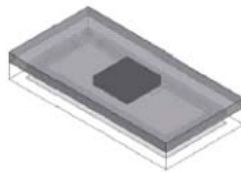


Murata Electronics
MAGICSTRAP®
Application Notes

Aug 2009

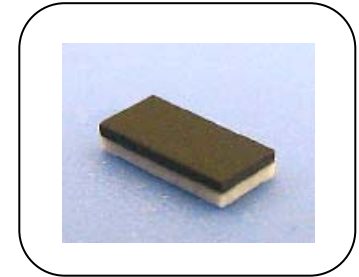


Application note of MAGICSTRAP®

Murata part number: LXMS31ACNA / LXMS31ACNB

General Description

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



[Features]

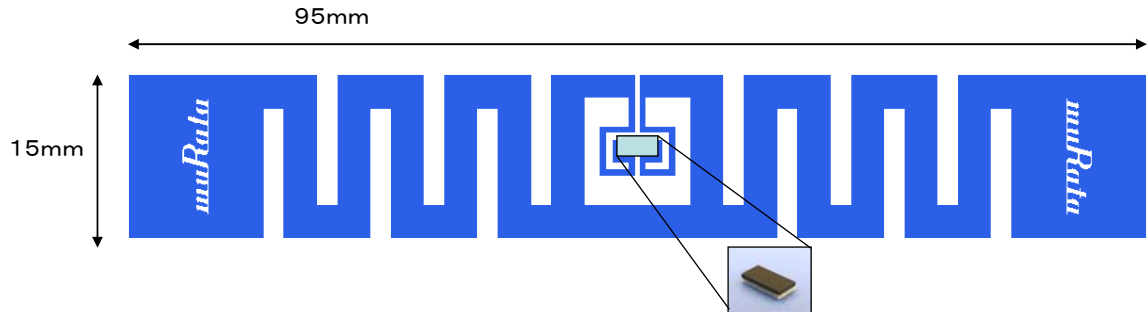
- 1-1. Compliant to EPC global Class1Gen2
- 1-2. Ultra small package (3.2 x 1.6 x 0.55mm typ.) ensuring high durability
- 1-3. Supports wide frequency range from 860MHz to 960MHz, covering all global UHF frequency bands with one single design.
- 1-4. Impedance transformation function for more accurate matching with various antenna designs
 - 4 different variants available, which allows 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

1. Applications

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

2. Antenna design for durable tag

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

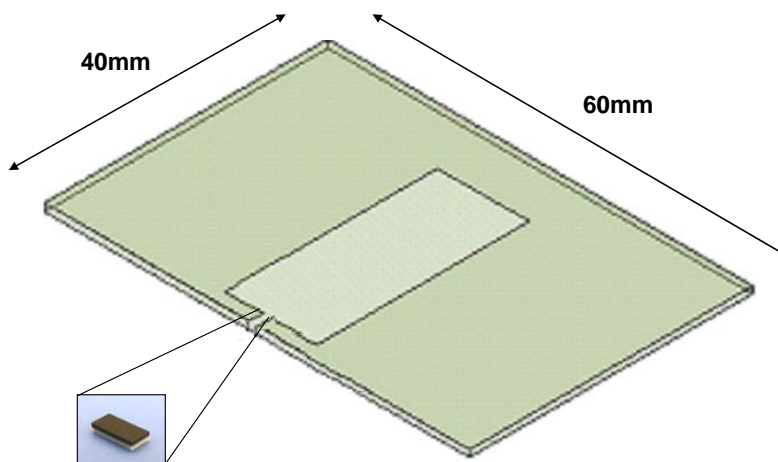


LXMS31ACNA-011 and LXMS31ACNB-021 match for “Murata-A3”.

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

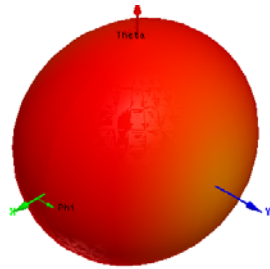


LXMS31ACNA-012 and LXMS31ACNB-022 match for “Murata-C1”.

