



# TOSHIBA GLOBE



January 2013



|   |         |
|---|---------|
| <b>Toshiba Develops Tetrapod Robot to Carry out Risky Work</b>                      | page 2  |
| <b>Toshiba Constructing Cutting Edge Global Power Engineering Center</b>            | page 4  |
| <b>Distributing Smartphone App for "FlashAir™", the SDHC Memory Card...</b>         | page 6  |
| <b>Toshiba to Launch Ultra-small Package Low-noise 200mA LDO Regulator...</b>       | page 8  |
| <b>Toshiba Launches New N-channel Low ON-Resistance MOSFETs</b>                     | page 10 |
| <b>Toshiba's New STT-MRAM Memory Element Promises World's Best...</b>               | page 11 |
| <b>Toshiba Launches New CMOS Multi-function Gate Logic Ics</b>                      | page 13 |
| <b>Toshiba Collaborating in Development of Wireless Power System IC</b>             | page 14 |
| <b>Toshiba Launches New Ultra-small Photorelay</b>                                  | page 16 |
| <b>Toshiba to Start Sales of White LED Packages</b>                                 | page 17 |
| <b>Toshiba Develops compact MOS-Varactor Simulation Model for Development...</b>    | page 18 |
| <b>Toshiba to Launch CompactFlash® Memory Card f. Digital Single Lens Reflex...</b> | page 19 |
| <b>Toshiba Launches Compact ESD Protection Diodes supporting High-speed...</b>      | page 21 |
| <b>Toshiba Launches Highly Sensitive 20MP BSI CMOS Image Sensor</b>                 | page 22 |
| <b>Toshiba Announces Cryptographic-erase and Self-encryption Features...</b>        | page 23 |
| <b>Toshiba to Showcase Lifestyle and Entertainment Technologies at CES 2013</b>     | page 24 |
| <b>Toshiba Launches New IGBT/MOSFET Gate Drive Photocoupler</b>                     | page 25 |
| <b>Toshiba Hybrid Drive Honored with Visionary Award at 2013 Storage Visions™</b>   | page 26 |
| <b>Toshiba Launches Ultra-Low Power Consumption Photorelay</b>                      | page 27 |

Information in the news releases, including product prices and specifications, content of services and contact information, is current on the date of the press announcement, but is subject to change without prior notice.

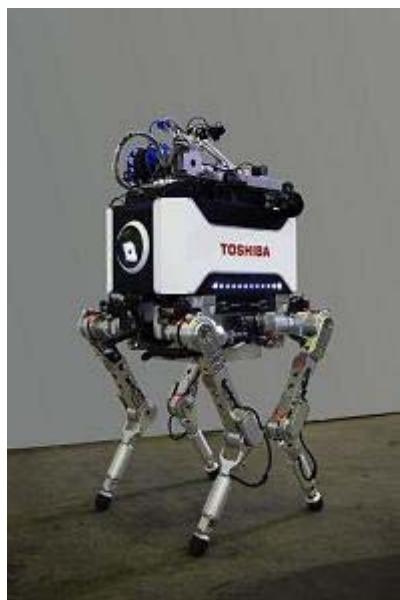
Source: <http://www.toshiba.co.jp> (if not indicated otherwise)

**TOSHIBA**  
Leading Innovation >>>



21<sup>st</sup> November 2012

## Toshiba Develops Tetrapod Robot to Carry out Risky Work



tetrapod robot



second camera

TOKYO—Toshiba Corporation (TOKYO:6502) today announced that it has developed a tetrapod robot able to carry out investigative and recovery work in locations that are too risky for people to enter, such as Tokyo Electric Power Plant Fukushima No.1 Nuclear power plant.

The new robot integrates a camera and dosimeter and can investigate the condition of nuclear power plants by remote-controlled operation. The multiple joints of its legs are controlled by a dedicated movement algorithm that enables the robot to walk on uneven surfaces, avoid obstacles and climb stairs, securing access into areas that is challenging to be reached by wheeled robots or crawlers. The robot also has a folding arm that can release a companion smaller robot that mounts a second camera. This can be launched from the main robot and positioned to take images of narrow places and any equipment behind them, and tubes and other places that are too small for the robot to enter. It is connected to the main robot by a cable.

Toshiba will continue research and development on capabilities and operation of the robot so as to enable it to position and install shielding, stop flows of water and remove obstacles.



# TOSHIBA GLOBE



## Toshiba Develops Tetrapod Robot to Carry out Risky Work

-continued

### Outline of the tetrapod robot

|                  |                                    |
|------------------|------------------------------------|
| Weight:          | 65kg                               |
| Size:            | 624mm (L) x 587mm (W) x 1066mm (H) |
| Power Source:    | Battery                            |
| Battery time:    | 2 hours (continuous use)           |
| Weight Capacity: | 20kg                               |
| Walking Speed:   | 1km/h                              |
| Operation:       | Wireless remote control            |
|                  |                                    |

### Outline of the second camera

|               |                                      |
|---------------|--------------------------------------|
| Weight:       | 2kg                                  |
| Size:         | 313mm (L) x 327mm (W) x 47mm (H)     |
| Power Source: | Battery                              |
| Battery time: | 1 hour                               |
| Speed:        | 200m/ h                              |
| Operation:    | cable connection with the main robot |



# TOSHIBA GLOBE



27<sup>th</sup> November 2012

## Toshiba Constructing Cutting Edge Global Power Engineering Center Will meet growing worldwide demand with higher quality engineering services



TOKYO—Toshiba Corporation (Tokyo: 6502) today announced that the company will start construction of a thermal, hydro and renewable power engineering center at its Keihin Product Operations in Yokohama, Japan. Scheduled to start operation in January 2014 and to operate as a global hub for key manufacturing-related functions, the new center will carry out engineering, design, procurement and production control, and will enhance Toshiba's overall engineering capabilities. It will also allow Toshiba to raise the level of its cooperation with and support for its overseas operations and international customers and to boost its competitiveness in the global market.

Toshiba anticipates growing demand for power generation systems in the global market, particularly for thermal and hydro power generation equipment in the emerging economies. The state-of-the-art engineering center will ensure the company is able to respond. Once completed, it will be home to 1,500 engineers, operate 24 hours a day, and its equipment will include the advanced CAD systems.

