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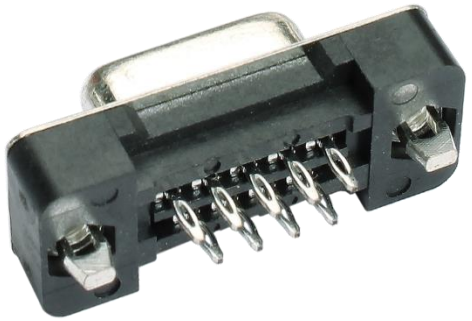
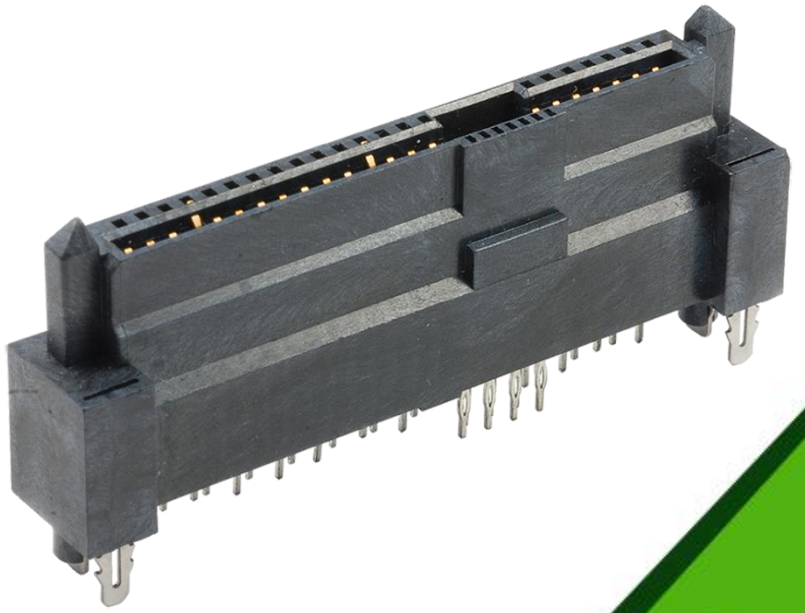




Solderless Solution

Press-fit Terminals

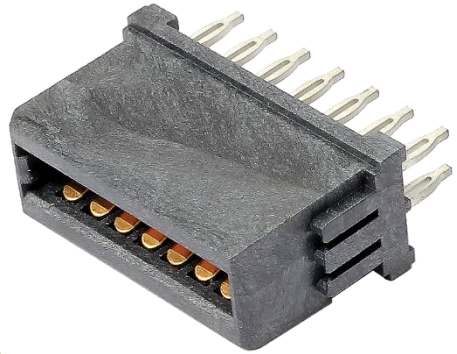
Rev. 202311

The technology known as "Press-Fit," also referred to as "Fish Eye Terminals," is an alternative solution to soldered installations. It involves pressing the fish eye terminal into the PCB (Printed Circuit Board) hole with relatively low pressure to achieve higher clamping force. During the pressing process, the fish eye terminal undergoes elastic deformation, forming a highly reliable and tight connection with the PCB through a cold joint. This minimizes contact impedance, reduces assembly time, and lowers production costs.

This technology is increasingly applied in the manufacturing of electrical systems across various markets, including the automotive industry. Its design and testing comply with various international standards such as IEC, EIA, and SAE, including vibration, mechanical performance, and thermal shock testing (with temperatures reaching up to 125℃).

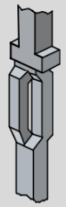
Advantages of Press-Fit over traditional soldering include:

- No heat stress on PCB components during pressing, resulting in lower contact impedance.
- Absence of common soldering issues like solder bridges, short circuits, and poor tinning.
- No residue from soldering, eliminating the need for cleaning.
- Facilitates recycling with strong reusability.
- Easy to install and maintain.
- Cost-effective, as lower temperature materials can be used without the need for soldering.



