TC90400XBG/FG Single-chip Solutions for Digital TV

Highlights

- Highly integrated system-on-chip (SoC) for digital TV that incorporates a high-performance 64-bit RISC processor and three highly optimized DSP processors

- Support for worldwide TV standards (ATSC, DVB & ARIB)

- 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- or dual-standard definition streams or single high-definition stream

- Decode up to three audio streams

- Two analog outputs and two digital outputs

- One ITU-R656/R601 input for video capture

- Unified memory architecture for optimum system cost

- Built-in MPEG-2 decoder, high-performance scalar and graphics controller for high-quality video output

- Support for HDD connection

- Low-power SoC with power-down modes

Description

The TC90400XBG and the TC90400FG are the first two members of the TC904XX family of products targeted for digital TV applications. The TC90400XBG/FG devices are highly integrated system-on-chip solutions with comprehensive support for worldwide TV standards. Systems based on the TC90400XBG also support hard-disk drive applications.

With capability to decode multiple standard definition streams or single high-definition streams, the TC90400XBG/FG can display content in standard-definition resolution (720 x 480) or half high-definition resolution (up to 960 x 1080). The TC90400XBG/FG can also output standard 480i analog output to support VCRs. This analog output can also be used to feed CRT TV for display of digital transmission.
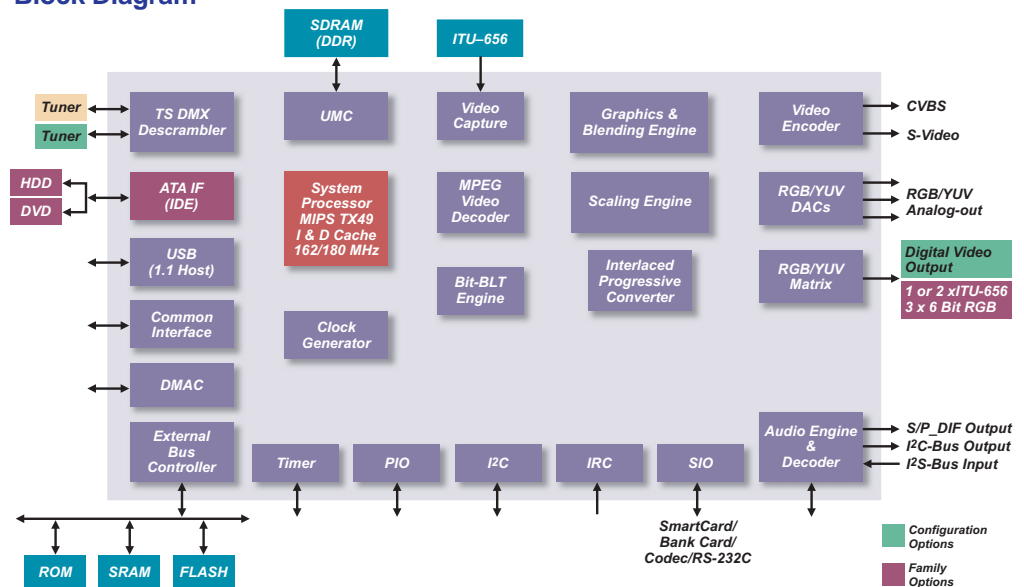
The TC90400XBG/FG devices use multiple DSP engines to perform compute-intensive, multimedia operations to offload the main CPU for efficient system management of demanding digital TV applications. These devices support a unified 16-bit DDR memory system, as well as a NAND and NOR flash memory controller to reduce overall system cost.

Features

- 180 MHz TX49/L3 64-bit MIPS RISC core
  – 8 KB each I & D cache
  – Unified memory system
  – DDR SDRAM controller (16-bit, 144/162/180 MHz)
  – NAND & NOR Flash support

- Transport Stream Processor
  – Fully compliant to ATSC, ARIB and DVB
  – Supports HDD recording and playback
  – Descrambler (Multi2, DES/TDES, DVB, AES)

- Video Decoder (SD decoding)
  – MPEG-2 decoding (MP@ML and MP@SL) and MPEG-1 decoding
  – Single- or dual-MPEG-2 decoding

- Video Decoder (HD decoding)

Block Diagram

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– MPEG-2 decoding for MP@HL for ATSC and BS-Digital
– HD Decoding
• Display in HD resolution up to 960 x 1080
• 720p or 1080i compliant
– HD-to-SD down-conversion
• Display in SD resolution

• Audio Processor
– MPEG- Audio, Dolby AC-3, AAC decoding
– Multi-stream decoding (up to 3 streams)
– Audio post-processing (firmware options)
– 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
– Support two different video signals (from independent sources)
– Video encoder (PAL, SECAM, NTSC)
– RGB & YUV output (analog & digital)
– 5 DACs (CVBS/S-Video, RGB/YUV)
– 3 x 6-bit RGB-output for LCD display
– 2 x 4:2:2 YUV Digital-Output (ITU R656/R601)
– VBI re-insertion (Teletext, WSS, closed-caption, video-ID/CGMS-A)
– Macrovision copy protection (version 7.1L1 and rev1.2 for progressive)
– Interlaced or progressive output

• Interfaces and Peripherals
– 8/16-bit ITU R656/R601 input
– 8/16-bit local bus for NAND/NOR flash and other I/O devices

– Smart card and DVB-CI interface (2 ch each)
– IDE interface, DMA controller (2 ch), SIO (4 ch), PIO (32), timer/counter (three 24-bit), I2C (2 ch), USB 1.1 host (12 Mb/sec), real-time clock, IR-decoding

• Power-down and standby operations

• Package
– TC90400XBG – 272-pin PBGA
– TC90400FG – 208-pin QFP

TC900400XBG/FG Development Tools

Reference Board:
Global DTV Reference System

Operating System:
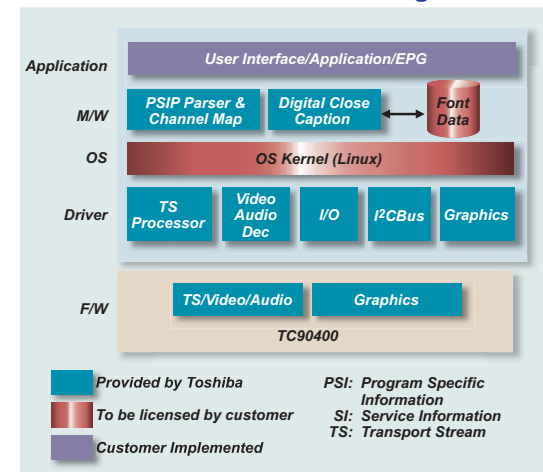Monta Vista Software, Inc.: Monta Vista Linux

Development Tools:
Compilers, debugger and assemblers

Software Support:
Firmware, Device Drivers, ATSC middleware and Unidirectional Digital Cable Ready (UDCR)

TC90400 Software Structure Diagram

Application	User Interface/Application/EPG	
M/W	PSIP Parser & Channel Map	Digital Close Caption	Font Data
OS	OS Kernel (Linux)	
Driver	TS Processor	Video Audio Dec	I/O	I2CBus	Graphics
F/W	TS/Video/Audio	Graphics
	TC90400	

■ Provided by Toshiba
■ To be licensed by customer
■ Customer Implemented

PSI: Program Specific Information
SI: Service Information
TS: Transport Stream

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