Form

ТЕСТЕР ПОЛУПРОВОДНИКОВЫХ ПРИБОРОВ
FORMULA TT2

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ВКЛ

ГРУППА

ГОДЕН   БРАК

Не проводить измерения при открытой крышке!

FORMULA® TT2
Test System

The high level of comprehensive automation of all stages of the measurement process provided by the FORMULA® TT2 ATE makes it possible to concentrate on the most important things – the features of operation, and analysis of deviations in the semiconductor devices tested.

The hardware/software, design and metrological solutions realized in the test system ensure highly reliable results, keep the work of test personnel free of routine and errors, and significantly increase operational efficiency when performing measurements and tests at industry facilities.
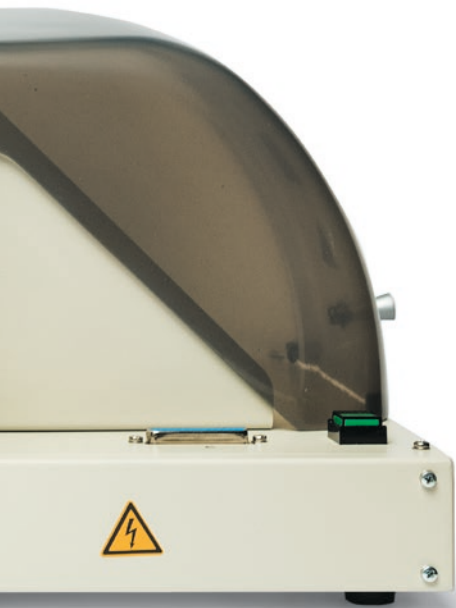
Purpose and application

The FORMULA® TT2 Test System is a universal testing and measuring system designed for comprehensive automated verification of the static parameters of semiconductor devices: field effect and bipolar transistors, diodes, thyristors, voltage regulator diodes, optrons and microassemblies.

The applications of the Test System are quality control of semiconductor devices when conducting tests and studies of newly developed types of semiconductor devices, and during in-production testing in series production.

The FORMULA® TT2 meets the requirements of the metrological standards for measurements and tests in microelectronics.

Basic technical characteristics and functional capabilities

FORMULA® TT2 Test Systems have been created to carry out highly reliable measurements of the parameters of semiconductor devices.

The key technical characteristics of the Test Systems are defined by the following values:

Key technical characteristics	Description/value
Number of operator posts	2
Connection scheme	Four-terminal (Kelvin) sensing
Voltage source and measure resources	
Range of specified and measured voltage	±100 mV...±2000 V
Number of independent voltage source and measure resources	10; 20; 200; 2000 V
Error in voltage setting and measurement	from ±(0.5% + 10) mV
Current source and measure resources	
Range of specified and measured current	±100 nA...±100 A
Number of independent current source and measure resources	5 mA; 200 mA; 10 A; 100 A
Error in current setting and measurement	from ±(1% ± 50) nA
Low current mode	±2 nA...±20 mA with error from ±(0.4% + 400) pA

The Test System is a functionally complete automated tool for measuring a wide range of semiconductor devices and provides users with the following advantages:

- High readiness of equipment for measurements and tests
- Automation of all stages of the measurement process and data management
- Operating modes with automated probes, handlers, test equipment and instruments
- Reliability in round-the-clock operations

- User-friendly, fully functional software
- Quickly interchangeable test fixtures
- Automatic diagnostics and metrological calibration
- Special solutions for independent metrological tests on the Client representative side (test jacks for connection of model devices).

The following capabilities of the equipment make the FORMULA® TT2 Test System easy to use:

- Short pulse (from 300 μs) mode for measurement of high-power transistors, eliminating the need for technically difficult heat removal from the device under test;
- Programming of parameters of output effects on test subject for duration and voltage/current;
- Multichip mode for testing transistor and diode assemblies;

- Device under test study modes with measurement of UI characteristic and capacity-voltage characteristic ;
- Precision measurement mode in the low current range from 2 nA on wafer and in the package;
- Performance of all types of measurements with connection of semiconductor devices by a Four-terminal (Kelvin) sensing.

