Application Note
HSCDTD series

Contents and page

ALPS ELECTRIC CO., LTD.

Head office 1-7,Yukigaya-otsukamachi, Ota-ku, Tokyo, 145-8501, JAPAN
Phone+81 3-3726-1211 FAX+81 3-3728-1741
Nagaoka Plant 1-3-5, Higashitakamimachi, Nagaoka-city, Niigata-pref.940-0006, JAPAN
Phone+81 258-24-4111 FAX+81 258-24-4110

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Geomagnetic sensor

ALPS
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HSCDTD series

2/
Rev.1.1
'2017.10.05

Notification on Layout

It is need note to layout the geomagnetic sensor near the magnet parts and/or magnetized parts, because these parts make a magnetic offset and /or a some gnetic distortion that might make same error on azimuth detection.

List of effective parts for azimuth error on geomagnetic sensor
Ⅰ Making static magnetic offset
①Speaker , Vibration Motor, Camera Module and etc.
   These parts are including with hard magneto that make a static magnetic field offset.
Ⅱ Making dynamic magnetic field
②Connector for Micro-SD, USB, SUS plate on LCD
   These parts will be magnetized under outside magnetic filed condition and making magnetic offset like as hard magneto.
③Supply current make a magnetic field that strength is depend on current values.
⑤Magnetized USB and HDMI cable make big magnetic offset change when it connect and disconnect.
Ⅲ Making magnetic distortion
④Soft magnetic sheet that use for near filed communication make magnetic distortion near sheet.
 See next page and after as ALPS recommendation for the distance form sensor and each parts ①～④.
And ALPS hardly recommend using ALPS magnetic simulation service on actual program.
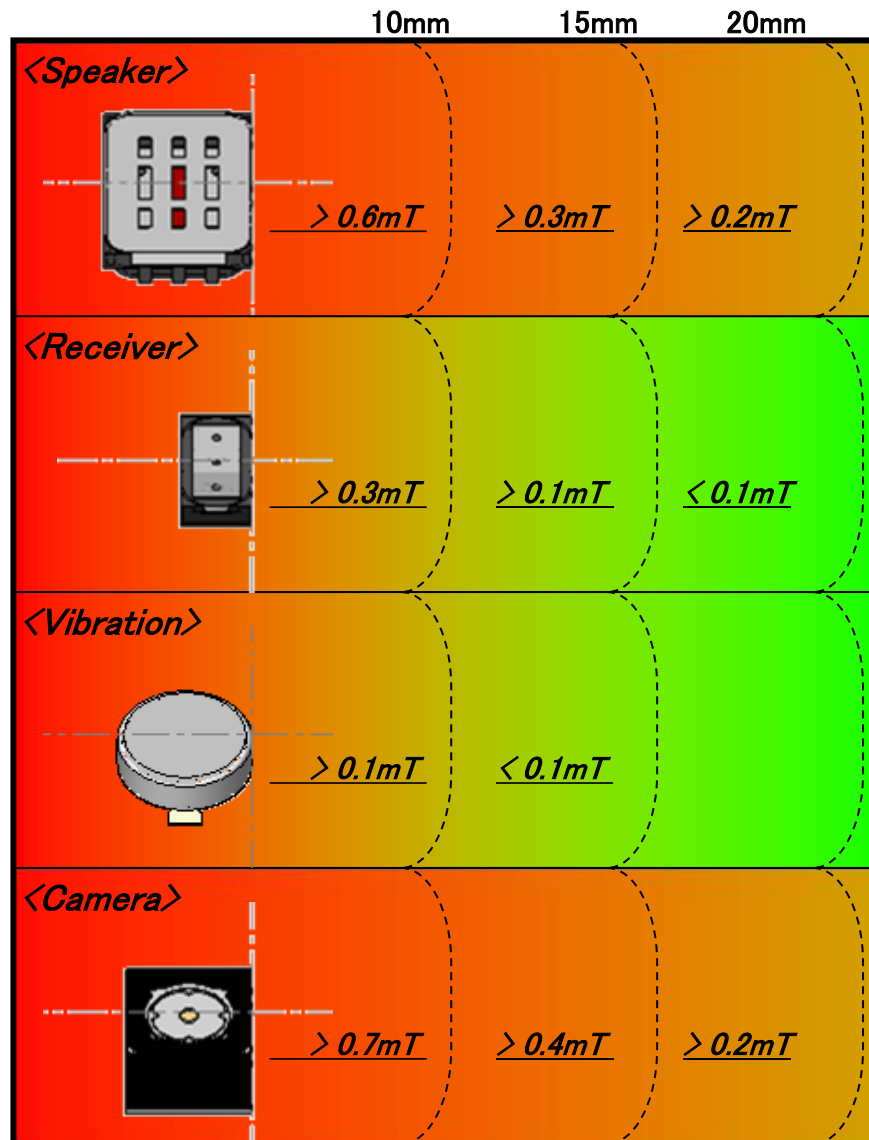

