Critical manufacturing
an ASM PT company

Wafer Mapping

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Wafer Mapping

Wafer Mapping started being mainly used in semiconductor industry, where they are also known as wafer maps. Wafer mapping is a mapping process where the performance of semiconductor devices on a wafer are represented by a map showing their performance as a color-coded grid. The map is a convenient representation of the variation in performance across the wafer units (dies/chips), since the distribution of those variations may be a clue as to their cause.

Wafer maps are graphical representations that can hold relevant data, such as the detail about the defects found on semiconductor wafers during the manufacturing process, the measurement data or even specific material attributes that might be stored in a specific unit. These maps are generated using wafer map calculators, employing statistical analysis and visualization tools to depict defect locations and densities on the wafer surface accurately.

A wafer map spots the defective integrated circuits (dies/chips) on a silicon wafer and provides important spatial information. It enables statistical analysis by monitoring the quality of the manufacturing process through the assessment of the spatial information represented in the wafer map.

Overview

This tutorial provides an overview of the purpose and concepts behind the following entities: Map Definition and Map. It also includes a step-by-step operational guide that walks the reader through the entire process, from creating a **Map Definition** in the system to creating and updating a **Map** instance.

Scenario

On this scenario, it will be explored an use case where it will be created a **Map Definition** that graphically represents a wafer containing 1588 units (dies/chips). Since wafers have a circular shape, this will be modeled as a regular map that will have a mask file to define the wafer's circular layout.

The wafer assignment process will be performed through the creation of a Map instance, which, once created, is linked to the corresponding material. Lastly, the tutorial demonstrates how cell values within the map layers can be edited, allowing you to visualize and manage different types of data across layers.

Modeling

This section will guide you through the required configurations and set up for the **Mapping** module.

Before starting the **Map Definition** creation, the system will require that user has pre-configured at least one value in the lookup table: MapDefinitionType.

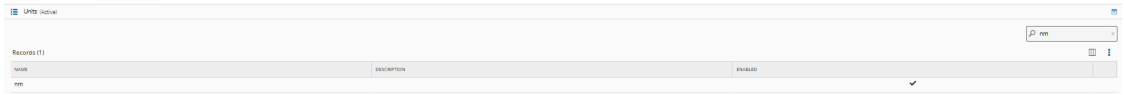
> **Note**
>
> If the map being created does not have a regular shape, a layout file that holds the shape format should be created beforehand so it can be uploaded onto the system when creating the map definition. Over the course of this tutorial, we will use a wafer map mask file that represents a circular shape.

Lookup Table Values

For the use case that will be explored, the following configurations were previously made:

- `WaferMap` as a `MapDefinitionType` value

- `nm` as a `Units` value



- `Die` as a `Units` value

Mask File (JSON Format)

This is the file used to create the map mask.

Modeling Notes

- When handling a map that has regular units, but doesn't have a rectangular shape, it's necessary to upload a mask file that will act as an additional layer that shapes the map format. This is made through the translation of a binary language that indicates which map cells (units) will be populated or not.
- When creating a **Map Definition** that doesn't follow a regular shape, it will be necessary to upload a layout file that holds the information related with the shape of the map units - this file translates through vectorial language the shape of the map and its units.

Useful Documentation

For more information on how to create a Map Definition and configuring its main properties, see Create Map Definition.

Warning

Basic model configurations will not be covered in the execution video.

Execution

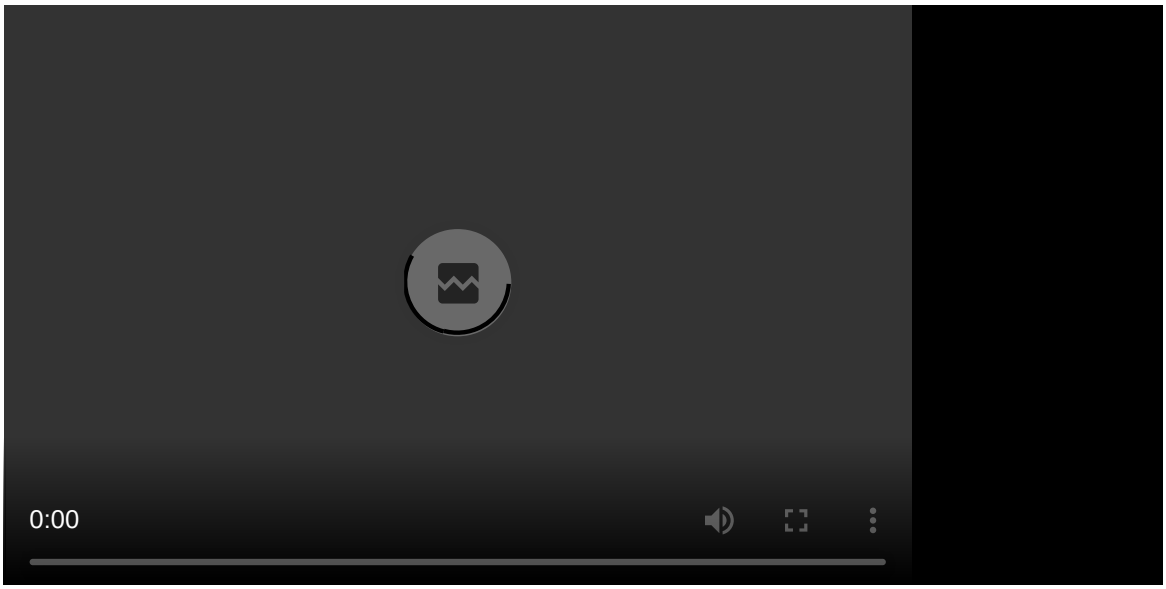
For this use case, when creating the **Map Definition** representing a wafer with 1588 dies, it is important to configure the following properties:

