Thermal Analyzer Catalog

Contact: Upstar Engineering Pte Ltd
tel: +65 62810793
email: info@upstar.com.sg

Thermal Analyzer Phase 12 Features

Analysis Tech Thermal Analyzers measure semiconductor junction temperatures using the electric method of junction temperature measurement for testing all types of semiconductor devices. This capability is the foundation of numerous test methods including: thermal resistance, transient thermal impedance, die attach screening and functional power cycling. The convenient flexibility of the analyzer also facilitates interconnected control of other laboratory test equipment.

Semiconductor Thermal Analyzers perform thermal measurements on all types of packaged semiconductor devices including diodes, LEDs, bipolar transistors, MOSFETs, functional analog/digital integrated circuits, ACSICS, IGBTs, SCRs, TRIACs, and thermal-test-dies. All products offered conform to applicable JEDEC and MIL Standards.

Using the electrical method of junction temperature measurement, Analysis Tech Thermal Analyzers accurately measure component thermal parameters - essential for design and implementation of thermally reliable electronics. In addition to equipment sales, Analysis Tech offers Component Test Services for thermal characterization of semiconductor devices at our factory test-laboratory.

This type of test equipment is alternately known as: semiconductor thermal resistance testers, semiconductor thermal impedance testers, component thermal resistance testers, component thermal impedance testers, die attach testers, die attachment testers.

All Test Modes:

- Testing all devices: diodes, LEDs, bipolar, MOSFET, IGBT, functional IC, thryistors, test dies
- Full 3-terminal and 2-terminal test modes for MOSFETs, IGBTs, bipolars
- Automated high speed data collection, reduction, and analysis for transient and steady state data
- Transient RC models generated directly from measured junction temperature heating/cooling
- Compatible with all 750E Mil Stds and JEDEC 51 Series methods
- Rjc measurement with JEDEC 51-14 transient method
- Transient data plots for all test parameters in all tests modes
- Simple, automated instrument-calibration procedures
- Multiple text and graphics file formats for convenient exporting
- Continuous intelligent monitoring for errors and data validity
- Kelvin (4-wire) connections to eliminate test cable resistances effects

- Selection of automatic power-control by current, wattage, and ΔTj
- Standard and custom test fixturing available
- Windows 7 operating system

Steady State Thermal Resistance Mode:

- Multi-junction temperature sensing capability for ICs & multi-die devices
- User-selectable thermal equilibrium criteria
- Batch-mode for determining power level and air flow effects
- Control of accessory laboratory equipment for integrated testing
- Capability for automatically switching the device under test

Die Attach or Power Pulse Mode:

- High speed thermal evaluation with test duration less than 1 second
- Pass/Fail or bin sorting based on die-attach quality
- Data plots of all parameters including die-attach histogram
- Extended-life testing with interspersed die-attach testing
- Interface for mechanized device handlers
- Batch mode die-attachment production testing multi-chip modules

Heating Characterization / Transient Thermal Impedance Mode:

- Heating and cooling curve time-resolution: 1 microsecond
- Heating and cooling curve span: 1 microsecond - 1000 seconds
- Rjc measurement with JEDEC 51-14 dual transient method
- Utilizes structure function analysis, cumulative and differential
- Produces high-order RC models and optimized compact dynamic RC models in Cauer and Foster topologies

Comparison of Phase 11 to Phase 12 Thermal Analyzers:

- 1 Megahertz sampling rate versus 333 Kilohertz
- Compatible with all existing Analysis Tech fixturing.
- Enhanced WinTherm Software for Shorter Test Durations
- Improved Signal-to-Noise Ratio
- Self-installation WinTherm CD

Engineered for Ease of Operation...

The Analysis Tech Phase 12 Thermal Analyzer performs a wide range of semiconductor thermal tests controlled from a powerful Windows based operating program and continuous-display front panel meters. The simple, yet powerful, user interface facilitates complete thermal characterization for any type of semiconductor device and/or package type.

The Phase 12 Thermal Analyzer can be easily configured to perform tests on a wide range of device types including functional integrated circuits, thermal test dice, bipolar transistors, diodes, MOSFETS, IGBTS, thyristors, and hybrids. During testing, comprehensive graphic data-displays offer superb detail on all test data, thus promoting confidence and understanding of the test results. All semiconductor junction temperatures are accurately measured using the electrical method. All junction temperature sense channels have floating differential inputs. This means that the sense junctions need not be referenced to device ground, thus offering the widest possible range of test/device configurations.

When a part type is tested for the first time, a test Setup File is created for that part designation. Thereafter, tests on "identical" parts can be initiated by simply entering the part designation, to recall the Setup File associated with that specific part type. The Setup File includes all of the necessary test parameter settings for the selected test method desired. When performing production testing by a semi-technical operator, options to alter the test Setup File are suppressed, ensuring test consistency.

During testing, test data is stored on the internal hard disk with optional print-out and hardcopy graphics. Test results include final numerical data such as thermal resistance, power levels, reference temperatures, as well as data plots, and pass/fail evaluations. The data files are also stored in a comma delimited format for easy exportation to other applications. Graphic files can be stored in standard Bitmap (.bmp) or JPEG (.jpg) file formats for exporting to applications written for the Windows operating system. A network connection (NIC) is provided so that test data can be archived to your LAN.

