

Low Energy Computing Enabling Smart Devices



北京君正集成电路股份有限公司
Ingenic Semiconductor Co., Ltd.

Outline



Market Overview and Trend



Today' s Solution and Challenge



Ingenic Low Energy Computing



About Ingenic

What the analyst say

Gartner Research

In 2016, we estimate that consumers will purchase 70 million to 100 million wrist-worn devices, as traditional watch companies add smart watches to their product lines and the Apple Watch triggers high interest.

In 2015, China could account for 50% of total smart watch and wristband shipments, with low-cost, Android-based (not Android Wear) devices as the majority.

<http://www.gartner.com/newsroom/id/2848817>

Citi Research

We believe the market for Smart watches alone is \$10bn, and eventually a wearables market including sport fitness bands, watches, and apparel could be \$30bn.

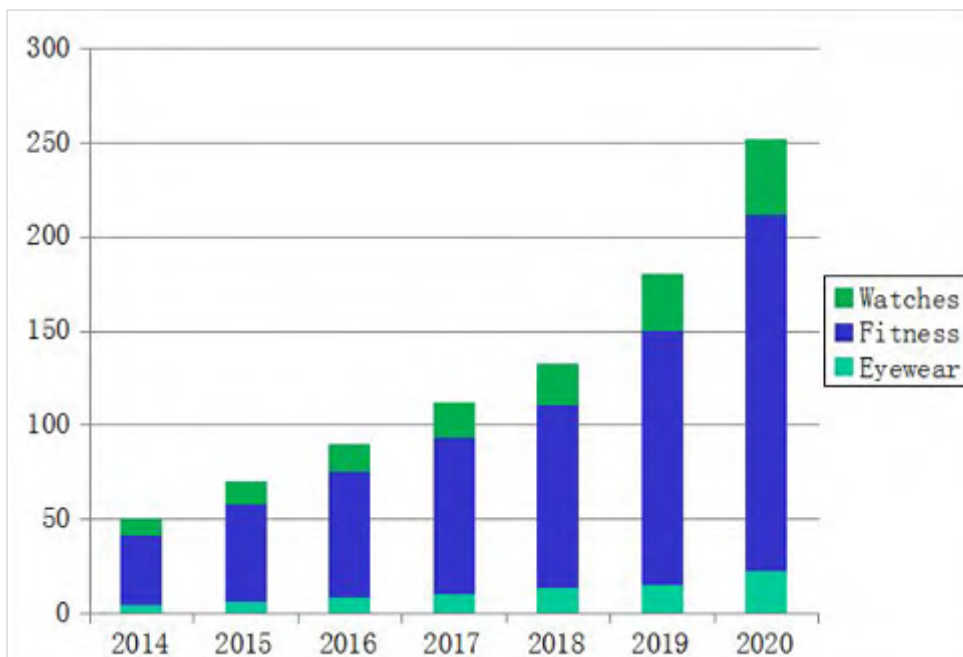
We expect the Smart watch market to reach ~\$10bn by 2018 vs. our estimate of \$1.4-1.8bn in 2014. Of the \$10bn, we estimate \$5bn is expected to come at the expense of traditional watch wearers & \$5bn from technology trendsetters who are non-watch wearers

Market Overview

Analysts Predictions

- Market grows at 113% CAGR
- Largest segment is fitness
- 40M Watches sold in 2020
- 20M Eyewear sold in 2020

Total wrist-worn devices could be as high as 82MU in 2016 (Depending on Analyst).



	2014	2015	2016	2017	2018	2019	2020	CAGR (14-20)
Smart Eyewear	4	6	8	10	13	15	22	51%
Personal Fitness and Wellness	37	52	67	83	97	135	189	105%
Infotainment - Smart Watches	9	12	15	19	22	30	41	64%
Total (Millions of units)	50	70	90	112	132	180	252	113%

