

Shields for Current Sensing Applications

Concepts for Mechanical Attachment and Assembly

1. Introduction

1.1 Scope

This application note explains the basics of mechanical shield attachment and the relationship between magnetic properties and mechanical stress.

It contains guidelines and examples of how ferromagnetic shields are crimped or screwed directly onto the current conductor.

1.2 Ferromagnetic Properties versus Mechanical Stress

Soft Magnetic Materials feature superior characteristics, i.e., very low hysteresis and high linearity which is achieved after applying a high temperature annealing process.

The remnant field effect (hysteresis) is subjected to mechanical stress applied to the material. Therefore, special care has to be taken for the assembly of the shield.

2. Attachment Guidelines

The ferromagnetic part that is involved in the measurement should not be subjected to mechanical stress during the assembly.

On the other hand, the ferromagnetic part that is not involved in the magnetic measuring circuit can be exposed to mechanical stress. Therefore this part is preferably used for crimping or screwing.

The part of the shield not involved in the magnetic measurement is usually located far from the sensitive area.

3. Attachment Example: Bonding the Shield to the Busbar

The shield is attached to the busbar with glue and/or mechanically aligned with slit-holes in the PCB.

Special care has to be taken, so that during assembly the shield is not bent and that no mechanical stress is applied to the shield at low and high temperature.

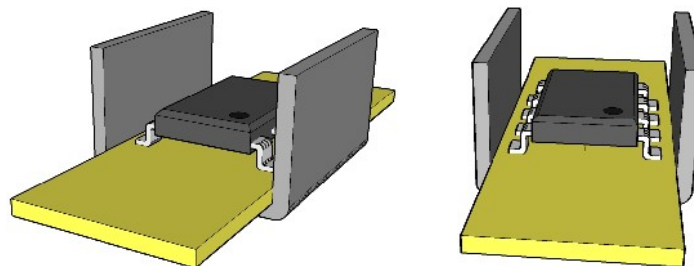


Fig. 1) Typical current sensing application based on a current conductor (rectangular busbar), an U-shape magnetic shield and a magnetic field sensor. (The PCB with slit holes is not shown.)

4. Attachment Example: Crimping the Shield onto the Busbar

The center part conducts the magnetic field generated by current. This field is measured by the sensor and therefore the center part of the shield must not be subjected to mechanical stress.

Whereas the part at the edge of the shield can be used for crimping the shield directly onto the busbar or PCB.

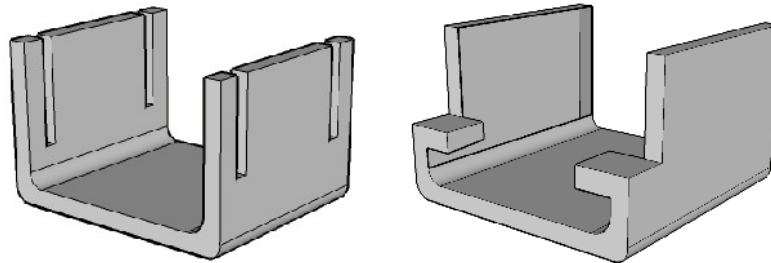


Fig. 2) The U-shape shield can be slotted as shown in the left picture. This edge can be bent and directly crimped on the conductor as shown in the right picture.

Note that crimping can take place on the one or on both sides of the shield.

5. Attachment Example: Screwing the Shield onto the Busbar

The center part should, again, not be subjected to mechanical stress since it conducts the magnetic field generated by the current. This field is measured by the sensor.

On the other hand it is possible to foresee screwing terminals or holes at the edge of the shield.

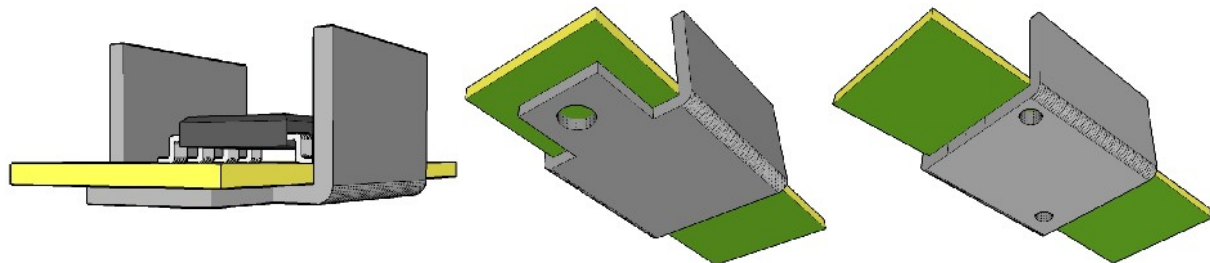


Fig. 3) On the left and middle picture a shield with an additional ear to be used for the attachment is shown. Another way is to foresee rather small holes (i.e. diameter = 2mm) as presented in the right picture.

Contact Information:

maglab GmbH
www.maglab.ch , info@maglab.ch
 Phone: +41 61 261 16 46