Direct Digital SM Printing Using Inkjet Technology

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- Printing SM using Ink Jet
  - Highlights
  - Zero clearance technology
  - Product improvements
  - PCB shops, end users and designers Benefits

All About GreenJet

- The first fully digital solder mask deposition system
- Replaces conventional SM process that includes coating, drying, exposure, developing and artworks production
- The first ever, single-step digital solder mask deposition system

What is Digital Printing

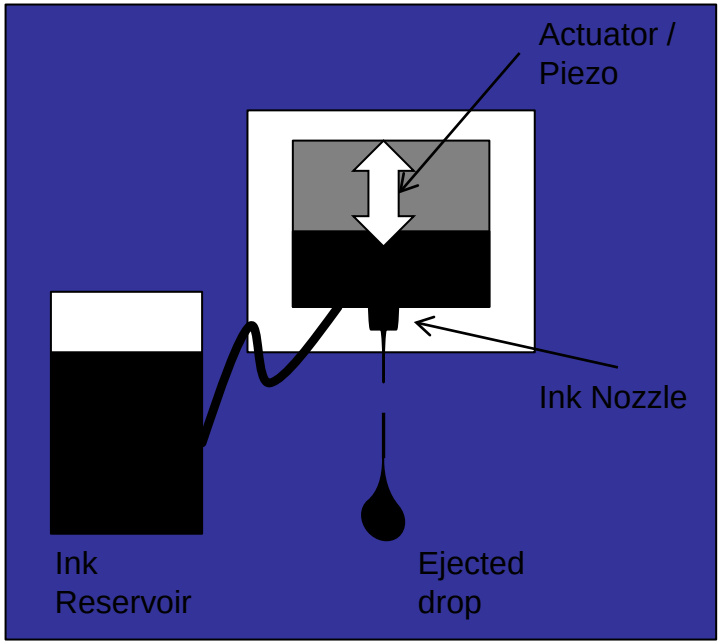
Digital printing refers to methods of printing from a digital based image directly to a variety of media

This is done by transferring the image to a substrate after converting it from a digital file on a computer

Ink Jet Digital Printing Technology

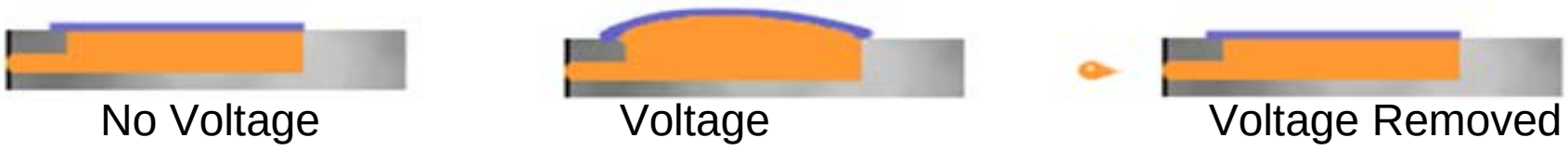
Uses Drop on Demand Piezoelectric heads

- print head fires ink drops in exact positions and timings.
- print heads, usually have an array of nozzles, each of which ejects ink drops, only when required to form the image.
- The distortion of a piezoelectric ceramic element is used to trigger the ejection



