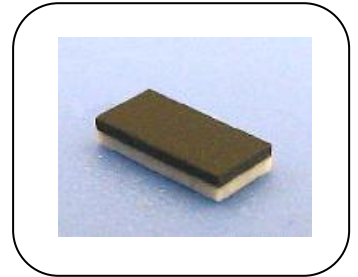


MAGICSTRAP[®] Application Note

Murata part number : LXMS31 series

1. General descriptions

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



[Features]

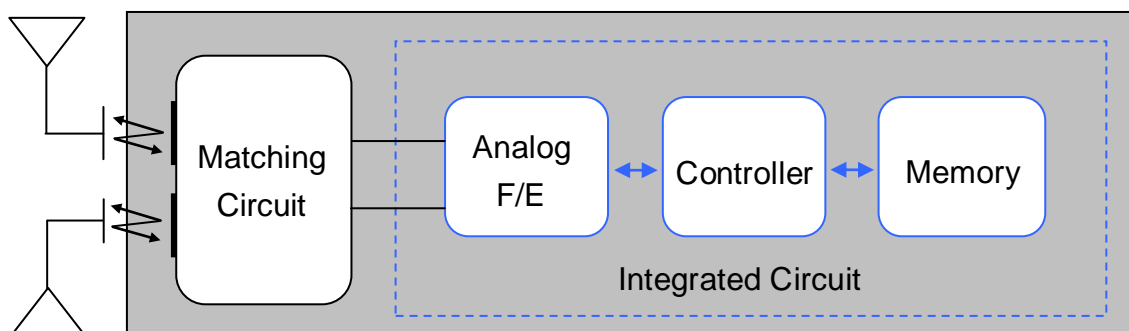
- 1-1. Compliant to EPC global Class1Gen2
- 1-2. Ultra small package (3.2X1.6X0.55mm typ.)
- 1-3. Supports wide frequency range from 865MHz to 955MHz, allowing to cover all globally relevant UHF frequency bands with single design.
- 1-4. Impedance transformation function for more precise matching with 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. Readable as antenna-less tag, in case very near field antenna is ready at reader/writer equipment
- 1-7. Wide mechanical mounting tolerance for assembly on RFID tag or inlay
- 1-8. Fully compatible with conventional SMT process and reflow soldering
- 1-9. Compatible with plastic molding process (150°C max. over 2 hours)
- 1-10. High ESD protection function
- 1-11. 100% green material for full RoHS compliance
- 1-12. Internal 512bits user memory available

2. Part number / IC / Memory

| P/N | IC | EPC | USER | TID |
|---------------------------------|----------|---------------|---------|--------|
| LXMS31ACNA - 009, 010, 011, 012 | NXP G2XM | up to 240bits | 512bits | 64bits |

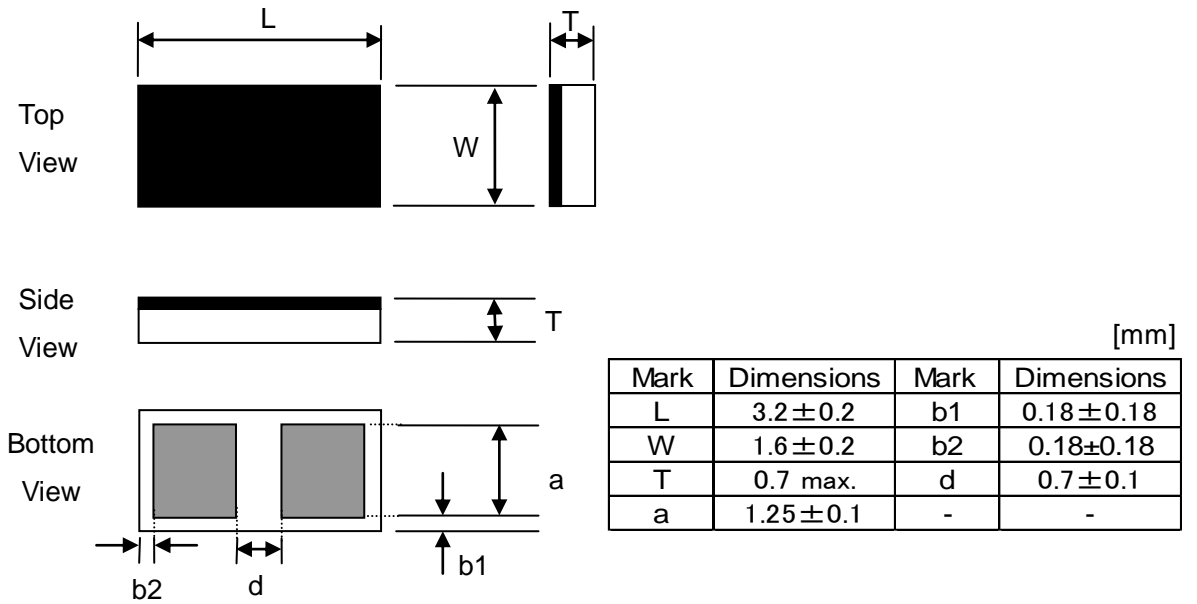
Each p/n has a different impedance value. Please refer “5-3. Electrical characteristics”.

