JHEAR OTC hearing aid Platform introduction

April. 2024

http://en.jhearing.com

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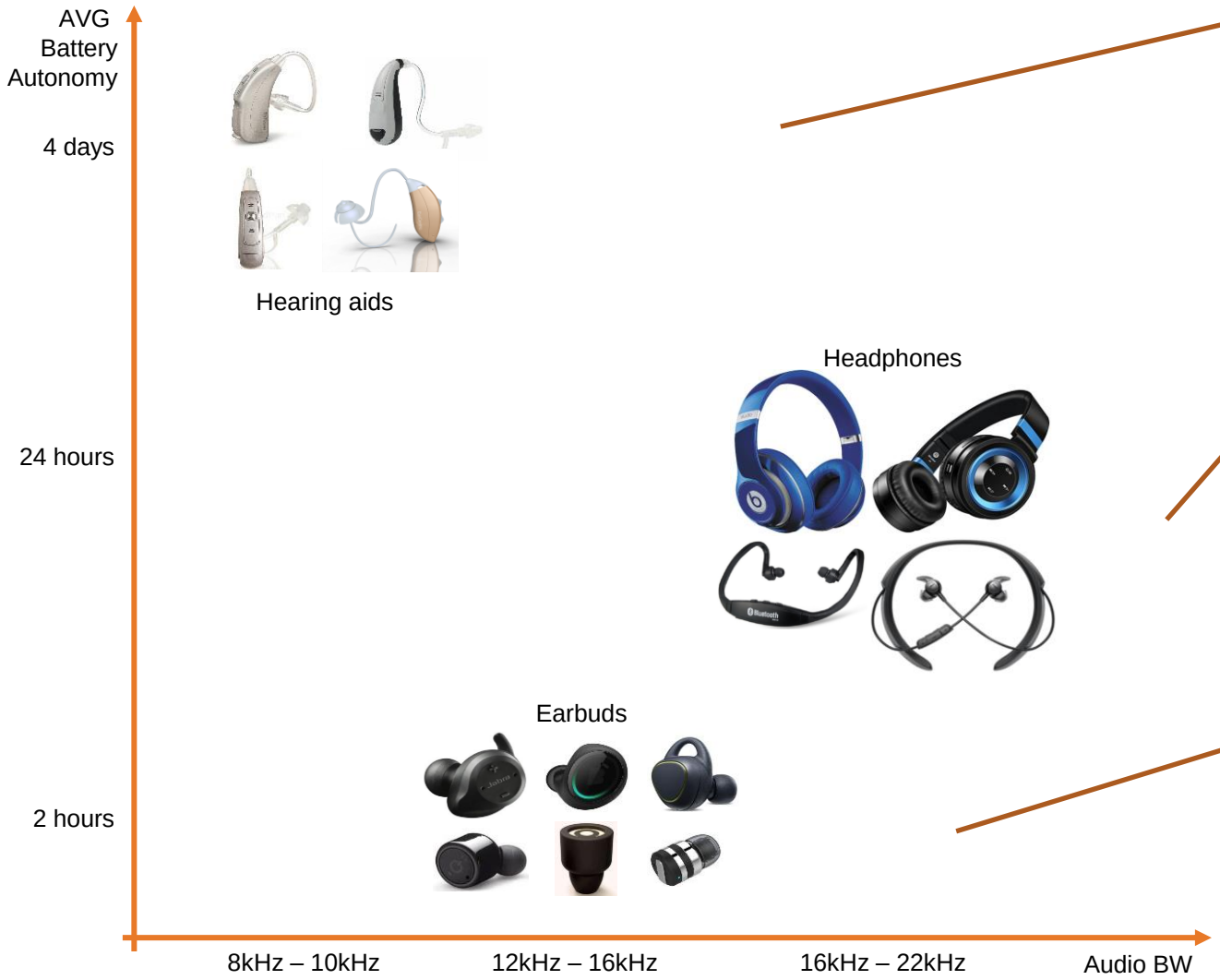
Agenda

- JHAR one page introduction
- J10 platform introduction
- J10 Platform overview
- J10 OTC Hearing Aid Scenarios
- J10 Platform Performance picture (OTC)
- J10 design support resource
- J10 Hearing Aid Accessories
- J10 platform eco-system build for ramping up market
- J10 hearing aid platform advantages
- JHEAR Hearing aid roadmap
- J10 platform Success stories

Wireless audio streaming

- Battery autonomy and audio BW landscape



- Discrete, worn all day
- Caters to speech and music
- Audio spectrum is limited for hearing correction, enhancement
- Audio streaming from Smartphone possible

- For music listening only
- HQ audio and decent autonomy
- Can be bulky so adding all-day hearing enhancement may not be ideal
- Standard Audio streaming: Bluetooth

- Emerging trend
- Good audio, terrible autonomy
- Investigating adding hearing enhancement, for that, autonomy must be improved greatly
- Standard Audio streaming: Bluetooth

JHEAR corporate evolution

JHEAR

In 2004, established R&D team for VOIP and soft switch systems

In 2010, data collection, mining and processing business. natural language text processing (NLP machine learning)

In 2015, the hearing aid department was established, to support onsemi platform business in APAC region

In 2020,the intelligent Wireless Division was established. Provide a complete wireless communication solution, software system, terminal software, and IoT SaaS

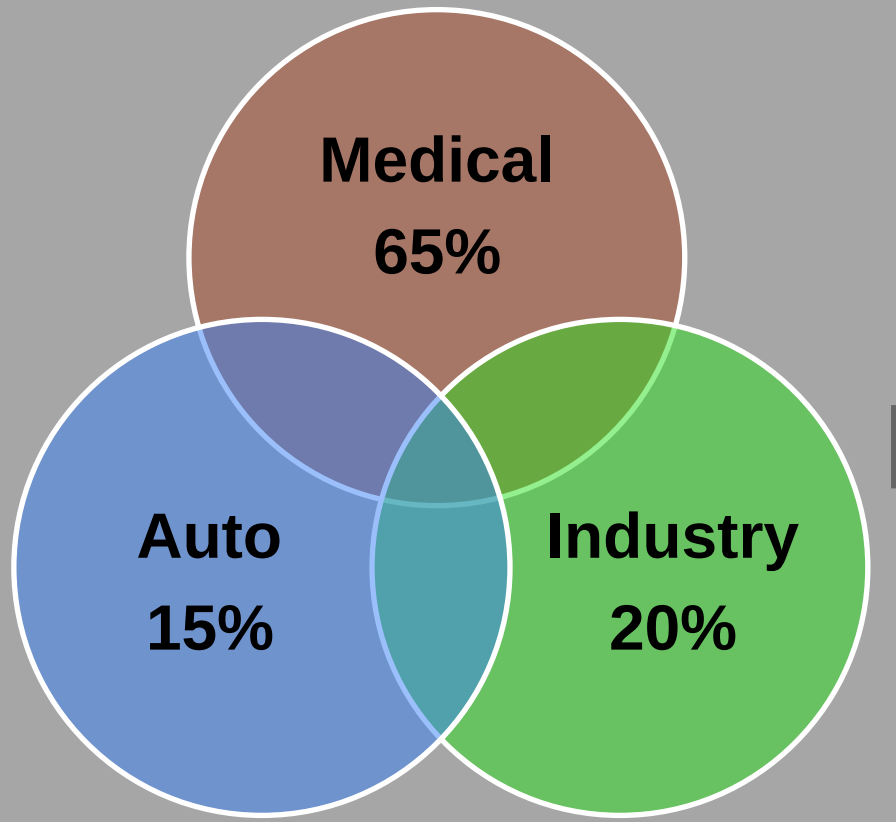
In 2021, the healthcare department was established, including hearing aid business and blood glucose business. The hearing aid business includes hardware, software, algorithms, fitting solution, also support CGM total solution as IDH.

