FOR IMMEDIATE RELEASE

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Toshiba Electronic Devices & Storage Corporation

Toshiba Develops DNN Hardware IP for Image Recognition AI Processor Visconti™5 for Automotive Driver Assistance Systems

TOKYO—Toshiba Electronic Devices & Storage Corporation ("Toshiba") today announced the development of Deep Neural Network (DNN [1]) hardware IP[2] that will help to realize advanced driver assistance systems (ADAS) and autonomous driving functions. The company will integrate the DNN hardware IP with conventional image processing technology and start sample shipments of Visconti™5, the next generation of Toshiba's image-recognition processor, in September 2019.

The DNN hardware IP draws on deep learning to deliver more accurate detection and identification of a wider range of objects than image recognition based on conventional pattern recognition and machine learning. It enables Visconti™5 to recognize road traffic

signs and road situations at high speed with low power consumption.

Toshiba will promote Visconti™5 equipped with DNN hardware IP as a key component of next-generation advanced driver assistance systems.

Advanced driver assistance systems such as autonomous emergency braking are now being widely adopted, from luxury cars to subcompacts. They are also expected to offer increasingly advanced capabilities - for instance, the 2020 version of the influential European New Car Assessment Programme (Euro NCAP), the EU-backed safety standard, adds testing to avoid collisions at intersections. This trend will increase the demand for more advanced and capable systems.

Toshiba Electronic Devices & Storage Corporation will continue to develop the Visconti™ family and contribute to traffic safety.

Outline of Visconti™5

Product Series Name	TMPV770 series
CPU core	Arm® Cortex®-A53
	Arm® Cortex®-R4 processor with Floating Point Unit
Image processing DSP	General DSP
Image Processing Accelerator	Affine conversion
	Pyramid Image Generator
	Enhanced CoHOG Feature-based Support Vector Machine
	High-density Optical Flow
	Template Matching
	High-density Stereo Matching
	Deep Neural Network
	Image Signal Processor
Video input interface	MIPI CSI-2 RX
Video output interface	MIPI CSI-2 TX

Notes

[1] DNN: an algorithm modeled after the neural networks of the human brain

[2] IP (Intellectual Property) is a function block for SoC development.

* Arm and Cortex are registered trademarks of Arm Limited (or one of its subsidiaries) in the United States or other countries.

* MIPI is a registered trademark of MIPI Alliance, Inc.

* Visconti^{TM} is a trademark of Toshiba Electronic Device & Storage Corporation

* All other company names, product names and service names may be trademarks of their respective companies.

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About Toshiba Electronics Europe

Toshiba Electronics Europe GmbH (TEE) is the European electronic components business of Toshiba Electronic Devices and Storage Corporation. TEE offers European consumers and businesses a wide variety of innovative hard disk drive (HDD) products plus semiconductor solutions for automotive, industrial, IoT, motion control, telecoms, networking, consumer and white goods applications. The company's broad portfolio encompasses integrated wireless ICs, power semiconductors, microcontrollers, optical semiconductors, ASICs, ASSPs and discrete devices ranging from diodes to logic ICs.

TEE has headquarters in Düsseldorf, Germany, with branch offices in France, Italy, Spain, Sweden and the United Kingdom providing design, manufacturing, marketing and sales. Company president is Mr. Tomoaki Kumagai

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