

Spring Finger Contacts

The ultimate guide
to these tiny
pieces



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1

Spring finger contact : what is it ?

A **spring finger contact** is a small mechanical part (several mm) used to make **connection** or **grounding** on electronic projects.

These contacts are made to support **harsh** environment (humidity, temperature, and vibrations).

Spring finger contacts are a type of **connector** used to make electrical contact with a (PCB).

PCB spring finger contacts provide an easy, low-cost way to ground circuit board and to prevent **EMI noise** and static electricity on an electronic assembly.

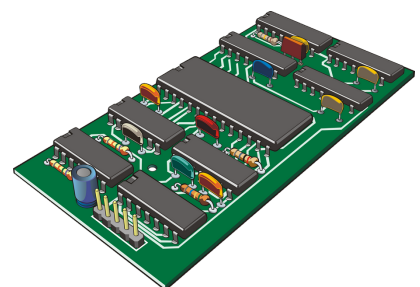


These spring parts are designed to make reliable **contact** between two PCB or from a PCB to the frame, in harsh conditions (vibration and humidity).

Spring fingers can be used both for grounding and connection purposes & come in a variety of different **shapes** and **sizes**.

Spring finger contacts are widely used on on-board electronic projects.

Especially for **automotive** projects (dashboard, headlight) but also on electrical bikes projects (**batteries** connection), **medical** applications (sensors) and **military** project (weapons or vehicles).



What is the composition of a Spring Finger Contact?

There are mainly 2 main types spring finger contacts : stainless steel & copper-beryllium



Copper Beryllium (CuBe)

Standard & most common material. This material is a kind of bronze.

- Excellent mechanical characteristics (>**300k** cycles)

- Good **thermal conductivity**

- Good **electric conductivity** (electrical resistance is few milliohms)

- Easy **forming**



Stainless Steel

Less common material.

- Lower mechanical characteristics than **Beryllium Copper** (CuBe)

- Lower electric conductivity

**Other metals and alloys
can be used**

However, not using standard material might lead to **higher costs** and **worst characteristics** (as electrical than mechanical characteristics).

That is why we recommended to use as much as possible Copper and Beryllium (CuBe) as **core material** for your spring finger contacts.

Inside & outside electroplating

Inside & outside electroplating insure that the contacts have a **high lifetime** (several tens of thousands cycles).

Inside Nickel treatment is mandatory & standard, on every contact (both standard & custom).

Ni (Nickel)

- Protect the inner core (CuBe) from **oxidation**

- Ensure a high adhesion force between the **electroplating layers** (with the optional gold electroplating for example)

- Withstand high friction level

- Good weldability on **PCB**

Other **surface electroplating** are available on demand (option).

They will reinforce the contact so that it can resist an even harsher environment. It also increases its **conductivity** & the **weldability**.

Here are some common outside electroplating :

Au (Gold)

- Higher resistivity to **bad** exterior environment (humidity, temperature)

- **Higher conductivity** (gold is a highly conductive material)

Sn (Tin)

- Good **weldability**

- Poor resistance to oxidation, especially in high humidity environment.

About Optional Surface Treatment

The spring finger contacts can be delivered without surface treatment on the outside (**Au/Gold plating**). Indeed, the price of the raw material (gold) is high and **volatile** comparing to the raw material CuBe (Copper Beryllium) used for the **core** of the spring contact

In some cases (depending on the volume and the design), the gold surface treatment can even **double** the cost of the spring finger contact.

Other metals and alloys can be used, on demand.

However, we recommended to use as much as possible Copper and Beryllium (CuBe) as core material for your spring finger contacts, for economical & technical reasons.

Thanks to their several dimensions & forms, there is a good chance that standard CuBe spring finger contacts will fit to your **projects** & needs.

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How a contact is made ?

The manufacturing of spring finger contacts starts with **metal strips** of several thousand of meters of Copper Beryllium (the raw material for the core of the spring contact). The **thickness** of the strip is 0.08mm or 0.1mm depending on the design of the spring finger contact.

Then this strip of material goes into a specific machine with tens of tools arranged in **circle**.

Each tool does a specific operation (a **blending**, a **cut**, or a **fold**) in a specific order.



After the different operations the spring finger contact has its final form. The next step is the **electroplating**.

Firstly, with Nickel (Ni), and if required, with gold (Au). Once the spring finger contact is electroplated, it is packaged on reel for assembly on **SMT** process (automatic assembly on PCB).

However the manufacturer is, the standard global lead time from order to delivery is **8 to 12 weeks** (if there is no stock). That is why you should anticipate as much as possible all of your electronic project using this kind of spring contact.

