S680DC/RF

RF Option for S680 Series Testers

Making complex RF metrology simple since 2002

- **Combines DC and RF measurement functions in a single tester/prober combination**
- **Independent DC and RF test execution**
- **Incorporates technology-leading Vector Network Analyzers and DC/RF probe cards**
- **Configurable with 13.5GHz, 20GHz, or 40GHz VNAs**
- **Uses existing S680 Series systems**
- **12 term SOLT calibration or user-defined calibration algorithm**
- **1fA/1µV DC precision**
- **1Hz frequency resolution**
- **Compatible with 200mm and 300mm probers**
- **Supports "lights out" factory automation**
- **Adapts easily and economically to new processes and applications**

High Performance Single-Insertion RF and DC Test Solution

Keithley's S680DC/RF Test System is designed to speed and simplify measuring RF parameters in concert with DC parametric testing. This system integrates DC and RF parametric testing capabilities in a single automated tester, allowing independent DC and RF test execution when used with a suitable test structure layout. The S680DC/RF system adds 2-port s-parameter measurement capabilities to Keithley's S680 Series Automated Parametric Test Systems, one of the most versatile and widely accepted DC test platforms available.

The measurement capabilities built into the S680DC/RF system were defined in cooperation with leading manufacturers of telecommunications components, many of whom employ Keithley test systems in their wafer fabrication facilities. To meet their requirements, Keithley has formed working partnerships with two companies at the cutting edge of RF test technology— Anritsu Corporation, a leading producer of Vector Network Analyzers (VNAs), and GGB Industries, Inc., the foremost maker of combined DC/RF probe cards.

The S680DC/RF Test System is targeted at the technology development testing needs of a fab's modeling and process integration engineering departments as well as manufacturing test operations. It offers an economical wafer level testing approach to handling the growing demand for wireless and telecom devices.

Dramatic Reductions in COT

The S680DC/RF Systems offer fabs producing components for telecommunications manufacturers a variety of ways to reduce their Cost of Test at the wafer level. The most obvious advantage is the extended use of existing S680 testers. By re-purposing these testers, fabs can continue to get returns on their original investments while adding RF testing functionality. Combining RF and DC parametric testing capabilities in a single existing system eliminates the high cost and significant floor space required for a separate RF tester and prober. The S680DC/RF is compatible with many popular probers, including many of those used with existing S680 Series testers.

Throughput improvements also allow S680DC/RF users to reduce their testing costs dramatically; depending on the system configuration chosen, S680DC/RF testers can offer up to ten times faster throughput than other RF testing approaches. This speed increase is made possible through the use of Anritsu's self-calibrating Vector Network Analyzer and GGB's DC/RF probe cards and calibration substrates. These system components work in cooperation with the rest of the tester hardware to reduce measurement calibration time to less than two minutes. The S680DC/RF tester employs a full Short-Open-Load-Through (SOLT) system-level measurement calibration process. By giving users improved confidence in the integrity of their test results, this calibration technique, which includes enhanced reflection standards, helps eliminate the need for time-consuming reprobing.

Electrical precision and mechanical stability ensure highly repeatable RF parametric measurements.

Speed and simplify DC and RF testing

SEMICONDUCTOR

1.888.KEITHLEY (U.S. only)

www.keithley.com

KEITHLEY

A GREATER MEASURE OF CONFIDENCE

S680DC/RF

Ordering Information

60500-13.5G
2-port s-parameter measurement system upgrade for S680 Series system, with 13.5GHz VNA, without Switch Matrix

60500-20G
2-port s-parameter measurement system upgrade for S680 Series system, with 20GHz VNA, without Switch Matrix

60500-40G
2-port s-parameter measurement system upgrade for S680 Series system, with 40GHz VNA, without Switch Matrix

Extended warranty, service, and calibration contracts are available

APPLICATIONS

Wafer level s-parameter testing for:

- **Device modeling (data compatible with popular packages such as BSIMPRO, IC-CAP, UTMOST)**
- **Process monitoring (with test macros for converting s-parameters to RF parameters such as fmax, ft, Rbb, and Q)**
- **General analysis of complex signals, including user-defined combinations of a1, a2, b1, and b2**

RF Option for S680 Series Testers

Making complex RF metrology simple since 2002

The system software includes a library of test macros that allow users to reduce 2-port s-parameters (transmission and reflection) to RF parameters rapidly and automatically. These parameters include maximum frequency, transit time as a function of current, base resistance of the bipolar transistor, and inductor quality. The repeatable, reliable measurements produced by the S680DC/RF tester correlate to any properly configured benchtop or rack solution.

