# Fingerprint module specification

ARA-EM01

Aratek Biometrics Technology Co. Ltd.

1 General view

The ARA-EM01 is high performance fingerprint module developed by Aratek Biometrics Technology Co, Ltd .it has many features : easy restructure, powerful functions, compatible with PC ，and multiple-functions in one module: Fingerprint enrollment, image process, characters acquisition, fingerprint template creation, fingerprint template storage, fingerprint compare (1: 1, 1: N), fingerprint delete. This module can work with different devices based on UAWRT such as PC, SCM and so on. Only easy circuits and fingerprint module can enhance your product into

fingerprint authentication power. It is widely used by electronics business, information security, access control, identity authentication and other security industry.

2 Photo
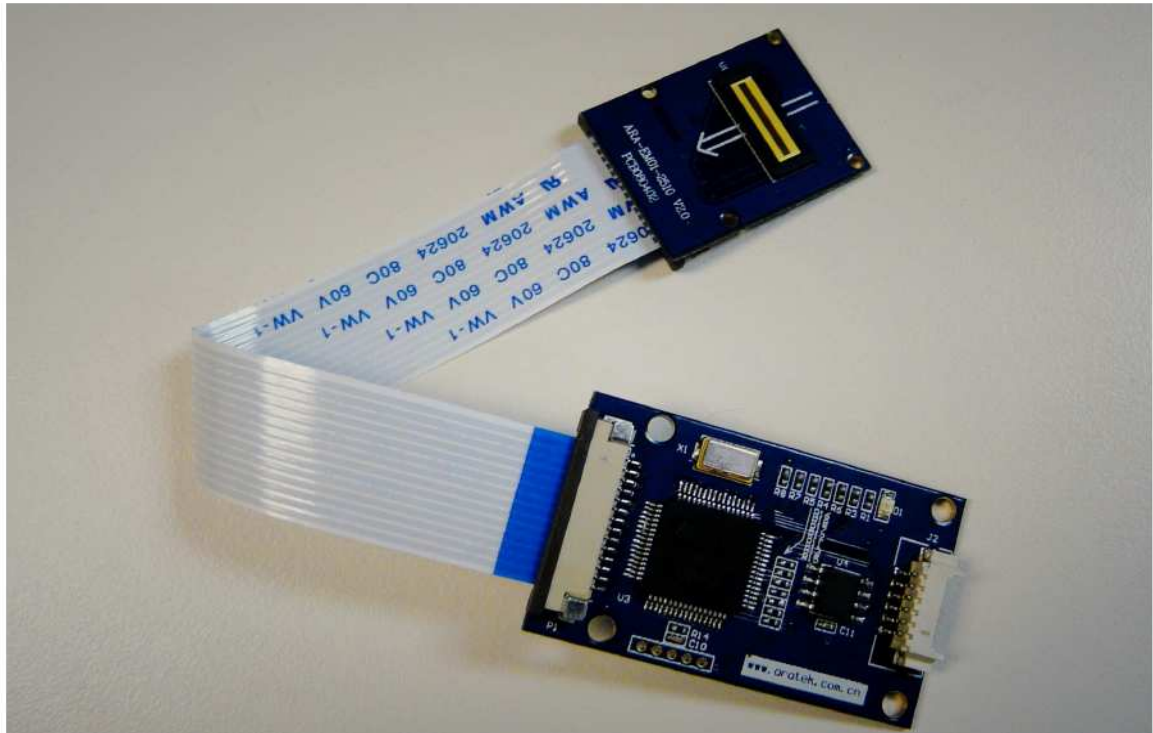
3 Application solution

1 When ARA-EM01 is embedded into your system, the other functions will be controlled by MCU Controller, so developer can realize his own function logic, user interface and communication port through hard ware and soft ware development, such as fingerprint time and attendance and so on.
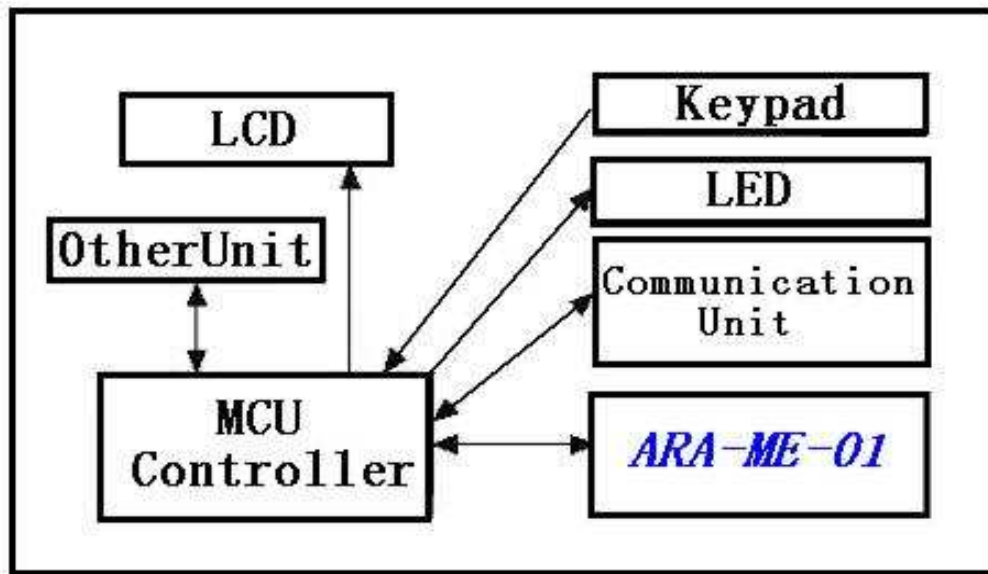
2 Expand the port such as RS485, Wiegand, even GPRS wireless communication with central controller outside by MCU in the central controller system.
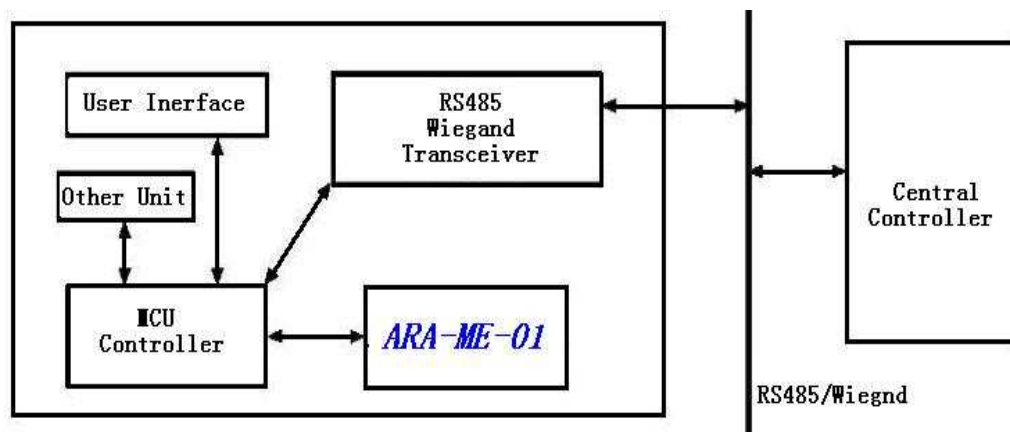
4 hardware spec
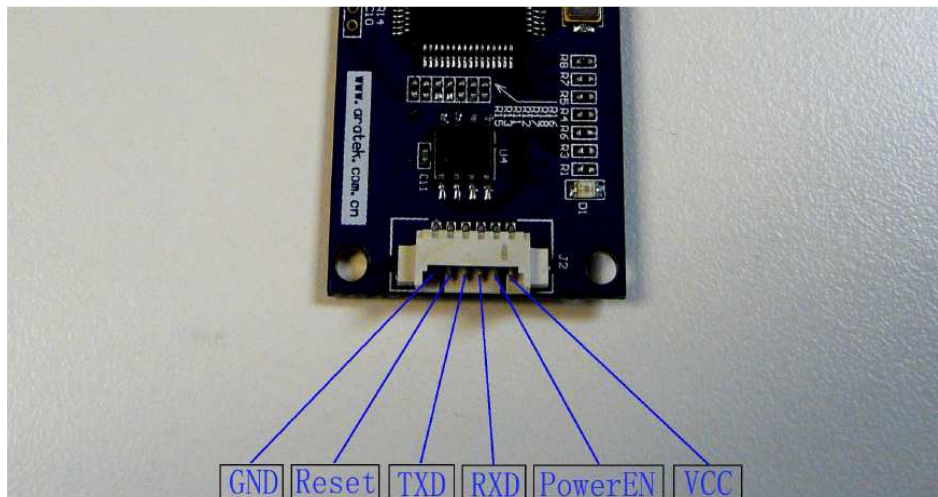
pin	Name	spec
1、	GND	Grand
2、	Reset	Module reset control
3	TXD	Serial sender
4	RXD	Serial receiver
5、	PowerEN	Power control
6、	VCC	5V

Remark：

1 reset signal is the low level, the level width is bigger than 10ms.

