

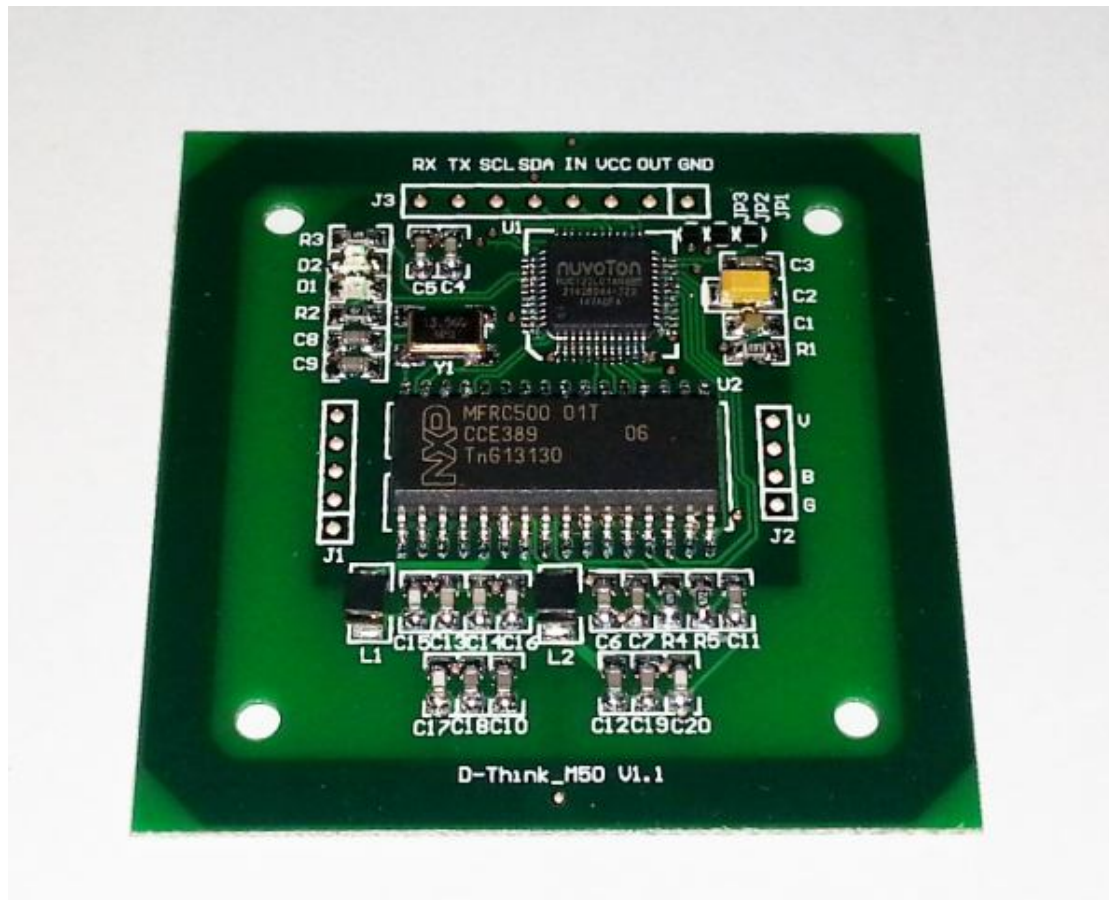
13.56MHz Reader/Writer

D-Think M50C

1

DataSheet

Version 1.0
Sept 2013



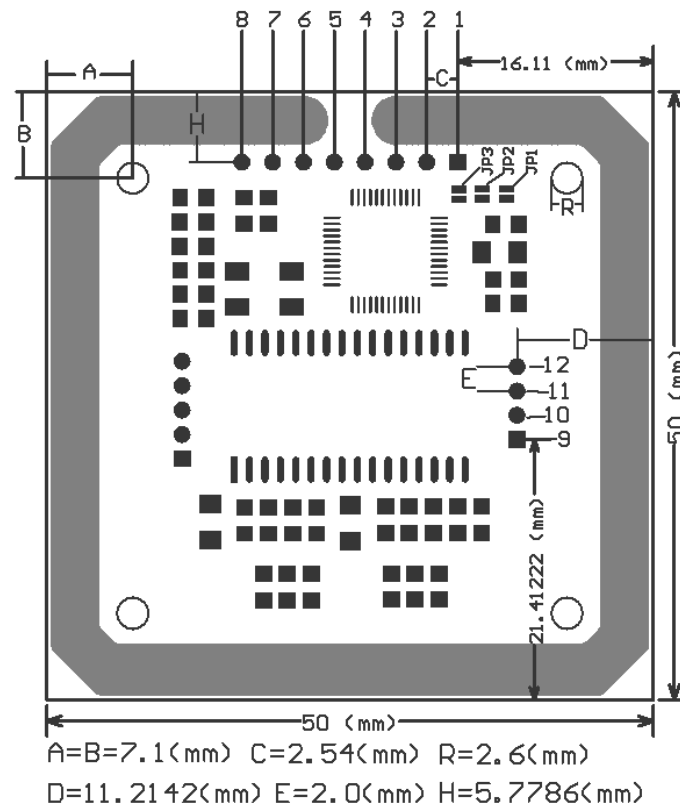
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1. GENERAL INFORMATION

- ◇ Tag supported : Mifare 1k, Mifare 4k, Mifare UltraLight
- ◇ I2C -bus interface, communication rate: 0–400KHz, selectable slave address
- ◇ Auto-detecting tag, Built-in antenna
- ◇ Integrated antenna
- ◇ DC4.5V ~ DC5.5V VDD Operating
- ◇ Maximum 110MA Working Current, sleep mode Less than 1 mA