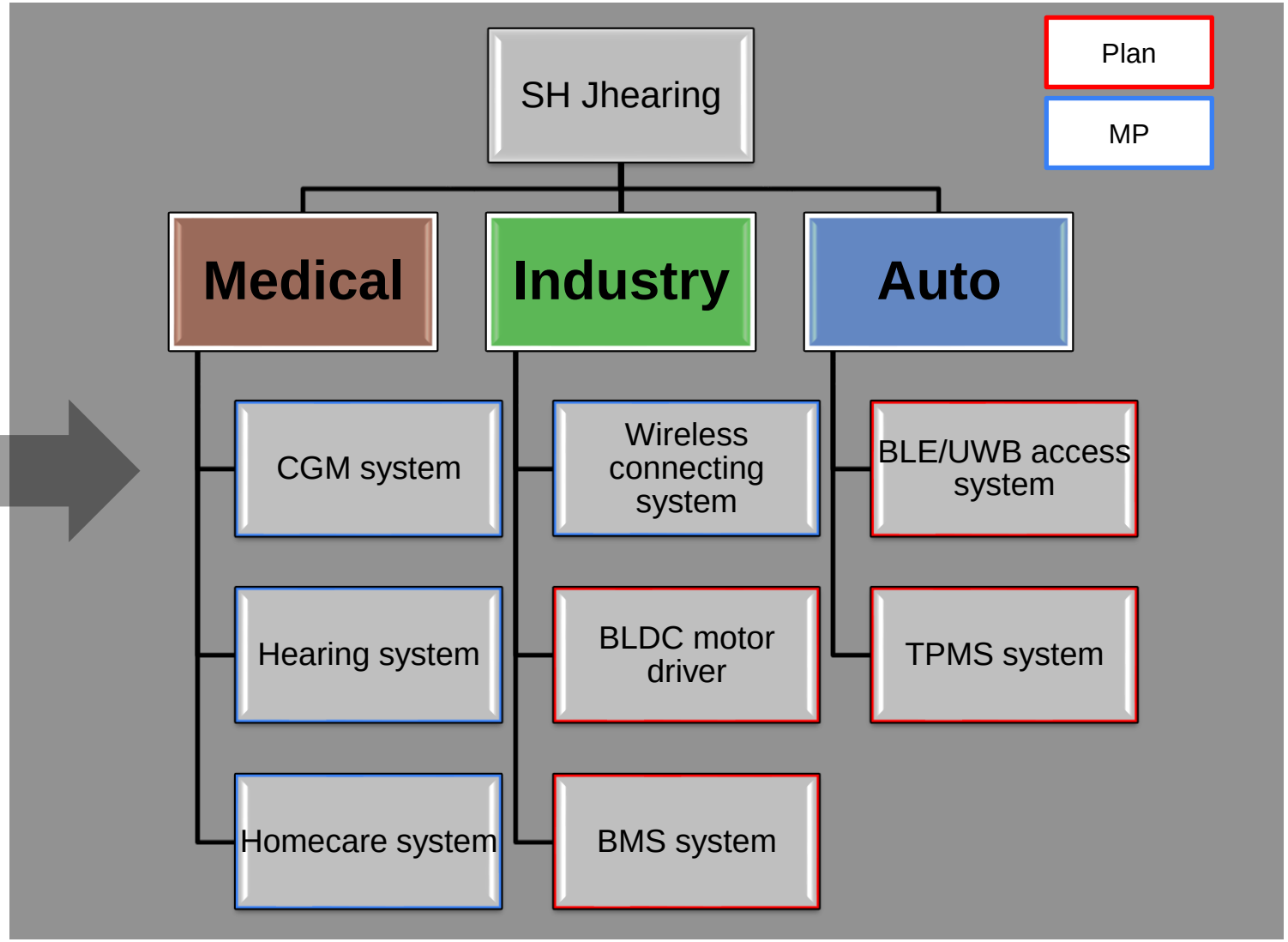
In 2022, it launched the first hearing aid SiP chip J10 in China, integrating core functional chips such as DSP, BLE, MCU, etc., and won more than 10 patents and Software copyright

In 2024, 2nd generation J102 SiP tape out with more diversity applications

Focus

JHEAR business structure





JHEAR HEARING

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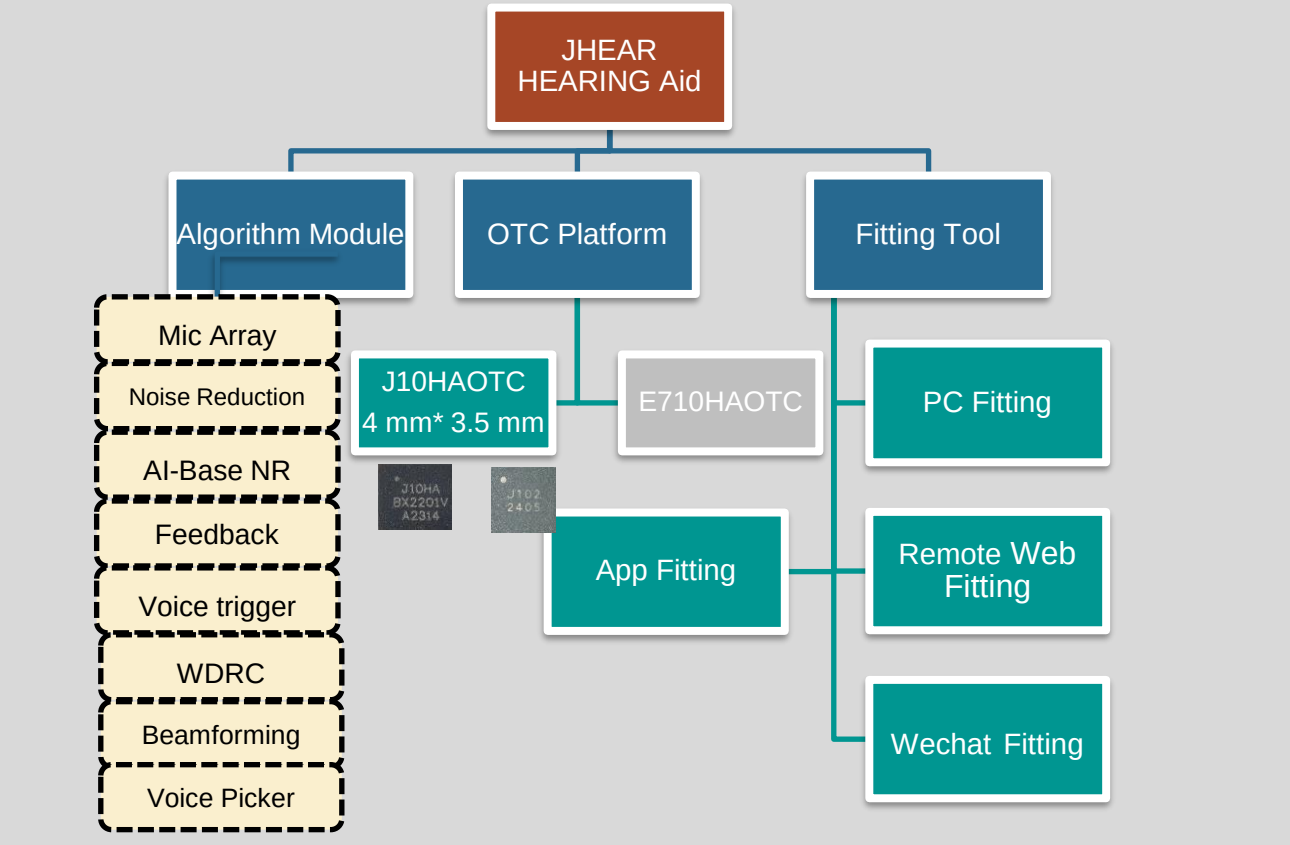
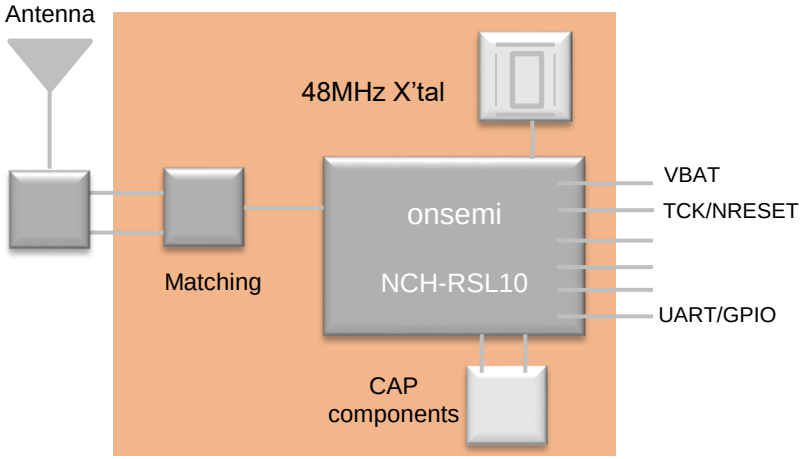


