

APDS-9900 and APDS-9901

Digital Proximity and Ambient Light Sensor



Data Sheet



Description

The APDS-9900/9901 provides digital ambient light sensing (ALS), IR LED and a complete proximity detection system in a single 8 pin package. The proximity function offers plug and play detection to 100 mm (without front glass) thus eliminating the need for factory calibration of the end equipment or sub-assembly. The proximity detection feature operates well from bright sunlight to dark rooms. The wide dynamic range also allows for operation in short distance detection behind dark glass such as a cell phone. In addition, an internal state machine provides the ability to put the device into a low power mode in between ALS and proximity measurements providing very low average power consumption. The ALS provides a *photopic* response to light intensity in very low light condition or behind a dark faceplate.

The APDS-9900/9901 is particularly useful for display management with the purpose of extending battery life and providing optimum viewing in diverse lighting conditions. Display panel and keyboard backlighting can account for up to 30 to 40 percent of total platform power. The ALS features are ideal for use in notebook PCs, LCD monitors, flat-panel televisions, and cell phones.

The proximity function is targeted specifically towards near field proximity applications. In cell phones, the proximity detection can detect when the user positions the phone close to their ear. The device is fast enough to provide proximity information at a high repetition rate needed when answering a phone call. This provides both improved "green" power saving capability and the added security to lock the computer when the user is not present. The addition of the micro-optics lenses within the module, provide highly efficient transmission and reception of infrared energy which lowers overall power dissipation.

Ordering Information

Part Number	Packaging	Quantity
APDS-9900	Tape & Reel	5000 per reel
APDS-9901	Tape & Reel	5000 per reel

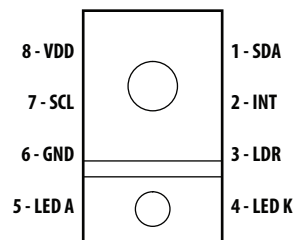
Features

ALS, IR LED and Proximity Detector in an Optical Module

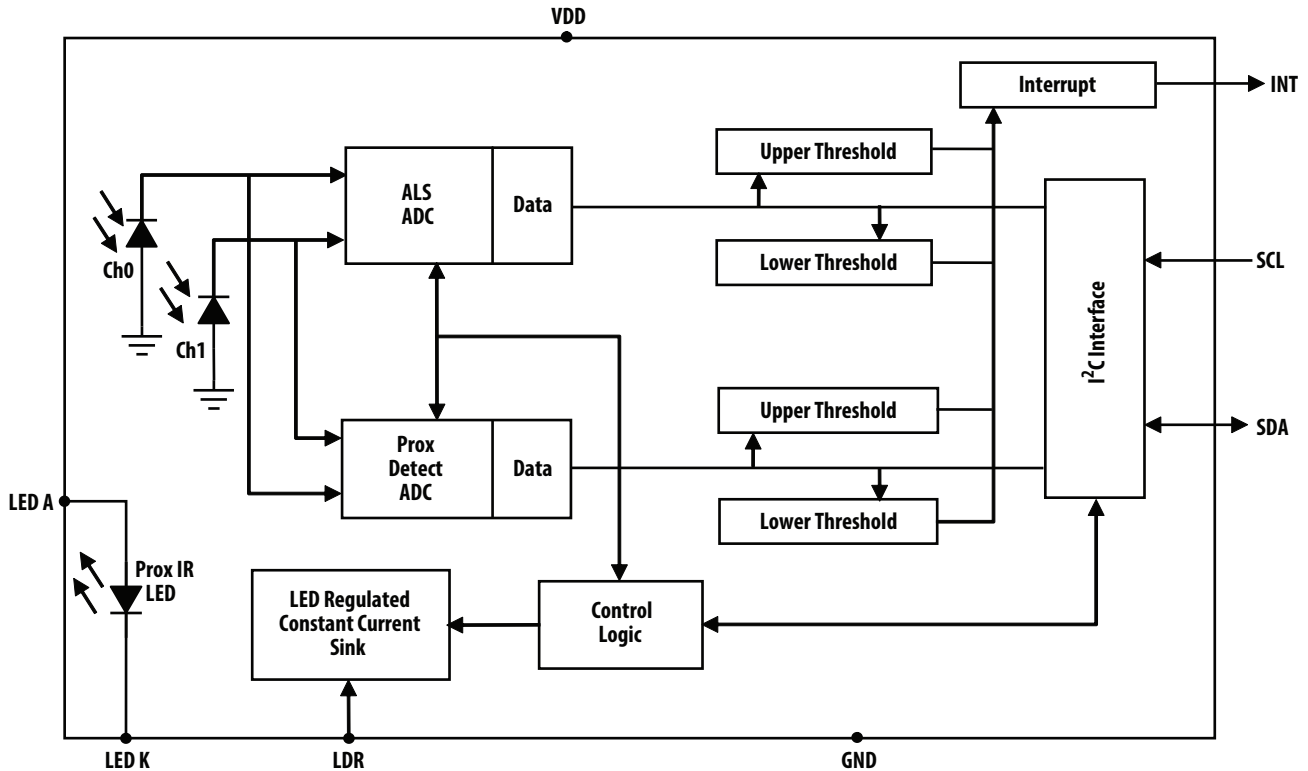
- Ambient Light Sensing (ALS)
 - Approximates Human Eye Response
 - Programmable Interrupt Function with Upper and Lower Threshold
 - Up to 16-Bit Resolution
 - High Sensitivity Operates Behind Darkened Glass
 - Up to 1,000,000:1 Dynamic Range
- Proximity Detection
 - Fully Calibrated to 100 mm Detection
 - Integrated IR LED and Synchronous LED Driver
 - Eliminates "Factory Calibration" of Prox
 - Covers a 2000:1 Dynamic Range
- Programmable Wait Timer
 - Wait State Power – 70 μ A Typical
 - Programmable from 2.72 ms to > 6 Sec
- I²C Interface Compatible
 - Up to 400 kHz (I²C Fast-Mode)
 - Dedicated Interrupt Pin
- Sleep Mode Power - 2.5 μ A Typical
- Small Package L3.94 x W2.36 x H1.35 mm

