FTF FREESCALE TECHNOLOGY FORUM 2015

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

FTF-INS-F1308

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freescale™

External Use

Session Introduction

- This session will introduce the audience to a new family of Freescale products called **‘Single Chip System Modules’ (SCM).**

  - Introduce customers to the worlds smallest single chip module.

  - Show how these class of products offer a differentiating value proposition for the customer.

Session Objectives

- After completing this session you will be able to:
  - Describe areas where these new single chip system modules differentiates themselves.
  - Customers will be able to assess how these new family of products could add significant value to their future products and business model.
  - Be able to secure products and support.

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 and wrap-up

Enabling the Customer

What Customers Desire

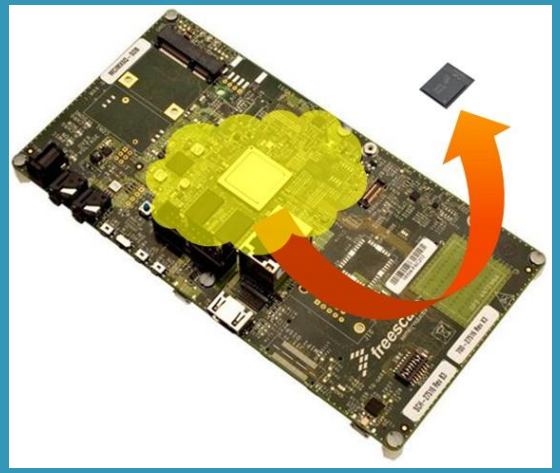
- Today
  - Die features and functionality
  - Power/ Performance
  - Die level security
  - Cost

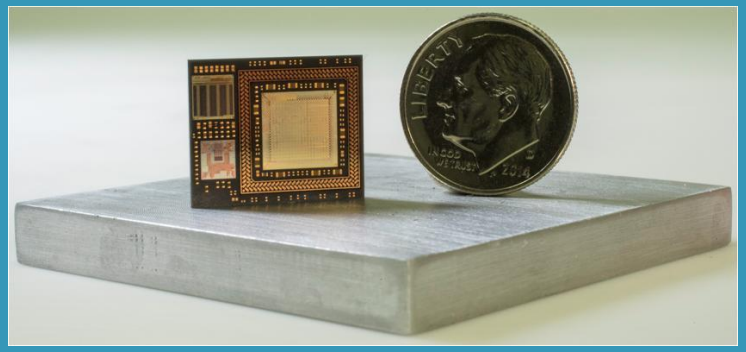
- Tomorrow
  - Time to Market
  - Time to Revenue
  - Higher levels of component integration
  - Smaller form factor
  - Energy efficiency and performance
  - Software/firmware enabled
  - System level cost
  - Security
  - Efficient hardware design

Customer Enablement

- Speed up system design
- Speed up hardware design and development
- Optimized electrical performance
- Component sourcing and management
- Software debug and support
- Module assembly and system level test
- Support from established Eco-system companies
- Quality

Introducing a Higher Level of Product Support





Combining IC's and discrete components to form Single Chip Modules.

Component Management

Assembly, Test and Quality

Eco-Partner Support

SCM-i.MX6D

i.MX 6 Series At a Glance

Scalable series of six ARM Cortex A9-based SoC families

Red indicates change from column to the left

i.MX 6SoloLite

- 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 6SoloX

- ARM Cortex-A9 up to 1GHz
- **ARM Cortex-M4 at 200MHz**
- 256KB L2 cache
- 32-bit DDR3 and LPDDR2 at 400MHz
- eMMC, **QSPI, NOR, NAND**
- 2D and **3D** graphics
- Display: RGB**, LVDS**
- Camera: RGB**, Analog**
- **Dual Gigabit Ethernet**
- **PCIe (x1 lane)**

i.MX 6Solo

- 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 1GHz
- 512KB L2 cache
- **64-bit** DDR3 and dual-channel 32-bit LPDDR2 at 400MHz
- eMMC, NOR, NAND
- 2D graphics
- 3D graphics with 1 shader
- 1080p30 video
- Display: RGB, LVDS E-Ink, MIPI, HDMI
- Camera: Parallel, MIPI
- Gigabit Ethernet
- PCIe (x1 lane)

i.MX 6Dual

- Dual ARM Cortex-A9 up to **1.2GHz**
- **1 MB** 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**

i.MX 6Quad

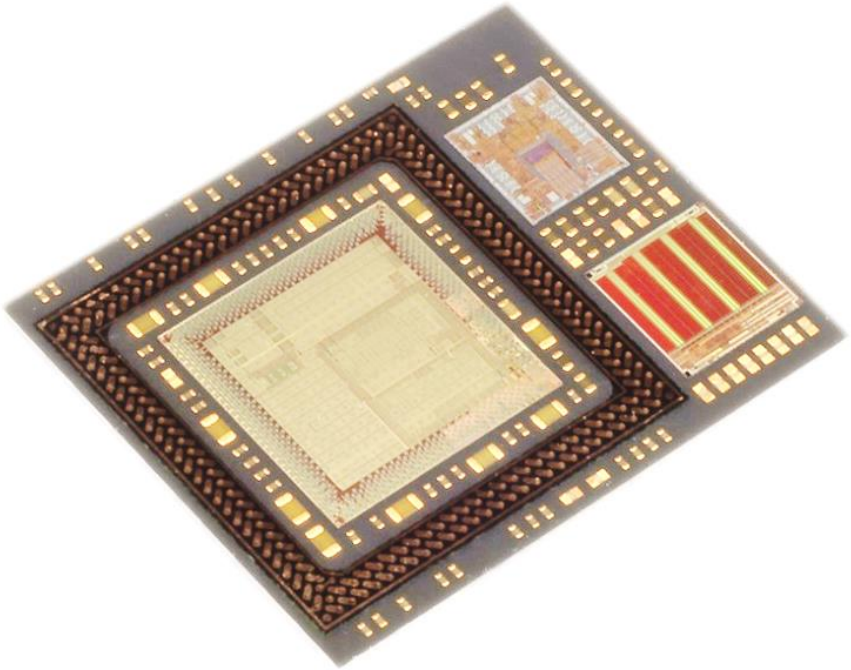
- **Quad** ARM Cortex-A9 up to 1.2GHz
- 1 MB L2 cache
- 64-bit DDR3 and 2-channel 32-bit LPDDR2 at 533MHz
- eMMC, NOR, NAND
- 3D graphics with 4 shaders
- Two 2D GFX engines
- 1080p60 video
- Display: RGB, LVDS, MIPI, HDMI
- Camera: Parallel, MIPI
- PCIe (x1 lane)
- Gigabit Ethernet
- SATA-II

