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金于质 升于智 阳于志

Peripheral Devices Selection

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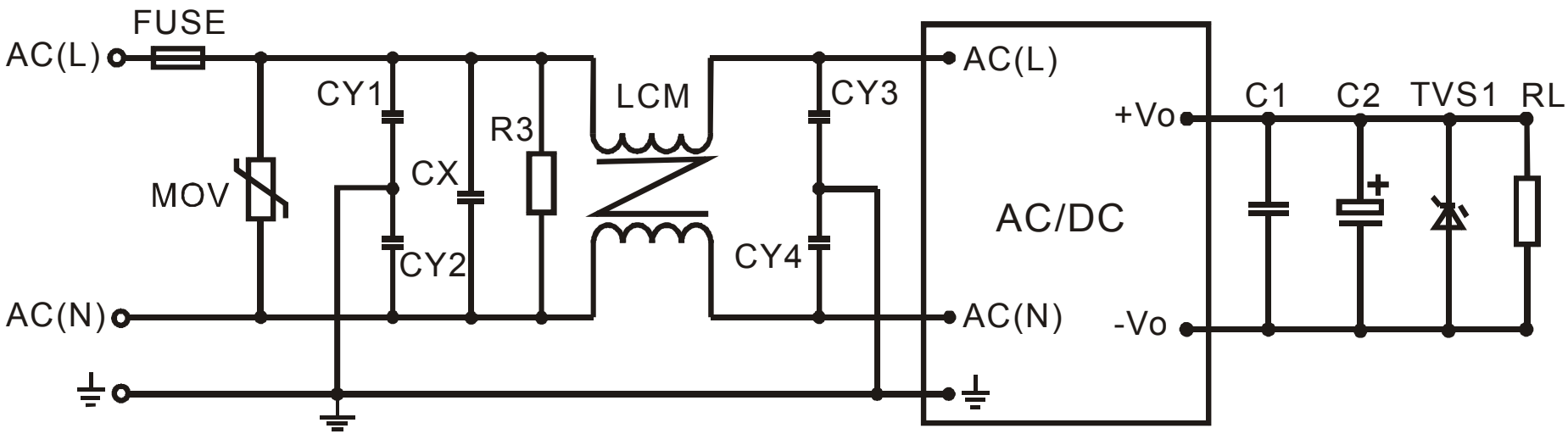
- The addition of the peripheral circuit can help to improve the life of the power supply, provide better protection circuit and better immunity capability.

  - Which are the peripheral devices?



Why focus on the peripheral devices

➢Peripheral devices and our life

- ◆ Vehicle refitting caused higher vehicle safety risk
- ◆ Glass films reduces the transmittance of the glass
- ◆ High power audio amplifier shorten battery life

➢The switching power supply experiences similar problems

Charger

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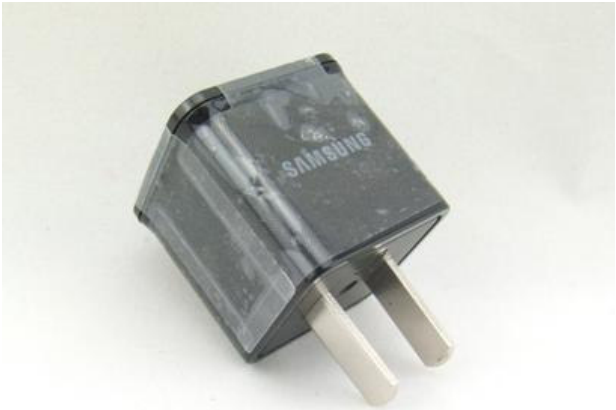

Discuss the peripheral devices

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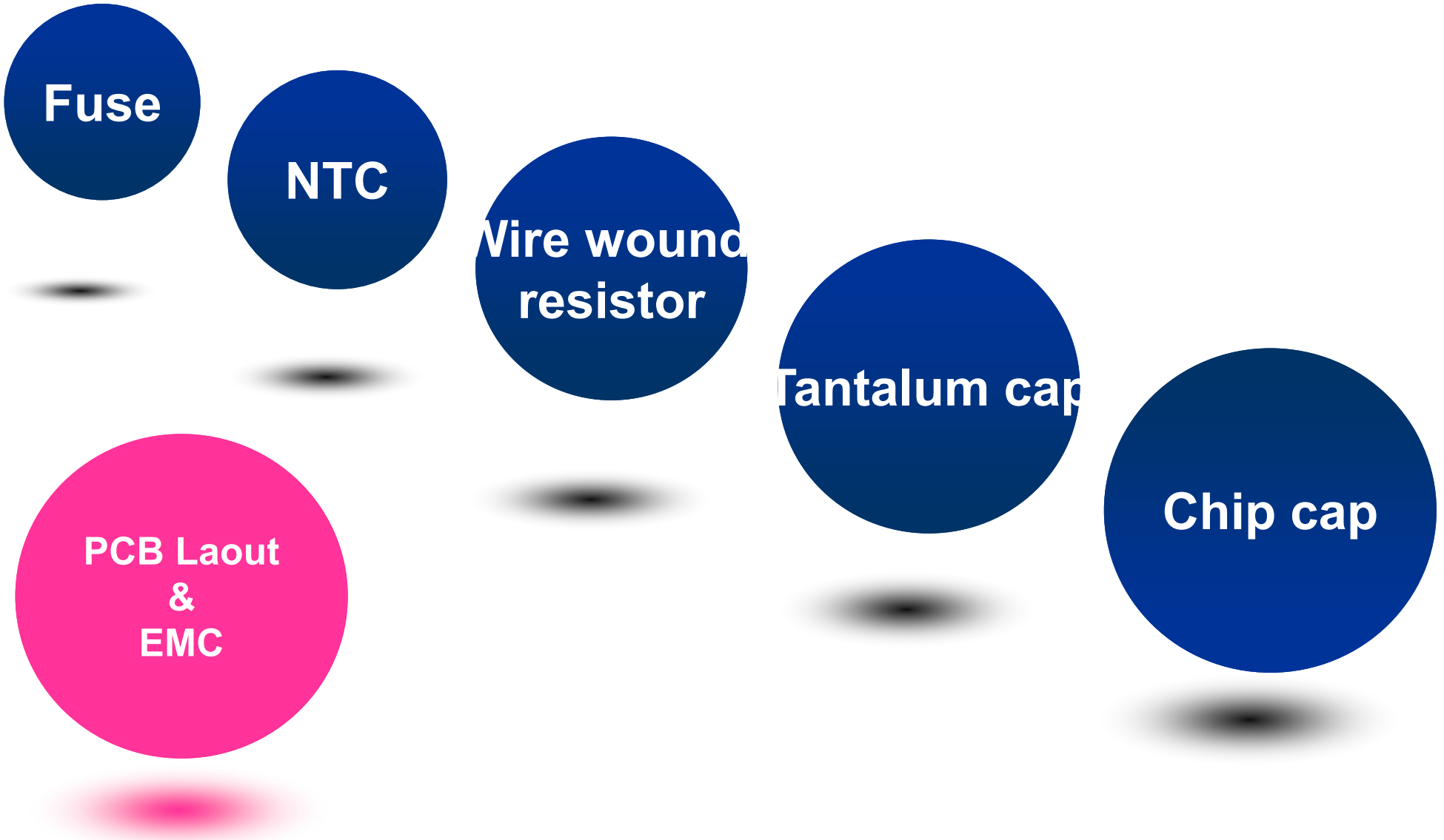

