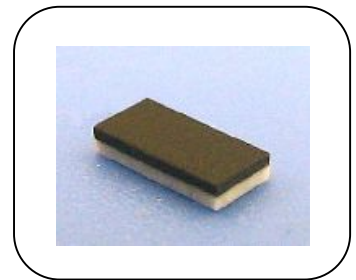# Application note of MAGICSTRAP®
Murata part number : LXMS31ACNA / LXMS31ACNB

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.) ensuring high durability

1-3. Supports wide frequency range from 860MHz to 960MHz, 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. Inductive coupling with antenna even through non-conductive adhesive

1-6. Wide mechanical mounting tolerance for assembly into RFID tag or inlay

1-7. Compatible with plastic molding process (150°C max. over 2 hours)

1-8. Fully Compatible with conventional SMT process (Soldering/Reflow)

1-9. High ESD protection function up to 2kV (MM)

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
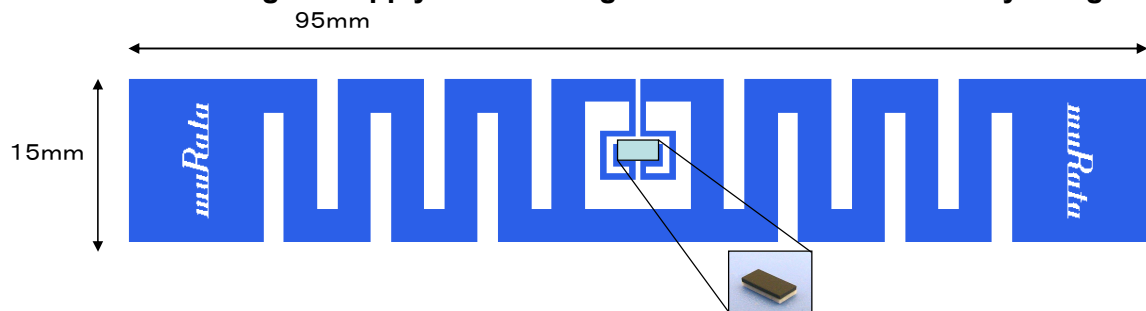
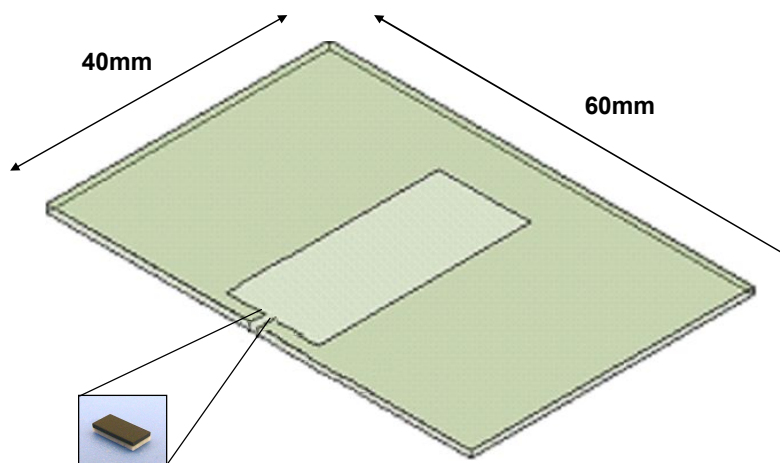LXMS31ACNA–011 and LXMS31ACNB–021 match for "Murata-A3".

Advantages :

- Size compatible with SCM label (<10 cm length)
- Compliant to EPC/g C1G2 (UHF band)
- Supports 860-960MHz 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

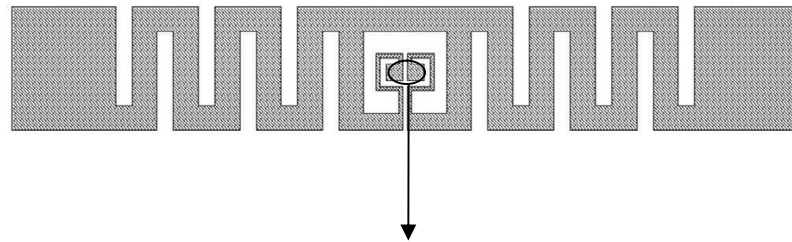**3-2. Durable RFID card for access control - "Murata-C1" inlay design**

LXMS31ACNA–012 and LXMS31ACNB–022 match for "Murata-C1".