- ◇ Size: 50 x 50 x3.6 mm
- ◇ Operating frequency: 13.56MHz
- ◇ Operating distance: Up to 80mm, depending on tag
- ◇ Two LEDs, green led is auto light when tag in detection range, red led is controlled by host
- ◇ An external buzzer
- ◇ Operating Temperature Range: -20°C ~ +50°C
- ◇ Storage Temperature Range: -25°C ~ +60°C
- ◇ The OUT pin at low level indicates tag in detective range, and high level indicating tag out

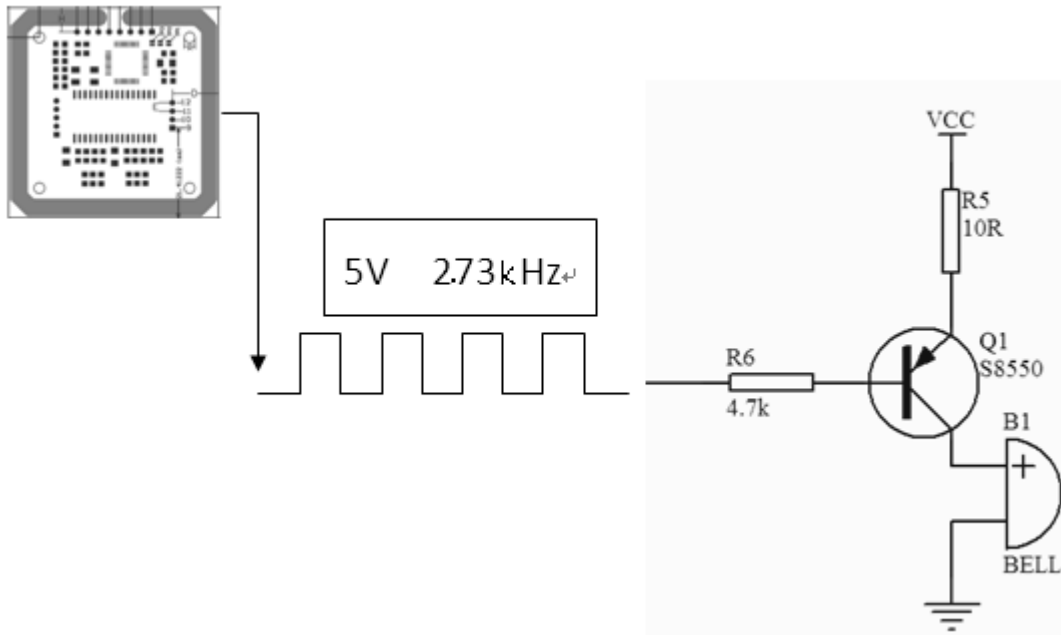
2. Hardware dimensions and pin Information



