



# We help the world listen

**14 November 2023**

Ad Lafort

**sonion** sound  
innovation  
partner

# SONION HAS BEEN **HELPING** THE WORLD TO **LISTEN** FOR HALF A CENTURY

- Leading B2B supplier of **micro electro-acoustic and micromechanical products and solutions** for the hearing health, consumer and professional audio markets
- Owned by Novo Holdings A/S (Denmark) since September 2014
- Revenue ~250M USD



## PRODUCTION AND R&D

# PRODUCTION IS CONSOLIDATED IN THREE FACTORIES IN VIETNAM AND THE PHILIPPINES, WHILE R&D TAKES PLACE IN THE NETHERLANDS

- ~6000 employees
- Facilities in Denmark, the Netherlands, Poland, US, China, Vietnam and the Philippines
- Certified according to ISO 9001: 2015, ISO 14001: 2015 and ISO 45001: 2018
- Lean manufacturing, 6 Sigma, 99% delivery performance

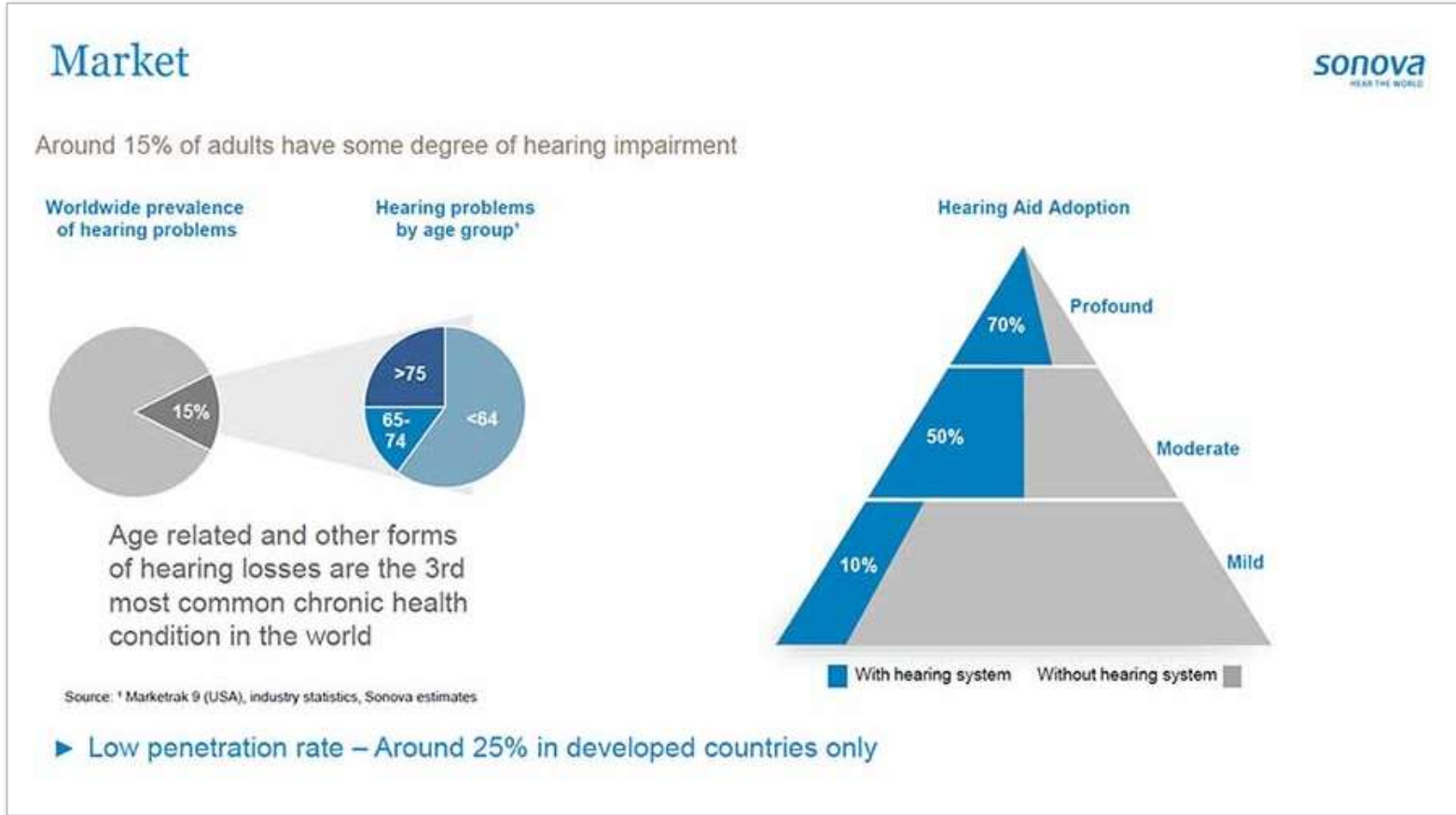


# Sonion Nederland, Hoofddorp



- 115 FTE; approx. 70 R&D
- BSc, MSc, PhD
- physics, mechanics, electronics, materials engineering
- 22 nationalities

