

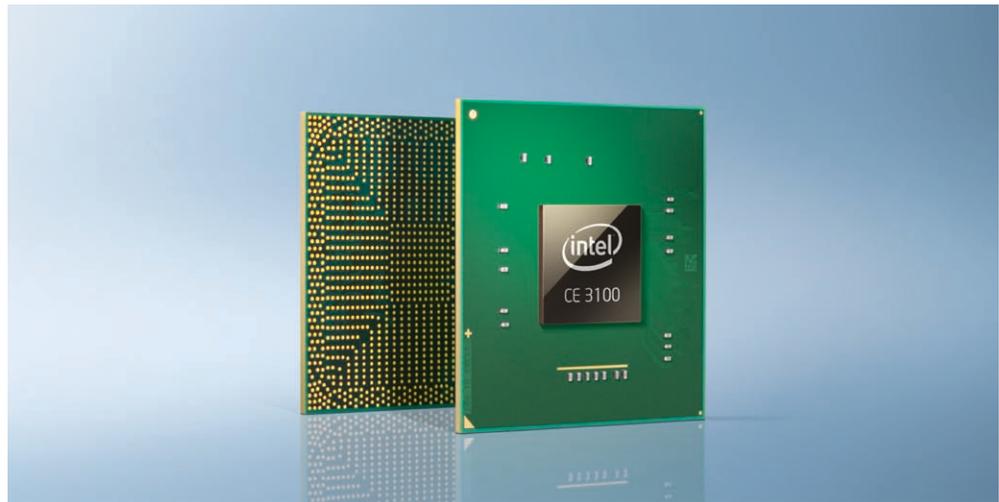
Product Brief

Intel® Media Processor CE 3100

Intel® Media Processor CE 3100
Development Platform

Consumer Electronics

Intel® Media Processor CE 3100



Product Overview

Today's Internet is largely built and optimized on personal computers based on Intel® architecture (IA). The arrival of the Internet in the living room makes IA an important asset for developers of CE devices. The availability of Internet-based content and services on TV is moving the CE industry into the next stage of its evolution, the era of connected CE.

This trend is creating a shift in demand from fixed-function CE products to programmable, scalable and interoperable CE devices. These new products will require the enhanced processing performance and connectivity to concurrently support high-def video, home-theater-quality audio, gaming, advanced UIs/EPGs, Internet applets and other software applications including soft audio/video codecs.

The Intel® Media Processor CE 3100 is the first system-on-a-chip (SoC) based on IA for Internet-connected Blu-ray* players, advanced cable set top boxes, modular DTVs, and other connected CE products. This highly integrated device combines a high-performance IA processor core with leading-edge video decoding and processing hardware, a 3-channel/800MT/s DDR2 memory controller, dedicated multi-channel audio processing DSPs, a powerful 3D-graphics engine, a security processor and support for multiple peripherals (Figure 1).

