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SVP and GM,
Semiconductor, NI

Semiconductor Test

INDUSTRY SOLUTIONS

ni.com

Lower your cost of test and improve your time to market with a disruptive approach to semiconductor test.

Connect to a Bolder Test Strategy

As an IC manufacturer, you've seen a lot of change occur in your industry, and that constant transformation likely brings with it a great deal of disruption to your process. Let's flip that efficiency-killing disruption and instead disrupt your approach to semiconductor test.

Regardless of the type of device you manufacture ICs for, the business drivers are the same. You must deliver more integrated functionality, ensure the highest reliability for mission-critical applications, remain highly cost competitive, and ensure a short time to market to meet tight design windows. You need a bolder approach to test that meets the IC industry's ever-changing demands and exceeds your customer's expectations. At NI, we deliver test solutions that scale from the lab to the production floor and meet your evolving business needs at every step of the process.

NI is here to help ease your challenges

At NI, we Engineer Ambitiously, and it's our privilege to work with innovators like you who apply this same belief in all you do to advance the semiconductor industry.

Of course, no one said that engineering a better world would be easy. We realize you're accomplishing incredible feats under less than optimal conditions. You're producing high-quality ICs with more functionality for less cost than ever before, even as timelines continue to shrink to meet extremely tight market windows. Plus, you're constantly having to adapt to new business and technical requirements.

Rest assured NI is here to help ease your challenges with tailored solutions that meet your needs. Think of us as your loyal partner, ready and willing to do what it takes so you reach your goals—because they're our goals, too.

Semiconductor test is a strategic focus area at NI, so we're constantly listening to our customers. In doing so, we've discovered that chipmakers require new and disruptive approaches to semiconductor test. We also believe that now is the time to be bold in how we design, deploy, and maintain test systems.

We apply this same forward-thinking approach to semiconductor test. Our software-connected architecture accelerates commercialization from first silicon to high-volume production test; it features highly integrated modular hardware that enables systems to scale and evolve over time as requirements change. With it you can build and deploy test systems with R&D grade measurement quality to meet the operational requirements of the production floor.

If you're anything like us, you're probably wondering—what's next for semiconductor? From 5G to optical sensing to autonomous driving, your industry plays a major role in shaping a better future for everyone. On behalf of NI, I'm excited to help you realize a tomorrow we can all believe in. Let's make it happen.

ERIC STARKLOFF
CEO

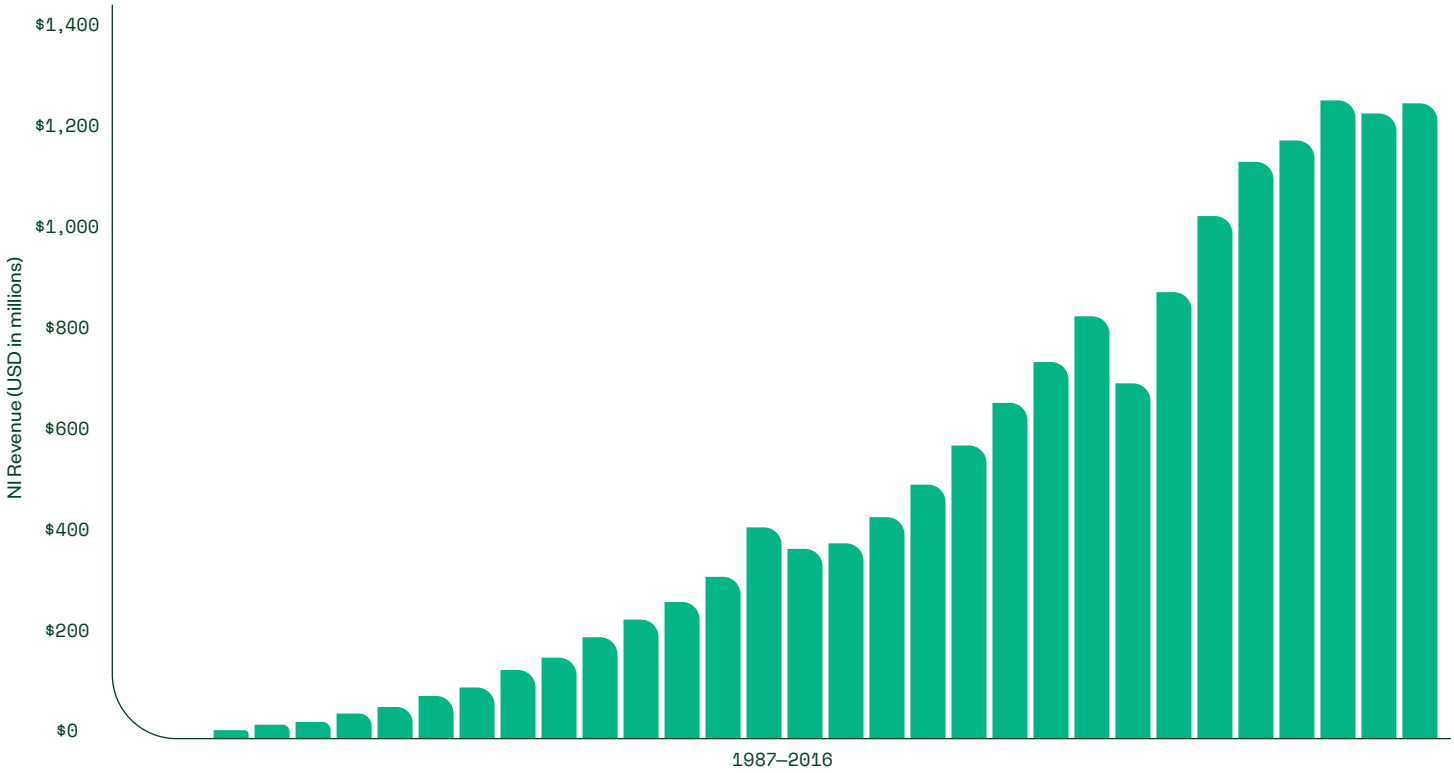
NI's diversified customer portfolio enables long-term investment in semiconductor

