



Mar'17

PRINTING GUIDE LINE

HEM R&D

Honeywell

Content

- **Background :**

- ✓ Screen Printing process is widely used in IGBT module application.
- ✓ Most customer request a printing guideline for HEM TIM material for this specific process.

- **Purpose :**

- ✓ This document provides customer a brief printing process reference with HEM TIM material.
- ✓ This document also includes solvent dry process for HEM TIM material.
- ✓ Further process optimization should be done based on the customer process condition including equipment and tooling.



Printing Process

Printing Equipment

Squeegee Blade

Stencil

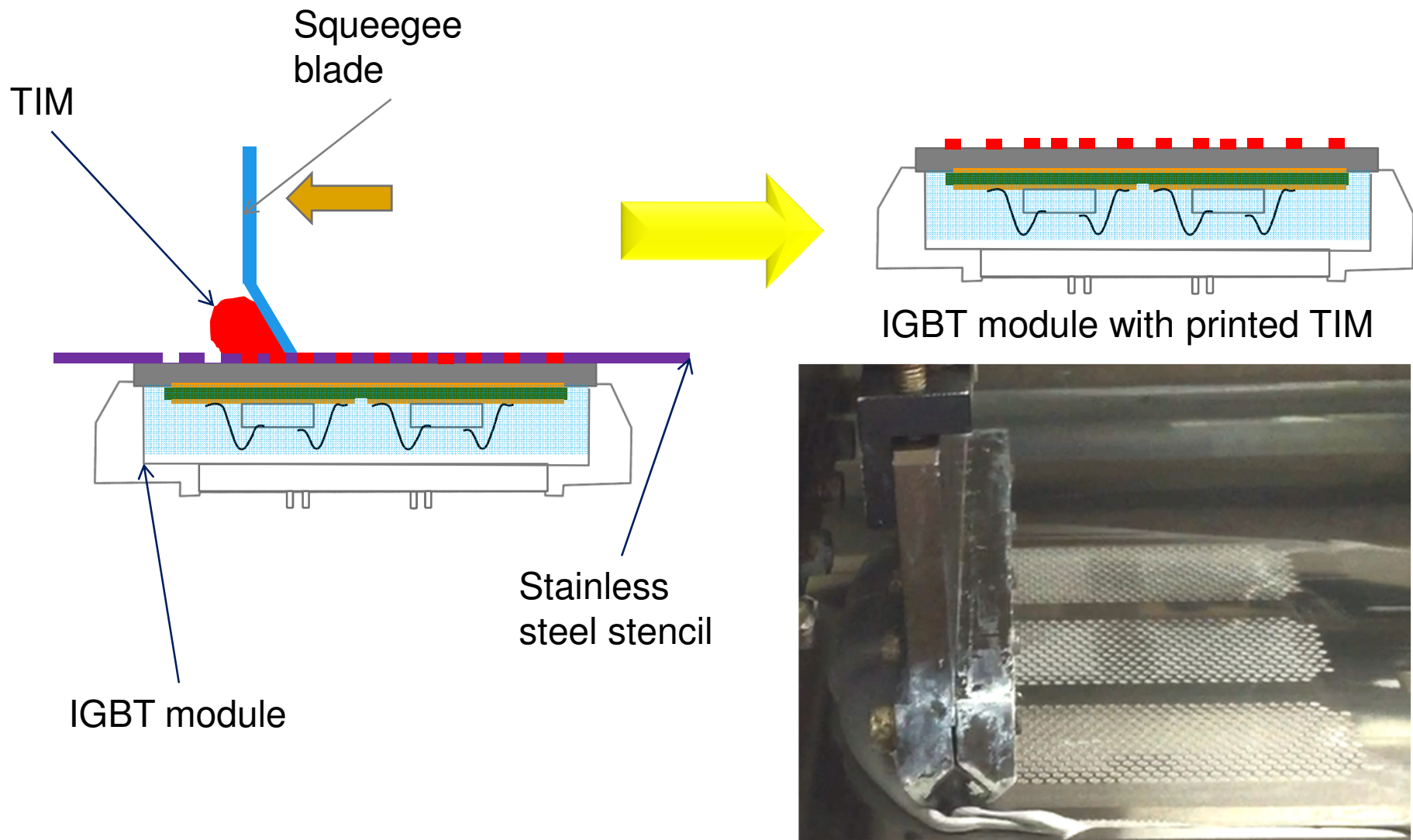


IGBT fixture

Process Parameter Setting :

