

Medical Devices

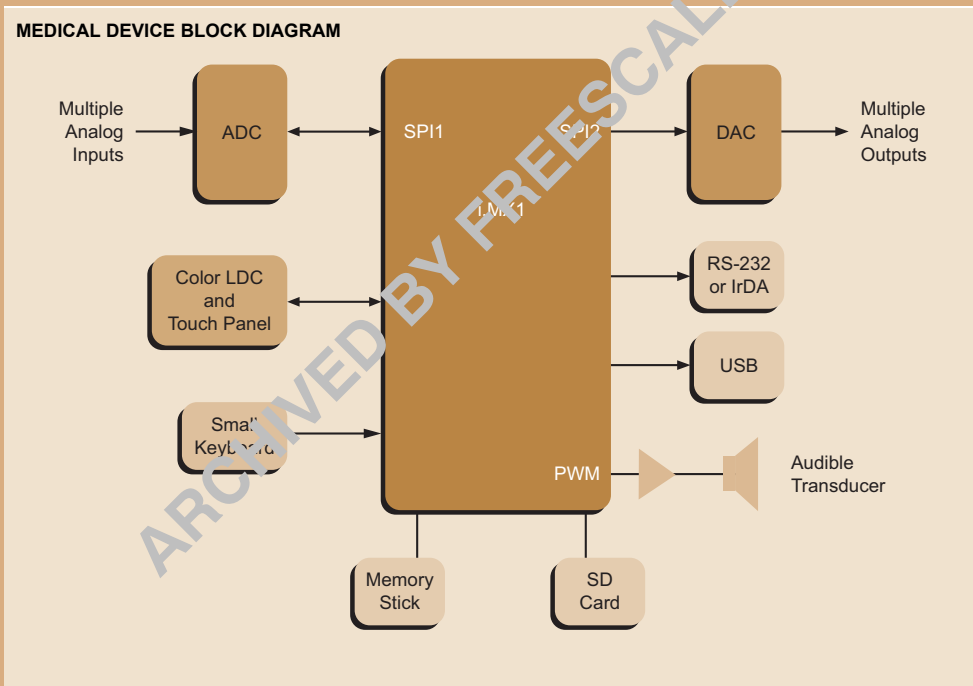
Overview

The medical devices market continues to move toward products with color displays, touch screen user interfaces, wired links to systems, and analog data acquisition. Also, wireless short-range connectivity is coming on-line. New portable products are continually striving for longer battery life, improved ergonomic form factors, and lighter weight.

Freescal Semiconductor's i.MX family of highly integrated applications processors based on ARM® core technology addresses the product requirements for these markets. The i.MXS, i.MXL, i.MX1, and i.MX21 processors provide high performance, low power consumption, and on-chip integration such as LCD controller and USB, making them appropriate for a wide variety of applications.

Key Benefits

- > ARM® core technology increases available software
- > High level system-on-chip integration
- > Power management optimizes battery life
- > Broad base of OS support
- > Family of products: speed, performance, and temperature options
- > I²C and SPI allow direct interface to external ADCs and DACs
- > Partitioned chip allows simultaneous multi-voltage operation: 1.7 to 3.3 V



Design Challenges

Medical devices possess a unique set of design requirements. They may need to meet tight size constraints and weight limits. Portability may be necessary and long, long battery life may be mandatory. Products' cases or housings may need to be airtight for use around oxygen sources. LCD screens with touch control often are necessary. In many cases, various audible tones and alarms are an integral part of the human interface. Additionally, customers want software familiarity among products, which forces designers to look to Linux, PalmOS, and WinCE for solutions.

Freescale Semiconductor Solution

The i.MX family of applications processors has the performance and features to suit a range of medical products. The power dissipation is low enough to allow sealed cases for end products, which helps cope with harsh or flammable environments. On-chip power management allows extended run times between battery charging. Also, weight is reduced because small batteries can be used. The designer can select from three temperature grades of i.MX devices, with the top-of-the-line being -40 to 85°C.

i.MX applications processors have general-purpose outputs with ability to directly drive optical isolators for operation in noisy electrical environments. On-chip LCD controllers help with implementing the human interface along with pulse width modulation (PWM) for audible tones and alarms, even from audio files. A touch screen interface is provided in the line

up. Serial interfaces, such as I²C and SPI, facilitate connection to analog-to-digital and digital-to-analog converters. Infrared communication is accommodated along with several types of wired communication.

The i.MX family offers support for all the major open operating systems, including Linux, PalmOS, Microsoft Windows CE.NET, Microsoft PocketPC, and Symbian.

i.MXS

The lowest-cost member of the family is the i.MXS which has an ARM920T core that can operate up to 100 MHz. This 0.18 μm chip's internal bus can run up to 96 MHz. There is an on-chip LCD controller and USB (client). Both an I²C and SPI are provided for interfacing to external analog devices. The i.MXS is applicable to products that do not require a camera interface, compact flash, or Memory Stick®.

i.MXL

The i.MXL applications processor is based on the ARM920T core available in two speed grades, 150 and 200 MHz. This 0.18 μm chip's internal bus can run up to 96 MHz and there is an on-chip LCD controller. In addition to the i.MXS features, the i.MXL accommodates a camera interface and a Memory Stick. In addition, there are two SPI ports and a secure digital controller.

i.MX1

The i.MX1 applications processor is based on the ARM920T core available in two speed grades, 150 and 200 MHz. This 0.18 μm chip's internal bus can run up to 96 MHz and there is an on-chip LCD controller. In addition to the i.MXL features, the i.MX1 processor allows direct interface to a touch screen and has 128 KB on-chip RAM. A smartcard interface module is included.

i.MX21

The i.MX21 multimedia applications processor is based on the ARM926EJ-S™ core operating up to 266 MHz. This 0.13 μm chip's internal bus can run up to 133 MHz. There is an on-chip standard LCD controller. i.MX21 comes with a smart LCD interface, too. Other features include a Smart Speed switch to reduce processor overhead, USB On-The-Go, and accommodation of PCMCIA® and compact flash. A 1-Wire® interface is added along with three SPI circuit blocks for interfacing to external analog devices.

Freescale Ordering Information^{NOTE}

Part Number	Product Highlights	Additional Information
MC9328MX21VG	ARM9™-based, starting at 266 MHz, 289 MAPBGA	www.freescale.com
MC9328MX21VH	ARM9™-based, starting at 266 MHz, 289 MAPBGA	
MC9328MX21VK	ARM9™-based, starting at 266 MHz, 289 MAPBGA	
MC9328MX21VM	ARM9™-based, starting at 266 MHz, 289 MAPBGA	
MC9328MX1VH20	ARM9-based, 200 MHz, 256 MAPBGA	
MC9328MXLVH20	ARM9-based, 200 MHz, 256 MAPBGA	
MC9328MXLVF20	ARM9-based, 200 MHz, 225 MAPBGA	

Note: Search on listed part number.

Development Tools^{NOTE}

Associated Device	Tool	Vendor	Additional Information
i.MXS	M9328MXLADS/B*	Freescale Semiconductor	www.freescale.com/imx
i.MXL	M9328MXLADS/B	Freescale Semiconductor	
i.MX1	M9328MX1ADS/B	Freescale Semiconductor	
i.MX21	M9328MX21ADS	Freescale Semiconductor	

Note: Search on associated device.

*The i.MXL ADS is used to develop applications for the i.MXS processor. See applications notes AN2908 for guidelines at http://www.freescale.com/files/32bit/doc/app_note/AN2908.pdf.

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