Series production of these spring finger contact requires a mass production **tooling**. For standard parts, there are no tooling costs (as the tool is already existing).

Custom-made spring finger contacts

For customized spring finger contacts, manufacturers usually ask for a cost participation, for the tooling mainly.

As for the **prototyping**, you can ask for a few pieces as samples, without paying any serie tooling cost.

In that case, a temporary tooling (or soft tooling) is used. It allows the manufacturer to create a couple of pieces without additional costs from big tooling. However, the unitary cost will be higher, as soft tooling efficiency is limited, from a mass production point of view.

3

Which application ?



Why are used the spring finger contacts (SMT) ?

Spring finger contacts are the perfect way to make low voltage electrical **connections** in all types of small, printed circuit board (PCB) applications.

They are easy to use. Spring finger contacts can be used for antenna feeds, **grounding**, or preventing EMI noise and static electricity.

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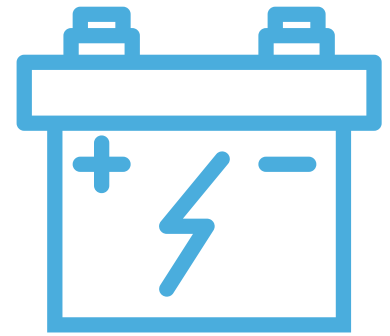
Which application ?

Examples of use cases

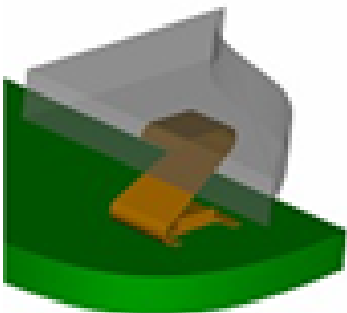
Power Connector

Battery contact :

- For Electric Bikes,
- Consumer Equipment (Electrical Household Equipment),
- Camera (Digital Still, On-Board Equipment, Drone),
- Cellular Phone



Grounding :



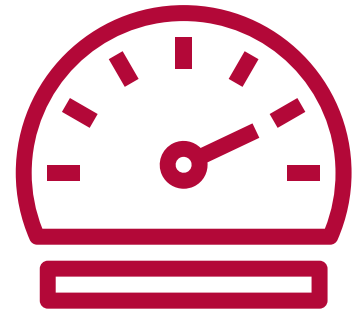
- Contact between **PCBs**,
- Contact between PCB and Frame

3

Which application ?

Vibration Proof Connection:

- Automotive Dashboard
- On-Board Equipment.



Signal Connector

Antenna Spring Connection :



- Cellular Phone Antenna
- GPS Antenna
- Automotive Antenna

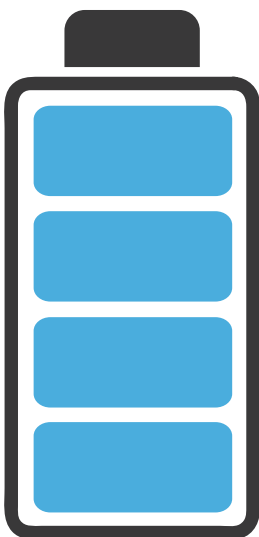
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Which application ?

Mechanical Connector

Vibration Proof Connector:

- Automotive Equipment
- Military Project and Weapon Equipment
- Aeronautic Equipment and Sensors



Plug And Play Setup :

