



FIM41

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# NITGEN® FIM41 Series

Stand-Alone Fingerprint Recognition Device with Built-in CPU

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## Datasheet

(Supported Firmware Version: 1.21 or higher)

Version 1.03

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Serial Number:

Specifications can be changed without notice.

## FIM41

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### Revision Information

Date	Version	Description
2011/01	1.00	release
2011/05	1.01	Describe IO Function Add SI_MAX_TEMPLATE in Board configuration option
2011/05	1.02	Add SI_USING_LATENT in Board configuration option
2012/02	1.03	Document Renewal DRAM specification is modified

## Contents

<b>1. GENERAL DESCRIPTION .....</b>	<b>6</b>
<b>2. FEATURE .....</b>	<b>7</b>
<b>3. TARGET APPLICATION.....</b>	<b>7</b>
<b>4. SPECIFICATION .....</b>	<b>8</b>
BASIC FEATURE .....	8
SENSOR FEATURE .....	9
INTERFACE FEATURE.....	10
<b>5. BLOCK DIAGRAM .....</b>	<b>11</b>
<b>6. OPERATION.....</b>	<b>12</b>
RESET.....	12
COMMUNICATION .....	12
CUSTOM DATA AREA.....	12
IO FUNCTION .....	12
BOARD CONFIGURATION OPTION.....	12
<b>7. TECHNICAL DATA.....</b>	<b>13</b>
7.1. PHYSICAL CHARACTERISTICS .....	13
<i>The Feature of Board.....</i>	<i>13</i>
<i>The feature of fingerprint sensor .....</i>	<i>14</i>
<i>The feature of sensor Cable.....</i>	<i>16</i>
7.2. EXTERNAL PORT .....	17
7.3. CONNECTOR .....	20
7.4. ELECTRICAL CHARACTERISTICS .....	21
<b>8. ORDERING INFORMATION.....</b>	<b>22</b>
8.1. FIM4110 ORDERING GUIDE.....	22

# FIM41

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- 8.2. FIM4120 ORDERING GUIDE..... 22
- 8.2. NAMING RULE ..... 23
- APPENDIX A. RECOMMENDATION CIRCUIT AND TIMING.....24**
  - RECOMMENDED CIRCUIT TO USE PROGRAMMABLE GPIOs ..... 24
    - Circuit for low-active input*..... 24
    - Circuit for high-active input*..... 25
    - Circuit for normal and inverted output* ..... 26
  - SENSOR CAPTURING TIMING IN PROGRAMMABLE GPIOs ..... 27
  - BOOT UP TIME ..... 28
- APPENDIX B. SUPPORT INFORMATION .....29**

## 1. General Description

Biometric systems are recently used in various authentication systems. They are increasingly used not only in environments that require high level of security but also in many other places because they are convenient and economical. Among various biometric systems, the fingerprint recognition system takes up most of the market because it is easy to use as well as economical and capable of developing various types of applications. NITGEN, a global leader in the fingerprint recognition industry, provides various fingerprint authentication solutions such as PC security, knowledge management, vaulting service, access control, electronic approval, and financial payment. NITGEN actively responds to customer needs through continuous research, development and quality management.

FIM41 is a stand-alone Fingerprint Identification Device with many excellent features. It provides benefits such as high identification performance, low power consumption and two UART serial interfaces with the various commands for easy integration into a wide range of applications. It is a durable and compact device with fingerprint identification module containing NITGEN® optics-based fingerprint sensor inside.

## 2. Feature

- ◆ One ID multi-templates mode
- ◆ Emulation Mode for compatibility with FIM20 and FIM30 series
- ◆ Up to 20,000 Templates
- ◆ More than 50,000 Logs
- ◆ Using New semiconductor sensors (TCS1 and TCS2)
- ◆ Changeable user's verification security level
- ◆ Selectable UART communication Level (RS232 or LVCMOS)
- ◆ Selectable fingerprint rotation angle range (+/- 45 ° or +/- 180 °)
- ◆ Support Auto-Identify mode
- ◆ Support ISO19794-2 and ANSI 378 template format
- ◆ Support Device Master password
- ◆ Provide custom data area
- ◆ Compatible template format with NITGEN eNBio API
- ◆ 8 Programmable GPIOs

## 3. Target Application

- ◆ Access Controller
- ◆ Time and attendance management solution
- ◆ Security solution
- ◆ Safety Box
- ◆ ATM, POS and more

## 4. Specification

### Basic Feature

#### Hardware Specification

ITEM		FIM41
Board Spec.	CPU	S3C2450 (ARM9 533Mhz)
	DRAM	64MByte
	Flash ROM	16MByte
Dimension		40 x 45 [mm <sup>2</sup> ]
Sensor		UPEK TCS1CM (FIM4110) UPEK TCS2CN (FIM4120)
Supply Voltage		5 [V]
Current Consumption	Normal	105 [mA]
	Max	115 [mA]
Operating Temperature		-20 ~ 60 [°C]
Humidity		~ 90 [% RH]
ESD Tolerance		±8 [KV] (indirect)
Communication Channel		2 UART (RS-232 Level, LVCMOS Level) Speed: 9600 ~ 115200 [bps] (1 start bit, 8 data bit, no parity, 1 stop bit)
External I/O		8 Programmable GPIOs
Maximum Template Storage		Up to 20,000 templates <sup>1)</sup>
Maximum Log Storage		Up to 55,269 Logs

<sup>1)</sup> (Up to 10,000 users can be stored in FIM20 2 templates emulation mode & Up to 5,000 users can be stored in FIM20 4 templates emulation mode).



