

Image gallery: Inside iPhone 4S

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UBM TechInsights got its hands on a new iPhone 4S when they hit stores Friday (Oct. 14) and immediately began a preliminary teardown analysis.

What did we find? How does the iPhone 4S differ from the original iPhone 4 released in the summer of 2010? First, is the design of a singular handset that will work across multiple carrier platforms such as GSM and CDMA. This was not a surprise, as such a capability was evident in the Verizon version of the iPhone 4. That version incorporated the first use of Qualcomm's MDM6600—a chipset that was already capable of working across both GSM and CDMA mobile standards.

The foundation for a “world phone” was set, and UBM TechInsights' discovery of a Qualcomm MDM6610 confirmed our initial speculation that the Verizon iPhone 4 was precursor for this design change. Not only that, but it finalizes Apple's baseband supplier switch from Infineon to Qualcomm. Qualcomm was able to secure not only the design win of the MDM6610, but also the RTR8605 RF transceiver and their PM8028 power management device.

Another major winner is Broadcom. Not only did Broadcom maintain their socket from the iPhone 4, they convinced Apple to upgrade to one of their newer devices, the BCM4330 802.11n WiFi/Bluetooth/FM Radio chipset. This is the second major design win for Broadcom who saw the same IC incorporated in the popular Samsung Galaxy S II handset.

Cirrus Logic and Dialog Semiconductor also found their companies' products upgraded within the iPhone 4S. Apple selected the CLI1560B0 audio codec, moving from the CLI1495 that was in the iPhone 4. Apple also upgraded to Dialog's D1881A power management IC, moving from the D1815A in the previous handset.

The second biggest change from the iPhone 4 to the iPhone 4S is one that was telegraphed on the release of the iPad 2. The selection of the Apple A5 dual-core processor should come as no surprise to anyone familiar with Apple's tendency to use their tablet format as a precursor to a new processor. As the iPad's use of the A4 processor alluded to its use in the iPhone 4, the iPad 2 and the introduction of the A5 processor within its casing foretold its use in the iPhone 4S.

Apple iPhone 4s Front

- Apple 33850987 - Cirrus Logic CL11560B0 Audio Codec
- AGD8 2132 - STMicroelectronics L3G4200DH 3-Axis Digital MEMS Gyroscope Module
- 33DH - STMicroelectronics LIS331DLH 3-Axis MEMS Accelerometer Module
- Apple A5 Dual-core processor - PoP like in the iPad 2
Elpida B4064B2PF-8D-F - Elpida 512 MB of Low-power DDR2 DRAM
- Qualcomm RTR8605 Multimode RF Transceiver
- TriQuint TQM9M9030 Multimode Quad-Band Power Amplifier Module
- TriQuint TQM666052 Bias Control Power Amplifier
- Skyworks SKY 77464-20 Load-Insensitive Power Amplifier
- Avago ACPM-7381-TR1 UMTS2100 4x4 Power Amplifier

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Primary component listing

Primary iPhone 4S components:

- Apple A5 dual-core processor – package-on-package implementation
- Elpida B4064B2PF-8D-F –Elpida 512 MB of low-power DDR2 DRAM (SI#26521)
- Qualcomm RTR8605 multimode RF transceiver
- AGD8 2132 - STMicroelectronics L3G4200DH 3-axis digital MEMS gyroscope module
- 33DH - STMicroelectronics LIS331DLH 3-axis MEMS accelerometer module
- Apple 338S0987 – Cirrus Logic CLI1560B0 audio codec
- TriQuint TQM9M9030 multimode quad-band power amplifier module
- TriQuint TQM666052 bias control power amplifier
- Avago ACPM-7381-TR1 UMTS2100 4x4 power amplifier
- Skyworks SKY 77464-20 load-insensitive power amplifier module for WCDMA/HSUPA bands
- Qualcomm MDM6610 baseband chipset solution
- Qualcomm PM8028 power management IC
- Apple 338S0973 – Dialog Semiconductor D1881A power management chip
- Toshiba THGVX1G7D2GLA08 16 GB MLC NAND flash memory
- Murata SW SS1919013 – wireless module featuring Broadcom BCM4330 MAC/baseband/radio with integrated bluetooth and FM transceiver

For a listing of key components of the iPhone 4S, images of the iPhone 4S deconstructed, and some preliminary estimates on how it compares in pricing in today's market to the cost of iPhone 4, is available on UBM TechInsights' website.

