WAFER READER DIVISION.
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# Supporting SiC Success Stories Through Technical Innovation

htt is the leading European organization supporting all customers in the Semiconductor Industry.

CS International Conference 2024
Speaker: Michael Köppl, David Liese

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## Supporting SiC Through Technical Innovation

# SINGLE WAFER TRACKING

## Why is it important?

- New Standards in the SEMICONDUCTOR industry

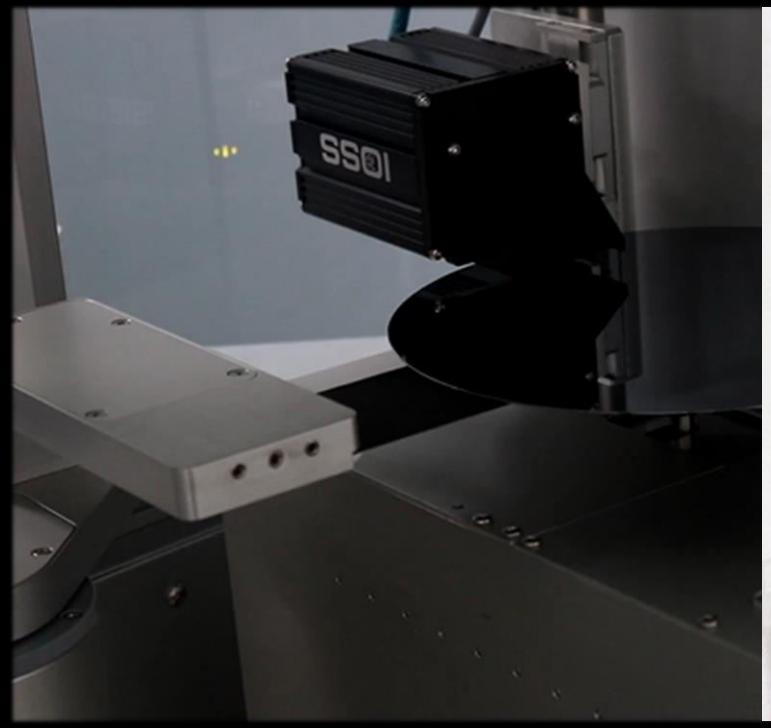
- Price per SiC Wafer still very high
  additional costs increase due to
  -SiC Wafer size increasing from 6“ to 8“
  -Increasing process steps –> increasing price per SiC wafer

- Identification of individual SiC-Boules + Wafer over your entire production process

# SINGLE WAFER TRACKING

## Why is it important?

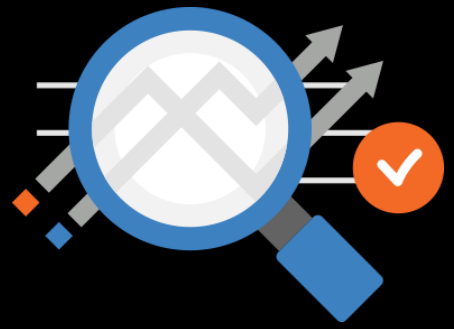
- Failure analysis – Defect analysis – locate production errors
- Monitoring of production steps per single wafer
- Allows an individual quality level to each single wafer
- Avoid mistakes in case of manual steps

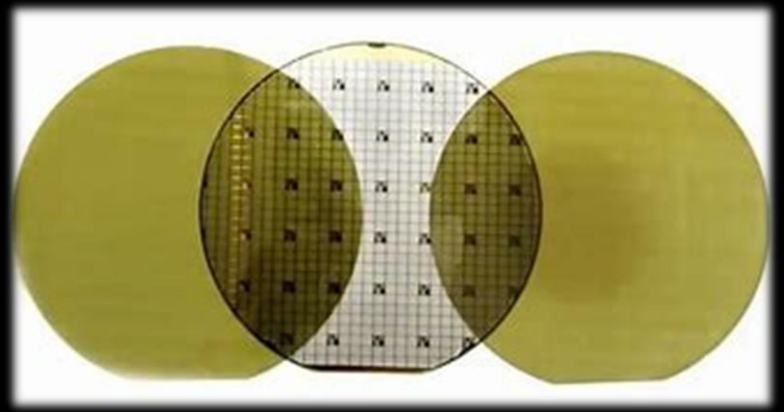



# SINGLE WAFER TRACKING

## What happens when this step is waived?

- Without single wafer tracking
  →higher effort of error analysis necessary
    - With a significant higher expenditure of time
- Higher handling effort
  →additional risk of wafer breakage
- Ends up with significant higher costs per Wafer