Piezoelectric Technology

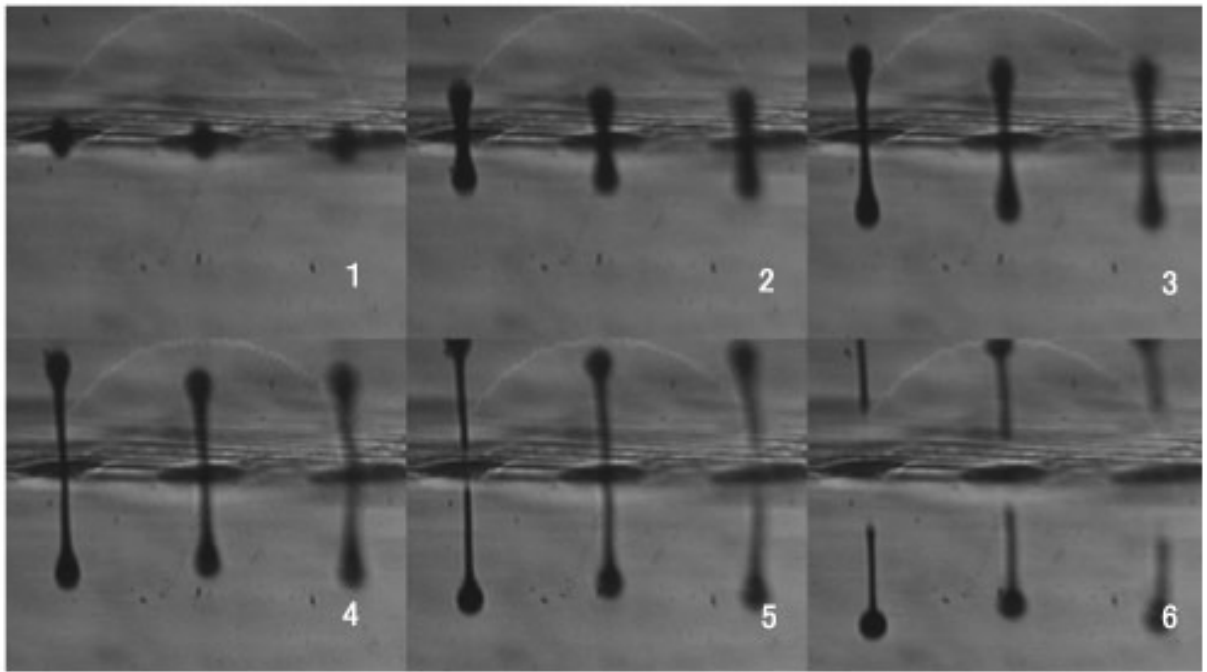
- By applying a voltage on the surface of the piezoelectric material, a section of the material (ceramics) can be made to expand
- Thus when voltage is applied, the material changes shape, which generates pressure in the fluid forcing a droplet of ink from the nozzle
- Voltage Level and Pulse width determine the drop size, drop speed and drop shape

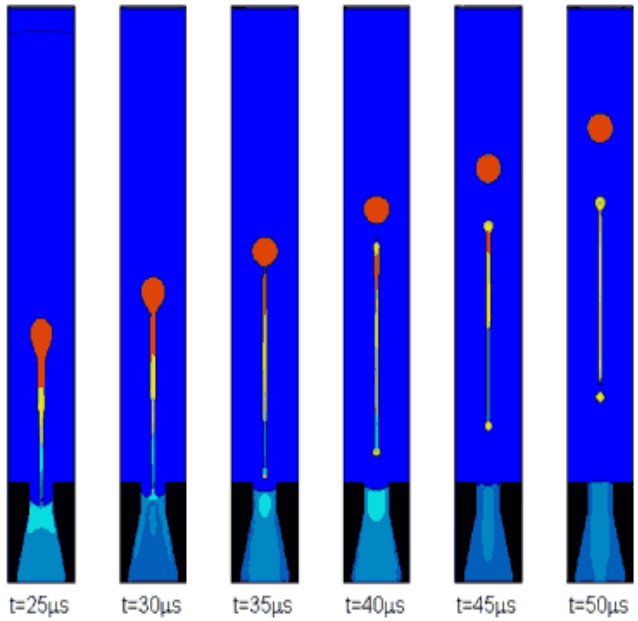


Drop Shape - DoD

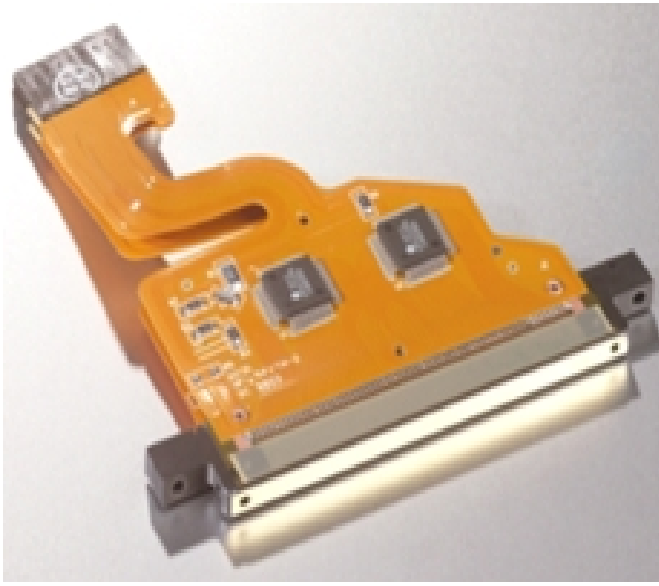
The drop on demand printers only print the ink that is actually used.

