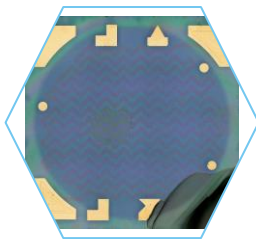
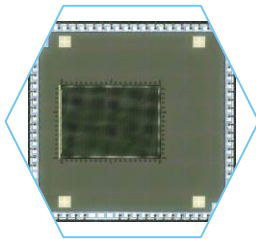


Apple iPad Pro LiDAR Module

The first 3D direct Time-of-Flight (dToF) CMOS image sensor from Sony with dedicated Lumentum VCSEL.



Following the first introduction of a 3D sensing module for Face ID in the front side of the iPhone X, Apple is now releasing the new iPad Pro with a rear LiDAR scanner. This rear 3D sensing module is using the first ever consumer direct Time-of-Flight (dToF) CMOS Image Sensor (CIS) product with in-pixel connection. It supports Apple's ARkit 3.5 development kit for augmented reality.

This full reverse costing study has been conducted to provide insights into technology data, the manufacturing cost and selling price of the rear LiDAR scanner in the iPad Pro.

The 3D sensing module includes a new generation of Near Infrared (NIR) CIS from Sony with a Single Photon Avalanche Diode (SPAD) array. The sensor features 10 μm long pixels and a resolution of 30 kilopixels. The in-pixel connection is realized between the NIR CIS and the logic wafer using hybrid Direct Bonding Interconnect technology, which is the first time Sony has used 3D stacking for its ToF sensors.

The LiDAR uses a vertical cavity surface emitting laser (VCSEL) coming from Lumentum. The laser is designed to have multiple electrodes connected separately to the emitter array. A new design with mesa contact is used to enhance wafer probe testing.

A wafer level chip scale packaging (WLCSP), five-side molded driver integrated circuit from Texas Instruments generates the pulse and drives the VCSEL power and beam shape. Finally, a new Diffractive Optical Element (DOE) from Himax is assembled on top of the VCSEL to generate a dot pattern.

Along with the complete technical analysis of the 3D depth sensing system, this report analyses the cost and estimates the price for the system. It also includes a technical and cost comparison with the rear 3D sensing system in the LG G8 ThinQ and the Vivo Nex dual display.

Title: Apple iPad Pro LiDAR Module

Pages: 174

Date:
June 2020

Format:
PDF & Excel file

Price:
EUR 3,990

Reference:
SP20557

COMPLETE TEARDOWN WITH

- Analysis of the LiDAR module structure, including SPAD NIR CIS, VCSEL, DOE and module
- Detailed optical and SEM photos
- Precise measurements
- Supply chain evaluation
- Manufacturing cost analysis
- Estimated selling price
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RELATED REPORTS



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Deep analysis of the rear 3D sensing module with Sony's 2nd Generation CIS.
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Sony's 3D Time-of-Flight Depth Sensing Camera Module

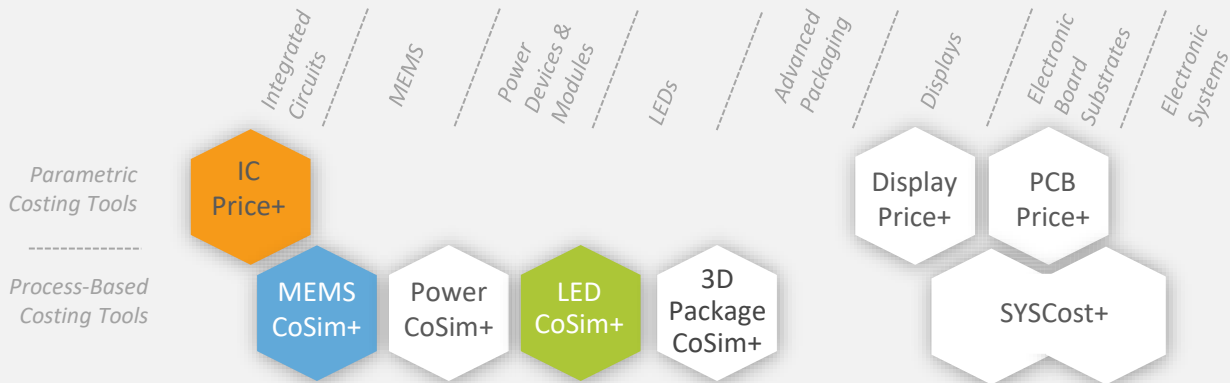
Deep analysis of the Sony's 3D ToF Sensor and the VCSEL in the Oppo RX17 Pro.
March 2019 - EUR 3,990*



Huawei Mate 20 Pro's 3D Depth-Sensing System

The complete system includes a 3D camera, flood illuminator, and DOT projector featuring a DOE.
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Cost simulation tool to evaluate the cost of any MEMS process or device.

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Reverse Costing® is the process of disassembling a device (or a system) in order to identify its technology and calculate its manufacturing cost, using in-house models and tools.



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System Plus Consulting may change its prices whenever the company thinks it necessary. However, the company commits itself in invoicing at the prices in force on the date the order is placed.

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