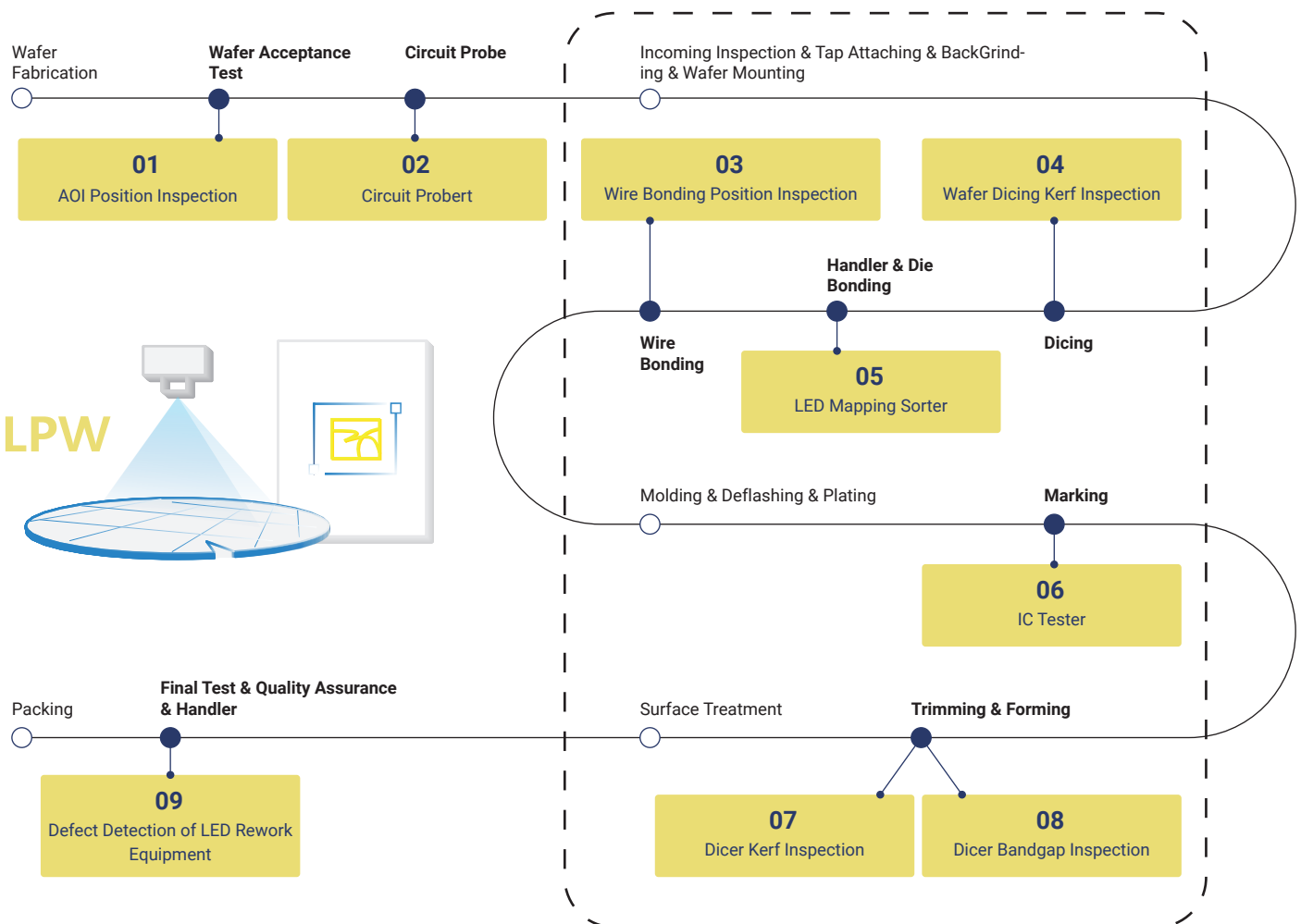# Waferscan

LEAPER Visual Inspection Solutions for Semiconductors

Leaper WaferScan Toolkit

Leaper WaferScan Toolkit (LPW) is designed to help user build the widest range of machine vision applications with ultimate flexibility. LPW allows developers to write their own vision processing, configure multi-threading, and access all tool properties and options.

Cost-effective, high-quality production of semiconductors and LEDs require speed, accuracy and frictionless tracking through the whole fabrication. Semiconductor manufacturers and OEMs rely on LEAPER machine vision technology to ensure precise alignment of wafers during sorting, counting, masking and etching processes, increase traceability of wafers and die as they move through the front and back-end processes, and improve product quality through advanced inspection procedures.

