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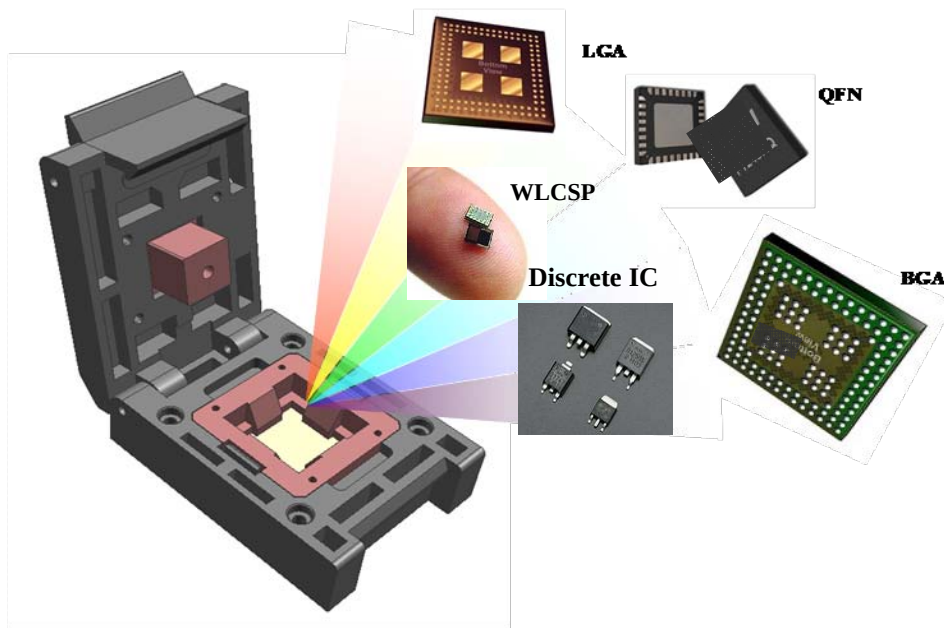


- Description of the **3M™** FAST Socket
- Market/Application Space that FAST Socket Addresses
- The **3M** FAST Product Line
- Ability to Accommodate Different Ball Patterns and Pitches
- High Speed Testing Issues
- Cartridges to Aid Power and Ground Distribution
- Embedded Capacitance Addressing Power Supply Noise Issues
- Probe Pins
- Flexibility and Economy Improvement Provided by FAST Sockets
- Conclusion





Flexible Array Socket for Testing

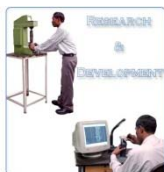


- Can accommodate different:
 - Package thicknesses
 - Package sizes
 - Ball pitches
 - Ball patterns
 - Non-standard or differing ball pitches
 - Probe pins
- Can provide:
 - Pitch conversions
 - Power and/or ground distribution
 - Power noise decoupling
 - SI improvement
 - Flexibility
- Modular cartridge construction
 - Can accept multiple different cartridge designs

FAST Socket Coverage

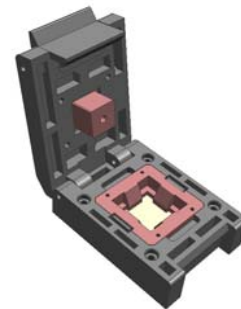


R&D center

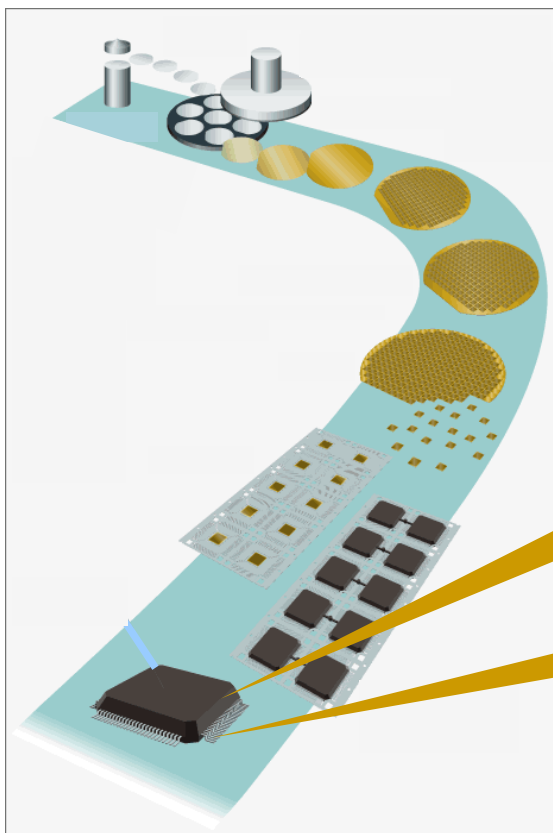


R&D

Function test
Evaluation (HAST,
HTOL, ESD etc.)