- Size compatible with ISO-compliant credit card, ID card, etc.
- Compliant to EPC/g C1G2 in UHF band
- Support 860-960MHz for world wide use
- Support one by one read / write in short rage
- Long read range (up to 4m)
- Round directivity
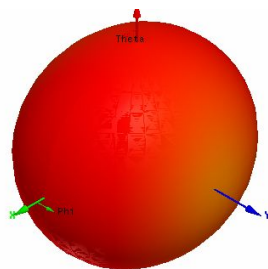
3-3. Recommended mounting pattern and tolerance of mounting
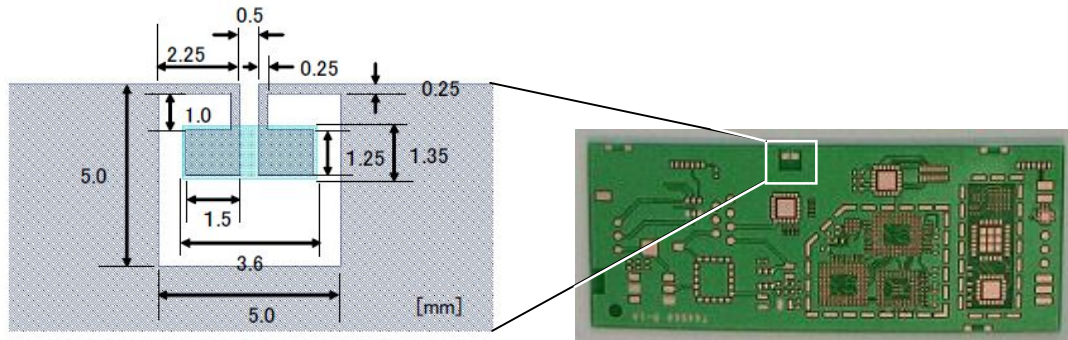

Top View of MAGICSTRAP®
and mounting pattern

MAGICSTRAP®
Recommended mouting pattern

Unit : mm

MAGICSTRAP®
Adhesive
Z
Antenna
Thickness of adhesive
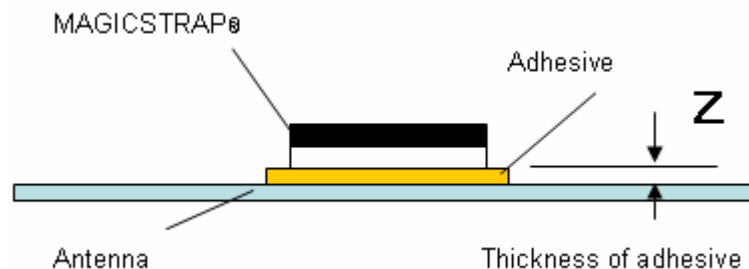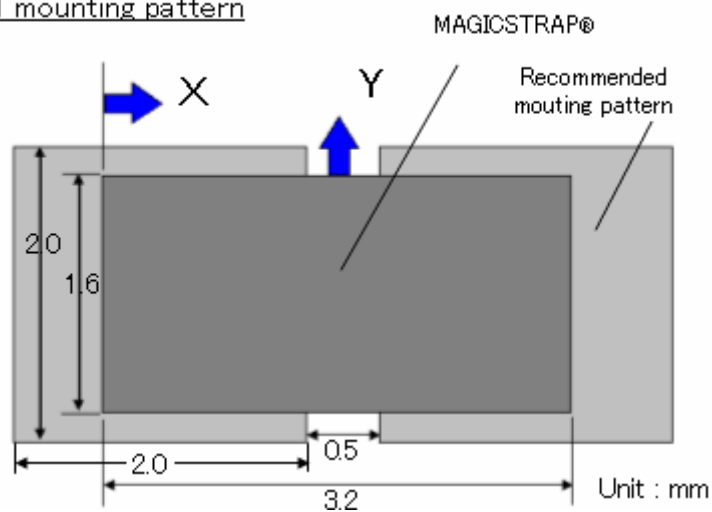
Tolerance of mounting :   X < ±500um,   Y < ±500um,   Z < 10umum

