UC20&M10

Compatible Design

UMTS/HSPA Module Series

Rev. UC20&M10_Compatible_Design_V1.3

Date: 2014-10-21

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About the Document

History

Revision	Date	Author	Description
1.0	2013-07-31	Mountain ZHOU	Initial
1.1	2013-08-22	Mountain ZHOU	1. Modified recommended footprint. 2. Updated Figure 5.
1.2	2014-1-17	Huik LI	1. Defined UC20-A as 3G only module. 2. Modified Table 6. 3. Released UC20's pin 2. 4. Added note for Figure 3. 5. Modified description of I2C in Table 5.
1.3	2014-10-21	Huik LI	1. Updated Figure 3 and Figure 14. 2. Changed TXB0108 to TXS0108 in Figure 12. 3. Modified VBAT voltage range of UC20. 4. Deleted FB1 and FB2 in Figure 15.

Contents

Table Index

Figure Index

1 Introduction

Quectel UC20 module is compatible with M10 module. This document briefly describes the compatible design of UC20 and M10. UC20 and M10 can be substituted with each other in your design and manufacturing.

2 General Descriptions

2.1. Product Description

The M10 is a Quad-band GSM/GPRS module that works at frequencies of GSM850, EGSM900, DCS1800 and PCS1900 and UC20 is a UMTS/HSPA+ module including three variants, UC20-A, UC20-E and UC20-G. The following tables show the frequency bands and module general information.

Table 1: Module Frequency Bands

Module	Frequency Bands
M10	GSM850/900/1800/1900
UC20-A	UMTS850/1900
UC20-E	GSM850/900/1800/1900, UMTS900/2100
UC20-G	GSM850/900/1800/1900, UMTS800/850/900/1900/2100

UC20 and M10 are designed as compatible products. You can choose the right module for your applications. Under the help of the compatible design guideline, you can migrate your products from M10 2G engine to UC20 3G module smoothly.

Table 2: Module General Information

Module Name	Picture	Packaging	Dimensions	Description
M10		64-pin LCC	29 × 29 × 3.6mm	GSM/GPRS module
UC20		72-pin LCC + 40 other pads	29 × 32 × 2.5mm	UMTS/HSPA+ module (UC20-A, UC20-E and UC20-G)

2.2. Pin Assignment

The following figures show the pin assignment of M10 and UC20.
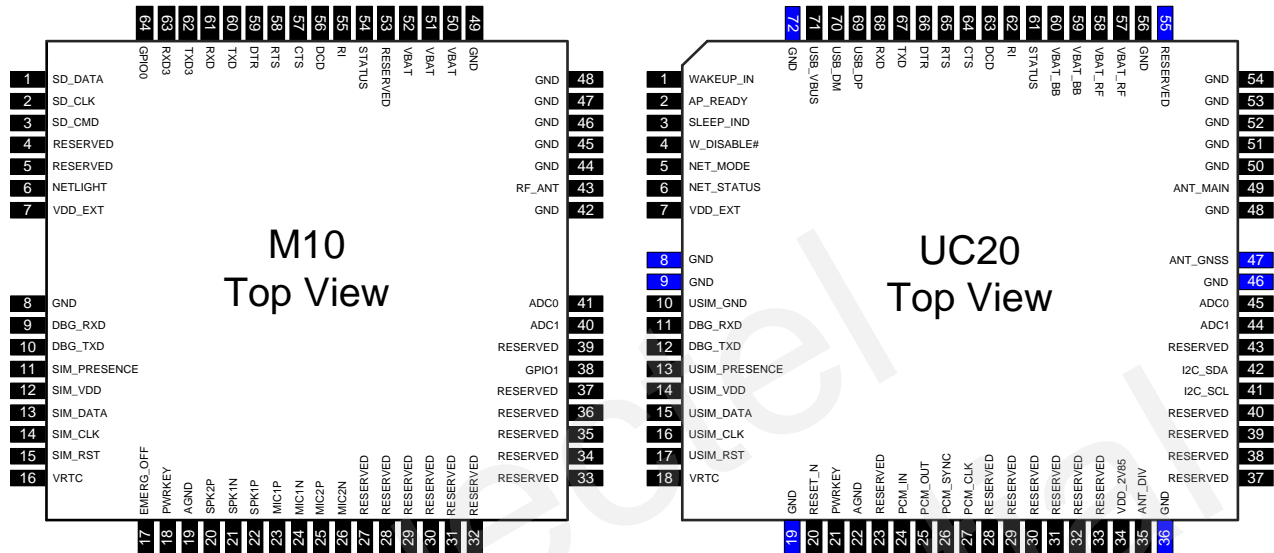
Figure 1: M10&UC20 Pin Assignment

> **NOTE**

The blue pins of UC20 are the additional pins compared with M10.

