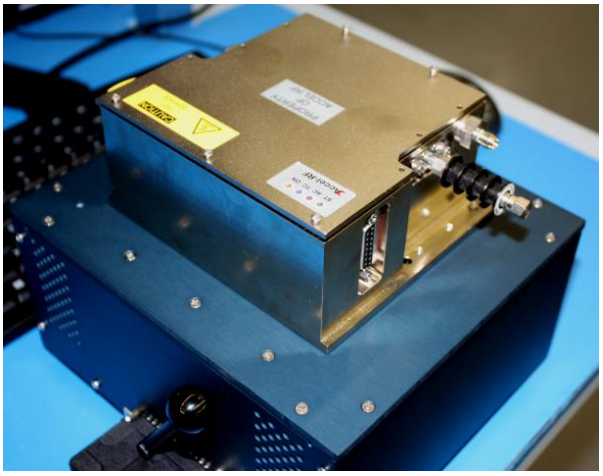
RF Test Characterization Platform Description:

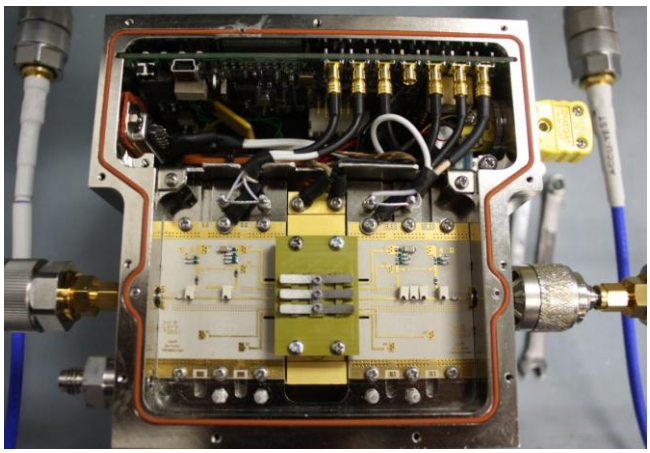
This standalone integral software and hardware platform is capable of functioning as an independent single-channel or virtual multi-channel characterization test subsystem. The platform is USB controlled to provide temperature, RF-signal and bias-control to a device-under-test (DUT) for semiconductor performance measurement. When used in conjunction with Accel-RF's embedded Pulser-Card Assembly, the test device is capable of pulsed DC and RF stimulus.



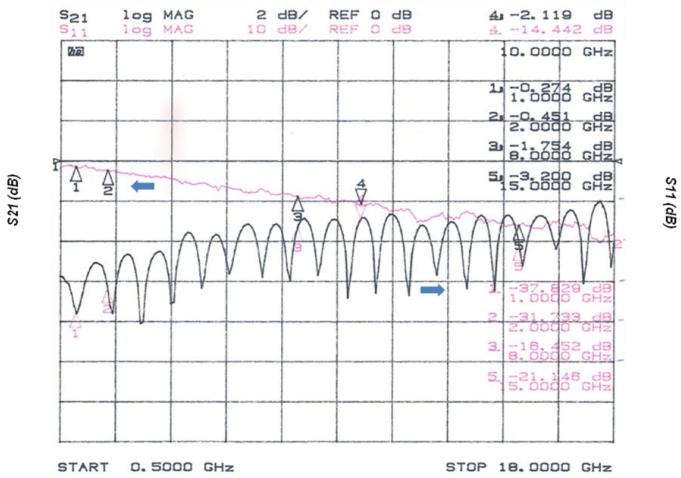
Testing at elevated temperature is precisely controlled and referenced to the base-plate or to the device channel or junction temperature if the device thermal-resistance is known. The Test Platform is also compatible with Accel-RF's AARTS LIFETEST product-line and may be used with standard test fixtures utilized in an AARTS reliability test system.

Augment the Capabilities of the Accel-RF SMART Fixture:

The AARTS SMART Fixture with its integrated pulsing capability and enhanced RF interconnection system will "plug-n-play" directly in to the virtual characterization platform. This independent test system will allow bench-top functional characterization of technology standard evaluation circuits and application-specific devices. This flexible test platform is able to accept over 15 standard device packages with a change of only an adapter-plate and the RF input and output matching circuits needed for the specific device to be tested. The ability to test and characterize a MMIC device is simplified by using standard 50-ohm interface boards.