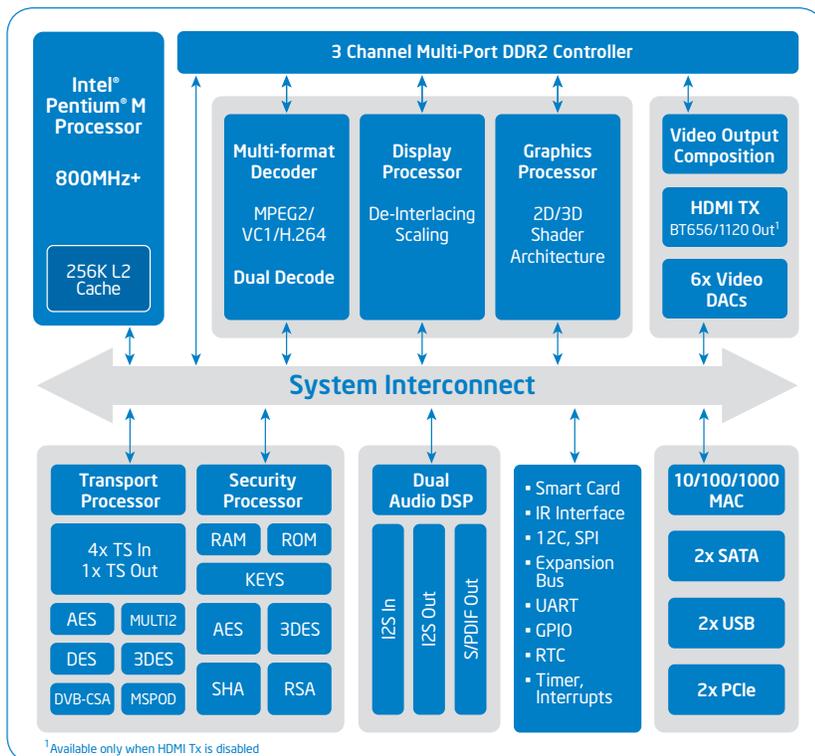
Intel is providing platform solutions that deliver the performance advantages of IA, with the integration and cost-effectiveness of an SoC designed specifically to meet consumer electronics price points. The use of IA in CE platforms provides the additional benefit of access to a library of code built up over the last 20 years including tools, compilers and re-usable Internet applications.

Product Highlights

Intel® Media Processor CE 3100

- Processor
 - 800MHz+ Intel® Pentium® M processor (90nm)
 - 256K 2-way set-associative L2 cache
 - 100/133MHz FSB
 - 6:1/8:1/9:1/10:1/12:1 FSB clock ratio
- Memory Controller
 - Three independent 32-bit DDR2 memory channels
 - Support for 533-800MT/s DDR speed
 - 64MB-3Gb memory capacity using 256Mbit-4Gbit x16 parts
 - 7 media ports to connect units with high-memory bandwidth requirements
 - Tiled memory mapping w/advanced arbitration methods to improve data-bus efficiency

- Memory channel interleaving to lower latency and improve bandwidth
- Graphics Core
 - Programmable 2D/3D Intel® Graphics Media Accelerator 500 (based on the POWERVR™ SGX535 from Imagination Technologies)
 - Dual universal scalable shader engines with up to 16 threads per core providing pixel and vertex shader functionality
 - Advanced shader feature set exceeding Shader Model 3
 - Enables acceleration of advanced geometry and pixel processing functions, tile-based rendering architecture
 - Enables 2D, 3D processing in a single pipeline
 - Accelerated 2D operations—BLT, alpha-blend BLTs
 - Programmable anti-aliasing
 - On-chip multiple-render target (MRT) support
 - 13 million polygon/sec with hardware texturing support, 2Pix/clock 2D operations
 - Industry standard API support—OpenGL ES 1.1, OpenGL ES 2.0 and OpenVG 1.0
- Video Decoding
 - Multi-stream and simultaneous decode for VC1/WM9, H.264 and MPEG2 up to 2HD
 - 250MHz embedded control processor for flexible and robust interface; elementary stream decoder interface
 - Start code detector to accelerate elementary stream parsing
 - Bit-stream error detection and recovery
 - Trick-mode support
 - MPEG-2 MP@HL or MP@ML, VC1-AP@L1-L3, H.264-HP@L4.1
- Display Processing
 - Configurable multi-stream 10-bit precision pipeline with 250MHz embedded control processor
 - Dual 1080i@60 input and 1.5x 1080p@60 output support
 - Chroma up-sampling
 - Temporal noise reduction to reduce Gaussian noise
 - Film mode detection for 3:2/2:2 pull-down detection



¹Available only when HDMI Tx is disabled

Figure 1 - Intel® Media Processor CE 3100 - Block Diagram

The Intel® Media Processor CE 3100 is a highly integrated system-on-a-chip that combines a high-performance Intel® architecture processor core with leading-edge video decoding and processing hardware, a 3-channel/ 800MT/s-each memory controller, dedicated multi-channel audio processing DSPs, a powerful 3D-graphics engine, a security processor, and a host of peripherals support.