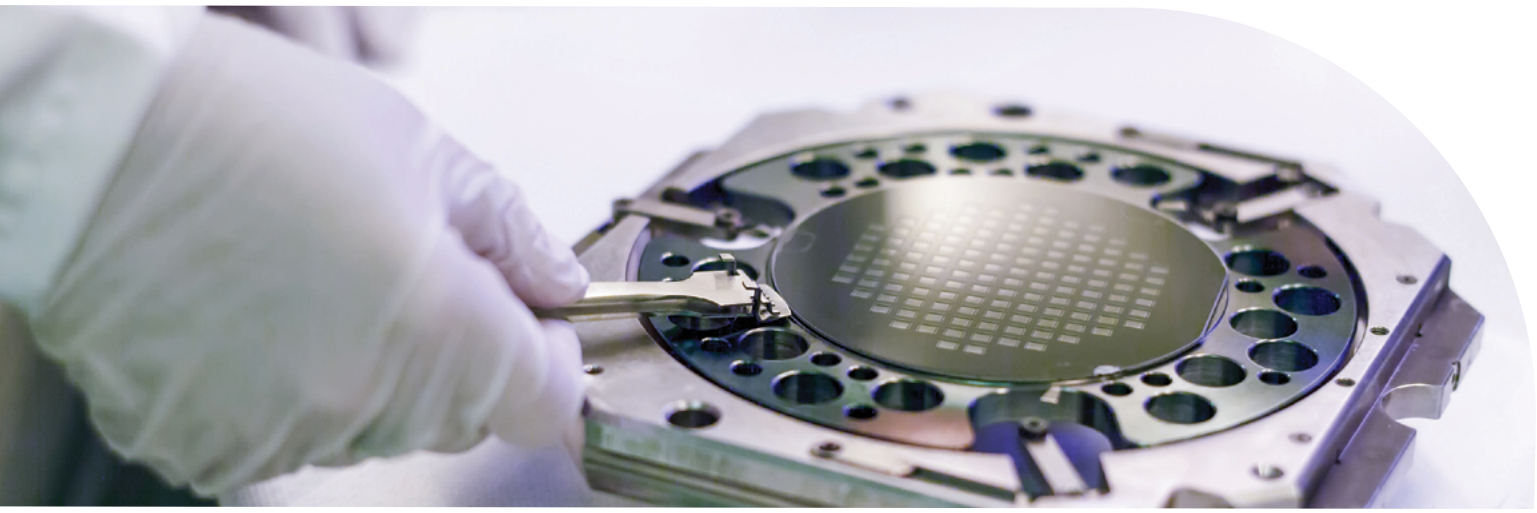
$236M
INVESTED IN R&D (IN 2016)

2,100+
R&D STAFF WORLDWIDE

1,400+
SALES AND SUPPORT ENGINEERS WORLDWIDE

NI's diversified product portfolio enables steady revenue growth





One Platform From Lab to Production

When ICs were simpler and less integrated, fixed-functionality box instruments were sufficient in the lab. But as test requirements grow with increased integration, so does the need for a broader mix of instrumentation. It is not uncommon to find a validation bench that is overflowing with instrumentation to the extent that floor and rack space becomes a limiting factor. But space isn't the only problem. Box instruments are optimized to work independently instead of together; integration over GPIB or Ethernet is not optimal for high data throughput, low latency communication, or tight synchronization.