RF Performance of Smart Fixture with 50-Ohm "Through"



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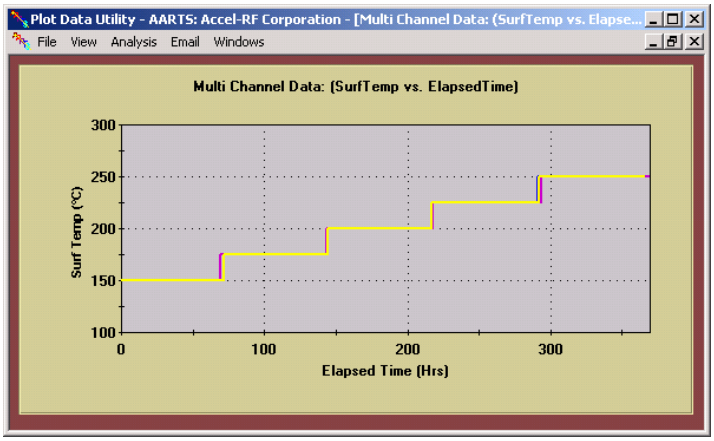
The Accel-RF virtual test and RF Characterization Platform allows for easy measurement of critical performance characteristics used for RF-HTOL burn-in/reliability studies, performance-degradation studies, environmental parameter-variation analysis, or for automated functional-test measurement.

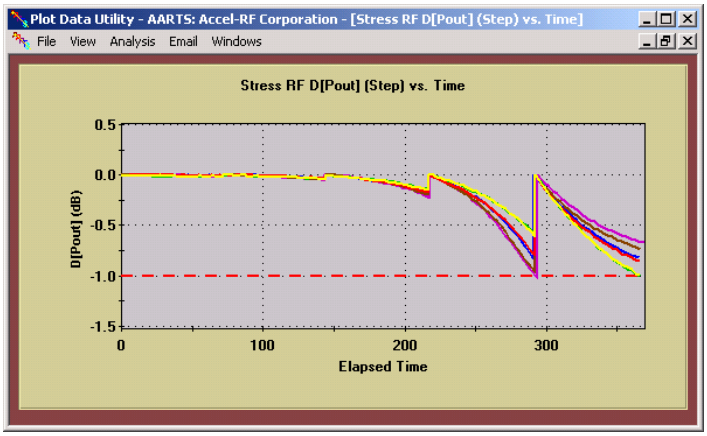
Examples of Specific Test Uses include:

The RF Characterization Platform is designed to support easy implementation of very generic step-stress stimuli, including DC and RF bias stress variations as well as temperature stress variations. The fact that any number of test sequences and stimulus defintions may be arbitrarily defined opens a world of test methodologies previously unavailable in a single test system platform. The following examples give only a small sampling of the myriad of test scenarios that can be accomplished quickly and consistently with the Accel RF Characterization Platform.

Auto-Sequence Step-Stress Temperature Profile



RF Pout Degradation versus Temp Step



1. Step-Stress Testing

Step-Stress is useful for a variety of purposes. Specifically, the JEDEC JEP118 standard suggests a methodology for determining the upper temperature in a 3-temperature life test. Further, step-stress testing may be used to develop accelerated-life testing algorithms. The RF Characterization Platform has incorporated the necessary hardware and software tools to significantly reduce user inter-action time to acquire data at shorter intervals, spaced regularly apart in time, and extract the information needed to identify failures.

The platform utilizes an Auto-Sequence operational mode to setup and control a variety of stress conditions (voltage, current, RF-power, temperature, etc.). Under this paradigm, the user defines a set of stimuli (RF, DC, and thermal) for each time interval. The step duration (dwell time) is also defined by the user. Once launched, all steps in the sequence are performed automatically. The user need only review the results to determine the appropriate upper temperature limits, as defined in his test campaign requirement or as defined in an industry standard such as JEP118.

