i.MX31 and i.MX31L Processors

Overview

Accelerate your power hungry mobile applications with Freescale Semiconductor's i.MX31 or i.MX31L multimedia applications processor. The i.MX31 and i.MX31L processors unplug multimedia, driving video and graphics to VGA 30 fps of quality with power to spare to perform other tasks simultaneously. Based on an ARM1136JF-S™ core, Freescale's i.MX31 and i.MX31L processors, starting at 400 MHz up to 532 MHz, with a vector floating point coprocessor and L2 cache, are designed for any wireless device running computationally intensive multimedia applications such as portable media players and portable navigation devices. They are also ideal for mobile devices favored by the power user who keeps several applications running at once. Target devices include feature rich smartphones, digital video recorders, digital cameras, mobile gaming consoles, mobile multimedia players and many other mobile wireless applications.

Features

CPU Complex

- ARM1136JF-S
- 128 KB L2 unified cache
- Jazelle® Java acceleration
- Vector floating point coprocessor (VFP)
- Smart Speed™ Switch

Multimedia

- VGA MPEG-4 HW encode
- Graphics acceleration (i.MX31 only)
- Image Processing Unit (IPU)
- CMOS/CCD sensor interface
- Resize, color space conversion
- Deblocking, deringing, blending
- Display/TV controller

External Memory Interface (EMI)

- SDRAM 16/32-bit, 133 MHz
- Mobile DDR 16/32-bit, 266 MHz
- NAND flash 8/16-bit
- PSRAM

Advanced Power Management

- Automatic Dynamic Voltage and Frequency Scaling (DVFS)
- Dynamic Process and Temperature Compensation (DPTC)
- Active well-bias
- Power gating

Connectivity

- High-Speed USB OTG, 2 Hosts
- 2 x MMC/SD, 2 x Memory Stick Pro™
- PCMCIA/CF
- ATA-6 (HDD) interface
- Audio MUX
- IrDA, fast IrDA, keypad
- Configurable SPI x 2, SSI/I²S x 2, UART x 5

Performance

- CPU complex: starting at 400 MHz up to 532 MHz
- System: 133 MHz
- 0° to 70°C operation for i.MX31 and i.MX31L
- -40° to +85°C operation for i.MX31C and i.MX31LC

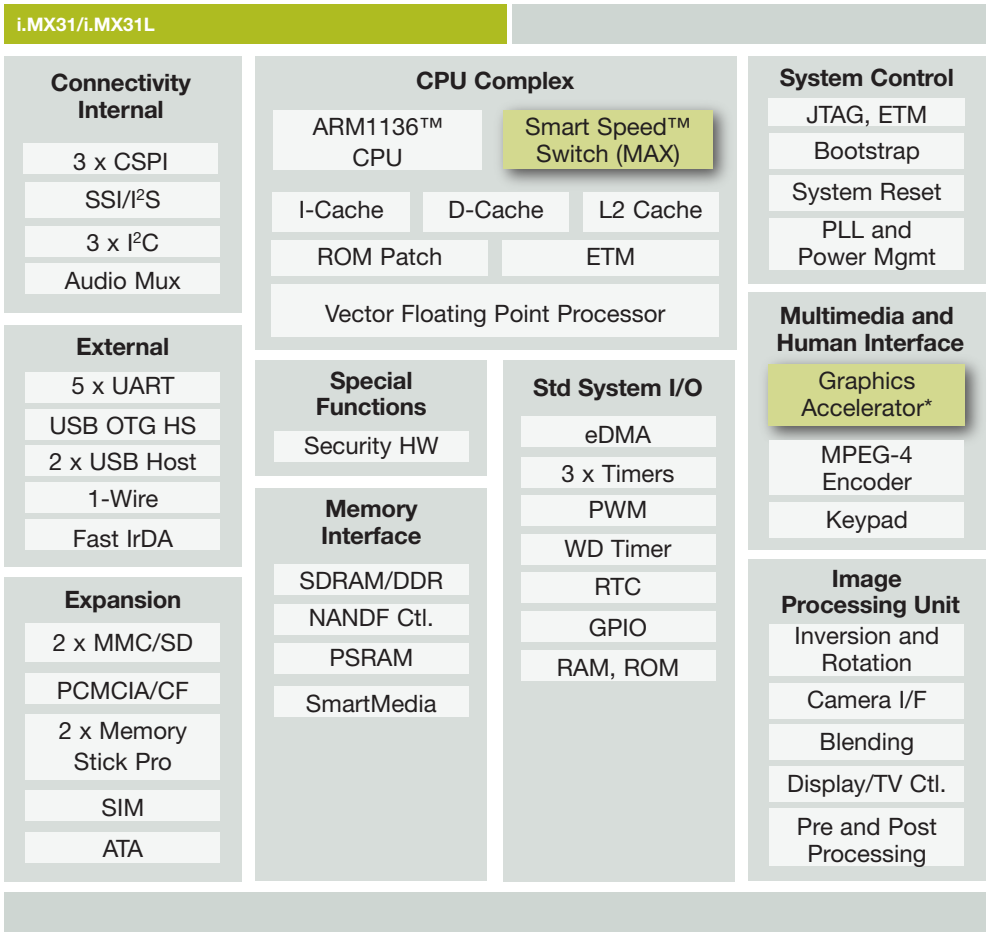
Technology

- 457 ball, 0.5 mm pitch MAPBGA or 473 ball, 0.8 mm pitch MAPBGA
- 90 nm CMOS

Benefits

Image Processing Unit

Freescale's i.MX31 and i.MX31L multimedia applications processors have a built-in IPU that includes the functionality required for image processing and display management including deblock, dering, color space conversion, independent horizontal and vertical resizing, blending of graphics and video planes, and rotation in parallel to video decoding. The IPU accelerates loop deblocking for H.264 decode as well as encode. It provides acceleration of image processing to deliver up to VGA 30 fps of video quality. The IPU is equipped with powerful control and synchronization capabilities to perform tasks with minimal to no involvement of the ARM® CPU.



