BC66&BC68&M66

Compatible Design

NB-IoT/GSM/GPRS Module Series

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About the Document

History

Revision	Date	Author	Description
1.0	2018-05-07	Speed SUN/ Power JIN/ King MA	Initial
1.1	2018-05-08	Speed SUN	Updated the description of BC66's auxiliary UART port in Table 2.

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1 Introduction

Quectel BC66 & BC68 are high-performance NB-IoT modules compatible with Quectel GSM/GPRS M66 module. This document briefly describes the compatible design among BC66, BC68 and M66 modules.

2 General Descriptions

2.1. Product Description

M66 is a quad-band GSM/GPRS module supporting GSM850/EGSM900/DCS1800/PCS1900. BC66 and BC68 are high-performance, low-power, multi-band NB-IoT modules. BC66, BC68 and M66 are designed as compatible products, and customers can choose a suitable product according to application requirements. The compatible design guideline ensures a smooth migration from M66 to BC66/BC68 modules.

Table 1: Module General Information

Module	Appearance	Packaging	Dimensions	Description
BC66		44 LCC pins + 14 LGA pins	17.7mm × 15.8mm × 2.0mm	Multi-band NB-IoT module
BC68		44 LCC pins + 14 LGA pins	17.7mm × 15.8mm × 2.0mm	Multi-band NB-IoT module
M66		44 LCC pins	17.7mm × 15.8mm × 2.3mm	Quad-band GSM/GPRS module

2.2. Features Overview

The following table compares general properties and features of BC66, BC68 and M66 modules.

Table 2: Features Overview

Feature	BC66	BC68	M66
Power Supply	2.1V~3.63V Typ. 3.3V	3.1V~4.2V Typ. 3.6V	3.3V~4.6V Typ. 4.0V
Peak Current	VBAT: Max 0.5A	VBAT: Max 0.8A	VBAT: Max 1.6A
Sleep Current	Max 5uA @Power Saving Mode (PSM)	Max 5uA @Power Saving Mode (PSM)	1.3mA @DRX=5 1.2mA @DRX=9
Frequency Bands	H-FDD: B1/B2*/B3/B5/B8/B12*/ B13*/B17*/B18*/B19*/ B20/B25*/B26*/B28*/B66*	H-FDD: B1/B3/B5/B8/B20/B28*	Quad-band: GSM850/EGSM900/ DCS1800/PCS1900
Temperature Range	Operation temperature range: -35°C ~ +75°C [1)] Extended temperature range: -40°C ~ +85°C [2)] Storage temperature range: -40°C ~ +90°C	Operation temperature range: -35°C ~ +75°C [1)] Extended temperature range: -40°C ~ +85°C [2)] Storage temperature range: -40°C ~ +90°C	Operation temperature range: -35°C ~ +75°C [1)] Extended temperature range: -40°C ~ +85°C [2)] Storage temperature range: -40°C ~ +90°C
UART Interface	**Main UART port:** ● When used for AT command communication and data transmission, supported baud rates are 4800bps, 9600bps, 115200bps (default), 230400bps, 460800bps and 921600bps. ● When used for firmware upgrading, supported baud rates are 115200bps (default) and	**Main UART port:** ● When used for AT command communication and data transmission, supported baud rates are 4800bps, 9600bps (default) and 115200bps. ● When used for firmware upgrading, supported baud rates are 115200bps and 921600bps (default).	**Main UART port:** ● Seven-wire main port ● Used for AT command communication, GPRS data transmission, etc. ● Support multiplexing function ● Support autobauding from 4800bps to 115200bps

	921600bps. **Debug UART port:** ● Used for firmware debugging. ● Supported baud rates are 4800bps, 9600bps, 115200bps (default), 230400bps, 460800bps and 921600bps. **Auxiliary UART port:** ● Used for AT command communication and data transmission. ● Supported baud rates are 4800bps, 9600bps, 115200bps (default), 230400bps, 460800bps and 921600bps. **Signal level:** 1.8V	**Debug UART port:** ● Used for firmware debugging. ● Only supports 921600bps baud rate. **Signal level:** 3.0V	**Debug UART port:** ● Two-wire debug port ● Only used for firmware debugging and the baud rate is 460800bps **Auxiliary UART port:** ● Used for AT command communication ● The default baud rate is 115200bps, and does not support autobauding. **Signal level:** 2.8V
(U)SIM	1.8V USIM	1.8V/3.0V USIM	1.8V/3.0V (U)SIM
Analog Audio	Not supported	Not supported	One analog input channel Two analog output channels
ADC	ADC0*	ADC*	ADC0
BT	Not supported	Not supported	BT 3.0
RTC Backup	Not supported	Not supported	Vnorm=2.8V VI=1.5V~3.3V
PCM Interface	Not supported	Not supported	Supported
Firmware Upgrade	UART, DFOTA*	UART, DFOTA	UART

NOTES

1. [1] Within operation temperature range, the module is 3GPP compliant.
2. [2] Within extended temperature range, the module remains the ability to establish and maintain a voice, SMS, data transmission, emergency call, etc. There is no unrecoverable malfunction. There are also no effects on radio spectrum and no harm to radio network. Only one or more parameters like P_{out} might reduce in their value and exceed the specified tolerances. When the temperature returns to

normal operating temperature levels, the module will meet 3GPP specifications again.

3. "*" means under development.

2.3. Pin Assignment

The following figure shows the pin assignment of BC66, BC68 and M66.

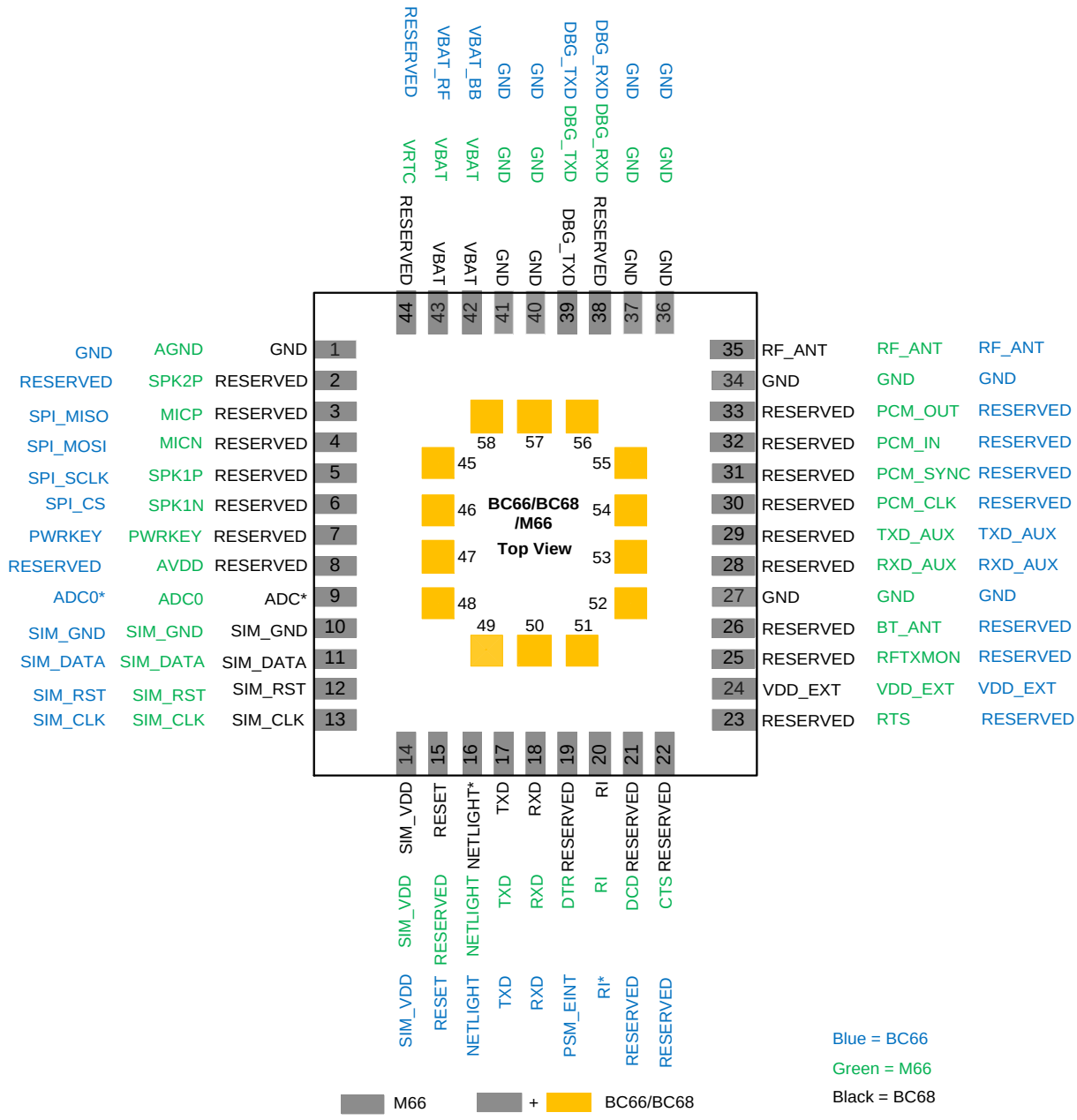

Figure 1: BC66&BC68&M66 Pin Assignment

NOTES

1. The black colored pin names are defined for BC68 module.
2. The green colored pin names are defined for M66 module.
3. The blue colored pin names are defined for BC66 module.
4. The orange colored pins are the additional pins of BC66/BC68 as compared with M66.
5. "*" means under development.