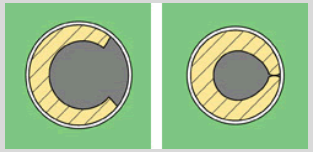
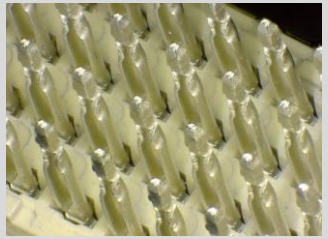
	Soldering	Press-fit
Energy Consumption	30-40 kW	4-6 kW
Environmental Disadvantage	Creates welding gas and welding residue	No residue
Cost of Plastic Parts	Requires the use of PA (Polyamide) and PPS (Polyphenylene Sulfide) materials	No residue temperature concerns, low-cost PBT (Polybutylene Terephthalate) and PET (Polyethylene Terephthalate) materials can be used.
Equipment Cost	High investment cost, large space required	Low investment cost, small space required
Volume	5-15mm keepouts	2mm keepouts
Failure rate	0.05fit	0.005fit

Action Pin

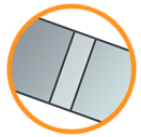

Action Pin is a previous patented product of TE Connectivity. It features a needle-eye structure with a slight rotational angle, allowing it to adapt to different holes. However, it has a higher requirement for hole diameter, and it may exert a certain rotational force on the hole.

C-Press

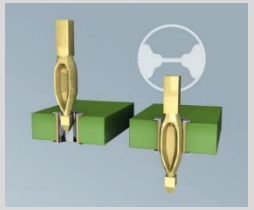
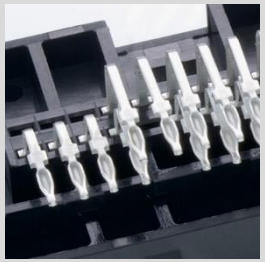
C-PRESS is a previous patent of Winchester Electronics. Its characteristic is that it looks like a C shape when viewed from a cross-section. The advantage is that the insertion force is continuous, resulting in minimal deformation between PCB holes. However, a drawback is that it is more challenging to implement for PCB holes with smaller diameters.

Eye of The Needle

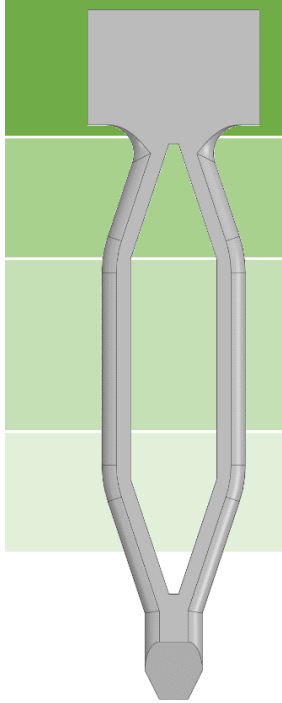



"Eye of The Needle" is the most common design solution, a fundamental needle-eye design with a simple structure. However, it demands a higher level of symmetry and positional accuracy.

