

## S-83-GESNB

### IEEE 802.11b/g/n 1T1R Wi-Fi Module

#### Features :

❖ Supporting Standard

IEEE Std. 802.11b

IEEE Std. 802.11g

IEEE Std. 802.11n

❖ Chip Solution

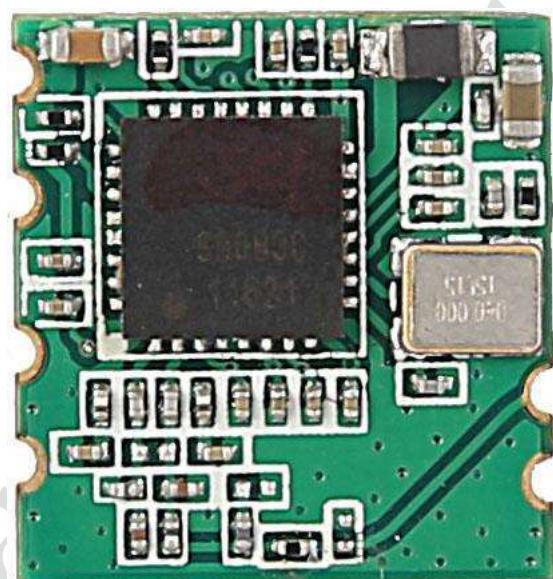
S9083C

❖ Band

2.4G

❖ Size

12.2mm x 13.0 mm



| Module     | Installation | Supporting Standard | bandwidth | Frequency band | Interface  | Remarks |
|------------|--------------|---------------------|-----------|----------------|------------|---------|
| S-83-GESNB | SMD          | 802.11b/g/n         | 150Mbps   | 2.4 GHz        | Stamp hole |         |

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## 1. Introduction

S-83-GESNB is a WIFI wireless module based on SCI S9083C chip. The module operates in the 2.412GHz ~ 2.484GHz frequency band and supports 802.11b / g / n protocol. This document describes the features and usage of the module.

### 1.1 Module architecture

S-83-GESNB is a wireless LAN (WLAN) module based on SCI S9082C wireless chip development. S9083C is a highly integrated wireless LAN SOC chip, supports USB2.0 interface, supports 802.11b / g / n protocol standard. S9083C integrates a MAC, a 1T1R baseband and RF link, which provides a complete, high-speed wireless LAN single-chip solution. S9083C hardware block diagram shown in Figure 1:

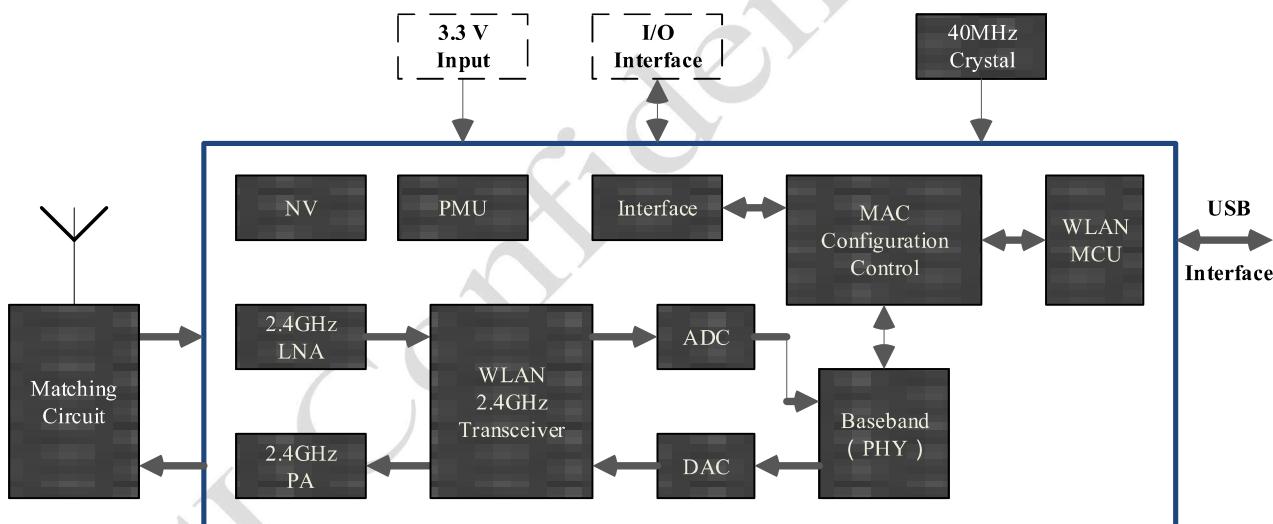


Figure 1.S9083C block diagram

### 1.2 Supporting Standard

The S-83-GESNB module supports the following protocols:

IEEE Std. 802.11b

IEEE Std. 802.11g

IEEE Std. 802.11n

### 1.3 Basic characteristics

The basic indicators are as follows:

|                       |  |
|-----------------------|--|
| Operating Frequency   | 2.412~2.484GHz   |
| WiFi Standard         | 802.11b/g/n(1x1)   |
| Modulation            | 11b: DBPSK, DQPSK and CCK and DSSS<br>11g: BPSK, QPSK, 16QAM, 64QAM and OFDM<br>11n: MCS0~7 OFDM     |
| Data rates            | 11b: 1, 2, 5.5 and 11Mbps<br>11g: 6, 9, 12, 18, 24, 36, 48 and 54 Mbps<br>11n: MCS0~7, up to 150Mbps |
| Form factor           | 6pin   |
| Host Interface        | USB 2.0  |
| PCB Stack             | 4-layers design  |
| Dimension             | Typical, 12.2mm*13.0mm   |
| Operation Temperature | -20°C to +70°C   |
| Storage Temperature   | -40°C to +85°C   |
| Operation Voltage     | 3.3V +/-10% (Ripple: ≤30mVp-p)   |
| Max Current           | 370mA @15dBm@54Mbps TX mode  |

## 2. Mechanical

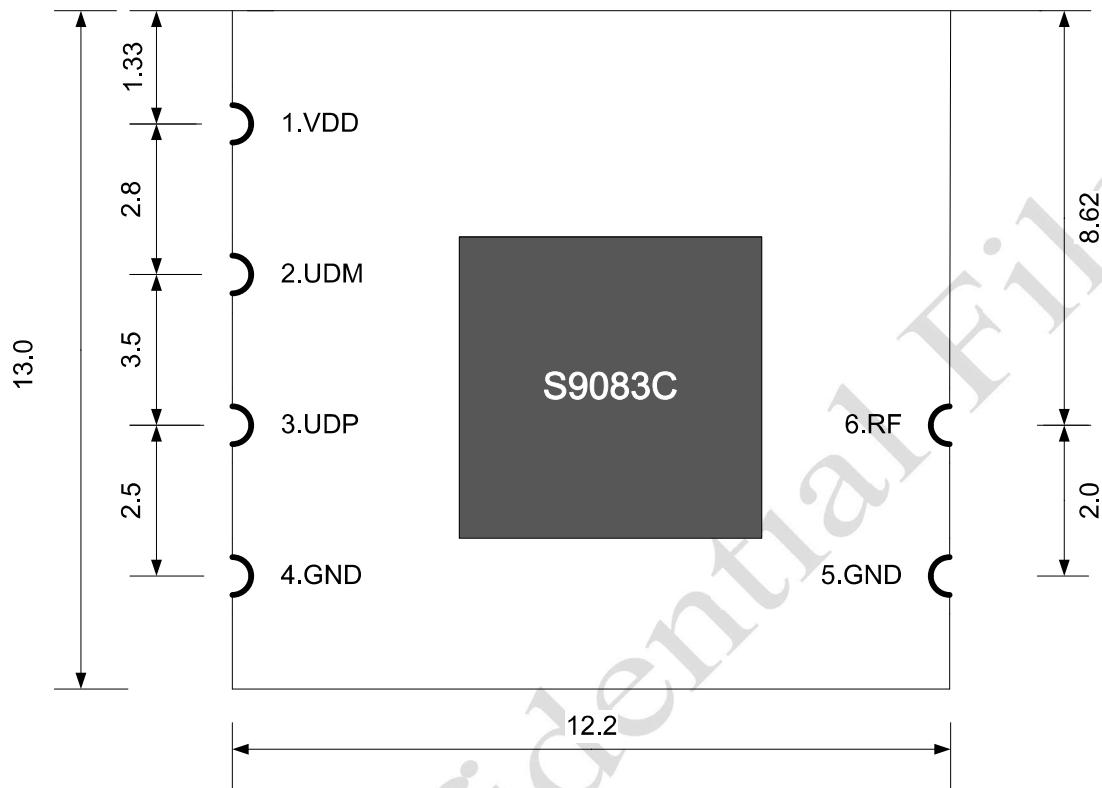


Figure 2 Specifications (Top View)