Applications

- Cell Phone Backlight Dimming
- Cell Phone Touch-screen Disable
- Notebook/Monitor Security
- Automatic Speakerphone Enable
- Automatic Menu Pop-up
- Digital Camera Eye Sensor



Functional Block Diagram



Detailed Description

The APDS-9900/9901 light-to-digital device provides on-chip Ch0 and Ch1 diodes, integrating amplifiers, ADCs, accumulators, clocks, buffers, comparators, a state machine and an I²C interface. Each device combines one Ch0 photodiode (visible plus infrared) and one Ch1 infrared-responding (IR) photodiode. Two integrating ADCs simultaneously convert the amplified photodiode currents to a digital value providing up to 16-bits of resolution. Upon completion of the conversion cycle, the conversion result is transferred to the Ch0 and CH1 data registers. This digital output can be read by a microprocessor where the illuminance (ambient light level) in Lux is derived using an empirical formula to approximate the human eye response.

Communication to the device is accomplished through a fast (up to 400 kHz), two-wire I²C serial bus for easy connection to a microcontroller or embedded controller. The digital output of the APDS-9900/9901 device is inherently more immune to noise when compared to an analog interface.

The APDS-9900/9901 provides a separate pin for level-style interrupts. When interrupts are enabled and a pre-set value is exceeded, the interrupt pin is asserted and remains asserted until cleared by the controlling firmware.

The interrupt feature simplifies and improves system efficiency by eliminating the need to poll a sensor for a light intensity or proximity value. An interrupt is generated when the value of an ALS or proximity conversion exceeds either an upper or lower threshold. Additionally, a programmable interrupt persistence feature allows the user to determine how many consecutive exceeded thresholds are necessary to trigger an interrupt. Interrupt thresholds and persistence settings are configured independently for both ALS and proximity.

Proximity detection is fully provided with an 850 nm IR LED. An internal LED driver (LDR) pin, is jumper connected to the LED cathode (LED K) to provide a factory calibrated proximity of 100 +/- 20 mm. This is accomplished with a proprietary current calibration technique that accounts for all variances in silicon, optics, package and most importantly IR LED output power. This will eliminate or greatly reduce the need for factory calibration that is required for most discrete proximity sensor solutions. While the APDS-9900/9901 is factory calibrated at a given pulse count, the number of proximity LED pulses can be programmed from 1 to 255 pulses, which will allow greater proximity distances to be achieved. Each pulse has a 16 μ s period.