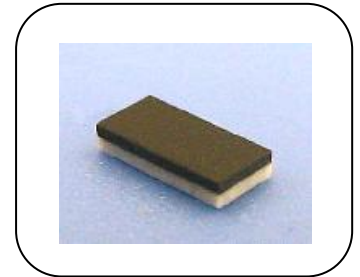


# Application note of MAGICSTRAP®

## Murata part number : LXMS31ACNA / LXMS31ACMD

### 1. General Description

Murata MAGICSTRAP® is an innovative RFID module with a wide range of RF features. It incorporates an industry standard IC.



#### [Features]

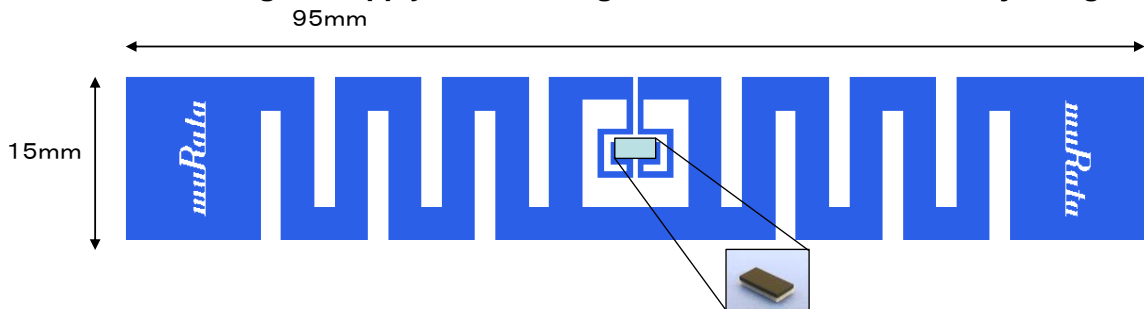
- 1-1. Compliant to EPC global Class1Gen2
- 1-2. Ultra small package (3.2X1.6X0.55mm typ.)
- 1-3. Supports wide frequency range from 865MHz to 965MHz, allowing to cover all globally relevant UHF frequency bands with one single design.
- 1-4. Impedance transformation function for more accurate matching with various antenna designs
  - 4 different variants available, which allow perfect matching to antenna impedance
- 1-5. Both conductive material & non-conductive material can be used for connection to antenna.
- 1-6. Wide mechanical mounting tolerance for assembly into RFID tag or inlay
- 1-7. Fully Compatible with conventional SMT process and reflow soldering
- 1-8. Compatible with plastic molding process (150°C max. over 2 hours)
- 1-9. High ESD protection function
- 1-10. 100% green material for full RoHS compliance
- 1-11. Internal 512bit user memory available

### 2. Applications

- 2-1. Durable RFID tag for supply chain management
- 2-2. Durable RFID card for access control
- 2-3. PCB traceability with MAGICSTRAP®

### 3. Antenna design for durable tag

#### 3-1. Durable RFID tag for supply chain management - “Murata-A3” inlay design



LXMS31ACNA-011 and LXMS31ACMD-143 match for “Murata-A3”.

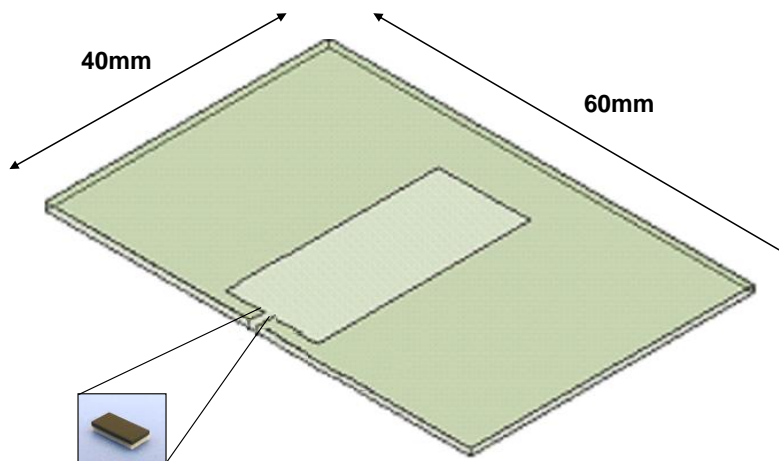
# Application note of MAGICSTRAP®

## Murata part number : LXMS31ACNA / LXMS31ACMD

### Advantages :

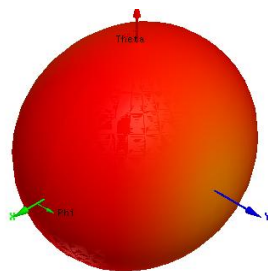
- Size compatible with SCM label (<10 cm length)
- Compliant to EPC/g C1G2 (UHF band)
- Supports 865-955MHz for world wide use in single design
- Supports wide read range (up to 5m)
- Stable against dielectric material near antenna
- Mechanically & electrically robust - especially against high humidity
- Connection to antenna with non-conductive adhesive