NOTE1: General tolerance  $\pm 0.15\text{mm}$  unless otherwise stated

NOTE2: Unit mm

| Pin | Function   |
|-----|------------|
| 1   | 3.3V Power |
| 2   | USB DP     |
| 3   | USB DM     |
| 4   | GND        |
| 5   | GND        |
| 6   | ANT        |

### 3. RF specifications

All parameters are based on the test results of the module DUT, and the test ambient temperature is + 25 ° C.

#### 3.1 802.11b Mode

|                                   |                   |      |      |      |  |
|-----------------------------------|-------------------|------|------|------|--|
| Specification                     | IEEE802.11b       |      |      |      |  |
| Mode                              | DSSS / CCK        |      |      |      |  |
| Channel                           | CH1-CH11          |      |      |      |  |
| Data rate                         | 1, 2, 5.5, 11Mbps |      |      |      |  |
| TX Characteristics                | Min.              | Typ. | Max  | Unit |  |
| 1. Power Levels(Calibrated)       |                   |      |      |      |  |
| 1) Target                         | 9.2               | 19.0 | 19.5 | dBm  |  |
| 2. Spectrum Mask @ target power   |                   |      |      |      |  |
| 1) fc +/-11MHz to +/-22MHz        | Pass              |      |      |      |  |
| 2) fc > +/-22MHz                  | Pass              |      |      |      |  |
| 3. Frequency Error                |                   |      | 4.8  | KHz  |  |
| RX Characteristics                | Min.              | Typ. | Max. | Unit |  |
| 4 Minimum Input Level Sensitivity |                   |      |      |      |  |
| 1) 1Mbps (FER ≤8%)                | -96               |      | -90  | dBm  |  |
| 2) 2Mbps (FER ≤8%)                | -94               |      | -88  | dBm  |  |
| 3) 5.5Mbps (FER ≤8%)              | -90               |      | -86  | dBm  |  |
| 4) 11Mbps (FER ≤8%)               | -88               |      | -84  | dBm  |  |
| 5 Maximum Input Level (FER ≤8%)   | -8                |      | -5   | dBm  |  |

#### 3.2 802.11g Mode

|               |             |  |  |
|---------------|-------------|--|--|
| Specification | IEEE802.11g |  |  |
| Mode          | OFDM        |  |  |

|  |                                  |       |      |      |  |
|--|----------------------------------|-------|------|------|--|
| Channel                                  | CH1-CH11                         |       |      |      |  |
| Data rate                                | 6, 9, 12, 18, 24, 36, 48, 54Mbps |       |      |      |  |
| TX Characteristics                       | Min.                             | Typ.  | Max. | Unit |  |
| 1. Power Levels                          |                                  |       |      |      |  |
| 1) Target                                | 3.5                              | 16.5  | 17.0 | dBm  |  |
| 2. Spectrum Mask @ target power          |                                  |       |      |      |  |
| 1) at fc +/-11MHz                        | Pass                             |       |      |      |  |
| 2) at fc +/-20MHz                        | pass                             |       |      |      |  |
| 3) at fc > +/-30MHz                      | pass                             |       |      |      |  |
| 3 Constellation Error(EVM)@ target power |                                  |       |      |      |  |
| 1) 6Mbps                                 |                                  | -31.2 |      | dB   |  |
| 2) 9Mbps                                 |                                  | -30.8 |      | dB   |  |
| 3) 12Mbps                                |                                  | -31.0 |      | dB   |  |
| 4) 18Mbps                                |                                  | -30.7 |      | dB   |  |
| 5) 24Mbps                                |                                  | -30.9 |      | dB   |  |
| 6) 36Mbps                                |                                  | -30.6 |      | dB   |  |
| 7) 48Mbps                                |                                  | -30.5 |      | dB   |  |
| 8) 54Mbps                                |                                  | -30.4 |      | dB   |  |
| 4 Frequency Error                        |                                  |       | 4.8  | KHz  |  |
| RX Characteristics                       | Min.                             | Typ.  | Max. | Unit |  |
| 5 Minimum Input Level Sensitivity        |                                  |       |      |      |  |
| 1) 6Mbps (PER $\leq$ 10%)                | -91                              |       | -87  | dBm  |  |
| 2) 9Mbps (PER $\leq$ 10%)                | -89                              |       | -85  | dBm  |  |
| 3) 12Mbps (PER $\leq$ 10%)               | -86                              |       | -82  | dBm  |  |
| 4) 18Mbps (PER $\leq$ 10%)               | -84                              |       | -80  | dBm  |  |
| 5) 24Mbps (PER $\leq$ 10%)               | -81                              |       | -77  | dBm  |  |
| 6) 36Mbps (PER $\leq$ 10%)               | -79                              |       | -75  | dBm  |  |
| 7) 48Mbps (PER $\leq$ 10%)               | -76                              |       | -72  | dBm  |  |
| 8) 54Mbps (PER $\leq$ 10%)               | -74                              |       | -70  | dBm  |  |

