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# BCM7401 PRODUCT Brief




## AVC/MPEG-2/VC-1 HD DIGITAL VIDEO SYSTEM-ON-A-CHIP SOLUTION FOR SATELLITE, IP, CABLE, AND WATCH-AND-RECORD DVR

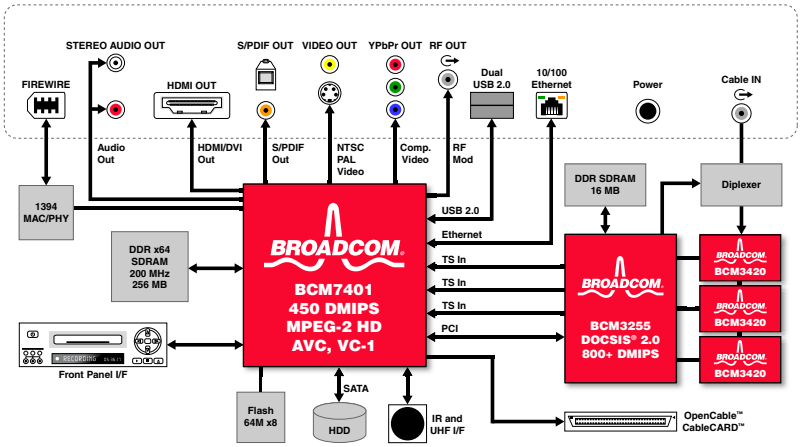
### FEATURES

- **Advanced HD AVC/MPEG-2/VC-1 decoder**
  - H.264/AVC main and high profile to level 4.1
  - VC-1 advanced profile @ level 3
  - VC-1 simple and main profile
  - HD MPEG-2 and SD MPEG-2
  - MPEG still-picture decode
- **Advanced audio processor supporting the following:**
  - AAC LC, AAC LC+SBR level 2, AAC+ level 2
  - Dolby® Digital, Dolby Digital Plus
  - MPEG I layers 1, 2, and 3 (MP3)
  - Windows Media® audio
  - One pair of on-chip stereo high-fidelity audio DACs
  - 3D SRS audio support
  - One $I^2S$ input port and one $I^2S$ output port
  - SPDIF output
- **Advanced 2D-effects graphic engine**
  - Studio quality text and graphics at HD resolution
  - Supports multiple layers and windows
- **Digital noise reduction (DNR)**
  - Reduces MPEG artifacts including block noise reduction
  - Reduces mosquito noise
- **Motion-adaptive deinterlacer with reverse 3:2/2:2 pulldown**
- **Letterbox detection**
- **Multiple simultaneous, independent DVR channels**
- **OpenCable™ ready with on-chip MPOD support**
- **300-MHz MIPS32®/16e class processor**
- **64-bit DDR DRAM controller**
- **SATA I/F for DVR applications**

### FEATURES (CONT.)

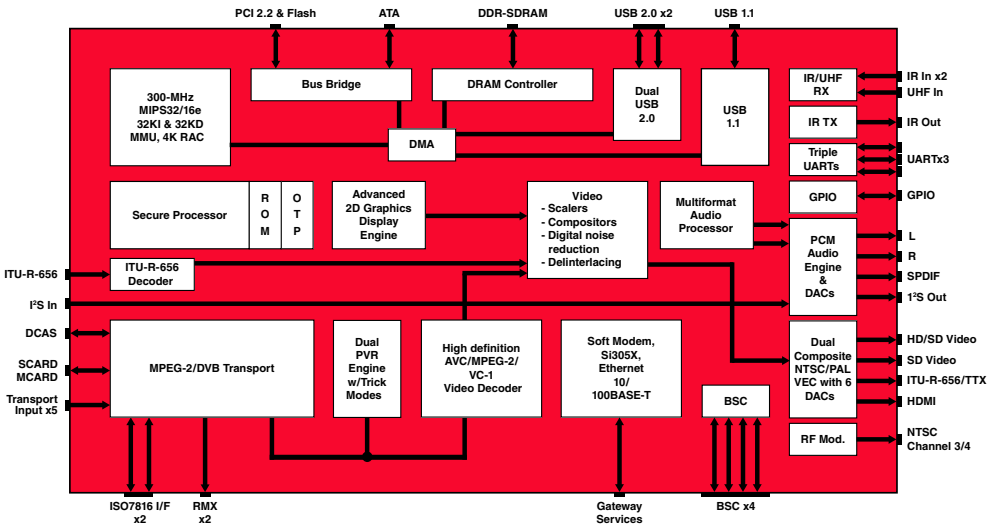
- **HD analog video encoder with simultaneous SD outputs**
  - NTSC-M, NTSC-J, PAL-BDGHIN, PAL-M, PAL-Nc analog outputs
  - 480i/480p/576i/576p/720p/1080i output formats
  - Component RGB or YPrPb output
  - HD-DVO Output
  - Macrovision® 7.1 support
  - SCART 1 and 2
  - Component, S-Video, and composite via six on-chip V-DACs
  - VBI encoders for CC/TTX with NABTS/CGMSA/WSS/Gemstar® standards and dedicated TTX sideband
  - RF modulator with BTSC encoder
  - ITU-R-656 input and output ports
- **HDMI 1.1/DVI 1.0 Mac and PHY with HDCP 1.1**
- **Broadcom security processor**
- **AES/1DES/3DES/CSS/CPRM/DTCP copy protection**
- **MPEG-2/DIRECTV/DVB/ARIB data transport demux with 1DES/3DES/DVB/Multi2/AES descramblers**
- **V.92-capable soft modem with integrated SiLab Si305x system side device**
- **3.3V 33-MHz PCI 2.2**
- **Dual USB 2.0 host controller with dual-port transceiver**
  - Additional independent USB 1.1 host controller
- **Serial ATA interface**
- **Ethernet Mac and PHY**
- **UHF remote control receiver**
- **Dual smart card support**