### 3-2. Durable RFID card for access control - “Murata-C1” inlay design

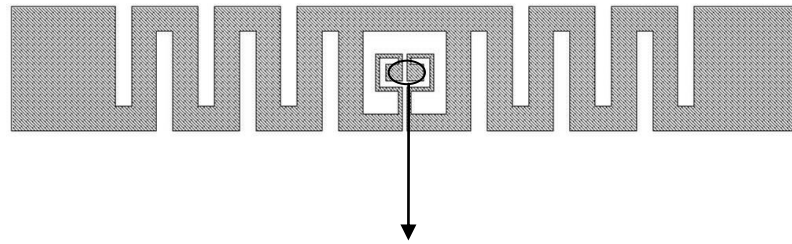


LXMS31ACNA-012 and LXMS31ACMD-144 match for “Murata-C1”.

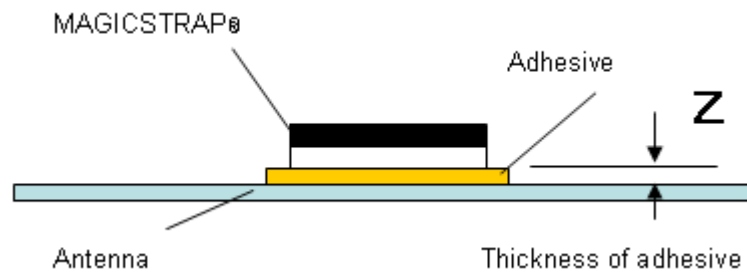
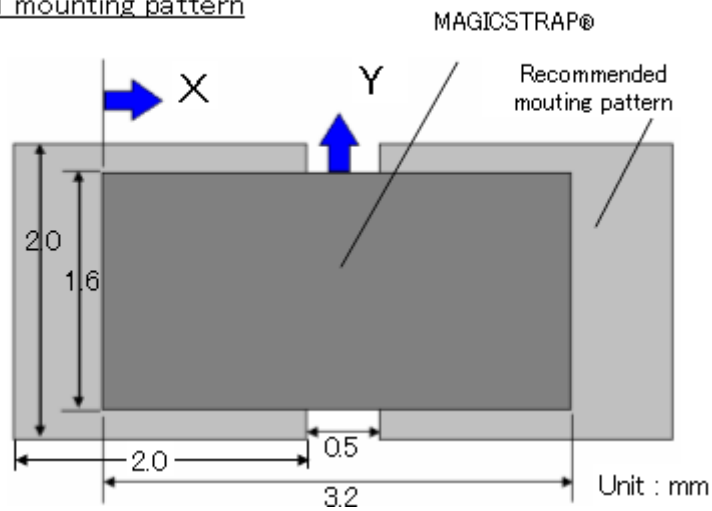
- Size compatible with ISO-compliant credit card, ID card, etc.
- Compliant to EPC/g C1G2 in UHF band
- Support 865-955MHz for world wide use
- Support one by one read / write in short range
- Long read range (up to 4m)
- Round directivity