Figure 2 shows the combination of pin assignment of UC20 and M10.
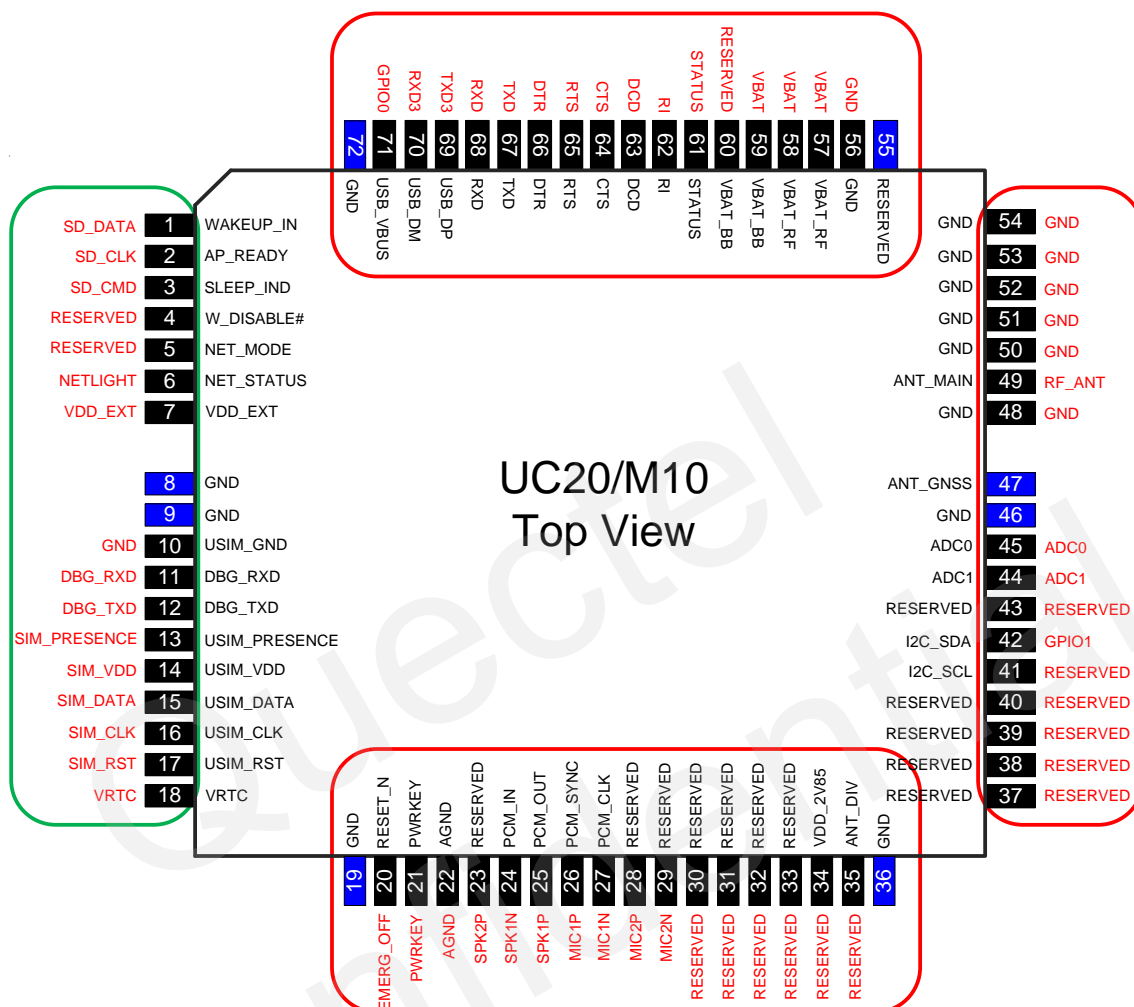
Figure 2: Combined Pin Assignment of UC20&M10

NOTES

1. The blue pins of UC20 are the additional pins compared with M10.
2. The pin names marked in red in the outside area are M10's.
3. The pins of main function in red pane are compatible pins of M10 and UC20.
4. The pins in green pane are compatible pins of M10 and UC20 in main function. However, please pay attention to the recommended footprint and reference design of the compatibility when you design your applications.

3 Pin Description

This chapter describes the pin definition and assignment of UC20 and M10.

Table 3: Parameters

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

3.1. Common Pins

The following table shows M10 and UC20's common pins with the same function.

Table 4: Common Pins

M10				UC20			
Pin NO.	Pin Name	IO	Power Domain	Pin NO.	Pin Name	IO	Power Domain
6	NETLIGHT	DO	2.8V	6	NET_STATUS	DO	1.8V
7	VDD_EXT	PO	2.8V	7	VDD_EXT	PO	1.8V

