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ISO/IEC JTC 1/SC 17/WG 8

Secretariat: DIN

## **Identification cards — Test methods — Part 6: Proximity cards**

**AMENDMENT 8**

**Additional PICC classes**

*Cartes d'identification — Méthodes d'essai — Partie 6: Cartes de proximité*

*AMENDEMENT 8*

*Classes additionnelles de PICC*

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Amendment 8 to ISO/IEC FCD10373-6:2009 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 17, *Cards and personal identification*.



## Identification cards — Test methods — Part 6: Proximity cards

### AMENDMENT 8: Additional PICC classes

*Page 3 of ISO/IEC FCD 10373-6:2009, 3.2*

Add the following definitions:

CCF      Coupling Compensation Factor

$V_{load}$       DC voltage measured at connector CON3 of the Reference PICC

*Page 8 of FCD 10373-6:2009, 5.3.2*

Replace the paragraph with:

"The size of the sense coils shall be either 100 mm × 70 mm or 60 mm × 47 mm, with corners radii of 10 mm, depending on the PICC class. The sense coils construction shall conform to the drawings in Annex C."

*Page 10 of FCD 10373-6:2009, 5.4.2*

Replace the first paragraph with:

"The Reference PICCs coils layouts are defined in Annex D. If connectors are used between the coils and the circuitry those connectors shall not influence the RF measurements."

*Page 11 of ISO/IEC FCD 10373-6:2009, Clause 5.4.3*

Replace "6 V" by " $V_{load}$ " in steps 6), 7) and 9) and in NOTE.

*Page 14 of ISO/IEC FCD 10373-6:2009, 7.1*

Add the following paragraph and table:

"Tests shall be performed using Reference PICCs 1, 2 and 3 and optionally other Reference PICCs corresponding to the optional classes supported by the PCD as defined in Table 3."

Table 3 — Classes parameters

Class	Reference PICC	$V_{load}$	$R2_{min}$	$R2_{max}$	Sense coils	CCF
1	1	6 V	870 $\Omega$	1070 $\Omega$	Sense coils 1	1
2	2	4,5 V	1030 $\Omega$	1260 $\Omega$	Sense coils 1	1
3	3	4,5 V	1080 $\Omega$	1320 $\Omega$	Sense coils 2	0,7
4	4	4,5 V	990 $\Omega$	1210 $\Omega$	Sense coils 2	0,8
5	5	4,5 V	960 $\Omega$	1170 $\Omega$	Sense coils 2	1,0
6	6	4,5 V	900 $\Omega$	1100 $\Omega$	Sense coils 2	1,4

NOTE 1 The use of sense coils 2 increases the measured values of PICC load modulation by a factor of approximately 2.

NOTE 2 With sense coils 2, a CCF higher than 0,5 corresponds to a reduction of the PICC load modulation limit specified in ISO/IEC 14443-2, 8.2.2.

Page 15 of ISO/IEC FCD 10373-6:2009, Clause 7.1.1

Add the following paragraph:

"The maximum and minimum field strength values to be used with each Reference PICC are given in ISO/IEC 14443-2:2001/PDAM 4, Table 1."

Page 15 of ISO/IEC FCD 10373-6:2009, Clause 7.1.1.2

Replace "3 V" with " $V_{load}$  as defined in Table 3" in steps c) and d) of the procedure for  $H_{min}$ .

Replace the warning in Procedure for  $H_{min}$  test with:

**"WARNING - R2 value should be between  $R2_{min}$  and  $R2_{max}$  as defined in Table 3. Check this range at least once before using the alternative method."**

Page 15 of ISO/IEC FCD 10373-6:2009, Clause 7.1.1.3

Replace the paragraph with:

"The test report shall confirm the operating volume in which the d.c. voltage measured at CON3 for R2 or variable load resistor adjusted to  $H_{min}$  and  $H_{max}$  field strength fulfils the requirements defined in steps d) of the two procedures of 7.1.1.2."

Page 15 of ISO/IEC FCD 10373-6:2009, Clause 7

Delete 7.1.2 and its subclauses

*Page 16 of ISO/IEC FCD 10373-6:2009, Clause 7*

Delete 7.1.3 and its subclauses

*Page 16 of ISO/IEC FCD 10373-6:2009, Clause 7.1.4.1*

Add the following paragraph after first paragraph:

"Tests shall be performed using Reference PICCs 1, 2 and 3 and optionally other Reference PICCs corresponding to the optional classes supported by the PCD."