On the other hand, production ATE is built primarily to meet the needs of highly integrated microprocessors, memory, and complex SOCs. But for RF and mixed-signal ICs, it struggles to scale, and often does not provide the right features. Overall, the traditional approach of box instruments in labs and ATEs in production is becoming a business risk for IC vendors. The inefficiencies range from the inability to reuse/leverage code modules to disjointed training and onboarding, resulting in a negative impact on both total cost and time to market. A new holistic approach, based on the platform of PXI and NI software, needs to be considered.

Coverage Without Compromise

Use more than 1,500 instrument modules from DC to mmWave to customize your test system IO as needed by highly integrated ICs.

Data Correlation

Simplify the time-consuming task of data correlation by using the same high-performance, high-density instrumentation in your lab and production system.

Software Reuse

Save time by leveraging a common software framework as well as the test routines from R&D in your production test system.

Small Footprint

Take advantage of substantial power in a compact form factor with PXI, which has no knobs, dials, or buttons.

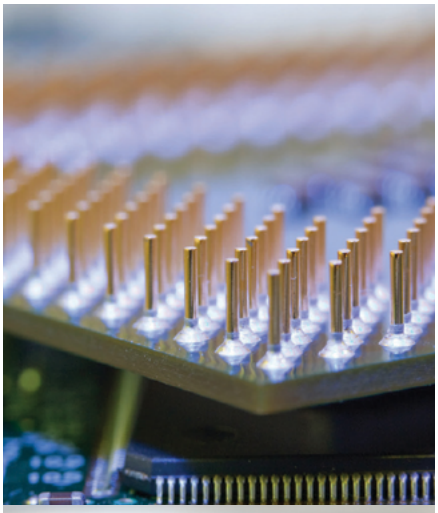
Automation

Harness the power of PXI's integrated timing and synchronization to fully automate tests and reduce test time.

Decreased Test Cost

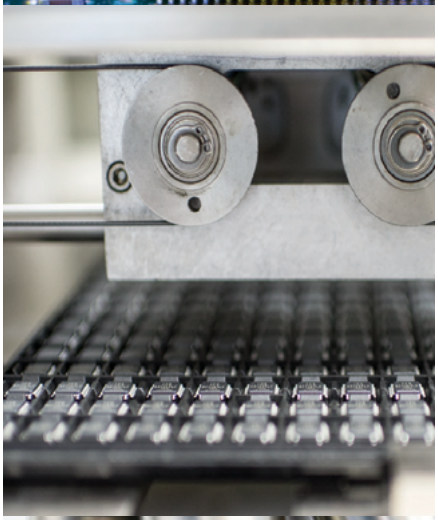
Lower total cost of ownership with PXI's fast test times, excellent uptime, increased test coverage, and competitive capital cost.

Industry-Proven Customer Success



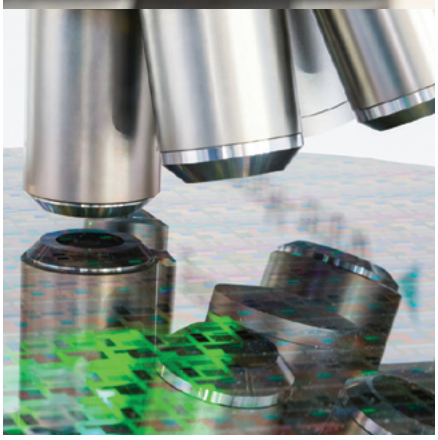
ON Semiconductor

ON Semiconductor used the STS to develop a complete ATE test solution for high-end image sensors. This resulted in unprecedented test performance and flexibility for future requirements.



Infineon

Infineon deployed the STS for end-of-line test for mixed-signal devices. With optimal test coverage and a much lower price point, this solution outperformed traditional ATE.