8	GND	-	Ground	10	USIM_GND	-	Ground
9	DBG_RXD	DI	2.8V	11	DBG_RXD	DI	1.8V
10	DBG_TXD	DO	2.8V	12	DBG_TXD	DO	1.8V
11	SIM_PRESENCE	DI	2.8V	13	USIM_PRESENCE	DI	1.8V
12	SIM_VDD	PO	1.8/3.0V	14	USIM_VDD	PO	1.8/3.0V
13	SIM_DATA	IO	1.8/3.0V	15	USIM_DATA	IO	1.8/3.0V
14	SIM_CLK	DO	1.8/3.0V	16	USIM_CLK	DO	1.8/3.0V
15	SIM_RST	DO	1.8/3.0V	17	USIM_RST	DO	1.8/3.0V
16	VRTC	IO	1.5~3.3V	18	VRTC	IO	1.5~3.25V
17	EMERG_OFF	DI	2.8V	20	RESET_N	DI	1.8V
18	PWRKEY	DI	Pull up to VBAT	21	PWRKEY	DI	1.8V
19	AGND	-	Ground	22	AGND	-	Ground
27	RESERVED	-	-	30	RESERVED	-	-
28	RESERVED	-	-	31	RESERVED	-	-
29	RESERVED	-	-	32	RESERVED	-	-
30	RESERVED	-	-	33	RESERVED	-	-
33	RESERVED	-	-	37	RESERVED	-	-
34	RESERVED	-	-	38	RESERVED	-	-
35	RESERVED	-	-	39	RESERVED	-	-
36	RESERVED	-	-	40	RESERVED	-	-
39	RESERVED	-	-	43	RESERVED	-	-
40	ADC1	AI	0~2.8V	44	ADC1	AI	0.2~4.2V
41	ADC0	AI	0~2.8V	45	ADC0	AI	0.2~2.1V
42	GND	-	Ground	48	GND	-	Ground
43	RF_ANT	IO	-	49	ANT_MAIN	IO	-
44	GND	-	Ground	50	GND	-	Ground

45	GND	-	Ground	51	GND	-	Ground
46	GND	-	Ground	52	GND	-	Ground
47	GND	-	Ground	53	GND	-	Ground
48	GND	-	Ground	54	GND	-	Ground
49	GND	-	Ground	56	GND	-	Ground
50	VBAT	PI	3.3~4.6V	57	VBAT_RF	PI	3.3~4.3V
51	VBAT	PI	3.3~4.6V	58	VBAT_RF	PI	3.3~4.3V
52	VBAT	PI	3.3~4.6V	59	VBAT_BB	PI	3.3~4.3V
54	STATUS	DO	2.8V	61	STATUS	OD	-
55	RI	DO	2.8V	62	RI	DO	1.8V
56	DCD	DO	2.8V	63	DCD	DO	1.8V
57	CTS	DO	2.8V	64	CTS	DO	1.8V
58	RTS	DI	2.8V	65	RTS	DI	1.8V
59	DTR	DI	2.8V	66	DTR	DI	1.8V
60	TXD	DO	2.8V	67	TXD	DO	1.8V
61	RXD	DI	2.8V	68	RXD	DI	1.8V

3.2. Different Functional Pins

The following table shows the different functional pins of UC20 compared with M10 at the same pin location.

Table 5: Different Functional Pins

M10				UC20			
Pin NO.	Pin Name	IO	Power Domain	Pin NO.	Pin Name	IO	Power Domain
1	SD_DATA	IO	2.8V	1	WAKEUP_IN	DI	1.8V
2	SD_CLK	DO	2.8V	2	AP_READY	DI	1.8V

3	SD_CMD	DO	2.8V	3	SLEEP_IND	DO	1.8V
4	RESERVED	-	-	4	W_DISABLE#	DI	1.8V
5	RESERVED	-	-	5	NET_MODE	DO	1.8V
20	SPK2P	AO	-	23	RESERVED	-	-
21	SPK1N	AO	-	24	PCM_IN	DI	1.8V
22	SPK1P	AO	-	25	PCM_OUT	DO	1.8V
23	MIC1P	AI	-	26	PCM_SYNC	IO	1.8V
24	MIC1N	AI	-	27	PCM_CLK	IO	1.8V
25	MIC2P	AI	-	28	RESERVED	-	-
26	MIC2N	AI	-	29	RESERVED	-	-
31	RESERVED			34	VDD_2V85	PO	2.85V
32	RESERVED	-	-	35	ANT_DIV	AI	-
37	RESERVED	-	-	41	I2C_SCL	OD	1.8V
38	GPIO1	IO	2.8V	42	I2C_SDA	OD	1.8V
53	RESERVED	-	-	60	VBAT_BB	PI	3.3~4.3V
62	TXD3	DO	2.8V	69	USB_DP	IO	-
63	RXD3	DI	2.8V	70	USB_DM	IO	-
64	GPIO0	IO	2.8V	71	USB_VBUS	PI	Typ.5V

3.3. Additional Pins

The following table shows the UC20 additional pins compared with M10.

Table 6: UC20 Additional Pins

PIN NO.	Pin Name	IO	Pin Description
8,9,19,36,46,72,85~112	GND	-	Ground
47	ANT_GNSS	AI	GNSS Antenna
55,73~84	RESERVED	-	-

NOTES

1. Keep all reserved and unused pins unconnected.
2. For different functional pins, if necessary, please reserve 0 ohm resistors.
3. All GND pins should be connected to ground.