3 Pin Description

This chapter describes the pin definition of BC66, BC68 and M66, as well as the pin comparison among them.

Table 3: I/O Parameters Definition

Symbol	Description
IO	Bidirectional
DI	Digital Input
DO	Digital Output
PI	Power Input
PO	Power Output
AI	Analog Input
AO	Analog Output
OD	Open Drain

Table 4: Pin Comparison among BC66, BC68 and M66

Pin No.	BC66			BC68			M66		
	Pin Name	I/O	Description	Pin Name	I/O	Description	Pin Name	I/O	Description
1	GND			GND			AGND		Analog ground. Specific ground for external audio circuits
2	RESERVED	/	/	RESERVED	/	/	SPK2P	AO	Channel 2 voice output (positive)
3	SPI_MISO	DI	Master input slave output of SPI interface	RESERVED	/	/	MICP	AI	Positive voice input

4	SPI_MOSI	DO	Master output slave input of SPI interface	RESERVED	/	/	MICN	AI	Negative voice input signal
5	SPI_SCLK	DO	Serial clock signal of SPI interface	RESERVED	/	/	SPK1P	AO	Channel 1 positive voice output
6	SPI_CS	DO	Chip selection of SPI interface	RESERVED	/	/	SPK1N	AO	Channel 1 negative voice output
7	PWRKEY	DI	Pull down PWRKEY to turn on the module	RESERVED	/		PWRKEY	DI	Used to power on/off the module
8	RESERVED	/	/	RESERVED	/	/	AVDD	PO	Reference voltage of ADC circuit. If unused, keep this pin open.
9	ADC0*	AI	General purpose analog to digital converter interface	ADC*	AI	General purpose analog to digital converter interface	ADC0	AI	General purpose analog to digital converter interface
10	SIM_GND		Specified ground for USIM card	SIM_GND		Specified ground for USIM card	SIM_GND		Specified ground for (U)SIM card
11	SIM_DATA	IO	USIM card data signal	SIM_DATA	IO	USIM card data signal	SIM_DATA	IO	(U)SIM card data signal
12	SIM_RST	DO	USIM card reset signal	SIM_RST	DO	USIM card reset signal	SIM_RST	DO	(U)SIM card reset signal
13	SIM_CLK	DO	USIM card clock signal	SIM_CLK	DO	USIM card clock signal	SIM_CLK	DO	(U)SIM card clock signal
14	SIM_VDD	PO	Power supply for USIM card	SIM_VDD	PO	Power supply for USIM card	SIM_VDD	PO	Power supply for (U)SIM card
15	RESET	DI	Reset the module	RESET	DI	Reset the module	RESERVED	/	/
16	NETLIGHT*	DO	Network status indication	NETLIGHT*	DO	Network status indication	NETLIGHT	DO	Network status indication
17	TXD	DO	Transmit data	TXD	DO	Transmit data	TXD	DO	Transmit data
18	RXD	DI	Receive data	RXD	DI	Receive data	RXD	DI	Receive data
19	PSM_EINT	DI	Dedicated external interrupt pin. Used to wake up the module from PSM.	DTR	DI	Data terminal ready	DTR	DI	Data terminal ready

20	RI	DO	Ring indication	RI	DO	Ring indication	RI	DO	Ring indication
21	RESERVED	/	/	RESERVED	/	/	DCD	DO	Data carrier detection
22	RESERVED	/	/	RESERVED	/	/	CTS	DO	Clear to send
23	RESERVED	/	/	RESERVED	/	/	RTS	DI	Request to send
24	VDD_EXT	PO	1.8V output power supply for external circuits. It cannot be used to supply power for external circuits when in PSM.	VDD_EXT	PO	3.0V output power supply for external circuits. It cannot be used to supply power for external circuits when in PSM.	VDD_EXT	PO	2.8V output power supply for an external circuit.
25	RESERVED	/	/	RESERVED	/	/	RFTXMON	DO	Transmission signal indication
26	RESERVED	/	/	RESERVED	/	/	BT_ANT	IO	BT antenna pad
28	RXD_AUX	DI	Receive data	RESERVED	/	/	RXD_AUX	DI	Receive data
29	TXD_AUX	DO	Transmit data	RESERVED	/	/	TXD_AUX	DO	Transmit data
30	RESERVED	/	/	RESERVED	/	/	PCM_CLK	DO	PCM clock
31	RESERVED	/	/	RESERVED	/	/	PCM_SYNC	DO	PCM frame synchronization
32	RESERVED	/	/	RESERVED	/	/	PCM_IN	DI	PCM data input
33	RESERVED	/	/	RESERVED	/	/	PCM_OUT	DO	PCM data output
35	RF_ANT	IO	RF antenna pad	RF_ANT	IO	RF antenna pad	RF_ANT	IO	RF antenna pad
38	DBG_RXD	DI	Receive data	RESERVED	/	/	DBG_RXD	DI	Receive data
39	DBG_TXD	DO	Transmit data	DBG_TXD	DO	Transmit data	DBG_TXD	DO	Transmit data
42	VBAT_BB	PI	Main power supply of the module: VBAT_BB =2.1V~3.63V	VBAT	PI	Main power supply of the module: VBAT=3.1V~4.2V	VBAT	PI	Main power supply of the module: VBAT=3.3V~4.6V
43	VBAT_RF	PI	Main power supply of the module: VBAT_RF =2.1V~3.63V	VBAT	PI	Main power supply of the module: VBAT=3.1V~4.2V	VBAT	PI	Main power supply of the module: VBAT=3.3V~4.6V

44	RESERVED	/	/	RESERVED	/	/	VRTC	IO	RTC power supply when the module is not powered by VBAT.
27, 34, 36, 37, 40, 41,	GND	/	Ground	GND	/	Ground	GND	/	Ground
45~58	/	/	/	RESERVED	/	/	/	/	/

NOTES

1. The red colored pins are compatible pins with different functions.
2. The black colored pins are compatible pins with the same function.
3. The orange colored pins are the additional pins of BC66/BC68 as compared with M66.
4. Keep all reserved and unused pins unconnected.
5. "*" means under development.

4 Hardware Reference Design

The following chapters describe the compatible design among BC66, BC68 and M66 on main functions.

4.1. Power Supply

4.1.1. Operation Voltage

Power supply ranges of BC66/BC68/M66 are listed below:

Table 5: Module Operating Voltage Range

Module	Power Supply Pins	Conditions	Min	Typical	Max	Unit
BC66	VBAT_BB & VBAT_RF	The actual input voltages must stay between the minimum and maximum values.	2.1	3.3	3.63	V
BC68	VBAT		3.1	3.6	4.2	V
M66	VBAT		3.3	4.0	4.6	V

When considering the compatibility design among modules, please make sure the input voltage is between 3.3V and 3.63V. During operation, please make sure the module's input voltage will never drop below 3.3V.

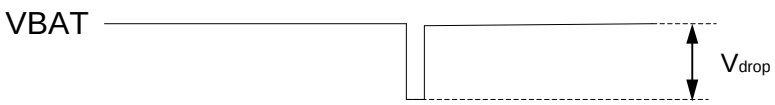

Figure 2: VBAT Voltage Waveform Diagram

4.1.2. Power Supply Reference Design

Power design for a module is critical to its performance. The power supply of BC66, BC68 and M66 should be able to provide sufficient current up to 2.0A.

