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Connecting
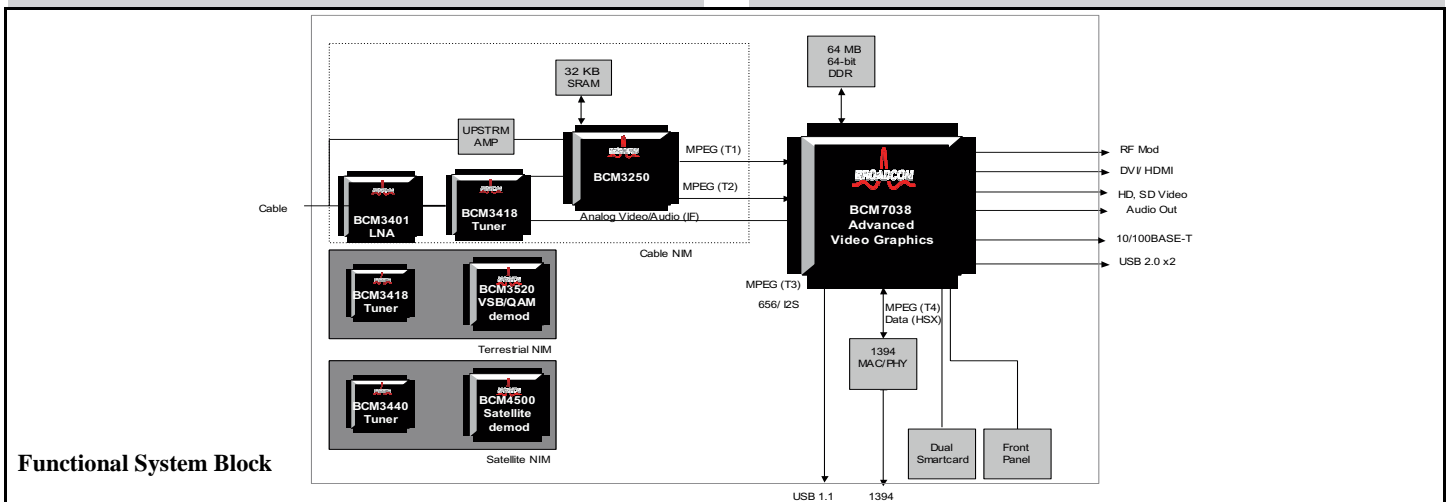e v e r y t h i n g ®