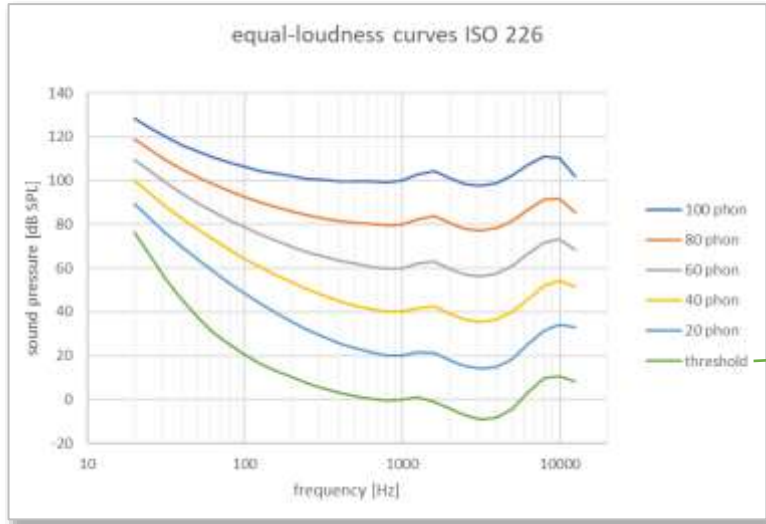
# World market and market penetration (source: Sonova)



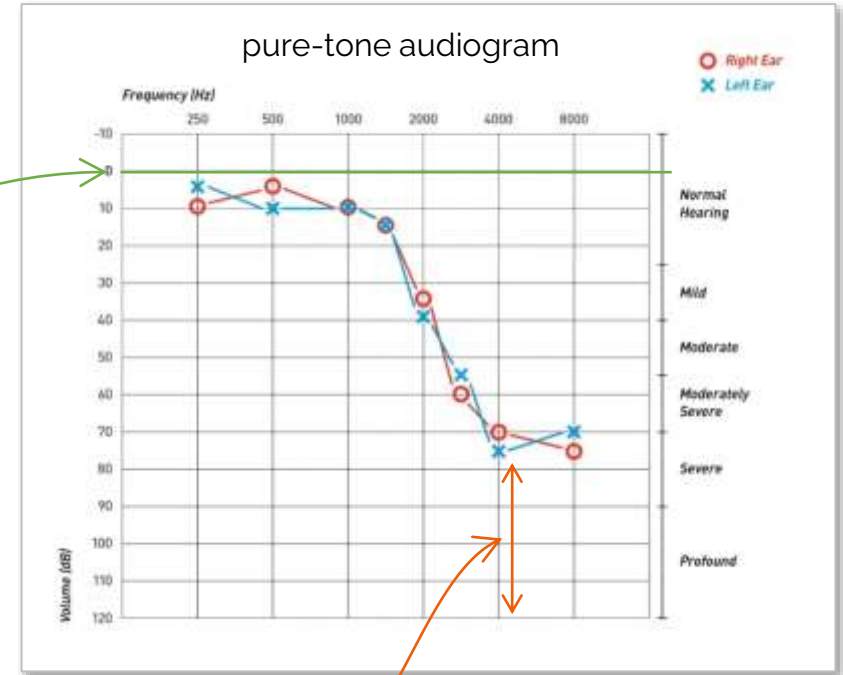
## Different degrees of hearing loss (source: Starkey)



# Ear sensitivity & hearing loss



- dB SPL is dB re. 20  $\mu$ Pa
- Hearing threshold is determined for “average young persons”
- Hearing loss is determined relative to threshold
- Gain and compression in hearing aid are programmed in DSP per frequency band



remaining dynamic range

# Hearing loss, risk & prevention

Takeaways:

- A hearing aid doesn't restore your hearing; it only enables better use of what remains

Thus:

1. Prevent exposure to loud noise
2. Use hearing protection

### The most frequent causes of hearing loss:

- Exposure to loud noise
- Natural Aging
- Heredity
- Head Injury
- Ototoxic Medications
- Illness

Source: Mayo Clinic  
© Starkey Hearing Technologies. All Rights Reserved.