3. Block diagram

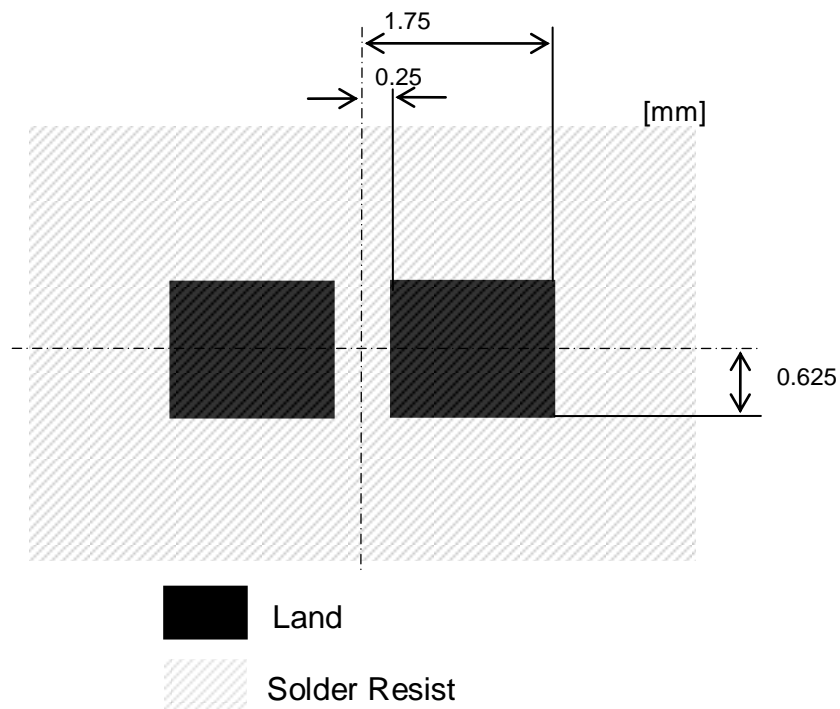


4. Mechanical information

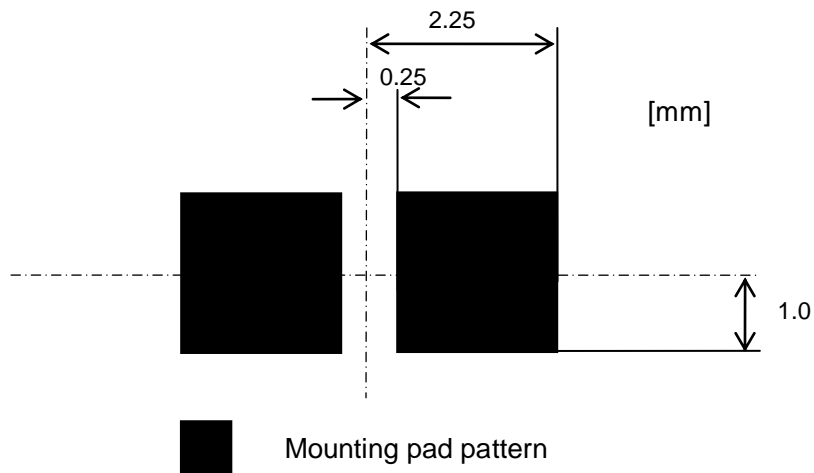
4-1. Dimensions



4-2. Recommended land pattern (SMT process)



4-3. Recommended land pattern (adhesive attachment)