Apple iPhone 4s Back

- Murata SW SS1919013 – Wireless module
- Toshiba THGVX1G7D2GLA08 16 GB MLC NAND Flash Memory
- Apple 338S0973
Dialog Semiconductor D1881A Power Management Chip
- Qualcomm PM8028 Power Management IC
- Qualcomm MDM6610 Baseband Chipset Solution

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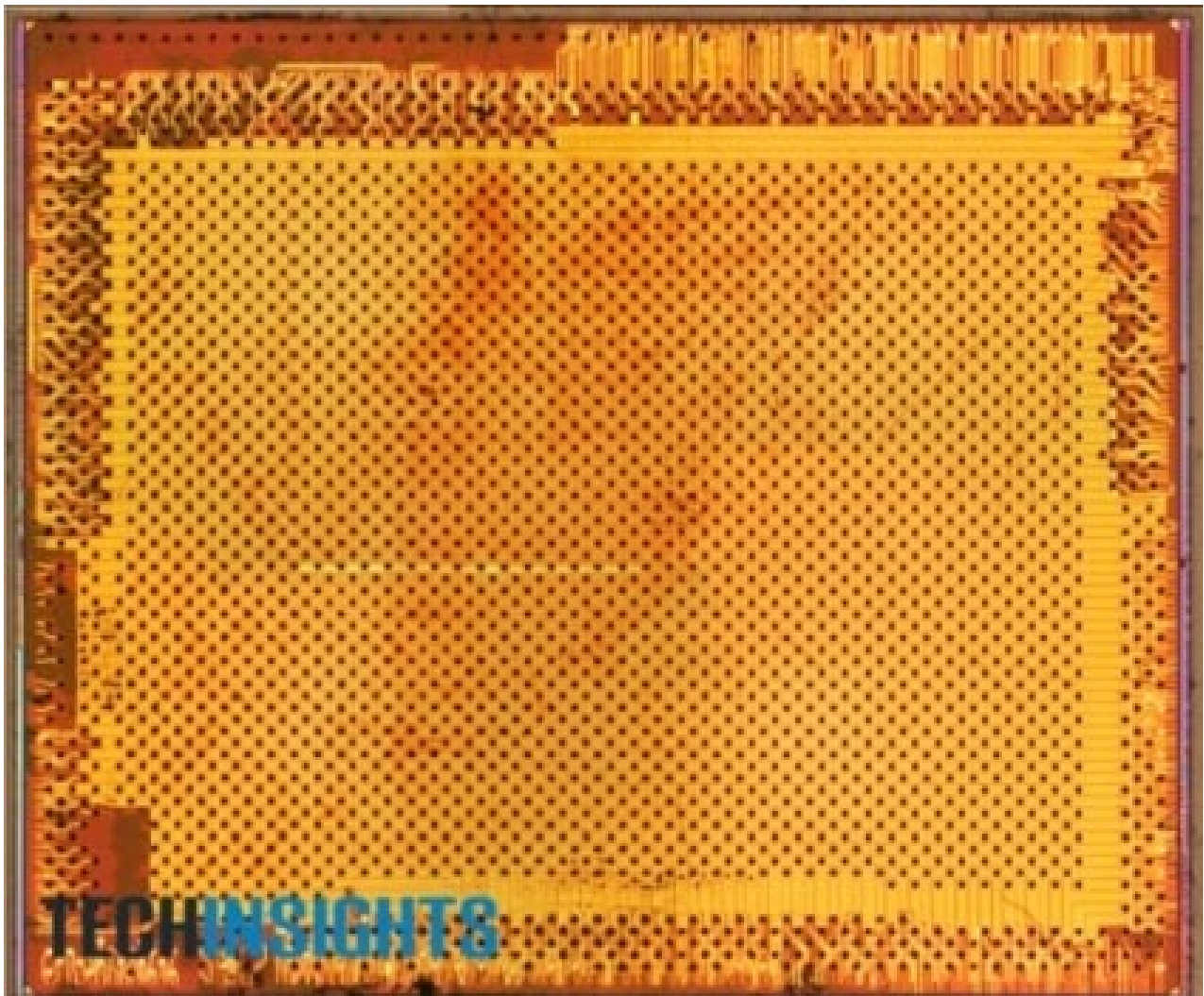


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Apple A5 processor

After making its first appearance inside the Apple iPad 2, the Apple A5 dual-core processor has now found its way into the iPhone 4S. The Apple A5 features two ARM cores and supports low power DDR2 DRAM memory.

