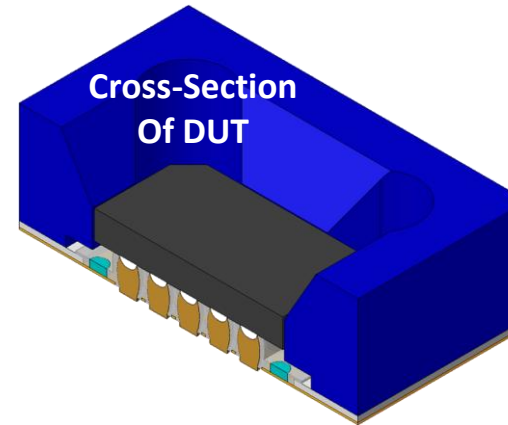
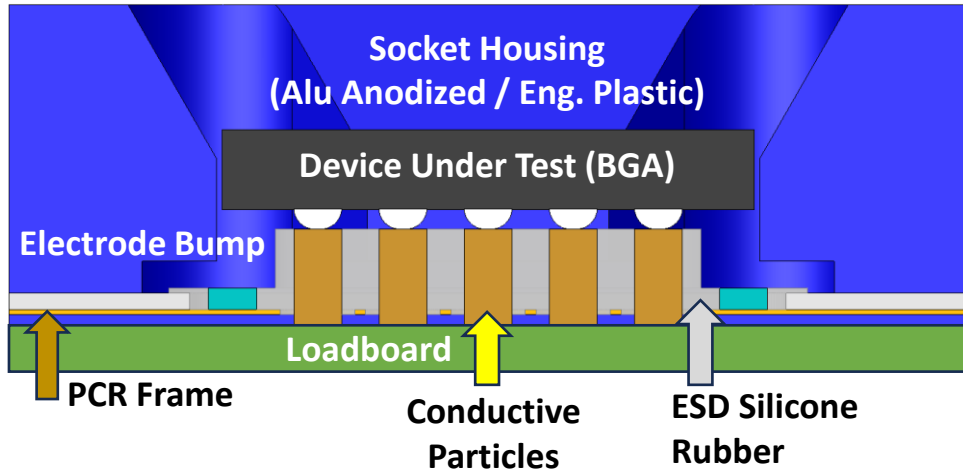


# **TFE (Total Solution Provider) For The Ultimate Solution On High-Speed & Cost-Effective Testing.**

# Understanding TFE/JMT's PCR Rubber Contact

**PCR:** Pressure Sensitive Anisotropic Conductive Rubber, suitable for a Broad Array of IC Test Applications

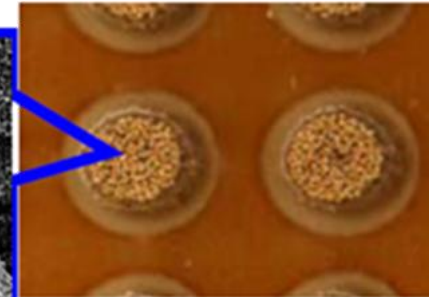
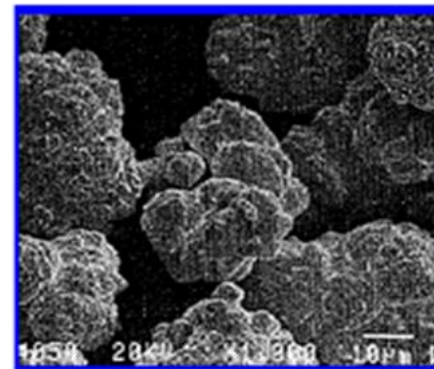
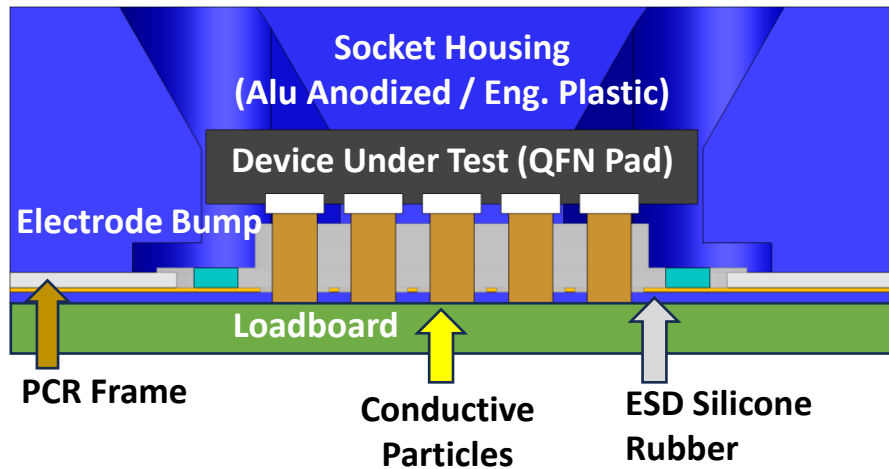
## How A PCR Test Socket Works



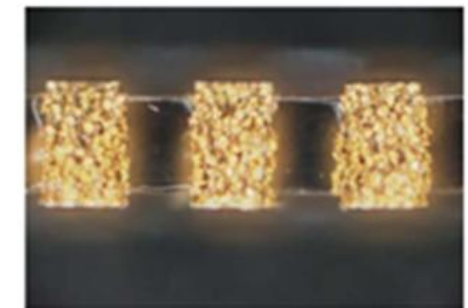
PCR contacts form a **snug, non-invasive connection** with BGA components during testing.

Their unique design allows them to **gently conform to the BGA's solder balls**, ensuring reliable electrical contact without damaging the delicate connections.

This approach **enhances the precision and safety** of BGA/QFN or any Leadless Packages testing.



Conductive Particles



PCR's Cross-Section



# The Fundamentals Of PCR Technology

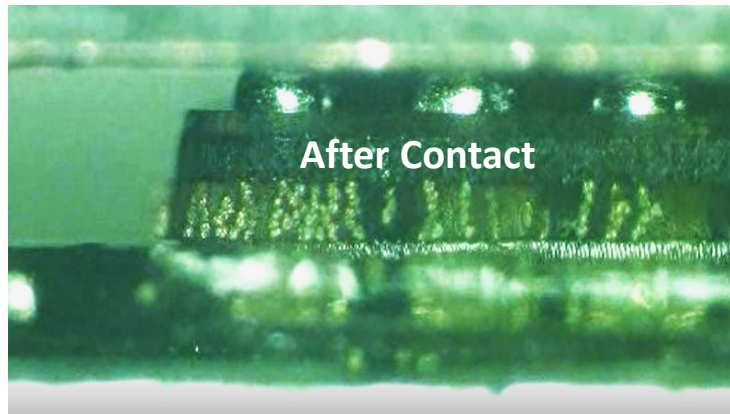
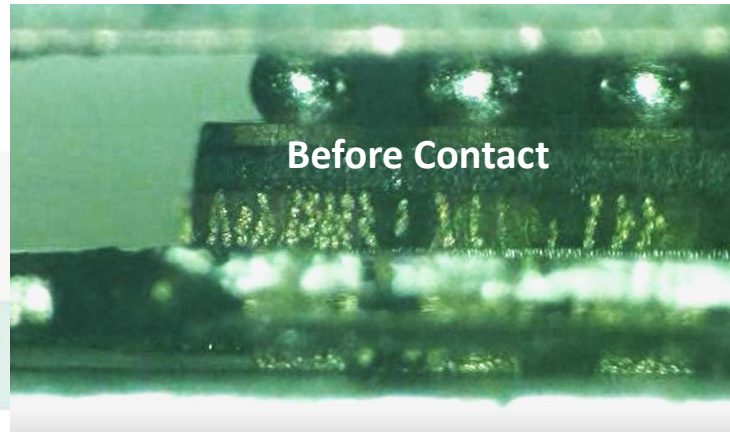
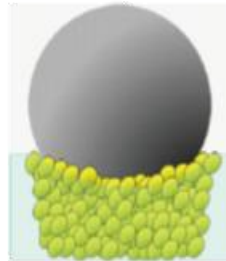
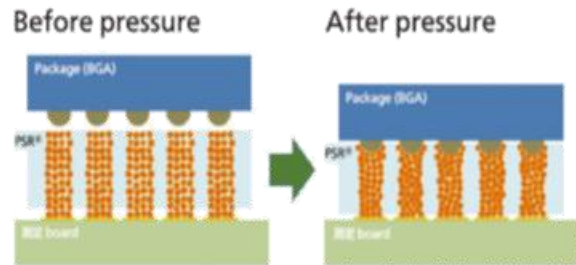
## Unique Selling Proposition (USP):

TFE/JMT's USP lies in its pioneering spirit and consistent innovation in elastomeric connectors.

