

## An SIC4310 Development Kit with LCD and temperature sensor

### Features Summary

#### SIC4310 : RFID Tag IC with UART Interface

- Compatible with NFC tag type 2
- 228-byte EEPROM (196-byte user memory)
- Direct data transfer between RFID and UART
- Operating from either RF-harvesting or external supply
- Up to 10mA current sourcing to external circuit (depends on harvested power from RF)
- UART speed from 9600 to 115200 bps

#### Supported Protocols

- ISO14443A @106kbps

#### Microcontroller

- STM32F051 ARM Cortex M0

#### Hardware Features

- Closed Coupling Antenna : size 45 x 30 mm
- 1x LCD (16 char x 2 line)
- 1xLED direct controlled by SIC4310
- 1x programmable function button
- On-board temperature sensor
- Dimension : 85.47 mm x 47.63 mm

#### Power Options

- fully passive mode or 3.3V external supply mode selectable by jumper

#### Interfaces

- SIC4310 interface : UART 115.2 kbps
- Host Interfaces : SPI/ I2C/UART
- SWP interface connector for programming and debugging

#### Operating Conditions

- Storage temperature from -20 to 70°C
- Operating temperature from -30 to 80°C
- Input operating voltage 3.3V

#### Information Support

- Hardware Manual
- Protocol Information
- Demonstration Android Application
- Software/Firmware source code are available per request



SIC4310-FU, An SIC4310 Development Kit with LCD and temperature sensor

### General Description

The SIC4310-FU is a development kit of SIC4310, a high-performance ISO14443A RFID tag IC with UART interface from Silicon Craft Technology. The SIC4310-FU is integrated with peripheral components e.g. antenna, LCD, LED, function button, and temperature sensor. These components work perfectly with ARM CORTEX-M0 STM32F051 microcontroller, to indicate the possibilities of using SIC4310 in many applications.

Base on pin selection, the power source of SIC4310 can be selected to be the external 3.3V power supply or harvesting power from the RF. Not only for supplying SIC4310 itself, but the harvested power can also source current to the external circuit up to 10mA. This feature makes SIC4310 to be the “NFC Enabler” by sourcing the power from NFC phone to the external circuit as well as communicating the data in the same time.

SIC4310-FU use UART as a main channel to interface between SIC4310 and STM32F051. However, the communication ports are provided with all major communication protocols nowadays e.g. SPI, I2C, and UART. User can use these ports to connect between host computer and SIC4310-FU to command and monitor the SIC4310-FU. Moreover, SWP port is provided for the developer to program and debug the SIC4310-FU via the debugger.

All support information as well as the demonstration Android application is already provided on the website. However, Software and Firmware source code are available per request.

### Applications

- Firmware Upgrade via NFC
- NFC Bridge for embedded system products
- NFC powering sensor
- Metering/Vending machine
- Smart Interactive Poster
- Smart Home Appliances
- Wireless industrial machine interface
- Customized, proprietary system RFID
- Smart toy/ Videogames affiliate
- Display-less home appliances

*The information herein is for product information purpose. While the contents in this publication has been carefully checked; no responsibility, however, is assumed for inaccuracies. Silicon Craft Technology Co., Ltd. reserves the right to make changes to the products contained in this publication in order to improve design, performance or reliability.*

## Revision History

Revision	Date	Description/ Change / Updated / Comment	Hardware version	Product Code
1.0	September 2013	1 <sup>st</sup> Release	SIC4310-FU v1.2	P102HS4310FU-01
1.1	December 2013	Correct the description of JGND jumper	SIC4310-FU v1.2	P102HS4310FU-01

## Ordering Information

Product Code	Package
P102HS4310FU-01	An SIC4310 Development Kit with LCD and temperature sensor

PRELIMINARY

### 1. Functional Overview

The SIC4310-FU is an SIC4310 Development Kit with LCD and temperature sensor. Its main purpose is to demonstrate usage and performance of the RFID Tag IC with UART Interface "SIC4310". **Figure 3** shows a simplified schematic diagram of the SIC4310-FU. The RF connection topology of the SIC4310-FU is a close-coupling antenna network. By pin selection (JP), the power supply can be either an external 3.3V or the harvested power from RF\*.