*Page 16 of ISO/IEC FCD 10373-6:2009, Clause 7.1.4.2*

Replace step d) by the following:

"d) Apply and adjust a d.c. voltage at CON2 to obtain a d.c. voltage at connector CON3 of  $V_{load}$ ."

*Page 17 of ISO/IEC FCD 10373-6:2009, Clause 7.1.5.1*

Add the following paragraph after first paragraph:

"Tests shall be performed using Reference PICCs 1, 2 and 3 and optionally other Reference PICCs corresponding to the optional classes supported by the PCD."

*Page 17 of ISO/IEC FCD 10373-6:2009, Clause 7.1.5.2*

Replace step c) by the following:

"c) Apply and adjust a d.c. voltage at CON2 to obtain a d.c. voltage at connector CON3 of  $V_{load}$ ."

*Page 18 of ISO/IEC FCD 10373-6:2009, Clause 7.2.1.2*

Add the following sentence at the end of the first paragraph starting with "Step 1":

"Depending on the PICC class, select the relevant sense coils as defined in Table 3."

*Page 19 of ISO/IEC FCD 10373-6:2009, Clause 7.2.1.2*

Add the following words at the beginning of the sentence starting with "The resulting peak amplitudes":

"Once multiplied by the coupling compensation factor CCF as defined in Table 3, "

*Page 21 of ISO/IEC FCD 10373-6:2009, Clause 7.2.4*

Replace 7.2.4 and its subclauses with the following:

## 7.2.4 PICC maximum loading effect

### 7.2.4.1 Purpose

This test is used to measure the PICC loading effect.

### 7.2.4.2 Test procedure

Depending on the PICC class, select:

- the relevant  $H_{\min}$  as defined in ISO/IEC 14443-2:2001/PDAM 4, Table 2;
- the relevant Reference PICC as defined in Table 3 and its reference voltage  $V_{\text{load}}$ .

The PICC loading effect at  $H_{\min}$  shall be measured using the Test PCD assembly. It shall not exceed the loading effect of the selected Reference PICC tuned to 13,56 MHz and calibrated to obtain  $V_{\text{load}}$  at CON3 at  $H_{\min}$ . The procedure of this substitution method is as follows.

- a) Tune the selected Reference PICC to 13,56 MHz as described in 5.4.3.
- b) Calibrate the Test PCD assembly to produce the  $H_{\min}$  operating condition on the calibration coil.
- c) Place the Reference PICC into the DUT position on the Test PCD assembly. Switch the jumper J1 to position 'b' and adjust R2 to obtain a d.c. voltage of  $V_{\text{load}}$  measured at connector CON3. Alternatively, jumper J1 may be set to position 'c' and the applied voltage on CON2 is adjusted to obtain a d.c. voltage of  $V_{\text{load}}$  at connector CON3. In both cases, the operating field condition shall be verified by monitoring the voltage on the calibration coil.

**WARNING — R2 value should be between  $R2_{\min}$  and  $R2_{\max}$  as defined in Table 3. Check this range at least once before using the alternative method.**

- d) Remove the Reference PICC.
- e) Place the PICC under test into the DUT position on the Test PCD assembly.
- f) Measure the field strength  $H_C$  monitored by the calibration coil.

The field strength  $H_C$  shall be greater than  $H_{\min}$ .

### 7.2.4.3 Test report

The test report shall give the value  $H_C$ .

*Page 31 of ISO/IEC FCD 10373-6:2009, Annex C*

Replace "Figure C.1 — Layout for sense coils a and b" by "Figure C.1 — Layout for sense coils 1 (a and b)".