Factory



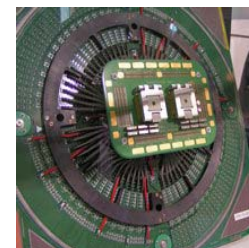
Burn-in

Production
Burn-in



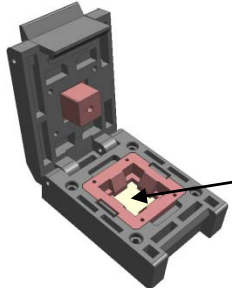
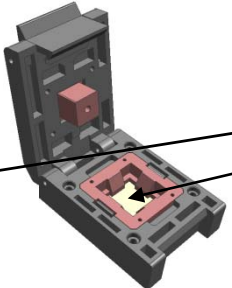
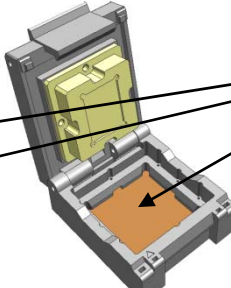
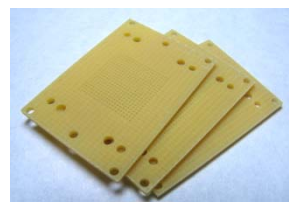
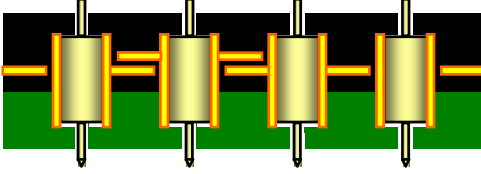
Final test

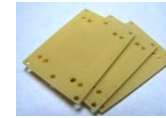
Function test for
production



Reference source:
Nitto Denko

FAST Product Line

	Type-1	Type-2	Type-3
Bodies			
Pins	 3M original stamped probe *Low Cost	 High performance spring probe	
Cartridges	 Free and variable pitch cartridges * Made by PCB process  3M C-Ply to include Embedded Capacitance		



CARTRIDGE

FAST Lidded Socket Line-up

	Type-0	Type-1	Type-2	Type-3	Type-4
Max. Package Size	8 mm sq.	13 mm sq.	23 mm sq.	35 mm sq.	60 mm sq.
Socket Size*1	22 x 22	30 x 42	37 x 42	48.3 x 57.2	91 x 91
Terminal Pitch	0.4 – 1.0 mm	0.4 – 1.0 mm	0.4 – 1.0 mm	0.4 – 1.0 mm	0.4 – 1.0 mm
Lid Feature	Clamshell type	Clamshell type	Clamshell type	Clamshell type (Mechanical Lid)*2	Clamshell type (Mechanical Lid)*2

Features

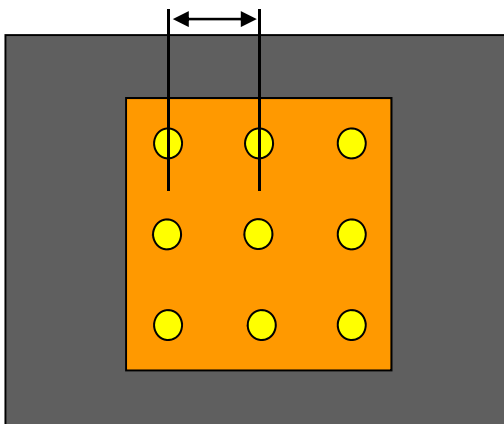
- Select standard probe pins or low cost pins
- Cover from 0.1 mm to 4.0 mm package thickness
- Cover both standard and variable pitch designs including staggered patterns down to 0.4 mm pitch
- Compatible with compliant interposer
- Available high speed cartridges
- Probe pin Length: 1.8 mm – 5.7 mm
- Grounding: Yes
- Embedded Capacitance: Yes



