



Dual Digital Broadcast MPEG-2 Standard Definition TV Decoder with PVR Support

CX2416x

Conexant's portfolio includes a comprehensive suite of semiconductor solutions for broadband communications and the digital home. Conexant's dual MPEG-2 Standard Definition Television (SDTV) decoder IC features all the major subsystems required to implement the core system and decoder electronics of dual-TV digital set-top box (STB) for satellite, cable, or terrestrial TV networks.

The CX2416x family offers dual MPEG-2 MP@ML video decoders, 32-bit RISC CPU, 2D graphics accelerator, dual video graphics display controllers, dual TV encoders, and a set of peripheral I/O ports for STB front and back panel connectors. The multi-format audio decoder supports MPEG-1, MPEG-2, and Dolby® Digital (AC-3). Certain members of the device family also feature an integrated NTSC channel 3/4 RF modulator and BTSC stereo encoder for distribution of composite video and full MTS stereo sound to a remote room in the house.

Personal video recorder (PVR) functionality is supported by three dual-stream transport processors (up to 8 baseband transport stream (TS) interfaces), fully integrated parallel- and serial-advanced technology attachment (ATA) interfaces for hard disk drive (HDD) connectivity, and 3DES/AES ciphering engines for encryption of data to the HDD. This functionality enables consumers to simultaneously watch and record separate programs, or record a program while watching one previously recorded. NDS XTV™ and RASP™ PVR technologies are integrated in the IC.

The CX2416x also features an impressive array of I/O features, including dual USB2.0 host controllers, PCI bus interface, and HomePlug® connectivity via a high-speed UART.

For a complete four tuner, dual TV PVR system design, the only additional components required are tuners, demodulators, modem codec, audio DACs, DDR SDRAM, and flash memory ICs. This high level of integration enables a low-cost system bill of materials and allows the flexibility of supporting different modulation and compression technologies with a low-cost, high-performance STB back end solution. Combining the CX2416x with the Conexant CX24128 dual stream satellite tuner and CX24130 dual QPSK demodulator provides a cost-effective satellite STB system solution for high-performance, multi-tuner, dual-TV PVR services.



Distinguishing Features

- Dual MPEG-2/DVB/DIRECTV® compliant SDTV decoder for worldwide markets
- XTV™ PVR with serial ATA interface
- High-performance 32-bit ARM920 CPU with Linux and Windows® CE-compatible MMU
- Integrated NTSC channel 3/4 RF modulator and BTSC stereo encoder
- Advanced security features, including secure boot software authentication, IC personalization via OTP memory, and 3DES/AES ciphering engines
- Dual multiplane video/graphics compositing and display engine
- Three dual-stream transport processors with DVB, DES, AES, and Multi-II descrambling
- Two integrated TV encoders with seven analog video DAC outputs
- High-performance 16/32-bit DDR-SDRAM memory controller
- Supports four simultaneous tuner inputs for dual-tuner PVR on two separate TVs

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Description	Dual Digital Broadcast MPEG-2 Standard Definition TV Decoder with PVR Support



CX2416x Product Features

- High-performance 32-bit ARM920 CPU with Linux/WinCE compatible MMU
- High-performance 16/32-bit DDR-SDRAM memory controller
- Dual MPEG-2 MP@ML video decoders
- Multi-format audio decoders supporting MPEG-1, MPEG-2, and Dolby Digital (AC-3)
- Three multi-standard dual-stream transport processors with DVB, DES, AES, and Multi-II descrambling
- MPEG picture and still-plane upscaling and downscaling
- Dual multiplane video/graphics image compositing with color key or 256-level alpha blending
- Advanced 2D graphics rendering engine for alphabl, bitblt, textblt, line draw, and color expansion acceleration
- Video-picture-in-graphics with flexible picture size and aspect ratio
- Flicker filtering, aspect ratio conversion, and hardware cursor
- 4/8/16-bit ARGB/AYCrCb graphics
- Dual NTSC/PAL/SECAM TV encoders with seven 10-bit video DACs
- Integrated NTSC channel 3/4 RF modulator and BTSC stereo encoder
- NDS XTV and RASP PVR support
- 3DES and 128 bit AES ciphering for up to three transport streams simultaneously
- Parallel- and serial-ATA interfaces for HDD attach
- 32-bit, 33 MHz PCI controller
- Dual USB2.0 host controllers
- Advanced security features, including secure boot software authentication and IC personalization via OTP memory
- NDS VideoGuard® conditional access hardware support
- Integrated DIRECTV® security
- High-speed UART with HomePlug support
- Three Smart Card ports
- CCIR656 digital video input and output ports
- I2S input and output ports
- OpenCable CableCard™ interface
- DVB-CI support
- Two UHF remote inputs
- Infrared (IR) input/output
- Macrovision® 7.X copy protection