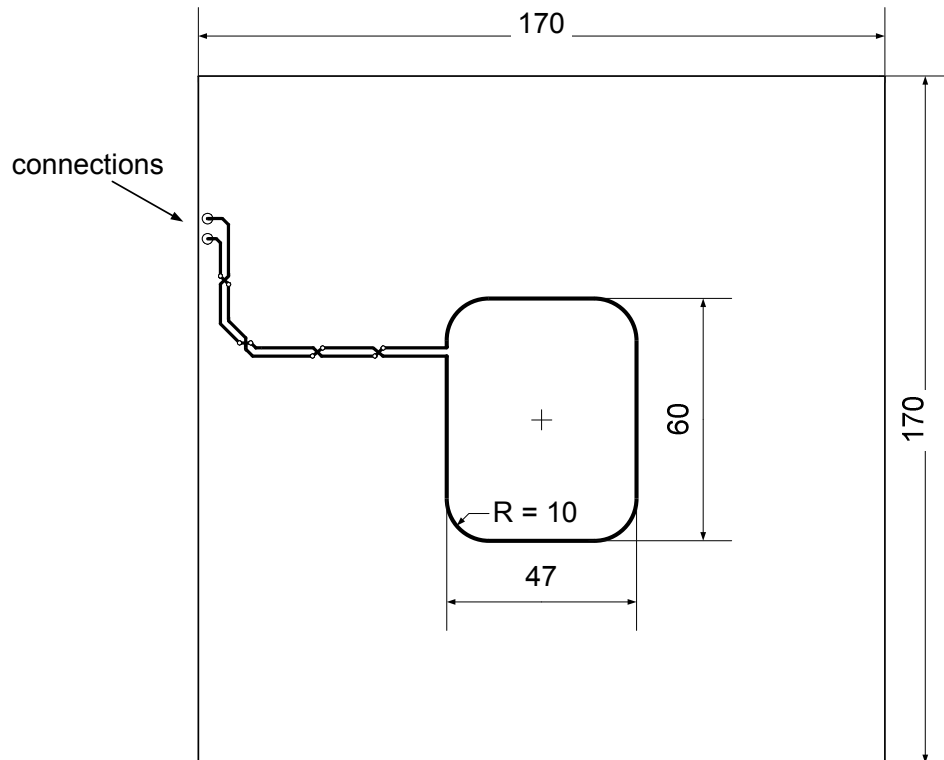
Add following sub clause headline directly after C.1:

### C.1.1 Sense coil 1 layout

Page 31 of ISO/IEC FCD 10373-6:2009, Annex C

Add following sub clause after Figure C.1 and renumber figures in annex C:

### C.1.2 Sense coil 2 layout



**Figure C.2 — Layout for sense coils 2 (a and b)**

Dimensions in millimeters (drawings are not to scale).

The sense coil track width is 0,5 mm with relative tolerance  $\pm 20\%$  (except for through-plated holes). Size of the coils refers to the outer dimensions.

Printed circuit board (PCB): FR4 material, thickness 1,6 mm, double sided with 35  $\mu\text{m}$  copper.

NOTE Such printed circuit boards are available from various commercial sources.

Page 35 of ISO/IEC FCD 10373-6:2009, Annex D

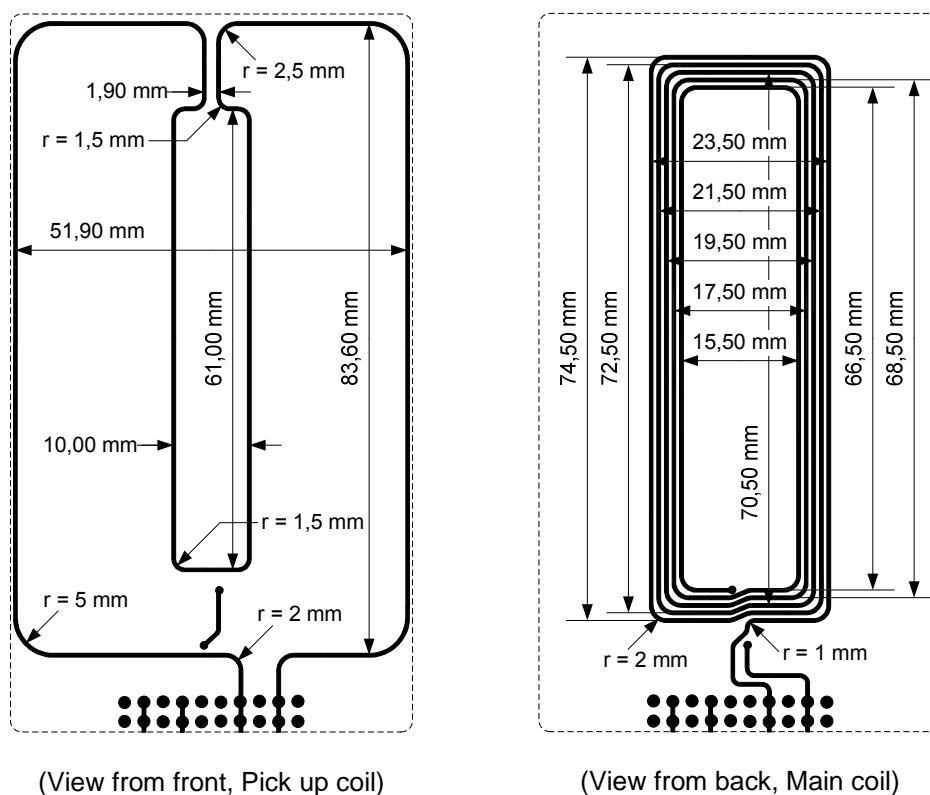
Change the title to "Reference PICCs".