5. Electrical performance

5-1. Frequency range

865 – 955 MHz

5-2. Minimum operating power

-8dBm

5-3. Electrical characteristics at minimum operating power (Ta=25°C, Unit : Ohm)

| Parameter | | MAGICSTRAP [®] | LXMS31ACNA | LXMS31ACNA | LXMS31ACNA | LXMS31ACNA |
|-----------------|--------|-------------------------|------------|------------|------------|------------|
| | | P/N | - 009 | - 010 | - 011 | - 012 |
| Impedance value | @866.5 | R | 15 | 12 | 25 | 80 |
| | MHz | X | -45 | -107 | -200 | -405 |
| | @915.0 | R | 25 | 12 | 25 | 80 |
| | MHz | X | -45 | -107 | -200 | -420 |
| | @953.0 | R | 30 | 9 | 20 | 60 |
| | MHz | X | -48 | -105 | -195 | -425 |

6. Operating temperature

-40 °C ~ +85 °C

7. RoHS compliance

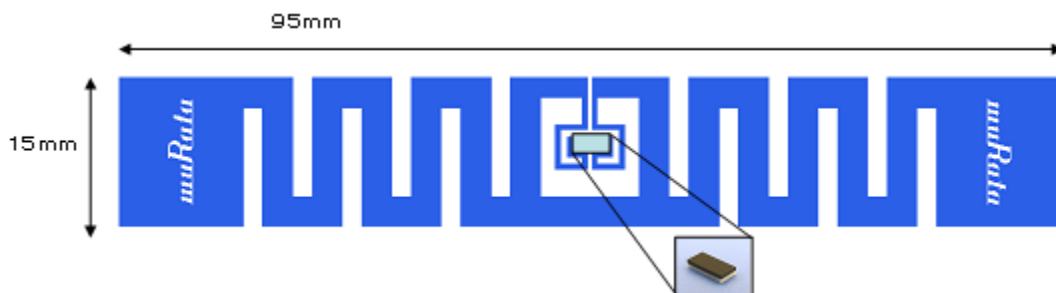
MAGICSTRAP® is compliant with RoHS directive.

8. Attachment of MAGICSTRAP®

MAGICSTRAP® allows both conductive connection such as conventional SMT process and non-conductive connection by adhesive material.

9. Antenna design example for RFID tags

9-1. 4 inches inlay for SCM - “Murata-A3” design

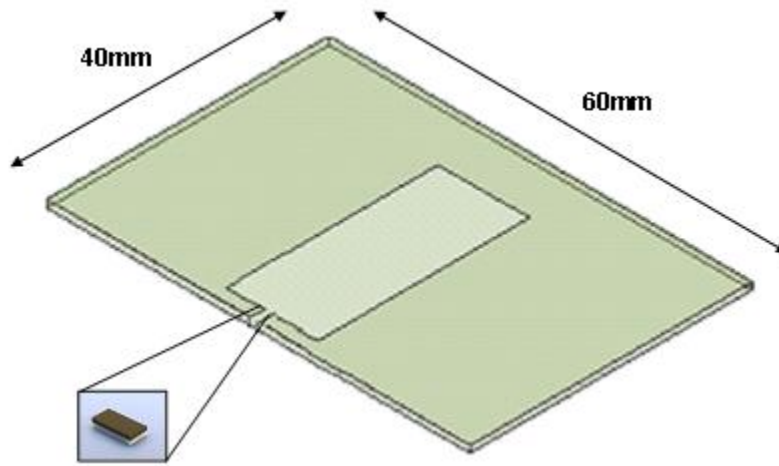


Use LXMS31ACNA-011 for “Murata-A3”.

Advantages :

- Size compatible with SCM label (4 inches width)
- Supports 865-955MHz for world wide use in single design
- Long read range (up to 5m)

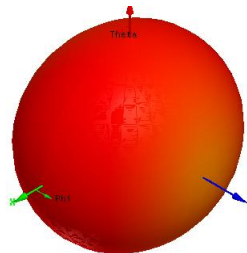
9-2. Card size inlay for access control - “Murata-C1” design



Use LXMS31ACNA-012 for “Murata-C1”.

