DIGITAL INDUSTRIES SOFTWARE

Simcenter Micred Power Tester

Product Information Sheet

Summary

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, trains, aviation, and renewable energy production. The Simcenter Micred Power Tester supports testing and diagnosis of possible failure causes of semiconductor devices and packages by combining active power cycling, thermal transient characterization and thermal structure investigation.

The Simcenter Micred Power Tester can power the modules through tens of thousands, potentially millions, of cycles while simultaneously providing a real-time failure-in-progress diagnosis. Perform the non-destructive structure-function assessment while the device is mounted, detecting critical failure modes, such as solder cracks, bond wire lift-offs, and thermal degradation. This can serve as indications for lifetime estimation of the device.

Benefits

- Detailed thermal characterization: shows complete heat flow path and internal structure of the DUT.
- Accurate metrics: provides precise junction temperature and thermal metrics ($R_{\theta JC}$, $R_{\theta JA}$).
- Time & cost efficiency: enables faster testing, reducing design cycles and prototypes.
- Supports multiple devices and industry needs: compatible with diodes, MOSFETs, IGBTs, digital ICs, and more, meeting various industry power requirements.
- Future-ready: capable of testing SiC MOSFETs, which play a key role in advancing EVs.
- Non-destructive thermal characterization: device remains operational post-transient tests.
- Reliability testing: simulates real conditions with accelerated life tests and diverse power cycling strategies (AQG-324).
- Low user interaction: requires minimal user input by combining active power cycling and intermediate thermal transient testing.
- Built-in safety features and high reliability.

Features

- Thermal transient testing: measures junction temperature using a defined Electrical Test Method (ETM).
- Structure function analysis: converts data into detailed thermal profiles.
- JEDEC 51 compliant: ensures standardized, reproducible testing.
- Integration flexibility: available in various cabinet options and electrical power ratings.
- Power cycling: evaluates reliability through heating and cooling cycles, with support for short- and long-duration tests (PCSEC and PCMIN).
- Parallel testing: supports testing of up to 16 devices simultaneously.
- Operator-friendly UI: includes recommended workflows and supports remote monitoring.
- Comprehensive reliability analysis: traces damage location and mechanism.
- Excellent support: backed by extensive global customer support.

Active Power Cycling

- Offering customizable test profiles with adjustable parameters (current, temperature, and cycle frequency) to align with specific application conditions.
- Real-time failure diagnosis is achieved by combining active power cycling with:
    - Intermediate transient thermal characterization
    - Thermal structure investigation.

Applications

- Automotive and Transportation: ensures the reliability of powertrain inverters, battery systems, and high-power electronics.
- Electronics and Semiconductors: verifies the reliability of semiconductor devices during development and qualification.
- Energy and Utilities: ensures the efficiency of power electronics in renewable energy systems.
- Academic Research: supports R&D, digital twins, and innovation in new designs and materials.

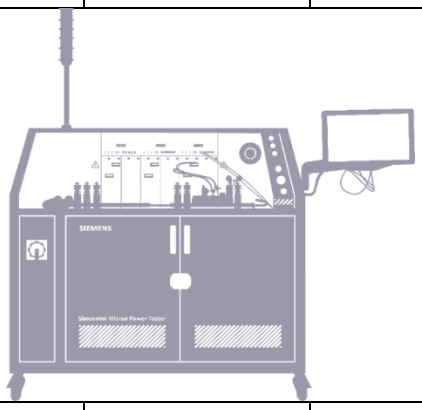
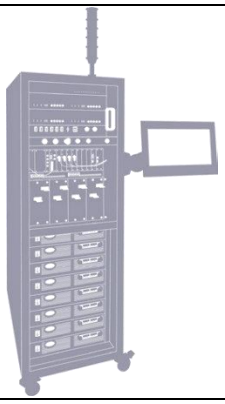
Different Cabinet Options

Available in two main options. One that is with integrated measurement cavity and cold plates,

- Two built-in cold plates (30x40 cm) with DUT fixture, and measurement chamber.
- Customer's own cold-plate or water jacket connection possible.
- Built-in temperature sensors (as recommended in AQG-324).
- Available at different current ratings up to 3600A.

The other solution is without integrated measurement cavity and cold plates,

- For integrations with measurement environments.
- External cooling.
- 16 inputs for auxiliary temperature sensors by the user such as PT100/Thermocouple/NTC.
- Available options up to 2400A.

Product	With integrated measurement cavity and cold plates			Without integrated measurement cavity and cold plates
	Simcenter POWERTESTER 1500A 3C/12C 8V	**Simcenter POWERTESTER 1800A 12C 12V**	**Simcenter POWERTESTER 3600A 12C 6V**	**Simcenter POWERTESTER 2400A 16C 12V**
Cabinet Options				
Heating channels	3	3	3	4
Maximum output current	1500A (3 x 500A)	1800A (3 x 600A)	3600A (3 x 1200A)	2400A (4 x 600A)
Maximum output voltage	8V	12V	6V	12V
Output power	12 kW	21 kW	21 kW	29 kW
Measurement positions	3 (3x1) / 12 (3x4)*	12 (3x4)	12 (3x4)	16 (4x4)
Sense current sources	3	3	3	4
Auxiliary temperature sensor inputs [PT100/Thermocouple/NTC]	3	3	3	16
Number of devices at maximum current, assuming <3V voltage drop	3 x 4, if 4 devices in series connected to the 3 power outlets (up to 8V max.)	3 x 4, if 4 devices in series connected to the 3 power outlets (up to 12V max.)	3 x 4, if 4 devices in series connected to the 3 power outlets (up to 6V max.)	4 x 4, if 4 devices in series connected to the 3 power outlets (up to 12V max.)
Automated k-factor calibration for thermal testing	3/12 devices in parallel*	12 devices in parallel	12 devices in parallel	16 devices in parallel
Pulse current duration	Can be short pulses. Supports PCsec and PCmin tests, short or long duration heating time power cycle strategies to induce thermo-mechanical stress			
Automated failure detection based on	V_{CE} (V_{DS}), ΔTj, Tjmax, Rth increase			
Data recording	V_{CE} (V_{DS})before and after switching, ΔTj, Tjmax, Tjmin, ΔP, ΔTj/ΔP, structure functions, Igate			
Gate current measurement	The gate current can be measured with high accuracy			Gate current measurement