2 high level turn on the power, low level turn off the power.

5 software port spec

1. Communication port UART (Universal Asynchronous Serial Port), 9600bps to 115200bps (option), start with 1 bit, stop with 1 bit, no check bit.

2. Communication protocol Module stays in slave mode, and host can direct the module work by different command. All the command of the host and response of the module and data transfer are in standard data pack. Host must pack and analyze the command and the data in standard format.

6 fingerprint authentication performance

item	spec
Sensor	AES2510
Image	256*288
Resolution	500DPI
Register time	<3 秒
Math time （1：1）	<0.1 秒
Math time （1：N）	<0.5 秒
FRR	<0.1%
FAR	<0.001%
Fingerprints capacity	160 fingerprints

7 other spec

item	Symbol	min	classic	max	Measure
Work Voltage	Vn	4.5	5	5.5	V
Work Current	In	50	60	80	mA
Sleep current	Is	9	10	12	uA
Work Temperature	Tn	- 20		70	℃
Humility	Hn	30		120	℉
Module size	Ln	40mm*25mm 20mm*25mm			mm

Interface

Type	Description
UART	3.3V CMOS level
	Baud rates up to 921.6kbps (factory default is 115.2kbps)
	RS232/422/485 supported via additional level converter

Digital I/O	3.3V CMOS level
	8 ports separately configurable
	26bit Wiegand I/O supported via additional level converter

Connector Specifications

Connector	Usage
J1	Host interface port I
J2	Host interface port II (Molex 53261-8090 compatible)
J3	Debug port for factory use only
J4	Sensor interface port, 20 pin FPC/FFC

8 Command summary

8.1 Flash storage structure:

Address	Spec	Size
0x0000-0x7fff	Some codes	32k
0x8000-0x8fff	System parameters storage	4k
0x9000-0xffff	Fingerprint database	28k- the end

8.2 System parameters storage area

Flash physical address	Page	Spec	remark
0x8000	0	Reserve	
0x8200	1	Parameter list	
0x8400	2	User notebook	
0x8600	3	Reserve	
0x8800	4	Reserve	
0x8a00	5	Reserve	
0x8c00	6	Reserve	

0x8e00	7	Reserve	

8.3 Command spec

PS_GetImage	Code: 01H	Function: read image from the sensor and store it in the image buffer.
PS_GenChar	Code: 02H	Function: create fingerprint features document through the image and store in CharBuffer1 or CharBuffer2.
PS_Match	Code: 03H	Function: compare the features documents in the CharBuffer1 and Charbuffer2.
PS_Search	Code: 04H	Function: search the fingerprint database according to the features document in the CharBuffer1 or CharBuffer2.
PS_RegModel	Code: 05H	Function: create fingerprint template according to the features documents in the CharBuffer1 and CharBuffer2.
PS_StoreChar	Code: 06H	Function: store the template into the flash fingerprint database from the features buffer.
PS_LoadChar	Code : 07H	Function: read template to features buffer from flash fingerprint database.
PS_UpChar	Code: 08H	Function: transfer the data in the features buffer to the PC.
PS_DownChar	Code: 09H	Function: load a template from PC to features buffer.
PS_DeletChar	Code: 0CH	Function: delete a template in the flash fingerprint database.
PS_Empty	Code: 0DH	Function: clear flash fingerprint database
PS_WriteReg	Code: 0EH	Function: write SSR
PS_ReadSysPara	Code: 0FH	Function: read basic system parameters
PS_SetPwd	Code: 12H	Function: set device password.
PS_VfyPwd	Code: 13H	Function: verify device password.
PS_GetRandomCode	Code: 14H	Function: get random code
PS_SetChipAddr	Code: 15H	Function: set the chip address
PS_WriteNotepad	Code: 18H	Function: write notepad
PS_ReadNotepad	Code: 19H	Function: read notepad
PS_ValidTempleteNum	Code: 1dH	Function: read the template number from the flash

8.4 Pack structure

8.4.1 Send command

The packet flag=01   command packet

The packet flag=02   data packet, and data packet followed

The packet flag=08   the last data packet

All the data packet's head is 0xEF01,0xFFFFFFFF

01 command packet format

Name	Packet head	Device address	Packet Flag	Packet Length	Command	Parameter 1	….	Parameter N	Checksum
Size	2bytes	4bytes	1 byte	2bytes	1byte	……			2 bytes
spec	0xEF01	xxxx	01						

02 data packet format

Name	Packet head	Device address	Packet Flag	Packet Length	Command	Parameter 1	….	Parameter N	Checksum
Size	2bytes	4bytes	1 byte	2bytes	N bytes ……				2 bytes
spec	0xEF01	xxxx	02						

08 last data packet

Name	Packet head	Device address	Packet Flag	Packet Length	Command	Parameter 1	….	Parameter N	Checksum
Size	2bytes	4bytes	1 byte	2bytes	N bytes ……				2 bytes
spec	0xEF01	xxxx	08						

·The data packet can't run itself; it must follow the command packet or the response packet.