Key Requirements for Wearables



Battery Life

Days to Months



Performance

Mobility Scaled



Application Rich

Infotainment, Health, Fitness



Sensor Rich

ECG, Gyro, Compass, Humidity

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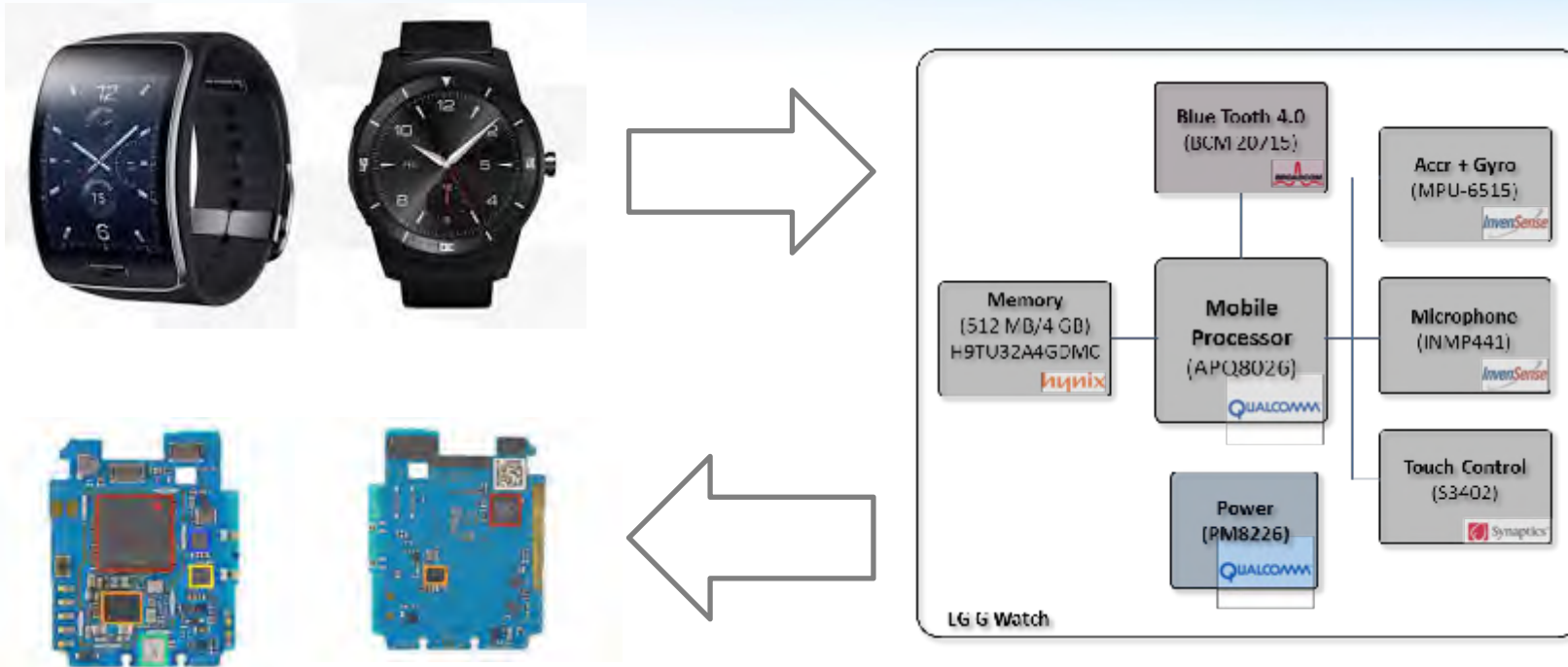


Ingenic Low Energy Computing



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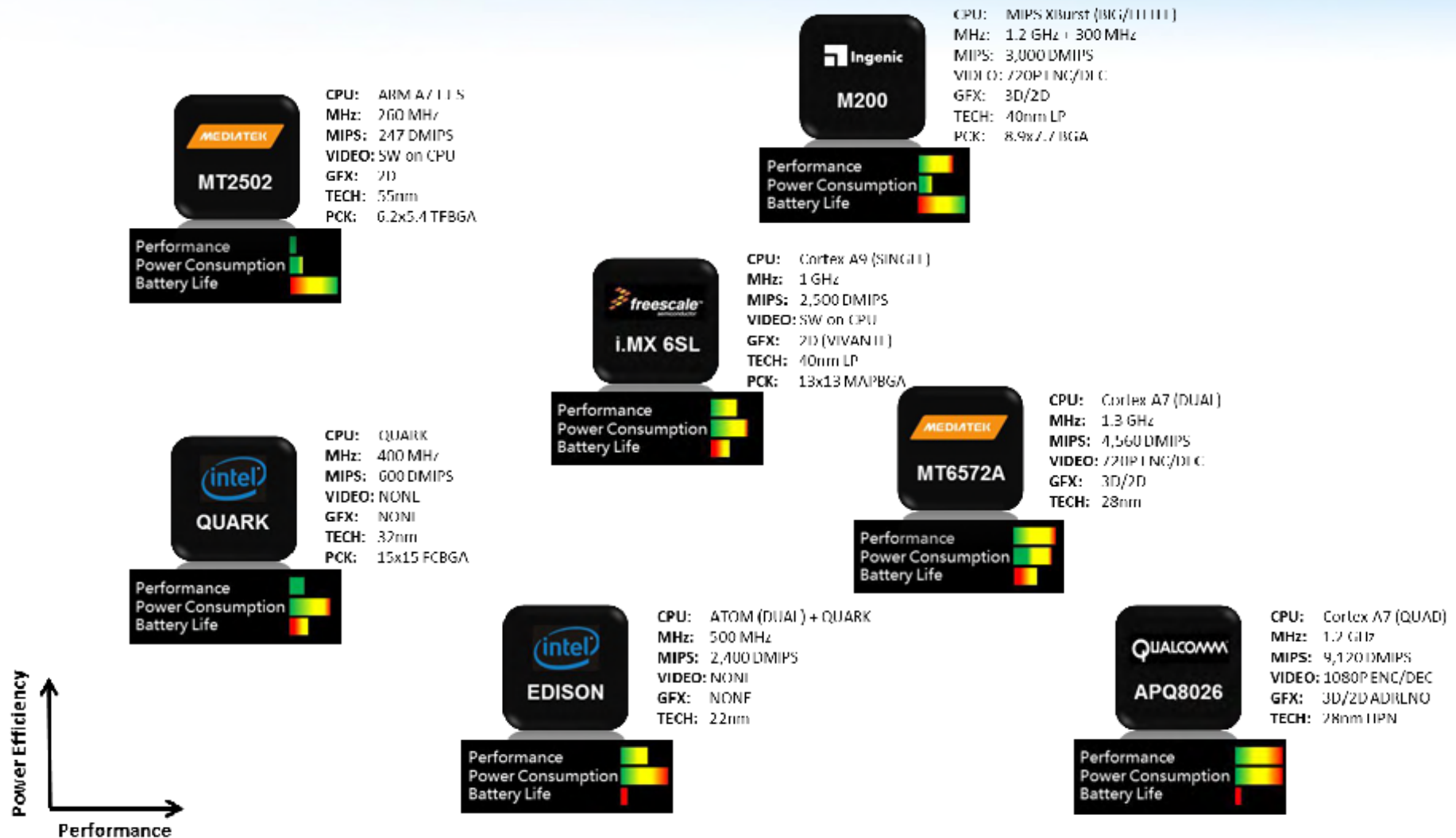
What's Available Now



Problems

1. APQ8026 is a mid-range mobility device (\$200 Smart Phone).
2. Battery life around one day.
3. Nobody wants to charge their watch every day!!!

