1. General description

The MF1 ICS 20 20 is a contactless Smart Card IC designed for card IC coils following the “Mifare card IC coil design guide” and is qualified to work properly in NXP’ reader environment, which is built according to NXP’ specification.

This specification describes electrical, physical and dimensional properties of sawn wafers.

2. Ordering information

Table 1. Ordering information

<table>
<thead>
<tr>
<th>Type number</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>MF1ICS2007W/V6D</td>
<td>Irradiated UV-tape</td>
</tr>
<tr>
<td></td>
<td>Ordering Code</td>
</tr>
<tr>
<td></td>
<td>9352 836 61005</td>
</tr>
</tbody>
</table>

3. Mechanical specification

3.1 Wafer

- Diameter: 8"
- Thickness: 150 μm ± 15 μm
- Flatness: not applicable
- PGDW: 25060

3.2 Wafer backside

- Material: Si
- Treatment: ground and stress relieve
- Roughness: $R_a$ max. 0.5 μm
  $R_t$ max. 5 μm

3.3 Chip dimensions

- Chip size: 1.10 x 1.03 mm
- Scribe lines:
  - x-line: 86.4 μm
  - y-line: 66.4 μm
3.4 Passivation

- Type: sandwich structure
- Material: PSG / Nitride
- Thickness: 500 nm / 600 nm

3.5 Bond pads

- Pad size: 118 x 118 µm² (LA, LB)²
- Material: Al-Cu
- Thickness: 0.76 µm

Remark: Substrate is connected to VSS.

3.6 Fail die identification

NO inkdots are applied to the wafer.

Electronic wafer mapping covers the electrical test results and additionally the results of mechanical / visual inspection.

4. Limiting values

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Min</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>I_{IN}</td>
<td>input current</td>
<td>-</td>
<td>30</td>
<td>mA</td>
</tr>
<tr>
<td>P_{TOT}</td>
<td>total power dissipation</td>
<td>-</td>
<td>200</td>
<td>mW</td>
</tr>
<tr>
<td>T_{STOR}</td>
<td>storage temperature</td>
<td>-55</td>
<td>125</td>
<td>°C</td>
</tr>
<tr>
<td>T_{OP}</td>
<td>operating temperature</td>
<td>-25</td>
<td>70</td>
<td>°C</td>
</tr>
<tr>
<td>V_{ESD}</td>
<td>electrostatic discharge voltage LA-LB</td>
<td>[4]</td>
<td>2</td>
<td>-</td>
</tr>
</tbody>
</table>

Table 2. Limiting values [1][2][3]

In accordance with the Absolute Maximum Rating System (IEC 60134).

[1] Stresses above one or more of the limiting values may cause permanent damage to the device
[2] These are stress ratings only. Operation of the device at these or any other conditions above those given in the Characteristics section of the specification is not implied
[3] Exposure to limiting values for extended periods may affect device reliability

---

1. Passivation window: 90 x 90 µm.
2. Pads VSS and TESTIO are disconnected when wafer is sawn.
5. Characteristics

Table 3. AC characteristics\[1\]\[2\]\[3\]

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Conditions</th>
<th>Min</th>
<th>Type</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>( f_{\text{IN}} )</td>
<td>input frequency</td>
<td>-</td>
<td>13.56</td>
<td>-</td>
<td>MHz</td>
<td></td>
</tr>
<tr>
<td>( C_{\text{IN}} )</td>
<td>Input capacitance</td>
<td>22°C, Cp-D, 13.56 MHz, 2 V</td>
<td>14.4</td>
<td>15.9</td>
<td>17.4</td>
<td>pF</td>
</tr>
<tr>
<td></td>
<td>(LCR meter HP4258)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( t_W )</td>
<td>EEPROM write time</td>
<td>-</td>
<td>2.9</td>
<td>-</td>
<td>ms</td>
<td></td>
</tr>
<tr>
<td>( t_{\text{RET}} )</td>
<td>EEPROM data retention</td>
<td>10</td>
<td></td>
<td></td>
<td>years</td>
<td></td>
</tr>
<tr>
<td>( N_{\text{WE}} )</td>
<td>EEPROM write endurance</td>
<td>( 10^5 )</td>
<td></td>
<td></td>
<td>cycles</td>
<td></td>
</tr>
</tbody>
</table>

[1] Stresses above one or more of the limiting values may cause permanent damage to the device

[2] These are stress ratings only. Operation of the device at these or any other conditions above those given in the Characteristics section of the specification is not implied

[3] Exposure to limiting values for extended periods may affect device reliability
6. Location of mapfile reference dies (SECS II format):

Fig 1. Location of mapfile reference dies (SECS II format)
7. Chip orientation and bondpad locations

Widths and lengths are measured from metal to metal (top layer).

