BG96&BC95&M95 R2.0

Compatible Design

LTE/NB-IoT/GSM/GPRS Module Series

Rev. BG96&BC95&M95 R2.0_Compatible_Design_V1.0

Date: 2017-04-26

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Quectel Wireless Solutions Co., Ltd.
Office 501, Building 13, No.99, Tianzhou Road, Shanghai, China, 200233
Tel: +86 21 5108 6236
Email: info@quectel.com

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About the Document

History

Revision	Date	Author	Description
1.0	2017-04-26	Lorry XU	Initial

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1 Introduction

Quectel LTE BG96 module is compatible with NB-IoT BC95 module and GSM/GPRS M95 R2.0 module. This document briefly describes the compatible design among BG96, BC95 and M95 R2.0 modules.

2 General Descriptions

2.1. Product Description

M95 R2.0 is a quad-band GSM/GPRS module which works at frequencies of GSM850, EGSM900, DCS1800 and PCS1900. BC95 is an NB-IoT module that contains three variants: BC95-B5, BC95-B8 and BC95-B20. BG96 is an LTE Cat M1 & NB1/GSM wireless communication module. BG96, BC95 and M95 R2.0 are designed as compatible products. Customers can choose a proper module for applications according to their needs. The compatible design guideline ensures a smooth migration from M95 R2.0/BC95 to BG96 for customers' products.

Table 1: Module General Information

Module	Appearance	Packaging	Dimensions	Description
BG96		102-pin LGA	22.5 × 26.5 × 2.3mm	LTE Cat M1 & NB1/ GSM module
BC95		54-pin LCC+ 40-pin LGA	19.9 × 23.6 × 2.2mm	NB-IoT module; contains three variants: BC95-B5, BC95-B8 and BC95-B20.
M95 R2.0		42-pin LCC	19.9 × 23.6 × 2.65mm	GSM/GPRS module

2.2. Feature Overview

The following table compares general properties and features of BG96, BC95 and M95 R2.0 modules.

Table 2: Feature Overview

Feature	BG96	BC95	M95 R2.0
Power supply	Supply voltage: 3.3V~4.3V Typical supply voltage: 3.8V	3.1V~4.2V	3.3V~4.6V
Peak current	TBD	VBAT: Max 0.3A	VBAT: Max 2.0A
Frequency bands	LTE-FDD: B1/B2/B3/B4/B5/B8/B12/B13/B18/B19/B20/B26/B28 LTE-TDD: B39 (for Cat M1 only) EGPRS: 850/900/1800/1900	BC95-B5: Band 5 @H-FDD BC95-B8: Band 8 @H-FDD BC95-B20: Band 20 @H-FDD	Quad band: GSM850/900/1800/1900
GPRS	Multislot class 12	Not supported	Multislot class 12
EGDE	Multislot class 12	Not supported	Not supported
Temperature range (Board temperature)	Operation temperature range: -35°C ~ +75°C[1)] Extended temperature range: -40°C ~ +85°C[2)]	Operation temperature range: -35°C ~ +75°C[1)] Extended temperature range: -40°C ~ +85°C[2)]	Operation temperature range: -35°C ~ +75°C[1)] Extended temperature range: -40°C ~ +85°C[2)]
UART interfaces	Baudrate: ● Main port: 9600bps~3000000bps ● Debug port: 115200bps ● UART3 Flow control: RTS/CTS Power domain: 1.8V	Baudrate: ● Main port: 9600bps/115200bps[3)] ● Debug port: 921600bps Power domain: 3.0V	Baudrate: 300bps~115200bps Autobauding: 4800bps~115200bps Flow control: RTS/CTS Power domain: 2.8V
(U)SIM interfaces	Support (U)SIM card: 1.8V or 3.0V	Only support USIM card: 3.0V	Support (U)SIM card: 1.8V or 3.0V
Audio interface	Digital I2S interface*	Not supported	Two analog input channels and two analog output channels
USB interface	USB 2.0, high speed	Not supported	Not supported

I2C interface	Supported	Not supported	Not supported
RTC backup	Not supported	Not supported	$V_O$max=3.0V V_I=1.5V~3.3V
Firmware upgrade	Via USB interface or DFOTA*	Via SWD or UART	Via 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 the normal operating temperature levels, the module will meet 3GPP specifications again.
3. [3)] BC95 supports 9600bps baudrate for AT command communication & data transmission and 115200bps for firmware upgrading on main port.
4. "*" means under development.

2.3. Pin Assignment

The following figure shows the pin assignment of BG96, BC95 and M95 R2.0.

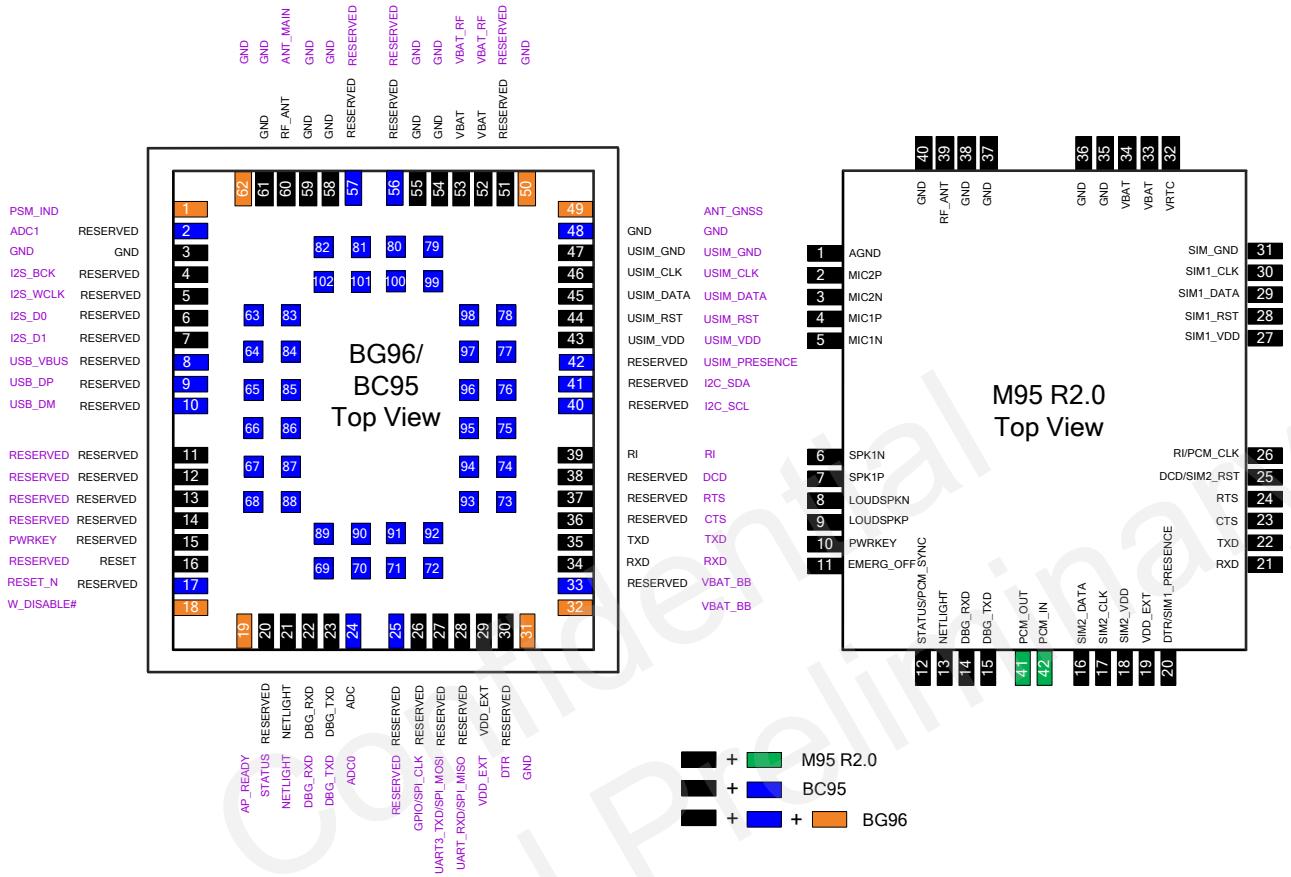


Figure 1: BG96&BC95&M95 R2.0 Pin Assignment

NOTES

1. The orange pins are the additional pins of BG96 as compared with BC95.
2. The blue pins are the additional pins of BC95 as compared with M95 R2.0.
3. The green pins are the additional pins of M95 R2.0 as compared with BG96 and BC95.
4. The pin names marked in purple are BG96's.

The figure below shows the combination of pin assignment for BG96, BC95 and M95 R2.0.

