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BCM7041
PRODUCT Brief

SIMULTANEOUS DUAL-CHANNEL DIGITAL VIDEO/AUDIO ENCODER

BCM7041 FEATURES

- **Simultaneous dual-channel, single-chip, NTSC/PAL MPEG-2 encoding system**
- **Dual channel MP@ML MPEG-2 video encoder**
  - Variable resolutions:
    Horizontal: 720,704,640,544,480,360,320,160
    Vertical: 480,240,112 (NTSC); 576,288,144 PAL
  - Variable frame rate, up to 30(NTSC)/25(PAL) fps
  - Supports constant/variable bit rates: 1 – 24 Mbps
  - Variable GOP length and structure: I, IP, IPB, IPBB
  - +/-100 pixels wide motion estimation search range
  - Automatic 3/2 pulldown detection
  - Video input; selectable 8/10 bits CCIR656
  - 4:2:2 to 4:2:0 conversion
- **Dual-channel, high-fidelity 24/56 bits programmable audio DSP**
  - MPEG-1 layer II stereo encoding
  - Dolby Digital (AC-3) stereo encoding
  - Programmable frequencies and bit rates (64 – 384 Kbps)
- **Highly programmable system multiplexing processor**
  - Ability to multiplex up to four inputs to one or two multiplexed streams
  - CBR/VBR Program/Transport stream multiplexing
  - User data / VBI insertion
  - Programmable stream parameters
- **Dual-channel video pre-processing**
  - 7-tap vertical/horizontal luminance/chrominance filter
- **Accurate 27 MHz video/audio/PCR timestamps for exact video/audio synchronization during playback**
- **Dual-channel dedicated serial/parallel DVB transport stream interface**
- **Dual-channel I²S/AC-97 stereo audio inputs**
- **PCI 32 bit/33 MHz, PCI DMA master or PCI slave and 16 bit Generic Host interface**
- **Integrated I²C controller**
- **Package: 256-pin BGA**
- **Supply voltage: 1.8/3.3V (5V compatible)**
- **Power consumption: less than 1.5 W**
- **System memory: SDRAM, 1 or 2 modules of 2Mx32**

SUMMARY OF BENEFITS

- **Fully integrated dual-channel MPEG-2 digital audio/video encoder and audio/video multiplexer in a single chip drastically reduces overall system and development costs.**
- **Dual encoder enables simultaneous time shifting of one channel and recording of another channel.**
- **Video/audio elementary, video/audio packetized elementary, program, and transport streams generated internally to the BCM7041.**
- **Broadcom fourth generation production/field-proven and in-production technology.**
- **Universal compatibility through standards compliance: Meets key video encoding (ISO/IEC 13818-2), audio encoding (ISO/IEC 11172-3, MPEG-1, Layer II and Dolby digital AC-3) and system multiplexing (ISO/IEC 13818-1).**
- **Broadcom-developed reference design kit includes application board, sample application, and drivers based upon industry-standard operating systems, enabling rapid and streamlined software and hardware development, reducing time to market.**
- **Simple system design: BCM7041 + 1 or 2 modules SDRAM.**

APPLICATIONS

- **Time shift/personal video recording (PVR):**
  - Set-top box
  - Stand-alone PVR
  - Television set
- **DVD recorder**
- **Digital VCR (VCR replacement)**
- **PC TV tuner**
- **Digital camcorder**
- **Video transmission:**
  - Video over IP
  - Video conferencing
  - Security and surveillance

