UC15&M10

Compatible Design

UMTS/HSDPA Module Series

Rev. UC15&M10_Compatible_Design_V1.2

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About the Document

History

Revision	Date	Author	Description
1.0	2013-11-25	Mountain ZHOU	Initial
1.1	2014-02-13	Huik LI	Modified the frequency bands of UC15-A.
1.2	2014-10-31	Huik LI	1. Released UC15 PCM function. 2. Updated reference circuit of power supply in Figure 12. 3. Added Chapter 5.10 about analog audio interface. 4. Updated recommended footprint in Figure 3. 5. Modified the frequency bands of UC15-A.

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1 Introduction

UC15 module is compatible with M10 module. This document briefly describes the compatible design of UC15 and M10. UC15 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. The UC15 is UMTS/HSDPA module includes two series, UC15-A and UC15-E. The following table shows the module frequency bands. UC15 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 UC15 3G module smoothly.

Table 1: Module Frequency Bands

Module	Frequency Bands
M10	GSM850/900/1800/1900
UC15-A	GSM850/900/1800/1900, UMTS850/1900
UC15-E	GSM900/1800, UMTS900/2100

Table 2: Module General Information

Module	Appearance	Packaging	Dimensions	Description
UC15		68-pin LCC + 40 other pads	29 x 29 x 2.5mm	UMTS/HSDPA module (UC15-A and UC15-E)
M10		64-pin LCC	29 x 29 x 3.6mm	GSM/GPRS module

2.2. Pin Assignment

The following figure shows the pin assignment of UC15 and M10.

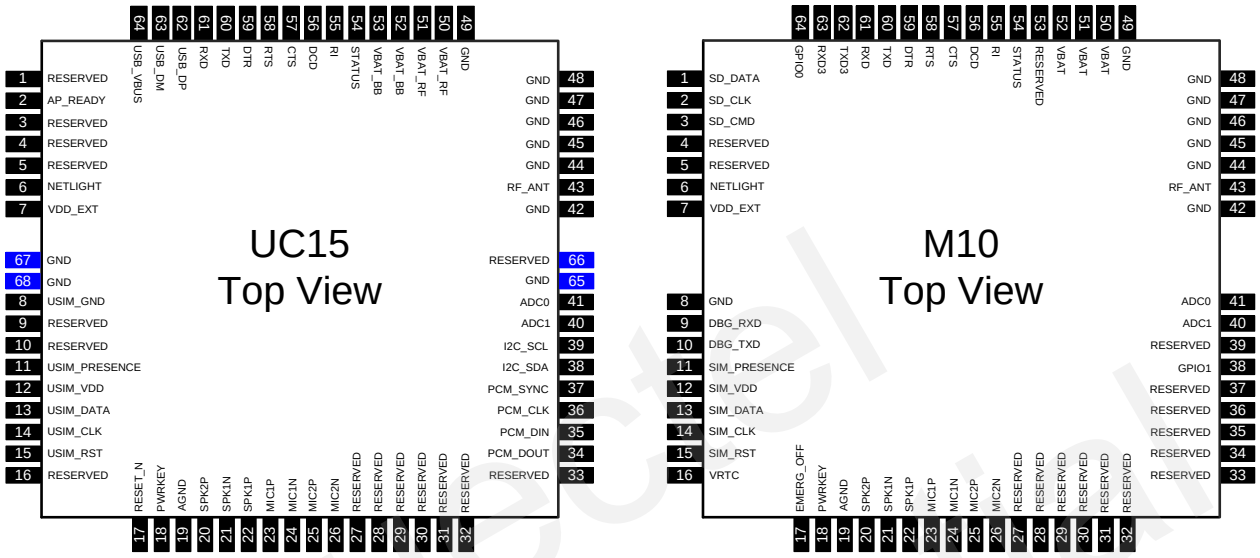

Figure 1: UC15&M10 Pin Assignment

NOTE

The blue pins of UC15 are the additional pins compared with M10.

Figure 2 shows the combination of pin assignment of UC15 and M10.