Number	Name	Type	Explanation
1	GND	Power	Power ground
2	OUT	O	Output high level when antenna sensing area has a label ,contrary output low level
3	VCC	Power	Power supply (DC4.5V~5.5V)
4	IN	I	Low level wake-up module
5	I2C_SDA	I/O	I2C SDA
6	I2C_SCL	I	I2C SCL
7	NC	NC	NC
8	NC	NC	NC
9	G	Power	Power ground
10	B	O	External passive buzzer (Frequency:2.73kHz)
11	NC	NC	NC
12	V	Power	Power supply

3. External buzzer

External buzzer diagram is as follows:



Note: Due to initialize the output pin high, so Q1 PNP type should be used, otherwise, there may be a buzzer starts ticking the moment a buzzer will sound and the Q1 and buzzer will always have current.

4. Slave address Configuration (1: Disconnect the connection point, 0 :Connection point)

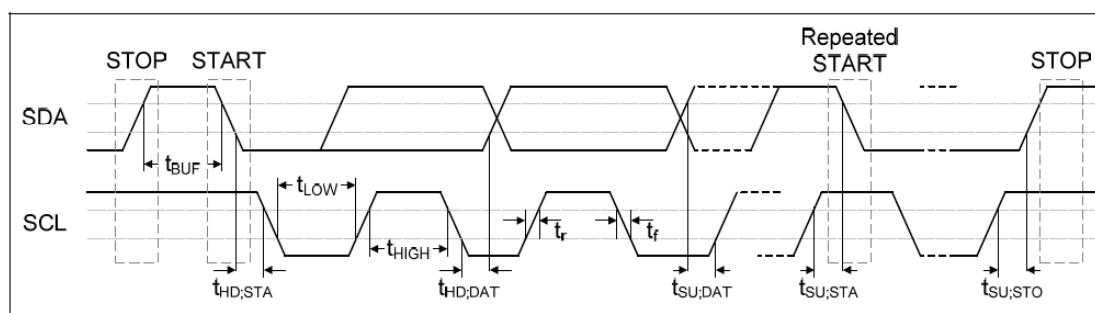
JP3	JP2	JP1	slave address
0	0	0	0x30
0	0	1	0x31
0	1	0	0x32
0	1	1	0x33
1	0	0	0x50
1	0	1	0x51
1	1	0	0x52
1	1	1	0x53

5. Communication Protocol

5.1 Clock and data transmission

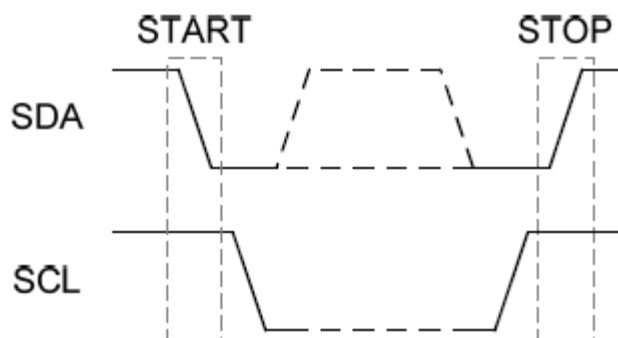
I2C is a two-wire, bidirectional serial bus that provides a simple and efficient way to achieve the exchange of data between devices, the standard I2C is a multi-master bus including collision detection and arbitration to prevent two or more masters attempt to control the bus simultaneously data corruption occurs, serial, bi-directional 8-bit data transfer.

Data communication between the master and slave clock line SCL SDA data line control to achieve a byte a byte synchronous transmission, each byte is 8 bits long, an SCL clock pulse is transmitted one bit of data, the data from the highest bit MSB transfer begins, each transferred byte followed by an acknowledge bit, each bit in the SCL high sampling; therefore, SDA line while SCL is low only when you can change in SDA while SCL is high stable when SCL is high transition on SDA as a command (START or STOP). refer to the diagram I2C bus timing.



Start signal (START): When the bus is idle, the description is not initiated by the bus master transfer request (SCL and SDA lines are high), the host can send a START signal to initiate the transfer request when the SCL line is high, SDA line signal from high to low, marking the start signal is generated on the bus, the new transmission can start.

Stop signal (STOP): Host sent to the bus stop signal the end of the data transfer when the SCL line is high, SDA line from low to high, is the stop signal.