In order to ensure better power supply performance and compatibility, the recommended input voltage is 3.6V. Also, it is recommended to add 47uF, 100nF, 33pF & 10pF capacitors near the VBAT pins of BC66/BC68, and 100uF, 100nF, 33pF & 10pF capacitors near the VBAT pins of M66. Additionally, it is recommended to add a TVS diode on the VBAT trace (near VBAT pins) to improve surge voltage withstand capability.

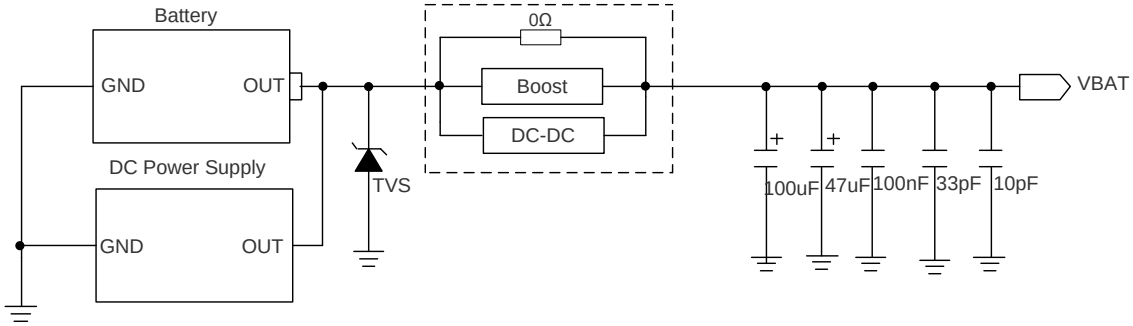

Figure 3: Reference Circuit of Power Supply

According to power supply type (battery or DC power), the reference design for power switching circuit in the above dashed box will be different. The details are illustrated in the table below.

Table 6: Power Supply Type and Power Switching Circuit Relationship

Power Supply Type	Power Switching Circuit		
	BC66 (VBAT=2.1V~3.63V)	**BC68** (VBAT=3.1V~4.2V)	**M66** (VBAT=3.3V~4.6V)
Li-SOCl2 Battery	0Ω	0Ω	Boost
Li-MnO2 Battery	0Ω	Boost	Boost
DC Power Supply	DC-DC	DC-DC	DC-DC

4.2. Turn on

BC66, BC68 and M66 have different turn on methods:

- BC68 can be automatically turned on by supplying power to VBAT pins.
- BC66 and M66 can be turned on by driving the PWRKEY pin to a low level for a certain time T1 (BC66≥300ms, M66>1s). It is recommended use an open drain/collector driver to control the PWRKEY. A reference circuit is shown below.

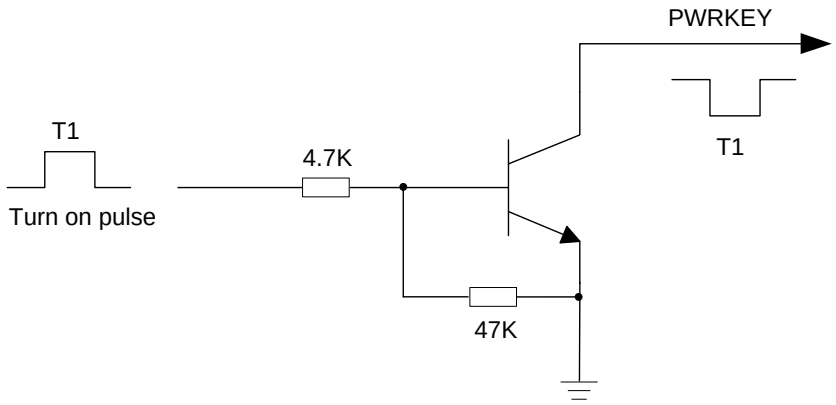

Figure 4: PWRKEY Driving Circuit for Module Turn-on (BC66/M66)

The turn-on scenario of BC66, BC68 and M66 are illustrated below.

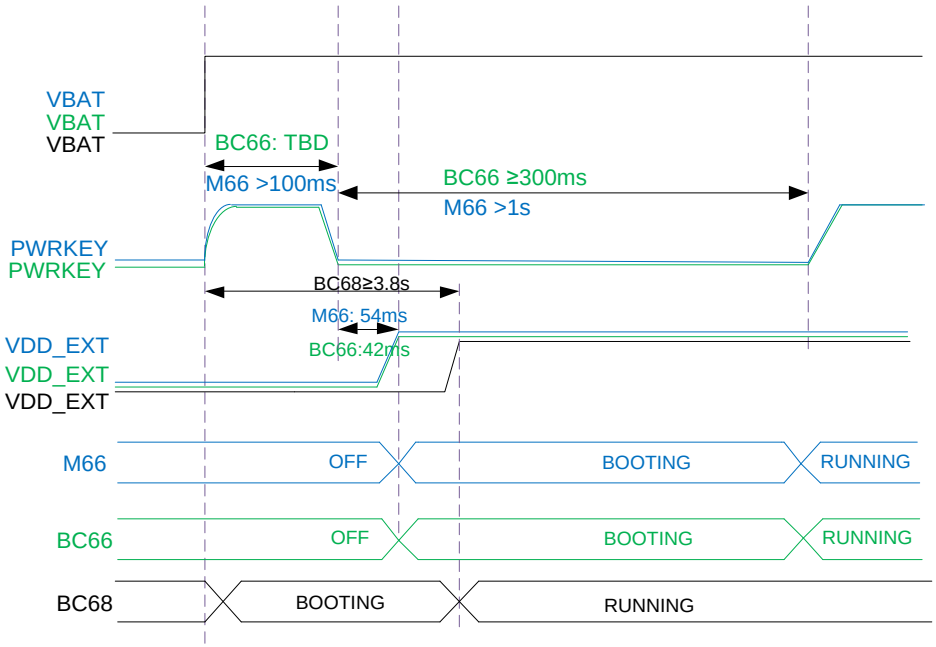

Figure 5: BC66&BC68&M66 Turn-on Timing

NOTES

1. When BC66/M66 is turned on through driving PWRKEY to a low level, please make sure that VBAT is stable before pulling down PWRKEY pin. The recommended minimum time is TBD for BC66, and 100ms for M66. PWRKEY cannot be pulled down all the time.
2. The parts marked in green in the above figure are for BC66.
3. The parts marked in blue in the above figure are for M66.
4. The parts marked in black in the above figure are for BC68. After successful power-up, it is recommended to wait for 3.8s before module operation.

4.3. Turn off

M66 can be turned off by **AT+QPOWD** command or by pulling down the PWRKEY pin for a period of time (0.7s~1s), while BC66 and BC68 can only be turned off by switching off the VBAT power supply.

The turn-off scenario is illustrated in the figure below.

