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 Feel**
  - Most precise air pressure sensor

- **Smart Nose**
  - PAS based gas sensor

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

Sensor+Test 2019

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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
### 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>
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</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>
</tr>
<tr>
<td>Sensitivity matching</td>
<td>+/-1 dBFS</td>
<td>+/-1 dBFS</td>
<td>+/-2 dBFS</td>
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## Infineon MEMS microphone technologies

<table>
<thead>
<tr>
<th>Single Backplate</th>
<th>Dual Backplate</th>
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<tbody>
<tr>
<td>Robust, low cost</td>
<td>High acoustic performance</td>
</tr>
<tr>
<td>Lowest acoustic performance</td>
<td>Care needed to avoid particles</td>
</tr>
</tbody>
</table>

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

- **Dual Backplate**:
  - High acoustic performance
  - Care needed to avoid particles
New sealed dual membrane MEMS design boosts audio pick-up quality: up to 75 dB SNR

<table>
<thead>
<tr>
<th>Single Backplate</th>
<th>Dual Backplate</th>
<th>Sealed Dual Membrane</th>
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</thead>
<tbody>
<tr>
<td>Robust, low cost</td>
<td>High acoustic performance</td>
<td>Highest acoustic performance, Water/particle immune</td>
</tr>
<tr>
<td>Lowest acoustic performance</td>
<td>Care needed to avoid particles</td>
<td>Available 2020</td>
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</tbody>
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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?

**Speech signal**

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

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

**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"

Normal voice: "dim the lights"

Up to 25% higher hit rate

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
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
Part of your life. Part of tomorrow.