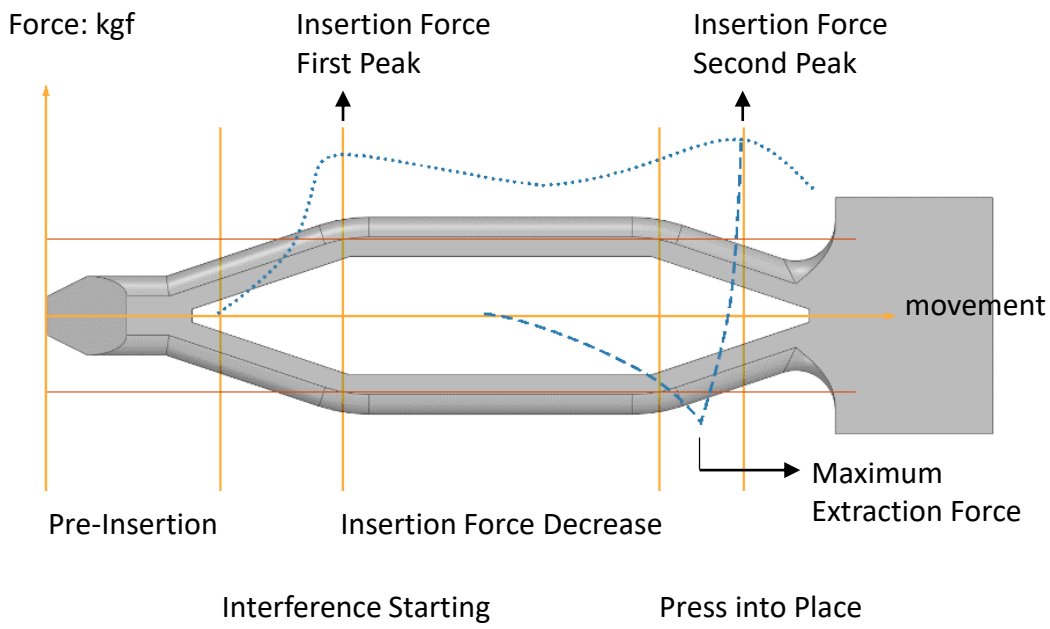
“H” Shape Pin

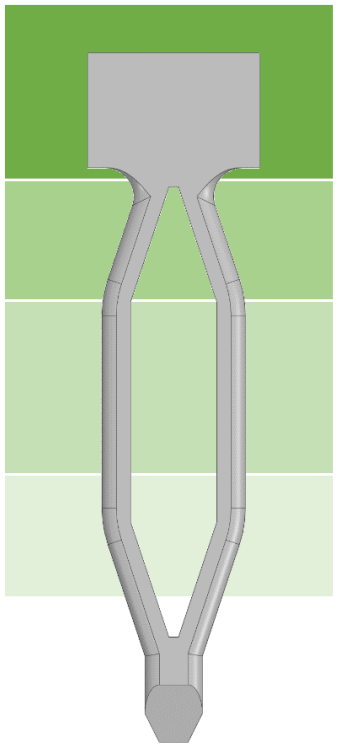
"H-Shape Pin" is an H-shaped pin from FCI. Its advantage lies in easier control during press-fitting, but a drawback is the higher manufacturing difficulty associated with the production of these pins.

	Area	Area Function Explanation
	Terminal Strength Zone	Provide the inherent strength of the terminal to prevent distortion during insertion
	Retention Force zone	Generate insertion force (second peak) and retention force
	Transition Zone	Connect the insertion zone and retention force zone to ensure smooth insertion
	Insertion Zone	Generate insertion force (first peak)
	Pre-Insertion zone	Incorporate Press-fit insertion zone/transition zone/retention force zone into the PCB

