Power Tester 600A—Real-Time Failure Diagnostics for Multiple Automotive IGBTs

HELPING MANUFACTURERS PRODUCE MORE RELIABLE VEHICLES

- *The Power Tester 600A is designed to test up to 16 parts powered in series (up to 3 V per part when under load)*
- *Capable of delivering 600 A at 48 V, giving a total power of ~29 kW*
- *The system is extensible, so that up to 8 units can be connected together to allow up to 128 parts to be tested*
- *128 parts exceeds the demands of automotive OEMs place on their suppliers, in accordance with current standards (a minimum of 77 parts, which would require 5 systems)*
- *Controlled by a ruggedized touch-screen computer*
- *Unlike the other Mentor Graphics Power Testers, the 600A is designed to support an external cooling solution for the parts tested, providing maximum flexibility to test parts mounted on a cold plate and parts that are direct liquid cooled*
- *Supports external cooling solutions, thereby minimizing CAPEX per part tested*

The **MicReD Industrial Power Tester 600A** 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 electric vehicles. The Power Tester 600A 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 Power Tester 600A is latest edition to Mentor Graphics MicReD Industrial systems, 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 600A is an industrial implementation of the MicReD T3Ster® thermal measurement and characterization technology, used during development to qualify the performance of electronic parts, LEDs, boards, systems, and power electronics products.

The Power Tester series is unique in that it provides fully automated electrical and thermal testing combined with active power 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 technicians to use it in a manufacturing or production environment and failure analysis engineers to use it in the lab.

The Power Tester 600A senses current, voltage, and die temperature while it uses structure-function analysis to record changes or damage in the package's physical structure. The machine can be used to enhance and speed

Mentor Graphics®

up package development, reliability testing, and batch checking of incoming parts before production. While running power cycles, the real-time structure-function analysis provides failure in progress information caused by the competing damage mechanisms the part may suffer, so that the cause of the failure can be understood from the test results, eliminating the need for a lab post-mortem.

Conducting lengthy iterations of cycling measurements on multiple samples combined with lab assessment during the testing process to try to detect damage caused by degradation during the testing process is no longer necessary. The Power Tester 600A ensures that the maximum amount of information is captured over the duration of the test, so that nothing is missed. The device under test only has to be mounted and connected once and removed or replaced when it has failed; thus, the cycling configuration is defined at the start.

The testing and characterization data produced by the Power Tester 600A can be used in conjunction with the Mentor Graphics FloTHERM thermal simulation software to provide automated calibration of detailed package thermal models.

The Power Tester 600A supports the reliability needs of the supply chain across power electronics component vendors, Tier 1 suppliers, and automotive OEMs, helping to speed the introduction of new technologies such as wide-band–gap semiconductors, while ensuring high reliability of automotive EV, and HEV powertrain and other high-power applications to minimize field failures and warranty costs.

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 by eliminating the need to remove components for lab testing, time consuming lab testing, then remounting them back onto tester for more cycling.

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 is used 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.

Concurrent Testing: Up to 16 samples (maximum 600 A).

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

Maximum load current	600 A
Pulse current duration	0.5 s to DC load
Automated k-factor calibration for thermal testing	As many as 16 samples in series
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	250 pA –100 µA , 2.5 pA resolution
Voltage measurement time base	1 µs
Gate driving voltage	-30 V to +30 V

Visit our website at www.mentor.com/mechanical

Corporate Headquarters
Mentor Graphics Corporation
8005 S.W. Boeckman Road
Wilsonville, Oregon 97070-7777
Phone: +1 503 685 7000
Fax: +1 503 685 1204

Mechanical Analysis Division
81 Bridge Road
Hampton Court
Surrey, UK KT8 9HH
Phone: +44 (0)20 8487 3000
Fax: +44 (0)20 8487 3001

Sales and Product Information
Phone: +1 800 547 3000
sales_info@mentor.com

05-16 MGC 1033920