Change the subclause title to:

**"D.1 Reference PICC 1 circuit diagram"**

Add following sub clauses at the end of D.1:

**D.2 Reference PICC 2 circuit diagram**



**Figure D.2 — Antenna layout**

Dimensions to track center (drawings are not to scale).

Main coil dimensions: 75 mm x 24 mm (outer dimensions).

The Pick up coil and the Main coil shall be concentric.

The two coils track width and spacing shall be 0,5 mm with a relative tolerance of  $\pm 20 \%$ .

All main coil corners radii shall be 2 mm.

Printed circuit board (PCB): FR4 material, thickness 0,76 mm with a relative tolerance of  $\pm 10 \%$ , double sided with 35  $\mu\text{m}$  copper.

NOTE 1 At 13,56 MHz the inductance of the Main coil L1 is 2,4  $\mu\text{H} \pm 10 \%$  and the resistance is 1,9  $\Omega \pm 10 \%$ .

NOTE 2 At 13,56 MHz the inductance of the Pick up coil L2 is 417 nH  $\pm 10 \%$  and the approximate resistance is 0,8  $\Omega \pm 10 \%$ .

## D.3 Reference PICC 3 circuit diagram

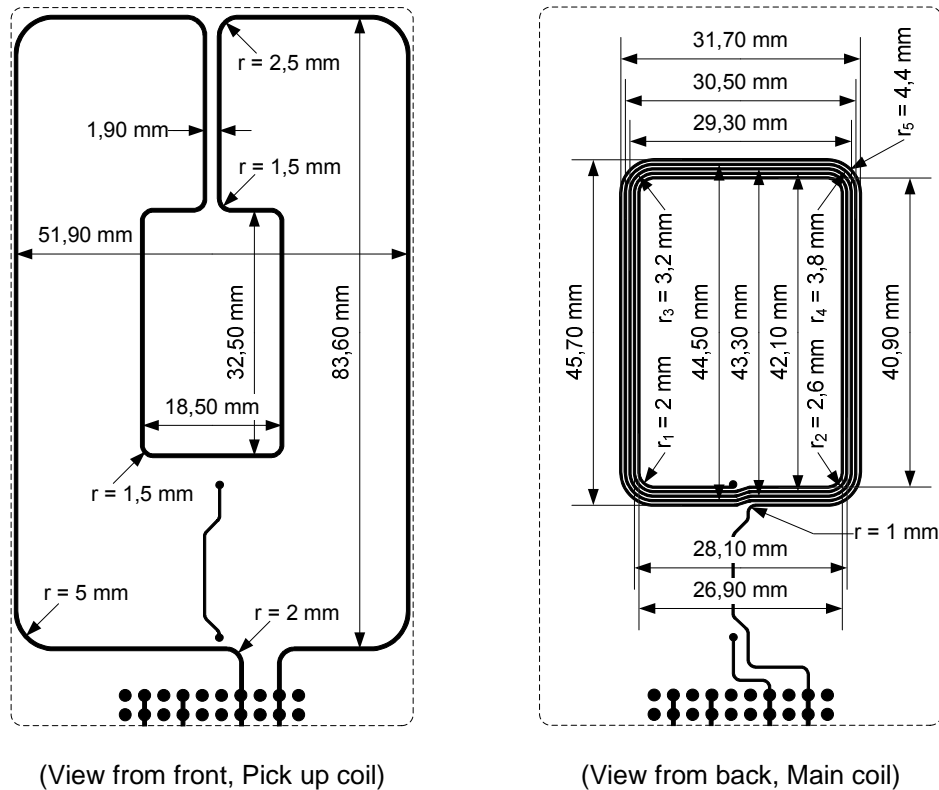