Press-Fit Terminal Insertion and Extraction Force Curve Chart

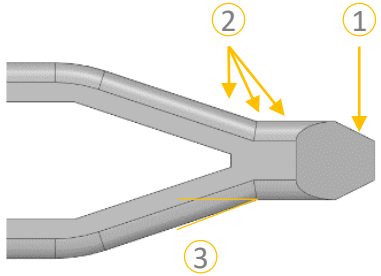


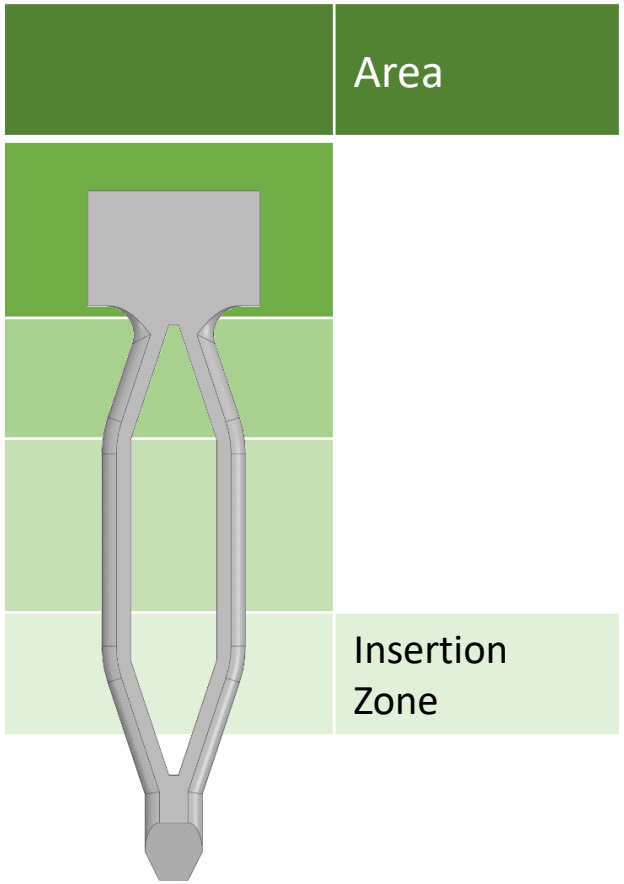
	Area



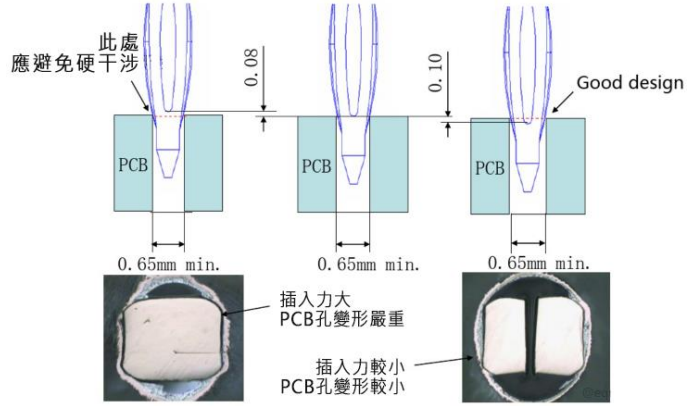
Pre-Insertion zone

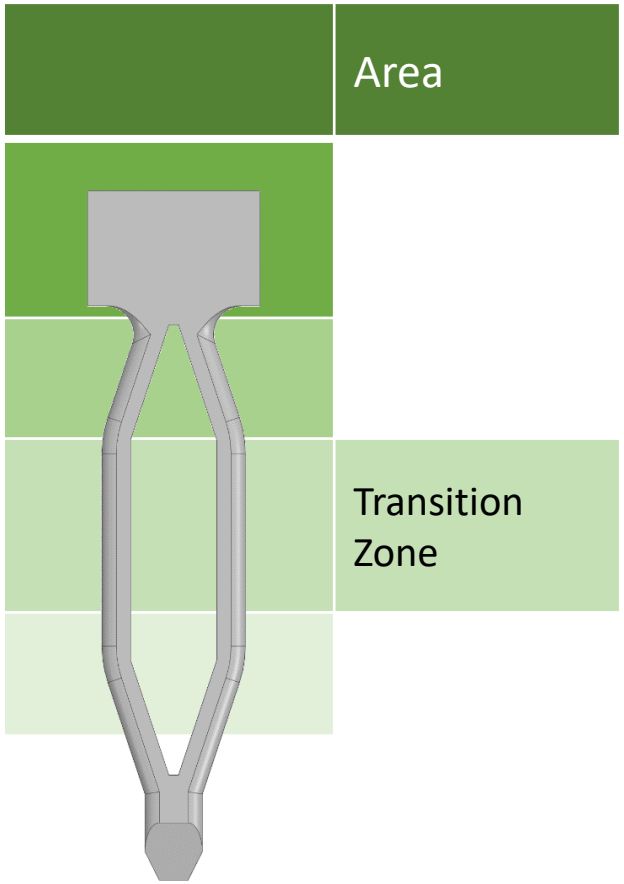
Basic Functions:	The product is pre-placed on the PCB. At this point, press-fit is introduced into the PCB hole to provide initial positioning for the product.
Key Features:	1. Lead-in structure, convenient for pre-insertion. Main types include: four-side lead angle, double-side lead angle. From a process perspective, it includes stamping molding, automated cutting, and V-cut bending.“ 2. "Coin structure”, preventing scratches on the PCB hole copper foil layer during pre-insertion. 3. Different tail lengths are achieved by changing the length of this part
Key Design Points:	1. Lead-in structure design needs to consider PCB hole size, hole positional accuracy, and connector terminal alignment to ensure that in the worst-case scenario, the terminal remains within the PCB hole. 2. The smaller the angle, the better, as it can reduce the impact force generated during insertion.