☑Hardware ☑software ☑algorithm ☑Fitting tool ☑System design

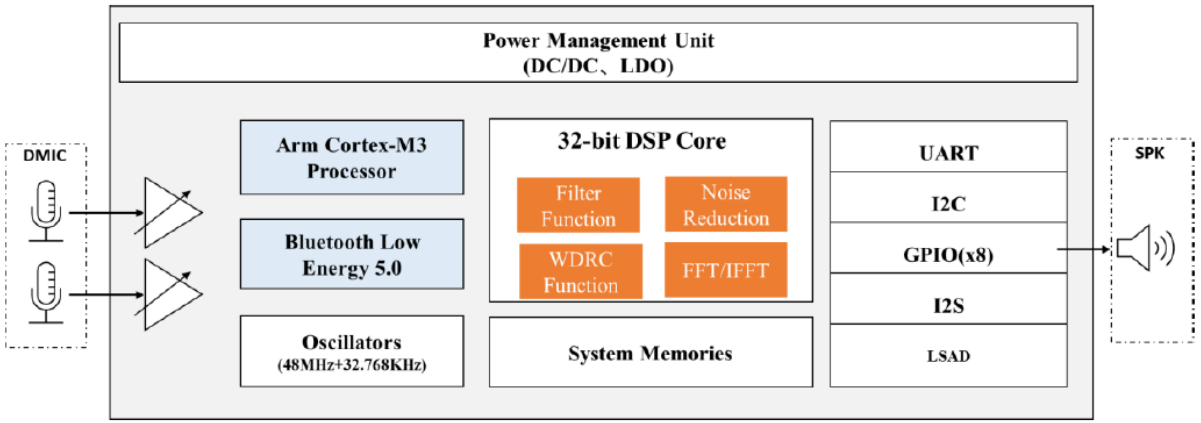
JHEAR J10 Smallest BLUETOOTH® 5.2 Wireless SiP

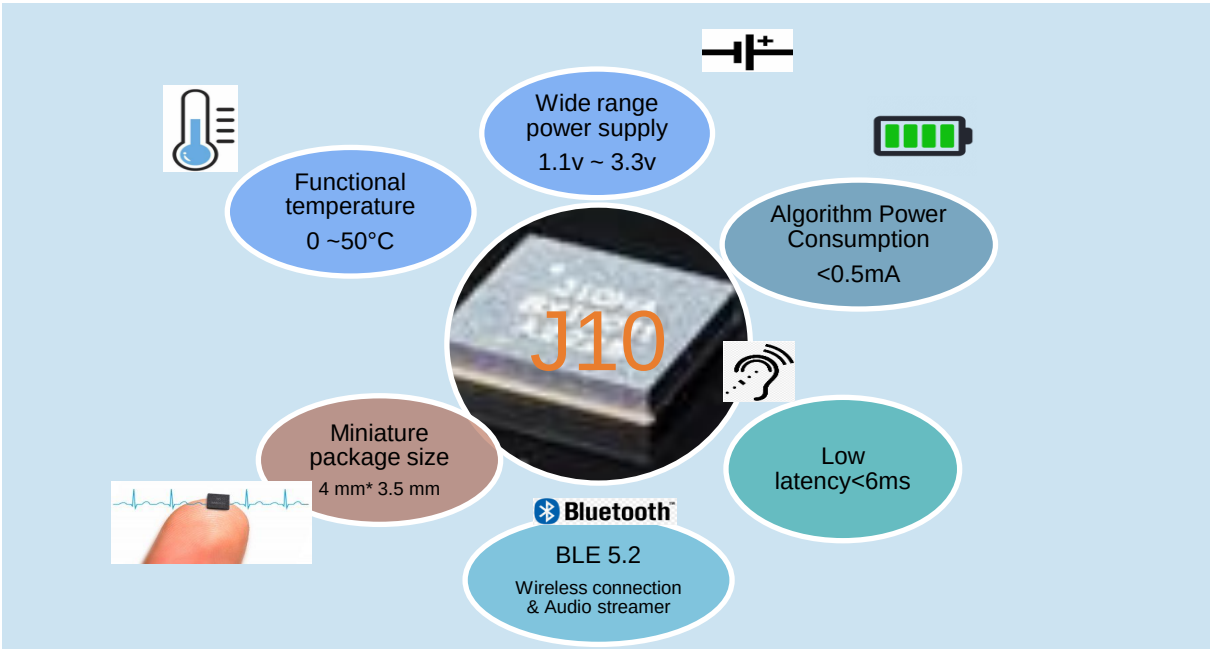
JHEARING ELECTORICS J10 BLUETOOTH® 5.2 Wireless Module is ultra-small, designed for connected portable devices in industrial and medical applications. This module offers ultra-low power consumption, integrated dual core- MCU core and DSP core for user applications. The J10 wireless module provides a 4mm x 3.5mm x 0.75mm LGA package, 48MHz Arm® Cortex® M3, 50ohm match to external antenna, and various I/O interfaces such as UART, QSPI, SPI, GPIO, ADC, DAC, PWM, and I2C. The Wireless Module has an operating temperature range -40°C to +85°C and an input supply range of 1.2V to 3.6V.

J102 SiP module offer 4mm*4mm*0.75mm LGA package with more GPIOs



Hearing Aid Applications





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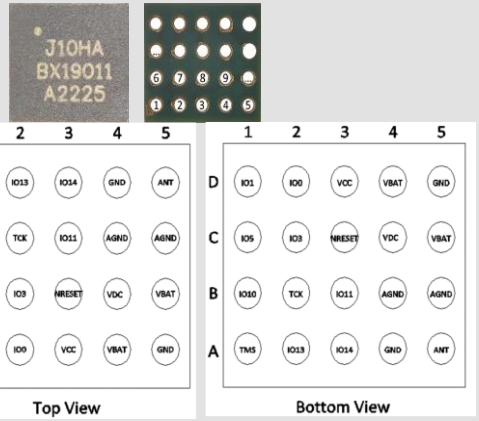
JHEAR J10 SiP &J102 SiP Package

J10 SiP

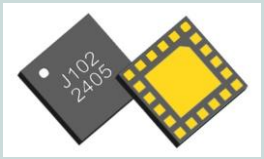
- 4mm*3.5mm*0.75mm
- 20 pins
- Mass Production

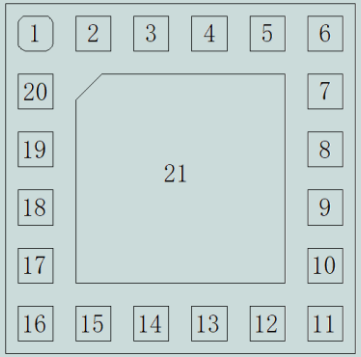


Pin#	Pin Def	Pin Name	Pin Function	Pin Description
1	A1	TMS	I/O	Test Mode Select
2	A2	IO13	I/O	I/O
3	A3	IO14	I/O	I/O
4	A4	GND	GND	GND
5	A5	ANT	RF	RF signal input/output (Antenna)
6	B1	IO10	I/O	I/O
7	B2	TCK	I/O	External clock input
8	B3	IO11	I/O	I/O
9	B4	AGND	AGND	AGND
10	B5	AGND	AGND	AGND
11	C1	IO5	I/O	I/O
12	C2	IO3	I/O	I/O
13	C3	NRESET	I/O	Reset
14	C4	VDC	VDC	DC−DC output voltage to external LC filter
15	C5	VBAT	Power Source	Power Source
16	D1	IO1	I/O	I/O
17	D2	IO0	I/O	I/O
18	D3	VCC	VCC	DC−DC filtered output
19	D4	VBAT	VBAT	VBAT
20	D5	GND	GND	GND