It stands as the original inventor of the Rubber Socket, a breakthrough that has set industry standards for over three decades.

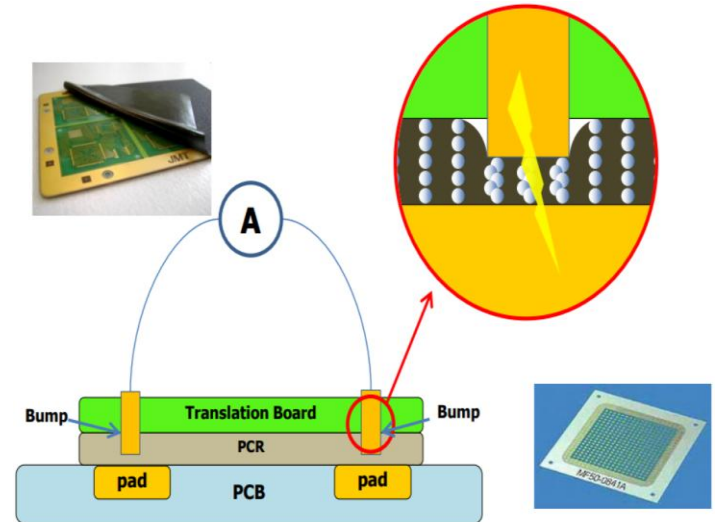
## Multiple Points Contact Structure

Image of Structure



PCR's Cross-Section During Contact

## Board-To-Board (BTB) Interposer/Interconnect



While many of our competitors primarily focus on the final test application, TFE's innovative engineering team does not limit itself to just one specific application; Instead, we excel in a diverse range of applications, with interconnect applications being just one of our many specialties.

# PCR's Electrical Specification:

Rigorous Quality Control processes ensure that TFE/JMT's elastomer contacts meet the highest industry standards,  
reinforcing its reputation for excellence.

## PCR Rubber Contact Characteristics By Pitch

Pitch	P0.30mm	P0.35mm	P0.40mm	P0.50mm	P0.65mm	P0.80mm
Total Thickness	0.45mm	0.45mm	0.55mm	0.75mm	0.8mm	0.9mm
Electrode Diameter	φ0.18mm	φ0.21mm	φ0.23mm	φ0.3mm	φ0.38mm	φ0.45mm
Insertion Loss	96 GHz (@ -1 dB)	>100 GHz (@ -1 dB)	91 GHz (@ -1 dB)	108 GHz (@ -1 dB)	62 GHz (@ -1 dB)	37 GHz (@ -1 dB)
Return Loss	44 GHz (@ -10 dB)	43 GHz (@ -10 dB)	99 GHz (@ -10 dB)	>110 GHz (@ -10 dB)	43 GHz (@ -10 dB)	23 GHz (@ -10 dB)
Inductance	0.09 nH (@ 1 GHz)	0.10 nH (@ 1 GHz)	0.12 nH (@ 1 GHz)	0.17 nH (@ 1 GHz)	0.16 nH (@ 1 GHz)	0.19 nH (@ 1 GHz)
Capacitance	0.06 pF (@ 1 GHz)	0.09 pF (@ 1 GHz)	0.08 pF (@ 1 GHz)	0.11 pF (@ 1 GHz)	0.20 pF (@ 1 GHz)	0.23 pF (@ 1 GHz)
**Contact Force (g/pin)	8	10	12	15	20	25
Contact Resistance	50 mOhm	50 mOhm	50 mOhm	50 mOhm	50 mOhm	30 mOhm
Max Current	2.5 A	2.5 A	3.0 A	3.5 A	5.0 A	7.0 A

**\*\* Insertion Loss Contact Force can be customized according to applications**

# Overcome Device Warpages with Advanced Technology

## Profile Elastomer Sockets Overview

- Overview:** Essential for semiconductor testing, especially for large device packages.
- Problem:** Warpage from thermal and mechanical stresses compromises contact reliability during testing.
- Objective:** Highlight why Profile PCR Elastomer sockets effectively address warpage challenges in large device packages.

## Advantages of Profile Elastomer Sockets

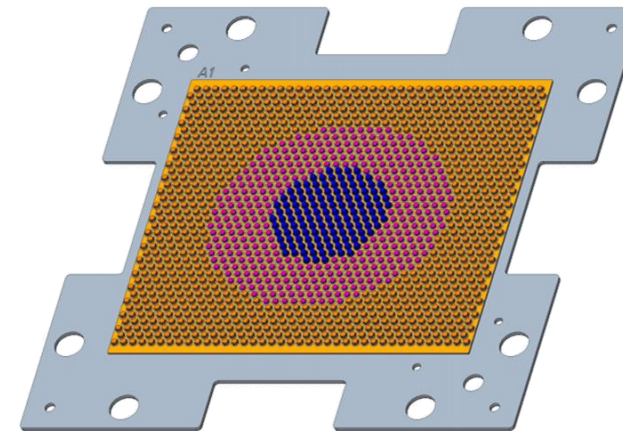
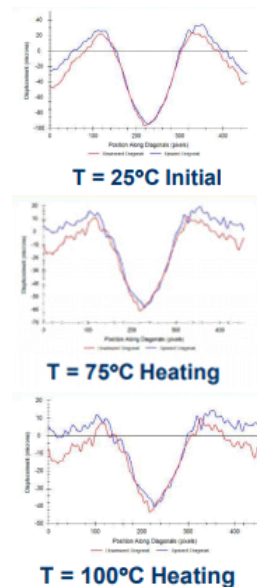
- High Compliance:** Adapts to irregularities and warpage in large devices without affecting electrical connections.
- Durability:** Resilient material ensures reliable performance under repeated stress.
- Optimized Force:** Minimal contact force reduces risk of damage during insertion and removal.

## Profile PCR's Precision Design

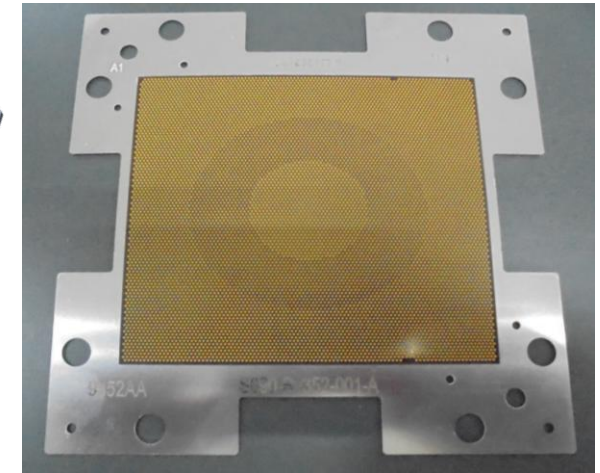
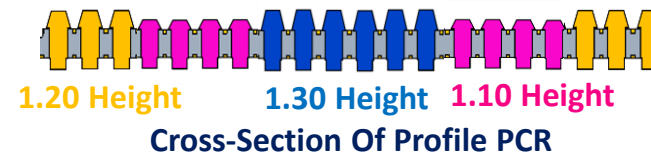
The zoomed-in view of TFE's Profile PCR reveals precision-engineered bump height variations, customized to match user-provided warpage simulations.

This profiling compensates for warpage, ensuring reliable contact and optimizing testing accuracy and device performance.

