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# Development Kit
## MLX91206
**REV002 – 2011**

## *1 Description*

The development kit provides the needed information and components to develop a current sensor based on the MLX91206. The main goal is to show the functionalities and the features of the part in a simple and effective way.

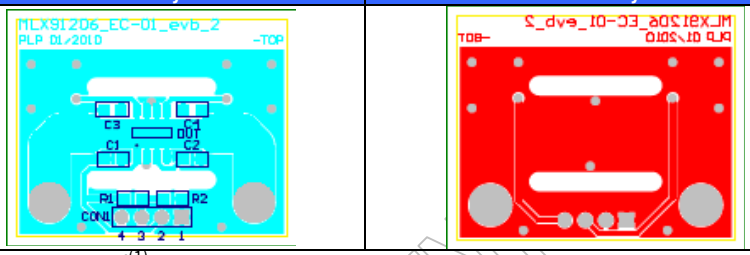
The kit includes:

- 1 MLX91206CAL mounted on PCB_EC01
- 1 MLX91206CAL mounted on PCB_EC02
- 1 separate MLX91206CAL
- 3 separate MLX91206CAHs
- 1 separate PCB_EC01
- 1 separate PCB_EC02
- 2 shields U_12

The kit does not include a bus bar.
Datasheet and Application Note can be found on www.melexis.com

## *2 Specification of EC-01*

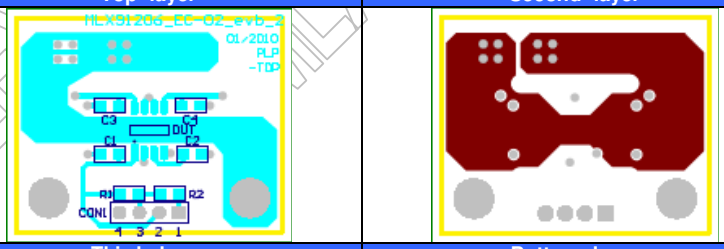
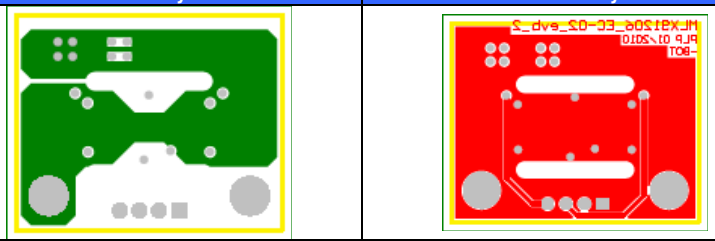
The included PCB utilizes PCB traces for medium current range measurements.

| | |
|---|---|
| Layer: | Two layer with copper thickness 105µm<br>The top layer is a conductor<br>The bottom layer is an expanded ground layer |
| | **TOP- layer** / **Bottom- layer**<br>  |
| Current: | We recommend(1):<br>MAX 30A RMS for PCB application<br>MAX 1kA for Bus bar application |
| Dimension [l/b/h]: | 36.8mm x 30.5mm x 1.6mm |

(1): The maximum current is limited by the PCB. For higher currents (> 30A), one can use an external conductor (i.e. a bus bar).

## *3 Specification of EC-02*

The included PCB is based on PCB loops for small current range measurements.

| | |
|---|---|
| Layer: | Four layers,<br>Top- and Bottom- layer with copper thickness 105µm,<br>Second- and the Third- layer with copper thickness 35µm<br>Three loops are on the PCB |
| | **Top- layer** / **Second- layer**<br>  <br>**Third - layer** / **Bottom- layer**<br>  |
| Current: | We recommend(1):<br>MAX 30A RMS for PCB application<br>MAX 1kA for Bus bar application |
| Dimension [l/b/h]: | 36.8mm x 30.5mm x 2mm |

(1): The maximum current is limited by the PCB. For higher currents (> 30A), one can use an external conductor (i.e. a bus bar).

