

Electronic Devices and Components

64 Gbit NAND Flash Memory Fabricated Using Second-Generation 19 nm Process

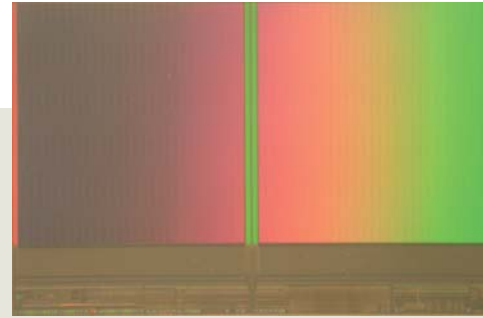
NAND flash memory is widely used in various consumer electronic devices, including memory cards, smartphones, tablets, and notebook PCs. It is also becoming more pervasive in enterprise applications such as data center solid-state drives (SSDs).

Against this background, Toshiba has developed the world's smallest 2-bit-per-cell 64 Gbit NAND flash memory chip^(*) with an area of only 94 mm² in collaboration with SanDisk Corporation. The newly developed NAND flash memory is fabricated using the second-generation 19 nm process.

Because of the use of the second-generation 19 nm process and innovations in peripheral circuits, the newly developed NAND flash memory chip is approximately 17% smaller than its first-generation 19 nm predecessor.

Furthermore, the second-generation chip incorporates a unique high-speed write algorithm, achieving a write speed of up to 25 Mbytes per second, the world's fastest class for 2-bit-per-cell NAND flash memory chips^(*).

(*) As of May 2013 (as researched by Toshiba)



World's smallest 64 Gbit NAND flash memory chip

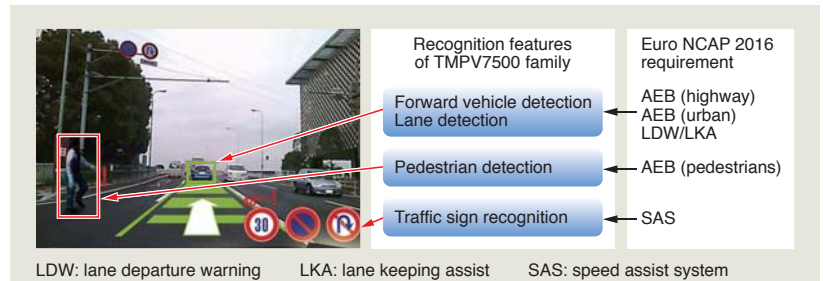
TMPV7500 Image Recognition Processor Family for Various Applications

The automotive image recognition market is expanding as advanced driver assistance systems rapidly become pervasive and the European New Car Assessment Program (Euro NCAP) now includes autonomous emergency braking (AEB) in safety tests.

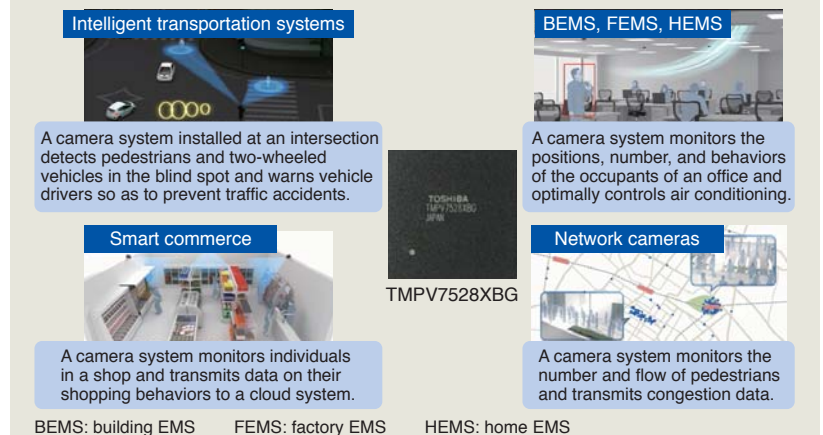
In response to these circumstances, Toshiba has developed the TMPV7528XBG image recognition processor incorporating two ARM[®] Cortex[™]-A9 MPCore[™] processors with a single/double-precision floating-point processing unit, as a new addition to the low-power-consumption and high-performance TMPV7500 family.

The TMPV7528XBG not only improves image recognition performance but also makes software development easier. Therefore, it makes new, non-automotive applications possible. Its applications include systems integrating car navigation and automotive communication functions, building and factory energy management systems (EMS), surveillance camera systems with personal authentication capability, and digital signage systems.

ARM, Cortex, and MPCore are trademarks or registered trademarks of ARM Limited.