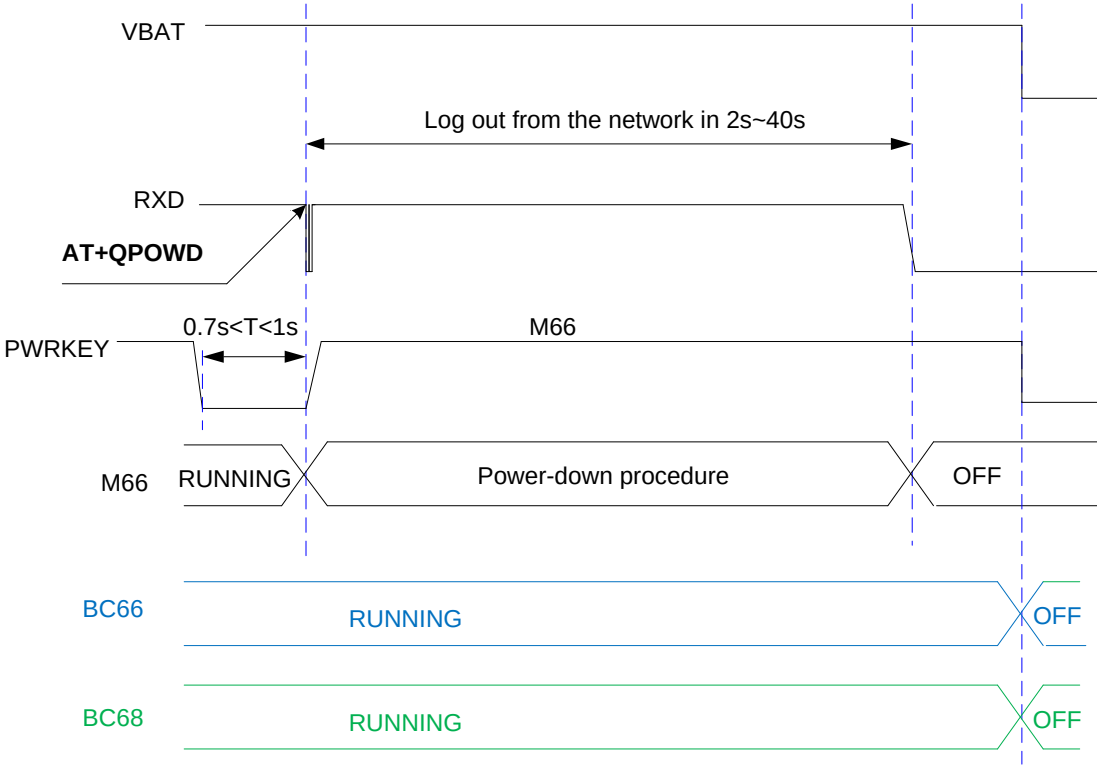

Figure 6:Timing of Power-down

NOTES

1. The parts marked in green in the above figure are for BC68.
2. The parts marked in blue in the above figure are for BC66.
3. The parts marked in black in the above figure are for M66.
4. When AT command is used to turn off M66, please make sure PWRKEY remains in high level.
5. When PWRKEY is used to turn off M66, please make sure PWRKEY is pulled down for a period of time between 0.7s and 1s.
6. Network logout time is related to local network signal strength.

4.4. Reset

M66 has no reset function. BC66 and BC68 can be reset by hardware and software methods as illustrated below.

4.4.1. Reset BC66/BC68 by Hardware Method

Driving the RESET pin to a low level voltage for a certain period of time (BC66≥50ms, BC68≥100ms) will reset BC66/BC68 module. The recommended circuit of resetting the module is shown below. An open drain/collector driver or button can be used to control the RESET pin.

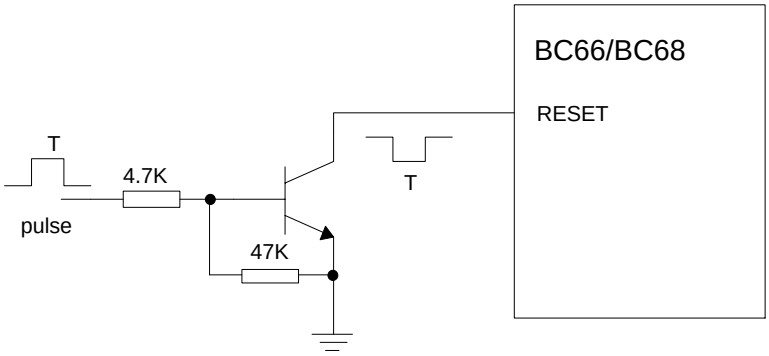

Figure 7: Reference Circuit of RESET by Using Driving Circuit

The reset scenario of BC66/BC68 is illustrated in the figure below.

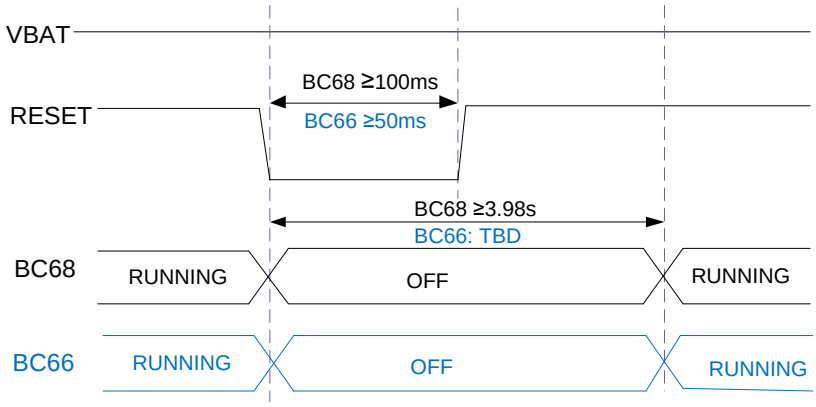

Figure 8: Timing of Resetting Module

NOTES

1. The parts marked in black in the above figure are for BC68.
2. The parts marked in blue in the above figure are for BC66.

4.4.2. Reset BC66/BC68 by Software Method

- **AT+NRB** command can be used to reset BC68. For more details about the command, please refer to ***document [2]***.
- **AT+QRESET=1** command can be used to reset BC66. For more details about the command, please refer to ***document [6]***.

4.5. Network Status Indication

The NETLIGHT signal can be used to drive a network status indicator LED, so as to indicate the network status of BC66/BC68/M66. A reference circuit is shown as below.

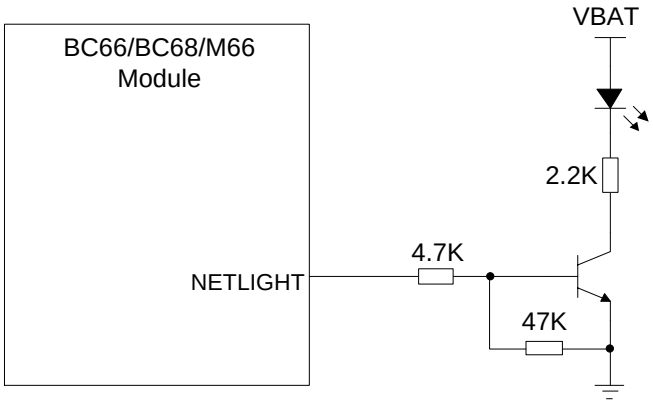

Figure 9: Reference Circuit of NETLIGHT

4.6. (U)SIM Interface

- BC66 supports 1.8 V USIM cards.
- BC68 supports 1.8 V/3.0 V USIM cards.
- M66 supports 1.8V/ 3.0V USIM/SIM cards.

The pin assignment of BC66/BC68's USIM interface and M66's (U)SIM interface are compatible with each

other. A compatible design for 6-pin (U)SIM interface is shown in the figure below:

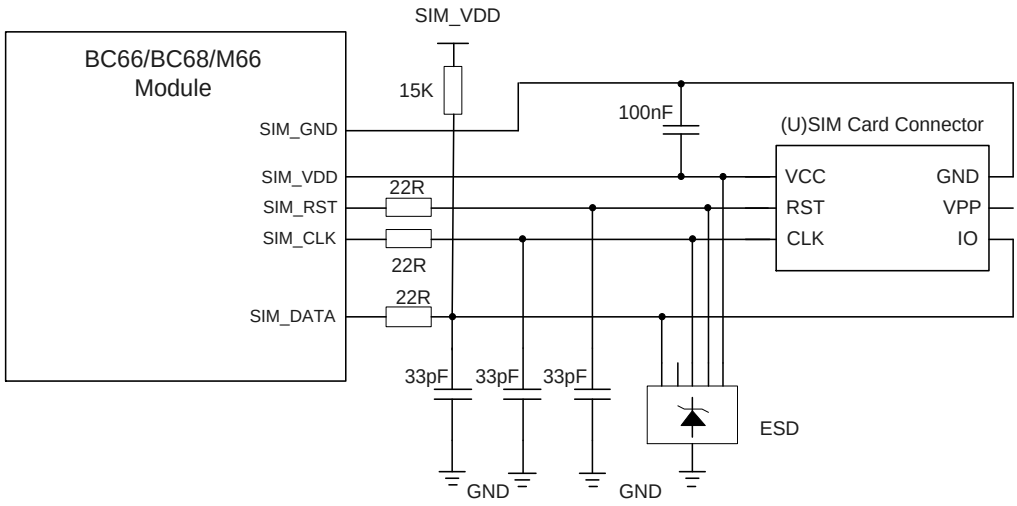

Figure 10: Reference Compatible Design for 6-Pin (U)SIM Interface

4.7. UART Interfaces

UART interfaces of BC66/BC68/M66 have different voltage domains, as listed below.