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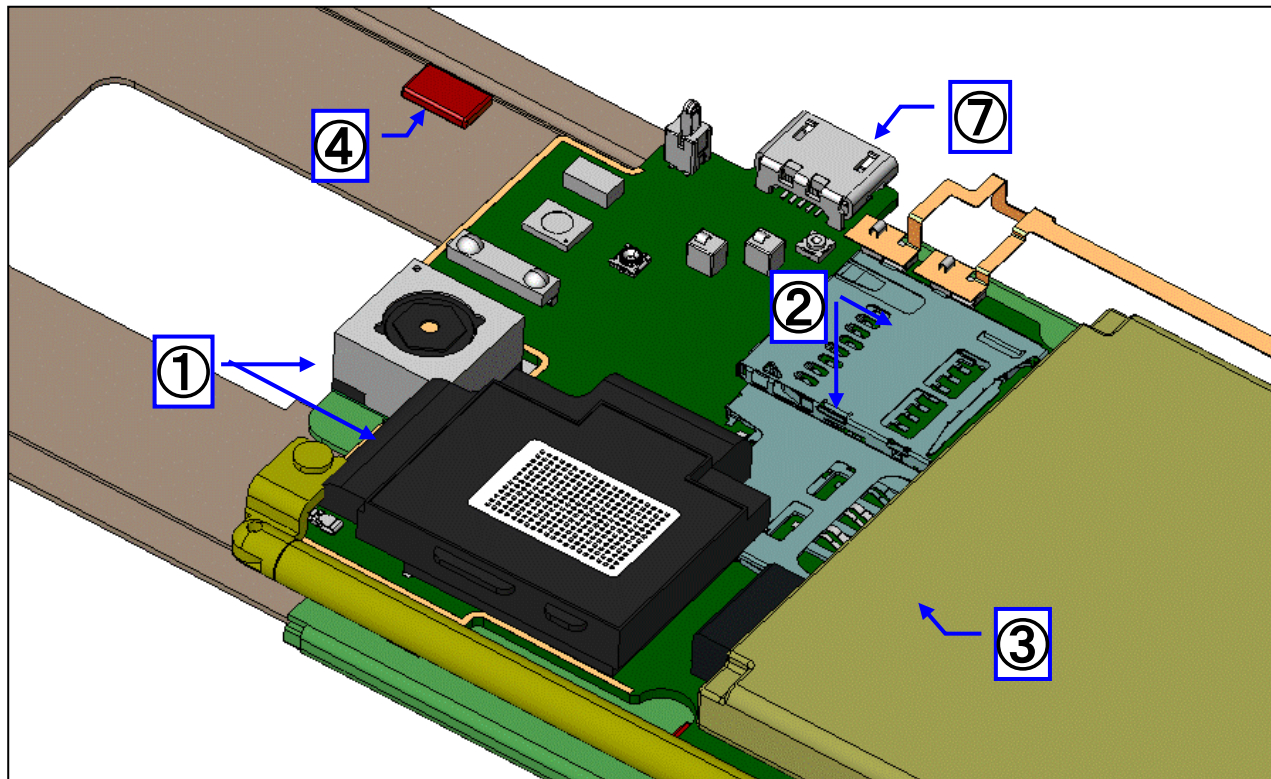
Guide line for each parts

① Magnet parts
These parts make a static magnetic field offset. It is need note to change the magnetic field when the distance is change by open/close at clam shell structure and by sliding LCD.
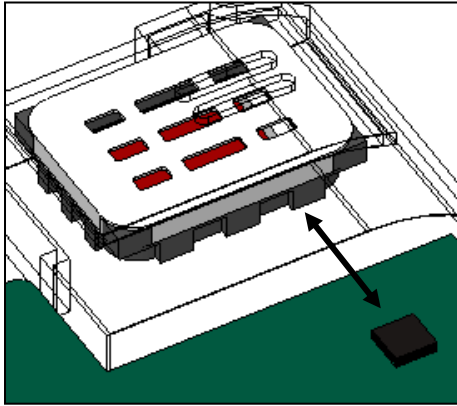
Magnet parts	Recommended distance
Speaker	15 mm
Receiver	10 mm
Vibration motor	8 mm
AF Camera	18 mm
Non-AF Camera	5 mm
Magnet e.g.) 4x3x2mm	21 mm