Features	Benefits
Intel® Pentium® M processor (90nm) core—800MHz+ with 256K L2 Cache	Performance and headroom for software-based video/audio codecs and resident applications Scalability for new applications. Large cache improves memory latency
MPEG-2, H.264, VC1 hardware decoders	Dedicated hardware for standard TV broadcast and Blu-ray content frees processor to run applications
2D/3D Intel® Graphics Media Accelerator 500 (based on the POWERVR™ SGX535 from Imagination Technologies)	Powerful 3-D graphics engine with high performance for advanced UIs, EPGs, and gaming
Dual 337 MHz Tensilica* DSP cores with Tensilica Instruction Extensions* (TIE)	Advanced audio codecs with up to 7.1 channel output, supporting Blu-ray requirements independent of the processor core
Advanced video processing, composition and display	Compelling visual experience, free of display artifacts Blended video and graphics planes with added flexibility to enable advanced UIs and EPGs
Memory controller with three independent 32-bit 533–800MT/s DDR2 memory channels Support for tiled memory mapping and channel interleaving	Peak bandwidth of 9.6 GB/s Optimum performance of hardware codecs Improved data-bus efficiency and hardware-load balancing

- Advanced 4-field per pixel motion adaptive de-interlacing; motion history for reducing flicker; low angle diagonal interpolation
- 9-tap 128-phase polyphase filter-based independent horizontal and vertical scaling
- Display Composition
 - Dual pipeline with independent timing control
 - 5 universal pixel planes supporting both video and graphics pixels
 - Each universal plane supports: programmable CSC, luma/chroma keying, 65-pt gamma correction
 - 2 8-bit indexed-pixel/alpha planes
 - Flexible blenders allowing sideband, global and per-pixel alpha blending per plane
 - Simultaneous HD and SD display through programmable downscaling of HD content to SD display (via write-back of down-scaled HD image to memory)
- Video Outputs
 - HDMI/DVI 1.3a compliant output with support for 1080P@60 with 36-bit deep color in RGB/YUV, 1080P@24 film format
 - 16-bit BT656/1120 interface to connect an external display processor
- 6 Integrated 10-bit 150MHz video DACs
- Component video-out supporting 480i to 1080i
- S-video and composite video output for standard-definition video
- Support for both NTSC/PAL timing
- Support for close caption, wide-signaling
- Simultaneous video on every output
- SCART Type I/II support
- Audio Processing
 - Dual 337MHz DSP Core with special audio instructions
 - Audio decode (MPEG1/3, AC3, Dolby Digital Plus,* DTS-HD/Master Audio & High Res,* Dolby True HD/MLP,* DTS LBR,* AAC plus V2, WMA)
 - Audio encode (AC3, DTS)
 - Audio effects, resampling, mixing
- Audio Interfaces
 - HDMI audio support including high-bit rate (HBR) audio
 - 5 I²S outputs supporting one stereo and one 7.1-channel outputs
 - 1 S/PDIF output

- 24-bit 192KHz audio support
- Simultaneous audio on each output
- 1 I²S stereo/mono audio input
- Integrated audio PLL to reduce BOM cost
- Transport Processing
 - Programmable transport demux
 - 4 serial transport stream interfaces with independent 32-PID filters and program clock recovery
 - Interface for external 1394 controller to support DV input and TS input/output
 - Stream muxing/demuxing for multi-stream POD
- Security Features
 - 2 smart card (ISO 7816) interfaces
 - SS/MS-POD support for OpenCable*
 - HDCP content protection for HDMI
 - Macrovision* (v7.1.L1) and CGMS-A protection on analog video
 - DES, 3DES, AES, MULT12 and DVB-CSA transport stream descrambling
 - 250MHz security processor with hardware acceleration for RSA, SHA, 3DES, AES ciphers for content access and content protection
 - Support for AACS for Blu-ray disk players
 - Random number generator
 - Secured boot with full authentication and option to encrypt external flash
 - DRAM memory obfuscation (scramble) to inhibit interface snooping
 - On-chip root of trust key storage
 - JTAG lockout with optional 64-bit password
- Peripherals
 - 2 USB 2.0 host ports
 - Ethernet 802.3 10/100/1000 MAC
 - 2 SATA-150 for drive connectivity
 - 2 PCI Express x1 ports for expandability
 - 3 I²C interfaces plus 1 additional dedicated for DDC (HDMI)
 - 1 SPI interface with 4 chip-selects
 - 2 UARTS, one with hardware handshake signals
 - A configurable 8/16-bit expansion bus with 4 chip-selects