Slave address transmission: START signal is transmitted immediately after the first byte is the slave address, which is a 7-bit slave address plus a R / W bit, R / W bit controls the direction of signal transmission from the machine. System no two slaves have the same address, only to be addressed from the opportunity to host the 9th SCL clock cycle will be set low SDA as a response.

Data Transfer: When the slave address is successfully identified, can be based on R / W determined by the direction of the start byte by byte data transmission, each transmitted byte is followed by a ninth clock cycle the response.

5.2 Receives the command format

Start + device address + Length + Command + Parameters

Start: 1 bit, I2C communication start flag

device address: 1BYTE, High seven bit for the slave address, the least significant bit is read-write flag

Length: 1BYTE, the number of bytes specified command from the command code to parameters, can not be 0

Command: 1BYTE, identifies the coding command functions, see section 5.4

Parameters: command packets (can be empty)

5.3 Back Command Format

(Start + device address +) Length + Command + Status + Parameters

Start: 1 bit, I2C communication start flag

device address: 1BYTE, High seven bit for the slave address, the least significant bit is read-write flag

Length: 1BYTE, the number of bytes specified command from the command code to parameters, can not be 0

Command: 1BYTE, identifies the coding command functions, see section 5.4

Status: 1BYTE, see section 5.4

Parameters: command packets (can be empty)

5.4 Command and Status list

Command list

Command	Explanation
0x01	Select Mifare card
0x02	Login to a sector

Command	Explanation
0x03	Read a data block
0x04	Write a data block
0x05	Read a value block
0x06	Initialize a value block
0x07	Write master key (key A)
0x08	Increment value
0x09	Decrement value
0x0A	Copy value
0x10	Read a data page (UltraLight)
0x11	Write a data page (UltraLight)
0x12	Download Key
0x13	Login sector via stored Key
0x15	Get stored Key information
0x40	Manage Red Led
0x41	Manage Beep
0x46	Enter the power saving mode
0xF0	Get firmware version

Status list

Status	Explanation
0x00	Operation succeed
0x01	No tag
0x02	Login succeed
0x03	Login fail
0x04	Read fail
0x05	Write fail
0x06	Unable to read after write

Status	Explanation
0x08	Address overflow
0x09	Download Key fail
0x0D	Not authenticate
0x0E	Not a value block
0xF1	Command code erro
0xEF	Operation fail

6. Detailed command

6.1 Detailed command

1. Select Mifare card

Command code: 0x01

Parameters: NONE

Status:0x00:Operation succeed

0x01:No tag

Answer data:If operation succeeds UID+1 byte tag type, as follows:

0x01:Mifare 1k,4 bytes UID

0x03:Mifare UltraLight 7 bytes UID

0x04:Mifare 4k,4 bytes UID

0x06:Mifare DesFire,7 bytes UID

0x0A: Other

2. Login to a sector

Command code: 0x02

Parameters: Sector need to login (0x00~0x27)+ Key type (0xAA: authenticate with KeyA, 0xBB: authenticate with KeyB) +6 bytes authenticate key

Status:0x02:Login succeed

0x01:No tag

0x03:Login fail

0x08:Address overflow

Answer data:NONE

3. Read a data block

Command code: 0x03

Parameters: 1 byte absolute address of block to be read

Status:0x00:Operation succeed

0x01:No tag

0x04:Read fail

0x0D:Not authenticate

Answer data: If operation succeeds block data returned, 16 bytes.

4. Write a data block

Command code: 0x04

Parameters: 1 byte absolute address of block to be written+16 bytes the data to write

Status:0x00:Operation succeed

0x01:No tag

0x05:Write fail

0x06:Unable to read after write

0x0D:Not authenticate

Answer data: If operation succeeds block data written, 16 bytes.

5. Read a value block

Command code: 0x05

Parameters: 1 byte absolute address of block to be read

Status:0x00:Operation succeed

0x01:No tag

0x04:Read fail

0x0D:Not authenticate

0x0E:Not a value block

Answer data: If operation succeeds 4 bytes value returned

6. Initialize a value block

Command code: 0x06

Parameters: 1 byte absolute address of block to be initialized +4 bytes value to be written

Status:0x00:Operation succeed

0x01:No tag

0x05:Write fail

0x06:Unable to read after write

0x0D:Not authenticate

Answer data: If operation succeeds 4 bytes value written

7. Write master key (key A)

Command code: 0x07

Parameters: 1 byte sector number to be written(0x00~0x27)+6 bytes authentication

key

Status:0x00:Operation succeed

0x01:No tag

0x05:Write fail

0x08:Address overflow

0x0D:Not authenticate

Answer data: If operation succeeds 6 bytes authentication key written

Attention: Be sure KeyB is readable, otherwise KeyB will be change to 0x000000000000.

