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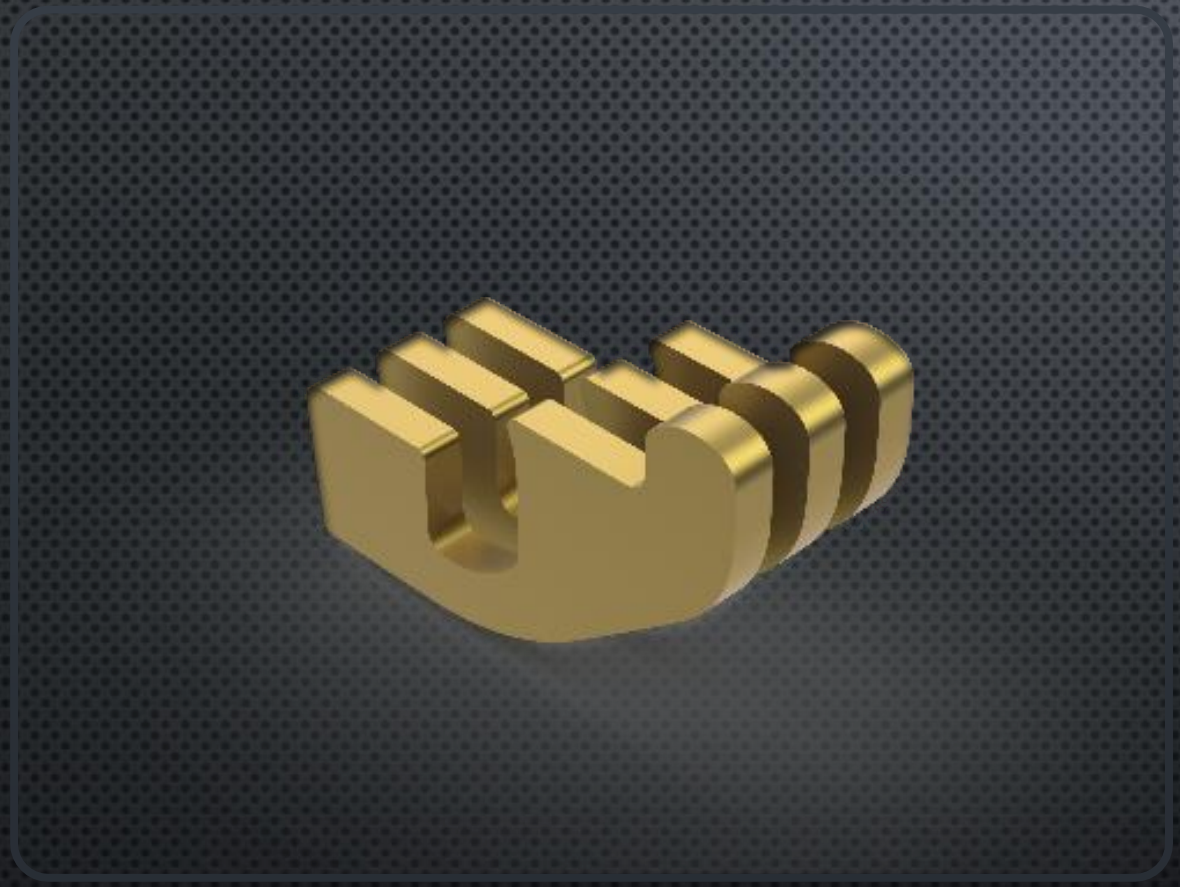

PICORAPTOR RIGID ATE CARTRIDGE

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Ironwood ATE PicoRaptor Cartridge flexibility & performance

- Drop into existing footprint
- Short wipe
- X, Y & Z compatible to existing technologies
- One frame, for multiple pin & pitch devices
- Multiple cartridges into single frame

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PICO RAPTOR RIGID CONTACT

MECHANICAL SPECIFICATIONS	PicoRaptor-1	PicoRaptor-2
Contact Pin Uncompressed Height (mm)	0.95	1.6
Contact Compliance (mm)	0.2	0.2
Contact Tip Coplanarity (mm)	±0.05*	±0.05
Gram Force per Contact (g)	30 ± 10	*20~40g
Wipe Length (mm)	0.09 ~ 0.12	*0.1
Number of Insertion - Laminated Housing	≥6M	≥6M
Number of Insertion - Pin (Mattte Tin.). Number of Insertion - Pin (NiPd)	200 - 300K *	300K ~ 500K*
Number of Insertion - Elastomer	~200K	*300K ~ 400K
Operating Temperature	-45 ~ 155 °C	-45 ~ 155 °C
Socket Frame	Torlon 5030 or Equivalent	Torlon 5030 or Equivalent
Contact Cartridge	Cirlex® Polyimide	Cirlex® Polyimide
Pin Material	BeCu - NiAu	BeCu - NiAu

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PICO RAPTOR RIGID CONTACT

ELECTRICAL SPECIFICATION	PicoRaptor-1	PicoRaptor-2
Self Inductance (nH)	0.62	0.76**
Mutual Inductance (nH)	0.23	0.46**
Ground Capacitance (pF)	0.06	0.15**
Mutual Capacitance (pF)	0.085	0.11**
S21 (Insertion Loss/Bandwidth)	- 1db @ 35.4GHz++	-1db @ 18GHz**
S11 (Return Loss/Bandwidth)	- 20dB @ 7.8 GHz++	- 20dB @ 3GHz**
S41 (Crosstalk /Bandwidth)	- 20dB @ 15.8GHz ++	- 20dB @ 12GHz**
Contact DC Resistance (mΩ)	≤ 25	≤ 25
Curent Carrying Capacity (A) Duty Cycle 100% (20° rise)	6	9A**
Current Leakage (pA) @ 10V	≤1	≤1

