



S6SATU01A

# I<sup>2</sup>C Interface for PMIC Communication Tool Operation Guide

Doc. No. 002-08680 Rev. \*B

Cypress Semiconductor  
198 Champion Court  
San Jose, CA 95134-1709  
[www.cypress.com](http://www.cypress.com)

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# Preface



This manual explains how to use the evaluation board. Be sure to read this manual before using the product. For this product, please consult with sales representatives or support representatives.

## **Handling and use**

Handling and use of this product and notes regarding its safe use are described in the manuals.

Follow the instructions in the manuals to use this product.

Keep this manual at hand so that you can refer to it anytime during use of this product.

## **Notice on this document**

All information included in this document is current as of the date it is issued. Such information is subject to change without any prior notice.


Please confirm the latest relevant information with the sales representatives.

# Cautions




## Caution of the products described in this document

The following precautions apply to the product described in this manual.

|  |   |
|--|---|
|  <b>WARNING</b> | Indicates a potentially hazardous situation which could result in death or serious injury and/or a fault in the user's system if the product is not used correctly. |
|--|---|

|                                   |   |
|-----------------------------------|---|
| <b>Electric shock,<br/>Damage</b> | Before performing any operation described in this manual, turn off all the power supplies to the system.<br>Performing such an operation with the power on may cause an electric shock or device fault. |
| <b>Electric shock,<br/>Damage</b> | Once the product has been turned on, do not touch any metal part of it.<br>Doing so may cause an electric shock or device fault.  |

|  |   |
|--|---|
|  <b>CAUTION</b> | Indicates the presence of a hazard that may cause a minor or moderate injury, damages to this product or devices connected to it, or may cause to lose software resources and other properties such as data, if the device is not used appropriately. |
|--|---|

|                     |   |
|---------------------|---|
| <b>Cuts, Damage</b> | Before moving the product, be sure to turn off all the power supplies and unplug the cables. Watch your step when carrying the product. Do not use the product in an unstable location such as a place exposed to strong vibration or a sloping surface. Doing so may cause the product to fall, resulting in an injury or fault.                                 |
| <b>Cuts</b>         | The product contains sharp edges that are left unavoidably exposed, such as jumper plugs. Handle the product with due care not to get injured with such pointed parts.  |
| <b>Damage</b>       | Do not place anything on the product or expose the product to physical shocks. Do not carry the product after the power has been turned on.<br>Doing so may cause a malfunction due to overloading or shock.  |
| <b>Damage</b>       | Since the product contains many electronic components, keep it away from direct sunlight, high temperature, and high humidity to prevent condensation. Do not use or store the product where it is exposed to much dust or a strong magnetic or electric field for an extended period of time. Inappropriate operating or storage environments may cause a fault. |
| <b>Damage</b>       | Use the product within the ranges given in the specifications.<br>Operation over the specified ranges may cause a fault.  |
| <b>Damage</b>       | To prevent electrostatic breakdown, do not let your finger or other object come into contact with the metal parts of any of the connectors. Before handling the product, touch a metal object (such as a door knob) to discharge any static electricity from your body.   |

|               |   |
|---------------|---|
| <b>Damage</b> | When turning the power on or off, follow the relevant procedure as described in this document. Before turning the power on, in particular, be sure to finish making all the required connections. Furthermore, be sure to configure and use the product by following the instructions given in this document. Using the product incorrectly or inappropriately may cause a fault. |
| <b>Damage</b> | Always turn the power off before connecting or disconnecting any cables from the product. When unplugging a cable, unplug the cable by holding the connector part without pulling on the cable itself. Pulling the cable itself or bending it may expose or disconnect the cable core, resulting in a fault.  |
| <b>Damage</b> | Because the product has no casing, it is recommended that it be stored in the original packaging. Transporting the product may cause a damage or fault. Therefore, keep the packaging materials and use them when re-shipping the product.  |

# Contents



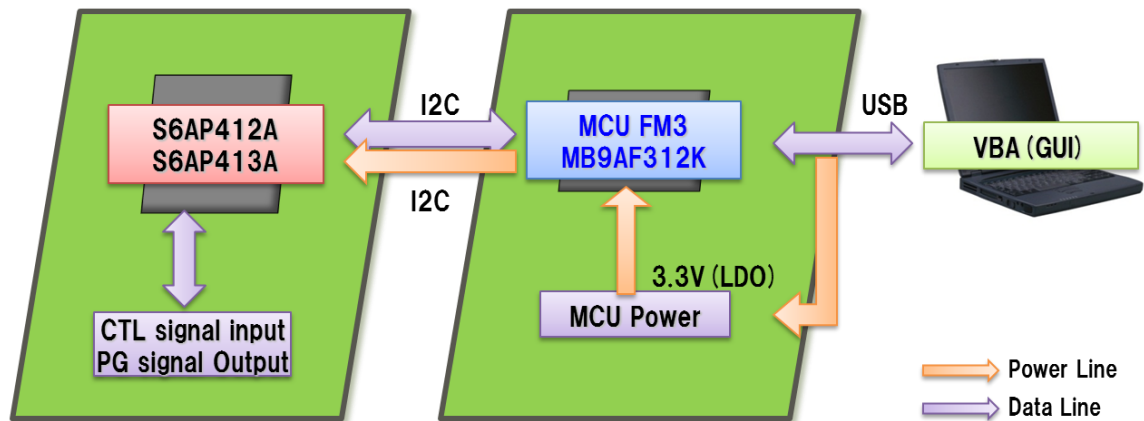
|   |           |
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# 1. Description



The S6SATU01A is communication tool for 2ch Buck + 1ch Buck/Boost DC/DC, S6SAP412A and for 3ch Buck + 1ch Buck/Boost DC/DC, S6SAP413A. This board implements our MCU : FM3(MB9AF312K) and can communicate with I<sup>2</sup>C easily by using windows PC and prepared software. It can select the output voltage, soft-start time, ON/OFF sequence, PFM/PWM mode.