Pin-to-pin and Power Compatible

Software Compatible

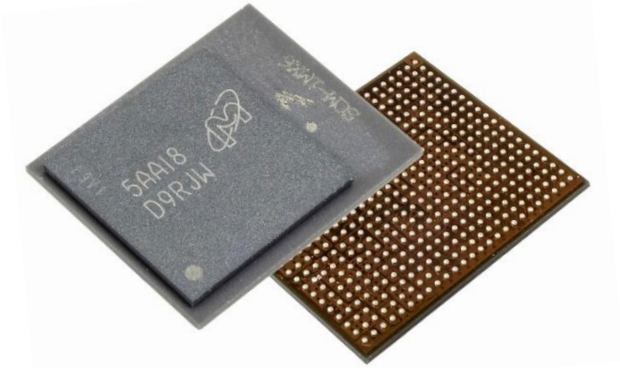
- ARM Cortex-A9 based solutions ranging up to 1.2GHz
- HD 1080p encode and decode (except 6SoloLite/6SoloX), 3D video playback in high definition (except 6SoloLite/6SoloX)
- Integrated IO's may include HDMI v1.4, MIPI and LVDS, display ports, MIPI camera, Gigabit Ethernet, multiple USB 2.0, SATA and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

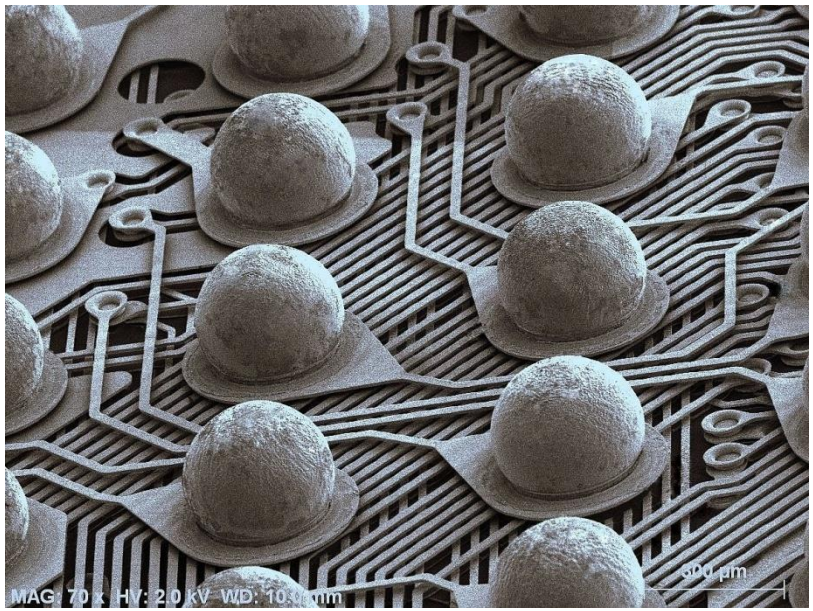
Systems Solution: SCM-i.MX 6D



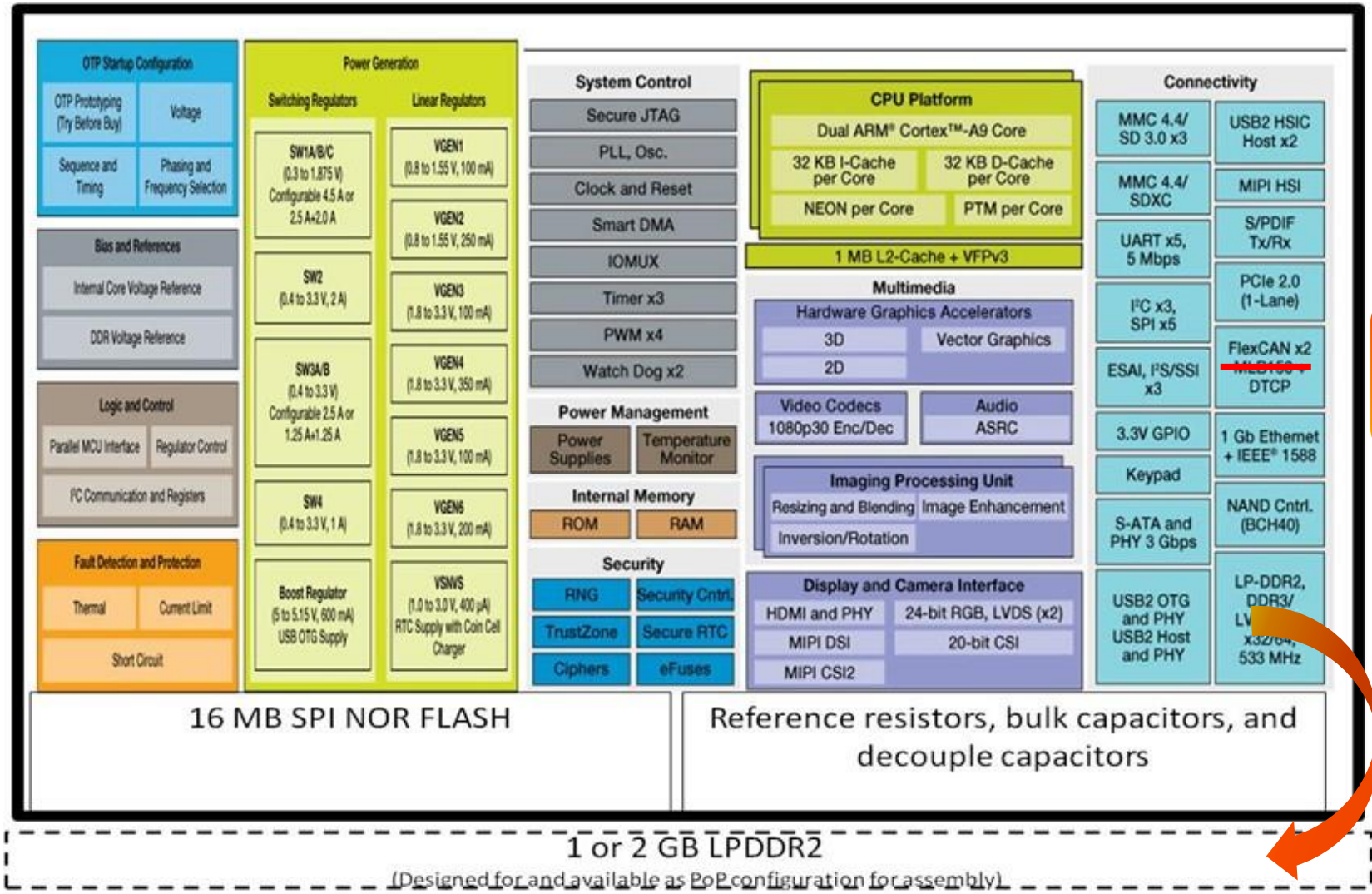
- 14mm x 17mm x 1.7mm
- i.MX6Dual
- PF0100 PMIC
- 16MB SPI NOR
- Enabled for 1GB or 2GB LPDDR2
- 109 discrete components
- 500 BGA balls P0.65mm