J102 SiP

- 4mm*4mm*0.75mm
- 20 pins
- MP: 2024. July

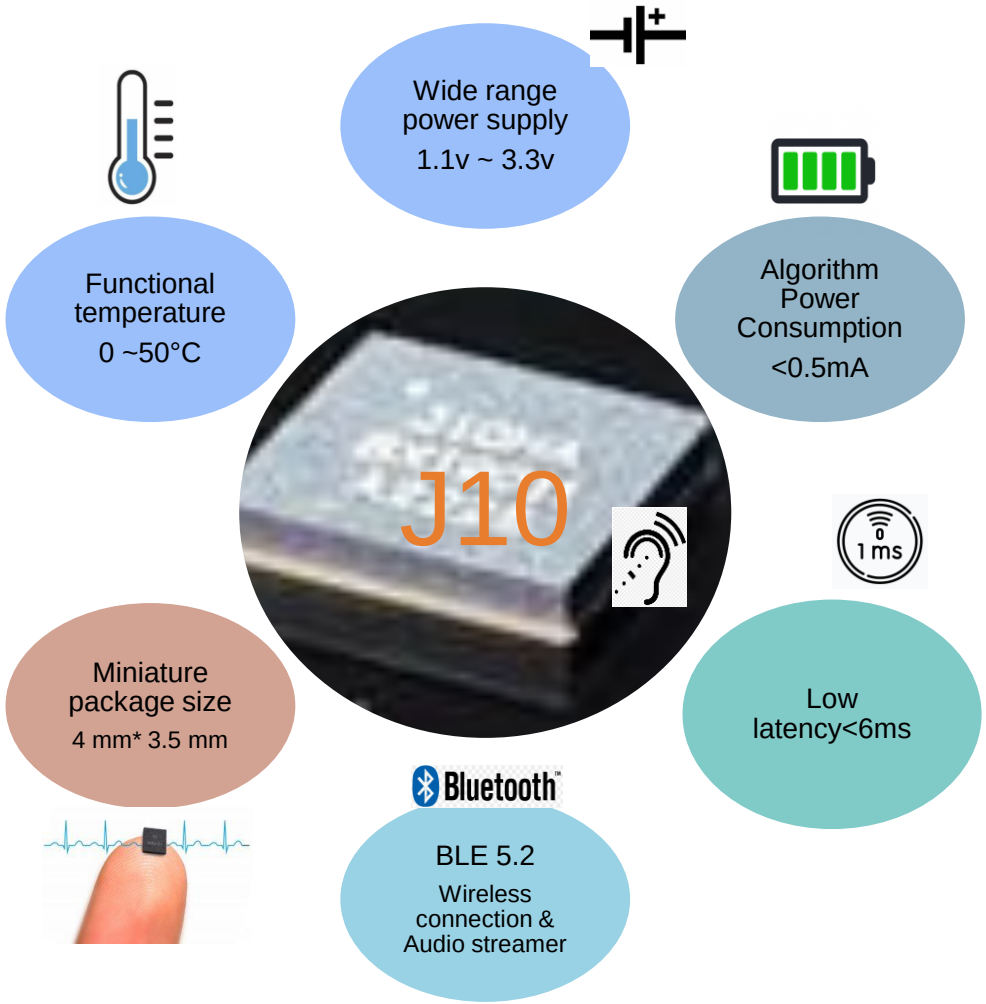




Pad #	Pad Name	Description	I/O	A/D
1	RF	RF signal input/output (Antenna)	I/O	
2	IO11	Digital input output 9	I/O	
3	IO9	Digital input output 10	I/O	
4	VCC	DC−DC filtered output		P
5	AGND	Analog ground		P
6	NRESET	Reset pin	I	
7	IO0	Digital input output / ADC 0	I/O	A/D
8	IO1	Digital input output / ADC 1	I/O	A/D
9	IO2	Digital input output / ADC 2	I/O	A/D
10	IO4	Digital input output 4	I/O	D
11	IO3	Digital input output / ADC 3	I/O	A/D
12	VBAT	Battery input voltage		P
13	IO10	Digital input output 10	I/O	D
14, 21	GND	Digital ground		P
15	IO12	Digital input output 12	I/O	D
16	IO13	Digital input output / CM3−JTAG Test Reset	I/O	D
17	TMS	CM3−JTAG Test Mode State	I/O	D
18	TCK	CM3−JTAG Test Clock	I/O	D
19	IO14	Digital input output / CM3−JTAG Test Data In	I/O	D
20	IO15	Digital input output / CM3−JTAG Test Data Out	I/O	D

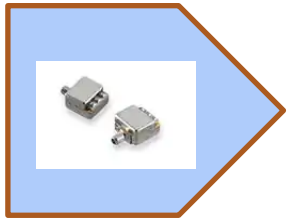
JHEAR J10/J102 Platform Introduction

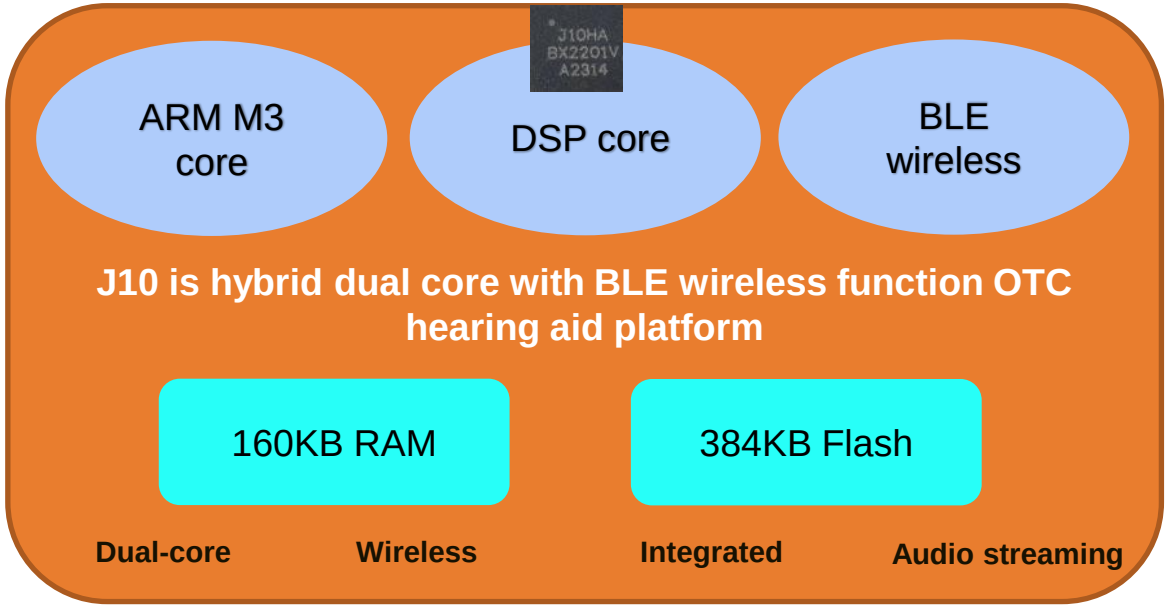
Features	Comment
1-2-3 Buttons	Flexible choice for volume up/down
additional touch sensor interface	Customized touch function for volume, mode etc., better waterproof
50-0hm antenna port	Save PCB size and design cycle time
Support Multi customized Mode	In door, meeting, outdoor, Restaurant mode, music mode, ASHA mode
TV streamer Mode	Property protocol with ultra low power consumption, broadcasting, enable group flexibly
8-WDRC	8 channel WDRC
AI-base Noise reduction	AI NR model, will full operate at next generation platform
Feedback Algorithm	Support in pulse noise compression
ASHA function	Embedded ASHA function
Wireless fitting (App, Website)	reference code for App design, web remote fitting through https://yp.jhearing.com/webj10_2022.php
Rechargeable battery	Mature design reference, charging indicator
Pure Tone test	Open interface for self test
audio prompt function	Support custom multi-languages



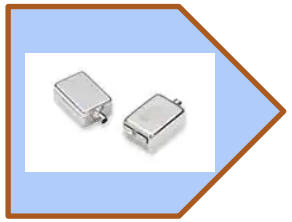
J10/J102 Wireless hearing aid Platform

DMIC





SPEAKER



Basic Algorithm

- Customized 8-ch WDRC
- 16-Ch EQ
- Ultra low power audio streaming
- Starry AI Noise reduction
- AFC Feedback Control
- Howling Detect
- Pure-Tone Audiometry(PTA)

Functions &Features

- TX SRC Sample Rate Convert: 16kHz
- 1->X style Audio broadcasting
- Marked Group for group education etc.
- Max latency<6 ms
- TV streamer support 15 meters
- Rechargeable battery
- Remote Mic