**Operation Specification**

ITEM	FIM41
Capture Speed	85 [msec]
Verification Speed	Less than 700 [msec]
Boot Up Time <sup>1)</sup>	125 [msec] for 100 templates 280 [msec] for 1,000 templates 880 [msec] for 5,000 templates 1,730 [msec] for 10,000 templates 3,450 [msec] for 20,000 templates
Data Encryption Method	AES for saving data AES for DB communication

<sup>1)</sup> Boot-up time is explained in Appendix A.

**Sensor Feature**
**TCS1CM**

Sensor Name	TCS1CM
Sensing Type	Semiconductor
Sensing Area	18.0mm x 12.8mm
Image Resolution	508 DPI
Image Size	256 x 360 (256 x 320 is used in FIM4110)

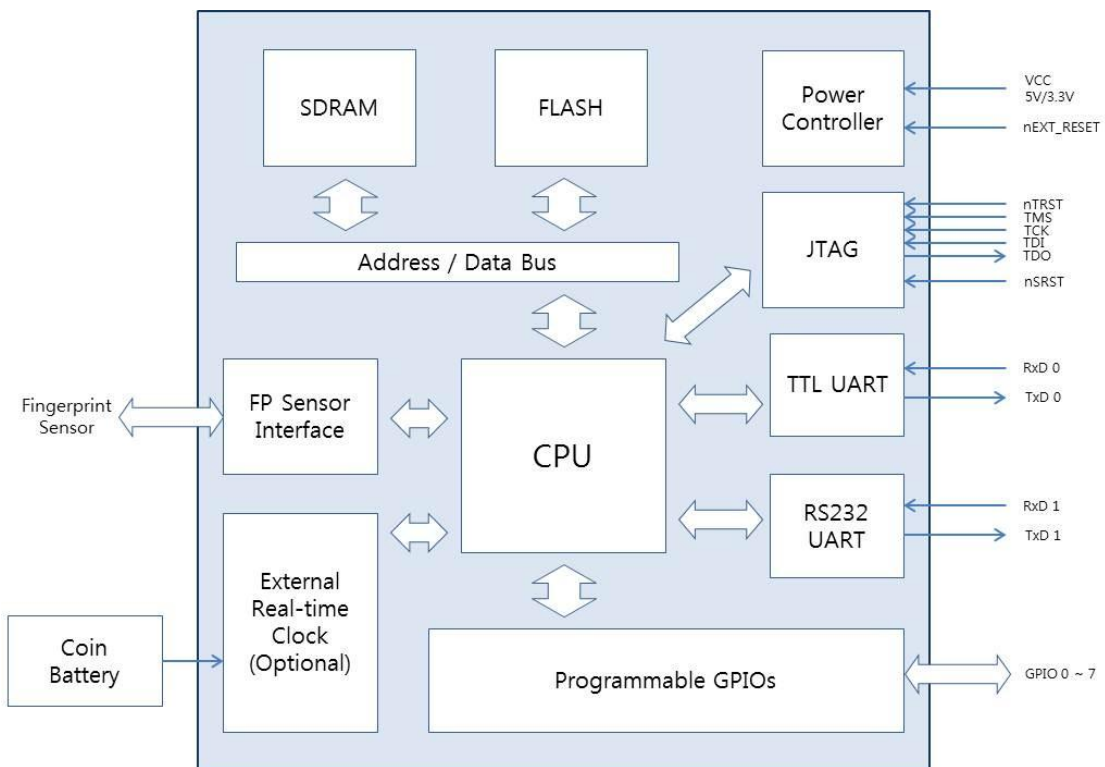
**TCS2CN**

Sensor Name	TCS2CN
Sensing Type	Semiconductor
Sensing Area	14.4mm x 10.4mm
Image Resolution	508 DPI
Image Size	208 x 288

**Interface Feature**

<b>Interface</b>	
Communication Channel 0 (LVCMOS Level)	LVCMOS Up to 115200bps Baud Rates supported (Default : 9600bps)
Communication Channel 1 (RS232 Level)	RS-232C Up to 115200bps Baud Rates supported (Default : 9600bps)
I/O	8 Programmable GPIOs

## 5. Block Diagram



RS-232C communication data consist of 8-bit data, no parity, 1-bit start-bit and 1-bit stop-bit.

## 6. Operation

### Reset

FIM41 provides external low-active reset signal port. By setting the reset port low state, FIM41 could be initialized. The reset port is internally pull-uped to VCC.

### Communication

FIM41 has two UART serial communication ports (RS232C and LVCMOS level) through those FIM41 communicates at the same time. These ports support 6 baudrate modes such as 9600, 14400, 19200, 38400, 57600, and 115200 bps.

FIM41 follows NITGEN Serial Communication protocol. For more detail information, please refer to the FIM ComProtocol document.

UART data consists of 1 start bit, 8 data bit, no parity bit and 1 stop bit.

### Custom Data Area

FIM41 provides 64 Kbytes flash memory. By using this memory, host can save private data for specific usage. The caution is needed for the responsibility for reading, writing and erasing because user data area is given to the host.