The principle of operation is the creation of waves in the fluid column by the piezo actuator which then, leads to controlled ejection of a single droplet of ink with volume of picoliters.





Ink Jet Print Heads



- 128 channels print head
- The 128 nozzles are configured in a straight line with a total print head width of 4.7mm only
- The distance between each nozzle is 508µm
- To increase resolution, 15 print heads are assembled with offset of 33µm between them resulting in 750 DPI

Technology Highlights

- Shorter cycle time - shortening time to market
- Better product
- Reduced costs
- Green technology

Traditional Solder Mask Process

Preparation

Coating & Tack Free

Exposure

Developing

Final Curing

Films

Plotter

Chemicals

Developer

Shortening Cycle Time

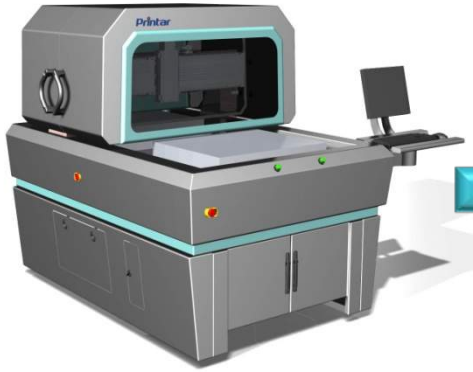
1 2 3

it's that SIMPLE!

1

Preparation

2



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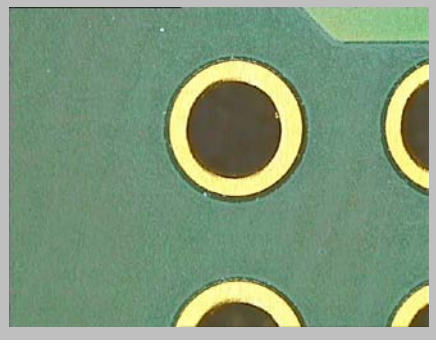
Final Curing

Traditional Process Limitations

Clearance around pads:

- Design limitation
- Registration limitations will result in exposed copper or SM on pad



Solder Dams:

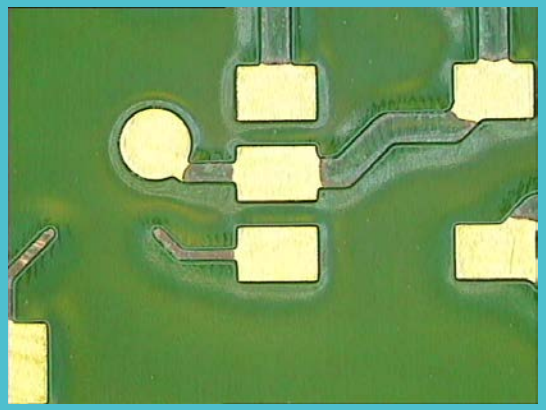
- Registration limitation
- When solder dam is too thin, it is removed

Solder Mask hole penetration:

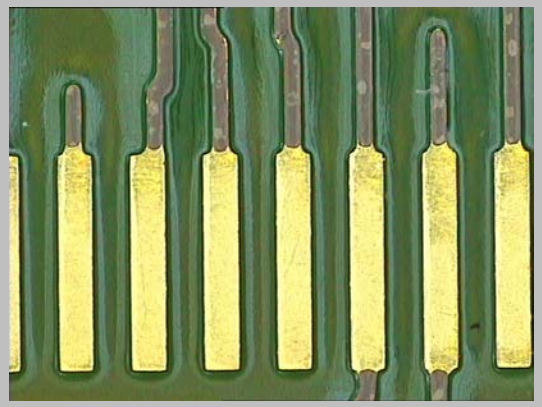
- Solder Mask is placed throughout the entire panel and then removed.
- Cleaning process not bullet proof

GreenJet Innovative Process Technology

- Zero Clearance around pads due to local registration capabilities.