Advantages :

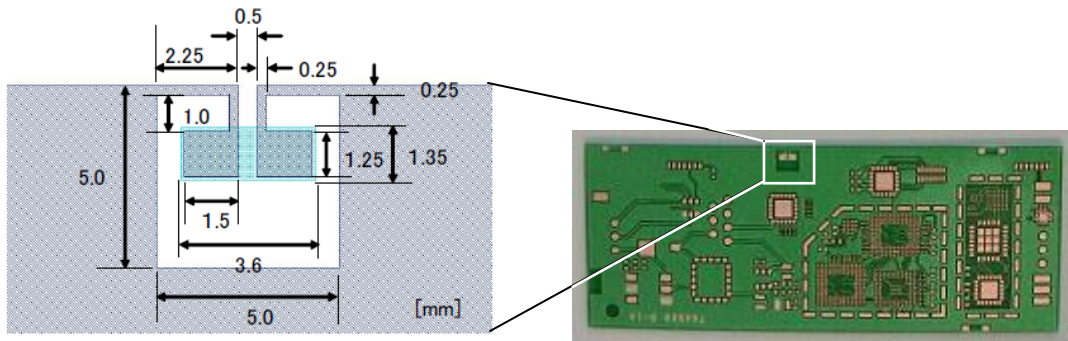
- Size compatible with ISO-compliant credit card, ID card, etc.
- Support 865-955MHz for worldwide use
- Support one by one read/write operation in short range
- Long read range (up to 4m)
- Round directivity



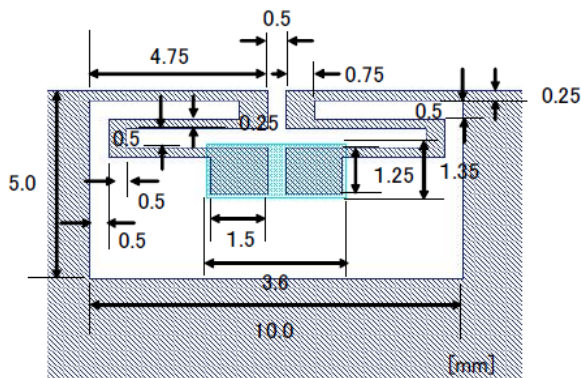
10. Antenna design on PCB

10-1. 4 different antenna designs are available for MAGICSTRAP[®].

