Single Chip System Modules – A Disruptive New Set of Products Offered by Freescale

JUNE 2015
Agenda

- Enabling the customer
- Introduction to a new family of products. ‘Single Chip System Module’ (SCM)
  - First product: SCM-i.MX6D
- Hardware design and value proposition
- Software enablement
- Roadmap and target markets
- Eco-System
- Session review, Beta program and wrap-up
Enabling the Customer
What Customers Desire

• **Yesterday**
  - Die features and functionality
  - Power/Performance
  - Die level security
  - Cost

• **Today**
  - Time to Market
  - Time to Revenue
  - Higher levels of component integration
  - Smaller form factor
  - Energy efficiency and performance
  - Software/firmware enabled
  - System level cost
  - Security
  - Efficient hardware design
Introducing a Higher Level of Product Support

Combining IC’s, discrete components, software and security to form Single Chip Modules.
Introducing our 1\textsuperscript{st} SCM product.

SCM-i.MX6D
i.MX 6 Series At a Glance
Scalable series of six ARM Cortex A9-based SoC families

**i.MX 6Solo**
- ARM Cortex-A9 up to 1GHz
- ARM Cortex-M4 at 200MHz
- 256KB L2 cache
- 32-bit DDR3 and LPDDR2 at 400MHz
- eMMC
- 2D graphics
- Display: RGB, E-Ink
- Camera: RGB
- 10/100 Ethernet

**i.MX 6SoloX**
- ARM® Cortex™-A9 at 1GHz
- 256KB L2 cache
- 32-bit DDR3 and LPDDR2 at 400MHz
- eMMC
- 2D graphics
- Display: RGB, E-Ink
- Camera: RGB
- 10/100 Ethernet

**i.MX 6Dual**
- Dual ARM Cortex-A9 up to 1GHz
- 512KB L2 cache
- 32-bit DDR3 and LPDDR2 at 400MHz
- eMMC, NOR, NAND
- 2D graphics
- 3D graphics with 1 shader
- Display: RGB, LVDS, E-Ink, MIPI, HDMI
- 1080p30 video
- Camera: Parallel, MIPI
- Gigabit Ethernet
- PCIe (x1 lane)

**i.MX 6DualLite**
- Dual ARM Cortex-A9 up to 1.2GHz
- 1MB L2 cache
- 64-bit DDR3 and dual-channel 32-bit LPDDR2 at 533MHz
- eMMC, NOR, NAND
- 2D graphics
- 3D graphics with 4 shaders
- Two 2D GFX engines
- 1080p60 video
- Display: RGB, LVDS, MIPI, HDMI
- Camera: Parallel, MIPI
- PCIe (x1 lane)
- Gigabit Ethernet
- SATA-II

**i.MX 6Quad**
- Quad ARM Cortex-A9
- 1MB L2 cache
- 64-bit DDR3 and 2-channel 32-bit LPDDR2 at 533MHz
- eMMC, NOR, NAND
- 3D graphics with 4 shaders
- Two 2D GFX engines
- 1080p60 video
- Display: RGB, LVDS, MIPI, HDMI
- Camera: Parallel, MIPI
- PCIe (x1 lane)
- Gigabit Ethernet
- SATA-II

*Pin-to-pin and Power Compatible*

*Software Compatible*
- ARM Cortex-A9 based solutions ranging up to 1.2GHz
- HD 1080p encode and decode (except 6SoloLite/6SoloX), 3D video playback in high definition (except 6SoloLite/6SoloX)
- Integrated IO’s may include HDMI v1.4, MIPI and LVDS, display ports, MIPI camera, Gigabit Ethernet, multiple USB 2.0, SATA and PCI-Express
- SW support: Google Android™, Linux®, QNX (3rd party), Windows® Embedded CE (3rd party)
Systems Solution: SCM-i.MX 6D

- 14mm x 17mm x 1.7mm
- i.MX6Dual
- PF0100 PMIC
- 16MB SPI NOR
- Enabled for 1GB or 2GB LPDDR2
- 109 discrete components
- 500 BGA balls P0.65mm

Order PN: PSCMMX6DZDK08AB
Systems Solution: SCM-i.MX 6D
Introducing The World’s Smallest Single Chip Module

Hardware Solution
Key Features
• i.MX 6Dual Apps Processor
• PF0100 (PMIC)
• 16 MByte SPI NOR Flash
• 109 discrete Components
• Enabled for 1GByte or 2GByte LPDDR2

Software Solution
Key Features
• Proven Board Support Package (BSP)
• Android Enabled
• Linux Enabled

Freescale Support
Key Features
• Development Board
• Freescale Software Services
• Ecosystem
• Arrow Electronics for supply chain
• Eco-System for PoP assembly
• SW & HW partners for design services
# World’s Smallest Single Chip Module

<table>
<thead>
<tr>
<th>Features</th>
<th>Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCM comes with majority of the components integrated inside the module</td>
<td>Get to market ~25% faster than the average development time and <strong>reduce</strong> design time</td>
</tr>
<tr>
<td>SCM in an unprecedented ultra-small form factor (17x14x1.7 mm)</td>
<td>Gives <strong>&gt;50% reduction</strong> over current discrete solutions</td>
</tr>
<tr>
<td>Embedded software and firmware is available and fully optimized for the SCM</td>
<td><strong>Provides</strong> a reduction in validation effort</td>
</tr>
<tr>
<td>SCM is LPDDR2 memory enabled and power management integrated</td>
<td><strong>Reduces</strong> design complexity of integrating and certifying DDR memory and power management into customer design</td>
</tr>
<tr>
<td>Freescale, with its partners, and ecosystem, provide embedded component sourcing, SW/HW customization and support</td>
<td><strong>Reduces</strong> customer’s supply chain complexity and <strong>Improves</strong> time to market</td>
</tr>
</tbody>
</table>
Hardware Design and Value Proposition
i.MX6D Dual Core Apps. Processor