|  |    |  |    |     |  |
|--|----|--|----|-----|--|
| 6 Maximum Input Level (PER $\leq 10\%$ ) | -8 |  | -5 | dBm |  |
|--|----|--|----|-----|--|

### 3.3 802.11n HT20 Mode

|   |                           |       |      |      |  |
|---|---------------------------|-------|------|------|--|
| Specification                             | IEEE802.11n HT20 @ 2.4GHz |       |      |      |  |
| Mode                                      | OFDM                      |       |      |      |  |
| Channel                                   | CH1-CH11                  |       |      |      |  |
| Data rate (MCS index)                     | MCS0/1/2/3/4/5/6/7        |       |      |      |  |
| TX Characteristics                        | Min.                      | Typ.  | Max. | Unit |  |
| 1. Power Levels                           |                           |       |      |      |  |
| 1) Target                                 | 3.5                       | 13.0  | 13.5 | dBm  |  |
| 2. Spectrum Mask @ target power           |                           |       |      |      |  |
| 1) at fc +/-11MHz                         | Pass                      |       |      |      |  |
| 2) at fc +/-20MHz                         | Pass                      |       |      |      |  |
| 3) at fc > +/-30MHz                       | Pass                      |       |      |      |  |
| 3. Constellation Error(EVM)@ target power |                           |       |      |      |  |
| 1) MCS0                                   |                           | -33.2 |      | dB   |  |
| 2) MCS1                                   |                           | -33.1 |      | dB   |  |
| 3) MCS2                                   |                           | -32.9 |      | dB   |  |
| 4) MCS3                                   |                           | -33.5 |      | dB   |  |
| 5) MCS4                                   |                           | -33.1 |      | dB   |  |
| 6) MCS5                                   |                           | -33.8 |      | dB   |  |
| 7) MCS6                                   |                           | -33.6 |      | dB   |  |
| 8) MCS7                                   |                           | -33.1 |      | dB   |  |
| 4. Frequency Error                        |                           |       | 4.8  | KHz  |  |
| RX Characteristics                        | Min.                      | Typ.  | Max. | Unit |  |
| 5. Minimum Input Level Sensitivity        |                           |       |      |      |  |
| 1) MCS0 (PER $\leq 10\%$ )                | -90                       |       | -87  | dBm  |  |
| 2) MCS1 (PER $\leq 10\%$ )                | -86                       |       | -83  | dBm  |  |

|   |     |  |     |     |  |
|---|-----|--|-----|-----|--|
| 3) MCS2 (PER $\leq 10\%$ )                | -84 |  | -81 | dBm |  |
| 4) MCS3 (PER $\leq 10\%$ )                | -79 |  | -76 | dBm |  |
| 5) MCS4 (PER $\leq 10\%$ )                | -77 |  | -74 | dBm |  |
| 6) MCS5 (PER $\leq 10\%$ )                | -74 |  | -71 | dBm |  |
| 7) MCS6 (PER $\leq 10\%$ )                | -73 |  | -70 | dBm |  |
| 8) MCS7 (PER $\leq 10\%$ )                | -72 |  | -69 | dBm |  |
| 6. Maximum Input Level (PER $\leq 10\%$ ) | -8  |  | -5  | dBm |  |