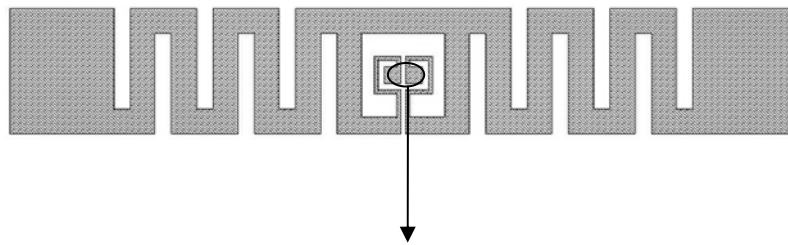
Application note of MAGICSTRAP®

Murata part number: LXMS31ACNA / LXMS31ACNB

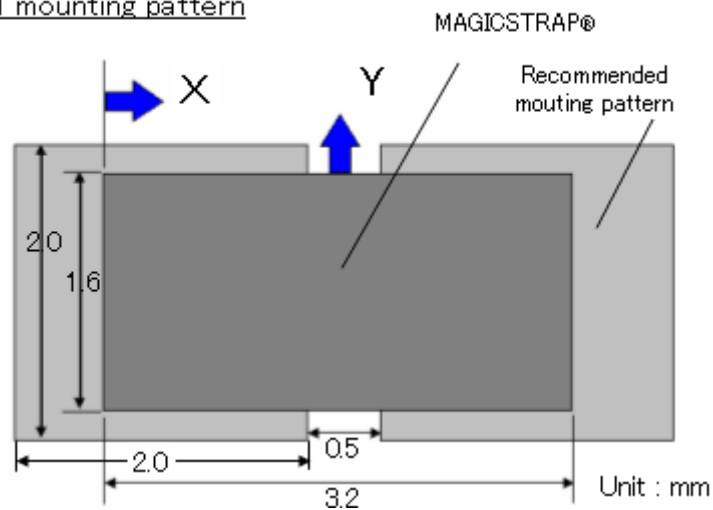
- Size compatible with ISO-compliant credit card, ID card, etc.
- Compliant to EPC/g C1G2 in UHF band
- Support 860-960MHz for world wide use
- Support one by one read / write in short range
- Long read range (up to 4m)
- Round directivity

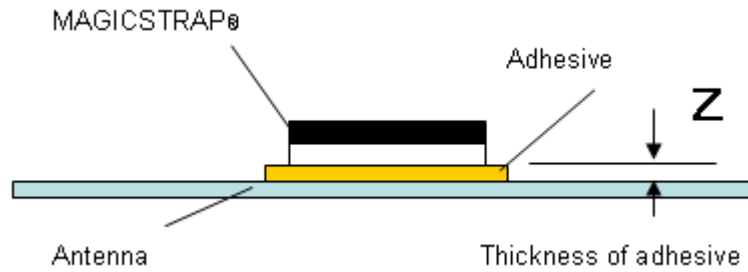


3-3. Recommended mounting pattern and tolerance of mounting



Top View of MAGICSTRAP®
and mounting pattern



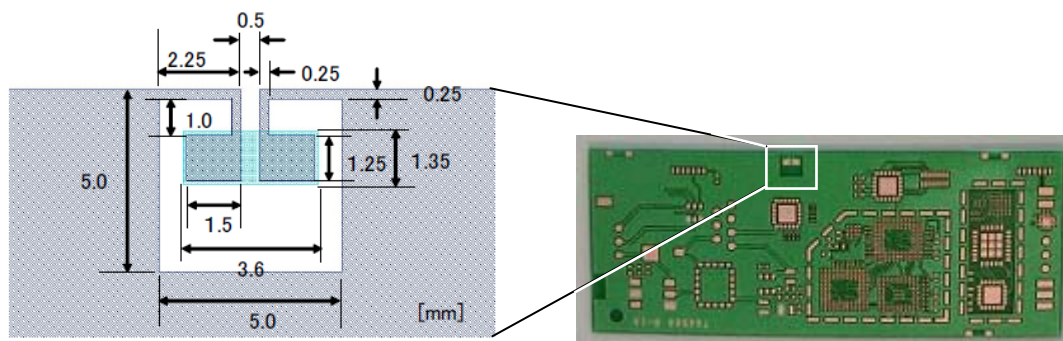


Tolerance of mounting : $X < \pm 500\mu\text{m}$, $Y < \pm 500\mu\text{m}$, $Z < 10\mu\text{m}$