Demonstration software for Android phone is able to download at Google Play store. It can be used as a guideline based on the applications. The sample GUI pictures of the demonstration software are illustrated in **Figure 1**.

\*For supplying external 3.3V to SIC4310-HARVEST, please read the application note "Supplying the external power to SIC4310" to understand how to supply the power to SIC4310.

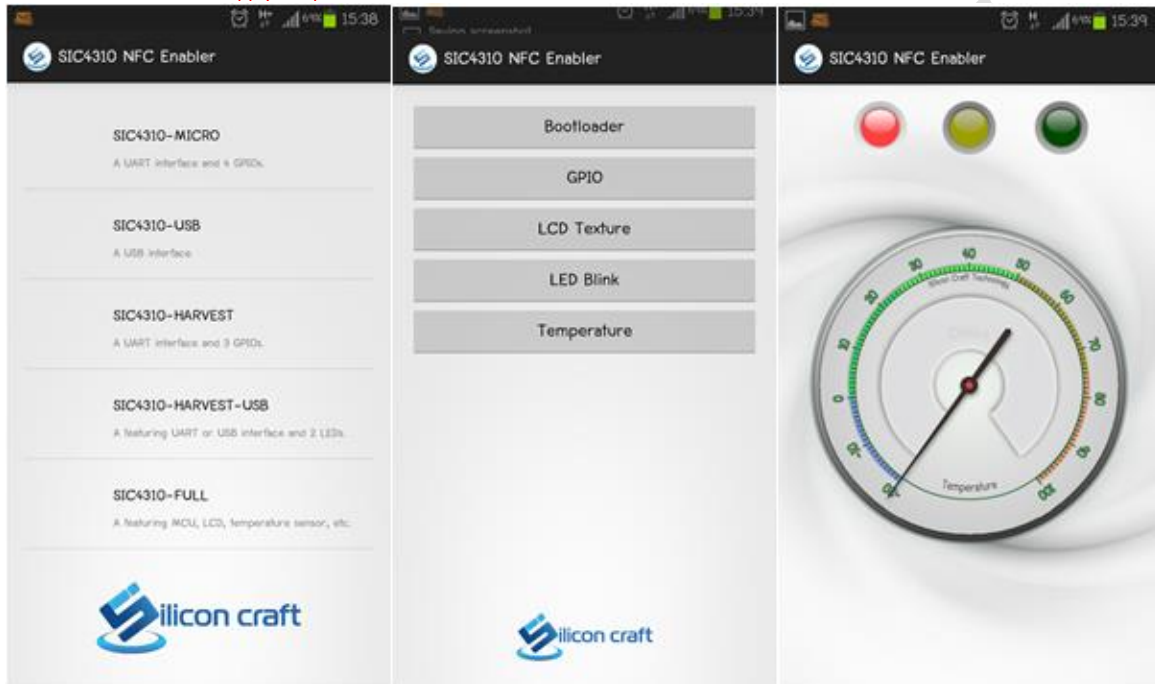


Figure 1 The GUI pictures of the demonstration software

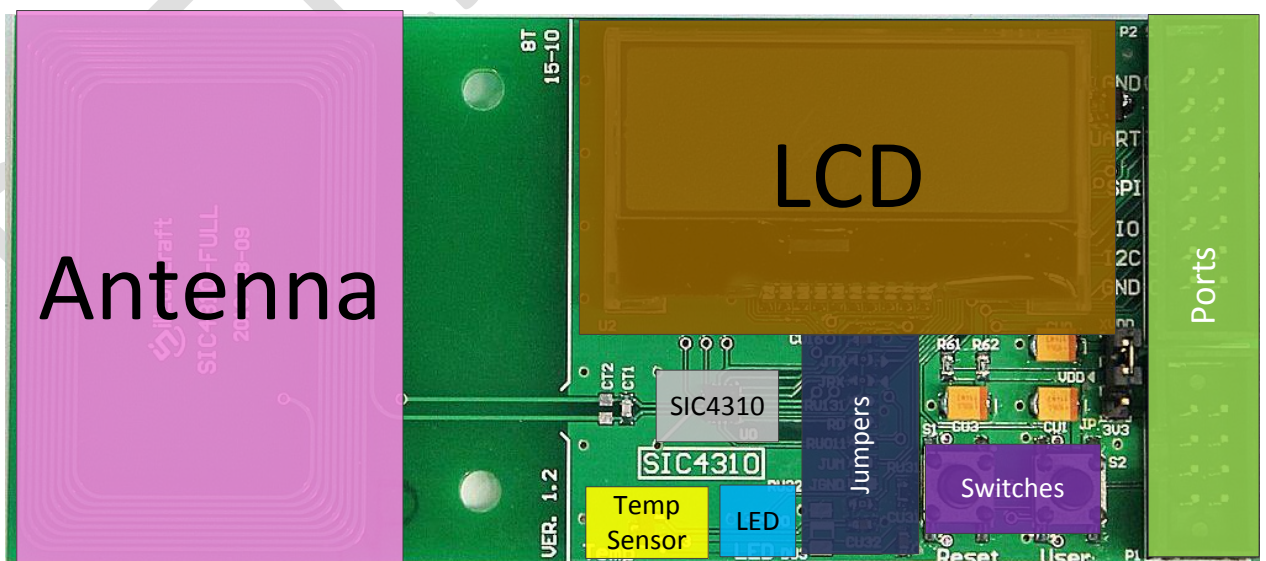


Figure 2 SIC4310-FU board layout