2. Infra-Red (IR) Thermal Characterization while under RF Drive

Determining an accurate Channel-Temperature for a semiconductor device is an important step in characterizing product reliability. Typically, the measurement setup, data acquisition, and device test fixture are a challenge to implement.

The RF Characterization Platform, when used in conjunction with an infrared or micro-Raman thermal imaging system, provides an elegant method for thermally characterizing a device to determine thermal-resistance and channel-temperature under DC and RF conditions.

Knowing the device channel (or junction) temperature is vital when using RF accelerated reliability test data to project product lifetimes. In order to estimate an accurate channel temperature, the device thermal resistance must be a known quantity since:

Tch = (Pdiss x Rth) + Tsurf

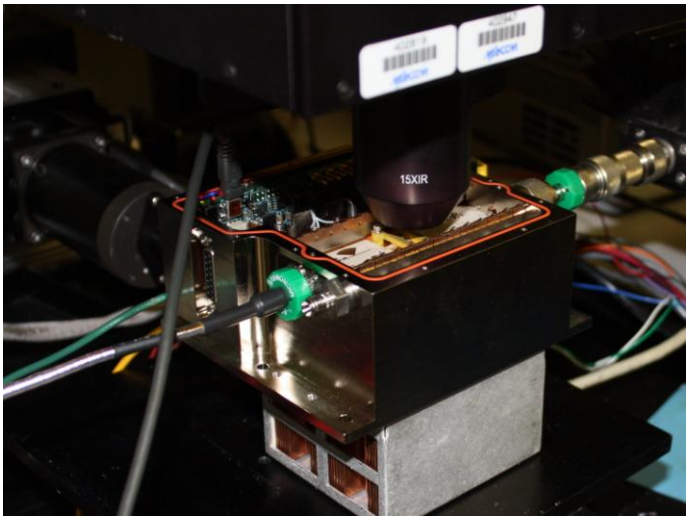
In order to achieve the best representation of this thermal resistance, it is important to recreate the same stress conditions that the device will be subjected to during the RF life test, including: RF, DC, and surface temperature.

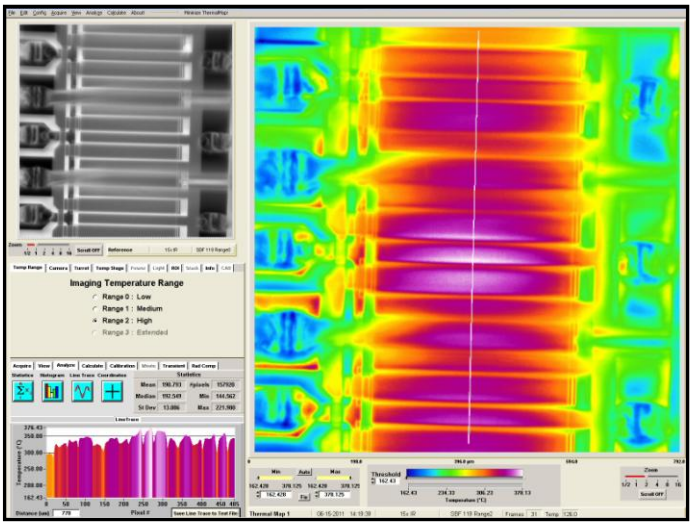
Since the device power dissipation, surface temperature, and channel temperature are now known, the thermal-resistance value is easily calculated.

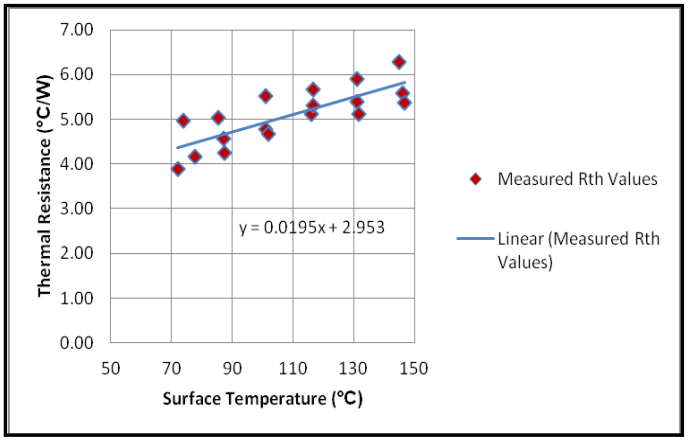
Using a population of devices measured at the same target operating conditions for the RF Lifetest, a curve fit is generated calculating the change in thermal-resistance as the surface temperature varies (see figure to the right).

