Photodetector for low-profile fitness sensors

New flush-mountable photodiode for heart rate measurements

Photodiode SFH 2440 L from Osram Opto Semiconductors saves on mounting height in the design of heart rate sensors. It can be flush-mounted on the printed circuit board (PCB), with longer leads ensuring secure mounting and reliable solder points. The component also features spectral sensitivity specially designed for measuring heart rate.

Ambient light effects suppressed

SFH 2440 L is a large-area photodiode with the same optical properties as the SFH 2440. Both are particularly good at registering visible wavelengths, whereas most of the infrared light is suppressed by a filter. This sensitivity characteristic addresses a major challenge in measuring heart rate. In such applications the sensor sits directly on the skin and emits light directly into the body – green emitters are used for example on the wrist. Part of this light is reflected back to the detector in the sensor. Because blood flowing through an artery absorbs more light than the surrounding tissue the changes in the detector signal over time can be used to deduce the heart rate. However, in most cases ambient light also falls on the area of the body where the measurement is taken. It also penetrates the skin, where it is scattered, causing noise in the detector. This effect is particularly strong for infrared wavelengths.

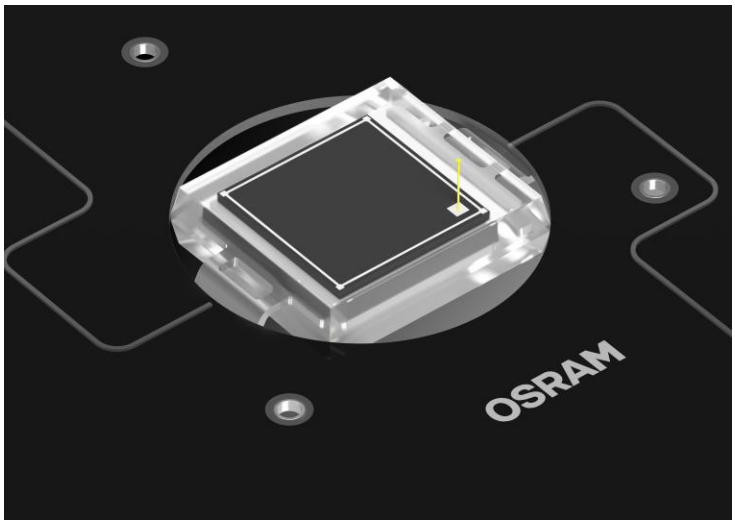
Very rapid switching times

To achieve the best possible signal-to-noise ratio the bandpass filter in the SFH 2440 and the SFH 2440 L therefore sharply cuts off wavelengths above the visible spectral range. In the infrared range the relative sensitivity is only five percent of the maximum value at 620 nanometers. At the same time, the sensitivity for green light is very high. Good signal quality can therefore be achieved for pulse measurements with green light even at a low operating current.

The photodiode offers extremely short switching times of 90 nanoseconds so that the detector signals modulated with the heart rate can be resolved with a high level of precision.

Secure mounting

The SFH 2440 L enables the height of the sensor design to be reduced by the thickness of the PCB used, because the 1.15 mm high photodiode can be installed in a cutout section. Osram supplies the component with an optimized lead frame in which the length of the leads has been increased to suit the application. This not only ensures reliable solder points but also keeps the footprint on the board as small as possible. The component can be securely mounted on the back of the board. It cannot slip through the cutout when the assembly happens within the usual placement tolerances.



Photodiode SFH 2440 L from Osram Opto Semiconductors enables fitness sensors to be made extremely thin. To save on mounting height it can be flush mounted in the board. Its spectral sensitivity – high in the green range and extremely low in the infrared range – has been designed specifically for heart rate measurements.
Picture: Osram

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