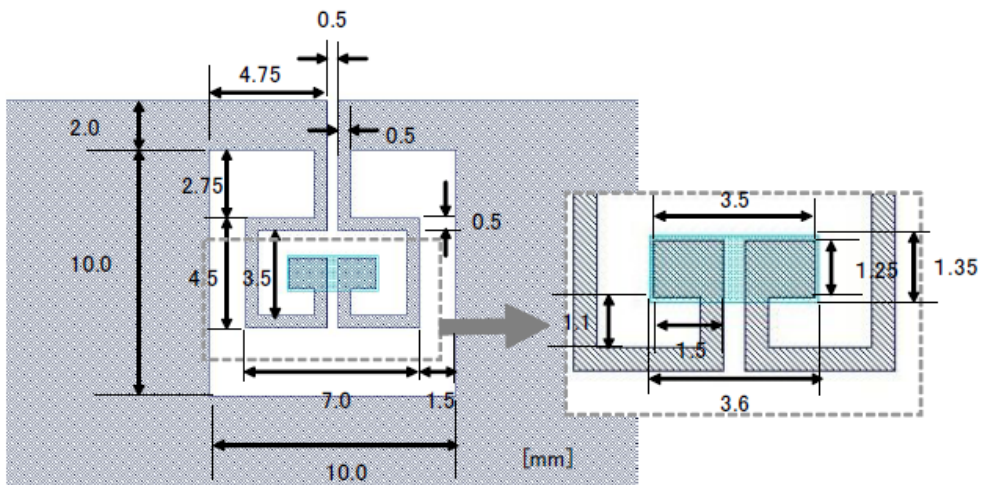
“Type-1” - 5x5mm for LXMS31ACNA-009



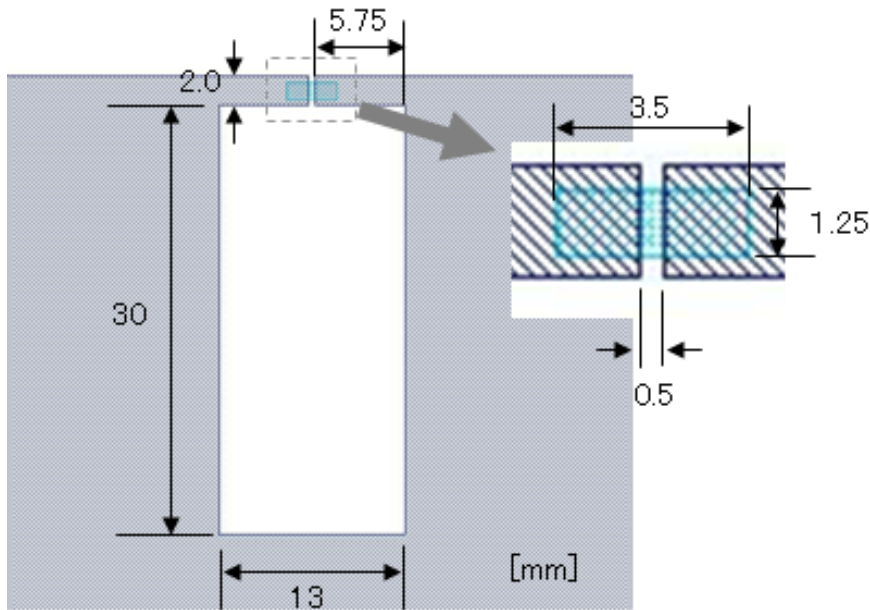
“Type-2” - 5x10mm for LXMS31ACNA-010



“Type-3” - 12x10mm for LXMS31ACNA-011

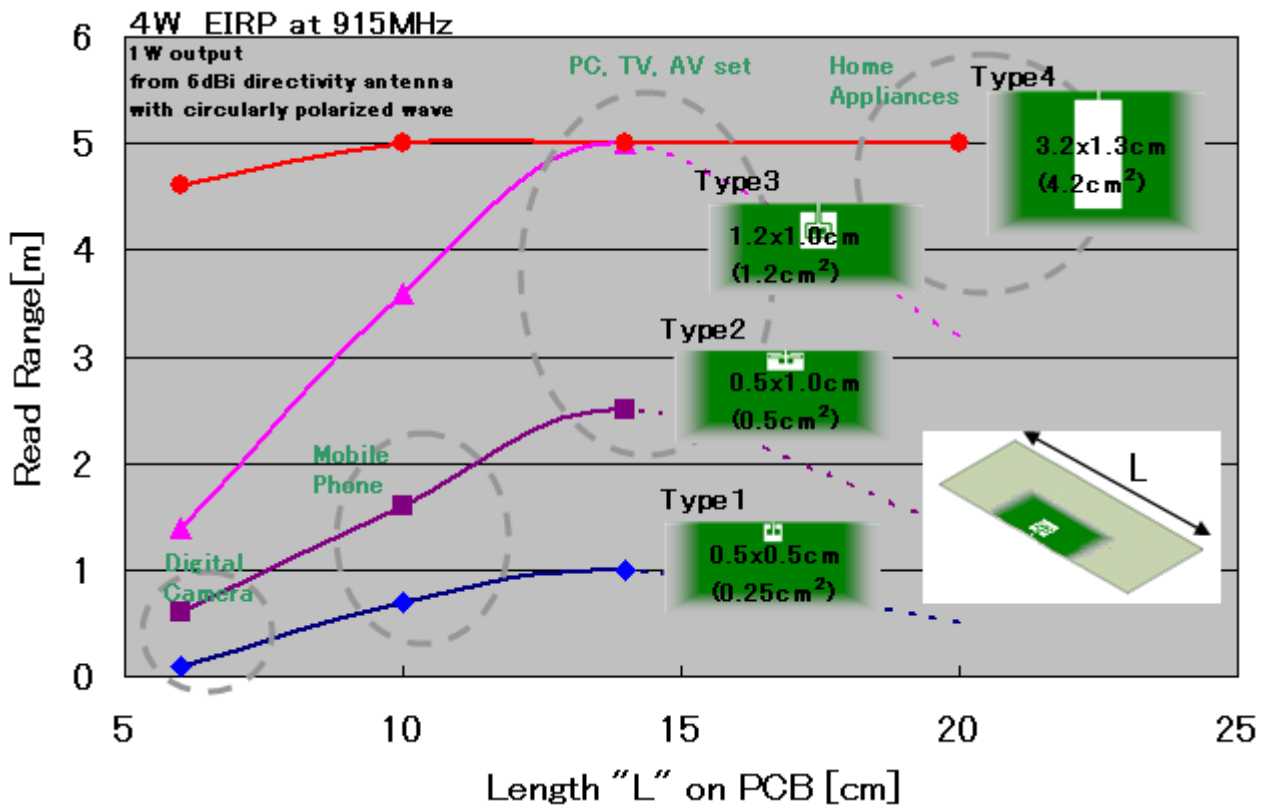


“Type-4” - 32x13mm for LXMS31ACNA-012



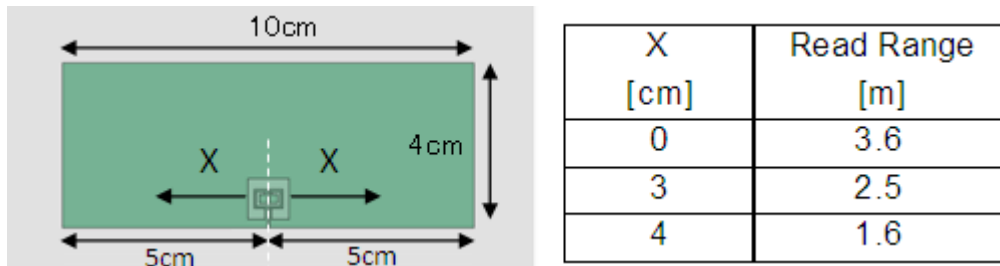
10-2. Read range

The read range of MAGICSTRAP® on PCB mainly depends on the type of mounting pattern as well as the size of PCB shown below.



10-3. Position of mounting pattern

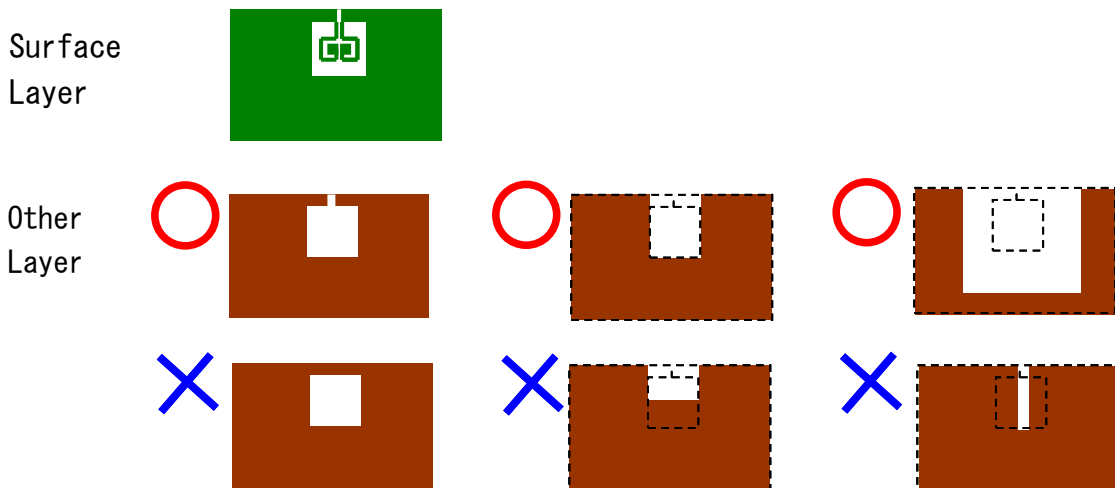
Mounting pattern shall be placed as close to the center of the PCB as possible. This ensures maximum read range. Followings