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AMD Accelerates Energy Efficiency of APUs, Details Plans to Deliver 25x Efficiency Gains by 2020

Design Optimizations, Intelligent Power Management and Heterogeneous System Architecture Advances to Enable AMD to Outpace Historical Energy Efficiency Trend by at Least 70 Percent

DALIAN, CHINA -- (Marketwired) -- 06/19/14 -- ***China International Software and Information Service Fair*** -- AMD (NYSE: AMD) today announced its goal to deliver a 25x improvement in the energy efficiency of its Accelerated Processing Units (APUs) by 2020.[1] Details including innovations that will produce the expected efficiency gains were presented today by AMD's Chief Technology Officer Mark Papermaster during a keynote at the China International Software and Information Service Fair (CISIS) conference in Dalian, China. The "25X20" target is a substantial increase compared to the prior six years (2008 to 2014), during which time AMD improved the typical use energy efficiency of its products more than 10x.[1]

Worldwide, three billion personal computers use more than one percent of all energy consumed annually, and 30 million computer servers use an additional 1.5 percent of all electricity consumed at an annual cost of $14 billion to $18 billion USD. Expanded use of the Internet, mobile devices, and interest in cloud-based video and audio content in general is expected to result in all of those numbers increasing in future years.[2]

"Creating differentiated low-power products is a key element of our business strategy, with an attending relentless focus on energy efficiency," said Papermaster. "Through APU architectural enhancements and intelligent power efficient techniques, our customers can expect to see us dramatically improve the energy efficiency of our processors during the next several years. Setting a goal to improve the energy efficiency of our processors 25 times by 2020 is a measure of our commitment and confidence in our approach."

"The energy efficiency of information technology has improved at a rapid pace since the beginning of the computer age, and innovations in semiconductor technologies continue to open up new possibilities for higher efficiency," said Dr. Jonathan Koomey, research fellow at the Steyer-Taylor Center for Energy Policy and Finance at Stanford University. "AMD has steadily improved the energy efficiency of its mobile processors, having achieved greater than a 10-fold improvement over the last six years in typical-use energy efficiency. AMD's focus on improving typical power efficiency will likely yield significant consumer benefits substantially improving real-world battery life and performance for mobile devices. AMD's technology plans show every promise of yielding about a 25-fold improvement in typical-use energy efficiency for mobile devices over the next six years, a pace that substantially exceeds historical rates of growth in peak output energy efficiency. This would be achieved

through both performance gains and rapid reductions in the typical-use power of processors. In addition to the benefits of increased performance, the efficiency gains help to extend battery life, enable development of smaller and less material intensive devices, and limit the overall environmental impact of increased numbers of computing devices."

Moore's Law states that the number of transistors capable of being built in a given area doubles roughly every two years. Dr. Koomey's research demonstrates that historically, energy efficiency of processors has closely tracked the rate of improvement predicted by Moore's Law.[3] Through intelligent power management and APU architectural advances, in tandem with semiconductor manufacturing process technology improvements and a focus on typical use power, AMD's expects its energy efficiency achievements to outpace the historical efficiency trend predicted by Moore's law by at least 70 percent between 2014 and 2020.

Architecting for Energy-Efficiency Leadership

Like advances in computing performance, advances in power efficiency have historically come along with new generations of silicon process technology that shrink the size of each individual transistor. AMD expects to outpace the power efficiency gains expected from process technology transitions through 2020 for typical use based on successfully executing three central pillars of the company's energy efficient design strategy:

- ***Heterogeneous-computing and power optimization***: Through Heterogeneous System Architecture (HSA), AMD combines CPU and GPU compute cores and special purpose accelerators such as digital signal processors and video encoders on the same chip in the form of APUs. This innovation from AMD saves energy by eliminating connections between discrete chips, reduces computing cycles by treating the CPU and GPU as peers, and enables the seamless shift of computing workloads to the optimal processing component. The result is improved energy efficiency and accelerated performance for common workloads, including standard office applications as well as emerging visually oriented and interactive workloads such as natural user interfaces and image and speech recognition. AMD provides APUs with HSA features to the embedded, server and client device markets, and its semi-custom APUs are inside the new generation of game consoles.
- ***Intelligent, real-time power management***: Most computing operation is characterized by idle time, the interval between keystrokes, touch inputs or time reviewing displayed content. Executing tasks as quickly as possible to hasten a return to idle, and then minimizing the power used at idle is extremely important for managing energy consumption. Most consumer-oriented tasks such as web browsing, office document editing, and photo editing benefit from this "race to idle" behavior. The latest AMD APUs perform real-time analysis on the workload and applications, dynamically adjusting clock speed to achieve optimal throughput rates. Similarly, AMD offers platform aware power management where the processor can overclock to quickly get the job done, then drop back into low-power idle mode.
- ***Future innovations in power-efficiency:*** Improvements in efficiency require technology development that takes many years to complete. AMD recognized the need for energy efficiency years ago and made the research investments that have since led to high impact features. Going forward many differentiating capabilities such as Inter-frame power gating, per-part adaptive voltage, voltage islands, further integration of system components, and other techniques still in the development stage should yield accelerated gains.

