconductor Substrate. In fact, the radiation sensitive element may comprise only apart of the pixel and only part of the pixels surface area (the proportion of the pixel area that the radiation sensitive element takes up may be known as the fill factor). Other parts of the pixel may be taken up by metallization, such as, transistorgates and so on.

Other image sensor components, such as readout electronics, analog-to-digital conversion circuitry, and so on, may be provided at least partially as part of each pixel, depending on the pixel architecture. A digital image sensor may be formed on and/or within a semiconductor substrate, for example, silicone.

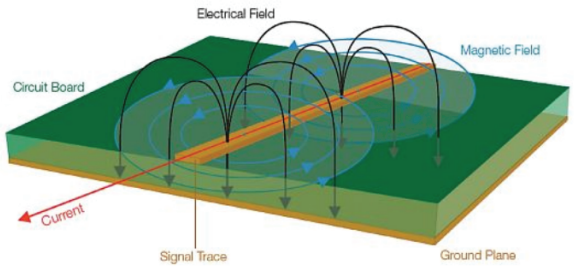
The sensor die may be connected to or form an integral subsection of a printed circuit board (PCB). A camera module may be a packaged assembly that may comprise a substrate, an image sensor, and a housing.

The housing may comprise optical components, for example, one or more lenses. Camera modules of this type may be provided in various shapes and sizes for use with different types of devices, for example, mobile telephones, webcams, and optical mice, to name but a few. Various other elements may be included as part of the module, for example, infra-red filters, lens actuators, and so on.

The substrate of the module may also comprise further circuitry for read-out of the image data and for post processing, depending upon the chosen implementation. For example, in System on a chip (SoC) implementations, various image post processing functions may be carried out on a PCB substrate that forms part of the camera module. Alternatively, a co-processor may be provided as a dedicated circuit com ponent for separate connection to and operation with the camera module.

Electromagnetic Interference (EMI) Problem

Electronic devices may be sensitive to electromagnetic fields. The effect is known as electromagnetic interference (EMI). Unwanted electromagnetic fields can interfere with the correct operation of the electronic devices. As well as being sensitive to EMI, electronic devices can also generate EMI that can degrade the performance of the devices them selves, or of other electronic components. It may be desirable for electronic devices that they are electromagnetically compatible for use in the specific environment for which they are designed.



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EMI Shielding Tape for Camera Module

Electromagnetic compatibility may be referred to as EMC. In general, unwanted EMI may be dealt with in two ways: either by electrical or circuit level modifications, or by physical shielding. Of course a combination of both types may be used for a particular device as appropriate.

Electrical techniques for dealing with EMI emissions from a device may include modifying the timing of clock signals by frequency modulation so that spectral density is reduced. This may not reduce the overall energy of the emitted EMI, but it may reduce unwanted peaks, which would block frequency chan nels for data communication or other purposes.

At the circuit level, the length of path that may act to transmit or receive EMI can be reduced. It may also be possible to introduce lossy components and relatively low impedance paths to a ground to suppress noise. Physical techniques may predominantly use shielding in the form of conductive layers or ground planes. Shields may act to absorb EMI or to reflect it, depending on the type and quantity of material that is used. Existing shielding approaches for camera modules may include a metal can, electroplating, or conductive paint.

All of these techniques may be applied to the outside of the module. However, a metal may add significant weight and bulk to the overall assembly. The forming process for manufacturing a metal may have a relatively poor yield, and the design of components within the module, such as, lens actuators, and so on, may have to take into account the specific structure of the metal can inadvance, in the design process. The connection to ground of the metal may also present problems, as it may rely on metallized sockets, or, in the case of flexed camera modules, a more complicated grounding chain, which may have poor reliability. Electroplating is relatively expensive to apply and often requires multiple passes of a plating applicator to achieve satisfactory coating. Coated modules also bond with conductive glue or paste to maintain a conductive path to the shield ground. The electroplated coatings may be easily scratched or damaged during handling, which may result in visual defects and foreign matter causing optical occlusion or electrical shorting.

Conductive paint is relatively cheaper to apply, however, the masking of the paint may present issues, and consistent application may be difficult. Use of conductive paint may also involve an additional curing process, adding time and expense to the manufacturing process. Trends in the manufacture of electronic devices increasingly consider EMI. For example, in the mobile telephone industry, there is a relatively strong desire to increase battery life, while providing multiple functions on one device. Additionally, there is a desire to reliably receive weaker signals to maintain communications. The weaker signals and sensitive antennas mean that unwanted EMI has a greater effect on the signal quality for Voice and data calls.