Figure 1-1. Board outline



## 2. Pin Descriptions



### 2.1 Input/output pin descriptions

Table 2-1. Input/output Pin Descriptions

| Block | Pin symbol | I/O | Function description                        |
|-------|------------|-----|---|
| MCU   | GND        | -   | Ground terminal                             |
|       | VBUS       | O   | VBUS terminal                               |
|       | USB_VCC    | I   | USB_VCC terminal                            |
|       | I2CVCC     | I   | Power supply terminal for I <sup>2</sup> C. |
|       | SCL_S      | I   | I <sup>2</sup> C clock terminal             |
|       | SDA_S      | I/O | I <sup>2</sup> C data I/O terminal          |
|       | P10        | I/O | MCU I/O port (25pin)                        |
|       | JP110      | -   | GND through JP110                           |
|       | P11        | I/O | MCU I/O port (26pin)                        |
|       | JP111      | -   | GND through JP111                           |
|       | P12        | I/O | MCU I/O port (27pin)                        |
|       | JP112      | -   | GND through JP112                           |
|       | P13        | I/O | MCU I/O port (28pin)                        |
|       | JP114      | -   | GND through JP114                           |
|       | P14        | I/O | MCU I/O port (29pin)                        |
|       | P15        | I/O | MCU I/O port (30pin)                        |
|       | JP115      | -   | GND through JP115                           |
|       | P21        | I/O | MCU I/O port (36pin)                        |
|       | P22        | I/O | MCU I/O port (35pin)                        |
|       | P23        | I/O | MCU I/O port (34pin)                        |



## 2.2 Jumper, Switch descriptions

Figure 2-1. Jumper, Switch Descriptions

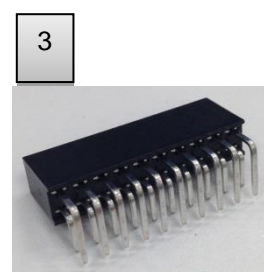
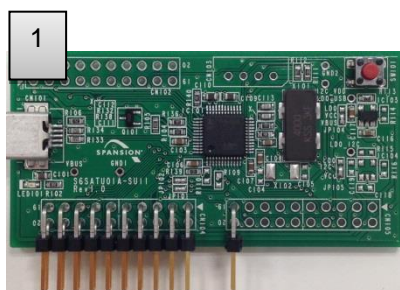
| Jumper, Switch  | Description  | Initial setting |
|-----------------|--|-----------------|
| JP101           | Short CN103 (2pin) and MCU I/O port (4pin)   | Solder Short    |
| JP102           | Short CN103 (3pin) and MCU I/O port (3pin)   | Solder Short    |
| JP104           | Short VBUS and VCC   | Solder Short    |
| JP105           | Short VCC and I2CVCC   | Solder Short    |
| JP108 back side | Short MCU I/O port (31pin) and (32pin)   | Pattern Short   |
| JP110 back side | Short CN104 (8pin) and GND   | Pattern Short   |
| JP111 back side | Short CN104 (10pin) and GND  | Pattern Short   |
| JP112 back side | Short CN104 (12pin) and GND  | Pattern Short   |
| JP114 back side | Short CN104 (14pin) and GND  | Pattern Short   |
| JP115 back side | Short CN104(17pin) and GND   | Pattern Short   |
| JP116 back side | Short CN105(5pin) and GND  | Pattern Short   |
| JP117 back side | Short CN105(13pin) and GND   | Pattern Short   |
| JP131 back side | Short MCU MD0 pin (21pin) and VCC  | Open            |
| JP132 back side | Short CN105(14pin) and MCU I/O port (15pin)  | Solder Short    |
| JP133 back side | Short CN105(15pin) and MCU I/O port (16pin)  | Solder Short    |
| SW101           | Reset push switch for MCU  | -               |
| CN101           | USB connector  | -               |
| CN102           | Test terminal  | -               |
| CN103           | Test terminal  | -               |
| CN104           | 1,8,10,12,14,17 : GND pin<br>2 : VBUS pin<br>3 :USB_VCC pin<br>4 :I2CVCC pin<br>5 : SCL_S pin<br>6 : SDA_S pin<br>7 : P10 pin<br>9 : MCU P11 pin<br>11 : MCU P12 pin<br>13 : MCU P13 pin<br>15 : MCU P14 pin<br>16 : MCU P15 pin<br>18 : MCU P21 pin<br>19 : MCU P22 pin<br>20 : MCU P23 pin | -               |
| CN105           | Test terminal  | -               |

# 3. Setup and Verification



## 3.1 Contents in a Package

| No. | Contents          | Description                          | Quantity | Notes |
|-----|-------------------|--------------------------------------|----------|-------|
| 1   | S6SATU01A         | I <sup>2</sup> C Communication board | 1        | -     |
| 2   | USB cable         | USB to USB mini B cable              | 1        | -     |
| 3   | L-Angle connector | Connector for PMIC board             | 1        | -     |

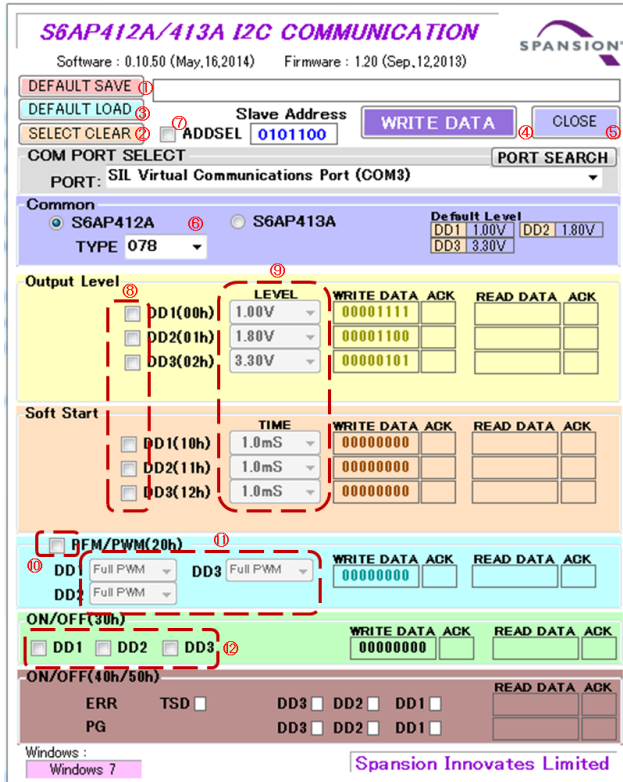


[Using items for evaluation with I<sup>2</sup>C control]

- S6SATU01A 1pic
- USB cable 1pic
- PC installed Windows7 or later OS 1pic
- S6SAP412A or S6SAP413A 1pic

### 3.2 Evaluation with I<sup>2</sup>C control

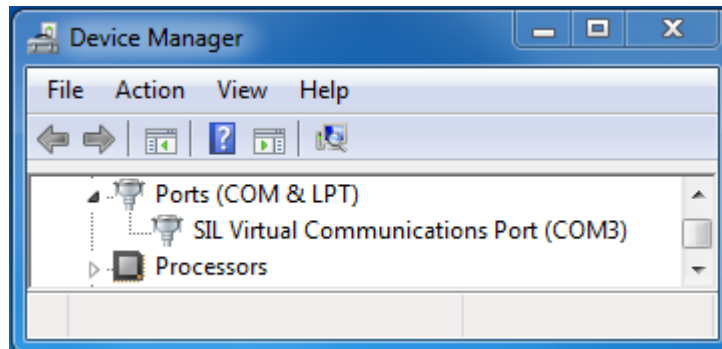
Any setting of S6SAP412A/S6SAP413A can be evaluated with Windows PC connected to USB port by I<sup>2</sup>C communication GUI.



