Technology Forum Review
by Fu Tai Liou, Chief Officer of Worldwide Sales and Marketing

This year’s Technology Forum was a great success. Over 1750 guests attended the U.S. event, and hundreds more came to our Japan and Taiwan Forums. The beat of taiko drums greeted our U.S. Forum guests as they entered, setting the tenor for a dynamic day.

We were privileged to have Dr. Hector Ruiz, president and CEO of AMD, as the keynote speaker. He discussed how business practices are changing in a digital content world increasingly defined by connectivity. During lunch, comedian Don McMillian’s clever technology-based jokes had the audience laughing. The afternoon ended with nearly 60 design and backend vendors participating in the IP Partners’ Pavilion.

Our U.S. Forum set the tone for the following Japan and Taiwan Forums. We were honored to have Mr. Katsuji Fujita, corporate vice president of Toshiba Corporation’s Semiconductor Company, and Mr. M. K. Tsai, chairman of MediaTek Corporation, as the keynote speakers for our Japan and Taiwan Forums, respectively. The three events held around the world each set record attendance levels, and we would like to thank everyone who was able to join us.

The Forums were an opportunity to showcase the great progress we have made in enhancing our technology and customer service offerings in the past year. UMC continues to believe that the foundation of our business is research and development, and our growing investment in this area attests to this commitment.

Naturally, our own success is dependent upon our customers’ success. Our customers continue to develop state-of-the-art products. This quality of our diverse customer base drives us to successfully introduce higher performance process technology well ahead of the industry roadmap year after year. We expect to continue this performance, as customer satisfaction is our top priority.

Over the past year, we have deepened our understanding of our customers’ needs. From this insight, we are determined to increase our customers’ productivity through better manufacturing services. We are pleased to have presented UMC’s exciting new developments to you and expect even better things to come for 2003.
2002 Forum: Technology Leadership
by Frank Wen, Head of Central Research and Development

At UMC, we believe that we can best serve our customers by constantly pushing the forefront of technology to provide the latest market-driven and customer-focused solutions. Consequently, R&D is a priority here, and we are constantly reviewing our operations to ensure that we are delivering the desired results. Recently, we reorganized our R&D teams by merging our Fab 8D operations into our Central R&D division. This move better focuses our resources so that we can continue to provide the high quality, cost effective manufacturing with the leading edge, solid technologies you have come to expect us to provide.

Smaller Geometries

This focus enables us to continue to extend our technical superiority. Already, 30 different customers have used our 0.13um process to produce 78 products, and 19 suppliers have performed 109 tape outs.

For future process development, UMC is actively working on new materials that promise significant performance enhancements. With our 90nm process, we are incorporating silicon-on-insulator (SOI) substrates in addition to standard bulk. Our 90nm CMOS process will also offer a partially depleted SOI option, while at 65nm, we need to consider fully depleted SOI as an important aspect of this technology generation’s enhancement. Strained silicon and double gate devices will need to be considered for our 45nm CMOS device structures. Our 90nm MPU process will feature SOI as a standard feature, while SOI will be an option possibility for our 65nm Cu/low K logic process. We are very excited about the performance gain data of our strained silicon samples in tests conducted at our lab. The strained silicon samples showed an obvious improvement in its transconductance when compared to our bulk samples.

We have been successful at integrating copper interconnects and low k dielectrics with a k value of 2.7 at the 0.13um technology node. We expect to have the same k value with our 90nm process, and will lower the k value even further to 2.2 when we reach our 65nm technology node.

Our technology leadership is a testament to the benefits of aggressively spending on R&D year after year. In the past five years, we have spent US$743 million on R&D, and $245 million last year alone. The ratio of R&D spending to sales has averaged 8.6%. This drive is reflected in the impressive number of U.S.
2002 Technology Summary

- Full copper 0.13µm with true low-k in production NOW!
- 90nm node pilot production in 1Q2003
- 65nm and 45nm nodes in development
- SOI and strained-Si in development for MPU/GPU
- Working together with customers on 0.13µm embedded DRAM and 1T SRAM
- Good progress made on 0.18µm SiGe BiCMOS for RF applications

In sum, we are offering a complete technology platform for overall SOC solutions.
AMCC Capitalizes on UMC's 0.13um CMOS Process

Applied Micro Circuits Corp. (AMCC) and UMC's coordinated efforts together have resulted in several 0.13um CMOS optical networking devices already sampling. Among the devices being manufactured in volume using UMC's 0.13um process technology with 8 copper layers and true low-k dielectrics are the nPX8005, a switch fabric announced last quarter that is optimized for Metro Access and Metro Core switching applications, and the S3485, the industry's lowest power OC-48 transceiver.