Property	Value
Layout Type	Regular
Columns	50
Rows	45

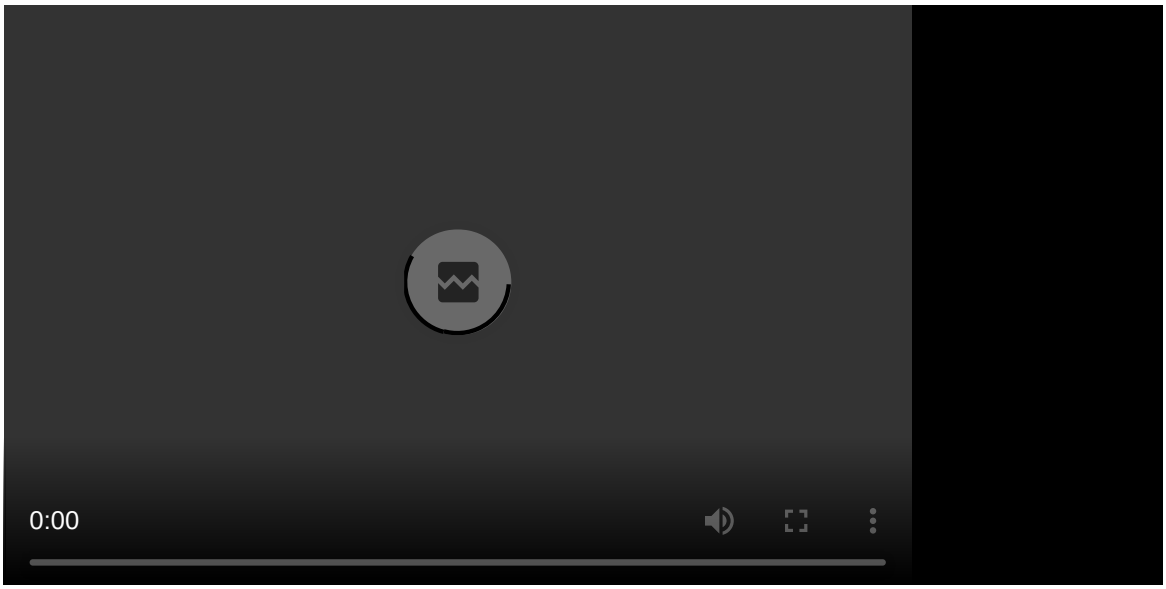
Property	Value
Dimension units	Die
Mask File	WaferMapLayout-50x45.xml
Empty Unit Color	White - RGB (255,255,255)
Grid Lines Color	Black - RGB (0,0,0)
Show Grid Lines Color	True
Notch	Bottom
Default Rotation	0
Material units	Die
Ruler Mode	0
Show Ruler by Default	True

Table: Map Definition settings

The demonstration walks you through all necessary steps to create a new **Map Definition**, starting by configuring the **Map Definition** properties, setting up layers, and defining filters that allow you to edit the cell values for each layer.



In the second part of the tutorial, once the **Map Definition** has been created, you will learn how to create a **Map** instance, which is an executable object based on the **Map Definition**. This section also demonstrates how to make changes to a **Map** during material execution.



Execution Notes

- The link between the **Map** and the material can be established either from the **Map** details page or the **Material** details page.
- After modifying cell values in any layer, the system refreshes the UI and reverts to displaying the default layer.
- Filters are displayed by default only if the Selected by Default option was enabled; otherwise, you must manually select the filter when needed.

Additional Notes

To use a Map you must first create a Map Definition. A Map Instance can only be linked to single material, but a material can hold more than one Map Instance.

Master Data

This is the Master Data file used to create this model.

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