The Analysis Tech Phase 12 Thermal Analyzer provides automatic heating power control based specified wattage, current, junction temperature rise, or via a manual front panel knob. During thermal resistance testing, up to three reference temperatures can be measured with thermocouples or infrared probes. Thermal equilibrium is automatically sensed based on a variety of user-selectable criteria. Real-time data plots and tabular displays are readily accessible as testing proceeds. Batch Mode testing offers automatic sequencing of tests with alternate power levels, different test-devices, or varied environmental conditions such as ambient air flow speed or temperature.

The Phase 10/11/12 Calibrator offers a powerful and easy method for annual or biannual instrument calibration. Now users can perform their own instrument calibrations without the expense and "down-time" associated with typical "cal-lab" procedures. Click here for more information.

The Analysis Tech Phase 12 Thermal Analyzer features capabilities specifically intended for production die-attachment evaluation. Bin-sorting control based on temperature rise or impedance criteria offers an efficient means to sort devices according to the thermal resistance quality of the die attachment. Another production oriented feature is the Power Pulse Batch Mode which performs a rapid sequence of die-attachment tests on up to eight separate devices. With this capability, multiple active devices on a hybrid or multi-chip module can be tested for die-attachment with one insertion of the device-under-test.

The Analysis Tech Phase 12 Thermal Analyzer requires an external DC supply for the heating power, coupled to the Thermal Analyzer via a rear-panel connection. In all test modes, the external supply is throttled and controlled by the Thermal Analyzer to provide the user-selected heating-power level. The external power supply is not included with the Thermal Analyzer, and would be sized for the users' particular range of test requirements. This economical separation of the heating power supply from the Thermal Analyzer also improves physical handling ease.

The maximum power handling capacity of the Analysis Tech Phase 12 Thermal Analyzer is 100W, 500W, and 1000W for the 2A, 10A, and 20 A analyzers, respectively at 50 volts (optional extended range up to 300V). The Power Booster accessory offers heating currents up to 400 amps and heating power levels up to 4000 watts. Complete specifications are provided in the product description sheets later in this catalog. During operation, the instrument continuously monitors the status of the test, and instantly signals operator errors such as disconnection or mis-connection. The high speed power control capability of the Thermal Analyzer provide continuous thermal runaway protection

All Thermal Analyzer sales include free training at our factory-based test lab facilities.

Thermal Analyzer Phase 12 Electrical Specifications

All Thermal Analyzers are available with either 2, 10 or 20 amp maximum heating current capacity, indicated by placing a "-2", a "-10" or a "-20" after the model number. The following specifications are labeled where differences exist between the 2, 10 and 20 amp units; otherwise, specifications apply to all versions. AC power requirements are assumed to be 120 VAC, 50/60Hz unless otherwise specified at the time ordering. For higher power testing, the Power Booster can extend the current capacity to 1000A and heating power delivery to 4500W.

Heating current, high-range accuracy: ±0.2% Rdg plus,

2A system: ±0.2mA 10A system: ±1mA 20A system: ±2mA

Heating current, low-range accuracy: ±0.2% Rdg plus,

2A system: ±.02 mA 10A system: ±.1mA 20A system: ±.2mA

Heating voltage measurement accuracy:

±0.2% of reading ±0.025% of full scale (typical 50V full scale)

Thermocouple measurement accuracy (type T standard):

±0.15°C typical ±0.3°C maximum

Junction temperature measurement accuracy and precision:

Tj Digital Resolution: ±0.007°C typical

Tj Display Precision: ±0.1°C

Tj Absolute Accuracy: ±0.2 to ±0.5°C typical (see Accuracy Analysis)

Junction Temperature measurement delay: 1 microsecond minimum
AC Power Supply: 120VAC, 3A, 50/60Hz (standard unless otherwise specified)
Maximum Heating Supply Voltage: 50 volts
Maximum Heating Supply Current: 2, 10 or 20 amps without Power Booster
Tj Sense Current Selections: 1mA, 5mA, 10mA, 20mA, 50mA, and adjustable 0.1 - 50mA

Phase 12 Chassis Dimensions : 17" x 17" x 7.5" high, 25 lbs

PC Hardware Required:
Operating System: Windows 7 Professional, 32 Bit, English Version (included with Phase 12)
Processor: 3 GHz, Single Core CPU or higher withminimum 2GB RAM memory
Graphics: Any primary graphics card with Windows drivers installed
Other: 500 gigabyte minimum hard disk and minimum of 4 USB ports

Nuova Device Calibration Bath

The Nuova Calibration Bath embodies the recommended method for calibrating semiconductor devices to be tested with Analysis Tech Thermal Analyzers. It offers optimum accuracy in measurement of the temperature sensitive parameters which is a critical requirement for precise junction temperature measurements. The temperature of the electronic-grade oil is controlled by the Thermal Analyzer and provides a safe and convenient method for calibrating up to eight devices at once. Once initiated, data collection and reduction continues without operator attention.