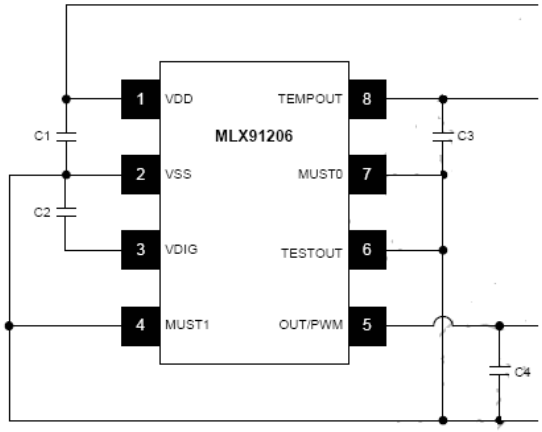
## 4 Details about the "multi-turn" concept

The purpose of the EC-02 and EC-03 PCBs is to offer a "coil-like" design, which acts as 3 windings (or 6 in the EC-03 case), in order to increase the sensitivity of the sensor. The PCB consists in 3 layers: top, second and third. This design allows the current flowing 3 times (6 times with the EC-03) below the sensor, increasing the field (and the sensitivity) as with a coil.

## 5 Sensor sensitivity

| Product Code | Ordering Option Code | Sensitivity Range (Typ.) |
|---|---|---|
| MLX91206 | CAL-001 | 460-700mV/mT (580mV/mT) |
| MLX91206 | CAL-002 | 300-470mV/mT (380mV/mT) |
| MLX91206 | CAL-003 | 200-310mV/mT (250mV/mT) |
| MLX91206 | CAH-001 | 210-330mV/mT (270mV/mT) |
| MLX91206 | CAH-002 | 130-220mV/mT (170mV/mT) |
| MLX91206 | CAH-003 | 80-140mV/mT (110mV/mT) |
| MLX91206 | CAH-004 | 60-110mV/mT (77.5mV/mT) |

## 6 Schematic




| | |
|---|---|
| DUT: | MLX91206 |
| C1 | 100 nF |
| C2 | 100 nF |
| C3 | 10 nF |
| C4 | 10 nF |

| | |
|---|---|
| VDD: | pos. supply voltage |
| VSS: | supply common |
| OUT/PWM: | analog sensor output |
| TEMPOUT: | temperature output |

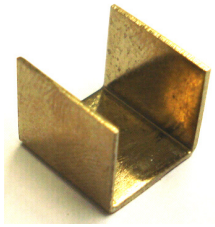
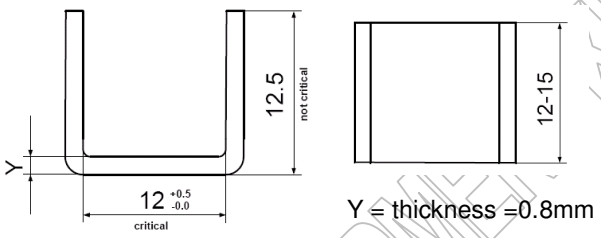
CON1 on the PCB EC-01 and EC-02:

| Pin # | Connected to |
|---|---|
| 1 | GND/VSS |
| 2 | VDD |
| 3 | OUT/PWM |
| 4 | TEMPOUT |

## *7 U_12 shield description*

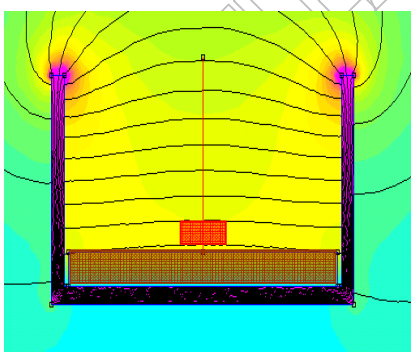
The shield is made of soft ferromagnetic material (i.e. low cost Fe-Si or Ni-Fe alloys) with a high μr value, this attracts and concentrates the magnetic flux. In order to get a low hysteresis the shields are annealed after shaping. Any applied mechanical stress will deteriorate the performance and should be avoided. The purpose of the shield is to concentrate the wanted signal and to reduce the influence of stray fields. Our shield is usable for both bus bar and PCB applications.