Industry analyst firm TIRIAS Research recently reviewed AMD's methodology for measuring its energy efficiency and the plans to achieve a 25x improvement by 2020 and produced a publicly-available white paper detailing their analysis.

"The goal of an energy-efficient processor is to deliver more performance than the prior generation at the same or less power," said Kevin Krewell, analyst at TIRIAS Research. "AMD's plan to accelerate the energy-efficiency gains for its mobile-computing processors is impressive. We believe that AMD will achieve its energy efficiency goal, partially through process improvement but mostly by combining the savings from reducing idle power, the performance boost of heterogeneous system architecture, and through more intelligent power management. With this undertaking, AMD demonstrates leadership in the computing industry, driving innovations for a more energy-efficient future."

Supporting Resources

- TIRIAS Research white paper
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1 Based on typical-use Energy Efficiency as defined by taking the ratio of compute capability as measured by common performance measures such as SpecIntRate, PassMark and PCMark, divided by typical energy use as defined by metrics such as ETEC (Typical Energy Consumption for notebook computers) as specified in Energy Star Program Requirements Rev 6.0 10/2013

2 Energy-efficient computing, The MIT Energy Initiative (MITEI); https://mitei.mit.edu/news/energy-efficient-computing

3 Assessing Trends in The Electrical Efficiency of Computation Over Time, Koomey: https://www.llnl.gov/news/aroundthelab/2010/Nov/attach/koomeyoncomputingtrends-v5.pdf

This press release contains forward-looking statements concerning Advanced Micro Devices, Inc. (the "Company"), including, the ability of the Company to continue to innovate in energy efficiency at a rate necessary to hit its 25X goal by 2020; and its ability to outpace Moore's law by at least 70% with respect to energy efficiency; which are made pursuant to the safe harbor provisions of the Private Securities Litigation Reform Act of 1995. Forward-looking statements are commonly identified by words such as "would," "may," "expects," "believes," "plans," "intends," "projects," and other terms with similar meaning. Investors are cautioned that the forward-looking statements in this press release are based on current beliefs, assumptions and expectations, speak only as of the date of this press release and involve risks and uncertainties that could cause actual results to differ materially from current expectations. Risks include the possibility Material factors that could cause actual results to differ materially from current expectations include, without limitation, the following: that Intel

Corporation's pricing, marketing and rebating programs, product bundling, standard setting, new product introductions or other activities may negatively impact the Company's plans; that the Company will require additional funding and may be unable to raise sufficient capital on favorable terms, or at all; that customers stop buying the Company's products or materially reduce their operations or demand for the Company's products; that the Company may be unable to develop, launch and ramp new products and technologies in the volumes that are required by the market at mature yields on a timely basis; that the Company's third-party foundry suppliers will be unable to transition its products to advanced manufacturing process technologies in a timely and effective way or to manufacture its products on a timely basis in sufficient quantities and using competitive process technologies; that the Company will be unable to obtain sufficient manufacturing capacity or components to meet demand for its products or will not fully utilize its projected manufacturing capacity needs at GLOBALFOUNDRIES' (GF) microprocessor manufacturing facilities; that the Company's requirements for wafers will be less than the fixed number of wafers that it agreed to purchase from GF or GF encounters problems that significantly reduce the number of functional die it receives from each wafer; that the Company is unable to successfully implement its long-term business strategy; that the Company inaccurately estimate the quantity or type of products that its customers will want in the future or will ultimately end up purchasing, resulting in excess or obsolete inventory; that the Company is unable to manage the risks related to the use of its third-party distributors and add-in-board partners or offer the appropriate incentives to focus them on the sale of the Company's products; that the Company may be unable to maintain the level of investment in research and development that is required to remain competitive; that there may be unexpected variations in market growth and demand for its products and technologies in light of the product mix that it may have available at any particular time; that global business and economic conditions will not improve or will worsen; that PC market conditions do not improve or will worsen; that demand for computers will be lower than currently expected; and the effect of political or economic instability, domestically or internationally, on the Company's sales or supply chain. Investors are urged to review in detail the risks and uncertainties in the Company's Securities and Exchange Commission filings, including but not limited to the Quarterly Report on Form 10-Q for the quarter ended March 29, 2014.

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