Solution support

- OTC hearing aid ”turn-key” solution
- Open-source Mobile App
- PC Fitting source code sharing
- TV streamer(3.5mm, AUX,SPDIF)
- MFi support(special approval)
- ASHA function support
- Custom logo, name, audio prompt

J10/J102 OTC Hearing Aid Scenarios

Support the coexistence of hearing aid features and ASHA function

- Volume control
- Mode switch
- EQ modification
- Pure Tone Test

Mobile Wireless Fitting

- WDRC
- NR
- Signal Chain Calibration
- Volume
- Mode
- AGC-O

PC Wireless Fitting

J10 hearing aids

- TV-Box

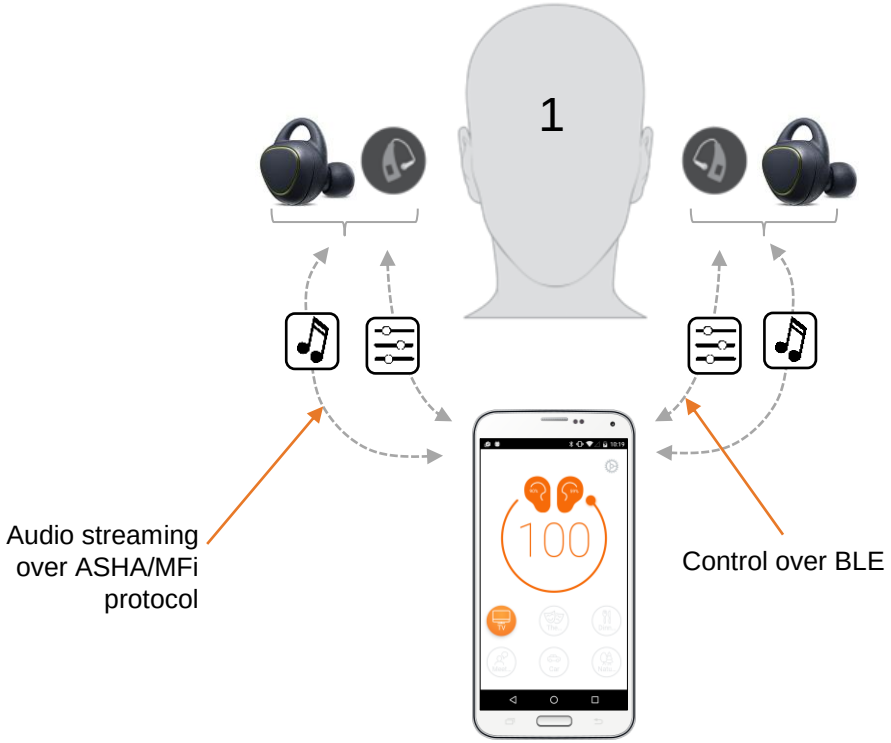
- ASHA
- MFi

- TV-Box
- Remote Mic

J10/J102 bases hearing aid use cases

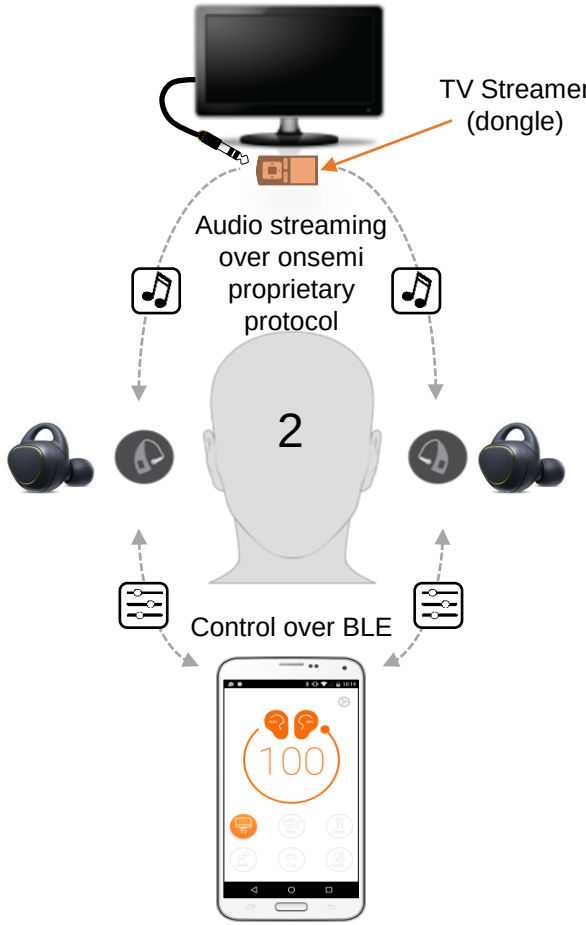
Direct connectivity with a Smartphone (no dongle)

- Streaming music and speech to earbuds/HA
- Controlling the earbuds/HA (volume up/down, equalizer etc..)



Connectivity with accessories i.e. TV set (via a dongle)

- The earbuds/HA receive audio stream from TV
- The Smartphone controls the earbuds/HA

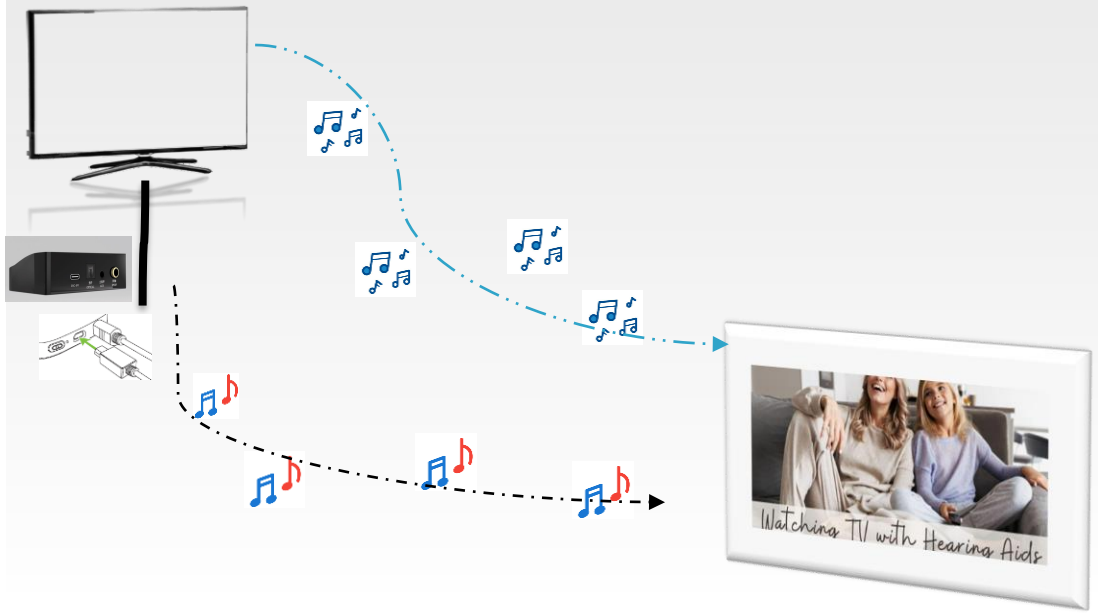


J10/J102 Platform for Audio

TV Steamer

With TV Steamer, you can

- watch TV, listen to music. we support audio broadcasting, one host for many salve device
- Support Group isolate group broadcasting
- Support all families TV enjoying together



