LASER THERMAL

SSTR-F

- Thermal Property Measurement System
- 150 mm x 150 mm travel stage
- Measurements from room temperature to 200 °C
- Pump/probe thermoreflectance system

APPLICATIONS

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

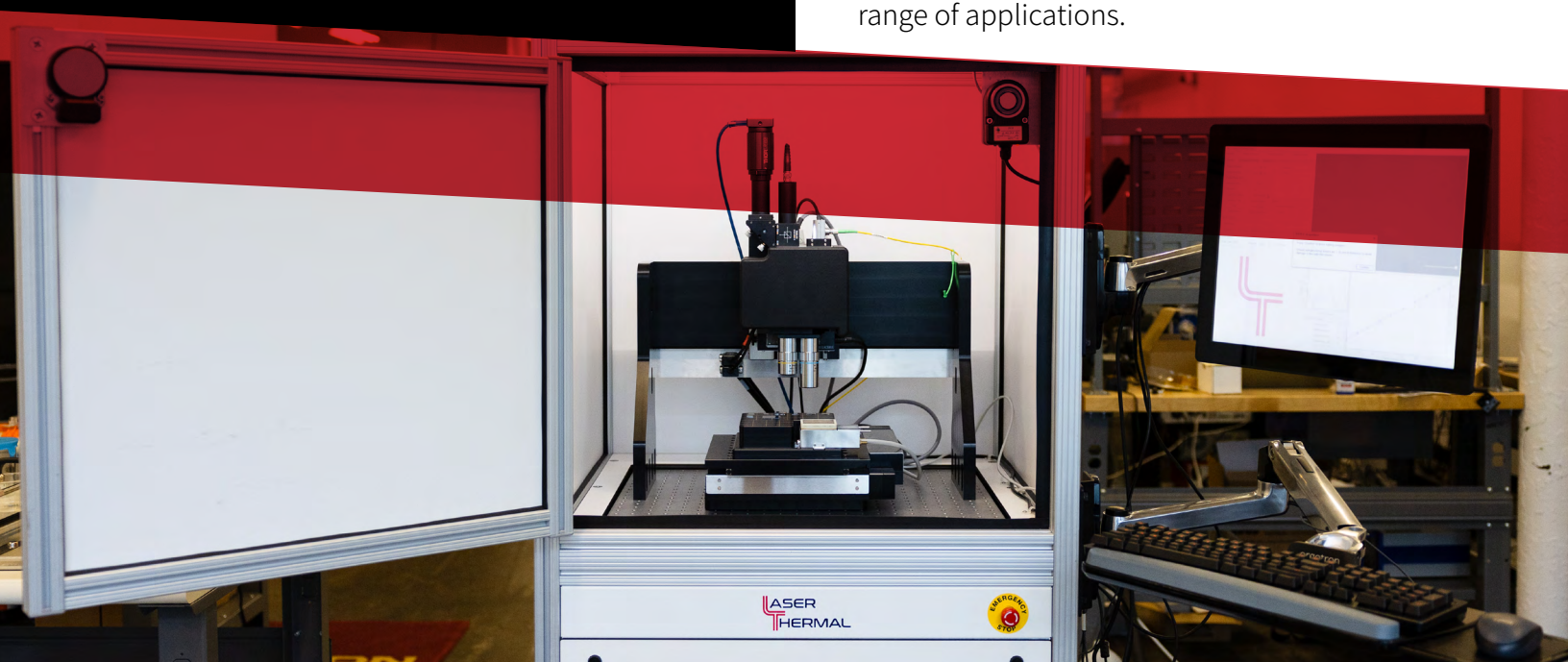
SPECIFICATIONS

The Steady-State Thermoreflectance in Fiber Optics (SSTR-F) offers a first-of-its-kind thermoreflectance-based thermal property measurement system developed to meet the R&D requirements of both industry and academia.

Born from free-space optical systems found in academia, SSTR-F brings the power of thin film and small volume thermal measurements to the industrial R&D setting. The patented fiber optic delivery system provides a turn-key solution, with unprecedented repeatability and speed for handling high volume R&D testing for screening the thermal conductivity and thermal resistance of materials, generating thermal property micrographs, and understanding thermal properties at elevated temperatures. The SSTR-F automation suite enables researchers to measure thermal properties with the push of a button.

With an intuitive analysis software suite, SSTR-F provides a variety of means for determining thermal properties, from traditional bulk measurements to thin film thermal resistance and thermal conductivity measurements, as well as generating thermal property micrographs at micrometer length scales.

SSTR-F is the ideal tool for developing and perfecting material choices used in a wide range of applications.



FEATURES

SAMPLE SIZE
Coupons from 5x5 mm to 6-inch diameter wafers

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

CONTROL
Automated sample setup for turn-key testing; multi-sample batch testing

SAFETY
Class I and Class IIIb laser products available.

MOTION STAGE
150 x 150 mm travel stage. Full automation for batch testing up to 30 samples. Automated acquisition of thermal property micrographs.

AUTOMATED OBJECTIVE SWITCHING
Dual objective lens measurement for additional sensitivities to thermal properties

ADDITIONAL FEATURE

TEMPERATURE TESTING
Room temperature to 200 °C

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	Single-point measurements, thermal property micrographs
Property Output	Cross-plane thermal conductivity, in-plane thermal conductivity (sample geometry dependent) thermal boundary resistance
Length Scales / Film Thickness	Sub-micrometer to tens of micrometers, bulk materials
Measurement Time	< 30 seconds per measurement location, thermal property micrographs dependent on pixel density
Transducer Requirements	80 nm Aluminum, Ruthenium, [alpha]-Tantalum, Tungsten for 785 nm probe. 100 nm Gold with 5 nm Titanium Adhesion Layer for 532 nm probe.
Pump Laser	640 nm (Aluminum Transducers) or 458 nm (Gold Transducers)
Probe Laser	785 nm (Aluminum Transducers) or 532 nm (Gold Transducers)

Laser Spot Size/Lateral Resolution	2 - 20 micrometers depending upon objective lens
Thermal Penetration Depth	Proportional to spot size (radius of spot size)
Termperature Range	Room temperature to 200 °C
Thermal Conductivity Range	0.05 to 500 W/m/K
Repeatability	±1%
Reproducibility	±2%
Maximum Sample Roughness	<10 nm RMS
Measurement Atmospheric Conditions	Ambient (purge gas or vacuum required for temperature testing above 200 °C)
Suitable Reference Materials	Corning High-Purity Fused Silica (HPFS) 7980 or thermal oxide on silicon
Software	SSTR-F: Acquisition and SSTR-F: Analysis software suites automated
Installation & Training	1 day