3. Mounting pad design for PCB traceability

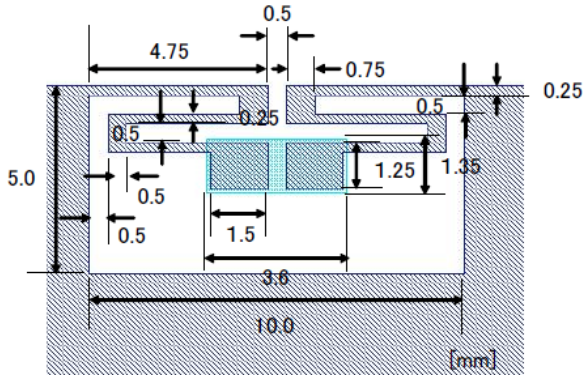
4 different mounting pad designs available for each MAGICSTRAP®

4-1. 5x5mm for LXMS31ACNA-009 and LXMS31ACNB-019 - "Type-1"

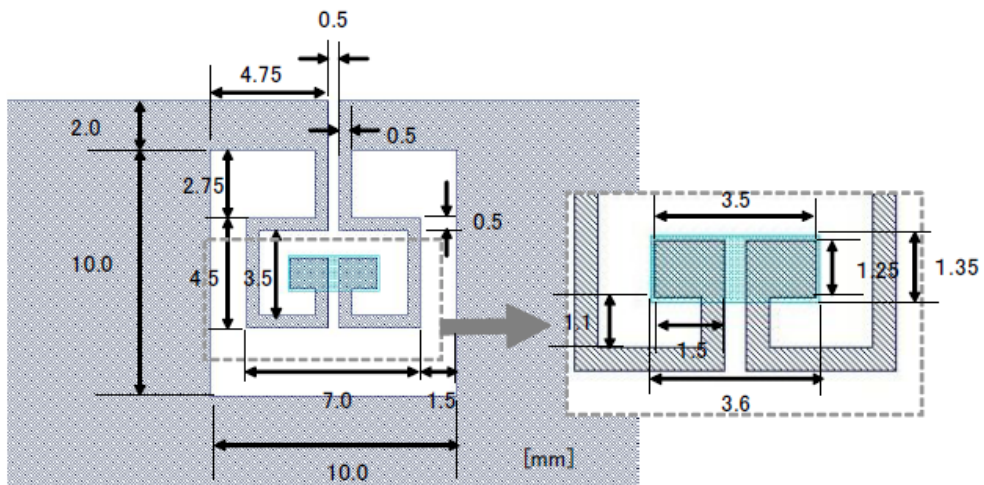


Application note of **MAGICSTRAP®**
Murata part number: **LXMS31ACNA / LXMS31ACNB**

4-2. 5x10mm for LXMS31ACNA-010 and LXMS31ACNB-020 - "Type-2"



4-3. 12x10mm for LXMS31ACNA-011 and LXMS31ACNB-021 - "Type-3"