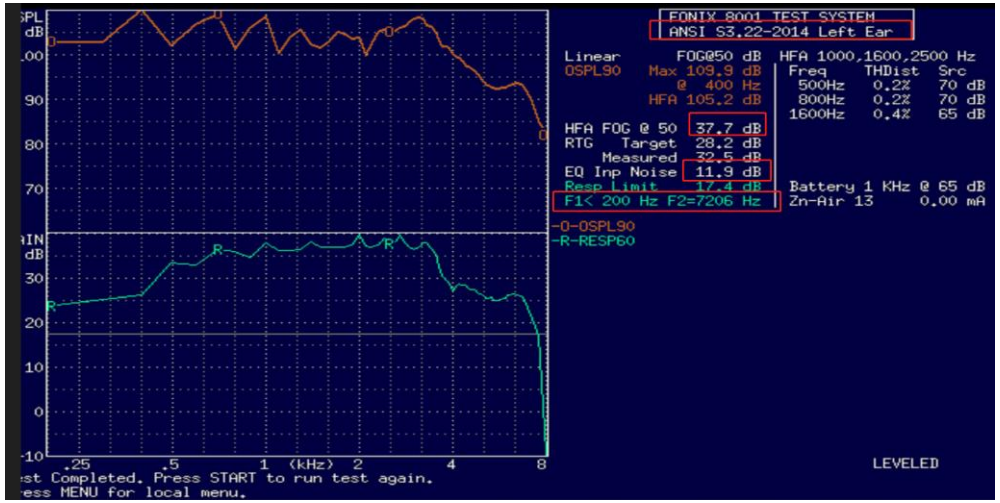
ASHA/MFi

Support most of Android phone, the system >10.0.0 version

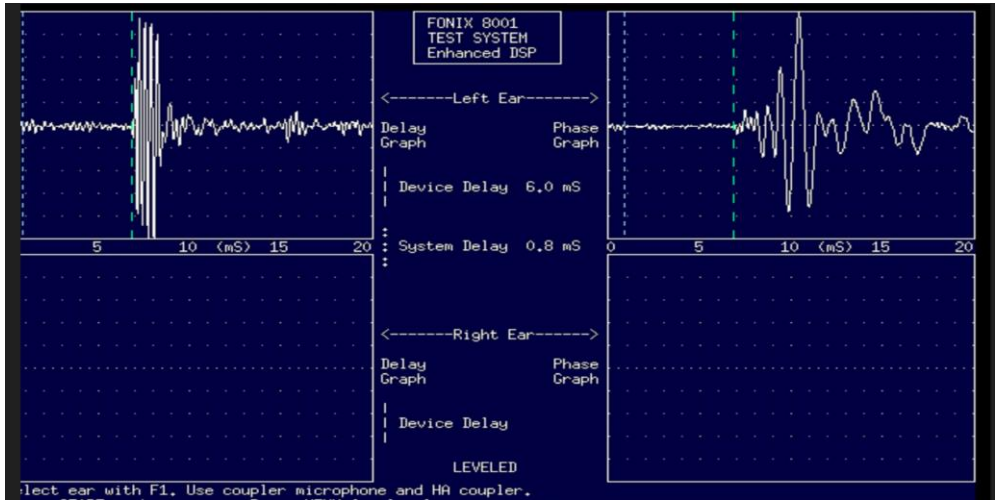
- ASHA is audio streaming for Android smart phone
- This is for single direction audio receive

J10 Platform Performance picture (OTC)

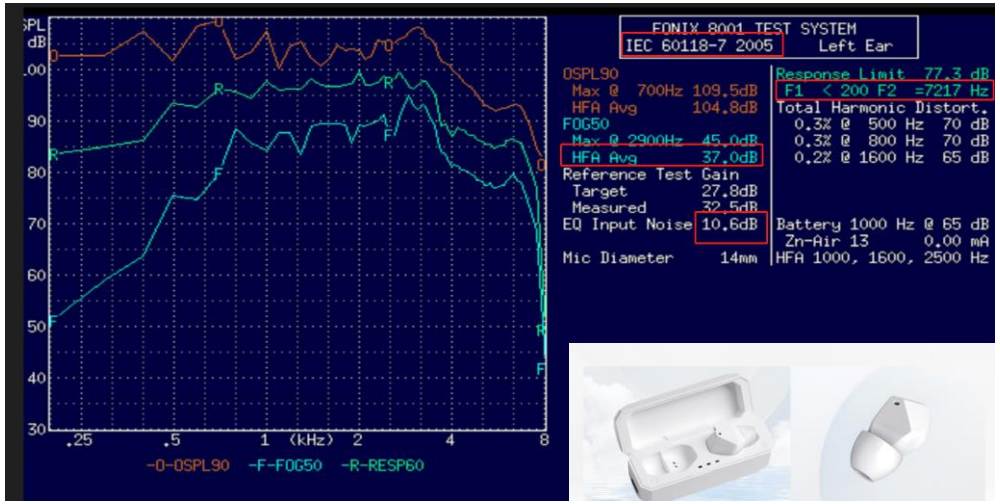
ANSI specification to support OTC hearing aid benchmark



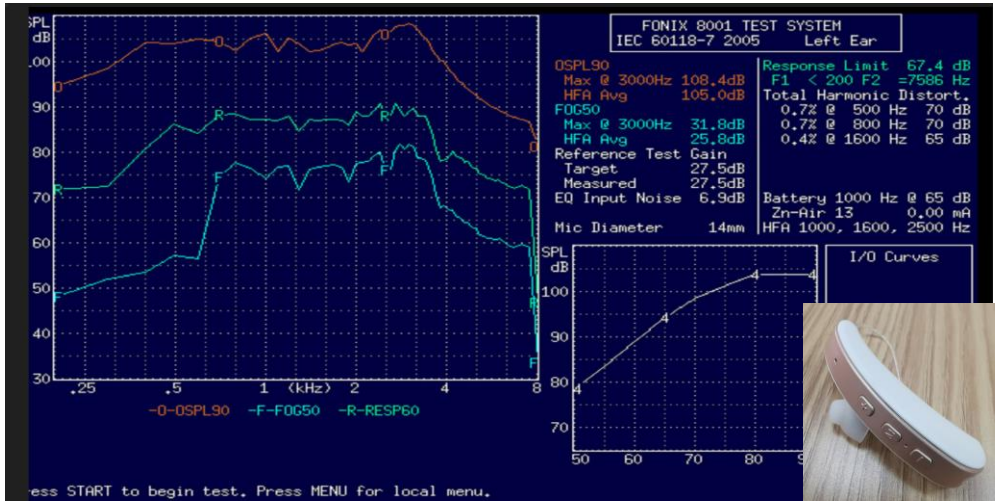
Delay=6ms



RIC hearing aid



ITE hearing aid



J10 OTC hearing aid design resource

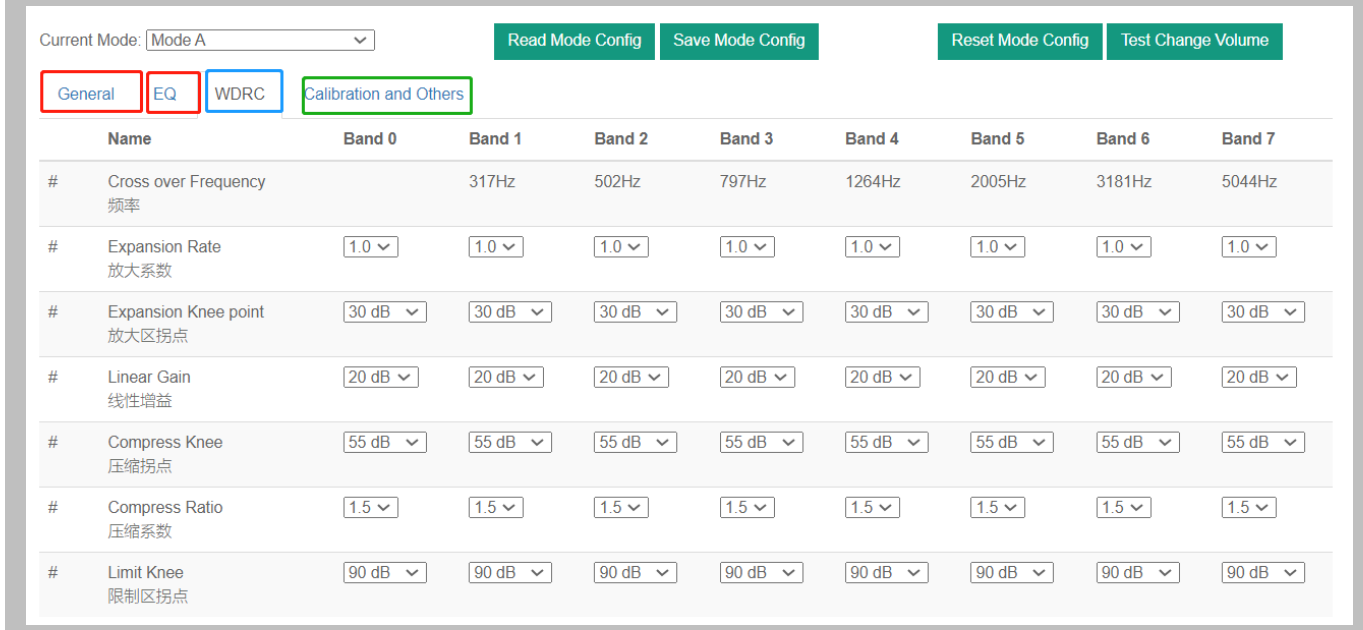
https://en.jhearing.com/docs/

J10 Document

- J10 Description
- Datasheet
- BLE protocol and client code
- J10 Schema pdf
- J10 Functions
- J10 Web fitting
- Downloads