"UMC has delivered on the promise of 0.13-micron CMOS process technology — to provide low power, high integration with a focus on total cost optimization at very high performance levels," said Brent Little, senior vice president of marketing for AMCC. The company has used UMC's technologies “to maximize semiconductor value for our customers in the high-bandwidth communications space with world-class silicon solutions," he added. "The availability of several CMOS silicon solutions further demonstrates UMC's leadership in the 0.13um CMOS process technology movement, and its commitment to AMCC as a highly strategic customer.”
MIPS Technologies and UMC Announce Licensing and Co-Marketing Agreement

Microprocessor Report's Analysts' Choice Award for Best High Performance Processor Core in 2001, MIPS Technologies' 64-bit 20Kc™ core, is now licensed to UMC. MIPS' next-generation core, code-named "Amethyst," will also be licensed to UMC. "We are pleased that UMC will be the first foundry to offer a 90nm process-optimized version of [this core]," said Kevin Meyer, vice president of marketing at MIPS Technologies. The 20Kc™ core, currently the industry's highest performance licensable core, is being ported to UMC's 0.13um process.

Applications for these cores include networking, multimedia, automotive telematics and office automation. The 20Kc™ core features a dual-issue, superscalar, 7-stage pipeline. Its 64-bit dual-issue integer capability and double-precision IEEE-754 floating-point unit (FPU) allow performances of 1020 Dhrystone 2.1 MIPS (without inlining) and peak 2.4 Gflops at 600 MHz. SIMD (single-instruction, multiple data) instructions in the FPU greatly accelerate the processing of large data streams, eliminating the need for a separate DSP and thereby lowering the cost of the end product. In addition, the MIPS®32- and 64-bit architectures are fully compatible. This enables customers with 32-bit MIPS-based™ products to seamlessly transition to these new 64-bit cores and preserve all of their software investment.

Ricoh and UMC Broaden Long-term Manufacturing Partnership

Ricoh has successfully developed a highly specialized ASIC, based on UMC's 0.13um copper/low-k technology, for image processing equipment. Although Ricoh Electronic Device Company operates their own manufacturing facilities, Dr. Terumoto Nonaka, president of Ricoh noted, "our latest generation of advanced products requires the industry's most cutting-edge process technologies. UMC is the perfect choice for Ricoh's advanced products to prove its leading technology in 0.13um process has been producing 0.18um products for Ricoh since May 2001.

UMC provided supporting design services including 0.13um libraries, IP resources, and integrated design rules, while Ricoh shared its product data and worked together with UMC engineers to achieve first silicon success. Said Nonaka, "We have been working with UMC for quite some time for our 0.18um based products and are pleased to be able to make the successful migration to 0.13um. We also expect to extend our existing and future product manufacturing to UMC's other worldwide production facilities, creating a win-win situation for both our companies through a more diversified manufacturing base." Mass production for the chip is expected to begin in August.
Matrox's Parhelia™-512 graphics chip made using UMC's 8-layer 0.15um process technology

Matrox's high-fidelity graphics chip, the Parhelia™-512, is the world's first 512-bit GPU and was made using UMC's 8-layer 0.15um process technology, which allows reasonable power dissipation and manageable die size. "We chose to base Parhelia-512 on an 8-layer 0.15um process technology in order to achieve high-routing density," said Ed Dwyer, executive vice president at Matrox Graphics Inc. The chip's breakthrough rendering platform of 80 million transistors, 256-bit DDR memory interface, and 10-bit Gigacolor Technology gives consumers rich, vibrant, precise colors and sharp graphics. This AGP 4X device supports frame buffers of up to 256MB in size and integrates two 400 MHz MDACs, a TV encoder and support for dual DVI transmitters.

"The constant introduction of ever more sophisticated graphics programs is placing great demand on today's graphics chip companies' to innovate," noted Fu Tai Liou, chief officer of worldwide sales and marketing, UMC.

UMC was chosen to help Matrox deliver the Parhelia-512 within critical market windows "because of its ability to quickly ramp up production and reach a high yield for our extremely complex design," said Dwyer.

SandCraft's SR71040A CPU IC made on UMC's 0.15um Cu Process

Today's highest value IC in terms of performance per dollar available in the MIPS64 architecture, SandCraft's SR71040A CPU chip, is being manufactured on UMC's 0.15um logic copper process. The 600MHz superscalar embedded microprocessor complements SandCraft's flagship SR71010A, the industry's highest performance production released MIPS64 CPU, also fabricated using UMC's 0.15um copper process. Both utilize the same CPU pipeline, with the SR71040A having smaller caches in a lower pin-count package.