Order PN: MSCMMX6DZDK08AB





Systems Solution: SCM-i.MX 6D



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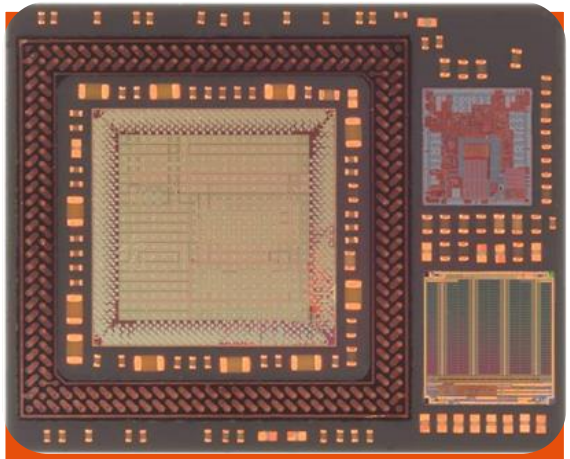
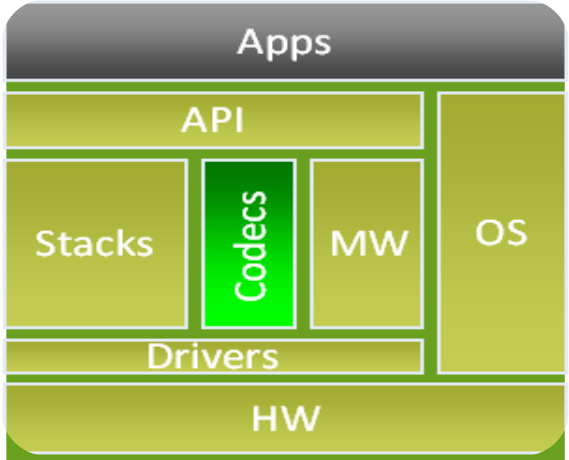
Introducing The World's Smallest Single Chip Module



Hardware Solution

Key Features

- i.MX 6Dual Apps Processor
- PF0100 (PMIC)
- 16 MByte SPI NOR Flash
- 109 discrete Components
- Enabled for 1GByte LPDDR2



Software Solution

Key Features

- Proven Board Support Package (BSP)
  - Android Enabled (KK4.4.2 Version)
  - Linux Enabled (3.10.53 Version)

Freescale Support

Key Features

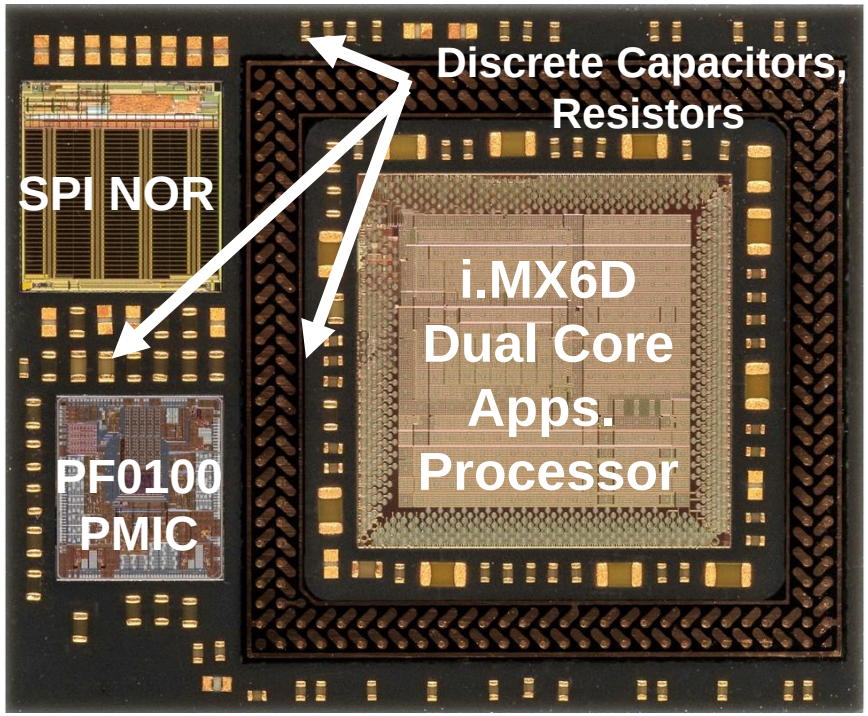
- Development Board
- Freescale Software Services **Ecosystem**
- Arrow Electronics for supply chain
- Eco-System for PoP assembly
- SW & HW partners for design services

