Towards passing the Turing test
Natural conversations enabled by premium microphones

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Product Marketing specialist MEMS microphones
Voice – the button of the future for an intuitive interaction with the environment around us

In 2023 – nearly **6 billion devices** are expected to have a voice interface enabling voice trigger, voice biometrics, embedded digital assistants and text to speech functions.

SAR Insight – Digital and Voice Interface Forecast October 2018
Infineon's consumer sensors link the real and the digital world

- **Smart Ears**
  - Highest SNR Microphones
  - Far field voice recognition
  - Crystal clear audio recording
  - Best-in-class mic to mic matching

- **Smart Nose**
  - Most precise air pressure sensor
  - PAS based gas sensor

- **Smart Eyes**
  - 3D Time of flight camera based

- **Smart Feel**
  - 3D Radar technology based
  - Crystal clear audio recording
  - Best-in-class mic to mic matching
A good sense of hearing

High signal to noise ratio (SNR)
- Crystal clear audio
- Recognition of voice commands

Wide dynamic range and high acoustic overload point (AOP)
- Recording of loud music
- Capturing of the faintest sounds

Robustness
- Against water, dust, mechanical shock

Low power consumption
- Lasting battery powered devices

Good phase and sensitivity matching
- Better manufacturability and performance for multi-mic applications

Capture of the faintest sounds, wide dynamic range and high acoustic overload point (AOP), high signal to noise ratio (SNR), crystal clear audio, recognition of voice commands, robustness against water, dust, mechanical shock, low power consumption, lasting battery powered devices, good phase and sensitivity matching.
### Infineon XENSIV™ MEMS microphones

#### IM69D130
World's best digital MEMS microphone

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Infineon</th>
<th>Competitor next best alternative</th>
<th>Competitor</th>
</tr>
</thead>
<tbody>
<tr>
<td>SNR</td>
<td>69 dB(A)</td>
<td>65.5 dB(A)</td>
<td>65 dB(A)</td>
</tr>
<tr>
<td>1% THD (Distortion)</td>
<td>128 dBSPL</td>
<td>114.5 dBSPL</td>
<td>115 dBSPL</td>
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<tr>
<td>Sensitivity matching</td>
<td>+/-1 dBFS</td>
<td>+/-1 dBFS</td>
<td>+/-2 dBFS</td>
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Sensor+Test 2019

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Infineon MEMS microphone technologies

<table>
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<tr>
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<th>Dual Backplate</th>
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<tr>
<td>+ Robust, low cost</td>
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</table>
New sealed dual membrane MEMS design boosts audio pick-up quality: up to 75 dB SNR

- **Single Backplate**
  - Robust, low cost
  - Lowest acoustic performance

- **Dual Backplate**
  - High acoustic performance
  - Care needed to avoid particles

- **Sealed Dual Membrane**
  - Highest acoustic performance, Water/particle immune
  - Available 2020

New capacitive MEMS design boosts audio pick-up quality even further to allow novel use cases

- **Binaural recording**
- **Real face-to-face calls**
- **Audio zoom**
What is the *audio Turing test*?

- **High dBSPL**: >90dBSPL
- **Mid dBSPL**: ~60dBSPL
- **Low dBSPL**: <35dBSPL

**Speech signal**

- **Close proximity loud signal**
- **Baby crying nearby**
- **Command from the kitchen**
- **Standard voice user interface**
- **Soft whisper**

**Distance between voice controlled device and speech source**

- 1m
- 3m
- >5m
Command from kitchen to living room: "play my favourite song"

Whisper speech - when someone is sleeping "set the alarm to 6am"

Up to 25% higher hit rate

Normal voice: "dim the lights"

Up to 40% higher hit rate

Up to 5% higher hit rate
Infineon high SNR microphones: 98% accuracy
(best tested alternative: 85% accuracy)

Response accuracy rate test by popular audio processor company
Tools for your conversation

› Infineon regional marketing and technical support across the world
› Application notes, implementation guidelines and evaluation kits available
› Partner network with reference designs and engineering support
Let's talk!
Infineon @ Sensor+Test, booth 429, hall 1
julian.kornprobst@infineon.com

› **Standard microphones fail** to pass the 'audio Turing test'
› **Infineon is pushing the limits** of microphone performance
› **Hit rate** of voice user interfaces is significantly **increased** by using **high SNR MEMS** microphones
› Fast go to market with **reference designs from our partners** – best microphones with best audio processing
› More information at [http://www.infineon.com/sensortest](http://www.infineon.com/sensortest)