Figure D.3 — Antenna layout

Dimensions to track center (drawings are not to scale).

Main coil dimensions: 46 mm x 32 mm (outer dimensions).

The Pick up coil and the Main coil shall be concentric.

The Pick up coil track width shall be 0,5 mm with a relative tolerance of  $\pm 20\%$ .

The Main coil track width and spacing shall be 0,3 mm with a relative tolerance of  $\pm 20\%$ .

Printed circuit board (PCB): FR4 material, thickness 0,76 mm with a relative tolerance of  $\pm 10\%$ , double sided with 35  $\mu\text{m}$  copper.

NOTE 1 At 13,56 MHz the inductance of the Main coil L1 is 2,39  $\mu\text{H} \pm 10\%$  and the resistance is 2,18  $\Omega \pm 10\%$ .

NOTE 2 At 13,56 MHz the inductance of the Pick up coil L2 is 405 nH  $\pm 10\%$  and the approximate resistance is 0,76  $\Omega \pm 10\%$ .

D.4 Reference PICC 4 circuit diagram

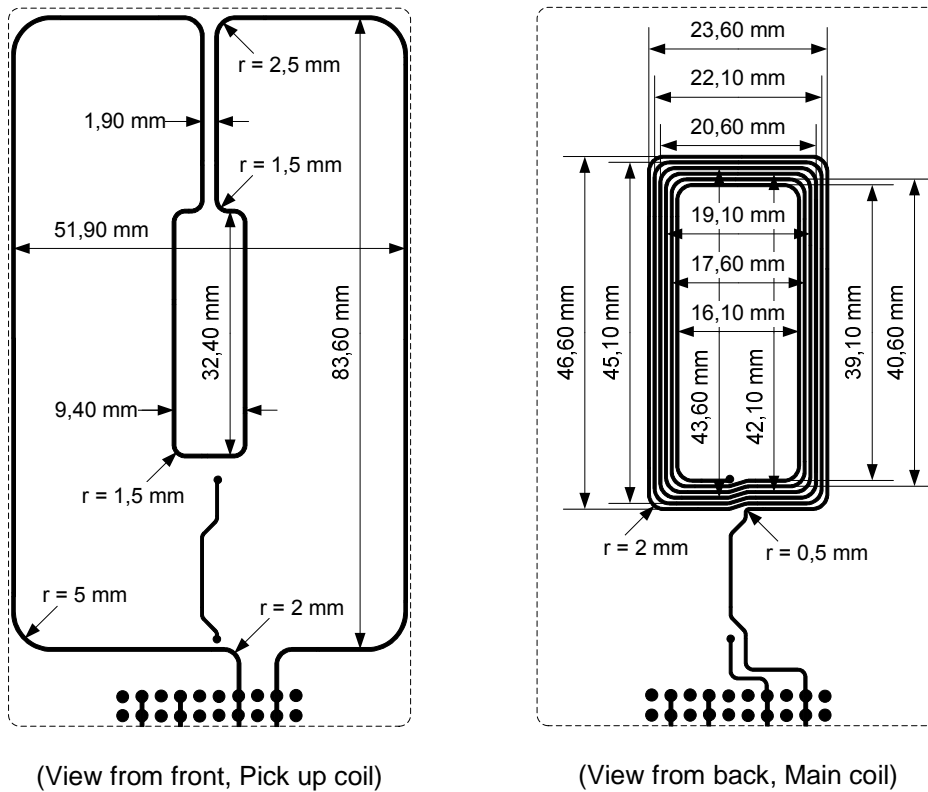


Figure D.4 — Antenna layout

Dimensions to track center (drawings are not to scale).

