## Key Specifications

### Key Features
- 64-bit CPU
- DTMB meeting new international performance requirements
- Embedded HDMI 2.0
- Comprehensive integrated digital television solution
- Security processing feature

### High-Performance CPU
- 64-bit dual-core RISC
- Maximum frequency of 1.2 GHz, supporting intelligent applications smoothly
- Independent I-cache, D-cache, and L2 cache
- Integrated multimedia acceleration engine NEON
- Integrated hardware floating-point coprocessor

### Video Decoding
- HEVC (H.265) MP@level 5.0 high-tier, 4K x 2K @30 fps
- H.264 BP/MP/HP @level 5.0, 4K x 2K @30 fps
- MVC, 1080p@60 fps
- MPEG1, 1080p@60 fps
- MPEG2 SP@ML, MP@HL, and 1080p@60 fps
- MPEG4 SP@level 0~3, ASP@level 0~5, GMC, 1080p@60 fps
- MPEG4 short header format (H.263 baseline), 1080p@60 fps
- AVS baseline@level 6.0, AVS+(AVS-P16), and 1080p@60 fps
- VC-1 SP@ML, MP@HL, and AP@level 0~3, 1080p@60 fps
- VP6/8, 1080p@60 fps
- Low-delay decoding
- Multi-channel decoding

### Image Decoding
- JPEG hardware decoding, a maximum of 64 megapixels
- Supported formats of 400, 420, 411, 422, 422T, and 444
- MPEG baseline decoding
- PNG hardware decoding, maximum 64 megapixels
- Gray-scale image, true color image, indexed-color image, gray-scale image with alpha channel data, and true color image with alpha channel data

### Video Encoding
- H.264 BP/MP@level 4.2 video encoding, 1x720p@30 fps encoding
- 1/4 pixel motion estimation, CABAC encoding
- Low-delay encoding
- Encoding of multiple ROIs
- VBR and CBR modes

### 2D Graphics Acceleration
- Hardware acceleration engine, supporting highly efficient 2D processing
- Data formats of ARGB, CLUT, and AYCbCr
- Copying, filling, pattern filling, resizing, clipping, alpha blending, colorkey, and clip mask
- ROP
- Anti-flicker, gamma correction, and contrast/luminance adjustment
- Programmable scanning mode
- Linked-List operation

### 3D GPU
- Quad-core high-performance GPU
- 1080p graphics rendering
- OpenGL ES 2.0/1.1/1.0 and OpenVG 1.1

### Intermediate-Frequency Demodulation for Analog TV
- All analog TV standards, including M/N, B/G/H, D/K, I, L, and L'
- Tuner low- and intermediate-frequency inputs and configurable intermediate frequency
- External SAW not required
- Group delay compensation and equalization filter

### Digital Demodulation
- Tuner low- and intermediate-frequency inputs and embedded 12-bit ADC
- One embedded DVB-C QAM modemulator
  - ITU-T J.83 Annex A/B/C
  - DVB-C 0.7~7 Mbaud symbol rate and correctable carrier frequency deviation range ±700 kHz
- One embedded DVB-T modemulator
  - Standard version 1.1
  - Low- and intermediate-frequency and high-and intermediate-frequency (36 MHz) inputs
  - Rapid signal acquisition (less than 200 ms), reducing the wait time for switching the channel
  - Adaptive spectrum reverse recognition
  - Frequency error detecting range broader than [–600 kHz, +600 kHz]
- Compliant with various test standards, including DTV7.0, Nordig-Unified Test Specification V2.2.1, and Digital Europe Ebook
- One embedded DTMB modemulator
  - All 330 clock modes of the standard DTMB (GB20600-2006)
  - 6 MHz, 7 MHz, and 8 MHz input bandwidth
  - Low- and intermediate-frequency (4~11 MHz) and high-frequency (11~25 MHz) inputs
- Adaptive spectrum recognition
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Audio Encoding/Decoding
- Audio decoding formats
  - Dolby Digital, Dolby Digital Plus, Dolby TrueHD
  - DTS, DTS-HD
  - MPEG L1/L2
  - MP3
  - AAC_LC, HE_AAC, HE_AACv2
  - LTPC
  - APE
  - FLAC
  - OggVorbis
  - AMRNB
  - AMRWB
  - G.711 (u/a)

Audio encoding formats
- AAC_LC, HE_AAC, HE_AACv2
- AMR-NB
- G.711 (u/a)

Professional HiSilicon Graphics Engines (Hi-Imprex III Engines)
- Hi-Imprex III scaling engine
  - High-order multi-phase filter with programmable coefficients
  - Various scaling modes including the non-linear scaling mode
  - -Pre-emphasis for graphics scaling and de-ring
- Hi-Imprex III video processing engine
  - MC progressive/interlaced switching
  - Automatic detection and restoration in 3:2, 2:2, or M: N film mode
  - 3D noise reduction for videos including network videos
  - Noise level detection
  - MPEG noise reduction, de-blocking, and mosquito noise reduction