	10mm	15mm	20mm
⟨Speaker⟩	＞0.6mT	＞0.3mT	＞0.2mT
⟨Receiver⟩	＞0.3mT	＞0.1mT	＜0.1mT
⟨Vibration⟩	＞0.1mT	＜0.1mT	
⟨Camera⟩	＞0.7mT	＞0.4mT	＞0.2mT

Note : The recommended distance is where the offset magnetic field strength becomes 0.3mT or less.
: The calibration procedure can be cancel the magnetic offset , if whole magnetic offset
is less than the measurement range of geomagnetic sensor.

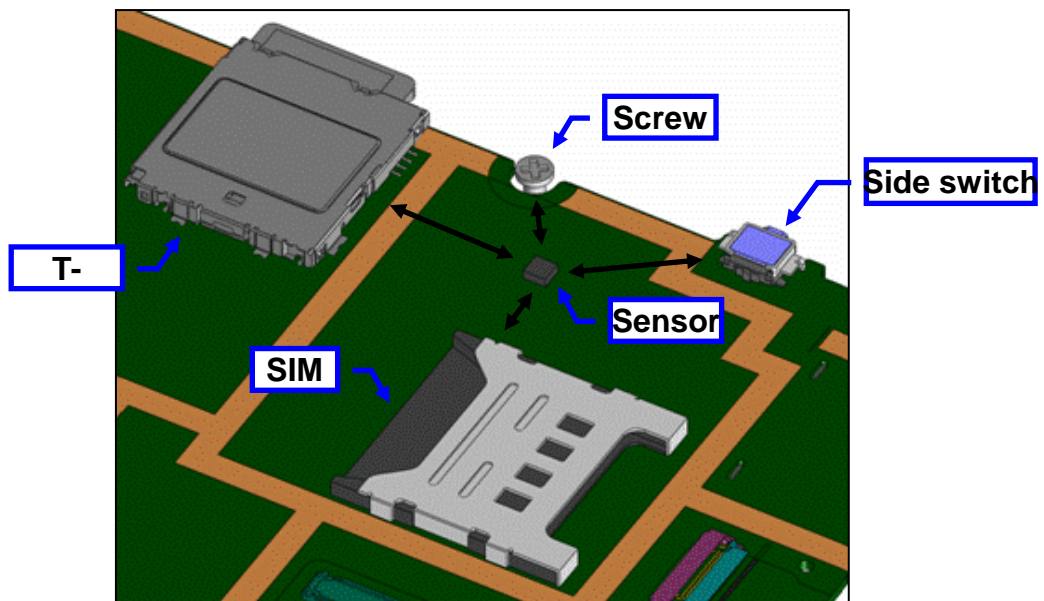**Guide line for each parts**

② Magnetized parts
　Magnetized level on these parts will be changed by outside magnetic condition.

Magnetized parts	Recommended distance	
T-Flash connector	8 mm	
Micro-SD connector	3 mm	
SD Socket	3 mm	
Micro-USB connector	4 mm	※1
SIM connector	4 mm	
HDMI connector	4 mm	
Metal dome	5 mm	
Side switch	3 mm	
IrDA module	4 mm	
Screw	4 mm	
Battery electrode	7 mm	
DCDC converter	10 mm	
MIC	2 mm	
Spring contact	2 mm	

Note:Please refer to page 9 about USB connector and Battery terminal.
※1：In the state of the cable non-connection.

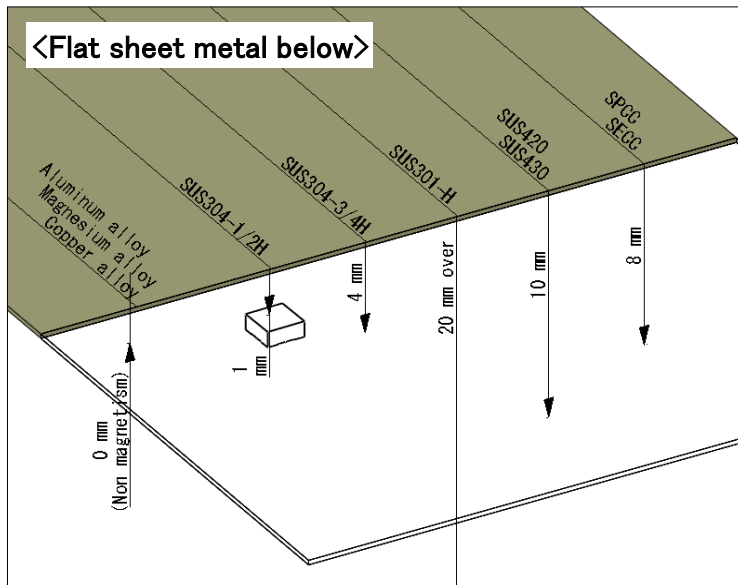Note : The recommended distance is where the offset magnetic field strength becomes 0.3mT or less.
　　 : The calibration procedure can be cancel the magnetic offset , if whole magnetic offset
　　　 is less than the measurement range of geomagnetic sensor.

