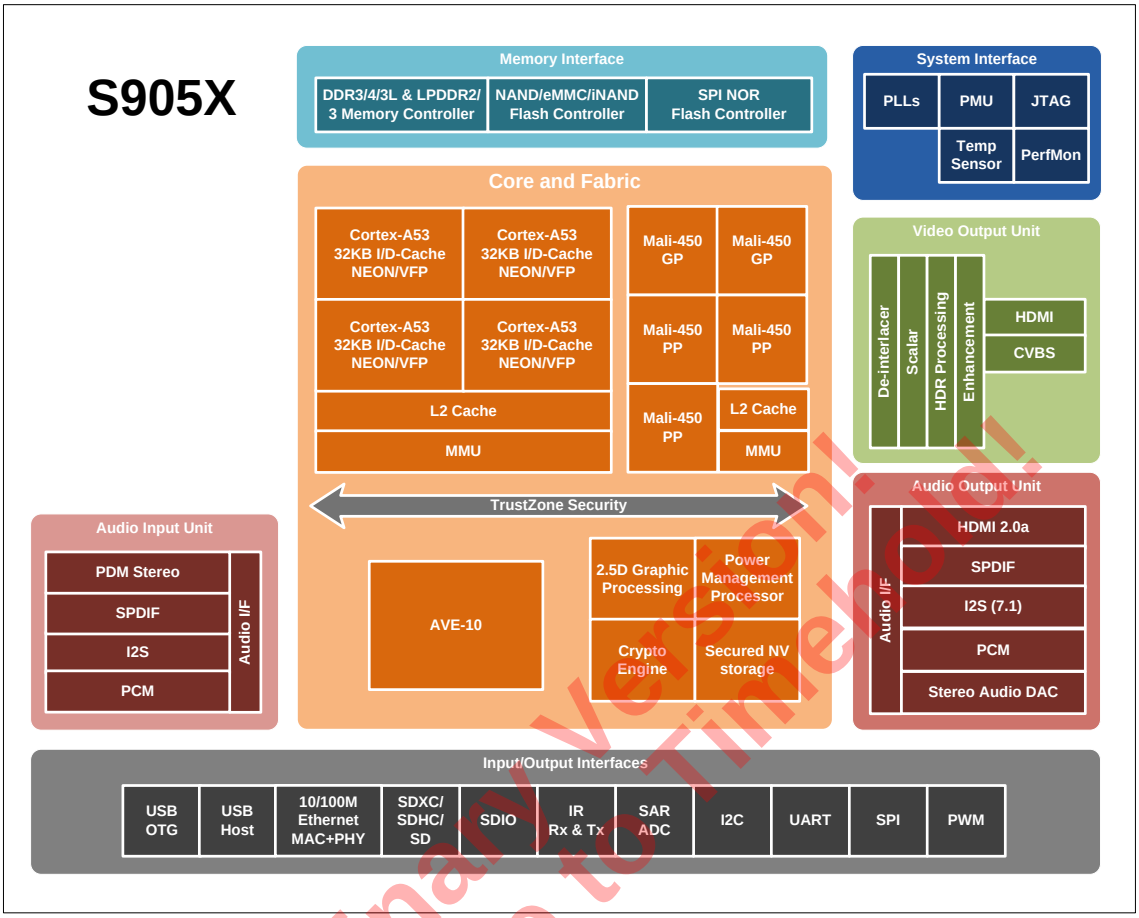
S905X

ADVANCED CONNECTED MULTIMEDIA PROCESSOR



FEATURES SUMMARY

Highlights

- ***2GHz 64-bit quad core ARM® Cortex™ A53 CPU***
- ***750MHz+ Penta core ARM Mali™-450 GPU processor***
- ***HW UHD H.265/VP9 60fps 10-bit video decoder & low latency 1080p H.264 60fps encoder***
- ***HDR10 and HLG HDR video processing***
- ***TrustZone based security for DRM video streaming***
- ***WIFI, BT, USB, SD, Ethernet, Analog Audio and TS peripheral ports***
- ***Power management auxiliary processor***

S905X is an advanced application processor designed for OTT/IP Set Top Box(STB) and high-end media box applications. It integrates a powerful CPU/GPU subsystem, a secured 4K video CODEC engine and a best-in-class HDR image processing pipeline with all major peripherals to form the ultimate low power multimedia AP.

The main system CPU is a quad-core ARM Cortex-A53 CPU with L1 instruction/data cache for each core and a large unified L2 cache to improve system performance. In addition, the Cortex-A53 CPU includes the NEON SIMD co-processor to improve software media processing capability. The quad-core ARM Cortex-A53 CPU can be overdriven to 2GHz and has a wide bus connecting to the memory sub-system.

