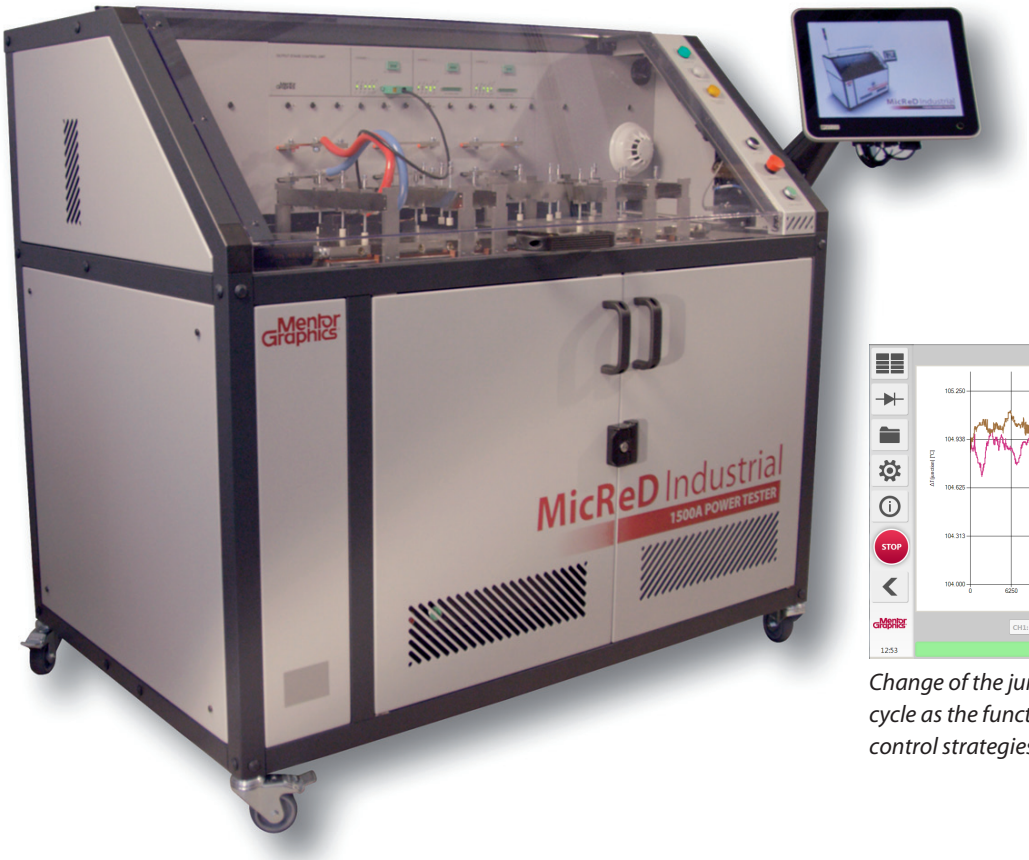
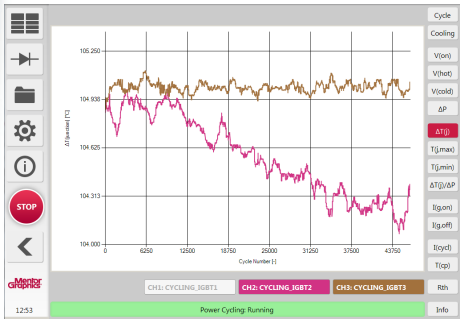
Power Tester 1500A—Accelerated Testing and Failure Diagnosis of High-Power Semiconductors





Change of the junction temperature during one cycle as the function of cycles (using different control strategies).

The MicReD Power Tester 1500A supports automatic testing and diagnosis of possible failure causes of power components on the manufacturing floor. The energy demands of both consumer and industrial electronic systems are increasing, and power electronics component suppliers as well as OEMs are faced with the challenge of providing the highly reliable systems needed for aviation, electric vehicles, trains, power generation, and reusable energy production. The Power Tester 1500A can power the modules through tens of thousands, potentially millions, of cycles while simultaneously providing real-time failure-in-progress diagnosis.