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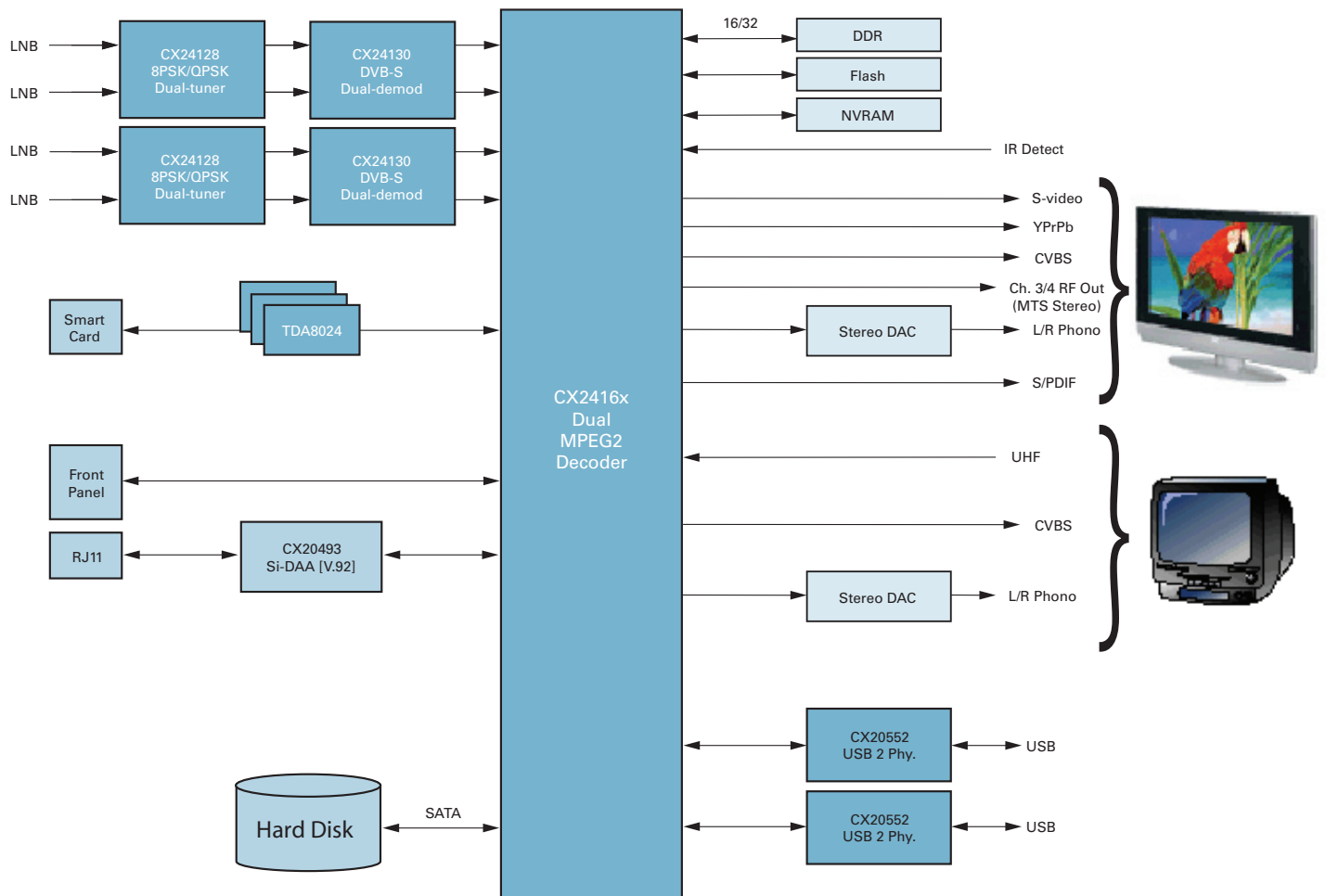