Now that the thermal-resistance is known, an accurate channel temperature under RF drive is easily calculated!

IR Measurement Using the SMART Fixture and RF Characterization Platform

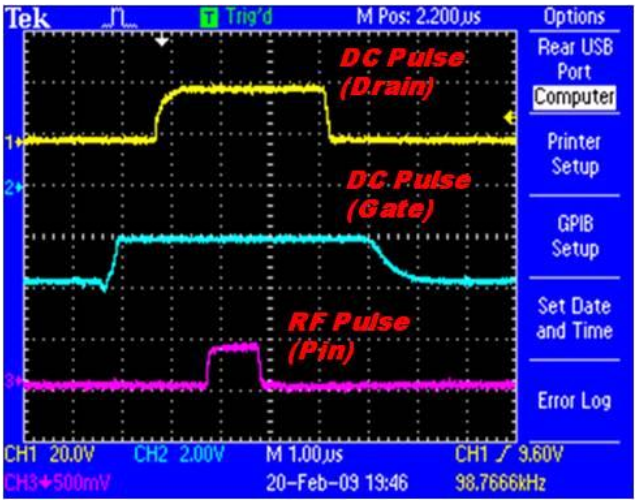






3. **DC and RF synchronized pulsing**

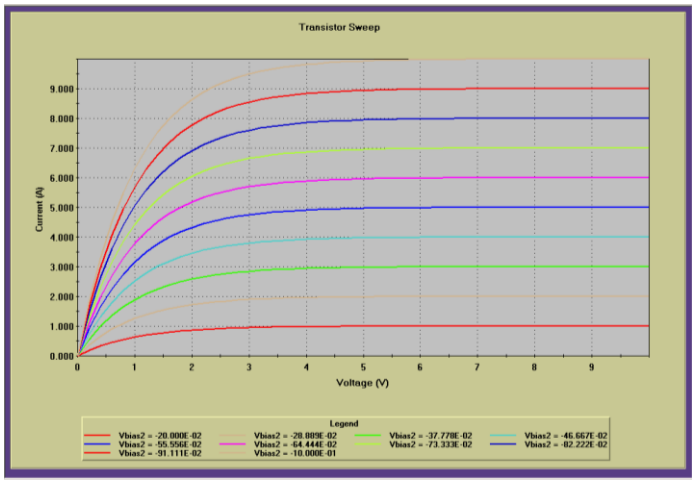
The RF Characterization Platform's hardware and software provide an easy interface to DC power-supply bias and RF signal-source stimulus circuitry for applying synchronized pulsed signals to the DUT. This enables application-specific testing to be carried out on a bench-top or custom location without the need for external cables or modulation equipment.



Typical pulse waveforms are:
- Resolution: 125ns
- Pulse Width: 10ms to 10ms
- Period: 30ms to 10ms
- Duty Factor: 0 to 100%
- Rise/Fall Time: <1ms, for (<100pF load)