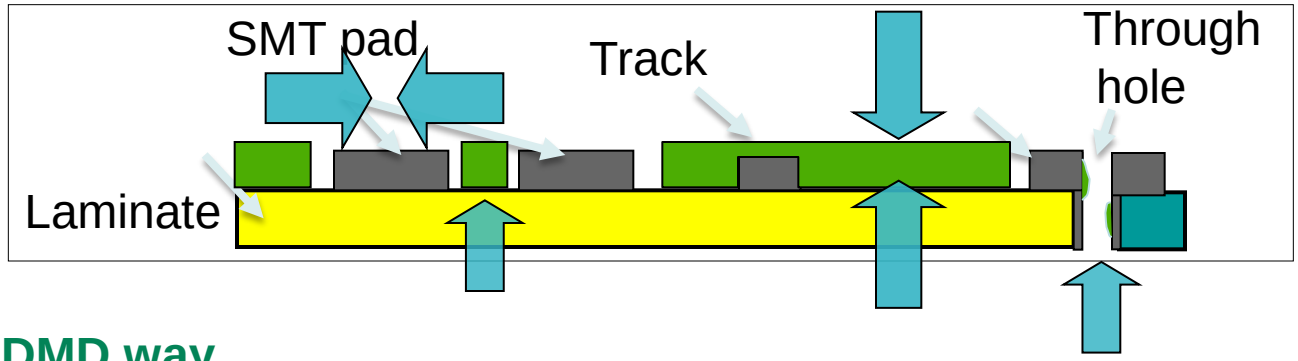


- Solder dams from pad to pad down to 100 µ
- No drill contamination – solder is printed where needed