- Support for NAND/NOR flash including boot (for NAND uses external controller)
- 16 general-purpose (GPIO) pins (8 dedicated; other pin-muxed) with interrupt
- Timers, RTC
- Other Features
 - 250MHz system clock
 - Unified memory architecture (UMA)
 - PCI-mapped internal devices
 - Legacy and MSI (message-based) interrupt support
 - Coherent data path for control and non-coherent data path for bulk video data
 - IEEE 1491.1-complaint JTAG
 - 609 signal pins in a 37.5mm lead-free FC-BGA7 (1434 balls) package

Performance to Bring Internet to TV: Intel® Media Play Technology

The Intel Media Processor CE 3100 makes Internet-based video content a seamless part of the TV viewing experience (Figure 2). Intel® Media Play Technology enables the Intel Media Processor CE 3100 to decode video content from broadcast and broadband sources. When a viewer watches a broadcast channel—or stored content—video is encoded in a standard format such as MPEG-2, H.264 or VC1. Streaming media drivers in the Intel Media Processor CE 3100 route the video to the on-chip hardware decoders.

When the viewer switches to an Internet channel, the software automatically routes the video (and audio as applicable) to a software codec such as DivX*, WMVx*, or other codec running on the Intel architecture processor core. Aided by optimized Intel instruction-set code, the processor core provides the computational capacity to perform the task.

The Internet is constantly evolving. The ability to decode multiple video and audio formats in software provides CE devices based on the Intel Media Processor CE 3100 with the flexibility to adapt to changing standards.

In addition to video and audio, the IA core of the Intel Media Processor CE 3100 allows viewers to interact with a spectrum of downloadable widgets (special-interest applets) and data services including localized news, weather, sports, stock tickers, traffic updates and instant messaging applications designed for the TV screen.

DDR2 Memory Support

Adequate memory bandwidth is critical for optimum performance of hardware codecs, in addition to concurrent application processing. The Intel Media Processor CE 3100's memory controller supports three independent 32-bit DDR2 memory channels at 533–800MT/s per channel resulting in a peak bandwidth of 9.6GB/s and a 64MB–3GB memory capacity using 256MBit–4Gbit x16 components. Each video unit in the Intel Media Processor CE 3100, including the video decoder, display processor, graphics and video display unit, has a dedicated connection to the memory controller, allowing up to 3.2GB/s of independent read and write bandwidth.

Non-video pixel traffic, such as disk traffic, network traffic, compressed-streams and audio, use a separate system bus with a star topology. Each leg has bandwidth of 1GB/s to a common interface that connects to the memory controller using another 3.2GB/s memory port. Other performance-enhancing features include tiled memory mapping with advanced arbitration methods and channel interleaving for hardware load balancing.

