

LED

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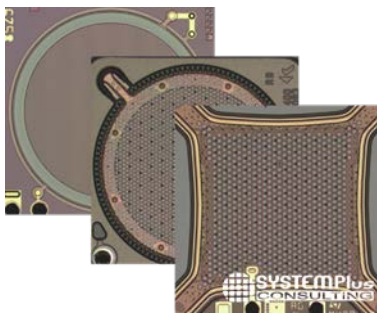
PACKAGING

SYSTEM

POWER

# Apple iPhone 7 Plus: MEMS Microphones from Knowles, STMicroelectronics, and Goertek-Infineon

*Introducing a brand-new design and process from three of Apple's main MEMS microphone suppliers.*



The MEMS microphone market has enjoyed continuous growth since its debut, and Yole Développement forecasts a 10% CAGR from 2015 - 2021 due to increased smartphone and home appliance integration. Indeed, MEMS microphones' penetration rate in smartphones is already close to 100%.

The Apple iPhone 7 and 7 Plus each have four MEMS microphones: a front-facing top microphone, two front-facing bottom microphones and a rear-facing top microphone. In every iPhone 7 Plus we examined, we observed a Knowles design win for the rear-facing top microphone and a STMicroelectronics design win for the front-facing top microphone. The two front-facing bottom microphones were sourced by either Knowles or Goertek.

On the process side, we observed for the first time full in-house manufacturing by STMicroelectronics, which now makes the MEMS die internally without relying on OMRON. This new integration confirms a new manufacturing process developed by STMicroelectronics. Goertek, which still relies on Infineon for die manufacturing, integrates the latest Infineon MEMS microphone process, which delivers a differential MEMS microphone using a dual backplate technology. The third manufacturer, Knowles, made strategic technical choices which allowed it to have the smallest MEMS die. Lastly, all four microphones share the same Apple-specific package dimensions, but with different internal structures (number of substrate metal layers, embedded capacitance, etc.).

*These three reports can be purchased separately or all together in order to compare the technology and pricing of these three key Apple iPhone suppliers. In fact, the three-report bundle includes a complete comparison of the three components.*

**Title:** iPhone 7 - MEMS Microphones

**Pages:** 300 (100 x 3)

**Date:** October 2016

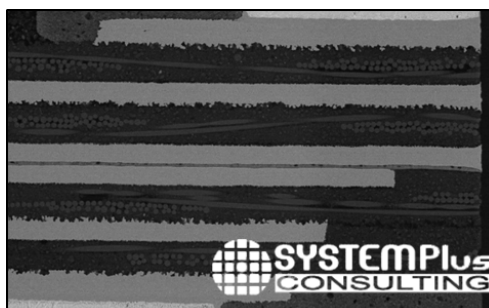
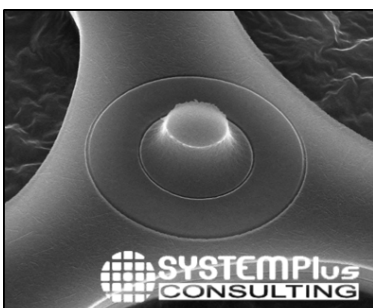
**Format:** pdf + xls

#### PRICES:

- Full report: EUR 3,290
- Bundle of 3 reports, including the complete comparison: EUR 7,500

#### COMPLETE TEARDOWN WITH:

- Detailed photos
- Precise measurements
- Material analysis
- Manufacturing process flow
- Supply chain evaluation
- Manufacturing cost analysis
- Estimated sales price
- Comparison between each supplier (Knowles vs. STMicroelectronics vs. Goertek-Infineon)



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## Estimated Selling Price



**Sylvain Hallereau** is in charge of costing analyses for IC,

IC, Power and MEMS. He has more than 10 years of experience in the Power Device manufacturing costs analysis and has studied a wide range of technologies.



**Yvon Le Goff** has joined System Plus Consulting in 2011, in order to

set up the laboratory of System Plus Consulting. He previously worked during 25 years in Atmel Nantes Technological Analysis Laboratory as fab support in physical analysis, and 3 years at Hirex Engineering in Toulouse, in a DPA lab.

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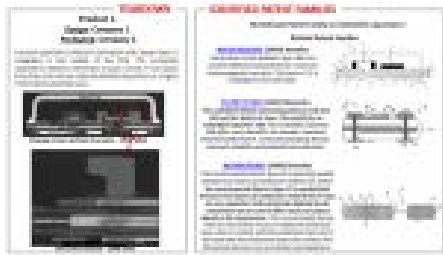
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### MEMS Microphone Technology and Patent Infringement Risk Analysis

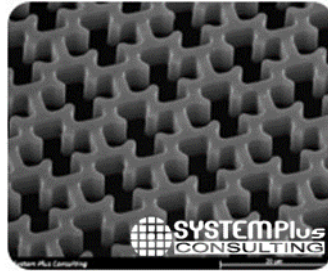
Knowles, STMicroelectronics/OMRON, AAC Technologies/Infineon Technologies, InvenSense/Analog Devices... Market growth, challenged leader: patent battle can start !



Pages: 170  
Date: April 2015  
Full report: EUR 5,990\*

### InvenSense ICS-43432 Digital MEMS Microphone

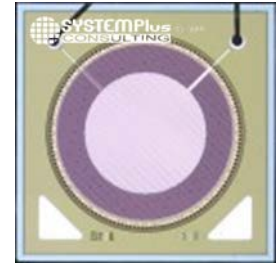
The high sensitivity last come of InvenSense digital MEMS Microphones portfolio with capacitive technology and I<sup>2</sup>S protocol interface.



Pages: 107  
Date: October 2014  
Full report: EUR 2,990\*

### Wolfson WM7121 & WM7132 Top & Bottom Port MEMS Microphones

Set of 2 reports highlighting MEMS and Packaging technologies of Wolfson Microphones.



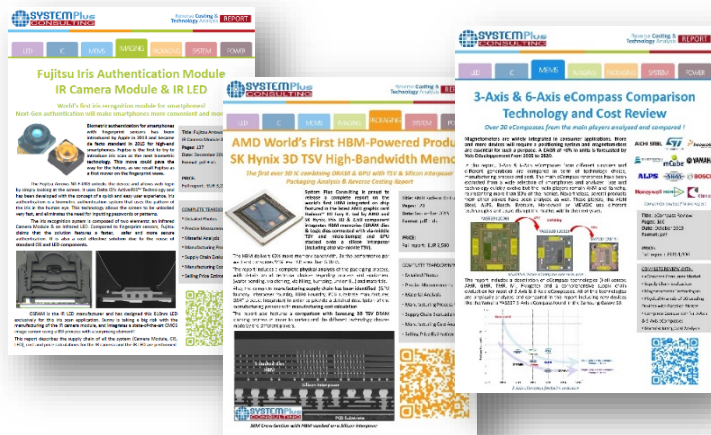
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