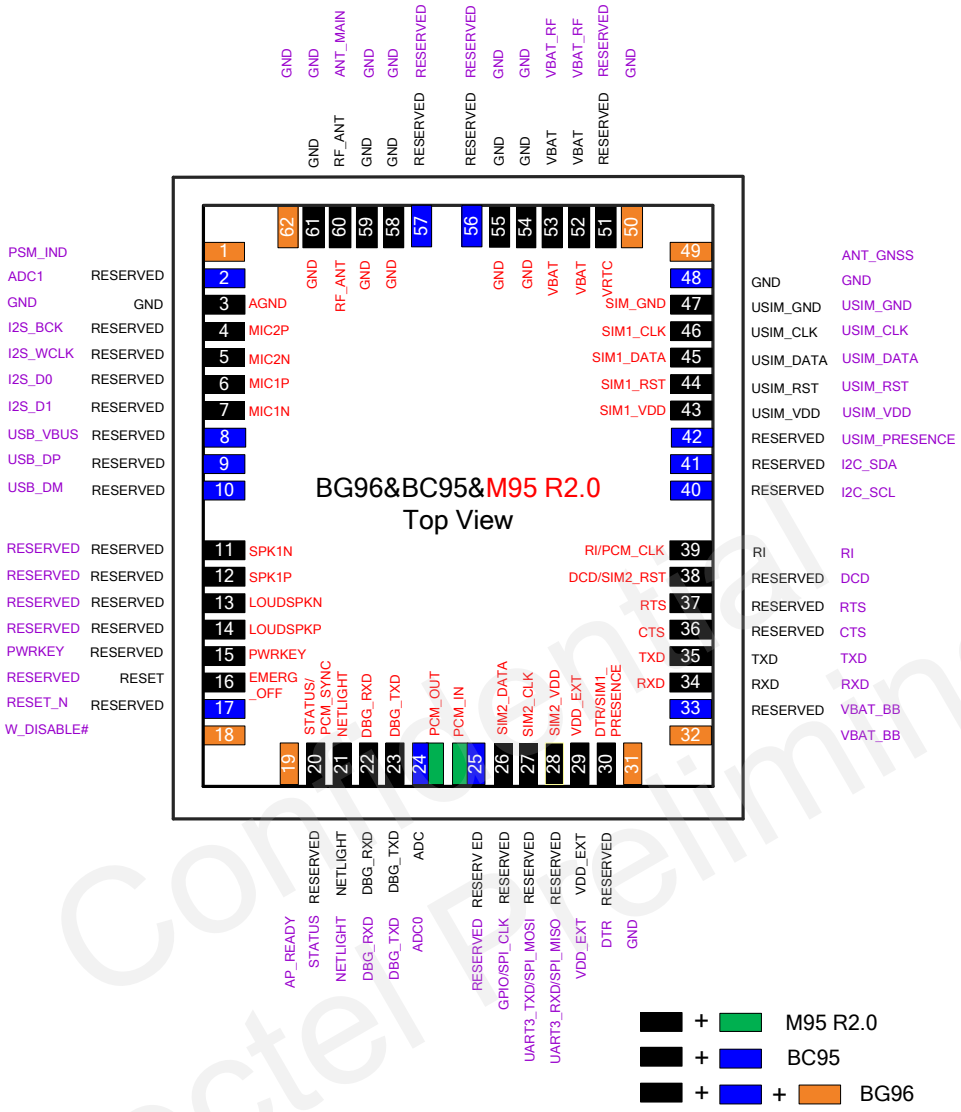


Figure 2: Combination of Pin Assignment of BG96&BC95&M95 R2.0

NOTES

1. BC95 and M95 R2.0 are identical in size, while BG96 is larger.
2. The pin names marked in purple are BG96's.
3. The pin names marked in black are BC95's.
4. The pin names marked in red in the inside area are M95 R2.0's.
5. The orange pins are the additional pins of BG96 as compared with BC95.
6. The blue pins are the additional pins of BC95 as compared with M95 R2.0.
7. The green pins are the additional pins of M95 R2.0 as compared with BC95 and BG96.

3 Pin Description

This chapter describes the pin definition and comparison of BG96, BC95 and M95 R2.0.

Table 3: I/O Parameters Definition

Type	Description
IO	Bidirectional
DI	Digital Input
DO	Digital Output
PI	Power Input
PO	Power Output
AI	Analog Input
AO	Analog Output

The following table shows the comparison of pins among BG96, BC95 and M95 R2.0.

Table 4: Comparison of Pins

BG96				BC95				M95 R2.0			
Pin No.	**Pin Name**	**IO**	**Description**	**Pin No.**	**Pin Name**	**IO**	**Description**	**Pin No.**	**Pin Name**	**IO**	**Description**
1	PSM_IND*	DO	Power saving mode indicator	/	/	/	/	/	/	/	/
2	ADC1	AI	General-purpose analog to digital converter interface	1	RESERVED	/	/	/	/	/	/
3	GND	/	Ground	2	GND	/	Ground	1	AGND	/	Ground
4	I2S_BCLK*	DO	I2S bit clock	3	RESERVED	/	/	2	MIC2P	AI	Channel 2 Microphone positive input
5	I2S_WCLK*	DO	I2S data frame clock	4	RESERVED	/	/	3	MIC2N	AI	Channel 2 Microphone negative input
6	I2S_D0*	IO	I2S data 0	5	RESERVED	/	/	4	MIC1P	AI	Channel 1 Microphone positive input
7	I2S_D1*	IO	I2S data 1	6	RESERVED	/	/	5	MIC1N	AI	Channel 1 Microphone negative input
8	USB_VBUS	PI	USB detection	7	RESERVED	/	/	/	/	/	/
9	USB_DP	IO	USB differential data bus (+)	8	RESERVED	/	/	/	/	/	/

10	USB_DM	IO	USB differential data bus (−)	9	RESERVED	/	/	/	/	/	/
11	RESERVED	/	/	10	RESERVED	/	/	6	SPK1N	AO	Channel 1 audio negative output
12	RESREVED	/	/	11	RESREVED	/	/	7	SPK1P	AO	Channel 1 audio positive output
13	RESERVED	/	/	12	RESREVED	/	/	8	LOUDSPKN	AO	Channel 2 audio negative output
14	RESERVED	/	/	13	RESREVED	/	/	9	LOUDSPKP	AO	Channel 2 audio positive output
15	PWRKEY	DI	Turn on/off the module.	14	RESREVED	/	/	10	PWRKEY	DI	Turn on/off the module. Pulled up to VBAT
16	RESERVED	/	/	15	RESET	DI	Reset signal of the module.	11	EMERG_ OFF	DI	Emergency off. Pulling down for at least 40ms will turn off the module in case of emergency. Use it only when shutting down via PWRKEY or AT command cannot be

											implemented.
17	RESET_N	DI	Reset signal of the module.	16	RESERVED	/	/	/	/	/	/
18	W_ DISABLE#	DI	Airplane mode control	/	/	/	/	/	/	/	/
19	AP_ READY*	DI	Application processor sleep state detection	/	/	/	/	/	/	/	/
20	STATUS	OD	Indicate the module's operation status. 1.8V power domain	17	RESERVED	/	/	12	STATUS/ PCM_SYNC[1)]	DO	Indicate the module's operation status/PCM synchronization signal. These functions can be switched through AT command. 2.8V.
21	NETLIGHT	DO	Indicate the module's network activity status. 1.8V power domain	18	NETLIGHT*	DO	Indicate the module's network activity status. 2.8V power domain	13	NETLIGHT	DO	Indicate the module's network activity status. 2.8V power domain
22	DBG_RXD	DI	Receive data. 1.8V power domain	19	DBG_RXD	DI	Receive data. 3.0V power domain	14	DBG_RXD	DI	Receive data. 2.8V power domain
23	DBG_TXD	DO	Transmit data.	20	DBG_TXD	DO	Transmit data.	15	DBG_TXD	DO	Transmit data.

			1.8V power domain				3.0V power domain				2.8V power domain
24	ADC0	AI	General-purpose analog to digital converter interface	21	ADC*	AI	General-purpose analog to digital converter interface	/	/	/	/
/	/	/	/	/	/	/	/	41	PCM_OUT	DO	PCM serial data output. 2.8V power domain
/	/	/	/	/	/	/	/	42	PCM_IN	DI	PCM serial data input. 2.8V power domain
25	RESERVED	/	/	22	RESERVED	/	/	/	/	/	/
26	GPIO/ SPI_CLK*[5)]	DO	GPIO/ SPI serial clock	23	RESERVED	/	/	16	SIM2_DATA	IO	Data signal of (U)SIM2 card. 1.8V/3.0V
27	UART3_ TXD/ SPI_MOSI*[6)]	DO	Transmit data/ Master Out Salve In of SPI interface	24	RESERVED	/	/	17	SIM2_CLK	DO	Clock signal of (U)SIM2 card. 1.8V/3.0V
28	UART3_ RXD/ SPI_MISO*[7)]	DI	Receive data/ Master In Slave Out of SPI interface	25	RESERVED	/	/	18	SIM2_VDD	PO	Power supply for (U)SIM2 card. 1.8V/3.0V.

29	VDD_EXT	PO	Provide 1.8V for external circuit	26	VDD_EXT	PO	Provide 3.0V for external circuit	19	VDD_EXT	PO	Provide 2.8V for external circuit
30	DTR	DI	Data terminal ready. Sleep mode control.	27	RESERVED	/	/	20	DTR/SIM1_ PRESENCE[2)]	DI	Data terminal ready/ (U)SIM1 card insertion detection. These functions can be switched through AT command. 2.8V
31	GND	/	Ground	/	/	/	/	/	/	/	/
32	VBAT_BB	PI	Power supply for module baseband part. 3.3V~4.3V	/	/	/	/	/	/	/	/
33	VBAT_BB	PI	Power supply for module baseband part. 3.3V~4.3V	28	RESERVED	/	/	/	/	/	/
34	RXD	DI	Receive data. 1.8V power domain	29	RXD	DI	Receive data. 3.0V power domain	21	RXD	DI	Receive data. 2.8V power domain
35	TXD	DO	Transmit data. 1.8V power domain	30	TXD	DO	Transmit data. 3.0V power domain	22	TXD	DO	Transmit data. 2.8V power domain
36	CTS	D0	Clear to send.	31	RESERVED	/	/	23	CTS	DO	Clear to send.