### IO Function

FIM41 provides 8 programmable GPIOs. These GPIOs can be configured or activated as normal IO, key function, result output, capturing status and so on.

Please refer clause 7 of FIM ComProtocol Vol2. ErrorCode & Structures document to get more details.

### Board configuration option

The following table shows board configuration system option.

These option values can be changed by using NITGEN Serial Communication protocol.

Please refer CMD\_SET\_SYSINFO (0x4C) and CMD\_GET\_SYSINFO (0x4D) commands of FIM ComProtocol Vol1. Overview & Commands document to get more details.

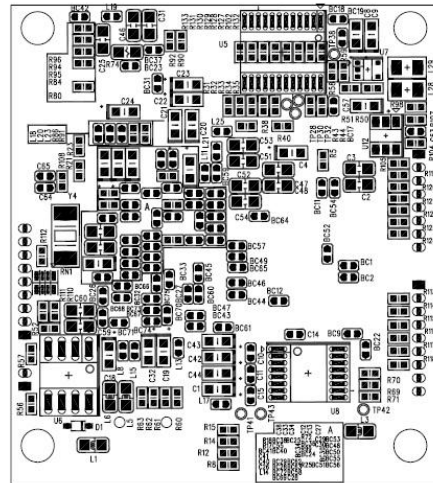
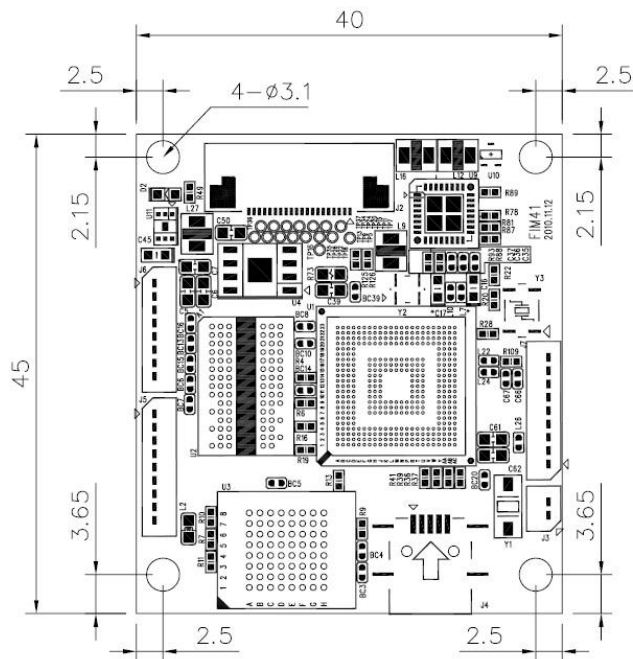
# FIM41

## 7. Technical Data

### 7.1. Physical Characteristics

#### The Feature of Board

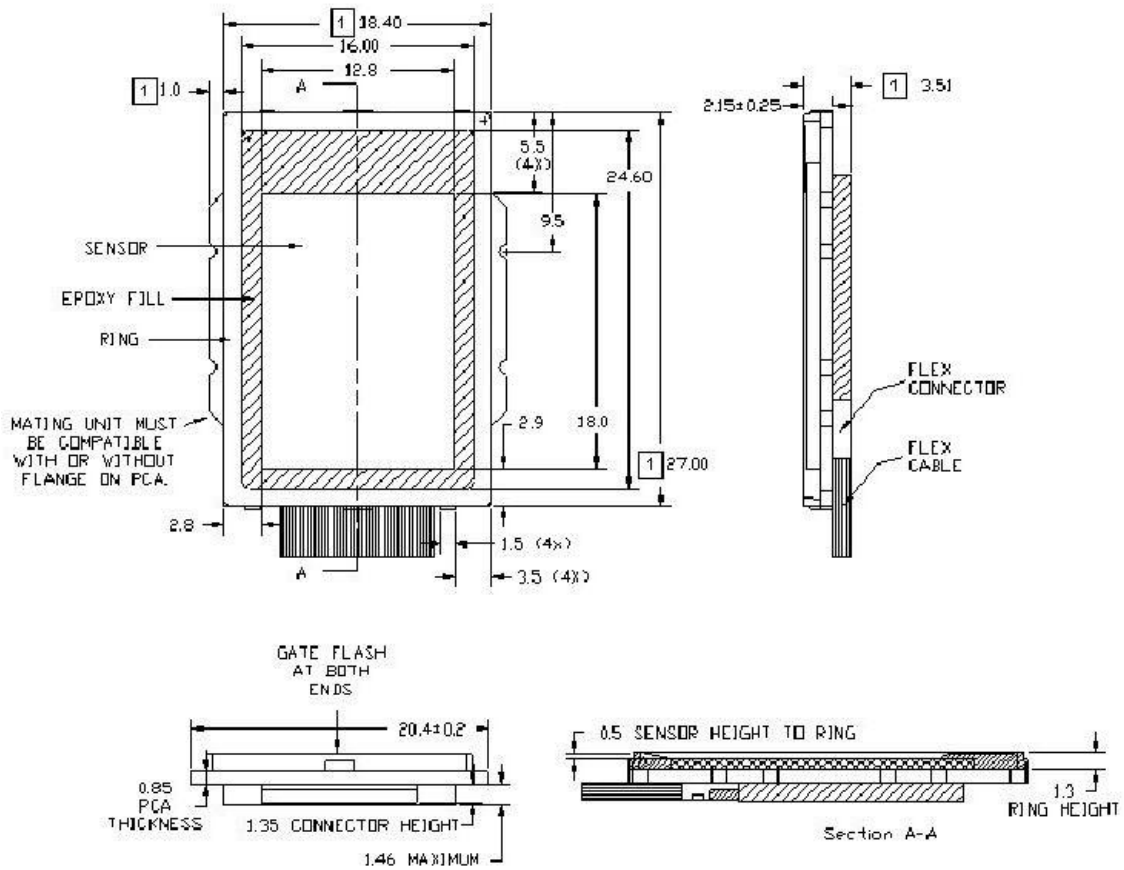
[Unit: mm]



