ALLWINNER

H616

High Picture Quality
4K STB solution

Overview

H616 is a new-generation high picture quality 64-bit 4K@60fps decoding SoC provided by Allwinner for the OTT and IPTV markets. It integrates the quad core 64-bit Cortex™-A53 processor, and the new G31 GPU engine of ARM that supports OpenGL ES 3.2/Vulkan 1.1. Besides, H616 supports full-format 4K@60fps 10-bit ultra-HD video decoding, Allwinner self-developed SmartColor3.3™ picture enhancement engine, Dolby, and DTS audio processing. H616 adopts the new generation of power consumption technology, and reduces power consumption of 20% than the last generation.

Highlights

- **Quad core ARM Cortex™-A53, 64-bit architecture**
- **High performance multi-core G31 GPU, supporting OpenGL ES 3.2/Vulkan 1.1**
- **Full formats H.265/VP9/AVS2 4K@60fps decoding**
- **Maximum 6K@30fps H.265 decoding performance**
- **Low latency H.264 4K@25fps video encoding**
- **Supports HDR10, HLG**
- **SmartColor™ 3.3 picture enhancement engine**

Features

CPU

- Quad-core ARM Cortex™-A53

GPU

- G31 MP2
- Supports OpenGL ES 3.2/2.0/1.0, Vulkan 1.1, OpenCL 2.0

Memory

- 32-bit DDR4/DDR3/DDR3L/LPDDR3/LPDDR4 interface, supporting maximum capacity of 4GB
- SD3.0/eMMC5.0 interface
- 8-bit Nand flash interface with maximum 80-bit/1KB ECC

Video Engine

Video decoder:

• H.265 Main10@L5.1 decoder up to 4K@60fps or 6K@30fps

• VP9 Profile 2 decoder up to 4K@60fps

• AVS2 JiZhun 10bit decoder up to 4K@60fps

• H.264 BP/MP/HP@L4.2 decoder up to 4K@30fps

• Multi-format 1080p@60fps video playback formats, including H.264 BP/MP/HP, H.263 BP, VP8, MPEG-1 MP/HL, MPEG-2 MP/HL, MPEG-4 SP/ASP@L5, AVS+/AVS JiZhun, WMV9/VC1, etc

Video encoder:

• H.264 BP/MP/HP encoder up to 4K@25fps or 1080p@60fps

• JPEG snapshot performance of 1080p@60fps

Display and Graphic

• Output size up to 4096 x 2048

• Six alpha blending channels for main display

• Four overlay layers in each channel, and has an independent scaler

• Potter-duff compatible blending operation

• Supports AFBC buffer

• Supports keystone correction

• Frame Packing/Top-and-Bottom/Side-by-Side Full/Side-by-Side Half 3D format data

• Supports 10-bit processing path for HDR video

• Supports SDR/HDR10/HLG EOTF and color space conversion

• Supports SmartColor3.1 for excellent display experience

• Supports one hardware accelerator for 2D graphic

• Supports one de-interlacing module

Display Output

• HDMI 2.0a up to 4K@60fps

• TV CVBS output, supporting PAL/NTSC

Package

• TFBGA 284balls

• 14 mm x 12 mm body size, 0.65 mm ball pitch, 0.35 mm ball size

Audio

• Two DAC channels

• Supports 1 audio output interface (differential LINEOUTP/N or single-end LINEOUTL/LINEOUTR)

• One Audio HUB, supporting internal mixing function

• Embedded 3 I2S/PCM (I2S0 for extended audio codec, I2S2 for BT, I2S3 for digital power amplifier)

• Supports Left-justified, Right-justified, Standard I2S mode, PCM mode, and TDM mode

