BROADCOM®
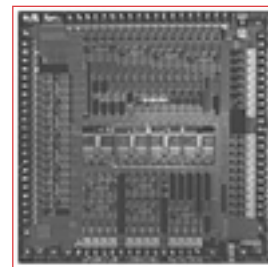
BCM7040 MPEG1/2 DIGITAL VIDEO/AUDIO ENCODER

BCM7040 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: 0.5 – 24 Mb/sec
  - 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 Kb/s)
- **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 27MHz video/audio/PCR timestamps for exact video/audio synchronization during playback**
- **Dedicated serial/parallel DVB transport stream interface**
- **I²S / AC-97 stereo audio inputs**
- **PCI-32bit/66MHz, PCI DMA master or PCI slave and 16-bit Generic Host interface**
- **Integrated I²C controller**
- **Package: 176 Pin LQFP**
- **Supply Voltage: I/O 3.3V (5V compatible)**
- **Power Consumption: less than 1 W**
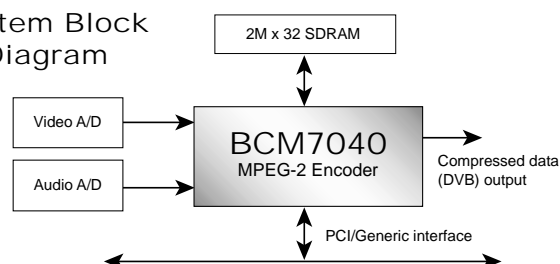- **System Memory: SDRAM, 1 Module of 2Mx32**

SUMMARY OF BENEFITS

- **Fully integrated MPEG-2 Digital Video/Audio Encoder and Video/Audio Multiplexer in a single chip drastically reducing overall system and development costs.**
- **Video/Audio Elementary, Video/Audio Packetized Elementary, Program, and Transport Streams generated internally to the BCM7040.**
- **Broadcom 3rd generation production/field-proven and in-production technology.**
- **Universal compatibility through Standards Compliance: Meets key Video Encoding (ISO/IEC 13818-2 & 11172-2), Audio Encoding (ISO/IEC 11172-3, MPEG-1, Layer 1/11/111 & Dolby Digital AC-3) and System Multiplexing (ISO/IEC 13818-1 and 11172-1).**
- **Broadcom developed reference design kit including application board, sample application, and drivers based upon industry standard operating systems enabling rapid and streamlined software and hardware development reducing time to market.**
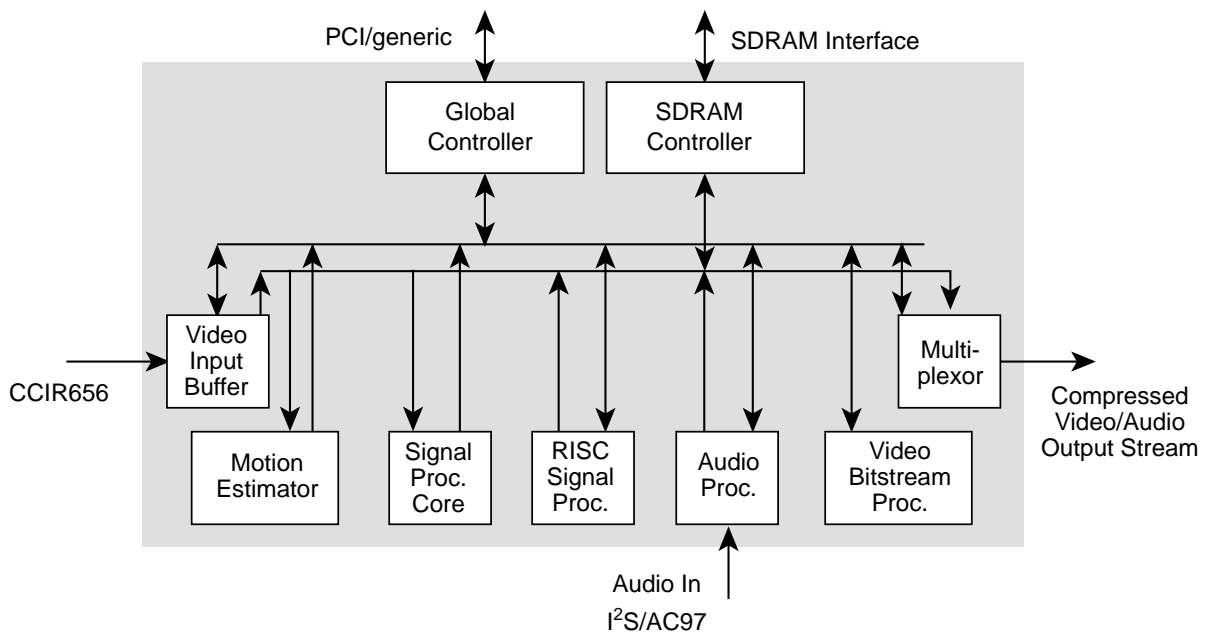- **Simple system design: BCM7040 + Single SDRAM**

APPLICATIONS

- **Time shift/personal video recording (PVR):**
  - Set Top Box
  - Stand alone PVR
  - Television set
- **DVD Recorders**
- **Digital VCR (VCR Replacement)**
- **PC TV Tuner**
- **Digital Cam coders**
- **Video Transmission:**
- **Video over IP**
- **Video conferencing**
- **Security and Surveillance**

System Block Diagram

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, adaptable system multiplexer capable of generating MPEG-1 system stream, and MPEG-2 program and transport streams. In addition, **BCM7040** integrates a video pre-filtering module, I²C controller, dual PCI/Generic bus interfaces, I²S/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 0.5Mb/sec up to 16 Mb/sec. 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 **BCM7040** audio DSP at a frequency of 32/44.1/48 KHz. The high quality 24/56 bits 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 64kb/s - 384kb/s. The AC-3 implementation conforms to the Dolby consumer class A encoder, including support for bit rates of 64kb/s - 448kb/s, 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-1 system, 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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