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8 DESIGN FEATURES

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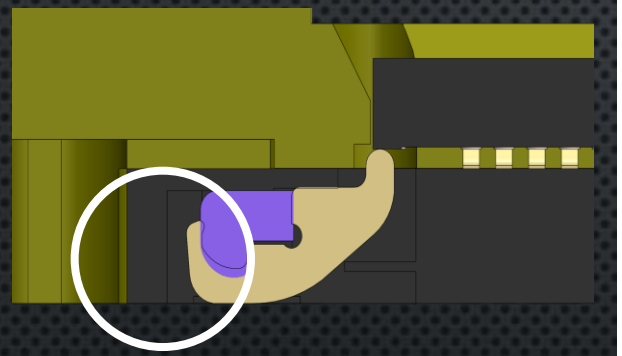
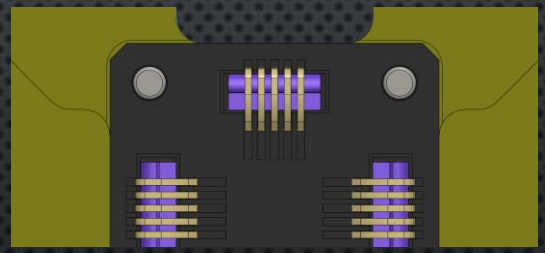
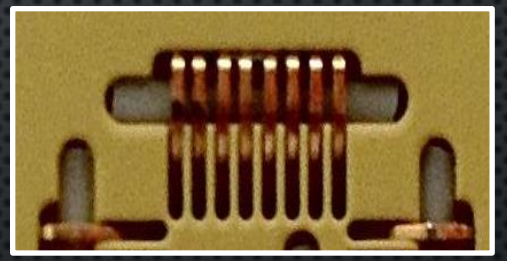
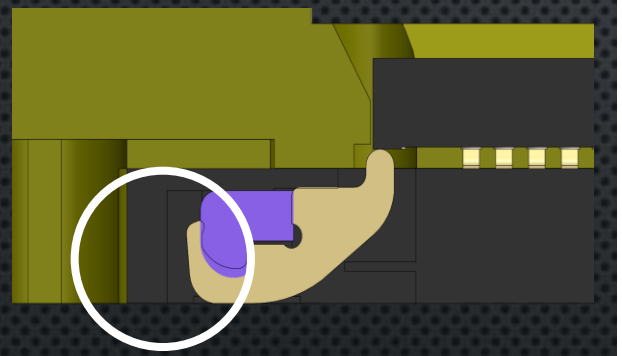
Feature #1 – No pin engagement to the back wall



- Sustainable specification & FPY can be achieved
- Longer housing lifespan; ≥6M insertion (≥200% longer lifespan than typical socket housing)
- It maximizes contact pin & elastomer lifespan







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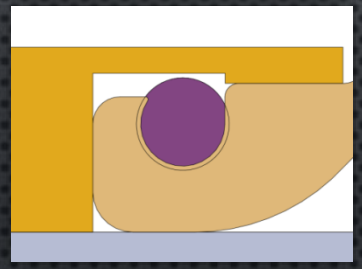
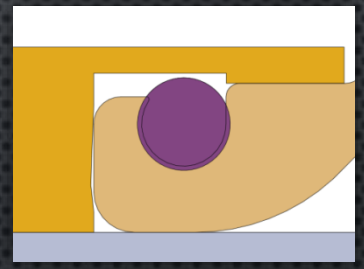
No Pin Engagement with Back-Stopper
Benefit : No Wearing of housing wall

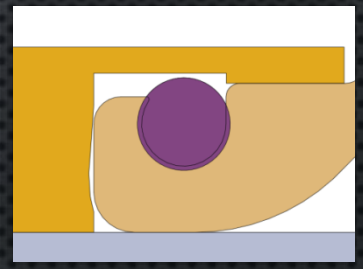
Progressive deterioration of the housing back-stopper



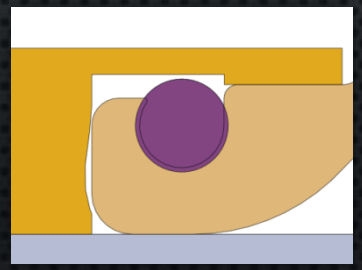
Starting Position



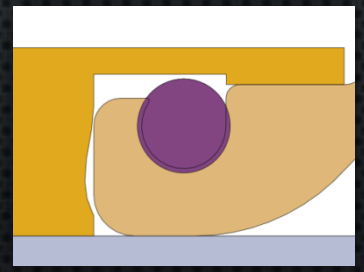
500k Cycles



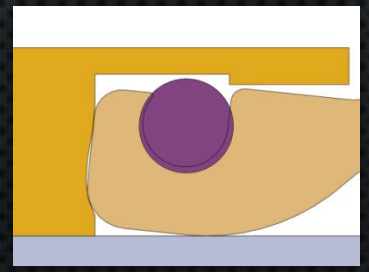
1000k Cycles



1500k Cycles

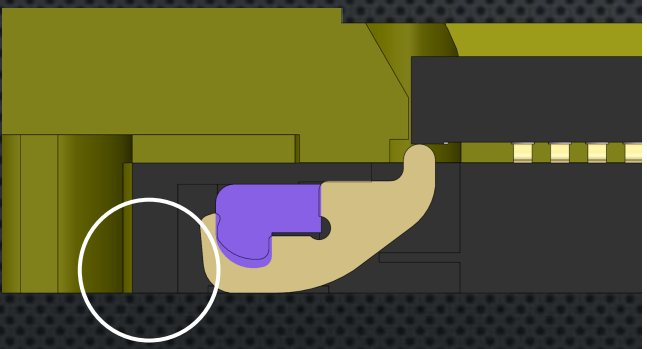


2000k Cycles



End Position*

When wearing occurs, contact force is compromised creating Cres to increase.



