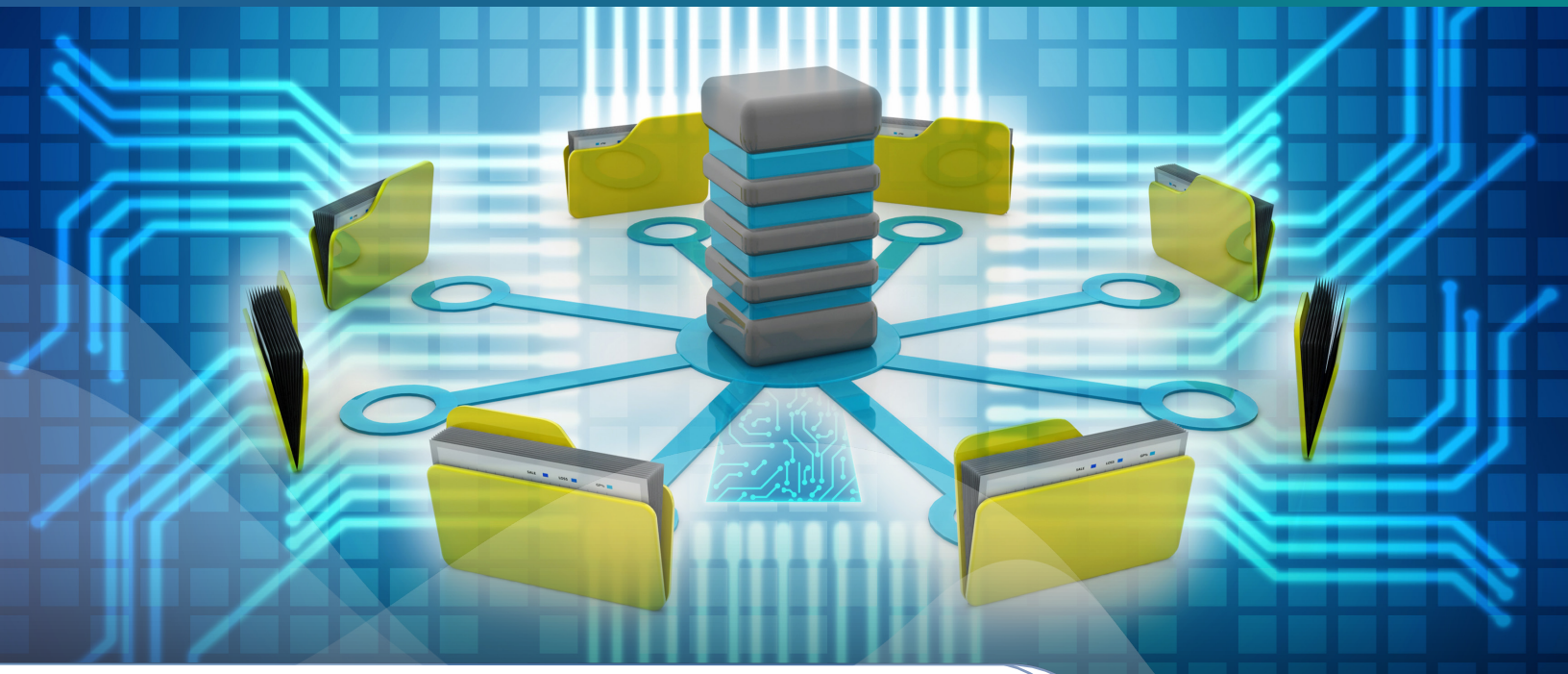

WHITE PAPER

Test Teams Gain Competitive Advantage by Embracing a Platform-Based Approach

PATHWAVE

Electronics are getting more sophisticated and complex every day. Chips, boards, and the systems they make up are increasingly difficult to design. Companies engaged in electronic product development are regularly employing platform-based approaches in their design projects. Benefits of a platform-based approach include faster time-to-market, increased engineering productivity and cost-efficiency, improved design and test reuse, and faster analysis and insight that supports better decision-making.