Fuse

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fuse is a kind of resistor

Fuse also called electric current fuse, originally made of Lead and lead-antimony alloy. However, this type of fuse is retired due to security concern.

Fuse

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Classification by the blowing time:

- Hyper slow blowing fuse(indicated by “TT”)
- Slow blowing fuse(indicated by “T”)
- Medium speed blowing fuse(indicated by “M”)
- Fast blowing fuse(indicated by “F”)
- Hyper fast blowing fuse(indicated by ”FF”)

Current	Blowing time
210%	2 min Max
275%	400mS~10S
400%	150mS~3S
1000%	20mS~150mS

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- Resettable fuse:

  Not suggest to use,

  Because the fuse cannot be disconnected completely and it retains current, especially for low-voltage DC and high current situation.

We always neglected, and there is misunderstand that when it said "cut off" it is dis-connected,

However it is like to an infinite resistance of which withstand voltage is infinite high.

Fuse

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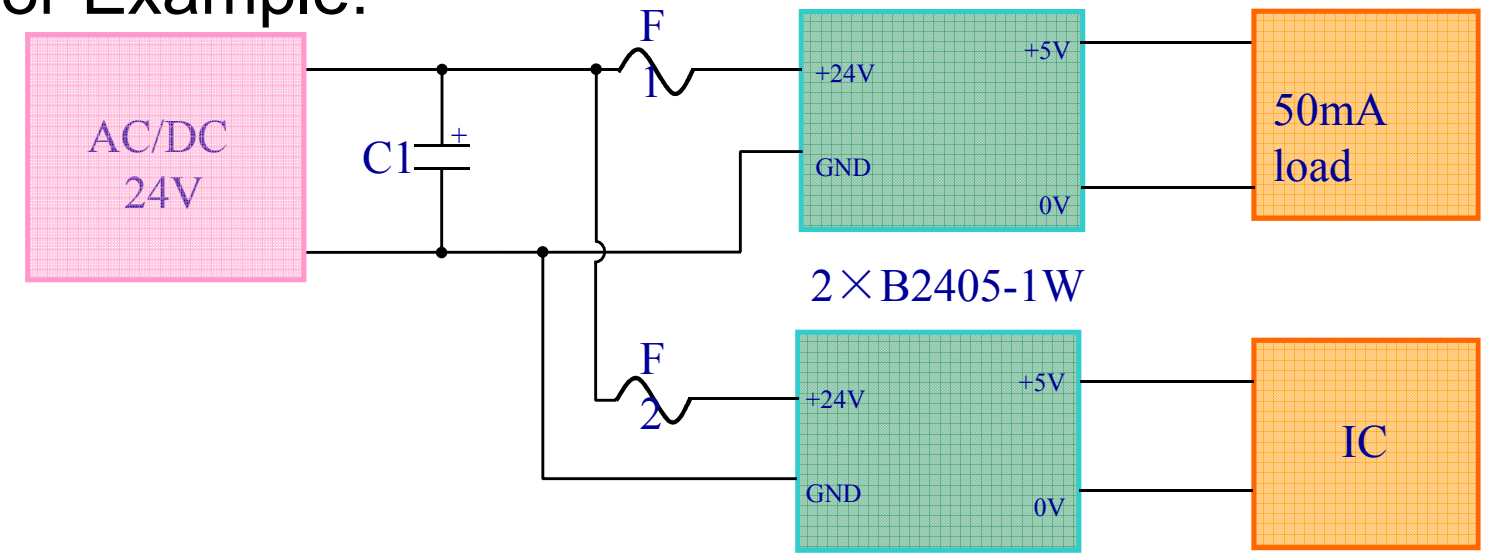
❖ For Example:



The DC/DC outputs 5V/200mA, the feedback to input is only 57mA, with the fuse holding current of 32mA, which might activate the DC/DC to output 112mA.

Under short circuit current of 1A, it took 12 seconds for the resettable fuse to react, by then the DC-DC will burnt.

Solution:

1. Use lower protective current fuse (that has high insertion loss);
2. Use electrical fuse;
3. Use Mornsun DC/DC module with short circuit protection.

