

A decorative graphic on the left side of the slide, consisting of a grid of overlapping squares in various shades of blue and purple, creating a pixelated or mosaic effect.

Mobile Handset Hardware Architecture

Focused Mobile Handset: Smartphone

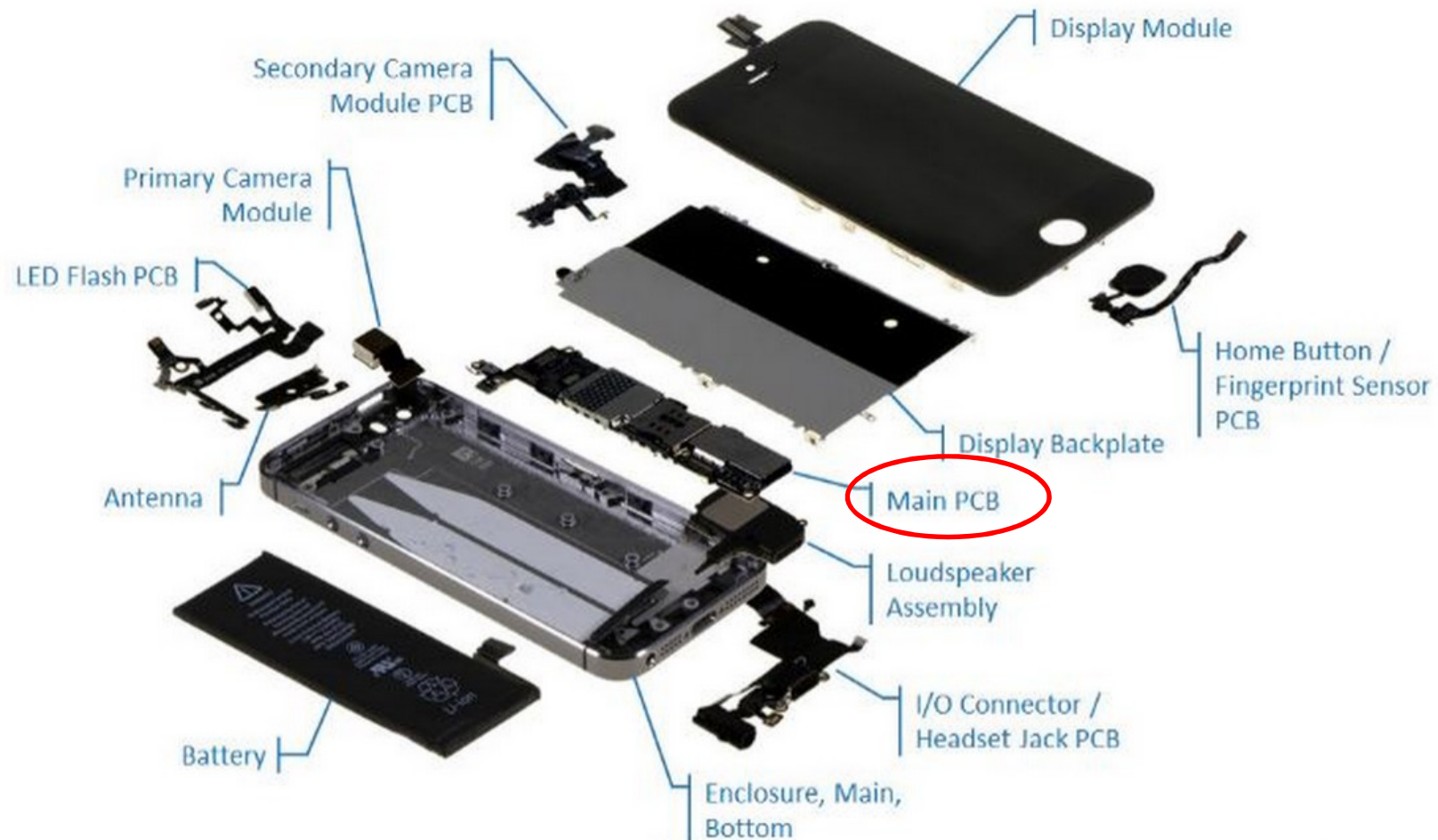
- We will take smartphone as an example to discuss mobile handset hardware architecture
- Smartphone is a new generation high featured and multifunctional cell phone which has
 - The functionalities of a handheld computer
 - The communication capabilities of a cell phone
 - Multiple sensors