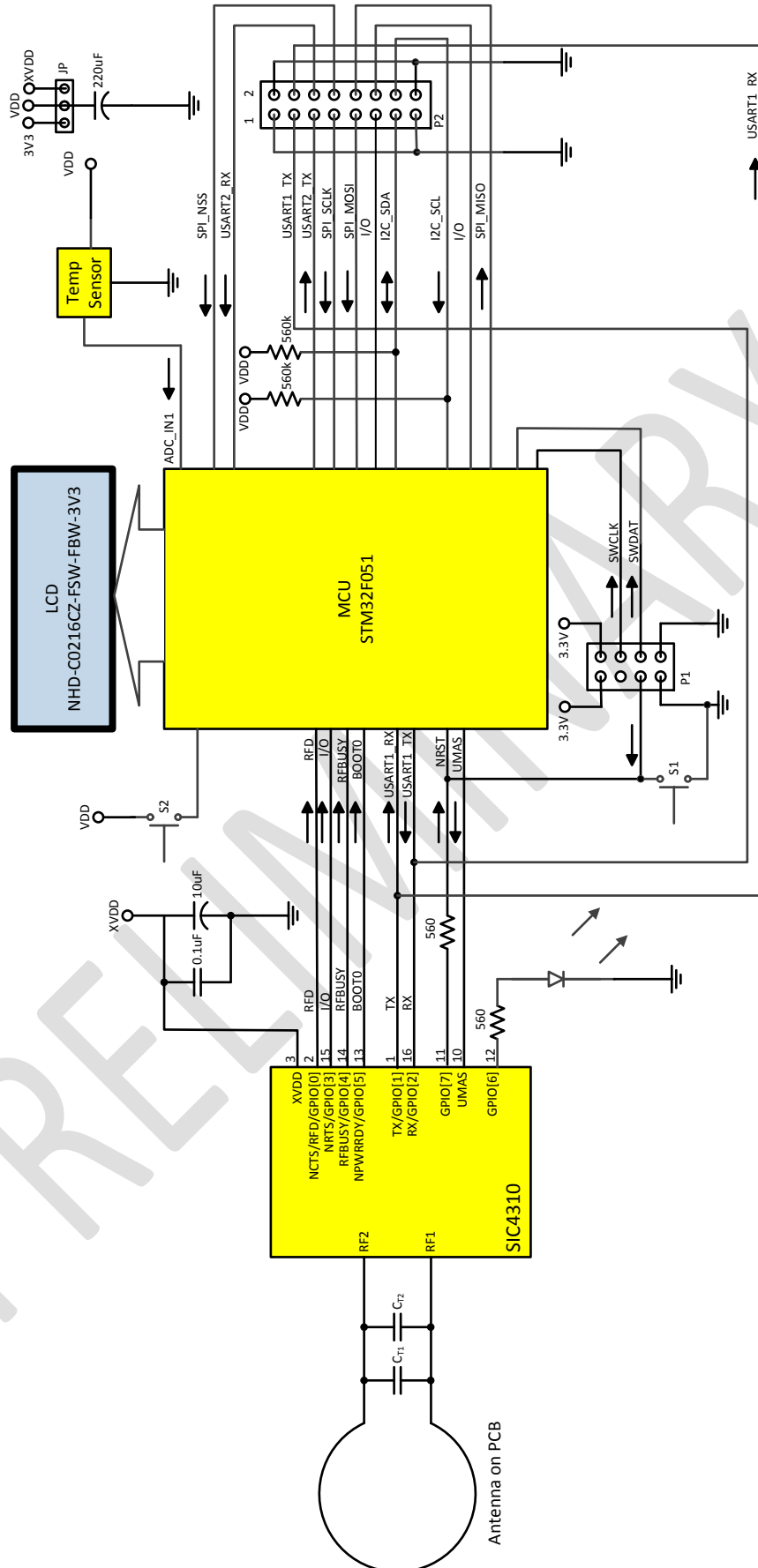


Figure 3 Simplified Schematic diagram of SIC4310-FU

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### 2. Port and Pin Selection

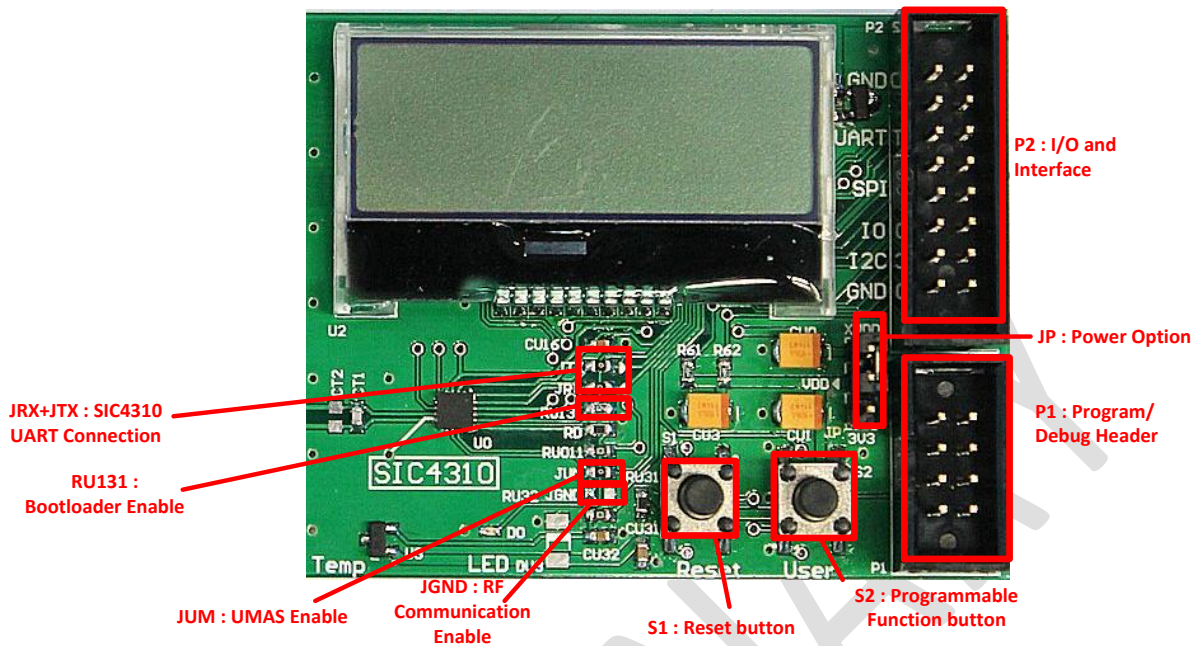


Figure 4 SIC4310-FU Picture shows key jumper and ports.