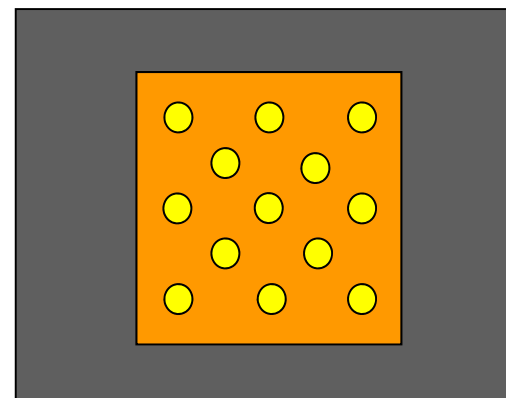
FAST Package Guide & Pin Layout

Non-standard pitch

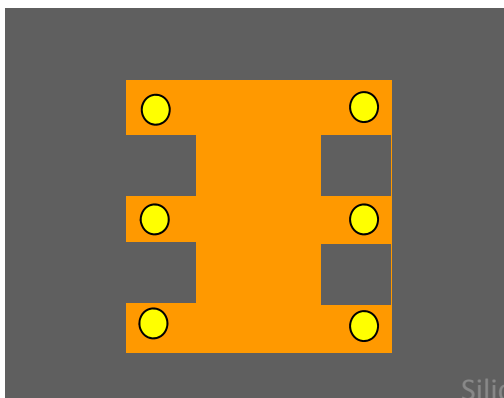
Example: 0.44 mm, 0.55 mm, 0.6 mm pitch



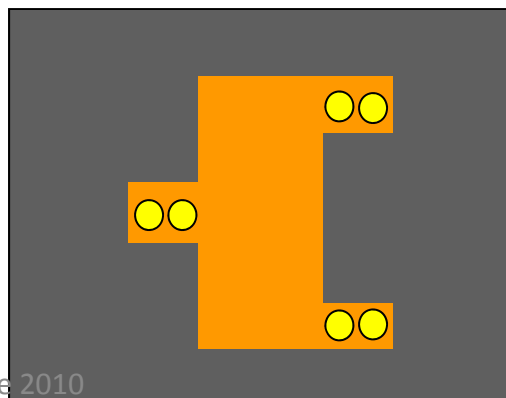
Interstitial



Lead Frame type



High Current / Kelvin contact





Issues for High Speed Testing



1. *Impedance mismatch*

- Multiple connection interfaces create impedance discontinuities resulting in reflections
- Short probe pins minimize length of impedance discontinuity
- In Development: Coaxial probe cartridge
 - Will provide match to system impedance and further minimize interface impedance discontinuities)

2. *Power supply instability*

- 3MTM Embedded Capacitance Material provides distributed decoupling with improved performance over discrete components

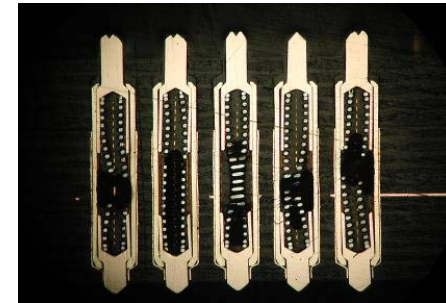
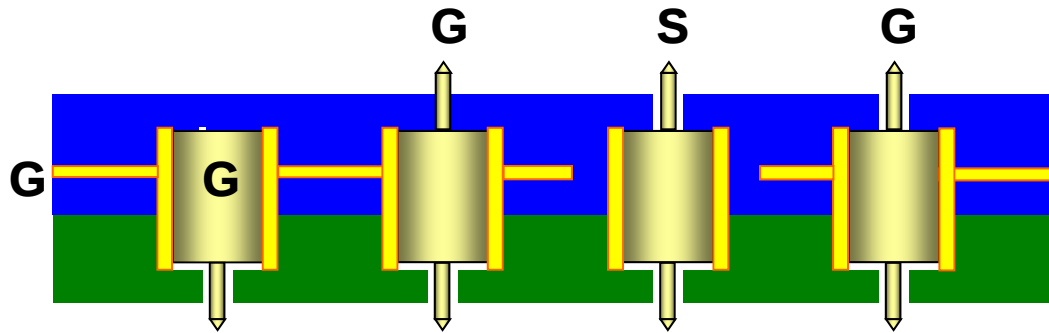
3. *Poor grounding*