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Guide line for each parts

③ Sheet metal
Magnetized level on these parts will be changed by outside magnetic condition.

And magnetic characteristic of stainless sheet metal might be changed by the bending processing.

<u>The tickness:from 0.1 to 0.3mm</u>

<Flat sheet metal below>

Material	Recommended distance
Aluminum alloy Magnesium alloy Copper alloy	0 mm
SUS304-1/2H	1 mm
SUS304-3/4H	4 mm
SUS304-H	20 mm
SUS301-H	25 mm
SUS420 SUS430	10 mm
SPCC SECC	8 mm
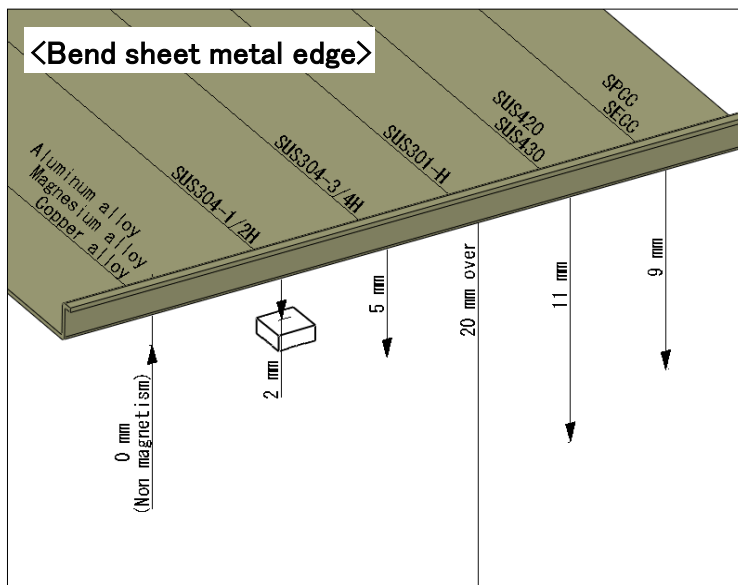
<Bend sheet metal edge>

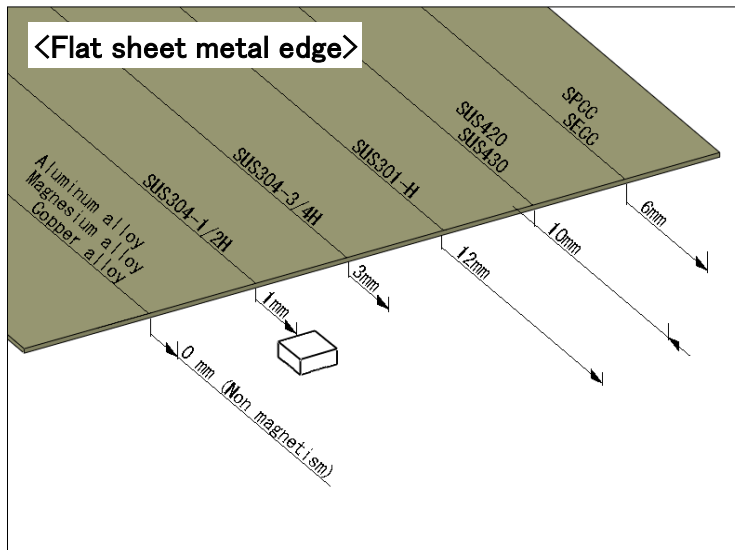| Material	Recommended distance
Aluminum alloy Magnesium alloy Copper alloy	0 mm
SUS304-1/2H	2 mm
SUS304-3/4H	5 mm
SUS304-H	20 mm
SUS301-H	25 mm
SUS420 SUS430	11 mm
SPCC SECC	9 mm

Note : The recommended distance is where the offset magnetic field strength becomes 0.3mT or less.
    : The calibration procedure can be cancel the magnetic offset , if whole magnetic offset
       is less than the measurement range of geomagnetic sensor.