NTC

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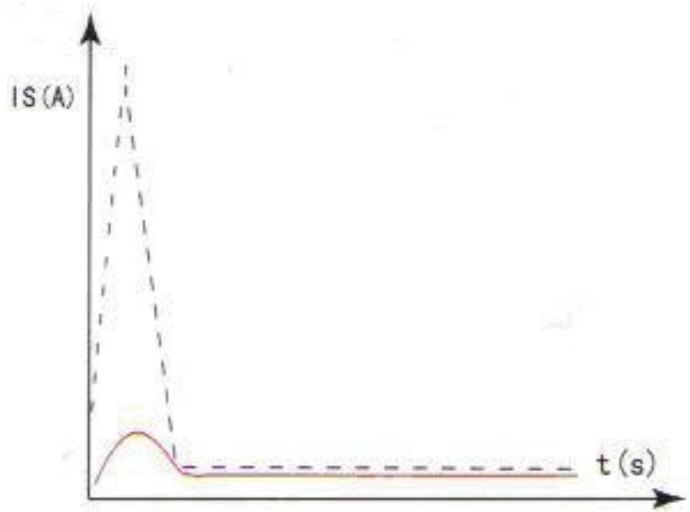
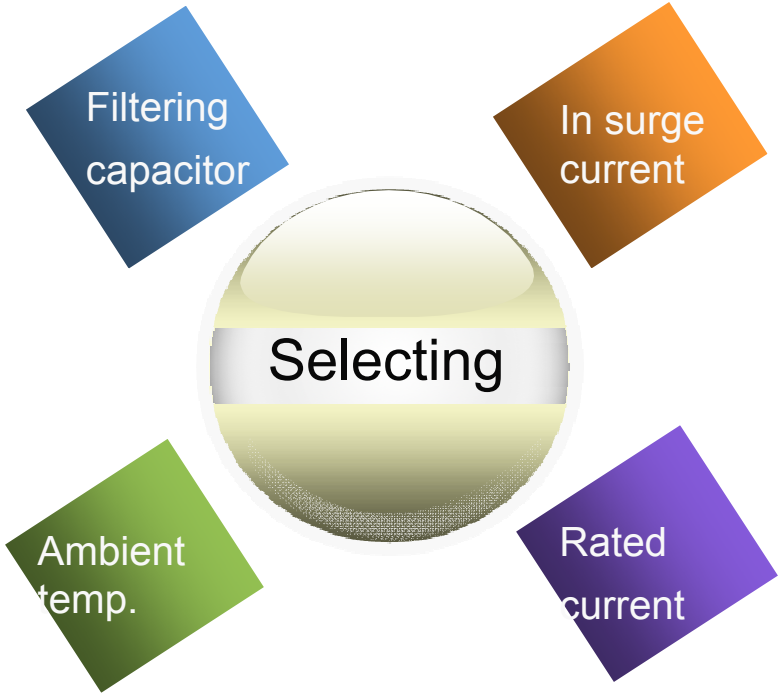
NTC Its resistance drops when the operating temperature increases.

Silk screen NTC 5D-13



NTC parameters



NTC's position in the circuit

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1. **NTC placed behind varistor?**
   Yes. The inrush current will be small by this way.

2. **Pin out length ? Long pin out**

3. **Be away from heat source? Yes**

Wind wound Resistor

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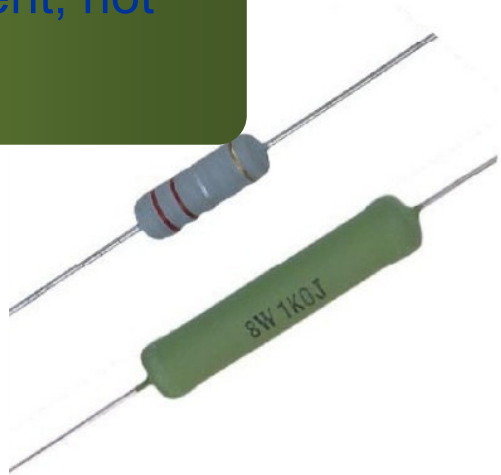
Wind wound resistor

- **Material** → Made by nickel-chromium wire, manganese copper wire or constantan wire
- **Power de-rating** → Below 25% rated power, special resistance for transient excess power use
- **Features** → High inductance coefficient, not suitable to use in high frequency circuit.

Not suitable to cross NTC



Tantalum capacitor

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MnO2 tantalum capacitor

Tantalum polymer capacitor

Tantalum capacitor

High accuracy, good filtration performance for high frequency harmonic, self-healing

Tantalum capacitor

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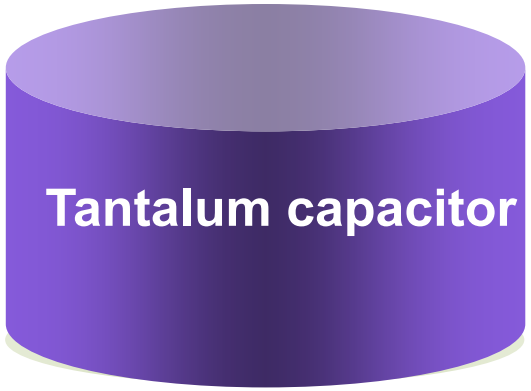
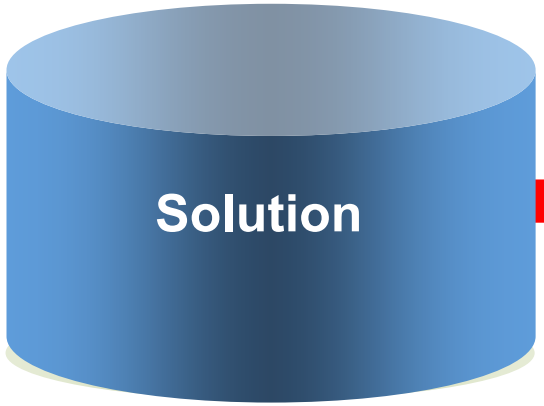


Tantalum considered as industrial “timebomb”.