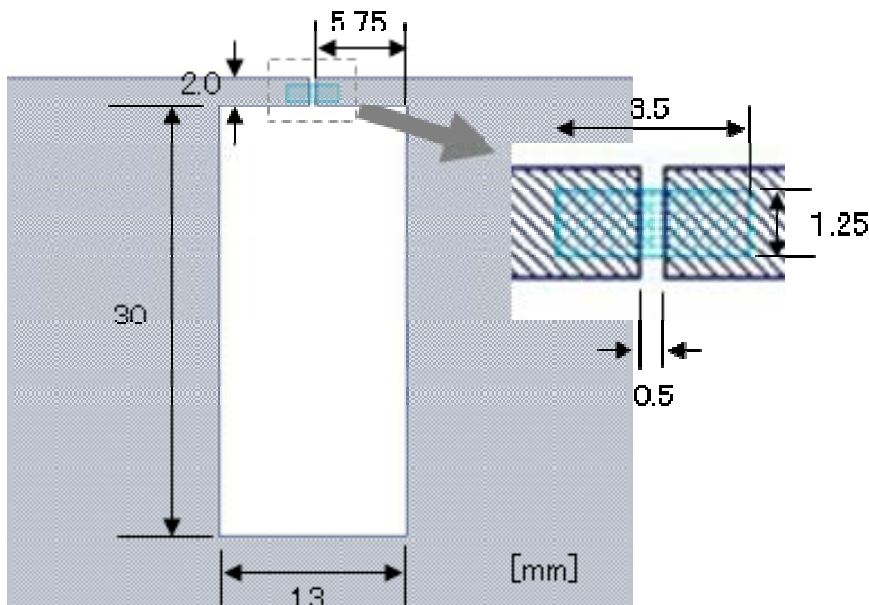


Application note of **MAGICSTRAP®**
Murata part number: LXMS31ACNA / LXMS31ACNB



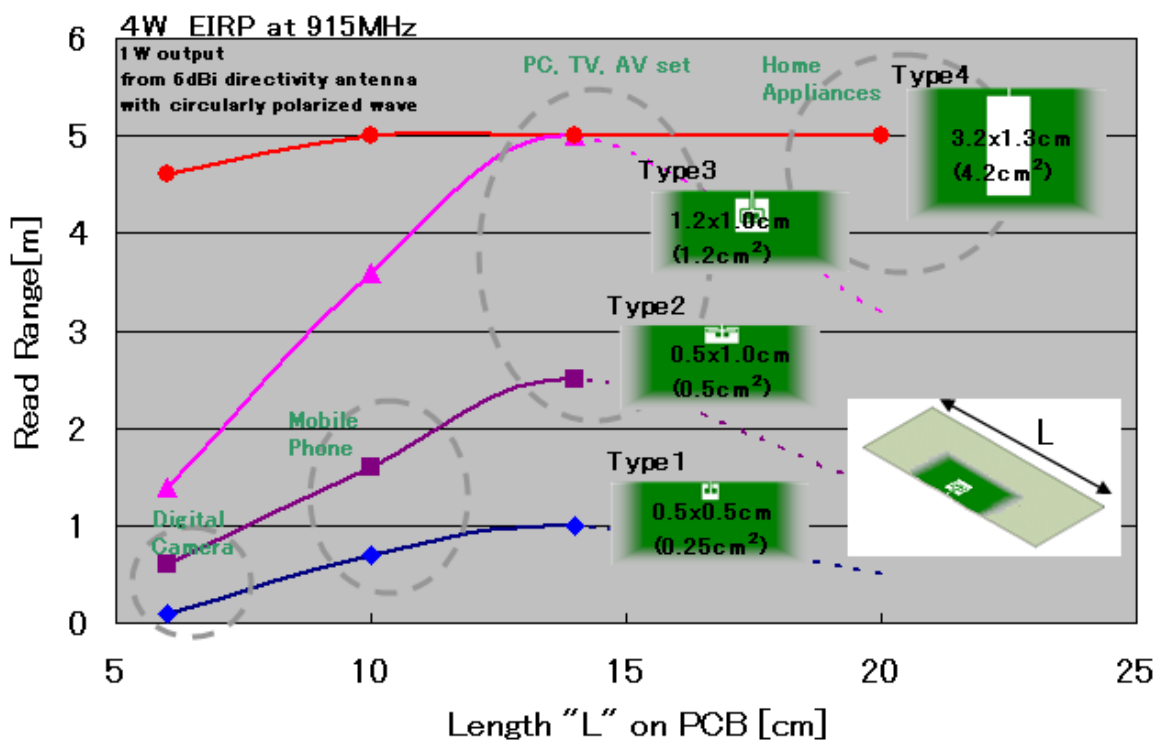