Features

- Direct, integrated temperature-control by a Thermal Analyzer
- Porcelain coated heating surface with magnetic stirrer
- Sturdy chassis with cooling fan for temperature rate-control & safety
- Stainless steel four liter bath with cover
- Suspension webs for supporting the parts being calibrated
- Dielectric oil, four liters, environmentally safe and reusable
- Complete instructions and warranty

Dimensions	12" H x 13.5" W x 8.5" D
Weight	17 lbs

The calibration temperature range is selectable and controlled by the Thermal Analyzer through a unique safety interlock design. The safety hood reduces the chances for accidental spillage of hot oil. Safety interlock features are designed into the software control algorithms. The Nuova II Calibration Bath design eliminates many potential common mistakes in component thermal calibration.

Phase 10/11/12 Instrument Calibrator

The Phase 10/11/12 Instrument Calibrator is used to perform NIST traceable instrument calibrations on the Phase 10 Thermal Analyzer, typically at 6 month intervals. The Phase 10 Instrument Calibrator can also be used as a powerful diagnostic tool in the event that operational problems or faults arise with the Phase 10 Thermal Analyzer. The Calibrator facilitates a simple, five-minute procedure for determining analyzer measurement inaccuracies and correcting them to within proper operating specifications. Frequent, precise instrument calibration ensures that the test data generated by the Thermal Analyzer will be of the highest quality and accuracy. The calibrated parameters include:

Heating-Power:

- Voltage Port voltage measurement
- Voltage Port current measurement
- Current Port voltage measurement
- Current Port current measurement

Temperature Sensing:

- Absolute functional check of all temperature sense channels
- Relative test of all channels at all sense currents
- Diagnostic information on "out-of-spec" channels

Current Delivery and Command Alignment:

- Complete scan of current delivery capability
- Alignment of current-command to current-delivery
- Functional test of current control regulators
- Operational test of power servo circuits

The Phase 10/11/12 Instrument Calibrator is a robust, precision reference unit that interfaces with the Phase 12 Thermal Analyzer heating power and junction temperature sensing connectors. Its precision meter provides readings that the operator enters via the keyboard when prompted during the course of the Phase 12 Thermal Analyzer calibration procedures. This small unit can be conveniently returned to the Analysis Tech factory every two years for re-certification to NIST traceable calibration standards.

Electrical Specifications

Voltage Sensing Accuracy (0 to 20V)	+/- 5 mV
Low Current Sensing Accuracy (0 to 2A)	+/- 1 mA
High Current Sensing Accuracy (0 to 20A)	+/- 5 mA
Sense Current Measurement Accuracy	+/- 0.24%

Mechanical Specifications

Dimensions	3" H x 9" W x 6" D
Weight	3 lbs

Phase 11/12 Thermocouple Port Calibrator

The Analysis Tech Phase 11/12 Thermocouple Port Calibrator is used to calibrate the reference thermocouple ports of the Phase 11 Thermal Analyzers. Using a fully automated WinTherm procedure, precise thermocouple inputs from the calibrator are used to adjust the thermocouple port accuracies to ± 0.1°C typical, and ± 0.2°C maximum. The Thermocouple Port Calibrator can be conveniently returned to the Analysis Tech factory each year for re-certification to NIST traceable calibration standards.

The Phase 11/12 Thermocouple Port Calibrator is supplied complete with alkaline batteries and the necessary cables.

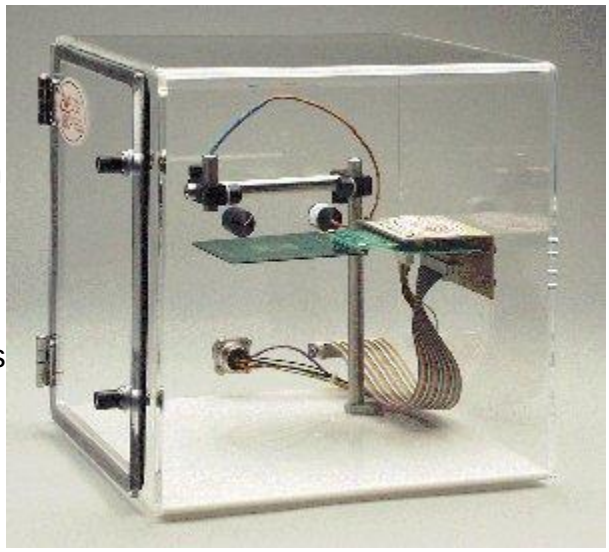
Mechanical Specifications

Dimensions	7" H x 4" W x 1.5" D
Weight	1.5 lbs

Ordering Information
Part Number: TC-800-Calibrator
Standard delivery 1 week. Ex Works (EXW)Mechanical Specifications

Dimensions	8.5" H x 4.5" W x 1.75" D
Weight	1.5 lbs

EVN-12 Still Air Test Chamber



The EVN-12 is used for testing components in a standardized still air ambient environment. Thermal resistance measurements under natural convection conditions are often very sensitive to unintended air currents in the lab.