1. short service life;
2. flammable;
3. easily goes in dormant state after power on (not easy to exit short circuit state. Once exit, the cap functions normally);



Choose leading brand, reliable agents as supplier;

Avoid applying inverse voltage to the tantalum capacitor, even it is an connection with multimeter, the capacitor should be scrapped.

When possible, do not use tantalum capacitors (we had issues before);

SMD capacitor as alternative to tantalum capacitor.

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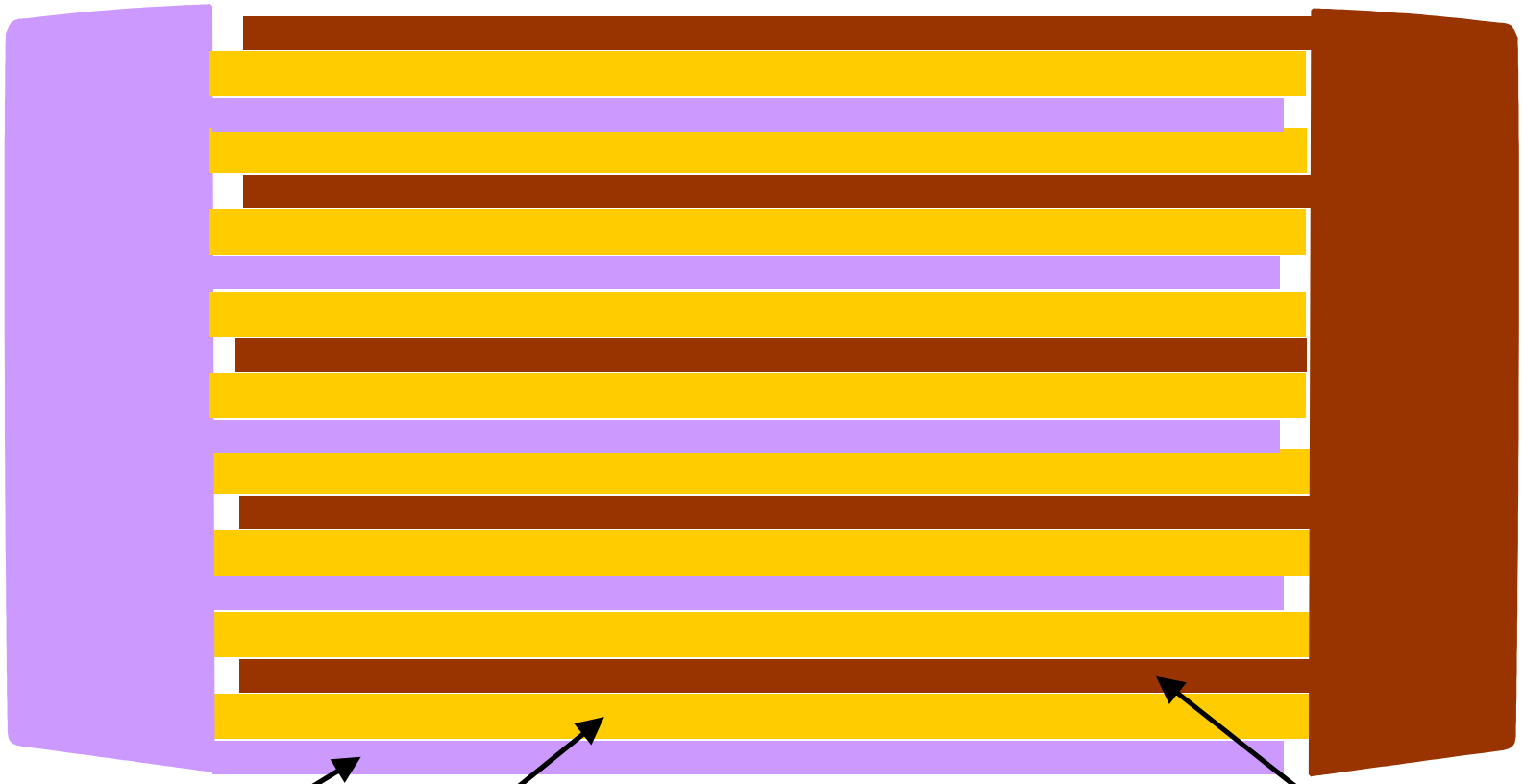
Ceramic cap internal Structure