- ① : Save the setting data, which is shown next as default
- ② : Clear the  of ⑧, ⑩, ⑫
- ③ : Reset the IC factory default
- ④ : Write the data to IC
- ⑤ : Close the window
- ⑥ : Select the preset option (ex. Select MB39C031-341)
- ⑦ : Select ADDSEL
- ⑧ : Set output voltage/soft star transfer
- ⑨ : Select the setting value after  of ⑧
- ⑩ : Set PFM/PWM mode transfer
- ⑪ : Select PFM/PWM mode after  of ⑩
- ⑫ : Set ON

#### 3.2.1 PC Setup

1. Unpack the driver file to a folder of PC running Windows 7 or later version OS, and run install.bat file.
2. Connect S6SATU01A to PC using USB cable.
3. After installed a device, open the device manager and confirm the new COM port.  
Start menu → Control panel → Device manager



4. Run "S6AP412A\_413A\_I2C.exe"
5. Click "PORT SEARCH" at "COM PORT SELECT" field and select "SIL Virtual Communications Port (COMxx) "

|  |             |
|--|-------------|
| COM PORT SELECT                              | PORT SEARCH |
| PORT: SIL Virtual Communications Port (COM3) |             |

- Please unplug the USB cable after setup.

### 3.2.2 Operation check

- Connect the S6SATU01A and S6SAP412A/S6SAP413A.
- 3.3V is applied to VIN terminal of S6SAP412A/S6SAP413A.
- USB cable is connected.
- Run I<sup>2</sup>C communication software and click the box of ON/OFF field.

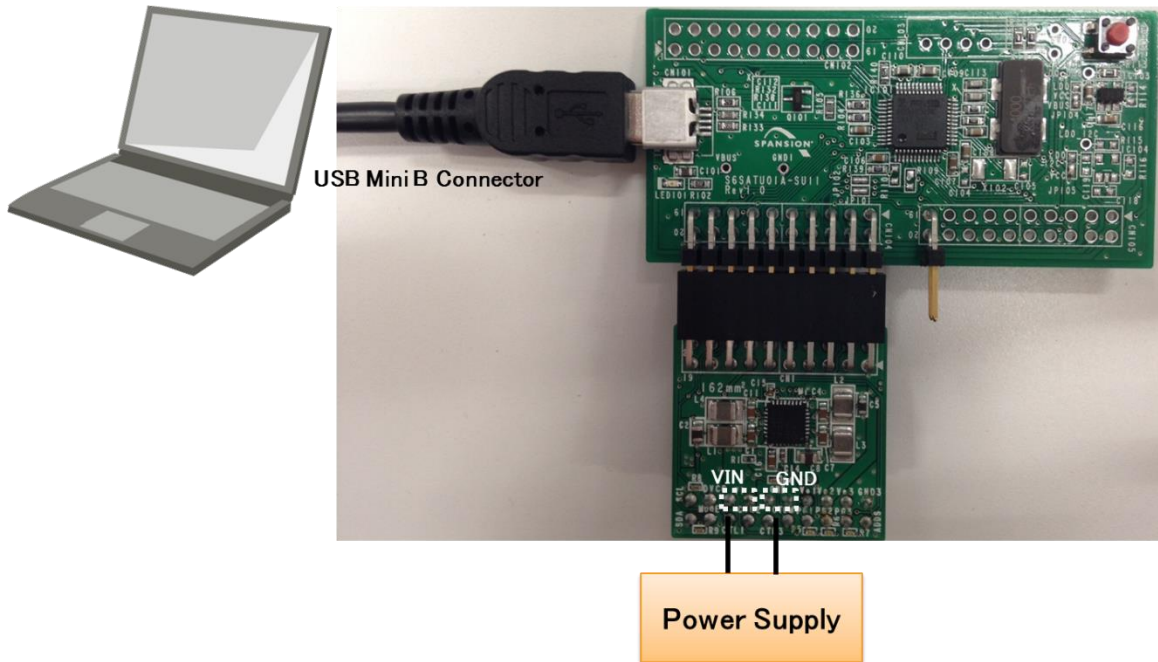
|   |   |   |  |            |     |           |     |
|---|---|---|--|------------|-----|-----------|-----|
| ON/OFF(30h)                             |   |   |  | WRITE DATA | ACK | READ DATA | ACK |
| <input checked="" type="checkbox"/> DD1 | <input checked="" type="checkbox"/> DD2 | <input checked="" type="checkbox"/> DD3 |  | 00000111   | 0   | 00000111  | 0   |

Click the WRITE DATA button.

WRITE DATA

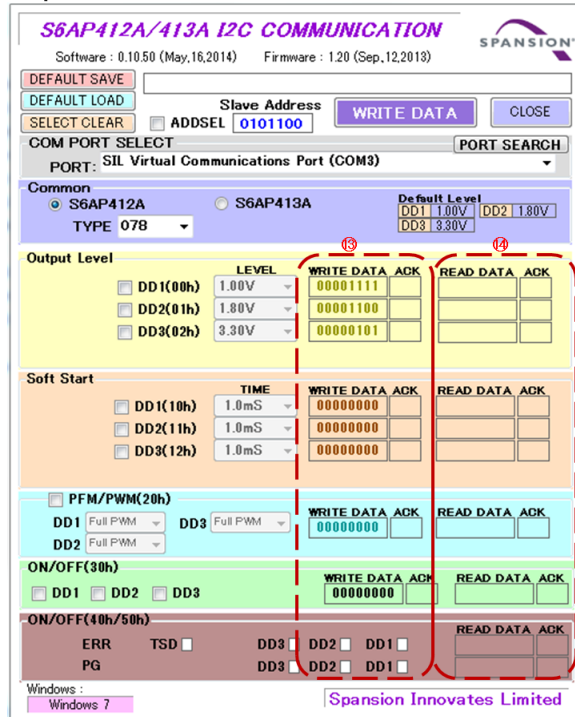
- Vo1, Vo2, Vo3 or Vo4 are output by software settings