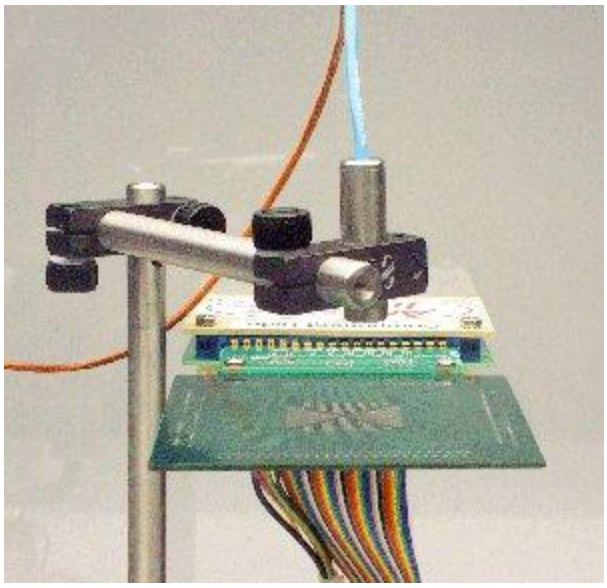
This Still Air Test Chamber eliminates this potential source of testing error. Its cubical 12 inch dimension conforms to the MIL-STDs and JEDEC Standards for still air test environments.

Electrical feed-throughs are provided for all channel sense and heating power connections for direct connections to the Thermal Analyzers.

The dual latch, dual hinge door ensures an air tight seal with a soft rubber gasket. The high quality 1/4" thick plastic cabinet is fabricated of transparent, non-yellowing, scratch-resistant plastic. The EVN-12 is designed for years of convenient testing duty. The chamber includes an internal air temperature sensing thermocouple probe, JEDEC Standard conforming. Retractable, coiled thermocouple extension cords are also included.

An optional infrared probe and adjustable support is available for measurement of IC case temperatures. These probes are factory calibrated by Analysis Tech for operation from 20 ° C to 120 ° C with an accuracy of ± 0.6 ° C for non reflective surfaces with a radiation emissivity of 0.8 - 1.0.

This makes them ideal for plastic and ceramic surfaces. The view angle of these probes is such that the spot diameter is equal to half of the distance from the probe tip to the surface; thus the typical minimum spot diameter is 0.05 inch for a 0.100 inch spacing. The Analysis Tech infrared probes are plug compatible with the Thermal Analyzers and provide exceptional convenience and accuracy in measurement of IC case temperatures.



Still Air Chamber showing test fixturing and infrared thermocouple.

Features

- High quality, non-yellowing, plastic enclosure
- High quality hinges and latches
- Two thermocouple ports
- Available Infrared probe and fixturing
- Complete instructions and warranty

Dimensions	12" H x 12" W x 12" D
Weight	11 lbs

Test Fixturing

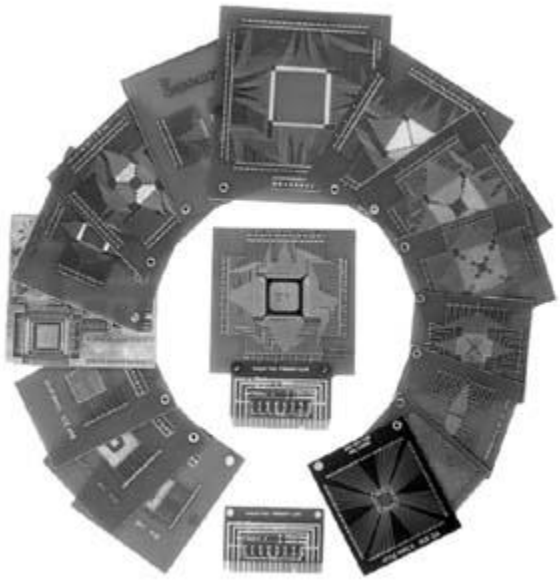
Thermal resistance measurements are strongly linked to the thermal impact of a given fixture or mounting arrangement for the device-under-test. Generally, the fixturing utilized should mimic the physical mounting of the part for the intended application.

For example, if the intended application of the part requires mounting on a PWB, the thermal testing of the part should be performed on a similar PWB; if the intended application of the part includes attachment to a heat sink, the thermal testing should utilize a heat sunk fixture. When planning a thermal test, the fixturing specification should be of paramount concern.

Analysis Tech offers a selection of standard fixture types. Although these products will accommodate most needs, there are certainly many situations which will require custom fixturing. Often, where application-specific mounting hardware or unusual sockets are used, the fixturing must be specifically created for the test job at hand.

The Analysis Tech Thermal Analyzers can be easily connected to custom or "home brewed" fixturing and are readily adaptable to existing fixturing from other manufacturers. The standard test fixtures are described below. Analysis Tech also offers custom fixtures and custom fixture design services to suit any test need.

Printed Circuit Board Fixturing



Thermal testing of devices designed to be attached to a circuit board (PWB) should always utilize a PWB test fixture. Analysis Tech offers a collection of standard test PWB fixture boards. All of these standard PWBs are fabricated of standard .0631 glass epoxy PWB material, with or without inner copper layers.

They are compatible with the PWB fixture connector used in the Still Air Chamber and Servo Controlled Wind Tunnel. PWB test boards can be conveniently configured for any part type with soldered wire jumpers. All connections for temperature sensing and heating power are easily performed in this manner.

All PWB test fixtures are designed to accommodate a wide range of package sizes and lead counts. These test PWBs are designed to minimize the number of different types of test PWBs required, and therefore limit the expense and

maximize the versatility of our PWB test fixturing. Other, non-Analysis Tech test PWB coupons can be readily adapted to utilize standard Analysis Tech PWB test fixtures.

Technical questions on standard and custom PWB fixturing can be addressed by contacting the Analysis Tech factory. A list of standard test PWBs can be found on page *, although the most current list is available directly from Analysis Tech.