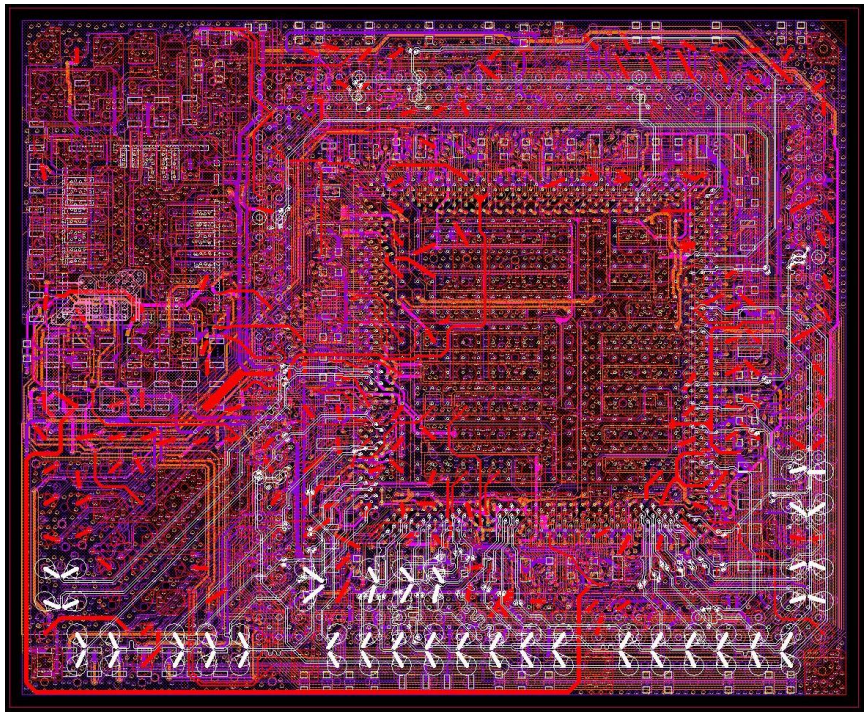
World's Smallest Single Chip Module

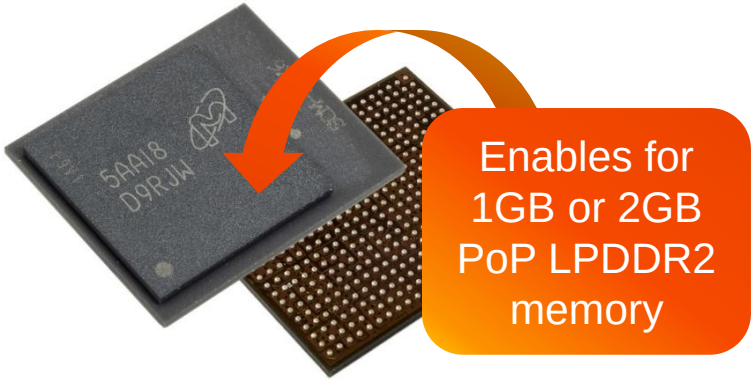
Features	Benefits
SCM comes with majority of the components integrated inside the module	Get to market **50% faster** than the average development time and **reduce** design time
SCM in an unprecedented ultra-small form factor (17x14x1.7 mm)	Gives >**50% reduction** over current discrete solutions
Embedded software and firmware is available and fully optimized for the SCM	**Provides** a reduction in validation effort
SCM is LPDDR2 memory enabled and power management integrated	**Reduces** design complexity of integrating and certifying DDR memory and power management into customer design
Freescale, with its partners, and ecosystem, provide embedded component sourcing, SW/HW customization and support	**Reduces** customer's supply chain complexity and **Improves** time to market

