Vesper VM1000 Piezoelectric Microphone

First piezoelectric MEMS microphone could disrupt consumer applications

Vesper has developed the first piezoelectric MEMS technology microphone. This breaks new ground in the MEMS microphone world, which has been exclusively composed of capacitive silicon MEMS for more than ten years. It is a very robust technology. The VM1000 is an IP68 microphone, meaning it is water- and dustproof, taking a step towards the waterproof smartphone.

This piezoelectric microphone targets consumer applications: smartphones, wearables and the Internet of Things (IoT). It also positions Vesper to compete with Knowles, Goertek, STMicroelectronics and others for applications in harsh environments.

Vesper’s VM1000 microphone device is manufactured using a proprietary MEMS technology based on recent innovations in piezoelectric material for semiconductors and more precisely for the latest BAW filters.

The sensing element in the VM1000 is based on a flexible piezoelectric material membrane formed above a cavity. Sound moves the membrane, which generates an electric current. The VM1000 has a very complex design to optimize signal to noise ratio.

The VM1000 is naturally immune to water and dust, which qualifies it for the IP68 ingress protection rating. It is very stable over time and in harsh environments.

This report presents a detailed analysis of sensor structure and cost. It also compares characteristics with the Knowles and Goertek capacitive microphones for the iPhone 7, highlighting differences in technical choices made by the companies.
Véronique is in charge of structure analysis of semi-conductors. She has a deep knowledge in chemical & physical technical analyses. She previously worked for 20 years in Atmel Nantes Laboratory.

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Sylvain is in charge of costing analyses for IC, power and MEMS. He has more than 10 years of experience in power device manufacturing cost analysis and has studied a wide range of technologies.

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Nicolas is in charge of physical analysis. He has a deep knowledge of chemical and physical analyses. He previously worked in microelectronics R&D for CEA/LETI in Grenoble and for STMicroelectronics in Crolles.

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<table>
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<tr>
<th>Knowles MEMS Microphones in iPhone 7</th>
<th>STMicroelectronics MEMS Microphones in iPhone 7</th>
<th>Goertek-Infineon MEMS Microphones in iPhone 7</th>
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<td>Knowles made strategic technical choices which allowed it to have the smallest MEMS die. Multiple design wins in the smartphone (rear-facing and front-facing).</td>
<td>STMicroelectronics developed a new manufacturing process which allowed a new integration. A design win for the front-facing top microphone.</td>
<td>Goertek integrated the latest Infineon MEMS microphone process, which delivered a differential MEMS microphone using a dual backplate technology.</td>
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