SandCraft's SR71040A utilizes various UMC design resources including high-performance bitcells for integrated on-chip memory, which includes 16KB of both primary instruction and primary data cache and 128KB of unified secondary cache. This optimizes system performance while reducing system cost. The SR71040A targets value-oriented applications, including enterprise LANs, Storage Area Network systems, security processing systems, remote aggregation systems such as DSLAMs and wireless head ends, and office automation products such as laser printers and multifunction peripherals.

"We are very pleased to have a strong strategic alliance with UMC. UMC offers leading-edge process technologies as well as an excellent support team allowing SandCraft to push both the performance end of the application spectrum with the SR71010A and value end of the application spectrum with the SR71040A," said Paul Vroomen, president and CEO of SandCraft, a leader in the design of high-performance MIPS® processors.

"We look forward to building on this partnership as we move to 0.13um and 90-nanometer processes."

The two companies have been strategic partners since 2000 and are now working together to develop the next generation of Sandcraft's 800MHz processors based on UMC's 0.13um process that features eight copper layers with true low-k dielectrics.
Synad's Mercury5G, world's First Integrated Two Chip Dual-Band WLAN Chipset Produced on UMC's 0.18um Technology

The world's first two-chip dual band WLAN chipset, Synad's Mercury5G, was recently delivered by UMC to Synad, a fabless chip start-up focused on wireless networking. The integrated chipset is part of Synad’s Mercury5G solution, which enables client interoperability and roaming between 2.4 GHz and 5 GHz wireless local area networks (WLANs). Mercury5G also includes protocol software, operating system drivers, a developers kit and reference designs. The Mercury5G chipset has two devices, a radio-chip (SYRF8100) and modem/MAC-chip (SYBB8200). Both devices have been manufactured on UMC's 0.18um CMOS process, with the RF chip utilizing UMC's RFCMOS enhancements.

"Synad has made a strategic choice in the selection of CMOS technology because of its inherent low cost of manufacture and wide availability. UMC's 0.18um CMOS technology has enabled us to create efficient RF circuits at 5GHz and beyond without compromising performance. [This] is a world first and sets the industry standard for dual band WLAN. UMC's support has been instrumental in our silicon success," said Ashok Dhuna, chief technical officer at Synad.

Mercury5G allows manufacturers to build a dual band client solution at a cost comparable to a single band solution. It exceeds the performance requirements for both the 5 GHz IEEE 802.11a and 2.4 GHz IEEE 802.11b standards. Mercury5G also delivers the architectural flexibility in terms of processor headroom, memory and software structure to support emerging standards such as the IEEE 802.11g.

"UMC recognizes Synad’s leadership in dual band technology. The success of the Mercury5G showcases UMC’s leadership in radio, analogue and mixed-signal 0.18um CMOS technology," said Fu Tai Liou, chief officer of worldwide sales and marketing, UMC.

Mercury5G is based on Synad’s patent pending AgileRF architecture, devised by Synad to deliver client interoperability between IEEE 802.11 standards.

Micronas utilizes UMC manufacturing and technologies

UMC has become the principal supplier of mixed-mode ICs for Micronas, a leading supplier of cutting-edge IC solutions for consumer and automotive electronics, in an agreement that was announced on June 11. Under the terms of the five-year agreement, Micronas will have access to UMC’s advanced technologies and foundry capacity. Micronas' DPS 9450 first pass silicon was successfully presented in April and is now in qualification at UMC, and first engineering lots of the MDE 9500, a single-chip hybrid analog/digital TV decoder, are to be processed soon. Both products use UMC's 0.18um mixed-mode CMOS technology.

"The foundry agreement will put the existing partnership between UMC and Micronas on a solid base," comments Dr. Wolfgang Kalsbach, CEO of Micronas. "Future system solutions on our roadmap will profit from an early access to most advanced technologies."
Xilinx Virtex® FPGA Series Sets Revenue Record

The first product series from a programmable logic company to reach the billion-dollar cumulative revenue mark in less than five years, the Xilinx Virtex® field programmable gate array (FPGA) series is almost entirely manufactured by UMC. Introduced to the market in 1998, the most advanced products in the series are built using the company’s 0.13-micron (130-nanometer) eight layer copper/low-k process.

Rich Sevcik, senior vice president of FPGA products at Xilinx, called UMC’s ability to meet Xilinx’s increasing volume requirements an “essential part of Xilinx’s success.” Said Sevcik, “We are extremely pleased with the excellent die yields and competitive cost structure that UMC continues to deliver. We are looking forward to working with UMC on future developments particularly as we migrate to 90-nanometer and beyond.”

Since Xilinx had such high-volume requirements due to increasing demand for the Virtex series, UMC was able to help the company minimize costs by migrating a large percentage of the company’s production to 300mm wafers. The larger die-sizes of the chips made manufacturing on 300mm wafers particularly ideal.