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Eviscerating the Xbox 360 Elite

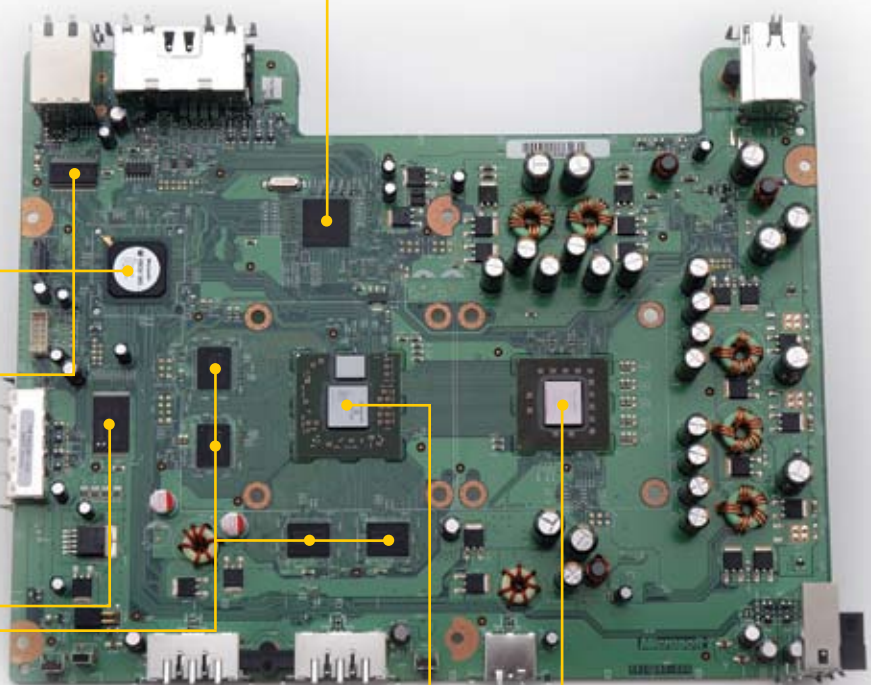
In late April, Microsoft refreshed its nearly 1½-year-old Xbox 360 product line with the high-end Elite variant, touting an upgraded-capacity 120-Gbyte HDD and a Version 1.2 HDMI port. When you crack open the Elite's sleek black case, what—if any—alterations to the initial console design do you discover beyond the HDMI augmentation?

Four of the Xbox 360 ICs carry Microsoft labels. In contrast to the first-generation Xbox, for which Microsoft depended on the supply-versus-demand whims of its IC partners, the company this time acquired IP from other companies and directly manages chip manufacturing. The system's south-bridge IC contains circuits from SiS; this chip's functions include SATA controllers for the system HDD and DVD drive, USB2 transceivers, audio DACs, and the Ethernet MAC.

The Ethernet PHY comes from ICS; Broadcom is an alternative source. A transceiver and antenna residing on a separate daughterboard (not shown) handle the 2.4-GHz wireless communication between the console and its game controllers.

The bulk of system memory is 512 Mbytes of GDDR3 SDRAM. Four of the 512-Mbit ICs, which are multi-sourced from Qimonda and Samsung, reside on the PCB topside; the other four are mirror-image-mounted on the motherboard backside. Because the Xbox 360 comes in a Core variant with no HDD, a Hynix 128-Mbit NAND-flash memory serves as an alternative storage location for operating-system patches and other code and data updates. Some versions of the motherboard (not shown) also include a 2-kbit Atmel EEPROM directly below the CPU.

The Xbox 360's hardware scaler represents the single biggest evolution in the system-design transition from the Core and Premium Xbox 360 models to the Elite version. This scaler is also a notable differentiation from the hardware-scaler-deficient Sony PlayStation 3. Microsoft uses the scaler to increase and decrease the resolution of, as well as to interlace and deinterlace, game and video content to match the connected display's desired attributes. The Core and Premium systems' Ana scaler IC embeds the necessary DACs for various analog-video connections; the Elite's Hana scaler (H=HDMI?) presumably also integrates the HDMI transmitter and therefore has access to both the digital-video and -audio data coming from other system ICs. Missing from the Elite motherboard is a Cypress clock-generator IC that was just to the left of Ana; a migration from TQFP to BGA packaging for the scaler IC also marks the Ana-to-Hana transition.



Under the heat sink, the GPU is a multi-die module comprising the graphics processor and a 10-Mbyte frame-buffer-memory IC. Analysis by Semiconductor Insights suggests that neither the CPU nor the GPU has yet migrated from a 90- to a 65-nm lithography; single-IC GPU integration is one possible outcome of the 65-nm conversion slated for later this year.

The Xbox 360 has no discrete boot memory IC; Microsoft learned a lesson from the hacker community on the first-generation Xbox, whose exposed traces between the CPU and flash memory were its Achilles' heel. This time, Microsoft embedded the system firmware within the CPU. The boot code is in-system-upgradable.

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