IDT Lowers Cost of Test by Adopting the NI Semiconductor Test System

Using the NI STS, we not only increased our test performance but reduced our overall cost of test by retiring older, difficult to support and maintain test systems.

"Traditional ATE systems require major costly retooling efforts on the test floor as generations of test systems become obsolete or unable to meet new test requirements, but the nature of the open PXI architecture of the STS helps us retain our original investment and build upon it, rather than throw it away. It provides the flexibility we need to reconfigure and grow our test platforms in parallel with our growing performance needs."

- Glen E. Peer, Integrated Device Technology Inc.

The Challenge:

Keeping pace with continuously increasing test performance requirements in a fast moving environment where device performance is constantly pushing the limits of ATE system capabilities and thereby accelerating tester obsolescence and driving test costs higher.

The Solution:

Using the open PXI architecture of the NI Semiconductor Test System (STS) to achieve the flexibility we needed and the ability to reconfigure and grow our test platforms in parallel with our rising performance needs as well as build on our original investment rather than throw it away like with traditional ATE systems, which generally require major costly reboots of the test floor as generations of test systems advance.

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IDT creates a wide range of mixed-signal semiconductor solutions from low-power to high-performance devices. A worldwide leader in timing devices (clock ICs), IDT offers a broad portfolio for networking and communications, consumer, and computing applications.

As the performance of IDT's devices increases, it becomes more difficult to maintain the pace in the production test environment. Traditional ATE systems capable of meeting our high-performance measurement requirements are expensive and often include extra capabilities that are not used but add to the cost. Additionally, within the traditional ATE environment, upgrading a tester to improve its performance often requires upgrading to the next-generation test platform and phasing out the current platform. This is both expensive and wasteful because a large portion of the engineering investment made during previous generations can be lost.

To combat this, we typically engineer our own solutions on top of our installed base of test systems. Having used various models from nearly every ATE vendor, we have become proficient at extending the useful life span of these ATE platforms while controlling costs and enhancing our measurement capabilities.

Evolution of Test

The evolution of test within the timing business unit at IDT is the perfect example of this approach. We began with an off-the-shelf, high-dollar ATE system. Soon we realized that this approach was too expensive, so we built our own internal test system(s). These homegrown systems met our high-performance requirements but sacrificed some of the benefits of using a commercial platform such as high parallelism and external support. We therefore migrated to a hybrid of these two approaches and combined a low-cost commercial ATE system with our own performance enhancement system (see Figure 1).

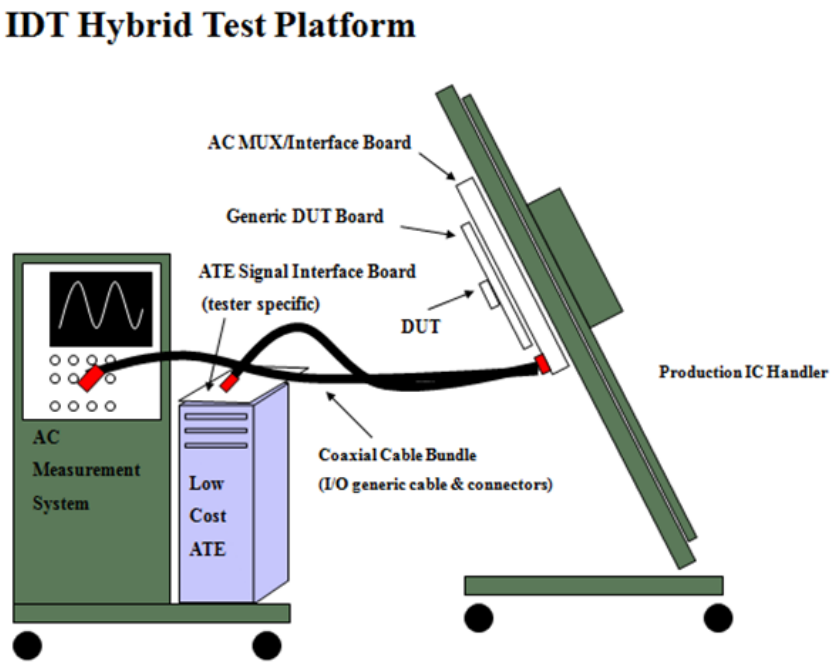

Figure 1. *We combined a low-cost commercial ATE system with our own enhancement system.*