4 Recommended Footprint

The following figure shows the recommended footprint which is compatible with M10 and UC20.
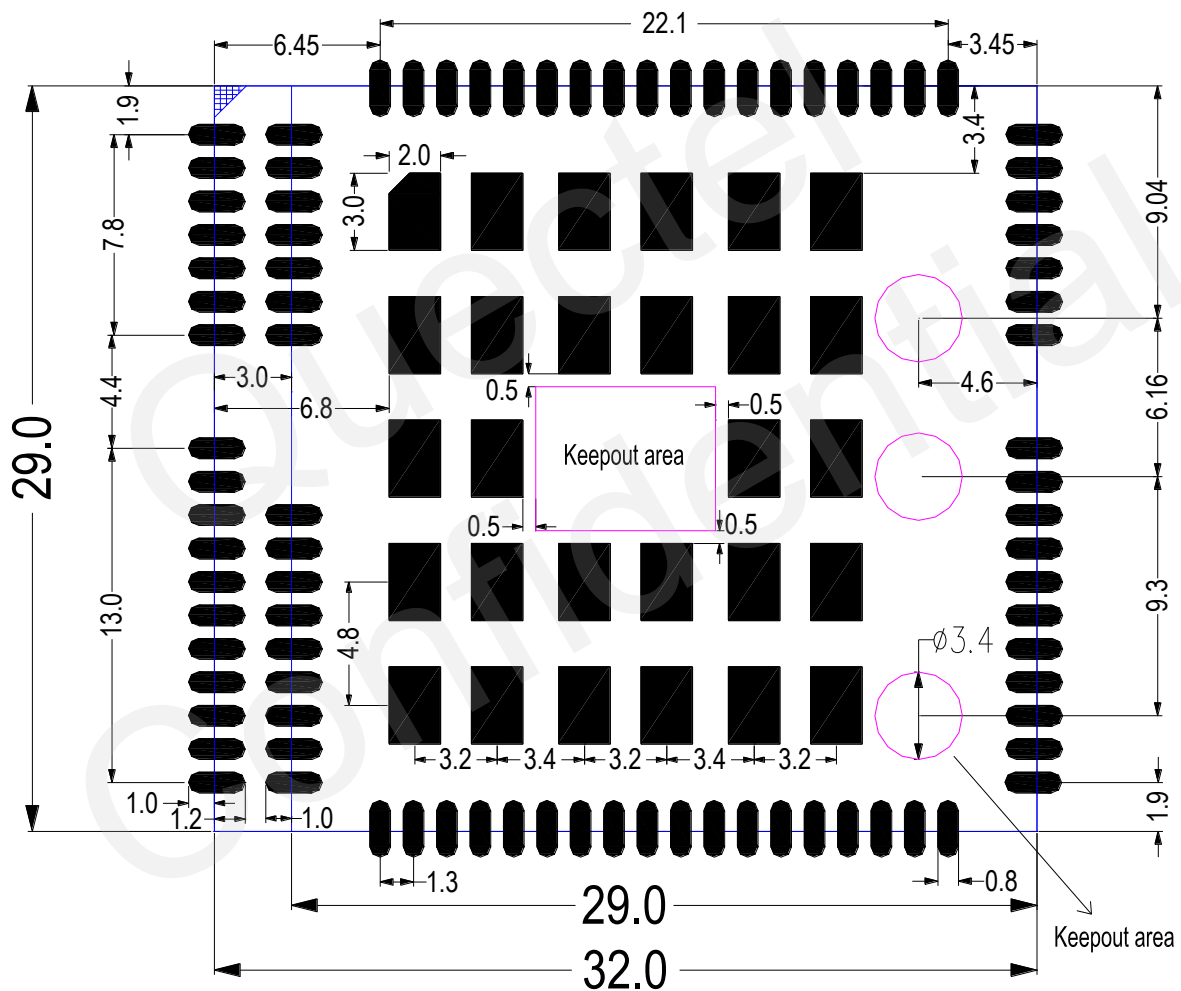

Figure 3: Recommended Footprint (Unit: mm)

NOTE

Pads 73~84 at the bottom center of UC20 cannot be designed, and the pink areas should be kept out.