			1.8V power domain							2.8V power domain
37	RTS	DI	Request to send. 1.8V power domain	32	RESERVED	/	/	24	RTS	DI	Request to send. 2.8V power domain
38	DCD	DO	Data carrier detection. 1.8V power domain	33	RESERVED	/	/	25	DCD/ SIM2_RST[3)]	DO	Data carrier detection/Reset signal of (U)SIM2 card. 2.8V power domain
39	RI	DO	Ring indicator. 1.8V power domain	34	RI*	DO	Ring indicator 3.0V power domain	26	RI/ PCM_CLK[4)]	DO	Ring indicator/PCM clock signal. These functions can be switched through AT command. 2.8V power domain
40	I2C_SCL	OD	I2C serial clock. Used for external codec.	35	RESERVED	/	/	/	/	/	/
41	I2C_SDA	OD	I2C serial data. Used for external codec.	36	RESERVED	/	/	/	/	/	/
42	USIM_ PRESENCE	DI	(U)SIM card insertion detection	37	RESERVED	/	/	/	/	/	/

43	USIM_VDD	PO	Power supply for (U)SIM card. 1.8V/3.0V	38	USIM_VDD	PO	Power supply for USIM card. 3.0V	27	SIM1_VDD	PO	Power supply for (U)SIM1 card. 1.8V/3.0V
44	USIM_RST	DO	Reset signal of (U)SIM card. 1.8V/3.0V	39	USIM_RST	DO	Reset signal of USIM card. 3.0V	28	SIM1_RST	DO	Reset signal of (U)SIM1 card. 1.8V/3.0V
45	USIM_DATA	IO	Data signal of (U)SIM card. 1.8V/3.0V	40	USIM_ DATA	IO	Data signal of USIM card. 3.0V	29	SIM1_DATA	IO	Data signal of (U)SIM1 card. 1.8V/3.0V
46	USIM_CLK	DO	Clock signal of (U)SIM card. 1.8V/3.0V	41	USIM_ CLK	DO	Clock signal of USIM card. 3.0V	30	SIM1_CLK	DO	Clock signal of (U)SIM1 card. 1.8V/3.0V
47	USIM_ GND	/	Specified ground for (U)SIM card	42	USIM_ GND	/	Specified ground for USIM card	31	SIM1_GND	/	Specified ground for (U)SIM1 card
48	GND	/	Ground	43	GND	/	Ground	/	/	/	/
49	ANT_GNSS	AI	GNSS antenna interface	/	/	/	/	/	/	/	/
50	GND	/	Ground	/	/	/	/	/	/	/	/
51	RESERVED	/	/	44	RESERVED	/	/	32	VRTC	PI/ PO	$V_O$max=3.0V $V_O$min=2.0V $V_O$norm=2.8V V_I=1.5V~3.3V Iin≈10uA
52	VBAT_RF	PI	Power supply for module RF part. 3.3V~4.3V	45	VBAT	PI	Main power supply of module. 3.1V~4.2V	33	VBAT	PI	Main power supply of module. 3.3V~4.6V

53	VBAT_RF	PI	Power supply for module RF part. 3.3V~4.3V	46	VBAT	PI	Main power supply of module. 3.1V~4.2V	34	VBAT	PI	Main power supply of module. 3.3V~4.6V
54	GND	/	Ground	47	GND	/	Ground	35	GND	/	Ground
55	GND	/	Ground	48	GND	/	Ground	36	GND	/	Ground
56	RESERVED	/	/	49	RESERVED	/	/	/	/	/	/
57	RESERVED	/	/	50	RESERVED	/	/	/	/	/	/
58	GND	/	Ground	51	GND	/	Ground	37	GND	/	Ground
59	GND	/	Ground	52	GND	/	Ground	38	GND	/	Ground
60	ANT_MAIN	IO	Main antenna interface	53	RF_ANT	IO	RF antenna	39	RF_ANT	IO	RF antenna
61	GND	/	Ground	54	GND	/	Ground	40	GND	/	Ground
62	GND	/	Ground	/	/	/	/	/	/	/	/
63	I2S_MCLK*	DO	I2S master clock	55	RESERVED	/	/	/	/	/	/
64	GPIO*	IO	General-purpose input and output	56	RESERVED	/	/	/	/	/	/
75	USB_BOOT	DI	Force the module to boot from USB port.	67	RESERVED	/	/	/	/	/	/
65~66 76~78 83~88 92~99	RESERVED	/	/	57~58 68~70 75~80 84~91	RESERVED	/	/	/	/	/	/

67~74 79~82 89~91 100~ 102	GND	/	Ground	59~66 71~74 81~83 92~94	GND	/	Ground	/	/	/	/

NOTES

1. Keep all reserved and unused pins unconnected.
2. All GND pins should be connected to ground.
3. The AGND pin of M95 R2.0 should be routed as single-ended to main ground when analog audio is used in single-ended application. Otherwise, it can be connected to GND directly.
4. The green pins are the additional pins of M95 R2.0 as compared with BC95 and BG96.
5. "*" means under development.
6. [1] The STATUS pin of M95 R2.0 can be multiplexed as PCM_SYNC pin.
7. [2] DTR pin can be multiplexed as SIM1_PRESENCE pin via AT command. For more details, please refer to ***document [3]***.
8. [3] The DCD pin of M95 R2.0 can be multiplexed as SIM2_RST pin. For more details, please refer to ***document [4]***.
9. [4] The RI pin of M95 R2.0 can be multiplexed as PCM_CLK pin.
10. [5] The BG96's pin 26 defaults to GPIO function and can be multiplexed as SPI_CLK pin.
11. [6] The BG96's pin 27 defaults to UART3_TXD function and can be multiplexed as SPI_MOSI pin.
12. [7] The BG96's pin 28 defaults to UART3_RXD function and can be multiplexed as SPI_MISO pin.

4 Hardware Reference Design

The following chapters describe compatible design among BG96, BC95 and M95 R2.0 on main functionalities.

4.1. Power Supply

4.1.1. Reference Design for Power Supply

The power supply is one of the key factors in module design, as the performance of a module largely depends on the power source. The power supply for BG96, BC95 and M95 R2.0 should be able to provide sufficient current up to 2A.

The following figure shows a reference design for battery power source. The typical output voltage is 3.8V.

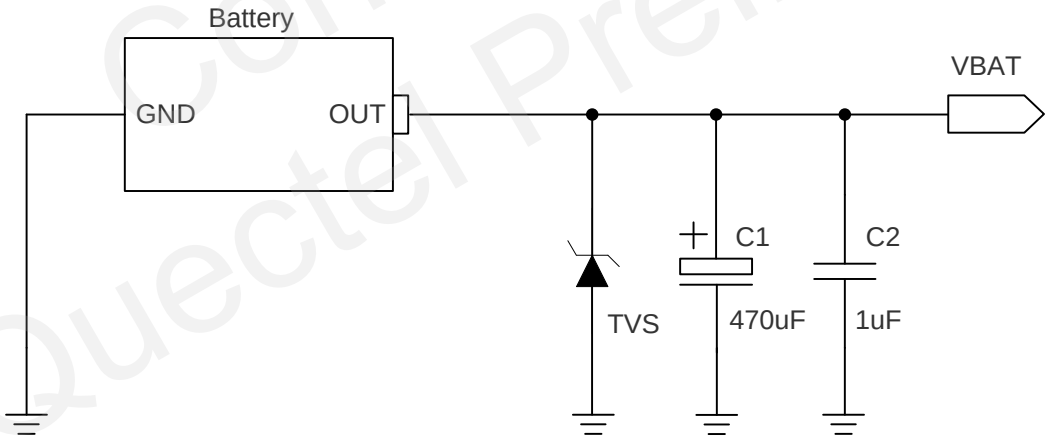


Figure 3: Reference Circuit of Battery Power Supply

4.1.2. Reduce Voltage Drop

The power supply voltage range of BG96, BC95 and M95 R2.0 is shown in the following table.

Table 5: Power Supply Voltage Range

Module	Pin Name	Conditions	Min.	Typ.	Max.	Unit
BG96	VBAT_BB & VBAT_RF	The power supply voltage range of modules must be within min/max values.	3.3	3.8	4.3	V
BC95	VBAT		3.1	3.8	4.2	V
M95 R2.0	VBAT		3.3	4.0	4.6	V

In the consideration of the compatible design of the modules, please make sure that the input voltage will never drop to below 3.3V or exceed 4.2V.

The power input pin of BC95 and M95 R2.0 is VBAT, while the power input pins of BG96 are VBAT_BB and VBAT_RF. The VBAT_RF of BG96 is compatible with the VBAT of BC95 and M95 R2.0. Capacitors C1~C4 are recommended to be used only in the power supply design of BG96. The reference circuit is as the following figure.

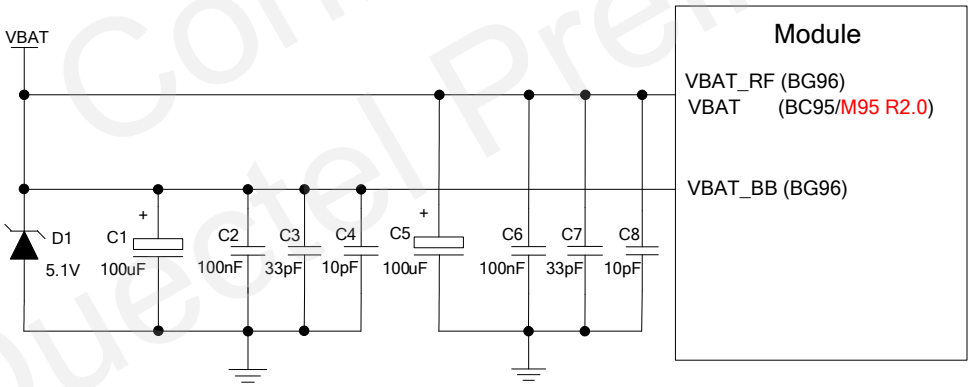


Figure 4: Reference Circuit for VBAT Input

4.2. Power-on Circuit

The turn-on method of BC95 is different from BG96 and M95 R2.0. BC95 will be automatically turned on when supplying power to VBAT pins, while BG96 and M95 R2.0 are started by pressing PWRKEY for a certain time. The following circuit is a reference design for BG96 and M95 R2.0 power-on circuit.

