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1015DS

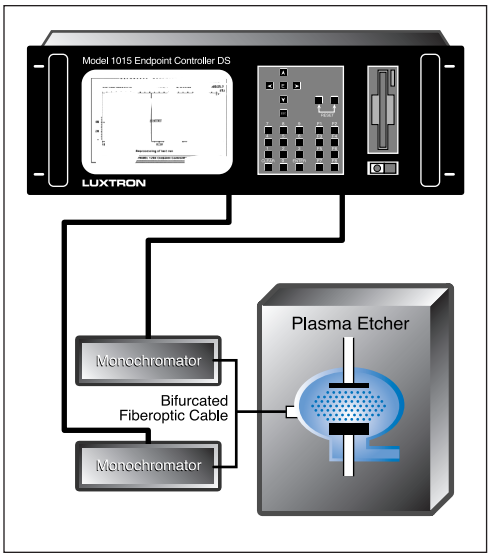
The 1015DS (Dual Sensor) Plasma Etch Endpoint Controller with Plasma Background Correction* provides:

- More Reliable Control of Your Process
- Increased Throughput
- Reduced Rework
- Improved Product Quality
- Shorter Process Characterization Time
- Detection of Chamber Contamination



1015DS Endpoint Detection for Low Exposed Area Plasma Etch

Plasma fluctuation, drift, and noise are common occurrences in any plasma etch process. They are caused by variations in gas pressure, RF power mismatch, chemical species and particles produced during etching. All of the above conditions are well known to affect reliable endpoint detection of an etch process and thus affect the quality of the product. The problems become even more pronounced when etching low exposed area wafers (contact holes), as demanded by today's advanced processing and design rule requirements.



Model 1015DS Dual Sensor Configuration

The Model 1015DS Plasma Endpoint Controller designed and produced by LUXTRON Corporation incorporates proprietary optical background correction, combined with dynamic signal processing techniques to compensate for plasma fluctuation, short and long term plasma drift and excessive noisy signal conditions.

*US Patent 5,208,644

LUXTRON® CORPORATION

1015DS

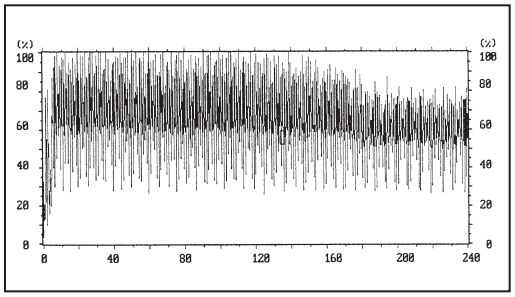


Exclusive Features

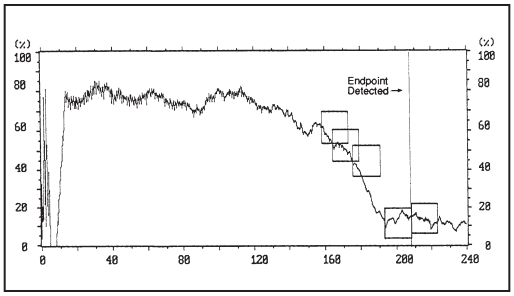
Improved signal to noise conditions due to plasma background monitoring, dynamic signal processing capabilities, including AGC (Automatic Gain Control) combined with proprietary endpoint algorithms can accommodate a wide range of signal intensities and thus assures reliable endpoint detection.

High Performance Signal Processing:

Compensation for signal noise

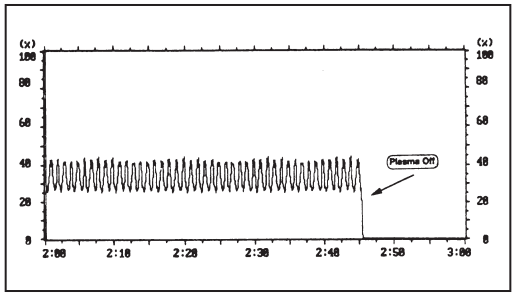


Raw signal

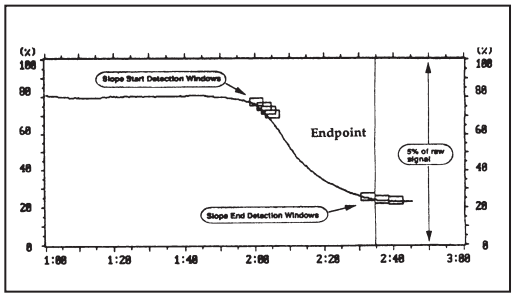


Processed signal

Compensation for signal oscillation



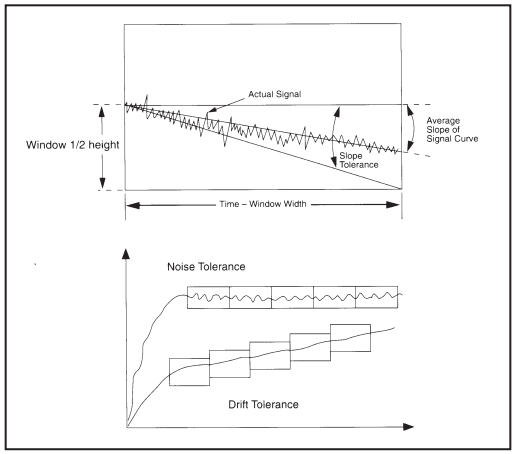
Raw signal



Processed signal

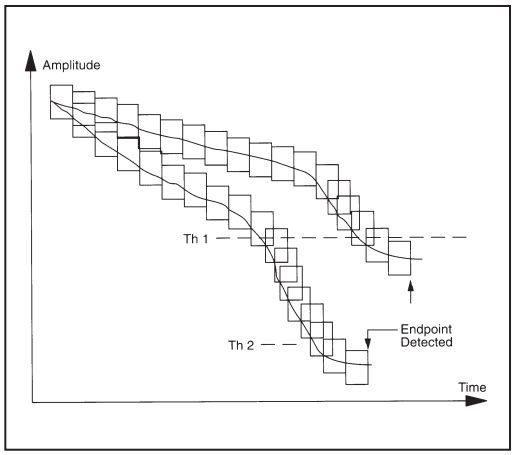
Dynamic Proprietary Algorithms:

Immunity to noise



Window uses average slope value, ignores fluctuation

Immunity to signal drift



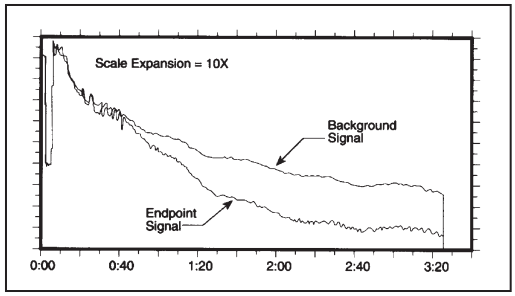
Window triggering will endpoint on a drifting signal, threshold setting will not

Outstanding Performance

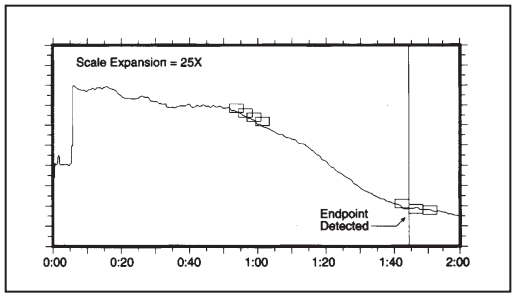
Accurate, repeatable endpoint detections have been achieved and demonstrated.

Low Exposed Area (<1%) Oxide Etch (Contact Holes):

Using dual sensor plasma background correction (US Patent 5,208,644)



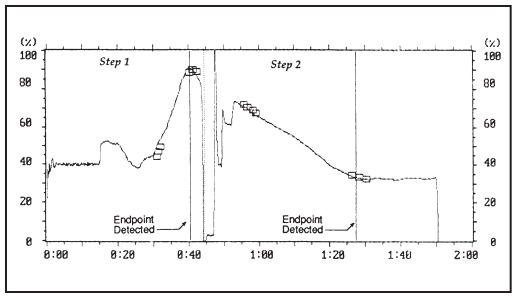
Background and endpoint signal traces as seen by each sensor



Endpoint trace after correction for plasma background emission

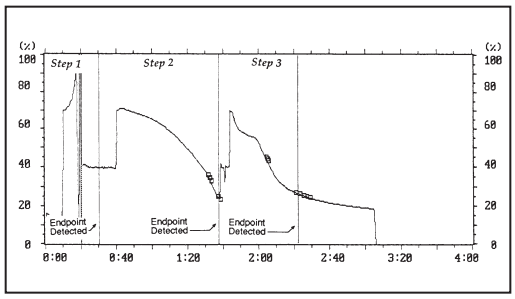
Multistep Recipe Programming:

Single Recipe: 2 Step TaSi/Poly Etch



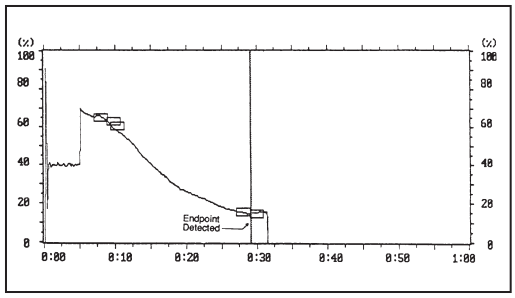
Single recipe with auto selection of different wavelengths at each step

Single Recipe: 3 Step Metal Etch



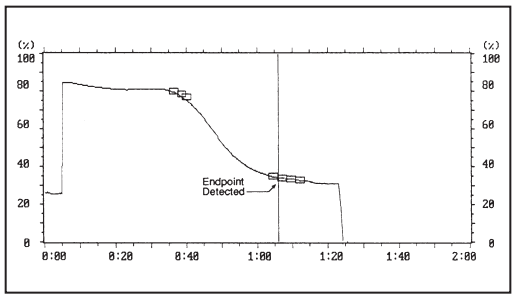
Step 1: Pre-etch (oxide removal); Step 2: Etch of bulk metal AL (4% Cu, 0.5% Si); Step 3: Softened programmed over etch with endpoint

Silicon Nitride Etch:



Birds beak structure

Oxide Etch <2% Exposed Area:



Heavy polymer deposit on viewport

1015DS

General Features

Storage of Endpoint Data:

- Extended storage capabilities of a single process run (up to 54 minutes).
- Automatic storage of endpoint data, endpoint times and recipe parameters on built-in floppy disk drive.
- Off line review of process data using QuickView™ software from LUXTRON.
- Transfer of recipe via floppy disk to other etchers equipped with 1015DS controllers.

Close Loop Interfaces to Etchers:

- Programmable interface selection with RS-232C or TTL (interfaces available for most common etchers).

Bifurcated Fiberoptics:

- Assures identical light paths for both beams.

Menu Driven, Window-Based Software for Ease of Programming:

- Endpoint parameters (falling, rising, oscillating signal).
- Multistep process sequences with individual wavelength selection.
- Signal conditioning (averaging AGC, scale expansion, auto offset).
- Timing parameters (min./max. set points, duration of AGC, over etch times: straight time, % of step, or % of total process time).
- Access protection codes.
- Selection of RS-232C or TTL for control interface purposes.
- Single or dual sensor operation.
- Reprocessing and display of the last run for recipe validation or optimization.
- Reprocessing of previously stored endpoint data.
- Selection of displays (short/long term graphics or numeric).
- Library capacity for permanent recipe storage (16 process recipes, each with up to 4 steps).

Control Unit:

- Built-in 9″ monochrome CRT (720x348 pixel resolution).
- Screen saver.
- Real time clock.
- Built-in key pad.
- Internal floppy disk drive 3 1/2″ 1.44 megabytes (front access).
- Rear access ports for sensors (2), printer, TTL or RS-232C control interfaces, analog signal 0-10 VDC for recorder.
- Dimensions: 19″ (W) x 17″ (D) x 7″ (H) for rack mounting.
- Power Requirements: 120 VAC, 60 Hz, 2A; 220 VAC, 50 Hz, 1A.

Additional Benefits

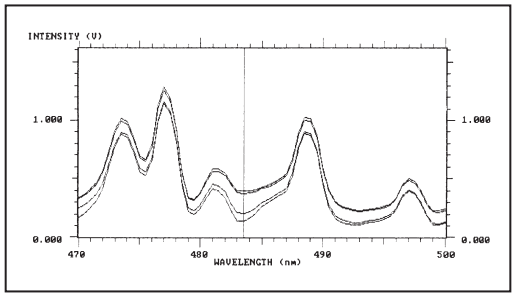
The Model 1015DS is a Powerful Diagnostic Tool:

The ability to scan and store the spectrum of a plasma reveals useful information about the condition and possible contamination of the process chamber. Such information is extremely useful in scheduling timely maintenance cycles.

