OMAP4470 mobile applications processor

TEXAS INSTRUMENTS

Building upon the strengths of the OMAP4460 processor, the OMAP4470 is the first OMAP™ processor designed for mobile computing, with enhanced graphic and memory performance to support intense computing applications and operating systems.

As part of Texas Instruments' (TI) OMAP 4 processor family, the OMAP4470 extends TI's expertise in powering high-end smartphones to the rapidly growing tablet and ultrathin laptop market. Like the other OMAP 4 processors, the OMAP4470 centers around two ARM® Cortex™-A9 MPCores that support symmetric multiprocessing (SMP) and deliver speeds up to 1.8 GHz each. These complemented by two ARM Cortex-M3 cores that can offload real-time processing functions, lowering overall power consumption. Other key architectural features include an Image Signal Processor (ISP) and IVA 3 accelerator offering unparalleled imaging and video performance and supporting multiple video encode/decode standards, and a programmable DSP.
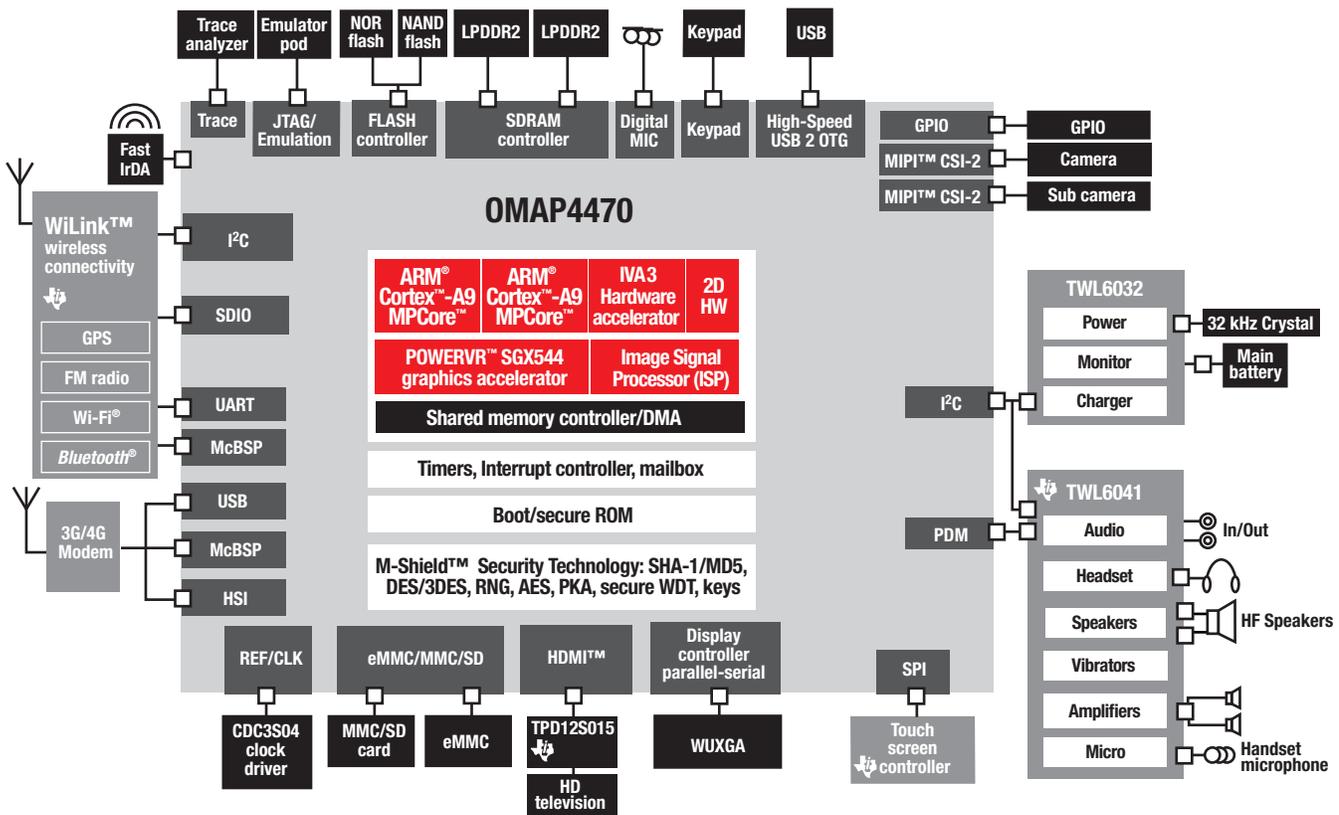
The OMAP4470 processor architecture has been enhanced to deliver top-notch graphics by increasing its predecessor processor specifications in a balanced manner. In addition to the latest-generation 3D graphics core – Imagination Technologies' POWERVR SGX544, the OMAP4470 system-on-chip (SoC) includes a dedicated 2D composition engine. This composition engine is able to accelerate rich UI composition with multilayer blending with transparency on high resolution displays to allow