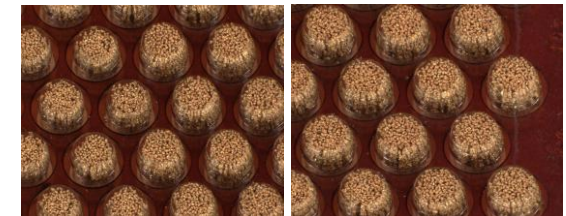
### Warpage Simulations Provided By Packaging



Design Of Profile PCR Contact



Physical Profile PCR Contact

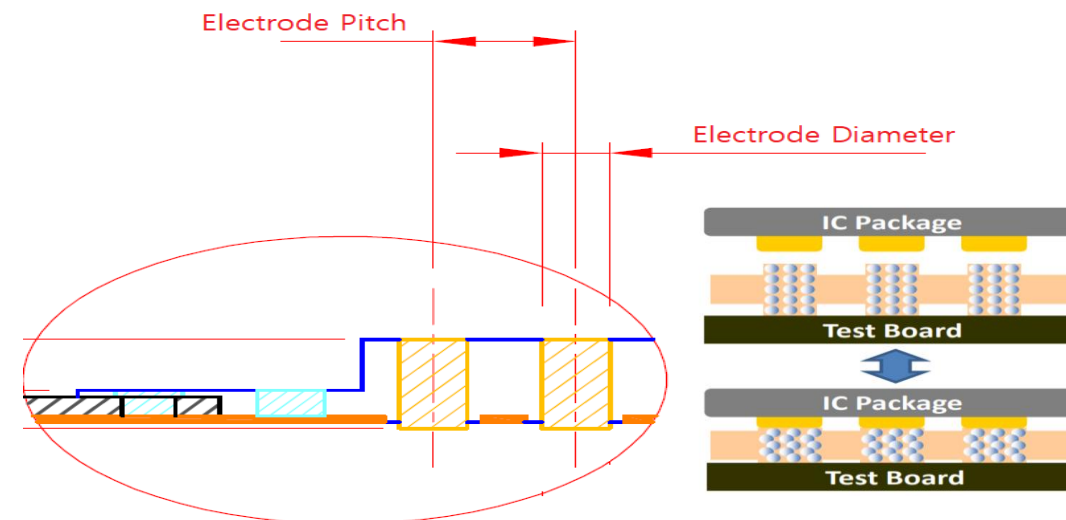
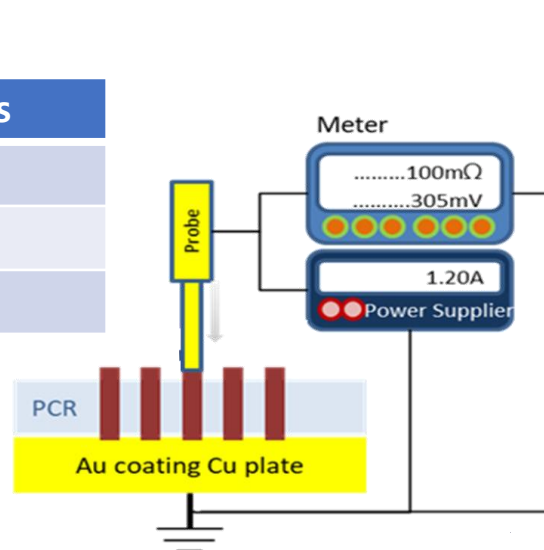


Profile PCR Contact Electrodes

# PCR Rubber Contact Current Rating Capacity

## For Power Applications

Item	Contents
Temp	RT
Starting Current	1A
Step <b>width</b>	100mA



Electrode Pitch (mm)	Electrode Diameter (μm)	Electrode Height (μ)	Max. Current Carrying Capacity (Till Burnt)	Recommended Current Rating
0.30mm	φ200	450t	2.5A	1.25A
0.40mm	φ230	550t	3A	1.5A
0.50mm	φ300	750t	3A	1.5A
0.65mm	φ380	800t	5A	2.5A
0.80mm	φ450	900t	7A	3.5A
1.00mm	φ500	900t	8A	4A



# Advantages Of PCR:

While competitors offer similar products, JMT differentiates itself through its legacy, technological advancements, and product quality

## Comparison PCR Rubber VS Spring Pin

	PCR <sup>®</sup>	Spring-pin	Co-Axial
Ball / PCB pad Damage	No	Yes	Yes
Test Frequency S21@-1dB	Up to 91Ghz (@ 0.4mm)	10GHz or less	30GHz or more
Contact Pitch (mm)	0.27mm~1.27mm (ready for 0.2)	0.15 ~	0.8~1.27
Cleaning Frequency	Few	Often	Often
Lifespan (Insertions)	~ 150K	150 ~ 300K	Less 20K
Cost per Pin	Cost-Effective	High	Very High

## PCR<sup>®</sup> Strong Points

Ready

Under development

### Anti-Oxidation

Minimizes the tin migration from the IC with proprietary surface coating. Good for intermittent uses.

### High Current (A)

Constant 3A for 0.4mm pitch, 3.5A for 0.5mm pitch 5A for 0.65mm pitches for Automotive IC testing

### Temperature

Field Proven and suitable for Automotive IC testing of -55°C ~ 160°C

### High Speed

108GHz with 0.5p, 91Ghz with 0.4p @-1dB ready to be used. Waiting for customer call.

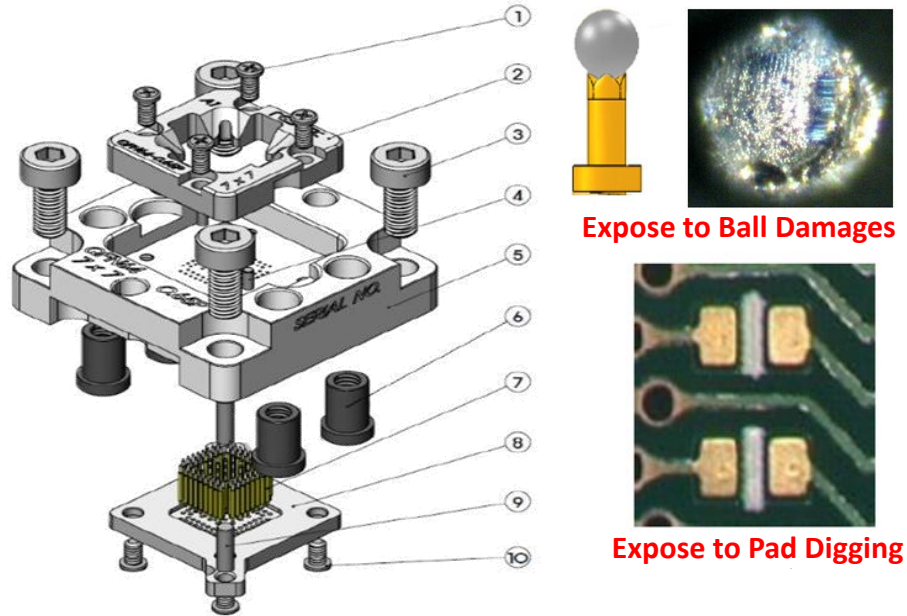
### Smaller pitch

0.25mm pitch with more than 1000 balls /PKG.

### GHz BI Socket

High-Speed Open-top Socket with PCR. (2023 Q2 for Evaluation)

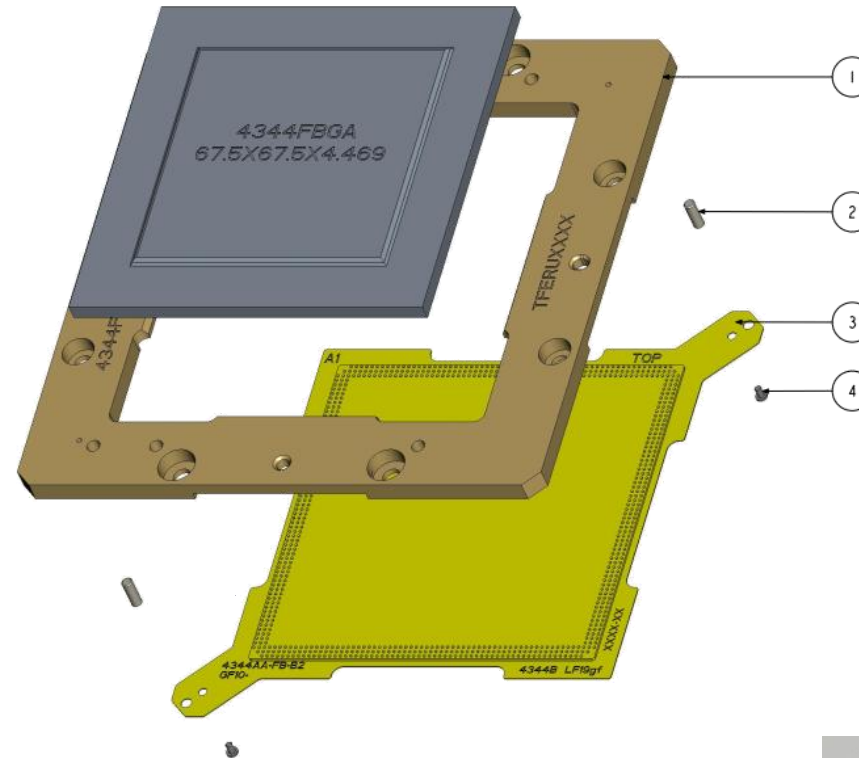
# Advantages of PCR Sockets Over Conventional Pogo Pin Sockets.