4. Semiconductor Parameter Analyzer (SPA) support

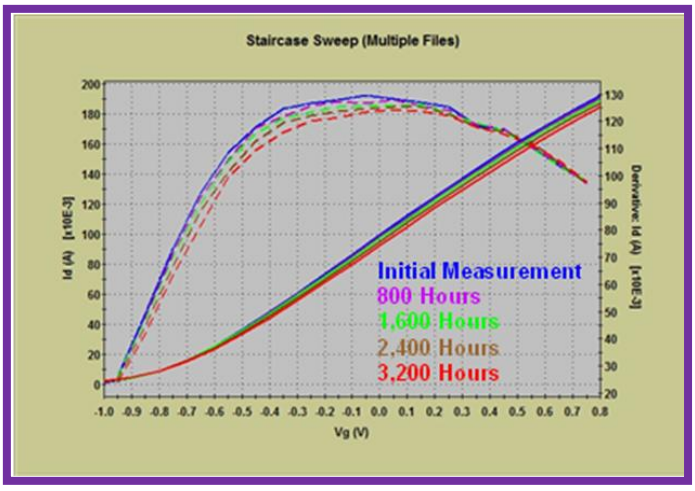
A Semiconductor Parameter Analyzer (SPA) is useful for observing performance degradation in the DC parameters of a device. The RF Characterization Platform allows one of a number of commercially available SPA models to be integrated with the test subsystem. Manufacturers such as Agilent and Keithley Instruments are typical manufacturers' models used with the RF Characterization Platform and are controlled via the AARTS Software with ***no additional programming or connection required.***



The "Transistor Sweep" mode is used to capture standard I-V sweeps based on a controlling source, such as a base current or gate voltage. The "Staircase Sweep" captures standard diode IV curves or such data as drain current at a constant drain voltage while sweeping gate voltage.

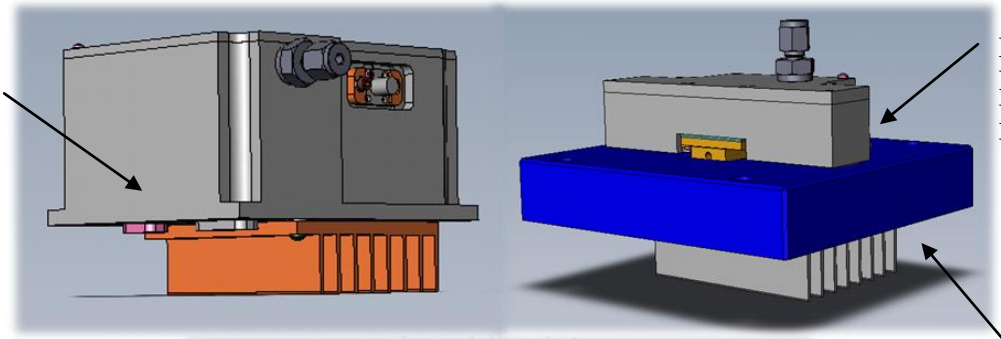
Once data has been captured it is displayed in the plot data display window. Additional controls exist to generate the plot values and labels of interest.

The RF Characterization Platform hardware and software allow multiple measurements to be scheduled at specific elapsed-test time to observe degradation with age (see figure to the right). In addition the software has an embedded data analysis tool that allows quick processing of data for mathematical and graphical analysis.



Enhance AARTS Legacy DUT Fixtures:

Turn Non-Smart Legacy DUT Fixtures into SMART Test platforms for independent control of stimulus input signals and performance data acquisition. The RF Test Characterization Platform can interface to either legacy RF DUT fixtures or legacy DC DUT fixtures used in prior versions of Accel-RF's AARTS reliability turn-key test systems.



Legacy RF DUT Fixture
P/N: 97508-01
P/N: 98200-01

Legacy DC DUT Fixture
P/N: 97783-01
P/N: 98685-01

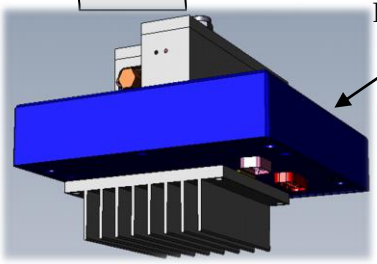
Thermal and Electrical Interface Adapter
P/N: 99436-01

Virtual RF Test & Characterization Platform with embedded Pulser Card Assembly
P/N: 99418-01
P/N: 99435-01

Once a legacy fixture is installed in the RF Characterization Platform it becomes an upgraded SMART RF Fixture, with most of the capabilities discussed above. This flexible and modular implementation achieves a forward compatibility path for previous AARTS reliability test fixtures to be seamlessly upgraded to the attributes and key features available with the latest software and hardware capabilities of new AARTS platforms.