Table 1 Port and Jumper in SIC4310-FU																										
Port/Jumper	Name	Note																								
P1	Program Header	<table border="0"> <tr> <td>3.3V</td><td><input type="checkbox"/></td><td>3.3V</td> </tr> <tr> <td>N/C</td><td><input type="checkbox"/></td><td>SWCLK</td> </tr> <tr> <td>NRST</td><td><input type="checkbox"/></td><td>SWDAT</td> </tr> <tr> <td>GND</td><td><input type="checkbox"/></td><td>GND</td> </tr> </table>	3.3V	<input type="checkbox"/>	3.3V	N/C	<input type="checkbox"/>	SWCLK	NRST	<input type="checkbox"/>	SWDAT	GND	<input type="checkbox"/>	GND												
3.3V	<input type="checkbox"/>	3.3V																								
N/C	<input type="checkbox"/>	SWCLK																								
NRST	<input type="checkbox"/>	SWDAT																								
GND	<input type="checkbox"/>	GND																								
P2	I/O and Interface	<table border="0"> <tr> <td>GND</td><td><input type="checkbox"/></td><td>GND</td> </tr> <tr> <td>USART1_TX</td><td><input type="checkbox"/></td><td>USART1_RX</td> </tr> <tr> <td>USART2_TX</td><td><input type="checkbox"/></td><td>USART2_RX</td> </tr> <tr> <td>SPI_SCK</td><td><input type="checkbox"/></td><td>SPI_NSS</td> </tr> <tr> <td>SPI_MOSI</td><td><input type="checkbox"/></td><td>SPI_MISO</td> </tr> <tr> <td>I/O MCU1</td><td><input type="checkbox"/></td><td>I/O MCU2</td> </tr> <tr> <td>I2C_SDA</td><td><input type="checkbox"/></td><td>I2C_SCL</td> </tr> <tr> <td>GND</td><td><input type="checkbox"/></td><td>GND</td> </tr> </table>	GND	<input type="checkbox"/>	GND	USART1_TX	<input type="checkbox"/>	USART1_RX	USART2_TX	<input type="checkbox"/>	USART2_RX	SPI_SCK	<input type="checkbox"/>	SPI_NSS	SPI_MOSI	<input type="checkbox"/>	SPI_MISO	I/O MCU1	<input type="checkbox"/>	I/O MCU2	I2C_SDA	<input type="checkbox"/>	I2C_SCL	GND	<input type="checkbox"/>	GND
GND	<input type="checkbox"/>	GND																								
USART1_TX	<input type="checkbox"/>	USART1_RX																								
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SPI_SCK	<input type="checkbox"/>	SPI_NSS																								
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I2C_SDA	<input type="checkbox"/>	I2C_SCL																								
GND	<input type="checkbox"/>	GND																								
JP	Power Option	<table border="0"> <tr> <td>xVDD</td><td><input type="checkbox"/></td><td>VDD</td><td><input type="checkbox"/></td><td>3V3</td><td><input type="checkbox"/></td> </tr> </table> <p>= Use external 3.3V to supply the circuit (except SIC4310)</p>	xVDD	<input type="checkbox"/>	VDD	<input type="checkbox"/>	3V3	<input type="checkbox"/>																		
		xVDD	<input type="checkbox"/>	VDD	<input type="checkbox"/>	3V3	<input type="checkbox"/>																			
		<table border="0"> <tr> <td>xVDD</td><td><input type="checkbox"/></td><td>VDD</td><td><input type="checkbox"/></td><td>3V3</td><td><input type="checkbox"/></td> </tr> </table> <p>= Use harvested power form RF to supply the circuit</p>	xVDD	<input type="checkbox"/>	VDD	<input type="checkbox"/>	3V3	<input type="checkbox"/>																		
xVDD	<input type="checkbox"/>	VDD	<input type="checkbox"/>	3V3	<input type="checkbox"/>																					
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xVDD	<input type="checkbox"/>	VDD	<input type="checkbox"/>	3V3	<input type="checkbox"/>																					
JRX+JTX	SIC4310 UART Connection	<table border="0"> <tr> <td><input checked="" type="checkbox"/></td><td><input checked="" type="checkbox"/></td> </tr> </table> <p>= Connected</p>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>																						
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<table border="0"> <tr> <td><input type="checkbox"/></td><td><input type="checkbox"/></td> </tr> </table> <p>= Disconnected</p>	<input type="checkbox"/>	<input type="checkbox"/>																								
<input type="checkbox"/>	<input type="checkbox"/>																									
RU131	Boot loader Enable	<table border="0"> <tr> <td><input checked="" type="checkbox"/></td><td><input checked="" type="checkbox"/></td> </tr> </table> <p>= Force to always run (cannot enter boot loader)</p>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>																						
		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>																							
<table border="0"> <tr> <td><input type="checkbox"/></td><td><input type="checkbox"/></td> </tr> </table> <p>= Boot loader enabled (controlled by SIC4310)</p>	<input type="checkbox"/>	<input type="checkbox"/>																								
<input type="checkbox"/>	<input type="checkbox"/>																									
JUM	UMAS Enable	<table border="0"> <tr> <td><input checked="" type="checkbox"/></td><td><input checked="" type="checkbox"/></td> </tr> </table> <p>= UMAS pin is able to control by MCU</p>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>																						
		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>																							
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<input type="checkbox"/>	<input type="checkbox"/>																									
JGND	UMAS Control Enable	<table border="0"> <tr> <td><input checked="" type="checkbox"/></td><td><input checked="" type="checkbox"/></td> </tr> </table> <p>= UMAS pin is forced to '0' (RF Communication is enabled, EEPROM R/W via UART is disabled)</p>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>																						
		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>																							
<table border="0"> <tr> <td><input type="checkbox"/></td><td><input type="checkbox"/></td> </tr> </table> <p>= UMAS pin is able to control by MCU if JUM is connected</p>	<input type="checkbox"/>	<input type="checkbox"/>																								
<input type="checkbox"/>	<input type="checkbox"/>																									
S1	Reset button	Push to reset STM32F051																								
S2	Programmable Function Button	Function can be set through firmware programming																								