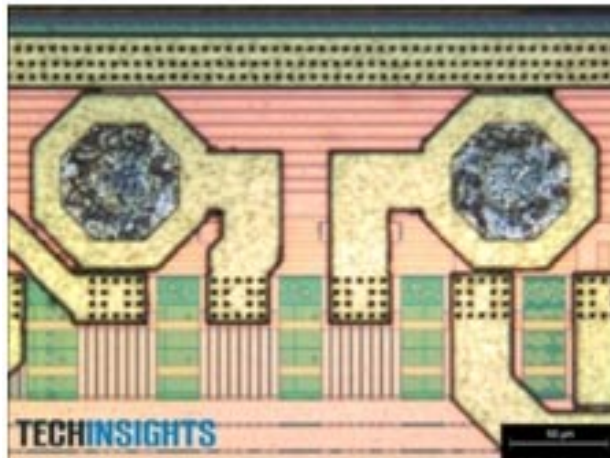
The iPhone 4S version of the A5 is nearly identical to the version of the processor found in the iPad 2—a good indicator that this version of the A5 is also manufactured at the 45-nm process node. A cross-section is required to determine if this version of the A5 is manufactured by someone other than Samsung (such as TSMC) but early indications show that this is most likely from Samsung.



A5 die photo.

Qualcomm MDM6610

The MDM6610 chipset from Qualcomm is an iteration of the MDM6600 and a member of their Gobi line of connectivity solutions. Much like the MDM6600 that was first used in the CDMA version of the Apple iPhone 4 that was released late in 2010, this chipset features multi-mode - supporting GSM/GPRS/EDGE, CDMA, HSDPA and HSPA+, as well as the 1x EV-DO standard. The MDM6610 really is a single chip, which was evident once we decapped the device. Doing so revealed the baseband and transceiver on separate dies. Below are images of the MDM6600 die, we'll have images of the new die available on the **UBM TechInsights website**.



Qualcomm MDM6610 die photos.

Teardown 1: Box contents



Contents of the iPhone 4S box, including manuals, earbuds, USB cord and plug adapter.

Teardown 2: The handset



Close up of the iPhone 4S torn down by UBM TechInsights (32GB model).

Teardown 3: Sim card removed



The iPhone 4S sim card removed.

Teardown 4: Back cover removed



The back cover of the iPhone 4S removed reveals the main board and the battery.

Teardown 5: Battery



A closer look at the iPhone 4S with the back cover removed. Here, you can see the new LI-ION battery that slightly improves upon the battery performance of the iPhone 4.

Teardown 6: Battery removed



The battery and the speaker removed from the main casing.

Teardown 7: Main components removed



The main board removed from the iPhone 4S. This board is features a lot of shielding over the main components.

Teardown 8: Image sensors



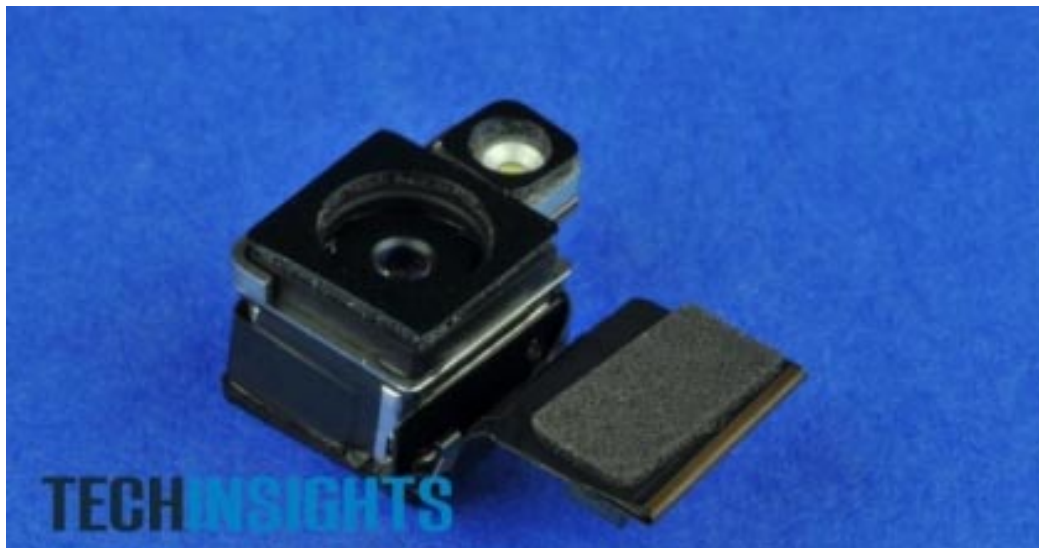
A closer look at the image sensors removed from the iPhone 4S.