Ceramic capacitor

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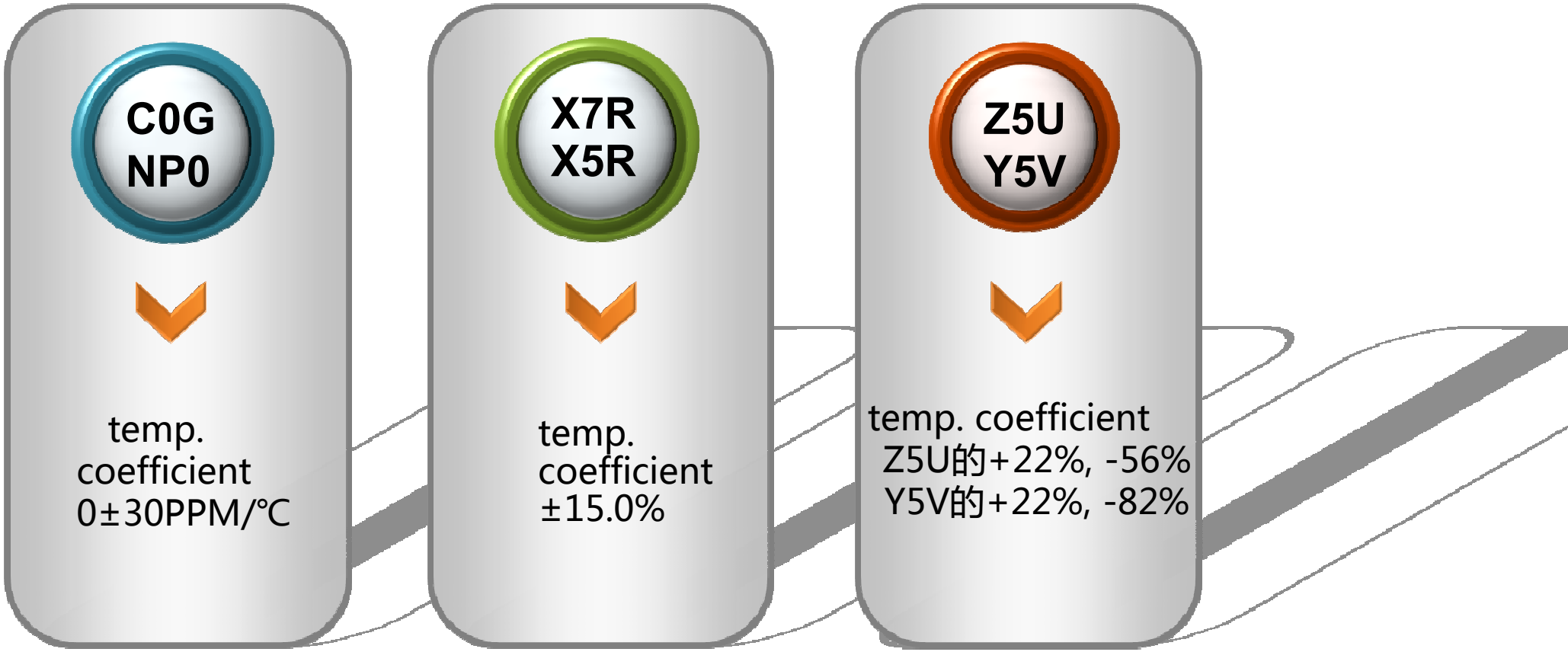
Selecting the right material



Ceramic capacitor

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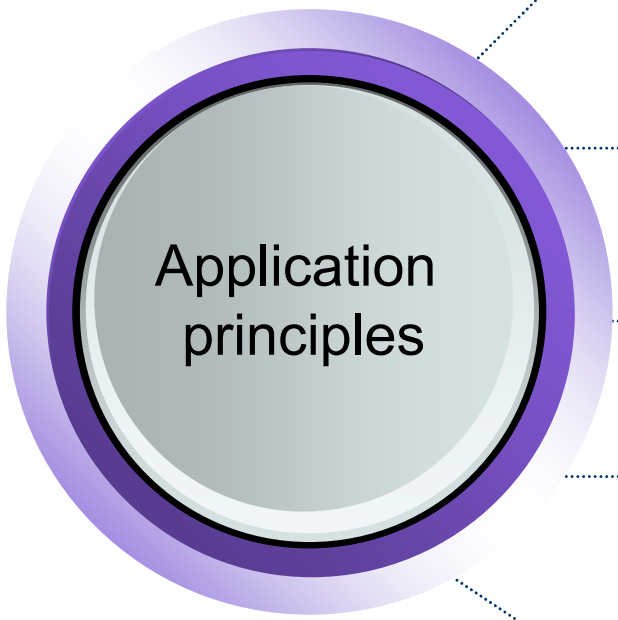
Rule of thumb when using ceramic capacitor



- Make sure both terminal rest evenly on the solder pad And have sufficient solder
- Solder pad start away from each other. Do not have big solder pad.
- Prohibit to mount the capacitor at 90° of axial direction
- Choose 1206 SMD capacitor with thickness larger then 0.8mm.
- Avoid touch up or hand soldering of ceramic Cap for size smaller than 0603.

Ceramic capacitor

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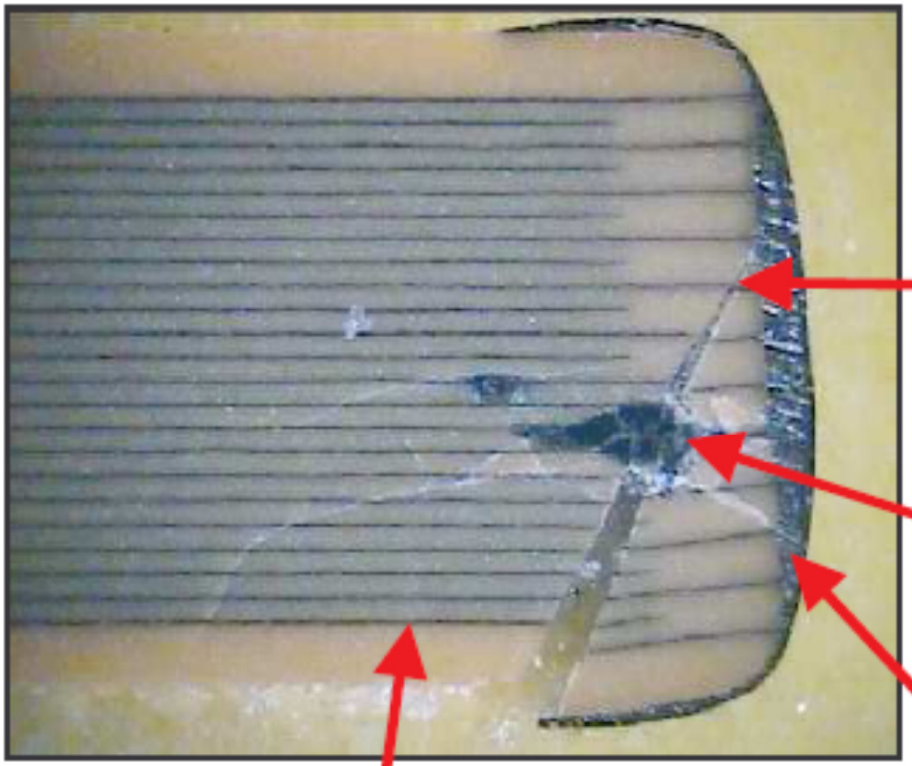
Ceramic capacitor malfunction