### *7.1 Geometry*

| View | Dimension [mm] |
|---|---|
|  |   |

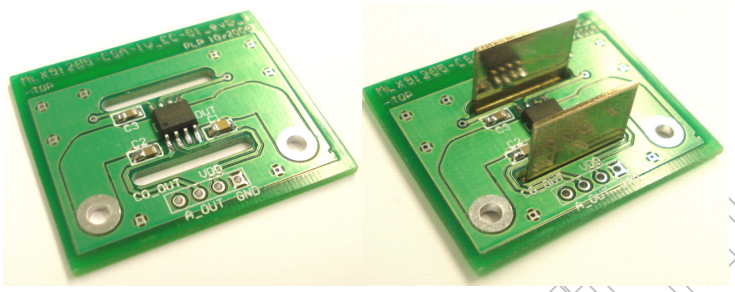
- Material: Mu - Metal with 48%Ni
- Shielding factor is > 50 in the linear range
- Nonlinearity is < 0.05mT in the linear range
- The onset of the saturation starts at about ±25mT
- Weight: 3.14g

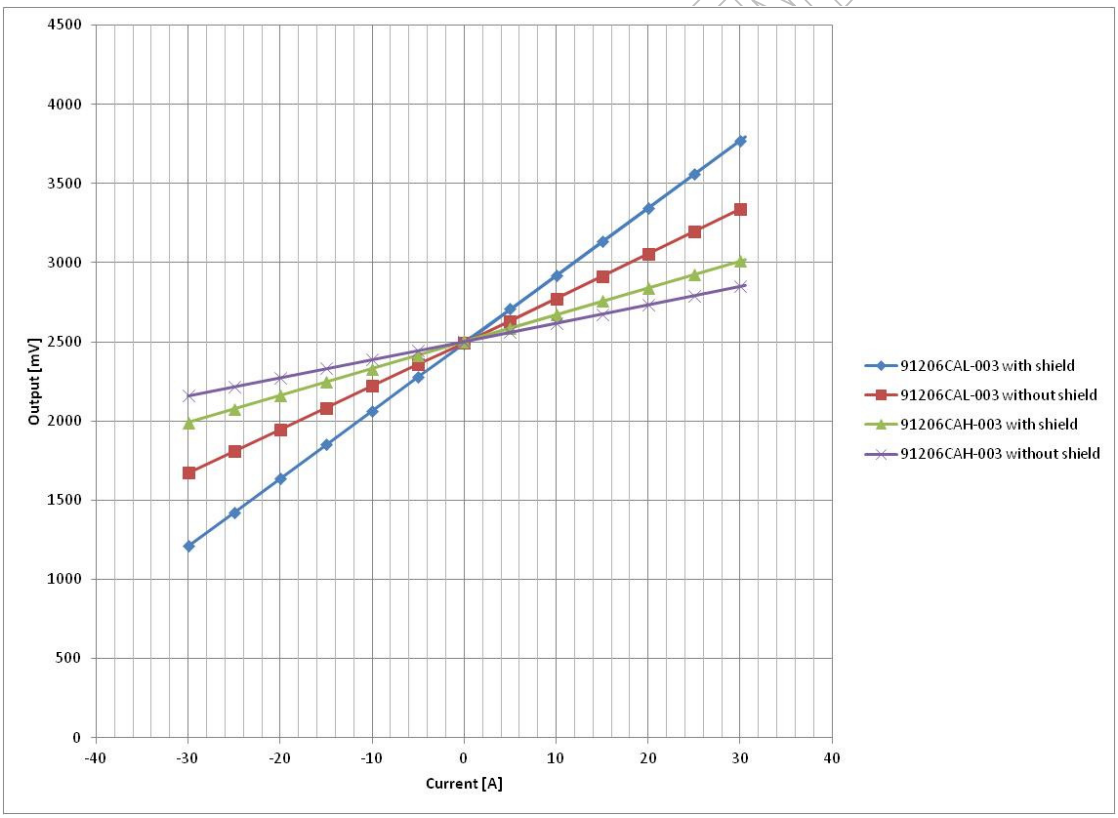
### *7.2 Good to know about shield*

| Simulation | Recommendation |
|---|---|
|  | • The closer the sensor to the ground plate of the shield, the better the shielding against external stray fields<br>➔ try to position the sensor as close as possible to the ground plate of the shield<br>• The higher and longer the shield the better the shielding<br>➔ choose the right dimension for your application<br>• The closer the sensor to the bus bar the better is the signal to noise ratio<br>➔ try to position the sensor as close as possible to the bus bar |

