

## Eyes Wide Open: ON Semiconductor Employs TDS8200 as 'Golden Reference' for Testing Emerging Serial Data Standards



### Solution Summary

Challenge	Accurately characterize jitter produced by clock and data signals within ECL devices that operate from 3-12 Gigabits per second (Gb/s). Previous generations of instruments could not accurately measure below 1 ps.
Solution	Tektronix TDS8200 high-performance digital sampling oscilloscopes, capable of measuring jitter at < 200 fs (typical).
Benefits	With industry-leading jitter measurement capabilities, the TDS8200 helped ON Semiconductor fully characterize the performance of its devices, reducing the burden on its customers' jitter budgets and enabling more complex designs.

When you're a leading developer of cutting edge integrated circuits (ICs), precision is absolutely essential. This includes the precise performance of the devices and the precise measurement of their performance.

ON Semiconductor develops state-of-the-art ICs for sophisticated electronics applications and is consequently attuned to these requirements. Precise performance is particularly critical to the company's High Performance Analog Business Unit, which develops Emitter-Coupled Logic (ECL) devices that are used to manage clock and data streams in electronic communications systems, networking products, and in automated test equipment.

Developing and testing ECL devices can be extremely challenging since they operate at very high speeds (3-12 Gigabits per second (Gb/s)). ON Semiconductor has to support both clock and data signals in the same device meaning it must be able to acquire and measure the different types of jitter these signals produce. In addition, signal shifts in the realm of picoseconds ( $\text{ps}_{\text{RMS}}$ ) and femtoseconds ( $\text{fs}_{\text{RMS}}$ ) can disrupt TX/RX performance and cause critical issues when precision is the name of the game.

A similar challenge exists for ON Semiconductor's customers. With jitter being of utmost concern, precise jitter measurements and specifications are paramount.

ON Semiconductor's customers integrate components into more complete assemblies and products. They have the difficult task of meeting tight jitter budgets – the total jitter is the sum of the individual jitter characteristics of each component – to comply with stringent serial data standards such as Fibre Channel and SONET. As a result, the ICs that go into their products must produce the least possible jitter while delivering signal shifts that are lightning fast and unvarying over billions of cycles.

Therein lays the challenge for ON Semiconductor in the development of ECL devices: maintaining performance and lowering the specified jitter to reduce the burden on its customers' jitter budgets.

Previously, ON Semiconductor could only measure its ECL devices down to a maximum jitter of 1 ps<sub>RMS</sub>. Test equipment that could practically and accurately measure below this limit simply did not exist.

According to Bill Schromm, Vice President of ON Semiconductor's High Performance Analog Business Unit, "We knew our components were performing better and producing less than 1 ps<sub>RMS</sub> jitter, but we had no way of measuring it. That inability to quantify the true performance of our devices not only inhibited our capacity to validate and promote our competitive advantage in the

marketplace, it also affected our customers who are working with extremely tight jitter budgets.”

The problem was immediately remedied when ON Semiconductor employed the Tektronix TDS8200, a new high-performance modular sampling oscilloscope. With configurations that provide bandwidth to 70 GHz and the only single-ended and differential clock recovery system covering all current and emerging serial data standards between 50 Mb/s and 12.6 Gb/s, the TDS8200

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-William George, Senior Vice President  
Operations, Chief Manufacturing Officer, ON  
Semiconductor

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offers the lowest noise floor and best signal fidelity in the world.

Because of the TDS8200, ON Semiconductor can now test its ECL device jitter down to 200 fs<sub>RMS</sub>, which is a 5X improvement over its previous measurement capabilities.

"As the speed of our designs increases, the eye closure associated with the 1 ps<sub>RMS</sub> system jitter of instruments currently in the market is becoming a significant issue," said William George, ON Semiconductor's Senior Vice President of Operations and Chief Manufacturing Officer. "The TDS8200 with the 82A04 phase reference module is the only measurement system that provides us <200 fs<sub>RMS</sub> system jitter and adequate bandwidth to accurately characterize our new 6 Gb/s designs. This capability enables us to stay ahead of competitors and bring products to market faster. The TDS8200 is the 'golden reference' for testing emerging serial data standards."

### **Industry-Leading Performance Reduces Burden on Jitter Budgets, Enables More Complex Designs**

Designs with limited jitter budgets and tight timing margins require test equipment with the best signal fidelity and the ability to provide accurate and repeatable results. To handle differential signals, test equipment must be flexible enough to provide true differential acquisition and clock recovery across multiple data rates.

The TDS8200 meets these needs and offers the lowest system jitter available, delivering superior measurement system fidelity. In doing so, the instrument eliminates false test failures and enables more accurate characterization of design tolerances for increased component performance and reduced costs. Also, with the ability to trigger on embedded clocks and measure random and deterministic jitter, ON Semiconductor engineers are better able to perform accurate, repeatable compliance testing of high-speed, low power differential signals.

Since ON Semiconductor can now measure and demonstrate dramatically improved performance capabilities of its ECL devices, the company has been able to enhance their competitive advantage in the industry, streamline its own development processes and better satisfy its customers.

"The test process for our ECL devices has been greatly expedited and simplified using the TDS8200. In the past, we were forced to use two instruments and two set-ups to measure the different types of jitter produced by clock and data signals, and the results were imprecise. Now we have a single process with one powerful, easy-to-use instrument," said Schromm. "Not only can we characterize our components with greater accuracy, we can also get those components to market more quickly."

Most importantly, the benefits ON Semiconductor is reaping from the TDS8200 are being passed along to its customers.

With lowered specified jitter of its ECL devices, ON Semiconductor's customers are able to develop more complex clock trees, stay within their limited jitter budgets and keep costs down. "In our industry, the largest eye opening wins," added Schromm. "With the Tektronix TDS8200, we're set for success."