4. Mounting pad design for PCB traceability

4 different mounting pad designs available for each MAGICSTRAP®
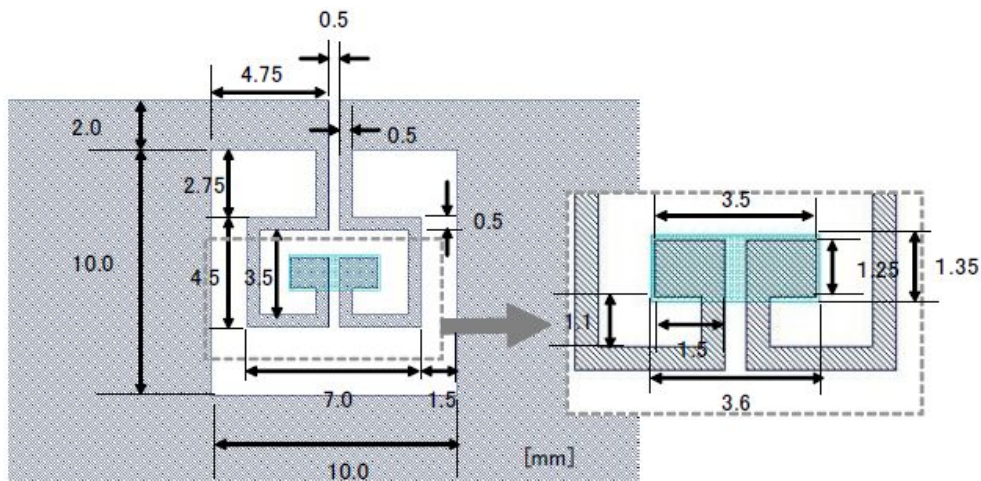
4-1. 5x5mm for LXMS31ACNA–009 and LXMS31ACNB–019   -   "Type-1"
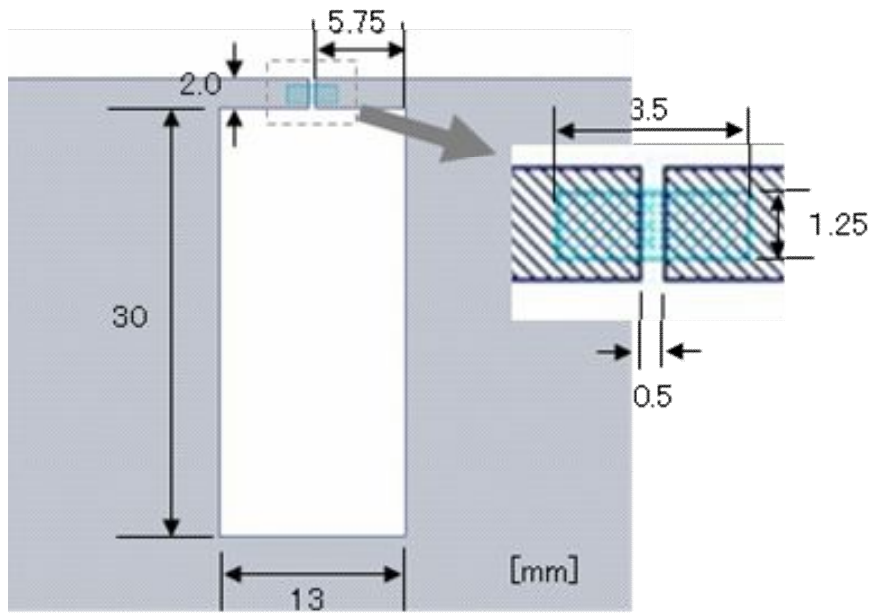