Discrete package, socket-type fixtures

Socket-type test fixtures handle standard discrete packages with low lead counts. Usually these types of fixtures are used exclusively for die attachment testing of devices such as diodes, bipolars, MOSFETS, etc. These fixtures utilize industry standard test sockets combined with a simple enclosure incorporating screw-terminal programming.

Each test fixture will handle a specific package regardless of its device-function. Analysis Tech offers custom socket-type test fixture design and production services. Order TOS-TO220-254, TOS-AXIAL, or other TOS-TOxxxx for any standard package type.

Heat Sunk Fixtures

These fixtures utilize a heavy aluminum plate with cooling fins protruding into a fan cooled enclosure ideally suited for measurement of Rjc. Case temperature is measured by a special spring-loaded thermocouple probe mounted so that only its small Teflon tip protrudes above the plate surface.

The test-device is secured to the heat sink plate by a manual or optional pneumatic clamping mechanism. Once secured, the device compresses the sensor thermocouple for an accurate measurement of the case temperature. The electrical connections to the device-under-test are accessible on the convenient, labeled terminal strip.

The heat sunk fixtures can be configured for testing any part type by simply rearranging these connections. The surface-to-ambient thermal resistance of this heat sunk fixture is 0.25° C/watt. When ordering, specify desired AC power requirement:
TOS-FC-MAN: Manual Clamp Heat Sunk Fixture
TOS-FC-AIR: Pneumatic Clamp Heat Sunk Fixture

Manual and Pneumatic Clamps for Heat Sunk Fixtures

The Manual Clamp is a simple mechanical toggle clamp that will perform the needed action of pressing the sample to the heat sink, but it has two disadvantages: it is a "displacement controlled" clamp so it has no means for determining the clamping force other than a vague "feel", and it does not maintain a constant clamping force as the temperature (and thus thickness) of the sample changes. The advantage is that it is inexpensive, although the force that it can generate ranges from insufficient to enough to break the sample.

The Pneumatic Clamp offers a regulated and measured clamping FORCE that will not change with temperature induced dimensional changes of the sample. The air cylinder used is a special air-balance that provides very accurate force measurement.

Thermal Analyzer Catalog

JEDEC (Theta JB) Thermal Test Fixture

Analysis Tech has developed a JEDEC q_{JB} Thermal Test Fixture that embodies the latest JEDEC procedures for measuring the junction-to-board thermal metric, q_{JB}.

The fixture incorporates a flexible, easy to use design, which will accommodate either size JEDEC thermal test coupon. The two piece design affords easy board loading and test setup modification.

JEDEC (Theta JC) Air Cooled Thermal Test Fixture

The Analysis Tech R_{jc} Air Cooled Thermal Test Fixture is a high performance air cooled heat sink with convenient connections to the device-under-test. This air-cooled heat sink fixture is ideally suited for measuring the JEDEC-defined "Rjc" according to MilStd 883 method 1012. Device case temperature is measured by a special type-T spring-loaded thermocouple probe mounted so that only its small Teflon tip protrudes above the plate surface. Once secured to the fixture, the device-under-test compresses the sensor thermocouple for an accurate measurement of the case temperature.

A top-mounted combination plug/screw connector provides high-current heating-power connections to the device-under-test. The side-mounted edge-card connector provides duplicate low-current terminals, convenient for part-specific wiring and kelvin connections. This design allows the fixture to be quickly reconfigured for any part-type by swapping the part-specific, two-connector wiring harness.

The device-under-test is clamped to the heat sink surface with a special pneumatic clamp, shown above. The pneumatic clamp offers a regulated and measured clamping force that will not change with temperature-induced dimensional changes of the sample. The air cylinder used is a special air-balance cylinder with fluidic bearing that provides very accurate force measurement and control. The cooling stage is isolated from ground, therefore devices with a "live" or "hot" connection to the heat sink can easily be tested.

Inexpensive upgrades to existing fixtures are available for the convenience of the latest connector system.

Rjc-Air Performance Specifications:

$R_{Heat\ Sink} = (T_{Plate} - T_{Air}) / Power\ Dissipation = 0.25°\ C/watt$

Ordering Information
Part Number: Rjc-Air-xxx where xxx is the AC supply voltage (110VAC, 50/60Hz or 220VAC 50/60Hz). Standard delivery 3 weeks. Ex Works (EXW). Custom orders welcome.

JEDEC (Theta JC) Liquid Cooled Thermal Test Fixture

The Analysis Tech R_{jc} (Theta JC) Liquid Cooled Thermal Test Fixture is a high performance liquid-cooled heat sink with convenient electrical connections to the device-under-test. This fixture is ideally suited for measuring the JEDEC-defined parameter 'Rjc' for all device types including IGBT modules and large MOSFET packages. Temperature controlled coolant water must be supplied to the fixture from a recirculating chiller. Drip-free quick-connect hose fittings are provided for convenient connection of the coolant hoses.