### 3.4 802.11n HT40 Mode

|  |                           |       |      |      |  |
|--|---------------------------|-------|------|------|--|
| Specification                            | IEEE802.11n HT40 @ 2.4GHz |       |      |      |  |
| Mode                                     | OFDM                      |       |      |      |  |
| Channel                                  | CH3-CH9                   |       |      |      |  |
| Data rate (MCS index)                    | MCS0/1/2/3/4/5/6/7        |       |      |      |  |
| TX Characteristics                       | Min.                      | Typ.  | Max. | Unit |  |
| 1. Power Levels (Calibrated)             |                           |       |      |      |  |
| 1) 13dBm Target                          | 5.5                       | 16.0  | 16.5 | dBm  |  |
| 2. Spectrum Mask @ target power          |                           |       |      |      |  |
| 1) at fc +/-22MHz                        | Pass                      |       |      |      |  |
| 2) at fc +/-40MHz                        | Pass                      |       |      |      |  |
| 3) at fc > +/-60MHz                      | Pass                      |       |      |      |  |
| 3. Constellation Error(EVM)@target power |                           |       |      |      |  |
| 1) MCS0                                  |                           | -34.1 |      | dB   |  |
| 2) MCS1                                  |                           | -33.7 |      | dB   |  |
| 3) MCS2                                  |                           | -33.4 |      | dB   |  |
| 4) MCS3                                  |                           | -33.5 |      | dB   |  |
| 5) MCS4                                  |                           | -33.2 |      | dB   |  |
| 6) MCS5                                  |                           | -34.2 |      | dB   |  |
| 7) MCS6                                  |                           | -33.8 |      | dB   |  |

|  |      |       |      |      |  |
|--|------|-------|------|------|--|
| 8) MCS7                                  |      | -33.6 |      | dB   |  |
| 4. Frequency Error                       |      |       | 4.8  | KHz  |  |
| RX Characteristics                       | Min. | Typ.  | Max. | Unit |  |
| 5. Minimum Input Level Sensitivity       |      |       |      |      |  |
| 1) MCS0 (PER $\leq 10\%$ )               | -88  |       | -84  | dBm  |  |
| 2) MCS1 (PER $\leq 10\%$ )               | -84  |       | -80  | dBm  |  |
| 3) MCS2 (PER $\leq 10\%$ )               | -81  |       | -77  | dBm  |  |
| 4) MCS3 (PER $\leq 10\%$ )               | -77  |       | -73  | dBm  |  |
| 5) MCS4 (PER $\leq 10\%$ )               | -74  |       | -70  | dBm  |  |
| 6) MCS5 (PER $\leq 10\%$ )               | -70  |       | -66  | dBm  |  |
| 7) MCS6 (PER $\leq 10\%$ )               | -69  |       | -65  | dBm  |  |
| 8) MCS7 (PER $\leq 10\%$ )               | -68  |       | -64  | dBm  |  |
| 6. Maximum Input Level(PER $\leq 10\%$ ) | -8   |       | -5   | dBm  |  |

## 4. Power

| Item                   | Content           |      |     |      |
|------------------------|-------------------|------|-----|------|
| Standard               | IEEE802.11b       |      |     |      |
| Mode                   | DSSS/CCK          |      |     |      |
| Frequency              | 2412~2484MHz      |      |     |      |
| Rate                   | 1, 2, 5.5, 11Mbps |      |     |      |
| DC Characteristics     | Min               | Type | Max | Unit |
| TX Mode (LDO, @17dBm)  |                   | 333  |     | mA   |
| TX Mode (DCDC, @17dBm) |                   | 273  |     |      |
| RX Mode (LDO)          |                   | 135  |     |      |
| RX Mode (DCDC)         |                   | 68   |     |      |
| Standard               | IEEE802.11g       |      |     |      |
| Mode                   | OFDM              |      |     |      |

|                        |   |      |     |      |  |
|------------------------|---|------|-----|------|--|
| Frequency              | 2412~2484MHz                            |      |     |      |  |
| Rate                   | 6, 9, 12, 18, 24, 36, 48, 54Mbps        |      |     |      |  |
| DC Characteristics     | Min                                     | Type | Max | Unit |  |
| TX Mode (LDO, @15dBm)  |   | 315  |     | mA   |  |
| TX Mode (DCDC, @15dBm) |   | 250  |     |      |  |
| RX Mode (LDO)          |   | 140  |     |      |  |
| RX Mode (DCDC)         |   | 70   |     |      |  |
| Standard               | IEEE802.11n                             |      |     |      |  |
| Mode                   | OFDM                                    |      |     |      |  |
| Frequency              | 2412~2484MHz                            |      |     |      |  |
| Rate                   | 6.5, 13, 19.5, 26, 39, 52, 58.5, 65Mbps |      |     |      |  |
| DC Characteristics     | Min                                     | Type | Max | Unit |  |
| TX Mode (LDO, @13dBm)  |   | 310  |     | mA   |  |
| TX Mode (DCDC, @13dBm) |   | 240  |     |      |  |
| RX Mode (LDO)          |   | 145  |     |      |  |
| RX Mode (DCDC)         |   | 72   |     |      |  |