Hardware Design and Value Proposition

Systems Design, Modeling and Fabrication

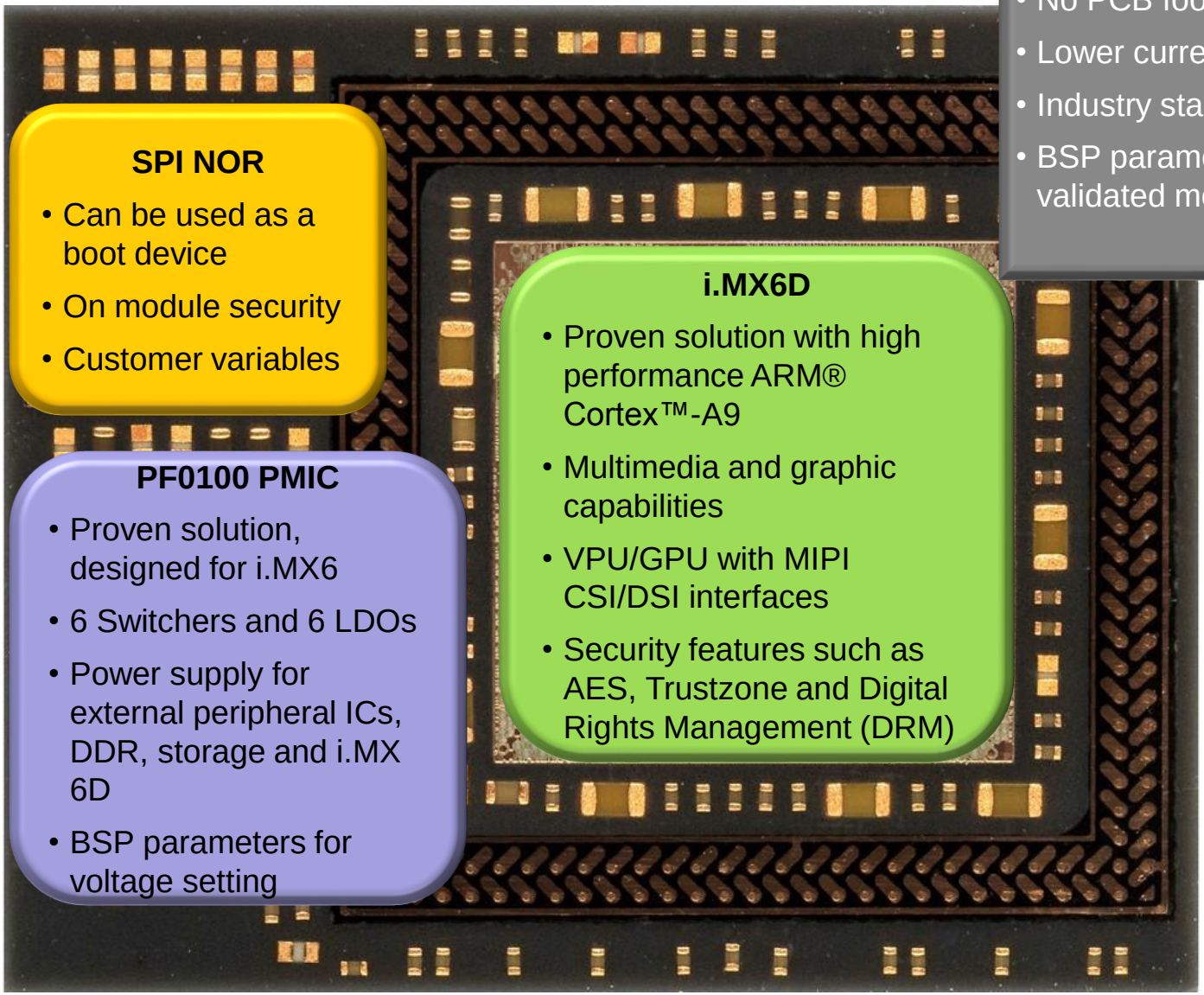






- i.MX6D running at 800MHz, LPDDR2 at 400MHz
- Consumer (-20°C to 85°C)
- Industrial (-40°C to 105°C) planned end of 2015