Figure 3-1. For I<sup>2</sup>C control evaluation

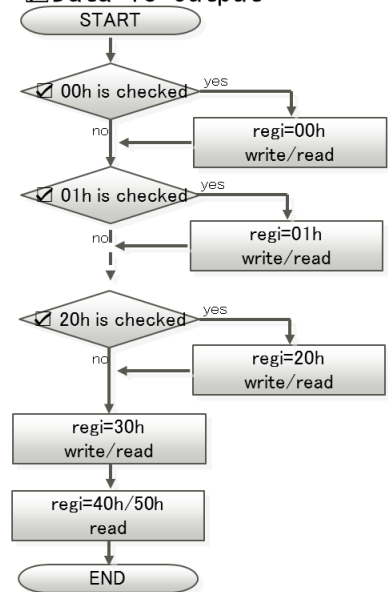


### 3.2.3 How to use I<sup>2</sup>C communication GUI

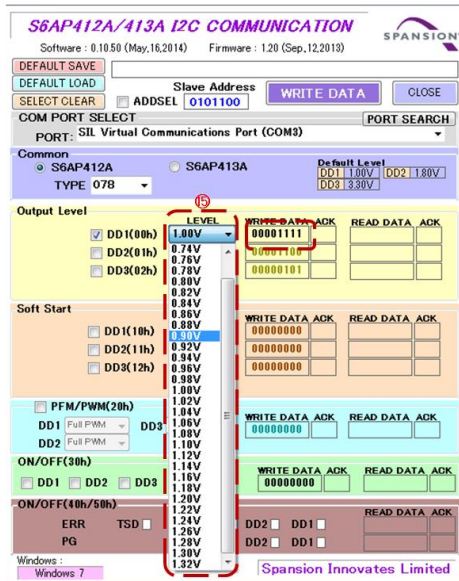
#### ■ Operation at write DATA



- ⑬ : Data written to IC  
 Data is transferred
- ⑭ : Data read from IC  
 after write  
 Data is output

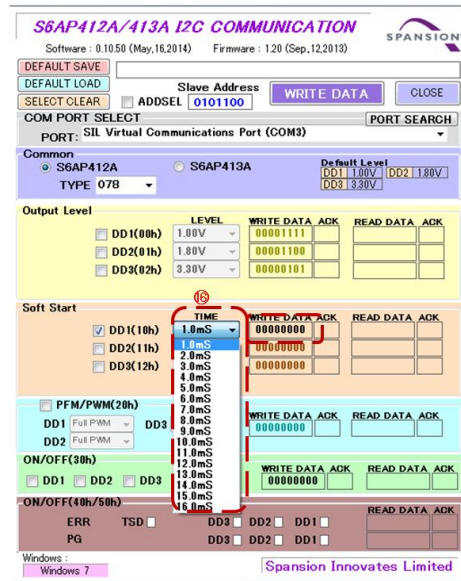


#### ■ Selection of output voltage



- ⑮ : After checked register address , preset voltage can be selected and bit data is shown.

#### ■ Selection of soft start time



- ⑯ : After checked register address , preset time can be selected and bit data is shown.

# 4. Component and Wiring Layout



## 4.1 Component layout

Figure 4-1. Component Layout (Layer 1)

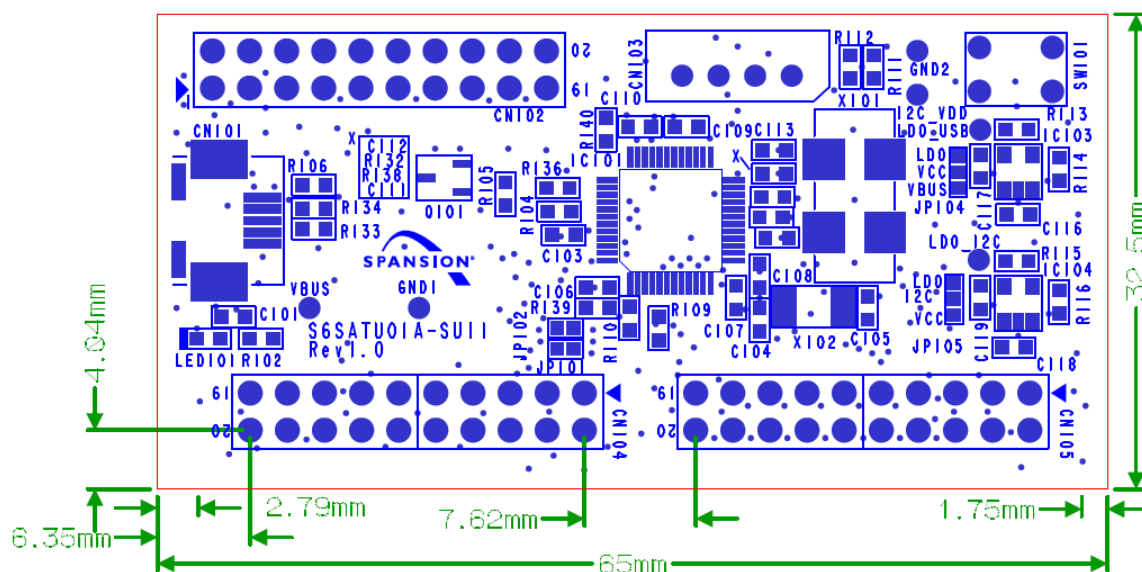
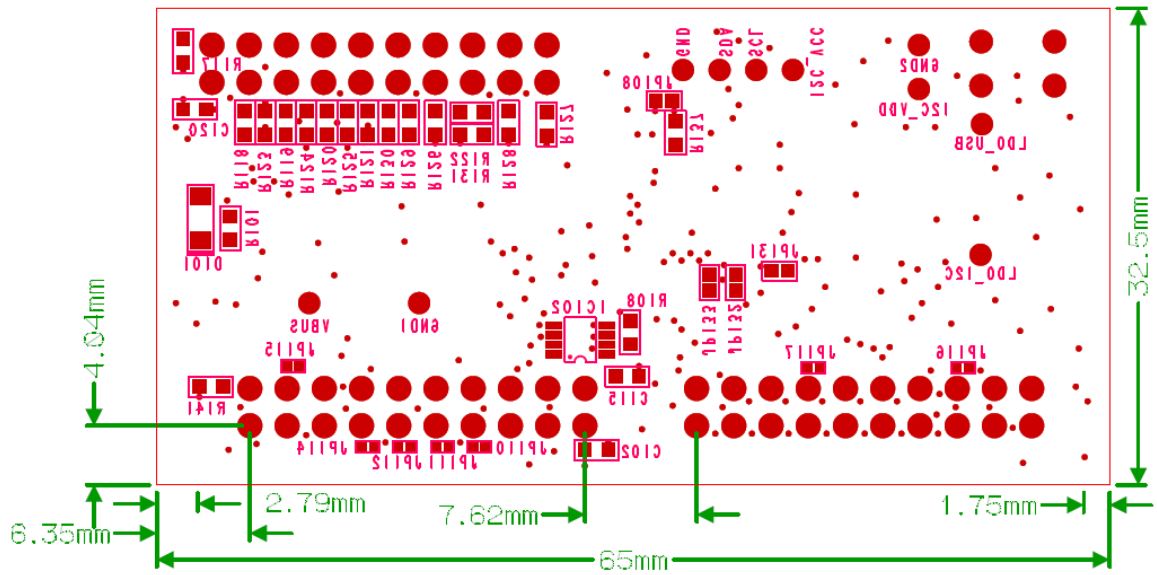