The building, a five storey, steel frame structure, is designed to withstand natural disasters and to secure assets and business continuity. Its features include an earthquake-resistant structure, the protection of flood barriers and an emergency, off-grid power generation system.

Toshiba is promoting power systems and related operations as key strategic businesses and reinforcing its capabilities in these areas with upgraded facilities. The company established a new nuclear power engineering center at its Isogo facility in Yokohama in November 2009 and is currently constructing a smart community center in Kawasaki that will start operation in October 2013.

The new engineering will collaborate closely with Toshiba's Fuchu Complex in Japan and overseas manufacturing operations in India and China and ensure that Toshiba Group is able to deliver total solutions for thermal, hydro and renewable energy generation at the global level.



# TOSHIBA GLOBE



## Toshiba Constructing Cutting Edge Global Power Engineering Center

- continued



Artist's impression of global engineering center

### Outline of new global engineering center

|                        |  |
|------------------------|--|
| Address:               | 2-4, Suehiro-cho, Tsurumi-ku, Yokohama, Kanagawa |
| Structure:             | Steel frame (earthquake resistant structure)     |
| Total Floor Area:      | Approximately 22,388 square meters               |
| Occupancy:             | Approximately 1,500 employees                    |
| Start of Construction: | December 2012                                    |
| Scheduled Opening:     | January, 2014                                    |



# TOSHIBA GLOBE



4<sup>th</sup> December 2012

## Distributing Smartphone App for "FlashAir™", the SDHC Memory Card with Embedded Wireless LAN Communications



TOKYO-Toshiba Corporation (TOKYO: 6502) has created and is distributing an application that simplifies and enhances wireless data transfers between smartphones and "FlashAir™", the SDHC memory card with embedded wireless LAN functionality. The app, "FlashAir", is currently available free of charge for Android devices through Google Play™ and an iOS version is scheduled for launch in spring next year.

The app makes wireless connections between Android devices and the Card easier and quicker to execute. A list of files and folders stored on the card are displayed and they can be downloaded selectively or as a batch.

### About "FlashAir™"

"FlashAir™" is an SDHC Memory Card that incorporates a wireless LAN chip set plus antenna for wireless communications. The Card supports wireless sharing and transfers of photos from digital cameras to smartphones and tablets. "FlashAir™" was launched in Japan in March this year and is a hit with consumers.

- Follow this link for more on "FlashAir™":  
<http://www.toshiba.co.jp/p-media/wwsite/flashair.htm>





# TOSHIBA GLOBE



## Distributing Smartphone App for "FlashAir™", the SDHC Memory Card with Embedded Wireless LAN Communications

- continued

### About "FlashAir™"

|                        |  |
|------------------------|--|
| Name                   | "FlashAir"   |
| App icon               |    |
| App screenshots        | See attached screenshots.  |
| Compatible OS versions | Android devices with Android 2.2 - Android 4.0   |
| Downloading procedure  | Download from Google Play web site.<br><a href="https://play.google.com/store/apps/details?id=jp.co.toshiba.android.FlashAir&amp;hl=en">https://play.google.com/store/apps/details?id=jp.co.toshiba.android.FlashAir&amp;hl=en</a> |

- This app is in a beta release.
- Android™ and Google play™ is a trademark of Google Inc.
- FlashAir™ is a trademark of Toshiba Corporation.



# TOSHIBA GLOBE

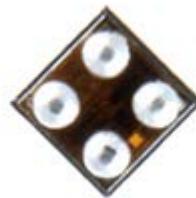


6<sup>th</sup> December 2012

## Toshiba to Launch Ultra-small Package Low-noise 200mA LDO Regulator for Mobile Devices

### TCR2DG Series achieves low-noise, high ripple rejection ratio, and excellent responsiveness under high-speed loads

TOKYO-Toshiba Corporation (TOKYO: 6502) will launch a 200mA output single LDO regulator fabricated with a newly developed micro-CMOS process. Its features include low-noise output, high ripple rejection ratio, excellent responsiveness under high-speed loads and low drop-out.



The new LDO regulator achieves a low-noise output of  $18\mu\text{Vrms}$  (2.5V output), an excellent ripple rejection ratio of 62dB at high frequency (2.5V output,  $f = 10\text{kHz}$ ), excellent responsiveness under high-speed loads of  $\Delta V_{\text{OUT}} = \pm 65\text{mV}$  ( $I_{\text{OUT}} = 1\text{mA} \leftrightarrow 50\text{mA}$ ,  $C_{\text{OUT}} = 1.0\mu\text{F}$ ), and low drop-out characteristics of 80mV (2.5V output,  $I_{\text{OUT}} = 100\text{mA}$ ).

Integration into an ultra-small W CSP4 package (0.79mm x 0.79mm x 0.5mm) ensures suitability for applications demanding high-density packaging, such as mobile devices.

Samples are available now and mass production is scheduled to start in January.

### Applications

Mobile phones, tablet PCs, portable audio players, digital cameras, digital video cameras and other small mobile devices



# TOSHIBA GLOBE



## Toshiba to Launch Ultra-small Package Low-noise 200mA LDO Regulator for Mobile Devices

- continued

### Key Features

#### 1. Low noise output

VNO = 20 $\mu$ Vrms (typ.) at 3.0V output, IOUT = 10mA, 10 Hz < f < 100kHz

VNO = 18 $\mu$ Vrms (typ.) at 2.5V output, IOUT = 10mA, 10 Hz < f < 100kHz

VNO = 14 $\mu$ Vrms (typ.) at 1.2V output, IOUT = 10mA, 10 Hz < f < 100kHz

#### 2. High ripple rejection ratio

RR = 75dB (typ.) at 2.5V output, IOUT = 10mA, f = 1kHz

RR = 62dB (typ.) at 2.5V output, IOUT = 10mA, f = 10kHz

RR = 50dB (typ.) at 2.5V output, IOUT = 10mA, f = 100kHz

#### 3. High-speed load transient response

$\Delta$ VOUT =  $\pm$ 65mV (typ.) at IOUT = 1  $\leftrightarrow$  50mA, COUT = 1.0 $\mu$ F

#### 4. Low drop-out voltage

VIN-VOUT = 80mV (typ.) at 2.5V output, IOUT = 100mA

5. The voltage-clamp type output voltage can be set between 1.2V and 3.6V in increments of 50mV.

6. Output voltage accuracy:  $\pm$ 1.0%

7. Built-in over-current protection circuit

8. Built-in over-temperature protection circuit

9. Ultra-small package contributes to reductions in space required.

Follow this link for more on this product.