# A few words about Wafer marking

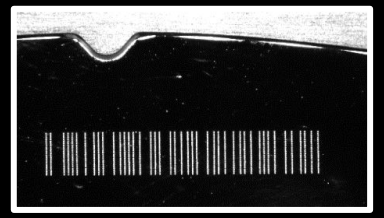
- Bare Wafer individualized using a Laser marker (as example)

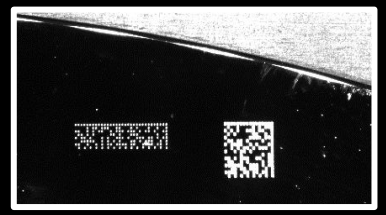
- Semiconductor Industry use
  - OCR, Barcode, Data Matrix, QR Code

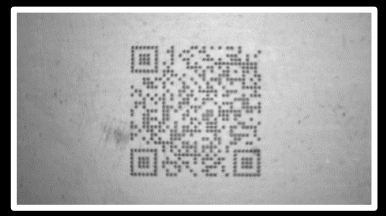
- A certain degree of security in the code selection should be taken into account

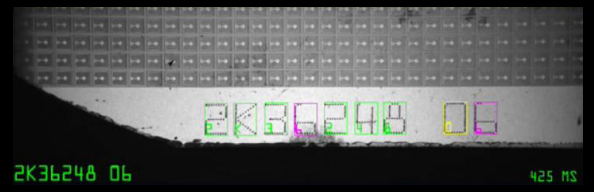
→We recommend:
- using Semi Standard codes
- High safety using a check sum, also with OCR
- Optimally two different kind of codes are used

- Markings on front and also backside of the wafer











# Requirements to a tool …

## … that identifies the codes on a SiC wafer

- Very fast + reliable identification even if it has low contrast
- Can be used flexibly to fulfill even unusual tasks – Identification of the code through the transparent SiC on the back (for example in Epitaxie tools)
- Fast and reliable transfer of reading result
- Simple integration
- Easy operation for teaching new recipes
- Service friendly
- Long term use in a tool – high quality
- Fast return of investment – fair price