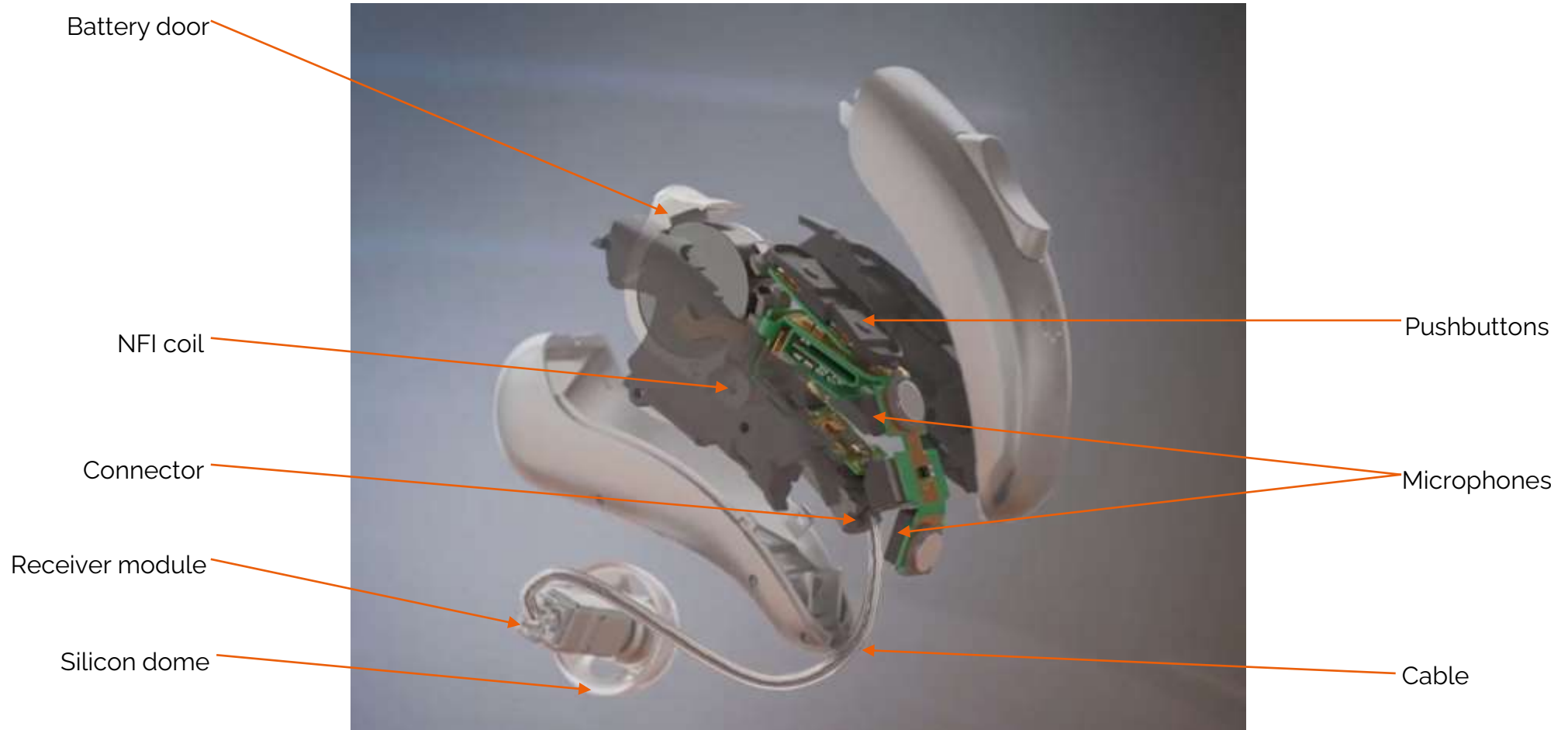




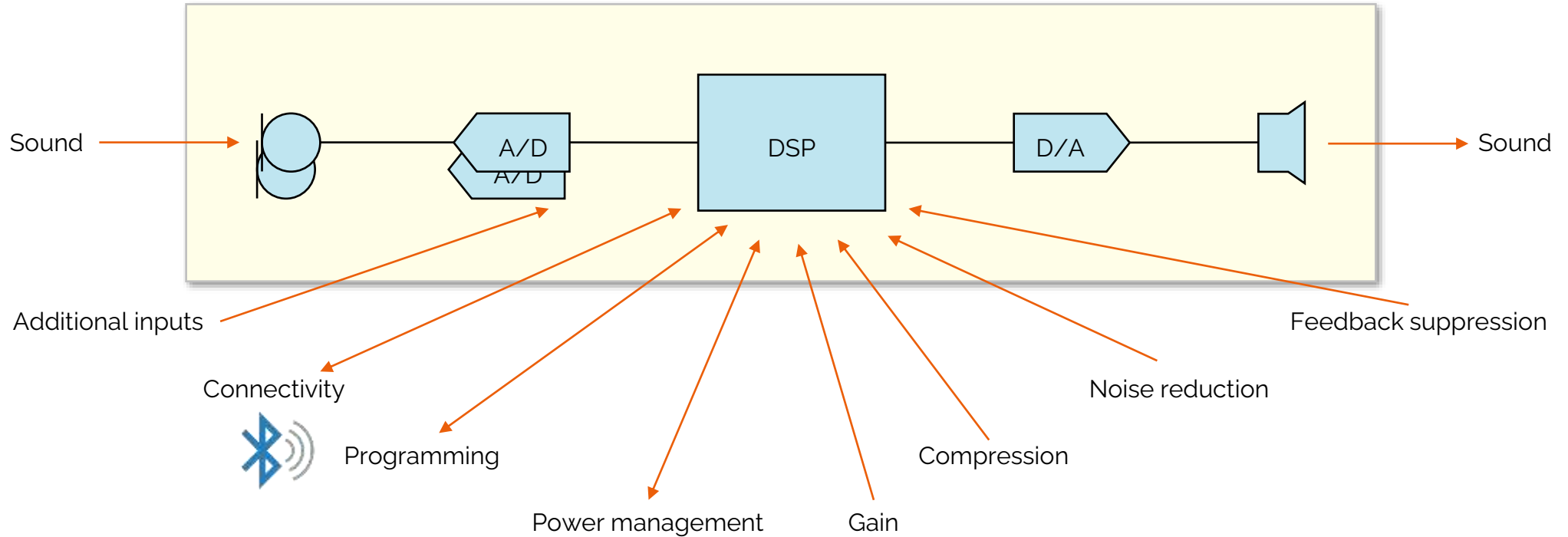
# Different styles of hearing instruments



