LASER THERMAL

SSTR-F

- Thermal Conductivity Measurement System
- 150 mm x 150 mm scanning stages
- From room temperature up to 200 degrees C
- Dual laser thermoreflectance measurements

APPLICATIONS

CLASS I SSTR-F SYSTEM

- Thin film oxide films
- Metals, nitrides, and alloys
- Wide band gap semiconductors
- Polymers and photoresists
- ALD thin films

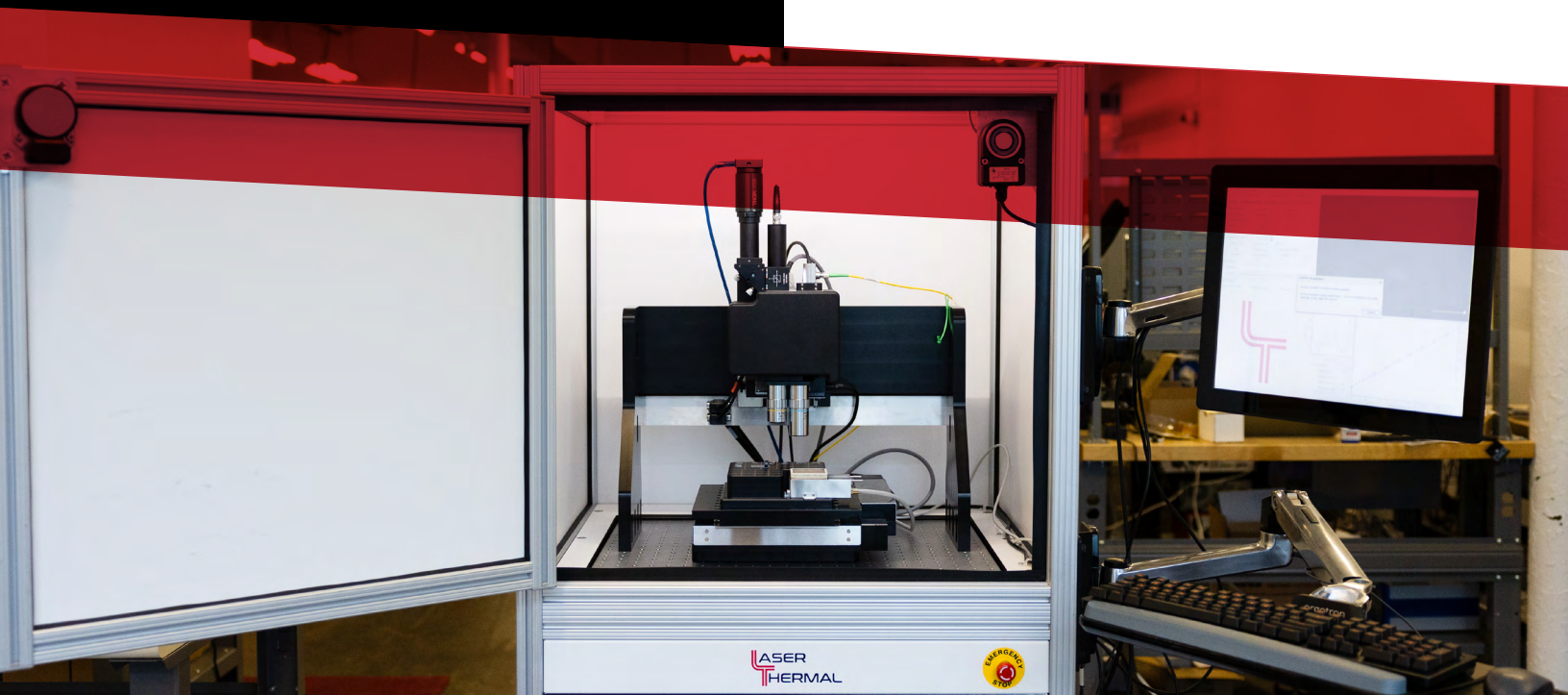
SPECIFICATIONS

The SSTR-F system offers a first-of-its-kind thermoreflectance-based thermal property measurement system developed to meet the needs of research and development groups.