3-3. Recommended mounting pattern and tolerance of mounting



Top View of MAGICSTRAP®  
and mounting pattern

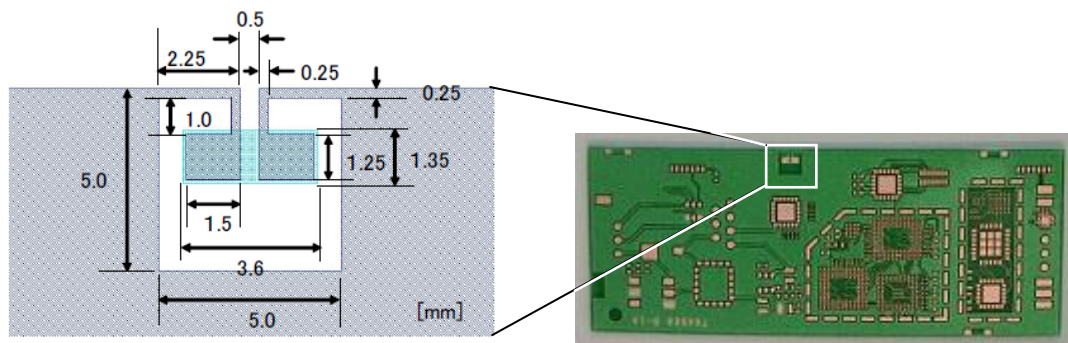


Tolerance of mounting :  $X < \pm 500\mu\text{m}$ ,  $Y < \pm 500\mu\text{m}$ ,  $Z < 10\mu\text{m}$

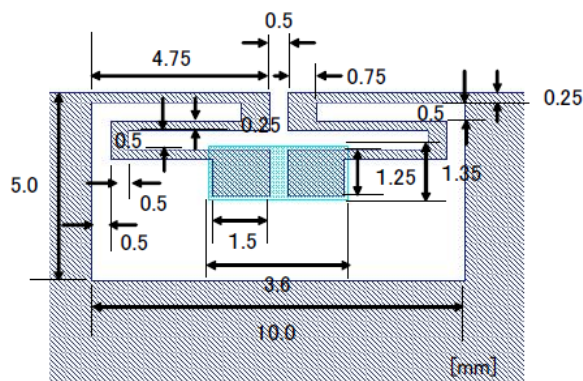
4. Mounting pattern design for PCB traceability

4 kinds of different mounting pattern design are available. Each mounting pattern matches with different MAGICSTRAP® part numbers according to its own impedance value.

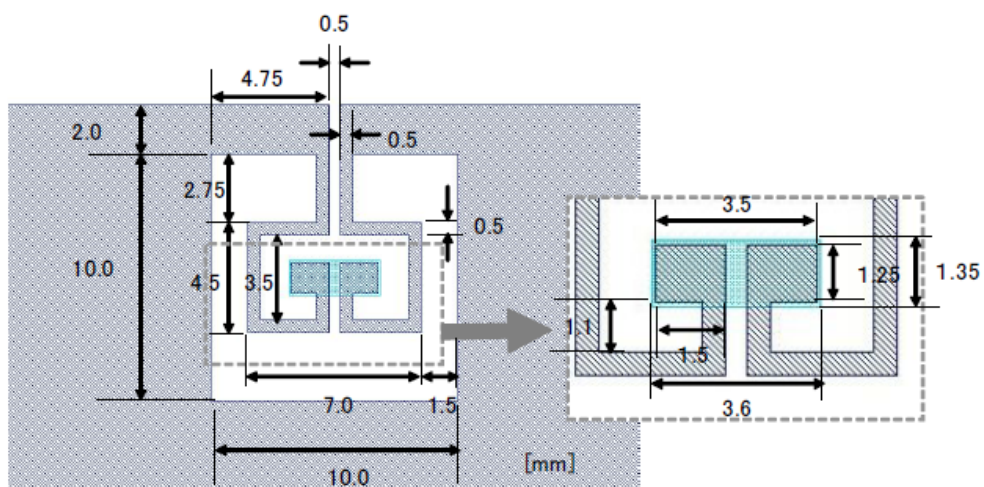
4-1. 5x5mm for LXMS31ACNA-009 and LXMS31ACMD-141 - "Type-1"



4-2. 5x10mm for LXMS31ACNA-010 and LXMS31ACMD-142 - "Type-2"