Current IoT/Wearable Solutions



Challenges – RAU Segment

- The current generation of RAU products reuse mobile application processors.
- Battery life is short, the SoC was not designed for the wearable market.
- RAU products need an ultra low power but high performance solution = Ingenic M200 WPU (Wearable Processor Unit).
- The M200 WPU is a fully custom design using low power techniques to provide performance with exceptional battery life.

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About Ingenic

MIPS Vs ARM

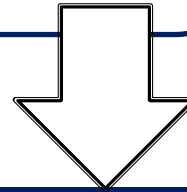


- MIPS architecture conquered the connected home, used in 100s Millions of STBs, TVs, DVD Players.
- ARM won the mobility battle, CPU of choice for Smart Phones and Tablets.
- MIPS and ARM will co-exist in the wearables market.
- Google Wear will support both architectures, applications will run seamlessly..

XBurst: Innovative CPU based on MIPS

MIPS Instruction Set Architecture (ISA)

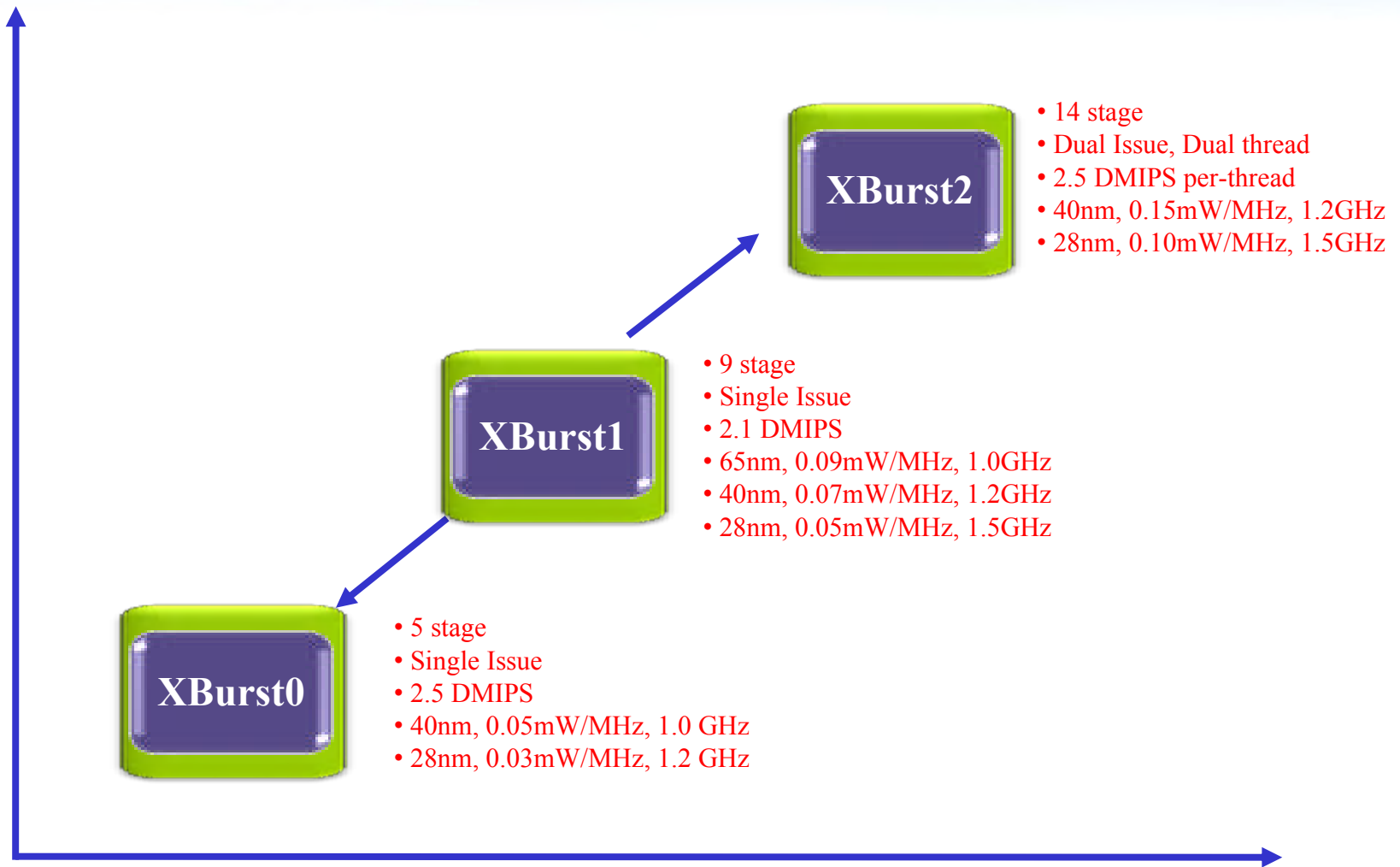
- **Pure**
- **Fast**
- **Efficient**
- **Elegant RISC**



XBurst CPU

- **Ingenic proprietary micro-architecture**
- **Balanced Performance and Low Power design**