# *8 Typical output*

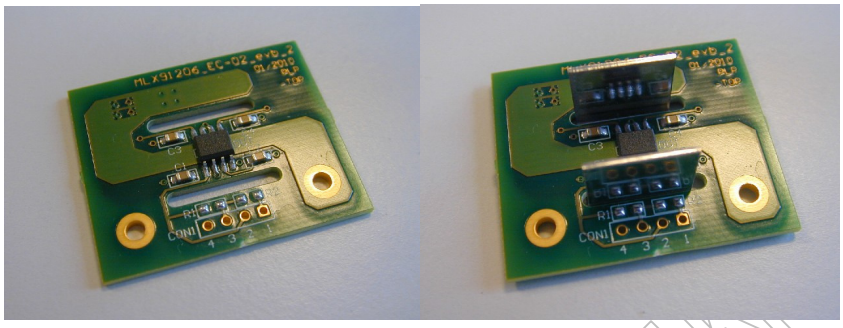
## *8.1 Typical output with PCB_EC-01*

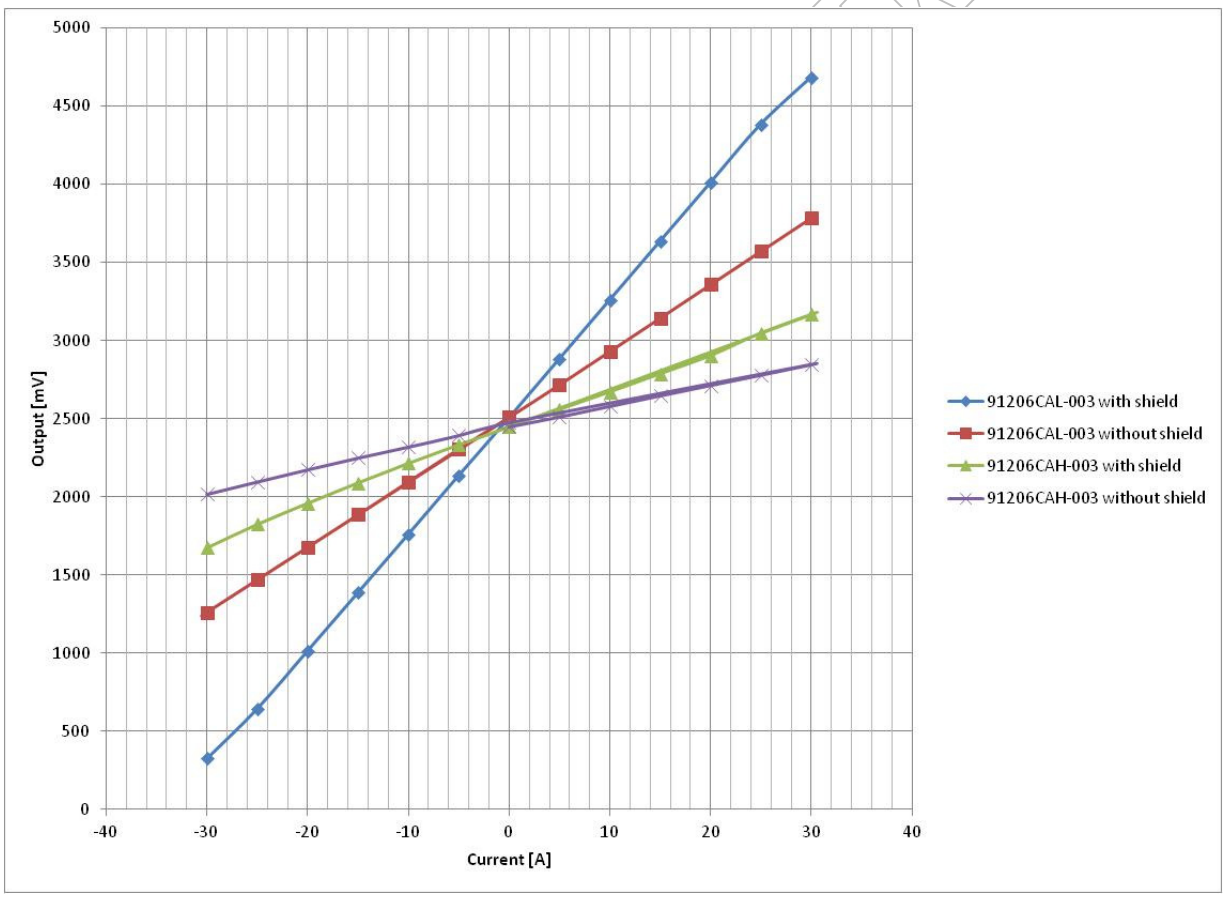





| | without shield | | with shield | |
|---|---|---|---|---|
| | **91206CAH-003** | **91206CAL-003** | **91206CAH-003** | **91206CAL-003** |
| Sensitivity [mV/A]: | 12.7 | 28 | 18.7 | 42.5 |
| Current range [A]: | +/-200 | +/-70 | +/-135 | +/-50 |