Smartphone History

■ Major Milestones

- ☐ 1997 - Term smartphone is coined
- ☐ 1999 - RIM begins making Blackberries
- ☐ 2007 - iPhone 1 released
- ☐ 2008 - Android v1.0 released
- ☐ Now – iPhone 6 and Android 5.0

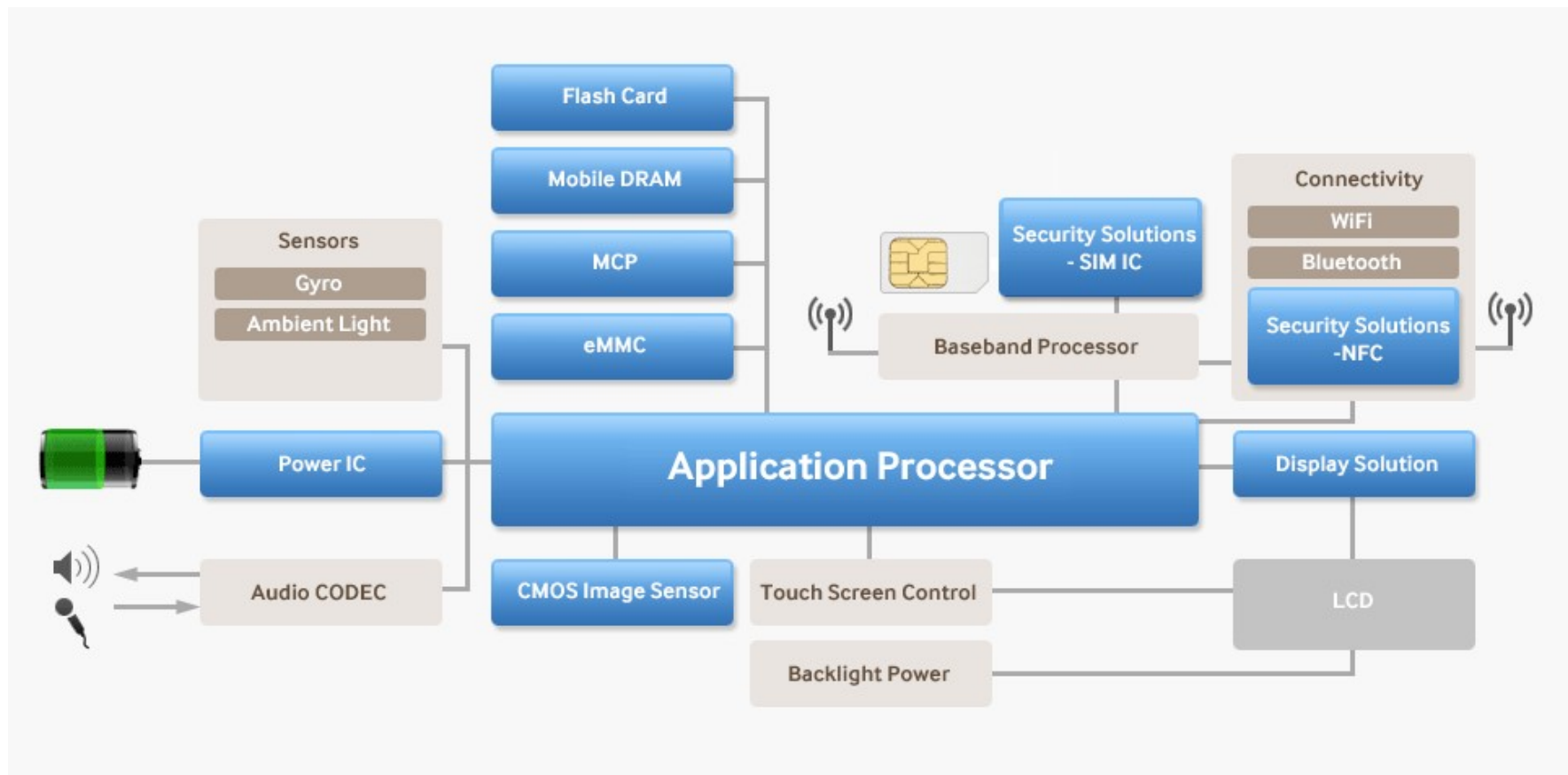
A Teardown of iPhone 5S