# Inside of an RIC-style hearing aid (source: Sivantos)

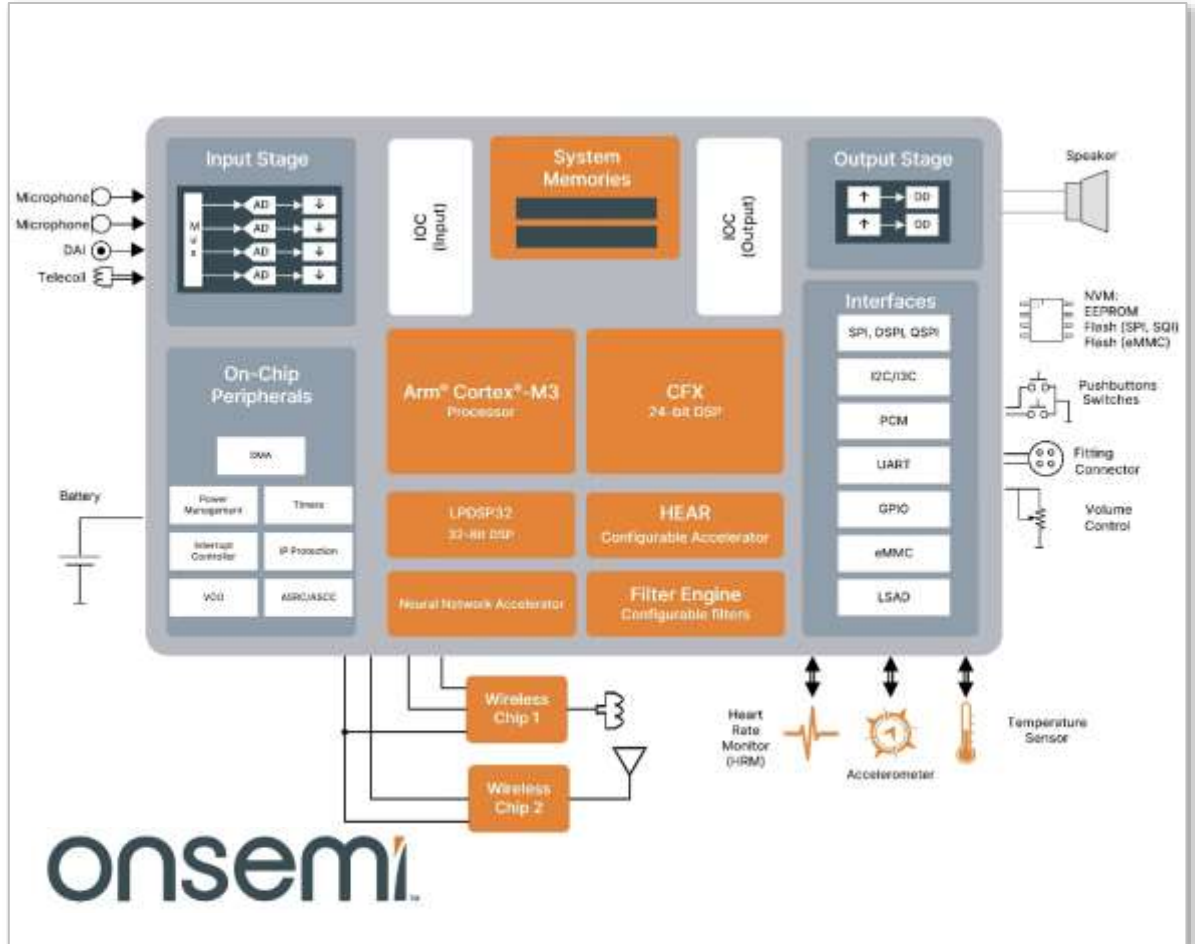


# Generic architecture of hearing aid



## DSP architecture (source: onsemi)

- Most HA manufactures have proprietary DSP platform.
- Example of generic platform is Onsemi Ezario.



# Microphone example: Sonion P11AC03

**Data Sheet**  
Microphone P11AC03

**SONION**

**Description**  
The P11AC03 is Sonion's next generation high performance MEMS microphone. Due to the upgraded sensor, the P11AC03 has improved SNR and is not sensitive to modulated light. The high electro-acoustic performance and tiny package volume (10.8 mm<sup>3</sup>), combined with the benefits of MEMS technology, make the P11AC03 the best microphone choice for hearing aids.

**Features**

- Small surface-mount package: 3.35x2.95x1.20 mm
- Reflow compatibility
- Stable response curve with humidity
- Not sensitive to modulated light
- Non-inverting transfer
- Compatibility with µ01 nanocasting process

**Product drawing - Dimensions in mm [inch]**

**Pin configuration**

1. Output: Analog output signal
2. GND: Ground\*
3. VDD: Power supply
4. GND: Ground\*

\* Pin 2 and Pin 4 should both be grounded

Subject to review for Agilent or other changes at any time to improve reliability, function or design in order to provide the best product possible.

SONION  
P11AC03  
Rev. 1.0  
Page 1 of 4

**Data Sheet**  
Microphone P11AC03

**SONION**

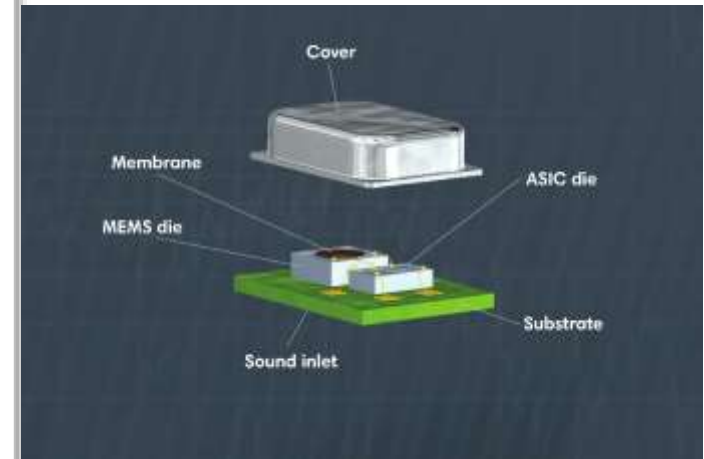
**Typical response curve**

**Typical 1/3 octave equivalent noise**

Subject to review for Agilent or other changes at any time to improve reliability, function or design in order to provide the best product possible.