Guide line for each parts

③ Sheet metal
   Magnetized level on these parts will be changed by outside magnetic condition.

   And magnetic characteristic of stainless sheet metal might be changed by the bending processing.

The tickness:from 0.1 to 0.3mm

<Flat sheet metal edge>

Material	Recommended distance
Aluminum alloy Magnesium alloy Copper alloy	0 mm
SUS304-1/2H	1 mm
SUS304-3/4H	3 mm
SUS304-H	8 mm
SUS301-H	12 mm
SUS420 SUS430	10 mm
SPCC SECC	6 mm
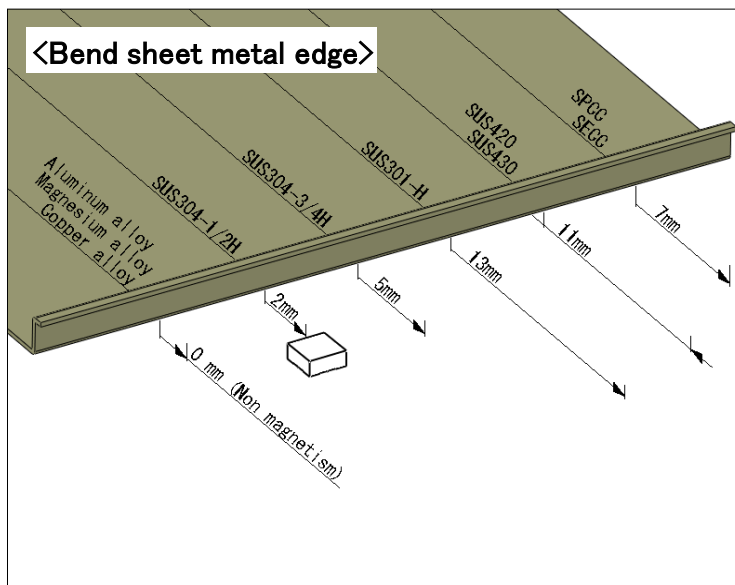
<Bend sheet metal edge>

Material	Recommended distance
Aluminum alloy Magnesium alloy Copper alloy	0 mm
SUS304-1/2H	2 mm
SUS304-3/4H	5 mm
SUS304-H	9 mm
SUS301-H	13 mm
SUS420 SUS430	11 mm
SPCC SECC	7 mm

Note : The recommended distance is where the offset magnetic field strength becomes 0.2mT or less.
    : The calibration procedure can be cancel the magnetic offset , if whole magnetic offset
      is less than the measurement range of geomagnetic sensor.
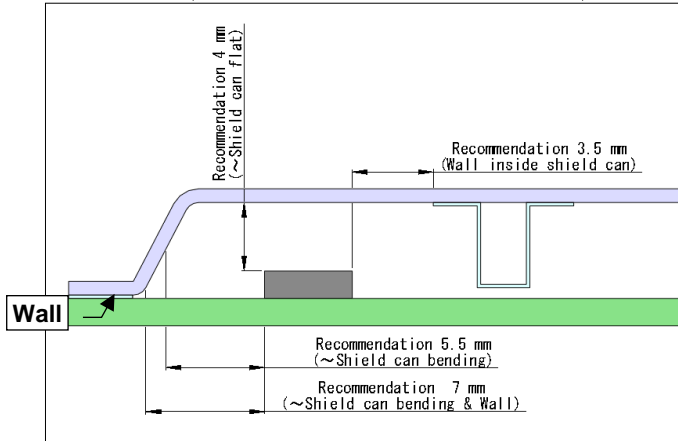
Geomagnetic sensor

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Rev.1.1
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Guide line for each parts
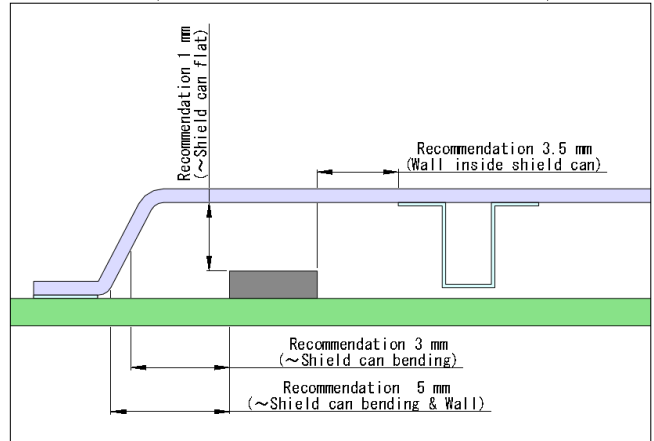
③ Sheet metal（Shield can）
Magnetized level on these parts will be changed by outside magnetic condition.