This methodology worked well, but we eventually faced hardware obsolescence that required replacing our chosen ATE and, therefore, a system redesign. Secondly, though our hybrid approach was successful from an engineering and performance perspective, it was not always production friendly. In general, as novel engineering enhancements get “bolted” onto ATE systems, the systems become more difficult to support in high-volume manufacturing. Adding cables, hardware, and sometimes device under test boards with extravagant electronics to ATE systems increases the potential for possible failure points in high-volume manufacturing environments.

The most ideal solution is to create or find a test platform with an open architecture that allows users to build on their investments from *within* the tester rather than through bolt-on enhancements or reinvestments in high-dollar big iron ATE. We needed an architecture that was resistant to hardware obsolescence and could be reinvented as technology improved. The NI STS provided this architecture.

The NI STS’s PXI platform is perfectly suited to solve these problems. The system offers multiple PXI chassis inside a tester mainframe to offer expansion capabilities so the user can add enhanced test features *within* the tester itself. The PXI open standard gives users the flexibility to select instruments from a variety of vendors based on their needs instead of from the limited choices of a single ATE hardware vendor.

The NI STS works well for IDT as the natural extension of our tester evolution. With it, we can continue to build high-performance, low-cost test platforms using only the modules and components we need to meet our performance targets. The open architecture of the NI STS makes this even easier.

During the past year of NI STS deployment at IDT, we have already enhanced the systems from their original configuration to meet our evolving test needs. Through careful planning during the startup phase, we ensured that despite these enhancements, these systems maintained 100 percent backward compatibility with the initial target solution(s). All of our initial investment was preserved as we expanded the testers to enable a broader usage base throughout IDT.

The Benefits of Using an NI Solution

We took advantage of many benefits to using NI solutions. First, unlike our previous hybrid approach, we could consolidate the test head, which reduced the number of potential failure points within manufacturing, downtime for maintenance and repair, and floor space requirements. We also increased our ability to test a wide range of devices with the same configuration because the system has interchangeable interface boards, and we can use the same tester configuration for different device types. The multisite system allows for higher test throughput because it is a true parallel test system with high-accuracy performance parameters for hardware optimization. Lastly, this solution was lower in cost compared to alternative integrated solutions because we needed to build only one set of instrumentation and we had fewer individual systems to maintain.

Growing for the Future

The NI STSs installed on IDT’s production test floor run 24/7. We have experienced test time reductions in the 10 percent to 25 percent range, enhanced our measurement capability and accuracy, and cleaned up our footprint on the test floor, which made our testers much more production friendly. Using the NI STS, we not only increased our test performance but reduced our overall cost of test by retiring older, difficult to support and maintain test systems. Some of these older systems had expensive power and cooling requirements, but the NI STSs simply plug into any 110 V outlet with no extra facilities required. Hourly test costs per unit on these older systems were as much as twice that of the NI STS. Additionally, our NI STSs provide high-performance measurement features across multiple test sites with true parallel test capabilities to further reduce the cost of test.

The NI STS is a scalable tester family with models available using one (STS T1), two (STS T2) and four (STS T4) internal PXI chassis. We designed our NI STS beginning with the T2 model with upgrades and enhancements in mind. The ability to grow our test platforms in response to our own needs is one of the strongest selling points of these systems. Previously, it was difficult or impossible to share test systems across internal business units, but we now have other teams evaluating our NI STS. These groups’ test needs are different from those that our systems are currently configured to handle, but with the open architecture of the PXI platform, these users can add capabilities to the original IDT system definition, which we’ve already proven in production.