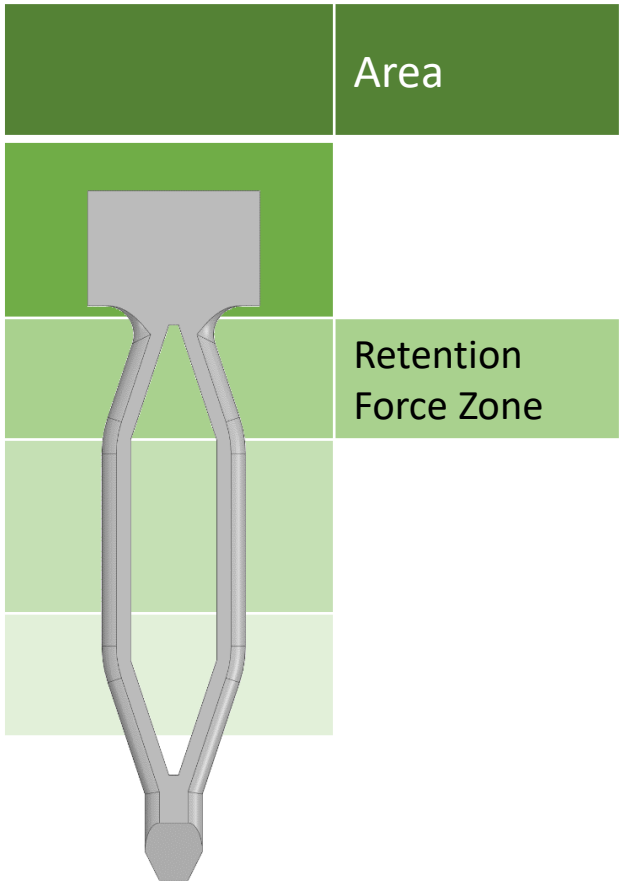


Basic Functions:	The terminal begins to interfere with the PCB, and the insertion force shows the first peak (refer to the figure on page 5)
Key Features:	1. The inner and outer Press-fit formations create two simply supported beams. 2. The outer Press-fit has four edges with an added coin structure to prevent scratching the PCB hole copper foil layer during the insertion process.
Key Design Points:	1. When the terminal begins to be pressed into the PCB, the impact between them should be minimized in the design to avoid excessive interference at the beginning, which could lead to issues such as terminal breakage or distortion. 2. By adjusting the width/thickness of the two simply supported beams, it is possible to modify the interference force between the terminal and the PCB. 3. During the designing phase , attention is given to the lower edge position of the press-fit inner hole (refer to the illustration below).





Basic Functions:	Connecting the insertion zone with the retention force zone
Key Features:	1. The widest part of the press-fit terminal structure does not correspond to the location where the terminal provides maximum insertion and extraction force. When the terminal is pressed into the pre-insertion zone, the arms on both sides of the terminal undergo deformation, causing a corresponding deformation in the transition zone, but its width has already decreased. 2. The outer press-fit has four edges with an added coin structure to prevent scratching the PCB hole copper foil layer during the insertion process. 3. The internal and external shapes are mostly connected by curved arcs, ensuring smooth transitions in the curves.
Key Design Points:	1. The transition zone is located at the center of the press-fit. After the terminal is pressed into the PCB, this part should be within the PCB to prevent possible rebound, causing improper insertion 2. The symmetry of the internal and external press-fit shapes needs to be strictly controlled. There are high requirements for the symmetry of insertion and extraction forces, as well as the positional accuracy of the tail after insertion, in relation to the press-fit symmetry.