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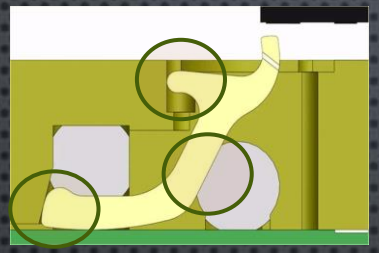
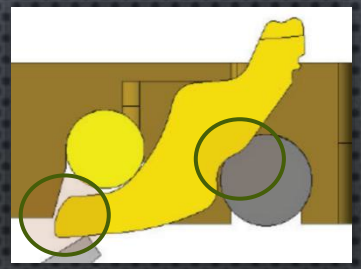
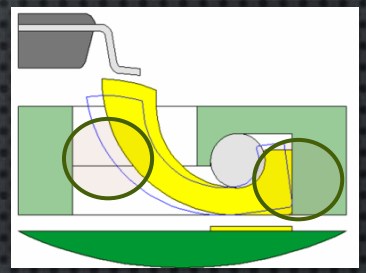
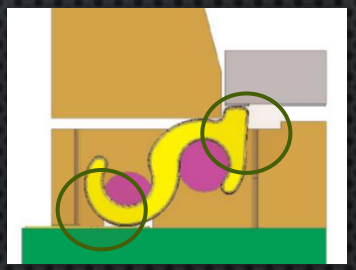
Where are the wear points?

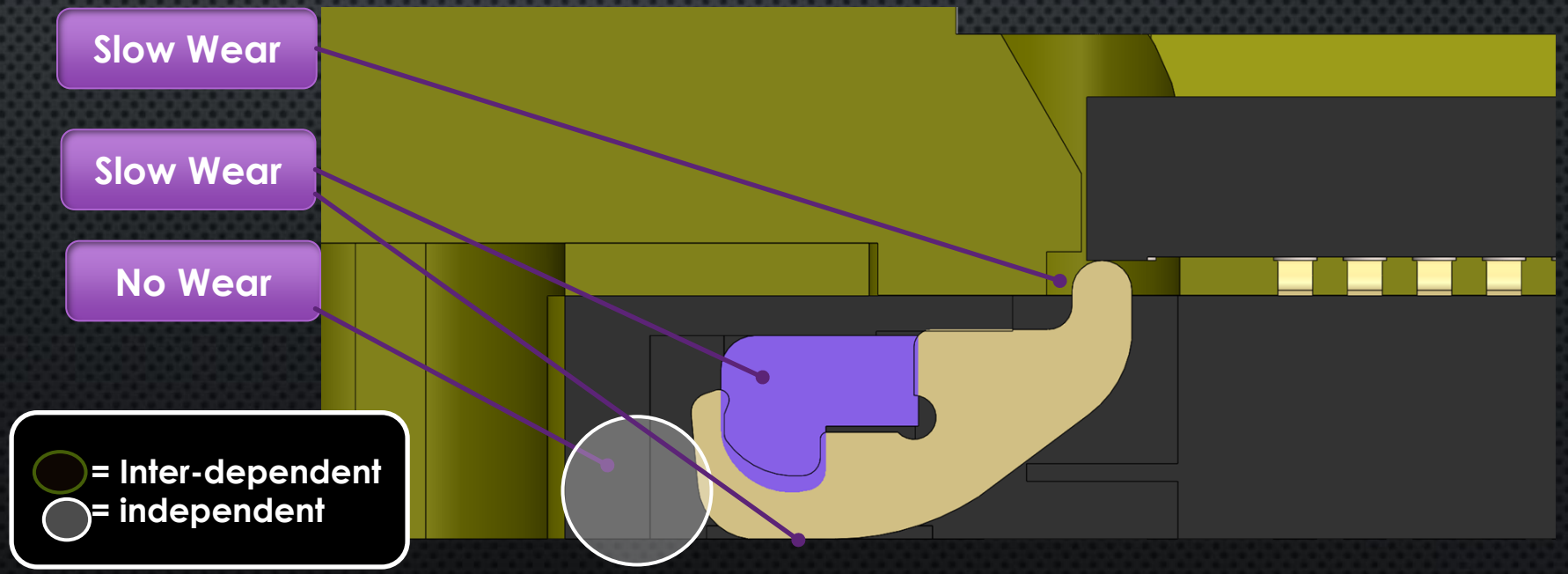


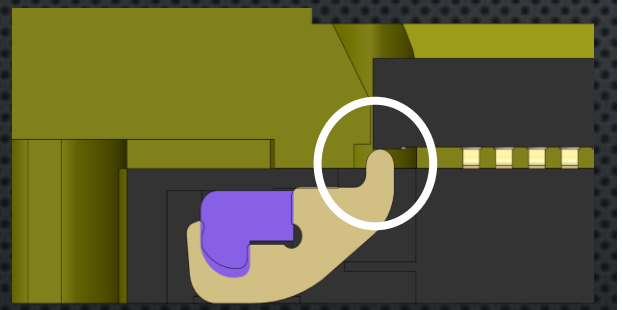






*All images are sourced from the internet





Feature #2 – Short Wipe Technology

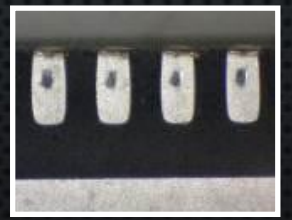
PicoRaptor has 0.10mm wiping length compared to typical 0.17~0.22mm

