Automotive Market

i.MX51 Applications Processors

Automotive portfolio: i.MX514 and i.MX516

Overview

The i.MX51 family represents Freescale Semiconductor's latest achievement in integrated applications processors. Optimized for low power consumption and high performance, this i.MX offering is part of a growing family of multimedia-focused products. The i.MX51 family of processors for the automotive market, the i.MX514 and i.MX516, features Freescale's advanced and power-efficient implementation of the ARM Cortex™-A8 core, operating at speeds up to 600 MHz with an advanced set of multimedia and connectivity peripherals. These processors are ideal for applications that require advanced user interfaces, sophisticated video processing, 2-D and 3-D graphics, multiple connectivity options and a high level of system integration.

Graphical Instrument Clusters, Infotainment, Telematics, Navigation, Advanced HMI

The i.MX51 family is targeted to drive automotive applications including graphical instrument clusters, infotainment, telematics, navigation and advanced human machine interfaces. With Freescale's advanced power management techniques and hardware accelerators, customers can optimize their power and performance tradeoffs and eliminate external cooling devices needed for typical high-performance applications. Further power reductions can be achieved in lower performance use cases by dynamically reducing the frequency of the processor, as well as through use of sleep modes offered on the i.MX51 family. Using Freescale's board support package (BSP) for Linux®, Android or Windows® CE OS' as a foundation for application development, customers or implementing industry-leading third-party solutions such as Microsoft® Auto, QNX®, or GENIVI customers have multiple paths to implement feature rich automotive application on the i.MX51 family.

Key Features

CPU Complex

- ARM Cortex-A8 CPU
- 32 KB instruction and data caches
- Unified 256 KB L2 cache
- NEON SIMD multimedia coprocessor
- Vector floating point unit
- Superscalar dual-issue core with 13-stage integer pipeline and 10-stage NEON pipeline
- Fully software backwards-compatible with previous ARM® CPUs

Multimedia

- OpenGL® ES 2.0 and OpenVG™ 1.1 Graphics Processing Units
- Multi-format HD720p video decoder and D1 video encoder hardware engine
- 24-bit primary display support up to WXGA resolution
- 18-bit secondary display support
- High-quality hardware video de-interlacing
- Image and video resize, inversion and rotation hardware
- Alpha blending and color space conversion
- Video/graphics combining: up to four planes plus hardware cursor
- Display quality enhancement: color correction, gamut mapping and gamma correction
- Two camera input ports

External Memory Interface

- DDR2 and mDDR DRAM, 16/32-bit, 200 MHz
- SLC/MLC NAND flash, 8/16-bit

Advanced Power Management

- Dynamic clock gating and frequency scaling
- Multiple independent power domains
- Proprietary state retention power gating

Connectivity

- High-Speed USB OTG with PHY
- Three additional High-Speed USB host controllers
- Wide array of serial interfaces, including SDIO, SPI, I²C and UART
- I²S and S/PDIF audio interfaces
- 10/100 Ethernet controller
- Parallel-ATA

Security

- Security controller, including secure RAM and security monitor
- High assurance boot, JTAG controller and real-time clock
- Cipher and random number generator accelerators
- Run-time integrity checker
- Universal unique identification
- Tamper detection

General

- 19 mm x 19 mm, 0.8 mm pitch MAPBGA package
- Up to 600 MHz CPU at -40ºC to +125ºC junction temperature with AEC-Q100 qualification

Benefits

- Very high-performance processing and multimedia capabilities
- High level of integration reduces overall system BOM
- Hardware acceleration enables very low power consumption for video and graphics and offloads the ARM CPU

Powerful Graphics Acceleration

The i.MX51's dual-GPU architecture supports automotive use cases by simultaneously accelerating 3-D navigation and graphical user

interface with separate GPUs. Alternatively the two GPUs can be combined to deliver high-performance graphics processing for re-configurable instrument clusters. The i.MX51 processor provides an integrated OpenGL|ES1.1 and OpenGL|ES2.0 compliant 3-D graphics processing unit that provides an incredible 27 Mtri/sec and effective 664 Mpix/sec (with overdraw). In addition, i.MX51 incorporates an OpenVG1.1 vector graphics processing unit to accelerate vector graphics applications such as user interfaces, Adobe® Flash® and OS-windowing system functions. The OpenVG GPU offers an additional 200Mpix/sec drawing capability with 16X hardware anti-aliasing.