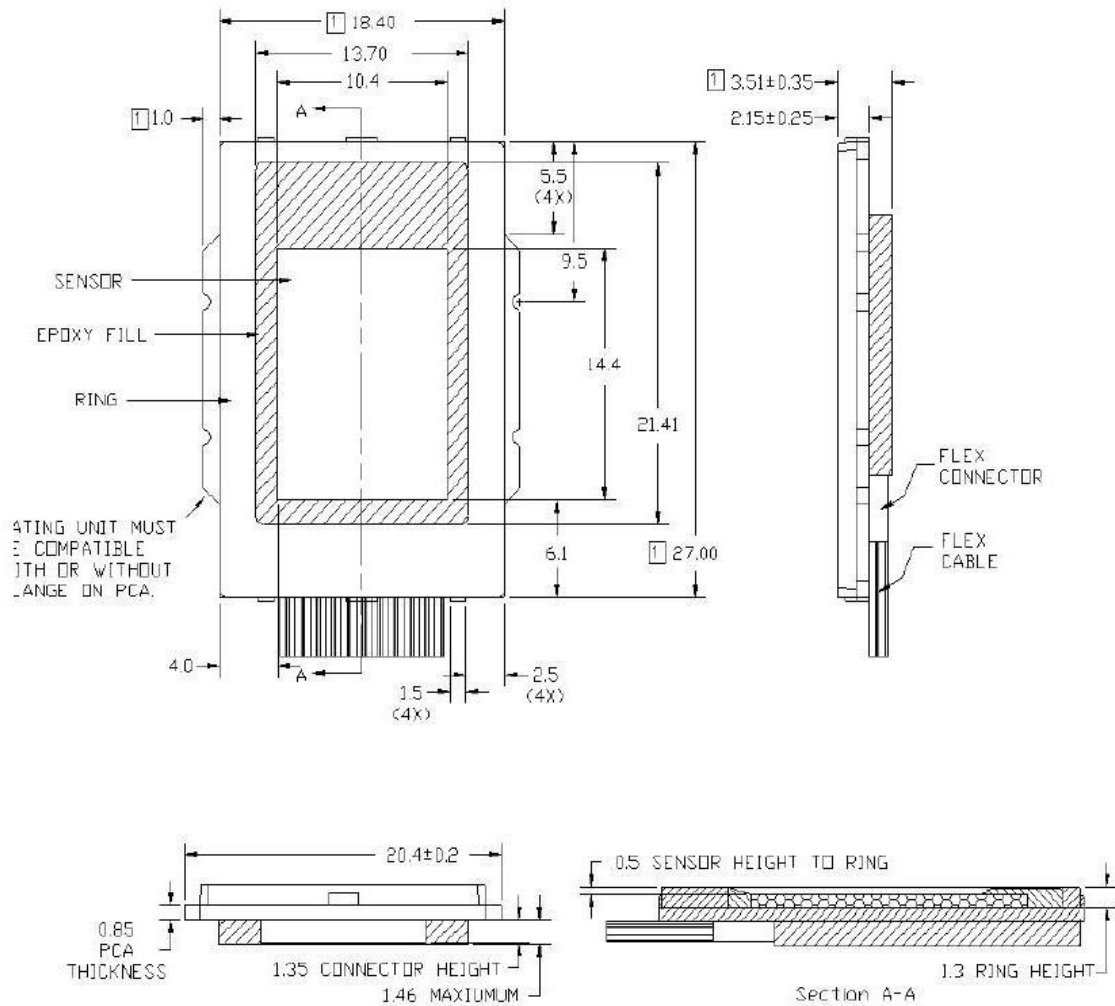
\* USB connector (J4) can be mounted for providing USB functionality without notice.