Wafer mapping capabilities allow test engineers and operators to do rapid on-tester visualization, plotting, and analysis of parametric test data at the site, die, wafer, and cassette levels.

Ultra-Low-Loss Interconnect

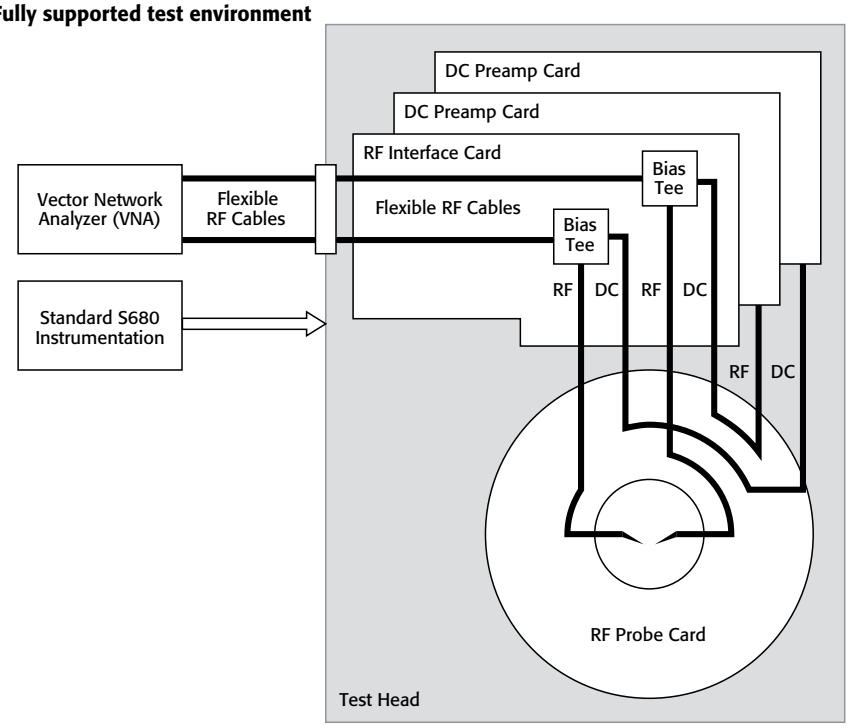
The S680DC/RF's measurement accuracy is specified as a complete system—VNA, interconnects, probe card adapter, probe card, and the calibration substrate—right to the probe tips. The S680DC/RF's high accuracy is a sharp contrast to the typical rack-and-stack RF testing approach, the accuracy of which depends largely on the skill of the engineer assembling the system and the care with which it is maintained and operated.

Fully Supported Test Environment

Unlike existing rack-and-stack approaches to RF parametric testing, which are often difficult to maintain or expand as needs change, the S680DC/RF tester is based on a standard test environment, the latest release of the Keithley Test Environment. All currently marketed Keithley testers can be operated in this same testing environment, which shortens the learning curve associated with new systems or applications significantly. Just as important, KTE provides the foundation for a growing line of operational productivity tools from Keithley. Some of these optional tools packaged with the RF option include:

- SofTouch Probing Solution. Wafer-level RF measurements are extremely sensitive to variations in probe contact resistance, especially measuring Q of inductors, capacitors, and varactors. The SofTouch probing solution automates detecting probe-to-pad contact on the measurement wafer,

Fully supported test environment



Speed and simplify DC and RF testing

SEMICONDUCTOR

1.888.KEITHLEY (U.S. only)

www.keithley.com

KEITHLEY

A GREATER MEASURE OF CONFIDENCE

RF Option for S680 Series Testers

Making complex RF metrology simple since 2002

as well as the calibration standard. This minimizes overdrive and extends the life of the RF probes and calibration standard.

- Probe Tip Cleaning Solution. Maintaining uniform probe contact resistance is essential for good wafer-level RF data integrity. The automated Probe Tip Cleaning technique tracks probe tip usage, allowing tips to be cleaned before data integrity can be compromised. Tips are cleaned automatically when cleaning is required, and the system returns to testing without the need for operator intervention. This solution is compatible with most major automatic wafer probers.

Additional optional tools include:

- Keithley Recipe Manager Option. This package helps test program developers generate valid test plans quickly by allowing them to modify existing test plans easily for reuse. By providing the version control tools needed to prevent unintentional, undesired, or undocumented code changes, it also ensures only approved test sequences are released to production.
- Adaptive Testing enhances throughput, yield, and process control by enabling the test system to make automatic changes to the test plan for each wafer being tested. These changes may be based on pre-defined zones or patterns contained in the wafer definition file. The software also supports result-based testing, which changes the sites and/or tests to be used based on the results of previous site tests.
- A SECS-II/GEM interface for easy tester integration into fab-wide automation/control systems.

