

BETTER BY DESIGN

The greatest results always begin with a good design. In the world of test and burn-in, the variations are endless. That's why this session features a broad assortment of design topics and perspectives. Beyond socket design, we'll learn about designing the right handler for the job. Next is a birds-eye view of a socket's creation from design concept to final assembly, followed by a specific look at designs and applications for package-on-package (PoP) device testing.



This Paper

A Novel Nested Doll Concept in Universal Kit for Test Handler

Yee Wei Tiang—Intel (Malaysia)

Anatomy of a Socket

Paul F. Ruo—Aries Electronics, Inc.

Special Designs and Applications for PoP Device Testing

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—Interconnect Devices, Inc.

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A Novel Nested Doll Concept in Universal Kit for Test Handler

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2013 BiTS Workshop
March 3 - 6, 2013



Universal Kit For Test Handler Agenda

- Background
- Understand the RFS handler kit & its challenges
- The Solution
 - Theory of the invention
 - Application
- Universal kits for others handler
- Conclusion

Background

What is the challenge today in Test operation in semiconductor industry?

- Continuous to improve productivity
- Drive cost savings in Test Operation
- Increase of product mix and lower volume
- Test Operation flexibility and machine utilization

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Conventional way of test handler kits

- Cater only single package form factors
- Average 6 hours per kit conversion
- Average 8 conversions per day concurrently across Test area depending on product mix
- Support 3 different types of test handlers

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Understand the RFS handler kit & its challenges

Challenge #1 – Kit conversion checklist



- 40 boats
- 2 cone chucks
- 2 cone indexer
- 2 picker
- place assemblies per product

No.	Task to be completed	Time (mins)
1	Off the temperature and cool down machine	30
2	Uninstall existing kit (40 boats, 2 cone chucks, 2 cone indexer and 2 pickers) and place assembly	67
3	Install new handler kit	52
4	Align the handler with 5 trays of mechanical units	90
	Cycle run the handler with 5 trays of mechanical units at ambient temperature	33
	Heat up the handler to 120°C	49
	Cycle run the handler with 5 trays of mechanical units at 120°C	39
	Total estimated time required per conversion	360

- Tray matrix
- Package size
- Boat pocket design
- Fully utilize existing handler kits in HMLV
- Lowering design cost

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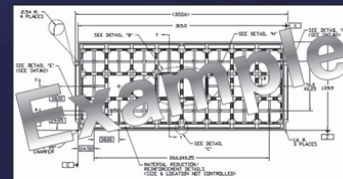
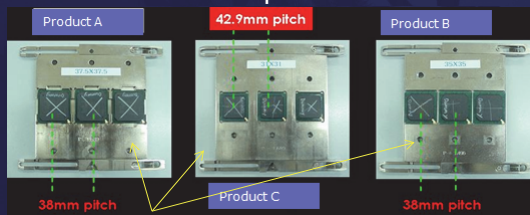
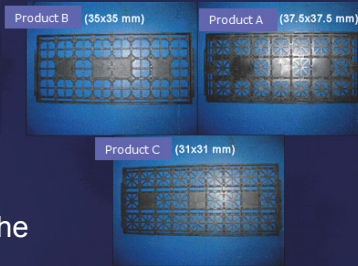
Challenge #2 – Product selection & its key parameter

Identify 3 products with same tray matrices

Parameter\Products	Product A	Product B	Product C
Form factor (mm)	37.5 x 37.5	35 x 35	31 x 31
Tray matrix	3 x 8	3 x 8	3 x 8
Tray pitch (mm)	38	38	42.9

All the 3 products are using different handler kits and in order to support testing on the same equipment, kit conversion is required.

Condition is to allow units seated inside the boats with different pitches.



3 different type of Boat for conversion

All the 3 products are having same tray matrices with different solid pocket

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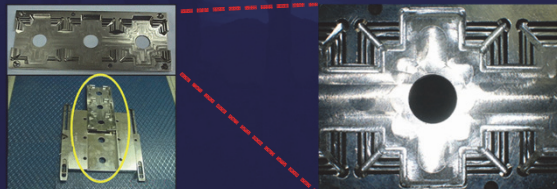
Feasibility Study & Ideas

By grouping the products with same tray pitch value & package type;

- Segmentation (insertion type)

Parameter\Products	A	B	C
Form factor (mm)	37.5 x 37.5	35 x 35	31 x 31
Tray matrix	3 x 8	3 x 8	3 x 8
Tray pitch (mm)	38	38	42.9

- Nested Doll (multi layered pockets)



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The Solution

1) The Theory of Inventive Problem Solving (TRIZ)

- Segmentation (Enables objects to be divided into independent parts)
- Nested Doll (Enables multiple objects to be placed inside others)

2) Pick and Place assembly / nest design

- It carries plug and play concept to handle different tray pitch and package dimension

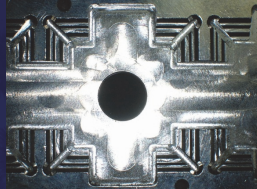
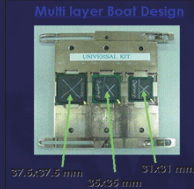
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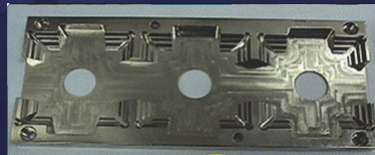
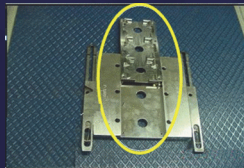
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Demonstration

- Insert type and multi layer boat design
 - Redesign multi layered pocket. (smallest package seated at lowest layer, largest package seated at highest layer)



- Reused and segmented the universal boat.