Over the past two decades, the trend toward disaggregation of the semiconductor and electronics industries served as a major driver for the adoption of platform-based design. The demands of higher design complexity made vertical integration of the entire development and manufacturing process impractical. Hence, the rise of fabless semiconductor companies, chip foundries, and contract electronics manufacturing services businesses. With disaggregation came the ability to focus engineering resources on a company's core competency and competitive market differentiation. Design platforms that deliver a complete solution for a particular problem or domain area help reinforce core competencies.

The same electronics industry trends apply to test. So, why are platform-based test approaches not more widely available and adopted like their design relatives? What is stopping test teams from benefitting by using the same type of platform approach as design teams? The answer is siloed workflows and homegrown test environments that inhibit easy data sharing.

KEYSIGHT TECHNOLOGIES

Much like early computer-aided engineering and design products (CAE / CAD), which were proprietary in nature, electronic test and measurement is a closely held business. Many companies build proprietary, in-house methodologies and tools to tackle their specific test challenges without regard for the resources required to maintain them. Recent Keysight research results reported in Realize the Future of Testing and Validation Workflows Today confirmed this point.

In the design world, interoperability standards and tool frameworks accelerated the movement to open systems and software solutions. They bridged the gap between logical and physical abstractions and their respective workflows. The collective work of the CAD Framework Initiative during the early and mid-1990s helped make electronic design automation tools and methods more accessible and interoperable. Frameworks also provided the means to better manage the ever-growing volumes of design data. While the design world is now accustomed to the benefits associated with interoperability and platform-based methods, the test world still suffers from silos and poor handoffs between different steps in the work process.

Platforms Orchestrate Data Processing, Sharing, and Analysis

Platforms are a technology abstraction layer. They enable data processing, sharing, and analysis at the highest levels to generate valuable operational insights from complex design, test, and measurement processes. Platforms consist of applications, software tool and hardware instrument suites, and work tasks and workflows. Individual tools and instruments produce and consume data in the performance of tasks. Tool suites integrate the data into functional workflows. Platforms perform all the management oversight across tasks and multiple workflows to orchestrate interdependent processes.

Electronic design, test, and measurement platforms are like a symphony maestro conducting world-class musicians. The platform is responsible for orchestrating the entire interoperability scenario and producing the desired insight or outcome.

An electronic engineering platform, like Keysight's PathWave, raises the design and test abstraction level from task or function to integrated workflow solution to orchestrated process. The platform produces results that are not possible in its absence. They include greater automation and engineering productivity, faster time to market, and reduced manufacturing risk.

Did You Know?

Ninety-one percent of respondents to a recent Dimensional Research study of design and test engineers, said they created in-house tools for testing and verification. Test engineers follow tried-and-true methods. They resist change from legacy ways to a more open and connected approach.

Platform Key Characteristics

At the core of the platform is mission-critical operational technology that provides the tool, solution workflow, and process interoperability infrastructure. Without this framework, there can be no high-level insights that fuel significant improvements in engineering and business operations. Large-scale enterprises need these insights to meet today's design, test, and measurement complexity challenges.

Requirements for Open Framework Architecture

Following the design world's example, the test community stands to gain significant competitive advantage by embracing a platform-based approach built around open frameworks and interoperability. Keysight and Nokia recently launched OpenTAP, the Open Test Automation Project, as a first step in this direction. OpenTAP provides an open source, scalable architecture that enhances and accelerates the development of automation solutions within the test and measurement ecosystem, with demonstrated success in 5G network equipment manufacturing.

While test automation is a necessary component of a platform-based solution, it does not address the complete workflow or end-to-end architecture. To enable faster solution development, maximize productivity through connected workflows, and integrate insights into operational systems, a platform-based test solution should cover the full development life cycle (Figure 1). It should also consider both horizontal work functions and vertical work tasks (Figure 2).