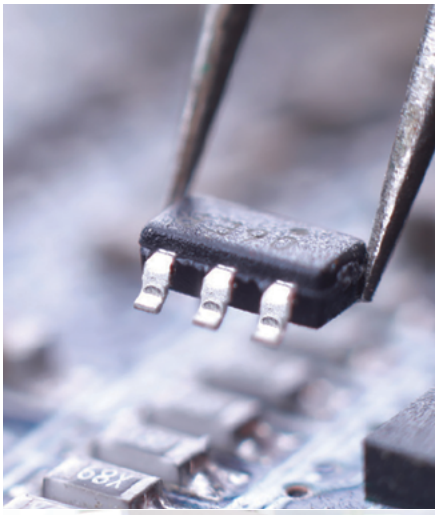


Qualcomm

Qualcomm paired the software-designed NI PXI Vector Signal Transceiver (VST) with NI software to significantly increase test coverage. This also improved test speeds by more than 200X compared with traditional rack-and-stack instruments.

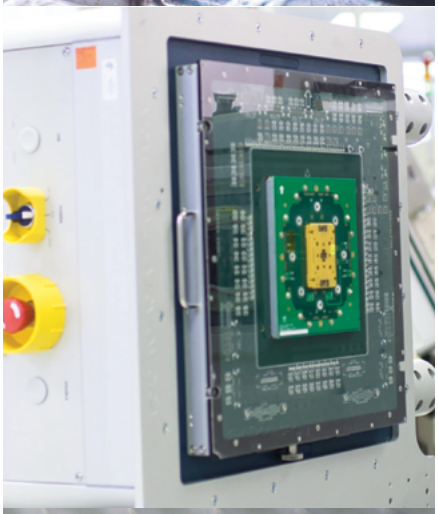
Intel

Intel used LabVIEW and the VST to more thoroughly test new features and corner cases for its latest RF transceivers. This increased product quality and saved several millions of dollars.



IDT

IDT deployed a next-generation production test system for its mixed-signal devices using the STS. The system's flexibility helped IDT reconfigure and grow as its performance needs increased.



Broadcom

Broadcom used the VST to implement power serving on an FPGA level. This reduced the manufacturing test time of power amplifiers by 5X compared with existing test systems.

Foundation for Innovation

NI's approach to semiconductor test is based on a single underlying platform of PXI and software that you can use from the lab through production. With support from a vibrant ecosystem, this approach offers the openness you need to integrate third-party hardware and software as well as industry-specific mechanical enclosures and fixturing.

Adopted across multiple industries, PXI is an open platform founded in 1997 and governed by the PXI Systems Alliance with more than 1,500 products from 60 vendors. PXI chassis provide a high-speed, high-bandwidth PCI Express bus for data sharing and integrated timing and synchronization. PXI also offers a framework for using commercial off-the-shelf (COTS) technologies such as the latest multicore processors and FPGAs. To take advantage of the latest commercial computing power while meeting the long-term life-cycle requirements of industrial environments, the processors for PXI controllers are selected from Intel's embedded roadmap, which features controllers designed for long-term industrial use. This creates both a high-performance and low-cost deployment platform for semiconductor test from first silicon to final production test.

A System Powered by Software

Customize your test system with high performance driver APIs optimized for the most popular application development environments such as NI LabVIEW or .NET.

Tightly Integrated Instrumentation

Perform complex multi-instrument routines seamlessly with multichassis synchronization options and the integrated timing and synchronization of the PXI backplane.

Higher Data Throughput

Stream up to 24 GB/s with subnanosecond latency through the latest PCI Express Gen 3 technology available on PXI Express chassis and controllers for data-intensive applications.