https://yp.jhearing.com/webj10_2022.php

J10 Hearing Aid ,you can fitting on the web page



	Name	Band 0	Band 1	Band 2	Band 3	Band 4	Band 5	Band 6	Band 7
#	Cross over Frequency 频率		317Hz	502Hz	797Hz	1264Hz	2005Hz	3181Hz	5044Hz
#	Expansion Rate 放大系数	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
#	Expansion Knee point 放大区拐点	30 dB	30 dB	30 dB	30 dB	30 dB	30 dB	30 dB	30 dB
#	Linear Gain 线性增益	20 dB	20 dB	20 dB	20 dB	20 dB	20 dB	20 dB	20 dB
#	Compress Knee 压缩拐点	55 dB	55 dB	55 dB	55 dB	55 dB	55 dB	55 dB	55 dB
#	Compress Ratio 压缩系数	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
#	Limit Knee 限制区拐点	90 dB	90 dB	90 dB	90 dB	90 dB	90 dB	90 dB	90 dB

J10 base power consumption

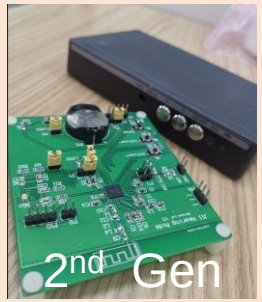
Hearing Aid work Status	Current	Comment		Summary
J10 Pure Hearing aid function	0.8mA	Include all algorithm functions	Feedback algorithm cost 0.7mA, better in next platform	for this customer hearing aid product: ❖ hearing aid algorithm total 0.8mA~, ❖ DMIC cost 0.5mA~1mA ❖ BLE cost 0.6~0.8mA ❖ ASHA cost 2mA (Note: different customers do have different settings and output power for Audio streaming, the data could be for reference only)
J10 support wireless ASHA	2.0mA	Feedback algorithm cost 0.7mA	We could reduce this when more powerful core in J20 platform by optimize the sample rate	
Shut down WDRC, EQ	2.5mA~ 2.6mA	The rest of hearing aid algorithm do not cost much power consumption		
System work, but shut down DMIC	2.3mA	DMIC power consumption in this hearing aid cost 1mA	There is better power consumption DMIC source in the future	
Only BLE, but no hearing aid algorithm	0.8mA	Which means if shut down BLE, we will save 0.8mA		

J10 Hearing Aid Accessories

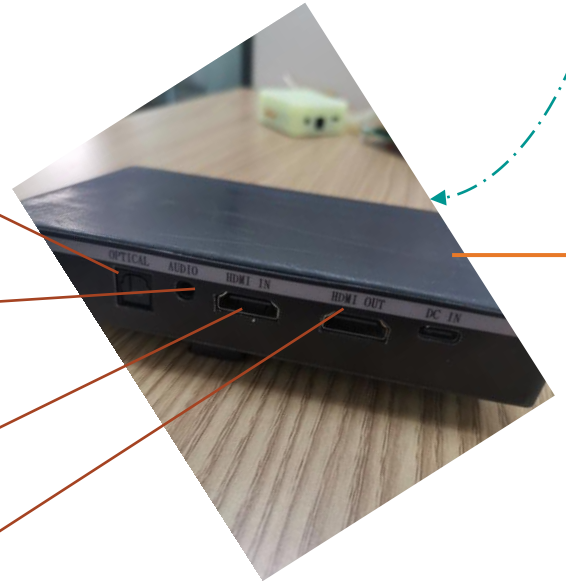
USB dongle

TV Streamer

TV Streamer



Remote Mic



3.5mm

SPDIF

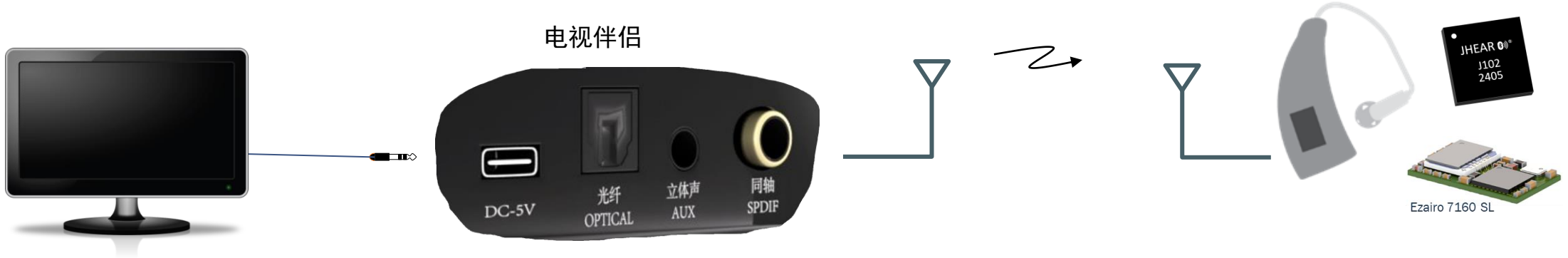
HDMI IN

HDMI OUT

Support Ezairo 7160/J10 hearing aid

https://en.jhearing.com/tv-streamer-2/

Support JHEAR J10/ Ezairo 7160SL Hearing Aid Platform TV streamer



- High quality audio streaming from your TV, Hi-Fi stereo, personal computer or other audio device directly to your J10/Ezairo 7160 SL-based hearing aid
- TV streamer from JHEAR
  - Support HDMI, 3.5mm analog audio, coaxial, optical audio
  - Type-C charge interface, 5v-2A adapter
  - Support V+ / V- push button
  - Support Power on/off LED light and Audio signal indicator
- TV streamer can be customized if desired
  - Design, features and form factor can be modified
- To access the reference design:
  - JHEAR also offers full manufacturing services as well
  - JHEAR contact– tech@jhearing.com

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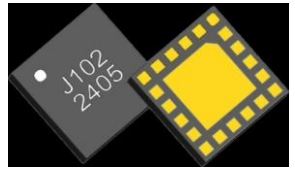
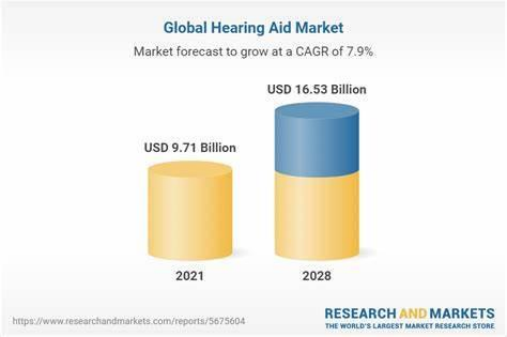
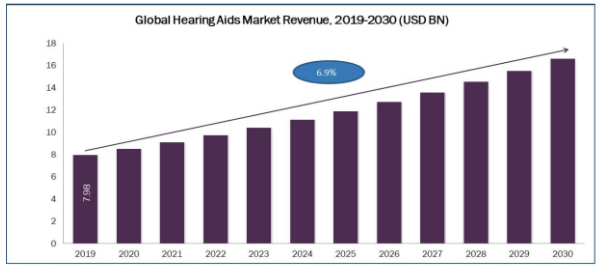
J10/J102 Hybrid SoC platform eco-system build for ramping up market

JHEAR could help support your HA supply chain to help your product best BOM and efficient design cycle







https://marketresearch.biz/report/hearing-aids-market/

JHEAR Hearing aid roadmap

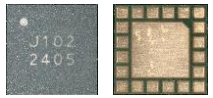
Released

In development

proposal

2024Q3

J20
DSP+M33 dual core
Binaural sync
LE audio/BT Dual model
Sensor interface
MFI,ASHA



2022Q3

J320
DSP +BT
Diversity algorithm
Customized algorithm
TWS hearable feature

2023Q1

J10/J102
Multi function integrated
SIP package
Customized algorithm
BLE wireless feature
Sensor interface
ASHA, Private audio streaming protocol