| Mode      | Requirement                                      | Min | Type | Max | Unit |
|-----------|--|-----|------|-----|------|
| Powerdown | Power down                                       |     | 36   |     | uA   |
| Sleep     | DTM1, LDO  |     | 21   |     | mA   |
|           | DTM3, LDO  |     | 7.4  |     |      |
|           | DTM1, DCDC                                       |     | 18.5 |     |      |
|           | DTM3, DCDC                                       |     | 6.2  |     |      |
| Idle      | Connected state, no data is transmitted LDO,DCDC |     | 133  |     | mA   |
|           | Connected state, no data is                      |     | 66   |     |      |

|      |  |  |     |  |    |
|------|--|--|-----|--|----|
|      | transmitted,DCDC                                       |  |     |  |    |
| Work | Connection status, transmit small amounts of data,LDO  |  | 138 |  | mA |
|      | Connection status, transmit small amounts of data,DCDC |  | 74  |  |    |

## 5. Antenna matching

PIN6 RF antenna connection, please refer to the specific needs of the project design.

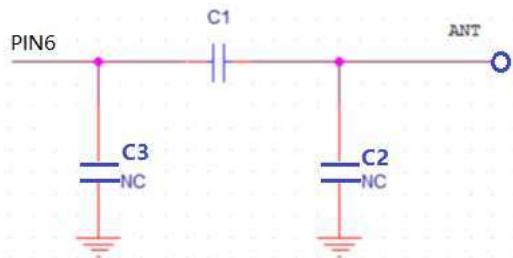


Figure 3.Antenna matching

Module and the antenna are away from noise sources claim, and the antenna module to require as a whole.

PIN6 to WIFI module RF interface between the antenna and cabling requirements coplanar impedance of  $50\Omega$ , recommend the use of arcs and lines, as short as possible.

C1, C2, C3 composed of  $\pi$ -type matching network and close to the antenna interface design, the specific adjustments based on the measured effects and recommended antenna layout design.

$C1 = 10\text{pF}$

### Caution:

All platforms must follow this antenna design when using this module. If not follow completely, the FCC authorization is no longer considered valid.

A

B

6

11

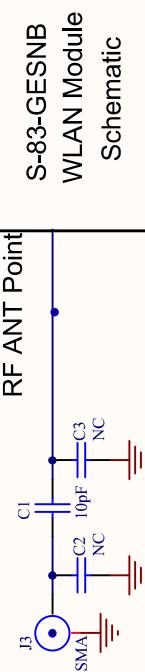
A

B

6

11

# S-83-GESNB WLAN Module Schematic



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Title

| Size<br>A4 | Number | Revision       |
|------------|--------|----------------|
| Date:<br>F |        | Sheet of<br>By |

