



## **Renesas Electronics and TSMC Announce 28nm MCU Collaboration for Next-Generation Green and Autonomous Vehicles**

**Tokyo, Japan and Hsinchu, Taiwan, R.O.C., September 1, 2016** — Renesas Electronics Corporation (TSE: 6723, Renesas) and TSMC (TWSE: 2330, NYSE: TSM) today announced that they are collaborating on 28nm (nanometer) embedded flash (eFlash) process technology for manufacturing microcontrollers (MCUs) targeted at next-generation green and autonomous vehicles. The automotive MCUs employing this new 28nm process technology are slated for sample shipment and mass production in 2017 and 2020, respectively.

Renesas and TSMC have collaborated closely on MCUs with on-chip flash memory since the 90nm technology generation. Four years after working together on 40nm MCU platform and production, the two companies are now extending their collaboration to develop 28nm MCUs that pave the way for making future green and autonomous-driving vehicles more efficient and reliable. Through this collaboration, Renesas' highly reliable and fast Metal-Oxide-Nitride-Oxide-Silicon (MONOS) eFlash technology will combine with TSMC's high-performance, low-power 28nm high-K metal gate process technology to produce the world's leading automotive MCUs for a broader range of applications such as autonomous vehicle sensor control, coordinated control among electronic control units (ECUs), fuel-efficient engine control for green vehicles, and highly efficient motor inverter control for electric vehicles.

Next-generation MCUs can fulfill the high performance and demanding safety requirements of future autonomous-driving cars since they enable high-precision sensing using 3D radar to monitor the environment surrounding the vehicle, integration of data from multiple sensors, as well as real-time judgment processing for autonomous operation. ECUs capable of safely



controlling autonomous-driving functionality require next-generation control MCUs that contribute to fast processing of complex control tasks (including fail-operational capabilities, security, and support for coordinated control among multiple ECUs), power efficiency of the overall system, and functional safety. To meet ever stricter emission regulations, fuel-efficient engines for next-generation green vehicles require powerful computing performance to implement new combustion systems as well as robust and large-capacity on-chip flash memory to accommodate larger firmware programs. Furthermore, a growing need for environmental friendliness and longer cruising range in electric vehicles (EVs) and plug-in hybrid vehicles (PHVs) creates demand for MCUs with improved computing performance and greater function integration to enable more efficient and compact motor inverters. There is also a need for large-capacity flash memory to allow more fine-grained support for the environmental regulations and standards of various countries as well as to enable over-the-air (OTA) wireless updating of control programs. In addition, the technology for embedding flash memory with superior performance and excellent safety in MCUs is also needed to implement next-generation control technology for a safe and secure society, for example in industrial fields such as Industry 4.0 and social infrastructure fields.

With the 28nm eFlash process technology developed through this collaboration, MCUs can meet the demands of next-generation automotive computing by delivering a maximum of more than four times the program memory capacity and greater than four-fold performance improvement compared to the current 40nm technology. Other enhancements on the new MCUs include the use of multiple CPU cores, more advanced security, and support for multiple interface standards.

“The auto industry is currently undergoing a major transformation, with next-generation green vehicles and autonomous-driving vehicles on the horizon,” said Ryuji Omura, Executive Vice



President, Renesas Electronics Corporation. “Innovative semiconductor technology is essential to accelerate the development of next-generation automobiles, and I am confident that the collaboration with TSMC on the technology development of next-generation MCUs will deliver enhanced peace of mind regarding the stable supply to our customers into the future. We are committed to building an MCU ecosystem and to continuing to act as a leader in propelling the MCU industry forward.”

“Collaborating with Renesas demonstrates our commitment to offering competitive technologies to achieve maximum value for customers’ products,” said Dr. BJ Woo, TSMC’s Vice President, Business Development. “By leveraging TSMC’s 28nm high-performance, energy-efficient technology, we believe we can showcase how best we optimize one of our advanced technologies to meet the demands and innovation for the next generation of automotive devices and deliver a highly competitive performance/cost advantage.”

#### **About Renesas’ Metal-Oxide-Nitride-Oxide-Silicon (MONOS) embedded flash technology**

MONOS is a structure in which each transistor in the flash cell consists of three layers—oxide, nitride, and oxide—on a silicon base, with a metal control gate at the top. Renesas has accumulated more than two decades of experience in the use of MONOS flash memory technology by providing MCUs for IC cards. Based on the track record in MONOS technology, Renesas successfully extended the technology by developing a split-gate (SG) structure suitable for MCU internal flash memory. The new “SG-MONOS” –type flash memory realizes MCUs with high reliability, high speed and low power consumption.

#### **About Renesas Electronics Corporation**



Renesas Electronics Corporation (TSE: 6723) delivers trusted embedded design innovation with complete semiconductor solutions that enable billions of connected, intelligent devices to enhance the way people work and live—securely and safely. The number one global supplier of microcontrollers, and a leader in Analog & Power and SoC products, Renesas provides the expertise, quality, and comprehensive solutions for a broad range of Automotive, Industrial, Home Electronics (HE), Office Automation (OA) and Information Communication Technology (ICT) applications to help shape a limitless future. Learn more at [renesas.com](http://renesas.com).

### **About TSMC**

TSMC is the world's largest dedicated semiconductor foundry, providing the industry's leading process technology and the foundry's largest portfolio of process-proven libraries, IPs, design tools and reference flows. The Company's owned capacity in 2016 is expected to reach above 10 million (12-inch equivalent) wafers, including capacity from three advanced 12-inch GIGAFAB<sup>®</sup> facilities, four eight-inch fabs, one six-inch fab, as well as TSMC's wholly owned subsidiaries, WaferTech and TSMC China. TSMC is the first foundry to provide both 20nm and 16nm production capabilities. Its corporate headquarters are in Hsinchu, Taiwan. For more information about TSMC please visit <http://www.tsmc.com>.

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