XBurst: Roadmap



XBurst1: Extreme Low Power

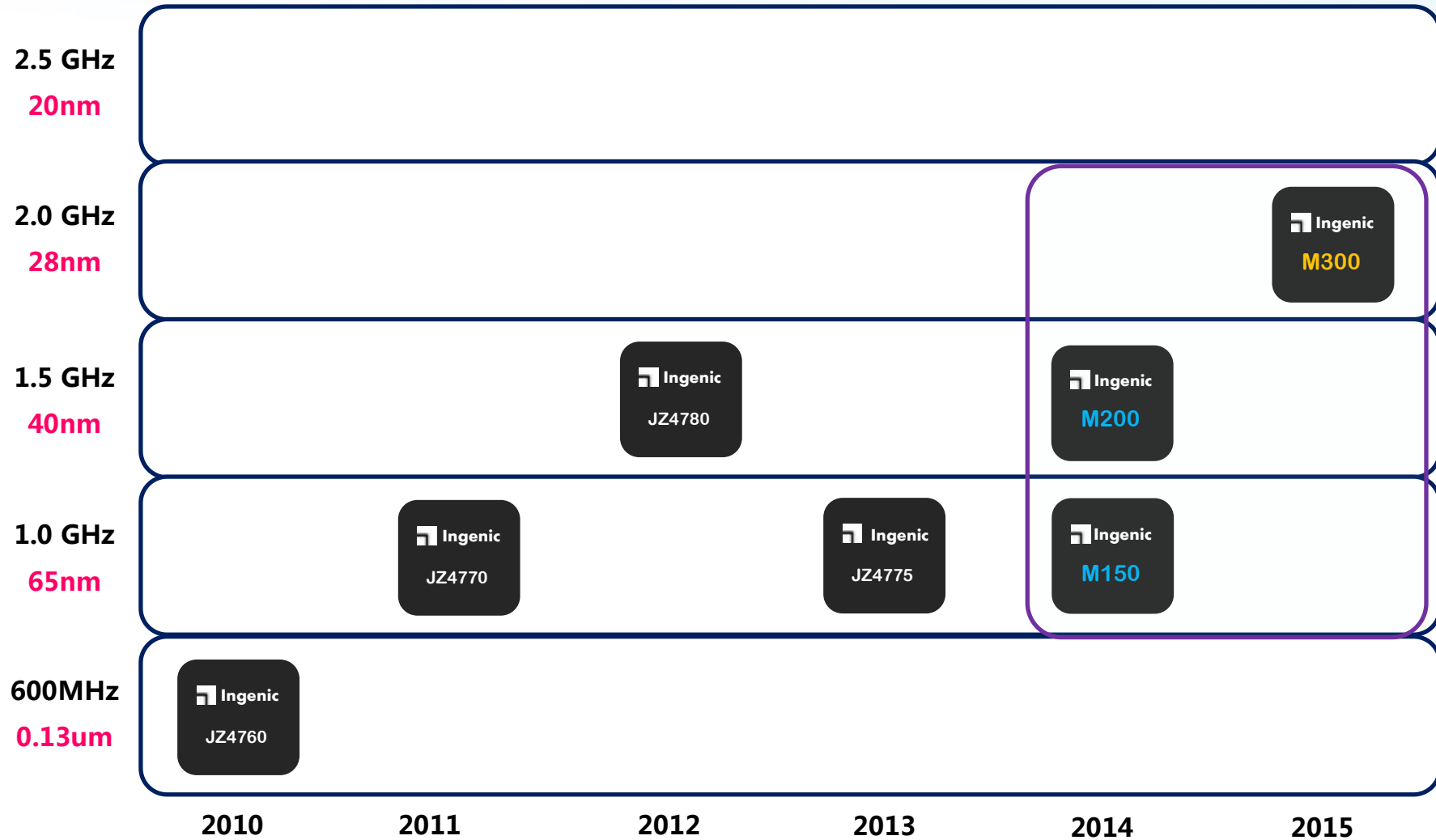
Key Features

- MIPS32 R2 ISA.
- IEEE754 compatible FPU (single and double precision).
- 9-stage pipeline, single issue.
- 32KB, 8-way, instruction and data cache.
- Concise inter-processor interrupt controller.
- Scalable directory based coherent protocol.