The following figures show the sketch map of installation between UC20 and M10.
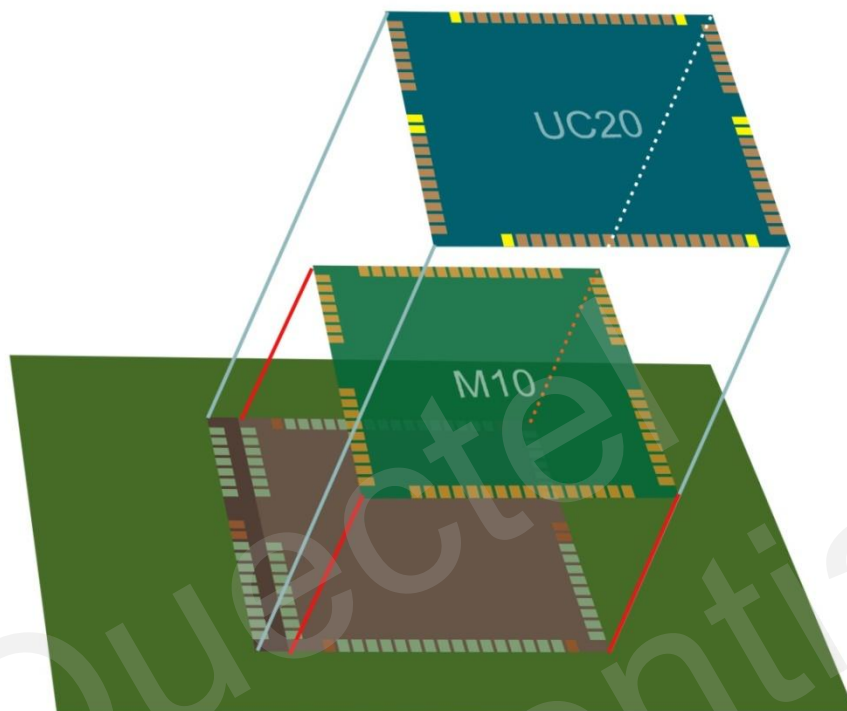
Figure 4: Renderings of Installation
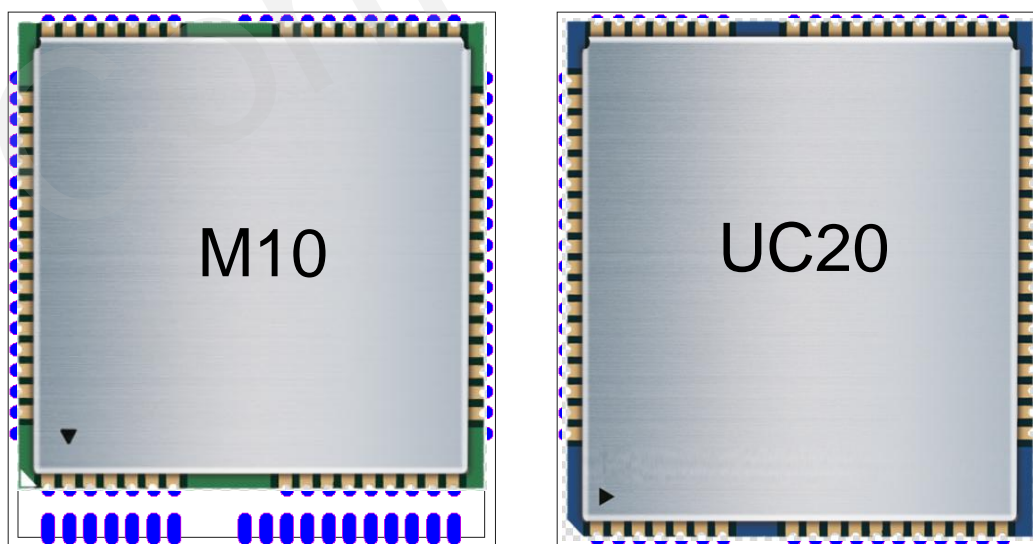
Figure 5: Actual Installation

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5 Hardware Reference Design

The following chapters describe M10 and UC20 modules' compatible design on main functions.

5.1. Power on Circuit
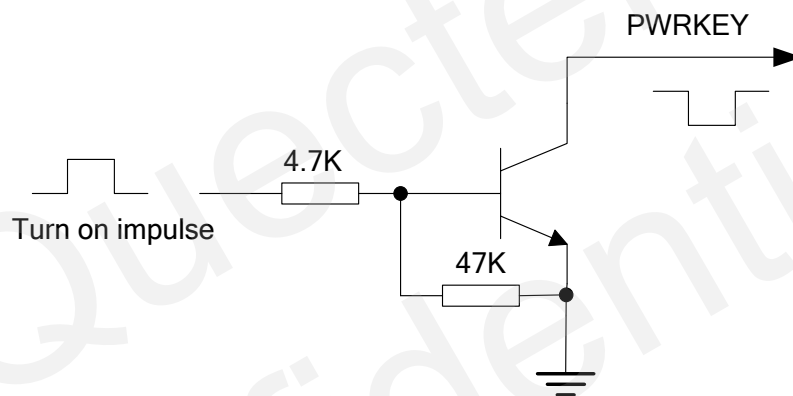
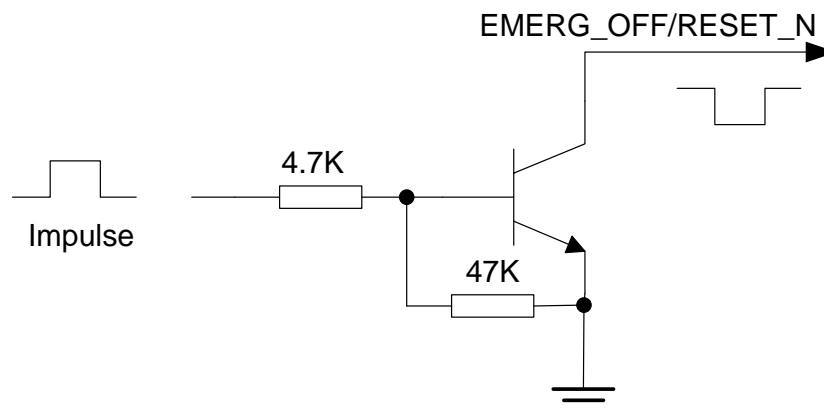**Figure 6: Turn on the Module Using Driving Circuit**