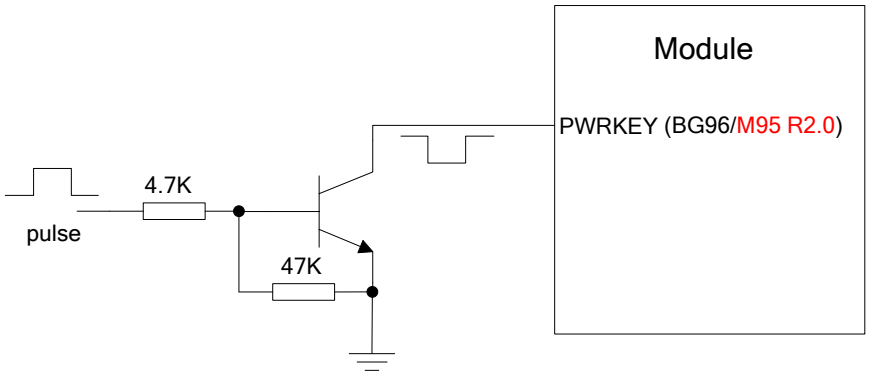


Figure 5: Driving Circuit of the PWRKEY

The turning on scenarios of BG96, BC95 and M95 R2.0 are illustrated as the following figure.

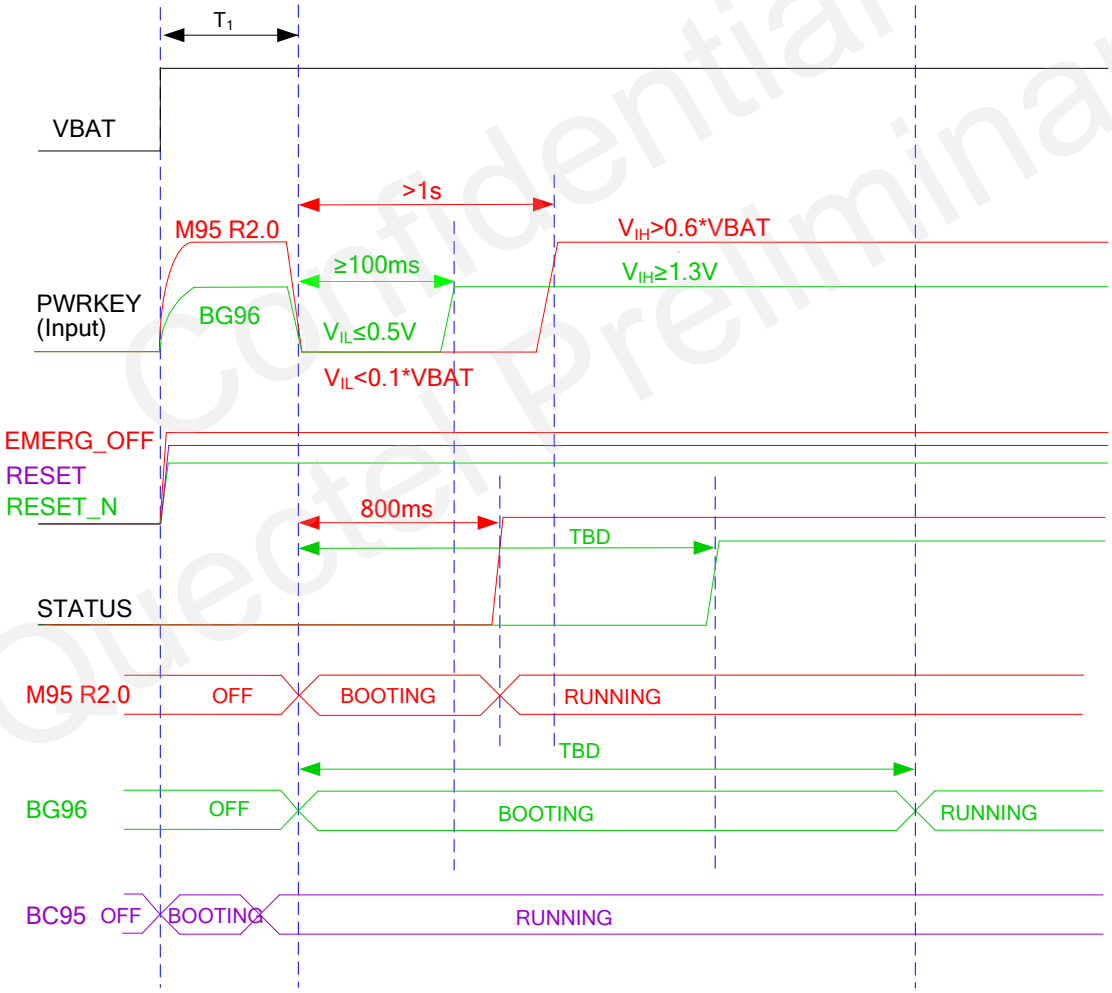


Figure 6: Timing of Turning on Scenarios

NOTES

1. Make sure that VBAT is stable before pulling down the PWRKEY pin of BG96/M95 R2.0. T1 is recommended to be 100ms after powering on VBAT to 3.8V. It is not recommended to always pull down PWRKEY pin.
2. The parts in the above figure marked in green are the turning on scenarios of BG96.
3. The parts in the above figure marked in purple are the turning on scenarios of BC95.
4. The parts in the above figure marked in red are the turning on scenarios of M95 R2.0.

4.3. Power-off Circuit

4.3.1. Power Down Module

BG96 and M95 R2.0 modules can be turned off through **AT+QPOWD** command or driving the PWRKEY to a low level voltage for a certain time, while BC95 can only be turned off by shutting down the VBAT power supply.

The power-down scenarios are illustrated as the following figure.

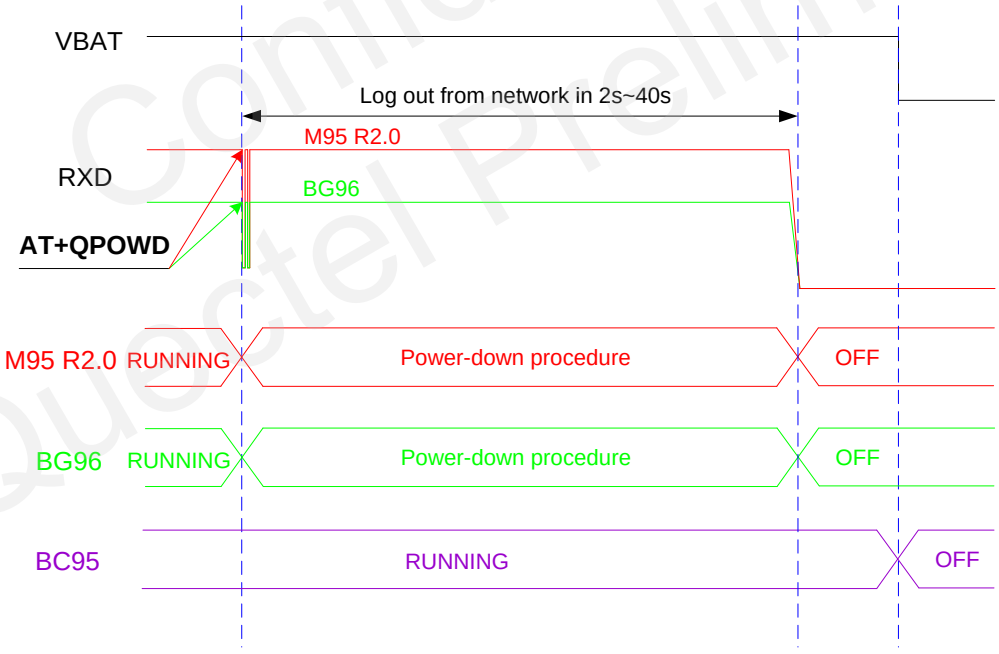


Figure 7: Timing of Turning off Scenarios (Use AT Command for BG96 and M95 R2.0)

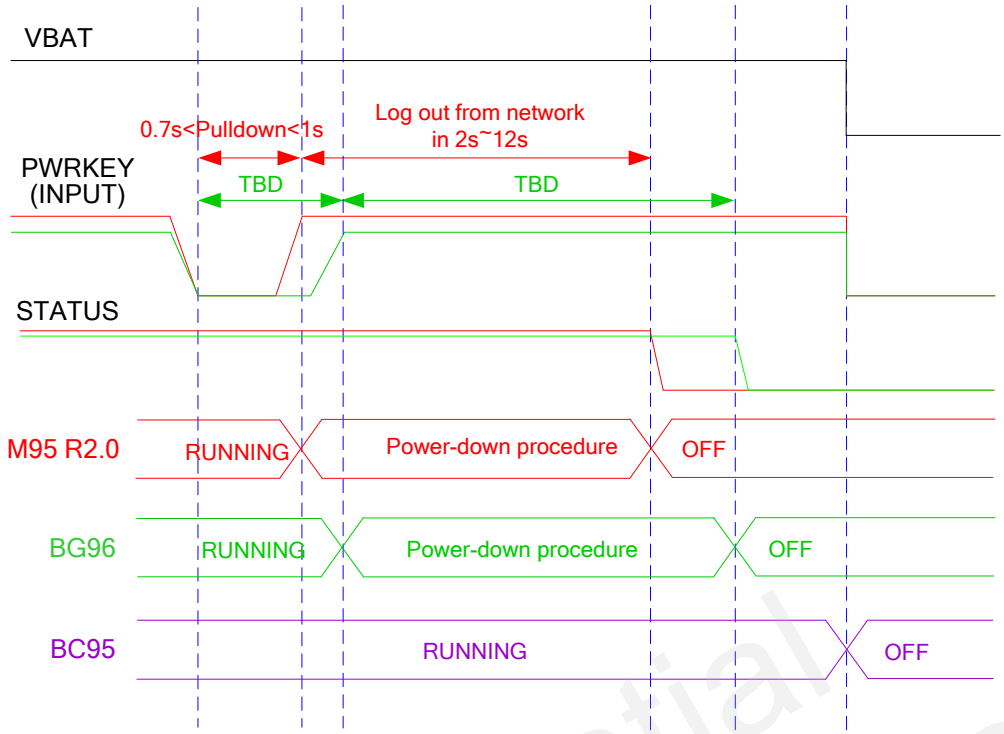


Figure 8: Timing of Turning off Scenarios (Use PWRKEY for BG96 and M95 R2.0)

NOTES

1. The parts in the above two figures marked in green are the turning off scenarios of BG96.
2. The parts in the above two figures marked in purple are the turning off scenarios of BC95.
3. The parts in the above two figures marked in red are the turning off scenarios of M95 R2.0.
4. The time of logging out from network depends on the local network signal.