• I2S mode supports 8 channels, and 32-bit/192kbit sample rate

• I2S and TDM modes support maximum 16 channels, and 32-bit/96kbit sample rate

• One OWA OUT interface, supporting 16-/20-/24-bit inputs and outputs

• Integrated digital microphone(DMIC), supporting maximum 8 digital PDM microphones
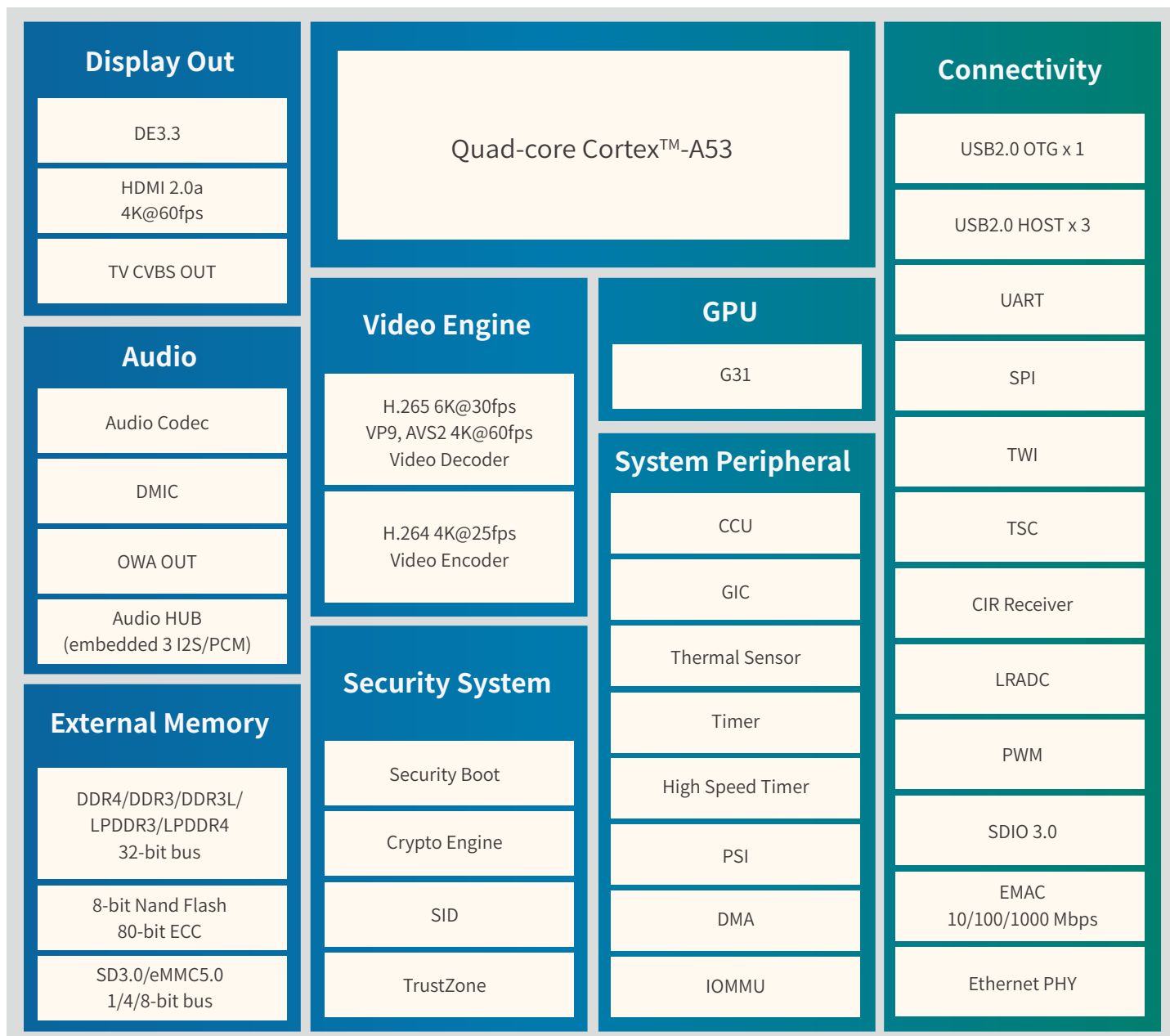
Security Engine

• Supports Full Disk Encryption

• AES, DES, 3DES, and XTS encryption and decryption algorithms

• MD5, SHA, and HMAC tamper proofing

• RSA, ECC signature and verification algorithms

• Supports 160-bit hardware pseudo random number generator(PRNG)

• Supports 256-bit hardware true random number generator(TRNG)