# FIM41

*The feature of fingerprint sensor*



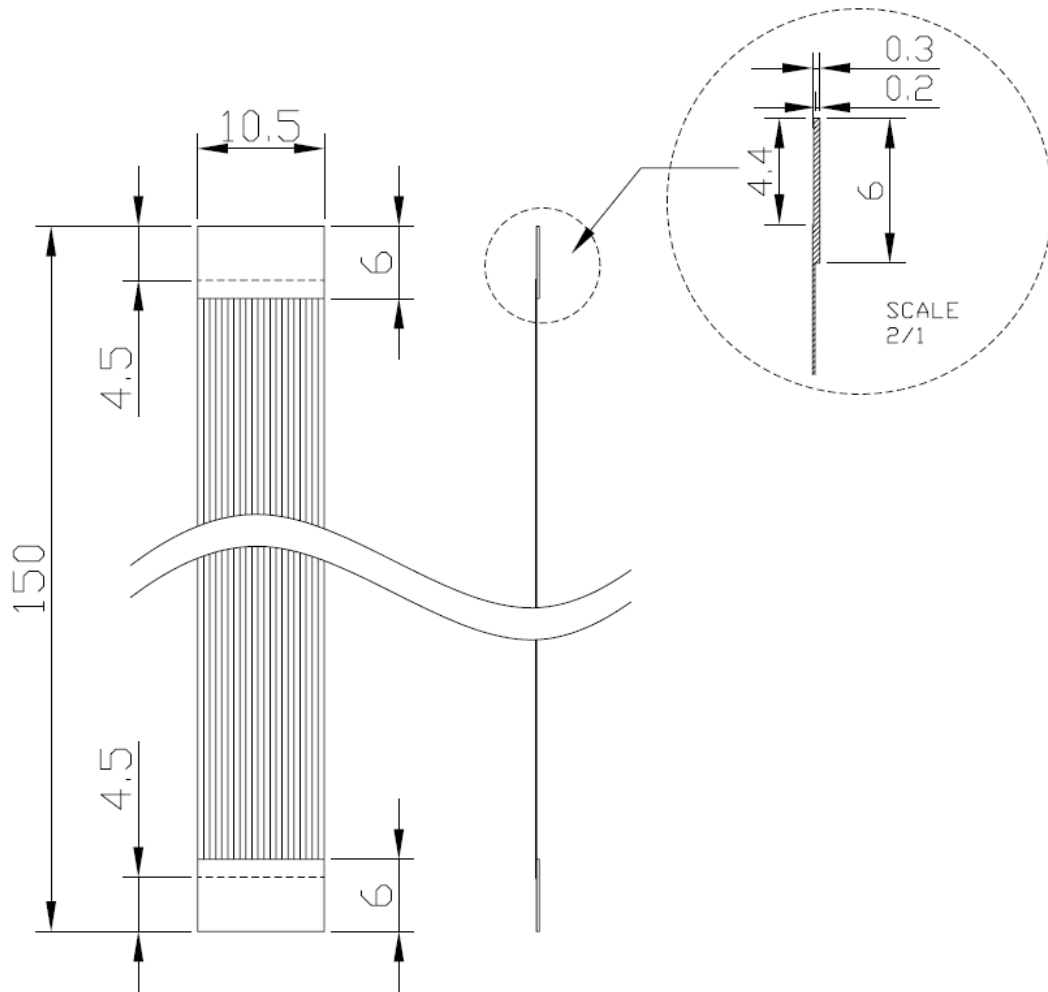
The Dimension of TCS1CM. Image is published by UPEK [Unit: mm]



The Dimension of TCS2CN. Image is published by UPEK [Unit: mm]

# FIM41

*The feature of sensor Cable*





# FIM41

## 7.2. External Port

### 20-Pin Semiconductor Sensor connector (J1)

Pin	Pin Name	Description
1	ESD-GND	Sensor ESD Ground
2	GND	Sensor Ground
3	WRB	Write Enable
4	NRST	Reset Enable
5	RDB	Read Enable
6	CSB	Chip Select
7	INT	Reserved
8	A0	Address 0
9	DATA0	Sensor Data 0
10	DATA1	Sensor Data 1
11	DATA2	Sensor Data 2
12	DATA3	Sensor Data 3
13	DATA4	Sensor Data 4
14	DATA5	Sensor Data 5
15	DATA6	Sensor Data 6
16	DATA7	Sensor Data 7
17	GPIO2	Reserved
18	GPIO1	Reserved (Full-down)
19	GPIO0	Reserved (Full-down)
20	VDD	Sensor VCC (5V)

### External Real-time Clock Connector (J3)

Pin	Pin Name	Description
1	VCC	3.3V
2	GND	Ground

## FIM41

### USB Connector (J4)

Pin	Pin Name	Description
1	VCC	5V
2	PDN0	Data[-] for USB peripheral
3	PDPO	Data[+] for USB peripheral
4	GND	Ground
5	ESD_GND	Connected with connector's case

### 9-Pin External Connector (J5)

Pin	Pin Name	Description
1	VCC	Supply Voltage (5V)
2	EXT_RXD	UART Channel 1 port receiving signal from host (RS232 Level)
3	EXT_TXD	UART Channel 1 port transmitting signal to host (RS232 Level)
4	TTL_RXD	UART Channel 0 port receiving signal from host (LVCMOS Level)
5	TTL_TXD	UART Channel 0 port transmitting signal to host (LVCMOS Level)
6	GPIO0	General Purpose Input / Output 0
7	GPIO1	General Purpose Input / Output 1
8	/EXT_RESET	Reset signal – active low
9	GND	Ground

### 8-Pin External Connector (J6)

Pin	Pin Name	Description
1	VCC	3.3V
2	GPIO2	General Purpose Input / Output 2
3	GPIO3	General Purpose Input / Output 3
4	GPIO4	General Purpose Input / Output 4
5	GPIO5	General Purpose Input / Output 5
6	GPIO6	General Purpose Input / Output 6
7	GPIO7	General Purpose Input / Output 7
8	GND	Ground

## FIM41

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### JTAG Connector (J7)

Pin	Pin Name	Description
1	VCC	3.3V
2	N/A	N/A
3	nSRST	JTAG control pin
4	TDO	JTAG control pin
5	TDI	JTAG control pin
6	nTRST	JTAG control pin
7	TCK	JTAG control pin
8	TMS	JTAG control pin
9	GND	Ground

\* J7 (JTAG connector) is used only for development or emergency recovery.