Cooling control/ mechanical features	2 cold-plates (30x40 cm) with DUT fixture, customer's own cold-plate or water jacket connection possible. Protocol for external chiller and controls or other alternative custom/3rd party cooling solution implemented by the customer		External cooling. Protocol for external chiller and controls or other alternative custom/3rd party cooling solution implemented by the customer
Safety Features	Autonomous system monitoring unit operated from UPS, smoke , coolant leakage, coolant temperature, switching module internal temperature, mains phase sensors, 4 color tower light with buzzer		Autonomous system monitoring unit operated from UPS, switching module internal temperature , mains phase sensors, connectors for smoke sensors, 4 color tower light with buzzer
Supported devices	Diode, IGBT, Si MOSFET and SiC MOSFET		
Physical Size (in cm)	163 × 98 × 140 (shipping size, without crate) 195 × 98 × 204 (when fully set-up)	163 × 98 × 140 (shipping size, without crate) 195 × 98 × 204 (when fully set-up)	100 x 58 x 167 (shipping size, without crate) 100 x 113 x 232 (when fully set-up)
Weight	~ 500 kg uncrated 540 kg crated as shipped	~ 600 kg uncrated 640 kg crated as shipped	~ 360 kg uncrated 400 kg crated as shipped

* Available with software extension

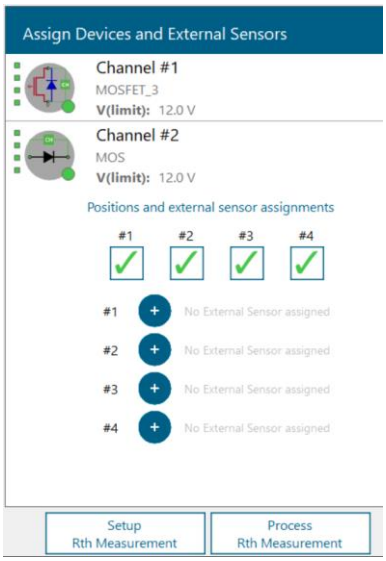
Micred Power Tester Control Software

The Simcenter Micred Power Tester Control Software offers a powerful and user-friendly environment for power cycling, measurement, and results post-processing. Upon system startup, the software automatically launches.

Key Features:

Data Handling: The software allows data export and import via the 'Export' and 'Import' network shares, or through USB media. With continuous data saving during measurements, no data will be lost in case of emergency shutdowns.

Real-Time Monitoring: The graphical user interface (GUI) enables real-time monitoring of temperature changes in the cold plates and thermostat. The system state can also be monitored remotely through a web browser.



The software comes with predefined semiconductor device types and measurement setups commonly used for thermal characterization, including:

- Diode Devices: Diode measurement mode.
- MOSFET Devices: MOS Diode, RDS-ON, Saturation, and Body Diode.
- IGBT Devices: MOS Diode, RDS-ON, and Saturation.

For external sensors, the following options are supported:

- Resistance sensor.
- Thermocouple.
- Sensor diode.

Calibration and Data Management:

The software offers comprehensive temperature sensitivity calibration and data management features. The Calibrate Device function enables automatic calibration based on the provided data. Users can also Import TCO calibration data generated by the T3STER SI measurement system. Additionally, the software allows users to View, Edit, Enter, and Export both existing and imported calibration data, providing flexibility in managing calibration information.

Power Cycling Parameters:

- Control measurement and water flow parameters.
- Set cycling stop criteria as absolute or relative limits.

Cycling Stop Criteria:

Voltage limits: Set the minimum and maximum voltage limits during cycling, including for low-current cycles and after heating begins.

Resistance limits: Monitor the device's resistance and heat dissipation, setting deviation limits for R(DS,on), R(th,jc), and R(th,ja).

Temperature limits: Define the maximum temperature and allowable temperature swings for both the device junction and case during each cycle.

Current and Power limits: Establish limits for the minimum cycling current, minimum power steps, and the maximum gate current.

Micred Power Tester Post-Processing Tool

The Simcenter Micred Power Tester Post-Processing Tool provides an easy and convenient way to analyze power cycling data collected from Power Tester measurements. It allows you to view the cycling data on your computer, examine the results, perform basic measurements, make initial corrections, and export the data. While the Post-Processing Tool is ideal for simple data manipulation, for more advanced and detailed analysis of thermal resistance (Rth) measurements during power cycling, the T3STER Master software is recommended.

Micred T3STER Master Thermal Transient Evaluation Tool

The Micred T3STER Master Thermal Transient Evaluation Tool complements any Micred testing hardware by enabling comprehensive evaluations as part of the post-processing procedure. These evaluations generate results such as pulse thermal resistance diagrams, time-constant spectra, complex loci of thermal impedance, structure functions, and differential structure or profile functions.

Additionally, the T3STER Master provides advanced options for manipulating and refining measurement data, along with an import wizard that supports thermal transient curves from various external data sources.