Global Market Trends for Camera-Equipped Cellular Devices (Breakdown by Resolution)

- ≥5M Ratio ⇒ 26%
- 64%

Mil pcs

Data Source: Sony
Activities and Accomplishments of Sony in the Field of Image Sensor Research

Papers presented at the International Solid-State Circuits Conference (ISSCC) — known as the “Semiconductor Olympics” — showcase Sony’s leading-edge technological developments.

Sony’s Image Sensor Technology

*Exmor R*

**High-spec CMOS image sensor provides a new level of excitement**

- High Speed
- High S/N
- Image Quality

Sony SVP Tomoyuki Suzuki gave a keynote presentation on image sensors at ISSCC 2010.

Sony’s Image Sensor Technology

- Image Quality
- High S/N
- High Speed

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Realizing “Super Reality” that Surpasses Human Vision

**Super Reality**

- Back-illuminated CMOS image sensor
- Ultra-high-speed imaging
- Wide dynamic range
- Defocused background
- Technology that realizes increased sensitivity

Super Reality: Back-Illuminated CMOS Image Sensor

Sony’s proprietary pixel fabrication process technology has enabled it to realize the industry’s smallest unit pixel size, 1.12μm, and the world’s first type 1/2.8 CMOS image sensor with 16.41 effective megapixels.

Sony has also commercialized a compact autofocus lens module for cellular devices using this sensor.

Even this tiny, the module achieves image resolution on a par with that of digital still cameras.

Major Awards

- Okochi Memorial Production Prize
- Semiconductor of the Year
- Walter Kosonocky Award
Super Reality: Ultra-High-Speed Imaging

Column-parallel A/D conversion and low power consumption enable ultra-high-speed video capture.

- 1,500 Column-parallel A/D conversion and low power consumption enable ultra-high-speed video capture.

**Conventional**

- Photodiode
- Amplifier device
- Row selection switch
- CDS
- Vertical signal lines
- Horizontal scan circuit

**Column-Parallel A/D Conversion**

- Photodiode
- Amplifier device
- Row selection switch
- CDS
- Vertical signal lines
- Horizontal scan circuit

- Analog/Digital Dual noise reduction
- Analog signal
- Digital signal
- Column-Parallel A/D Conversion
- Thousands of A/D conversion circuits convert simultaneously
- Digital signal is transferred with high-speed and without noise

- CDS=Correlated Double Sampling
- Dynamic Noise reduction system

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Super Reality: Wide Dynamic Range

Using technologies for spatially varying exposure and multi-sampling exposure, dynamic range reaches 120dB.

- (a) Normal CCD image sensor (Dynamic range at 50dB)
- (b) CMOS image sensor (incorporating wide dynamic range function) (Dynamic range at 120dB)
Super Reality: Defocused Background

To enable a diverse range of image expression capabilities, Sony has realized larger sensors not only for still images but also for video capture.

(a) Depth of field: deep  (b) Depth of field: shallow

Misconception that Reduced Pixel Size Causes Deterioration in Characteristics

If the viewing angle is the same, then the total number of incident photons is the same. At the same viewing angle (1/3.2), 1.12μm / 13 effective megapixels and 1.4μm / 8 effective megapixels produce the same image quality.
Impact of Increased Pixel Count: Zooming When Shooting with a Wide Viewing Angle

1.12μm / 13 effective megapixels: sensor suitable for Full HD

12μm / 13 effective megapixels produces 2.56 times the brightness when shooting video

Example of the Thinking behind Pixel Count: From the Perspective of Fusing Still and Moving Images

1.12μm / 13 effective megapixels: sensor suitable for Full HD

(1.12 x 1.12 x 4) / (1.4 x 1.4) = 2.56
Sony’s Image Sensor Business: Objective

In addition to further developing its image sensors, in the area of imaging technology Sony will continue to lead the industry in both quality and innovation.

Sony’s goal is to realize “Super Reality” that surpasses human vision.

Sony will continue on this journey together with its customers, seeking to redefine cameras and photography.

Cautionary Statement

Statements made in this presentation with respect to Sony’s current plans, estimates, strategies and beliefs and other statements that are not historical facts are forward-looking statements about the future performance of Sony. Forward-looking statements include, but are not limited to, those statements using words such as "believe," "expect," "plans," "strategy," "prospects," "forecast," "estimate," "project," "anticipate," "aim," "intend," "seek," "may," "might," "could" or "should," and words of similar meaning in connection with a discussion of future operations, financial performance, events or conditions. From time to time, oral or written forward-looking statements may also be included in other materials released to the public. These statements are based on management’s assumptions, judgments and beliefs in light of the information currently available to it. Sony cautions you that a number of important risks and uncertainties could cause actual results to differ materially from those discussed in the forward-looking statements, and therefore you should not place undue reliance on them. You also should not rely on any obligation of Sony to update or revise any forward-looking statements, whether as a result of any new information, future events or otherwise. Sony disclaims any such obligation. Risks and uncertainties that might affect Sony include, but are not limited to (i) the global economic environment in which Sony operates and the economic conditions in Sony's markets, particularly levels of consumer spending; (ii) exchange rates, particularly between the yen and the U.S. dollar, the euro and other currencies in which Sony makes significant sales and incurs production costs, or in which Sony's assets and liabilities are denominated; (iii) Sony's ability to continue to design and develop and win acceptance of, as well as achieve sufficient cost reductions for, its products and services, including LCD televisions and game platforms, which are offered in highly competitive markets characterized by continual new product and service introductions, rapid development in technology and subjective and changing consumer preferences; (iv) Sony's ability and timing to recoup large-scale investments required for technology development and production capacity; (v) Sony's ability to implement successful business restructuring and transformation efforts under changing market conditions; (vi) Sony's ability to implement successful hardware, software, and content integration strategies for all segments excluding the Financial Services segment, and to develop and implement successful sales and distribution strategies in light of the Internet and other technological developments; (vii) Sony's continued ability to devote sufficient resources to research and development and, with respect to capital expenditures, to prioritize investments correctly (particularly in the Consumer Products & Services and the Professional, Device & Solutions segments); (viii) Sony's ability to maintain product quality; (ix) the effectiveness of Sony's strategies and their execution, including but not limited to the success of Sony's acquisitions, joint ventures and other strategic investments; (x) Sony's ability to forecast demands, manage timely procurement and control inventories; (xi) the outcome of pending legal and/or regulatory proceedings; (xii) shifts in customer demand for financial services such as life insurance and Sony's ability to conduct successful asset liability management in the Financial Services segment; (xiii) the impact of unfavorable conditions or developments (including market fluctuations or volatility) in the Japanese equity markets on the revenue and operating income of the Financial Services segment; and (xiv) risks related to catastrophic disasters or similar events, including the Great East Japan Earthquake and its aftermath. Risks and uncertainties also include the impact of any future events with material adverse impacts.