SONION  
P11AC03  
Rev. 1.0  
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- Volume: 11 mm<sup>3</sup>
- Sensitivity: -35 dB V/Pa
- Noise: 4.5 dB SPL (A)
- Power: 29 µW



# Balanced armature receiver example: Sonion 26UA01C

**Data Sheet**  
Receiver 26UA01C

**SONION**

**Description**  
Subminiature magnetic receiver (Balanced Armature Type) for use in In The Canal and Completely In The Canal applications with standard response.

**Features**  
- Excellent for mini BTE, ITE, ITC and CIC applications  
- Improved efficiency  
- Improved maximum LF output

**Mechanical data**  
Weight: 0.17 gr  
Case material: Ni80P+15Mo2  
Solder pad material: Sn-60, 5Ag3, 0Cu1.5  
Dimensions: Refer to outline drawing.

**Product drawing - Dimensions in mm [inch]**

SONION reserves the right to make changes at any time to improve reliability, Sonion or design, in order to provide the best product possible. Please review all the data on this product and high speed product series. When full features are applied in hearing individuals or other communication equipment cases all attempts should be made to suit the individual in order to obtain maximum hearing benefit.

SONION  
1-800-442-8000  
1-800-543-6900  
1-800-543-6902 (Toll Free)  
1-800-543-6903 (Toll Free)

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RECYCLED MATERIALS

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SONION 26UA01C  
Rev. 01/01/2016  
Page 1 of 3

**Data Sheet**  
Receiver 26UA01C

**SONION**

**Typical response curve**

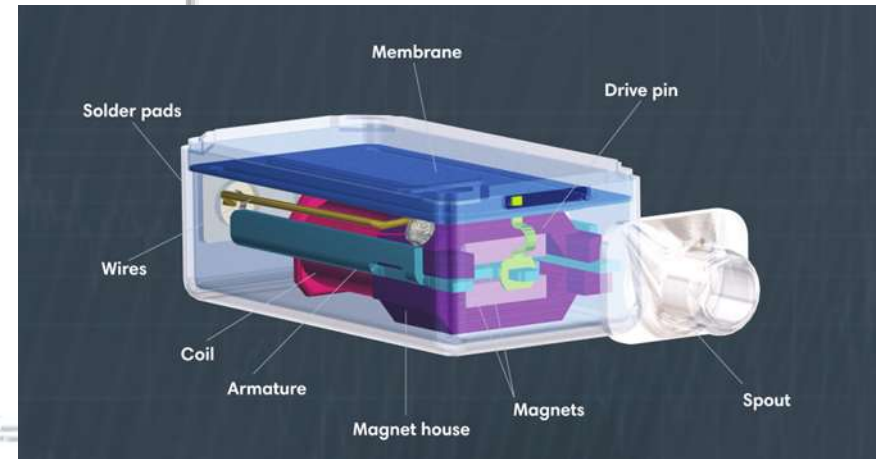
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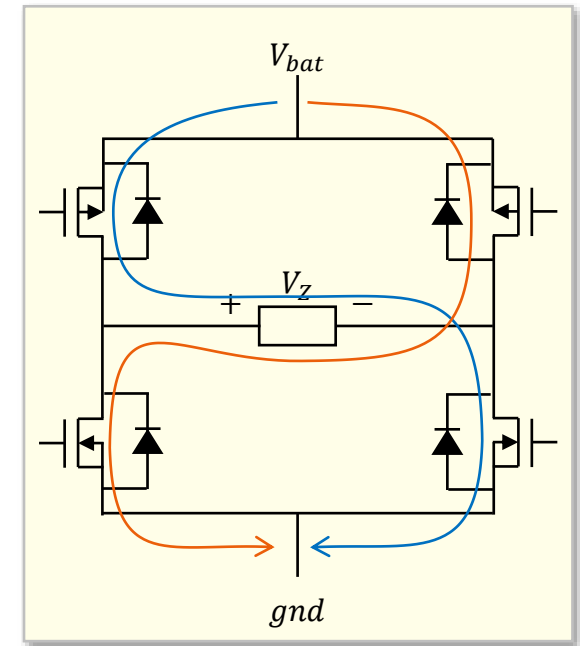
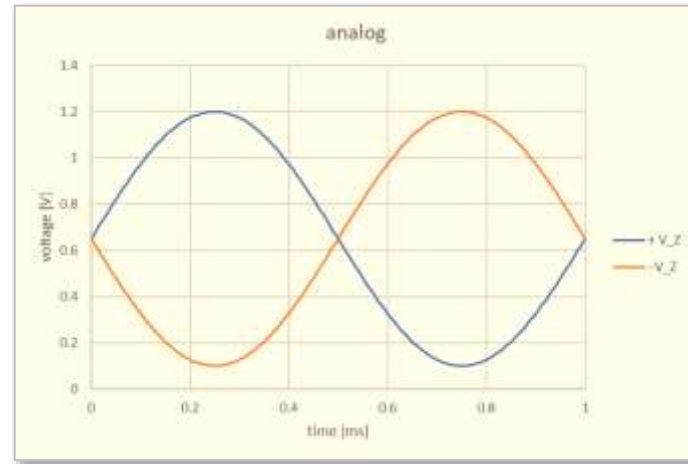
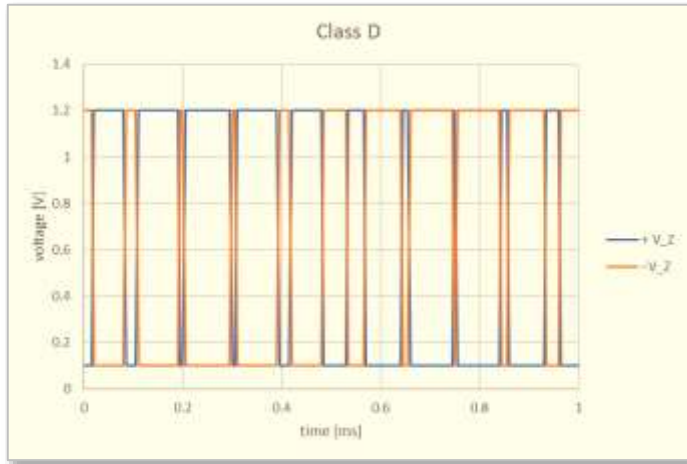
Non-Confidential material  
SONION 26UA01C  
Rev. 01/01/2016  
Page 1 of 3