[http://www.semicon.toshiba.co.jp/eng/product/selection/topics/1264512\\_2398.html](http://www.semicon.toshiba.co.jp/eng/product/selection/topics/1264512_2398.html)



# TOSHIBA GLOBE

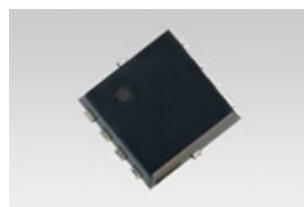


7<sup>th</sup> December 2012

## Toshiba Launches New N-channel Low ON-Resistance MOSFETs

Latest 8th generation process products for use in lithium-ion battery protection circuits and mobile phone power management switches

TOKYO-Toshiba Corporation (TOKYO: 6502) has launched a low ON-resistance MOSFET, TPN2R503NC, fabricated with the latest 8th generation process, for use in lithium-ion battery protection circuits and mobile phone power management switches. Two other 8th-generation products, TPN4R203NC and TPN6R303NC, have also been added to the line-up as successors to existing models. All three products can contribute to the reduction of device thickness and overall size and improve efficiency.



### Applications

1. Lithium-ion battery protection circuits
2. Mobile phone power management switches

### Key Features

1. Lower ON-resistance over existing Toshiba secured with the latest 8th generation process.
2. TSON Advance package, which offers good heat radiation performance
3. High avalanche resistance.

\*Follow this link for more on this product.

[http://www.semicon.toshiba.co.jp/eng/product/transistor/selection/topics/1265359\\_2470.html](http://www.semicon.toshiba.co.jp/eng/product/transistor/selection/topics/1265359_2470.html)



# TOSHIBA GLOBE



10<sup>th</sup> December 2012

## **Toshiba's New STT-MRAM Memory Element Promises World's Best Power Consumption and to Outperform SRAM Cuts power consumption of mobile processor by two-thirds**

TOKYO—Toshiba Corporation (TOKYO: 6502) today announced that the company has developed a prototype memory element for a spin transfer torque magnetoresistive random access memory (STT-MRAM) that achieves the world's lowest<sup>1</sup> power consumption yet reported, indicating that it has the potential to surpass the power consumption efficiency of SRAM as cache memory.

Like all digital products, mobile devices, including smartphones and tablet PCs, rely on high-speed memory to supply the main processor with essential instructions and frequently requested data. Until now SRAM has provided the cache-memory solution. However, improving the performance of SRAM to match advances in mobile products results in increasing current leakage, both during operation and in standby mode, degrading power performance.

MRAM, a next-generation memory based on magnetic materials, has emerged as an alternative to SRAM because it is non-volatile, cutting leak current during standby status. However, until now MRAM power consumption has exceeded that of SRAM, throwing up a major barrier to practical application.

Toshiba's new memory element advances the company's pioneering work in STT-MRAM and overcomes the longstanding operating trade-off by securing improved speed while reducing power consumption by 90 percent<sup>2</sup>. The improved structure is based on perpendicular magnetization<sup>3</sup> and takes element miniaturization to below 30nm. Introduction of this newly designed "normally-off" memory circuit with no passes for current to leak into cuts leak current to zero in both operation and standby without any specific power supply management.

Toshiba has confirmed the performance of the new STT-MRAM memory element with a highly accurate processor simulator. This modeled application of an STT-MRAM integrating the memory as cache memory and recorded a two-thirds reduction in power consumption by a standard mobile chip set carrying out standard operating functions, a result confirming that the new MRAM element has the lowest power consumption yet achieved. This clearly points the way toward the first MRAM with the potential to surpass SRAM in practical operation.

Going forward Toshiba expects to bring the new memory element to STT-MRAM cache memory for mobile processors integrated into smartphones and tablet PCs, and will promote accelerated research and development toward that end.



# TOSHIBA GLOBE



## Toshiba's New STT-MRAM Memory Element Promises World's Best Power Consumption and to Outperform SRAM

- continued

This work includes results from the "Normally-off Computing" project funded by Japan's NEDO (New Energy and Industrial Technology Development Organization). Toshiba will present three papers on the new STT-MRAM and its technologies on December 11 and 12 at IEDM, the International Electron Device Meeting held by IEEE in San Francisco from December 10.

### Notes:

1. As of December 10, 2012. Source: Toshiba Corporation.
2. Comparison with the data of STT-MRAM University of Minnesota and colleagues announced the paper of 2012.
3. Magnetization perpendicular to the magnetic layer. This can be reversed at a lower energy level than in-plane magnetization, making it possible to program data at a lower current and fabricate smaller transistors. Toshiba developed the world's first perpendicular MRAM in 2007.

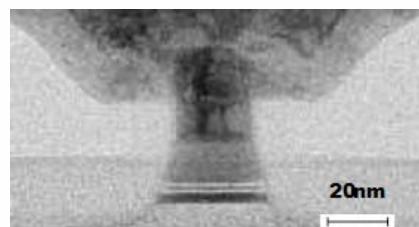


Figure 1: Cross-section of memory element of Toshiba's perpendicular magnetization type STT-MRAM