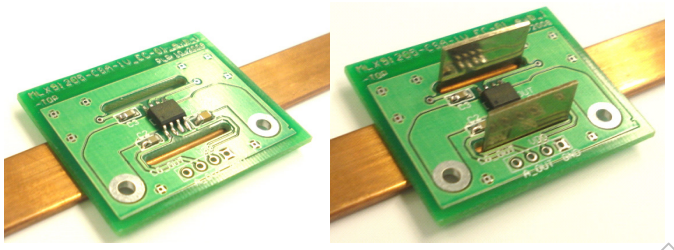
### *8.2 Typical output with PCB_EC-02*

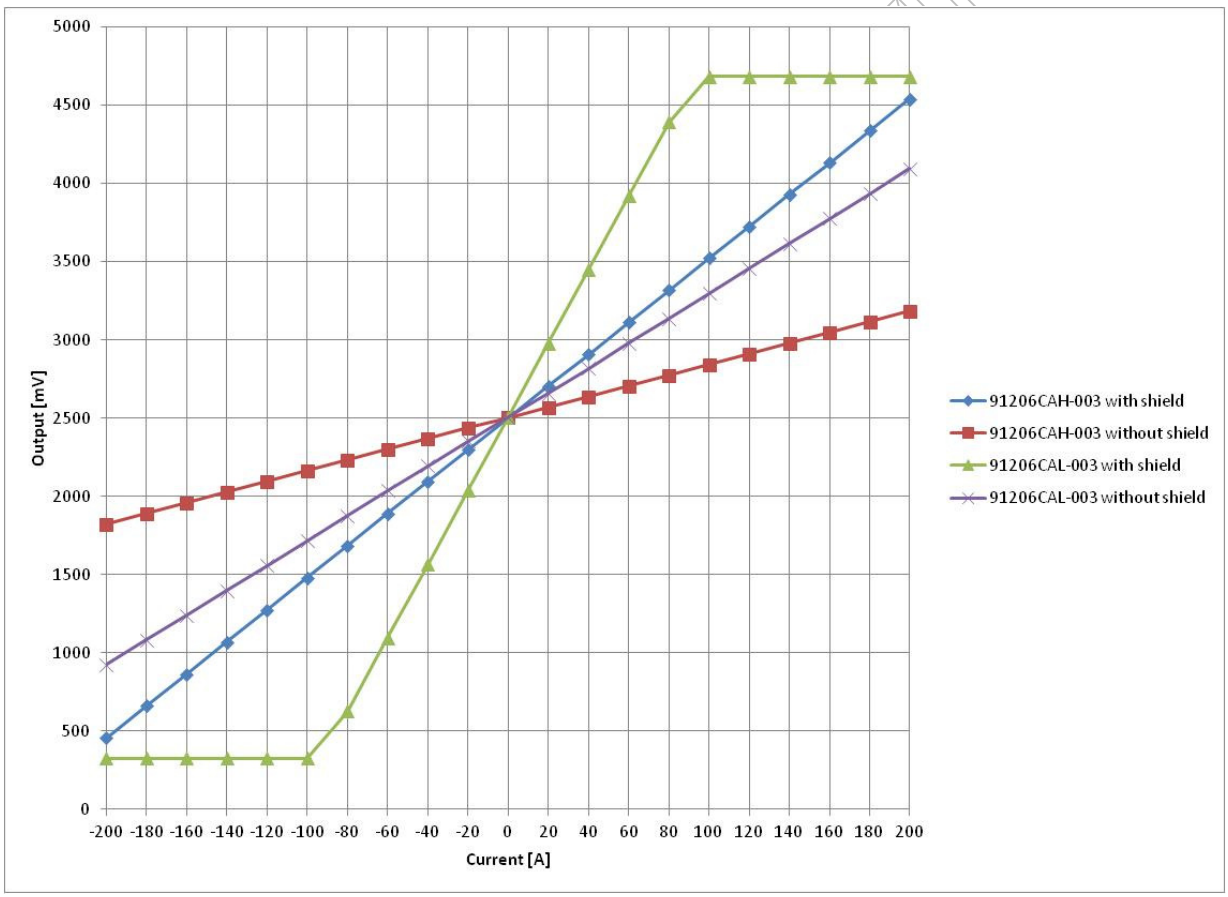





| | without shield | | with shield | |
|---|---|---|---|---|
| | **91206CAH-003** | **91206CAL-003** | **91206CAH-003** | **91206CAL-003** |
| Sensitivity [mV/A]: | 27.5 | 62 | 40.7 | 92.5 |
| Current range [A]: | +/-90 | +/-30 | +/-50 | +/-18 |