BCM7038
PRODUCT Brief

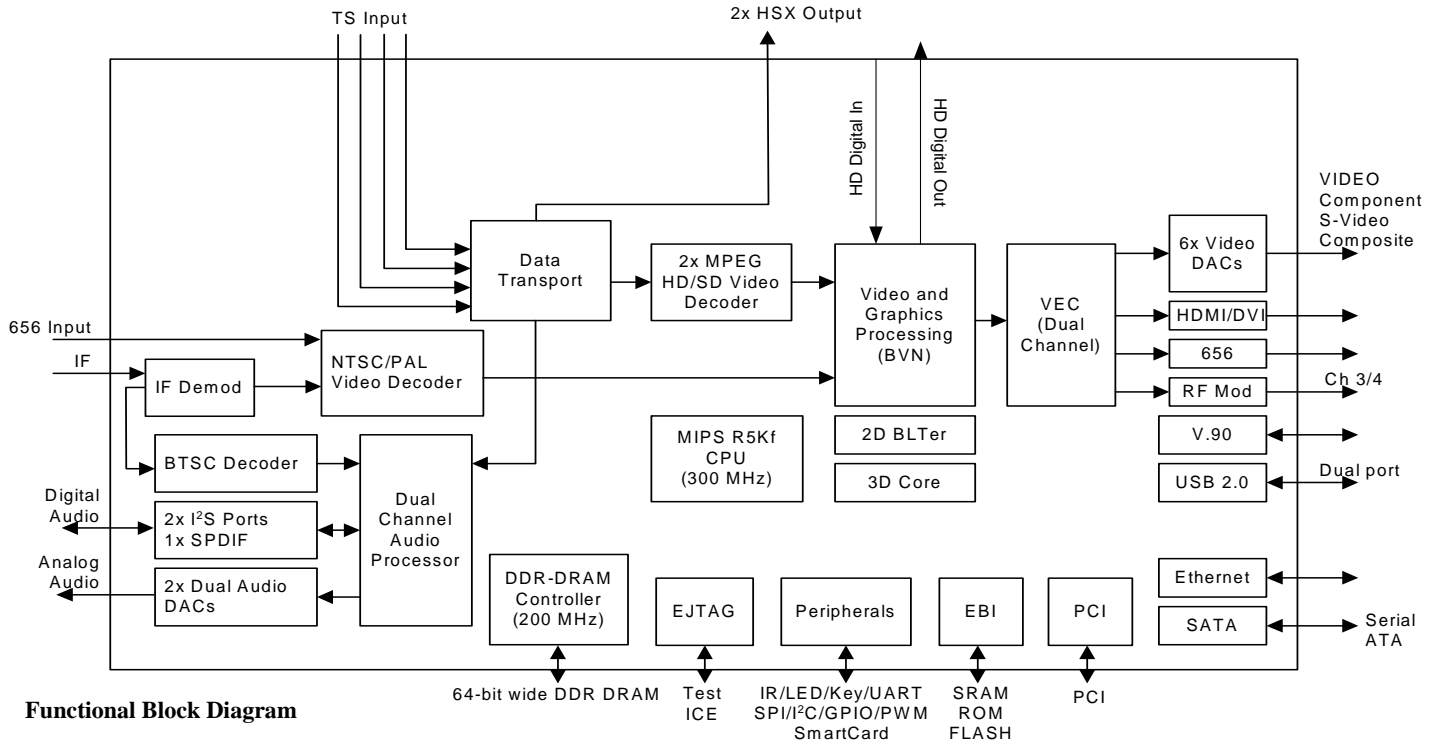# DUAL HD DIGITAL VIDEO SYSTEM-ON-CHIP SOLUTION FOR CABLE, SATELLITE AND DTV

FEATURES

- **Two Complete HD/SD Video/Audio Channels**
  - Quad video scalers
- **Multi-frame Per Pixel Motion Adaptive De-interlacer Circuit**
  - Reverse 3:2 pull-down with automatic scene edit detection
- **PEP™ Picture Enhancement Processing for DTV**
- **3D Y/C Comb Separation Circuit for Analog Video Decode**
- **Triple PVR with Copy Protection and Trick Mode Support**
- **Dual Channel SATA Controller**
- **Dual Channel USB 2.0 Controller**
- **Six On-chip Video DACs**
- **HDMI/DVI MAC and PHY**
- **RF Modulation with BTSC Encoder**
- **SPDIF**
- **Dual I2S**
- **Dual Flexible Audio Interfaces**
- **On-chip IF Demodulation Circuit**
- **On-chip BTSC Decoder**
- **10/100 Ethernet MAC and PHY**
- **400 MHz 64-bit DDR Interface**
- **On-chip 300 MHz 64-bit CPU**
- **HD Digital Output Port for DTV Solutions**
- **HD Input Port for DTV Solutions**

SUMMARY OF BENEFITS

- **Dual video/audio channels allow dual TV support, with independent PIP support on main and secondary**
- **On-chip multi-frame de-interlacing delivers superior scaling and display quality for today's digital display devices**
- **PEP™ provides advanced video signal processing for in-the-box DTV solutions**
- **On-chip 3D comb filter delivers superior analog video capture quality**
- **Triple PVR with dual USB 2.0 and dual SATA provide for flexible recording options**
- **Six video DACS, on-chip DVI/HDMI MAC and PHY, and RF modulation circuit allow for all format video output**
- **Dual stereo audio DAC pairs, SPDIF, dual I2S, and dual custom audio interfaces allow for all format audio output**
- **Comprehensive system integration provides for low system cost**
- **HD Digital input and output ports combined with on-chip multi-frame motion adaptive de-interlacer and PEP™ facilitate in-the-DTV module solutions**

Functional System Block

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Functional Block Diagram

Diagram labels:
- TS Input
- 2x HSX Output
- HD Digital In
- HD Digital Out
- 656 Input
- IF
- Digital Audio
- Analog Audio
- Data Transport
- 2x MPEG HD/SD Video Decoder
- Video and Graphics Processing (BVN)
- VEC (Dual Channel)
- 6x Video DACs
- VIDEO Component S-Video Composite
- HDMI/DVI
- 656
- RF Mod — Ch 3/4
- V.90
- USB 2.0 — Dual port
- NTSC/PAL Video Decoder
- IF Demod
- BTSC Decoder
- 2x I²S Ports 1x SPDIF
- 2x Dual Audio DACs
- Dual Channel Audio Processor
- MIPS R5Kf CPU (300 MHz)
- 2D BLTer
- 3D Core
- DDR-DRAM Controller (200 MHz)
- EJTAG
- Peripherals
- EBI
- PCI
- Ethernet
- SATA — Serial ATA
- 64-bit wide DDR DRAM
- Test ICE
- IR/LED/Key/UART SPI/I²C/GPIO/PWM SmartCard
- SRAM ROM FLASH
- PCI

The **BCM7038** combines an IF demodulator, an NTSC/PAL video 3D Y/C comb filter enabled decoder, a transport processor, dual digital audio processors, dual high-definition (HD) MPEG video decoders, advanced 2D and 3D graphics processing, digital processing of analog video and audio, analog video digitizer and DAC functions (six DACs), stereo high-fidelity audio DACs, an MIPS R5000 class processor, and a peripheral control unit providing a variety of set-top box control functions.

The **BCM7038** has an MPEG-2 DVB compliant transport processor with advanced section filtering capability, a DVB descrambler, dual MPEG-2 (MP@HL profile) video decoders, a BTSC audio decoder, dual Dolby AC3/MPEG layer 1 and 2 audio decoders with a SPDIF and two pairs of analog output, dual NTSC/PAL/SECAM video encoders with Macrovision™ and analog output, and an NTSC/PAL analog video decoder with a 3D comb filter and time-base correction.

The IF demodulator receives its input from a 12-bit A/D converter. The video decoder uses this same 12-bit A/D converter for CVBS inputs. A fixed 54-MHz crystal clock is used for the highest possible fidelity clock in the ADC.

In addition, the **BCM7038** includes Broadcom's advanced 2D and 3D graphics processing, offering true studio quality text and graphics with extremely efficient use of memory bandwidth.

The **BCM7038** supports up to three simultaneous records and playbacks of digital video. The **BCM7038** also incorporates a complete MIPS64™-based microprocessor subsystem, including caches with bridging to memory and a local bus. Integrated peripherals include two UARTS, three ISO7816 smart card interfaces, counter/timers, GPIO, keypad, LED, dual IR Tx/Rx, IR blaster, IR keyboard, and BSC and SPI controllers.

Advanced connectivity features include two USB 2.0 ports, one USB 1.1 port, dual serial ATA ports, an Ethernet port with MAC and PHY, an HDMI interface, a DVI/HDMI MAC and PHY. Incorporated in the HD video display path is a multi-frame deinterlacer circuit. All scaling from SD to HD and HD to SD occurs in a single pass thereby allowing for a high-quality rendering. The **BCM7038** is capable of displaying four video frames simultaneously.

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