Mechanical crack

Electrical failure site

Termination material

Electrodes

Ceramic capacitor

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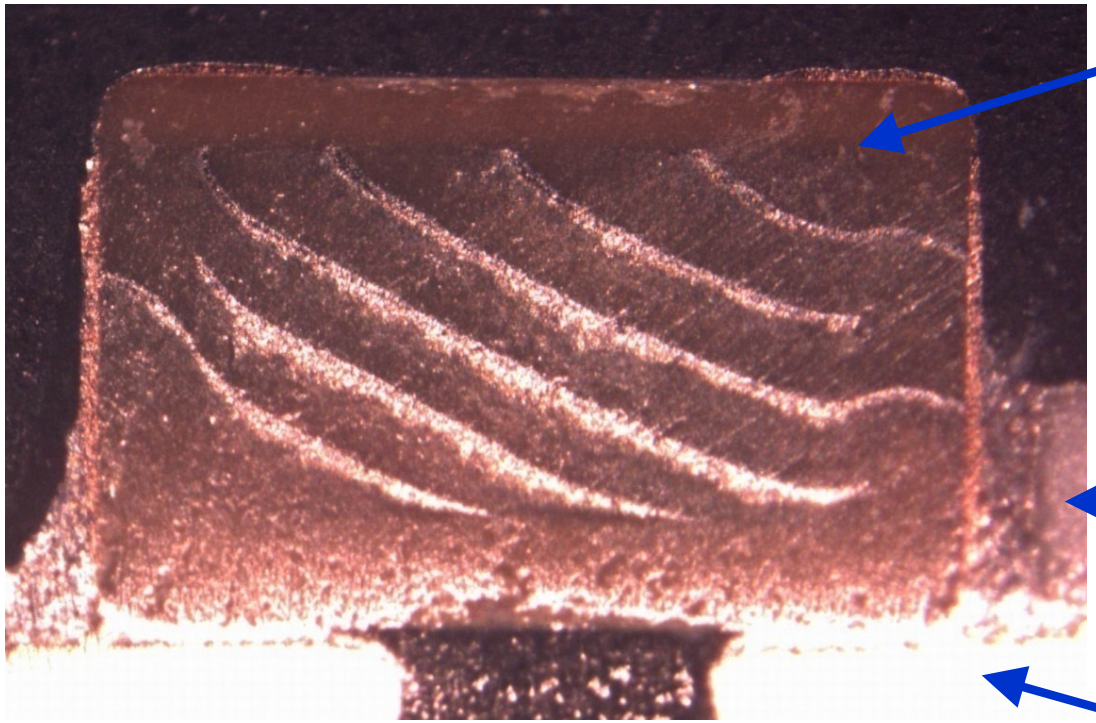
Failure due to rotating 90° in axial direction



The cross section shows the rotating trace, and continuous paste (Material, repair welding)

Getting too close to the resistance, the cap cracks due to squesszing.

PCB

PCB Layout

1. The PCB trace brings distributed capacitor and distributed inductance.
2. We are making it too ideal when doing PCB layout.

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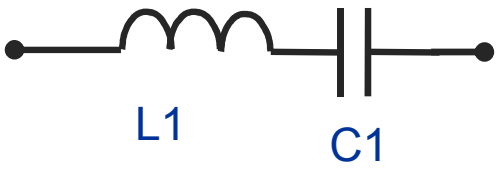
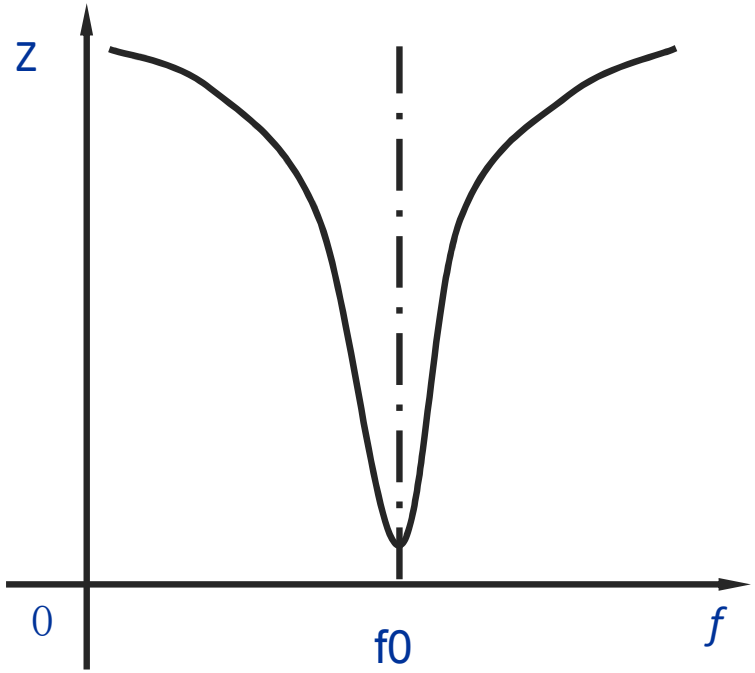
Series resonance





At the resonant frequency, the circuit shows low impedance.