Hi-Imprex III image enhancement engine
- 3D adaptive sharpening for the videos including 4K x 2K videos, and enhancement and shoot control for different directions and frequencies
  - 1.1TI and CTI
  - 3D adaptive color management such as specified color management and automatic color copy
  - Dynamic contrast enhancement such as adaptive contrast adjustment and color compensation based on luminance variance
  - Blue level expansion
- Hi-SuperClear III processing
- Programmable 12-bit gamma look-up table
- Automatic 3D format detection
- 2D-to-3D processing
- 0D-local dimming

Security Processing Option
- Advanced security
- DRM
- AES, DES, and 3DES data encryption and decryption
- Hardware hash algorithm
- Content protection for USB devices
- Downloadable CA option

Audio/Video Interfaces
- Audio interfaces
  - One I/0 output and one SPDIF output
  - One HDMI ARC channel
  - Three stereo inputs and two MIC inputs
  - Three stereo outputs
- YPbPr/RGB interface
  - Two analog channels, at most 1080p
  - SoG
  - Automatic format and mode detection
  - Position and phase adjustment for the RGB channel
- One SCART interface
- Cable online detection for analog video channels
- HDMI interfaces
  - Three HDMI input interfaces (one supports HDMI 2.0,
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one supports MHL 2.0/HDMI 1.4, and the other one supports HDMI 1.4/(ARC)
- 4K x 2K@60 Hz inputs
- Rapid port switching
- CEC
- HDCP 2.2/1.3/1.1
- 2-link LVDS outputs
- 8-lane VbyOne outputs
- One CVBS output

Memory Control Interfaces
- DDR3/DDR3L interface
  - Components with the 512 MB/768 MB/1 GB/1.5 GB/2 GB capacity
  - Maximum 32-bit interface
  - Up to 1.6 Gbit/s rate
- SPI flash interface
  - 1-, 2-, or 4-bit flash memory
  - Maximum capacity of 32 MB
- eMMC flash interface

Peripheral Interfaces
- Two USB 2.0 host ports
- One USB 3.0 host port

- One SDIO 3.0 interface, supporting 3.3 V or 1.8 V component
- One 10 Mbit/s or 100 Mbit/s adaptive Ethernet port
- One CI/CI+
- One IR receiver
- Four keypad interfaces
- Multiple I²C interfaces
- Three UART interfaces
- Multiple GPIO interfaces
- Multiple PWM interfaces
- Integrated POR module

Others
- 2-layer PCB
- Various boot modes
- Boot program download and execution over a serial port or USB port
- Integrated and dedicated standby processor, supporting various low-power modes
- HDMI wakeup
- Low-power design using the technologies such as AVS and DVFS

Acronyms and Abbreviations

3DES  triple data encryption standard
ADC  analog-to-digital converter
AES  advanced encryption standard
ARC  audio return channel
AVS  adaptive voltage scaling
BER  bit error rate
CABAC  context-based adaptive binary arithmetic coding
CBR  constant bit rate
CC  closed caption
CEC  consumer electronics control
CI  common interface
CTI  chroma transient improvement
CVBS  composite video broadcast signal
DES  data encryption standard
DRM  digital rights management
DTMB  digital terrestrial multimedia broadcasting
DVFS  dynamic voltage frequency scaling
eMMC  embedded multimedia card
GPIO  general-purpose input/output
GPU  graphics processing unit
HDCP  high-bandwidth digital content protection
HDMI  high-definition multimedia interface
HEVC  high efficiency video coding
I²C  inter-integrated circuit
IR  infrared
I²S  inter-IC sound
LTI  luma transient improvement
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<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Definition</th>
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<tbody>
<tr>
<td>LVDS</td>
<td>low-voltage differential signaling</td>
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<tr>
<td>MHL</td>
<td>mobile high-definition link</td>
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<tr>
<td>OSD</td>
<td>on-screen display</td>
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<tr>
<td>PCB</td>
<td>printed circuit board</td>
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<tr>
<td>POR</td>
<td>power-on reset</td>
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<tr>
<td>PVR</td>
<td>personal video recorder</td>
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<tr>
<td>PWM</td>
<td>pulse-width modulation</td>
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<tr>
<td>QAM</td>
<td>quadrature amplitude modulation</td>
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<tr>
<td>RISC</td>
<td>reduced instruction set computing</td>
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<tr>
<td>ROI</td>
<td>region of interest</td>
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<td>ROP</td>
<td>raster of operation</td>
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<td>SCART</td>
<td>Syndicat des Constructeurs d’Appareils Radiorécepteurs et Téléviseurs</td>
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<tr>
<td>SDIO</td>
<td>secure digital input/output</td>
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<td>SIF</td>
<td>sound intermediate frequency</td>
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<tr>
<td>SoG</td>
<td>sync on green</td>
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<tr>
<td>SPDIF</td>
<td>Sony/Philips digital interface</td>
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<td>SPI</td>
<td>serial peripheral interface</td>
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<tr>
<td>TS</td>
<td>transport stream</td>
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<tr>
<td>TT</td>
<td>teletext</td>
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<tr>
<td>UART</td>
<td>universal asynchronous receiver transmitter</td>
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<tr>
<td>VBI</td>
<td>vertical blanking interval</td>
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<td>VBR</td>
<td>variable bit rate</td>
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<tr>
<td>WSS</td>
<td>wide screen signaling</td>
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