Additionally, AARTS systems with DC-only capability can now have their DC fixtures adapted to RF AARTS system platforms with the use of the Thermal/Electrical Interface Adapter. Achieving maximum return on investment for past equipment purchases.

AARTS RF System

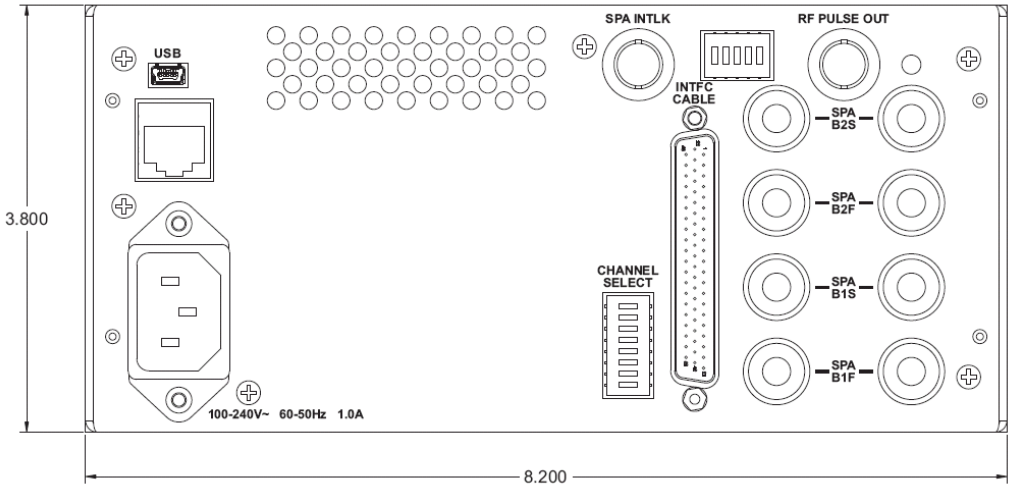


AARTS Legacy DC Fixture Thermal and Electrical Interface Adapter
P/N: 99436-01

Create a Virtual Test System:

The RF Test Characterization Platform can interface via a USB connection HUB in conjunction with other RF Test and Characterization Platforms to enable a mult-channel *virtual* test system. Using Accel-RF's LIFETEST software or Accel-RF's USB Interface software package, each individual test platform can be addressed and controlled to perform similar or independent test campaigns. The test platform has Force and Sense connections for integrating a Semiconductor Parametric Analyzer (SPA) to the virtual test system in a "cascade" architecture. Through Accel-RF's software interface the SPA may be accessed by any individual test platform on the USB network and test stimulus can be programmed, executed, and stored. This exercise can be scheduled at various elapsed-times or as directed at a prescribed specific time. Each test platform has a SPA force/sense connection for two power-supply bias capability (4-triax set). The cascade paradigm utilizes a SPA input set and output set which accomplishes the SPA cascade connection.

By configuring multiple test platform units of various-type (DC, RF, SMART-RF, or custom) fixtures in a cascaded network, a virtual burn-in, RF-HTOL, or reliability test campaign may be carried out with flexibility not found in a comparably fixed-position multi-channel rack system. Additionally, each individual test platform/fixture subsystem may be independently configured for a specific test paradigm. All sites are stimulated and exercised as desired by the user thus achieving an ultimate adaptability and flexibility not available in other test solutions offered today.



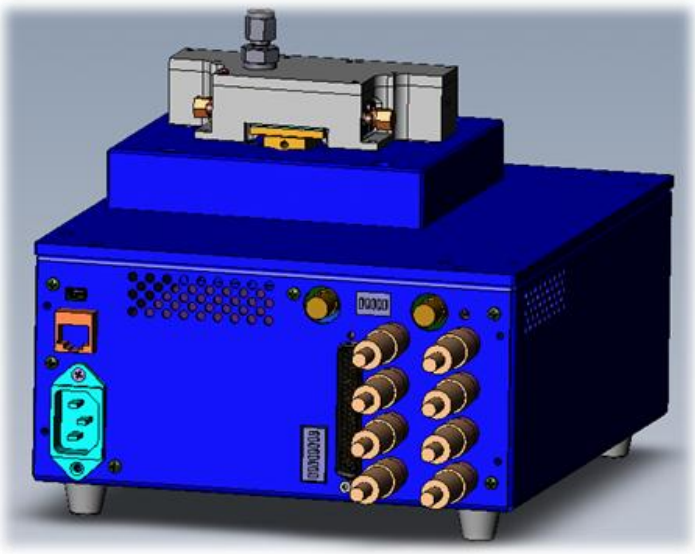


Table of Items and Features
(See Figure on Page 5)