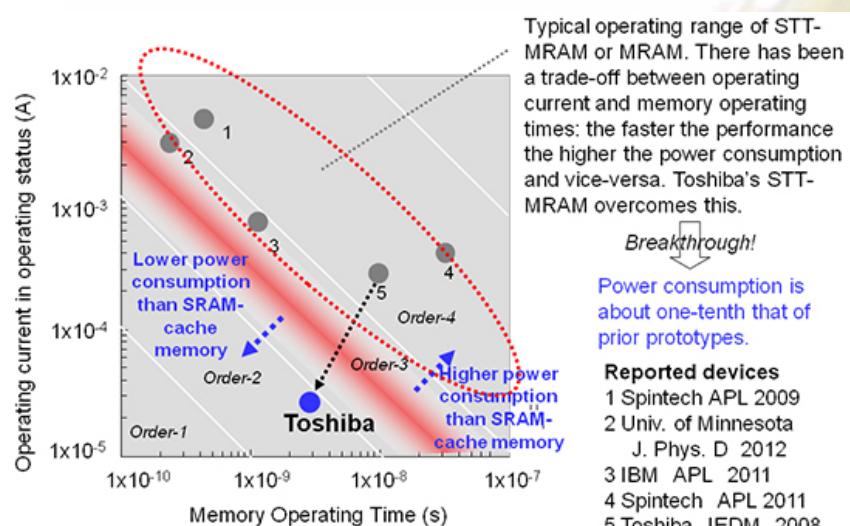


Figure 2: Relationship between MRAM processing speed and power consumption

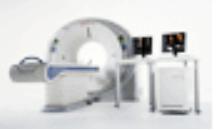


# TOSHIBA GLOBE



10<sup>th</sup> December 2012

## Toshiba Launches New CMOS Multi-function Gate Logic Ics Supports 5V systems in a small package especially suitable for mobile devices



TOKYO-Toshiba Corporation (TOKYO: 6502) has launched a new series of CMOS multi-function gate logic devices that support 5V systems and that are housed in small packages suitable for mobile devices such as mobile phones, smartphones, tablet PCs, digital cameras and digital video cameras.

Multifunction gate logic ICs allows users to select one from multiple gate functions, depending on the processing status of input signals. The new SZ series, based on Toshiba's existing low voltage drive multi-function gate logic SP series, extends support to 5V systems. Also added to the line-up is the SZT Series, a TTL-input-type device that secures level translation from low-voltage systems. A Schmitt trigger circuit is used for all input. The new products are in small MP6 packages (1.0mm x 1.45mm x 0.55mm) that support the requirements of small mobile devices.

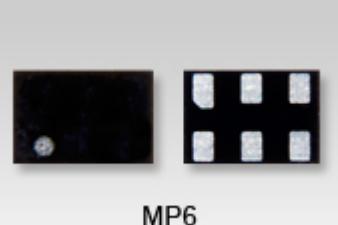
Samples will be available in January with mass production scheduled to start in March.

### Applications

General-purpose products for a variety of applications, but particularly suited to small mobile devices, such as mobile phones, smartphones, tablet PCs, digital cameras and digital video cameras.

### Key Features

1. Multiple basic gate functions are selectable with one product.
2. Small MP6 package (1.0mm x 1.45mm x 0.55mm) achieves a smaller mounting area.
3. Operating power-supply voltage: VCC=1.65 to 5.5V
4. 5.5V input tolerant function
5. Power down protection function (for all input pins)



MP6

\*Follow this link for more on this product.

[http://www.semicon.toshiba.co.jp/eng/product/logic/selection/topics/1265425\\_2333.html](http://www.semicon.toshiba.co.jp/eng/product/logic/selection/topics/1265425_2333.html)

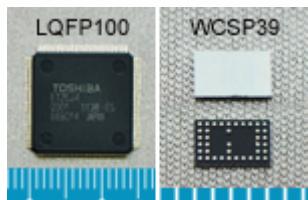


# TOSHIBA GLOBE



12<sup>th</sup> December 2012

## Toshiba Collaborating in Development of Wireless Power System IC Agreement with Hanrim on Wireless Power System Based on the Qi Standard



TOKYO--Toshiba Corporation (TOKYO: 6502) today announced that the company is collaborating with Hanrim Postec LLC (Hanrim) in the development of wireless power system ICs. The companies are working on ICs and systems based on the Qi standard<sup>1</sup> low power spec for mobile devices, including smartphones and mobile phones, as proposed by the Wireless Power Consortium<sup>2</sup> (WPC).

Toshiba and Hanrim will enter the mobile market this month with a non-contact charge system. Toshiba has developed and manufactures the ICs for the system and Hanrim provides the module.

Demand for smartphones is growing rapidly, and so is their usage, as more and more people rely on them as a platform for messaging and accessing the internet. As a result, it is often necessary to charge smartphones twice a day, sometimes even more, requiring users to carry a charging cable. This is stimulating demand for a new, cable-free, non-contact charging system that offers greater convenience and ease of use.

Toshiba has developed two products to the Qi standard, utilizing Hanrim's non-contact charging systems. Samples shipments will start from December.

\*1: Qi standard

An inductive transfer standard for low power applications, standardized from 0 to 5W.

\*2: WPC

As of this month, WPC had a total of 137 member companies, clear recognition that it has established the global de facto standard for non-contact inductive systems, with companies working on both Qi standard compatible power transmission and power receiver systems.

Toshiba joined WPC in February and has closely studied the standard toward developing ICs for non-contact charging systems. Hanrim is also a member.



# TOSHIBA GLOBE



## Toshiba Collaborating in Development of Wireless Power System IC

- continued

### Product summary

| Part number                   | Engineering samples | Mass production | Remarks                           |
|-------------------------------|---------------------|-----------------|-----------------------------------|
| TB6865FG<br>Power transmitter | Dec. 2012           | Jan. 2013       | Compliant with Qi standard ver1.0 |
| TB6860WBG<br>Power receiver   | Dec. 2012           | Jan. 2013       | Compliant with Qi standard ver1.0 |

### Features

#### 1. Compliant with WPC Qi standard ver1.0

#### 2. Integrated DC-DC converter is used for charge and power feed.

For the TB6860WBG power receiver, the DC-DC converter is used to output voltage. A current capacity output of 1,200mA (max.) ensures rapid charging.

#### 3. Battery charge function included.

The TB6860WBG has a power feed mode which feeds power to the charge system of platform it is charging. It also has a charging mode for charging the battery directly. If a non-contact charge system is included in the battery of a mobile device, applying the TB6860WBG reduces the use of special ICs for charging. It can reduce product size and cost. The included register can create a unique charging profile for batteries from multiple companies.