Benefit

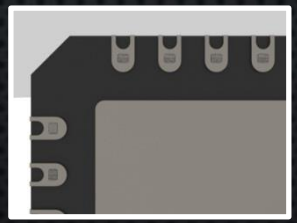
- Less debris generation leads to less cleaning
- Optimizes lifespan of pin's contact tip due to bigger contact area (≥60% longer lifespan than typical contact pin)
- Longer MTBA, MTBR and MTBF
- Ideal for chamfered corner pad, short pad and wettable flank pad/dimple pad
- Shorter wiping length retain more solderability area
- Ideal for multiple testing insertion

Typical wiping length 0.17~0.22mm

Short chamfered corner pads



***EZ* wiping length 50~100% shorter length**

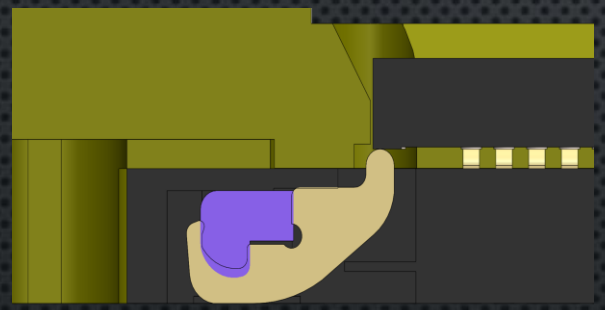


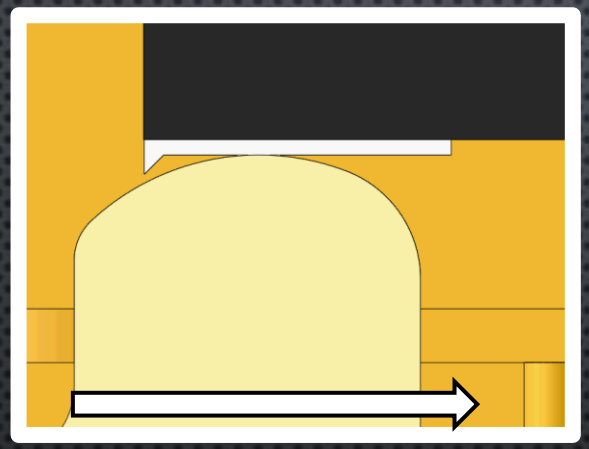
Wettable flank pad/ Dimple pad

Ironwood ELECTRONICS

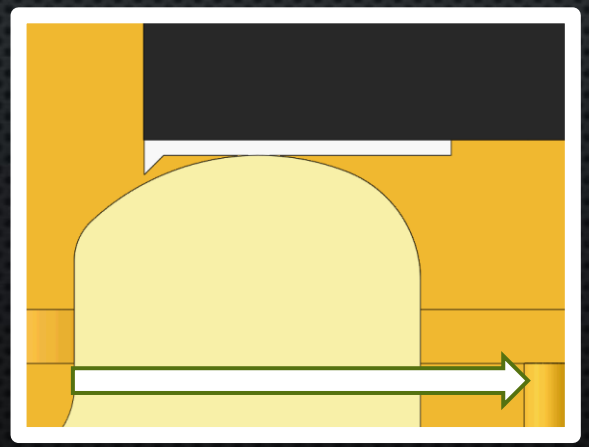
SWS (Short Wiping Stroke) Technology
Benefit : Slow Wearing