Workplace ergonomics and safety

The design ensures reliable protection of the high-voltage measurement zone, guaranteeing complete electrical safety for the operator.

In manual measurement mode, operators only work with the "Start" button and display panels that show the "Accept" and "Reject" results, with the option to sort devices tested by various suitability groups. After each measurement, the display shows the number of the suitability group, using up to 69 types of grading.

Means for integration with external equipment

The FORMULA® TT2 Test System is equipped with hardware and software for integration with external equipment: probes, test equipment, external devices, handler.

Options can be provided when purchasing the system and later, during operation, as part of ATE reconfiguration.

There are options for ATE integration, including special software modules, switches and integrated Handler, RS232, GPIB and LAN ports.

Use of the FORMULA® TT2 in testing of semiconductor devices

The design, hardware and software of the test system create good conditions for testing semiconductor devices, including for tests combined with measurements, for example, using hot-cold chambers.
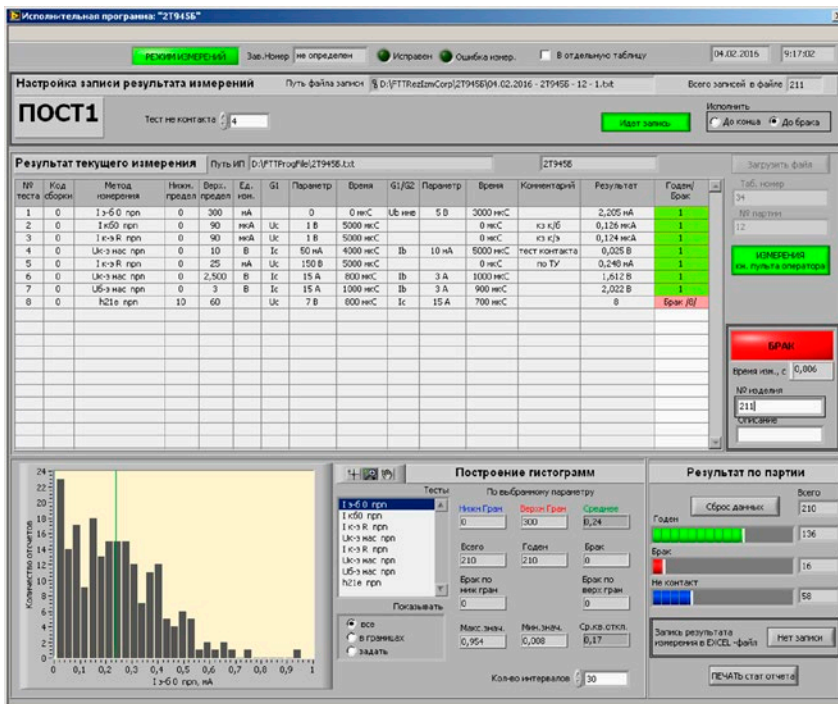
FORMULA® TT2 Test system software

FORMULA® TT2 Test System operation is controlled by FTT software developed by FORM for maximum user convenience.

FTT software automates all phases of the measurement process, from test routine development and debugging to measurements and service procedures.

The software is uniquely simple to use, consisting of an intuitively understandable high level symbolic-graphical environment represented in table form Fig. 2. This means that the test program developer does not need to be qualified as a programmer.

Figure 2
FTT software environment window for writing and editing test programs

Test methods library

The basis for automating ATE operations is the Library of Semiconductor Devices Measurement Methods, created in compliance with metrological requirements and built into the FTT software.

Using the Library of Semiconductor Devices Measurement Methods, the measurement program is created by simply moving data from the technical specification for the item tested to the "Measurement Program Editor" table Fig. 2.

If the measurement program must be run using algorithms for conditional and unconditional transitions, the special "Transition Editor" tool is used to write the test program Fig. 2.