Key features

- Highly-optimized mobile applications platform including: applications processors, multimedia software and power management
- IVA 3 accelerator enables full HD 1080p, multi-standard video encode/decode
- Integrated Image Signal Processor (ISP) for faster, higher-quality image and video capture with digital SLR-like 20-megapixel imaging
- Integrated POWERVR™ SGX544 graphics core drives next-generation, 3D user interfaces with larger displays, life-like graphics and intuitive touch screens
- Dual-core ARM® Cortex™-A9 MPCore™ with SMP for higher mobile computing performance and PC-like, uncompromising web browsing experience
- Support for leading mobile operating systems including Microsoft® Windows and Linux® (Android™, Chrome)

- Software and pin-to-pin compatibility with other OMAP 4 family processors
- Programmability and performance headroom to support new and emerging applications and standards
- Pre-integrated WiLink™ 7.0 combination connectivity solution offering Wi-Fi®, *Bluetooth*®, GPS and FM radio wireless connectivity
- Pre-validated modem interface software to connect with any external modem
- Industry-leading power management and SmartReflex™ 2 technologies delivers more than 10 hours of 1080p HD video playback, 4+ hours of 1080p HD video recording and 120+ hours of CD quality audio playback

the 3D graphics core to handle more intensive tasks, or even completely turn off to conserve power. The CPUs' increased speed is complemented by a 16 percent increase in LPDDR2 memory throughput – up to 466 megahertz, which is also dual-channel for greater efficiency.

A variety of subsystems and applications are discussed below, which deliver hardware and software system solutions that scale across customer roadmaps, optimizing time to market, flexibility and R&D efficiency.

Trace analyzer — **Emulator pod** — **NOR flash** — **NAND flash** — **LPDDR2** — **LPDDR2** — **Keypad** — **USB**

Trace — **JTAG/Emulation** — **FLASH controller** — **SDRAM controller** — **Digital MIC** — **Keypad** — **High-Speed USB 2 OTG**

GPIO — **GPIO**
MIPI™ CSI-2 — **Camera**
MIPI™ CSI-2 — **Sub camera**

Fast IrDA

WiLink™ wireless connectivity
GPS
FM radio
Wi-Fi®
Bluetooth®

I²C
SDIO
UART
McBSP

OMAP4470

ARM® Cortex™-A9 MPCore™ — **ARM® Cortex™-A9 MPCore™** — **IVA3 Hardware accelerator** — **2D HW**

POWERVR™ SGX544 graphics accelerator — **Image Signal Processor (ISP)**

Shared memory controller/DMA

Timers, Interrupt controller, mailbox

Boot/secure ROM

M-Shield™ Security Technology: SHA-1/MD5, DES/3DES, RNG, AES, PKA, secure WDT, keys

TWL6032
Power — **32 kHz Crystal**
Monitor — **Main battery**
Charger

I²C

3G/4G Modem
USB
McBSP
HSI

PDM

TWL6041
Audio — **In/Out**
Headset
Speakers — **HF Speakers**
Vibrators
Amplifiers
Micro — **Handset microphone**

REF/CLK — **eMMC/MMC/SD** — **HDMI™** — **Display controller parallel-serial** — **SPI**

CDC3S04 clock driver — **MMC/SD card** — **eMMC** — **TPD12S015** — **WUXGA** — **Touch screen controller**

HD television

▲ *OMAP4470 block diagram*

Latest-generation graphics for the operating system and beyond

The OMAP4470 processor includes the latest-generation graphics core from Imagination Technologies, the POWERVR SGX544. SGX544 offers more than two times the performance of the previous SGX540 core. This core provides full support for DirectX with maximum hardware acceleration, making it ideal for tablets, computing devices and smartphones. In common with all POWERVR Series5XT cores SGX544 delivers all the benefits of SGX cores, including the highest processing power per mm2 and per mW , unified shader architecture, tile-based deferred rendering, and low power.