# Examples

## Our experiences at customer sites

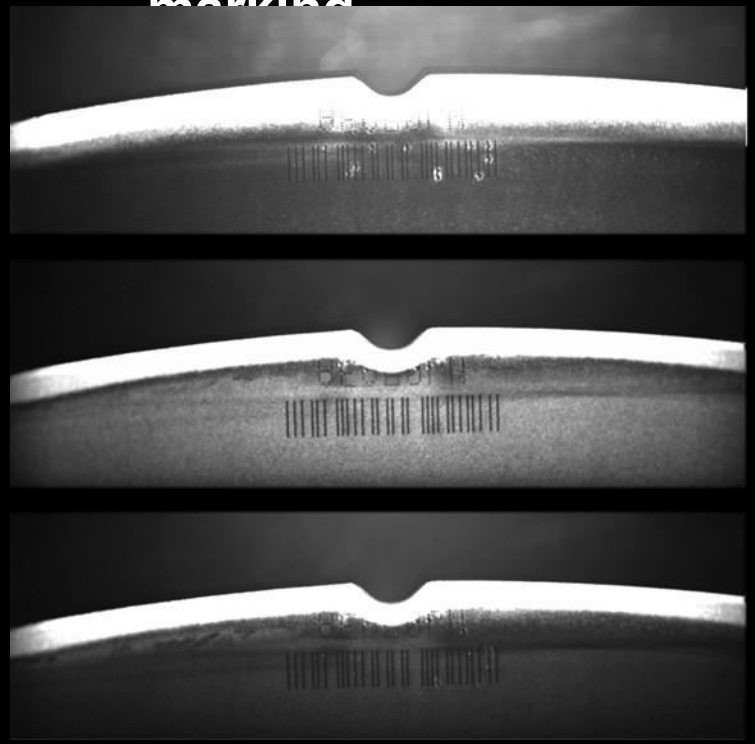
**Frontside marking**


RED

GREEN

BLUE

**Backside marking**



RED

GREEN

BLUE

# Examples

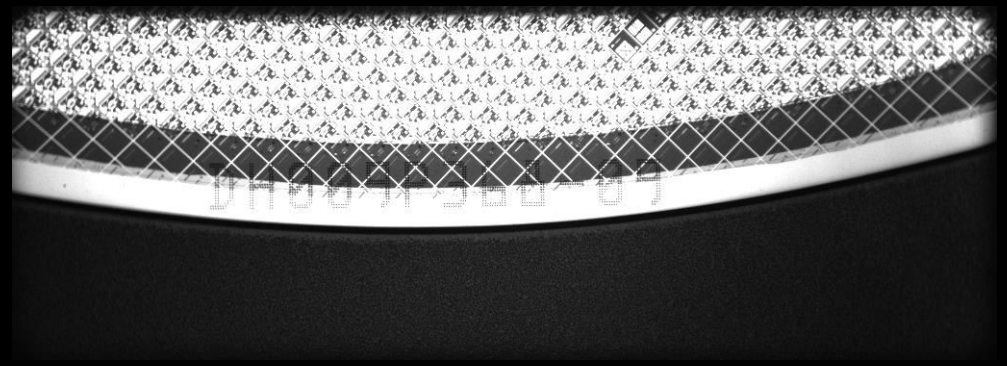
## Our experiences at customer sites

Identification of Codes by changing RGB illumination

# Examples

## Our experiences at customer sites

Deep Range combines the best information from multiple exposures images, into one new picture.
The final result is a smoother and enhanced result, easier to extract the Wafer ID reading.



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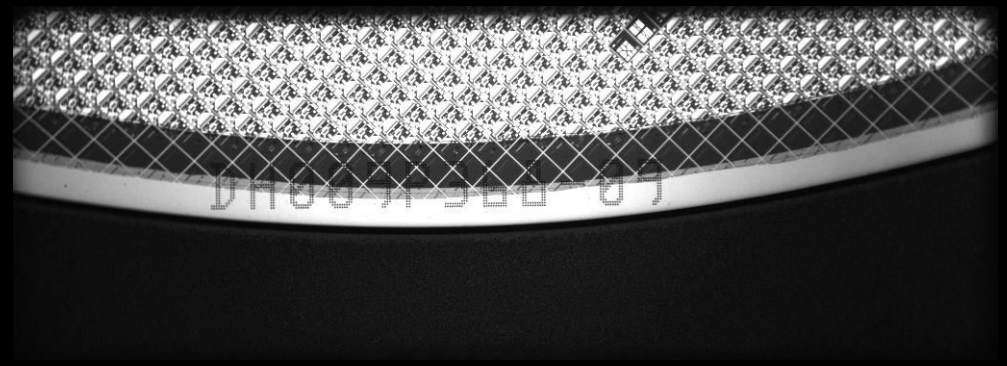