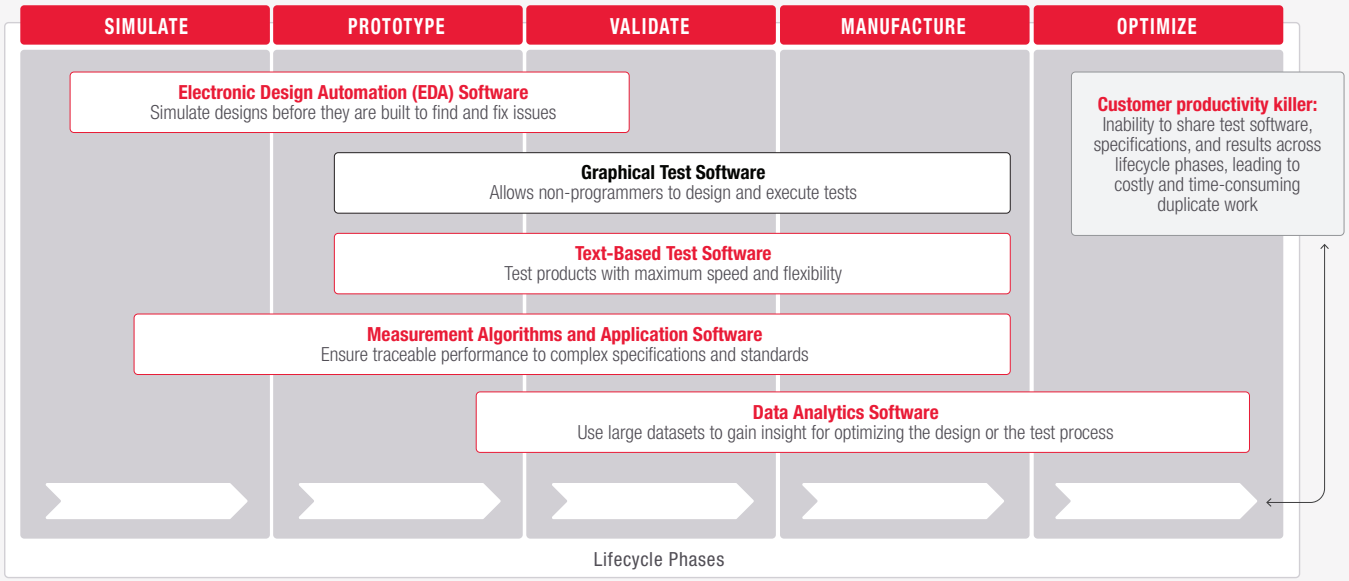

Figure 1. Test platforms must cover the whole electronic product development life cycle, from simulation to optimization