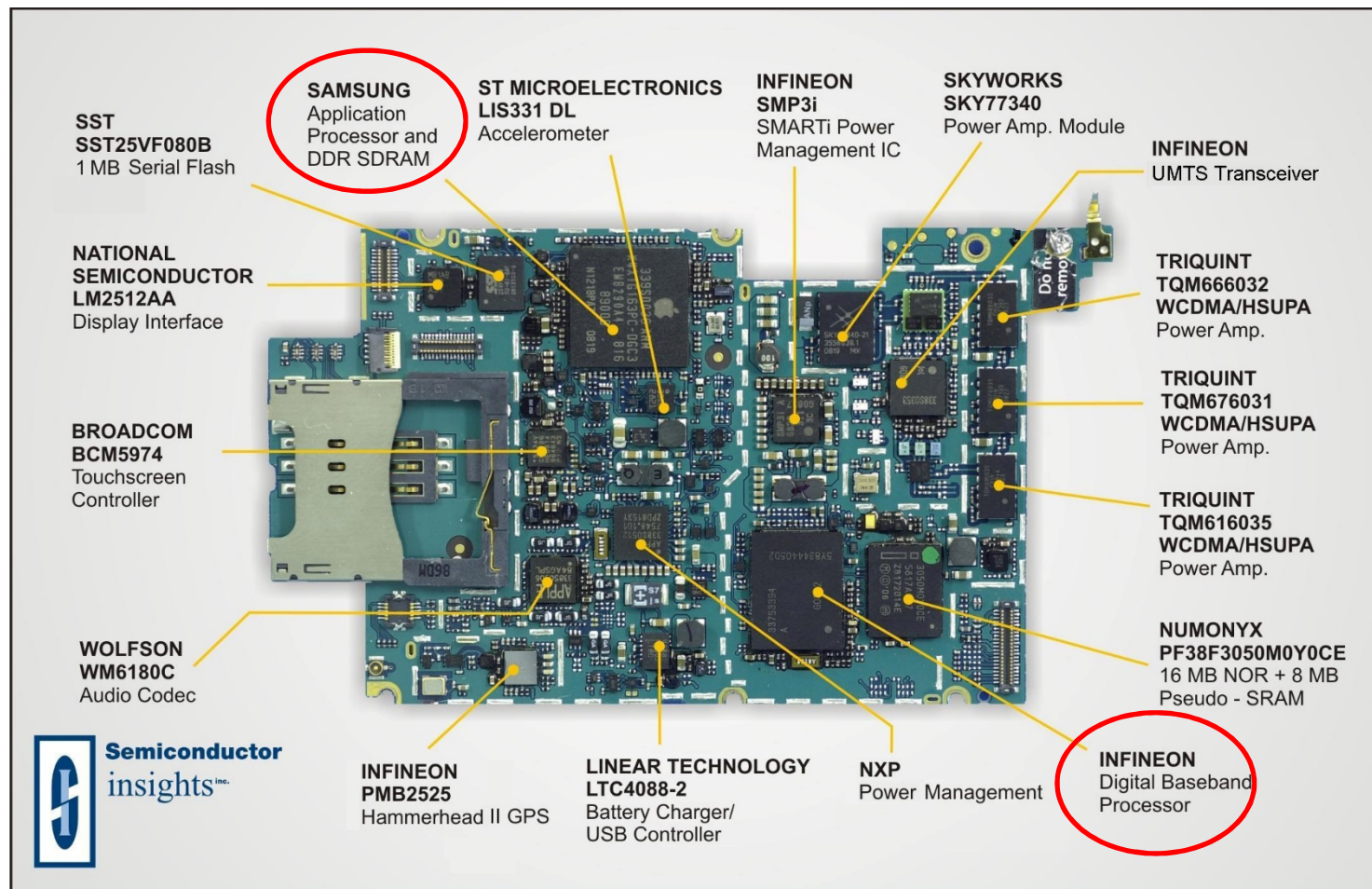
Main PCB

- PCB stands for Printed Circuit Board
- Smartphone main PCB has three main parts
 - An application processor which executes users' application software
 - A baseband processor which controls radio activities
 - A number of peripheral devices for interacting with the user