## Conventional Spring Pin Test Socket

### Disadvantages:

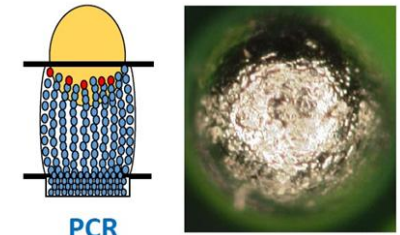
- Multiple Structure that requires all part's tolerance to be within
- **High Cost** due to multi-parts and pins
- Long change over time



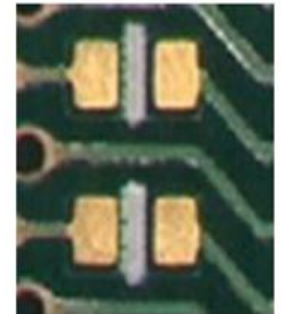
## TFE / JMT PCR Elastomar Test Socket

### Advantages:

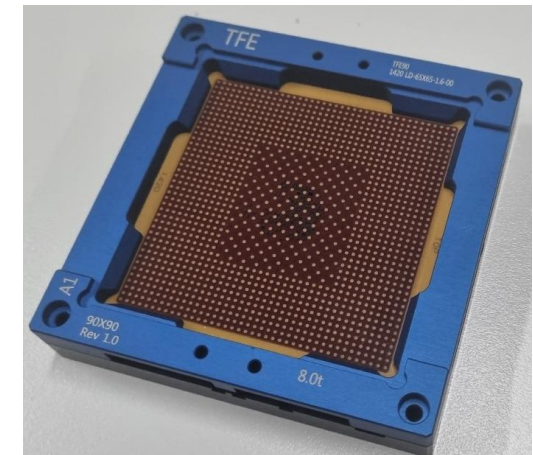
- Simple Structure socket housing
- Very **Cost Effective**
- Very fast change over time



PCR  
ZERO Ball Damages



ZERO Pad Digging





# PCR Open-Top Sockets Application.

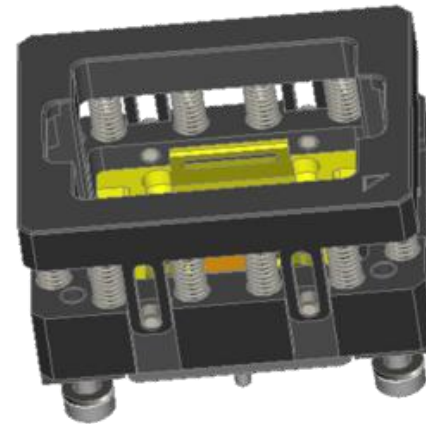
The PCR is offered in an **Open-Top design**, providing significant advantages over conventional open-top sockets.

## **Key benefits:**

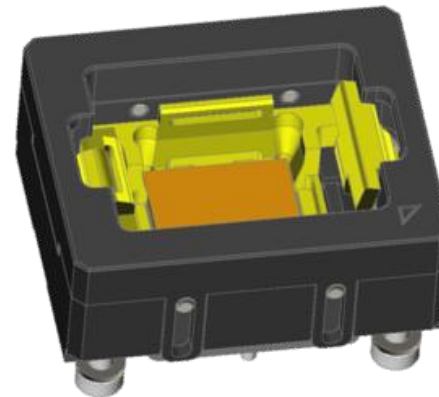
Includes the ability to reuse the open-top body by replacing only the PCR as a consumable spare, thereby reducing maintenance costs.

Additionally, this design eliminates the risk of PCB pad damage, as it avoids the soldering or desoldering required with receptacle-type open-top sockets.

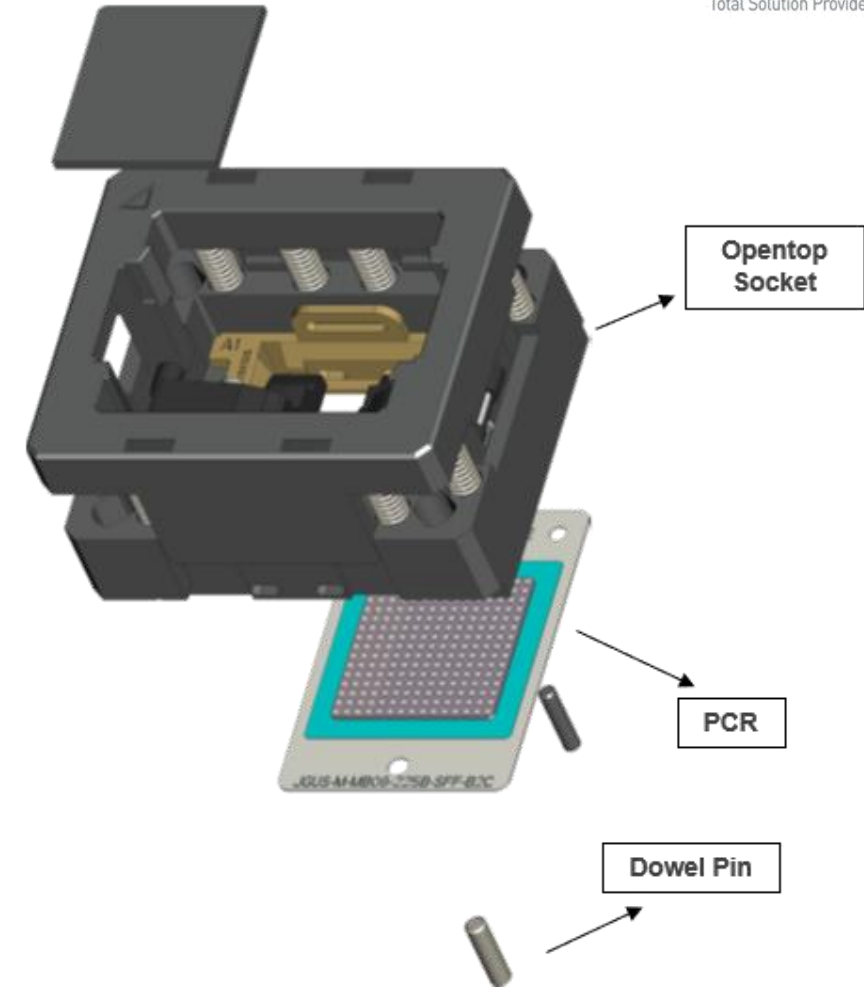
Furthermore, it ensures zero damage to the contact pads of QFN and LGA devices, or the solder balls in BGA arrays, maintaining device integrity and reliability throughout testing.