<table>
<thead>
<tr>
<th>PAD location 1)</th>
<th>x [µm]</th>
<th>y [µm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>VSS</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>TESTIO</td>
<td>263.7</td>
<td>606.6</td>
</tr>
<tr>
<td>LA</td>
<td>17.4</td>
<td>596.9</td>
</tr>
<tr>
<td>LB</td>
<td>712.4</td>
<td>0.0</td>
</tr>
</tbody>
</table>

1) Reference point: Lower left corner of pad.

(1) X-Scribeline width: 66.4 µm  
(2) Y-Scribeline width: 86.4 µm  
(3) Chip step, x-length: 1.10 mm  
(4) Chip step, y-length: 1.03 mm  
(5) LA pad edge to chip edge, y-length: 110.9 µm  
(6) LA pad edge to chip edge, x-length: 107.5 µm  
(7) LB pad edge to chip edge, y-length: 137.8 µm  
(8) LB pad edge to chip edge, x-length: 93.1 µm
8. References

- Data sheet “General specification for 8” wafer on UV-tape with electronic fail die marking”
- Data sheet “Standard card IC MF1 IC S20 functional specification”
- Application note “MIFARE(Card) coil design guide”

9. Revision history

<table>
<thead>
<tr>
<th>Document ID</th>
<th>Release date</th>
<th>Data sheet status</th>
<th>Change notice</th>
<th>Supersedes</th>
</tr>
</thead>
<tbody>
<tr>
<td>132310</td>
<td>January 2007</td>
<td>Product data sheet</td>
<td></td>
<td></td>
</tr>
<tr>
<td>132311</td>
<td>16 March 2007</td>
<td>Product data sheet</td>
<td>treatment information</td>
<td>Revision 1.0</td>
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</tbody>
</table>

Modifications:

- The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors.
- Legal texts have been adapted to the new company name.
10. Legal information

10.1 Data sheet status

<table>
<thead>
<tr>
<th>Document status</th>
<th>Product status</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Objective [short] data sheet</td>
<td>Development</td>
<td>This document contains data from the objective specification for product development.</td>
</tr>
<tr>
<td>Preliminary [short] data sheet</td>
<td>Qualification</td>
<td>This document contains data from the preliminary specification.</td>
</tr>
<tr>
<td>Product [short] data sheet</td>
<td>Production</td>
<td>This document contains the product specification.</td>
</tr>
</tbody>
</table>

[1] Please consult the most recently issued document before initiating or completing a design.
[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL http://www.nxp.com.

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12. Tables

Table 1. Ordering information ........................................... 1
Table 2. Limiting values [1][2][3] .................................... 2
Table 3. AC characteristics[1][2][3] ................................. 2
Table 4. Revision history ................................................. 6

13. Figures

Fig 1. Location of mapfile reference dies ............... 4
Fig 2. Chip orientation and bond pad locations .......... 5

14. Contents

1 General description ................................................. 1
2 Ordering information .............................................. 1
3 Mechanical specification ........................................ 1
  3.1 Wafer ............................................................ 1
  3.2 Wafer backside ............................................... 1
  3.3 Chip dimensions ............................................. 1
  3.4 Passivation .................................................... 2
  3.5 Bond pads ..................................................... 2
  3.6 Fail die identification ...................................... 2
4 Limiting values ..................................................... 2
5 Characteristics ....................................................... 3
6 Location of mapfile reference dies (SECS II format): ......................... 4
7 Chip orientation and bondpad locations ............ 5
8 References .......................................................... 6
9 Revision history .................................................... 6
10 Legal information .................................................. 7
  10.1 Data sheet status ............................................ 7
  10.2 Definitions ................................................... 7
  10.3 Disclaimers .................................................. 7
  10.4 Trademarks .................................................. 7
11 Contact information ................................................ 7
12 Tables ............................................................. 8
13 Figures ............................................................. 8
14 Contents ............................................................. 8

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