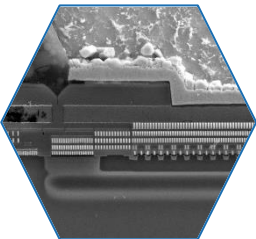
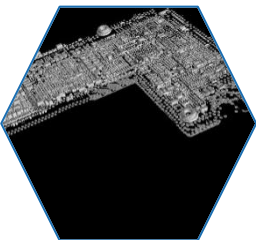




## Apple iPhone 12 series mmWave 5G Chipset & Antenna

*A study of the complete 1st generation of the 5G millimeter-wave chipset for Apple's phones including custom antenna, front-end module and antenna-on-package.*



With a projected Compound Annual Growth Rate (CAGR) of 72 % in shipped units between 2020 and 2025, the 5G market is expected to be profitable in the next few years. In this context, following competitors like Samsung, Apple has also started to gamble on mmWave 5G communication. In its latest generation of iPhone, the twelfth, the company decided to implement a 5G mmWave chipset for US-only models. For this to happen, Apple and Qualcomm made an arrangement despite their previous lawsuit.

Since 2016 no iPhone generation has featured Qualcomm's components. But this year, Apple has allowed the company to supply 5G components to enable mmWave communication in US versions of the iPhone Mini, Standard, Pro and Pro Max. All the series features custom designs for the first time. The chipset in the iPhone 12 series comes with six sub systems spread throughout the smartphone. The two first Systems-in-Packages (SiPs) in the chain are the baseband processor X55M and the modulator Intermediate Frequency (IF) circuit, SMR526. Both came from Qualcomm. The other devices are a Front-End Module (FEM) specially designed to work with a rear and a front facing passive antenna system and an Antenna-on-Package (AoP) at the side.

In this chipset, Qualcomm still supplies the transceiver and the Power Management Integrated Circuit (PMIC) included in the

FEM and the AoP. But Apple has totally rethought the architecture with arrangements like in-house antenna designs, custom Printed Circuit Board (PCB) substrates for the AoP, and separated FEM and antenna systems. All of this enables 5G communication like every other smartphone, but Apple could integrate more functions with its system, such as human body detection or Machine-to-Machine (M2M) communication.

This report includes a full investigation of the system, featuring a detailed study of the SiPs, including die analyses, processes and board cross-sections. It contains a complete cost analysis and a selling price estimation of the system. Finally, it features a light technical comparison with the latest 5G mmWave AoP and a cost comparison with the second generation of 5G mmWave chipset from Qualcomm.

**Title:** Apple iPhone 12 series mmWave 5G Chipset

**Pages:** 250

**Date:** February 2021

**Format:**  
PDF & Excel file

**Price:**  
EUR 3,990

**Reference:**  
SPR21587

### COMPLETE TEARDOWN WITH

- Detailed photos
- Precise measurements
- Materials analysis
- Manufacturing process flow
- Supply chain evaluation
- Manufacturing cost analysis
- Comparison with previous generation of Qualcomm's 5G mmWave chipset

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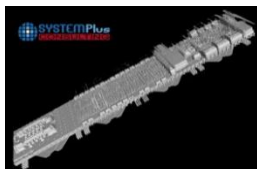


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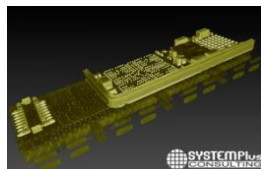


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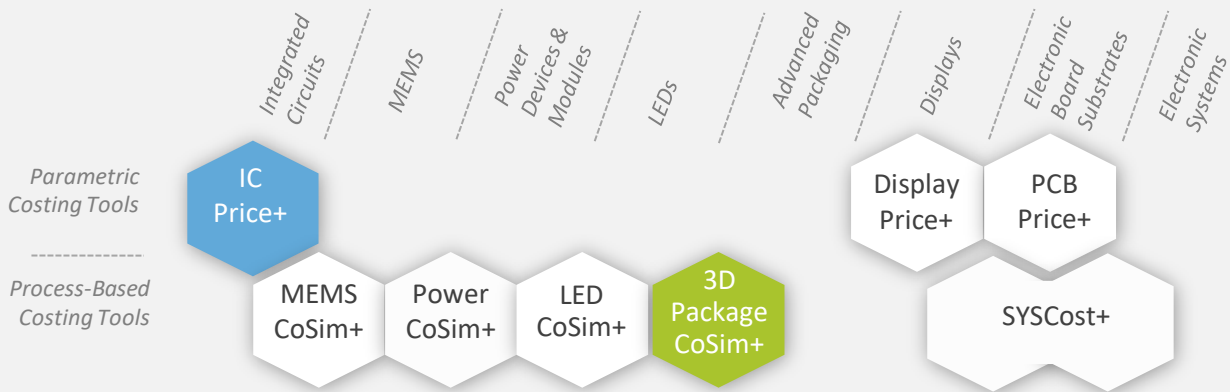


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Our analysis is performed with our costing tools 3D Packaging CoSim+ and IC Price+.

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# TERMS AND CONDITIONS OF SALES

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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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The delivery schedule on the purchase order is given for information only and cannot be strictly guaranteed. Consequently any reasonable delay in the delivery of services will not allow the buyer to claim for damages or to cancel the order.

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