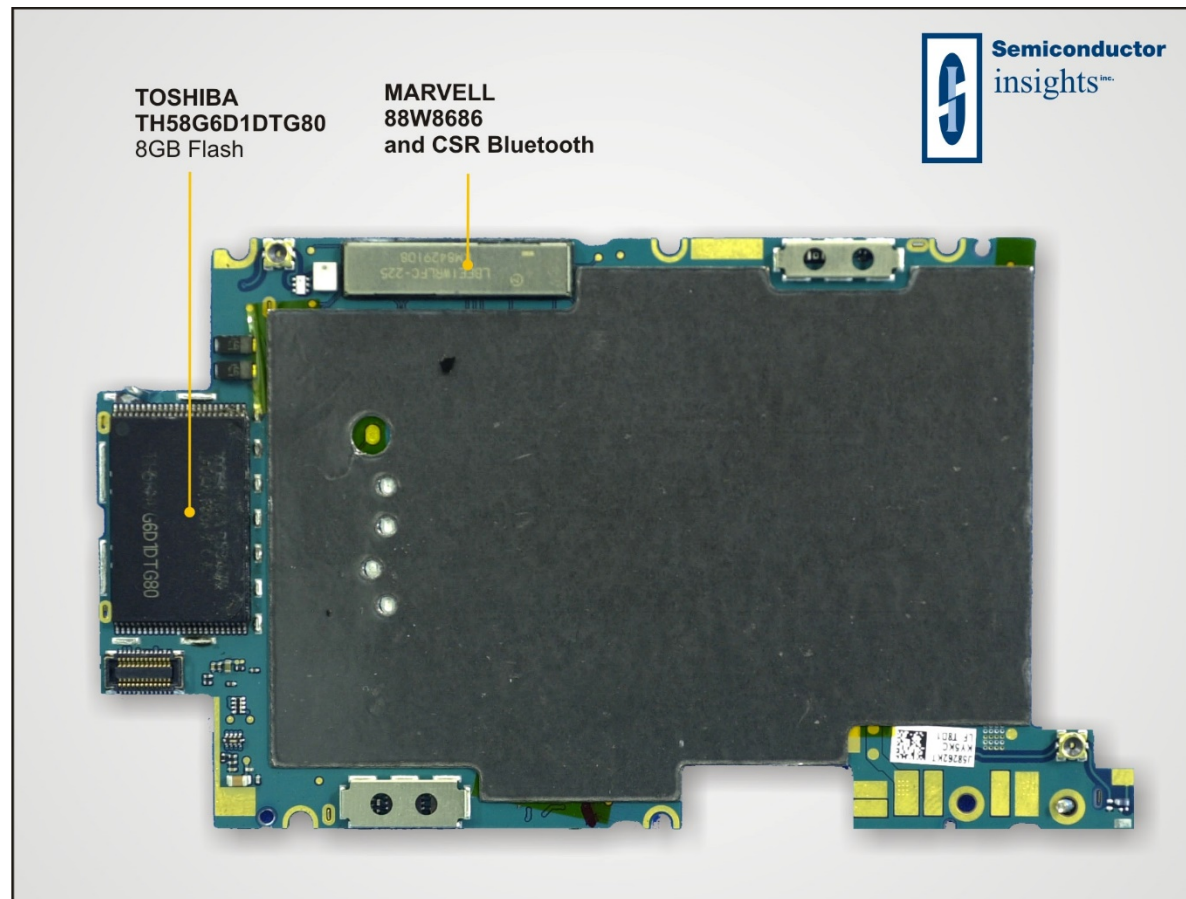
Main PCB Architecture



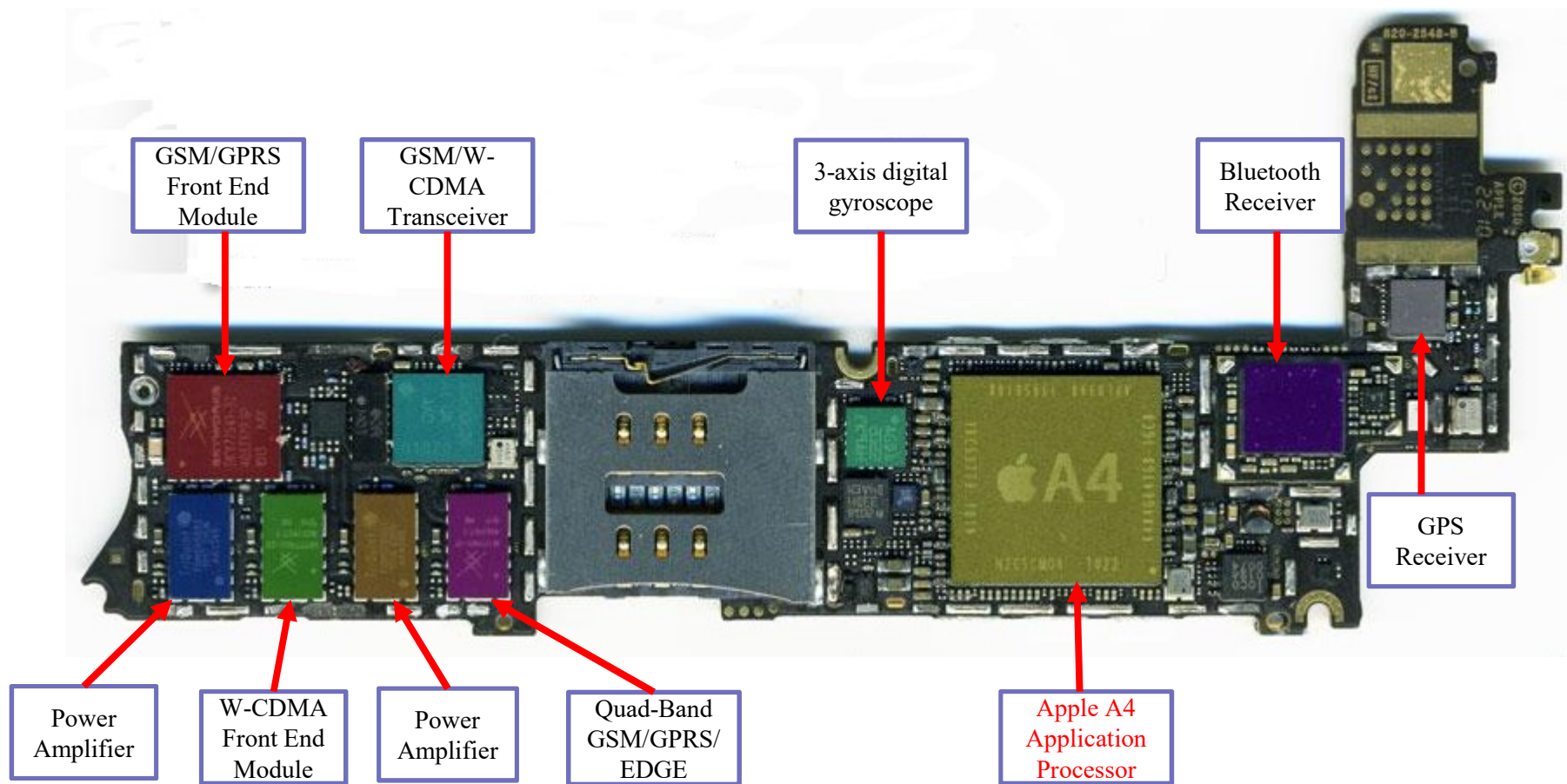
An Example – iPhone 3G Main PCB Front



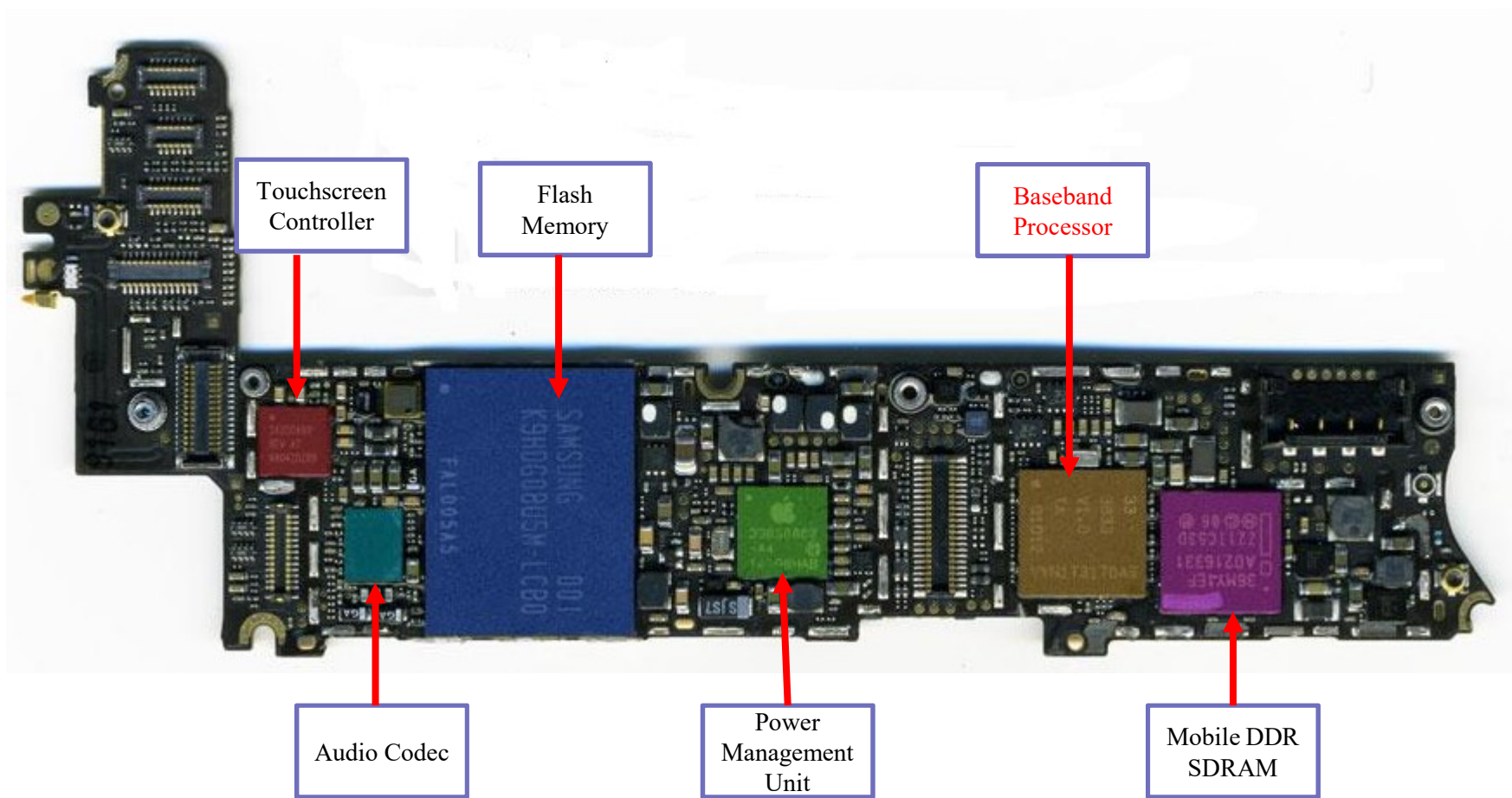
An Example – iPhone 3G Main PCB Back



Another Example – iPhone 4 Main PCB Front