- Stencil down speed:
20 mm/s
- Blade Pressure:
100 Psi (Air pressure)
- Sweep speed:
20mm/s
- Stencil raise speed:
10mm/s

Preparation – Screen Printing Mechanism



Preparation – Squeegee Blade Selection



Rubber Type

Suggest for small aperture opening



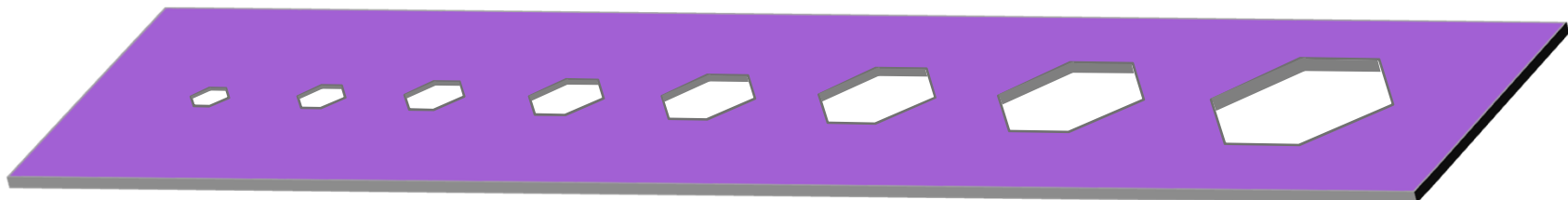
Stainless Steel

Suggest for big aperture opening

Soft rubber

Hard rubber

Stainless Steel



Small

Aperture Opening of Stencil

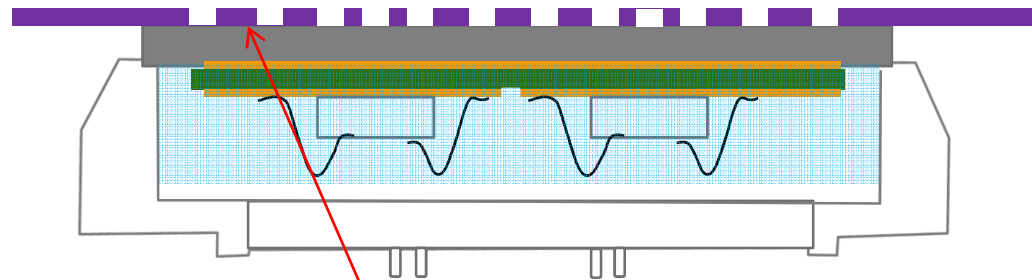
Big

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Different Type Stencil for Different Aperture Design

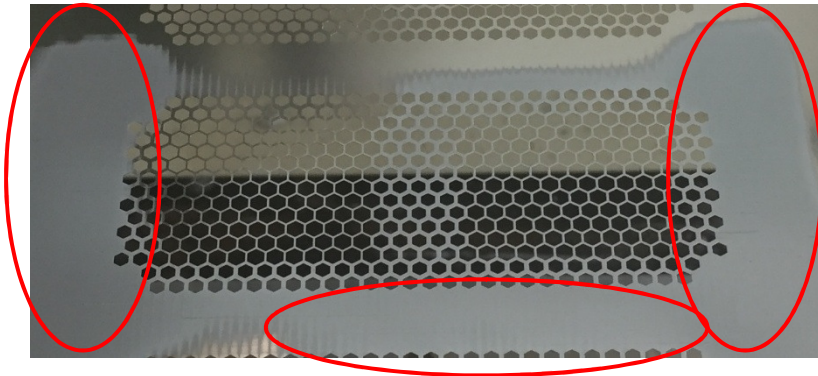
Printing Process – Place the Module

- #1. Put the IGBT module on the work table
- #2. Place the stencil over the module and align the position
- #3. Compressing the stencil with high pressure