2024Q2

J711
DSP + BLE
Diversity algorithm
Customized algorithm

2022Q3

J300
DSP ONLY
Diversity algorithm
Customized algorithm

2023Q3

J11
DSP+M3 dual core
WDRC,NR algorithm etc.
Customized algorithm
BLE wireless feature
Sensor interface
MFI,ASHA

2024Q1

J700
DSP ONLY
Diversity algorithm
Customized algorithm

2025Q2

J820
DSP+BT+NNA
Diversity algorithm
Customized algorithm
TWS hearable feature

J300 Platform

J10 Platform

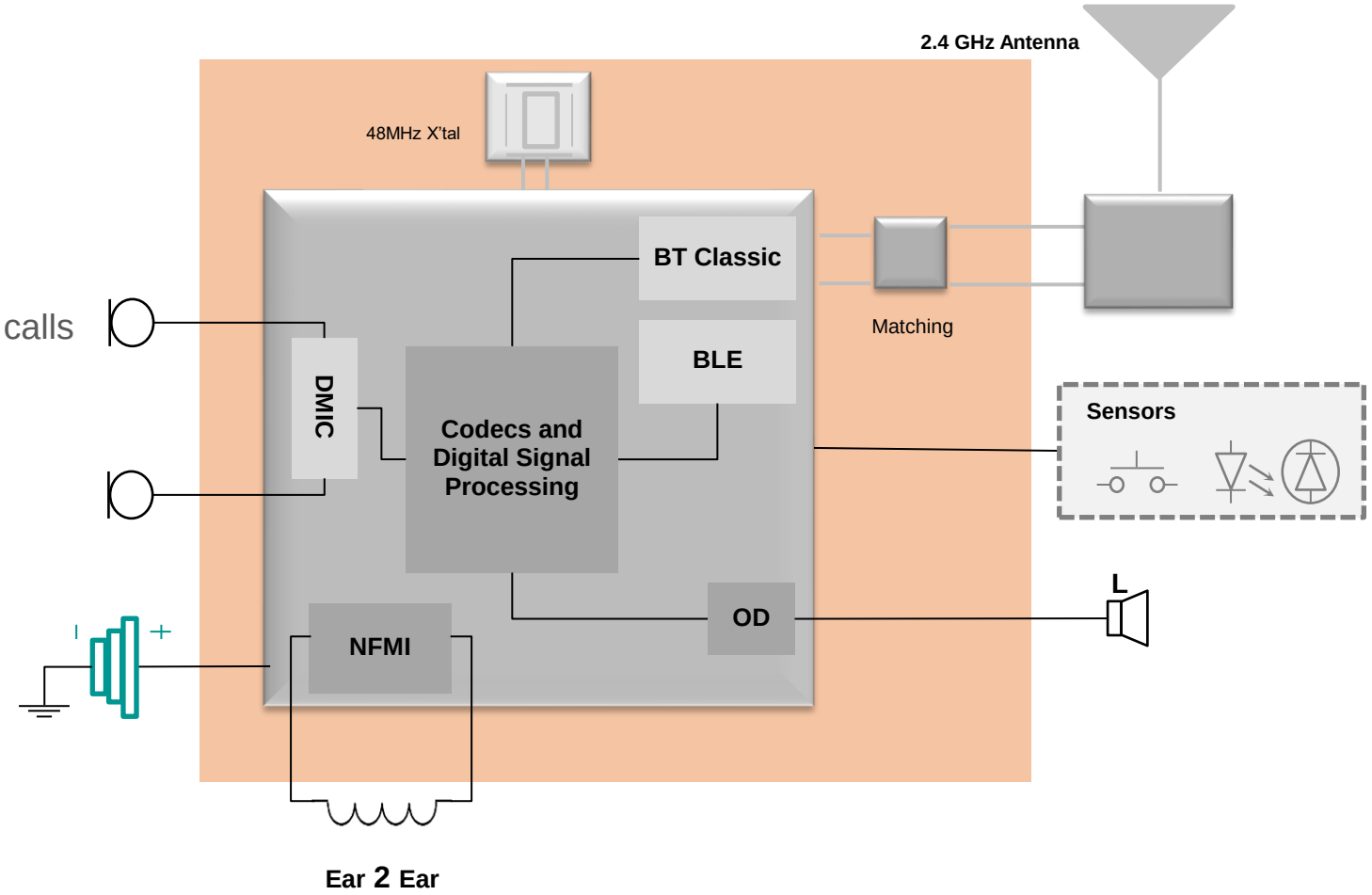
J710 Platform

J820 Platform

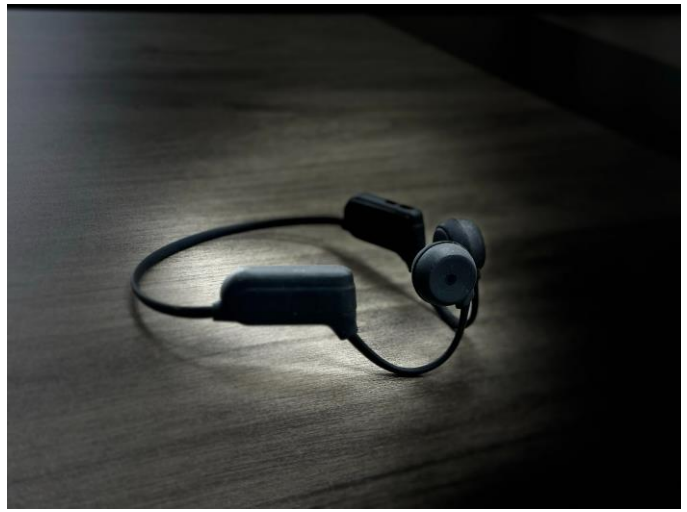
J20 Over-The-Counter (OTC) Hearing Aids concept

The Key content of J20

- Open Algorithm interface
  - Features customizable by customers
  - Kindly SDK
- Low-power Bluetooth Classic TWS earbud
  - A2DP with ear-to-ear relay
  - Hands-Free Profile support bi-directional audio phone calls
- LE Audio version for absolute lowest power
  - Isochronous stream to each ear (LC3 codec)
  - Auracast (broadcast) receiver
- Transparency mode
  - With EQ, noise reduction and directional processing
- Additional OTC hearing aid features
  - 16 channel WDRC
  - Feedback cancellation
  - AI base Noise reduction
  - Wireless fitting and remote control
  - Support natively Li-Ion and ZnAir battery
    - Li-Ion will use DCDC mode
    - ZnAir will use LDO mode



J10 platform Success stories



More coming soon…

JHEAR support whole supply Chain

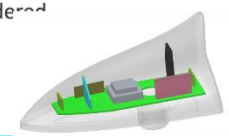
Antenna category Support

Antenna

Antenna category

- LDS/PDS/LAP antennas
- Mobile phone/laptop/panel antenna
- TWS earphone/Hearing Aid antenna
- Internet of Things/Smart "Water and Electricity" Three Antennas
- NFC/RFID antennas
- V2X/UWB/GNSS antennas for new energy vehicles

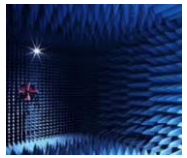


R&D Capability Resource

3D Chamber



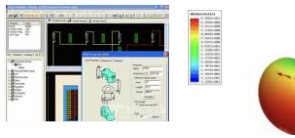
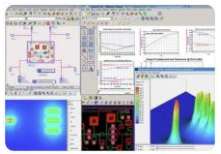


Shenzhen 8 Set: ETS & SATIMO Chambers
TW 1 set: ETS
Shanghai 1set: ETS & Satimo
XiAn 1 set: ETS
Fuzhou 2 Set: ETS & Satimo

Test equipment


Cellular protocol testing :BT, DVB-H, DVB-T and GPS, LTE SISO
Positive test:
2G,3G,4G,5G,WiFi/6E,BT,GPS
NFC (Microprossor / EMVCo)

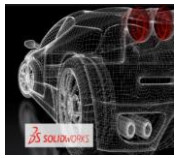
RF simulation Tool

CST MICROWAVE STUDIO
HFSS 2 Sets
ADS Circuit
Maxwell

Mechanical modeling software





PRO/E 5.0
Catia
Creo 8.0
CAD 2019

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J10 Algorithms flow