X1000 Security IoT Processor
Best Energy Efficiency
Best Price-Quality

Ingenic
X1000

Product Overview

The X1000 is the first 1.0 GHz dedicated IoT Processor for wireless audio speaker, home appliance, smart toy and far-field voice recognition applications. It has the best-energy-efficiency MIPS32 XBurst RISC core with double precision hardware float point unit.

The X1000 has the best price-quality, it integrates audio codec, voice trigger and 32MB LPDDR, these make the hardware design easily and shorten the time-to-market.

Applications

- ◆ **Far-field voice recognition**
- ◆ **Wireless audio speaker**
- ◆ **Home appliance**
- ◆ **Remote control**
- ◆ **Smart toy**

Key Benefits of X1000

High performance and long useful life

The energy efficiency is very important for IoT devices. The high performance can enable stand-alone intelligent algorithm, such as voice recognition and image recognition, and this can make your product clever. While you enjoying the thrill of performance, you can get the benefit of low energy, that means your device is difficult to generate heat, and have long useful life.

Key Features

- ◆ Operating at 1.0GHz, based on MIPS
- ◆ Double precision hardware float point
- ◆ System level package with 32MB LPDDR
- ◆ Voice trigger engine
- ◆ JPEG encoder
- ◆ Hi-Fi Quality audio codec up to 192kbps sample rate
- ◆ Hardware Security
- ◆ Low power consumption
- ◆ Open source Linux platform

XBurst Technology

The XBurst is best energy efficiency RISC core based on the MIPS Instruction Set Architecture (ISA). Based on the Ingenic unique ultra low power pipeline technology, the dynamic power consumption of XBurst core consumes only 0.09mW/MHz while the frequency operating at up to 1.0 GHz. And when it gets into sleep mode, the static power is only 0.2mW.

Voice Trigger Engine(VTE)

Voice Trigger Engine is a low energy voice detect IP designed by Ingenic. The VTE can support far-field voice command recognition and voice trigger. Once the VTE function is enabled, it will automatically sample the voice and detect the specified key words and then trigger the processor to do the preset task, even the processor is under sleep mode. The key words of voice command can be configured.

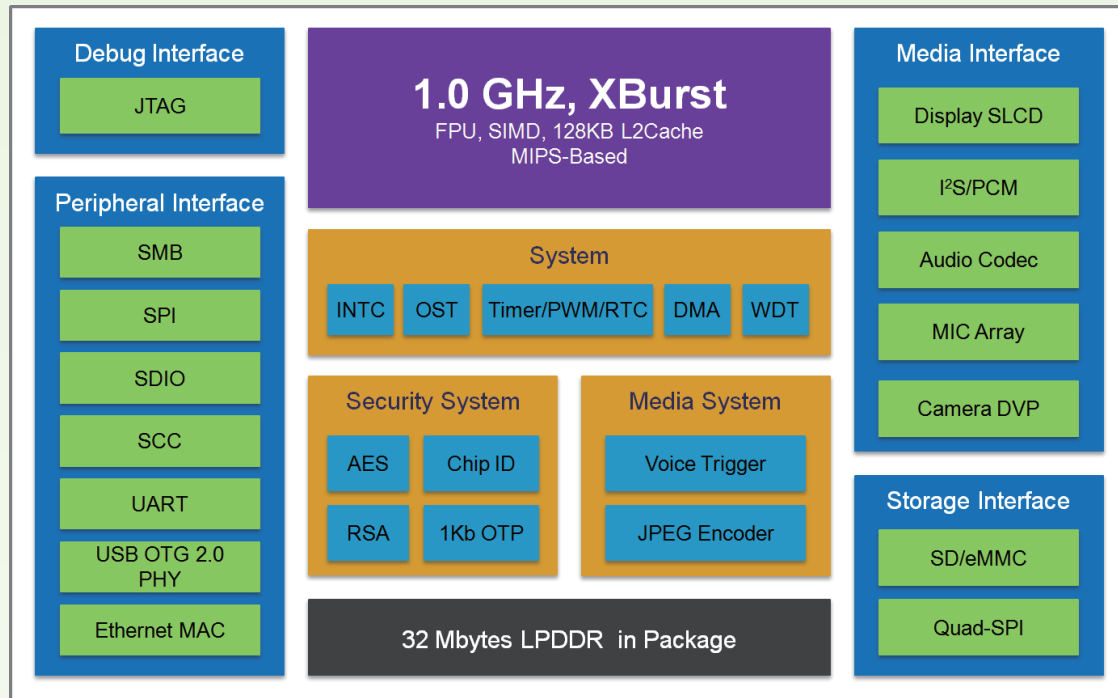### More protection for exchanging data

The X1000 has a hardware security core designed by Ingenic. if needed, the data can be encrypted by the security core first, and then exchange the encrypted data between product and server. And this make your data and device more safer.

Easy to do software development

The operating system of the X1000 is Linux. There are rich device drivers, mid-ware and sample code in the source package.

Ingenic Semiconductor

Low Energy Computing Enabling Smart Devices

X1000 Block Diagram

Debug Interface
- JTAG

Peripheral Interface
- SMB
- SPI
- SDIO
- SCC
- UART
- USB OTG 2.0 PHY
- Ethernet MAC

1.0 GHz, XBurst
FPU, SIMD, 128KB L2Cache
MIPS-Based

System
- INTC
- OST
- Timer/PWM/RTC
- DMA
- WDT

Security System
- AES
- Chip ID
- RSA
- 1Kb OTP

Media System
- Voice Trigger
- JPEG Encoder

32 Mbytes LPDDR in Package

Media Interface
- Display SLCD
- I²S/PCM
- Audio Codec
- MIC Array
- Camera DVP

Storage Interface
- SD/eMMC
- Quad-SPI

Product Features

CPU Core
- Ingenic MIPS XBurst 32-bit core up to 1.0 GHz
- Double precision hardware float point unit
- L1 cache 16KB/16KB, and L2 cache 128KB

Security Core
- On chip security ROM and RAM
- Hardware AES and RSA
- Support Security boot and user customization

Memory Sub-systems
- Support 16-bit DDR2, DDR3 and LPDDR up to 512MB
- Support Quad-SPI NOR/NAND, eMMC, SDHC

Hardware JPEG encoder Core
- JPEG encoder up to 2.0 MPixels@15fps
- Motion JPEG encoder up to 1280x720@30fps

USB OTG 2.0 High Speed
- On chip USB OTG 2.0 high speed PHY
- Support host only, device only and OTG mode

Voice trigger Engine
- Low-power DMIC controller
- Noise reduction for voice recognition
- Low trigger latency
- Kinds of filter for voice detect
- Far-field voice recognition
- Micphone array supported

Audio Codec
- Hi-Fi quality audio codec
- Support audio sample rate up to 192kbps

Process Technology and Package
- 65nm LP, BGA-190, 0.8mm pitch
- 13mm x 13mm x 1.2mm