Parallel Test Execution

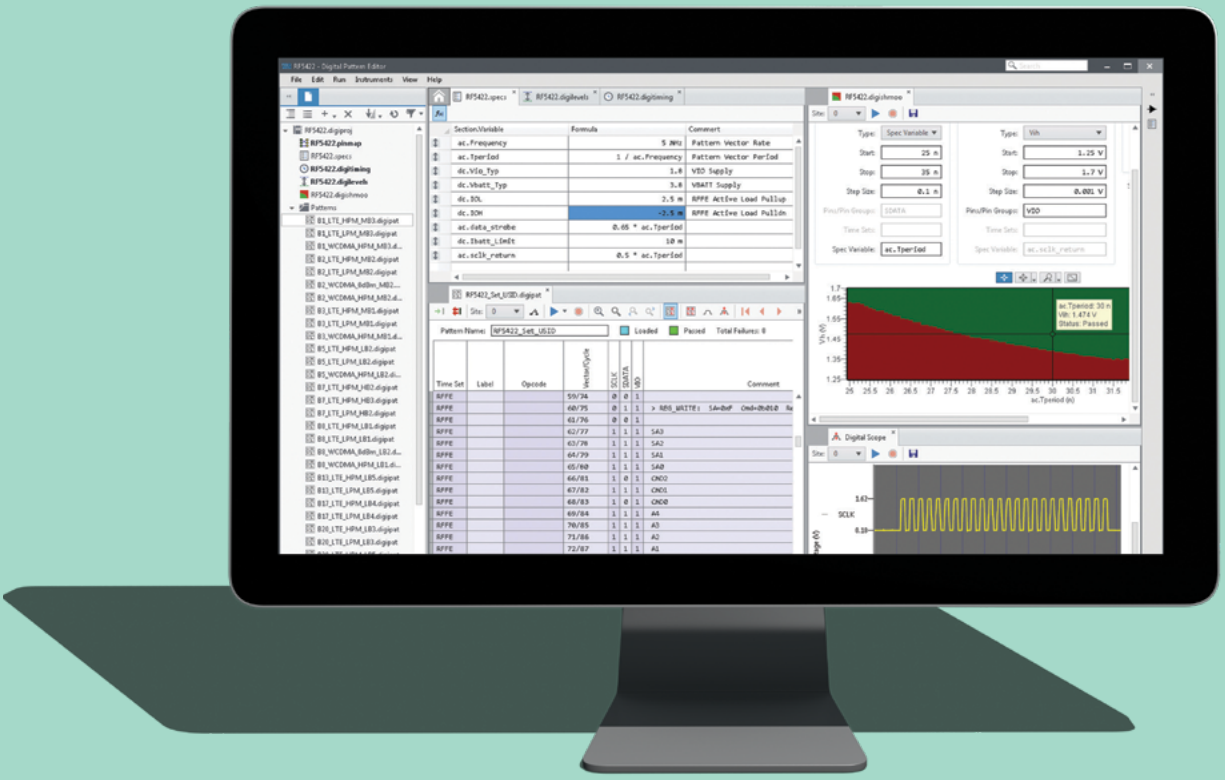
Rest assured that your system's controllers, with up to eight cores of Intel Xeon processing, have the horsepower to process as much as your tests demand without sacrificing efficiency.

Increased Measurement Coverage

Get the digital patterns, high-density source measure units, and high performance RF measurements you need with PXI's breadth of class-leading instrumentation I/O.

Faster Measurement Times

Achieve best-in-class test times with technologies unique to NI, such as LabVIEW FPGA and advanced algorithms.



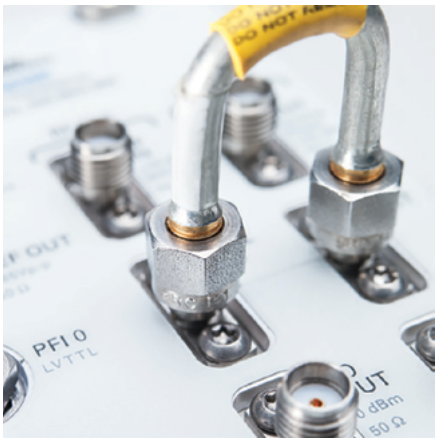
Semiconductor Test System (STS)

The STS series features fully production-ready test systems that pack NI technology in a form factor suitable for a semiconductor production test environment. The STS combines the NI PXI platform, TestStand test management software, and LabVIEW graphical programming inside a fully enclosed test head. Its “tester in a head” design houses all the key components of a production tester including system controllers; DC, AC, and RF instrumentation; device under test (DUT) interfacing; and device handler/prober docking mechanics. This compact design eliminates the extra floor space, power, and maintenance required by traditional ATE testers that unnecessarily increase the cost of test. Additionally, with the open, modular STS design, you can take advantage of the latest industry-standard PXI modules for more instrumentation and computing power.

