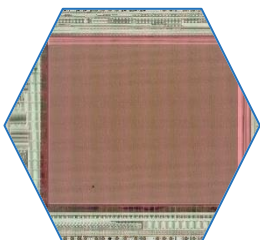
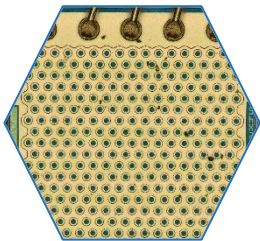
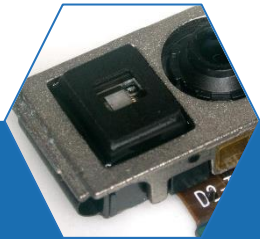


## Smartphone 3D Sensing Modules Comparison 2020

*Technical choices and cost comparison of 3D sensing modules in flagship smartphones including Apple, Huawei, Samsung, Xiaomi and Oppo, with a focus on VCSELs and NIR CIS.*



The consumer 3D sensing module market is expected to reach \$8.1B in 2025 from \$2B in 2019, according to the “3D Imaging & Sensing 2020” report from Yole Développement. The main driver technologies are Time-of-Flight (ToF) for photography enhancement and Structured Light (SL) for facial recognition. From 2016 to 2019, a total of 22 smartphones integrating a 3D sensing module have been released, 13 with SL and 9 with ToF.

In this dynamic context, System Plus Consulting provides a deep comparative review of technology and cost of 11 3D sensing modules found in flagship smartphones, with a focus on Vertical Cavity Surface Emitting Lasers (VCSELs) and Near Infra-Red CMOS Image Sensors (NIR CIS).

This report offers technological and economical comparison of five VCSEL dies and six NIR CIS integrated by the major manufacturers, Apple, Samsung, Xiaomi, Huawei, Oppo, LG and Vivo, in their flagship smartphones. The VCSELs are provided by three key suppliers - Lumentum, Trumpf and ams. The manufacturers of NIR CIS are numerous including Sony, Omnicision, Infineon, STMicroelectronics, and Panasonic.

The integration of the VCSELs and NIR CIS in smartphones is shown, and the analysis are based on full teardowns of these components to reveal the technological choices made by the different manufacturers. Also, the report assesses the various supply chain participants.

Finally, this report features a full technical and cost comparison of the 3D sensing solutions at the module level, with a focus on the VCSELs and NIR CIS.

### COMPLETE TEARDOWN WITH

- Overview of the 3D sensing modules
- Detailed SEM and optical photos
- Precise measurements
- Module and die cross-sections
- Materials analysis
- Process analysis
- Supply chain evaluation
- Cost analysis
- Technical and cost comparison

**Title:** Smartphone 3D Sensing Modules Comparison 2020

**Pages:** 228

**Date:** June 2020

**Format:** PDF & Excel file

**Price:** EUR 6,490

**Reference:** SP20531

## TABLE OF CONTENTS

### Overview/Introduction

- Executive Summary
- Glossary

### Company Profile

### Market Analysis

### 3D Sensing in Smartphones

- Technology Overview
- Module Integration
  - ✓ Structured light
  - ✓ Time-of-Flight
  - ✓ Release timeline
  - ✓ Apple: iPhone x, iPhone 11
  - ✓ Xiaomi: Mi8 Explorer
  - ✓ Oppo: FindX, Rx17 pro
  - ✓ Huawei: Mate 20 pro, P30 pro
  - ✓ Vivo: Nex Dual Display
  - ✓ LG: G8 ThinQ
  - ✓ Samsung: Galaxy note 10+, Galaxy S10

### Physical Analysis

- Physical Analysis NIR CIS
  - ✓ Sony 1st gen
    - Die overview and dimensions
    - Die process
    - Die cross-section
    - Die process characteristic
  - ✓ Sony 2nd gen
  - ✓ Omnivision
  - ✓ STMicroelectronics
  - ✓ Infineon/PMD
  - ✓ Panasonic

- Physical Analysis NIR VCSELLIDAR Module Cost
  - ✓ Lumentum
    - Die overview and dimensions
    - Die process
    - Die cross-section
    - Die process characteristic
  - ✓ ams
  - ✓ Trumpf

### Cost Analysis

- Cost Analysis NIR CIS
  - ✓ Sony 1st gen
    - Total wafer and die cost
  - ✓ Sony 2nd gen
  - ✓ Omnivision
  - ✓ STMicroelectronics
  - ✓ Infineon/PMD
  - ✓ Panasonic
- Cost Analysis NIR VCSEL
  - ✓ Lumentum
    - Total wafer and die cost
  - ✓ ams
  - ✓ Trumpf