Free-State

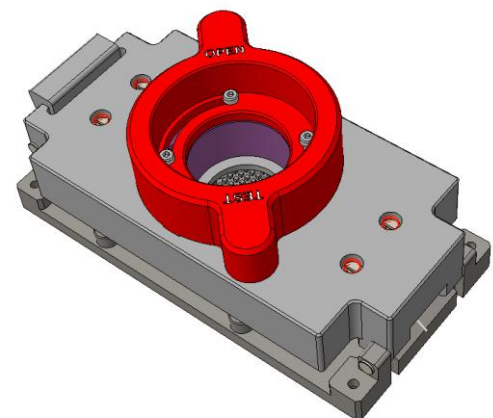


Test-State

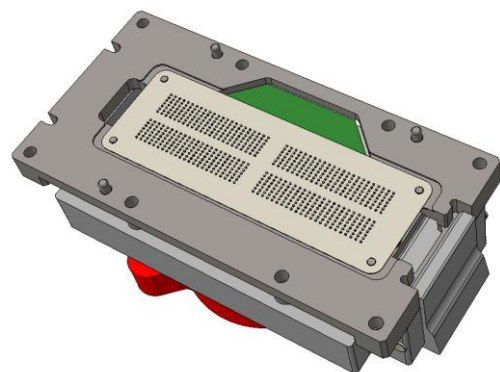


Exploded View

# LPCAMM PCR Test Socket For Manual Test / System Level Testing

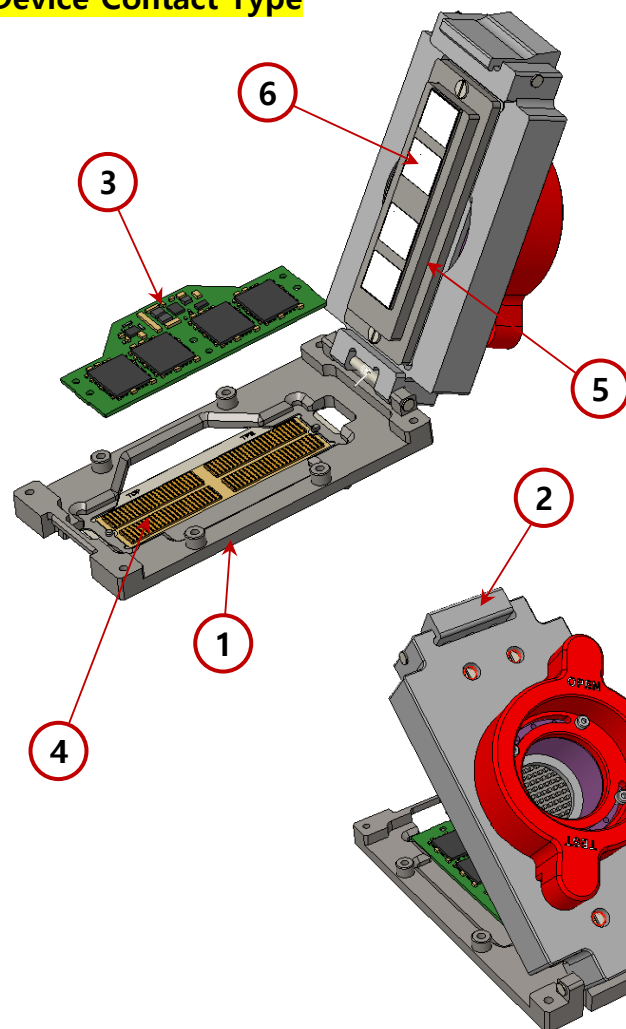


< Top View >

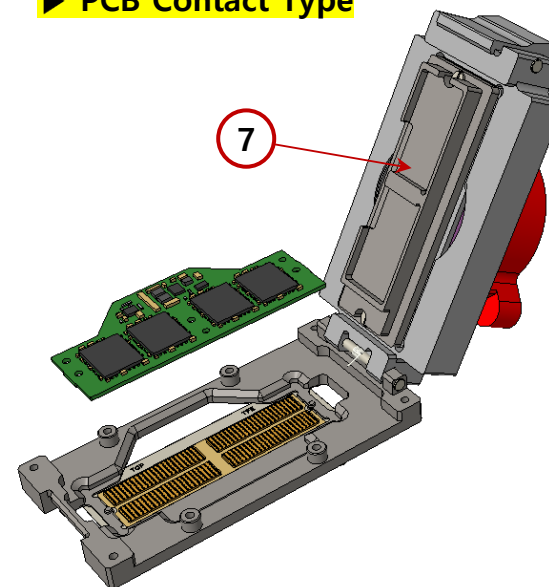


< Bottom View >

## ► Device Contact Type



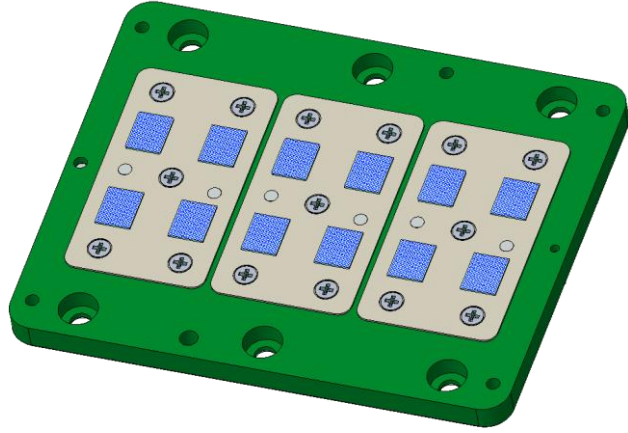
## ► PCB Contact Type



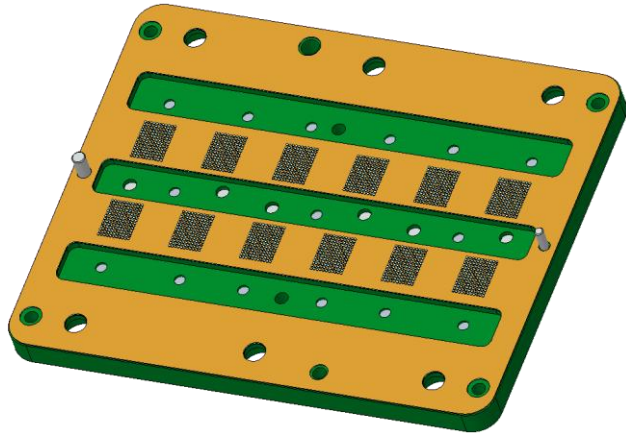
### BOM:

- ① Socket Guide
- ② Manual Socket Housing
- ③ Test Product
- ④ Rubber Socket
- ⑤ Device Contact Pusher (Heat Sink)
- ⑥ Silicone(0.3T) (Device Protection)
- ⑦ PCB Contact Pusher (Heat Sink)
- ⑧ Manual Knob

# TFE Rubber Contact: The Ideal Solution For WLBGA Applications



● Top View



● Bottom View



● Side View



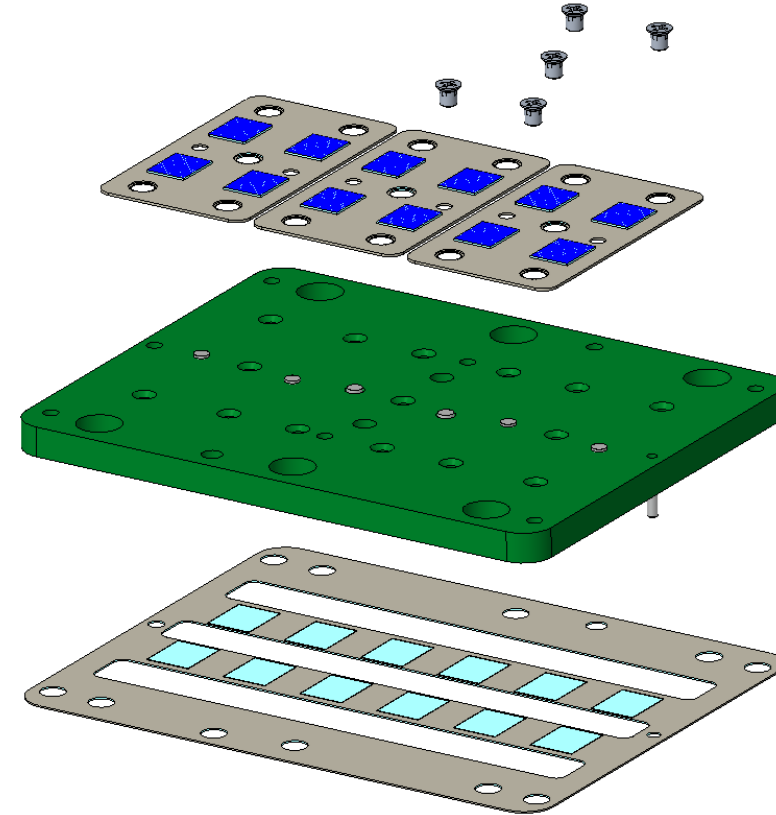
● Section View

## Advantages of using TFE rubber in Wafer-Level Chip Scale Package (WLCSP) technology.

WLCSP is favored for its compact design and cost-effectiveness, but handling small Ball Grid Arrays (BGAs) with tight pitches can pose challenges such as ball damage, missing balls, and loadboard issues.

TFE rubber's unique properties make it an ideal solution for WLCSP, allowing for precise small BGA handling without damage, preventing missing balls, protecting loadboards, and enabling low-force handling.

This results in a **High First-Pass Yield**, reducing costs and increasing the reliability of WLCSP components, making it a valuable choice for the semiconductor Final Test.