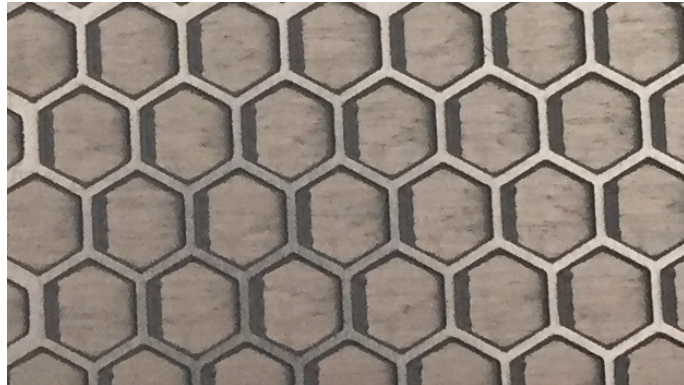


Make sure there is **no gap** between stencil and the substrate of module

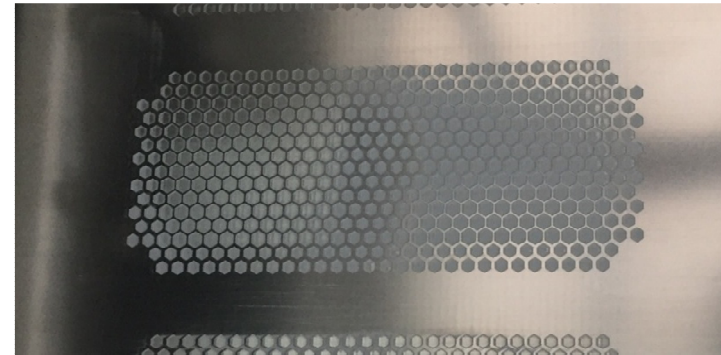
Printing Process – Pressure Impact



Too low blade pressure leads to thin contamination layer on the stencil



For rubber blade, too high blade pressure leads to no TIM be printed on the substrate



High blade pressure will eliminate the thin contamination layer



Suitable blade pressure will make sure the TIM is printed on the substrate

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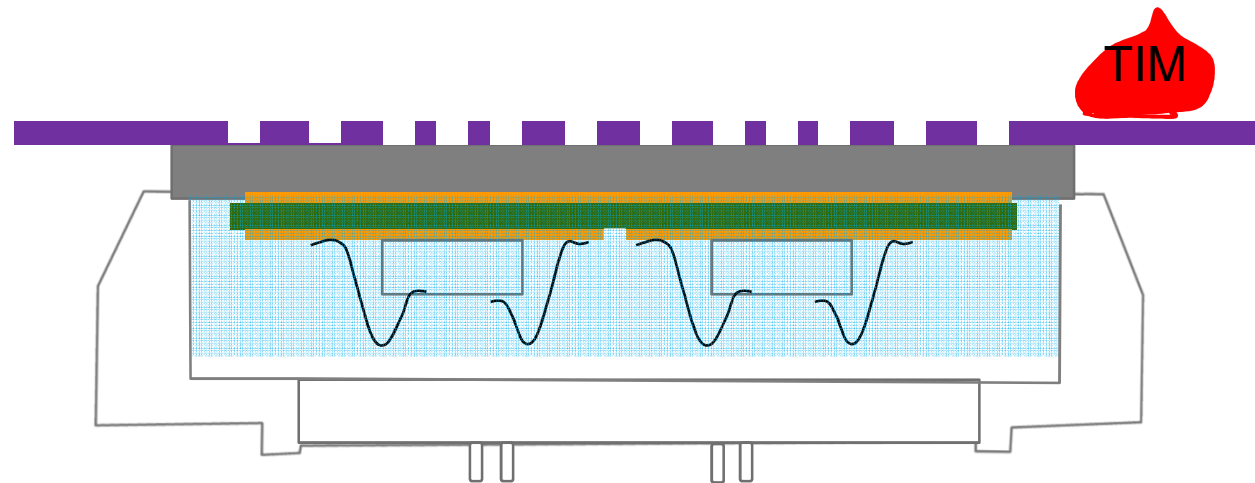
Proper Pressure is Important for Printing Quality

Printing Process – Place the TIM Material

#4. Stirring the TIM in container to make sure material is well mixed

#5. Take out certain amount material from the container : volume depends on the printing module size and quantity