### Technical and Cost Comparison

- Dot Projector
- NIR Camera module
- Time of Flight Camera module
- NIR CIS Die Comparison
- VCSEL Die Comparison

### Company Services

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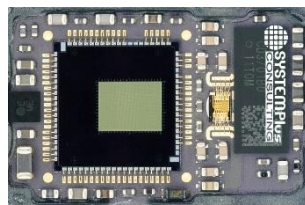
## RELATED REPORTS



### Samsung Galaxy Note 10+ 3D Time of Flight Depth Sensing Camera Module

Deep analysis of the rear 3D sensing module with Sony's 2nd Generation CIS.

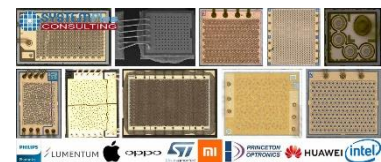
January 2020 - EUR 3,990\*



### Apple iPad Pro LiDAR Module

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

June 2020 - EUR 3,990\*

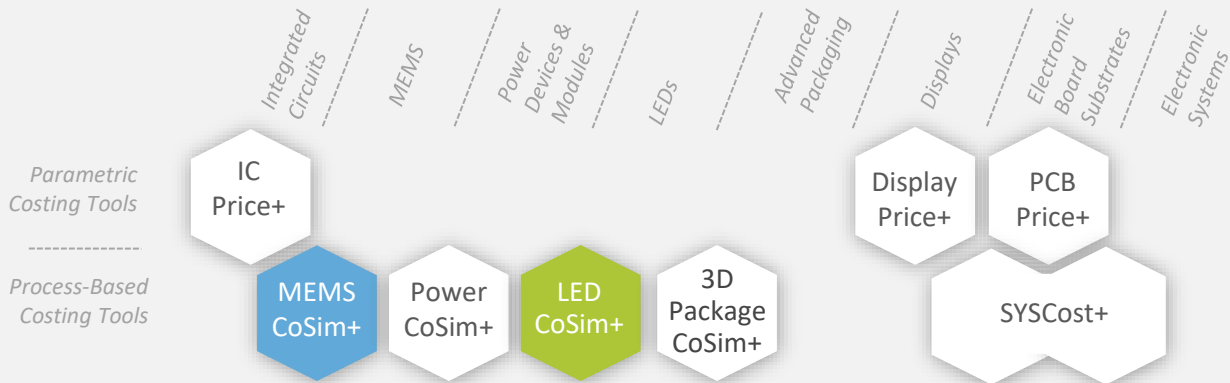


### VCSEL in Smartphone – Comparison 2019

Physical analysis and cost comparison of ten leading flagship smartphone VCSEL dies from Apple, Huawei, Xiaomi, Oppo, Lenovo, and Intel.

April 2020 - EUR 6,490\*

## COSTING TOOLS



Our analysis is performed with our costing tools MEMS CoSim+ and LED CoSim+.

System Plus Consulting offers powerful costing tools to evaluate any process or device, the production cost and selling price, from single chip to complex structures. All these tools are on sale under corporate license.

### MEMS CoSim+

Cost simulation tool to evaluate the cost of any MEMS process or device.

### LED CoSim+

A process-based costing tool to design and evaluate the cost of any LED process flow.

## ABOUT SYSTEM PLUS CONSULTING

System Plus Consulting is specialized in the cost analysis of electronics from semiconductor devices to electronic systems. A complete range of services and costing tools to provide in-depth production cost studies and to estimate the objective selling price of a product is available.

Our services:

- STRUCTURE & PROCESS ANALYSES
- TEARDOWNS
- CUSTOM ANALYSES
- COSTING SERVICES
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## WHAT IS A REVERSE COSTING®?

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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# TERMS AND CONDITIONS OF SALES

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## 1. INTRODUCTION

The present terms and conditions apply to the offers, sales and deliveries of services managed by System Plus Consulting except in the case of a particular written agreement.

Buyer must note that placing an order means an agreement without any restriction with these terms and conditions.

## 2. PRICES

Prices of the purchased services are those which are in force on the date the order is placed. Prices are in Euros and worked out without taxes. Consequently, the taxes and possible added costs agreed when the order is placed will be charged on these initial prices.

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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System Plus Consulting delivered services are to be paid within 30 days end of month by bank transfer except in the case of a particular written agreement.

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System Plus Consulting remains sole owner of the delivered services until total payment of the invoice.

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As a rule, all information handed by customers to system Plus Consulting are considered as strictly confidential.

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