A top-mounted combination plug/screw connector provides high-current heating-power connections to the device-under-test. The side-mounted edge-card connector provides duplicate low-current terminals, convenient for part-specific wiring and kelvin connections. This design allows the fixture to be quickly reconfigured for any part-type by swapping the part-specific, two-connector wiring harness. The backside case temperature of the device-under-test is sensed with a built-in thermocouple. This thermocouple is available in either of two designs: embedded flush in the plate surface OR spring loaded with theTc Sensor. Each design offers slightly different characteristics. Analysis Tech engineers can provide assistance in making this selection.

The device-under-test is clamped to the heat sink surface with a special pneumatic clamp, shown above. The pneumatic clamp offers a regulated and measured clamping force that will not change with temperature induced dimensional changes of the sample. The air cylinder used is a special air-balance cylinder with fluidic bearing that provides very accurate force measurement and control. For larger packages, convenient tapped holes (10-32 size) are provided to accommodate many common device/module footprints. The positioning jig is also provided for easy and consistent placement of devices with respect to the case thermocouple.

Note: The plated copper cooling stage is typically connected to ground through the coolant water conduction, therefore devices with an electrically "live" connection to package (and thus the cooling stage) require the use of distilled water or non-aqueous, dielectric coolants. Contact Analysis Tech for additional information.

Rjc-Liquid Performance Specifications

$R_{Heat\ Sink} = (T_{Plate} - T_{Inlet\ Water}) / Power$

Sink Thermal Resistance (R_{HS})	Coolant Flow Rate (Liter/min. - H_2O)
0.016 °C/W	6.0 LPM
0.014 °C/W	8.0 LPM
0.012 °C/W	10.0 LPM
0.011 °C/W	12.0 LPM

(Maximum Pressure Required: 400 kPa (60 psi)

Mechanical Specifications

Dimensions	9" H x 7.5" W x 11.5" D
Weight	7 lbs

Ordering Information
Part Number: Rjc-Liquid-Flush (for flush mounted Tc) **OR** Rjc-Liquid-Sensor (for Tc Sensor Probe)
Standard delivery 3 weeks. Ex Works (EXW)

Servo Controlled Wind Tunnel

The Servo Controlled Wind Tunnel provides uniform, forced-convection test conditions necessary for measuring the thermal performance of electronic components in non-still-air conditions. Since the thermal resistance of air-cooled electronic devices depends strongly on air flow velocity, accurate measurement and control of flow speed is essential for accurate test results. With a device-under-test fixture in the test section, thermal resistance measurements can be conveniently and accurately performed over a range of air flow speeds.

Wind Tunnel Features

- Integrated hot-wire-anemometer air speed measurement
- Feedback control for uniform air-speed
- Ample hatch-access to test section
- Two piece construction for easy transit and storage
- Spatially uniform air velocity ± 0.9% in test section
- Flow steadiness to ± 1% in test section
- Sturdy, heavy-gauge aircraft aluminum construction
- Convenient display and control console
- Compact and safe "table top" axial fan design
- Selectable stand-alone operation
- Complete including test fixturing, thermocouple probe, and anemometer

Wind tunnel Control Console

The control console provides a continuous LCD display of the air flow speed in feet per minute. Air speed can be controlled manually with the front panel knob or automatically from a Thermal Analyzer. The linkage of the Analyzer with the Wind Tunnel allows complete software coordination of component test and air flow speed. When testing in batch mode, the air flow speed is automatically indexed to the next value in the prepared batch-test list after equilibrium has been detected in the current test. In this manner a battery of tests can be initiated to generate complete curves of thermal resistance versus air flow speed without operator attendance.

An optional, plug-compatible infrared probe and adjustable support is available for measurement of IC case temperatures. These probes are factory calibrated by Analysis Tech for operation from 20°C to 120°C with an accuracy of ± 1.5 °C for non reflective surfaces with a radiation emissivity of 0.8 - 1.0, suitable for plastic and ceramic surfaces. The view angle of these probes is such that

the spot diameter is equal to half of the distance from the probe tip to the surface.

Performance Specifications

Typical Speed Range	0 to 1000 fpm / 0.0 to 5.0 m/s (other ranges available)
Uniformity (center 90% of test section)	±1% max
Nozzle Ratio	4.4:1
Maximum Stabilization Time Required	50 seconds
Supply Voltage	120 VAC 50/60 Hz unless otherwise requested

Mechanical Specifications

Inlet Diameter	22"
Test Section Diameter	10.5"
Test Section Axial Length	12"
Overall assembled length	58"
Dimensions	22.5" H x 58" W x 22.5" D
Weight	50 lbs

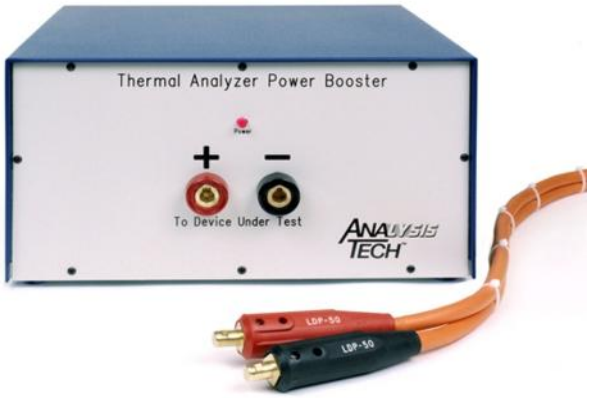
Ordering Information

Order numbers: Wind-Tunnel-1000. Standard delivery: 6 weeks. Ex Works (EXW)
(Custom sizes and speed ranges are also available.)