5.2. EMERG_OFF or RESET Circuit

Figure 7: Urgently Turn off or Reset the Module Using Driving Circuit

5.3. NET_STATUS

The NET_STATUS (the NETLIGHT on M10) signal can be used to drive a network status indicator LED. The following circuit is the reference design of NET_STATUS.
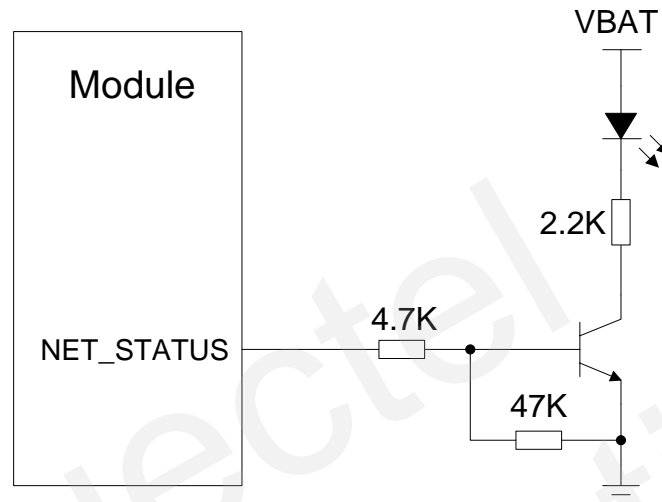

Figure 8: Reference Circuit of the NET_STATUS

5.4. Operating Status Indication

The STATUS pin is set as the module status indication and can be used to judge whether module is power-on or not. M10's STATUS is a general purpose output type, while UC20's STATUS is open drain output type. The following figures show the reference circuits of driving LED for M10 and UC20 modules.
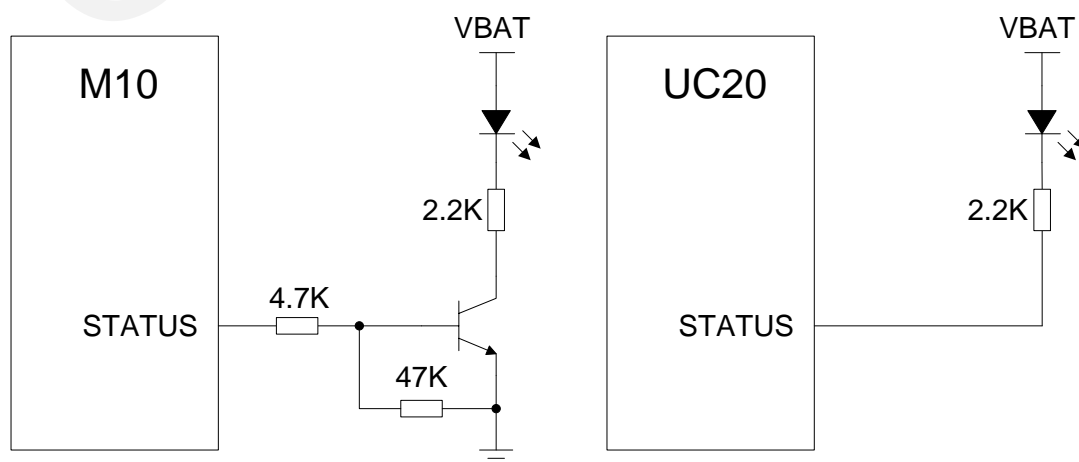

Figure 9: Reference Circuit of the STATUS

5.5. RTC Backup

The RTC (Real Time Clock) circuit can be powered by an external capacitor or battery (rechargeable or non-chargeable) through the pin VRTC. The following figure shows a reference circuit for RTC backup.
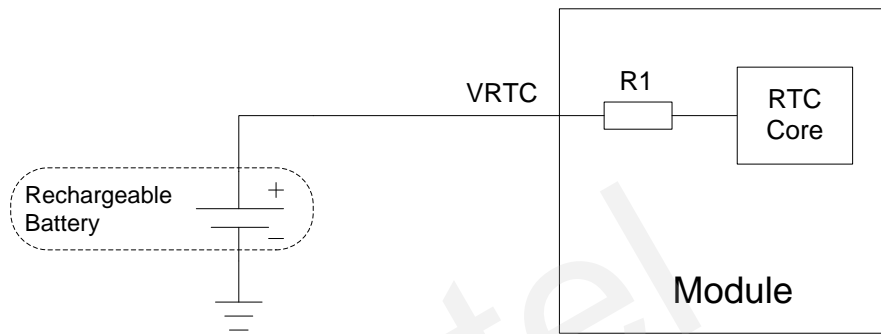

Figure 10: RTC Supply from Rechargeable Battery

5.6. SIM Interface

SIM interfaces of UC20 and M10 support 1.8V or 3.0V SIM cards automatically.