Basic Functions:

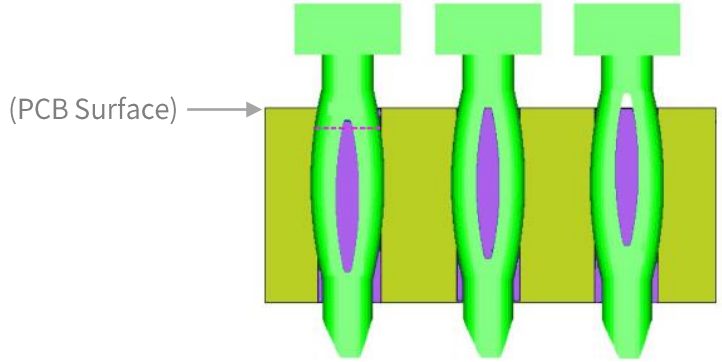
The terminal interferes with the PCB, and the insertion force exhibits the second peak (refer to the figure on page 5). Once the terminal is fully pressed in, it provides retention force.

Key Features:

1. The internal and external press-fit structures form two simply supported beams.
2. The external press-fit has four edges with an added coin structure to prevent scratching the PCB hole copper foil layer during the insertion process.

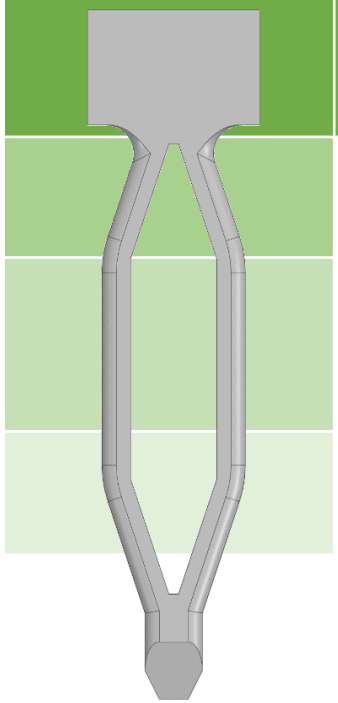
Key Design Points:

1. To increase terminal retention force, it is advisable to maximize the interference between the terminal and PCB hole within the allowable range.
2. This can be achieved by adjusting the width/thickness of the two simply supported beams to change the interference force between the terminal and PCB.
3. In the design, it is generally preferred to keep the insertion depth below the upper edge of the internal press-fit. If the insertion depth exceeds the upper edge of the internal press-fit, it is important to avoid hard interference (refer to the diagram below).

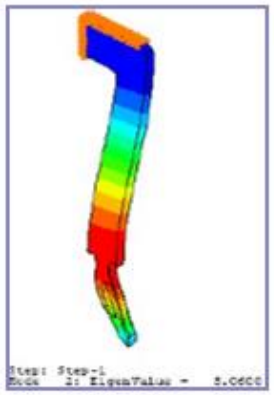


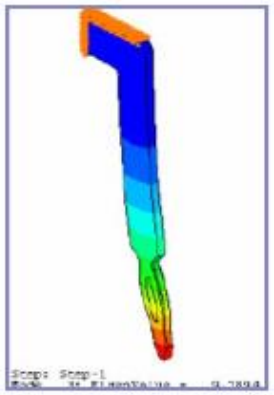
(Figure 1) (Figure 2) (Figure 3)

1. Designing to ensure that the insertion depth is below the upper edge of the internal press-fit guarantees that there will be no hard interference between the PCB and the base of the terminal (see Figure 3).
2. If the insertion depth is higher than the upper edge of the internal press-fit, it is necessary to ensure that the interference position is below the upper edge of the internal press-fit.