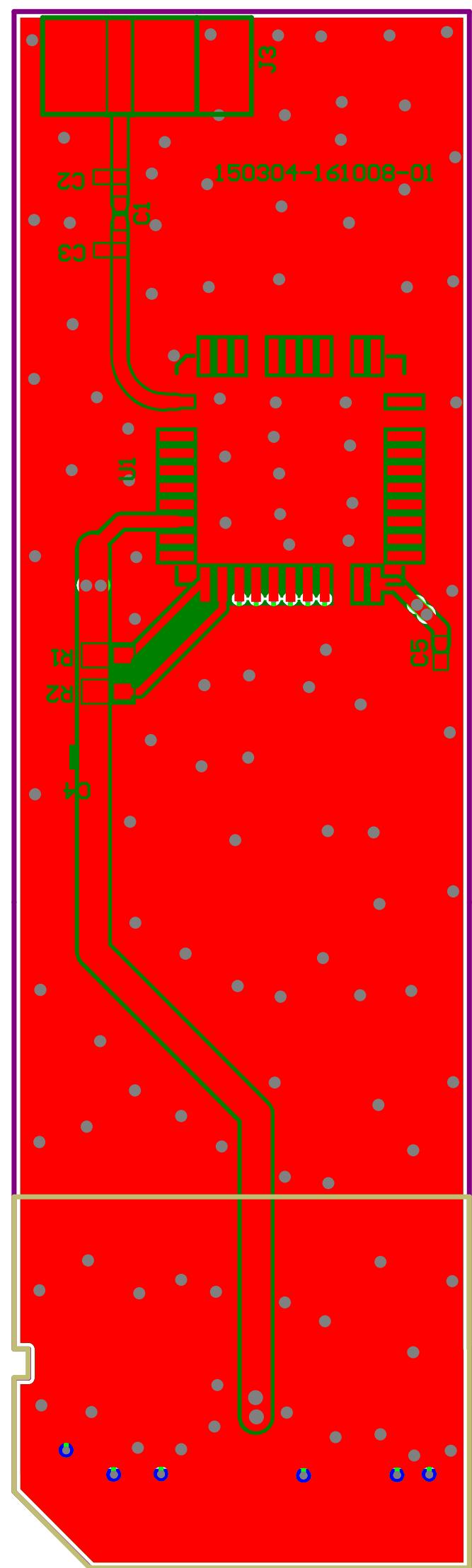
By A

88

2

—

1



## 6. Welding conditions

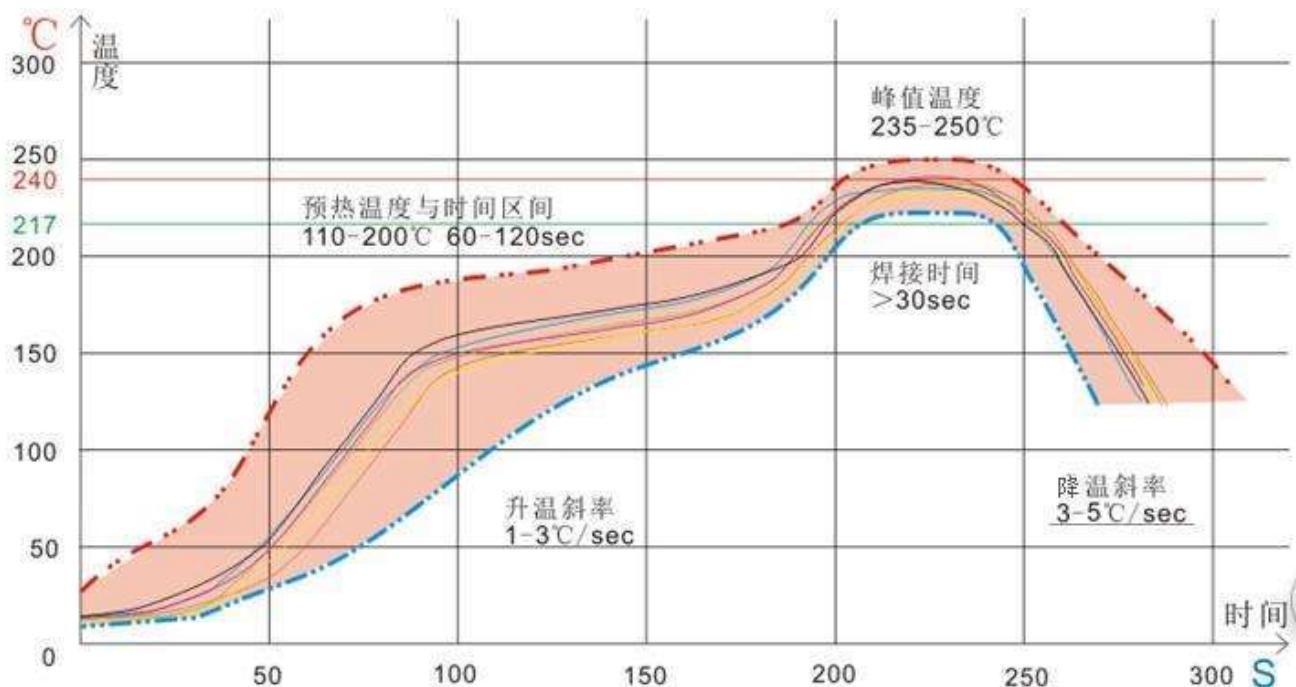


Figure 7. Welding temperature curve

1. Temperature range: temperature: <150 °C, time: 60 ~ 90 seconds, slope control in the 1 ~ 3 °C / S between.
2. Preheat temperature zone: temperature: 150 °C ~ 200 °C, time: 60-120 seconds, the slope between 0.3-0.8.
3. Reflow soldering area: peak temperature 235 °C ~ 250 °C (recommended peak temperature <245 °C), time 30-70 seconds.
4. Cooling zone: temperature: 217 °C ~ 170 °C, the slope of 3 ~ 5 °C / S between.
5. The solder is Sn / Ag & Cu Lead-free solder (SAC305) for tin-silver-copper alloy lead-free solder.