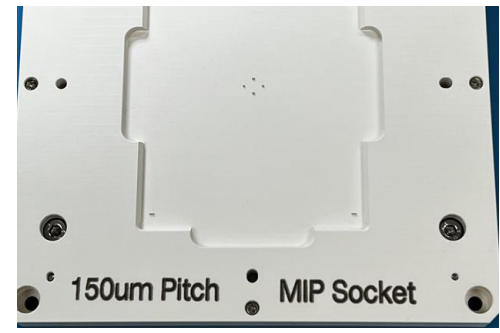
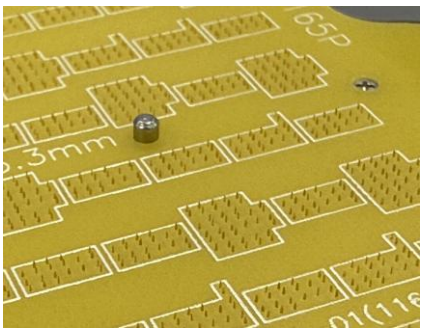
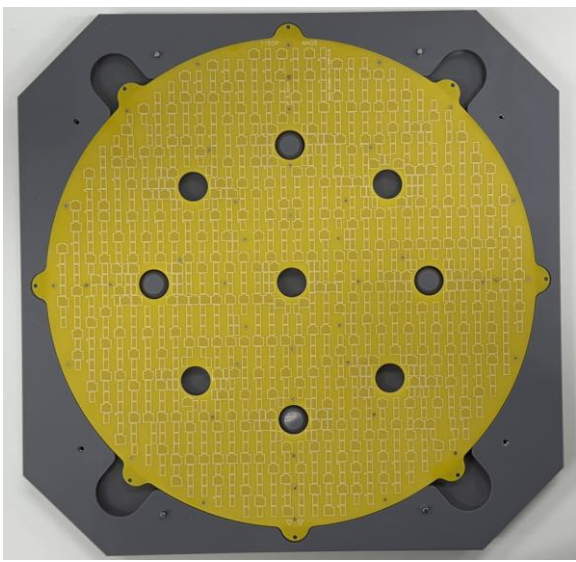
● Exploded View



# Pogo Pin Test Socket Solution

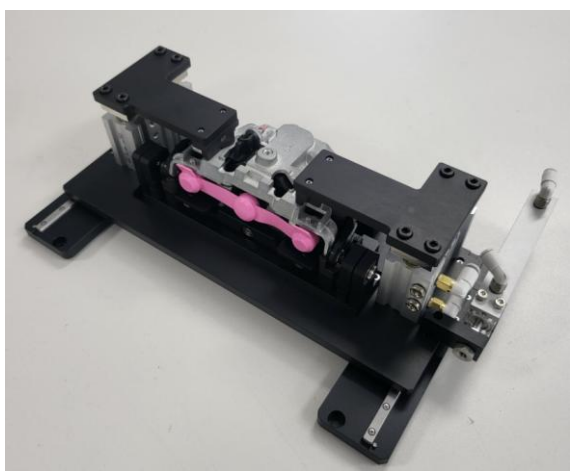
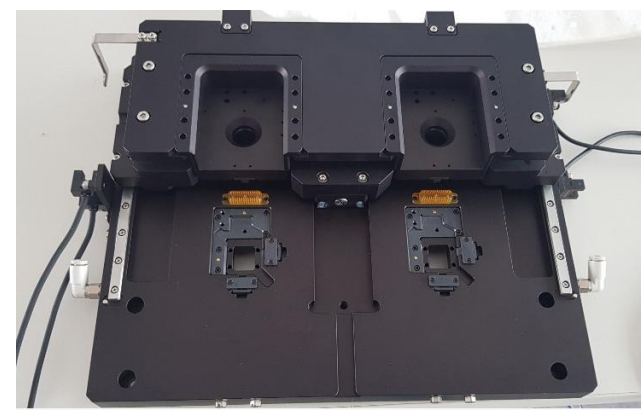
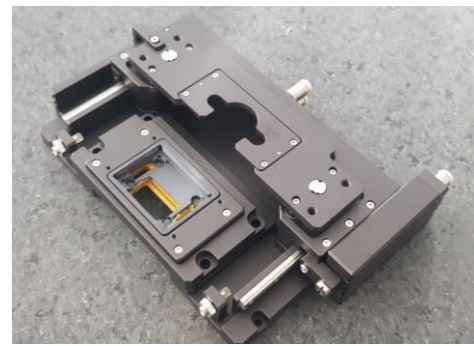
Provides high-quality sockets, including test pins

- . System Level Test Socket
- . RF Device Test Socket
- . Large Device Test Socket
- . Memory Device Test Socket
- . High Bandwidth Memory Socket
- . Burn In Socket



## Camera Module Socket

- . Auto Test Socket
- . Manual Test Socket
- . Customize to needs
- . Un-conventional design with innovation



# Pogo Contact Solution

Testing BGA, LGA, QFN Package, Camera Module, LCD Module, etc.

- . Pogo Pin - down to 0.18mm pin pitch
- . Rubber Socket - down to 0.2mm pin pitch
- . Stamping Pin - down to 0.15mm pin pitch



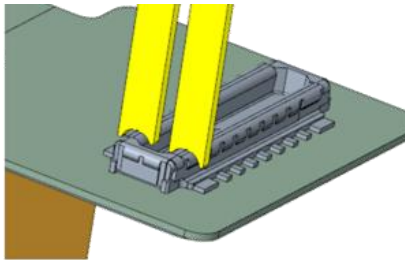
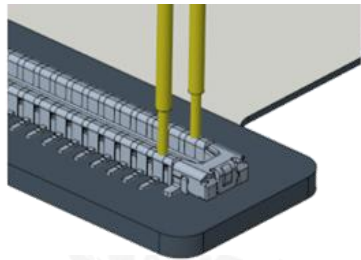
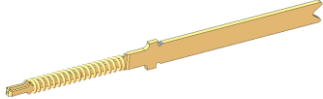
## GENERAL Standard Of Test Socket