#### 4. Charge two devices simultaneously.

The TB6865FG can charge two devices simultaneously. While a smart phone with the "Qi" mark is charged, another mobile device (digital still camera, mobile game consoles, and so on) with the "Qi" mark can be charged by placing it on the transmission pad. On charge pad can support two "Qi" mobile devices. No special cable is required.

\*Follow this link for more on this product.

<http://www.semicon.toshiba.co.jp/eng/product/linear/selection/powersupply/wpc/>



# TOSHIBA GLOBE



13<sup>th</sup> December 2012

## Toshiba Launches New Ultra-small Photorelay

High voltage and high current product for use in semiconductor testers and measuring device



USOP4

TOKYO-Toshiba Corporation (TOKYO: 6502) has launched an addition to its line-up of ultra-small USOP package photorelays, the high voltage, high current TLP3306. In addition for application in a range of high voltage semiconductor testers, especially SoC testers, which require particularly high voltage characteristics, the new photo relay is also a candidate for other applications that include battery and power supply control.

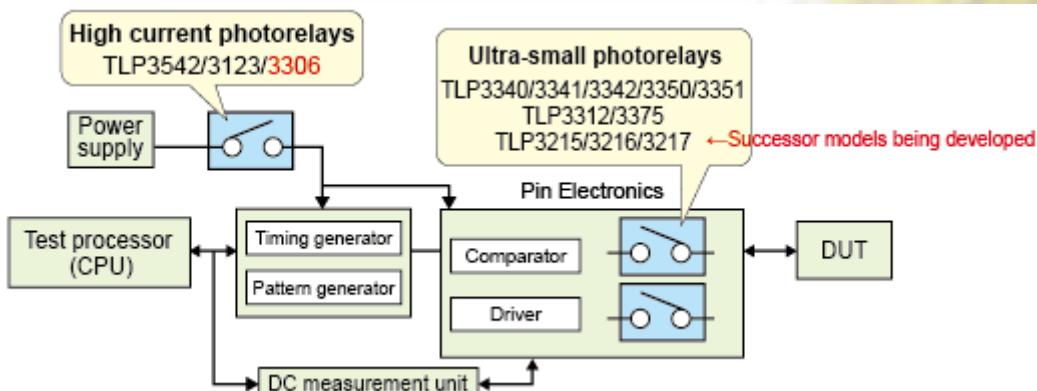
### Applications

1. Semiconductor testers
2. Measuring devices

### Key Features

1. Ultra-small USOP4 package (3.25 x 2.20 x 1.65 mm)
2. Can be driven with 400mA at 75V

### Circuit Example



\*Follow this link for more on this product.

[http://www.semicon.toshiba.co.jp/eng/product/opto/selection/topics/1267532\\_2411.html](http://www.semicon.toshiba.co.jp/eng/product/opto/selection/topics/1267532_2411.html)



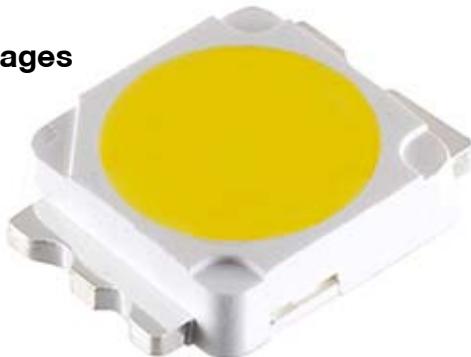
# TOSHIBA GLOBE



14<sup>th</sup> December 2012

## Toshiba to Start Sales of White LED Packages

New product to use GaN chips manufactured on 200mm silicon wafer



TOKYO—Toshiba Corporation (Tokyo: 6502) today announced that the company will start sales of white light-emitting diode (LED) packages that offer makers of general purpose and industrial LED lighting solutions a cost-competitive alternative to current LED packages. Mass production will start this month.

Production of LED chips is typically done on 2- to 4-inch wafers with an expensive sapphire substrate. Toshiba and Bridgelux, Inc. have developed a process for manufacturing gallium nitride LEDs on 200mm silicon wafers, which Toshiba has brought to a new production line at Kaga Toshiba Electronics Corporation, a discrete products manufacturing facility in northern Japan. Mass production of packages using the new line's output starts this month.

Deployment of Toshiba and Bridgelux's new gallium nitride-on-silicon (GaN-on-Si) technology to produce LED chips has allowed Toshiba to replace sapphire substrates and to produce the chips on a much more cost-competitive silicon substrate.

The low power consumption and long life of the white LED lighting is winning wide adoption in general purpose lighting, TV backlighting and other areas of application. In FY2011 the global market stood at 700 billion yen (approximately US\$8.5 billion) and it is expected to almost double to 1,250 billion yen (\$15.2 billion) in FY2016.

Going forward, Toshiba will promote product development and global sales toward securing a 10% share of the world market in FY2016.

### Product Outline

|                                  |                                       |
|----------------------------------|---------------------------------------|
| Product name:                    | TL1F1 series (1W)                     |
| Size:                            | 6.4 mm (L) x 5.0 mm (W) x 1.35 mm (H) |
| Light flux:                      | 112 lm (at 350mA)                     |
| Mass Production start:           | December 2012                         |
| Production capability (planned): | 10,000,000 units per month            |



# TOSHIBA GLOBE



17<sup>th</sup> December 2012

## Toshiba Develops compact MOS-Varactor Simulation Model for Development of CMOS Millimeter Wave Circuits Good Accuracy from DC to Millimeter with a Single Model

TOKYO- Toshiba Corporation (TOKYO: 6502) today announced the development of a compact MOS-Varactor<sup>(1)</sup> simulation model that delivers high level accuracy from DC to the millimeter wave (60 GHz) region. The new model was developed in cooperation with Professor Nobuyuki Itoh of Okayama Prefectural University.

The new compact MOS-Varactor model introduces an original algorithm to express scaling effects and can capture the impacts of parasitic effects that dominate in the 60 GHz region. Measurement parameters from 1MHz to 60 GHz for samples with different cell sizes were used for modeling. In general, it is difficult to express MOS-Varactor with a single model, but this newly developed model fully succeeds.