- Ground layers in cartridges provide low impedance ground distribution

4. *Crosstalk*

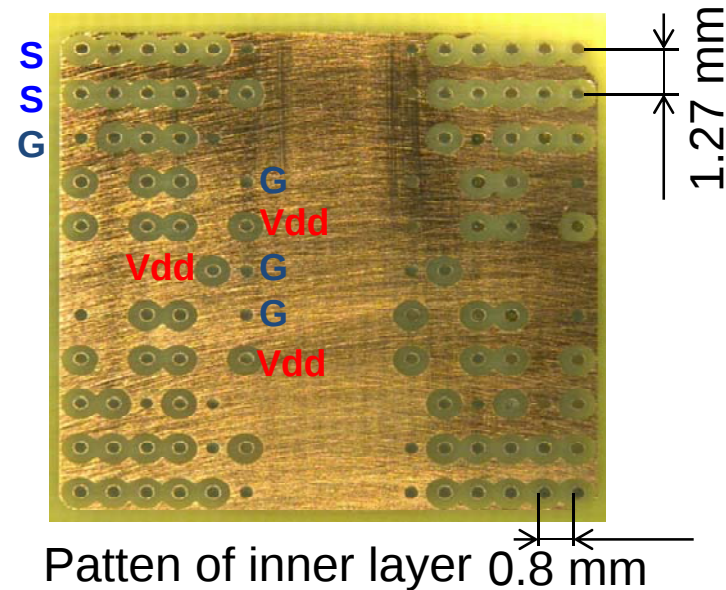
- Unshielded high speed signals experience crosstalk in tight pitch sockets
- In Development: Coaxial probe cartridge
 - Coaxial shielding will minimize coupling between neighboring probe pins

