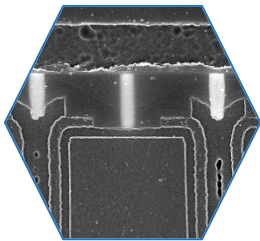
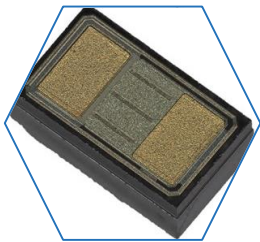


Integrated Passive Devices Comparison 2021

A technical and cost analysis of 8 IPDs and 12 silicon capacitors from 11 different manufacturers including STMicroelectronics, Skyworks, Murata, and more.



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Passive devices (inductor, capacitor, and resistor) are essential building blocks in electronics. The integrated passive device (IPD) is a specialty technology considered as an evolution of standard passives. According to Yole Développement, IPD will reach a total market of almost \$607M in 2025, exhibiting a CAGR of 6.5% from 2019-2025.

In this report, System Plus Consulting presents a technological and cost overview of eight IPDs occupying different ranges of communication frequency, as well as twelve Si capacitors targeting multiple applications.

The eight IPD devices studied in this report are in three categories: Balun for 2.4 GHz Wifi, filter for n77/n78/79 5G bands, and multipurpose filter/ESD. These devices are found in different consumer products such as smartphones, notebooks, and smartwatches. They are manufactured by several players: NXP, Qualcomm, STMicroelectronics, UMC, Qorvo, and Skyworks.

The 12 Si capacitors are divided into seven devices with Deep Trench Technology from Murata and TSMC. Si capacitors from TSMC are land-side decoupling capacitors found in A14 and M1 application processors from Apple. The other five devices are multipurpose planar capacitors from Microchip, Macom,

Skyworks, and Vishay.

This report includes a description of each component and its major characteristics (substrate type (silicon, glass)), passivation layers, and passive integration, along with a comparison of all devices analyzed. Also provided are detailed optical and SEM pictures from the device's opened-package, down to the microscopic level. The focus of this report is on chip technology, hence the devices are analyzed and costs are simulated at wafer and die levels.

Lastly, this report provides physical, technological, and manufacturing cost comparisons of the analyzed devices.

COMPLETE TEARDOWN WITH:

- Detailed optical and SEM photos
- Precise measurements
- Manufacturing process flow
- Supply chain evaluation
- Wafer manufacturing and die cost analysis
- Estimated bare die selling price
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AUTHORS

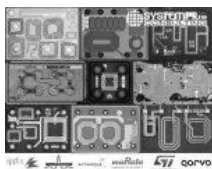


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Florian Ferre serves as a laboratory Analyst at System Plus Consulting, part of Yole Développement (Yole). Florian oversees the physical analyses of electronic components, chooses the operating mode adapted to the component to analyze, and performs sample preparation and analysis by optical and electronic microscopy. Florian holds a Technological University Diploma (DUT) in Chemistry from the University of Rennes (France).

RELATED ANALYSES



RF Integrated Passive Devices: Reverse Costing Overview

Players active in the RF applications market include IDM companies like Qorvo, Skyworks, Murata, Broadcom, and STMicroelectronics, as well as OSATs such as STATS ChipPAC, ASE, Amkor, and TSMC. December 2017



Consumer Teardown Track

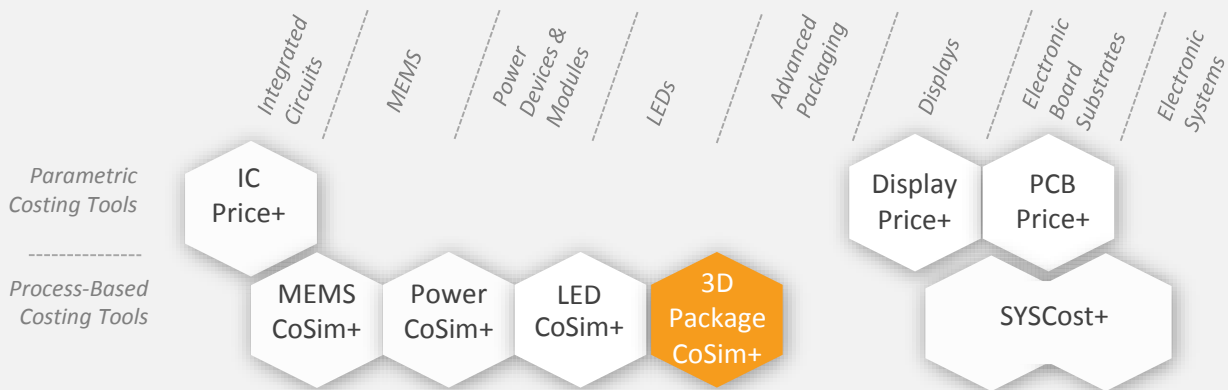
More than 140 systems are torn down every year. Phone Module with more than 530 products already available and Smart Home Module with more than 110 products already available.



Thin-Film Integrated Passive Devices 2020

5G and 3D integration are pushing the IPD market towards further growth. September 2020

COSTING TOOLS



Our analysis is performed with our costing tool 3D Package CoSim+.

System Plus Consulting offers powerful costing tools to evaluate the production cost and selling price from single chip to complex structures.

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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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