And magnetic characteristic of stainless sheet metal might be changed by the bending processing.

<Shield can（SUS304-3/4H & thickness：0.4mm）>

Recommendation 4 mm
(～Shield can flat)

Recommendation 3.5 mm
(Wall inside shield can)

Wall

Recommendation 5.5 mm
(～Shield can bending)

Recommendation 7 mm
(～Shield can bending & Wall)

<Shield can（SUS304-1/2H & thickness：0.3mm）>

Recommendation 1 mm
(～Shield can flat)

Recommendation 3.5 mm
(Wall inside shield can)

Recommendation 3 mm
(～Shield can bending)

Recommendation 5 mm
(～Shield can bending & Wall)

Shield can meterial	Parts	Recommended distance
SUS304-3/4H (thickness : 0.4mm)	Flat	4 mm
	Bending	5.5 mm
	Wall	3.5 mm
	Bending & Wall	7 mm
SUS304-1/2H (thickness : 0.3mm)	Flat	1 mm
	Bending	3 mm
	Wall	3.5 mm
	Bending & Wall	5 mm
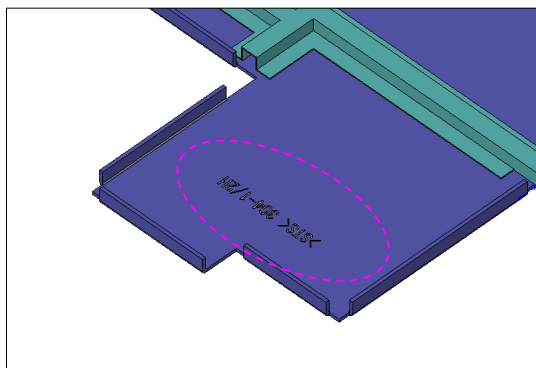
Note:The carved seal of sheild can is magnetized strongly.
We recommend that the sensor position isn't right under the carved seal of shield can.

Note : The recommended distance is where the offset magnetic field strength becomes 0.3mT or less.
: The calibration procedure can be cancel the magnetic offset , if whole magnetic offset
is less than the measurement range of geomagnetic sensor.

Guide line for supply line

Recommend distance for supply line

Sensor
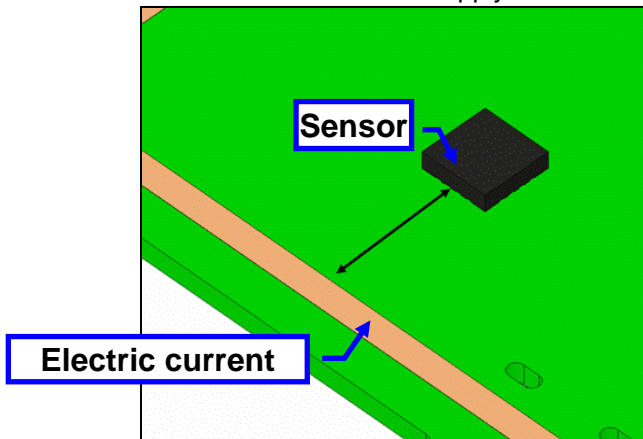
Electric current

Electric current	Recommended distance	
	Ripple ±10%	On/Off
1000mA	20 mm	100 mm
700mA	15 mm	80 mm
500mA	10 mm	65 mm
300mA	8 mm	45 mm
150mA	5 mm	20 mm
100mA	3 mm	10 mm
50mA	2 mm	6 mm
20mA	1 mm	3 mm
10mA	1 mm	1 mm

③-1 Current Ripple is 10%

This recommend value is expected less than 2degree of azimuth error.

③-2 Current Ripple is 100% (Current is turn on and off)

This recommend value is also expected less than 2degree of azimuth error.