·Download or upload the data packet in the same format.

·Packet length = the total bytes quantity of from the packet length to the checksum，including checksum，but not including the bytes quantity of the packet length itself.

·Checksum is the summer of all the bytes quantity from the packet flag to checksum，including packet flag, neglect the rounding over 2bytes.

8.4.2 Command response

Response packet/data packet:

The Packet flag = 07   response packet

The packet flag = 02   data packet, and packet followed

The packet flag = 08   the last data packet

Response is to send report to host about the result and how the commands run; data packet can follow the response packet. The host can confirm situation about the command execution and receiving response packet.
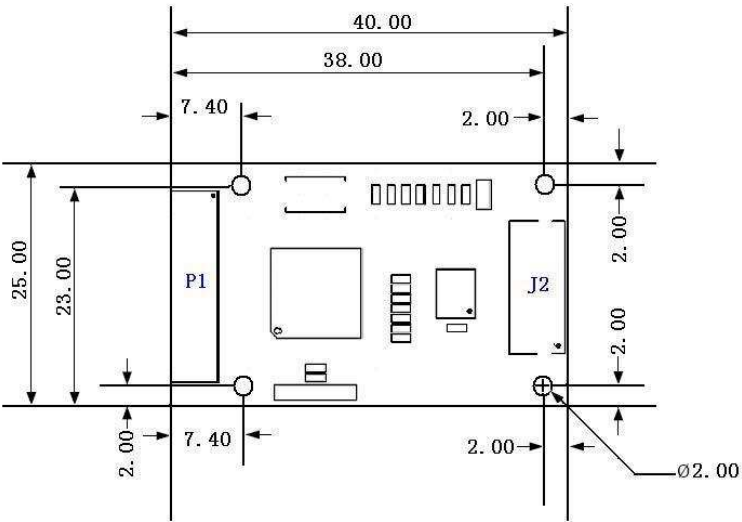
Response packet format:

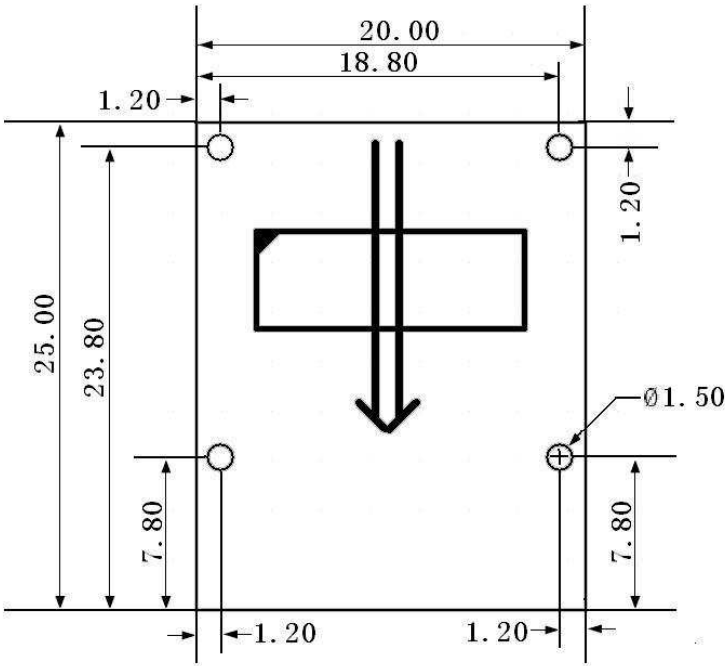| Name	Packet head	Device address	Packet Flag	Packet Length	Confirmation code	Parameter	Checksum
Size	2bytes	4bytes	1 byte	2bytes	1 bytes	N bytes	2 bytes
spec	0xEF01	xxxx	07				

9 Physical Dimensions

9.1 Main board

* Dimensions in millimeters

9.2 Sensor

* Dimensions in millimeters

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