All tests and the parameters indicated within them are automatically combined into one measurement program, which can be run immediately on the device under test, either in full or step by step.

The convenience of the FTT program tool for creating tests leaves the engineer free to concentrate on the most important thing – the operating features of the test subject and effective resolution of quality control issues with the semiconductor devices tested.

The Library of Semiconductor Devices Measurement Methods includes 65 regulatory test methods, significantly simplifying the development, updating and modification of measurement programs and reducing processing time and quantity of errors created, as well as error correction.

It takes a maximum of 10 minutes to write one test program: just select the necessary measurement methods from the Library of Semiconductor Devices Measurement Methods and arrange them in order, and enter the test conditions and anticipated results.

Figure 3
Display of modes, methods and results in the measurement process

Test process control includes automatic documentation of data used to confirm the conformity or nonconformity of the tested component to the requirements of the technical specification or technical assignment. The data include information on the serial number of the measurement tool, the testing modes and the results of measurements for each test of each subject. The symbolic and graphical display of the results in the measurement process is shown in Fig. 3. It is also possible to display the results for measured lots for any time period Fig. 4.
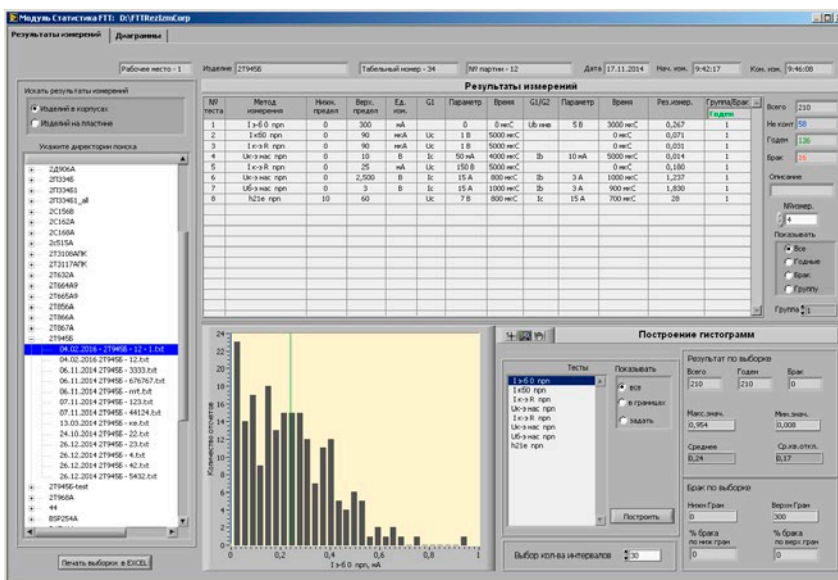
Figure 4
Display of summary results for measurements over period in "Statistics" program unit
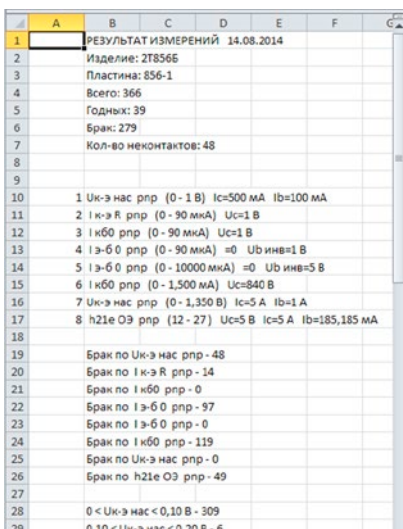
Figure 5
Measurement record in Excel format

The FTT software makes it possible to automatically generate test records of measurements with various levels of detail: from the results of "Accept" / "Reject" grading to comprehensive reports for each device and parameter measured Fig. 5. The measurement records are easy to read and analyze and can be converted to the standard forms used at the user's facility.

The records are automatically saved in a text or Excel file and serve as the documentary and metrological basis for quality complaint follow-up.

Data on measurements can be relayed to remote servers at the facility by connecting the test system to a network using dynamic libraries.