Guide line for Magnetic sheet

Recommend distance on soft magnetic sheet

Magnetic Sheet

Sesnor
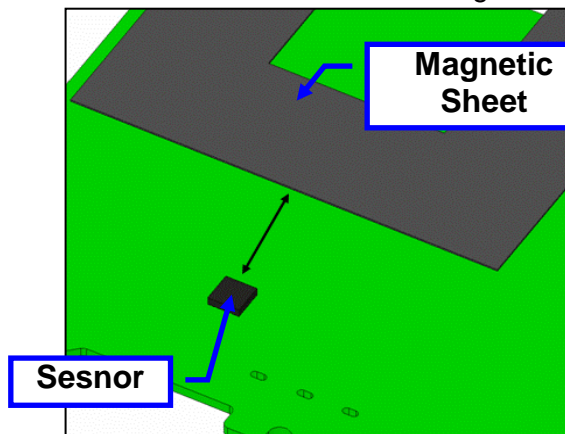
④ Magnetic sheet (NFC)

This sheet make a big distortion of magnetic fields. If the magnetic field have big distortion, the calibration procedure can not complete or the azimuth calculation have some azimuth error.

The recommend distance between this sheet and sensor is bigger than 10 to 15mm (Note).

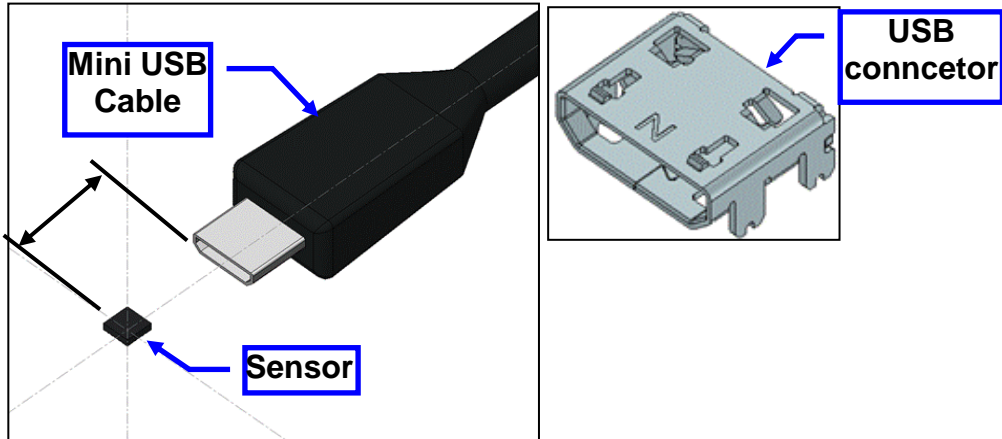**Note**: It depend on thickness of magnetic sheet.
(t0.1mm need bugger than 10mm/ t0.2mm need bugger than 20mm)

ALPS can provide correction parameter for this distortion by simulation and actual measurement.

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Guide line for USB cable
Recommend distance for mini USB cable and USB connector

⑤-1 Mini USB cable (USB connector)
Mini USB cable will be magnetized and make a magnetic offset.
The calibration is not complete after connecting the USB cable.
Because end user fix the mobile set when the USB cable is connected to it.
The calibration procedure needs some motion with mobile set.

The recommended distance between mini USB cable (connector) and sensor is bigger than 15mm.

Guide line for Battery terminal
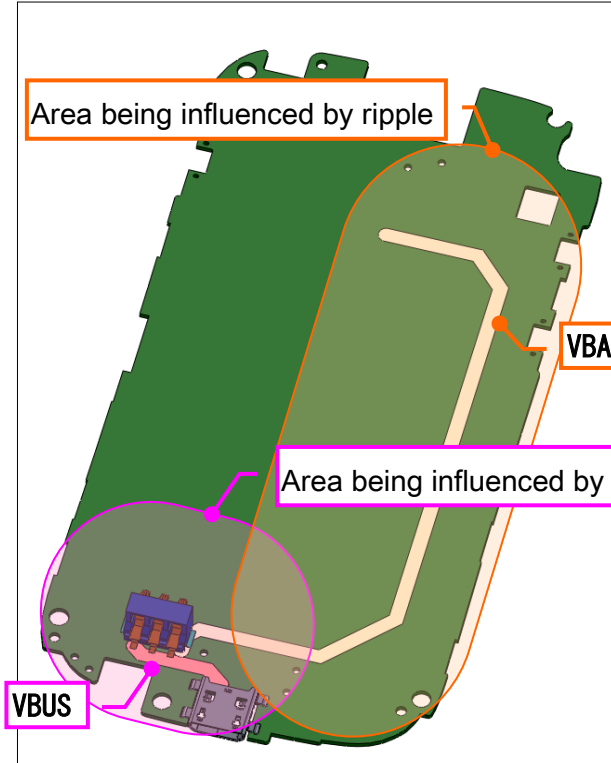Recommend distance for Battery terminal
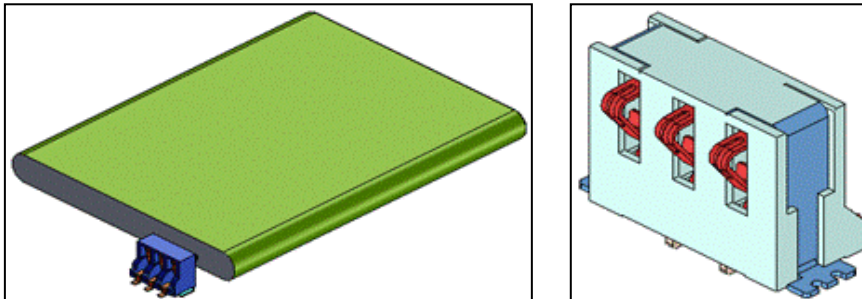
⑤-2 Battery terminal
The calibration is not complete after charging battery by connecting the USB cable.
Because the magnetic field changes around battery terminal ,when end user charge the battery.
The calibration procedure needs some motion with mobile set.