Table 7: UART Interface Voltage Domain

Module	UART Interface	Voltage Domain	Description
BC66	Main UART & Debug UART& AUX UART	1.8V	/
BC68	Main UART & Debug UART	3.0V	/
M66	Main UART	2.8V	Support RTS/CTS
	Debug UART& AUX UART		/

A compatible voltage level translation reference design for BC66/BC68/M66's UART interfaces is shown below. The circuit design of dotted line section can refer to the design of solid line section, in terms of both module input and output circuit designs, but please pay attention to the direction of connection.

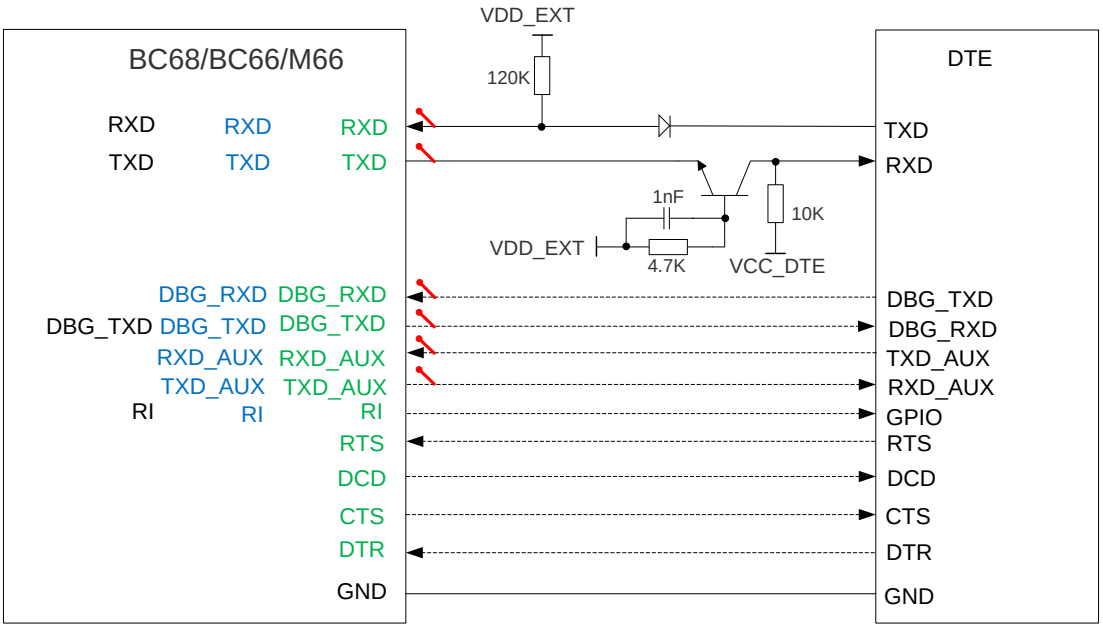

Figure 11: Compatible Reference Circuit with Transistor Circuit

NOTES

1. Transistor circuit solution as shown above is not suitable for applications with high baud rates exceeding 460Kbps.
2. "\" represents the test point of UART interfaces. It is also recommended to reserve the test points of VBAT and PWRKEY, for convenient firmware upgrade and debugging when necessary.
3. The parts marked in black in the above figure are for BC68. Only RXD, TXD, RI and DBG_TXD need to be designed for BC68.
4. The parts marked in blue in the above figure are for BC66.
5. The parts marked in green in the above figure are for M66.

4.8. ADC Interface

BC66, BC68 and M66 modules provide a 10-bit ADC input channel to read the voltage value.

- The maximum voltage value applied on BC66's ADC0* pin is 1.4V.
- The maximum voltage value applied on BC68's ADC* pin is 4.0V, but the value must be lower than VBAT supply voltage.
- The maximum voltage value applied on M66's ADC0 pin is 2.8V

Table 8: Module ADC Interface Information

Module	Pin Name	Pin No.	Description
BC66	ADC0*	9	Analog to digital converter interface
BC68	ADC*	9	Analog to digital converter interface
M66	ADC0	9	Analog to digital converter interface

NOTE

"*" means under development.

4.9. RF Antenna Interface

M66's antenna interfaces ANT_MAIN/BT_ANT and BC66/BC68's RF_ANT antenna interface are compatible with each other. The antenna ports have an impedance of 50Ω.

In order to achieve better RF performance, it is recommended to reserve a π-type matching circuit (R1/C1/C2) and place it close to the antenna. The capacitors (C1/C2) are not mounted and a 0Ω resistor is mounted on R1 by default. A reference design for RF antenna interface is shown as below.

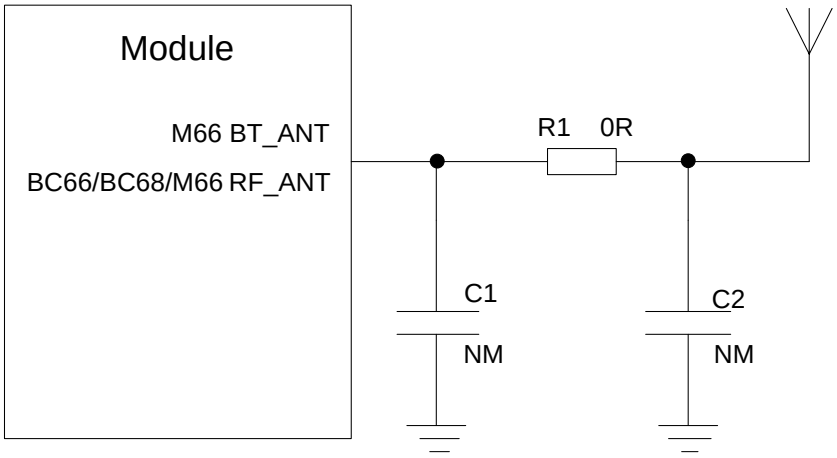

Figure 12: Reference Circuit of RF Antenna Interface

5 Recommended Footprint and Stencil Design

This chapter mainly introduces the recommended compatible footprint and stencil design of BC66, BC68 and M66. All dimensions are measured in millimetre (mm), and the tolerances for dimensions without tolerance values are ±0.05mm.

5.1. Recommended Compatible Footprint

The following figure shows the bottom view of BC66, BC68 and M66.

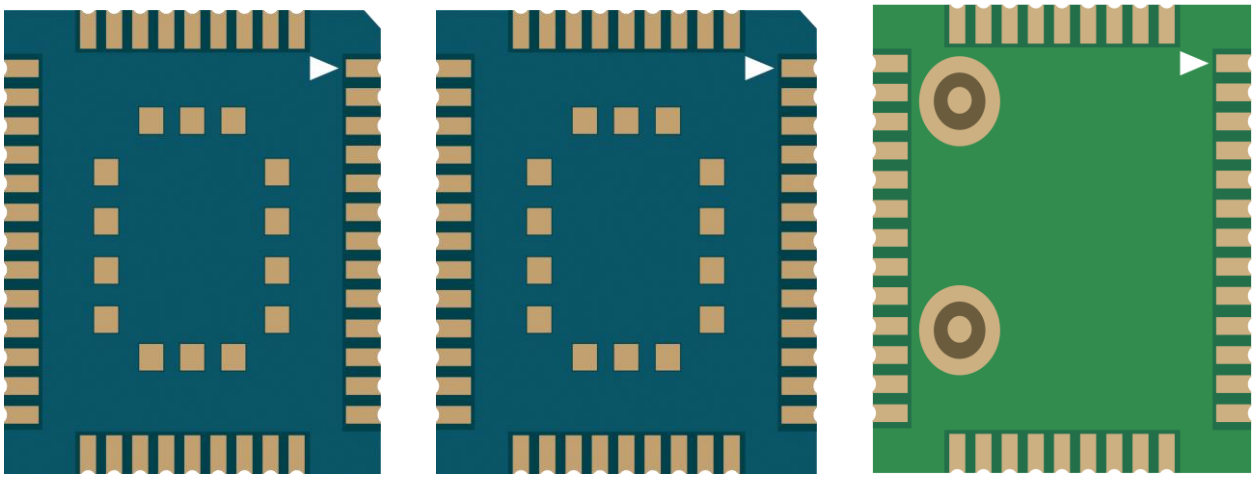

Figure 13: Bottom View of BC66/BC68/M66

The following figure shows the recommended compatible footprint of BC66, BC68 and M66.

