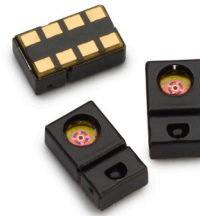


# APDS-9950

## Digital Proximity, RGB and Ambient Light Sensor



### Data Sheet



#### Description

The APDS-9950 device provides red, green, blue, and clear (RGBC) light sensing and proximity detection. The devices detect light intensity under a variety of lighting conditions and through a variety of attenuation materials, including dark glass. The proximity detection feature allows a large dynamic range of operation for accurate distance detection, such as in a cell phone, for detecting when the user positions the phone close to their ear. IR LED sink current is factory-trimmed to provide consistent proximity response without requiring customer calibrations. An internal state machine provides the ability to put the device into a low power state in between proximity and RGBC measurements, providing very low average power consumption.

The color-sensing feature is useful in applications such as LED RGB backlight control, solid-state lighting, reflected LED color sampler, or fluorescent light color temperature detection. The integrated IR blocking filter makes this device an excellent ambient light sensor and color temperature monitor sensor.

#### Ordering Information

Part Number	Packaging	Quantity
APDS-9950	Tape & Reel	5000 per reel

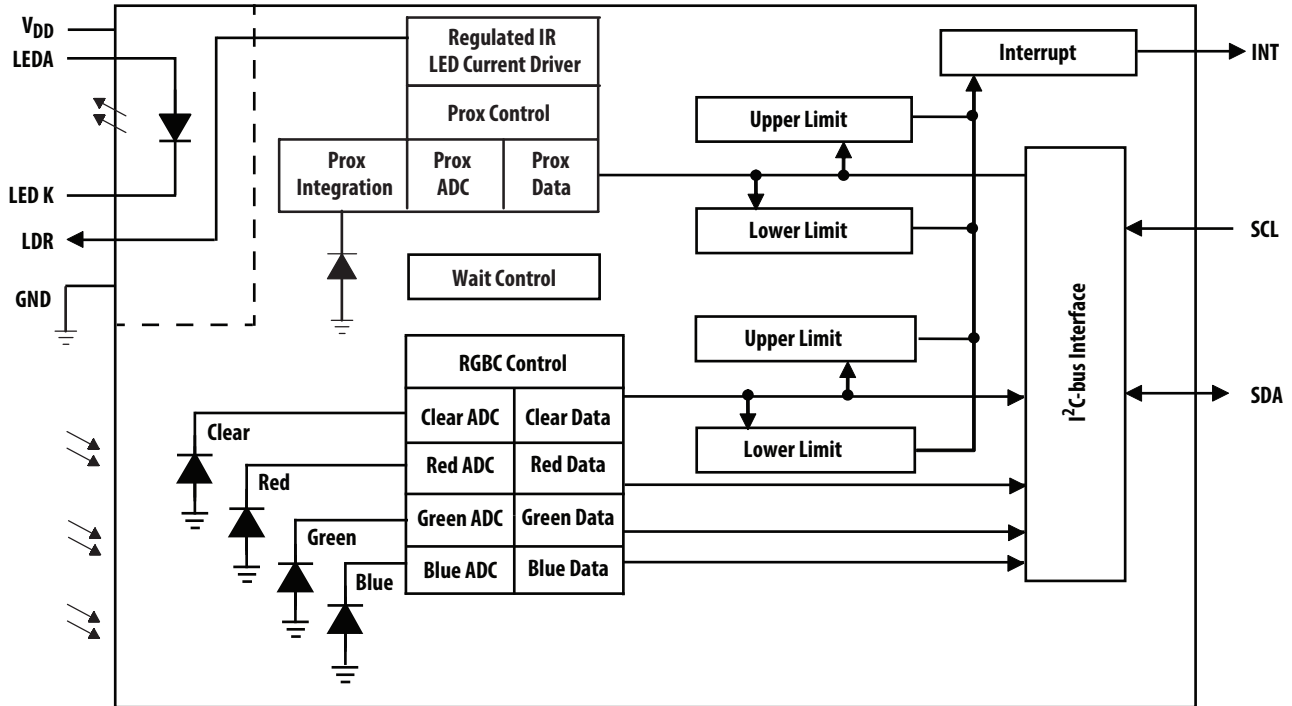
#### Features

- RGB and Clear Color Sensing and Proximity Detector and IR LED in an Optical Module
- Color Light Sensing with IR Blocking Filter
  - Programmable Analog Gain and Integration Time
  - Very High Sensitivity – Ideally suited for Operation Behind Dark Glass
- Proximity Detection
  - Trimmed for Calibrated 100 mm Detection
  - Ambient Light Rejection
  - Integrated IR LED and LED Driver
- Maskable Light and Proximity Interrupt
  - Programmable Upper and Lower Thresholds with Persistence Filter
- Power Management
  - Low Power – 2.5  $\mu$ A Sleep State
  - 85  $\mu$ A Wait State with Programmable Wait State Timer from 2.4 ms to > 7 sec
- I<sup>2</sup>C-bus Fast Mode Compatible Interface
  - Data Rates up to 400 kHz
  - Input Voltage Levels Compatible with V<sub>DD</sub> or 1.8 V V<sub>BUS</sub>
  - Dedicated Interrupt Pin
- Small Package L 3.94 × W 2.36 × H 1.35 mm

#### Applications

- OLED Display Control
- RGB LED Backlight Control
- Ambient Light Color Temperature Sensing
- Cell Phone Touch-screen Disable
- Automatic Speakerphone Enable
- Automatic Menu Pop-up
- Mechanical Switch Replacement
- Industrial Process Control

## Functional Block Diagram



## Description

The APDS-9950 is a next-generation digital color light sensor device containing four integrating analog-to-digital converters (ADCs) that integrate currents from photodiodes. Multiple photodiode segments for red, green, blue, and clear are geometrically arranged to reduce the reading variance as a function of the incident light angle. Integration of all color sensing channels occurs simultaneously. Upon completion of the conversion cycle, the conversion result is transferred to the corresponding data registers. The transfers are double-buffered to ensure that the integrity of the data is maintained. Communication with the device is accomplished through a fast (up to 400 kHz), two-wire I<sup>2</sup>C serial bus for easy connection to a microcontroller or embedded controller.

The APDS-9950 provides a separate pin for level-style interrupts. When interrupts are enabled and a preset 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 a clear channel or proximity conversion exceeds either an upper or lower threshold. In addition, 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 clear and proximity.

Proximity detection is done using a dedicated proximity photodiode centrally located beneath an internal lens, an internal LED, and a driver circuit. The driver circuit requires no external components and is trimmed to provide a calibrated proximity response. Customer calibrations are usually not required.

The number of proximity LED pulses can be programmed from 1 to 255 pulses. Each pulse has a 14  $\mu$ s period.

This LED current coupled with the programmable number of pulses provides a 2000:1 contiguous dynamic range.