The graphic subsystem consists of two graphic engines and a flexible video/graphic output pipeline. The five core ARM Mali-450 GPU including dual geometry processors (GP) and triple pixel processors (PP).The multi-core GPU processor handles all OpenGL ES 1.1/2.0 and OpenVG graphics programs, while the 2.5D graphics processor handles additional scaling, alpha, rotation and color space conversion operations. Together, the CPU and GPU handle all operating system, networking, user-interface and gaming related tasks. The video output pipeline includes advanced HDR10 and HLG HDR processing, REC709/BT2020 processing, motion adaptive edge enhancing de-interlacing, flexible programmable scalar, and many picture enhancement filters before passing the enhanced image to the video output ports.

Amlogic Video Engine (AVE-10) offloads the Cortex-A53 CPUs from all video CODEC processing. It includes dedicated hardware video decoder and encoder. AVE-10 is capable of decoding 4Kx2K resolution video at 60fps with complete Trusted Video Path (TVP) for secure applications and supports full formats including MVC, MPEG-1/2/4, VC-1/WMV, AVS, AVS+, RealVideo, MJPEG streams, H.264, H265-10, VP9-10 and also JPEG pictures with no size limitation. The independent encoder is able to encode in JPEG or H.264 up to 1080p at 60fps.

S905X integrates all standard audio/video input/output interfaces including a HDMI2.0a transmitter with 3D, HDR, CEC and HDCP 2.2 support, stereo audio DAC, a CVBS output, PCM, I2S and SPDIF digital audio input/output interfaces, and a stereo PDM digital MIC inputs.

The processor has rich advanced network and peripheral interfaces, including a 10/100M Ethernet MAC with FE PHY interface, dual USB 2.0 high-speed ports (one OTG and one HOST) and multiple SDIO/SD card controllers, UART, I2C, high-speed SPI and PWMs.

Standard development environment utilizing GNU/GCC Android tool chain is supported. Please contact your AMLOGIC sales representative for more information.