Increased Security

Because the need for advanced security for mobile and hand-held devices continues to increase, the i.MX51 processor delivers hardware-enabled security features that support secure e-commerce, digital rights management (DRM), information encryption, secure boot and secure software downloads.

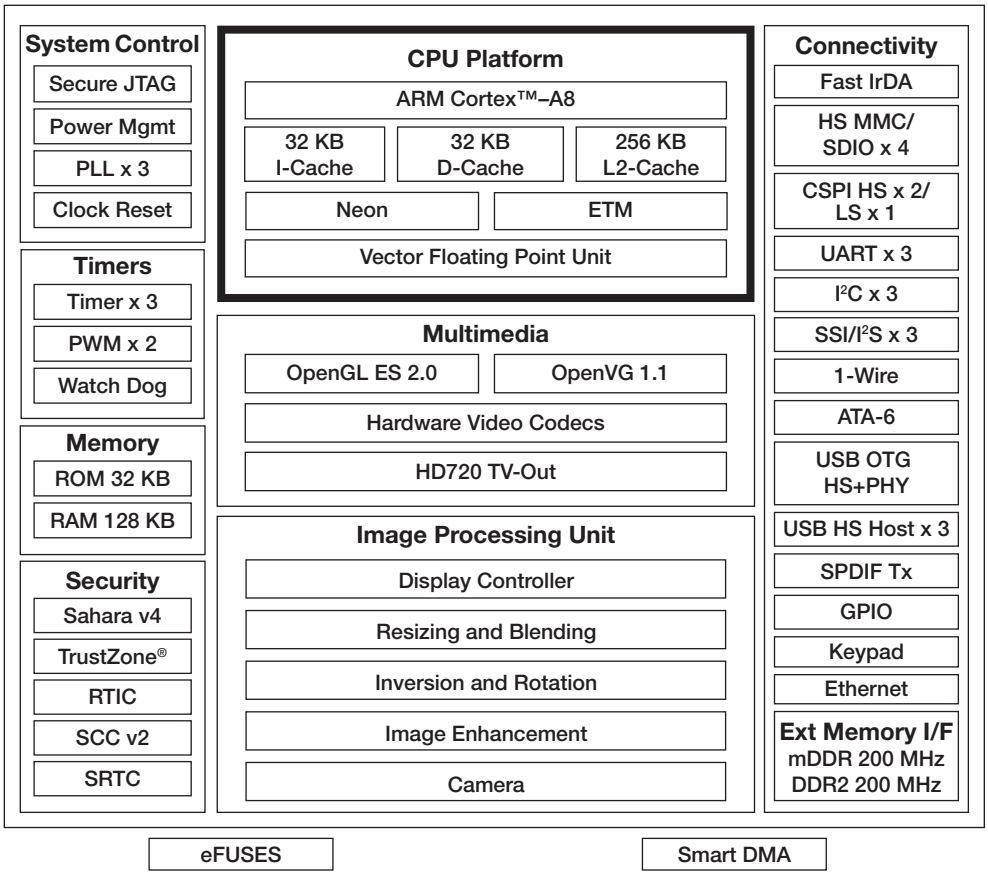
Interface Flexibility

The i.MX51 family supports connection to popular types of external memories such as mobile DDR and DDR2, SDRAM, NOR flash, PSRAM, cellular RAM, NAND flash (MLC and SLC) and OneNAND. Designers seeking to provide products that deliver a rich multimedia experience will find a full suite of on-chip peripherals: LCD controller and CMOS sensor interface, High-Speed USB on-the-go, three High-Speed USB hosts, multiple expansion card ports (high-speed MMC/SDIO host and others), fast Ethernet controller and a variety of additional interfaces (UART, I^2C, I^2S serial audio, SIM card and more).

i.MX51 Development Tools

Freescale delivers the cost-effective i.MX51 evaluation kit, allowing customers to develop, debug and demonstrate their next great product without compromising performance.

i.MX516 Applications Processor



As part of our new price, performance and personality series, the evaluation kit is designed to support all the features of the device in a single board to enable designers to complete a development platform at a low price point estimated at $700 (USD). The i.MX51 EVK has two optional add-on modules: an LCD module and an expansion board which includes a camera, TV-out, keypad and UART. For more information, visit **www.freescale.com/imx51evk**.

The i.MX Processor 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 automotive 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 low power consumption to help them reduce CO^2 emissions. Freescale gives you the power of choice to address all your embedded designs, for the automotive, consumer, industrial and general-purpose markets. 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 like QNX.

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

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