You can tie M10's SIM pins to UC20's directly and then route to SIM card cassette. The following figure shows the SIM reference design with SIM card detection function.
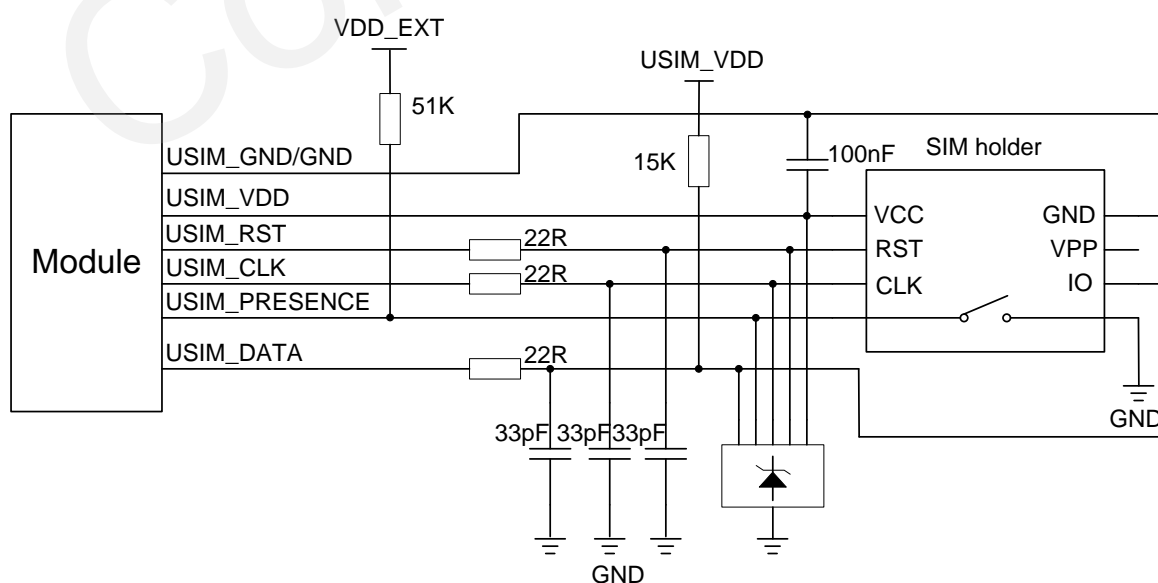

Figure 11: SIM Reference Design

5.7. UART Interface

Because of the different power domain of the UART interface, you need to add level match circuit between M10 or UC20 module and MCU.

The following circuit shows reference design of main UART interface level match.
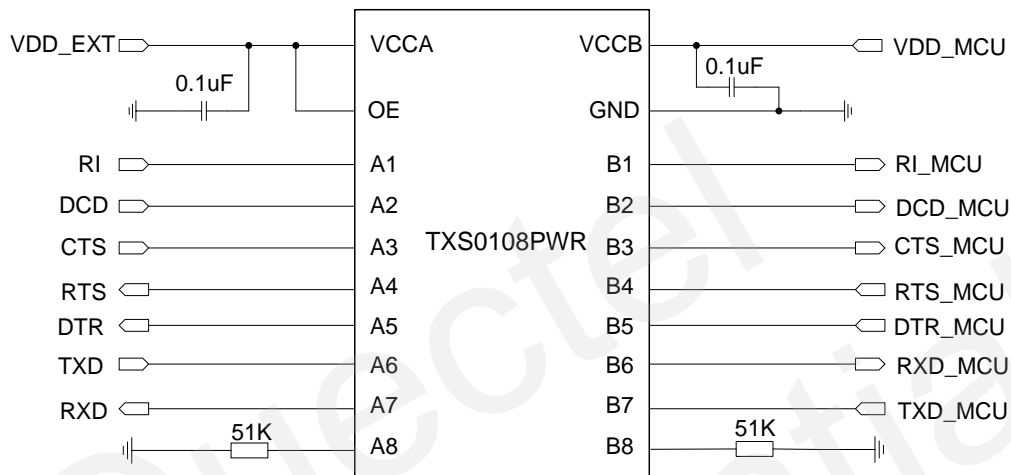

Figure 12: Reference Design of Main UART Interface

NOTES

1. M10's UART pins belong to 2.8V power domain.
2. UC20's UART pins belong to 1.8V power domain.

5.8. ADC Interface

Both UC20 and M10 have two ADC pins for general purpose analog-to-digital converter. M10's ADC pins are compatible with UC20's. But there are some differences in their voltage range. The following table shows the differences between M10 and UC20.

Table 7: ADC Voltage Range

Channel	M10	UC20
ADC0	0~2.8V	0.2~2.1V
ADC1	0~2.8V	0.2~4.2V

5.9. RF Interface

The UC20 pin 49 (M10 pin 43) is the RF antenna pad. The RF interface has an impedance of 50Ω. Because M10 and UC20 have the same RF antenna pin location, they can use the same RF circuit. A reference circuit is shown in the following figure. In order to adjust RF performance, it should reserve a π-type matching circuit. By default, the resistance of R1 is 0Ω and capacitors C1 and C2 are not mounted.
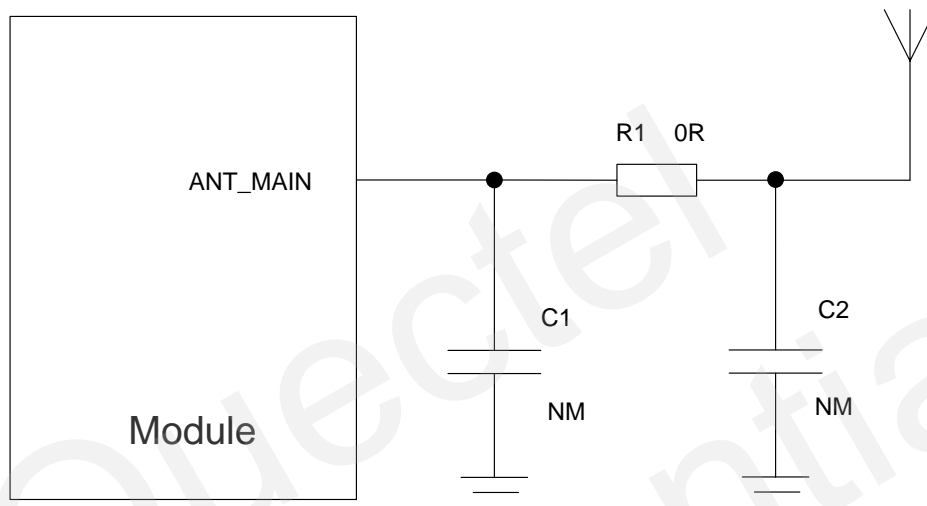