Figure 4-2. Component Layout (Layer 2)



## 4.2 Wiring layout

Figure 4-3. Wiring Layout (Layer 1)

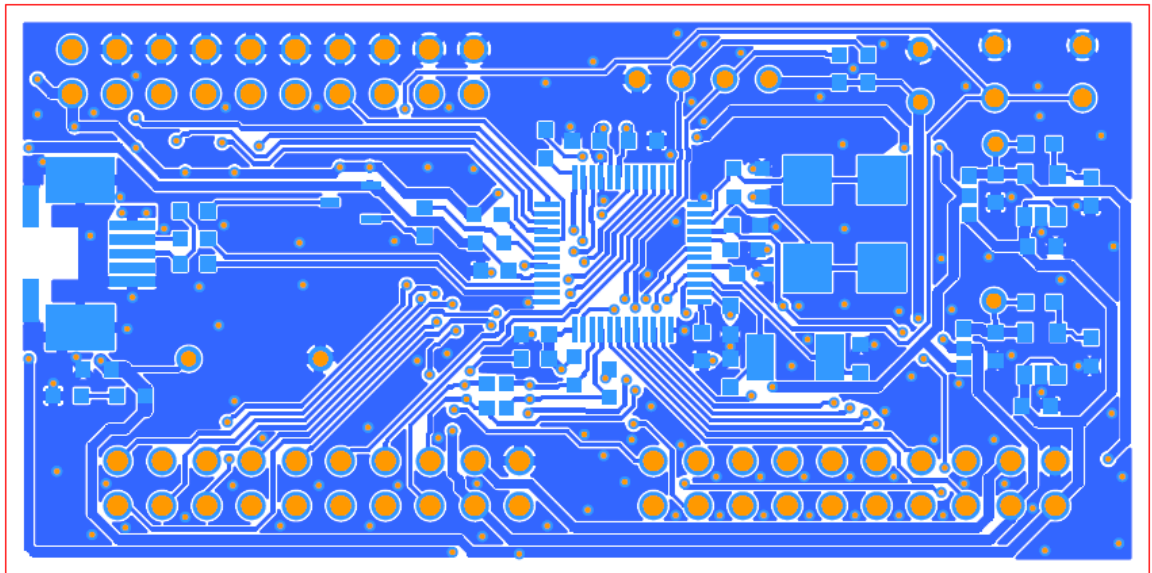
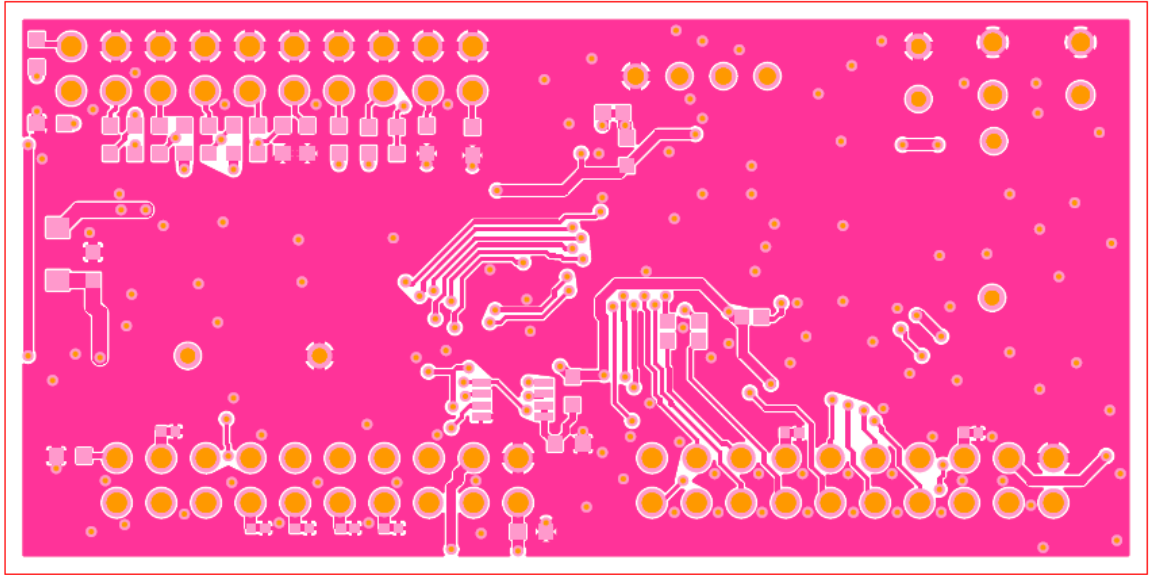


Figure 4-4. Wiring Layout (Layer 2)