Intel® Graphics Media Accelerator 500

The Intel® Graphics Media Accelerator 500 is an integrated programmable graphics core that enables a new class of graphics performance for the targeted applications. It has a multi-threaded dual

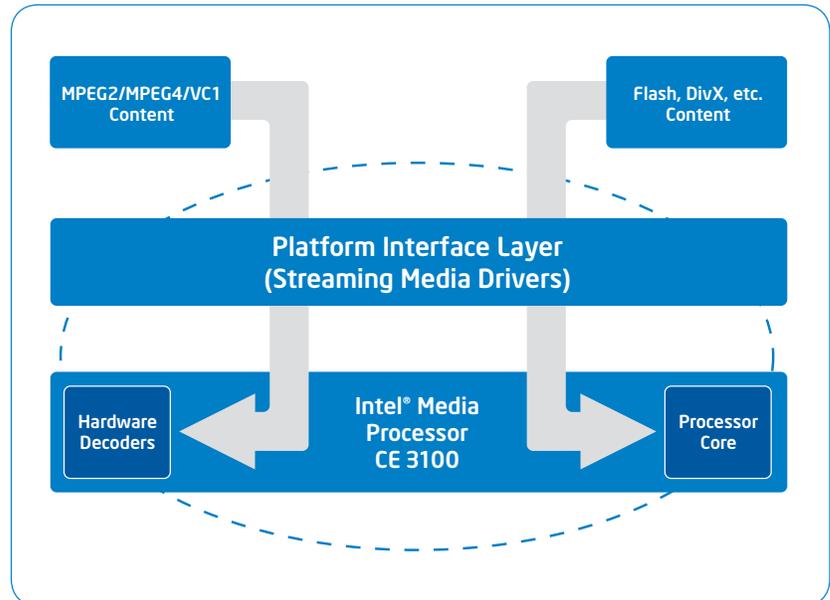


Figure 2 - Intel® Media Play Technology

The Intel® Media Processor CE 3100 combines hardware-based decode of broadcast TV/stored content and software-based decode of Internet content, enabling a seamless viewing experience.

universal scalable shader engine incorporating pixel and vertex shader functionality and acceleration. Other key features include tile-based rendering, accelerated 2D operations, such as BLT and alpha-blended BLTs, programmable anti-aliasing and 13 million polygons/s performance with 2pix/clock 2D operations. The Intel Graphics Media Accelerator 500 supports industry standard graphics APIs including OpenGL ES 1.1, OpenGL ES 2.0 and OpenVG 1.0.

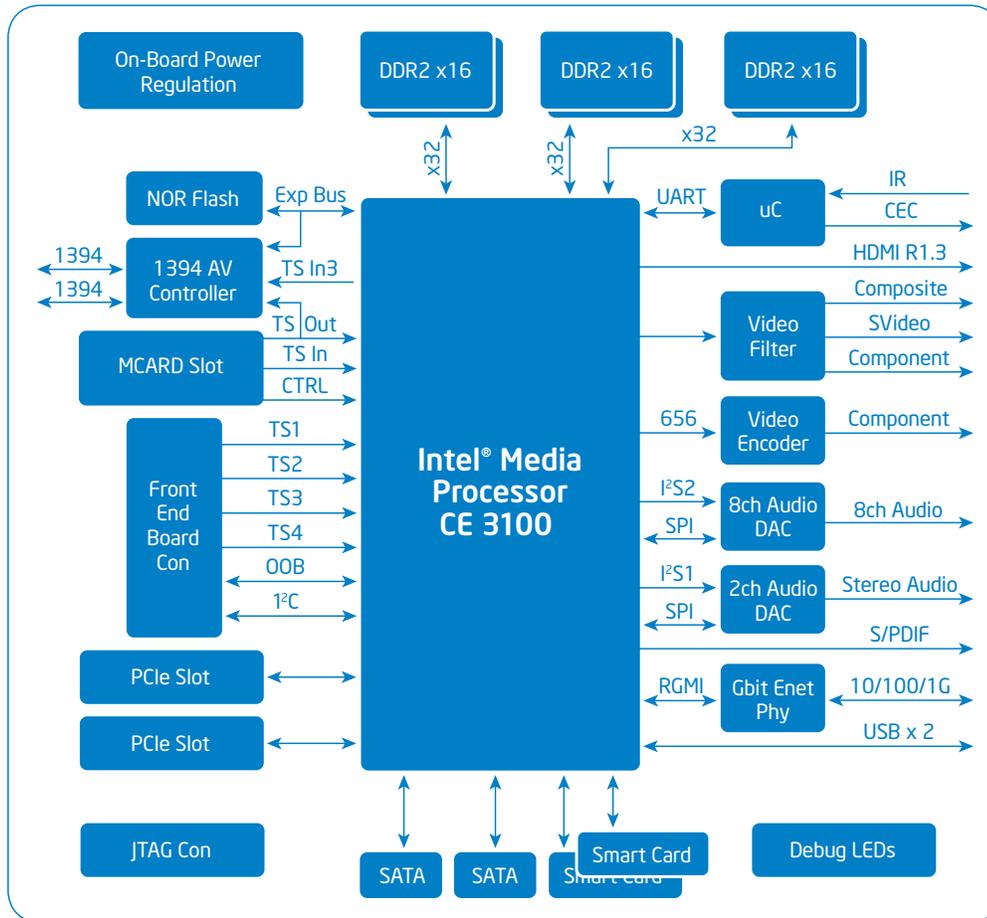
Intel® Media Processor CE 3100 Development Platform