LPW

Wafer Fabrication

Wafer Acceptance Test

Circuit Probe

Incoming Inspection & Tap Attaching & BackGrinding & Wafer Mounting

01 AOI Position Inspection

02 Circuit Probert

03 Wire Bonding Position Inspection

04 Wafer Dicing Kerf Inspection

Handler & Die Bonding

Wire Bonding

Dicing

05 LED Mapping Sorter

Molding & Deflashing & Plating

Marking

06 IC Tester

Packing

Final Test & Quality Assurance & Handler

Surface Treatment

Trimming & Forming

09 Defect Detection of LED Rework Equipment

07 Dicer Kerf Inspection

08 Dicer Bandgap Inspection

01.AOI Position Inspection

Inspection Requirements: Identification and positioning of LED components.

Detection Accuracy: XY offset ≤ ±40μm, angular deflection ≤±9°

Detection Speed: 60s /90,000 PCS

Detection Solution: Realize the positioning of bounding pads and chips through template matching and image processing.
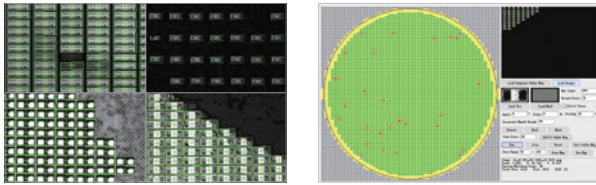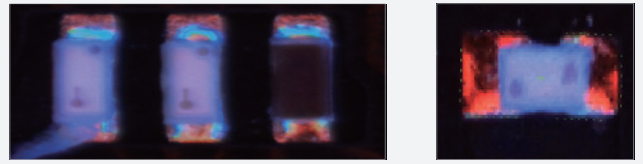
02.Circuit Probert

Inspection Requirements: Positioning of LED chips, forming a map of the wafer, and marking.

Detection Accuracy: < 0.2 pixel

Detection Speed: 70ms / 400 PCS / 6MP, 180ms / 4500 PCS / 1.5MP

Detection Solution: Realize high-speed and accurate die positioning during wafer scanning, and remove twins and bad dies based on die arrangement, as well as generate waferMap in real time according to die coordinates and data.

03.Wire Bonding Position Inspection

Inspection Requirements: Accurately locate the pad to achieve wire bonding between the lead and pad.

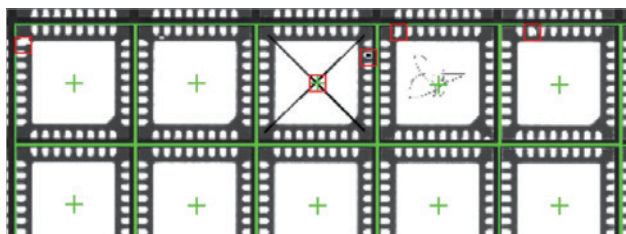**Detection Accuracy:** 2 pixels

Detection Speed: 8ms

Detection Solution: Template matching based on shape and machine learning to realize pad positioning in environments with uneven pad imaging quality and large background interference.
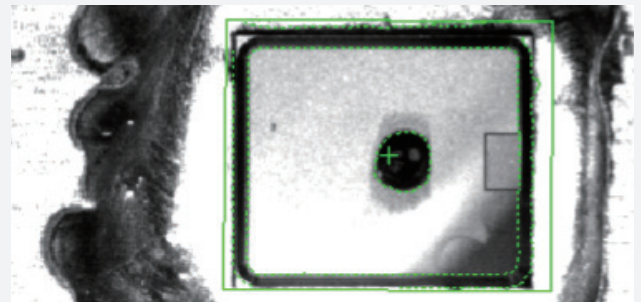
04.Wafer Dicing Kerf Inspection

Inspection Requirements: According to the different wafer process and requirements, different dicing processes are used to cut the wafers to separate the chips into single pieces.
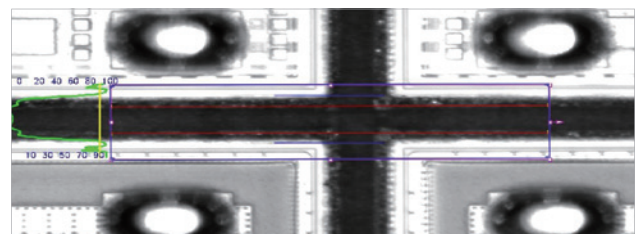