Means of analysis and display

The "Statistics" software unit makes it possible to plot bar charts and graphs for visual interpretation of summary reports on measurements of various lots of devices over the required period Fig. 4 with the ability to analyze deviations in parameters and other indicators of items/lots.

All of the measurements are displayed on the screen in the form of the measured value of the parameter, as well as graphically displayed as measured signal

waveforms on the oscilloscope integrated into the system Fig. 7.

Graphical interpretation of measurements in the form of current−voltage characteristic helps users to make a fast visual assessment of the measurement results, and to study the behavior of the device measured in a range of effects Fig. 6.
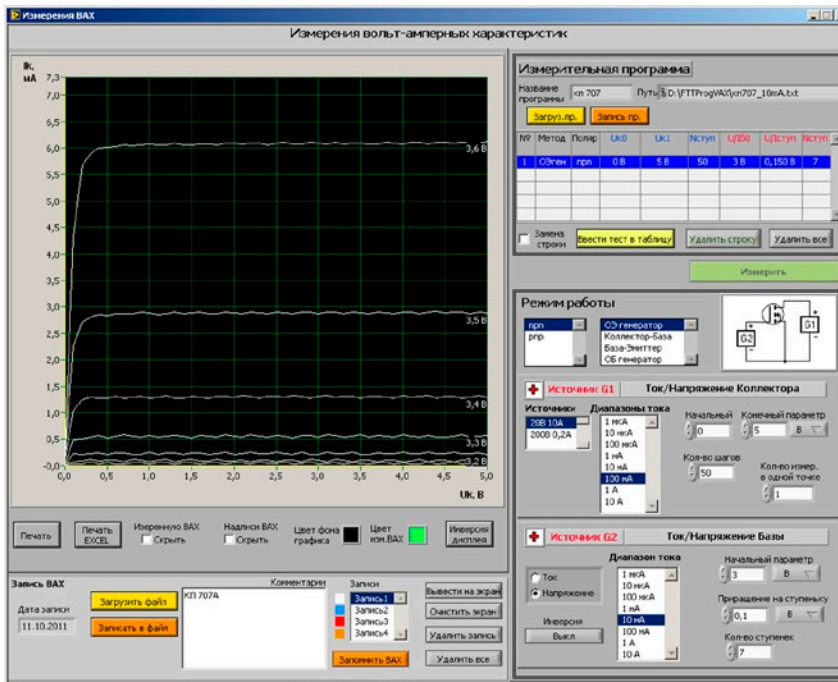
Figure 6
Graphical interpretation of measurements in the form of current−voltage characteristic
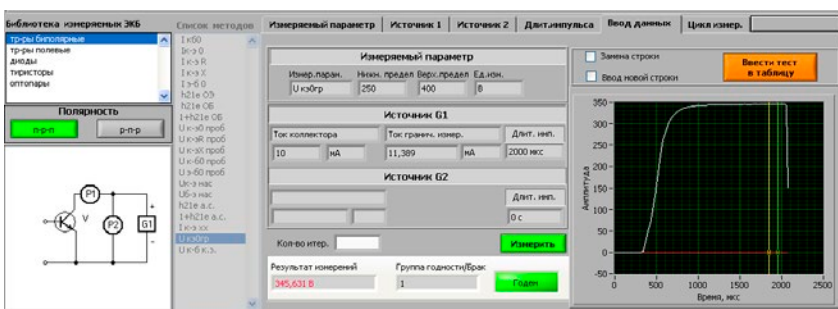

Figure 7
Graphical interpretation of measurement results in the form of oscillograms

Automation of service and metrological support

The FTT software service package covers all aspects of FORMULA® TT2 Test System operation, including equipment serviceability, hardware diagnostics and verification of metrological conformity.

Equipment maintenance time can be minimized as a result, giving users complete confidence in the accuracy of measurement results.

It is possible to control diagnostics and calibration of the test system and automatically generate verification records.