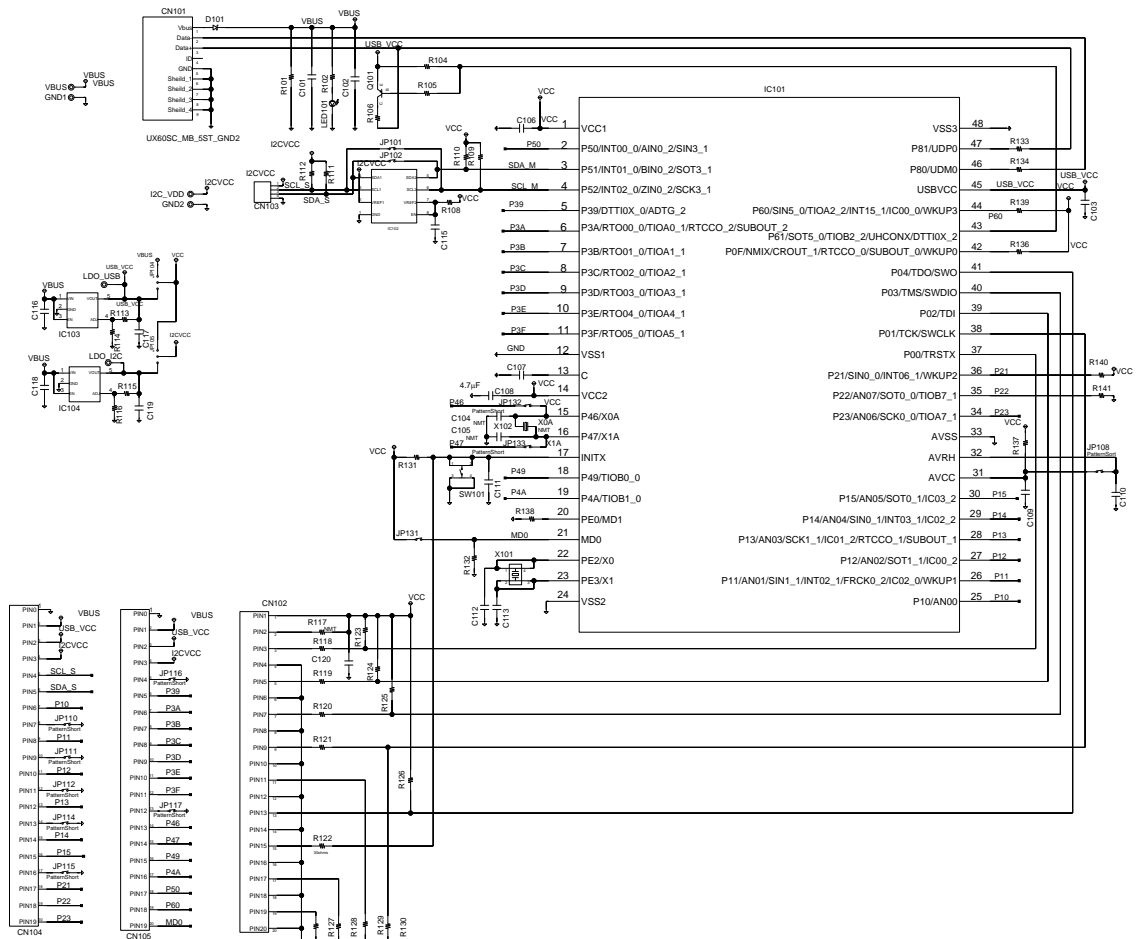




# 5. Circuit Schematic



Figure 5-1. Circuit Schematic



## 6. Component List



Table 6-1. Component List

| No. | Component | Item              | Parts number             | Vendor     | Value       | Remarks |
|-----|-----------|-------------------|--------------------------|------------|-------------|---------|
| 1   | IC101     | MCU               | MB9AF312K                | Cypress    | -           | -       |
| 2   | IC102     | -                 | -                        | -          | -           | NMT     |
| 3   | IC103     | PMIC              | TCR5SB33                 | TOSHIBA    | -           | -       |
| 4   | IC104     | -                 | -                        | -          | -           | NMT     |
| 5   | Q101      | Tr                | BC857BLT1G               | ROHM       | -           | PNP     |
| 6   | X101      | -                 | -                        | -          | -           | NMT     |
| 7   | X102      | Crystal           | CX1255GB04000<br>H0PESZ1 | KYOCERA    | 4MHz        | -       |
| 8   | LED101    | LED               | OSHR1608C1A              | OptoSupply | -           | RED     |
| 9   | SW101     | Push-SW           | SKHRAHA010               | ALPS       | -           | -       |
| 10  | C101      | Ceramic Capacitor | C1608JB1H106M            | TDK        | 10 $\mu$ F  | 50V     |
| 11  | C109      | Ceramic Capacitor | C1608JB1H106M            | TDK        | 10 $\mu$ F  | 50V     |
| 12  | C110      | Ceramic Capacitor | C1608JB1H106M            | TDK        | 10 $\mu$ F  | 50V     |
| 13  | C102      | -                 | -                        | -          | -           | NMT     |
| 14  | C104      | -                 | -                        | -          | -           | NMT     |
| 15  | C105      | -                 | -                        | -          | -           | NMT     |
| 16  | C107      | Ceramic Capacitor | C1608JB1V475K            | TDK        | 4.7 $\mu$ F | 35V     |
| 17  | C103      | Ceramic Capacitor | C1608JB1H104K            | TDK        | 0.1 $\mu$ F | 50V     |
| 18  | C105      | -                 | -                        | -          | -           | NMT     |
| 19  | C106      | Ceramic Capacitor | C1608JB1H104K            | TDK        | 0.1 $\mu$ F | 50V     |
| 20  | C108      | Ceramic Capacitor | C1608JB1H104K            | TDK        | 0.1 $\mu$ F | 50V     |
| 21  | C111      | Ceramic Capacitor | C1608JB1H104K            | TDK        | 0.1 $\mu$ F | 50V     |
| 22  | C114      | Ceramic Capacitor | C1608JB1H104K            | TDK        | 0.1 $\mu$ F | 50V     |