indicates the relationship between the location of mounting pattern and the read range in case of Type-3.





“X” means the distance from the center of PCB.

10-4. How to design under the mounting pattern

Please remove all the copper pattern area from all layers of the PCB, if it is located under mounting pattern on surface layer.

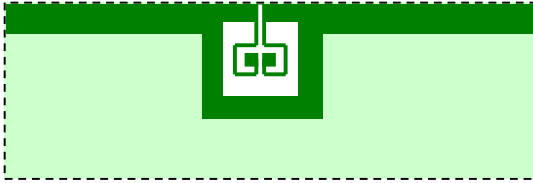


In the above drawing examples, non-printed square zone on each layer means non-copper area. Square size of non-copper pattern in each layer shall be equal or larger than the mounting pattern on surface layer.

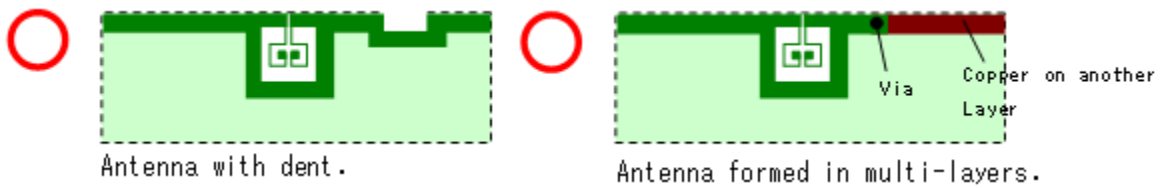
 are good examples.  are bad ones.