Cartridges to Aid Power and Ground Distribution

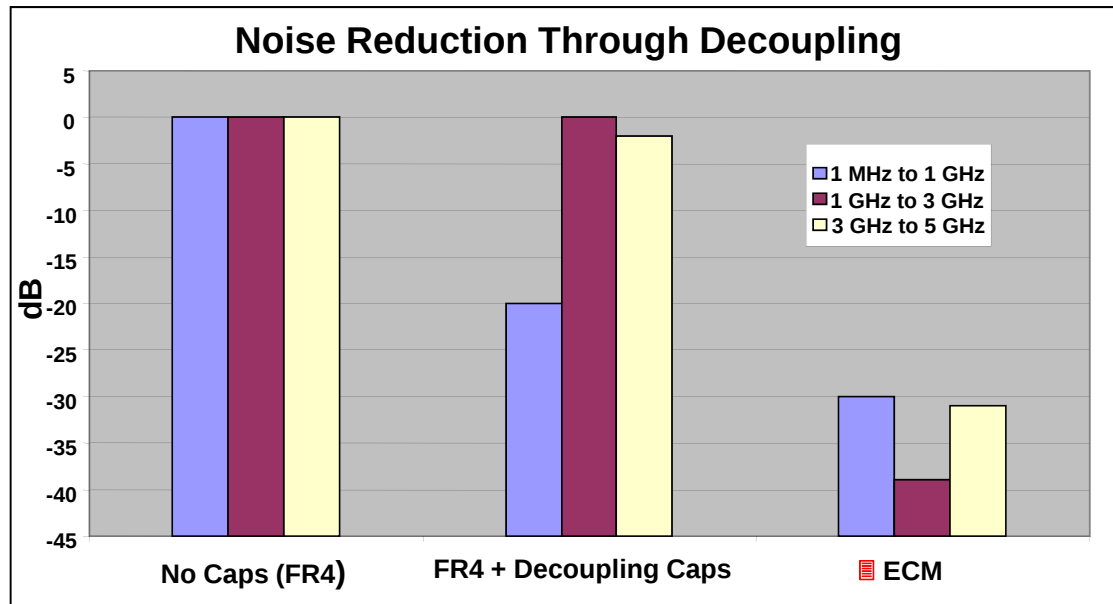


Cross section of probe pins

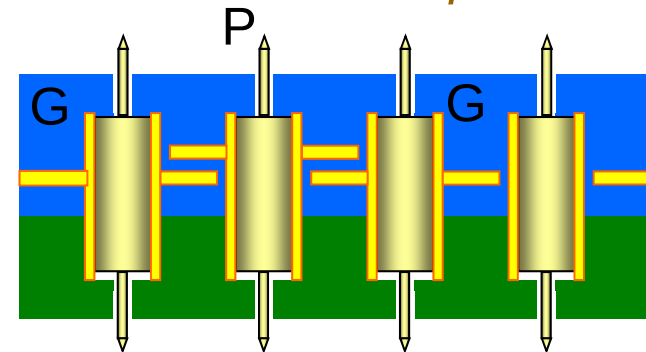
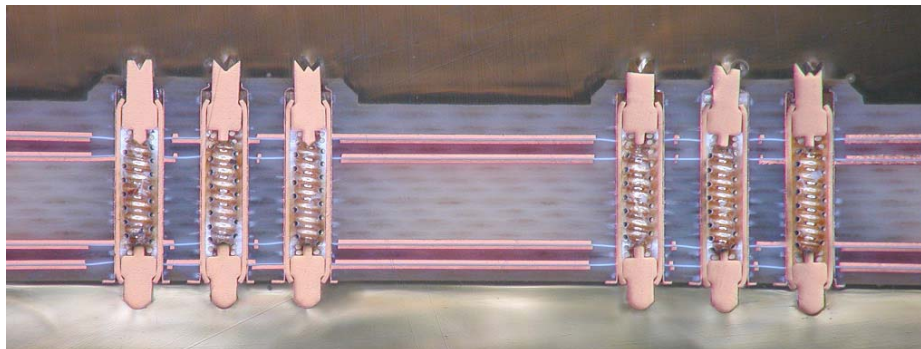
- Low impedance planes increase margin for operating devices because of decreased impedance for supply and return paths
- Minimum supply voltage can be reduced
- Margin of voltage and timing for memory devices will be enhanced resulting in improved SI



3M™ Embedded Capacitance Material (ECM) Addresses Power Supply Noise Issues



- ECM included in test cartridge provides:
 - *Integrated decoupling*
 - *Reduced power distribution impedance over discrete capacitors*



Cartridge sample cross section

Silicon Valley Test Conference 2010



™ Embedded Capacitance Material (ECM)

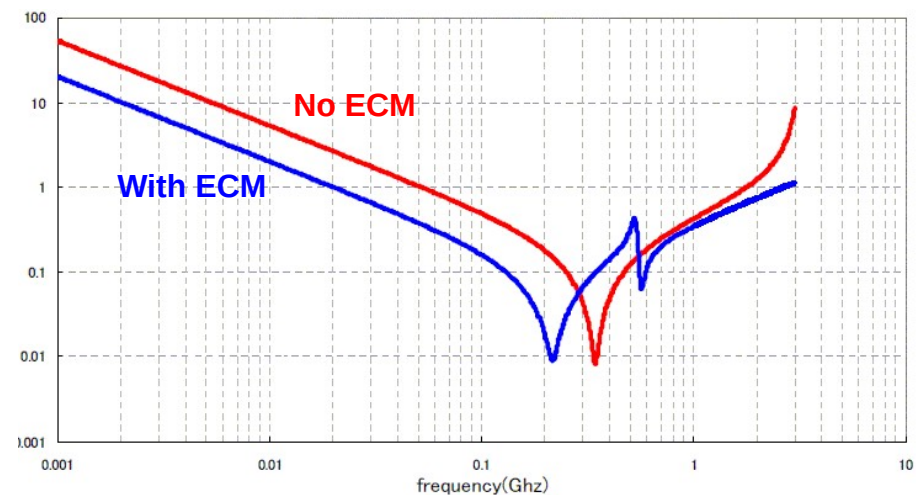


- Lowers impedance of power distribution system
- Dampens board resonances
- Reduces noise on power plane
- Reduces radiated emissions

Works more effectively at higher frequencies than decoupling caps

ECM Properties

Property	Value (Mass Pro)
Capacitance/area, nF/in ²	6.4
Dielectric constant	16
Dielectric thickness, μ m	14
Dielectric material	epoxy-filler
Dielectric strength, V/mil	3300
Breakdown voltage, V	>100
Dielectric loss @ 1 GHz	0.03
Freq., Volt., Temp.	meets X7R
Copper thickness, μ m	35
Flammability rating	94V-0