## FIM41

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### 7.3. Connector

#### Sensor

NO	DESCRIPTION	VENDOR
1	20-PIN (52746-2090)	MOLEX

#### Communication

NO	DESCRIPTION	VENDOR
1	9-pin Male (53047-0910)	MOLEX
2	8-pin Male (53047-0810)	MOLEX

# FIM41

## 7.4. Electrical Characteristics

Parameter	MIN.	TPY.	MAX.	UNITS
<b>Power</b>				
Supply current			200	mA
Supply Voltage	4.5	5.0	5.5	V
<b>UART (RS-232 Level)</b>				
Output Voltage Swing	±5.0	±5.4		V
Input Voltage Range	-15		+15	V
Input Threshold LOW	0.6	1.2		V
Input Threshold HIGH		1.5	2.4	V
Maximum data rate			115,200	BPS
<b>UART (LVCMOS Level)</b>				
Output Voltage LOW			0.4	V
Output Voltage HIGH	2.7		3.3	V
Input Threshold LOW			0.8	V
Input Threshold HIGH	2.4		3.3	V
Maximum data rate			115,200	BPS
<b>GPIO</b>				
Output Voltage LOW			0.4	V
Output Voltage HIGH	2.7		3.3	V
Input Threshold LOW			0.8	V
Input Threshold HIGH	2.4		3.3	V
<b>E.T.C.</b>				
Reset pulse Width	1			ms

## 8. Ordering Information

### 8.1. FIM4110 Ordering Guide

Product Name	Max. Templates	Supply Voltage [V]	RTC
FIM4110-HV	20,000	5	Internal
FIM4110-HVM2	20,000	5	External