4.3.2. EMERG_OFF & RESET Interfaces

The EMERG_OFF circuit of M95 R2.0 is compatible with the RESET circuit of BG96 and BC95. M95 R2.0 can be shut down by EMERG_OFF pin, while BG96 and BC95 can be reset by pins RESET_N and RESET respectively. Be cautious to use the pins EMERG_OFF and RESET_N/RESET, which should only be used under emergency situations, such as when the module crashes or works abnormally.

The following circuit is a reference design for BG96/BC95's reset and M95 R2.0's emergency shutdown.

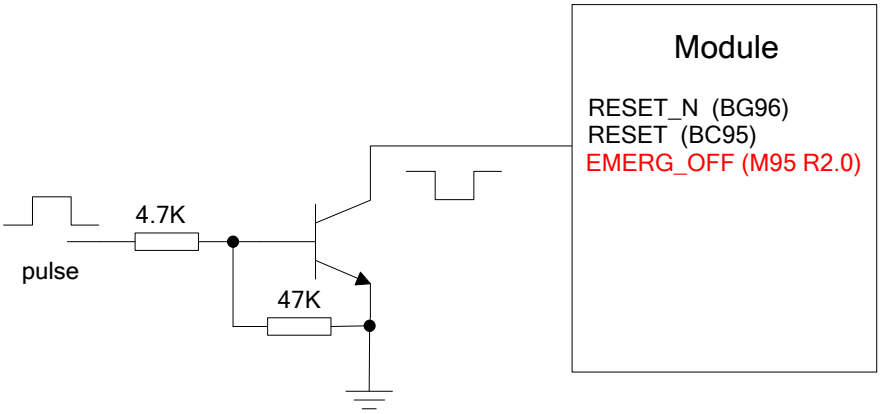


Figure 9: Driving Circuit of Emergency Shutdown and Reset

The emergency shutdown and reset scenarios are illustrated as the following figure.

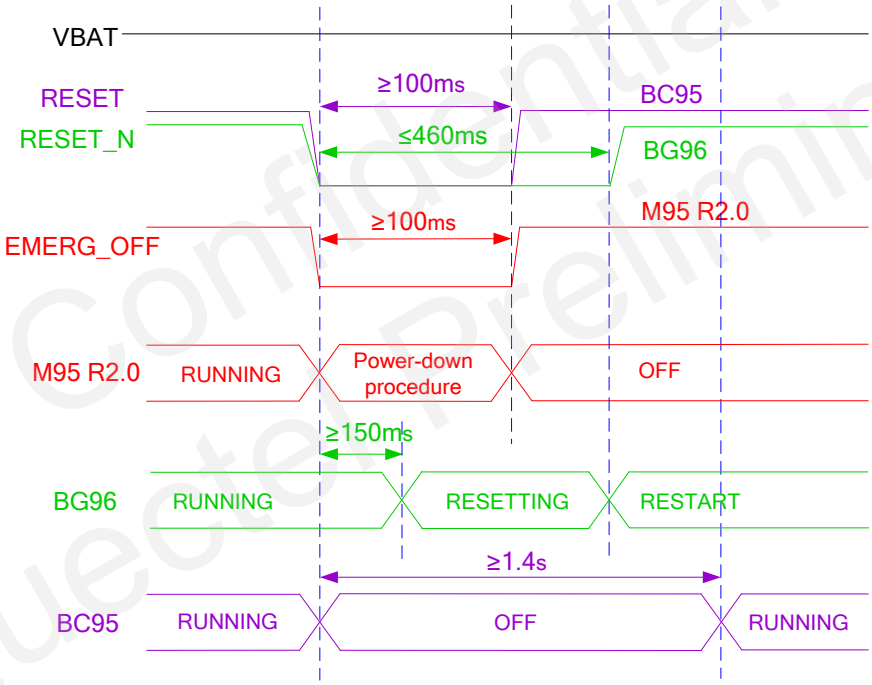


Figure 10: Timing of Emergency Shutdown and Reset

NOTES

1. The parts in the above figure marked in green are the reset scenarios of BG96.
2. The parts in the above figure marked in purple are the reset scenarios of BC95.
3. The parts in the above figure marked in red are the emergency shutdown scenarios of M95 R2.0.

4.4. Network Status Indication*

The NETLIGHT pin can be used to drive a network status indicator LED. The following circuit is a reference design of NETLIGHT.

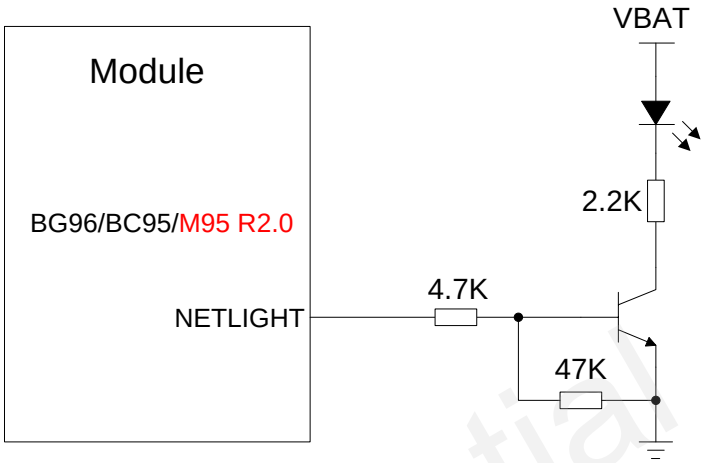


Figure 11: Reference Circuit of the NETLIGHT

NOTE

"*" means this function of BC95 is under development.

4.5. (U)SIM Interfaces

The (U)SIM interfaces of BG96 and M95 R2.0 both support 1.8V or 3.0V USIM/SIM cards by default, and BC95 only supports 3.0V USIM card. The pin assignment of (U)SIM interfaces of BG96 and BC95 is compatible with that of the (U)SIM1 interface of M95 R2.0.

The following figure shows a reference design for (U)SIM card interface with a 6-pin (U)SIM card connector.

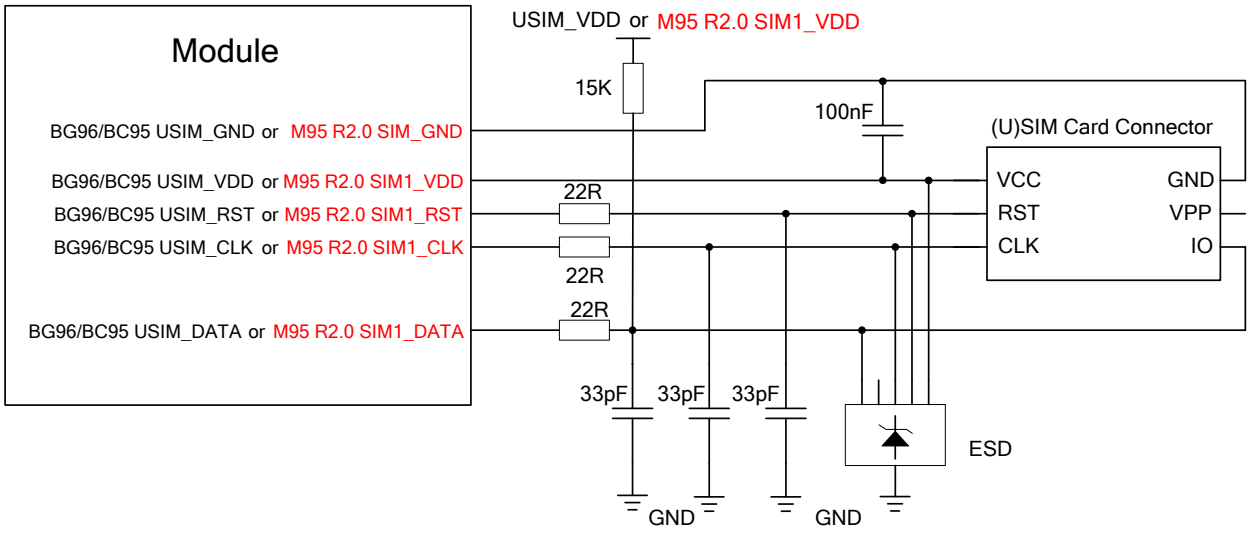


Figure 12: Reference Circuit of (U)SIM Card Interfaces with a 6-Pin (U)SIM Card Connector

4.6. UART Interfaces

Main UART port and Debug port on BG96, BC95 and M95 R2.0 have the same function, but with different voltage domain. The UART3 of BG96 is the additional UART interface as compared with BC95 and M95 R2.0. The main UART port of BC95 does not support RTS/CTS flow control. The following table shows the detailed voltage domain of UART interfaces.