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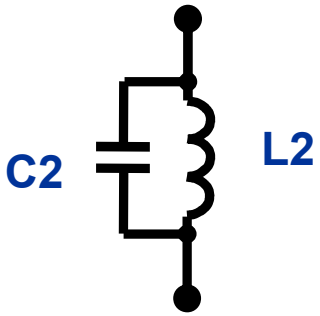
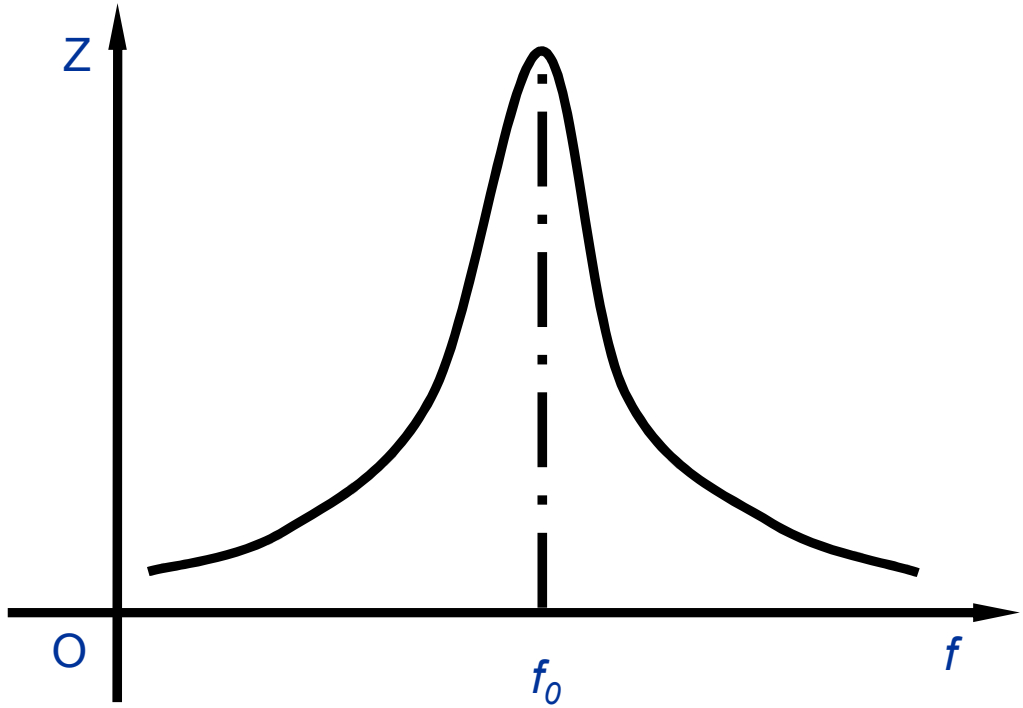
Parallel resonance





At the resonant frequency, the circuit shows high impedance.

Lead wire

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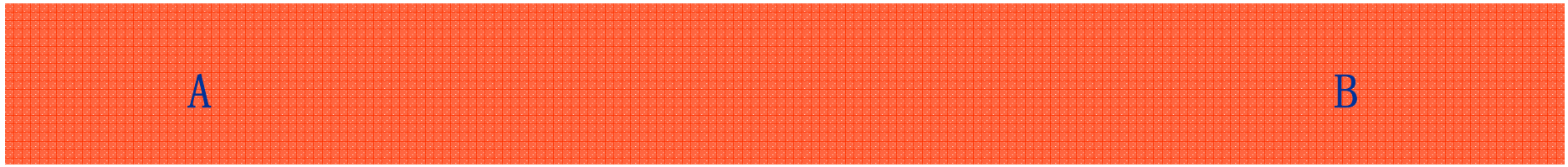
Layout parameters



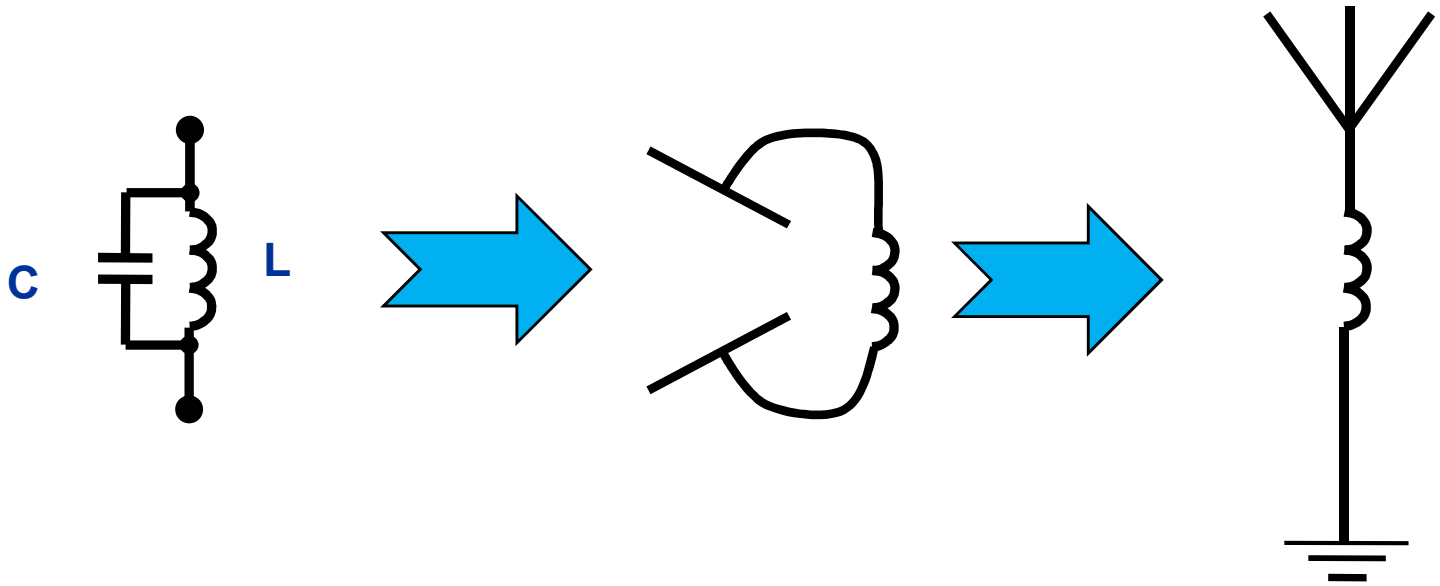
Cut off the connection between A and B will brings in capacitance;

Join them together, the capacitance doesn't disappear;

There is also inductance existed between them, so it has self-resonant frequency.

Lead wire

Antenna emission



For open-ended antenna, the emission frequency is high and its loop area is large.

