NXP

Consumer and Industrial/General Embedded Market

i.MX233 Applications Processor
32-bit Embedded Microprocessor – ARM®

Energy Efficient Solutions
by Freescale

Overview

The i.MX233 applications processor extends Freescale's ARM9 portfolio and introduces several unique features such as power management, analog audio, 12-bit ADC's and a touch screen controller that allows customers to eliminate external components, reducing their overall system bill of materials cost. The i.MX233 integrates industry-leading power management technology to manage the power sequencing required by the processor itself and supplies power to other components in the system, such as external memories, from a single Li-Ion battery. Additionally, analog audio features such as the stereo ADC/DAC and amplifiers, plus a mono speaker amplifier provide a complete solution in a single device for multimedia applications. Furthermore, many consumer applications require a rich graphical user interface which is supported with the LCD touch screen controller and basic hardware graphics acceleration with the pixel pipeline processor.

The i.MX233 is offered in two packages to provide more tailored options for the various target applications. The 169 BGA package provides access to all of the features of the i.MX233. The 128 LQFP package provides a subset of these features in order to fit into the smaller pin count package. This smaller package option is ideal for cost-sensitive entry level applications that use small displays, don't require touchscreen user interface and have manufacturing restrictions (number of board layers). The feature differences are shown in the block diagram and table.

Target applications

- Portable Media Players
- Portable Navigation Devices
- Home Appliances

- Graphical Remote Controls
- Home Automation
- eBooks
- Digital Picture Frames
- Audio peripherals and accessories
- VoIP Handsets
- Simple human machine interface (HMI) panels for industrial applications

Key Features

CPU

- ARM926EJ-S™ runs up to 454MHz
- 16KB I & D L1 Cache

Power Management

- Integrated DC-DC converter with multiple channel outputs
- Supports Li-Ion batteries
- Direct power from 5V source (USB, wall power or other source)
- Battery charging capability
- On-chip silicon speed and temp sensors

Connectivity

- High-Speed USB Host / Device with integrated PHY
- UART
- Serial peripheral interfaces (SPI)
- 12-bit Low-Resolution ADC (LRADC)
- 3.3V general purpose I/O

Multimedia and Graphics Processing

- Display controller optimized for up to 24-bit-per-pixel VGA (640 x 480) resolution
- Pixel processing pipeline (PXP) to handle post display frame pre-processing in hardware with minimal memory overhead
- TV Encoder and 10-bit Video DAC out

Memory

- Internal 32KB SRAM
- Support for external DDR1, mDDR
- Support for external NAND with hardware error correction (20-bit BCH or 8-bit Reed Solomon)
- Support for external managed NANDs via SDIO

Audio

- Stereo analog audio ADC/DAC
- Stereo headphone amplifier
- 1.5W mono speaker amplifier output
- S/PDIF digital output
- Serial Audio Interface (I2S)

Benefits

CPU Performance and Low Power
454MHz ARM9 CPU with ample headroom for many consumer and embedded applications without sacrificing battery life. For plugged in "always on" devices, the low power consumption of the i.MX233 can improve energy efficiency.

Simplified Development
The integration of mixed-signal analog such as power management, analog audio and A/D channels reduces system complexity and speeds time-to-market. In addition, an image processing unit supporting 24-bit VGA displays is integrated to provide rich user interfaces. With a wide range of connectivity options, such as UART, SDIO, USB and I2C, the i.MX233 processor provides the ability to connect wirelessly to other devices, through the use of off-chip Bluetooth™, Wi-Fi and other wireless protocols.