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### 3. Specifications

#### 3.1 Absolute maximum rating

Stresses above those listed under Absolute Maximum Ratings may cause permanent damage to the device. Exposure to the absolute maximum rating conditions for an extended period of time may affect the device reliability. Only one absolute maximum rating can be applied at a time.

**Table 2 Absolute maximum rating**

Parameter	Rating
Power supply input voltage (P1 and P2)	3V to 3.6V
Operating Temperature Range	-20 °C to +70 °C
Storage Temperature Range	-30 °C to +80 °C

#### 3.2 Electrical characteristic

**Table 3 Operating condition**

Parameter	Description	Min	Typ	Max	Unit	Conditions
VDD	Input Supply Voltage	3	3.3	3.6	V	
I <sub>XVDD</sub>	Supply current at XVDD pin			10	mA	<ul style="list-style-type: none"> <li>Read range = 0</li> <li>Up to the power supplied from the NFC phone</li> </ul>

**Table 4 Performance Characteristic**

Parameter	Description	Min	Typ	Max	Unit	Conditions
Read range	Read range		TBD		cm	
UART Speed	UART Communication Speed	9.6		115.2	Kbit/s	
Temp. range	Temperature range of temperature sensor	-40		125	°C	

**Table 5 Physical Characteristic**

Parameter	Description	Value	Unit	Conditions
Dimension	Width	85.47	mm	
	Length	47.63	mm	
	Height	16	mm	
Weight	Weight	TDB	gram	

**Table 6 LCD Characteristic**

Parameter	Description	Min	Typ	Max	Unit	Conditions
Dimension	Width	24.0	24.3	24.6	mm	
	Length	41.1	41.4	41.7	mm	
	Height	3.7	4.0	4.3	mm	
Viewing angle	Vertical	-60		+35	°	Cr ≥ 2
	Horizontal	-40		+40	°	Cr ≥ 2
Cr	Contrast Ratio		6			
Tr	Response time - rise		150	250	ms	
Tf	Response time - fall		150	250	ms	