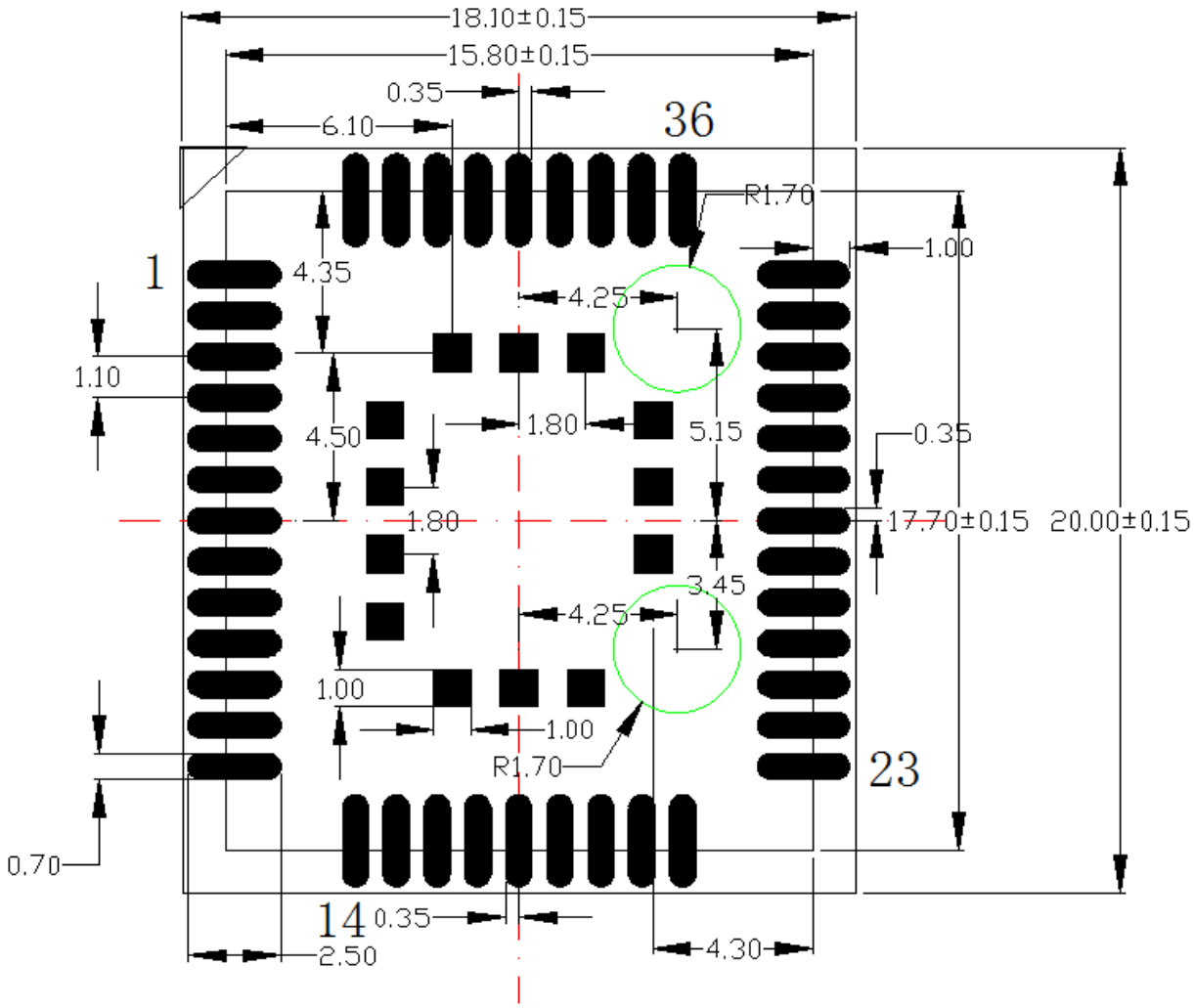

Figure 14: Recommended Footprint of BC66/BC68/M66 (Unit: mm)

NOTES

1. The modules should be kept about 3mm away from other components on the host PCB.
2. The circular test points with a radius of 1.7mm in the above recommended footprint should not be designed in schematic and PCB decal, and these test points should be served as a keepout area.
3. The pin 52 of BC66 and BC68 should not be designed in the recommended footprint for compatibility with M66 module.

5.2. Recommended Stencil Design

BC66, BC68 and M66 have different PCB thicknesses. In order to ensure the module soldering quality, the thickness of stencil is recommended to be 2.0mm for M66 and 0.15mm for BC66/BC68. For more details, please refer to ***document [4]***.

The recommended stencil design for BC66 and BC68 is shown as below.

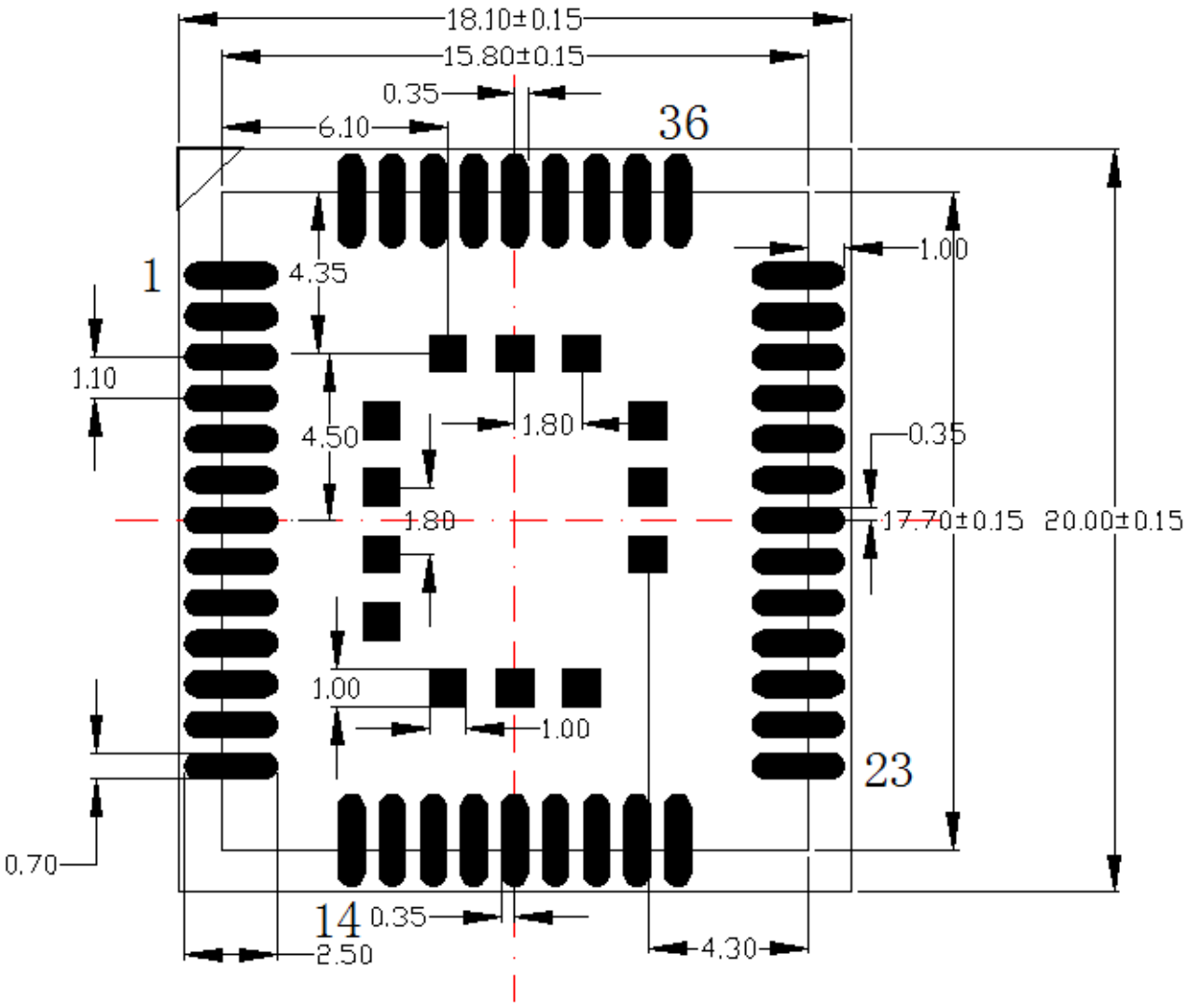

Figure 15: Recommended Stencil Design for BC66/BC68 (Unit: mm)

The recommended stencil design for M66 is shown as below.