The new model's accurate capture of parasitic effects supports realization of low power consumption in RF-CMOS products, and Toshiba will use it a basic technology for developing such chips, key devices of the company's Analog and Imaging IC Division.

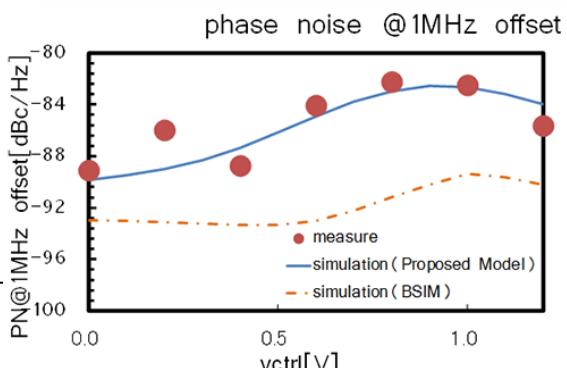
Building on the work done so far, Toshiba expects to secure accurate simulation of CMOS millimeter wave circuits in the future.

The new model has been verified with samples with cell lengths ranging from 0.26  $\mu$ m to 2.0  $\mu$ m formed with Toshiba's 65nm RF-CMOS technology. Very good accuracy for all cell sizes was achieved from DC to 67 GHz.

Verification of this model was made on a 60GHz circuit. Phase noise level dependency on the control voltage of the 60 GHz VCO was measured and compared with a circuit simulation, with this model used in the frequency tuning block. Measurement accuracy was found to be 8 dB better than with the conventional model<sup>(2)</sup>.

These development results were presented at APMC, the Asia-Pacific Microwave Conference, held in Taiwan from December 4 to 7.

1. MOS (Metal Oxide Semiconductor)-Varactor is a planar device, conventionally fabricated in CMOS technology. Generally, it is widely used in the frequency tuning block of the CMOS VCO (Voltage Controlled Oscillator) circuits.
2. BSIM (Berkeley Short-channel IGFET Model) is the conventional model generally utilized in simulating MOS-Varactor. It was developed by the University of California, Berkeley.





# TOSHIBA GLOBE



18<sup>th</sup> December

## Toshiba to Launch CompactFlash® Memory Card for Digital Single Lens Reflex Market

Bringing its advanced NAND flash memory technology to world's fastest class of CF memory cards for high-end DSLR



TOKYO—Toshiba Corporation (TOKYO: 6502) today announced that it will launch a new line of high performance CompactFlash®<sup>1</sup> (CF) memory cards, the EXCERIA PRO™<sup>2</sup> series, expressly targeting the digital single lens reflex camera market. The initial line-up of 16GB, 32GB, 64GB cards will come to market in spring of 2013 and offer the world's highest level<sup>3</sup> read and write speeds. EXCERIA PRO™ will position Toshiba to meet the demands of the high-end DSLR market, including high resolution image capture, sustained continuous shooting, HD video recording and high speed data transfers to other devices.

The EXCERIA PRO™ CF cards integrate Toshiba's high performance NAND flash memory and specially developed dedicated firmware. They achieve a read speed of 160MB/s and write speed of 150MB/s<sup>4</sup>, the highest level yet reported.

The new cards are compliant with the CompactFlash Association (CFA) standard CompactFlash® Specification Revision 6.0 and compatible with the UDMA7 high speed interface, ensuring they can support high performance DSLRs to the full. The cards are also compatible with the latest Video Performance Guarantee standard, VPG-20. VPG-20 secures Full HD video capture streams at a minimum write speed of 20MB/s for compatible host devices and recording media. VPG-20 enables high quality Full HD video capture at high frame rates with no dropped frames.

The market for DSLR is expected to grow by some 50% in the period 2012 to 2015 and demand for CF cards will grow with it. Toshiba aims to capture a 30% market share by 2015 by developing high performance memory cards.





# TOSHIBA GLOBE



## Toshiba to Launch CompactFlash® Memory Card for Digital Single Lens Reflex Market

- continued

### Specifications

| Capacity             |      | 64GB   | 32GB   | 16GB |
|----------------------|------|--|--------|------|
| Price                |      | Open   |        |      |
| Launch               |      | Spring 2013  |        |      |
| Standard             | Card | CF+™ *1 and CompactFlash® Specification Revision 6.0 |        |      |
|                      | VPG  | VPG-20   |        |      |
| Max read speed       |      | 160MB/s  |        |      |
| Max write speed      |      | 150MB/s  | 95MB/s |      |
| Interface            |      | UDMA 7(Ultra DMA Mode 7 theoretical:167MB/s)         |        |      |
| Power Supply Voltage |      | 3.3/5.0V   |        |      |
| File Format          |      | FAT32  |        |      |
| External Dimensions  |      | 36.4mm (L) × 42.8mm (W) × 3.3mm (T)                  |        |      |
| Approx. Weight       |      | Approx. 10g.   |        |      |

#### Notes:

1 CompactFlash® card is a memory card standardized by CompactFlash Association. VPG logo and CF+ are trademarks of CompactFlash Association. CompactFlash® is a registered trademark of CompactFlash Association.

2 EXCERIA PRO is a trademark of Toshiba Corporation.

3 As of December 2012, Toshiba.

4 16GB cards will have 95MB/s maximum write speed. Read/Write speed was internally tested based on UDMA mode 7 16bit (LBA48). Read and write speed may vary, depending on user specifications such as devices used and file size read or written. (Transfer speed of 1MB/s calculated as 1,000,000 bytes/s)



# TOSHIBA GLOBE



19<sup>th</sup> December 2012

## Toshiba Launches New Compact ESD Protection Diodes supporting High-speed Data Lines

Multi-bit flow-through type products added to the Extreme High Speed series line-up

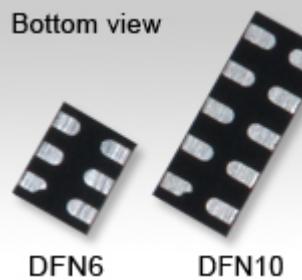
TOKYO-Toshiba Corporation (TOKYO: 6502) has added multi-bit (2-bit and 4-bit) flow-through type ESD (electrostatic discharge) diode products to its low capacitance and low clamp voltage Extreme High Speed series. The new products, DF6D7M1N (2-bit) and DF10G7M1N (4-bit), realize multiple diodes while maintaining the signal quality achieved by the low-inductance flow-through layout. Samples are available now with mass production scheduled for the end of December.