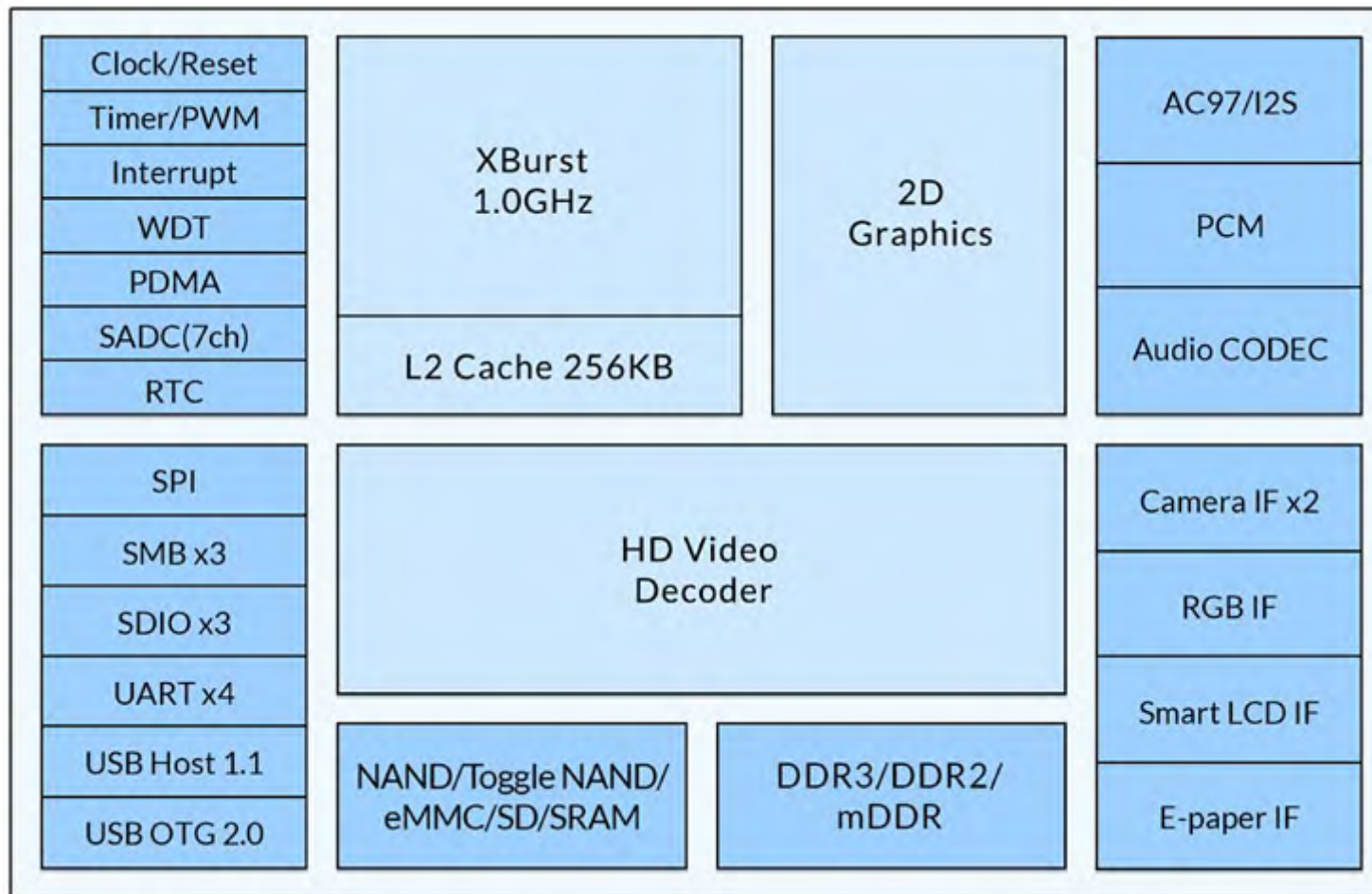
ULTRA low power consumption

- 2.1DMIPS!
- 1.0GHz, 0.09mW/MHz @65nmLP
- 1.2GHz, 0.07mW/MHz @40nmLP, performance optimized
- 500MHz, 0.05mW/MHz @40nmLP, power optimized