System Block Diagram

BCM7041 Block Diagram
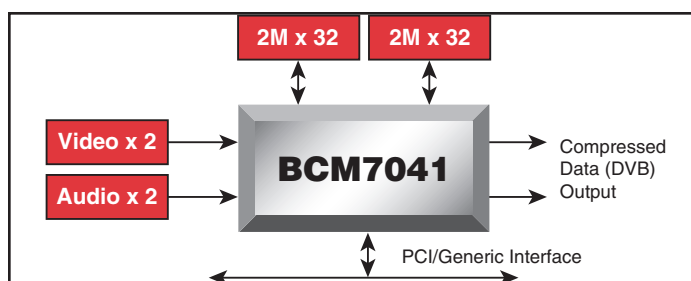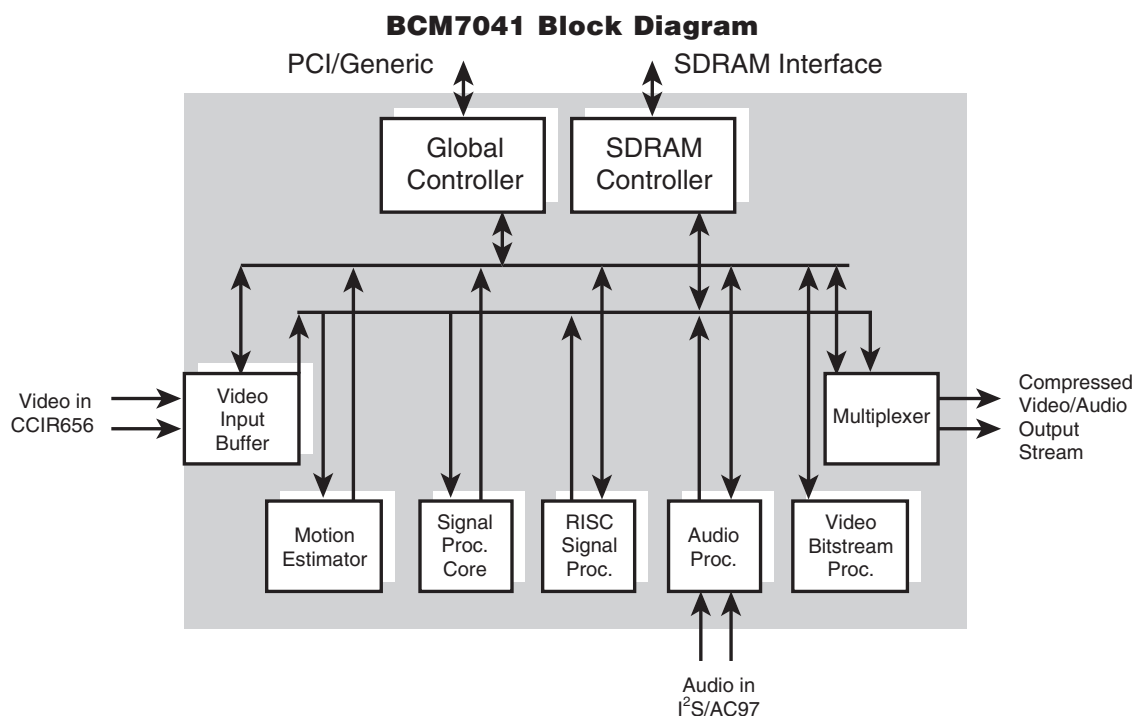
The **BCM7041** is a highly integrated dual-channel, single-chip NTSC/PAL MPEG-2 encoder system. Integrated features in the **BCM7041** include two MPEG-2 video encoders, two high-fidelity audio encoder DSPs supporting both MPEG-1 layer II and Dolby digital AC-3 encoding and an adaptable system multiplexer capable of generating one or two MPEG-2 program and transport streams. In addition, the **BCM7041** integrates video pre-filtering modules, I²C controller, dual PCI/Generic bus interfaces, I²S/AC-97 audio input interfaces, and two dedicated compressed data/DVB interfaces.

CCIR-656 digital video is delivered to the **BCM7041** video input and pre-filtering units. The digital video is filtered, optionally decimated from Full D1 to lower resolutions, and passed to the video encoders.

The video encoders support bit rates of 1 Mbps up to 24 Mbps. The +/-100 pixels motion estimation, in combination with sophisticated scene complexity analysis algorithms, variably change the bit rate to ensure the best possible video quality even in low video bit rates. Also supported are 3/2 pull down detection, variable GOP structure, and VBI insertion.

I²S/AC-97 digital audio is delivered to the **BCM7041** audio DSPs at a frequency of 32/44.1/48 KHz. The high-quality, 24/56-bit, fixed-point DSP encodes the audio either in MPEG-1 layer II or in Dolby AC-3 format. The MPEG implementation supports bit rates of 64 kbps - 384 kbps. The AC-3 implementation conforms to the Dolby consumer class A encoder, including support for bit rates of 64 kbps - 448 kbps, and dynamic range compression.

The two compressed video streams and two compressed audio streams are delivered to a highly programmable multiplexing unit. The multiplexer combines the video and audio streams in the MPEG-2 program or MPEG-2 transport format. The multiplexer can output two multiplexed streams, each containing one video stream and one audio stream, or one multiplexed stream containing all the four input streams.

Various multiplexer parameters are configurable, including SID, PID, and user-defined PAT/PMT/SDT tables. In addition, multiplexing of external user data into the transport stream is supported. The compressed stream is delivered either to a dedicated DVB interface or to the PCI/generic host interface.

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