4-2. 5x10mm for LXMS31ACNA–010 and LXMS31ACNB–020   -   "Type-2"
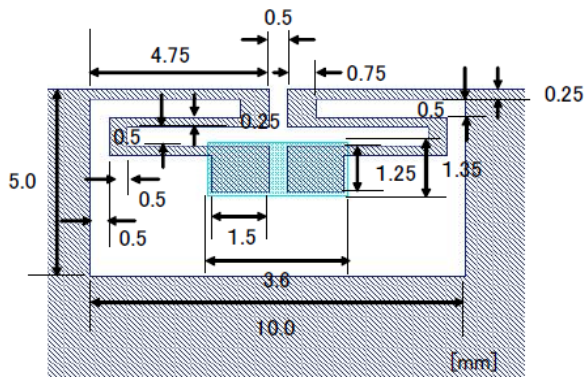
4-3. 12x10mm for LXMS31ACNA–011 and LXMS31ACNB–021   -   "Type-3"
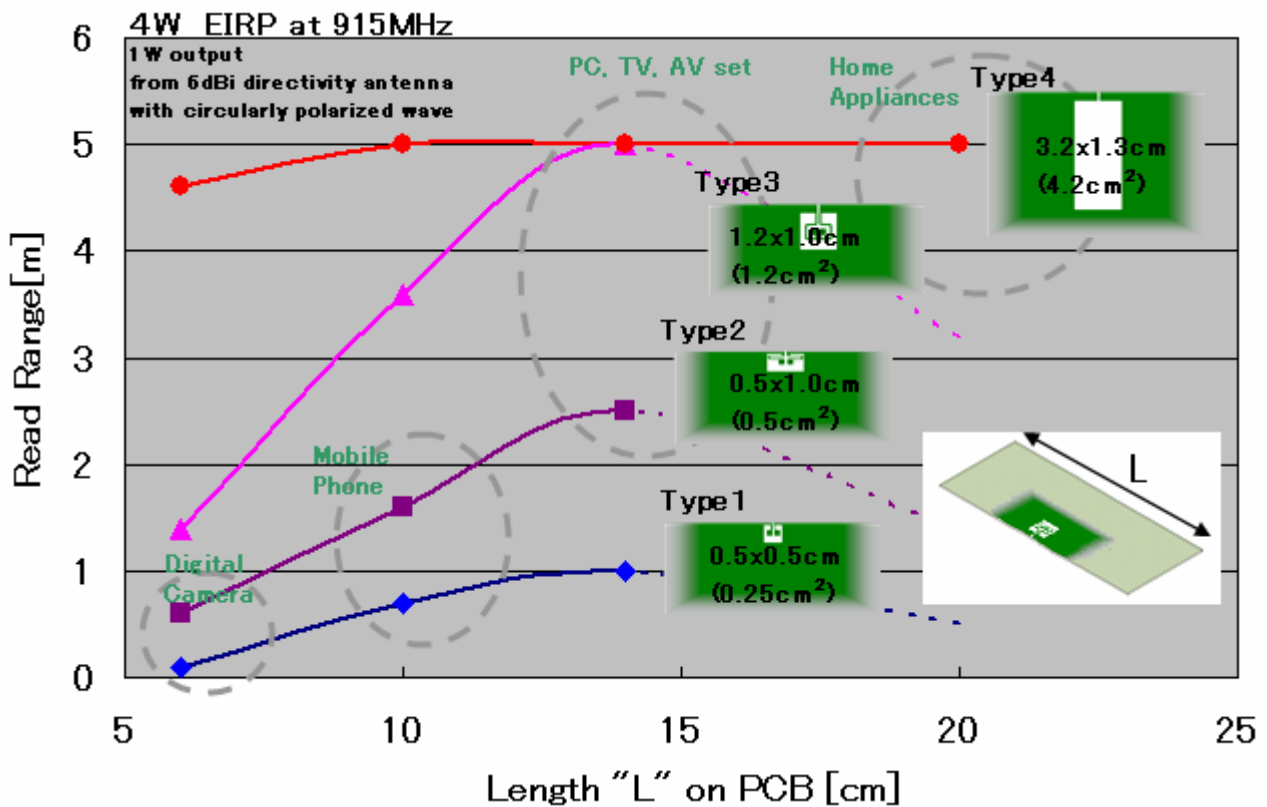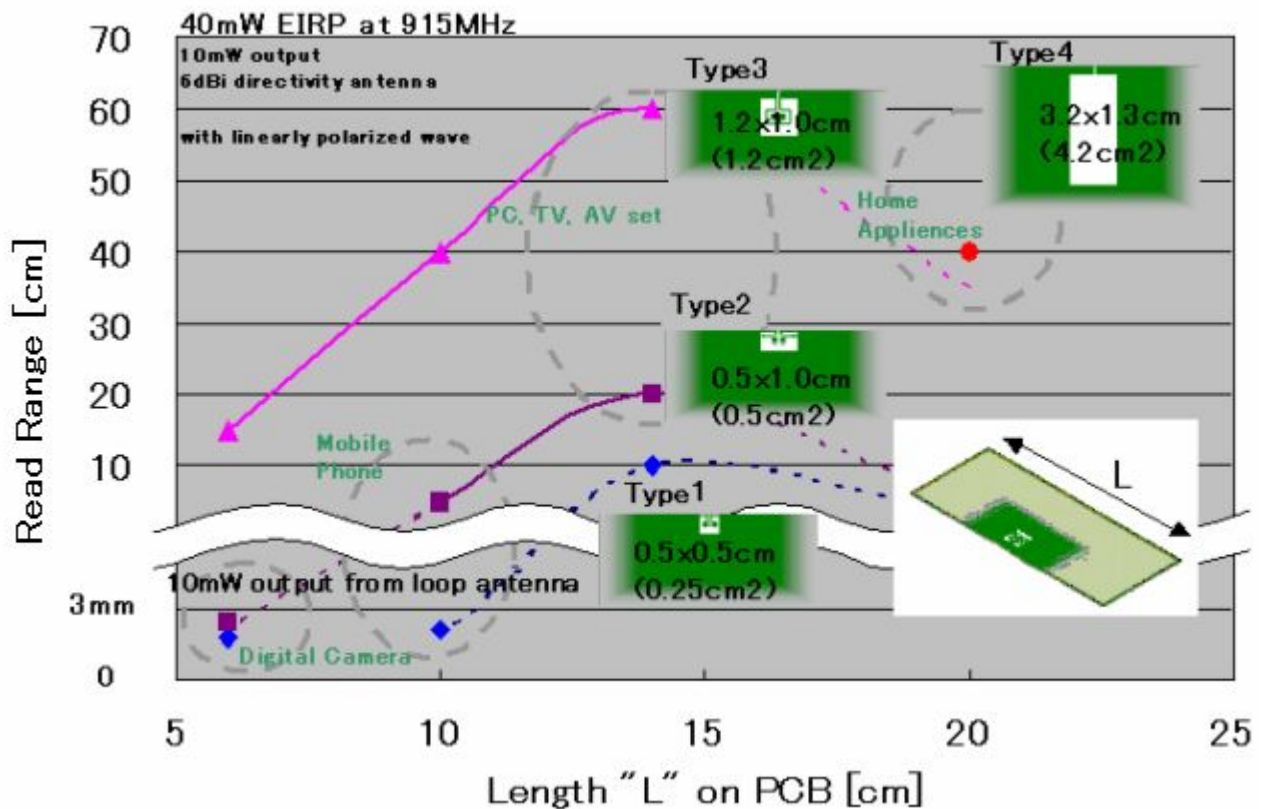