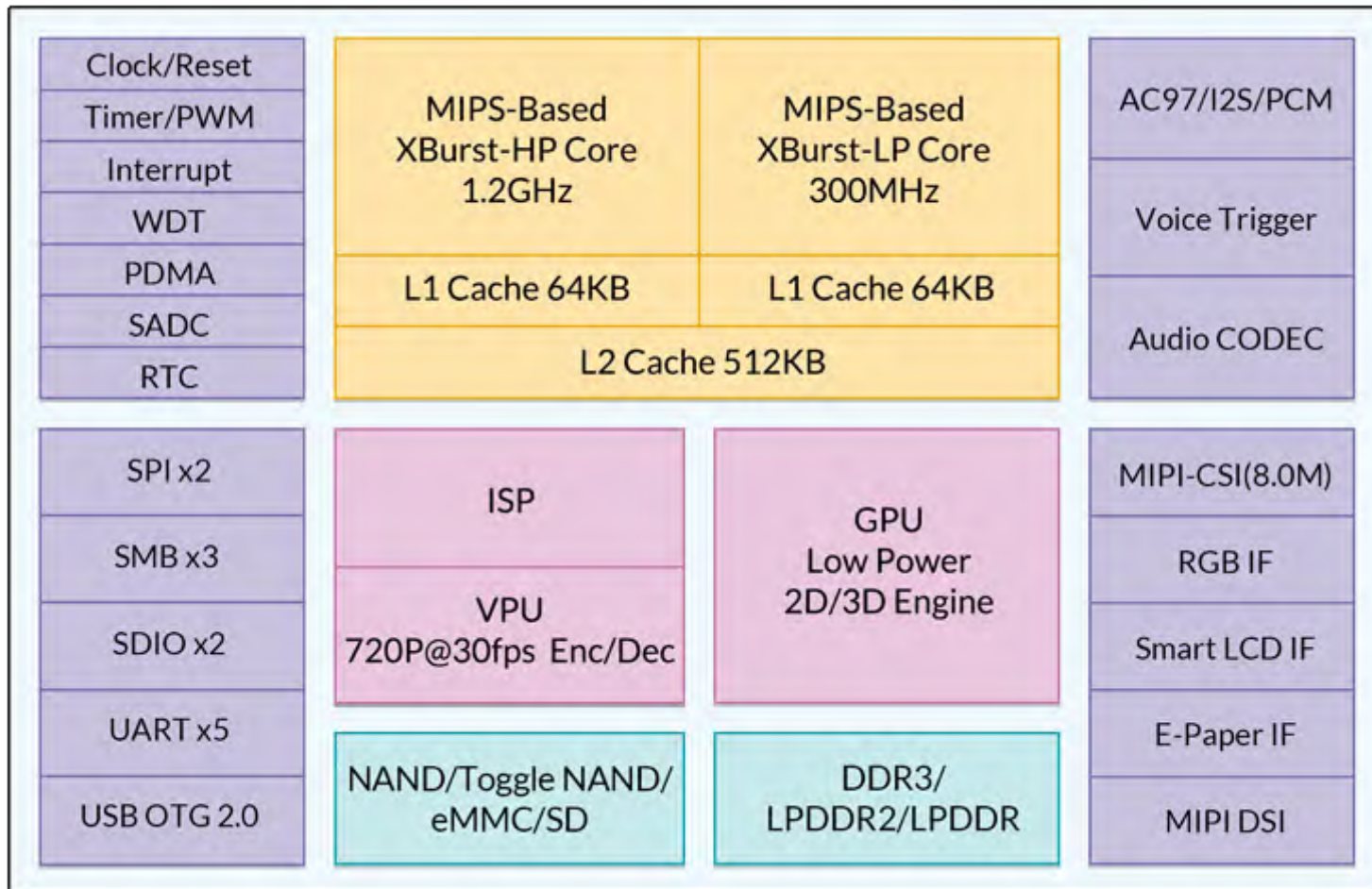
SoC Roadmap



JZ4775: The start



M200: Mobile Performance, Wearable Power



M Series Roadmap



M200: Power Consumption

On Chip Modules

On-Chip Module	Full-Working Conditions	Current (mA)	Power (mW)
CPU	1.1V, 1.2G	82	84
GPU	1.1V, 150MHz	53	58
ISP	1.1V, 100MHz	34	37
VPU	1.1V , 300MHz Dec: H.264 720P@30fps	21	23
	1.1V , 300MHz Dec: H.264 1080P@30fps	27	30
IPU	1.1V, 200MHz	6	7
IO	1.8V	2 9	3.6 16
DDR-PHY	1.2V, 150MHz	26	31

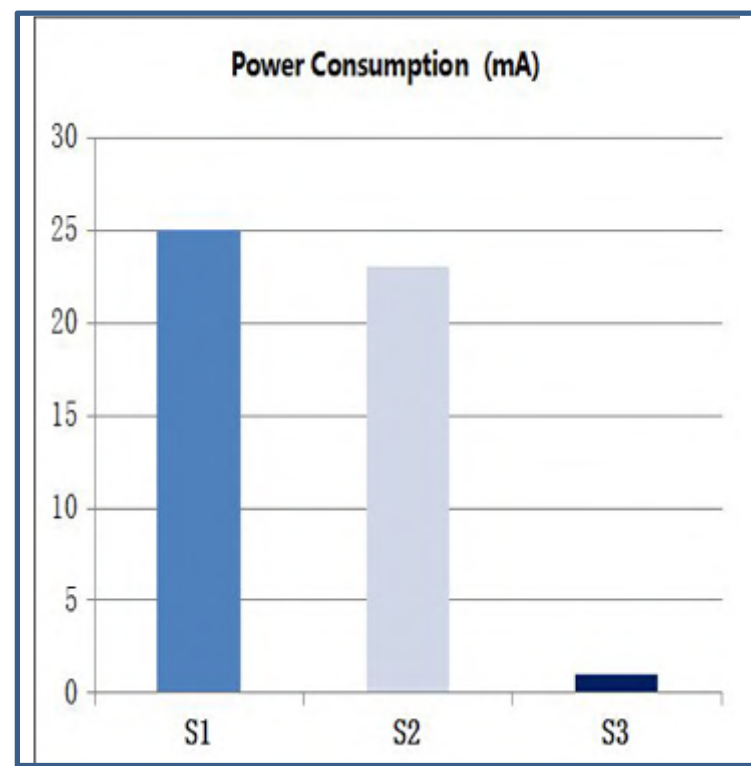
Working Scenarios

Scenario	Core (mW)	DDR-PHY (mW)	IO (mW)	Total (mW)
CPU idle	53	10	3.6	66.6
GCC	119	19	3.6	141.6
Memory copy	128	22	3.6	153.6
Video playback 1080P@30fps	117	21	16	154
3D game	168	31	16	215
Browser loading	120	20	16	156
Browsing web-page	53	10	16	79