Innovator in Electronics

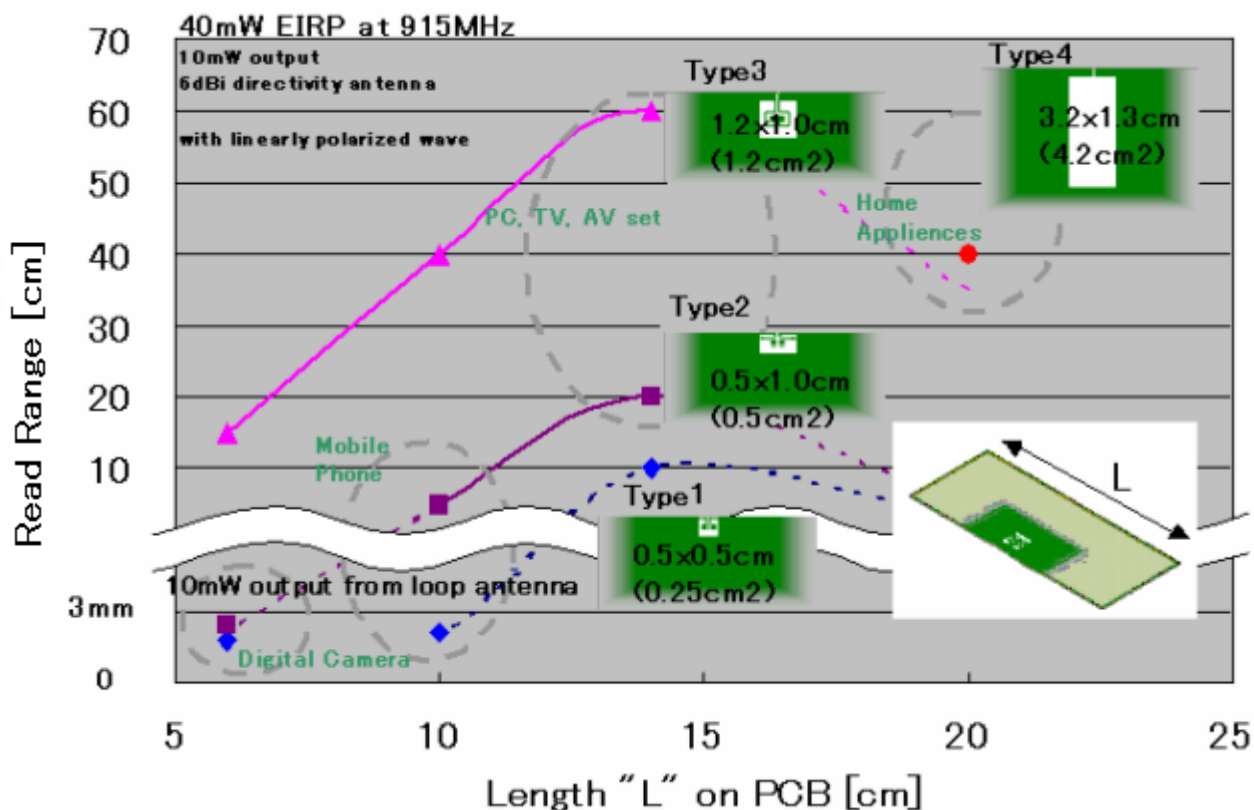
4-4. 30x13mm for LXMS31ACNA-012 and LXMS31ACNB-022 - "Type-4"



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.