PicoRaptor has 0.10mm wiping length compared to typical 0.17~0.22mm

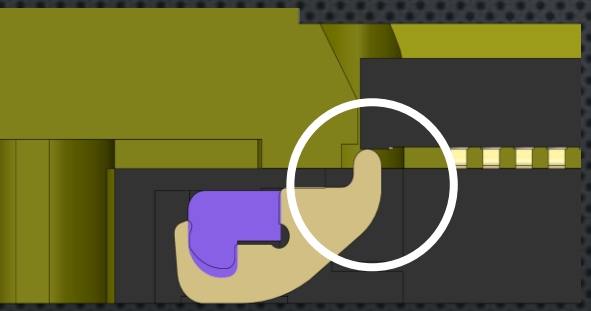


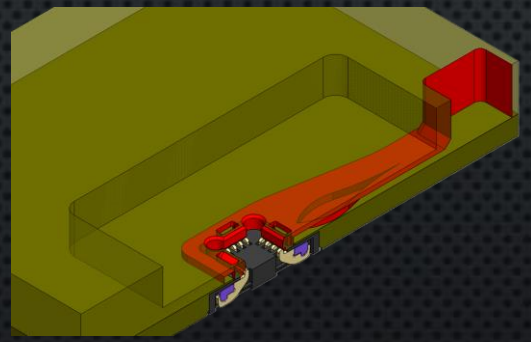


***PicoRaptor* SWS technology**



Typical wiping stroke

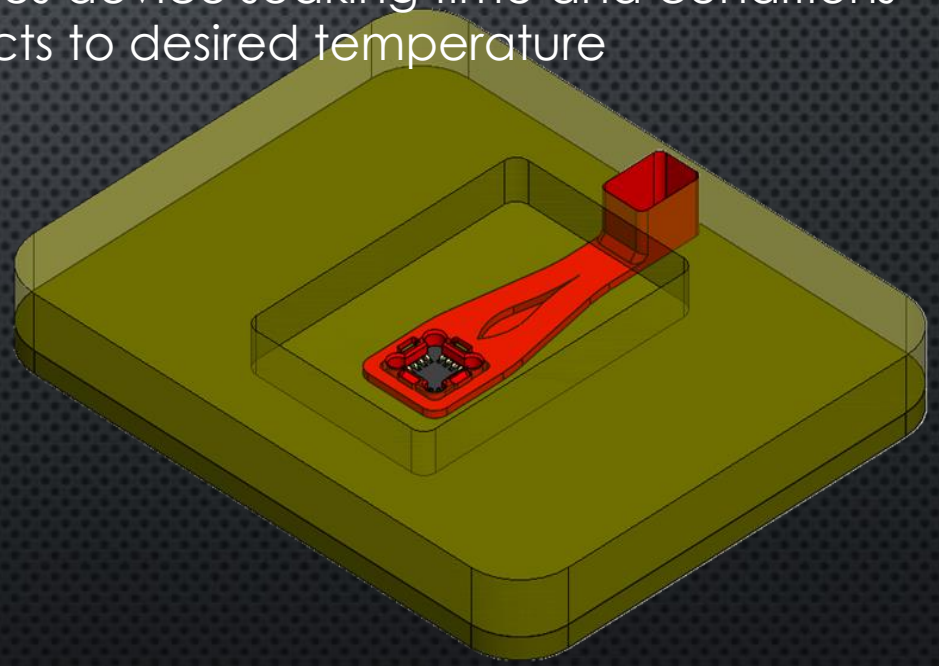




Feature #3 – AirTherm Air Flow

Benefit

- Enable temperature testing on DUTs with +/- 2◦C
- Reduces device soaking time and conditions contacts to desired temperature



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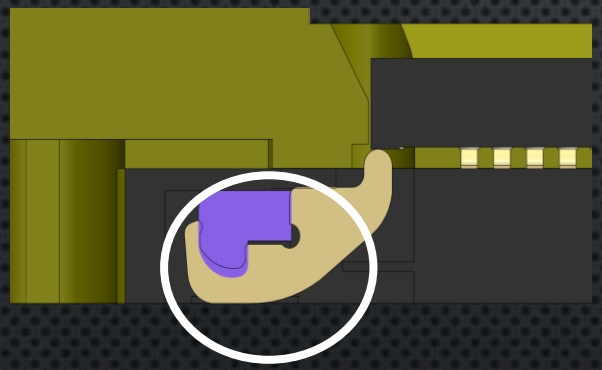
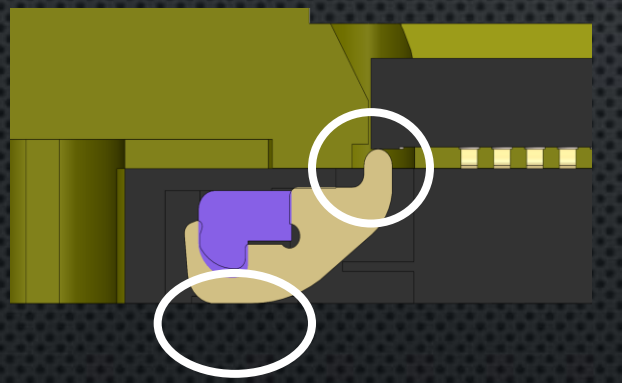
Feature #4 – P-Shaped Elastomer
Benefit : Single and Multifunction Elastomer
One elastomer for gripping and stress distribution



Benefit

- No dropping of the pin
- Generates high gram force
- Insurance of contact & consistent Cres
- Sustainable test performance
- Longer MTBA, MTBR & MTBF

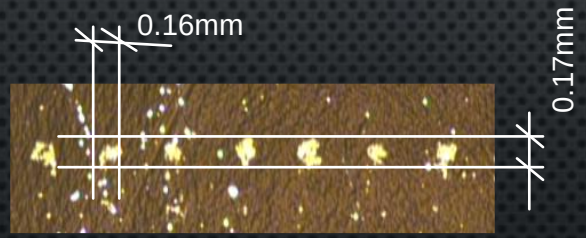


Feature #5– ACF (Adv. Contact Finishing) Technology
Benefit : Slow Wearing

Finer contact finishing has less cavity for debris accumulation at contact tip of DUT & less abrasive to loadboard

Benefit

- Loadboard friendly
- Less cleaning frequency
- Less cost of loadboard repair
- Longer MTBA, MTBR & MTBF



Digging level stays at Level 0 – Gold after 1M cycles (Note: In house testing)

Customer Reference:-

- Digging level 0 – Gold
- Digging level 1 – Nickel
- Digging level 2 – Copper
- Digging level 3 – FR4