The Intel® Media Processor CE 3100 development platform (Figure3) is designed to facilitate early software application development and provides flexibility for developers to evaluate new usage models. The use of Intel architecture in CE devices enables developers to engage with a community of more than 5,000 registered independent software vendors and benefit from proven tool chains and development support available from Intel and leading vendors.



Feature Highlights

- Major Inputs
 - Multiple TS ports support cable, terrestrial or satellite
 - Analog audio inputs for microphone for Karaoke or VoIP
 - IR remote control and box front panel display/control
- Major Outputs
 - HDMI 1.3a transmitter with CEC
 - Component, S-Video and Composite analog video outputs
 - Line level analog audio outputs—one 8-channel and one 2-channel
 - TOS-link/optical digital audio (S/PDIF)
 - Video encoder for BT656 output (EVO)
- Power Supply
 - ATX power supply connectors
 - On-board local regulators
- On-Board Functions
 - 3 32-bit DDR2 x16-channels support up to 1MB each with 2Mb SDRAM
 - NOR flash memory
 - 1394 with DTCP
 - uC for IR user buttons, and CEC
 - 4-digit POST code HEX display
 - External NAND flash controller
- Connectors
 - Front end board interconnect for flexible front-end device interface
 - Connectors for on-chip support
 - 2 x1 PCIe slots, 2 USB, 2 SATA, Gbit Ethernet
 - HDMI, component, composite output
 - Component video output for DVO
 - 8-channel audio, stereo outputs, S/PDIF outputs
 - Stereo audio input
- Security
 - 2 Smart card ports
 - OpenCable* CableCARD slot
- Peripherals
 - 802.11n wireless LAN (PCI-express connect)
 - Hard-disk drive on SATA for DVR
 - Optical drive on SATA for high-definition video
 - USB 2.0 for memory card reader and other devices
- Additional Expansion Boards
 - Cable front end board (Hillsborough Bay)
 - HDMI/analog video capture

Figure 3 - The Intel® Media Processor CE 3100 Development Platform

Software Developers' Kit

- Streaming Media Driver (SMD)
 - Low-level driver with high-level GStreamer plugin, which provides API for applications to control media streams
- Integrated Device Library (IDL)
 - Low level API for controlling devices integrated into the silicon
- External Device Library (EDL)
 - Low-level API for controlling devices that are part of the platform, but external to the silicon
- Display Device Library (DDL)
 - API for applications to control the display subsystem, including port drivers
- Graphics API (OpenGL ES, OpenVG and DirectFB)
 - Open standard APIs used to render graphical 2D and 3D scenes
- Consumer Electronics Firmware Development Kit (CEFDK)
 - Low-level libraries for initializing Intel architecture components
- Sample applications

For more information, visit the Intel Consumer Electronics home page at: www.intel.com/go/consumerelectronics

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