Introducing the Industrial i.MX25 ARM9™ Applications Processor
Ethernet, CAN, USB

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i.MX Product Marketing
Introduction

► Purpose
  • Overview of the Freescale i.MX25 family of ARM® 9-based applications processors for industrial and general embedded devices

► Objectives
  • Learn the target applications
  • Understand the features and benefits of the i.MX25 processors
  • Describe the available hardware and software tools

► Learning Time
  • 15 minutes
i.MX25 ARM9 Overview
Target Applications
The i.MX25 family of devices extends Freescale’s proven ARM9 platform and provides the essential performance, low-power, integration and connectivity to create feature-rich, cost-competitive industrial and general embedded products.

### Performance

- Based on Freescale’s proven ARM926EJ-S technology, with embedded SRAM to boost system performance.

### Connectivity

- Connectivity designed to address the needs of industrial and general embedded devices.

### Cost Sensitivity

- Smart integration reduces system Bill of Materials.
- Hardware boards and BSP’s reduce development costs.

<table>
<thead>
<tr>
<th>Performance</th>
<th>Connectivity</th>
<th>Cost Sensitivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARM926EJ-S core up to 400MHz.</td>
<td>Ethernet and CAN support for high bandwidth data transfers.</td>
<td>Support for low-cost DDR2, as well as mDDR and SDRAM for design flexibility.</td>
</tr>
<tr>
<td>Large integrated SRAM (128KBytes) to improve performance of critical customer code, and/or provide low-power display refresh while the system is in standby.</td>
<td>USB, UART, SDIO for interfacing to external Wi-Fi and Bluetooth chipsets. USB, SD for external data storage.</td>
<td>Integrated Ethernet 10/100 MAC, USB PHY’s, touchscreen controller and A/D converters reduces system cost.</td>
</tr>
<tr>
<td>Improved security sub-system to enable a trusted device that is resistant to external threats and attacks.</td>
<td>Smartcard interface for e-commerce.</td>
<td>High quality development board provided by Freescale; layout and design files available for customer reference to reduce development effort.</td>
</tr>
<tr>
<td>Numerous low power modes to minimize power consumption.</td>
<td>Multiple boot options, including USB, SD, SLC/MLC NAND or NOR flash.</td>
<td>Royalty-free Linux and WinCE BSP’s available from Freescale.</td>
</tr>
</tbody>
</table>
### i.MX25 – Target Applications

#### Industrial
- HMI (Factory Automation & Building Control)
- Medical (Patient Monitoring)
- Residential Gateways (Smart Meters)

#### Point Of Sale
- Secure ePOS Terminals
- Data Acquisition (Scanners)
- Mobile and Tethered Printers

<table>
<thead>
<tr>
<th>Feature</th>
<th>Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Integration and Connectivity – Ethernet, CAN, SDIO, Touchscreen Controller, DDR2, USB PHY, Camera I/F</td>
<td>Reduced system cost and complexity, greater product feature scalability</td>
</tr>
<tr>
<td>LCD Controller</td>
<td>Can drive high color SVGA displays for information display and user interaction</td>
</tr>
<tr>
<td>Security</td>
<td>Robust, tamper-resistant devices for secure applications</td>
</tr>
<tr>
<td>Industrial qualification and product longevity</td>
<td>Supports the full life of the product in the field</td>
</tr>
<tr>
<td>WinCE and Linux BSP’s</td>
<td>Reuse software across i.MX platforms</td>
</tr>
<tr>
<td>Optimized performance and power consumption</td>
<td>Fanless automation, increased battery life for portable equipment</td>
</tr>
</tbody>
</table>
# i.MX25 – Comparison Chart

<table>
<thead>
<tr>
<th>Feature</th>
<th>i.MX253</th>
<th>i.MX257</th>
<th>i.MX258</th>
</tr>
</thead>
<tbody>
<tr>
<td>Core</td>
<td>ARM926EJ-S™</td>
<td>ARM926EJ-S™</td>
<td>ARM926EJ-S™</td>
</tr>
<tr>
<td>CPU Speed</td>
<td>400 MHz</td>
<td>400 MHz</td>
<td>400 MHz</td>
</tr>
<tr>
<td>L1 I/D Cache</td>
<td>16K I/D</td>
<td>16K I/D</td>
<td>16K I/D</td>
</tr>
<tr>
<td>On-chip SRAM</td>
<td>128 KB</td>
<td>128 KB</td>
<td>128 KB</td>
</tr>
<tr>
<td>PATA/CE-ATA</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>LCD Controller</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Touchscreen</td>
<td>-</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>CSI</td>
<td>-</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>CAN</td>
<td>-</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>ESAI</td>
<td>-</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Smartcard</td>
<td>-</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Security</td>
<td>-</td>
<td>-</td>
<td>Y</td>
</tr>
<tr>
<td>10/100 Ethernet</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>HS USB 2.0 OTG + PHY</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>HS USB 2.0 Host + PHY</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>12-bit ADC</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>SD/SDIO/MMC</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>I2C, SSI/I2S, SPI, UART</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Package</td>
<td>17x17 MAPBGA 0.8mm</td>
<td>17x17 MAPBGA 0.8mm</td>
<td>17x17 MAPBGA 0.8mm</td>
</tr>
<tr>
<td>Temperature</td>
<td>-20°C to +70°C -40°C to +85°C</td>
<td>-20°C to +70°C -40°C to +85°C</td>
<td>-40°C to +85°C</td>
</tr>
</tbody>
</table>

- HMI
- Portable/Tethered Printers
- Medical
- Factory Automation

- “Smart Touch” HMI
- Factory Automation (CAN)
- Barcode Scanners

- Smart Meters
- Point-of-sale
- Biometrics
- Secure Devices
i.MX25 ARM9 Overview
Features and Benefits
Key Features and Advantages