### AVC/MPEG-2/VC-1 Platform Example




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# OVERVIEW




**BCM7401 Block Diagram**

The BCM7401 is a high-definition satellite, cable, and IP set-top box DVR solution offering integrated AVC (H.264/MPEG-4 Part 10), MPEG-2, and VC-1 video decoding technology. It combines a data transport processor, high-definition AVC/MPEG-2/VC-1 video decoder, advanced-audio decoder, 2D graphics processing, high-quality video scaling and motion adaptive deinterlacing, six video DACs, stereo high-fidelity audio DACs, a MIPS32/MIPS16e™ class CPU, and a peripheral control unit providing a variety of set-top box control functions.

The MPEG-2 DVB-compliant transport stream/PES parser and demultiplexer is capable of simultaneously processing 256 PIDs via 128 PID channels in up to five independent external transport stream inputs and two internal playback channels. All 128 PID channels can be used by the record, audio, and video interface engine (RAVE), PCR processing, message filter, and for output via the high-speed transport or remux module. The data transport module can be configured to support eight record channels for PVR functionality and six AV channels to interface to audio and video decoders. The transport provides 1DES/3DES/DVB/Multi2/AES descrambling support. A memory-to-memory DMA security module may be programmed for supporting AES/1DES/3DES/CSS/CPRM/CPPM/DTCP copy protection algorithms/standards. The BCM7401 features the Broadcom secure processor providing secure key generation, management, and protection.

An advanced video decoder is featured in the BCM7401, capable of supporting high-definition AVC, VC-1, and MPEG-2 streams. AVC support is for main- and high-profile to level 4.1 for 720p and 1080i high-definition support or to level 3.1 for standard definition streams. AVC high profile was added to the fidelity range extensions specifically to address the needs of consumer broadcast and playback applications. Tools include additional transform sizes and spatial prediction modes and support for adaptive quantization matrix. The video decoder also supports high-definition VC-1 (advanced-profile level 3, main, and simple profiles) and MPEG-2, main profile at main and high levels. The BCM7401 has an advanced audio processor capable of decoding Dolby Digital, Dolby Digital Plus, AAC 5.1, AAC+ level 2, and MPEG 1 layers 1, 2, and 3 with simultaneous pass-through support. 3D SRS audio is also supported. Available audio outputs are $I^2S$, SPDIF, and one pair of analog outputs.

High-quality video and graphics processing is integrated, featuring advanced studio quality 2D graphics processing. Also included are motion-adaptive deinterlacing with 3:2 pulldown, and letterbox detection. Digital noise reduction minimizes mosquito noise and MPEG artifacts, including block noise.

The BCM7401 has a dual-stream analog video encoder with Macrovision that supports the following output standards: NTSC-M, NTSC-J, PAL-BDGHIN, PAL-M, and PAL-Nc. The following output formats are supported: composite, S-Video, SCART, RGB, and YPrPb component. The following output resolutions are supported: 480i, 480p, 576i, 576p, 720p, and 1080i. Six output video DACs are available to be shared among the output functions. The BCM7401 also supports output over an HDMI interface and a channel 3/4 RF modulator. An ITU-R-656 output port is also available with teletext sideband.

The BCM7401 incorporates a complete MIPS32™-based microprocessor subsystem, including caches with bridging to memory and a local bus. Integrated peripherals include three UARTS, two ISO7816 smart card interfaces, counter/timers, a GPIO, a LED/keypad controller, IR receivers, an IR blaster, a UHF remote control receiver, an integrated soft modem system side device, and BSC and SPI controllers. Advanced connectivity features include two USB 2.0/1.1 ports, an additional independent USB 1.1 port, a serial ATA port, and an Ethernet port with Mac with integrated PHY and alternate media independent interface (MII).

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7401-PB03-R 7/26/06

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