Table 6: Voltage Domain of UART Interfaces

Module	UART Interfaces	Voltage Domain	Description
BG96	Main UART port & Debug port & UART3	1.8V power domain	Main UART port supports RTS/CTS.
BC95	Main UART port & Debug port	3.0V power domain	Main UART port does not support RTS/CTS.
M95 R2.0	Main UART port & Debug port	2.8V power domain	Main UART port supports RTS/CTS.

The following circuit shows a reference design of UART interface level match when application processor communicates with module via UART interface. It is recommended to add a level match circuit between BG96/BC95/M95 R2.0 module and DTE because of the difference on power domain. For details, please refer to ***document [1]***, ***[2]*** and ***[3]***.

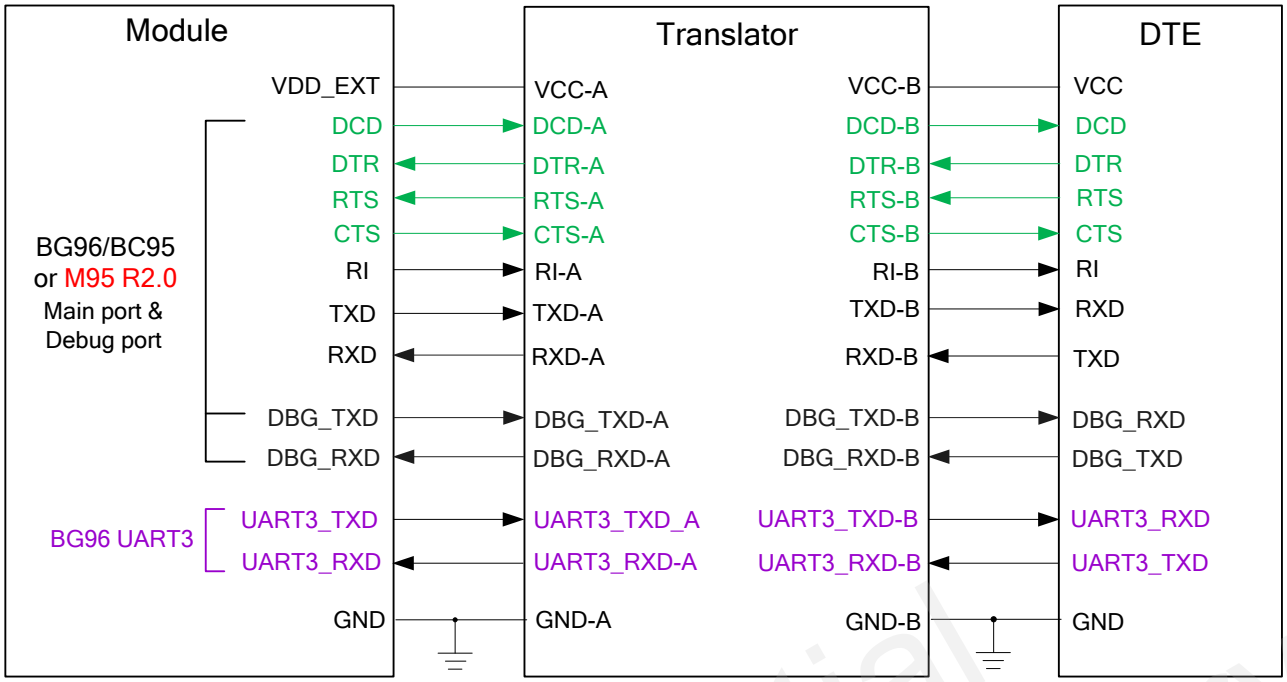


Figure 13: Reference Design of UART Interface

NOTES

1. The UART pins of BG96, BC95 and M95 R2.0 belong to 1.8V, 3.0V and 2.8V power domain respectively.
2. The green parts in the above figure are the additional pins and circuit designs of BG96 and M95 R2.0 as compared with BC95.
3. The purple parts in the above figure are the dedicated UART3 and circuit design of BG96.

4.7. RF Interface

ANT_MAIN pin of BG96 is compatible with the RF_ANT pin of BC95/M95 R2.0. The impedance of RF interface is 50Ω. A reference circuit is shown as the following figure. In order to achieve better RF performance, a π-type matching circuit should be reserved, and the π-type matching components (R1, C1, C2) should be placed as close to the antenna as possible. The resistance of R1 is 0Ω by default and capacitors C1/C2 are not mounted.

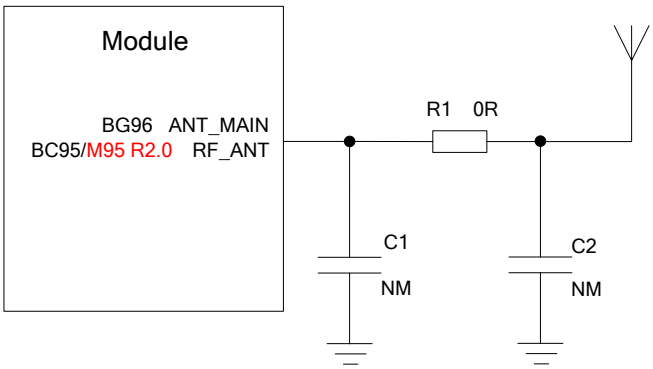
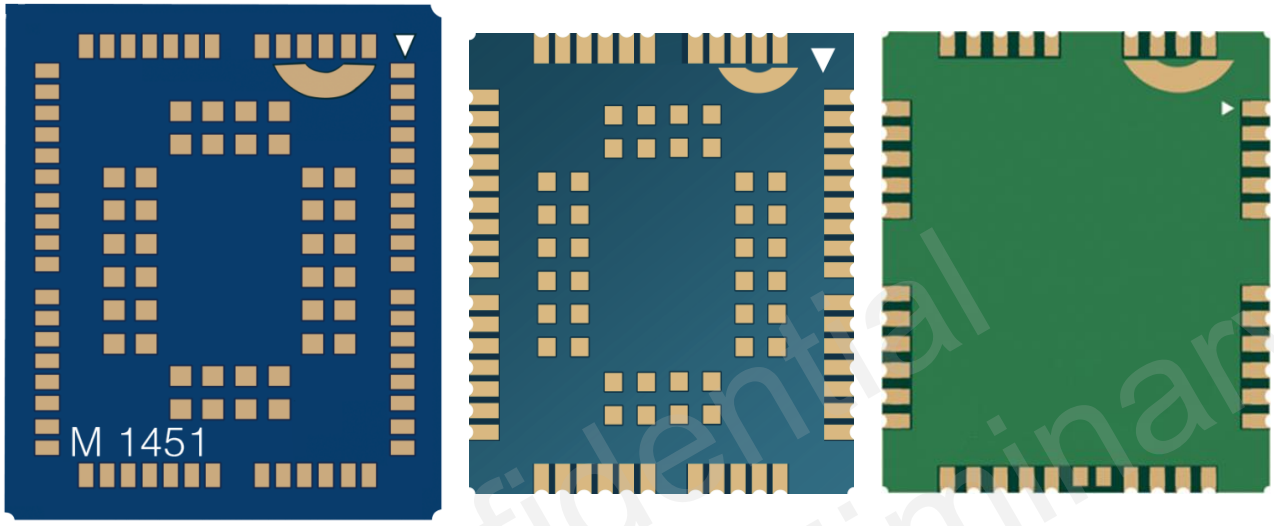


Figure 14: Reference Circuit of RF Interface

5 Recommended Footprint

The following figure shows the bottom views of BG96, BC95 and M95 R2.0.



BG96 BC95 M95 R2.0

Figure 15: Bottom Views of BG96, BC95 and M95 R2.0

The following figure shows the recommended compatible footprint of BG96, BC95 and M95 R2.0.

