FM1208M01 Contactless CPU Card

Datasheet

May. 2008
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1. Product Overview

1.1. Description

FM1208M01 is an Contactless CPU card designed by Fudan Microelectronics Co., Ltd. It is designed to support both Electronics Wallet and existing Public Traffic RF Card based on ISO14443-A contactless interface platform. Furthermore, it supports both existing contactless M1 card and CPU card based on PBOC2.0 Standard.

1.2. Feature

- Contactless RF interface according to ISO/IEC14443 TypeA
- Compatible with FM11RF08 (Support M1)、FM11RF08SH、FM11RF32M、FM11RF32SH series contactless card
- MCU command set compatible with Turbo 8051
- Support 106Kbps data transmission
- Triple-DES/Single-DES processor
- Program memory: 32K x 8bit ROM
- Data memory: 8K x 8bit EEPROM
- iRAM: 256 x 8bit
- xRAM: 384 x 8bit
- SPA、DPA resistant controller
- Reset controller of low voltage detection
- Reset controller of High/Low frequency detection
- Memory data encryption (ROM、EEPROM、RAM)
- ROM code reverse resistant
- EEPROM endurance: minimum 100,000
- EEPROM data retention: 10 years minimum

Typical Dealing Time:

- Identifying Card: 3ms (include REQA/ANTI-COLLISION/SELECTION)
- EEPROM Erase and Write time: 2.4ms
- Typical ticketing transaction: <350ms

Security Features:

1. DPA resistant
2. Frequency sensors
3. ROM code not visible due to implantation, encryption of memory data
1.3. Block Diagram

Figure 1-1  FM1208M01 Block diagram
1.4. Absolute Maximum Ratings

1.4.1. Module Maximum Ratings

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Range</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Temperature</td>
<td>Topr</td>
<td>-25 - +70</td>
<td>°C</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>Tstr</td>
<td>-25 - +85</td>
<td>°C</td>
</tr>
<tr>
<td>ESD*</td>
<td>Vesd</td>
<td>4000（minimum）</td>
<td>V</td>
</tr>
</tbody>
</table>

Table 1-1  FM1208M01 Module Maximum Ratings

1.4.2. Card Maximum Ratings

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Range</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Temperature</td>
<td>Topr</td>
<td>0 - +70</td>
<td>°C</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>Tstr</td>
<td>-20 - +70</td>
<td>°C</td>
</tr>
<tr>
<td>ESD*</td>
<td>Vesd</td>
<td>6000（最小）</td>
<td>V</td>
</tr>
</tbody>
</table>

Table 1-2  FM1208M01 Card Maximum Ratings

1.5. Package

FM1208M01 module: XOA2
FM1208M01 card: according to ISO7810 5.1.1

1.6. Pin Description

<table>
<thead>
<tr>
<th>Number</th>
<th>Symbol</th>
<th>Type</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>IN1</td>
<td>inout</td>
<td>Coil connection pin 1</td>
</tr>
<tr>
<td>2</td>
<td>IN2</td>
<td>Inout</td>
<td>Coil connection pin 2</td>
</tr>
</tbody>
</table>

Table 1-3  FM1208M01 Pin Description

1.7. ATQA and SAK Description

<table>
<thead>
<tr>
<th>Type</th>
<th>ATQA</th>
<th>SAK</th>
</tr>
</thead>
<tbody>
<tr>
<td>FM1208M01</td>
<td>0x0004</td>
<td>0x08</td>
</tr>
</tbody>
</table>

Table 1-4  FM1208M01 ATQA and SAK Description
2. Operating Flow

![Operating Flow Diagram](image)

Figure 2-1 FM1208M01 Operating Flow
3. Memory Organisation

FM1208M01 include internal memory and external memory (according to MCU). External memory includes program memory and data memory. The size of data memory is 8K byte.

![Figure 3-1 FM1208M01 Memory Organisation](image)

External Memory Organisation:

<table>
<thead>
<tr>
<th>Number</th>
<th>Address</th>
<th>Size</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0000H ~ 9FFFH</td>
<td>40K</td>
<td>Program Memory</td>
</tr>
<tr>
<td>2</td>
<td>A000H ~ DFFFH</td>
<td>16K</td>
<td>Data Memory</td>
</tr>
<tr>
<td>3</td>
<td>E000H ~ EFFFH</td>
<td>4K</td>
<td>xRAM</td>
</tr>
<tr>
<td>4</td>
<td>F000H ~ FFFFH</td>
<td>4K</td>
<td>Register set</td>
</tr>
</tbody>
</table>

Table 3-1 FM1208M01 External Memory Organisation
External Memory Organisation:

- 64K: Regester Set
- 60K: xRAM
- 56K: Data Memory
- 40K: Program Memory
- 0:

Figure 3-2  FM1208M01 External Memory Organisation
4. Command Set

CPU command compatible to Turbo51 command set.

Common command set:

<table>
<thead>
<tr>
<th>Command</th>
<th>Code (HEX)</th>
<th>Description</th>
</tr>
</thead>
</table>
| request std     | 26         | **Answer to Request**  
Look for card in operating area. 'Request Std' means looking for card which is not set to halt |
| request all     | 52         | **Answer to Request**  
Look for card in operating area. 'Request All' means looking for all cards which are in operating area |
| Anti-collision  | 93         | **Anti-collision**  
It means selecting only one card if there is one card or several cards in operating area. |
| Select Card     | 93         | **Select Card**  
It means setting up the communication with the selected card after the anti-collision command. |
| Authentication.1a | 60/61     | **Authentication**  
Before visiting memory, the user must verify if the operation is legal by coherence of cipher in RWD and cipher in card. |
| Read            | 30         | **Read**  
Read 16 bytes of one block. |
| Write           | A0         | **Write**  
Write data to one block. |
| Increment       | C1         | **Increment**  
Increment a certain value to numerical block, store the result in register. |
| Decrement       | C0         | **Decrement**  
Decrement a certain value to numerical block, store the result in register. |
| Restore         | C2         | **Restore**  
Read contents of numerical block to register. |
| Transfer        | B0         | **Transfer**  
Write contents of register to numerical block. |
| Halt            | 50         | **Halt**  
Card is set to halt. |

Table 4-1 FM1208M01 Command Set
5. Ordering Information

<table>
<thead>
<tr>
<th>Ordering Code</th>
<th>Package</th>
<th>Operation Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>FM1208M01-X0A2</td>
<td>XOA2 module</td>
<td>-25°C ~ +70°C</td>
</tr>
</tbody>
</table>
6. Revision History

<table>
<thead>
<tr>
<th>Version</th>
<th>Publication date</th>
<th>Pages</th>
<th>Paragraph or Illustration</th>
<th>Revise Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.1</td>
<td>Oct. 2007</td>
<td>13</td>
<td></td>
<td>Initial Release.</td>
</tr>
<tr>
<td>0.2</td>
<td>May. 2008</td>
<td>13</td>
<td>Sales and service</td>
<td>Updated the address of HK office.</td>
</tr>
</tbody>
</table>
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