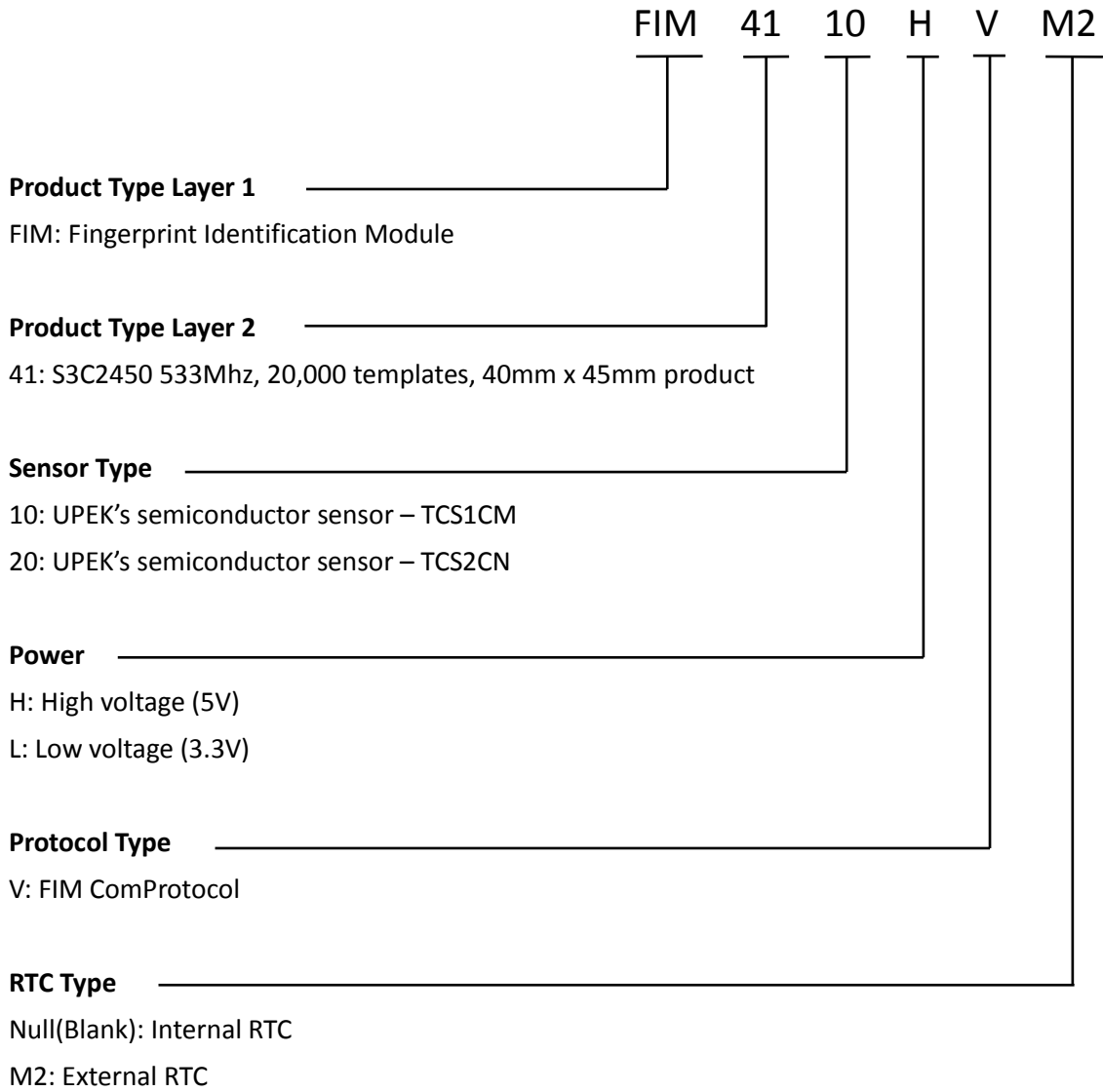
### 8.2. FIM4120 Ordering Guide

Product Name	Max. Templates	Supply Voltage [V]	RTC
FIM4120-HV	20,000	5	Internal
FIM4120-HVM2	20,000	5	External

# FIM41

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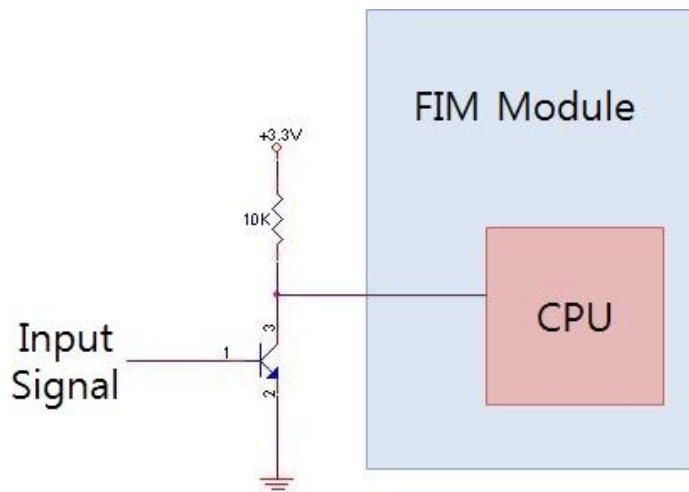
## 8.2. Naming Rule



## APPENDIX A. Recommendation Circuit and Timing

### Recommended circuit to use programmable GPIOs

#### *Circuit for low-active input*



This circuit is recommended for,

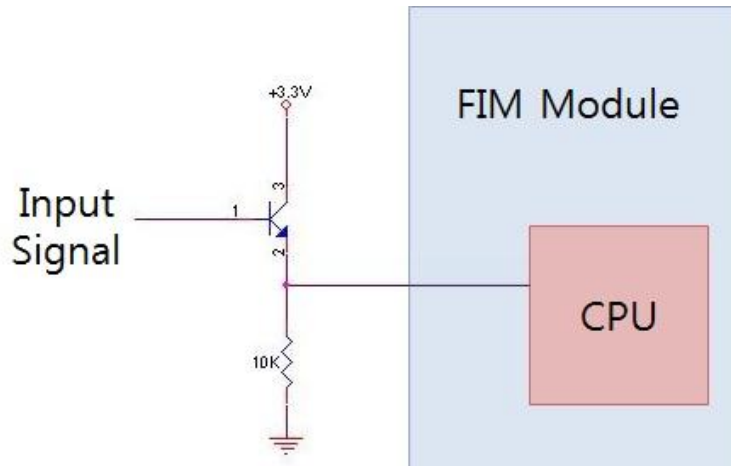
- ◆ GPIO\_IN\_NORMAL (0x00)
- ◆ GPIO\_IN\_ENROLL\_LOW (0x02)
- ◆ GPIO\_IN\_DELETE\_LOW (0x04)
- ◆ GPIO\_IN\_IDENTIFY\_LOW (0x06)

\*All GPIO definitions are defined in clause 7 of FIM ComProtocol Vol2. ErrorCode & Structures document.