8. Increment value

Command code: 0x08

Parameters: 1 byte absolute address of block to be increased +4 bytes the value to be increased by

Status:0x00:Operation succeed

0x01:No tag

0x05:Write fail

0x06:Unable to read after write

0x0D:Not authenticate

0x0E:Not a value block

Answer data: If operation succeeds 4 bytes value after increment

9 .Decrement value

Command code: 0x09

Parameters: 1 byte absolute address of block to be decreased +4bytes value to be decreased by

Status:0x00:Operation succeed

0x01:No tag

0x05:Write fail

0x06:Unable to read after write

0x0D:Not authenticate

0x0E:Not a value block

Answer data: If operation succeeds 4 bytes value after decrement

10. Copy value

Command code: 0x0A

Parameters: 1 byte source block copy from +1 byte destination copy to

Status:0x00:Operation succeed

0x01:No tag

0x05:Write fail

0x06:Unable to read after write

0x0D:Not authenticate

0x0E:Not a value block(source)

0xEF:Operation fail

Answer data: If operation succeeds 4 bytes value after copy

Attention: The source and destination must in the same sector

11. Read a data page (UltraLight)

Command code: 0x10

Parameters: 1 byte page number to be read (0x00~0x0F)

Status:0x00:Operation succeed

0x01:No tag

0x04:Read fail

0x08:Address overflow

Answer data: If operation succeeds 4 bytes block data returned

12. Write a data page (UltraLight)

Command code: 0x11

Parameters: 1 byte page number to be written(0x00~0x0F)+4 bytes data to write

Status:0x00:Operation succeed

0x01:No tag

0x05:Write fail

0x06:Unable to read after write

0x08:Address overflow

Answer data: If operation succeeds 4 bytes page data written

13. Download Key

Command code: 0x12

Parameters:1 byte sector (0x00~0x27)+1 byte key type(0xAA: KeyA, 0xBB: KeyB)
+6 bytes key

Status:0x00:Operation succeed

0x08:Address overflow

0x09:Download fail

Answer data: NONE

14. Login sector via stored Key

Command code: 0x13

Parameters: 1 byte sector(0x00~0x27)+1 byte key type(0xAA: KeyA, 0xBB: KeyB)

Status:0x02:Login succeed

0x03:Login fail

0x08:Address overflow

Answer data:NONE

Attention: "Sector number" must be stored in the module "sector number" of one to key information stored in the module can be "stored in the reading module key-related information (0x15)" command to read out.

15. Get stored key information

Command code: 0x15

Parameters: NONE

Status:0x00:Operation succeed

0xEF:Operation fail

Answer data: If operation succeeds 4 bytes store key information: 1 byte Key A sector number+0xAA(Other values that are not stored)+ 1 byte Key B sector number +0xBB(Other values that are not stored).

16. Manage Red Led

Command code: 0x40

Parameters: 1 byte(0:red led off,other:on)

Status:0x00:Operation succeed

Answer data:NONE

17. Manage Beep

Command code: 0x41

Parameters: 1 byte beep time(× 10mS)

Status:0x00:Operation succeed

Answer data:NONE

18. Enter the power saving mode

Command code: 0x46

Parameters: NONE

No answer

19. Get firmware version

Command code: 0xF0

Parameters:NONE

Status:0x00:Operation succeed

Answer data: Firmware version (ASCII)

6.2 Command Example

Host send command: Get firmware version

Length	Command	Parameters
0x02	0xF0	NONE

Command operation successful return

Length	Command	Status	Parameters
0x14	0xF0	0x00	See table below

Parameters

HEX	44 2D 54 68 69 6E 6B 20 4D 35 30 43 20 56 31 2E 30
ASCII	“D-Think M50C V1.0”

Revision history

Version	Date	Author	Modify description
V1.0	2013-9-4	jin	Create