

LED

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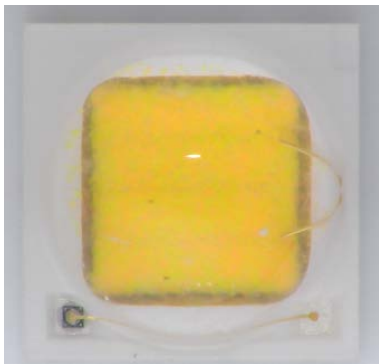
SYSTEM

POWER

# Toshiba TL1L4-WH0

## 3<sup>rd</sup> gen GaN on Silicon LED

*First high brightness LED GaN-on-Silicon with 160lm per watt, almost equivalent to sapphire LED Base*



Toshiba has completely changed its technology to multiply by 2 the brightness of their GaN-on-silicon LEDs. Today the Toshiba white LEDs have characteristics close to the classic sapphire LED with a smaller cost.

The large panel of products and packages available today shows the maturity of Toshiba products and their willing to conquer the white LED market.

**Title:** TL1L4 GaN on Si LED

**Pages:** 107

**Date:** June 2015

**Format:** pdf + xls

**PRICE:**

Full report: EUR 2,990

Technology report: EUR 1,990

With a footprint of 3.5x3.5mm, the TL1L4-WH0 from Toshiba is tiny and benefits of the last package innovations like the sintering and a SMD leadframe with ceramic substrate and take full benefit of strong innovations.

The TL1L4 LED are produced on a cheap 8" silicon substrate in a standard power silicon facility from Toshiba. The integration in a standard facility has been facilitate by a gold-free smart bonding process.

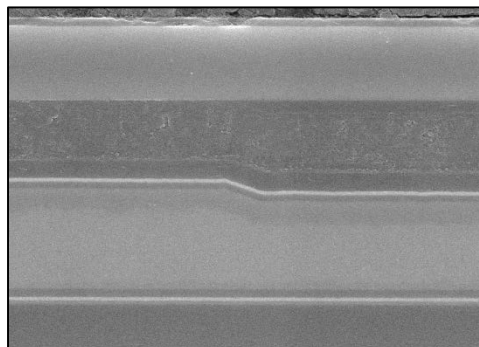
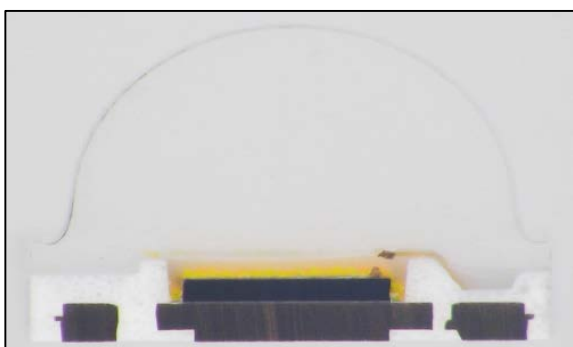
A significant work has been done on the epitaxial layer in GaN to enhance the brightness. In 18 months, the brightness has been multiplied by 2. The optimization of the GaN epitaxy is the core of this amazing improvement.

Moreover, all the manufacturing process has been enhanced to reach this brightness. Today the Toshiba white LEDs are similar to the last sapphire LEDs with a vertical thin film with via structure.

The report includes a detailed technology and a cost analysis describing the innovations of Toshiba and a comparison with the first generation Toshiba LED. LED on silicon can now compete against LED on Sapphire.

### COMPLETE TEARDOWN WITH:

- Detailed Photos
- Precise Measurements
- Material Analysis
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- Manufacturing Cost Analysis
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Sylvain  
Hallereau

Sylvain is in charge of costing analyses for IC, Power and LED. He has more than 6 years of experience in the LEDs manufacturing costs analysis and has studied a wide range of technologies.



**Author (Lab):**  
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Le Troadec

Véronique is in charge of structure analysis of semi-conductors. She has a deep knowledge in chemical & physical technical analyses. She previously worked for 20 years in Atmel Nantes Laboratory.

## ANALYSIS PERFORMED WITH OUR COSTING TOOLS LED COSIM+

	Process-Based Costing Tools	Parametric Costing Tools
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### LED Cosim+

Cost simulation tool to evaluate the cost of any LED process or device:

**From single chip to complex structures.**

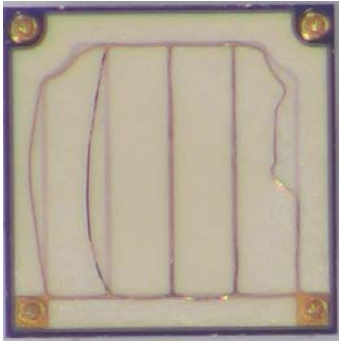
**LED CoSim+** is a process-based costing tool used to evaluate the manufacturing cost per wafer using your own inputs or using the pre-defined parameters included in the tool.

It is possible to enter any LED process flow.

## RELATED REPORTS

### Toshiba: TL1F1-LW1 GaN-on-Si White LED

First GaN on Silicon LED produced on 8" Substrate.



Pages: 87  
Date: December 2013  
Full report: EUR 2,990\*

### CREE: CXA1520 LED Array 1710 lumens

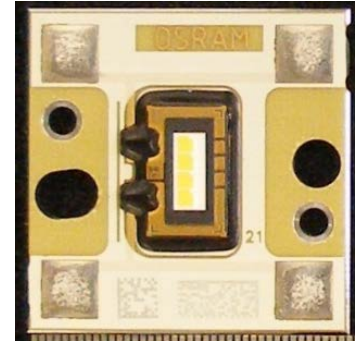
First High Density LED Array is based on Flip Chip dies with a luminosity x2 and a cost divided by 4 in 3 years.



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\*\* Technology Analysis report contains only Physical Analysis & Manufacturing Process Flow

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