	Area
	Terminal Strength Zone

Basic Functions:	Providing the inherent strength of the terminal to prevent deformation during insertion.
Key Design Points:	While ensuring the retention force area is unaffected, it is advisable to maximize the width of the terminal base to prevent bending, breaking, or deformation during the insertion process.





	Advantage	Disadvantage
Phosphor Bronze CuSn4/C511 CuSn6/C519 CuSn8/C521	Strength level, fine crystallite, a low Young's modulus	Low electrical conductivity, and lower stress relaxation performance under high-temperature conditions (>100°C)
White Copper C7025 C19005/C19010	High strength, stress relaxation performance up to 150°C/1000h, and moderate conductivity	A high Young's modulus - depends on the loading direction
Chromium Zirconium copper C18150/C18160 C18400	High conductivity, stress relaxation performance up to 175°C/1000h, and moderate strength	Formability and electroplating performance

Pins come in various structures, with the ultimate goal being to manufacture pins with minimal insertion force and high retention force under conditions that are as easy to produce and cost-effective as possible.

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	 ATG103-0101BE	 ATG106-0122AB	 ATG107-01P4AB
Product Characteristics:	Material: Brass Manufacturing Process: Stamping Total Length: 24.2mm Contact Length: 7.5mm Contact Width: 0.63mm Thickness: 0.64mm Contact Thickness: 0.6mm Plating: Bottom Nickel 50-100µ", Full Tin 80-160µ" Rated Current: 3A Operating Temperature: -40°C to +105°C PCB Mounting: Solderless PCB Hole Diameter: ø1.02mm Packaging: Reel	Material: Phosphor Bronze Manufacturing Process: Stamping Total Length: 14.43mm Contact Length: 7.9mm Contact Width: 1.0mm Thickness: 0.64mm Plating: Bottom Nickel 50-100µ", Matte Tin 80-160µ" Rated Current: 3A Operating Temperature: -40°C to +105°C PCB Mounting: Solderless PCB Hole Diameter: ø1.02mm Packaging: Reel	Manufacturing Process: Stamping Total Length: 23.2mm Contact Length: 10.8mm Contact Width: 0.64mm Thickness: 0.64mm Contact Thickness: 0.63mm Plating: Bottom Nickel 50-100µ", Tin 40-80µ" Rated Current: 3A Operating Temperature: -40°C to +105°C PCB Mounting: Solderless PCB Hole Diameter: ø1.0mm Packaging: Reel
Application:	Automotive interior lights	Car mirror switch	Car mirror switch

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Product Characteristics:	Material: Phosphor Bronze Manufacturing Process: Stamping Total Length: 20.96mm Contact Length: 14.1mm Contact Width: 1.0mm Thickness: 0.64mm Plating: Bottom Nickel at contact end 8u", Min Matte Tin 40-120μ“ Rated Current: 3A Operating Temperature: -40°C to +105°C PCB Mounting: Solderless PCB Hole Diameter: ø1.35mm Packaging: Reel
Application:	Automotive

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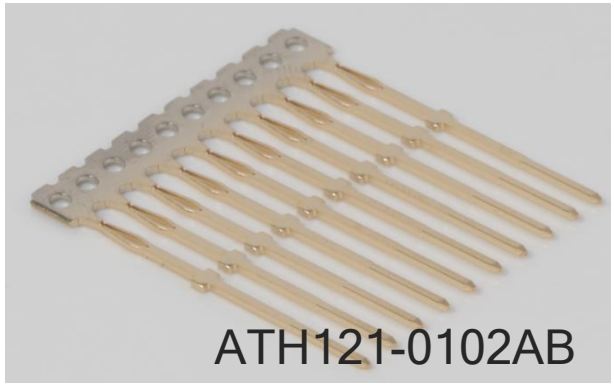