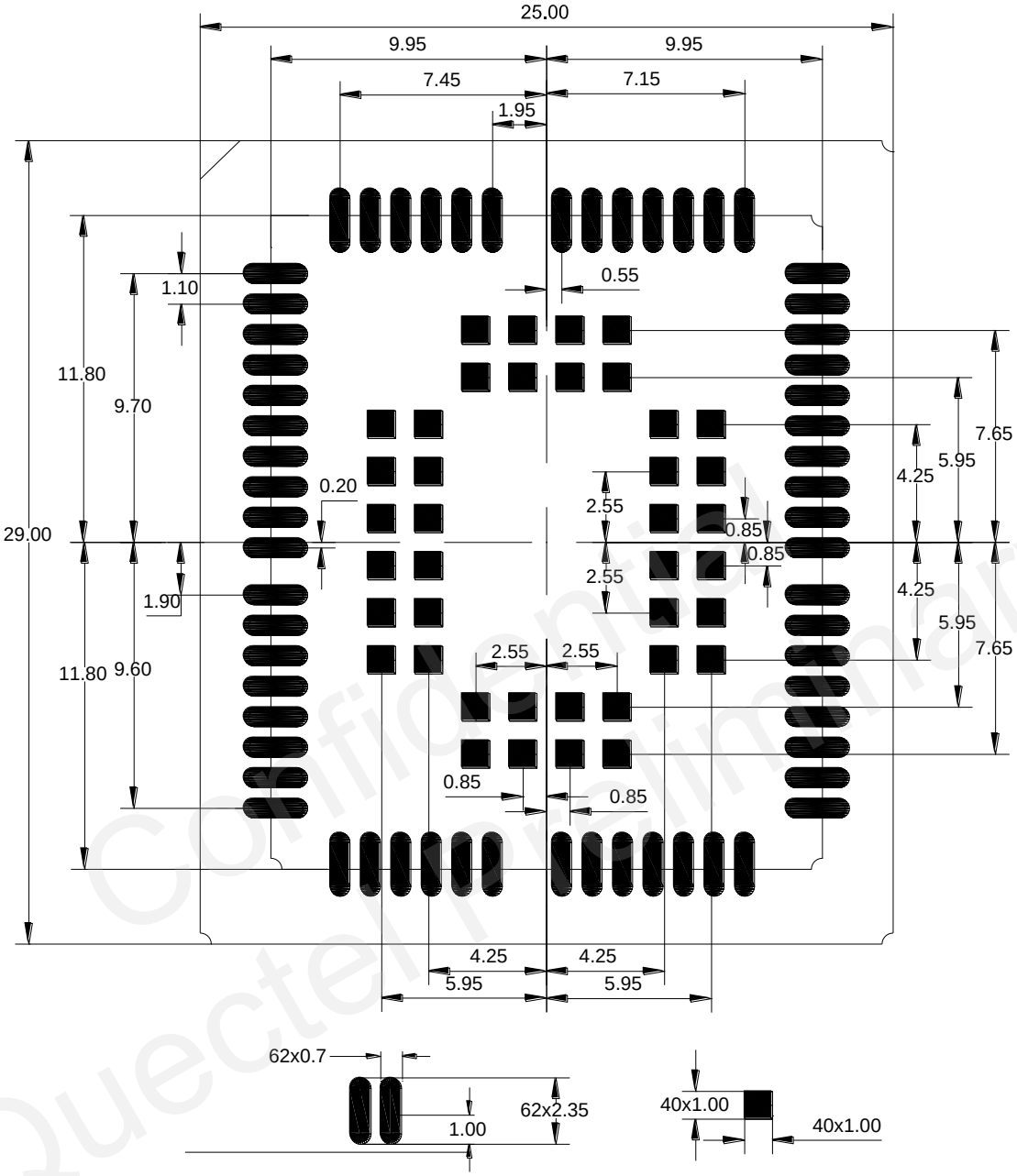


Figure 16: Recommended Compatible Footprint (Unit: mm)

As the thickness of PCB is different, to ensure the module soldering quality, the thickness of stencil is recommended to be 0.18mm for BG96, 0.15mm for BC95, and 0.2mm for M95 R2.0. For more details, please refer to ***document [5]***.

The recommended stencil of BG96 is shown as below.

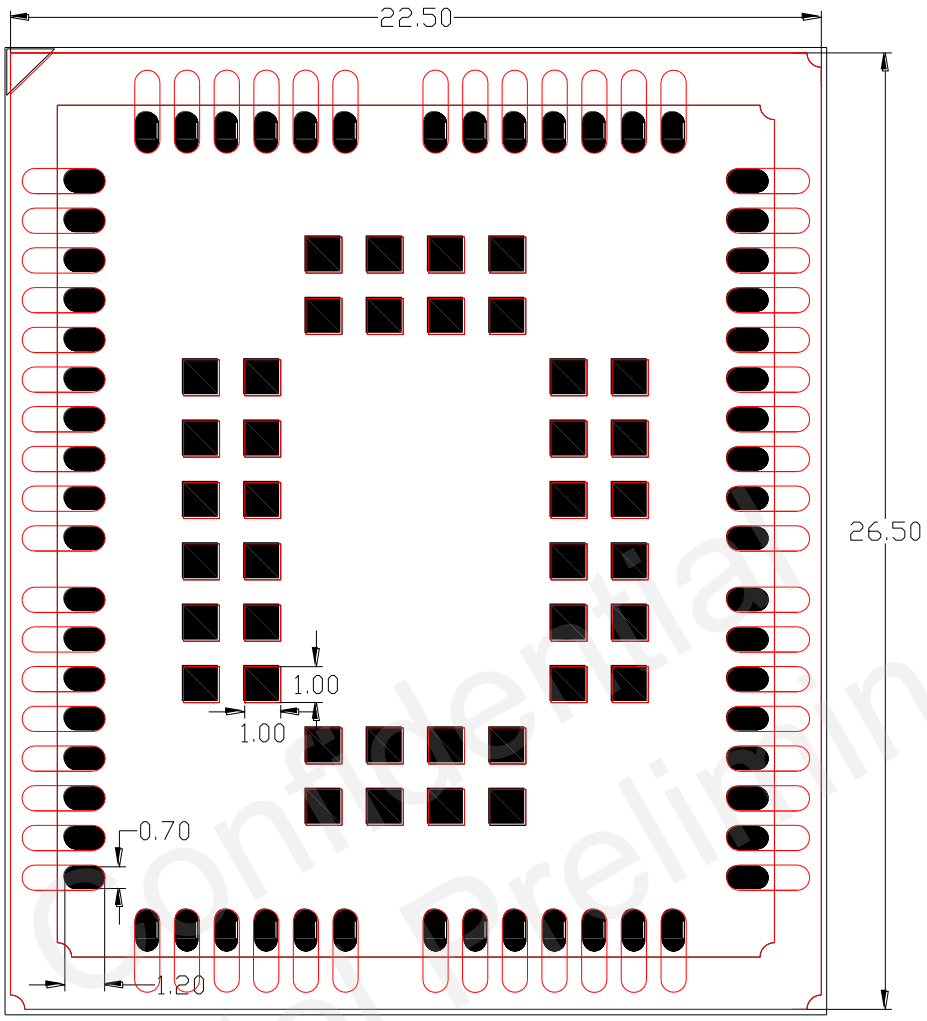


Figure 17: Recommended Stencil of BG96 (Unit: mm)

The recommended stencil of BC95 is shown as below.

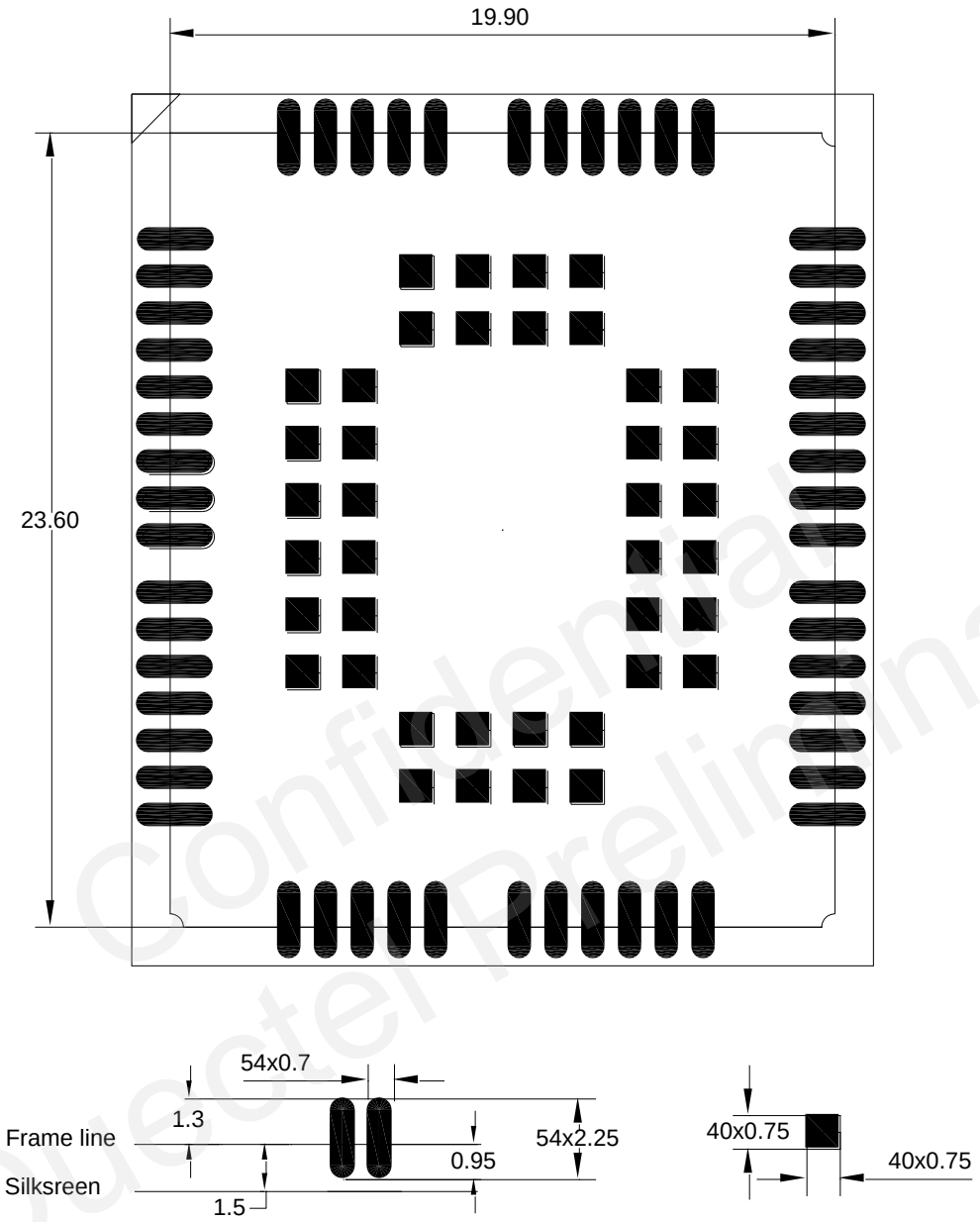


Figure 18: Recommended Stencil of BC95 (Unit: mm)

The recommended stencil of M95 R2.0 is shown as below.