Power Boosters

Power Booster for High Current Testing: 200, 400, and 1000 Ampere Heating Currents

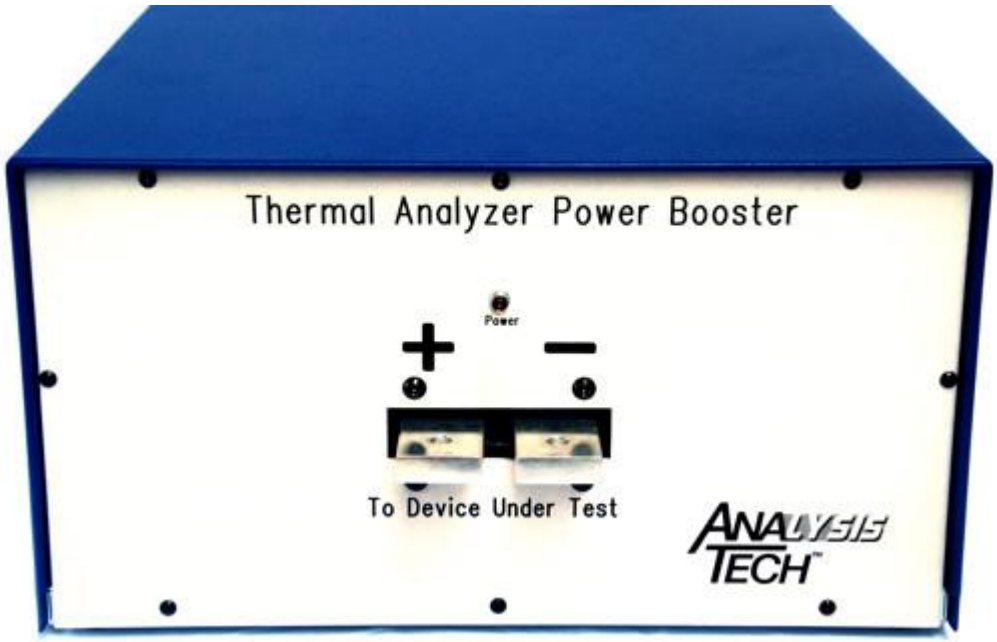
Power Boosters are available to extend the heating current range above the maximum 10 or 20 amp level of the stand-alone Thermal Analyzers. The Power Booster includes its own DC heating supply and is controlled by the Thermal Analyzer using the same software and user-interface controls for all steady state and transient test methods. From the operator's perspective, using the Power Booster simply involves a change in the wires (cables) used for heating power delivery. It can be used for all device types normally tested by the Thermal Analyzers but more typically for diodes, IGBTs, MOSFETS, and Thyristors.



wer Booster features safe and convenient twist-lock high-current onnectors with ultra-flexible cables for power-delivery to the nder test. All connectors are color-coded and keyed for polarity nt mistakes in setup. All necessary cables and interface ions up to the device fixture and AC power link are included.

Power Boosters are rated by maximum steady state heating current capacity and also offer surge testing capabilities with a variety of programmable surge sequences. The 200A Booster is air cooled whereas the 400A and 1000A Boosters are liquid cooled.

1000 Ampere Power Booster:



Features

- Designed for convenient in-house calibration
- Standard and custom fixturing for various power-devices
- Compatible with all existing Analysis Tech test fixtures
- Included cable set (2 meters) for connection to Device Under Test
- Complete instructions and warranty

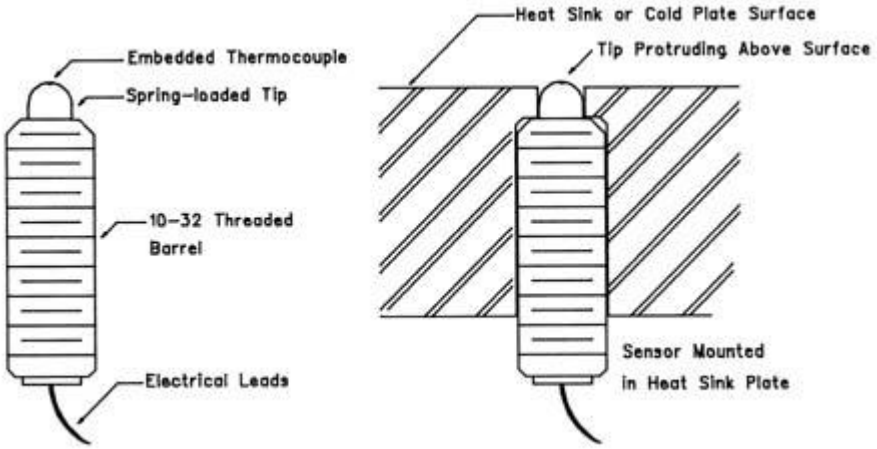
Specifications

Max. Heating-Current(Steady State)	200 Amps	400 Amps	1000 Amps
Max. Heating Voltage	20 volts	15 volts	6 volts
Current Measurement Accuracy	+/-0.2% of F.S.	+/-0.2% of F.S	+/-0.2% of F.S.
Booster Cooling	Air cooled	Liquid cooled (>1 gpm @ 30 psi, 900 W)	Liquid cooled (>3.5 gpm @ 50 psi, 2400W)
Supply Voltage (standard)	180-235VAC 20A 3-Phase, 47-63Hz	180-235VAC 35A 3-Phase, 47-63Hz	180-235VAC 35A 3-Phase, 47-63Hz
Dimensions	10"Hx17"Wx17"D 10"Hx17"Wx28"D	10"Hx17"Wx17"D 10"Hx17"Wx28"D	10"Hx17"Wx17"D 22 "Hx17"Wx28"D
Net Weight	170 lbs (77 kg)	250 lbs (115 kg)	350 lbs (160 kg)