### *8.3 Typical output with bus bar*



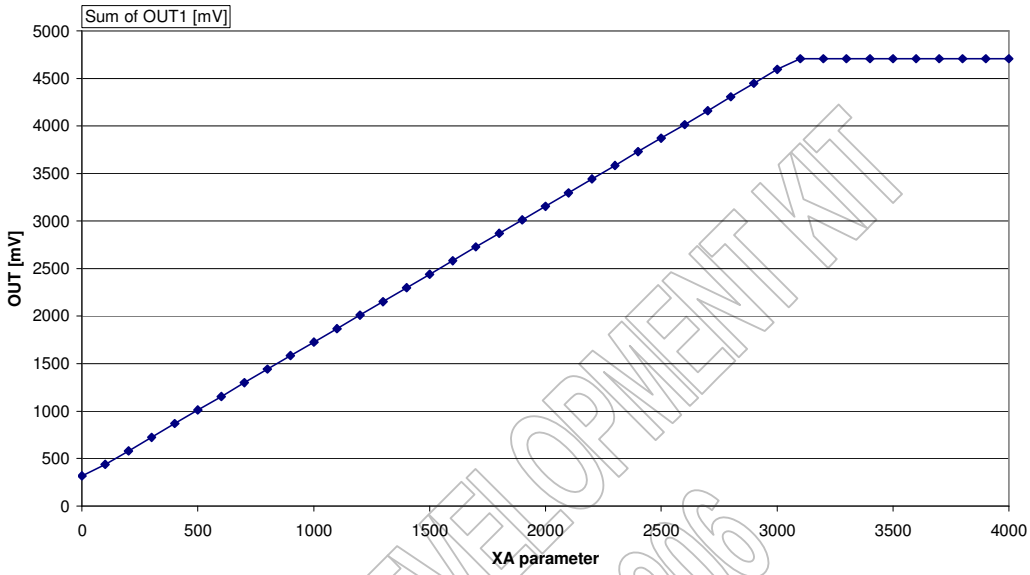



| | without shield | | with shield | |
|---|---|---|---|---|
| | **91206CAH-003** | **91206CAL-003** | **91206CAH-003** | **91206CAL-003** |
| Sensitivity [mV/A]: | 3.6 | 8 | 12.2 | 24 |
| Current range [A]: | +/-600 | +/-240 | +/-250 | +/-100 |

- The dimension of the used copper bus bar was 12mm x 100mm x 2mm.