In addition to these capabilities, KTE offers test engineers the flexibility of User Access Points (UAPs), which simplify integrating fab-specific functionality into the overall test environment. Backed by Keithley's worldwide technical and applications support network, KTE eliminates the time-consuming and cumbersome programming of new test functions associated with older RF test hardware. There's no need for the device modeling engineer to "babysit" a problematic test setup, so he can spend time analyzing reliable data because all aspects of system automation and program generation are part of a standard, well-supported test environment.

S680DC/RF SYSTEM BENEFITS

The S680DC/RF test solution offers fabs' modeling and process integration engineering departments capabilities and advantages never before available:

- **Up to 10 times faster throughput than other RF approaches.**
- **Integrated single-insertion DC/RF test solution.**
- **Complete-high speed 12 term SOLT calibration process and supporting substrates.**
- **Fully integrated package with ultra-low-loss interconnections for high accuracy measurements.**
- **Full range of DC measurements to provide complete DC and RF characterization and monitoring.**
- **A full package of RF extraction library routines to provide industry standard analysis.**
- **Support for user extensions of extraction library to provide company specific analyses.**
- **Complete KTE support for development and operational tools that are easy to use.**

S680DC/RF

RF Option for S680 Series Testers

Making complex RF metrology simple since 2002

Speed and simplify DC and RF testing

SEMICONDUCTOR

60500-13.5G: 13.5GHz VNA without Switch Matrix

RF PARAMETERS:

FREQUENCY: 40MHz–13.5GHz

IMPEDANCE: 50Ω.

PROBE CARD: Coplanar Probes – Ground, Signal, Ground.

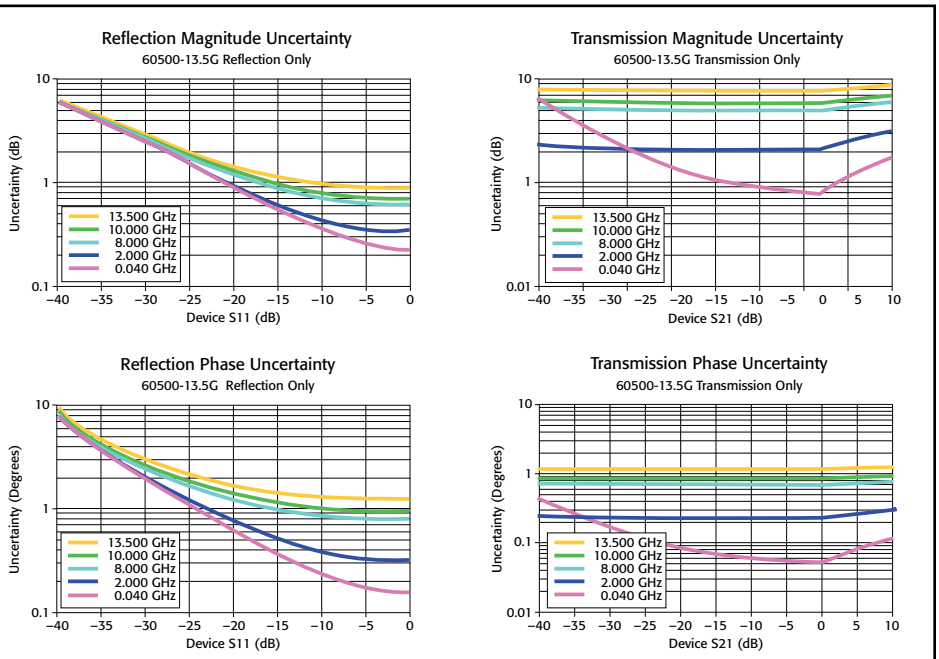
CALIBRATION SUBSTRATE: Manufactured for probe card design.

DC BIAS: 16V max., 500mA max.[1]

MEASUREMENT UNCERTAINTY[2]:

The graphs give measurement uncertainty after 12-term vector error correction. The errors are worst case contributions of residual directivity, load and source match, frequency response, isolation, network analyzer dynamic accuracy, and connector repeatability. In preparing the graphs, 10Hz IF bandwidth and averaging of 512 points were used. Changes in the IF bandwidth or averaging can result in variations at low levels.

0dB = –7dBm.



60500-20G: 20GHz VNA without Switch Matrix

RF PARAMETERS:

FREQUENCY: 40MHz–20GHz

IMPEDANCE: 50Ω.

PROBE CARD: Coplanar Probes – Ground, Signal, Ground.