## 4. Usage

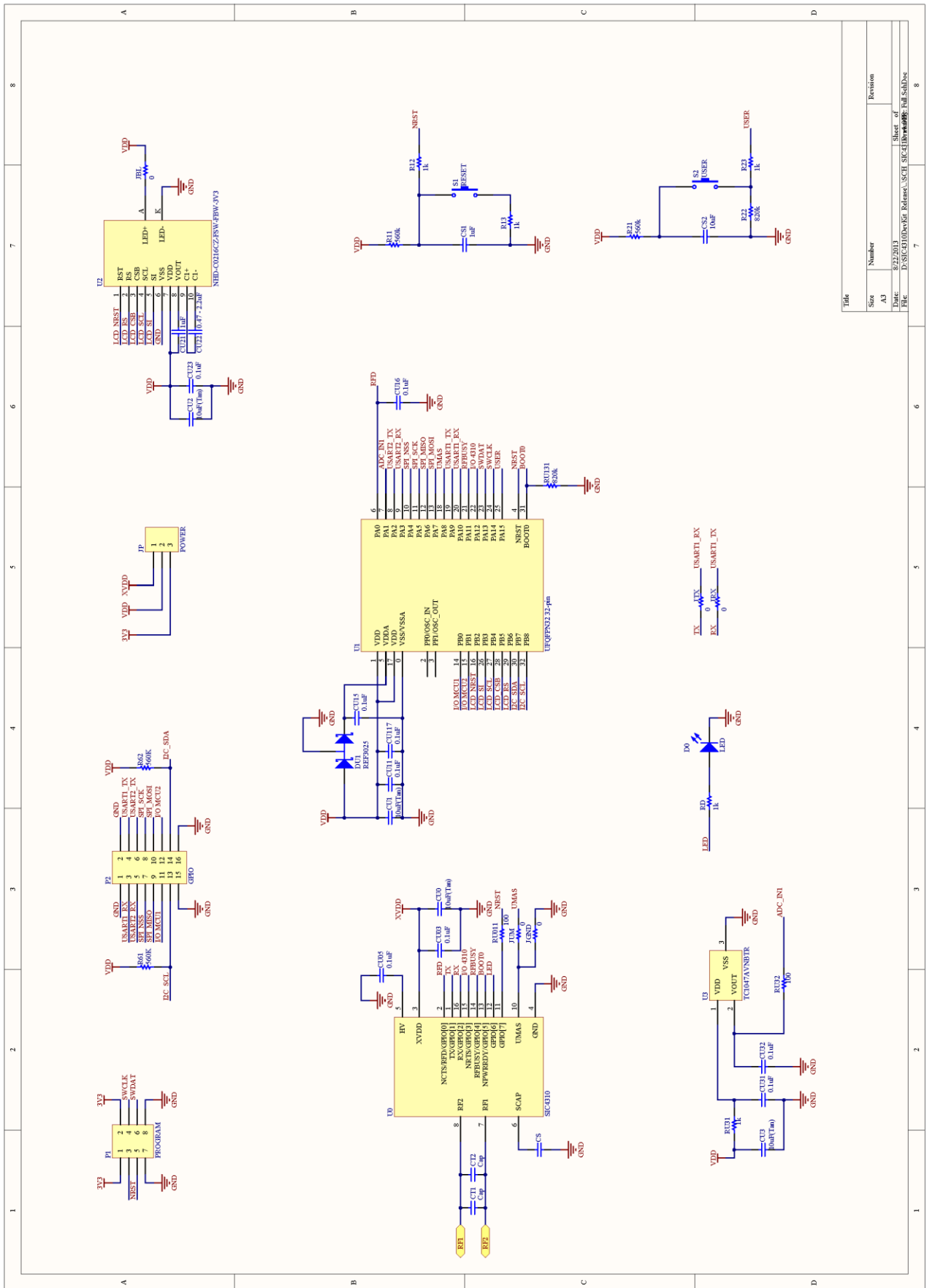
Before operating the SIC4310-FU, user shall check the following lists to ensure the correct operation.

### 4.1 Power setup

The Power option jumper “JP” shall be set by the user to match the specific application before power-up the SIC4310-FU.

If SIC4310 is set to **use the external 3.3V supply**, user shall follow the instructions in “Special configuration for using external supply voltage” application note before power-up the SIC4310-FU.

PRELIMINARY



Title		Revision	
Size	Number		
A3			
Date:	8/23/2013	Sheet of	8
File:	D:\SIC4310DevSgr_Release\SCH_SIC4310Fu_v0.06P_Full_SchDoc		

Figure 5 Schematic diagram

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