Wafer Sawing

Detection Accuracy: 0.5 pixel

Detection Speed: 120ms

Inspection Solution: template matching algorithm to locate the packaged chip, Kerf algorithm to detect the position and width of the dicing line, geometric algorithm to detect the size of the lead and pad of the packaged chip, and AOI algorithm to locate the defects of the lead and pad.
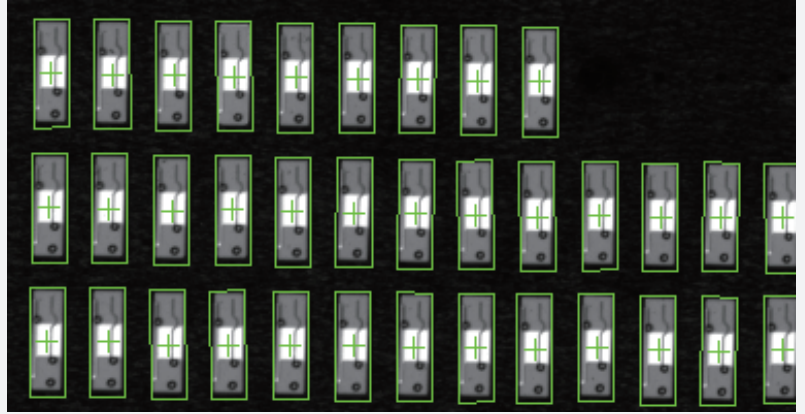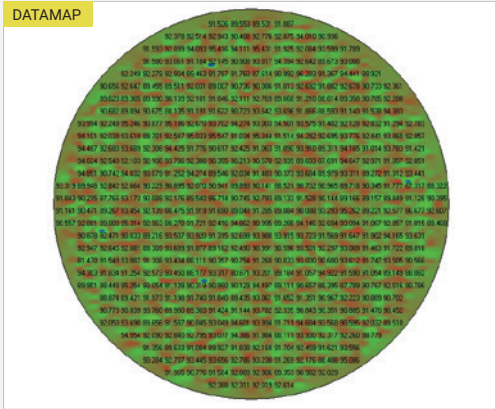
Laser Dicer

Detection Accuracy: 1μm

Detection Speed: 20ms

Detection Solution: Kerf algorithm realizes the center position positioning of the dicing line and the measurement of the dicing line size. Double edge detection can be used in the scene with large interference.

05.LED Mapping Sorter

Inspection Requirements: Accurately provide chip positions, detect and eliminate chip defects, such as twins, notch, dirt, large angle deviations, etc.

Detection Accuracy: 0.3 pixel, angle < 1°

Detection Speed: 100-300ms

Detection Solution: Use template matching to locate the chips in the wafer, image preprocessing and Blob to filter abnormal chip data, then sort the remains and provide them to the equipment pick up.
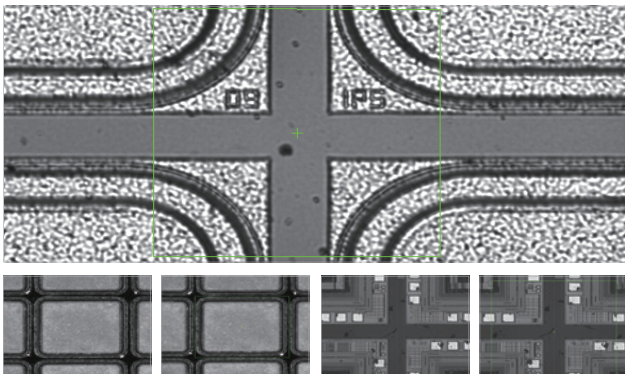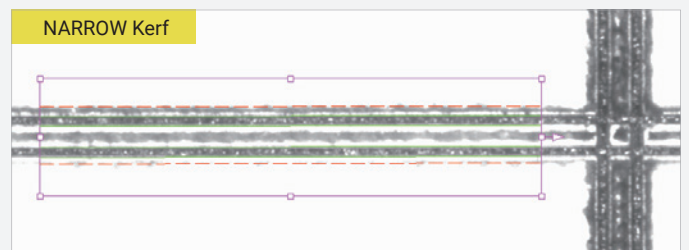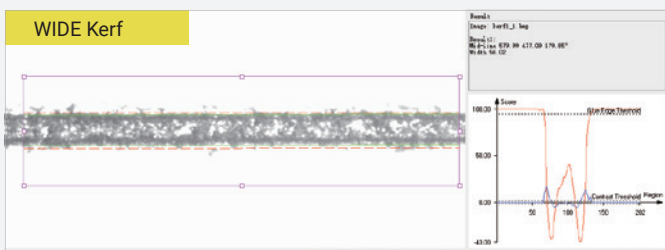

06.IC Tester

Inspection Requirements: For the precise positioning of chips in complex backgrounds.

