TC90407XBG/FG Single-chip Solutions for Digital TV

TC90407XBG/FG is a single-chip solution for digital TV applications. It is a second-generation product from Toshiba targeted for mid- to low-end digital TV applications. Compared to previous designs, it integrates more functional blocks on chip reducing system cost and supports new algorithms for improved picture quality. The device incorporates VSB/QAM logic on chip for ATSC and Cable streams demodulation.

The TC90407XBG/FG is capable of decoding single SD or HD streams and displaying content in standard-definition resolution (720 x 480 pixels) or half-high-definition resolution (960 x 1080 pixels). With two analog and one 8/16-bit digital outputs, the TC90407XBG is a very cost-effective solution for CRT TV, LCD TV or digital-to-analog converter set-top box applications.

The TC90407XBG/FG devices use multiple DSP engines to perform compute-intensive, multimedia operations to offload the main CPU for efficient system management of demanding digital TV applications. The TC90407XBG architecture also supports a unified 16-bit DDR memory system, as well as a NAND and a NOR flash memory controller to reduce overall system cost.

**Features**
- 162 MHz TX49/L3 64-bit MIPS RISC core
  - 8 KB each I & D cache
  - Unified memory system
  - DDR SDRAM controller (16-bit, 162 MHz)
  - NAND & NOR Flash support
- Transport Stream Processor
  - Fully compliant to ATSC and cable transport streams
- Video Decoder (SD decoding)
  - MPEG-2 decoding (MP@ML and MP@SL) and MPEG-1 decoding
  - Single-MPEG-2 decoding
- Video Decoder (HD decoding)
  - MPEG-2 decoding for MP@HL for ATSC
  - Display in HD resolution up to 960 x 1080
  - 720p or 1080i compliant
  - HD-to-SD down-conversion
  - Display in SD resolution

**Highlights**
- Highly integrated system-on-chip (SoC) for digital TVs that incorporates a high-performance 64-bit RISC processor and two highly optimized DSP processors
- Specifically designed for North American TV standards (ATSC & digital cable)
- Integrated VSB/QAM demodulator for ATSC TV
- Complete reference system with software and middleware support for quick product deployment
- Software and middleware based on Linux® OS
- Common API support for middleware and application development
- Decode single-standard definition stream or single high-definition stream
- Decode one audio stream
- Two 480i or one 720p/1080i analog video outputs and one SD/HD digital video output
- Unified memory architecture for optimum system cost
- Built-in MPEG-2 decoder, high-performance scalar and graphics controller for high-quality video output
- Low-power SoC with power-down modes
- Package: 292-pin PBGA and 256-pin LQFP

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• Audio Processor
  - MPEG-Audio, Dolby AC-3 decoding
  - iPS and S/P-DIF Transmitter
    (IEC-60958/61937)
• Graphics Engine
  - Two planes (YUV/Graphics)
  - Alpha blending and video scaling
  - Progressive scan (I/P conversion by
    line-interpolation)
• Video Output
  - Dual NTSC Video Encoder
  - 4 DACs (supports two 480i analog
    outputs for SD and one 720p/1080i
    output for HD)
  - 4:2:2 YUV Digital-Output
    (ITU R656/R601)
  - VBI re-insertion (closed-caption and
    CGMS-A)
  - Interlaced or progressive output
• Interfaces and Peripherals
  - 8/16-bit local bus for NAND/NOR
    flash and other I/O devices (40.5 MHz),
  - DMA controller (2 ch), SIO (2 ch),
    PIO (10), timer/counter (three 24-bit), I²C
    (2 ch), IR-decoding and IR-blaster
• Power-down and Standby Operations
• Package
  - TC90407XBG – 292-pin PBGA package
  - TC90407FG – 256-pin LQFP package in
    Q1’07

**TC90407XBG**
- Reference Board: DLVM-GC and DLVM-GL reference modules
- Operating System: Monta Vista Software, Inc.: Monta Vista Linux
- Development Tools: Compilers, debugger and assemblers
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