NOTE: The reflow profile should seek to balance the quality of the solder joints without compromising the board and components.

## 7 Version

| Date       | Version | Update   |
|------------|---------|--|
| 2016-06-06 | 1.0     | Document Draft                                     |
| 2016-06-08 | 1.1     | Initial documents                                  |
| 2016-06-09 | 1.2     | Increasing the RF characteristics of the test data |
| 2016-07-09 | 1.3     | Update RF characteristics of the test data         |
| 2016-07-15 | 1.4     | Increase the power consumption test data           |
| 2016-09-01 | 1.5     | Update power test data                             |

## Compliance Information

### FCC Compliance Statement:

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- (1) This device may not cause harmful interference, and
- (2) This device must accept any interference received, including interference that may cause undesired operation.

This device must accept any interference received, including interference that may cause undesired operation. Product that is a radio transmitter is labeled with FCC ID.

### FCC Caution:

- (1) Exposure to Radio Frequency Radiation. This equipment must be installed and operated in accordance with provided instructions and the antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be collocated or operating in conjunction with any other antenna or transmitter. End-users and installers must be provided with antenna installation instructions and transmitter operating conditions for satisfying RF exposure compliance.
- (2) Any changes or modifications not expressly approved by the grantee of this device could void the user's authority to operate the equipment.
- (3) This Transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.
- (4) Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user authority to operate the equipment.

### RF exposure warning

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment

The equipment must not be co-located or operating in conjunction with any other antenna or transmitter.

**IMPORTANT NOTE:** In the event that these conditions cannot be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization is no longer considered valid and the FCC ID cannot be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

The antenna gain which being use as below:

| Antenna Type   | Manufacturer           | M/N            | Max Peak Gain |
|----------------|------------------------|----------------|---------------|
| Dipole Antenna | Cortec Technology Inc. | AN2400-1761BRS | 3dBi          |

**General OEM integration instructions:**

This device is intended only for OEM integrators under the following conditions:

The antenna must be installed such that 20 cm is maintained between the antenna and users, and the transmitter module may not be co-located with any other transmit or antenna. The module shall be only used with the dipole antenna(s) that has been originally tested and certified with this module. As long as 3 conditions above are met, further transmitter test will not be required.

However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirement with this module installed(for example, digital device emission, PC peripheral requirements, etc.)

**Additional OEM integration instructions Requirement:**

- a) Trace layout and dimensions including specific designs for each type:
  - 1) Layout of trace design, parts, antenna, connectors, and isolation requirements;
  - 2) Boundary limits of size, thickness, length, width, shape(s), dielectric constant, and impedance must be clearly described for each type of antenna;
  - 3) Different antenna length and shapes affect radiated emissions, and each design shall be considered a different type; e.g., antenna length in multiple(s) of frequency wavelength and antenna shape (traces in phase) can affect antenna gain and must be considered;
  - 4) The above data is to be provided by a Gerber file (or equivalent) for PC layout.
- b) Appropriate parts by manufacturer and specifications.
- c) Test procedures for design verification.

If you have some technology problem, please contact with us.

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Telephone: +86-0512-62620006

Fax: +86-0512-62620002

Mail: Company@sci-inc.com.cn

**End product labeling:**

This transmitter module is authorization only for use in device where the antenna may be installed such that 20 cm may be maintained between the antenna and users. The final end product must be labeled in a visible area with the following:

"Contains Transmitter Module FCC ID: 2AKCE-S83GESNB or Contains FCC ID: 2AKCE-S83GESNB"

**Information that must be placed in the end user manual:**

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module. The end user manual shall include all required regulatory information/warning as show in this manual.

**Caution:**

The module is only restricted on this product (Detail information show as below)

Manufacturer: 深圳创盈芯科技有限公司

Product name: NEXBOX

Product Model Number: A95X-B7N