Recognition features of TMPV7500 family compliant with Euro NCAP 2016

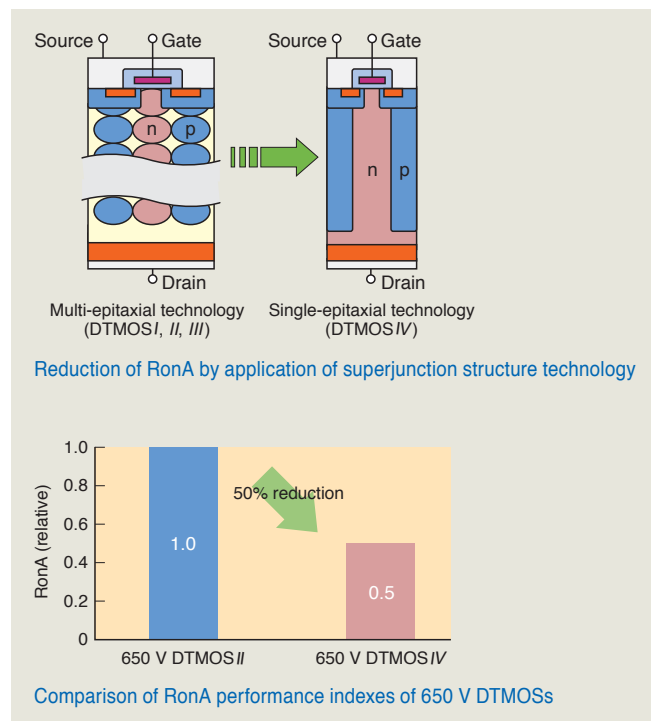


Applications of TMPV7500 family

Fourth-Generation 650 V DTMOS_{IV} Series

Toshiba has developed the 650 V DTMOS_{IV} series as the fourth generation of its deep-trench metal-oxide-semiconductor (DTMOS) series of high-voltage power MOS field-effect transistors (MOSFETs) with a superjunction structure. The DTMOS_{IV} series is designed to provide sufficient voltage margins for switching power supplies aimed at emerging nations where the electricity supply is unstable, as well as for light-emitting diode (LED) lighting applications and inverters for photovoltaic power generation systems.

The 650 V DTMOS_{IV} series is fabricated using a single-epitaxial technology, as is the case with the 600 V DTMOS_{IV} series that is already available for mass-production quantities. The 650 V DTMOS_{IV} series provides even higher performance, with approximately half the on-resistance per unit area (RonA) of the previous 650 V DTMOS_{II} series. The reduction in RonA allows the newly developed devices to be housed in smaller packages, making it possible to reduce the power loss of switching power supplies.



Expanded Lineup of SSDs for Enterprise Use

Toshiba has launched the PX02SS series of enterprise solid-state drives (SSDs) featuring high performance and high endurance. Available in capacities of up to 800 Gbytes, these SSDs have a Serial Attached SCSI (SAS) interface with a data transfer speed of 12 Gbit/s and deliver 24/7 operation. The PX02SS series provides a higher 4 KiB random write performance of 42 000 input/output operations per second (IOPS) compared with the 27 000 IOPS of the standard PX02SM series. In addition, the PX02SS series has an endurance rating of up to 30 drive writes per day (DWPD)^(*), compared with the 10 DWPD of the PX02SM series.

The PX02SM series was a recipient of the METI Commerce and Information Policy Bureau Director-General's Award of the Green IT Awards 2013. The PX02SM series was recognized not only for its high transfer speeds and large storage capacities but also for its design for reduced environmental impact.

We will continue to meet diverse market needs with our extensive lineup of enterprise SSDs, including the high-speed and high-endurance PX02SS series, the mainstream PX02SM series, the read-intensive PX03SN series, and the HK3R series equipped with a Serial Advanced Technology Attachment (SATA) interface providing a 6 Gbit/s data transfer speed.



1 Gbyte: 10⁹ = 1 000 000 000 bytes 1 Gbit: 10⁹ = 1 000 000 000 bits
 1 KiB (kibibyte): 2¹⁰ = 1 024 bytes 24/7: 24 hours per day, 7 days per week
 METI: Ministry of Economy, Trade and Industry, Japan SCSI: Small Computer System Interface

(*) One full drive write per day means that the drive can be written and rewritten to its full capacity once a day every day for five years, the stated product warranty period. Actual results may vary with system configurations, usage, and other factors.

FFSA New Type Structured Array

As a new system LSI solution, Toshiba has released the Fit Fast Structured Array (FFSA) fabricated with the latest process node that can contribute to reductions in development time and cost. Combining high-speed performance and low power dissipation, FFSA helps to attain the performance and power dissipation goals that have been difficult to realize with field-programmable gate arrays (FPGAs). FFSA has a metal-configurable architecture and offers a wide selection of intellectual property (IP) cores. In addition, a high-performance serializer/deserializer (SerDes) core is embedded on-chip.

Design teams can utilize industry-standard electronic design automation (EDA) tools to shorten design turnaround time.

We have set up a dedicated website called the FFSA Center (<https://www.ffsa.semicon.toshiba.co.jp/>), which offers various menus such as price estimation, technical document downloads, and interactive design assistance.