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FEATURES SUMMARY

- **CPU Sub-system**
  - Quad core ARM Cortex-A53 CPU up to 2GHz (DVFS)
  - ARMv8-A architecture with Neon and Crypto extensions
  - 8-stage in-order full dual issue pipeline
  - Unified system L2 cache
  - Advanced TrustZone security system
  - Application based traffic optimization using internal QoS-based switching fabrics
- **3D Graphics Processing Unit**
  - Penta-core ARM Mali-450 GPU up to 750MHz+ (DVFS)
  - Dual Geometry Processors and triple Pixel Processors
  - Concurrent multi-core processing
  - Full scene over-sampled 4X anti-aliasing engine with no additional bandwidth usage
  - OpenGL ES 1.1/2.0 and OpenVG 1.1 support
- **2.5D Graphics Processor**
  - Fast bitblt engine with dual inputs and single output
  - Programmable raster operations (ROP)
  - Programmable polyphase scaling filter
  - Supports multiple video formats 4:2:0, 4:2:2 and 4:4:4 and multiple pixel formats (8/16/24/32 bits graphics layer)
  - Fast color space conversion
  - Advanced anti-flickering filter
- **Crypto Engine**
  - AES/AES-XTS block cipher with 128/192/256 bits keys, standard 16 bytes block size and streaming ECB, CBC and CTR modes
  - DES/TDES block cipher with ECB and CBC modes supporting 64 bits key for DES and 192 bits key for 3DES
  - Built-in hardware True Random Number Generator (TRNG), CRC and SHA-1/SHA-2/HMAC SHA engine
- **Video/Picture CODEC**
  - Amlogic Video Engine (AVE) with dedicated hardware decoders and encoders
  - Supports multiple “secured” video decoding sessions and simultaneous decoding and encoding
  - Video/Picture Decoding
    - VP9 Profile-2 up to 4Kx2K@60fps
    - H.265 HEVC MP-10@L5.1 up to 4Kx2K@60fps
    - H.264 AVC HP@L5.1 up to 4Kx2K@30fps
    - H.264 MVC up to 1080P@60fps
    - MPEG-4 ASP@L5 up to 1080P@60fps (ISO-14496)
    - WMV/VC-1 SP/MP/AP up to 1080P@60fps
    - AVS-P16(AVS+) /AVS-P2 JiZhun Profile up to 1080P@60fps
    - MPEG-2 MP/HL up to 1080P@60fps (ISO-13818)
    - MPEG-1 MP/HL up to 1080P@60fps (ISO-11172)
    - RealVideo 8/9/10 up to 1080P@60fps
    - WebM up to VGA
    - Multiple language and multiple format sub-title video support
    - MJPEG and JPEG unlimited pixel resolution decoding (ISO/IEC-10918)
    - Supports JPEG thumbnail, scaling, rotation and transition effects
    - Supports *.mkv,*.wmv,*.mpg, *.mpeg, *.dat, *.avi, *.mov, *.iso, *.mp4, *.rm and *.jpg file formats
  - Video/Picture Encoding
    - Independent JPEG and H.264 encoder with configurable performance/bit-rate
    - JPEG image encoding
    - H.264 video encoding up to 1080P@60fps with low latency
- **Video Post-Processing Engine**
  - Supports HDR10 and HLG HDR processing
  - Motion adaptive 3D noise reduction filter
  - Advanced motion adaptive edge enhancing de-interlacing engine
  - 3:2 pull-down support
  - Programmable poly-phase scalar for both horizontal and vertical dimension for zoom and windowing
  - Programmable color management filter (to enhance blue, green, red, face and other colors)
  - Dynamic Non-Linear Luma filter
  - Deblocking filters
  - Programmable color matrix pipeline
  - Video mixer: 2 video planes and 2 graphics planes per video output
- **Video Output**
  - Built-in HDMI 2.0a transmitter including both controller and PHY with CEC, HDR and HDCP 2.2, 4Kx2K@60 max resolution output
  - CVBS 480i/576i standard definition output
  - Supports all standard SD/HD/FHD video output formats: 480i/p, 576i/p, 720p, 1080i/p and 4Kx2K
- **Audio Decoder and Input/Output**
  - Supports MP3, AAC, WMA, RM, FLAC, Ogg and programmable with 7.1/5.1 down-mixing
  - I2S audio interface supporting 2-channel input and 8-channel (7.1) output
  - Built-in serial digital audio SPDIF/IEC958 output and PCM input/output
  - Built-in stereo audio DAC
  - Stereo digital microphone PDM input
  - Supports concurrent dual audio stereo channel output with combination of analog+PCM or I2S+PCM
- **Memory and Storage Interface**
  - 16/32-bit SDRAM memory interface running up to DDR2133
  - Supports up to 2GB DDR3/4, DDR3L, LPDDR2, LPDDR3 with dual ranks
  - Supports SLC/MLC/TLC NAND Flash with 60-bit ECC, compatible to Toshiba toggle mode in addition to ONFI 2.2
  - SDSC/SDHC/SDXC card and SDIO interface with 1-bit and 4-bit data bus width supporting spec version 2.x/3.x/4.x DS/HS modes up to UHS-I SDR104
  - eMMC and MMC card interface with 1/4/8-bit data bus width fully supporting spec version 5.0 HS400
  - Supports serial 1, 2 or 4-bit NOR Flash via SPI interface
  - Built-in 4k bits One-Time-Programming memory for key storage
- **Network**
  - Integrated IEEE 802.3 10/100M Ethernet MAC controller with 10/100M PHY interface
  - Supports Energy Efficiency Ethernet (EEE) mode
  - WiFi/IEEE802.11 & Bluetooth supporting via SDIO/USB/UART/PCM
  - Network interface optimized for mixed WIFI and BT traffic
- **Integrated I/O Controllers and Interfaces**
  - Dual USB 2.0 high-speed USB I/O, one USB Host and one USB OTG
  - Multiple UART, I2C and SPI interface with slave select
  - Multiple PWMs
  - Programmable IR remote input/output controllers
  - Built-in 10bit SAR ADC with 2 input channels
  - A set of General Purpose IOs with built-in pull up and pull down
- **System, Peripherals and Misc. Interfaces**
  - Integrated general purpose timers, counters, DMA controllers
  - 24 MHz crystal input
  - Embedded debug interface using ICE/JTAG
- **Power Management**
  - Multiple external power domains controlled by PMIC
  - Multiple internal power domains controlled by software
  - Multiple sleep modes for CPU, system, DRAM, etc.
  - Multiple internal PLLs for DVFS operation
  - Multi-voltage I/O design for 1.8V and 3.3V
  - Power management auxiliary processor in a dedicated always-on (AO) power domain that can communicate with an external PMIC
- **Security**
  - Trustzone based Trusted Execution Environment (TEE)
  - Secured boot, encrypted OTP, encrypted DRAM with memory integrity checker, hardware key ladder and internal control buses and storage
  - Protected memory regions and electric fence data partition
  - Hardware based Trusted Video Path (TVP) , video watermarking and secured contents (needs SecureOS software)
  - Secured IO and secured clock
- **Package**
  - LFBGA,13x13mm, 20x20 ball matrix, 0.65 ball pitch, RoHS compliant

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