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BCM7040
PRODUCT
Brief

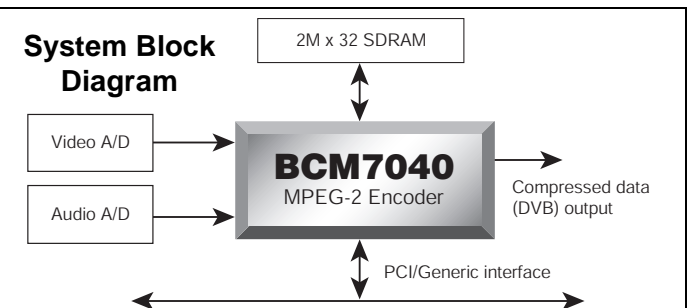# BCM7040 MPEG2 DIGITAL VIDEO/AUDIO ENCODER

FEATURES

- **Single-chip NTSC/PAL MPEG-2 encoding system**

- **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

- **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)Bullet

- **Highly programmable system multiplexing processor**
  - CBR/VBR program/transport stream multiplexing
  - User data/VBI insertion
  - Programmable stream parameters

- **Video pre-processing**
  - 7-tap vertical/horizontal luminance/chrominance filter

- **Accurate 27-MHz video/audio/PCR time stamps for exact video/audio synchronization during playback**

- **Dedicated serial/parallel DVB transport stream interface**

- **I^{2}S/AC-97 stereo audio inputs**

- **PCI 32 bit/33 MHz, PCI DMA master or PCI slave and 16-bit Generic Host interface**

- **Integrated I^{2}C controller**

- **Package: 176-pin LQFP**

- **Supply voltage: I/O 3.3V (5V compatible)**

- **Power consumption: less than 1W**

- **System memory: SDRAM, 1 module of 2M x 32**

SUMMARY OF BENEFITS

- **Fully integrated MPEG-2 Digital Video/Audio Encoder and Video/Audio Multiplexer in a single chip drastically reduces overall system and development costs.**

- **Video/Audio Elementary, Video/Audio Packetized Elementary, Program, and Transport Streams are generated internally to the BCM7040.**

- **Broadcom third generation production of field-proven and in-production technology.**

- **Universal compatibility through standards compliance: 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.**

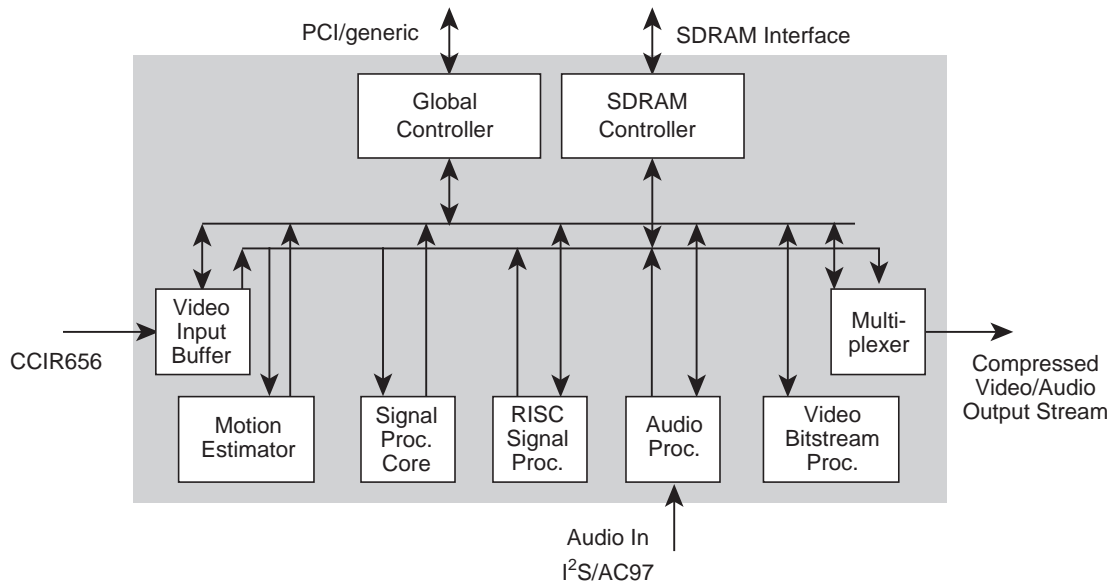- **Simple system design: BCM7040 + single SDRAM.**

APPLICATIONS

- **Time shift/personal video recording (PVR):**
  - Set-top boxes
  - Stand-alone PVRs
  - Television sets

- **DVD recorders**

- **Digital VCRs (VCR replacements)**

- **PC TV tuners**

- **Digital camcorders**

- **Video transmission**

- **Video over IP**

- **Video conferencing**

- **Security and surveillance**

System Block Diagram

2M x 32 SDRAM

Video A/D

Audio A/D

BCM7040
MPEG-2 Encoder

Compressed data
(DVB) output

PCI/Generic interface

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BCM7040 Block Diagram

The BCM7040 is a highly integrated, single-chip NTSC/PAL MPEG-2 encoder system. Integrated features in the BCM7040 include an MPEG-2 video encoder, high-fidelity audio encoder DSP supporting both MPEG-1 layer II and Dolby digital AC-3 encoding and an adaptable system multiplexer capable of generating MPEG-2 program and transport streams. In addition, BCM7040 integrates a video pre-filtering module, I^{2}C controller, dual PCI/Generic bus interfaces, I^{2}S/AC-97 audio input interfaces, and a dedicated compressed data/DVB interface.

CCIR-656 digital video is delivered to the BCM7040 video input and pre-filtering unit. The digital video is filtered, optionally decimated from Full D1 to lower resolutions, and passed to the video encoder.

The video encoder supports 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.

I^{2}S/AC-97 digital audio is delivered to the BCM7040 audio DSP 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 compressed video and 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. 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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