Teardown 9: Touchscreen display



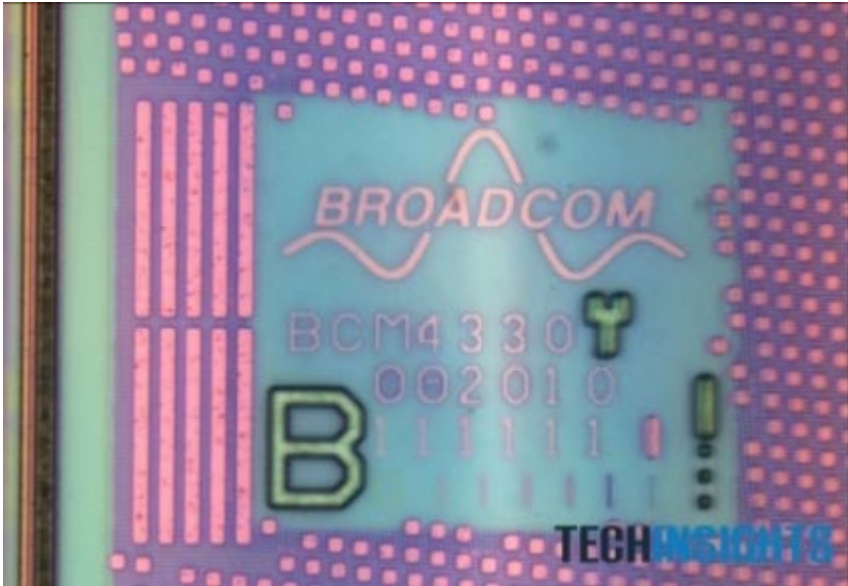
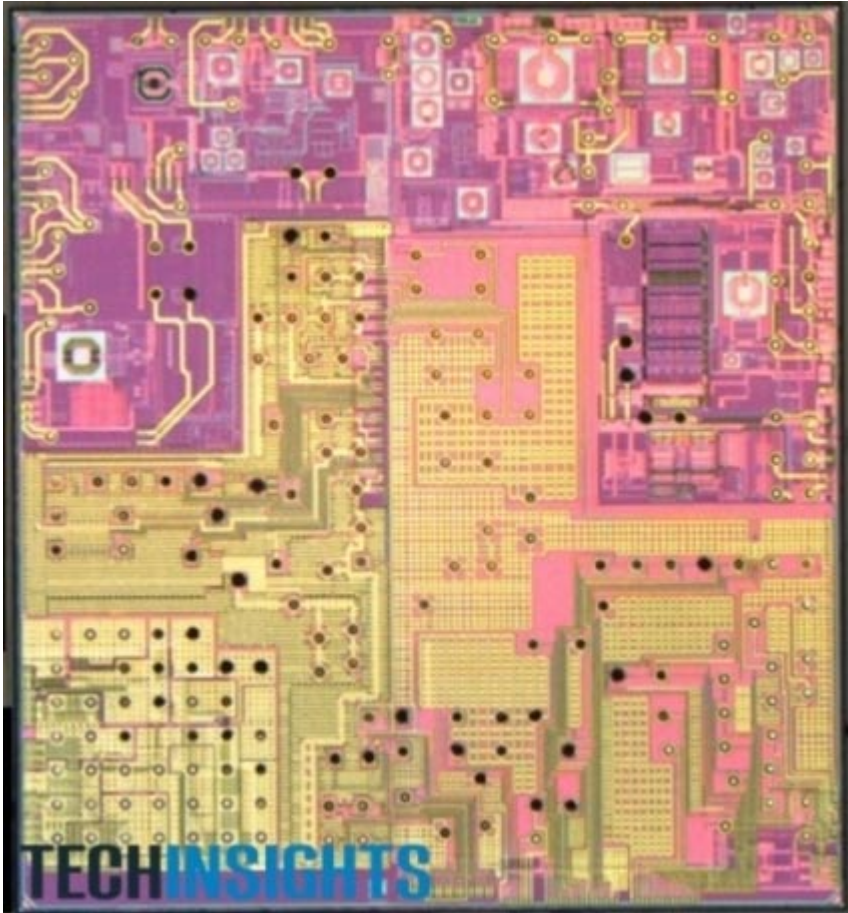
A closer look at the Touchscreen display of the iPhone 4S.

Teardown 10: 8MP image sensor



A closer look at the new 8-megapixel image sensor selected for the iPhone 4S.

Broadcom BCM4330



Broadcom BCM4330 die shots

Elpida B240ABB-LPDDR2



Close up of section of Elpida B240ABB-LPDDR2.

Samsung k4P2G324EC



Samsung k4P2G324EC.

*Allan Yogasingam is a technical market manager for **UBM TechInsights**, a sister company of EE Times.*