Value Proposition



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

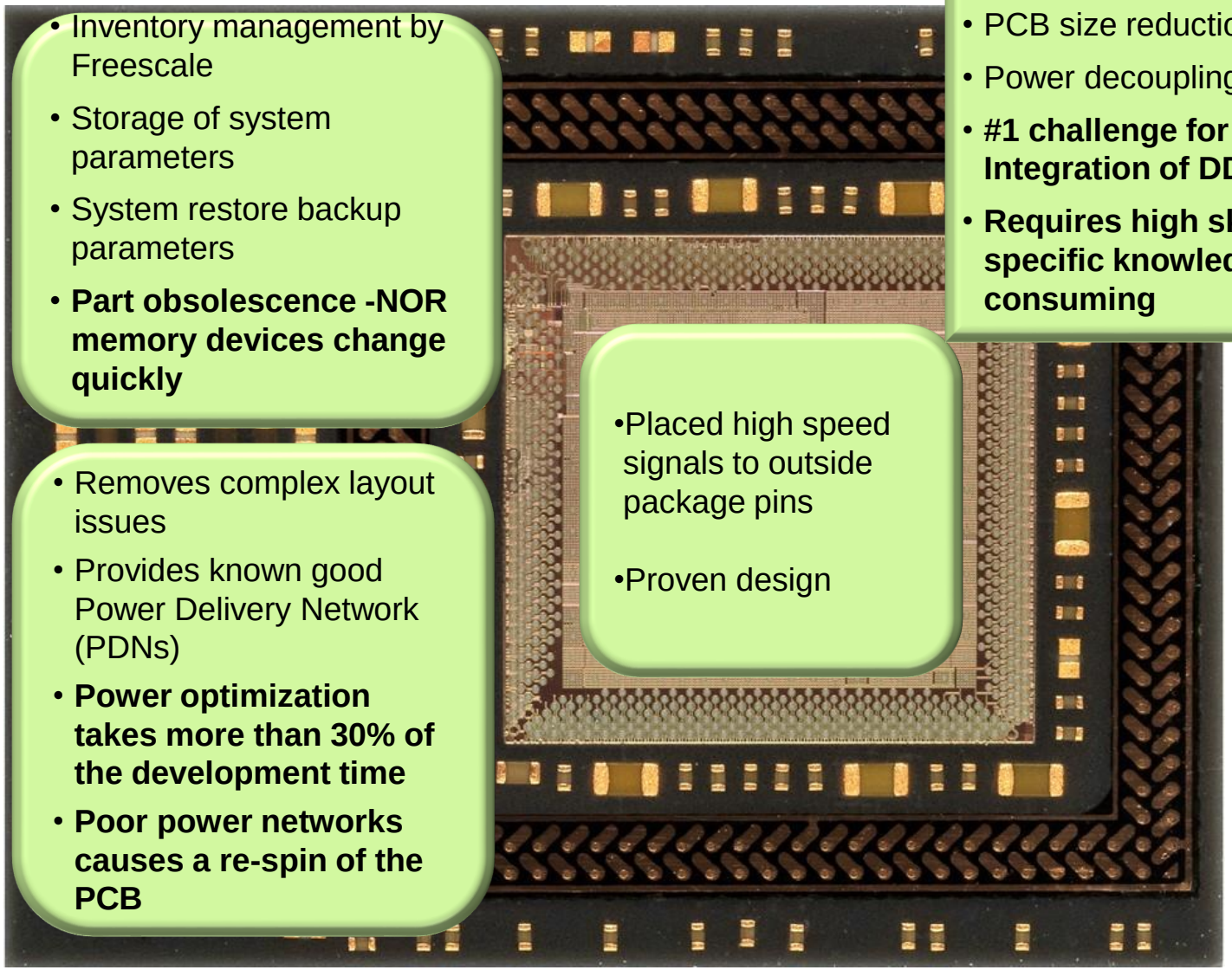
i.MX6D

- 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

System Design Challenges and Solutions



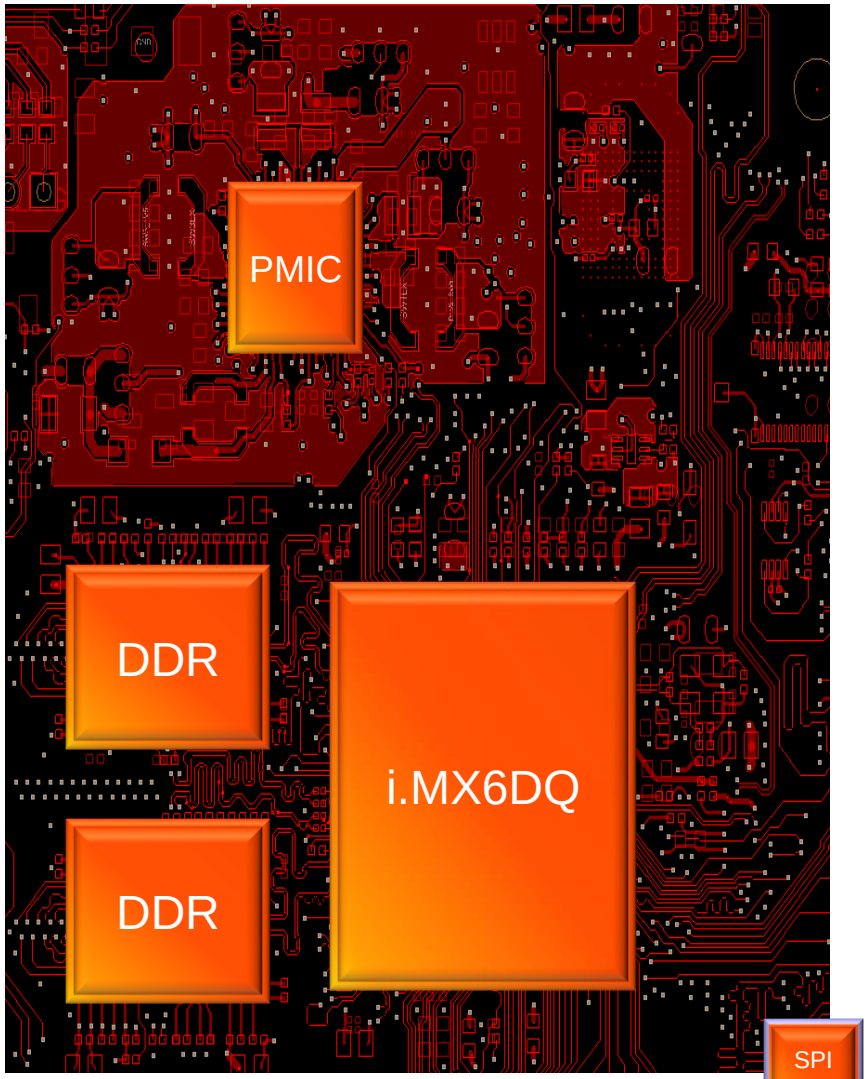
- Inventory management by Freescale
- Storage of system parameters
- System restore backup parameters
- **Part obsolescence -NOR memory devices change quickly**

- 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**

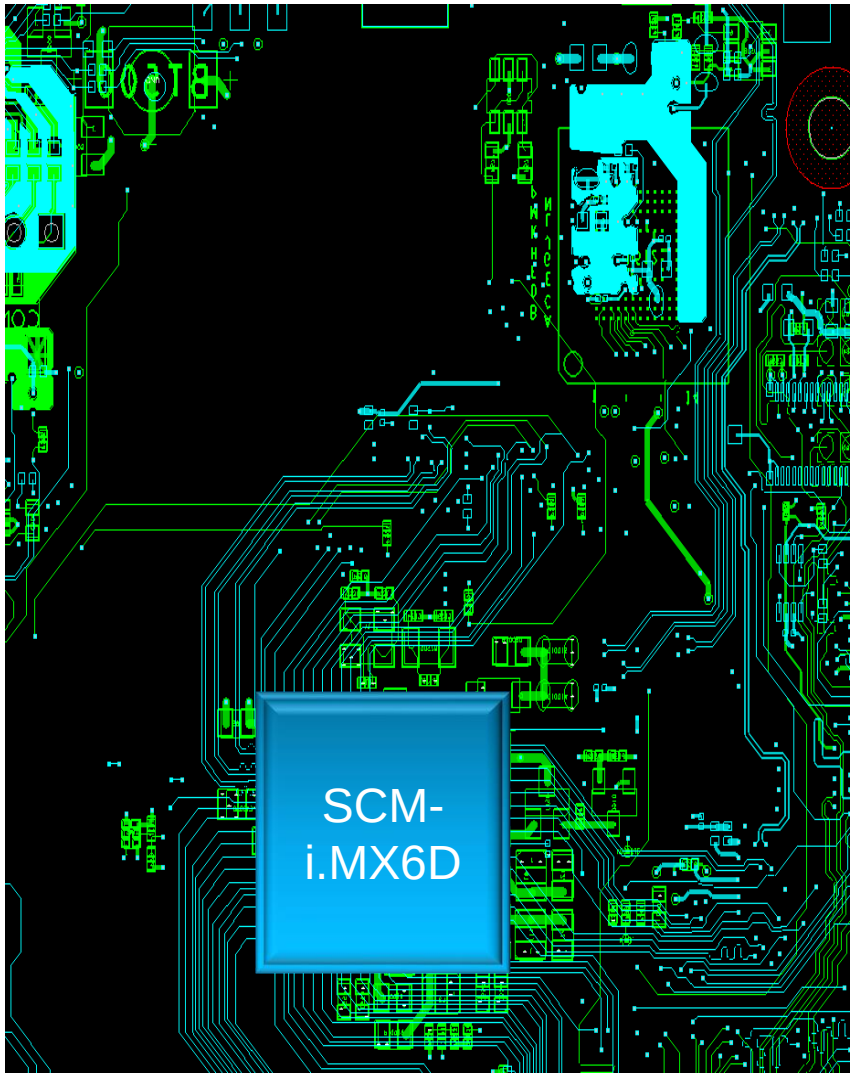
- Placed high speed signals to outside package pins
- Proven design

- Removes PCB layout issues
- Compliance testing ($5K)
- 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