EZ's ACF

Competitor pin

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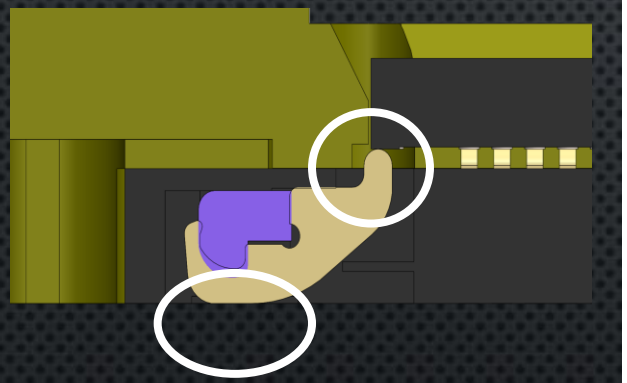
Feature #5– ACF (Adv. Contact Finishing) Technology
Benefit : Slow Wearing – Customer report *after 960,000 insertions*

Finer contact finishing has less cavity for debris accumulation at contact tip of DUT & less abrasive to loadboard



[redacted]

Failure Analysis Report

Colorado Springs Facility

Failure Analysis Request #: 2200030 N/A NONE	Requester: [redacted]	Requester Contact #'s: Phone 1034/Pager
FAB Part #: unknown	Engineer: [redacted]	Engineer Contact #'s: Phone 1034/Pager
Part Name/Generic: unknown	Wafer Lot #: unknown	Date Code:
DATE REQUEST RECEIVED: 1/21/2020	DATE REQUEST COMPLETED: 1/22/2020	DATE REQUEST NEEDED: 3/20/2020

Work Requested: *Procedures wanted*

Depth of the contactor scrubs in copper plate.
(8 scrub marks)

Problem: *Issue impacting material*

New boards with probe mark scrubs

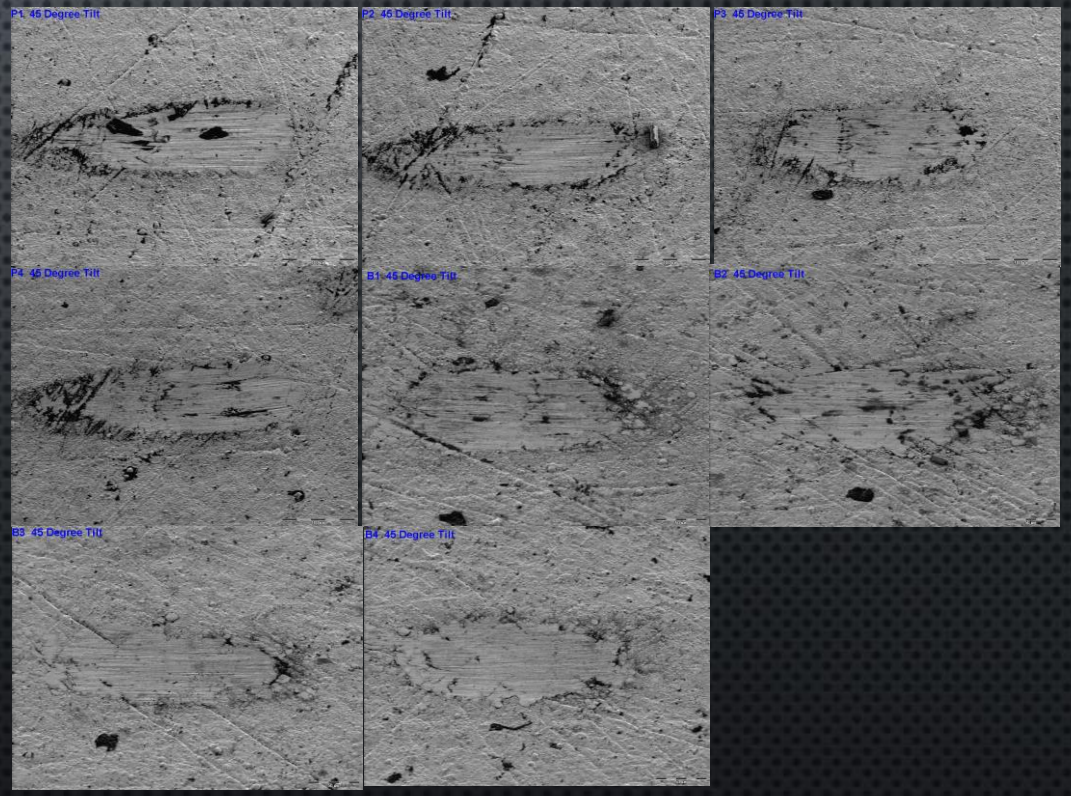
Analysis Notes *Analysis Procedure*

Took sem images at a 45 degree tilt.

Analysis Results *Summary of Findings*

The probe marks appear to be very shallow and the depth could not be measured. See attached photos.

Analyst1: [redacted]	**Hours:** 2
Phone# 1284	**Pager#**
Analyst2:	**Hours:**
Phone#	**Pager#**