### Applications

ESD protection for USB 3.0 and other interfaces

### Key Features

1. Multi-bit, flow-through type
2. Low clamp voltage:  $V_C=12V$  (typ.) at IEC61000-4-5 compliant ( $I_{PP}=1A$ )
3. Suitable for high speed signal lines:  $C_t=0.3pF$  (typ.)
4. ESD-immunity level:  $\pm8kV$  guaranteed at IEC61000-4-2 compliant (contact)
5. Small packages
  - DF6D7M1N (2-bit) : DFN6 package (1.25mm×1.0mm×0.5mm)
  - DF10G7M1N (4-bit) : DFN10 package (2.5mm×1.0mm×0.5mm)



Follow this link for more on this product.

[http://www.semicon.toshiba.co.jp/eng/product/diode/selection/topics/1266096\\_2381.html](http://www.semicon.toshiba.co.jp/eng/product/diode/selection/topics/1266096_2381.html)

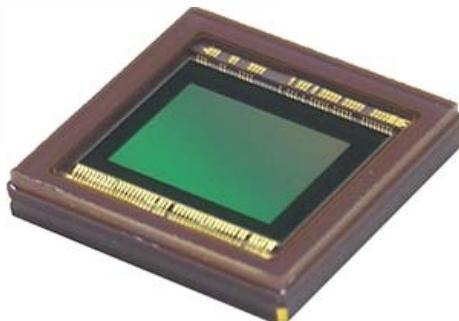


# TOSHIBA GLOBE



26<sup>th</sup> December 2012

## Toshiba Launches Highly Sensitive 20MP BSI CMOS Image Sensor Industry's highest level resolution brings enhanced image quality to digital still cameras



TOKYO—Toshiba Corporation (TOKYO: 6502) today announced that it will launch a new 20-megapixel (MP) CMOS image sensor, the TCM5115CL, as the latest addition to its sensor line-up for digital still cameras. TCM5115CL offers the industry's highest resolution in the 1/2.3 inch optical format, using backside illumination technology (BSI) to improve sensitivity and imaging performance.

Sampling of the new sensor will begin at the end of January 2013 and mass production will follow in August 2013.

Continued advances in the resolution offered by compact digital cameras—now in the range of 10- to 16MP—have brought with them the challenge of improving performance and picture quality with smaller pixels. The TCM5115CL does just this by achieving a 15% improvement in full well capacity—the amount of charge an individual pixel can hold before saturating—against Toshiba's previous generation 16MP sensor (pixel size = 1.34μm).

TCM5115CL is designed to meet the demands of high quality, fast frame rate image capture and HD video recording supporting smooth, slow motion playback, and delivers the high frame rates 60fps at 1080p and 100fps at 720p.

CMOS image sensors are the main product of Toshiba's Analog and Imaging System business. The addition of the TCM5115CL to its CMOS sensor line-up for digital cameras will reinforce the business and support the company in securing its target of a 30% market share in 2015.



# TOSHIBA GLOBE



7<sup>th</sup> January 2013

## Toshiba Announces Cryptographic-erase and Self-encryption Features for New Enterprise SSD and Mobile HDD

New security features to help companies better manage sensitive information in datacenters, cloud computing and client computing applications



TOKYO- Toshiba Corporation (TOKYO: 6502) today announced new enterprise SAS solid state drives (SSD), mobile SATA hard disk drives (HDD), including self-encrypting drive (SED) models in both product categories, and new enterprise-grade SATA SSD supporting cryptographic-erase. Select drives will start to ship in January with other models following later in the first quarter.



PX02SMQ and PX02SMU series enterprise SED (eSED) deliver government-grade Advanced Encryption Standard (AES) 256-bit self-encryption and offer Trusted Computing Group (TCG) Enterprise SSC protocol self-encryption and cryptographic-erase support. These high-performance, 2.5 inch enterprise models with SAS interface, target high-end servers and data center applications and provide capacities ranging up to 1.6TB<sup>[1]</sup>.

The PX02AMU value line of SATA eSSD models and the PX03ANU read-intensive line of SATA eSSD models, both for enterprise applications, feature cryptographic- erase for fast and secure media sanitization.

For mobile computing, the MQ01ABU\*\*\*W series provides self-encryption, cryptographic-erase and TCG-Opal SSC protocol support in a slim 7mm height with up to 500GB<sup>[1]</sup> of storage capacity. The MQ01ABU\*\*\*W series also supports Toshiba's innovative Wipe technology, which adds security features that allows system designers to automatically cryptographic-erase sensitive user data if an unexpected host attempts to access the HDDs or if a defined number of authentication failures occurs.

Toshiba is also working on FIPS 140-2 certification<sup>[2]</sup> for select SED products to meet government-class security requirements.

[1] One terabyte (1 TB) is  $10^12$  =1,000,000,000,000 bytes. One Gigabyte (1 GB) is  $10^9$  =1,000,000,000 bytes.

[2] FIPS 140-2, Federal Information Processing Standards 140-2 is a U.S. government computer security standard used to certify cryptographic modules.

Follow this link for more on this product.

[http://www.semicon.toshiba.co.jp/eng/product/storage/selection/built-in/enterprise\\_ss/](http://www.semicon.toshiba.co.jp/eng/product/storage/selection/built-in/enterprise_ss/)



# TOSHIBA GLOBE



8<sup>th</sup> January 2013

## Toshiba to Showcase Lifestyle and Entertainment Technologies at CES 2013

LAS VEGAS, January 7, 2013 and TOKYO, January 6, 2013—Toshiba Corporation (TOKYO: 6502) will invite visitors to the International Consumer Electronics Show, CES 2013, to experience how the company's smart home concept and cloud-based solutions will deliver a wide range of impressive, convenient and secure services that add to quality of life and entertainment.