REAL-TIME FAILURE DIAGNOSIS

The Mentor Graphics MicReD Power Tester 1500A is the only machine built for manufacturing as well as laboratory environments that does automated power cycling while producing analytical data for real-time failure-in-progress diagnosis. It's designed to perform lifetime testing to test the reliability of applications that use power electronic modules.

The Power Tester 1500A is the industrial implementation of the MicReD T3Ster® thermal measurement and characterization technology to enhance the capabilities from electronic parts, LEDs, and systems to high power electronics. The Power Tester 1500A is unique in that it provides fully automated power testing and cycling at the same time, on the same machine, without having to remove the device under test during the process. A simple touch-screen interface allows a technician to use it on the manufacturing floor and/or failure analysis engineer to use it in the lab.

Mentor Graphics®

The Power Tester 1500A senses current, voltage, and die temperature while it uses structure function analysis to record changes or failures in the package structure. The machine can be used to enhance and speed up package development, reliability testing, and batch checking of incoming parts before production.

While running power cycles, the real-time structure function analysis shows the failure in progress, the number of cycles, and the cause of the failure, eliminating the need for a lab post-mortem. Conducting lengthy cycling measurements on multiple samples to estimate the cycle count range corresponding to degradation is no longer necessary. Also there's no need for an excess number of thermal measurements in this range to ensure degradation is captured. The device under test only has to be mounted and connected once; cycling and configuration are defined at the start.

With the Power Tester 1500A, power electronics suppliers will be able to design a more reliable power electronics package and supply reliability specifications to their customers.

The testing and characterization data produced by the Power Tester 1500A can be used to calibrate and validate detailed models in FloTHERM and FloEFD thermal simulation software.

TECHNICAL HIGHLIGHTS

Field-Tested Technology: Based on the T3Ster advanced thermal testing hardware solution used in industries worldwide for accurate thermal characterization.

Test a Wide Range of Power Electronics: Includes metal-oxide semiconductor field-effect transistors (MOSFETs), insulated-gate bipolar transistors (IGBTs), and power diodes.

Conduct Continuous Power Cycling until Failure: Save time because the component doesn't need to be removed, taken for lab testing, then back to tester for more cycles.

User-Friendly Touch-Screen Interface: Can record a broad range of information during test, such as current, voltage, and die temperature sensing; and detailed structure function analysis to record changes in the package's thermal structure.

Apply Different Powering Strategies during Operation: Constant power on/off time, constant case temperature swing, constant junction temperature rise, and constant applied power.

"Real-Time" Structure Function Diagnostics: Obtain results such as failure in progress, number of cycles, and failure cause quickly.

No Lab Post-Mortem or Destructive Failure Analysis: Eliminate the need for x-ray, ultrasonic, or visual and costly destructive failure analysis.

Easy to Operate: Can be used by both specialists and production personnel.

Enhanced Safety Features: Over-temperature, smoke, and coolant leakage detection ensure safe operation of the system even if it is left standalone.

Concurrent Testing: Up to three samples (maximum 500 A each).

Remote Monitoring during Operation: Follow progress on a tablet or computer.

Maximum load current	3 x 500 A / 1 x 1,500 A
Pulse current duration	0.5 s onward
Automated k-factor calibration for thermal testing	As many as 3 samples in parallel
Automated failure detection based on	UCE, ΔT_j, T_{jmax}, R_{th} increase
Data recording	UCE before and after switching, ΔT_j, T_{jmax}, T_{jmin}, ΔP, $\Delta T_j/\Delta P$, structure functions, Igate
Gate current measurement range and resolution	200 pA –100 µA , 25 pA resolution
Voltage measurement time base	1 µs

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