10-5. How to design edge part of PCB

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



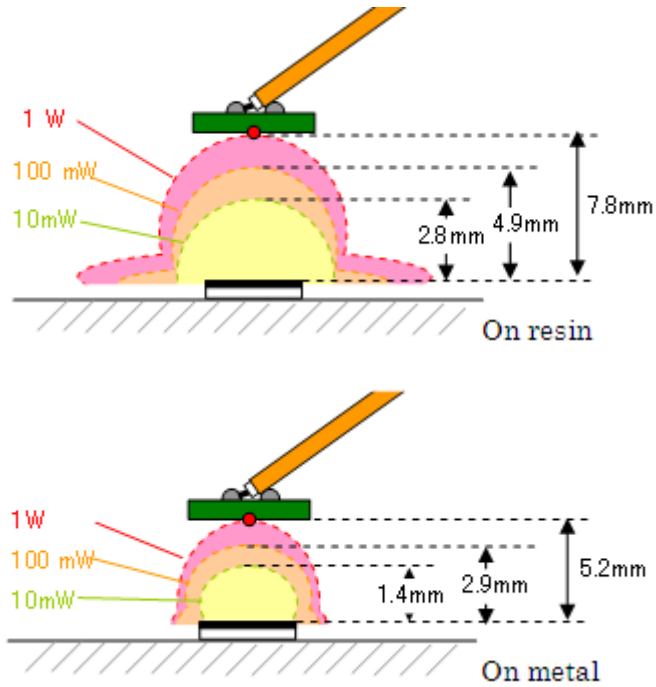
A dent on PCB or a connection of the antenna to other layers also works well without large detuning.



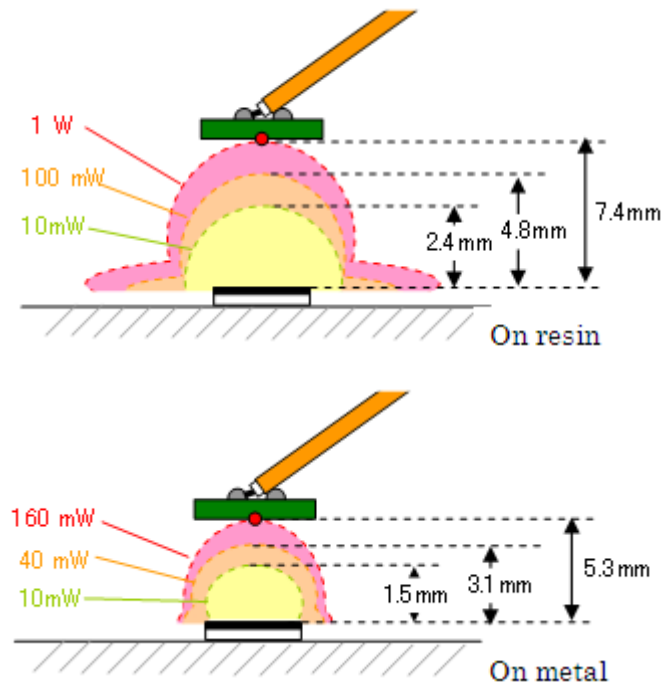
11. Antenna-less use case of MAGICSTRAP[®]

How to use: <http://www.murata.com/products/rfid/demonstration/index.html>

11-1-1. Read area (EU band)