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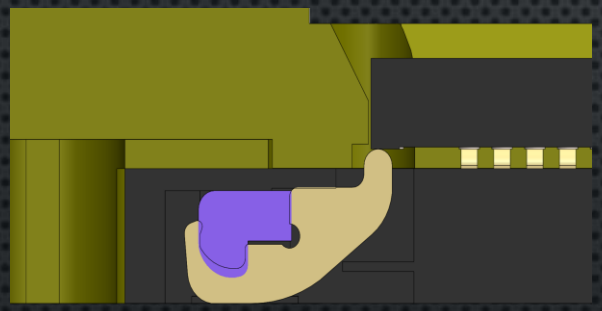
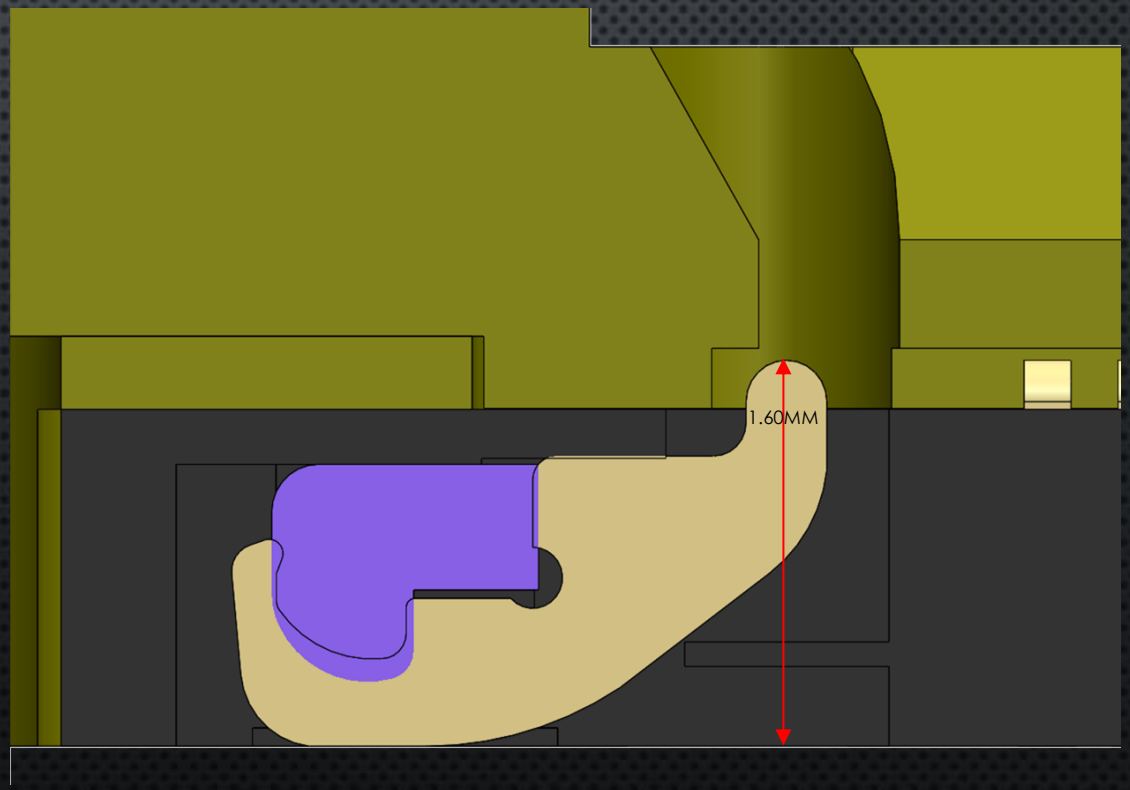
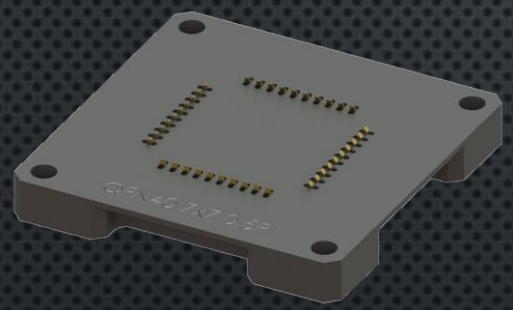
Feature Design Feature #6 XYZ Compatible with market platform
Benefit: Minimal or zero hardware investment
Plug & Play







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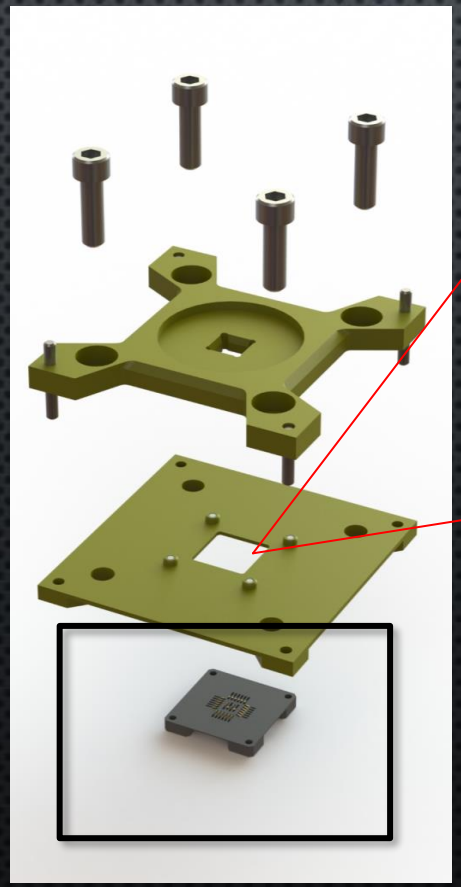
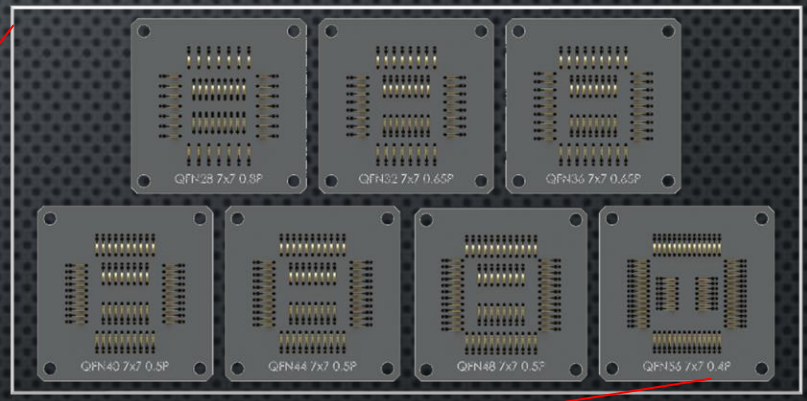
Design Feature #7 : 1 Frame for multiple devices & pitch, as long as, package is same size & pad design is compatible
Benefit: increased throughput, lower acquisition cost