Main coil dimensions: 47 mm x 24 mm (outer dimensions).

The Pick up coil and the Main coil shall be concentric.

The Pick up coil track width shall be 0,5 mm with a relative tolerance of  $\pm 20\%$ .

All main coil corners radii shall be 2 mm.

The Main coil track width shall be 0,4 mm and the spacing shall be 0,35 mm with a relative tolerance of  $\pm 20\%$ .

Printed circuit board (PCB): FR4 material, thickness 0,76 mm with a relative tolerance of  $\pm 10\%$ , double sided with 35  $\mu\text{m}$  copper.

NOTE 1 At 13,56 MHz the inductance of the Main coil L1 is  $2,3\ \mu\text{H} \pm 10\%$  and the resistance is  $1,8\ \Omega \pm 10\%$ .

NOTE 2 At 13,56 MHz the inductance of the Pick up coil L2 is  $390\ \text{nH} \pm 10\%$  and the approximate resistance is  $0,7\ \Omega \pm 10\%$ .

## D.5 Reference PICC 5 circuit diagram

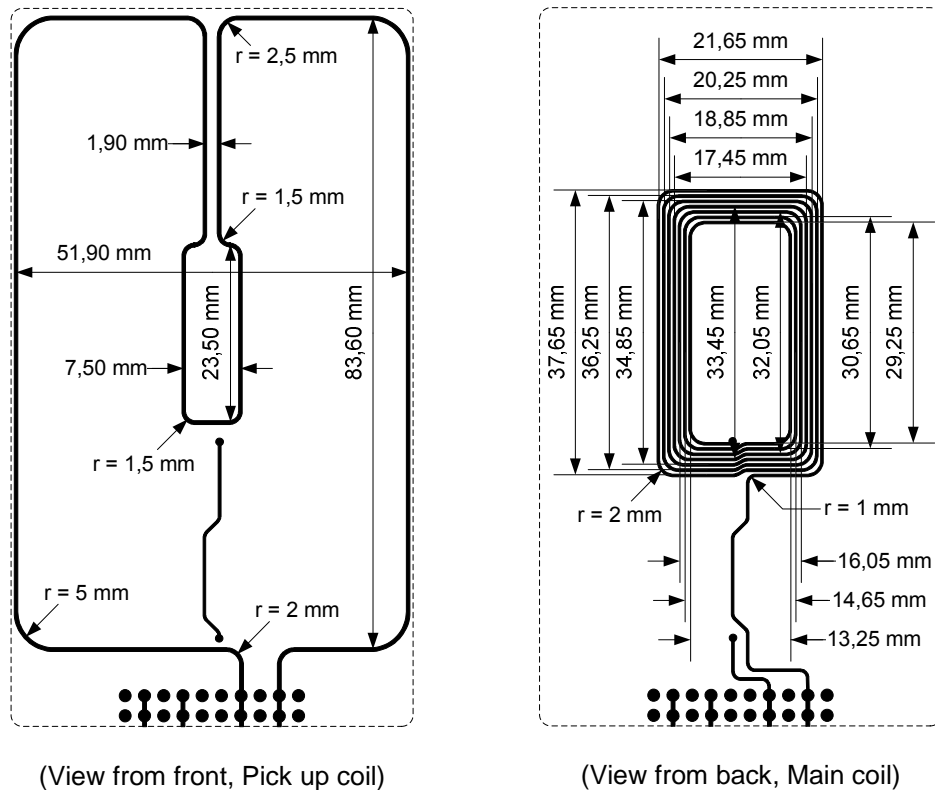


Figure D.5 — Antenna layout

Dimensions to track center (drawings are not to scale).

Main coil dimensions: 38 mm x 22 mm (outer dimensions).

The Pick up coil and the Main coil shall be concentric.

The Pick up coil track width shall be 0,5 mm with a relative tolerance of  $\pm 20\%$ .

All main coil corners radii shall be 2 mm.

The Main coil track width and spacing shall be 0,35 mm with a relative tolerance of  $\pm 20\%$ .

Printed circuit board (PCB): FR4 material, thickness 0,76 mm with a relative tolerance of  $\pm 10\%$ , double sided with 35  $\mu\text{m}$  copper.