- . Camera Module
- . PCB
- . System Interface
- . LCD / OLED / LED



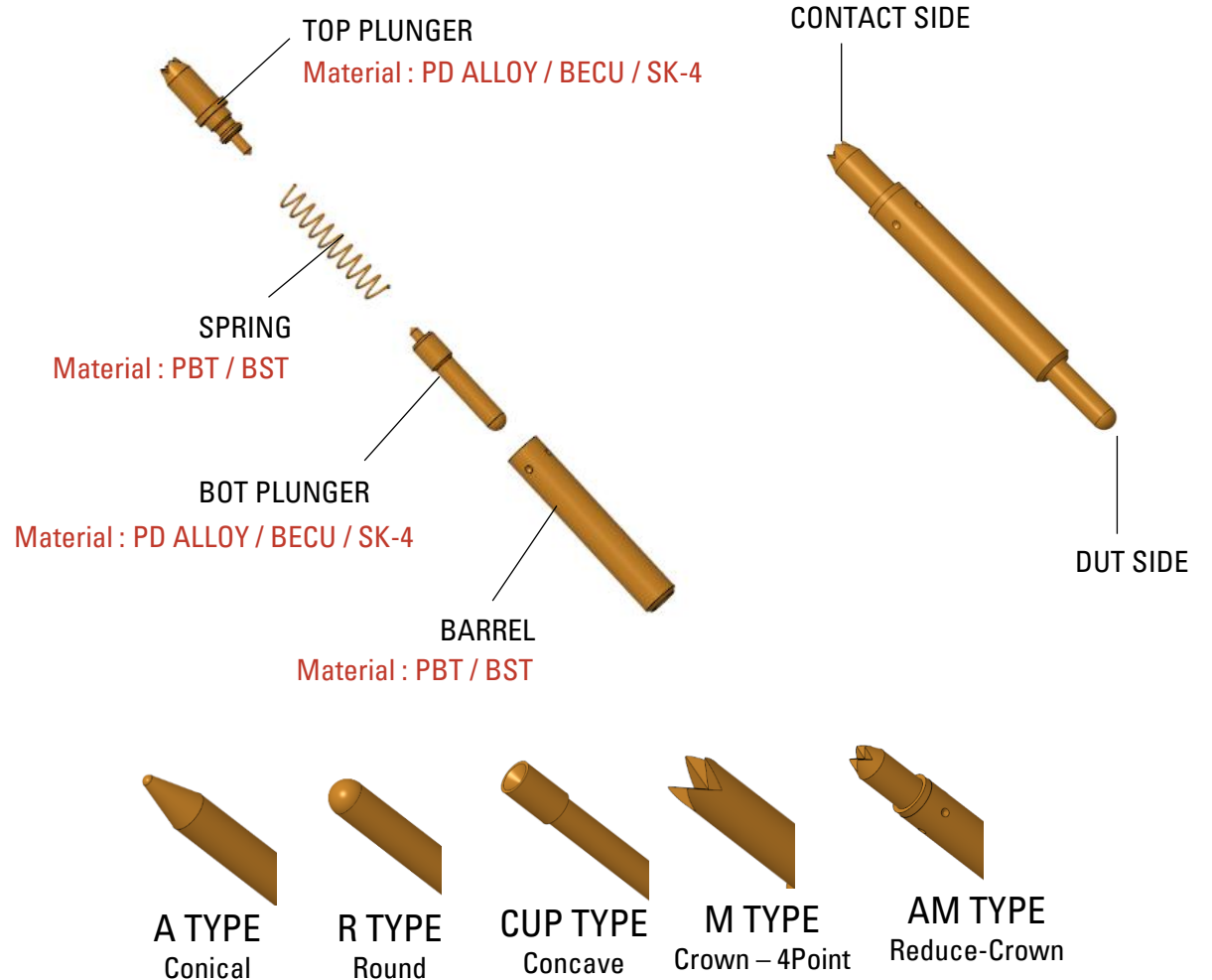
## SEMICONDUCTOR Pogo Test Socket

- . Memory
- . Logic
- . HBM
- . WLCSP



## POGO PIN – down to 0.18mm pin pitch

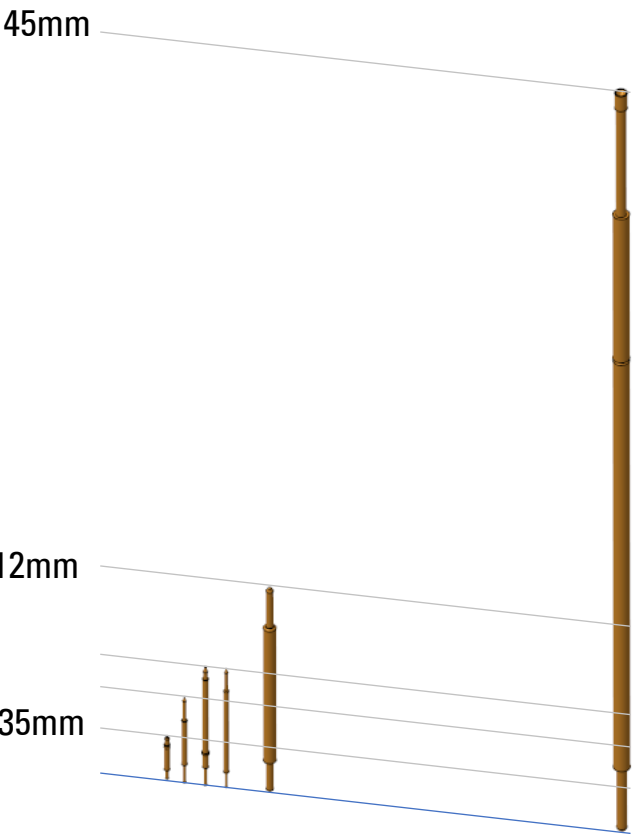
- Double PIN
- Single PIN



# Pogo Contact Solution

## High Speed Pin

ITEM	General specifications
Body Diameter	Φ0.22mm ~
Probe Length	1.35mm ~
Plunger Material	BeCu / SK-4 / Pd-Alloy
Plating	Au, Rhodium, Pd Plating



## Fine Pitch Pin

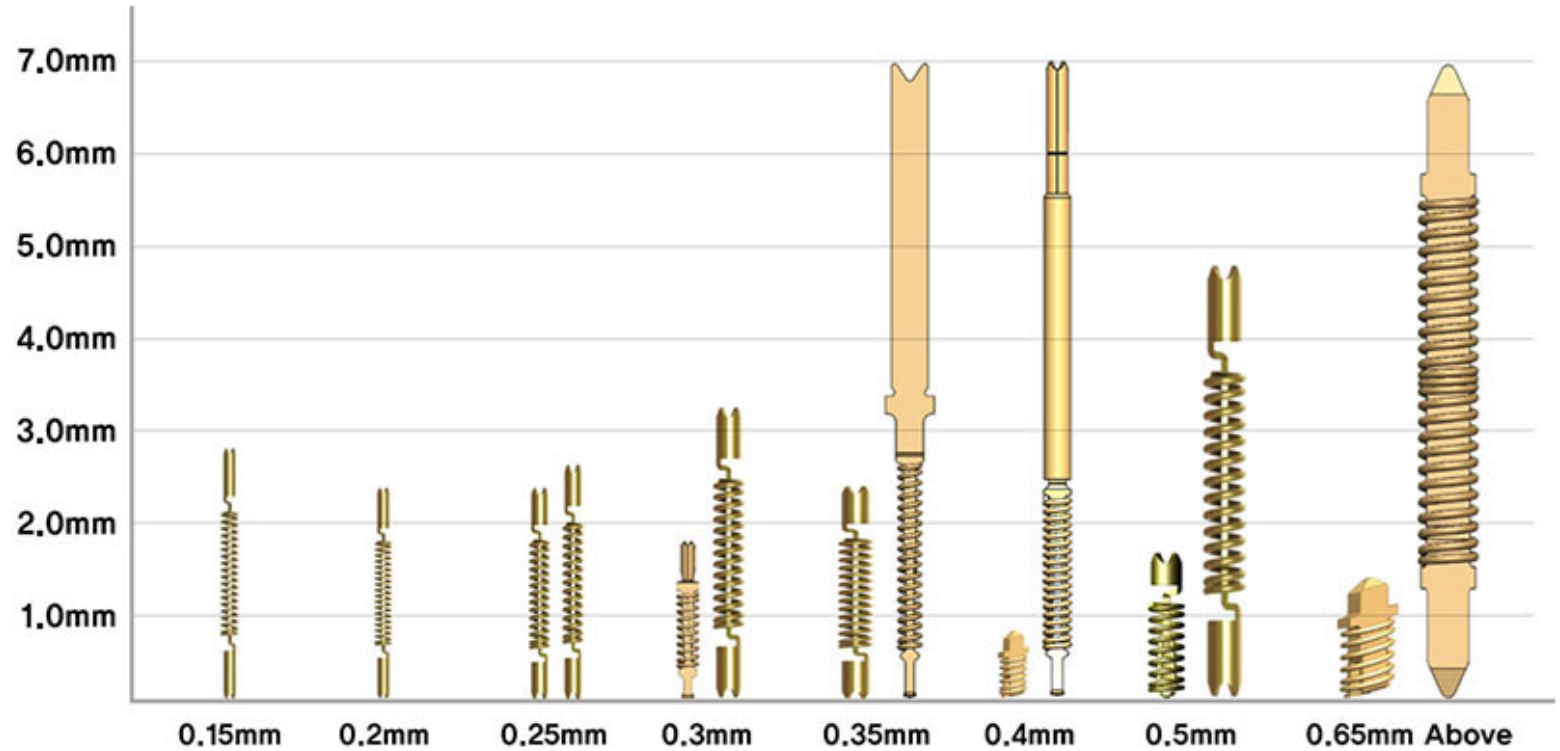
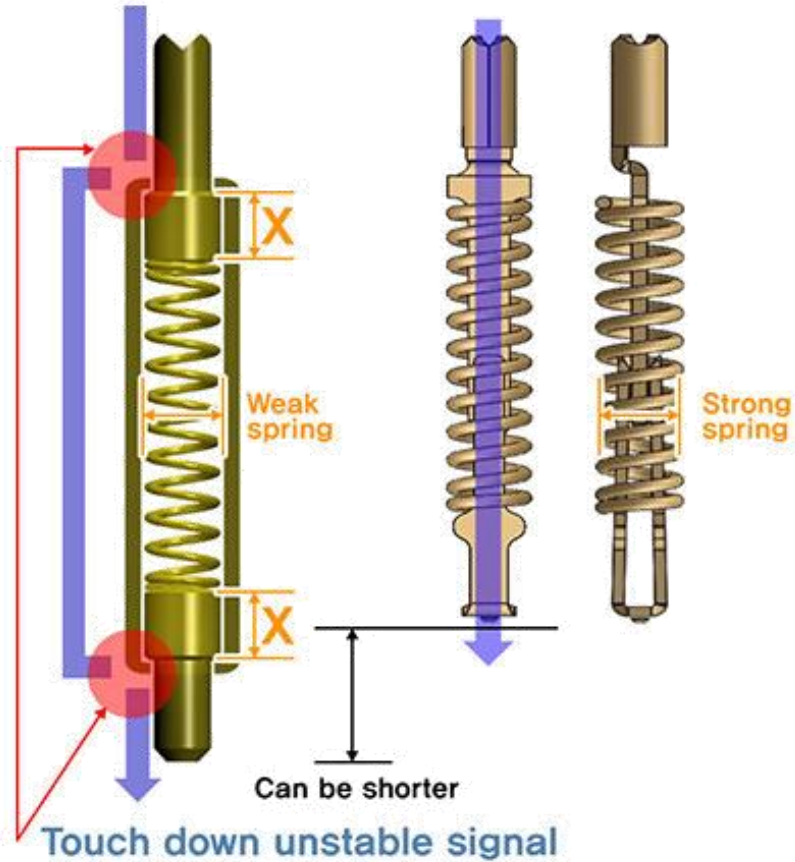
ITEM	General specifications
Body Diameter	Φ0.13mm ~ Φ0.3mm
Probe Length	2.0mm ~
Plunger Material	BeCu / SK-4 / Pd-Alloy
Plating	Au, Rhodium, Pd Plating