Measurement accessories

The FORMULA® TT2 Test System delivery package includes diverse types of measurement accessories developed and manufactured by FORM to ensure that the system is introduced into the user's operations as quickly as possible and provide a faster return on investment Fig. 8.

Custom and factory-ready TestBox® Test Solutions

So that FORMULA® TT2 Test System clients can more quickly achieve their business objectives and promptly see a return on investment, FORM offers both factory-ready and custom TestBox® Test Solutions for measuring specific types of microcircuits: under normal conditions and under the impact of extreme temperatures.
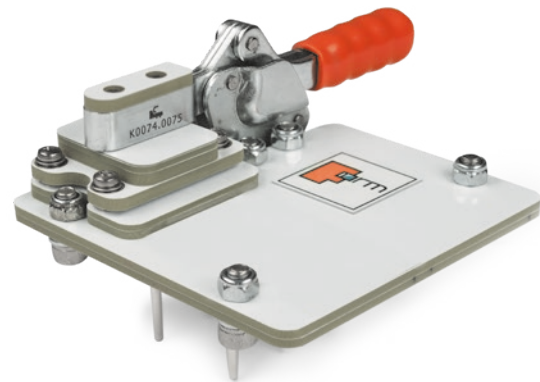
Figure 8
FORMULA® TT2 Test fixture

Each TestBox® Test Solution includes:

- Specialized test fixture for connecting a specific type of semiconductor device
- A disk containing test and measurement software
- A data sheet and operating manual
- Manufacturer's warranty

A group of experienced engineers at our testing laboratory develops designs and software for Test Solutions. The quality of TestBox® Test Solutions is the result of their correspondence to the regulations on electronic components, technical requirements and Client specifications.

By purchasing the TestBox®, Clients can significantly reduce the time required to put their products on the market.

Today, more than 550 types of Test Solutions already developed are used by FORMULA® Test System Clients, providing consistent metrological support for quality control of electronic components.

Manufacturer's services

To reduce the Client's time and costs for support work, FORM offers the following technical services to FORMULA® TT2 Test System Clients:

- Integration of FORMULA® TT2 Test Systems into the Client's technological, informational and testing infrastructure, with connection of external equipment, instruments and IT networks
- Scheduled maintenance, repair and metrological services at the place where the ATE is operated
- Organization of workstations based on FORMULA® TT2 Test Systems with a database for ensuring traceability of measurements
- Expansion of the ATE configuration according to a list of typical options, or with custom development of options

Delivery composition of FORMULA® Test System

The FORMULA® TT2 Test System has modular bus architecture and allows for custom hardware and software configuration according to the design versions indicated in the type description of the means of measurement.

The configuration of each Test System is determined based on an analysis of the Client's tasks, requirements and preferences, and is reflected in the Delivery Specification, as well as in the data sheet for each Test System.

The delivery set includes complete operating and metrological documentation and an initial calibration certificate.

Manufacturer's warranties and operator support

FORMULA® Test System warranty service and maintenance in operations are provided by the developer and manufacturer, FORM.

The hardware warranty is 1 year and provides for free visits by engineers to the place where the ATE is operated for warranty repair and unscheduled metrological calibration.

At the end of the warranty period, FORM offers Clients a service contract and provides technical service and metrological service upon individual Client request.

The FORM technical support service provides FORMULA® Test System Clients with the following unlimited free services:

- Consultation via telephone, email and fax, during terminal sessions, and directly at FORM premises
- Methodological assistance in complaint analysis
- Remote ATE diagnostics with fault detection
- Updating of software versions
- Arranging for maintenance and repair
- Information on new ATE options and new Test Solutions

Delivery time and price

The FORMULA® TT2 Test System delivery time is from 9 to 15 weeks depending on the configuration.

The cost includes:

- 1 year warranty
- Delivery to the Client's address, with installation and connection of the ATE on the Client's premises
- Client personnel training on rules for FORMULA® ATE operation and development of test programs
- Commissioning of Test System with application of TestBox® Test Solutions

FORM develops,
produces, delivers
and supports the
ECB FORMULA®
Test System
in operation