NOTE 1 At 13,56 MHz the inductance of the Main coil L1 is 2,4  $\mu\text{H} \pm 10\%$  and the resistance is 1,9  $\Omega \pm 10\%$ .

NOTE 2 At 13,56 MHz the inductance of the Pick up coil L2 is 380 nH  $\pm 10\%$  and the approximate resistance is 0,7  $\Omega \pm 10\%$ .

D.6 Reference PICC 6 circuit diagram

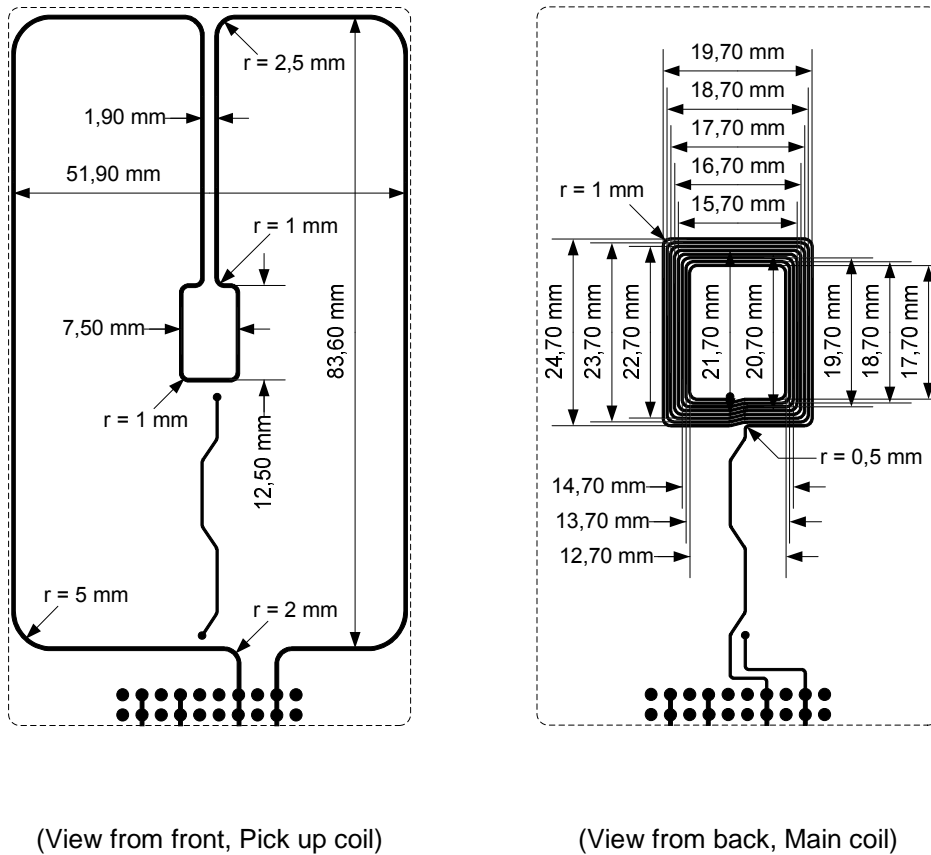


Figure D.6 — Antenna layout

Dimensions to track center (drawings are not to scale).

Main coil dimensions: 25 mm x 20 mm (outer dimensions).

The Pick up coil and the Main coil shall be concentric.

The Pick up coil track width shall be 0,5 mm with a relative tolerance of  $\pm 20 \%$ .

All main coil corners radii shall be 1 mm.

The Main coil track width shall be 0,3 mm and the spacing shall be 0,2 mm with a relative tolerance of  $\pm 20 \%$ .

Printed circuit board (PCB): FR4 material, thickness 0,76 mm with a relative tolerance of  $\pm 10 \%$ , double sided with 35  $\mu\text{m}$  copper.

NOTE 1 At 13,56 MHz the inductance of the Main coil L1 is 2,3  $\mu\text{H} \pm 10 \%$  and the resistance is 2,2  $\Omega \pm 10 \%$ .

NOTE 2 At 13,56 MHz the inductance of the Pick up coil L2 is 370 nH  $\pm 10 \%$  and the approximate resistance is 0,7  $\Omega \pm 10 \%$ .