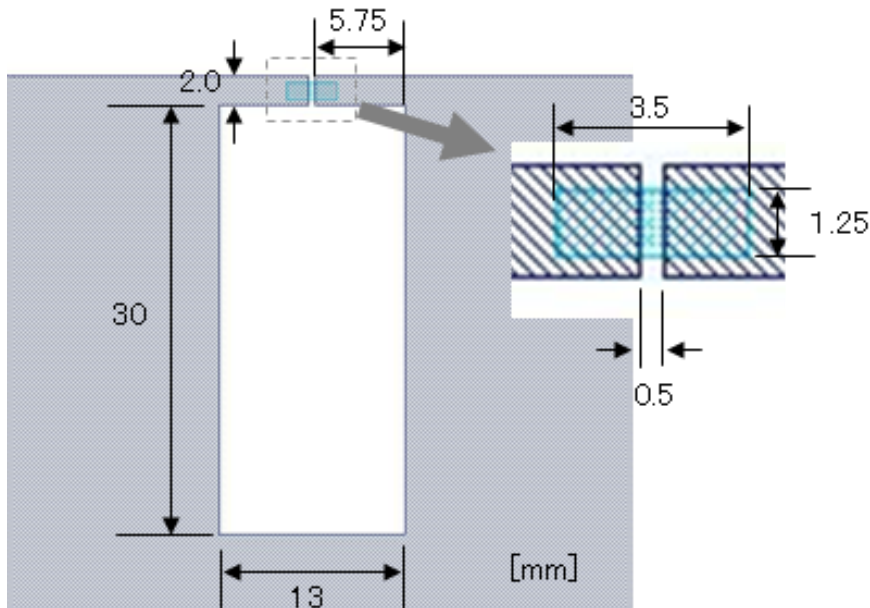


4-3. 12x10mm for LXMS31ACNA-011 and LXMS31ACMD-143 - "Type-3"



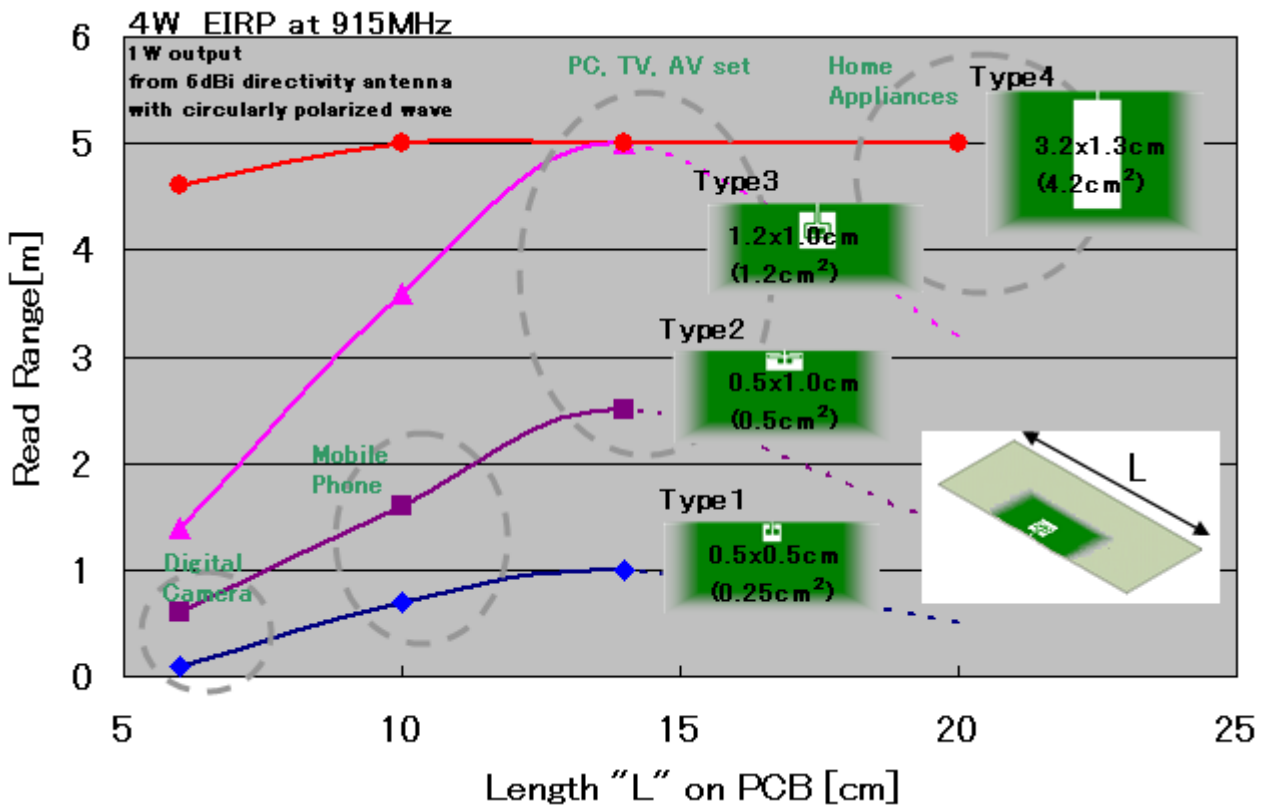
**Application note of MAGICSTRAP®**  
**Murata part number : LXMS31ACNA / LXMS31ACMD**