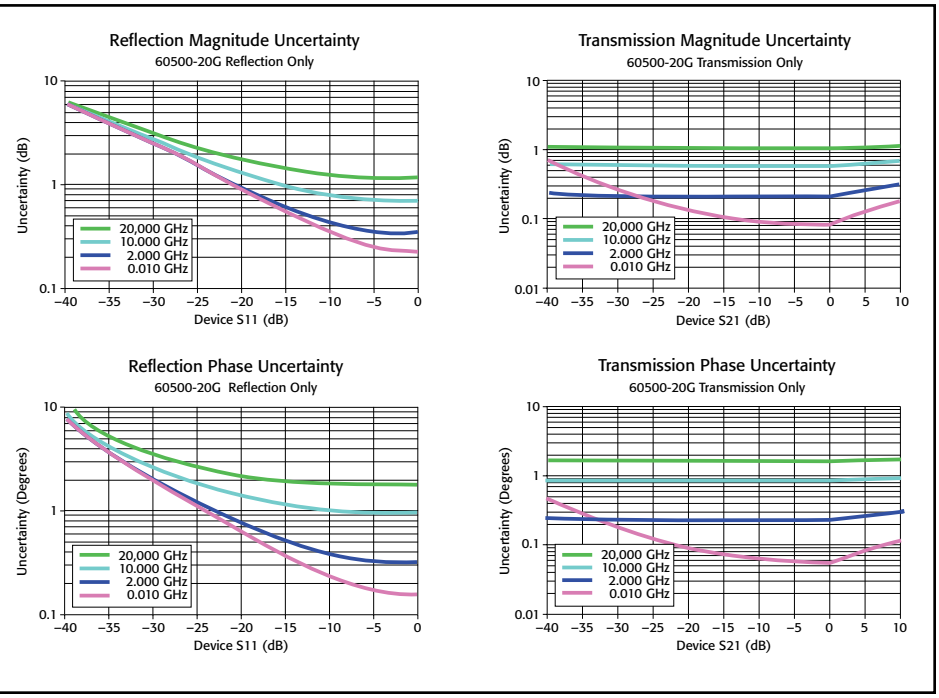
CALIBRATION SUBSTRATE: Manufactured for probe card design.

DC BIAS: 16V max., 500mA max.[1]

MEASUREMENT UNCERTAINTY[2]:

The graphs give measurement uncertainty after 12-term vector error correction. The errors are worst case contributions of residual directivity, load and source match, frequency response, isolation, network analyzer dynamic accuracy, and connector repeatability. In preparing the graphs, 10Hz IF bandwidth and averaging of 512 points were used. Changes in the IF bandwidth or averaging can result in variations at low levels.

0dB = –7dBm



1.888.KEITHLEY (U.S. only)

www.keithley.com

KEITHLEY

A GREATER MEASURE OF CONFIDENCE

S680DC/RF

RF Option for S680 Series Testers

Making complex RF metrology simple since 2002

60500-40G: 40GHz VNA without Switch Matrix

RF PARAMETERS:

FREQUENCY: 40MHz–40GHz

IMPEDANCE: 50Ω.

PROBE CARD: Coplanar Probes – Ground, Signal, Ground.

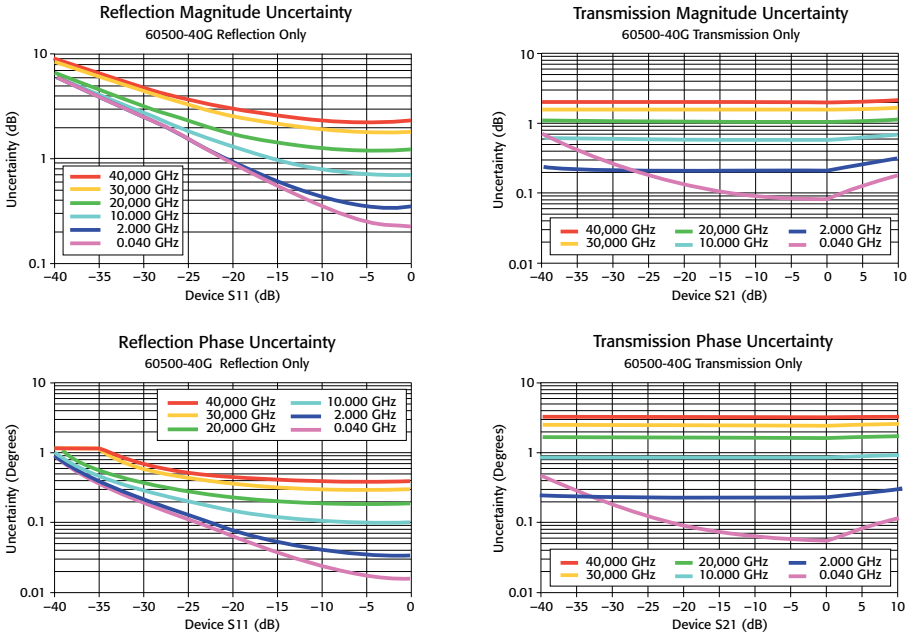
CALIBRATION SUBSTRATE: Manufactured for probe card design.