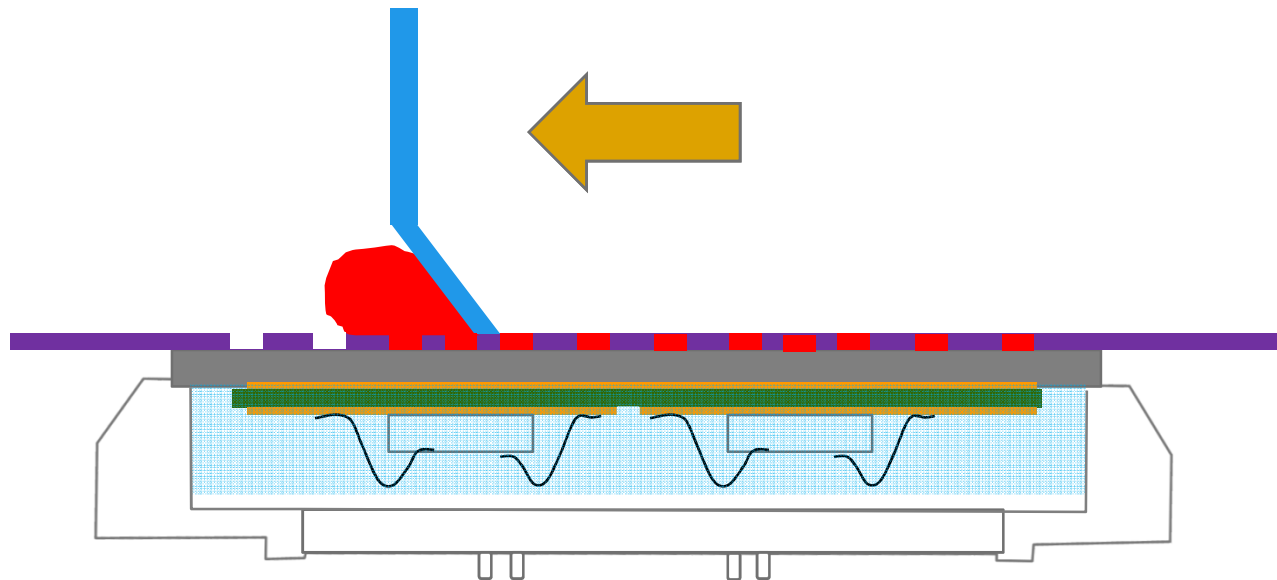
#6. Place the material on one side of the stencil and ready for print



Suitable volume and reloaded frequency of TIM paste will provide better and more continuous printing