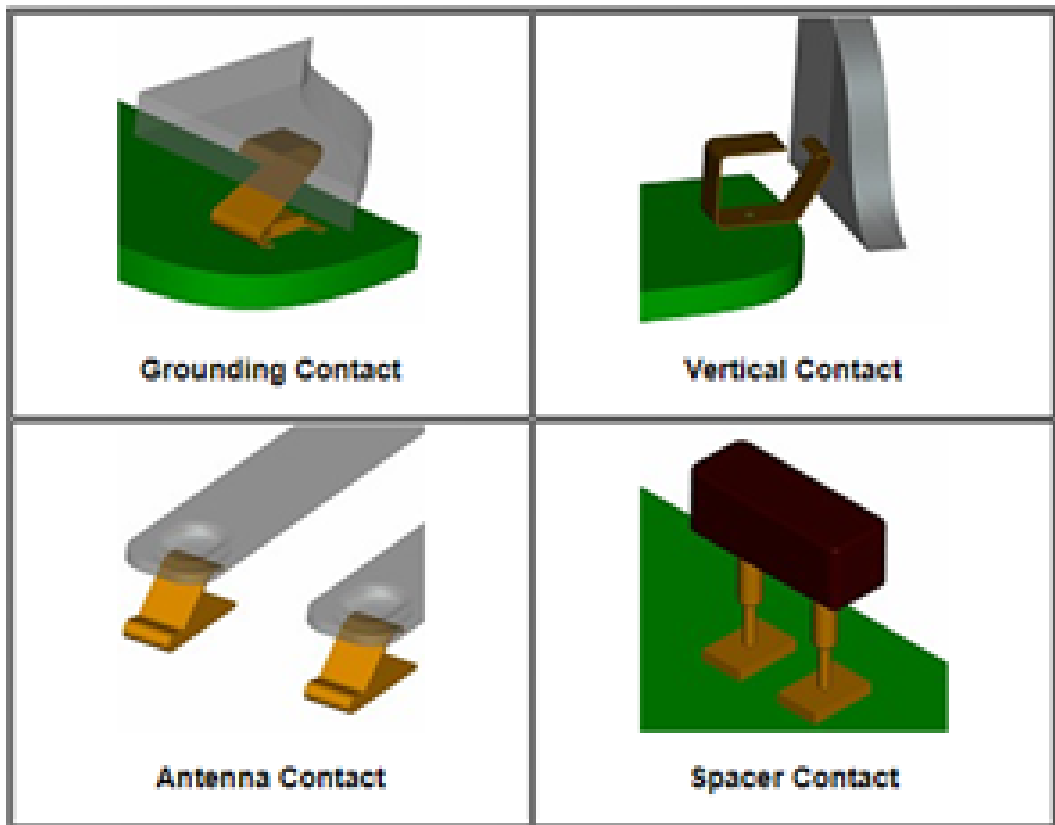
- Modular Connection
- Battery Connection
- Wire Clampers

3

Which application ?

How are spring finger contacts used?

Spring finger contacts can be used on different setup and **configurations**. Depending on the shape and the design of the spring contact, the electrical contact is made vertically or laterally on the PCB.



3

Which application ?

How are spring finger contacts used?

These kinds of spring finger contacts can handle over **300 000** compression cycles.

The standard, recommended compression rate is between 10% and 30%.

The maximum recommended compression rate is **40%**. It means that for a 10mm height spring finger contact; the recommended maximum compressed height is 6mm.

Over 40% compression the spring finger contact might be definitively deformed. So, you will lose the spring effect of this contact and the electrical contact might be lost.

3

Which application ?

Spring finger contact compression rate table example

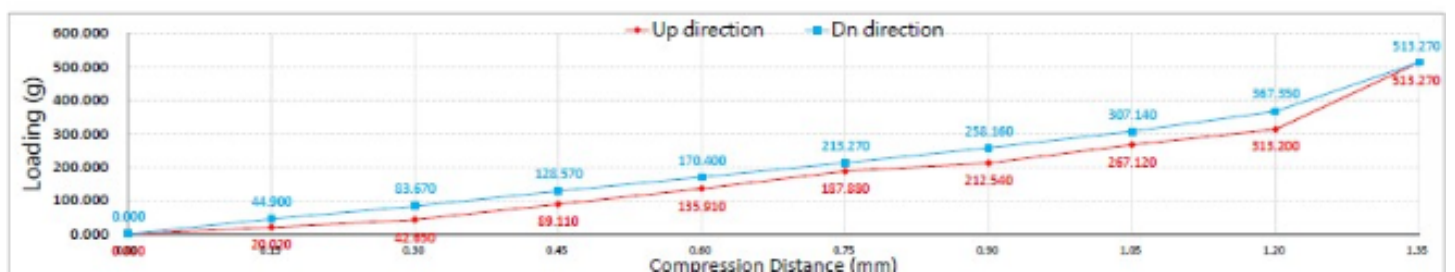
Date : 20130429

Part no : OTG 20600408

Material : BeCu

Test equipment : Compression ratio tester

Total Compression Distance(mm)	1.35	
Displacement (mm)	Loading force(g) Down direction	Loading force(g) UP direction
0.000	0.000	0.000
0.150	44.900	20.020
0.300	83.670	42.650
0.450	128.570	89.110
0.600	170.400	135.910
0.750	213.270	187.880
0.900	258.160	212.540
1.050	307.140	267.120
1.200	367.350	313.200
1.350	513.270	513.270



3

Which application ?

Spring finger contacts are made to be surface mounted (SMT).

That is why you can see on the internet these parts named: SMT spring finger contacts (SMT: Surface Mounted Technology). To permit **SMT** process assembly (automatic assembly on PCB), the spring finger contacts are packaged on reel.