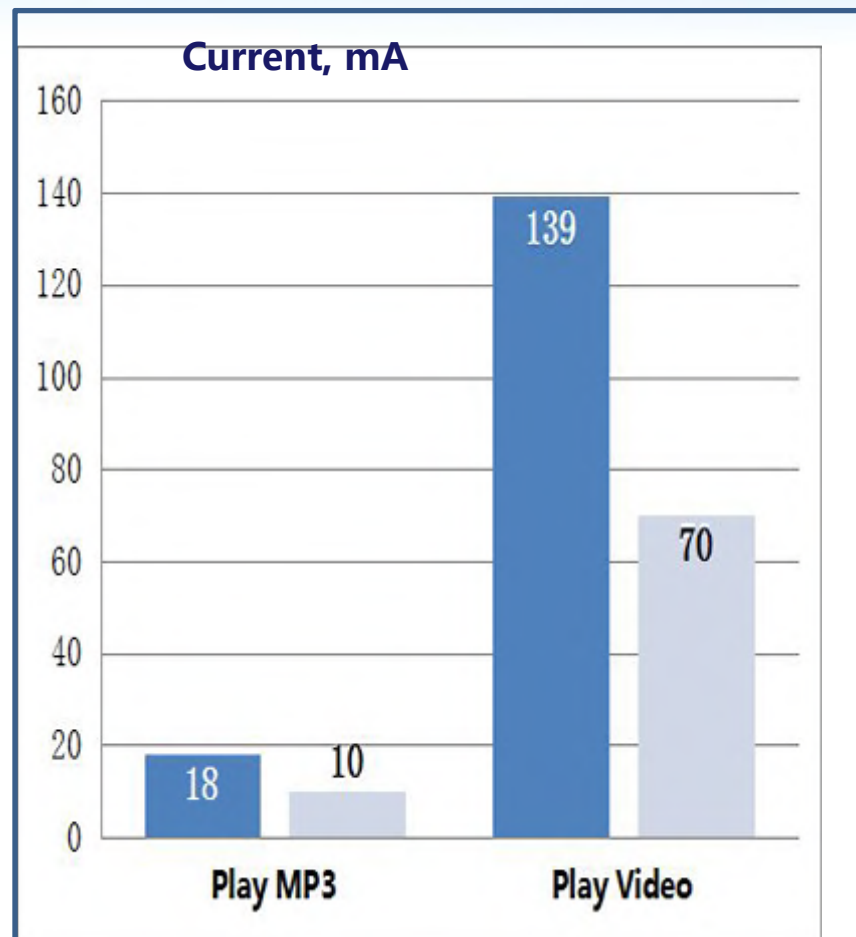
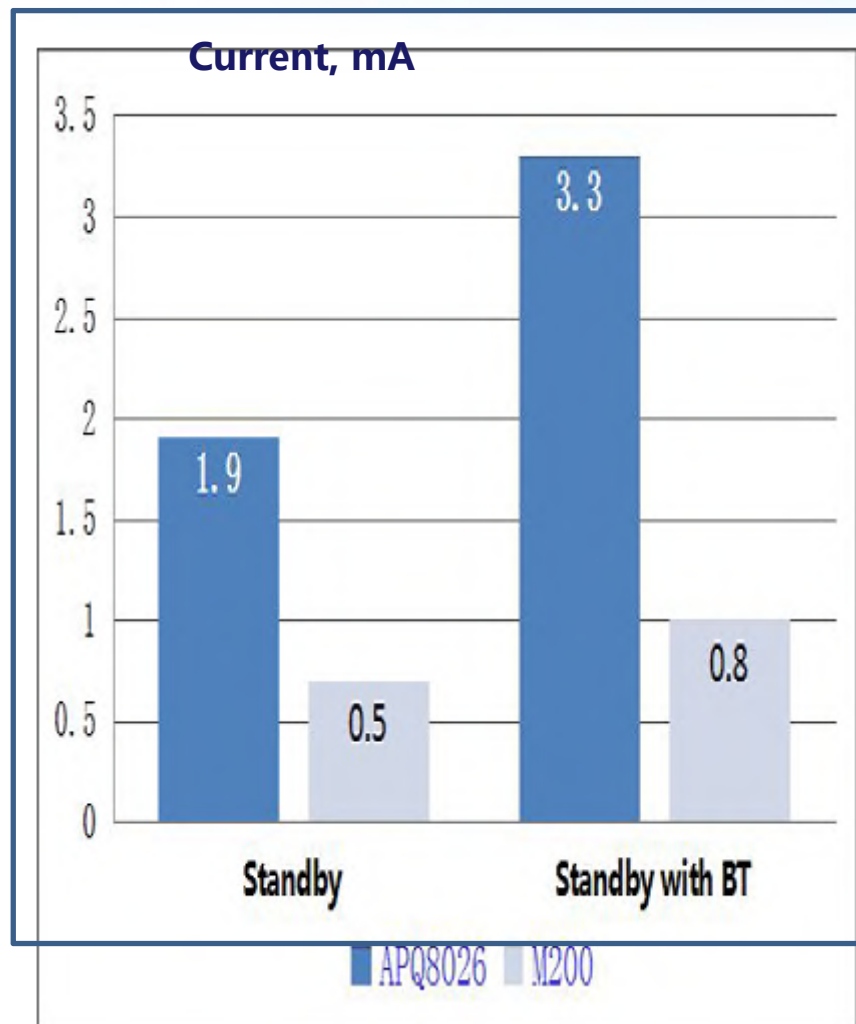
M200: Voice Trigger Engine

- Voice trigger = system wakes up from sleep mode
- M200 VTE supported in S3 mode

	MIC	ADC	VTE	CPU
S1	Analog	Yes	No	Idle
S2	Digital	No	No	Idle
S3	Digital	No	Yes	Sleep