DC BIAS: 16V max., 500mA max.[1]

MEASUREMENT UNCERTAINTY[2, 3, 4]:

The graphs give measurement uncertainty after 12-term vector error correction. The errors are worst case contributions of residual directivity, load and source match, frequency response, isolation, network analyzer dynamic accuracy, and connector repeatability. In preparing the graphs, 10Hz IF bandwidth and averaging of 512 points were used. Changes in the IF bandwidth or averaging can result in variations at low levels.

0dB = –7dBm.



GENERAL

SAFETY: Conforms with European Union Directive 73/23/EEC: EN61010-1.

EMC: Conforms with European Union Directive 89/336/EEC: EN61326.

ENVIRONMENT:

Operating: 18°C to 28°C, <50% relative humidity, ±3°C operation from calibration temperature.

Storage: –25°C to +65°C.

NOTES:

1. The S680 system is capable of outputting higher voltages and currents than the bias tees are rated. The user must take this into consideration when programming the test routines by limiting voltage and current levels.
2. All RF specifications listed are typical based on a 24 hour calibration, and are relative to the calibration substrate and the calibration factors provided with the calibration substrate. Changing of probe card, breaking and reconnecting interconnect cables, or 24 hours elapsed time from calibration requires that the system be recalibrated.
3. At frequencies above 30GHz and up to 40GHz, the uncertainty characteristics shown may produce unacceptable measurement results below –30dB signal level.
4. Verification of specification uncertainty characteristics above 20GHz was done with a GGB probe card model 40A.

S680DC/RF

RF Option for S680 Series Testers

Making complex RF metrology simple since 2002

Speed and simplify DC and RF testing

SEMICONDUCTOR

KEITHLEY

A GREATER MEASURE OF CONFIDENCE

KEITHLEY INSTRUMENTS, INC. ■ 28775 AURORA ROAD ■ CLEVELAND, OHIO 44139-1891 ■ 440-248-0400 ■ Fax: 440-248-6168 ■ 1-888-KEITHLEY ■ www.keithley.com

BELGIUM
Sint-Pieters-Leeuw
Ph: 02-363 00 40
Fax: 02-363 00 64
www.keithley.nl

CHINA
Beijing
Ph: 8610-82255010
Fax: 8610-82255018
www.keithley.com.cn

FINLAND
Espoo
Ph: 09-88171661
Fax: 09-88171662
www.keithley.com

FRANCE
Saint-Aubin
Ph: 01-64 53 20 20
Fax: 01-60-11-77-26
www.keithley.fr

GERMANY
Germering
Ph: 089-84 93 07-40
Fax: 089-84 93 07-34
www.keithley.de

INDIA
Bangalore
Ph: 080-26771071-73
Fax: 080-26771076
www.keithley.com

ITALY
Milano
Ph: 02-553842.1
Fax: 02-55384228
www.keithley.it

JAPAN
Tokyo
Ph: 81-3-5733-7555
Fax: 81-3-5733-7556
www.keithley.jp

KOREA
Seoul
Ph: 82-2-574-7778
Fax: 82-2-574-7838
www.keithley.co.kr

MALAYSIA
Kuala Lumpur
Ph: 60-3-4041-0899
Fax: 60-3-4042-0899
www.keithley.com

NETHERLANDS
Gorinchem
Ph: 0183-63 53 33
Fax: 0183-63 08 21
www.keithley.nl

SINGAPORE
Singapore
Ph: 65-6747-9077
Fax: 65-6747-2991
www.keithley.com.sg

SWEDEN
Solna
Ph: 08-50 90 46 00
Fax: 08-655 26 10
www.keithley.com

SWITZERLAND
Zürich
Ph: 044-821 94 44
Fax: 41-44-820 30 81
www.keithley.ch

TAIWAN
Hsinchu
Ph: 886-3-572-9077
Fax: 886-3-572-9031
www.keithley.com.tw

UNITED KINGDOM
Theale
Ph: 0118-929 75 00
Fax: 0118-929 75 19
www.keithley.co.uk

Printed in the U.S.A. No. 2390 August 07