4-4. 30x13mm for LXMS31ACNA–012 and LXMS31ACNB–022   -   "Type-4"

4-5. Read range

The read range of the RFID tag function after the assembly of the MAGICSTRAP® onto the antenna not only depends on the mounting pattern type, but also on the size and shape of PCB as shown below.
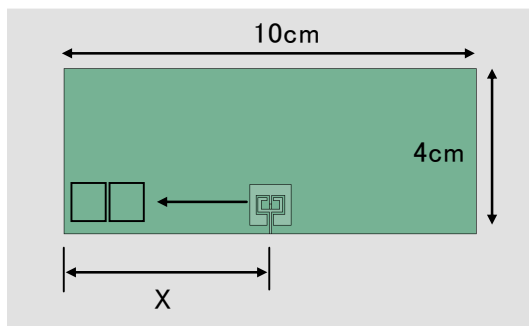
4-6. Best position of mounting pattern

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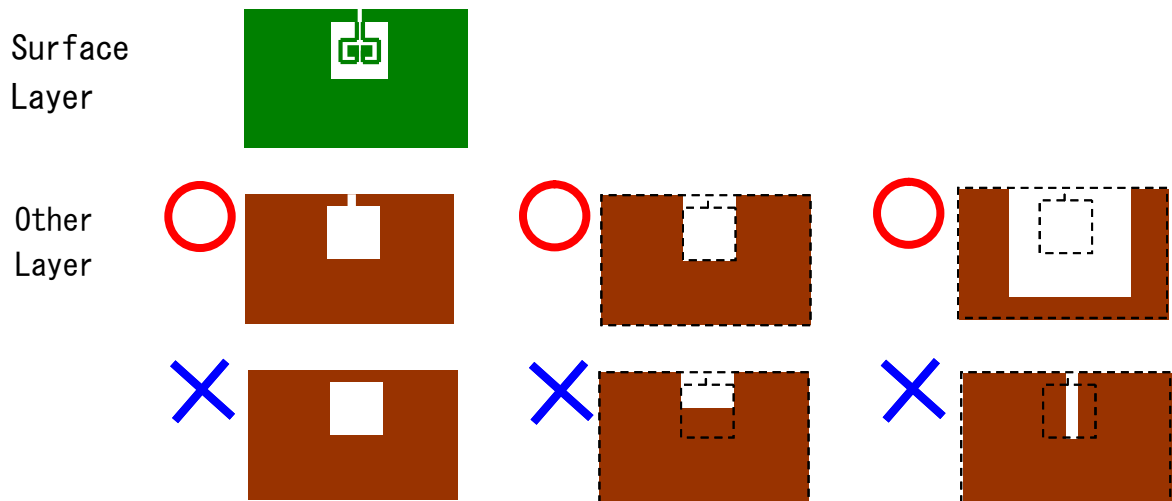
The following indicates the relationship between "X" length and read range in case of mounting pattern Type-3.

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 .

Surface
Layer

Other
Layer

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

From this point of view, ⭕ is a good example for long read range. ✖ Is a bad one.

4-8. Important area for better tuning

Important area for RFID tag sensitivity is the edge part of PCB shown as "dark green" below.
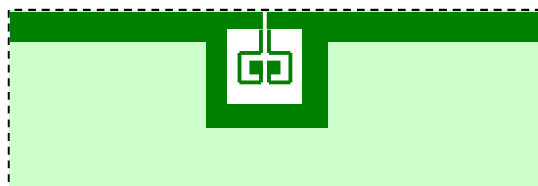
A dent on the antenna or a connection of the antenna to other layers also works well without large detuning.

Antenna with dent.

Via   Cupper on another Layer

Antenna formed in multi-layers.

Aug. 2009   **7 / 8**

< Note >

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