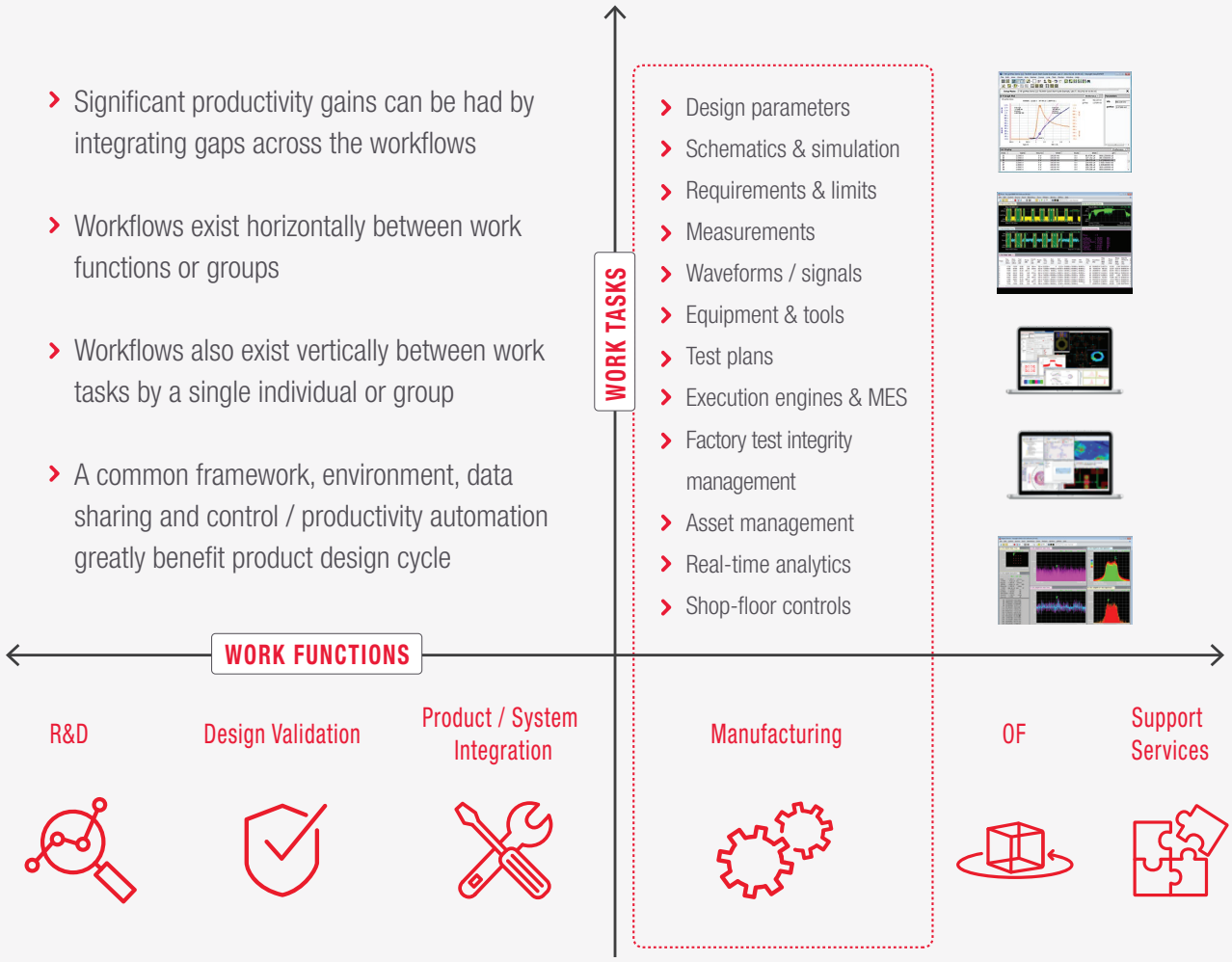

Figure 2. Test platforms must incorporate both horizontal work functions and vertical work tasks

To support both horizontal work functions and vertical work tasks, platform-based test architectures need a framework that is open, flexible, and scalable (Figure 3). The central elements in a new framework are a high-performance communication fabric and an easy-to-use integration kit that allow rapid plug and play between homegrown tools and commercially available tools. The infrastructure mechanism is the connecting fabric that streamlines the necessary transactions between participants in the platform. The integration kit is a set of rules and programming interfaces that connect application plug-ins with the fabric.