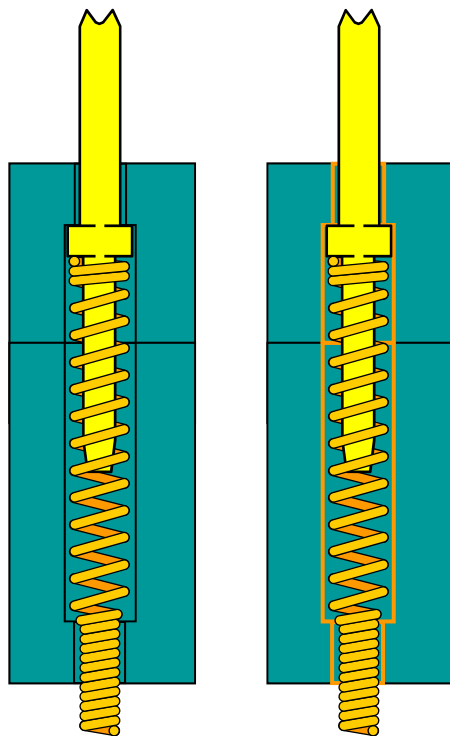
Source Japanese customer



TM FAST Probe Pin Options



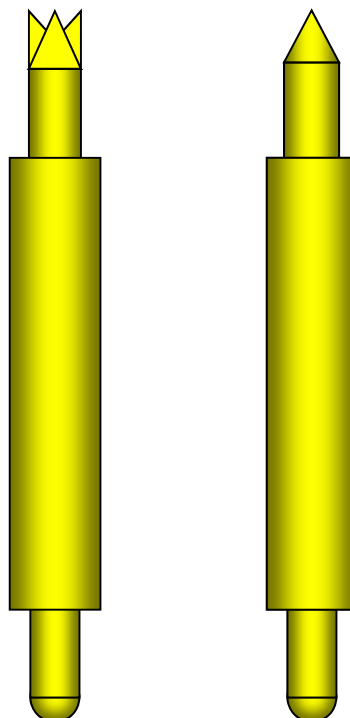
Economy probe



**Stamped
probe
+ Micro
spring**

**Stamped probe
+ Micro spring
+ Au plating
cartridge hole**

Standard probe



For BGA

For LGA/QFN

Short probe



For high speed

Thin probe



For fine pitch

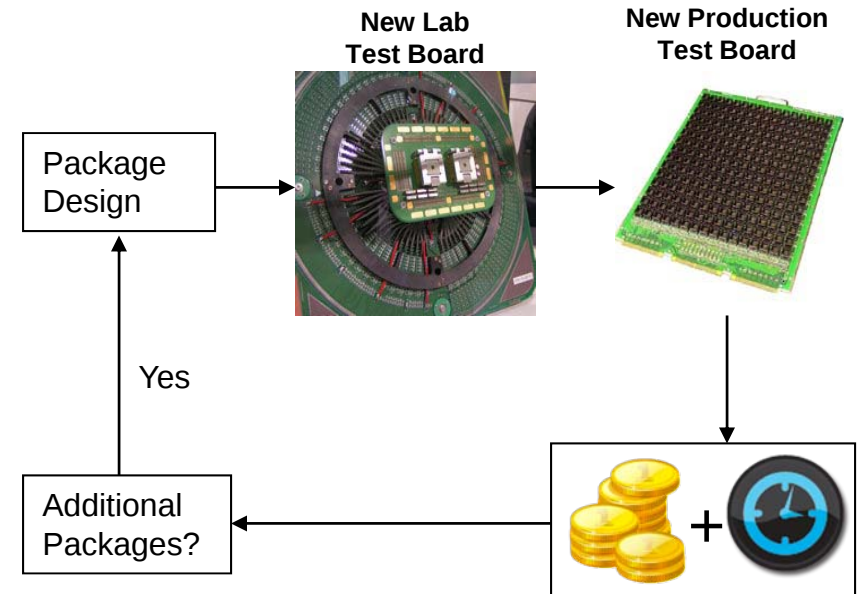




Traditional Testing Approach

Old Paradigm:

- Lab Testing
 - Test boards must be designed for every new package design AND unique singular test fixturing is developed for use only in lab environment
 - Time and expense for generating new test boards with each succeeding design are considerable
- Production Testing
 - Production testing requires test scheme to be re-considered a second time.
 - Full testing, as performed in the lab is typically not available in production