The ARM920 CPU in the CX2416x provides up to 250 Dhrystone 2.1 MIPS and enables broadcasters to adopt complex, feature-rich middleware platforms, such as OpenTV®, multimedia home platform (MHP), and MediaHighway™. The advanced CPU platform allows STB manufacturers to offer improvements such as faster interactive applications loading, electronic program guide (EPG) scrolling performance, and scalability to Linux®-based software platforms via memory management unit (MMU) hardware support. A telco return channel can be supported via data access arrangement (DAA) interface to a V.22-V.92 hardware or software modem, or via PCI interface to a digital subscriber line (DSL), Ethernet, or wireless broadband modem.

Advanced Security Features

The CX2416x incorporates advanced security technologies that greatly enhances the ability of broadcasters to protect their service against piracy. Using an advanced on-chip one-time-programmable (OTP) memory technology, Conexant offers broadcasters the ability to personalize individual STBs via the system IC with unique serial numbers and encryption keys. This allows broadcasters to secure transactions between the STB Smart Cards and the MPEG-2 decoders. The CX2416x also includes embedded cryptographic technology to allow secure authentication of the STB system software that is loaded into flash memory.

Full-Featured Development Platform



CX2416x System Diagram

The CX2416x IC family is integrated into a fully engineered interactive TV STB reference development system that implements third-party interactive middleware/real-time operating system (RTOS) software and provides a complete set of STB low-level drivers based on the Nucleus+, VxWorks and Linux operating systems. A mature and robust hardware abstraction layer is assured by reuse of core driver libraries developed over three generations of production MPEG ICs. The STB development platform hardware is designed with a flexible architecture that supports multiple front-end tuner/demodulator NIMS.

Common Platform for Satellite, Cable, and Terrestrial

STB manufacturers increasingly look to leverage a common hardware platform that can be reused over various broadband networks, including satellite, cable, terrestrial, DSL, and Ethernet Internet protocol (IP) networks. Conexant's CX2416x IC can serve as a common back-end platform that easily interfaces to a variety of broadband front-ends, including QPSK, QAM, OFDM, VSB, ADSL/VDSL, 802.3, 802.11a/b/g, or IEEE 1394 through either TS or PCI interface. This provides a flexible STB solution that can be targeted to a variety of broadband operators while minimizing hardware/software development costs.

The CX2416x is also fully compatible with the CX2418x co-processor to provide bandwidth-efficient MPEG-4 AVC/ H.264-compliant advanced-compression bitstream decoding.

The company's broad portfolio of semiconductor products also includes client-side DSL and cable modem solutions, home

network processors, broadcast video encoders and decoders, digital STB components and systems solutions, and dial-up modems. In addition to its IEEE 802.11a/b/g-compliant wireless local area network (WLAN) chipsets, software, and reference designs, Conexant offers a suite of networking components that includes solutions for applications based on HomePlug and HomePNA™. Additional products include a complete line of asymmetric and symmetric DSL central office solutions, which are used by service providers worldwide to deliver broadband data, voice, and video over copper telephone lines.

CX2416x Part Number Guide

The CX2416x IC family includes four base part numbers defined by the functionality differences shown in Table 1.

Table 1 - CX2416x Base Part Numbers		
Part Number	PVR Support	BTSC Encoder
CX24160		
CX24161		X
CX24162	X	
CX24163	X	X

The CX2416x includes optional license-based features optional as designated by the dash numbers in Table 2.

Table 2 - CX2416x Dash Number Options				
CX24160/1/2/3-mn				
Dash Number:	-0n	-1n	-2n	-3n
Macrovision		✓		✓
Dolby Digital			✓	✓

m = optional feature combinations (0 thru 3)

n = die revision (e.g. n=1 for die rev A, 2 for die rev B etc.)