NOTE: alternative optional supply voltage: 360-440 VAC, 3-phase. 47-63 Hz
NOTE: AC consumption specifications do not include power for the recirculating chillers for the 400A and 1000A Power Boosters. For more information see Recommended Chillers for the 400A and 1000A Power Boosters.

Ordering Information
Part number Booster-xxx-yyy, where xxx is the output current (200 A, standard), and yyy is the AC supply voltage (220VAC, 3 Phase standard). Standard delivery: 8 weeks. Ex Works Wakefield, MA. Custom orders welcome.

Thermocouple Sensor Probes



The thermocouple sense probes used with Analysis Tech heat sunk fixturing for measuring the case temperature are now available as a separate product. These probes are specifically manufactured by Analysis Tech for optimum performance in the measurement of case temperature.

Each probe measures one inch long and is threaded (10-32) over its length. The spring-loaded Teflon tip has an embedded type T thermocouple on its end and bears on the device case for an accurate case temperature measurement. The insulating tip provides an ideal low-gradient temperature field in the vicinity of the thermocouple junction for accurate, reproducible case temperature measurements.

The standard unit is type T although other thermocouple types can be specified. The thermocouple wire length is 12' (Order TC-SENSOR-X where x is the desired thermocouple type.)

Thermal Test PWBs

The following Thermal Test Coupons are available from Analysis Tech. For other board types, contact the Analysis Tech technical staff. Specific board designs that are not present in the stock-list below can be designed and fabricated to specification. Custom test board designs are routine and welcome. Note: All JEDEC Standard Thermal Test Coupons utilize Analysis Tech Thermal Analyzer PWB Adapter Cards for connection to standard Analysis Tech Thermal Test Fixtures.

Universal Types

Type	Pitch	Max Pin Count	Design	Inner Layers	Order Number
DIP	.10 in	68	SEMI	0	DIP.10IN
SOP	.05 in	46	JEDEC	0	SOP.05IN
SOP	.05 in	46	JEDEC	2	SOP.05IN-2
SOP	.025 mm	58	SEMI	0	SOP.025IN
SOP	.50 mm	60	JEDEC	0	SOP.50MM
SOP	.65 mm	36	JEDEC	0	SOP.65MM
SOP	.80 mm	46	JEDEC	0	SOP.80MM
SOP	.80 mm	46	JEDEC	2	SOP.80MM-2
QFP	.05 in	116	JEDEC	0	QFP.05IN
QFP	.40 mm	176	JEDEC	0	QFP.40MM
QFP	.50 mm	208	JEDEC	0	QFP.50MM
QFP	.50 mm	208	JEDEC	2	QFP.50MM-2
QFP	.65 mm	184	JEDEC	0	QFP.65MM
QFP	.65 mm	184	JEDEC	2	QFP.65MM-2
QFP	.80 mm	128	JEDEC	0	QFP.80MM
QFP	.85 mm	128	JEDEC	0	QFP.80MM
QFP	1.0 mm	64	JEDEC	0	QFP1.0MM
PGA	.10 in	625	SEMI	0	PGA.10IN
PGA	.05 in staggered	2700	JEDEC	0	PGA.05IN
BGA	.80 mm	625	JEDEC	0	BGA.8MM
BGA	1.0 mm	289	JEDEC	0	BGA1.0MM
BGA	1.0 mm	289	JEDEC	2	BGA1.00MM-2

Specific Types

Type	Pitch	Max Pin Count	Design	Inner Layers	Order Number
QFP	.40 mm	216	JEDEC	0	QFP.40MM216
QFP	.50 mm	64	JEDEC	0	QFP.50MM64
QFP	.50 mm	64	JEDEC	2	QFP.50MM64-2
QFP	.50 mm	100	JEDEC	0	QFP.50MM100
QFP	.50 mm	128 (38x26)	JEDEC	0	QFP.50MM128RE
QFP	.50 mm	176	JEDEC	0	QFP.50MM176
QFP	.50 mm	208	JEDEC	0	QFP.50MM208
QFP	.50 mm	240	JEDEC	0	QFP.50MM240-2
QFP	.50 mm	304	JEDEC	0	QFP.50MM304
QFP	.65 mm	100 (30x20)	JEDEC	0	QFP.65MM100RE
QFP	.80 mm	80 (24x16)	JEDEC	0	QFP.80MM80RE
BGA	.05 in	256	JEDEC	2	BGA.05IN256-2
BGA	.05 in	352	JEDEC	0	BGA.05IN352
BGA	.05 in	352	JEDEC	2	BGA.05IN352
BGA	.05 in	304	JEDEC	0	BGA.05IN304
BGA	1.0 mm	100	JEDEC	2	BGA1.0MM100-2