Detection Accuracy: 0.3 pixel

Detection Speed: 30ms

Detection Solution: Template matching realizes the positioning of the IC chip, the gauge realizes the wafer edge inspection, and the blob realizes the needle mark detection.
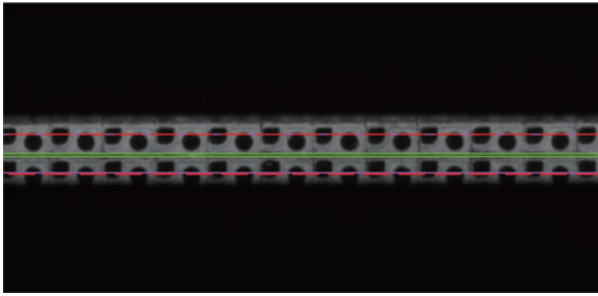
07.Dicer Kerf Inspection

Inspection Requirements: Wafer cutting line position, size and chipping inspection.

Detection Accuracy: 1μm

Detection Speed: 20ms

Detection Solution: Kerf algorithm realizes the positioning and measurement of the cutting line. Double-edge detection scheme can be used in scenes with large interference.

08.Dicer Bandgap Inspection

Inspection Requirement: Dicing line inspection for Mini LED chips, and also used for most conventional LED chips.

Detection Accuracy: 0.5 pixel

Detection Speed: 40ms

Detection Solution: Kerf algorithm realizes crack gap detection before and after the dicing, judges whether the wafer is completely fractured, and then adjusts the cutting depth.
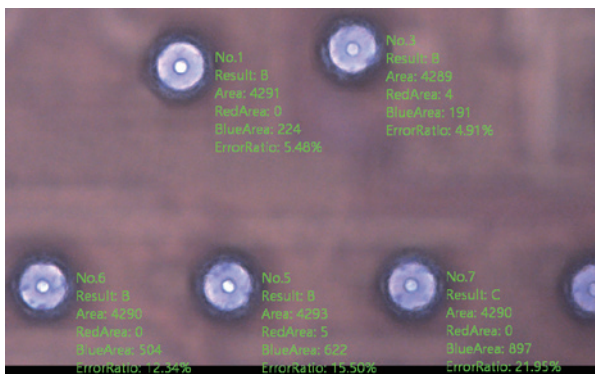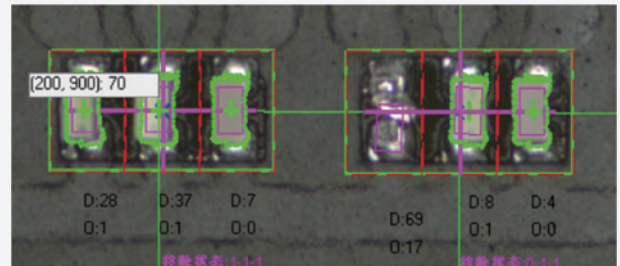
09.Defect Detection of LED Rework Equipment

Inspection Requirements: Identify and position pads and chips.

Detection Accuracy: 2 pixels

Detection Speed: 300ms

Detection Solution: Image preprocessing, template matching and array sorting to realize pad positioning, search for internal LED die position and quality based on pad position.

10.Bump Oxidation Classification

Inspection Requirements: Detects and grades the degree of Bump oxidation on Wafer.

Detection Accuracy: overkill < 2%

Detection Speed: 7ms / PCS

Detection Solution: Bump oxidized areas will show different shades of abnormal colors, which are graded by analyzing the percentage of abnormal colors.
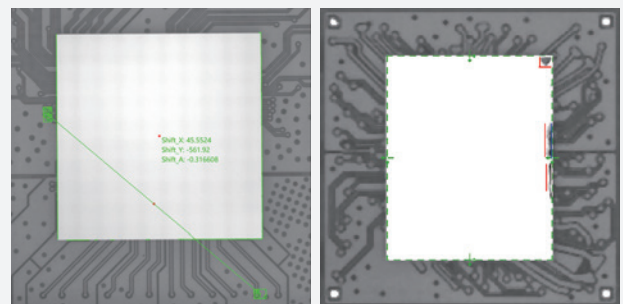
11. DIE Detection

Inspection Requirements: Crack, Shift, and Chipping Detection of DIE.

Detection Accuracy: overkill<0.05%

Detection Speed: Crack: 4ms, Shift: 90ms, Chipping 180ms

Detection Solution: The AI classification model is used to determine the OK/NG of the Crack image. template matching, blob and other tools are used to realize the Shift and Chipping detection of DIE.