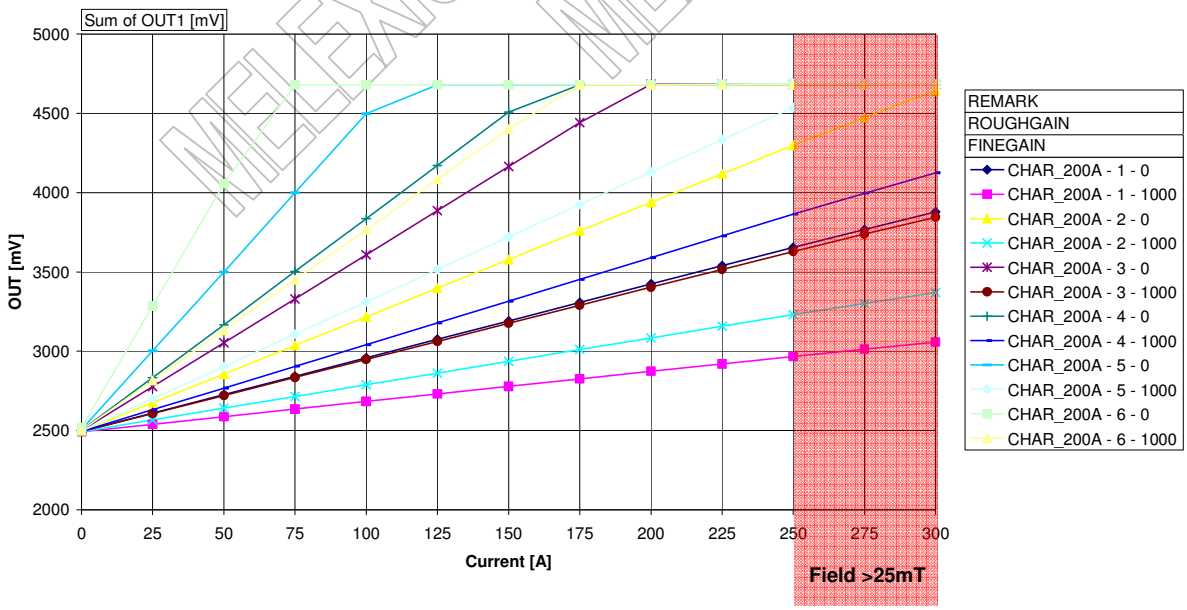
# 9 Possible programming

## 9.1 OFFSET vs. XA parameter



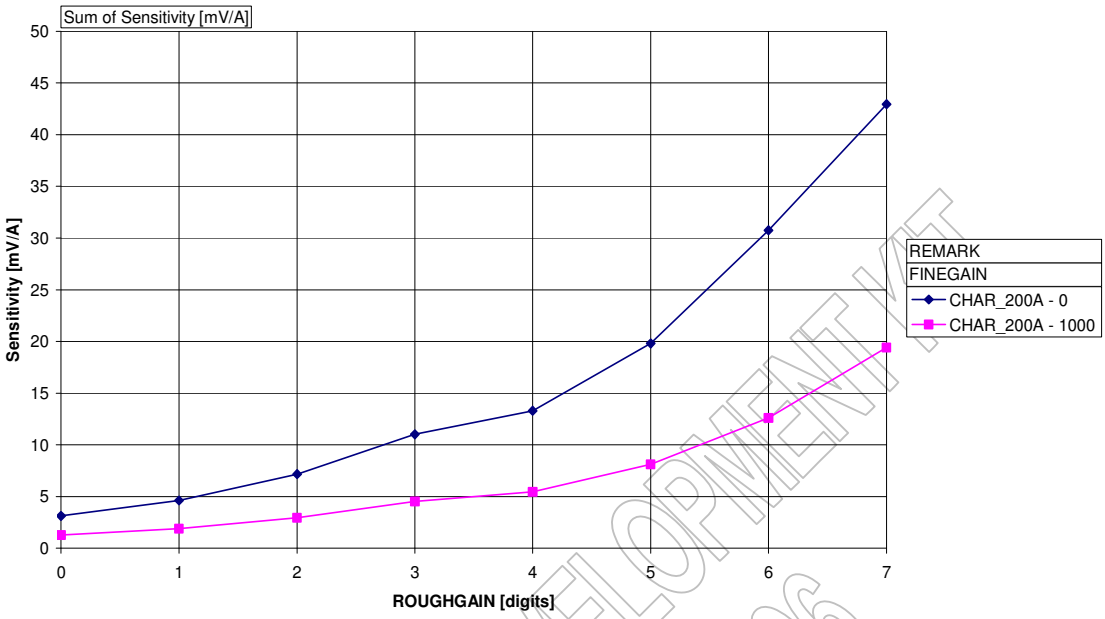

- Possible to set the offset voltage between 300 and 4700 mV

## 9.2 OUT vs. CURRENT with different ROUGHGAIN and FINEGAIN



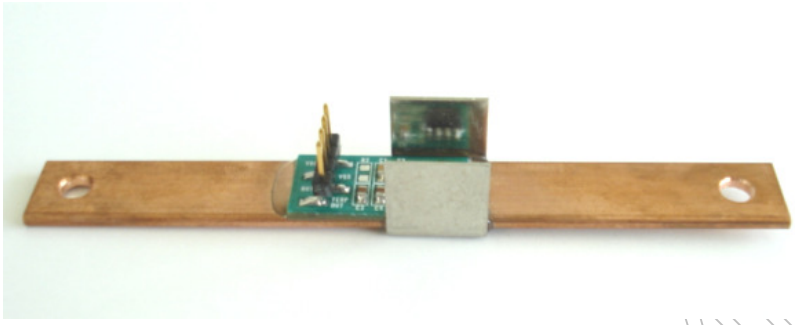

- Measurements based on bus bar 12mm x 100mm x 2mm
- Demonstrators can be build for ranges from ± 50A to ±250A

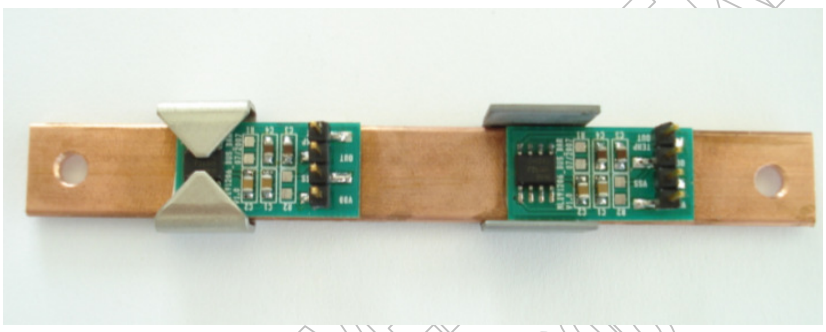
### *9.3 Sensitivity vs. ROUGHGAIN with different FINEGAIN*




- Adjustable sensitivity range from 2mV/A to 40mV/A

Examples of possible demonstrators with MLX91206:





Melexis will be happy to support you design-in. Please feel free to contact us for further questions.

Sebastien Grisot
Application Engineer
sgt@melexis.com