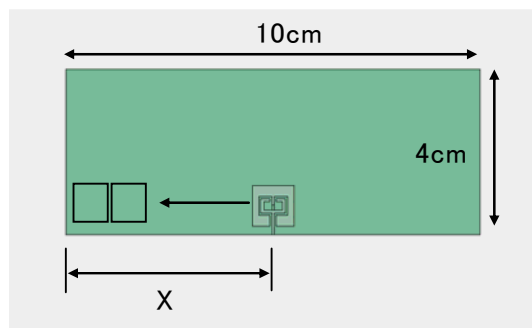




4-6. Best position of mounting pattern

For best performance MAGICSTRAP® should be centered on the long side of the PCB. This will ensure to achieve the maximum read range.

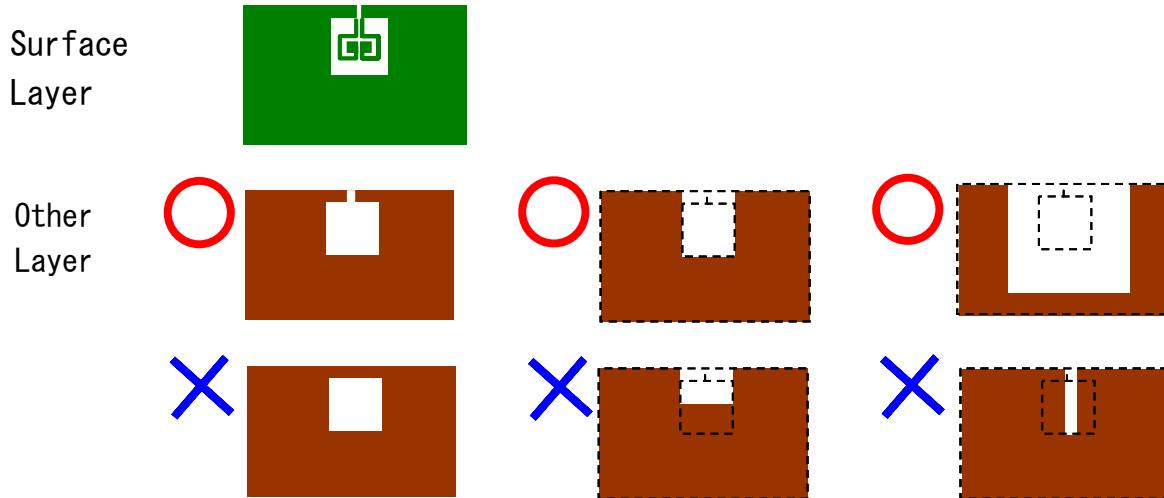
The following indicates the relationship between "X" length and read range in case of mounting pattern Type-3.





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 .

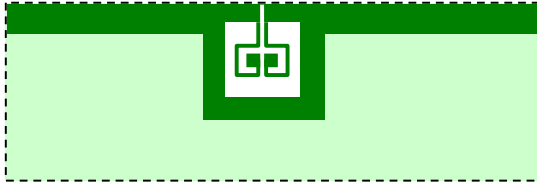


In the above drawing, non-printed square zone on each layer means removed copper printing. Square size without copper printing in each layer shall be equal or larger than the surface layer with mounting pattern, Type-1, 2, 3 and 4.

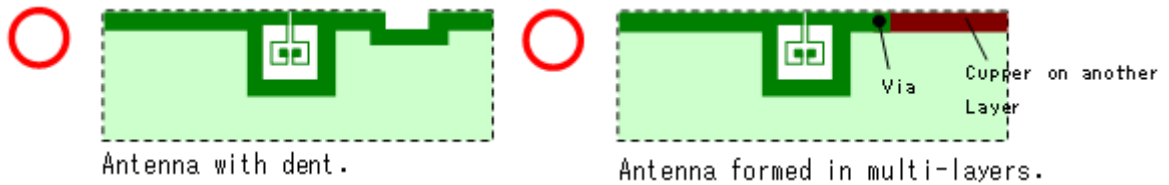
From this point of view,  is a good example for long read range.  is a bad one.

4-8. Important considerations for max read range

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



Off set of the antenna or interlayer connectors are also possible with minimum antenna detuning..



< Note >

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