Datasheet

Talos F200E (S)TEM

High-throughput (S)TEM with low-distortion imaging and powerful analytical capabilities for a range of semiconductor applications

The Thermo Scientific Talos F200E (S)TEM (scanning transmission electron microscope) enables fast, precise, quantitative characterization of semiconductor devices in multiple dimensions, supporting power, memory, display, advanced packaging, and more. This workhorse solution is well-suited for failure analysis and metrology applications with its broad scope of analytical capabilities and exacting distortion specifications. Designed to optimize productivity, footprint, and ease of use, the Talos F200E (S)TEM is excellent for semiconductor labs in an industrial environment.

Dedicated solution for semiconductor challenges

The Thermo Scientific™ Talos™ F200E (S)TEM combines outstanding high-resolution STEM and TEM imaging with advanced energy dispersive X-ray spectroscopy (EDS) signal detection and 3D characterization with compositional mapping.

Utilizing Thermo Scientific Velox™ Software, the Talos F200E (S)TEM supports many innovative features for semiconductor applications, including live TEM image rotation, simultaneous operation of multiple STEM detectors, integrated differential phase contrast (iDPC) imaging, STEM field-of-view matching, drift-corrected frame integration (DCFI) in both TEM and STEM, instant EDS map quantification, integrated spectrum profile for accurate EDS quantification, and time-resolved EDS mapping.

The Thermo Scientific Ceta™ M Camera displays a large field of view and supports free image rotation. The stage control is synchronized with the image rotation. (S)TEM DCFI, together with the piezo stage, ensures maximum imaging quality, saving time and allowing you to capture more data from each sample.

Accelerate analysis for high productivity

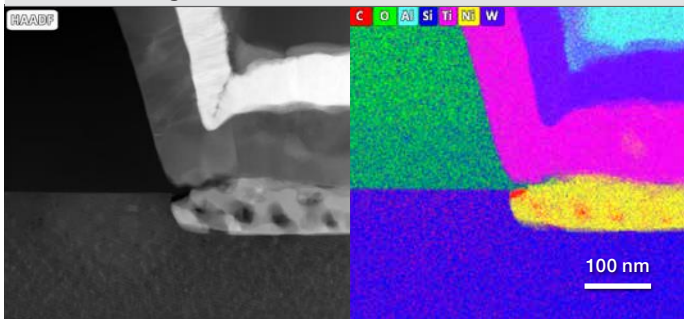
The Talos F200E (S)TEM can be configured with either a Thermo Scientific Super-X™ or Dual-X Integrated EDS System. Both have multiple silicon drift detectors (SDDs) for superior sensitivity and are proven in the semiconductor industry. Integration with the X-TWIN objective lens maximizes collection efficiency while enabling outstanding EDS output count rates.

Key features

High-resolution, high-throughput, and high-quality TEM/STEM imaging and simultaneous, multiple signal detection and contrast-optimized STEM imaging.

Rapid, precise qualitative or quantitative EDS acquisition and analysis.

Dedicated semiconductor-related applications, such as STEM field-of-view matching, live TEM image rotation, and minimized image distortion.



SiC MOSFET interfaces with high angle annual dark field (HAADF) imaging and EDS mapping.

The electron optical system of the Talos F200E (S)TEM is further optimized to reduce image distortion. Together with the low-distortion Ceta M Camera, it supports industry-leading measurement reliability and higher productivity.

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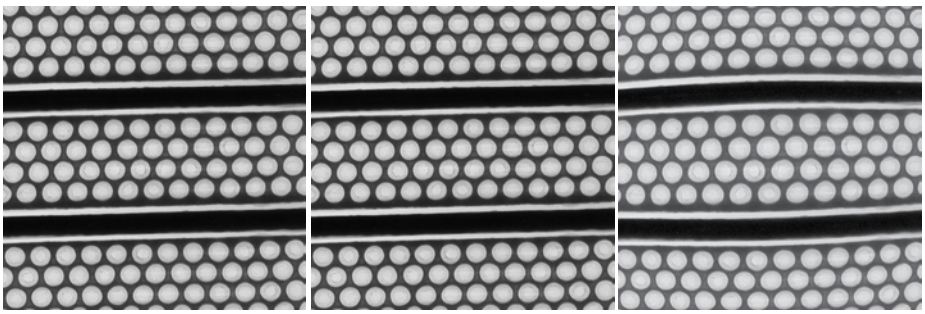
Image distortion and variation

The three examples below show the simulated effects of distortion on a 3D NAND image. The original image is shown on the left. The middle image shows the effects of linear image distortion, which is the result of magnification differences in the X and Y direction. This makes the 3D NAND cell images appear elliptical. The image on the right highlights the effects of magnification variability within the field-of-view. This makes the 3D NAND cells located at the corners of the image appear smaller than those at the image center.



TEM image distortions are generated by optical system variability and from intrinsic camera distortions. The Talos F200E (S)TEM features an optimized optical system and a dedicated low-distortion camera, which guarantees minimal image distortion, greatly improving TEM data reliability and integrity.

Installation requirements

Refer to pre-install guide for detailed data.

Additional features

- **High brightness field-emission gun** with cold FEG option — X-CFEG is up to 35% brighter, excelling in EDS and EELS.
- **Class-leading optical performance**—Constant-power X-TWIN objective lens, high resolution, and large EDS collection angle.
- **Maximized productivity**—Fast, easy operation and mode switching.
- **Ultra-stable platform**—Constant power objective lens, piezo stage, robust system enclosure, and operation in a different room ensure maximum stability and minimal lab environment requirements.
- **SmartCam camera**—Digital search-and-view camera improves the handling of all applications and allows daylight operation.
- **Low-distortion imaging**—Minimized linear image distortion and optional minimized TEM image variation help ensure measurement reliability.
- **Live TEM image rotation**—Aligning device features by live image rotation, with synchronized stage movement control.
- **Remote monitoring**—Monitoring performance or performing basic operations remotely through intranet or internet.
- **Greatly improved sensitivity**—Proprietary Panther STEM subsystem delivers images with excellent signal-to-noise ratio even when the probe current is very low.
- **3D volume analysis**—Capable of 3D volume analysis with TEM, STEM, and EDS tomography.
- **AutoSTEM**—STEM imaging auto-focus and auto-stigmation.
- **Align Genie**—Automated alignment package for daily and column alignment provides optimized, reproducible setup.

Talos F200E (S)TEM		
Camera	Ceta M	
TEM Linear Distortion	≤ 1%	
TEM Image Variation	≤ 1% (option)	
TEM Magnification Cal.	≤ 2% (option)	
STEM Linear Distortion	≤ 1% (option)	
STEM Magnification Cal.	≤ 2% (option)	
Electron Source	**X-FEG**	**X-CFEG**
Brightness (@ 200kV)	≥ 1.8×10^9 A/cm^2 srad	≥ 2.4×10^9 A/cm^2 srad
Maximum current	> 50 nA	> 14 nA
STEM resolution	≤ 0.16 nm	≤ 0.14 nm
TEM information limit	≤ 0.12 nm	≤ 0.11 nm
TEM line resolution	≤ 0.10 nm	≤ 0.10 nm
EDS	**Super-X**	**Dual-X**
Full solid angle	0.9 srad	2.56 srad
Effective solid angle	0.9 srad	1.65 srad
Detectors	4 SDD	2 SDD

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