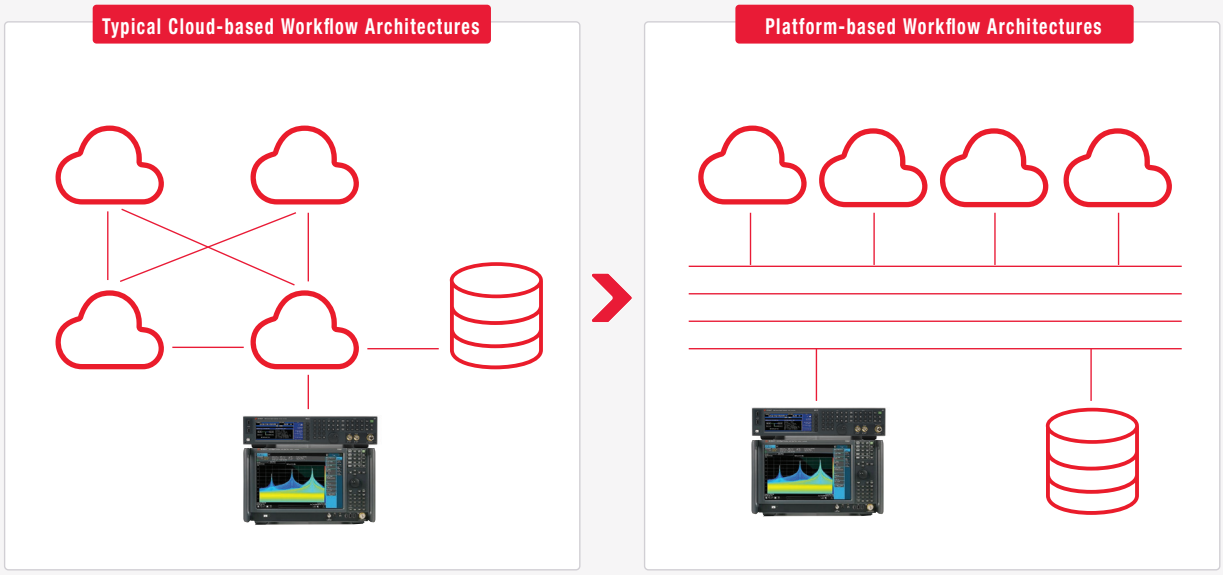

Figure 3. Platform-based test architectures must feature an open, flexible, and scalable connecting fabric

In addition to providing the proper connections, the framework must foster the exchange and co-creation of value between users. The framework should attract system engineers, hardware engineers, lab managers, test planners, and system administrators to use and contribute to it for technical and business purposes. When the framework engages users by delivering compelling value connections, it turns community members into both producers and consumers of new capabilities and data not possible with homegrown solutions.

Also key to a framework's success are a common data model and user experience. A common data model lets producers quickly develop and plug in to the framework their own unique intellectual property (IP). Once the IP connects to the framework, consumers can deploy solutions and workflows. A common user experience provides a centralized view into the platforms and their management.

How a Connected, Platform-Based Design and Test Workflow Works

As an example of an ideal platform concept, consider a specification-driven workflow that starts and ends with the actual product specification, linking simulation with reality. The specification and test vectors assist in automation, measurement, compliance, and analytics (Figure 4). Engineers break down product specifications into requirements. Then they automatically translate test classes / vectors into a format that all framework plug-ins understand and share throughout the development life cycle.