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Cost Efficient

The integration of mixed-signal analog such as power management, analog audio and A/D channels eliminates external components thereby reducing overall system bill of materials cost.
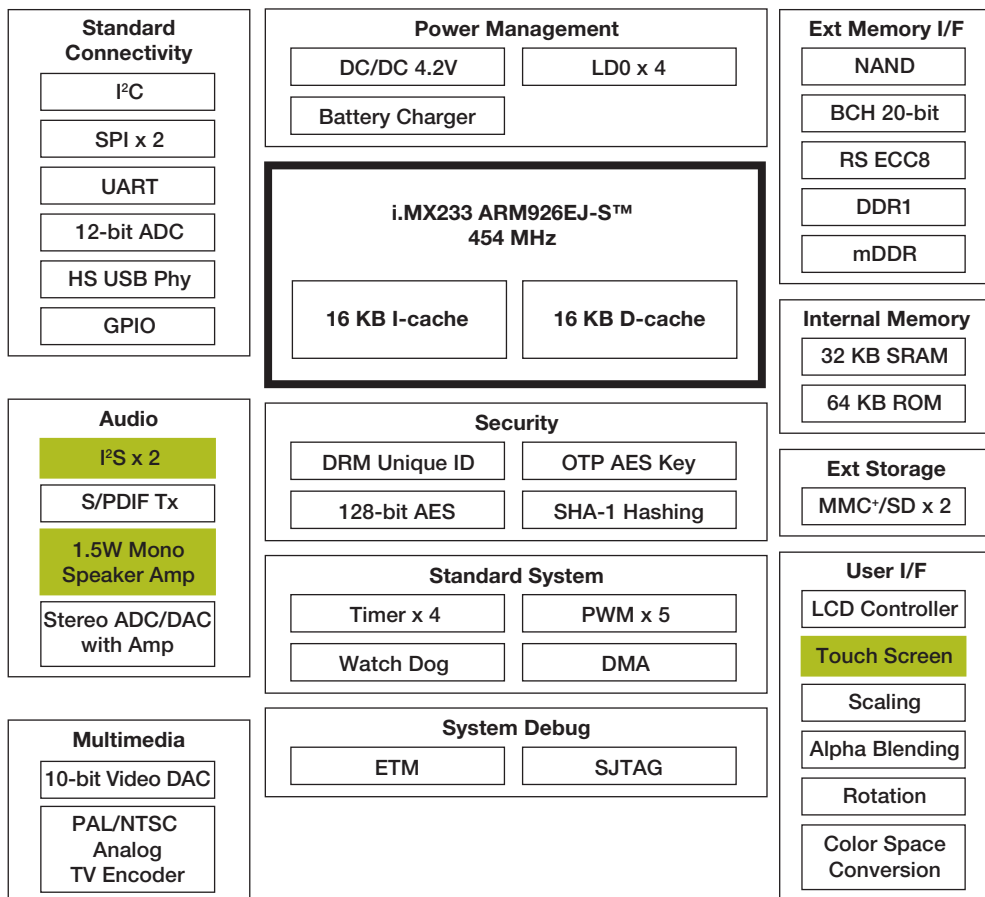
Optimized System-on-Chip

With an ARM9 core operating up to 454MHz, the i.MX233 processor is designed to maximize performance and extend battery life. An integrated power management system enables efficient MIPS per application while clock gating and multiple low power modes optimize low power performance.

The i.MX233 also includes boot from SLC, MLC and managed NANDs capability and supports up to 20-bit BCH or 8-bit Reed Solomon error correction to improve reliability.

Development Tools

Freescale delivers the i.MX23 evaluation kit that is price-effective with out compromising performance and allowing the customer to ultimately develop, debug and demonstrate the personality of their next great product. The evaluation kit includes support for Linux®, DDR1, NAND, SDIO and USB. An optional display module using a 4.3" WQVGA TFT LCD is also offered.

i.MX233 Applications Processor

Standard Connectivity
- I²C
- SPI x 2
- UART
- 12-bit ADC
- HS USB Phy
- GPIO

Power Management
- DC/DC 4.2V
- LDO x 4
- Battery Charger

i.MX233 ARM926EJ-S™ 454 MHz
- 16 KB I-cache
- 16 KB D-cache

Ext Memory I/F
- NAND
- BCH 20-bit
- RS ECC8
- DDR1
- mDDR

Internal Memory
- 32 KB SRAM
- 64 KB ROM

Audio
- I²S x 2
- S/PDIF Tx
- 1.5W Mono Speaker Amp
- Stereo ADC/DAC with Amp

Security
- DRM Unique ID
- OTP AES Key
- 128-bit AES
- SHA-1 Hashing

Ext Storage
- MMC⁺/SD x 2

Standard System
- Timer x 4
- PWM x 5
- Watch Dog
- DMA

User I/F
- LCD Controller
- Touch Screen
- Scaling
- Alpha Blending
- Rotation
- Color Space Conversion

Multimedia
- 10-bit Video DAC
- PAL/NTSC Analog TV Encoder

System Debug
- ETM
- SJTAG

■ Not available in QFP package

Package options

Part Number	Temp ranges	Package
MCIMX233DJM4B	-10C to +70C	169 MAPBGA , 0.8mm
MCIMX233CJM4B	-40C to +85C	169 MAPBGA , 0.8mm
MCIMX233DAG4B	-10C to +70C	128LQFP
MCIMX233CAG4B	-40C to +85C	128LQFP

Function	128 LQFP	169 BGA
External Memory Interface	1 chip enable , 64MB	2 chip enables, 128MB
General Purpose Media Interface (GPMI)	8-bit data NAND data width	16-bit data NAND data width
LCD Interface (LCDIF)	8-bit serial	8-bit serial, 24-bit parallel
Mono Speaker Amplifier	No	Yes
Serial Audio Interface (I²S)	0	2
A/D Channels	2	6
UARTs	1 Debug UART, 1 App UART	1 Debug UART, 2 App UARTs
Synchronous Serial Ports (SSP)	SSP1 – 4-bit data	SSP1 – 8-bit data
Rotary Encoder	Muxed with PWM, Debug UART	Dedicated
Real Time Clock (RTC)	24MHz	32kHz and 24MHz
PWM Channels	3	5

Learn More: For current information about Freescale products and documentation, please visit **www.freescale.com/imx233**

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