Though no single ATE platform is ideal for all situations, for the first time we see the possibility of maintaining an ATE platform that can be reconfigured and reused across multiple business units through the simple swapping of interface boards or internal instrumentation modules. With the NI STS, we believe we can define one or two system configurations and use these systems on our production test floor to satisfy the different needs of all the businesses within IDT. We designed our NI STSs so that we can simply swap interface boards to enable various hardware configurations as required. This ability will greatly simplify our overall test operations and help further drive down the total cost of test.

Finally, we can break away from the big iron ATE vendors and their hardware obsolescence cycles and determine the best test strategy based on our own overall needs. Our current and future investments in test hardware and software are preserved and reusable for the foreseeable future.

Figure 2. *NI STS Scalable Tester Family*

Figure 3. *NI STSs Running Production Test Within IDT's Manufacturing Facility*

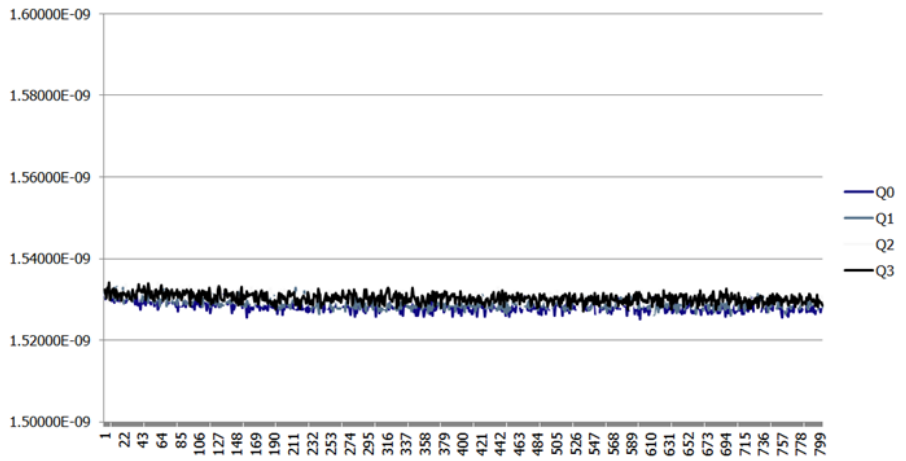

Figure 4. *Propagation Delay Repeatability Testing*

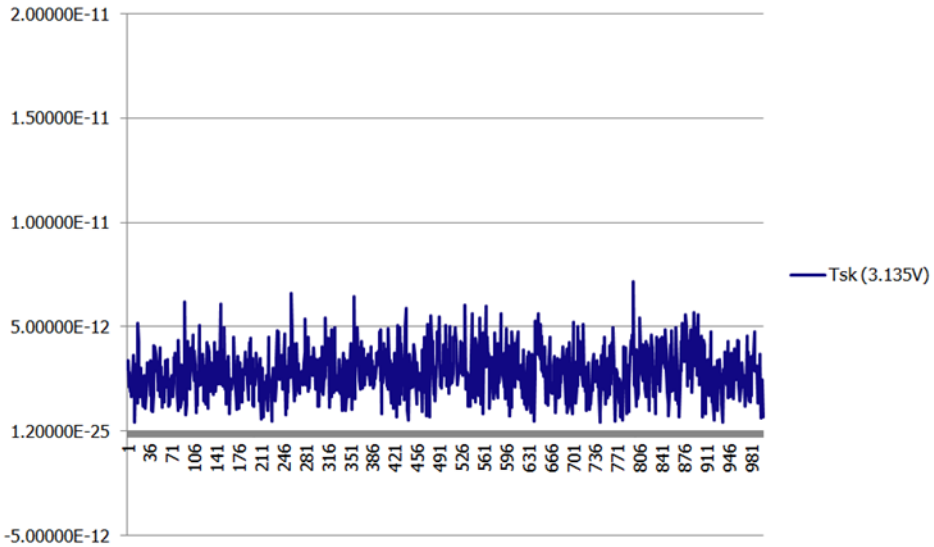

Figure 5. *Output Skew Repeatability Testing*

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