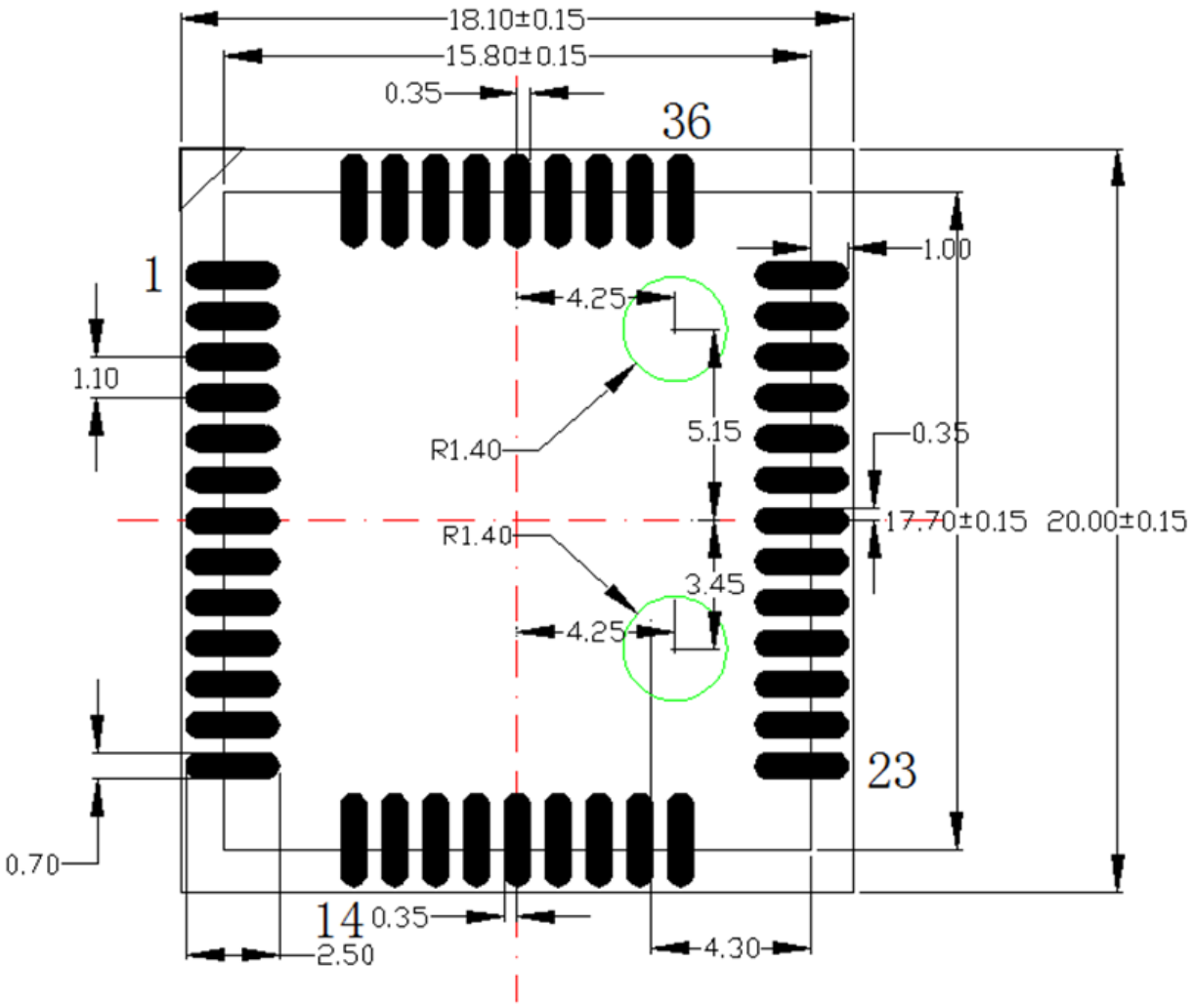

Figure 16: Recommended Stencil Design for M66 (Unit: mm)

5.3. Installation Sketch Map

The following figure shows the sketch map of installation for BC66, BC68 and M66.

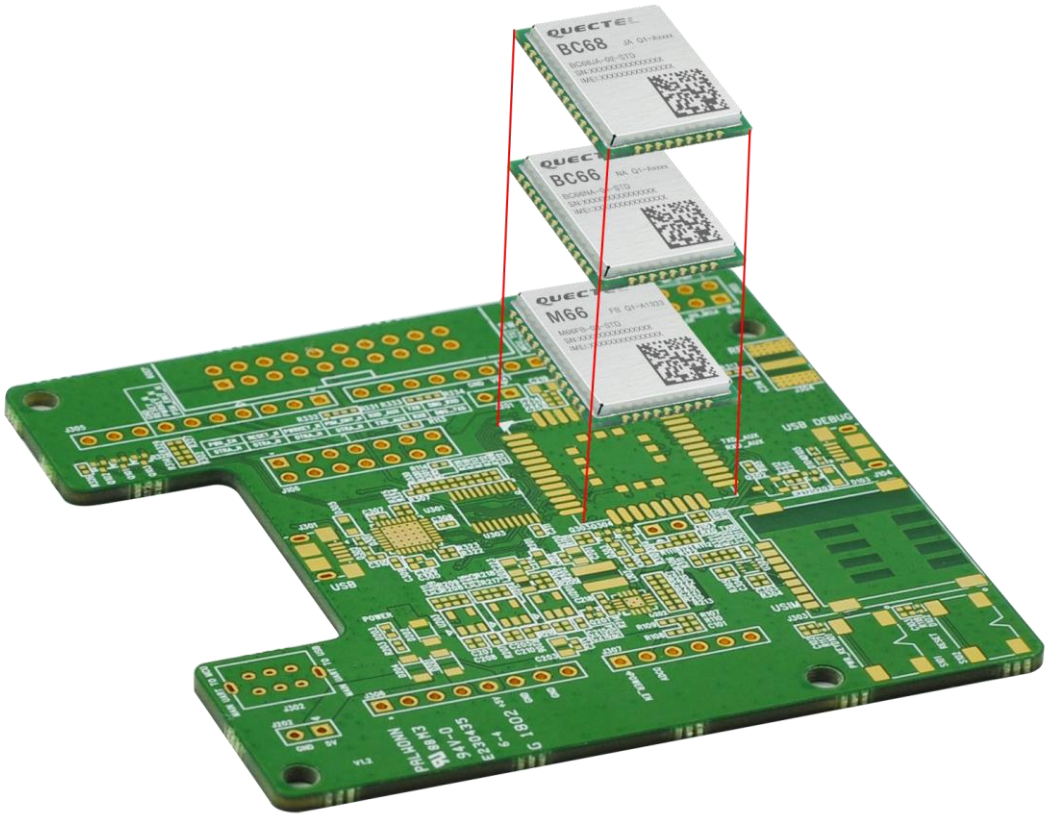

Figure 17: Installation Sketch Map for BC66/BC68/M66

6 Manufacturing and Packaging

6.1. Soldering

Push the squeegee to apply the solder paste on the surface of stencil, thus making the paste fill the stencil openings and then penetrate to the PCB. The force on the squeegee should be adjusted properly so as to produce a clean stencil surface on a single pass. To ensure the module soldering quality, the thickness of stencil for BC66/BC68 is recommended to be 0.15mm, and that for M66 is recommended to be 0.20mm.

It is suggested that the peak reflow temperature is 235ºC~245ºC (for SnAg3.0Cu0.5 alloy). The absolute maximum reflow temperature is 260ºC. To avoid damage to the module caused by repeated heating, it is suggested that the module should be mounted after reflow soldering for the other side of PCB has been completed. Recommended reflow soldering thermal profile is shown below.