APQ8026 vs. M200 Power



Platform and Solutions



Smart Watch



Smart Glass



Smart Camera



SDKs			
Android		Android Wear	
I/O	Display	Sensor	Communication

Newton HW/SW Platform

Newton: A Platform for Wearables



Newton-I



Newton-2

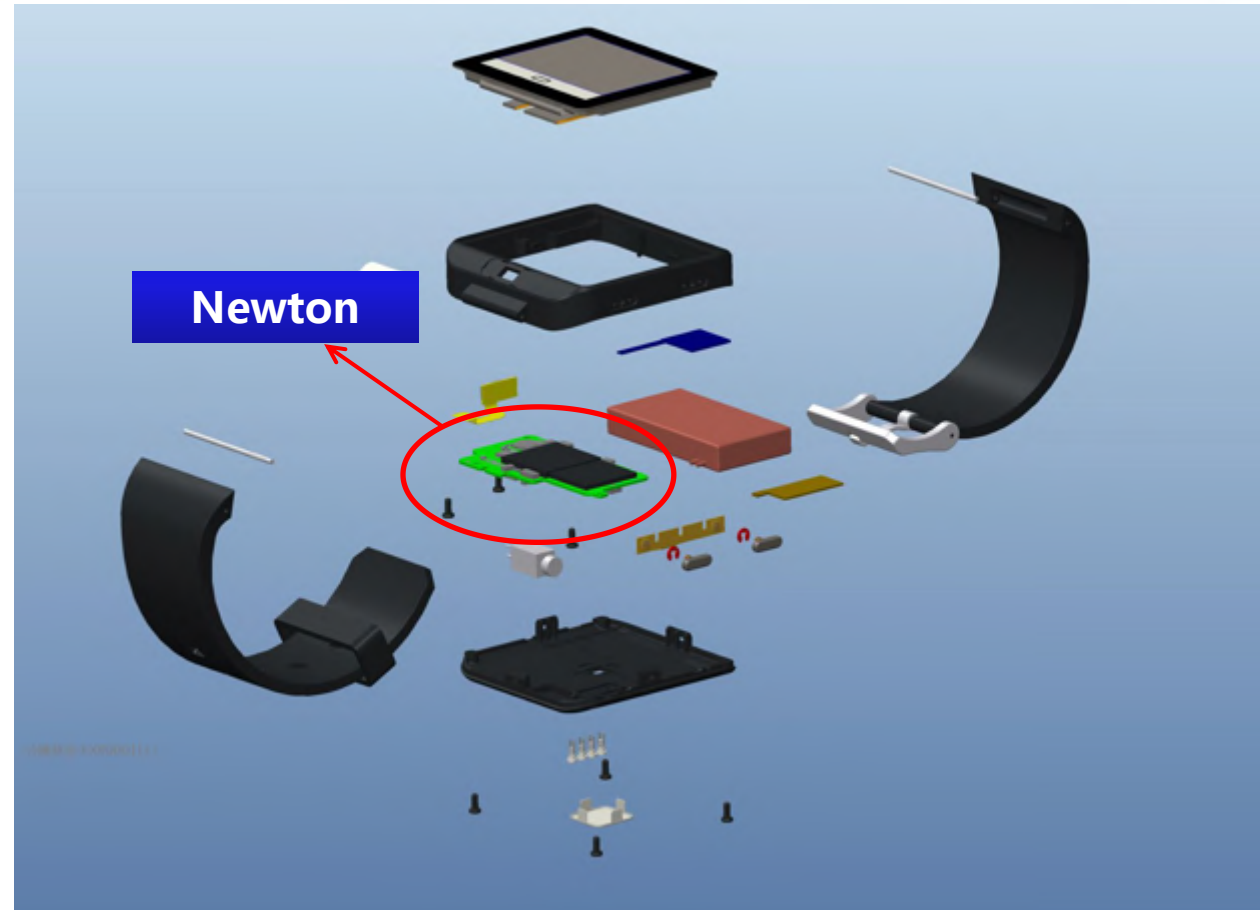


Newton: Comparison



	Edison	Warp	Linkit ONE	Newton2
CPU	ATOM	Cortex-A9	ARM7 EJ-S	MIPS XBurst
Memory	LPDDR2 + NAND	LPDDR2 + eMMC	SERIAL FLASH	LPDDR2 + eMMC
Display	✗	LCD + EPD	✗	LCD + EPD
Touch	✗	✓	✗	✓
Wireless	WiFi + BT LE	WiFi + BT LE	WiFi + BT + GSM + GPRS	WiFi + BT LE + NFC + FM
G-Sensor + Gyro	✗	✓	✗	✓
E-Compass	✗	✓	✗	✓
Humidity + Temp	✗	✗	✗	✓
Pressure Sensor	✗	✗	✗	✓
ECG Sensor	✗	✗	✗	✓
Audio	✗	✗	✗	DMIC and SPEAKER
Video Decode (HW)	✗	✗	✗	720P ENCODE/DECODE
Android	✗	✓	✗	✓
Power Consumption	250mW – 1W	TBD	TBD	150mW

Smart Watch Solution



Smart Watch Products

Geak

<http://10w.igeak.com/gkmain.php?mod=watch2>



Galaxy

<http://www.galaxytech.com/>



Zhiriqi

<http://www.smartdevices.com.cn/>



Tick

<http://www.tickwatch.cn/>



Tomoon

<http://www.tomoon.cn/index>



Speed Up

<http://speedup.co.id/smartwatch/>

Smart Glass Solution

Newton



Hands Free
Talk

SMS

WeChat ...

7*24
Voice wakeup

Voice control

AR

Video Record

Map and
Navigation

Blink activated
camera

Bluetooth and WiFi, GPS Navigation

Android 4.3 OS + Glass UI + Glass SDK

M200 Hardware Platform

Smart Glass Highlights

Ultra Low Power Consumption

- Standby < 1mA
- Standby with voice trigger < 2mA
- Normal use > 2 days
- Video recording > 8 hours

Voice Activated = Wake up anytime

Augmented Reality

- Makes your life more convenient
- Push notifications = Keeping you informed

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Founded in Beijing, 2005

- Develops XBurst, an innovative CPU Technology based on the MIPS ISA.
- Alternative computing platform to ARM and X86.

History

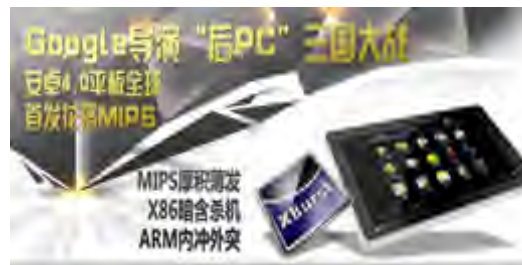
2005

- Founded in BJ
- Embedded



2011

- IPO in SZ
- Mobile



PHILIPS
sense and simplicity

Karbons SMART
TABLETS

SpeedUp®
Keep You Connected

2013

- Wearable



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Thank You