The fully-automated system brings the power of thin-film and small-volume thermal measurements from the academic lab to the industrial R&D setting. Laser Thermal's patented fiber optic delivery system offers unprecedented repeatability and speed to handle high volume R&D testing for screening of materials, thermal conductivity measurements, small-scale thermal mapping, and testing at elevated temperatures. Automated focus and sample alignment give researchers the ability to measure thermal resistance of films and thermal conductivity of materials with the push of a button.

With intuitive analysis software, SSTR-F offers a variety of analysis options, from traditional bulk measurements, thin-film thermal resistance measurements, thin- film thermal conductivity measurements, and quantitative maps of relative thermal properties at length scales down to sub-micron.

SSTR-F is the ideal machine to develop and perfect material choices used in a range of applications.



BASIC FEATURES

SAMPLE SIZE

Coupons from 5 mm up to 6-inch diameter wafers with automated motion stage

THICKNESS RANGE

Thermal resistance measurements for thin films as thin as 1 nm; thermal conductivity for most films thicker than 100 nm up through bulk materials

CONTROL

Full PC control with automated focus and sample alignment for turn-key testing; multi-sample batch testing

SAFETY

Class I and Class IIIb Laser Product. SSTR-F can be fully integrated into a laser safety enclosure to become compliant as a Class I Laser Product

ADDITIONAL FEATURES

MOTION STAGE

Up to 150 mm x 150 mm motion stage. Enables full automation with batch routines up to 30 samples (10 mm x 10 mm) at a time; allows for large scale thermal mapping of sample surfaces

TEMPERATURE STAGE

From room temperature up to 200C for up to four 10 mm x 10 mm samples

AUTOMATED OBJECTIVE SWITCHING

Increased automation to measure samples with two probing volumes, offering additional sensitivities to thermal properties

PHYSICAL SPECIFICATIONS

Facilities

- Voltage: 110V/220V, 50/60Hz
- Power: 1 kW

Dimensions and Weight

- Width: 31 in
- Depth: 32 in
- Height: 69 in
- Weight: 500 lbs

CUSTOMER SUPPORT

- ✓ Customer support available 9AM-5PM EST M-F
- ✓ Full-service contracts and extended warranties available
- ✓ Remote support available via remote login, email, and phone support
- ✓ Capability to tailor testing routines for customers

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FAQ

Technique Description	Steady-state thermoreflectance-based optical pump-probe technique to measure the thermal conductivity of materials using a continuous wave laser heat source. The technique works in principle by inducing a steady-state temperature rise in a material via long enough exposure to heating from a pump laser. A probe beam is then used to detect the resulting change in reflectance, which is proportional to the change in temperature at the sample surface. Increasing the power of the pump beam to induce larger temperature rises, Fourier's law is used to determine the thermal conductivity. We show that this technique is capable of measuring the thermal conductivity of a wide array of materials having thermal conductivities ranging from 1 to >2000 W m−1 K −1 , in excellent agreement with literature values.
SSTR-F	Steady state thermoreflectance in fiber optics
Scanning Capabilities	Spot measurements, thermal mapping (user defined pixel resolution)
Property Output	Thermal conductivity, thermal boundary resistance, interfacial thermal resistance
Measurement Types	Cross-plane, In-plane (sample geometry dependent)
Length Scales / Film Thickness	Sub-micron up to tens of microns (effectively bulk)
Measurement Time	Less than 30 seconds per spot (thermal mapping time depends on pixel density)
Transducer Coating	Aluminum or gold, 80 nm thick
Pump Laser	Diode laser, 637 nm aluminum transducer, 532 gold transducer, frequency 10 khz, power less than 10 mW
Probe Laser	Diode laser, 785 nm aluminum transducer, 488 gold transducer, power less than 1 mW

Measurement Area	Based on spot size
Spot Size	Variable diameter of 2 - 20 microns depending upon objective
Penetration Depth	Proportional to spot size (radius of spot size)
Absorption Depth	30-40 nm (in metal transducer)
Termperature Range	Room temperature to 300C
Thermal Conductivity Range	0.05 to 500 W/m/K
Spatial resolution (X-Y)	Down to ~ 1 micrometer
Repeatability	+/-1%
Reproducibility	+/-2%
Test Sample Roughness	<10 nm RMS
Atmosphere	Ambient (purge gas or vacuum on request)
Calibration Standard	Corning HPFS 7980 or thermal oxide on silicon
Software	Data acquisition, Data analysis, Database - Fully automated
Installation & Training	1 day