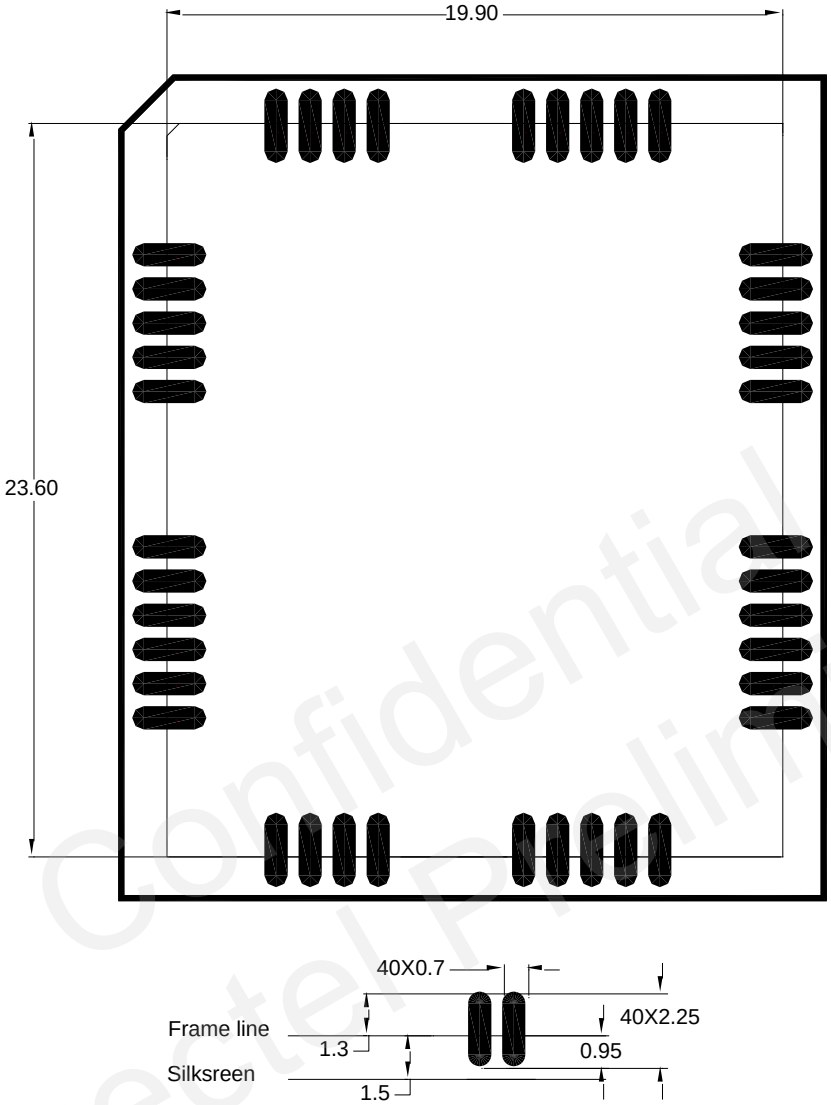


Figure 19: Recommended Stencil of M95 R2.0 (Unit: mm)

The following figure shows the sketch map of installation among BG96, BC95 and M95 R2.0.

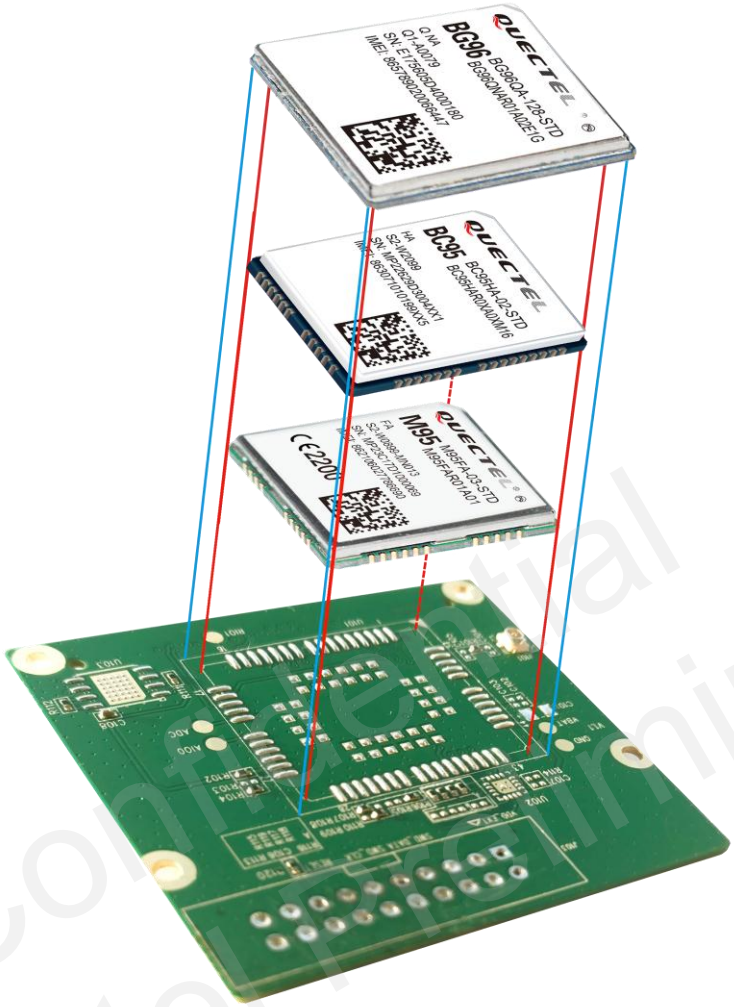


Figure 20: Installation Sketch Map for BG96, BC95 and M95 R2.0

6 Manufacturing

6.1. Manufacturing and 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 BG96 module is recommended to be 0.18mm, for BC95 module is 0.15mm, and for M95 R2.0 module is 0.2mm. For more details, please refer to ***document [5]***.

It is suggested that the peak reflow temperature is 235 ~ 245ºC (for SnAg3.0Cu0.5 alloy). The absolute max reflow temperature is 260ºC. To avoid damage to the module when it is repeatedly heated, 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.

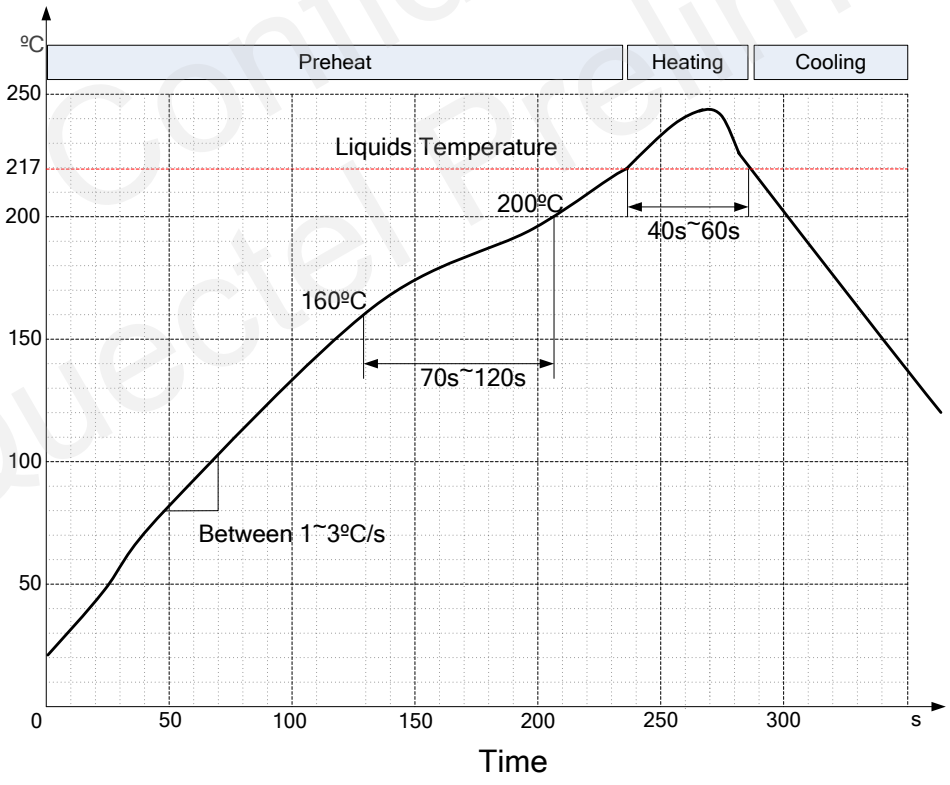


Figure 21: Reflow Soldering Thermal Profile

7 Appendix A References

Table 7: Related Documents

SN	Document Name	Remark
[1]	Quectel_BG96_Hardware_Design	BG96 hardware design
[2]	Quectel_BC95_Hardware_Design	BC95 hardware design
[3]	Quectel_M95_Hardware_Design	M95 hardware design
[4]	Quectel_M95_Dual_SIM_Application_Note	M95 dual SIM application note
[5]	Quectel_Module_Secondary_SMT_User_Guide	Module secondary SMT user guide

Table 8: Terms and Abbreviations

Abbreviation	Description
CTS	Clear To Send
DFOTA	Delta Firmware Upgrade Over the Air
ESD	Electrostatic Discharge
3GPP	3rd Generation Partnership Project
GND	Ground
PCB	Printed Circuit Board
PCM	Pulse Code Modulation
RTS	Ready To Send
SIM	Subscriber Identity Module
SMT	Surface Mount Technology
SWD	Serial Wire Debug

TBD	To Be Determined
UART	Universal Asynchronous Receiver & Transmitter
USB	Universal Serial Bus
USIM	Universal Mobile Telecommunication System
$V_O$max	Maximum Output Voltage Value
$V_O$norm	Normal Output Voltage Value
$V_O$min	Minimum Output Voltage Value