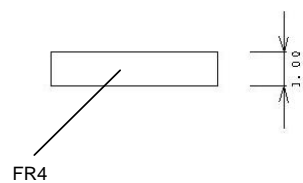
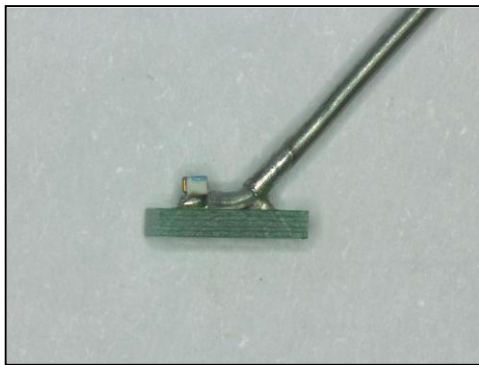
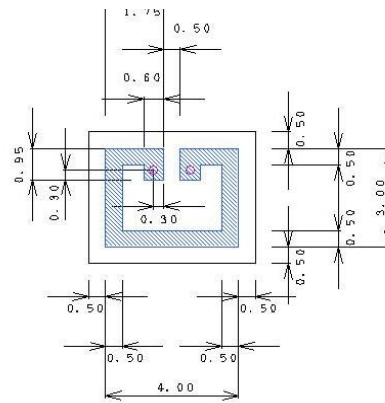
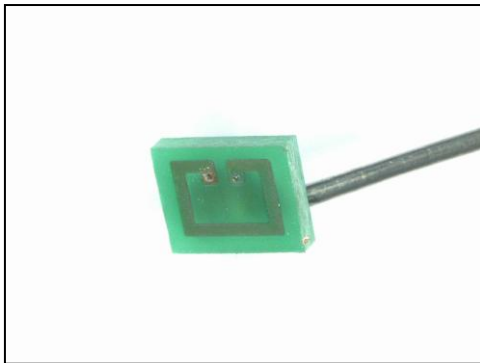
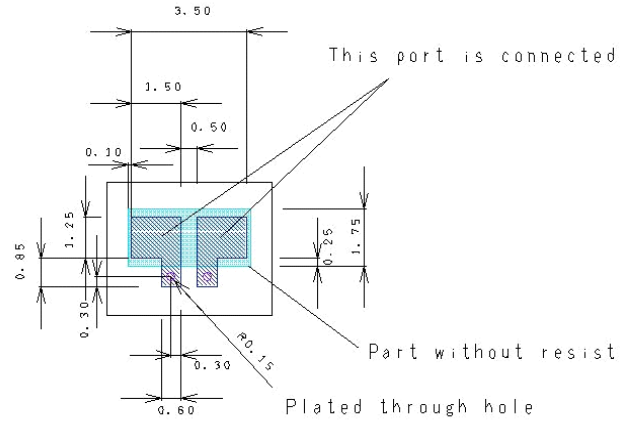
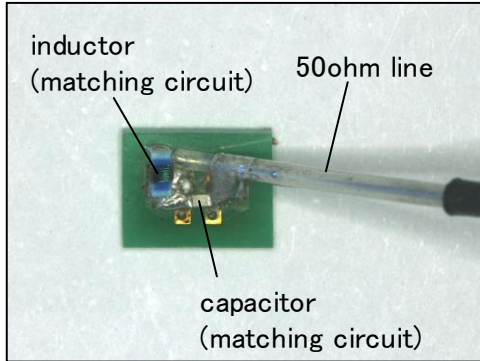


11-1-2. Read area (US band)



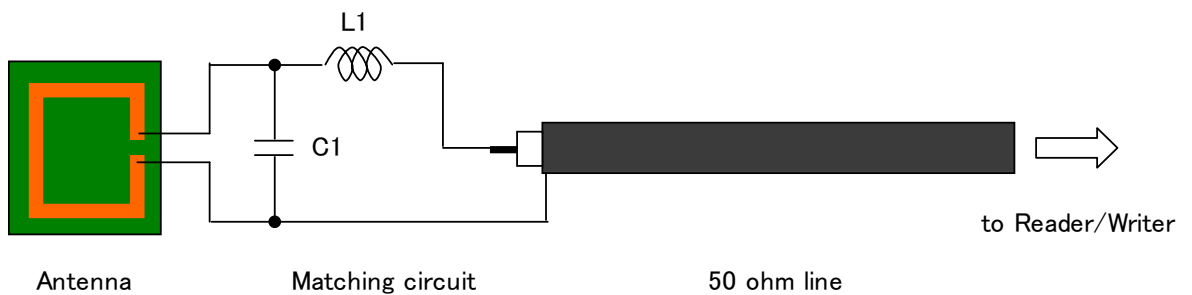
11-3. Reference design of reader/writer antenna - for antenna-less MAGICSTRAP[®]

11-2-1. Dimension



[mm]

11-2-2. Matching circuit



MAGICSTRAP[®] Application Note

Murata part number : LXMS31 series



| Frequency | | C1 | L1 |
|-----------|----|-------|------|
| 866.5MHz | EU | 6.8pF | 39nH |
| 915MHz | US | 6.0pF | 39nH |

Above C1 & L1 are just for references. In actual setting, these values are recommended to be adjusted according to actual antenna characteristics. The best tuning balance will show the minimum return from antenna.

12. Tape and reel packing

MAGICSTRAP[®] is supplied by taping and reel package.

12-1. Quantity per reel

Packaging unit :4000 pcs./ reel

12-2. Minimum order quantity

4000 pcs

13. Contact window / the latest data about MAGICSTRAP[®]

e-mail : magicstrap@ml.murata.co.jp

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

< Note >

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