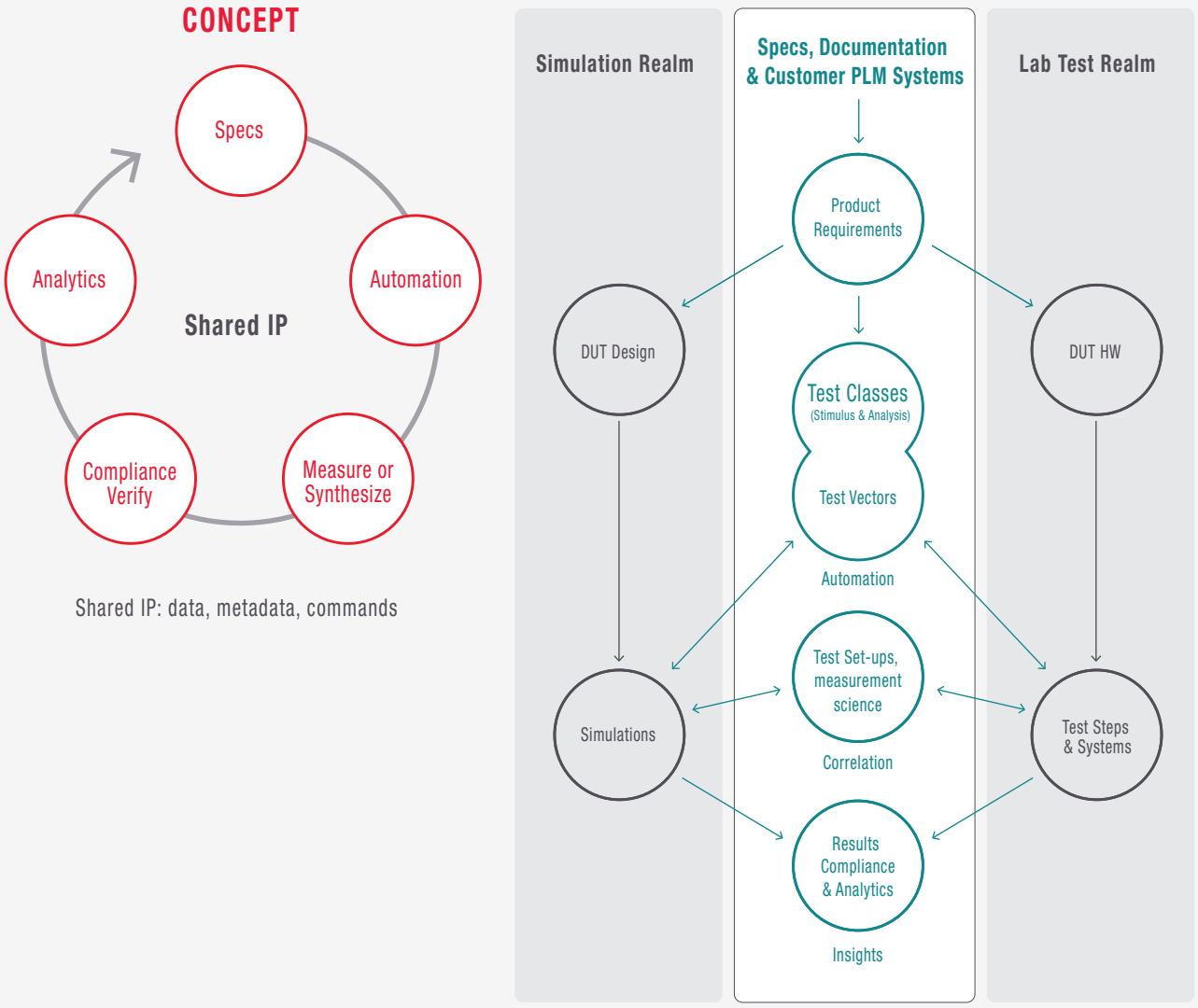

Figure 4. Connecting design and test environments using a common data model and user experience supports the creation of specification-driven workflows

Automated translation of test classes and vectors into test plans drives simulations and lab tests. It eliminates a time-consuming manual process and provides consistency in the way engineers perform tests in both environments. Typically, they model test setups in simulation, but it is not easy to share the same measurement science to reduce the variance in simulation to test correlation. To reduce correlation variance, engineers use the same stimulus and analysis software plug-ins for simulation and test to stimulate and analyze the device under test. A common design and test platform improves test lab correlation to simulated results and accrues significant benefits from software asset reuse.

In traditional siloed workflows, volumes of simulation and test data reside in a file that requires manual sorting, which is time-consuming and mistake-prone. A platform-based workflow tags all results with relevant data, which includes the date, product version, workspace, test performed, and test vector parameters. Since the results are tagged, engineers can tell which test is associated with the data and how it was done.

Next, engineers can automatically populate a compliance matrix with pass-fail criteria and summary results. For deeper analysis, engineers can click on any test result in the compliance matrix to open a waveform viewer. Engineers then can view a waveform for a given test against any other waveform of the same test, regardless of whether it is simulation or test data, to perform comparisons and gain critical insights.

More engineers and their managers are recognizing how a platform-based test workflow breaks down homegrown test environment silos and fosters software reuse. To achieve results that accelerate time to market and dramatically improve productivity, test professionals need a new interoperability framework founded on an open, flexible, and scalable architecture. Key framework characteristics include a high-performance communication fabric, an easy-to-use plug-in integration kit, and a common data model and user experience. Engineers and test operations executives who want to maximize return on investment while focusing on their core competencies must look to a platform-based test approach that leverages the best of homegrown and third-party IP.

Additional Resources

Keysight's PathWave platform delivers the necessary foundational technologies of a platform-based test architecture. It also provides the tool workflow integration and process management capabilities to unlock the greatest value from shared engineering data. Visit the PathWave platform to find out more. To learn more about connected, agile design and test, read Keysight's TestOps Manifesto and white paper How TestOps Speeds Electronic Design and Test.

Learn more at: www.keysight.com

For more information on Keysight Technologies' products, applications or services, please contact your local Keysight office. The complete list is available at: www.keysight.com/find/contactus

KEYSIGHT TECHNOLOGIES