Optitherm® III

MEASURE EMISSIVITY FOR TRUE TARGET TEMPERATURE

EMISSIVITY MEASURING INFRARED THERMOMETER

INFRARED TEMPERATURE ACCURACY TO ±3°C
Traceable to NIST Standards

THE OPTIMUM SEMICONDUCTOR TEMPERATURE MEASUREMENT SYSTEM

APPLICATIONS

- Semiconductor Wafer Temperature Measurement
- Production, Research & Development of Wafers
- Temperature Measurement of Epitaxial Growth in:
  - CVD Reactors
  - MBE Reactors
  - MOCVD Reactors
- Specular Targets and Substrates

FEATURES

- Automatically Measures Radiance & Emissivity
- Temperature Range: 250°C - 1500°C
- Temperature Accuracy: ±3°C
- 6 Spectral Wavelengths Available:
  808, 850, 905, 940, 980, and 1550nm
- Data Acquisition Rate to 1ms
- Digital RS232 PC Interface
- Output 70 Readings Per Second to Host PC
- Target Spot Sizes From 0.25" and Larger

ADVANTAGES

- Measures Rapidly Changing Emissivity During Layer Growth Providing Accurate Temperature Determination
- Waveband Selection Based on Target Material Properties
- Emissivity Channel Can Be Field Calibrated

COMPATIBLE SUBSTRATES

- Silicon
- Silicon Nitride
- Gallium Arsenide
- Indium Phosphide
- Highly Polished Metals
- Silicon Carbide
- Indium Arsenide
- Gallium Nitride
- Germanium

DESCRIPTION

The Optitherm® III Automatic Emissivity Measurement System uses fiber optics and the latest pulsed laser technology to measure precisely a single or multi-wafer temperature during epitaxial growth in CVD, MBE and MOCVD applications. While all passive infrared instruments measure a target radiance temperature, the Optitherm® determines dynamically the emissivity value of a specular target resulting in unmatched temperature accuracy to ±3°C.

The Optitherm® incorporates an active reflectometer technique to determine the target emissivity (E%) and true temperature (Te). This is accomplished by automatically measuring the target specular reflectivity at the same time, location and wavelength as the radiance measurement to determine the true temperature. The microprocessor collects these values at an extremely fast 1ms data acquisition rate and transmits data to host PC for temperature calculation, data logging and immediate process control.

The Optitherm® technology can be implemented into a variety of semiconductor applications including production tools, wafer processing, research and development anywhere accurate temperature measurements are critical.

PRECISION PYRO PYROMETERS

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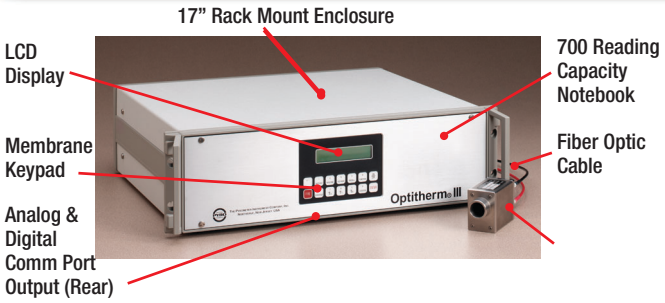

TECHNOLOGY

The Optitherm® III uses a patented laser based infrared technology to determine the emissivity and true temperature (Te) of the target.

A low-powered pulsed GaAs pulsed laser is fired at the target measuring zone via a dedicated optical path (Laser Channel) and both the laser return signal and infrared radiance signal are detected via a secondary optical path (Radiance Channel); the laser signal being (AC) on top of the (DC) target signal. Having monitored the laser outgoing energy and knowing the geometry involved (including target distance). The Optitherm® can determine the specular reflectivity and thus the emissivity of the target measuring zone. The wave band of the collected target radiance is limited to a narrow band centered in the laser wavelength depending on the specific application offering the highest degree of accuracy.

The Optitherm® internal software includes five (5) modes of operation: Remote Control for host PC command driven operational and process control, Auto Mode for continuous data output at selectable integration time, Single Mode for single shot temperature measurements, Interval Mode for dedicated time sequencing measurements and Off-Line Mode for setup and calibrations functions. Host PC communication software available.

TYPICAL INSTALLATION

(A) Single Axis Sensor must be perpendicular to the target.

(B) Dual Axis Sensors with symmetric angles to the target.
Note: This may require compensation for polarization.

PYRO'S AUTHORIZED REPRESENTATIVE

Optitherm® III Specifications

Model	Spectral Wavelength	Temperature Range
OT-808	808 nm	600°C - 1500°C
B		
OT-850	850 nm	600°C - 1500°C
OT-905	905 nm	550°C - 1200°C
OT-940	940 nm	500°C - 1150°C
OT-980	980 nm	460°C - 1100°C
OT-1550	1550 nm	250°C - 800°C
Spectral Bandwidth, Typical	±35 nm	
Temperature Accuracy Resolution Repeatability	±3°C 0.1°C 0.1°C	
Emissivity Measurement Range Resolution Repeatability	0.01 to 1.00 0.001	
Acquisition Time	1ms to 200ms Selectable	
LCD Display, 40 Characters	Including Manual Keypad	
Measured Values	E% Emissivity value Tu Radiant Temperature only	
Calculated Values	Te Emissivity Corrected True Temperature	
Specify Target Distance	12" to 18" (Fixed Focus) Custom Available	
Target Spot Size	0.25" to 0.40" Custom Available	
Interface Communications	Digital RS-232 Analog 0-20 Ma or 0-5 Vdc (for Te or E%)	
Selectable Operating Modes: Remote Control	 Command driven from PC	
High Speed Transmit	Raw data is sent to host PC at 70r/sec for 1ms. The PC will calculate E%, Tu, Te for use in process control or data storage.	
Auto Mode	Provides continuous output measurement mode E%, Tu, Te	
Single Mode	On demand measurement & display E%, Tu, Te	
Interval Mode	Same as Single Mode except at specific time intervals	
Off-Line Mode	For setup and calibration	
Instrument Enclosure	STD 19" Rack Mount Enclosure 19" L x 14.1" D x 5.2" H	
Power Requirements	115Vac/60 Hz or 220Vac/50 Hz	
Standard Sensor Head	4.15" L x 2.1" W x 1.45" H	
Operating Ambient Conditions	Electronics: 15º - 27ºC Sensor Head: 0º - 250ºC Fiber Optic Cables: 0º - 125ºC Non Condensing Humidity	
Typical Sensor Head Configuration		
A		
Single Axis		
Dual Axis		
Dual Axis		
PC		
Electronics		

Note: Specifications subject to change without notice.

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