Not available in i.MX31L or i.MX31LC

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Graphics Processing Unit

Freescale's i.MX31 processor delivers an integrated 3-D Graphics Processing Unit (GPU) that provides an incredible 1 MTri/sec (double textured, bi-linear, Gouraud shaded) at about 100 Mpix/sec (effective). The GPU is built around the ARM MBX R-S™ graphics accelerator. It offers full scene anti-aliasing for superior image quality and provides OpenGL® ES and Java Mobile 3-D support.

L210 Level 2 Cache Controller

Freescale's level 2 cache controller, containing an ARML210™ core, and the accompanying 128 KB of memory, combined with the ARM1136JF-S processor, can increase performance by 25 to 75 percent and extend battery life, while reducing memory cost. By bringing more data on-chip, and closer to the CPU, the ARML210 level 2 cache controller helps remove the performance-limiting bandwidth constraints associated with off-chip memory. Freescale was the lead partner in formulating the definition and is the first ARM partner to license it.

Power Management

Freescale's i.MX31 and i.MX31L are built using Freescale's Smart Speed technology with some powerful enhancements. Our Dynamic Process and Temperature Compensation (DPTC) mechanism measures reference circuits' delays dependent on the process speed and temperature. The DPTC then lowers the voltage to the minimum level needed to support the current operating frequency. Automatic DVFS allows on-the-fly frequency adjustment according to the current performance requirements of the system. The automatic DVFS hardware mechanism monitors the processor load and controls the supply voltage and the frequency with minimal software and operating system involvement. By lowering the frequency it is possible to lower the operating voltage (on-the-fly as well) thereby dramatically reducing the power consumption.

The i.MX31 and i.MX31L offer an abundance of different power saving modes, giving the system developer the ability to make trade-offs between power consumption in stand-by and recovery times. These modes include: Run, Wait, State Retention and Deep Sleep.

Smart Speed Switch

The 6 x 5 Smart Speed Switch allows you to achieve parallelism resulting in fewer effective cycles per instruction (eCPI) required. The switch allows up to five simultaneous transactions, which can provide the effective throughput of a 3 GHz system. This allows enriched multimedia experiences, such as streaming video and videoconferencing, with exceptional quality that exceeds the performance of higher MHz processors.

Security Features

Freescale's i.MX31 and i.MX31L incorporate Freescale's platform independent security architecture, a combination of security features that provides a high level of confidence for carriers, content providers and consumers. The i.MX31 security architecture is a blended hardware/software solution. The i.MX31 processors feature electronically blown fuses that enable design engineers to hardwire their devices' IDs, security codes and other data into the i.MX31 processors' E-Fuse Box. Other security features include:

- Memory Management Unit (MMU)
- Security Controller (SCC), including secure RAM and security monitor
- Random Number Generator Accelerator (RNGA)
- Secure JTAG controller (with optional JTAG disabling)
- Universal Unique Identification
- Run-Time Integrity Checker (RTIC), including SHA-1 accelerator
- High Assurance Boot (HAB)
- Tamper detection

For carriers, the security architecture helps to protect against malicious service attacks, theft of services, configuration protection and concerns with cloning. For content providers, it helps to block against illegal access to licensed content, thereby protecting against unauthorized use and distribution. And for consumers it helps to block access to private data, helping protect against identify theft.

USB On-The-Go

Freescale's i.MX31 and i.MX31L integrate one High-Speed USB On-The-Go port for connection to a PC or PC peripherals without PC involvement, plus one high-speed USB host and one full-speed USB host for interfacing with peripherals such as Wi-Fi®, Bluetooth® and cellular baseband.

Connectivity

i.MX31 and i.MX31L support connectivity to a wide range of external devices—cameras, displays, graphics accelerators, TV encoders and decoders and more. The display controller can support two smart displays, plus a TV encoder simultaneously.

Freescale Wireless Developer Network

Combining resources from Freescale and industry leaders, the Freescale Wireless Developer Network offers advanced pre-integrated platforms and solutions designed to work out-of-the-box, accelerating your business and giving you a competitive advantage. The Freescale Wireless Developer Network is a global program created to bring comprehensive platforms to market that include hardware and software solutions, tools, systems integration, consulting and other services. With early access to improved tools, Freescale Wireless Developer Network members are better equipped to deliver mobile and wireless solutions to a global audience in less time, with less effort and at a lower cost.

For more information about the Freescale Wireless Developer Network, visit **www.freescale.com/fwdn**.

The i.MX Family

Freescale's i.MX family of applications processors delivers power to the people who demand it: designers like you, and users who crave it for their mobile devices. Designers love the amazing performance i.MX processors achieve at low clock speeds, and the high degree of integration that shortens design times. Consumers love the lifelike video and 3-D graphics reproduction, quick response and long, long play times for hours of work or entertainment use.

Freescale gives you the power of choice to address all of your embedded designs, from the i.MXS for price sensitive applications, and i.MXL and i.MX21S for mid-range devices, to i.MX21, i.MX27, i.MX31 and i.MX31L for high-performance mobile multimedia devices.

The i.MX family supports a range of platforms such as those based on Microsoft Windows® CE and Mobile, Linux® OS, and a number of leading RTOSs.

Learn More: For current information about Freescale products and documentation, please visit **www.freescale.com/imx.**

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