Discrete Capacitors, Resistors

SPI NOR

PF0100 PMIC

Enables for 1GB or 2GB PoP LPDDR2 memory

- i.MX6D running at 800MHz, LPDDR2 at 400MHz
- Consumer (-20°C to 85°C)
- Industrial (-40°C to 105°C) planned end of 2015
Value Proposition

i.MX6D
- Proven solution with high performance ARM® Cortex™-A9
- Multimedia and graphic capabilities
- VPU/GPU with MIPI CSI/DSI interfaces
- Security features such as AES, Trustzone and Digital Rights Management (DRM)

PF0100 PMIC
- Proven solution, designed for i.MX6
- 6 Switchers and 6 LDOs
- Power supply for external peripheral ICs, DDR, storage and i.MX 6D
- BSP parameters for voltage setting

SPI NOR
- Can be used as a boot device
- On module security
- Customer variables

LPDDR2
- No PCB footprint
- Lower current
- Industry standard
- BSP parameters for validated memory

SPI NOR
- Can be used as a boot device
- On module security
- Customer variables

LPDDR2
- No PCB footprint
- Lower current
- Industry standard
- BSP parameters for validated memory
System Design Challenges and Solutions

- Placed high speed signals to outside package pins
- Proven design

- Removes complex layout issues
- Provides known good Power Delivery Network (PDNs)
- Power optimization takes more than 30% of the development time
- Poor power networks causes a re-spin of the PCB

- Inventory management by Freescale
- Storage of system parameters
- System restore backup parameters
- Part obsolescence - NOR memory devices change quickly

- Removes PCB layout issues
- Compliance testing
- PCB size reduction
- Power decoupling
- #1 challenge for i.MX6 – Integration of DDR
- Requires high skill set and specific knowledge and time consuming
PCB Space Reduction Achieved by SCM-i.MX 6D

- PMIC
- DDR
- i.MX6DQ
- MCIMX6Q-SDB
- SPI NOR

- SCM-i.MX6D
- SCMMX6D-SDB Demo
Number of Passive Elements Needed

i.MX6Q SABRE-SD

- Reduces BOM
- Makes power system more robust
- Added power decoupling to known noise susceptible supply lines
- Board routing
- Added unique voltage reference resistors

>45 capacitors for core power rails

SCM-MX6D EVK

Only 6 bulk caps with SCM-MX6D
Software Enablement
• Fully validated Linux and Android BSP releases will be supported on the SCM platform. This support will be aligned with official i.MX releases.

• Standard configurations can be structured using external NVMs such as eMMC, NAND, SD, SATA, etc.

• SCM BSP
  • LPDDR2 configuration (uBoot & Kernel)
  • PFUZE voltage rails to meet SCM requirements (uBoot & Kernel)
  • SPI-NOR driver support added (uBoot & kernel)
## Software BSP Release Plan

<table>
<thead>
<tr>
<th>OS</th>
<th>Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>Linux</td>
<td>3.10.53_GA</td>
</tr>
<tr>
<td></td>
<td>3.14.28_GA</td>
</tr>
<tr>
<td></td>
<td>3.14 R2.0</td>
</tr>
<tr>
<td>Android</td>
<td>KK4.4.2</td>
</tr>
<tr>
<td></td>
<td>L5.0.0_1.0.0</td>
</tr>
<tr>
<td></td>
<td>L5.0.0_3.0.0</td>
</tr>
</tbody>
</table>
Roadmap and Target Markets
Roadmap and Target Markets
Target Markets

IoT/ Graphic Hub
- Higher power
- High graphic applications
- Power management
- Linux/ Android

Portable
- Linux Support
- Apps
- Processor and Memory
- Connectivity – WiFi and BLE/ 802.15.4

Wearable
- Low power
- Ultra-small form factor
- Lower cost Sensors
- Connectivity (BLE)

Autonomous Sensing
- Low power
- Low standby Connectivity
- Small integrated systems

Auto
- Integrated systems
- In-dash
Next SCM Products

Includes Baluns, Crystals, Switches R, L, C, Shielding

2015

2016

2017

i.MX6SX + 512MB LPDDR2 + WiFi b.g.n or BLE + Z15.4

i.MX6SX + 512MB LPDDR2 + WiFi b.g.n and BLE + Z15.4
Eco-System and Summary
Tools and Support Model

**SCM Product**
- SCM Design
- Supply Chain
- SCM Assembly
- SCM Test
- SCM Quality
- Software Enablement

**SCM Sales and Application Support**
- Freescale and Distributor Partner
  - Sales
  - Field Application Engineering Support
  - Evaluation Boards
  - Product Collateral
  - Community Support

**Post Sale Enablement**
- Ecosystem
  - PoP Assembly Support
  - Software/ Firmware/ Application Enhancement Support
  - Hardware Support (Customer Board, Enhancements, Implementation)
  - Community Support
Summary

• New family of products focused on ‘fast time-to-market’ for the customers AND the smallest form factor.

• **Customer Beta program sign up.**

• Targeting consumer and industrial customers initially and eventually automotive.

• 800MHz, Consumer (-20°C to 85°C)
  – Industrial (-40°C to 105°C) planned

• Strong Eco-System Partner support for the customer.

• Product support (documentation, Community FAE support, eco-system support, etc)
Customer Beta program

Beta Program

- Customer may sign up for the beta program to have an opportunity to get early access and direct support for the SCM using the link below.

- https://www.surveymonkey.com/s/HVPHZ5B

Scan the QR Code to sign up for more information or the beta program.