| No. | Component | Item              | Parts number   | Vendor | Value | Remarks     |
|-----|-----------|-------------------|----------------|--------|-------|-------------|
| 23  | C115      | -                 | -              | -      | -     | NMT         |
| 24  | C116      | Ceramic Capacitor | C1608JB1H104K  | TDK    | 0.1μF | 50V         |
| 25  | C120      | Ceramic Capacitor | C1608JB1H104K  | TDK    | 0.1μF | 50V         |
| 26  | C112      | Ceramic Capacitor | C1608C0G1H120J | TDK    | 12pF  | 50V         |
| 27  | C113      | Ceramic Capacitor | C1608C0G1H120J | TDK    | 12pF  | 50V         |
| 28  | C118      | -                 | -              | -      | -     | NMT         |
| 29  | C119      | -                 | -              | -      | -     | NMT         |
| 30  | R137      | Chip Resistor     | RK73H1JT4R70F  | KOA    | 4.7Ω  |             |
| 31  | R106      | Chip Resistor     | RR0816P-152-D  | SUSUMU | 1.5kΩ |             |
| 32  | R108      | -                 | -              | -      | -     | NMT         |
| 33  | R109      | -                 | -              | -      | -     | NMT         |
| 34  | R110      | -                 | -              | -      | -     | NMT         |
| 35  | R117      | -                 | -              | -      | -     | NMT         |
| 36  | R113      | Chip Resistor     | RR0816P-563-D  | SUSUMU | 56kΩ  |             |
| 37  | R138      | Chip Resistor     | RR0816P-102-D  | SUSUMU | 1kΩ   |             |
| 38  | R111      | Chip Resistor     | RR0816P-103-D  | SUSUMU | 10kΩ  | 1/16W, 0.5% |
| 39  | R112      | Chip Resistor     | RR0816P-103-D  | SUSUMU | 10kΩ  | 1/16W, 0.5% |
| 40  | R101      | Chip Resistor     | RR0816P-103-D  | SUSUMU | 10kΩ  | 1/16W, 0.5% |
| 41  | R104      | Chip Resistor     | RR0816P-103-D  | SUSUMU | 10kΩ  | 1/16W, 0.5% |
| 42  | R114      | -                 | -              | -      | -     | NMT         |
| 43  | R115      | -                 | -              | -      | -     | NMT         |
| 44  | R116      | -                 | -              | -      | -     | NMT         |
| 45  | R123      | Chip Resistor     | RR0816P-202-D  | SUSUMU | 2kΩ   | 1/16W, 0.5% |
| 46  | R124      | Chip Resistor     | RR0816P-202-D  | SUSUMU | 2kΩ   | 1/16W, 0.5% |
| 47  | R125      | Chip Resistor     | RR0816P-202-D  | SUSUMU | 2kΩ   | 1/16W, 0.5% |
| 48  | R126      | Chip Resistor     | RR0816P-103-D  | SUSUMU | 10kΩ  | 1/16W, 0.5% |
| 49  | R127      | -                 | -              | -      | -     | NMT         |
| 50  | R128      | -                 | -              | -      | -     | NMT         |
| 51  | R129      | -                 | -              | -      | -     | NMT         |
| 52  | R130      | Chip Resistor     | RR0816P-103-D  | SUSUMU | 10kΩ  | 1/16W, 0.5% |
| 53  | R131      | Chip Resistor     | RR0816P102D    | SUSUMU | 1kΩ   | 1/16W, 0.5% |
| 54  | R132      | Chip Resistor     | RR0816P-103-D  | SUSUMU | 10kΩ  | 1/16W, 0.5% |
| 55  | R133      | Chip Resistor     | RR0816P-220-D  | SUSUMU | 22Ω   | 1/16W, 0.5% |
| 56  | R134      | Chip Resistor     | RR0816P-220-D  | SUSUMU | 22Ω   | 1/16W, 0.5% |
| 57  | R135      | -                 | -              | -      | -     | NMT         |
| 58  | R136      | Chip Resistor     | RR0816P-103-D  | SUSUMU | 10kΩ  | 1/16W, 0.5% |
| 59  | R137      | -                 | -              | -      | -     | NMT         |
| 60  | R138      | -                 | -              | -      | -     | NMT         |
| 61  | R139      | Chip Resistor     | RR0816P-103-D  | SUSUMU | 10kΩ  | 1/16W, 0.5% |

| No. | Component | Item          | Parts number  | Vendor | Value | Remarks                                    |
|-----|-----------|---------------|---------------|--------|-------|--|
| 62  | R140      | Chip Resistor | RR0816P-103-D | SUSUMU | 10kΩ  | 1/16W, 0.5%                                |
| 63  | R141      | Chip Resistor | RR0816P-103-D | SUSUMU | 10kΩ  | 1/16W, 0.5%                                |
| 64  | R102      | Chip Resistor | RR0816P-202-D | SUSUMU | 2kΩ   | 1/16W, 0.5%                                |
| 65  | R103      | -             | -             | -      | -     | NMT  |
| 66  | R105      | Chip Resistor | RR0816P-222-D | SUSUMU | 2.2kΩ | 1/16W, 0.5%                                |
| 67  | R118      | -             | -             | -      | -     | NMT  |
| 68  | R119      | -             | -             | -      | -     | NMT  |
| 69  | R120      | -             | -             | -      | -     | NMT  |
| 70  | R121      | -             | -             | -      | -     | NMT  |
| 71  | R122      | -             | -             | -      | -     | NMT  |
| 72  | CN101     | Connector     | UX60SC-MB-5ST | HIROSE | -     | mini USB                                   |
| 73  | CN102     | -             | -             | -      | -     | NMT  |
| 74  | CN103     | -             | -             | -      | -     | NMT  |
| 75  | CN104     | Connector     | 90122-0770    | MOLEX  | -     | 2x10 L-angle pin header                    |
| 76  | CN105     | Connector     | 90122-0770    | MOLEX  | -     | 2x10 L-angle pin header,<br>Cut 90122-0770 |
| 77  | JP110     | JMP           | JPPAD         | -      | -     | Pattern Short                              |
| 78  | JP111     | JMP           | JPPAD         | -      | -     | Pattern Short                              |
| 79  | JP112     | JMP           | JPPAD         | -      | -     | Pattern Short                              |
| 80  | JP114     | JMP           | JPPAD         | -      | -     | Pattern Short                              |
| 81  | JP115     | JMP           | JPPAD         | -      | -     | Pattern Short                              |
| 82  | JP116     | JMP           | JPPAD         | -      | -     | Pattern Short                              |
| 83  | JP117     | JMP           | JPPAD         | -      | -     | Pattern Short                              |
| 84  | JP101     | Solder JMP    | JPPAD         | -      | -     | Solder Short                               |
| 85  | JP102     | Solder JMP    | JPPAD         | -      | -     | Solder Short                               |
| 86  | JP108     | JMP           | JPPAD         | -      | -     | Pattern Short                              |
| 87  | JP131     | -             | -             | -      | -     | NMT  |
| 88  | JP132     | JMP           | JPPAD         | -      | -     | Pattern Short                              |
| 89  | JP133     | JMP           | JPPAD         | -      | -     | Pattern Short                              |
| 90  | JP104     | Solder JMP    | JPPAD         | -      | -     | Solder Short                               |
| 91  | JP105     | Solder JMP    | JPPAD         | -      | -     | Solder Short                               |

These components are compliant with RoHS, and please ask each vendor for details if necessary.