STS Services and Support

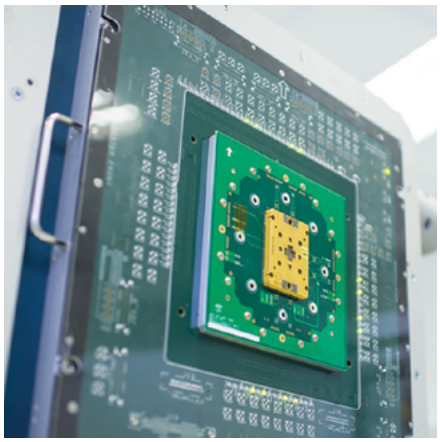
NI offers specialized service programs for the STS designed to meet the critical uptime needs of semiconductor customers. In addition to standard NI services and support, STS customers have access to:

- On-site setup included with every first STS system deployment
- 24x7 technical support by phone, by email, or on-site
- On-site engineering support
- STS calibration services
- Repair coverage and express delivery of replacement parts



RF Instruments

NI's RF portfolio includes the industry-leading VST supported by a multiport RF subsystem in the STS that is highly configurable for a variety of RFIC test needs.



Standard Docking/Interface

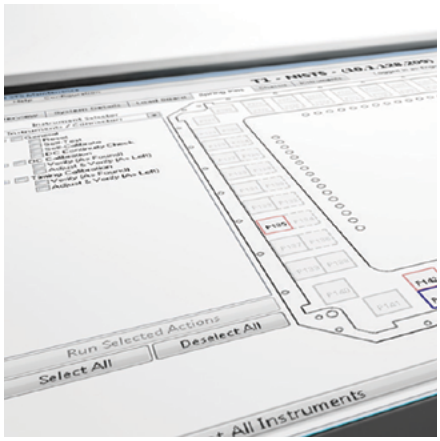
The STS docking and interfacing infrastructure allows for seamless integration with both device handlers for package test and wafer probers, making it ready for any production test cell.

Robust Test Head

With a compact form factor and a ruggedized frame, the STS's "tester in a head" design houses all the key components of a production tester including system controllers.

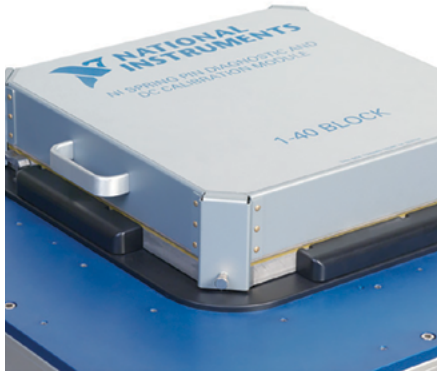
Mixed-Signal and DC Instruments

NI has a comprehensive portfolio of source measure units (DC), digital pattern instruments, dynamic signal analyzers, arbitrary waveform generators, and oscilloscopes for a variety of mixed-signal test needs.



Maintenance Software

The STS's intuitive graphical user interface allows for quick troubleshooting, monitoring, and system-level debugging to ensure high uptime and reliability when you deploy the STS to the manufacturing floor.



System Calibration

The STS offers system-level DC, digital, and RF tools to calibrate to the spring probe interface or RF blind mates, saving valuable time and ensuring the highest possible system-level measurement quality.