Item No.	*P/N and Description*	*Features*
1.	*P/N: 99418-01 or P/N: 99435-01* *RF Test Platform with virtual system cascadable network and USB controller.*	*RF Test Characterization Platform* • *Includes embedded control board for interfacing to external power supplies, thermal controller, and RF source.* • *Includes Programmable DC and RF pulse control circuit board assembly (P/N:99435-01).* • *Semiconductor Parametric Analyzer (SPA) interface with 2-Bias Supply connection and Kelvin sensing at DUT.* • *Includes individually settable address and USB control interface.* • *Software definable test paradigm and parameter monitoring.*
2.	*P/N : 97385-01 or P/N: 97390-01* *Independent SMART-Fixture for device DC/RF/Thermal Characterization*	*Integral Device Under Test (DUT) Fixture for thermal/RF/DC performance characterization and evaluation.* • *Includes embedded control board for interfacing to external power supplies, thermal controller, and RF source.* • *Includes Programmable DC and RF pulse control circuit.* • *Internal heater for elevated temperature measurement capability. Baseplate temperature range to 250°C.* • *Thermo-couple monitor under DUT location used for on-board measurement and control.* • *Secondary thermocouple monitor on DUT heater-block surface with external meter connectivity.* • *Safety-interlock circuit for over-temperature setting and fail-safe.* • *DUT package "easy-mount" system for quick and easy device insertion and removal.* • *DUT package adapter-plate mounting system for quick change of DUT package type.* • *Embedded RF input and output networks for routing of RF and DC signals to DUT package leads.* • *Frequency range to 18GHz with higher frequency coverage available (consult Accel-RF)*
3.	*P/N: 97508-01 or P/N: 98200-01* *AARTS Legacy RF-Fixture for device DC/RF/Thermal Characterization*	*Integral Device Under Test (DUT) Fixture for thermal/RF/DC performance characterization and evaluation.* • *Internal heater for elevated temperature measurement capability. Baseplate temperature range to 250°C.* • *Thermo-couple monitor under DUT location used for external measurement and control.* • *Safety-interlock circuit for over-temperature setting and fail-safe.* • *DUT package "easy-mount" system for quick and easy device insertion and removal.* • *DUT package adapter-plate mounting system for quick change of DUT package type.* • *Embedded RF input and output networks for routing of RF and DC signals to DUT package leads.* • *Frequency range to 18GHz with higher frequency coverage available (consult Accel-RF)*
4.	*P/N: 97783-01 or P/N: 98685-01* *AARTS Legacy DC-Fixture for device DC/ Characterization* *P/N: 99436-01* *DC Fixture-to-RF Test Platform Adapter System*	*Integral Device Under Test (DUT) Fixture for DC performance characterization and evaluation.* • *DUT package "easy-mount" system for quick and easy device insertion and removal.* • *DUT package adapter-plate mounting system for quick change of DUT package type.* • *Embedded RF input and output networks for routing of RF and DC signals to DUT package leads.* • *Frequency range to 10GHz with higher frequency coverage available (consult Accel-RF)* • *Includes interface to AARTS reliability system to set elevated temperature* • *Temperature isolation from DUT mounting surface to fixture electronic components.* • *Baseplate temperature range to 250°C.* *DC Fixture Thermal and Electrical Interface Adapter System* • *Allows DC Fixture to be mounted in RF Test Platform* • *Internal heater for elevated temperature measurement capability. Baseplate temperature range to 250°C.* • *Thermo-couple monitor under DUT location used for external measurement and control.* • *Safety-interlock circuit for over-temperature setting and fail-safe.*