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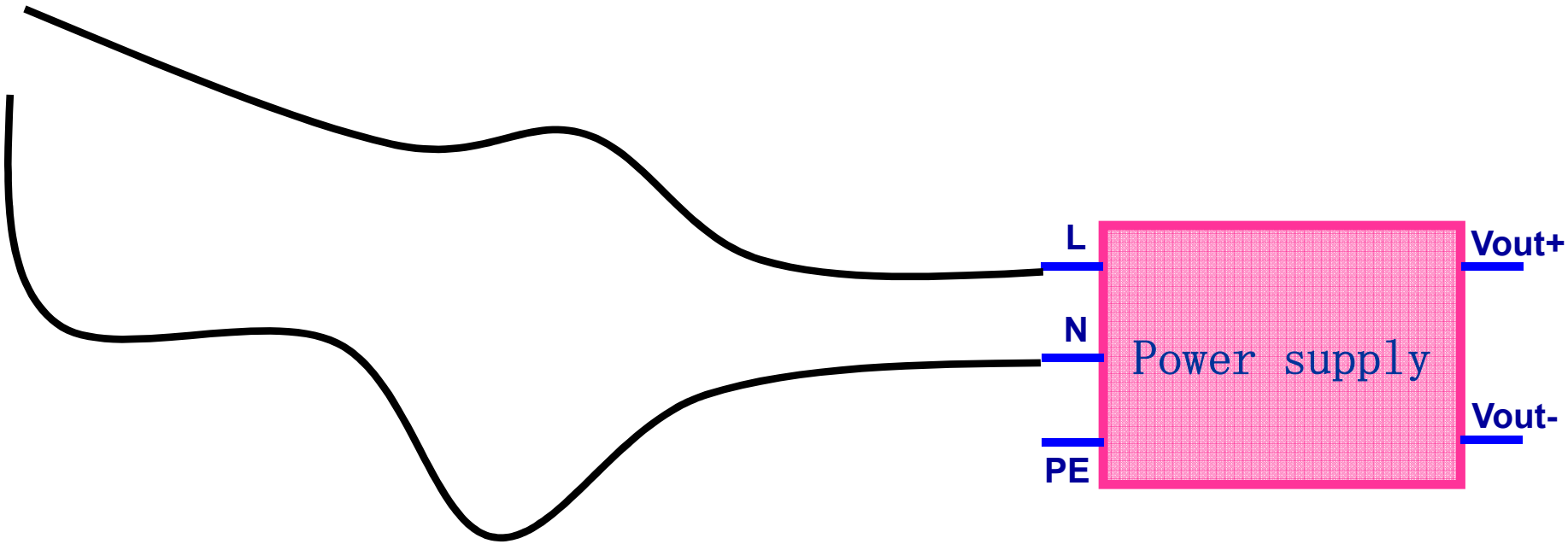
Antenna emission

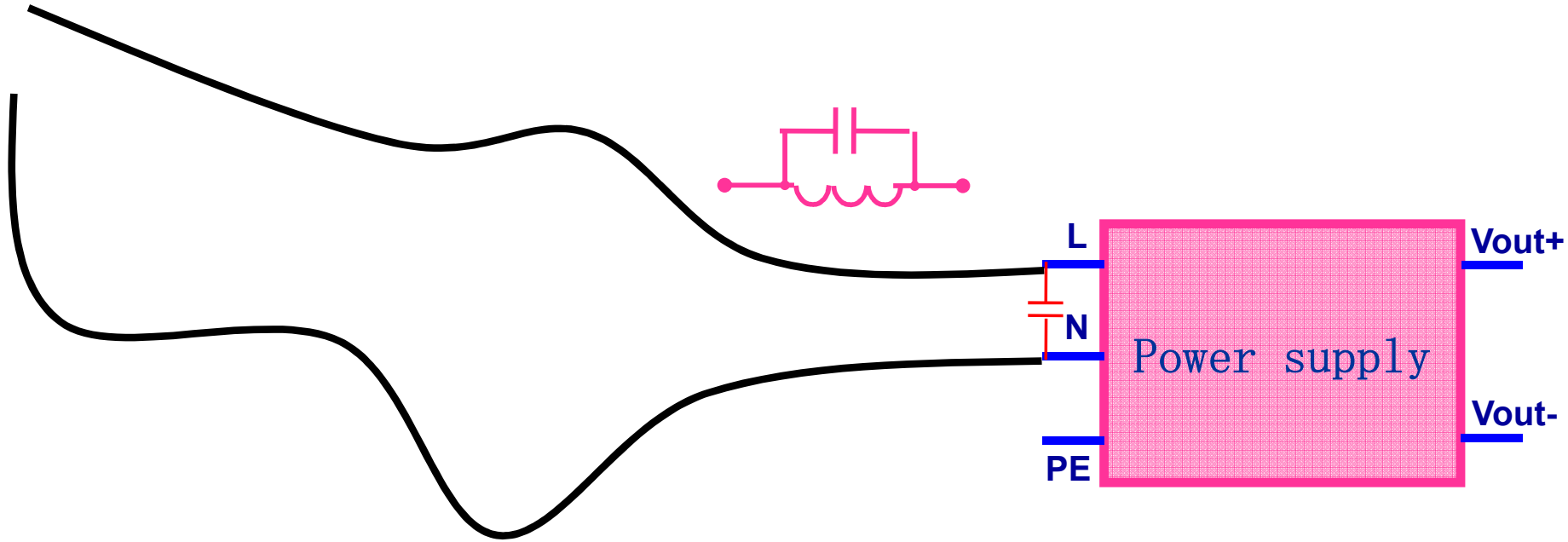
L and N act as an emission antenna.



Lead wire

Emission absorption

1. Shrink the loop area. To make it as closer as possible, as long as the module meet the isolation requirement ;
2. Add absorption loop between L and N, e.g. cap., series resonance circuit;
3. Connect an inductance in series to the loop, or connect LC to the loop (of which the filtering effect is more specific to the certain point);



Thank you !