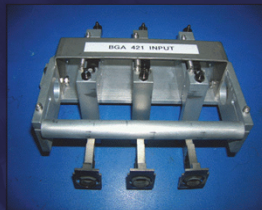
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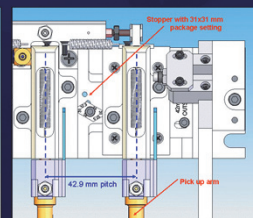
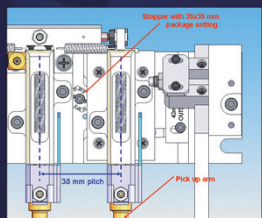
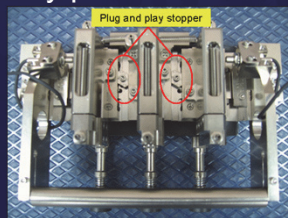
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- Plug and play input pick and place assembly

- Conventional pick and place assembly with fixed pitch value per tray pitch.



- New design pick and place with flexible pitch value per tray pitch.

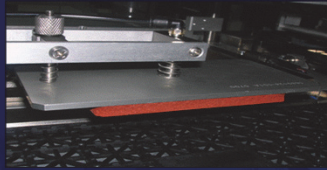


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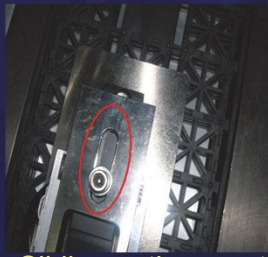
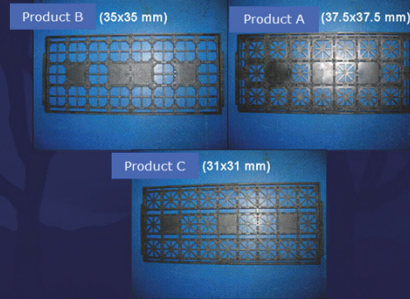
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- Sliding type design for auto tray transfer (ATT)
- Redesign ATT into adjustable mode.



Conventional ATT



Sliding options on the universal ATT

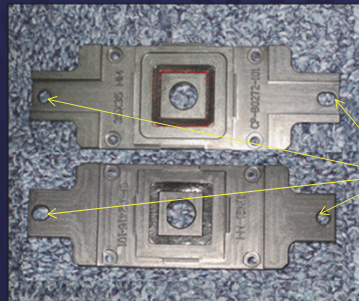
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- Plug and Play nest design

- Universal static dissipative Nest or work press fit is being used on the cone chuck to hold the units during test.
- Cone chuck guide hole located on both sides of the outer multi layer pocket will determine which package size should fit.
- Only swap the Nest without having to remove the cone chuck.



Cone chuck guide hole on Nest

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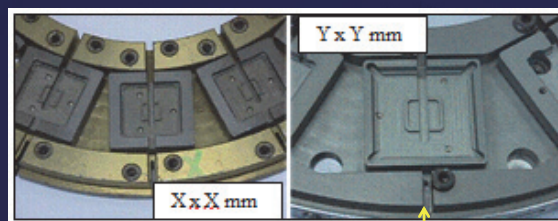
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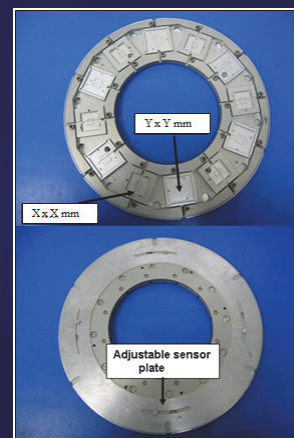
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Universal kits for others handler



Pocket sensor slot

- Front and bottom view of universal tunable handler.
- This tunable universal kits is able to support 2 package type.

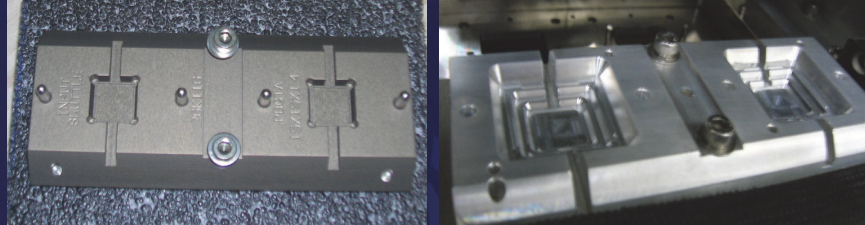


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Universal kits for others handler



Conventional shuttle vs Universal shuttle for another type of handler

Guess how many package able to support for this universal shuttle?

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Conclusion

Universal kit is a good example of how engineering design changes can dramatically improve manufacturing productivity:

- Conversion time
- Reuse conventional parts
- Cost saving
- Low maintenance
- Flexibility

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