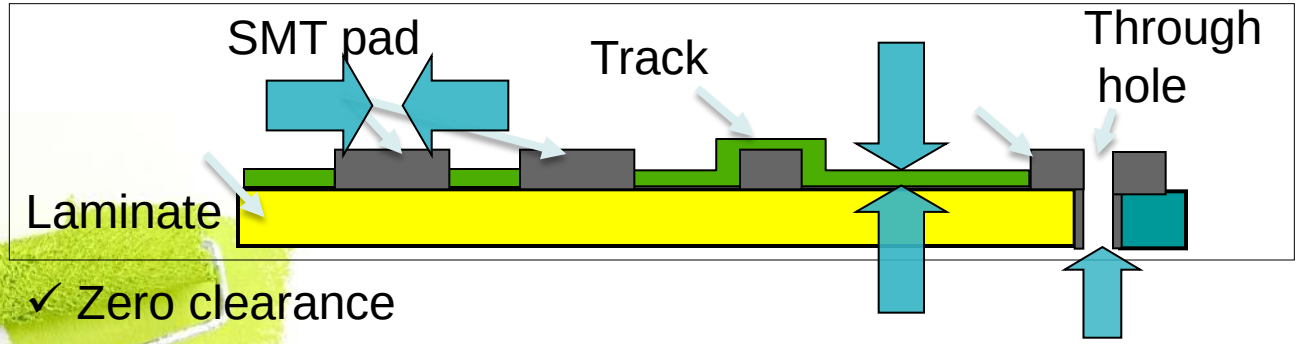
- Selective solder mask height

Conventional way

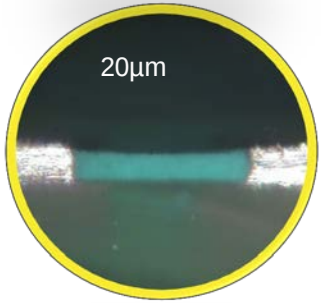


PCB Cross section

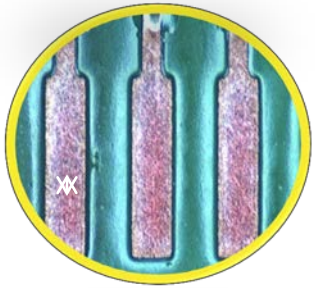
DMD way



PCB Cross section



- ✓ Zero clearance
- ✓ Controllable SM thickness
- ✓ SM dam
- ✓ Clean holes



Significant Cost Reduction

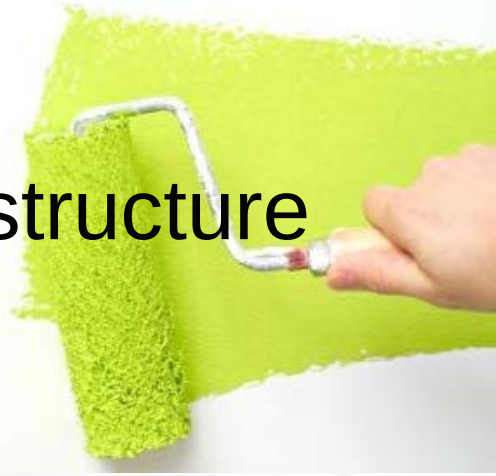
- Less Manpower required

  A single person operation

- Less facility floor space and infrastructure

  A single machine replaces a whole production line

- Smaller operating costs
  - Less Electricity used
  - Smaller maintenance costs
  - Less chemical used
  - No waist
  - Less Solder mask Consumption – Controlled solder thickness



Green Technology

- No waste in the process !!
- No artwork required
- No chemicals are used
- Less then 4% solvents in the ink
- Specific coating: Applied on required area
- Full RoHS compliant
- Halogen free

Ink Main Characteristics

- Hybrid ink- UV & thermal combined curing system
- Solvent less chemical system
- Excellent chemical resistant
- Full RoHS Compliant
- Comply with IPC-SM-840 and UL 94-V0
- Halogen Free

Ink SMI-200 Properties

IPC-SM-840 Compliant

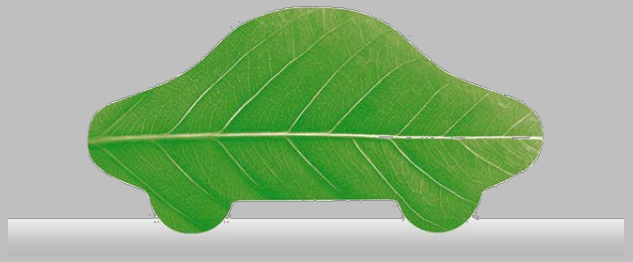
Property	Value
Color	Green
Surface Tension	38 dyne/cm
Flash Point	60˚C
Shelf Life	6 Months
IPC Approval	PASS
Pencil Hardness	>4H
ROHS Standard	PASS
Plating Resistance	HASL, ENIG, Immersion Tin, etc.
Moisture & Insulation resist.	>500MΩ
Flammability	UL94-V0
Dielectric Strength	500V/mil

GreenJet Advantages Summary

Technology-enabler: End product

- Better assembly performance
- Improved routings
- Higher density designs

Excellent Registration



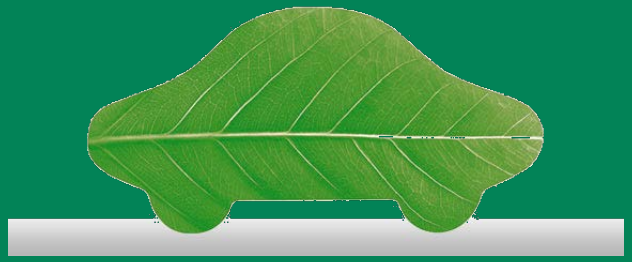
Lower production cost: PCB Manufacturer

- Deposit what you need where you need
- Reduces processes, Electricity consumption and labor

Excellent Registration – Higher Yields

Shorter manufacturing cycle: PCB manufacturer and end customer/product

Excellent Registration – No Rework



Thank you!
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The Blanket is too short

Standard Process: the Clearance exposes the Trace

Zero Clearance –Trace is covered

Allows higher densities with current equipment and processes