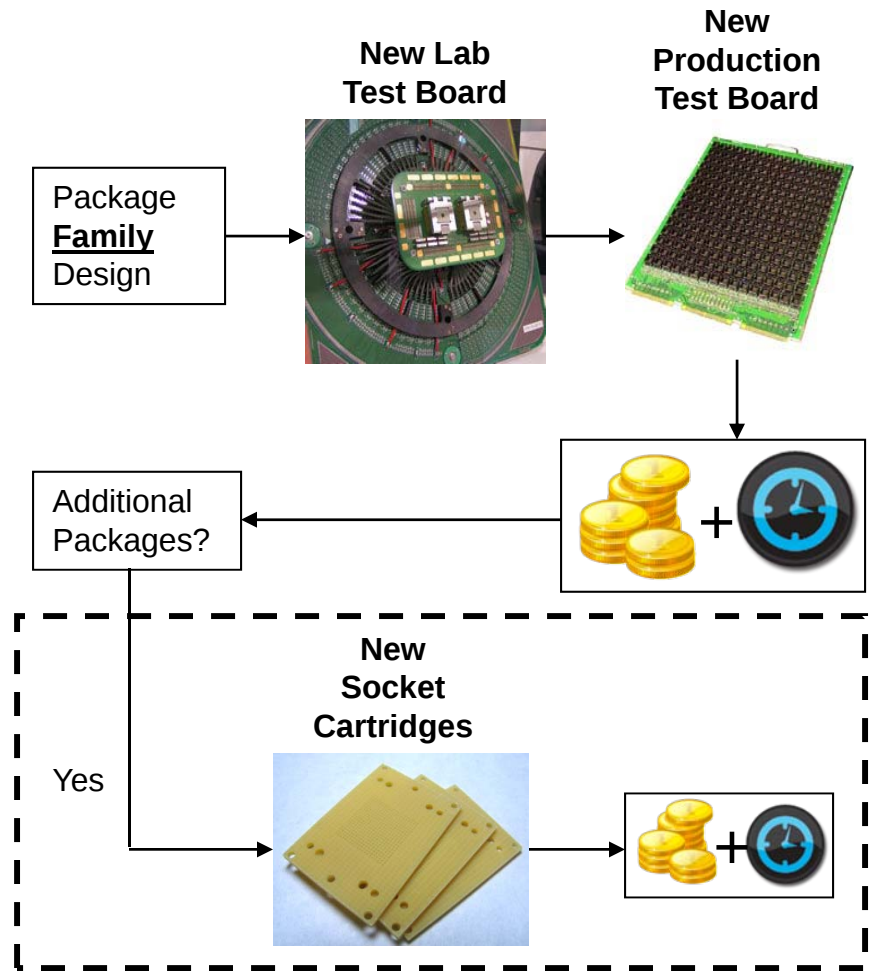


Large Penalty Incurred
for Each Package!

Flexibility and Economy Provided by FAST

New Paradigm:

- Lab Testing
 - Test board providing encompassing and generic functionality is designed once and utilized for Lab testing of a family of packages
 - New socket cartridges are fabricated to accommodate each package iteration within a family at roughly 1/10th the cost as compared to generating new test boards
- Production Testing
 - Production environment can leverage whatever subset of Lab testing and board design deemed appropriate
 - More accurate and reliable production evaluation is possible
 - Production test boards may be re-used repeatedly by leveraging new cartridges for new package designs



Small, Incremental Cost!

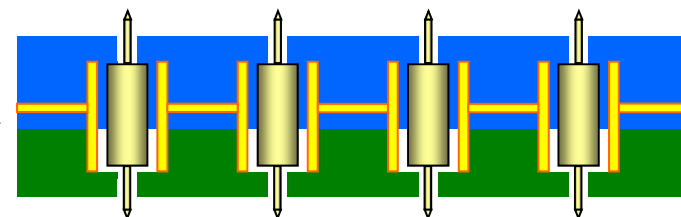
Conclusion

- The 3M FAST socket is a new modular test and burn-in socket that is designed to meet the cost and flexibility needs of 21st century array packages
- FAST can accommodate different:
 - Package thicknesses
 - Package sizes
 - Ball pitches
 - Ball patterns
 - Non-standard or differing ball pitches



Conclusion

- FAST is adaptable to many different needs including, but not limited to:
 - Pitch conversions
 - Power and/or ground distribution
 - Power noise decoupling
 - SI improvement
- FAST is upgradable minimizing socketing investments as well as providing flexibility that can help reduce time-to-market



Coming:
Coaxial
Cartridge

Further Information



If you would like further information on
™ test socket solutions please contact:

Global Contact: Akihiko Furuta

afuruta@mmm.com

81-3-3709-8399

US Contact: Brent Gossett

bgossett1@mmm.com

512-984-3520

www.3m.com/interconnects



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