Product Characteristics:	Material: Phosphor Bronze Manufacturing Process: Stamping Total Length: 22.06mm Contact Length: 15.8mm Contact Width: 0.64mm Thickness: 0.64mm Plating: Bottom Nickel 50-100µ", Matte Tin 80-160µ" Rated Current: 3A Operating Temperature: -40°C to +105°C PCB Mounting: Solderless PCB Hole Diameter: ø1.02mm Packaging: Reel	Material: Phosphor Bronze Manufacturing Process: Stamping Total Length: 22.97mm Contact Length: 6.5mm Contact Width: 0.61mm Thickness: 0.64mm Plating: Bottom Nickel 50-100µ", Gold plating above 0.6µ" Rated Current: 3A Operating Temperature: -40°C to +105°C PCB Mounting: Solderless PCB Hole Diameter: ø1.05mm Packaging: Reel
Application:	Automotive instrument panel	Automotive radar system

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	ATZ219-01N9AB-R	ATZ305-01M7AB-R	ATZ603-0105AB
			
Product Characteristics:	Material: Phosphor Bronze Manufacturing Process: Stamping Total Length: 18.39mm Contact Length: 9mm Contact Width: 1.2mm Thickness: 0.6mm Plating: Bottom Nickel at contact end 40-120µ", Matte Tin 120-200µ" Rated Current: 3A Operating Temperature: -40˚C to +105˚C PCB Hole Diameter: ø1.02mm Packaging: Reel	Material: Phosphor Bronze Manufacturing Process: Stamping Total Length: 13.3mm Contact Length: 9mm Contact Width: 1.2mm Thickness: 0.6mm Plating: Bottom Nickel at contact end 40-120µ", Matte Tin 120-200µ" Rated Current: 3A Operating Temperature: -40˚C to +105˚C PCB Hole Diameter: ø1.02mm Packaging: Reel	Material: Phosphor Bronze Manufacturing Process: Stamping Total Length: 25.32mm Contact Length: 12.0mm Contact Width: 1.5mm Thickness: 0.8mm Plating: Bottom Nickel 50-100µ", Gold plating 0.6µ" at the contact area, Tin 80-160µ" in other areas Rated Current: 3A Operating Temperature: -40˚C to +105˚C PCB Hole Diameter: ø1.35mm Packaging: Reel
Application:	Automotive headlights	Automotive headlights	Automotive data signal system

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ATZ605-01K6PG

ATZ607-01K6PG

ATZ614-01T4AB-R

	ATZ605-01K6PG	ATZ607-01K6PG	ATZ614-01T4AB-R
Product Characteristics:	Material: High Conductivity Copper Manufacturing Process: Stamping Total Length: 21.85mm Contact Length: 6.5mm Contact Width: 0.5mm Thickness: 0.4mm Plating: Bottom Nickel 40-88µ", Matte Tin 60-120µ" Rated Current: 2A Operating Temperature: -40˚C to +105˚C PCB Hole Diameter: ø0.85mm Packaging: Reel	Material: Phosphor Bronze Manufacturing Process: Stamping Total Length: 24.82mm Contact Length: 6.7mm Contact Width: 0.63mm Thickness: 0.64mm Contact Thickness: 0.63mm Plating: Bottom Nickel 40-88µ", Matte Tin 60-120µ" Rated Current: 4A Operating Temperature: -40˚C to +105˚C PCB Hole Diameter: ø1.05mm Packaging: Reel	Material: Phosphor Bronze Manufacturing Process: Stamping Total Length: 13.4mm Thickness: 0.6mm Plating: Bottom Nickel 20-60µ", Tin Plating 120-200µ" Rated Current: 3A Operating Temperature: -40˚C to +105˚C PCB Hole Diameter: ø1.08mm Packaging: Bulk/Reel
Application:	Automotive infotainment system	Automotive battery management system	Automotive air conditioning motor

Product Characteristics:	Material: Phosphor Bronze Manufacturing Process: Stamping Total Length: 6.9mm Thickness: 0.6mm Plating: Bottom Nickel 20-60µ", Bright Tin 120-200µ" Rated Current: 3A Operating Temperature: -40°C to +105°C PCB Hole Diameter: ø1.08mm Packaging: Bulk/Reel
Application:	Automotive air conditioning motor

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Press-fit Terminals

Solderless Solution

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