- Volume: 42 mm<sup>3</sup>
- 500 Hz efficiency: 103.5 dB SPL @ 0.35 mAV

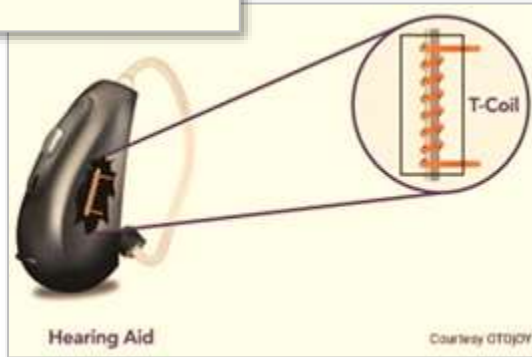
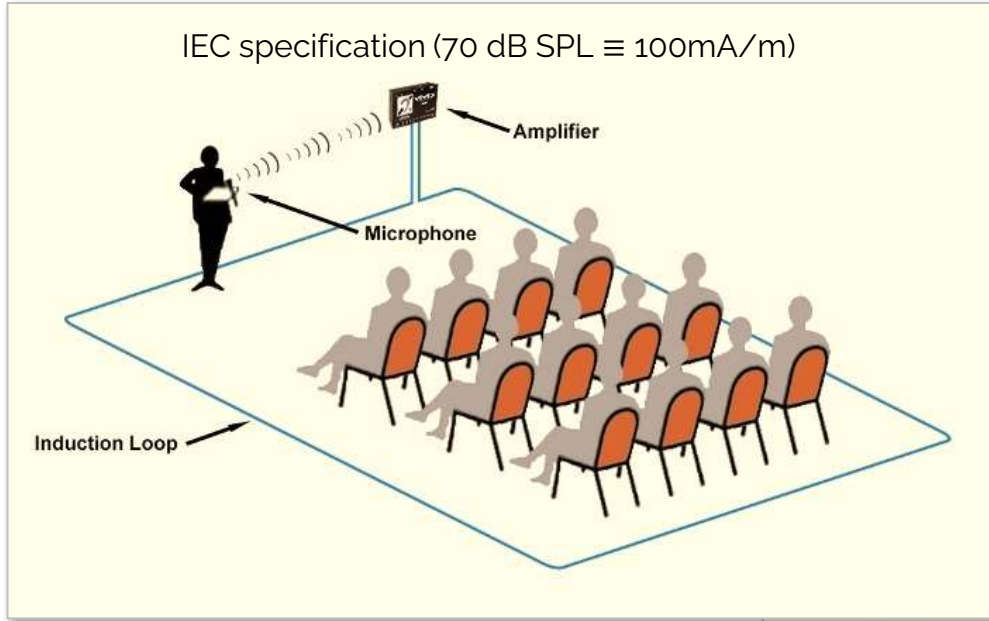


