STMicroelectronics’ Time of Flight Proximity Sensor & Flood Illuminator in the Apple iPhone X

A unique combination of STMicroelectronics’ latest proximity sensor, based on single-photon avalanche diode (SPAD) technology and a VCSEL illuminator, all in Apple’s most advanced handset

Located in the front above the main speaker, the proximity sensor/flood illuminator is packaged using optical LGA. The device is unique to Apple. In the past, STMicroelectronics released a custom proximity sensor two times smaller (2.80 x 2.40 mm) than the devices in its portfolio, based on FlightSense™ technology. This new version comes with a flood illuminator used in the True Depth system. The flood illuminator is an NIR VCSEL with a wide beam that illuminates the face and allows for nighttime user recognition with the NIR camera. The packaging is specially designed for the flood illuminator’s heat management.

In this report the complete microsystem is analyzed, from the two illumination devices (which are vertical-cavity surface-emitting lasers (VCSEL)) to the collector (based on the SPAD developed by STMicroelectronics). Moreover, a complete cost analysis and price estimate is presented for the device, based on a detailed description of the package, the ToF detector, the VCSEL, and the second VCSEL for flood illumination.

Also featured is a complete technology comparison with STMicroelectronics’ ToF portfolio since its first generation: the VL53L0X, the VL6180X, and the most recent custom proximity sensor in the Apple iPhone 8.
Analysis performed with our costing tools MEMS CoSim+ and IC Price+

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The world’s most advanced dot projector for 3D sensing with four innovative parts: its package; a dedicated VCSEL; a folded optic; and the active DOE.

The first NIR camera sensor with multiple innovations based on imager-silicon-on-insulator substrate from SOITEC, supplied and produced by STMicroelectronics for the Apple True Depth Module.

A look inside the Single Photon Avalanche Diode (SPAD) from STMicroelectronics entering the high-end Apple handset.

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