Device Body Size, mm (D x E)	Lead Pitch, mm	Lead Count
7 x 7	0.80	28
	0.65	32
	0.65	36
	0.50	40
	0.50	44
	0.50	48
	0.40	56

Interchangeable Cartridges can be utilized with different handlers

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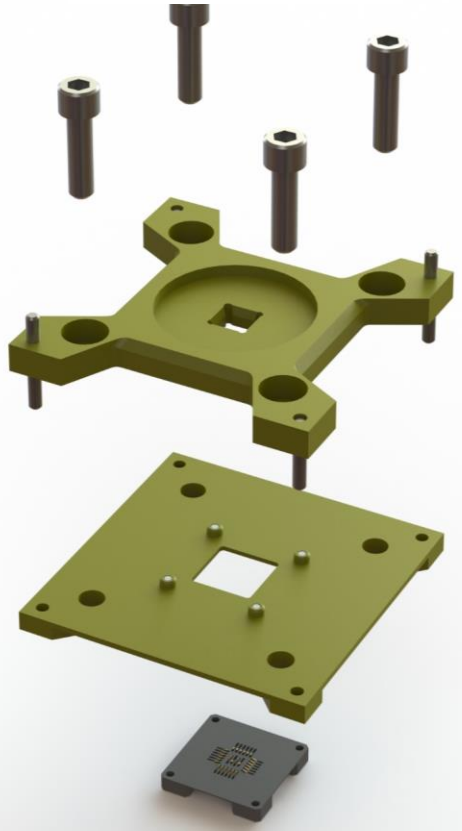
Seiko Epson



Mounting Screws
(Socket to PCB)

Alignment Plate for
different handler

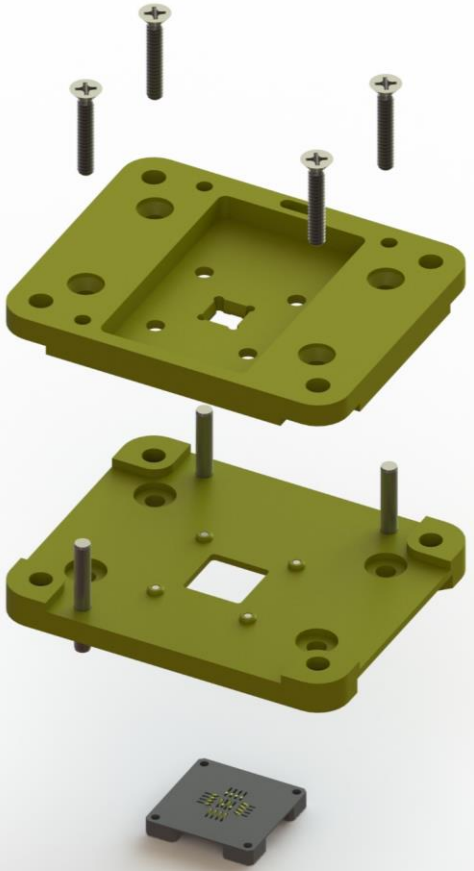
Socket Frame for
different handler

Contact Set
QFN24 4x4 0.5P

OR

Contact Set
QFN16 4x4 0.65P

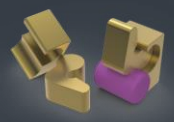
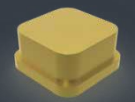
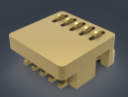
Rasco



Both contact set with similar package size are interchangeable, as long as, outline and alignment holes are identical.

Key Features	ATE PicoRaptor Cartridge Benefits
Single Multifunctional Elastomer	Easy Installation, Inventory and Cost Reduction, Consistent / Controlled Contact Motion, Consistent Cres, Longer MTBA
Short Electrical Length	Superior Signal Performance
No Contact Pin Engagement with Back Wall of Socket Housing	No Wearing of the Socket Housing, Extended Lifespan
SWS (Short Wiping Stroke) Technology	Ideal for Short Pads, Chamfered Corner Pads, Wettable Flank, and Step Cut Styles
ACF (Advanced Contact Finishing) Technology	Loadboard Friendly, Minimizes Debris, Prolonged Cleaning
AirTherm Air Flow	Conditions Contact pins to desired temperature
ATE Cartridge Technology	Same Frame for Multiple Pin count & Multiple Pitch cartridges equates to cost & inventory reduction & Quick change to reduce downtime

GROUND BLOCK OPTIONS

Bell Contact (BC)	Hinged Contact Insert (HCI)	*PicoRaptor*	Ground Block with/without Pin
≥ 2x2	≥ 3x3	≥ 5x5	≥ 2x2 (With BC) ≥ 3x3 (With HCI) ≥ 5x5 (With *EZ*)
			 

MANUAL ACTUATOR OPTIONS

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Hinged Single latch ball bearing Z actuated

Double Latch ball bearing Z actuated