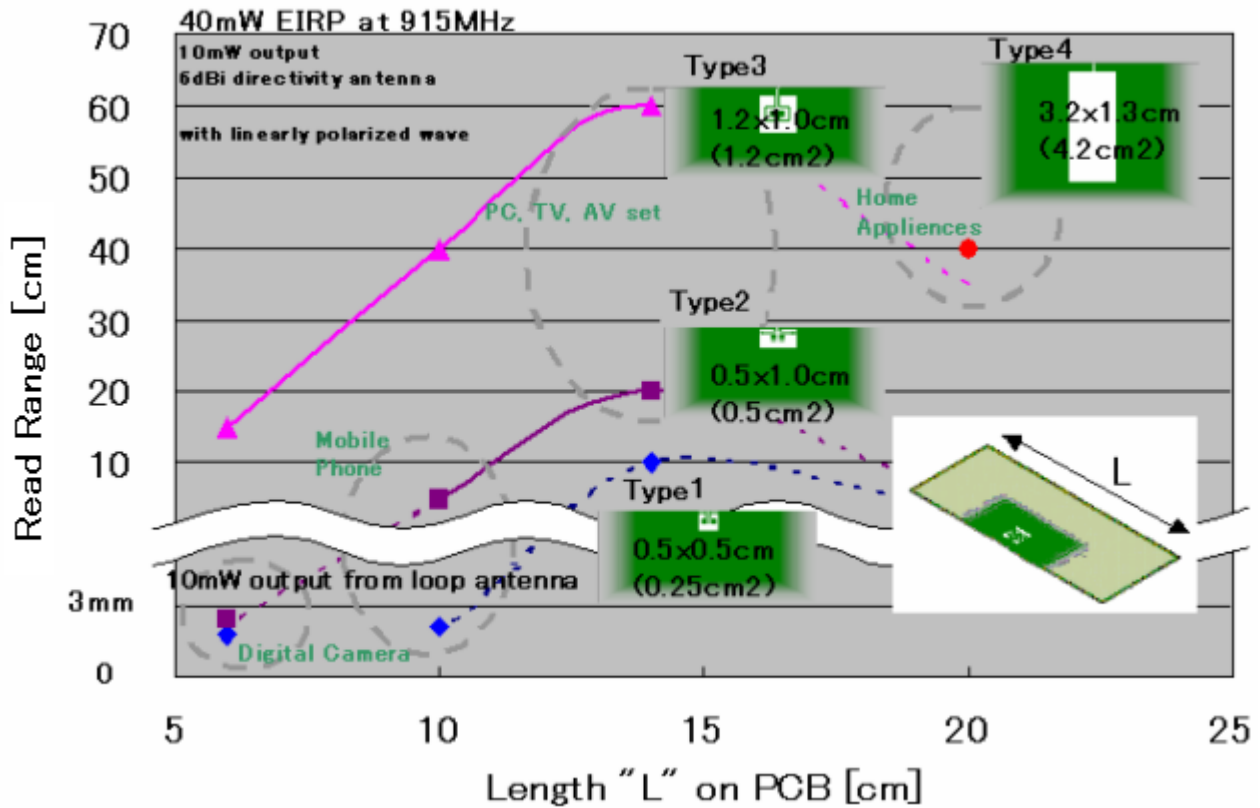
**4-4. 30x13mm for LXMS31ACNA-012 and LXMS31ACMD-144 - "Type-4"**



**4-5. Read range** (PN LXMS31ACNA-\*\*\* at USA band)

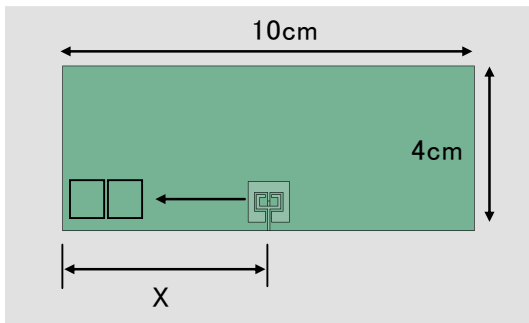
The read range of the RFID tag function, after the assembly of the MAGICSTRAP® onto PCB, depends on the type of mounting pattern above as well as the length "L" of PCB.





#### 4-6. The best position of mounting pattern on PCB

MAGICSTRAP® shall be mounted as center as possible on the longer side of the PCB. This will ensure to achieve the maximum read range. The below indicates the relationship between length "X" and read range of PCB tag in case of mounting pattern Type-3.