Another Example – iPhone 4 Main PCB Back



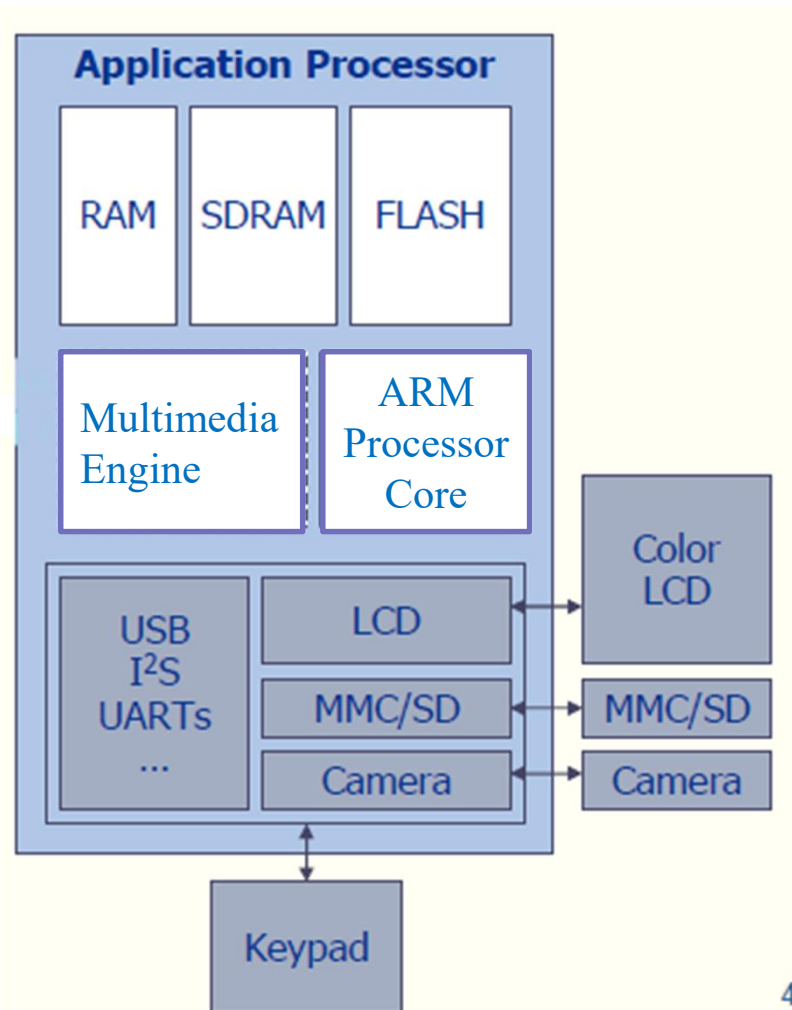
Application Processor: Overview

- A dedicated processor which enables smartphone to run mainstream OS such as Android, iOS and Windows Mobile etc.
- Optimized to run a number of user applications
- Emphasize multimedia processing (audio/video/still image/2D/3D)
- Do not handle “baseband” (wireless communications)

Application Processor: Components

- Processor core (e.g. ARM based processor) which is specifically optimized for minimal power consumption
- Multimedia engine which is hardware implementation of one or more multimedia standards (e.g. JPEG module, MPEG module, Audio module)
- Device interfaces which are used to communicate with peripheral device (e.g. USB, camera, display)

