TI TechNotes

Ambient Light Sensor in Wearable Applications

Wearable equipment such as smart watches, wearable glass, and health and fitness devices are getting increasingly popular. Most wearable products are small and battery operated, so when thinking about which devices to design in the system, a small package and low power consumption are key factors. Ambient light sensors detect the ambient light around the display and adjust the backlight accordingly. This not only provides the display user with a comfortable viewing experience, but also helps to manage the power consumption of the display. For applications such as these, Texas Instruments has developed the OPT3006, the world's thinnest ambient light sensor.

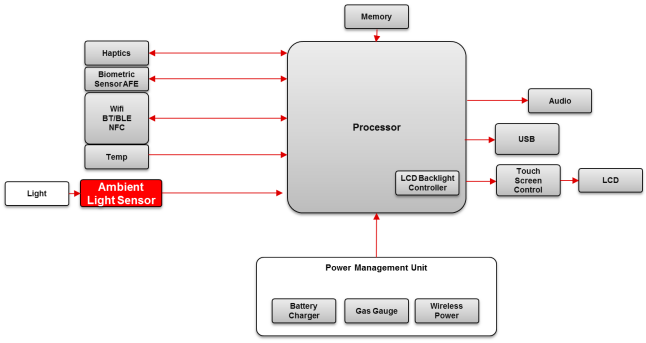

Figure 1. Smart Watch Display Block Diagram

Battery life is one of the most important features of a wearable application. Ambient light sensors (ALS) are used to measure light and control display brightness while minimizing power consumption, but if the sensor power itself is too high, then the power-saving benefit is diminished. In an example design using a 2400mAh battery, competitive ambient light sensors are at about 100µA of operating current, which translates to a battery life of just 2.6 years. The OPT3006 is at about 2uA operating current leading to a battery life of around 138 years.

Another important feature in a wearable application is size. As phones, wearables and other consumer electronics get smaller; the devices inside must scale down accordingly. Previously, ambient light sensors (ALS) were too thick to embed within a display. The OPT3006 , with a flex PCB, 200µm thickness and an ultra-small XY form factor (0.9mm x 0.8mm), can be embedded within displays.

Another problem that can occur with backlight display is the fact that light measurement changes under different light inputs. Dark glass, for example, transmits IR. The OPT300x devices have a very high IR rejection and discard most of the IR light reaching the actual sensor, measuring only what is in the visible region. The strong IR rejection also aids in maintaining high accuracy when industrial design calls for mounting the sensor under dark glass for aesthetics. The OPT3006 is designed for systems that create light-based experiences for humans, and an ideal preferred replacement for photodiodes, photoresistors, or other ambient light sensors with less human eye matching and IR rejection.

The OPT3006 is a sensor that measures the intensity of visible light and is suitable for all wearable display applications. The OPT3006 is not only the world's thinnest ambient light sensor, but the spectral response tightly matches the response of the human eye, includes significant infrared rejection, all while maintaining a long battery life. The OPT3006 maintains performance regardless of light source or application.

1 Related Documentation/ Learn More

- OPT3006 Product Folder: http://www.ti.com/product/OPT3006
- *Automatic Control of Display Backlight Using an Ambient Light Sensor with Human-Eye Response*

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