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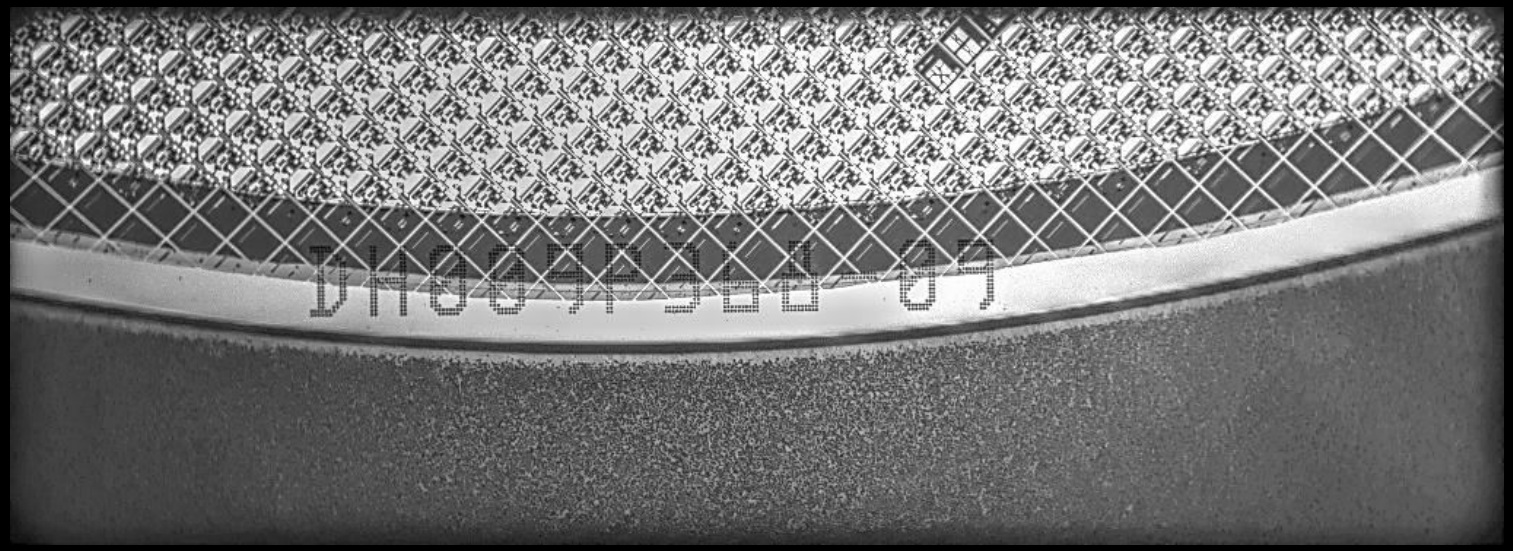
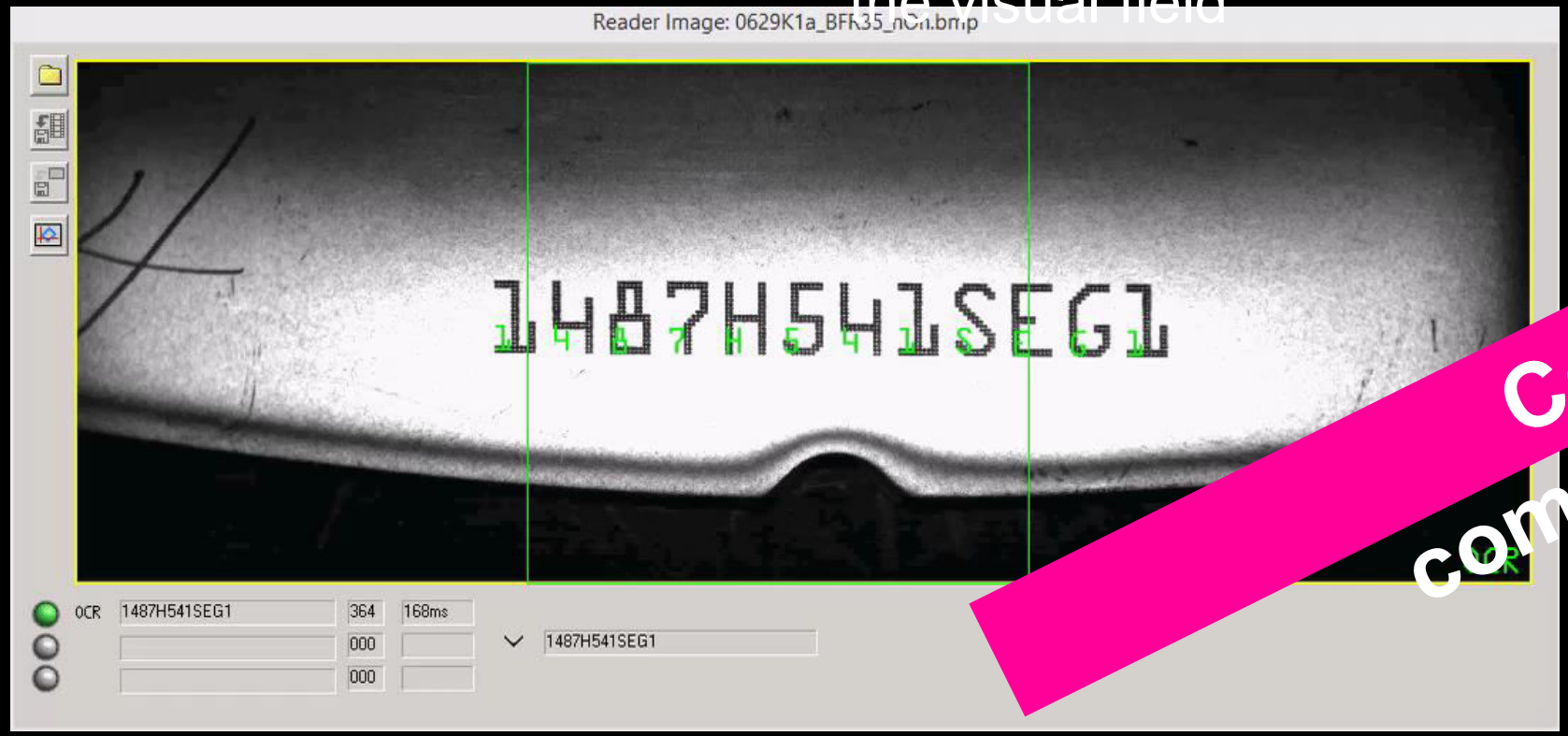


# Our experiences at customer sites

Identification of codes independent from position inside the visual field



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# WID120 WAFER ID READER

„The longer it works, the faster it gets.“

- New Benchmarks in ID Reading
  - Identify codes on any kind of Wafer material

  SiC, GaN, GaAs, Si, InAs, Saphire, Cu, Quarz, Glas etc.