Figure 13: Reference Circuit of RF Interface

5.10. Power Supply

The power supply range of the M10 module is 3.3V to 4.6V and the power supply range of the UC20 is 3.3V to 4.3V. Attention should be paid in the range of the power source to make sure that the input voltage will never drop below 3.3V and never exceed 4.3V. The typical power supply of UC20 is 3.8V. The following figure shows a reference design for +5V input power source. The designed output for the power supply is about 3.8V and the maximum load current is 3A. The VBAT to UC20 VBAT_BB and VBAT_RF pins should be divided into two separated paths in star structure. It is also applicable to M10. In addition, in order to get a stable output voltage, it is suggested to use a zener diode whose reverse zener voltage is 5.1V and dissipation power is more than 0.5 watt.
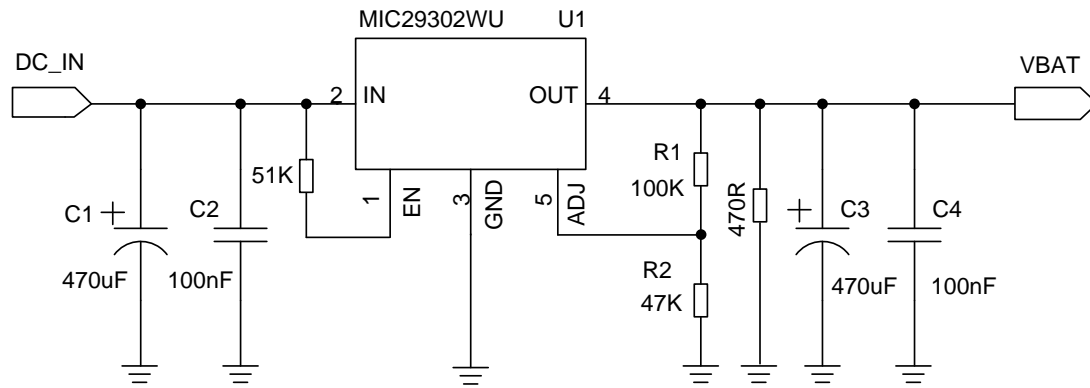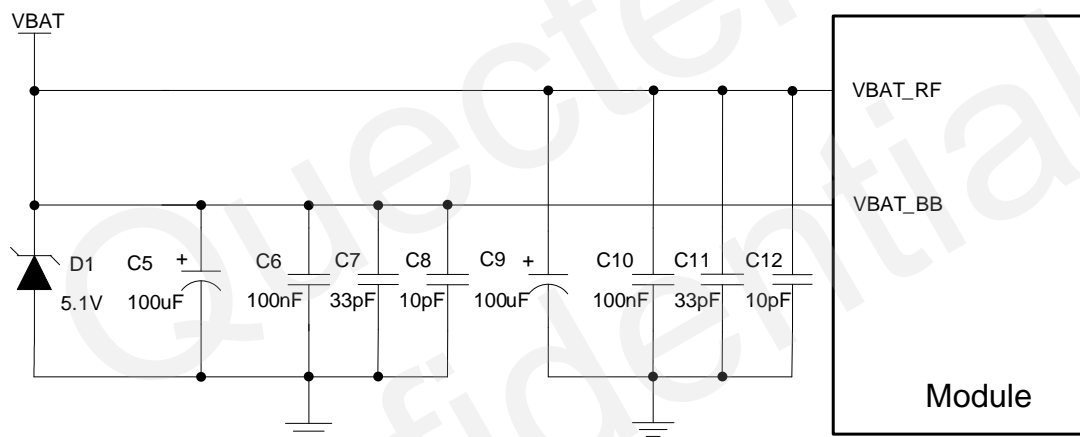
Figure 14: Reference Circuit of Power Supply

Figure 15: Reference Circuit of Star Structure

6 Appendix A

Table 8: Related Documents

SN	Document Name	Remark
[1]	Quectel_UC20_Hardware_Design	Quectel Hardware Design
[2]	Quectel_M10_Hardware_Design	Quectel M10 Hardware Design
[3]	Quectel_UC20&M10_Reference_Design	Quectel UC20 and M10 Compatible Reference Design