There are **2 standard sizes** of reel for these spring contacts: 7" or 13" diameter. The size of the reel and the number of spring contacts on each, depends on the size of the spring finger contacts packaged.

It starts from **500 contacts/reel** for the biggest spring contacts, to 5 500 contacts/reel for the smaller ones.

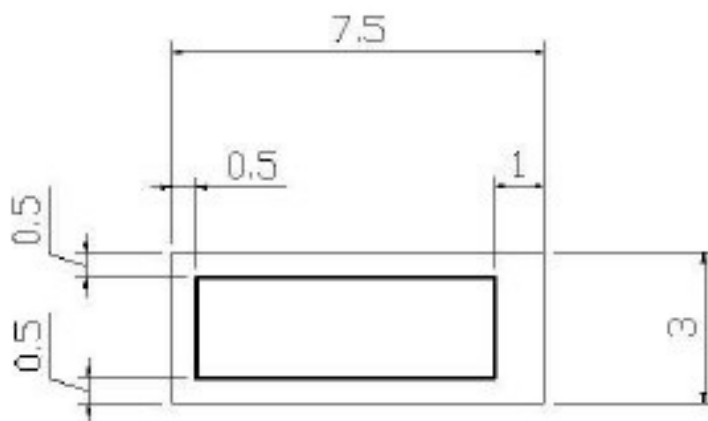
3

Which application ?

For prototyping steps, these spring finger contacts can be delivered on bulk packaging.

That way, you can manually test different designs of spring finger contacts.

For each spring finger contact, there is a recommended PCB **layout**. In main cases it is at least 0.5mm much than the base of the spring finger contact.



PCB Layout Recommend

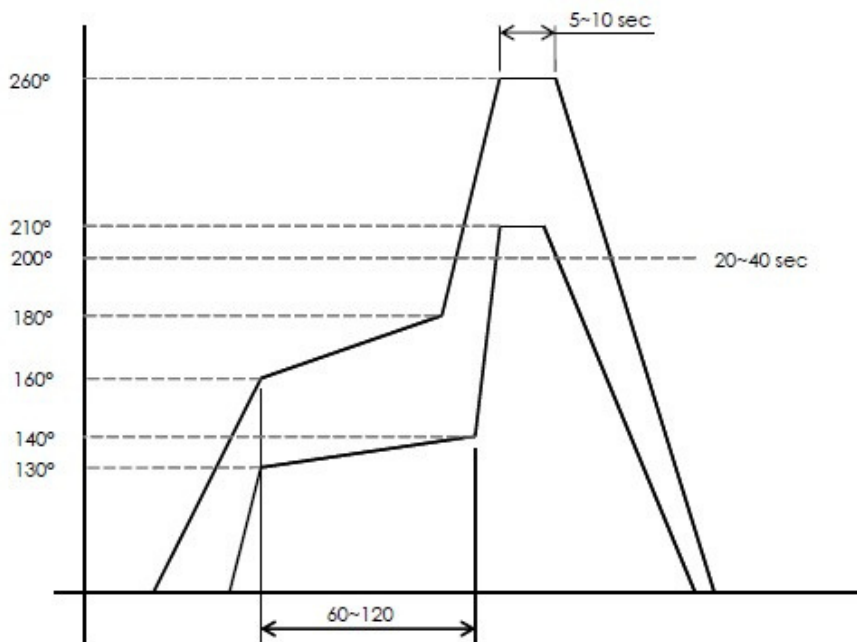
3

Which application ?

Once on the PCB, the spring finger contact are welded, following a specific temperature and speed process.

This process is detailed on the datasheet of each spring finger contact.

The **Nickel** contained on surface of the spring finger contact makes welding easier. You can use standard welding material (as Copper and Tin alloys).



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Certification & controle

That is why site production are certified **IATF16949** (strict automotive norm) and processes are certified **ISO 9001**.



Final spring contacts are compliant to **RoHS** and **Reach** norms.

Compression Tester



2D Auto Inspection System

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Conclusion



Spring finger contacts are an alternative to **EMI Gaskets** (Loaded Silicone or Metallic Gaskets) for EMI shielding and grounding.

These spring finger contacts are also used as connectors.

Spring finger contacts are developed for highly efficient manufacturing process. Indeed, these contacts are SMT friendly and packaged on reels.

Most of the spring finger contacts (SMT) are manufacturing in **CuBe** (Beryllium Copper), Au (**Gold**) electroplated outside, and Ni (**Nickel**) electroplated inside.

These surface treatments on the spring finger contacts have a lot advantages.

Design of the spring finger contact can be standard, or custom-made following your specifications.



**You want to discuss about how
to put these contacts within
your projects ?**

I send a mail

I go on the chat