Application Processor: Structure



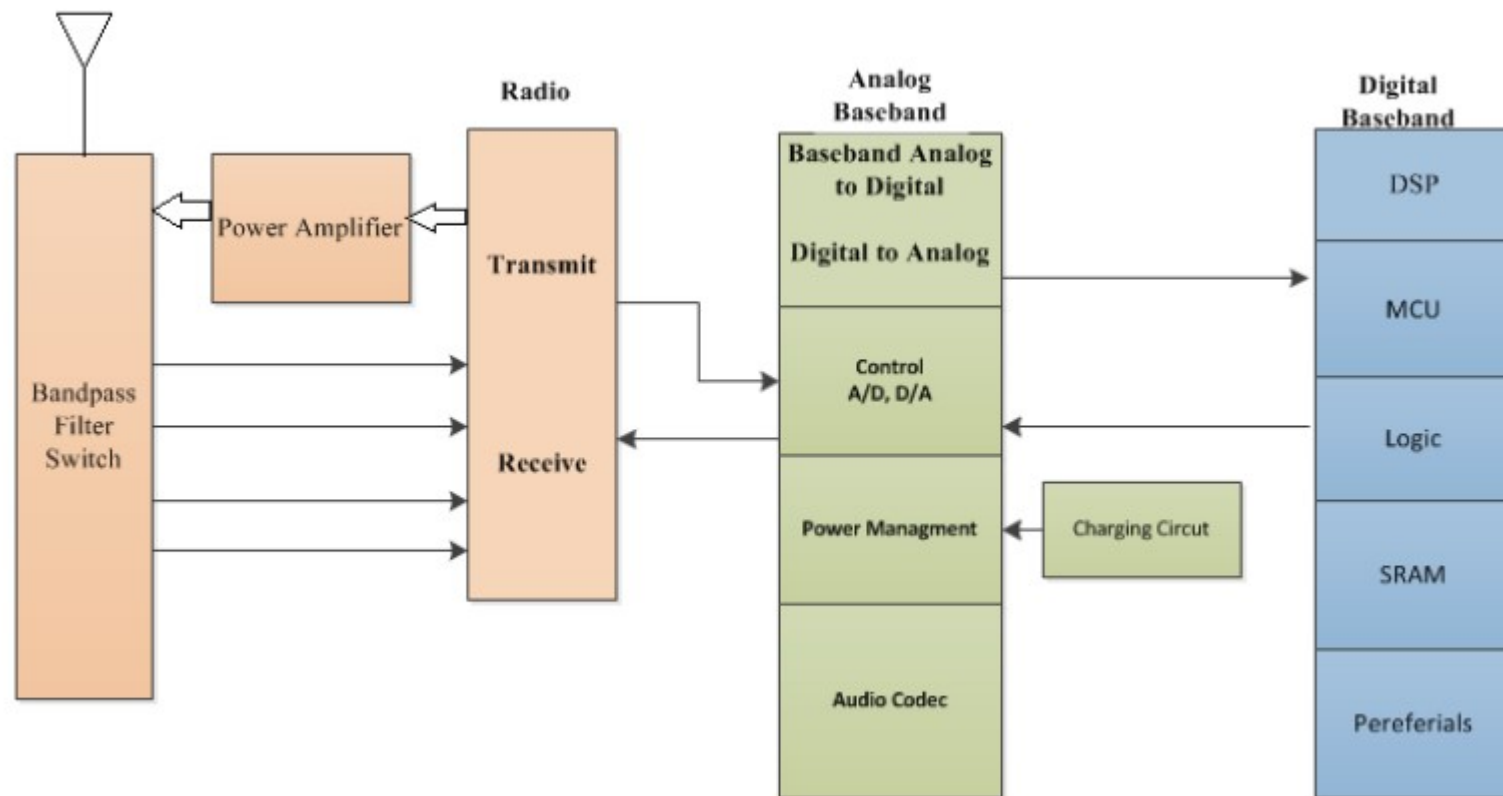
Baseband Processor: Overview

- It has a communication protocol stack which enables different types of wireless technologies such as LTE, WCDMA, CDMA, ZigBee, Bluetooth, Wi-Fi, etc.
- It provides radio communication related functions: signal modulation, RF shifting, encoding/decoding, etc.

Baseband Processor: Components

- RF front end: a component for receiving and transmitting on different frequencies
- Analog baseband: an interface between the digital domain and the analog domain
- Digital baseband: a component which handles higher layers of the protocols by using Digital Signal Processors

Baseband Processor: Structure



Processor Vendors

Vendor	Notes
ARM	Family of GPP cores used in most application processors
AMD	Family of MIPS-based application processors
Intel	PXA family of application, application/baseband processors
MIPS	Family of GPP cores used in some application processors
MediaQ	Katana family of application processors
Motorola	Several families of application, application/baseband processors
NeoMagic	MiMagic family of application processors
Qualcomm	MSM7xxx family of application/baseband processors
Renesas	Family of SH-based application processors
Samsung	S3Cxxxx family of application processors
STMicro	OMAPI-compatible Nomadik application processors
TI	OMAP families of application, application/baseband processors

References

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