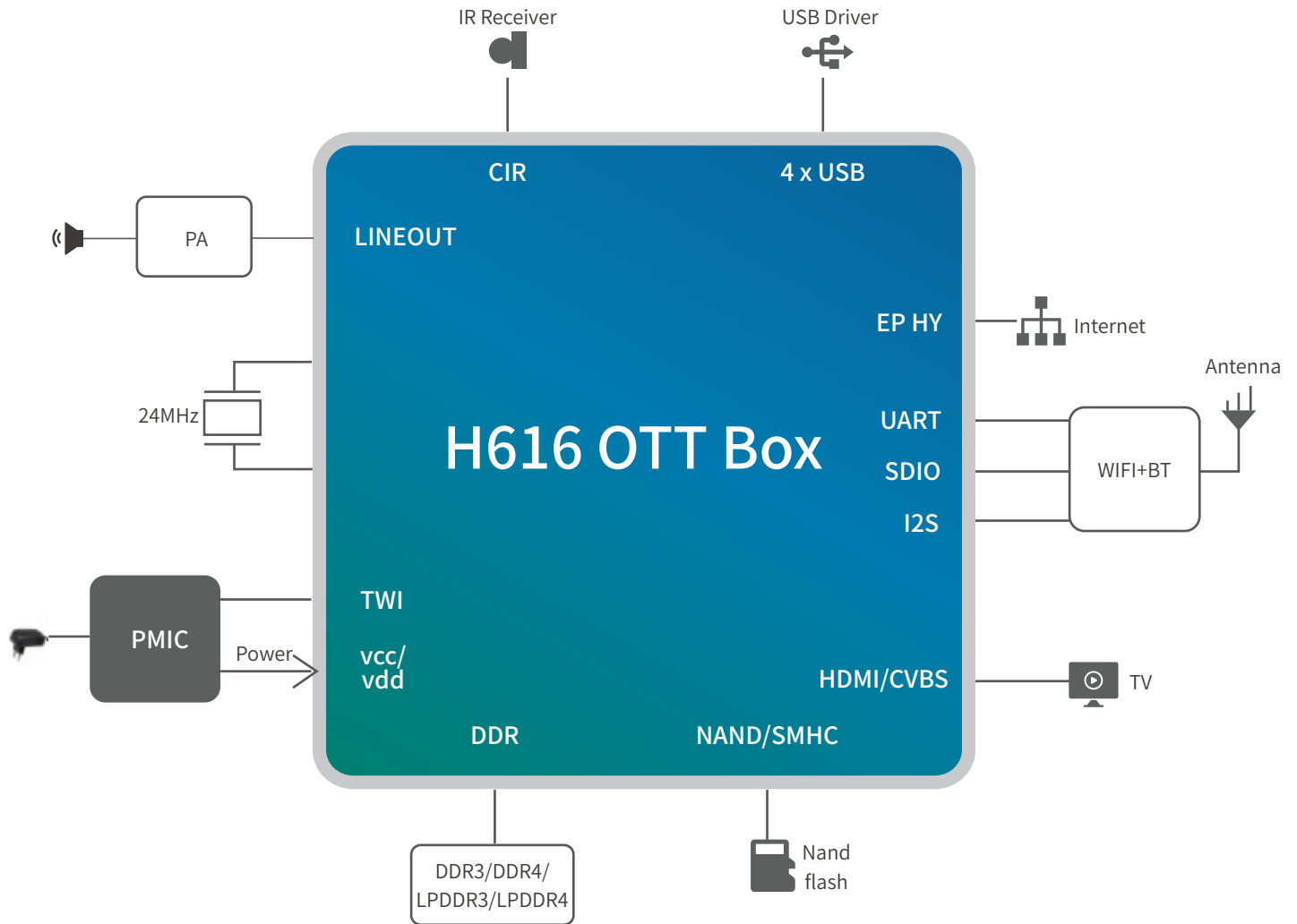• Integrated one EFUSE for chip ID and security application

Connectivity

• 3 x USB2.0 Host, 1 x USB2.0 OTG

• One 10/100/1000 Mbps Ethernet port with RGMII and RMII interfaces

• One 100Mbps Ethernet port with PHY

• SDIO 3.0, TSC, CIR Receiver

• TWI, SPI, UART

• PWM, LRADC

Block Diagram

Display Out

DE3.3

HDMI 2.0a
4K@60fps

TV CVBS OUT

Audio

Audio Codec

DMIC

OWA OUT

Audio HUB
(embedded 3 I2S/PCM)

External Memory

DDR4/DDR3/DDR3L/
LPDDR3/LPDDR4
32-bit bus

8-bit Nand Flash
80-bit ECC

SD3.0/eMMC5.0
1/4/8-bit bus

Quad-core Cortex™-A53

Video Engine

H.265 6K@30fps
VP9, AVS2 4K@60fps
Video Decoder

H.264 4K@25fps
Video Encoder

Security System

Security Boot

Crypto Engine

SID

TrustZone

GPU

G31

System Peripheral

CCU

GIC

Thermal Sensor

Timer

High Speed Timer

PSI

DMA

IOMMU

Connectivity

USB2.0 OTG x 1

USB2.0 HOST x 3

UART

SPI

TWI

TSC

CIR Receiver

LRADC

PWM

SDIO 3.0

EMAC
10/100/1000 Mbps

Ethernet PHY

OTT Box Solution

Block diagram: H616 OTT Box

- IR Receiver → CIR
- USB Driver → 4 x USB
- PA → LINEOUT (speaker)
- 24MHz
- EP HY → Internet
- UART / SDIO / I2S → WIFI+BT → Antenna
- PMIC → Power → TWI, vcc/vdd
- HDMI/CVBS → TV
- DDR → DDR3/DDR4/LPDDR3/LPDDR4
- NAND/SMHC → Nand flash