# Driving the receiver by an H-bridge

- Switching frequency approx. 1 MHz
- No filtering used (BA-receiver has inductive impedance)
- HA manufactures apply smart schemes to save current
- Receiver size selection based on required output SPL
- Receiver impedance selection based on efficiency optimization



# The hearing loop & telecoil example: Sonion T20AF03



**Data Sheet**  
Passive Telecoil T 20 AF 03

**Description**  
Inductive pick-up coil for use in hearing instruments.

**Features**

- Highly durable coating
- Small size
- High sensitivity

**Electrical data**  
Measuring conditions: Temperature 23°C (73.4°F) ± 5°C (84.4°F-82.4°F)

Parameters	Min	Typ	Max	Unit	Comments
DC resistance	788	875	962	Ohm	
Inductance @ 1 kHz	102	120	130	mH	
O.C. 1 kHz sensitivity	-60.9	-59.4	-57.9	dBV/A/m	
10 kOhm load 1 kHz sensitivity	-61.7	-60.2	-58.7	dBV/A/m	
Resonance frequency	150			kHz	
Winding sense	North positive				

**Lead wires**  
Start lead description: Green, 30 mm, #36 AWG (Ø 0.125 mm), solid Cu with PU coating, 4 mm braid  
Finish lead description: Red, 39 mm, #36 AWG (Ø 0.125 mm), solid Cu with PU coating, 4 mm braid  
Lead wire length measured from edge flange

**Product drawing - Dimensions in mm (inch)**

**Mechanical data**

Dimensions	in mm	in inch
Dimension A max.	2.1	0.083
Dimension B max.	7	0.276

When viewed the light is a blue change at the time to improve visibility, function or design, it may be possible the design sheet is revised.

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 WWW: www.sonion.com


RoHS  
 2011/06/26

Non-Compliance material: 0%  
 Material: 100%  
 Page 1 of 1






# Hearing aid batteries: size 312

- Expected battery life 5-7 days (approx. 80 hrs.)
- Regulated voltage 1.05-1.10 V
- H-bridge supplied directly from battery
- Impedance estimated from datasheet approx.  $70 \Omega$




<b>Name</b>	Premium 312 0 Hg
<b>Cell Chemistry</b>	Zinc Air
<b>Designation</b>	IEC: P941, ANSI: 7502ZD, Common: 312
<b>Nominal Voltage</b>	1.45 volts
<b>Weight</b>	0.54 grams (0.019 oz)
<b>Volume</b>	0.17 cc (0.010 cu. in.)
<b>Operating Temperature Range</b>	-10°C to 50°C (14°F to 122°F)
<b>Impedance</b>	< 4.5 ohm @ AC 1000 Hz
<b>IEC/ANSI Standard</b>	90 hours - 2 mA background, 1E mA 130 ms pulse once every 2 hr, 12 hr/day to 1.05V at 21°C (70°F) and 50% RH
<b>IEC/ANSI Wireless Streaming</b>	38 hours - 2 mA background 4E mA, 5 mA 25 ms pulse once every hour, 12 hr/day to 1.1V at 21°C (70°F) and 50% RH
<b>How to Use</b>	Hearing Aid Instruments: Remove and discard the plastic tabs covering air holes. Allow the battery to stand for 15 minutes to ensure proper activation.
<b>Storage Conditions</b>	Batteries should be stored in ambient conditions between +10°C (50°F) and +30°C (86°F). Avoid direct sunlight.
<b>Shelf Life</b>	Four years with tabs applied when stored at 21°C (70°F)
<b>Environmental</b>	These cells have no added mercury. Refer to Rayovac Safety Data Sheets for more detailed information.
<b>Compliant to the following Standards</b>	IEC 60336-1, IEC 60086-2, ANSI C18.1M Part 1 & 2

DIMENSIONS SHOWN ARE IEC STANDARD FOR ENGINEERING TOLERANCES CONTACT RAYOVAC

**Typical IEC/ANSI Standard Discharge Performance**



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QUESTIONS?



**THANK YOU  
FOR LISTENING**

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armature receivers to high-end in-ear  
earphones and professional in-ear  
monitors