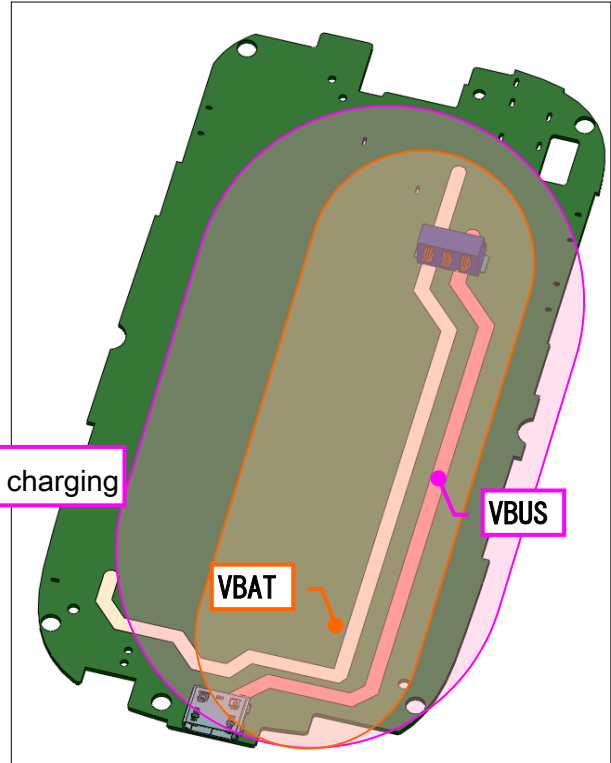**The recommended distance between battery terminal and sensor is bigger than 30mm.**

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Guide line for VBAT and VBUS lines
Recommend distance for VBAT and VBUS lines

<Model -A>

Area being influenced by ripple

VBAT

Area being influenced by USB charging

VBUS

<Model -B>

VBUS

VBAT
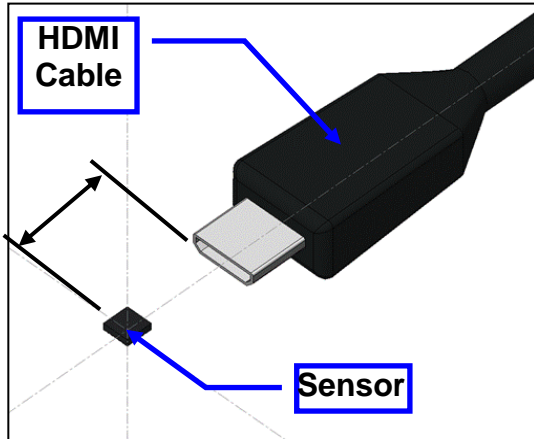
⑤-3 VBAT line & VBUS line
  If VBAT line has ripple , It may generate the unstablel offset magnetic field.
  VBUS line generates the offset magnetic field ,when USB charging.

Note:Please refer to page 8 about VBAT and VBUS lines.

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Guide line for HDMI cable

Recommend distance for HDMI cable

⑤-4 HDMI cable

HDMI cable will be magnetized and make a magnetic offset. The calibration procedure is not complete after connect the HDMI cable. Because end user fix the mobile set when the HDMI cable connect the mobile set. The calibration procedure need some motion with mobile set.

The recommend distance between HDMI cable and sensor is bigger than 39mm.

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