The Toshiba booth is at LVCC Central Hall, Booth #10926.

Toshiba's approach to supporting lifestyles and entertainment with, cloud-based services grows from a deep understanding of energy management, home appliances and connectivity with digital products. The company's strengths in energy management range from optimized smart home solutions for appliances in individual homes through to building management and the integration of diverse services at the community level. CES will showcase a line-up of smart home appliances and the comfortable, convenient lifestyles they will bring to us.

Toshiba's recent progress in digital technologies for image processing and personalized connectivity is brought to life with its leading-edge 4K Ultra HD TV series designed with an advanced 4K panel. Following the company's strategy to reinforce its large screen size TVs, the series will be available in 58-, 65- and 84-inch models. The cloud-based solutions supported by the TVs provide graphical access to a wide variety of new services such as "News" for news videos on your big screen and "Calendar" to share family events and favorite programming reminders, yet assure that users navigate and access just the services they want, bringing entertainment even closer and making it more immediate than ever. Other products that will be showcased in the booth include Windows 8<sup>®</sup> PCs for the U.S. market.

For further information on the products, please visit  
<http://us.toshiba.com/pressreleases>

Further information on Toshiba at CES2013 will be available at  
<http://www.ad-toshiba.jp/en/exhibition/ces2013>



# TOSHIBA GLOBE



8<sup>th</sup> January 2013

## Toshiba Launches New IGBT/MOSFET Gate Drive Photocoupler

Helps reduce dead time and improve efficiency in inverter circuits in an operating temperature range between -40°C and 125°C.



TOKYO-Toshiba Corporation (TOKYO: 6502) today announced that it will launch a DIP8-package IC coupler that can directly drive a middle-capacity IGBT or power MOSFET. The new product, TLP250H, offers a maximum propagation delay time of 500ns and a propagation delay skew between photocouplers of 150ns, a performance that will reduce dead time and improve efficiency in inverter circuits. The use of a new LED with superior longevity supports a wide operating temperature range, between -40°C and 125°C. In addition, the coupler contributes to lower power consumption by reducing the operating voltage to 10V (min.) against 15V (min.) for Toshiba's previous model. It can be used in a wide range of products, including industrial devices used in high temperature environments, home solar photovoltaic power generation systems, digital products and measuring and control instruments. Samples are available now with mass production scheduled for February.

### Applications

IGBT / power MOSFET gate drivers, power conditioners, general-purpose inverters, IH (Induction Heating) equipment, etc.

### Key Features

1. Operating power-supply voltage:  $V_{CC}=10$  to 30V
2. Propagation delay time:  $t_{pLH}, t_{pHL}=500$ ns (Max)
3. Propagation delay skew:  $\pm 150$ ns (Max)
4. Wide guaranteed operating temperature range:  $T_{opr}=-40^{\circ}\text{C}$  to  $125^{\circ}\text{C}$
5. Peak output current:  $I_{OP}=\pm 2.5$ A (Max)
6. Low input current:  $I_{FLH}=5$ mA (Max)
7. Isolation voltage:  $BV_S=5000$ Vrms (Min)
8. Common mode transient immunity:  $CMR=\pm 40$ kV/ $\mu$ s



Follow this link for more on this product:

[http://www.semicon.toshiba.co.jp/eng/product/pto/selection/topics/1267682\\_2411.html](http://www.semicon.toshiba.co.jp/eng/product/pto/selection/topics/1267682_2411.html)



# TOSHIBA GLOBE



9<sup>th</sup> January 2013

## Toshiba Hybrid Drive Honored with Visionary Award at 2013 Storage Visions™ Recognized for its visionary approach and technologies in the mobile consumer storage category

TOKYO-- Toshiba Corporation (TOKYO: 6502) is pleased to announce that its MQ01ABDH hybrid drive series was awarded the Storage Visions™ Visionary Award in the Mobile Consumer Storage product category at the 12th annual Storage Visions Conference, held in Las Vegas, U.S.A. from January 6th to 7th . Storage Visions is an annual storage products technical event covering hard disk drives (HDD) and solid state drives (SSD), and the award recognizes excellence in embedded storage solutions in mobile consumer devices.

Today's PCs must meet increasingly strong demands for storage capacities that can handle multiple HD videos and other data-rich sources, and deliver read/write speeds that support excellent performance. Toshiba's MQ01ABDH hybrid drive integrates NAND flash memory with a hard drive to make full use of the large capacity of the HDD and the fast data access speeds of the NAND. It also features self-learning caching algorithms that optimize performance by learning the system user's data access patterns. The Visionary Award was presented in recognition of Toshiba's innovative approach and the advanced technologies the company brought to the hybrid drive.

Shipments of the MQ01ABDH series started in autumn 2012 for OEM customers and notebook PCs with the drive are already in the market. Toshiba expects hybrid drives to account for about half of all 2.5-inch storage products shipped for the notebook PC market in fiscal year 2015. Toshiba is now developing next generation hybrid drives and will continue to promote advances in its storage products business, pursuing development of solutions offering higher capacities and even better levels of performance.

### Related Links:

- [Web page introducing the hybrid drive](#)
- [Video clip that showcases the drive's features](#)





# TOSHIBA GLOBE



11<sup>th</sup> January 2013

## Toshiba Launches Ultra-Low Power Consumption Photorelay 80 % reduction of trigger LED current from the previous model

TOKYO-Toshiba Corporation (TOKYO: 6502) has launched photorelays that achieve an 80% reduction of trigger LED current over the previous model. The new TLP171 series employs a high luminosity LED to control the trigger LED current to 0.2mA (max.) against the 1.0mA (max.) of the previous TLP170 series. The reduction of power consumption offers developers the option of battery drive or direct drive from a microcontroller, which can reduce the number of peripherals and achieve smaller set design. The new product is suited for such applications as the replacement of mechanical relays, security systems, measuring and control instruments, factory automation control systems and amusement machines.



2.54SOP4

Follow this link for more on this product:

[http://www.semicon.toshiba.co.jp/eng/product/opto/selection/topics/1267637\\_2411.html](http://www.semicon.toshiba.co.jp/eng/product/opto/selection/topics/1267637_2411.html)