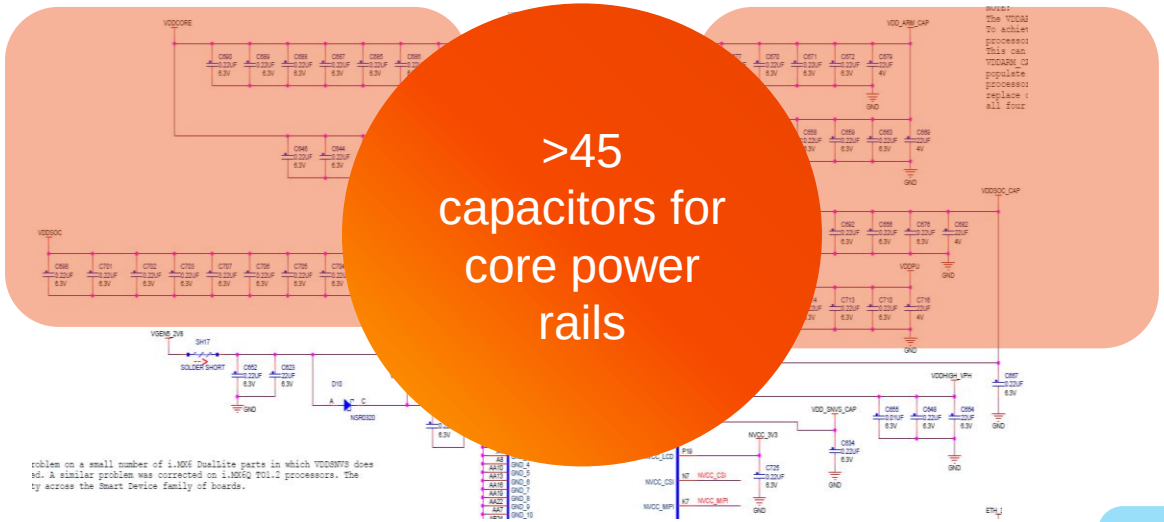


MCIMX6Q-SDB



SCMMX6D-SDB Demo

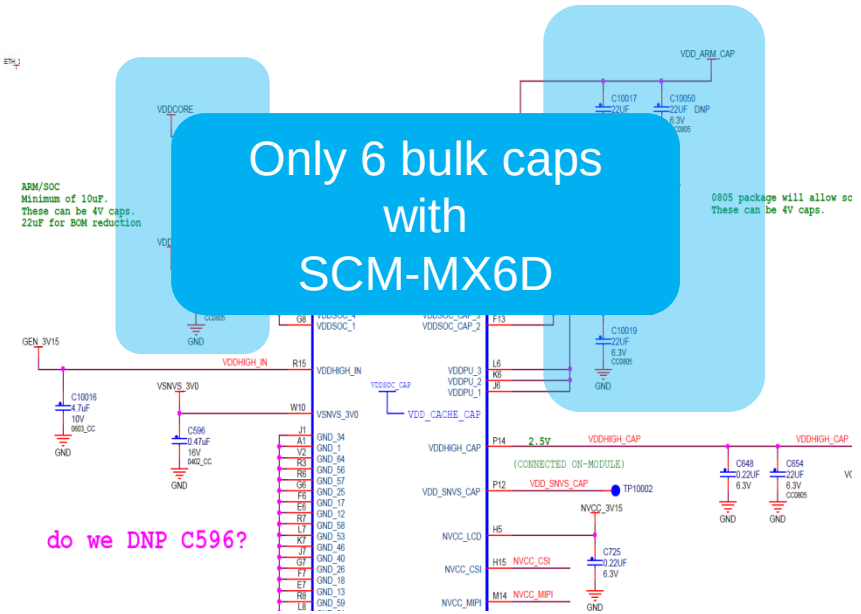
Number of Passive Elements Needed



i.MX6Q SABRE-SD

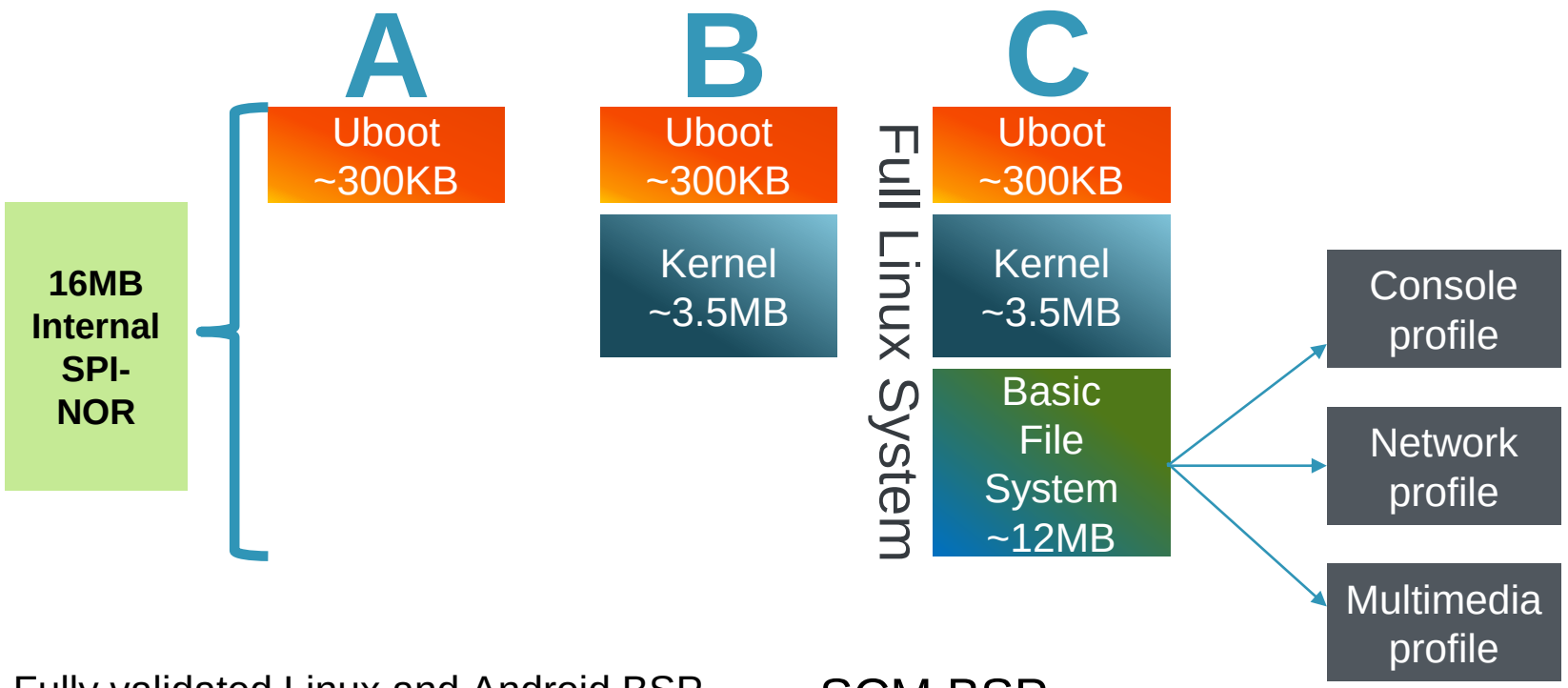
- Reduces BOM
- Makes power system more robust
- Added power decoupling to known noise susceptible supply lines
- Board routing
- Added unique voltage reference resistors

