

Visit www.edn.com/070903pry for more in-depth coverage of the iPhone, including internal photography of various subsystems and useful links for additional research.

Apple's iPhone delivers more than just a dial tone

By now, you're probably overwhelmed with hands-on analyses of the iPhone, which Apple and partner AT&T began selling on June 29. Few reviewers, though, have cracked open the device's case and peered inside. Read on for details on the system building blocks that enable the iPhone to work its multifunction magic.

A 2M-pixel Micron CMOS sensor combines with a three-element, fixed-focus and -focal-length lens to create the iPhone's flash-deficient and still-image-capture-only camera.

The 3.5-in.-diagonal, 2×3-in. LTPS TFT (low-temperature-polysilicon-thin film-transistor) LCD delivers a 480×320-pixel, half-VGA resolution at 160 dpi, but Apple doesn't specify the display's native or dithered color depth. The touchscreen elements arranged in a coordinate system can support both self- and mutual-capacitance modes, thereby enabling simultaneous multitouch support; a Broadcom controller and an NXP Semiconductor ARM7TDMI manage the touchscreen.

The iPhone's RF board is jam-packed with ICs concentrated on one side of the PCB. Chips include an Infineon GSM/EDGE RF transceiver and companion Skyworks power amplifier and Epcos transmitter/receiver duplexer; a Marvell Wi-Fi transceiver and companion power amplifier from an unknown manufacturer; a Cambridge Silicon Radio Bluetooth transceiver; an Infineon cellular-baseband processor; and an Intel-labeled, single-package, two-die memory stack containing NOR-flash memory and pseudo SRAM—that is, self-refreshing, low-power DRAM with an SRAM-like system interface.



The main board assembly, swathed in EMI-shielding material, is a two-PCB digital/RF sandwich. One side of the digital board contains an STMicroelectronics accelerometer, a Wolfson Microelectronics audio codec, Linear Technology and NXP power-management ICs, a National Semiconductor MPL transmitter, a Texas Instruments LCD-boost converter, and a triumvirate of Samsung Semiconductor ICs: a 4- or an 8-Mbyte NAND-flash chip, depending on the iPhone model; 128 Mbytes of low-power, single-chip DDR SDRAM; and an ARM11 applications processor. The SIM connector dominates the digital board's other side, but it also houses a diminutive, 1-Mbyte SST flash memory, which probably acts as the ARM CPU's boot device.

A single flex circuit encompasses all of the iPhone's antennas: a combined Bluetooth/Wi-Fi element and a separate and much larger multiband cellular element. The planar antennas attach to the phone speaker's acoustical chamber.

The 3.7V lithium-ion battery consumes a dominant percentage of the iPhone's total volume and is a key determinant of the device's substantial specified battery life. Apple estimates that, after 400 recharge cycles, the battery will still retain 80% of its original capacity; replacing it will cost you \$79 plus \$6.95 shipping.