- 400MHz ARM926EJ-S™
- 16KB L1 I-Cache, 16KB L1 D-Cache
- 128KB on-chip SRAM for low power LCD refresh
- External memory interface supports DDR2, mDDR, or SDRAM up to 133MHz
- Supports off-chip NAND or NOR Flash
- 10/100 Ethernet MAC with RMII support
- USB 2.0 OTG 480Mbps with high-speed PHY
- USB 2.0 Host 480Mbps with full-speed PHY or ULPI
- SVGA (800x600) LCD controller with integrated touch screen controller
- CMOS sensor interface
- Two CAN interfaces
- Two Smartcard interfaces
- Enhanced serial audio interface
- 3 general purpose 12-bit ADC channels
- UART’s, CSPI’s, I2C, I2S
- 3.3V I/O reduces external component count
- Enhanced security features, including tamper detection for voltage, frequency and temperature
- High-Assurance Boot (HAB)

Available Parts

- i.MX251, i.MX255, i.MX253, i.MX257, i.MX258

Package and Temperature

- 0.8mm, 17x17, 400-pin MAPBGA
- -40C to +85C, -20C to +70C
i.MX25 – Multimedia

► Supports TFT LCD’s
  • Up to SVGA (800x600) resolution
  • Up to 18-bit (RGB666) color support
  • 128 x 32-bit buffer for pixel data
  • Embedded DMA controller

► Dual plane blending
  • Based on alpha key or color

► Integrated touchscreen controller
  • 4- and 5-wire resistive touch screens

► Integrated camera interface
  • CCIR656, VSync/HSync CMOS sensors
  • 128 x 32-bit buffer for image pixel data
  • Embedded DMA controller
  • Double-buffering in external memory
10/100 Ethernet
- Integrated Ethernet MAC for system development or inter-system data transfer
- 3 physical interfaces: 10/100 IEEE 802.3 MII, 10/100 RMII, 10-Mbps 7-wire serial

2 x 480Mbps USB 2.0 controllers
- External media connectivity w/o hub
- HOST with integrated full speed PHY
- On-The-Go (OTG) with high speed PHY
- Hardware support for low-power modes

2 x FlexCan 2.0B controllers
- Programmable bit rate up to 1 Mbps
- Dual ports allows for a local CAN bus and connectivity to an external bus
i.MX25 – On-Chip and Off-Chip Memory

► Off-Chip Memory Interface
  • Supports 4-bank DDR2, mDDR, SDRAM
  • 133MHz, 16-bit wide data bus
  • NOR flash interface
  • External interface to FPGA’s, graphics cards

► Off-Chip NAND Flash
  • Supports 8-/16-bit SLC/MLC NAND Flash
  • Page sizes: 512byte, 2KB, 4KB
  • 4KB + 512byte internal RAM buffer
  • Bootable from NAND Flash

► On-Chip 128KB SRAM
  • Ideal for low-power LCD refresh
  • Improve algorithmic performance
i.MX25 – Other Connectivity

- 2 x Subscriber Identification Module (SIM)
- 2 x SDIO – Wireless 802.11 connectivity
- 5 x UARTs – Bluetooth connectivity
- 3 x CSPI – Serial Peripheral Interface bus
- 3 x I2C – System control for peripherals

Digital Audio Connectivity
- Enhanced Serial Audio Interface (ESAI)
- 2 x SSI/I2S – industry standard connectivity to external CODECs
i.MX25 – External Mass Storage

► Parallel ATA
  • Standard interface for external mass storage
  • E.g. In-dash playback or map storage

► 2 x SDIO/SD/MMC
  • Ideal for external flash drives
  • Designed to work with CE-ATA V1.0, SD Memory V2.0 (supports high capacity), SDIO Card V2.0, MMC V4.2
  • Up to 52 MHz, 8-bit data

► 2 x 480Mbps USB 2.0 controllers
  • External media connectivity w/o hub
  • HOST with integrated full speed PHY
  • On-The-Go (OTG) with high speed PHY
  • Hardware support for low-power modes
High Assurance Boot
- Protection against rogue software; only authenticated software can run on device
- Needed for secure residential gateways, biometric devices, point-of-sale

Tamper detection, key storage
- Voltage, frequency, temperature monitors
- Fast key erasure upon threat detection
- Secure 47-bit time counter
- Secure 32-bit monotonic counter
- Volatile key storage

True Random Number Generator

User Programmable e-Fuses
i.MX25 ARM9 Overview
Development Tools
Freescale i.MX25 Product Development Kit (PDK)

**CPU Module**
- i.MX25 ARM926EJ-S™ Processor
- Freescale MC34704B PMIC
- Freescale SGTL5000 Audio Codec
- 512Mb DDR2
- 2GB NAND Flash

**Personality Module**
- 5.7” VGA LCD with Touchscreen
- USB 2.0 OTG, USB 2.0 Host, 10/100 Ethernet
- SD/MMC Connector
- Smartcard and CAN Connectors
- CMOS Image Sensor

**Software**
- Windows Embedded 6.0 r2 BSP
- Linux 2.6.26 BSP
- ATK Flash Utility

**Debug Module**
- Debug Ethernet, Serial, JTAG
- Reset, Interrupt, Boot Switches
- Debug Display/LED’s
- Current/Power Monitoring

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CPU Module contains:

- i.MX25 ARM9 Applications Processor
- MC34704 Power Management IC
- SGTL3000 Audio Codec
Thank you for attending this presentation. We’ll now take a few moments for the audience’s questions and then we’ll begin the question and answer session.