SCM-MX6D EVK



Software Enablement

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)

BSP Release SW Plan

OS	Version	Estimated Date
Linux	3.10.17_GA	HVB: 2015/06/1
	3.10.53_GA	HVB: 2015/06/20
	3.14 R2.0	TBD
Android	KK4.4.2	HVB: 2015/06/1
	L5.0.0_1.0.0	EVB: TBD
	L5.0.0_3.0.0	TBD

Roadmap and Target Markets

Target Applications

IoT / Graphic Hub

- High performance
- High graphic applications
- Power management
- Memory
- Linux / Android

High End Applications

Portable

- Linux Support
  - Apps Processor
  - Memory
- Connectivity
  - WiFi
  - BLE/ 802.15.4

Linux and Connectivity

Wearable

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

Low Power with High Functionality

Target Applications

Autonomous Sensing

- Low power
- Low cost
- Connectivity
- Small integrated systems

Data Collection and Communications

Automotive

- Integrated System

In-dash Systems

Eco-System and Summary

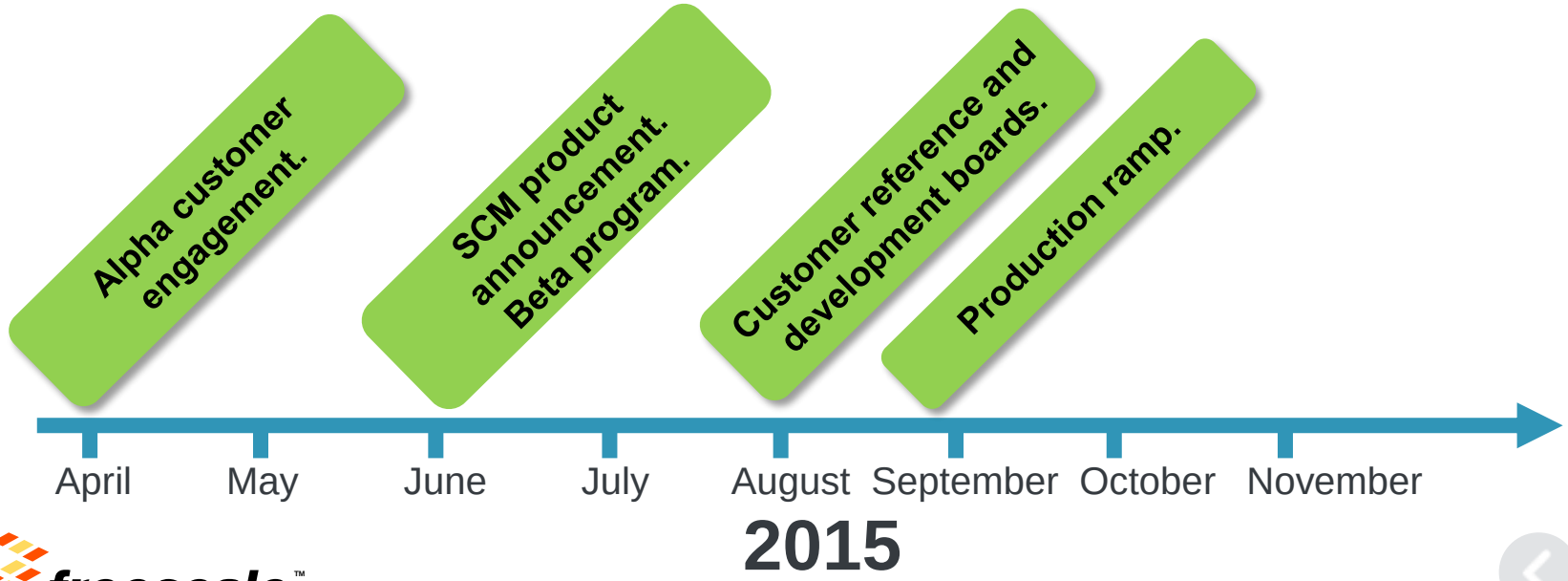
Fast time to Market through customers product launch.

Customer support model

SCM Product	SCM Sales and Application Support	Post Sale Enablement.
Freescale • SCM Design • Supply Chain • SCM Assembly • SCM Test • SCM Quality • Software Enablement	**Freescale and Distributor Partner** • Sales • Field Application Engineering Support • Development boards • Product Collateral	**Eco-System** • PoP assembly support • Software/ Firmware/ Application enhancement support • Hardware support (customer board, enhancements, implementation)

Product Summary

- New family of products focused on ‘fast time-to-market’ for the customers AND the smallest form factor.
- Goal to introduce a new product and/or derivative every 4-5 months.
- 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, FAE support, eco-system support, etc)



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