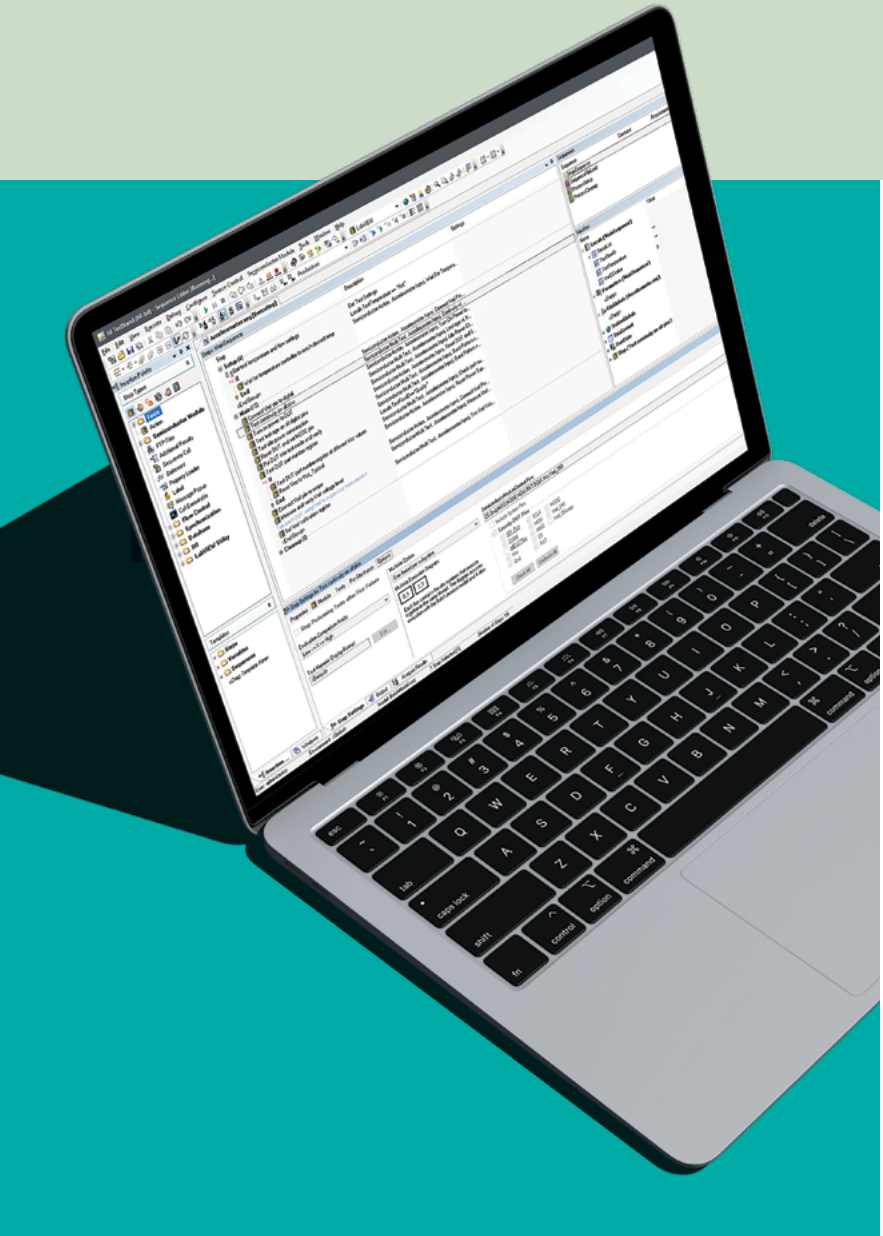
"As integrated circuit complexity grows exponentially, cost-effective ATE that provides optimal test coverage in applications from design verification to end-of-line production test is increasingly important. For mixed-signal test, the PXI-based STS outperforms what we typically see in traditional ATE with optimal test coverage at a very low cost."

Dr. Hans-Peter Kreuter
Infineon

Software that Scales

Test Management Software

Extend the off-the-shelf functionality of TestStand, the industry-standard test management software, with the TestStand Semiconductor Module to quickly develop, debug, and deploy characterization and production test programs. The same software framework that powers the STS serves as the backbone of PXI test systems in characterization, making a seamless path for scaling your efforts and IP from the lab to production. Designed for both wafer-level and final package test applications, the software framework offers features including pin/channel mapping (for pin-based programming), binning, handler/prober drivers, limit importing/exporting, and multisite programming.



Sequence Editor

The TestStand Sequence Editor supports code modules developed in LabVIEW or .NET, so you can develop and debug complex DUT test sequences. Set break points, step in and out of modules, and pinpoint bottlenecks.

Parallel Test

TestStand's parallel processing engine unlocks the potential of the latest multicore processing technologies, making multisite test programs execute with an unprecedented level of efficiency and performance.

DUT-Centric Paradigm

You can create multisite test programs that seamlessly execute with a variable number of sites by developing channel maps to instruments.

Interactive, Out-of-the-Box Software

The Digital Pattern Editor is an interactive tool for importing, editing, debugging, and bursting test patterns. The editor includes tools like Shmoo plots to provide a deeper understanding of DUT performance across variation. You also can use rich debugging features to overlay pattern failures on a pattern or use the digital scope tool to view the pin data. With integrated editing sheets for device pin maps, specifications, and patterns, you can develop or edit imported digital test vectors and patterns.