SGX544 provides comprehensive market proven support for desktop OpenGL 2.1 (including X11 integration with DRI2, EXA and DRM support), OpenGL ES 1.1 & 2.0, OpenVG 1.1 and OpenCL 1.1 Embedded Profile, offering the widest ranges of supported APIs of any mobile or embedded graphics IP core available today. POWERVR SGX software stacks have passed rigorous Khronos and Microsoft conformance tests, guaranteeing fast time to market with high confidence across the widest range of embedded and desktop operating systems.

Rich user interfaces, deep resolution

Rich, distinctive user interfaces are quickly becoming a differentiator for mobile devices. There are two primary factors necessary for this progress: high screen resolution and an increasing number of layers used to compose and overlay the UI. The OMAP4470 processor architecture enables OEMs and ODMs to support up to QXGA (2048x1536) resolution with UIs composed of more blended layers than the original OMAP4430 device and up to two times more layered imaging and video composition than competitive solutions.

Dual-channel memory

When this interface richness is combined with the super responsiveness enabled by OMAP4470's dual-channel memory, consumers get extreme multi-tasking ability and download times. The dual-channel architecture enables 100 percent higher bandwidth than the conventional single-channel architecture allows. It maintains a higher number of instructions actually executed by processor cores as usage gets more complex and consumers run more intensive applications or multiple screens compared to single-channel architecture, even when running at the same speed.

This means OMAP4470 devices can maintain very high user experience running a combination of applications when performances would collapse on a conventional single channel memory. Dual-channel memory, together with the OMAP4470's enhanced 2D and 3D cores allows it to offer up to two times the numbers of blended UI layers required for tomorrow's rich UI compositions.

The SMP Advantage

In line with the OMAP family's heritage of delivering high performance and low power, the OMAP4470 processor supports SMP parallel processing for higher performance and efficiency. SMP allows identical processing subsystems to run the same instruction set; have equal access to memory, I/Os and external interrupts; and run a single copy of the operating system to control all the cores. SMP's scalable performance activates only the cores that are needed for a particular process to reduce power consumption or substantially increase performance.

IVA 3 Hardware accelerator

The third-generation IVA on the OMAP 4 applications processor is divided into two sections: a power-optimized, multi-format hardware accelerator for mainstream codecs and a programmable digital signal processor (DSP) based portion for emerging codecs and audio. IVA 3 delivers up to 1080p30 encode/decode and up to 1080p60 Internet content playback on the broadest set for multimedia codecs available today, including, but not limited to:
- H.264 HP
- MPEG4 ASP
- VC-1 AP
- MPEG2 MP
- ON2 VP7 and VP8

Display sub-system

The OMAP4470 display sub-system is a flexible multi-pipeline system that supports multiple high resolution displays, including multi-touch, to deliver larger, color-rich viewing of local or external displays. The platform can interface to MIPI-compliant serial displays as well as parallel displays. To drive external displays, the OMAP4470 includes an integrated HDMI v1.4a 3D transmitter with High-bandwidth Digital Content Protection (HDCP) and deep color support can drive an external HD display from the handset, making it easy to share multimedia content.
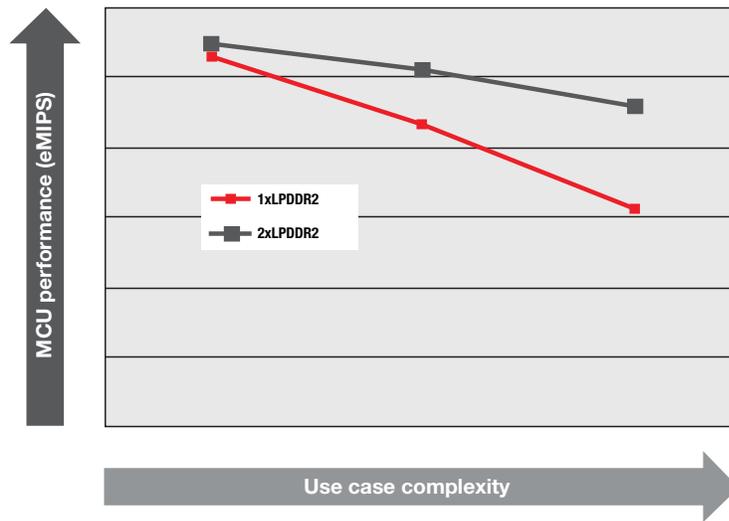
▲ *Single- vs. Dual-Channel Performance Comparison*