# 7. Evaluation Board Picture



Figure 7-1. Picture (top)

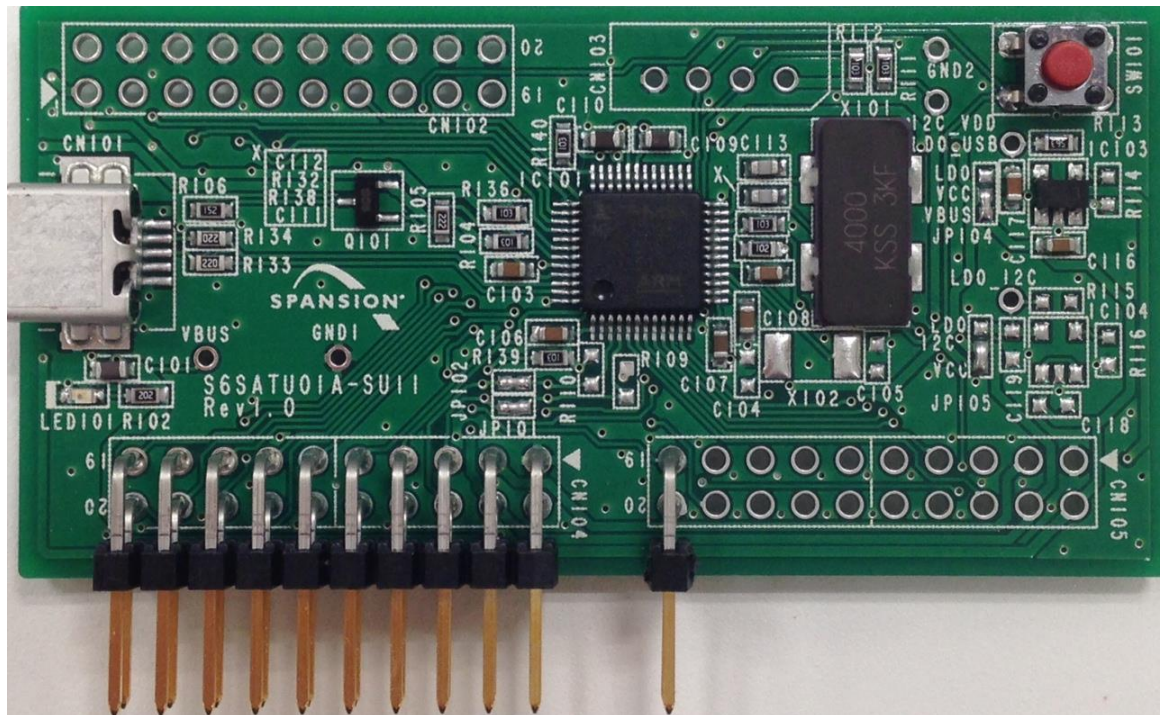
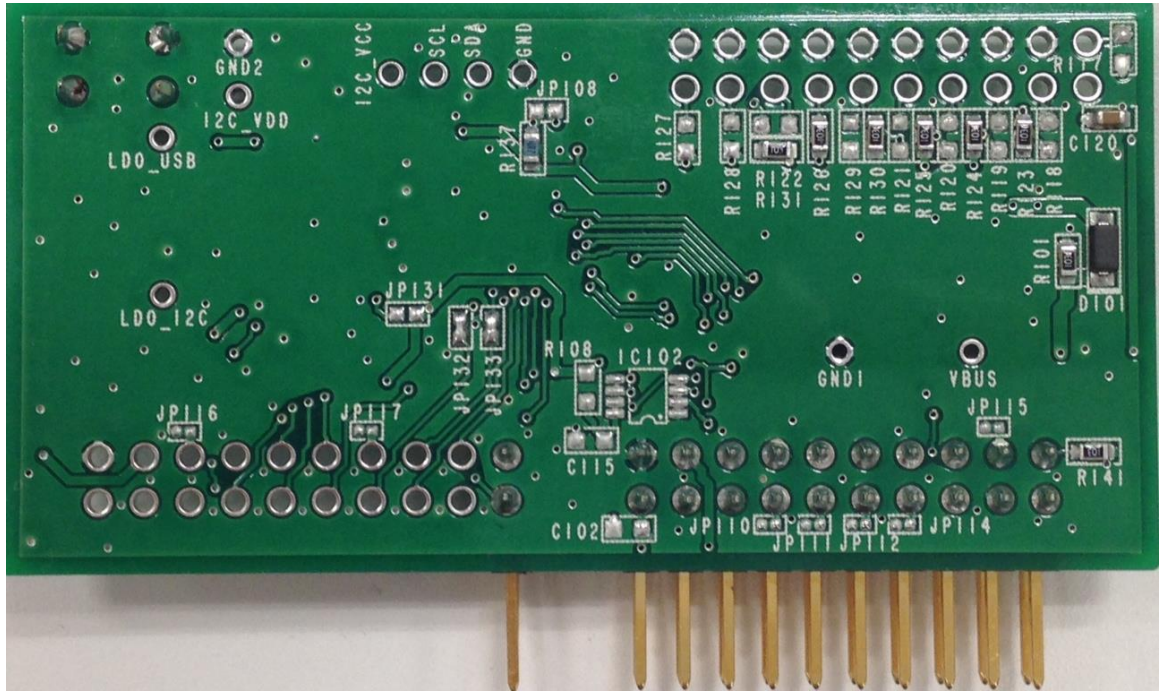


Figure 7-2. Picture (back)



## 8. Ordering Information



Table 8-1. Ordering Information

| Part number       | EVB revision | Note |
|-------------------|--------------|------|
| S6SATU01A00SU1101 | Rev 1.0      | ---  |

# Revision History



## Document Revision History

Document Title: S6SATU01A I<sup>2</sup>C Interface for PMIC Communication Tool Operation Guide

Document Number: 002-08680

| Revision | Issue Date | Origin of Change | Description of Change  |
|----------|------------|------------------|--|
| **       | 07/22/2014 | MITK             | Initial release  |
| *A       | 02/04/2016 | MITK             | Migrated Spansion Guide from S6SATU01A_SS901-00027-1v0-E to Cypress format |
| *B       | 11/30/2017 | MASG             | Adapted Cypress new logo.  |