Device Specifications

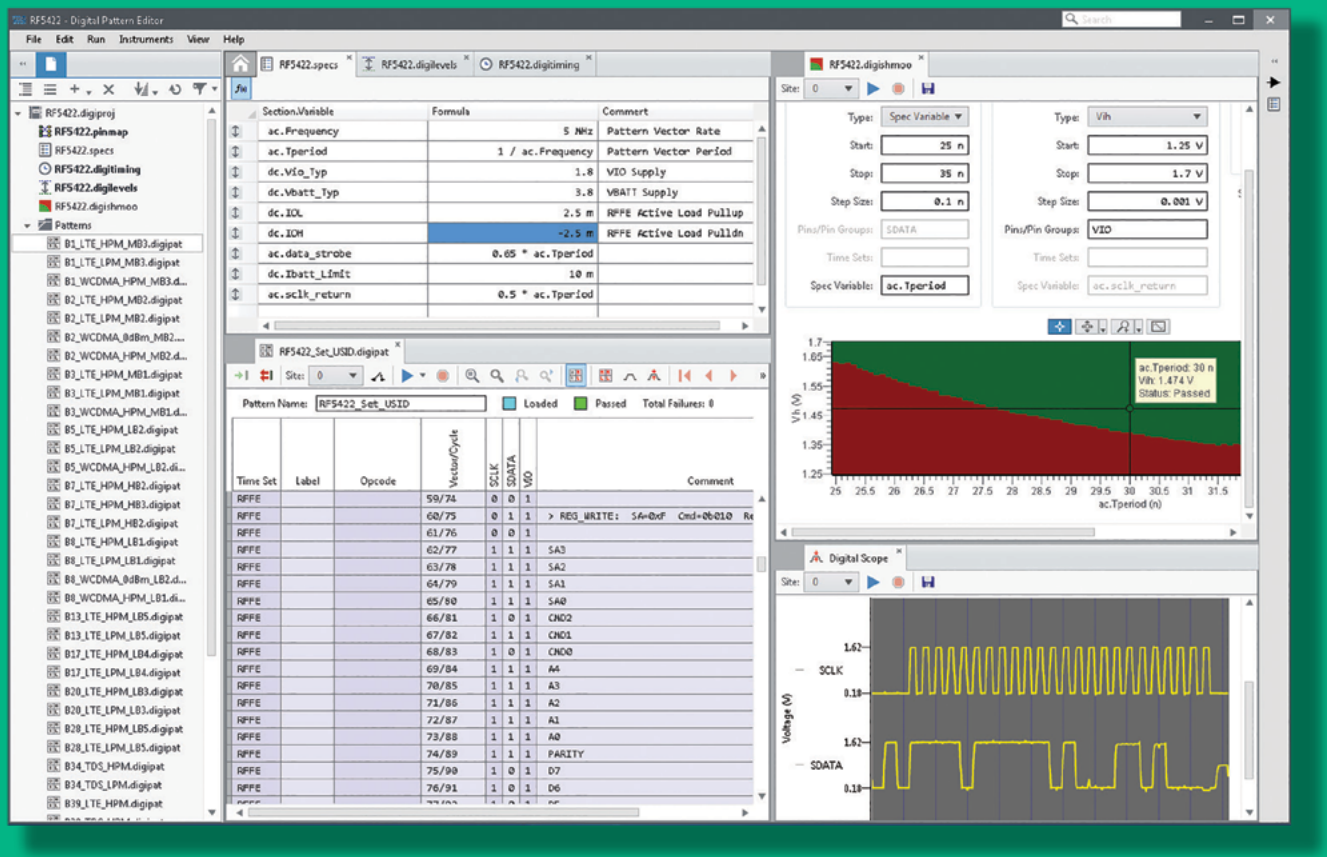
All devices have, or need, specifications that define how they can be used. A test engineer can define these specifications and use them as variables in formulas throughout the Digital Pattern Editor.

Digital Scope Tool

The tool features a progressively updated two-dimensional plot of the actual analog levels of the digital waveform using the pattern, timing set, and level.

Shmoo Tool

The Shmoo tool provides a dynamically updated intensity plot of pass and fail values for a sweep of two variables including levels, voltages, currents, edges, or specifications at a time.



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NI Services and Support

Hardware Services
Minimize downtime, save on maintenance costs, and simplify logistics with world-class service programs for hardware.

Training and Certification
Develop 50 percent faster and spend 43 percent less time on code maintenance with NI training courses. Also validate your expertise with NI certifications.

Technical Support
Get started with NI products faster or troubleshoot tough issues by contacting NI applications engineers who are ready to help via phone and email.

Consultation and Integration
Leverage our extensive network of Alliance Partners and NI systems engineers for assistance with prototyping, feasibility analysis, consulting, and systems integration.

Software License Programs
Streamline NI software management by accessing multiple levels of training, technical support, and tools through your software license.

Technical Resources
Access volumes of self-help information at ni.com including application tips, example programs, and developer communities.

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