## FIM41

### *Circuit for high-active input*

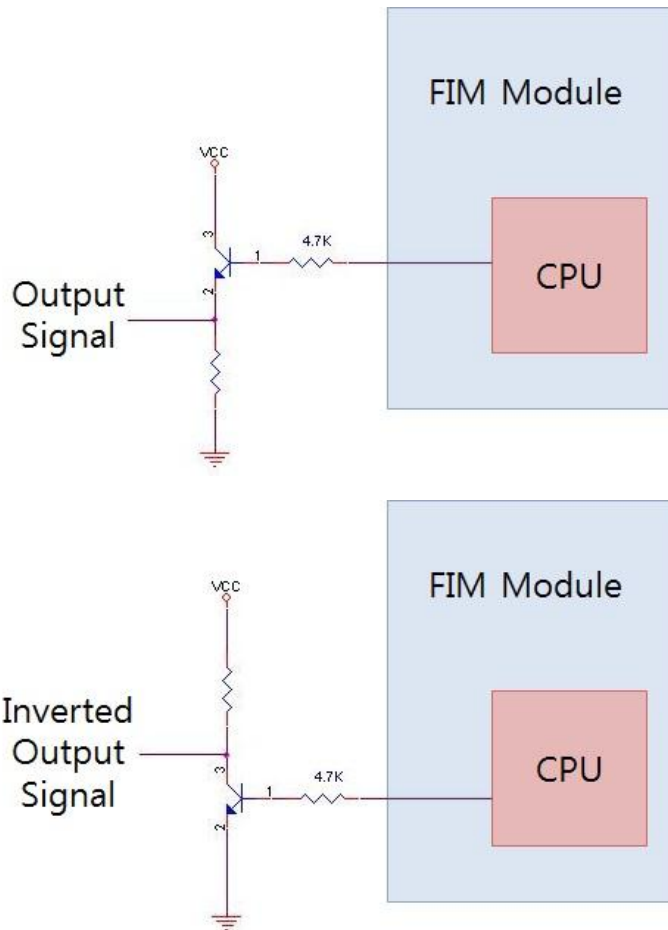


This circuit is recommended for,

- ◆ GPIO\_IN\_NORMAL (0x00)
- ◆ GPIO\_IN\_ENROLL\_HIGH (0x01)
- ◆ GPIO\_IN\_DELETE\_HIGH (0x03)
- ◆ GPIO\_IN\_IDENTIFY\_HIGH (0x05)

## FIM41

### *Circuit for normal and inverted output*

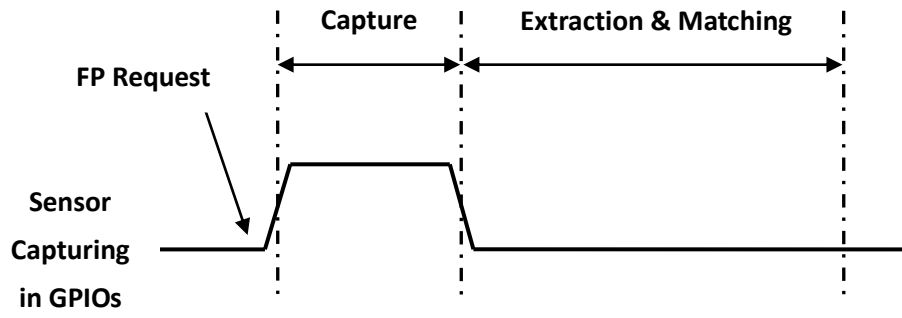


This circuit is recommended for,

- ◆ GPIO\_OUT\_NORMAL (0x80)
- ◆ GPIO\_OUT\_SUCCESS\_HIGH (0x81)
- ◆ GPIO\_OUT\_SUCCESS\_LOW (0x82)
- ◆ GPIO\_OUT\_FAIL\_HIGH (0x83)
- ◆ GPIO\_OUT\_FAIL\_LOW (0x84)
- ◆ GPIO\_OUT\_CAPTURING (0x85)
- ◆ GPIO\_OUT\_FP\_STATUS (0x86)

# FIM41

## Sensor Capturing timing in programmable GPIOs



# FIM41

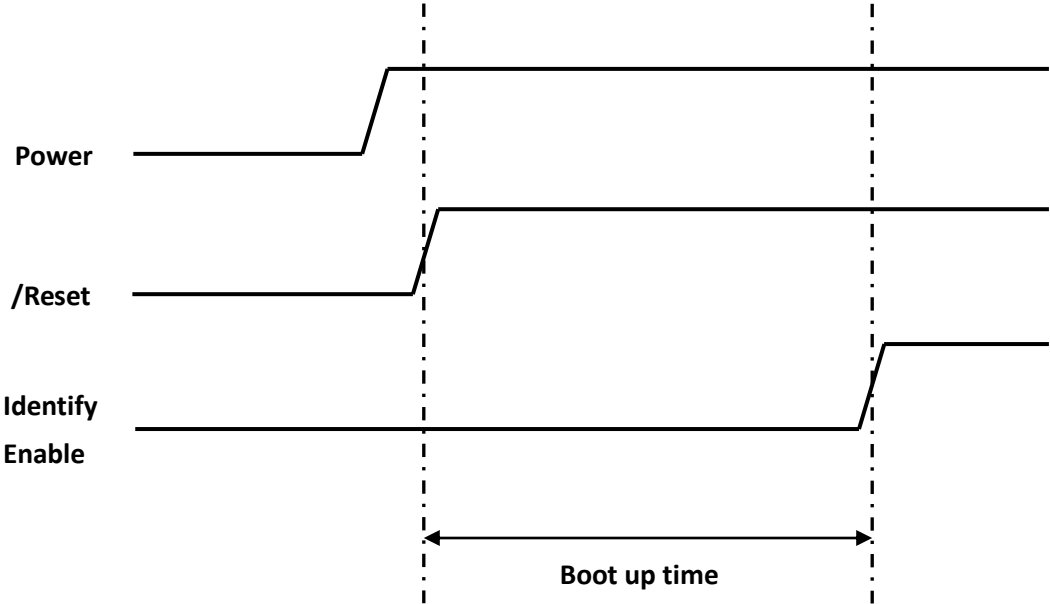
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## Boot up time

System Boot-up time means the total time consumed by FIM41 after system power and /Reset are supplied.

Boot-up time depends on the number of templates stored in FIM41.

System Boot-up time can be measured as the following.



## Appendix B. Support Information

A large, light blue circular graphic with a white border, centered on the page. Inside the circle, the company name and contact information are listed.

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