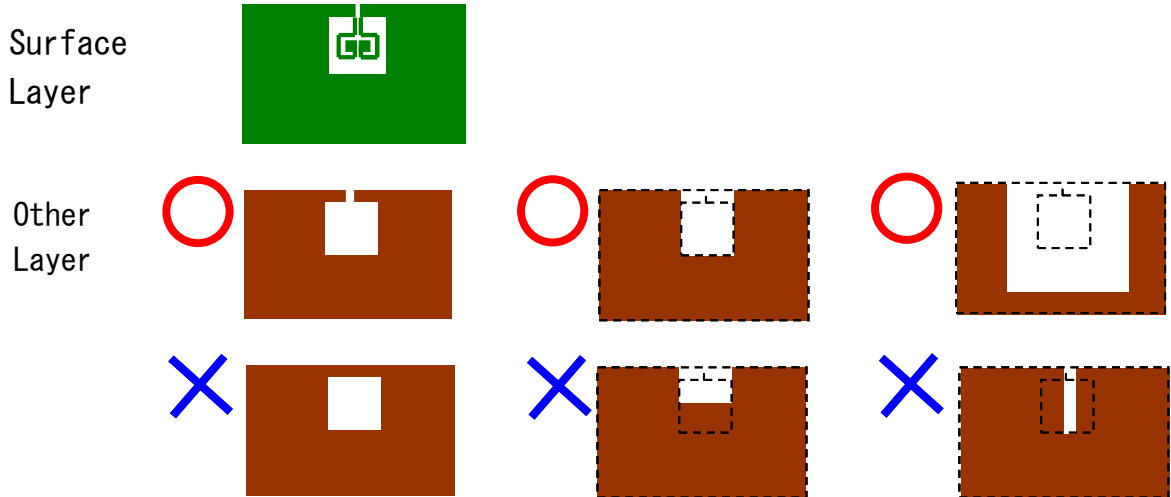


length X [cm]	Read Range [m]
5	3.6
2	2.5
1	1.6



#### 4-7. How to design layers below the mounting pattern



In the area of mounting pattern of Type-1, 2 3 and 4, please remove the conductive copper printing from all layers of the PCB .

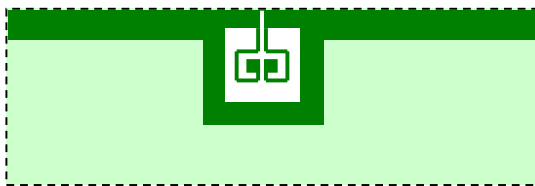


In the above drawing, non-printed square zone on each layer means removed copper printing. Square size without copper printing in each layer shall be equal or larger than that of the surface layer with mounting pattern, Type-1, 2, 3 and 4.

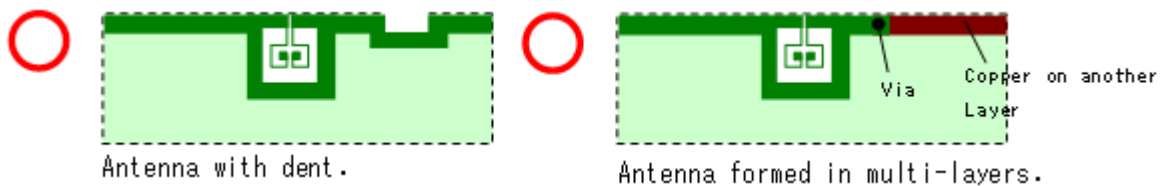
From this point of view,  are good examples for long read range.  are bad ones, which drastically reduce the read range of PCB tag function .

#### 4-8. Important area for better tuning

Important area for PCB tag sensitivity is the edge part of PCB shown as “dark green” below.



A dent on the antenna or a connection of the antenna to other layers also works well without large detuning.



**Application note of MAGICSTRAP®**  
**Murata part number : LXMS31ACNA / LXMS31ACMD**



< Note >

- This document is subject to change or our products in it may be discontinued without advance notice. Please check with our sales representatives or product engineers before ordering.
- Please refer to following URL for other usage of MAGICSTRAP® and our company RFID related products.

URL : <http://www.murata.com/products/rfid/index.html>

- For any inquiries/queries, please feel free to contact us.

e-mail : [magicstrap@ml.murata.co.jp](mailto:magicstrap@ml.murata.co.jp)