LSI: large-scale integration



Evaluation board for FFSA with on-chip SerDes

Thin Camera Module for Smartphones and Tablets

In response to the growing popularity of thin smartphones and tablets, Toshiba has developed the industry's thinnest camera module^(*1) with a height of 4.7 mm for smartphone and tablet applications. The newly developed camera module has a 13-megapixel complementary MOS (CMOS) image sensor with a 1/3-inch optical format and a custom companion LSI chip for image preprocessing such as distortion correction and image restoration.

The height of a conventional camera module can be reduced relatively easily by decreasing the number of plastic lenses from five to four. However, this could cause lens distortion^(*2) and modulation transfer function (MTF)^(*3) degradation in the corners of an image. Our newly developed companion LSI chip is designed to correct both lens distortion and MTF degradation. As a result, the new camera module achieves both high image resolution and a thin form factor.

(*1) As of March 2013 (as researched by Toshiba)

(*2) A type of lens aberration resulting in distortion of the image at the periphery

(*3) An optical resolution index



1/3-inch 13-megapixel camera module for smartphones and tablets

Rapid Food-Borne Pathogen Detection System Using Electrochemical DNA Chips

The mainstream method for food-borne pathogen testing still requires the complicated and time-consuming process of pathogen cultivation. Demand has therefore been growing for new technologies that can detect food-borne pathogens rapidly and efficiently in line with the greater emphasis on food safety and security in recent years.

As a solution to this issue, Toshiba has developed an automatic deoxyribonucleic acid (DNA) detection technology for food-borne pathogen testing called the DNA chip card, using electrochemical DNA chips to improve the complicated process of genetic testing. We have conducted verification tests using DNA chip cards and confirmed that 15 major types of food-borne pathogens can be detected rapidly and efficiently by this system.

This system is contributing not only to prompt investigations into the causes of food-borne illnesses and prevention of the further spread of infection, but also to safe and secure manufacturing through application to hygiene management in the food, pharmaceuticals, and cosmetics fields.



Rapid food-borne pathogen detection system using DNA chip cards

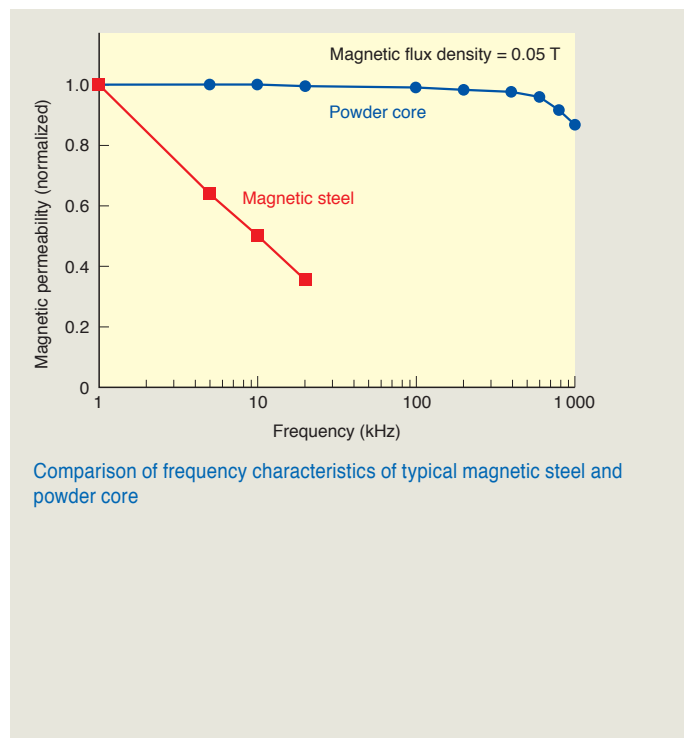
Powder Core with Low Magnetic Loss for Valve Reactors in HVDC Transmission Systems

High-voltage direct-current (HVDC) transmission systems and frequency conversion stations are operating throughout Japan to secure the reliability of the country's electricity supply. These facilities allow interchange of power between 50 Hz and 60 Hz alternating-current (AC) networks, and help to reduce power generation costs and balance the electrical load over a larger network.

These facilities utilize optical thyristor valves for conversion between AC and DC. Valve reactors protect the optical thyristor valves from abrupt changes in excessive pulse current. Their powder cores are required to have low magnetic permeability loss.

Toshiba Materials Co., Ltd. has developed a new material that successfully maintains the magnetic permeability loss at less than 5% in the frequency range up to 600 kHz. This has been achieved by optimizing the powder characteristics and the powder insulation process. The newly developed powder core will be employed in valve reactors for submarine HVDC transmission between Italy and Montenegro.

We will continue to enhance the performance of this powder core to further increase the global sales of our DC power transmission business.



Comparison of frequency characteristics of typical magnetic steel and powder core