Printing Process – Print

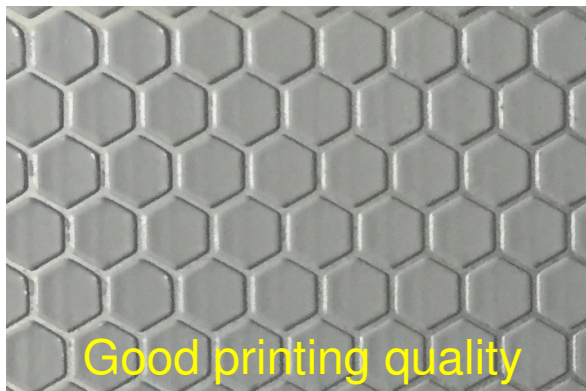
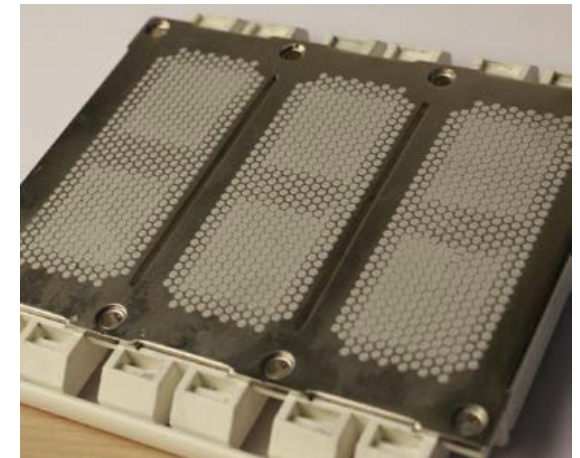
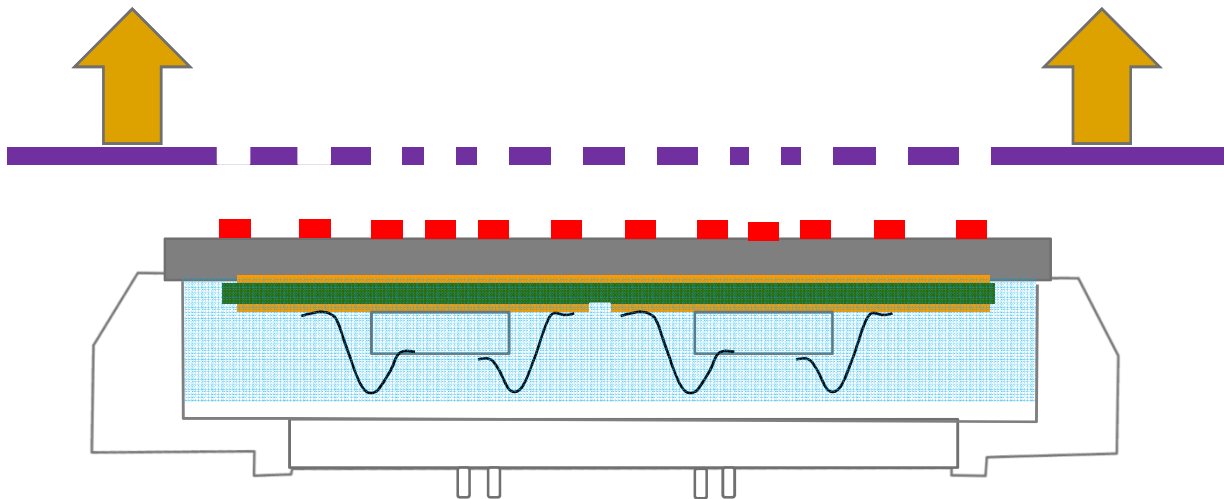
#7. Start auto printing process with proper printing speed setting



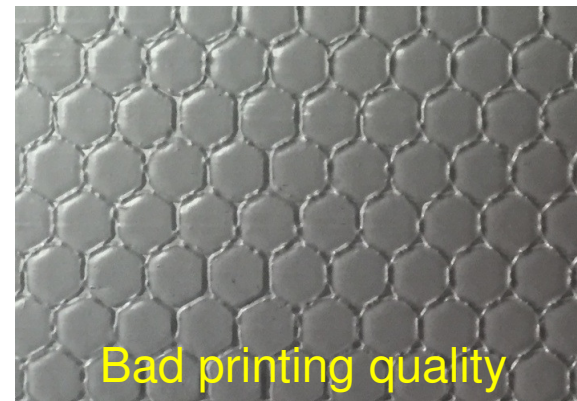
Blade pressure	Material Viscosity	Aperture Opening	Print Speed
High	High	Small	Slow
Low	Low	Big	Fast

Printing Process – Finish Printing

- #7. Raise the stencil slowly after printing
- #8. Take out the printed IGBT module
- #9. Re-start from step#1 and place a new module



Good printing quality



Bad printing quality



Solvent Drying Process

Solvent Drying Time

Material\Drying Temperature	RT (23°C)	100°C	Remark
PCM45F-SP	3hrs	3.5mins	Fast Drying Type
PTM5000-SP	2.5hrs	2.5mins	
PTM6000-SP	2.5hrs	2.5mins	
PTM7000-SP	2.5hrs	2.5mins	
PCM45F-SPM	>48hrs	8mins	Extend Drying Type
PTM5000-SPM	48hrs	7mins	
PTM6000-SPM	48hrs	7mins	
PTM7000-SPM	48hrs	7mins	
PTM6000HV-SP	48hrs	8mins	

Solvent Drying Test is conducted under following condition :

- Printing thickness 0.1mm
- Drying with different temperature condition
- Measure solvent weight loss according to solvent ratio in formulation
- Two different solvent solution can be selected with different customer process condition

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Alternative Solvent Solution for Different Customer Needs