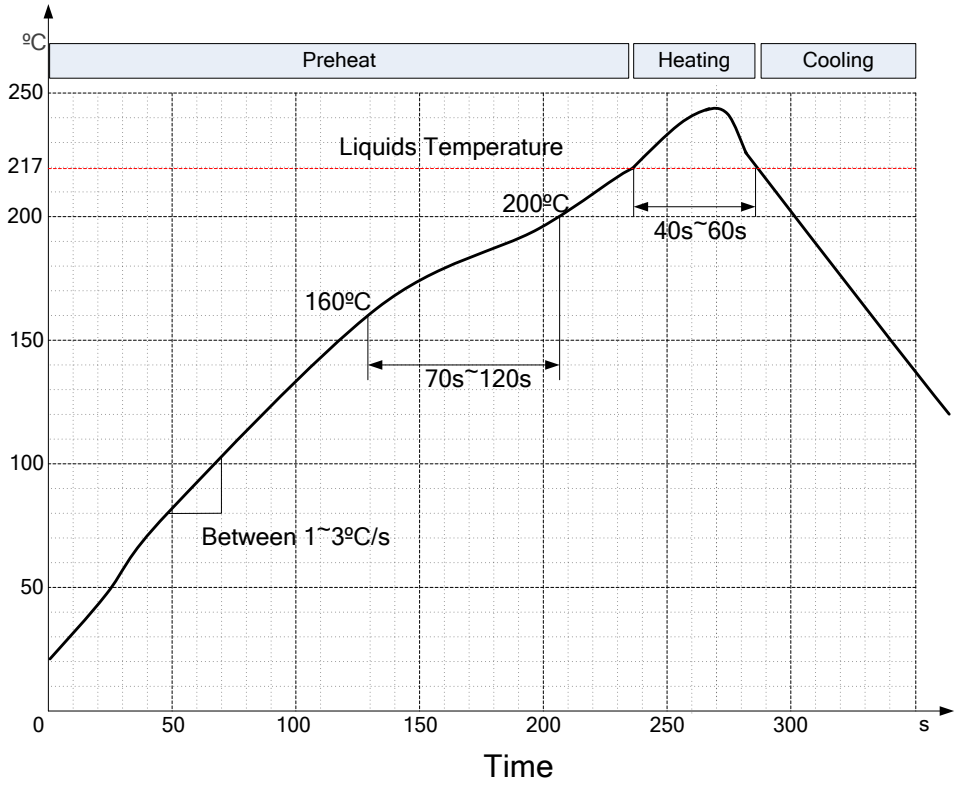

Figure 18: Reflow Soldering Thermal Profile

NOTES

1. During manufacturing and soldering, or any other processes that may contact the module directly, NEVER wipe the module's shielding can with organic solvents, such as acetone, ethyl alcohol, isopropyl alcohol, trichloroethylene, etc. Otherwise, the shielding can may become rusted.
2. The shielding can for the module is made of Cupro-Nickel base material. It is tested that after 12 hours' Neutral Salt Spray test, the laser engraved label information on the shielding can is still clearly identifiable and the QR code is still readable, although white rust may be found.

6.2. Packaging

BC66, BC68 and M66 modules adopt tape and reel packaging and are stored in a vacuum-sealed bag which is ESD protected. Each reel is 330mm in diameter and each reel contains 250 modules.

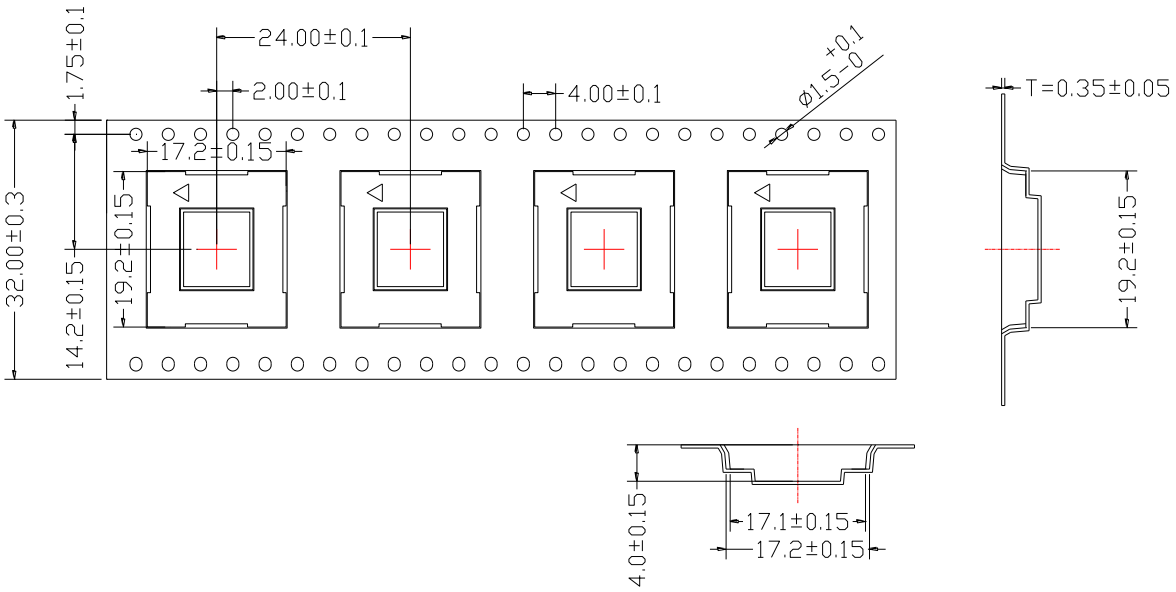

Figure 19: Tape Dimensions (Unit: mm)

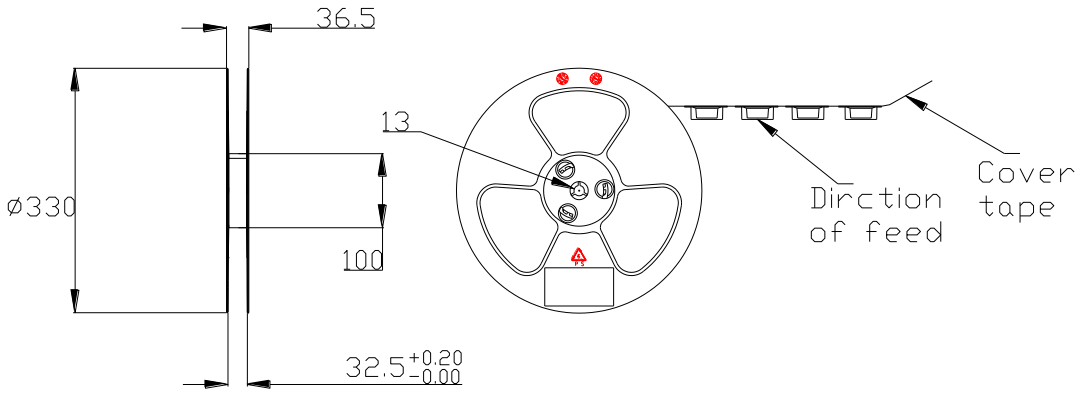

Figure 20: Reel Dimensions (Unit: mm)

7 Appendix A References

Table 9: Related Documents

SN	Document Name	Remark
[1]	Quectel_M66_AT_Commands_Manual	M66 AT Commands Manual
[2]	Quectel_BC35-G&BC68_AT_Commands_Manual	BC68&BC35-G AT Commands Manual
[3]	Quectel_M66_Hardware_Design	M66 Hardware Design
[4]	Quectel_Module_Secondary_SMT_User_Guide	Quectel Module Secondary SMT User Guide
[5]	Quectel_BC68_Hardware_Design	BC68 Hardware Design
[6]	Quectel_BC66_AT_Commands_Manual	BC66 AT Commands Manual
[7]	Quectel_BC66_Hardware_Design	BC66 Hardware Design

Table 10: Terms and Abbreviations

Abbreviation	Description
ADC	Analog-to-Digital Converter
BT	Bluetooth
CTS	Clear To Send
DCD	Data Carrier Detect
DCS	Digital Communication System
DFOTA	Delta Firmware Upgrade Over the Air
DRX	Discontinuous Reception
DTR	Date Terminal Ready
EGSM	Extended Global System for Mobile

ESD	Electrostatic Discharge
GSM	Global System for Mobile Communications
GPRS	General Packet Radio Service
LCC	Leadless Chip Carriers
LDO	Low Dropout Regulator
LED	Light Emitting Diode
LGA	Land Grid Array
Li-MnO2	Lithium Manganese Dioxide
Li-SOCl2	Lithium Thionyl Chloride
LTE	Long Term Evolution
NB-IoT	Narrow Band Internet of Things
PCB	Printed Circuit Board
PCM	Pulse Code Modulation
PCS	Personal Communication System
PSM	Power Saving Mode
RF	Radio Frequency
RI	Ring Indicator
RTC	Real Time Clock
RTS	Require To Send
RXD	Receive Direction
SMT	Surface Mount Technology
SWD	Serial Wire Debug
TXD	Transmitting Direction
UART	Universal Asynchronous Receiver & Transmitter
(U)SIM	(Universal) Subscriber Identity Module