- Identifies OCR, Barcode, DataMatrix and QR code

- Automatic Illumination control – Red-Green-Blue

- Improve Yield →Lower tool stops

  – no re-alignments required as known with alternative systems

- Best Cost of Ownership
  - Achieve highest yield
  - Increase of MTBA/MTBF
  - Decrease of MTTR


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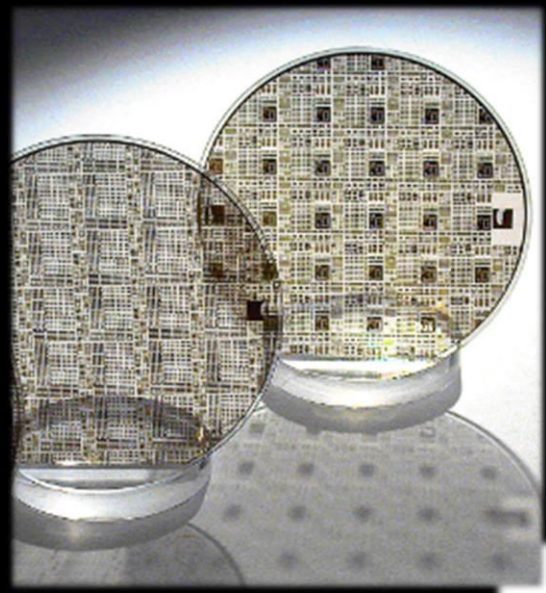
# Further Challenges in Wafer Process Automation

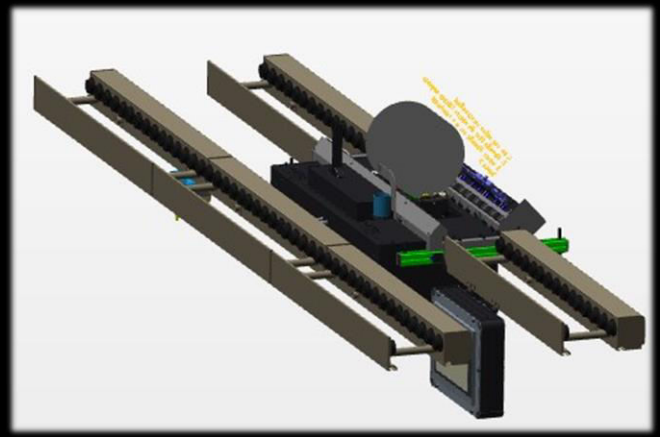
- SiC/GaN/Compound Wafers bring more challenges for wafer processing tools, e.g.:
  - Thin/thick wafers and boules
  - Hard material
  - Unique surface properties
  - Non-Semi Standard Geometry

- All automation tools need to be „Ready for SiC“!
  - Wafer Presence Detection
  - Wafer Aligning
  - Wafer ID Reading
  - Custom Motion Controls
  - Custom Wafer Transfer Arms / End Effectors



# Further Challenges in Wafer Process Automation

- Wafer Alignment
  - Standard Alignment tools often times are not successful moving SiC Wafers -> high abrasion, contamination, misalignments
  - Solution: Use different material properties and finishes on rollers/effectors, that still serve ESD and other compliances
  - Non-Semi Standard Properties (e.g. Flat Lengths) might lead to misalignments
  - Solution: Use Software Parameters to fine-tune offsets – use specialized motion control with easy drag-and-drop command structures

# Further Challenges in Wafer Process Automation

- Wafer Storing/Moving
  - SiC Wafers can be thin and very sharp edged which leads to abrasion, contamination and possible breakage in cassettes
  - Solution: Use different materials with different properties. E.G. FB (FujiBakelite). The advantages of this material include dimensional stability, low outgassing, low ion leaching, low particle generation, long lifetime, and anti-static stability comparable to PEEK. Although the price of FB-0437 is significantly lower than that of PEEK, the superior abrasion resistance of FB-0437 with sharp edge, thin compound semiconductor wafers results in a lower level of particle generation, and thus higher yield, compared with PEEK.

# Further Challenges in Wafer Process Automation

- Wafer Sorting / Moving
  - Compound Wafers have unique surface / material properties
  - Solution: Customized Wafer End Effectors to handle, e.g. vacuum, bernoulli, or thick wafer handling effectors (e.g. for Sapphire)
  - Compound Wafers (esp. SiC) is in a transfer from smaller to larger wafer sizes (6“ to 8“)
  - Solution: Use modular sorting/moving tools that are easy to adapt to other wafer sizes (easy interchangeable load ports, end effectors capable of moving different sized wafers reliably)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# THANK YOU FOR YOUR ATTENTION.


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