Imaging sub-system

The OMAP4470 imaging sub-system includes a flexible yet powerful image signal processor that is capable of supporting camera sensors up to 20-megapixel resolution at less than one-second shot-to-shot delay, comparable to the best digital still cameras available. The ISP also supports advanced image processing and quality enhancement features such as, but not limited to:
- Digital anti-aliasing
- On-the-fly defect pixel correction
- Lens-distortion correction
- Edge enhancement
- Noise filtering
- Stabilization
- Auto-focus/auto-white balance/ auto-exposure
- Digital zoom
- Face detection

The OMAP 4 applications processor's ISP is able to capture high quality digital pictures and provide greater design flexibility while saving printed circuit board (PCB) area, design cost and system power.

OMAP 4 platform security

TI's M-Shield™ mobile security technology is a hardware and software solution that enables robust protection of premium copyrighted digital media content, secure protocol applications and e-commerce applications such as ticketing, banking, brokering and shopping. M-Shield is based on open APIs and provides an environment for secure applications that deliver robust performance, interoperability, greater development speed and large economies of scale. Devices with M-Shield technology are enterprise-ready thanks to best-in-class device integrity and data protection service.

Software and support

TI provides a comprehensive software suite that supports the leading mobile OSes, including Microsoft Windows and Linux (Android, Chrome), and is integrated and tested up to the application level, enabling faster and easier development for end equipment manufacturers and application developers. Additionally, the software platform has been performance and power optimized for the OMAP 4 platforms to ensure the highest performance in customers' products. The software suite allows OEMs and partners to spend their resources on differentiating their product at the user interface and application level while reusing most of the system platform software components directly from TI.

All OMAP platforms are backed by TI's extensive development support. Code compatibility among processors makes it easy to port software and a sophisticated development environment speeds programming for all on-chip processors. In addition, the OMAP ecosystem provides access to TI Developer Network members and OMAP Technology Centers (OTCs), as well as systems integrators, development tool providers and leading content providers worldwide.

With an advanced set of features, including dedicated 2D and 3D graphics, display and imaging subsystems, high security and a programmable DSP, the OMAP4470 is the perfect processor to implement feature-rich, high-performance mobile computing devices that offer compelling displays, rich Uls, and applications for both the consumer and enterprise markets.

Availability disclaimer

The OMAP 4 platforms are intended for high-volume OEMs and ODMs and are not available through distributors. If your company meets this description, please contact your TI sales representative.

For more information

To learn more about the OMAP4470 processor, or other processors in the OMAP family, visit www.ti.com/omap4470-pb.

Key features at a glance

	OMAP4430	OMAP4460	OMAP4470
Process node	45nm	45nm	45nm
ARM® Cortex™-A9 Clock Speed (two)	1 GHz	1.5 GHz	1.8 GHz
2D & 3D Graphics	Hardware accelerated	Hardware accelerated	Hardware accelerated Dedicated 2D and 3D graphics cores
Video performance (2D)	1080p HD	1080p HD	1080p HD
Video performance (3D)	720p stereoscopic 3D	1080p Stereoscopic 3D	1080p Stereoscopic 3D
Imaging Performance (per second)	20 MP main camera 5MP stereo (dual cameras)	20MP main camera 12 MP stereo (dual cameras)	20MP main camera 12 MP stereo (dual cameras)
Availability	Currently sampling	Currently sampling	Samples in Q4 2011

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