# Pogo Contact Solution

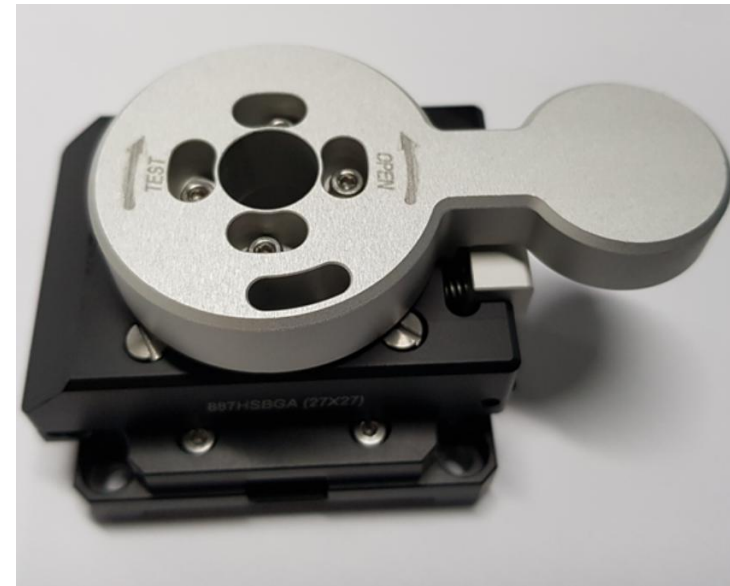
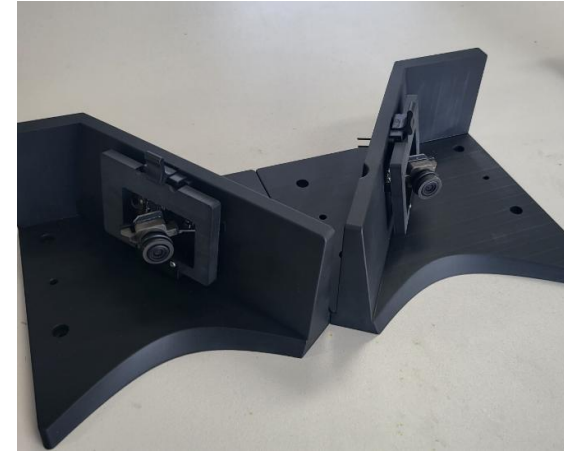
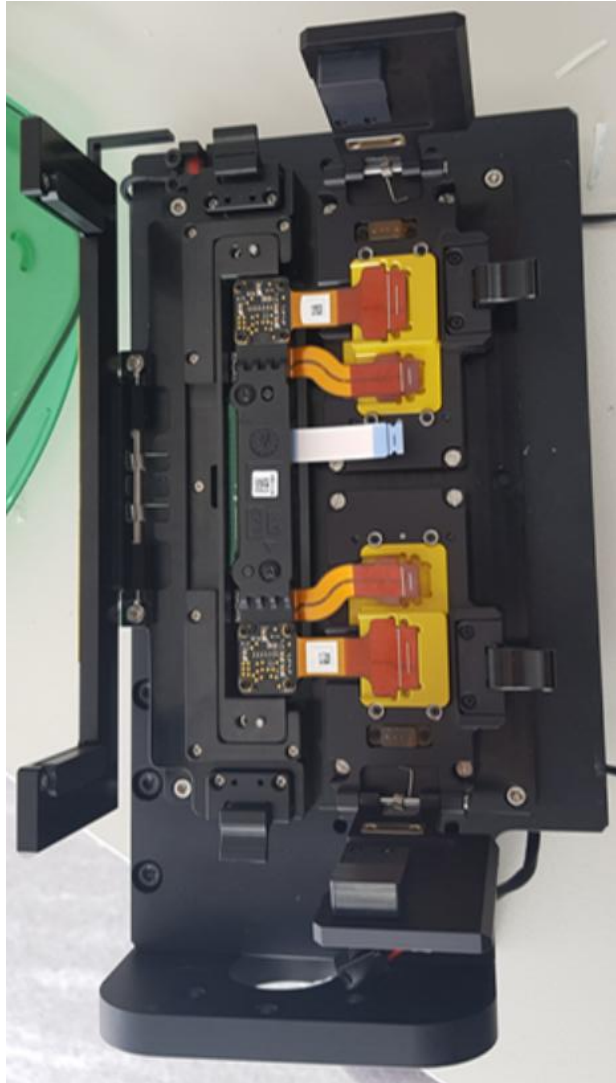
Stamping Pin – down to 0.15mm pin pitch

**Ordinary POGO**      **New Technology**  
Signal path stable



# Pogo Contact Solution

Customization by customer request







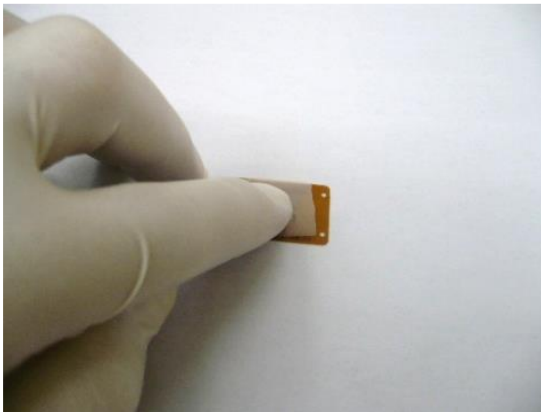
## PCR Cleaning Procedure and Tools

**Cleaning Wands** with tacky Polyurethane tips are effective at removing foreign particles from PCR surfaces

- Use repeatedly by washing with water
- Select the tip shape according to the application

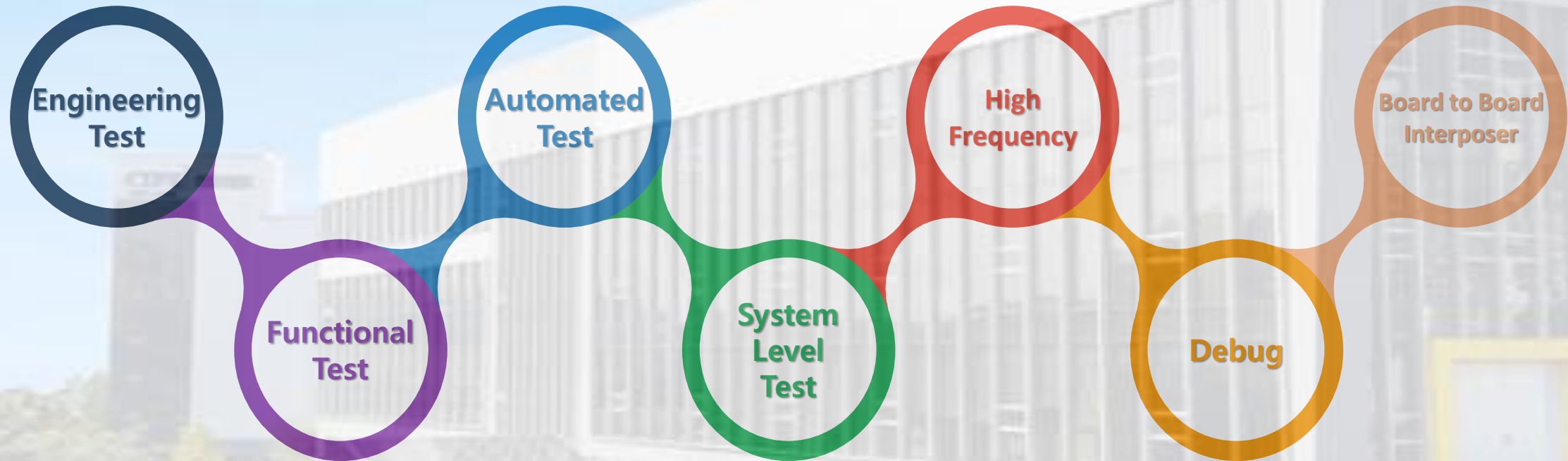


**Cellophane tape** can also be used to clean PCR



- Ingredients: Polyurethane (99.9%) (plasticizer free)
- GHS classification
  - Physical and chemical hazards: Not applicable
  - Health hazards: Not applicable
  - Environmental hazards: Not applicable
- RoHS compliant

## Maximizing Efficiency: The Various Applications of Rubber Contacts



***Thank You!!***