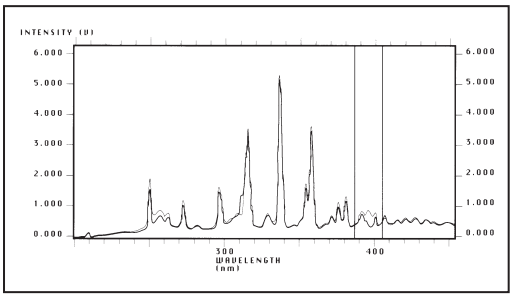
Changes in plasma emission intensities are readily apparent through comparison of spectra data recorded at periodic intervals. These changes are often indications of irregularities in process conditions (pressure, power changes, etc.) which require correction to maintain optimum results.

Repetitive scanning of the plasma spectrum during processing makes it convenient to observe the changes which occur during a process. Determining the optimum emission line required for endpoint detection in a new recipe becomes easy and uncomplicated.

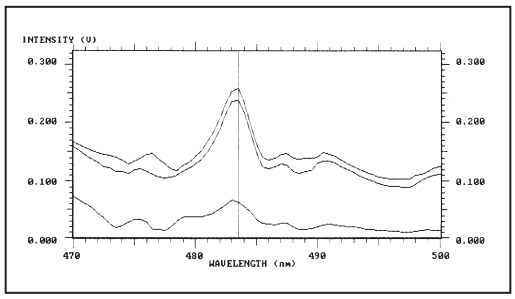
Expanded Scan for Better Readability



Full Spectrum Scan



Differential Presentation of Above Recorded Spectra

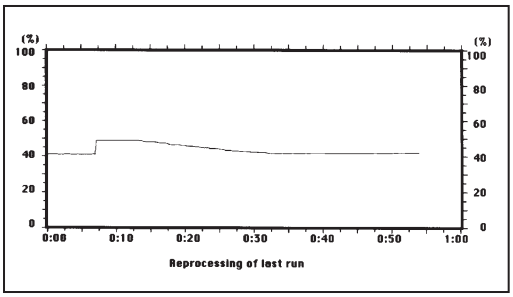


The Model 1015DS is an Intelligent Endpoint Monitor:

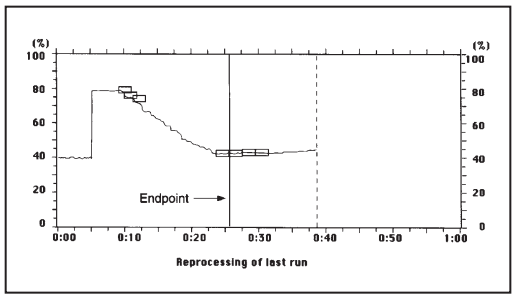
The Reprocessing capability of the Model 1015DS shortens the time required to characterize a new process. This sophisticated feature permits reexamination of stored endpoint data, either the last run, or runs previously stored on floppy disks.

Modification to a process recipe can be evaluated without altering the original raw data and without conducting new trials. This feature greatly reduces the number of wafers needed to verify an endpoint recipe - a savings of time and material.

In the example below, the user has created a new recipe with optimized parameters, and without processing any additional wafers!



In the example above, the signal amplitude of the trace is very weak and no distinct transition is recognizable to detect an endpoint.



Changing the scale factor to 10X and applying the falling signal algorithms produced a distinct signal to detect endpoint.

Model 1015

Single Detector Version

LUXTRON also offers a lower priced single detector version. Similar in specifications and identical in dimensions, the standard Model 1015 employs one detector and a single (not bifurcated) fiberoptic probe to collect the plasma emission.

The same proprietary algorithms and programming features are provided in the standard 1015 as in the 1015DS version. The 1015 can be upgraded to a 1015DS should process conditions change (because of adverse signal/noise conditions) and the use of plasma background compensation becomes necessary.

The Company

LUXTRON Corporation was founded in 1978 with headquarters and ISO 9001-certified manufacturing facilities, located in Santa Clara, California.

LUXTRON develops, manufactures and markets unique sensors and instrumentation, based on optical and heat flow technologies, for a wide range of industrial, medical, semiconductor and R&D applications.

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2775 Northwestern Parkway
Santa Clara, CA 95051-0941
1.800.627.1666
408.727.1600 Tel
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