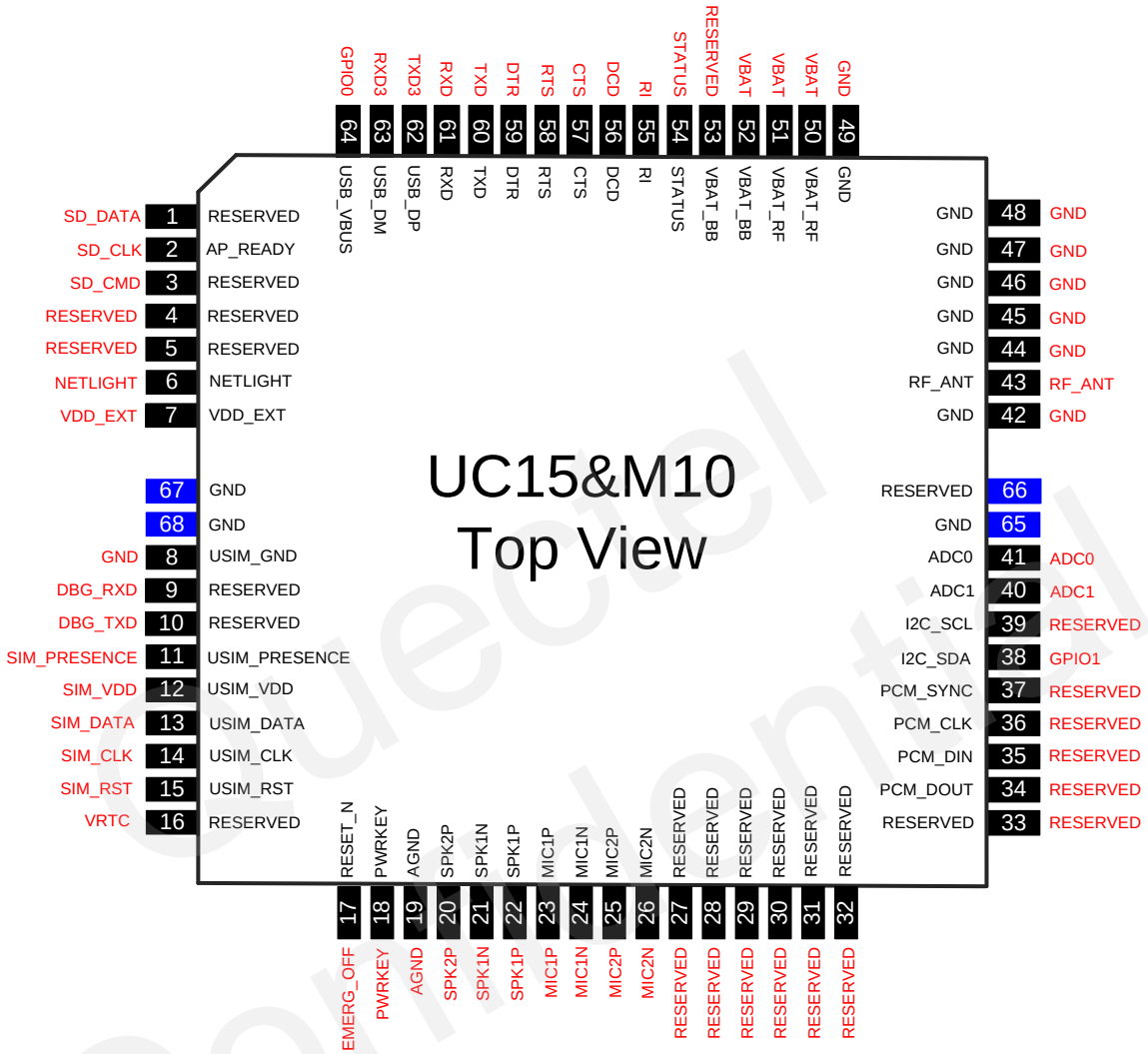

Figure 2: Combined Pin Assignment of UC15&M10

NOTES

1. The blue pins of UC15 are the additional pins compared with M10.
2. The pin names marked in red in the outside area are M10's.
3. UC15 and M10 are identical in size. The pins of UC15 and M10 are compatible on main functions.

3 Pin Description

This chapter describes the pin definition and assignment of UC15 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

3.1. Common Pins

The following table shows UC15 and M10's common pins with the same functions.

Table 4: Common Pins

UC15				M10			
Pin NO.	Pin Name	IO	Power Domain	Pin NO.	Pin Name	IO	Power Domain
4	RESERVED	-	-	4	RESERVED	-	-
5	RESERVED	-	-	5	RESERVED	-	-
6	NETLIGHT	DO	2.6V	6	NETLIGHT	DO	2.8V
7	VDD_EXT	PO	2.6V	7	VDD_EXT	PO	2.8V

8	USIM_GND	-	Ground	8	GND	-	Ground
11	USIM_PRESENCE	DI	2.6V	11	SIM_PRESENCE	DI	2.8V
12	USIM_VDD	PO	1.8/3.0V	12	SIM_VDD	PO	1.8/3.0V
13	USIM_DATA	IO	1.8/3.0V	13	SIM_DATA	IO	1.8/3.0V
14	USIM_CLK	DO	1.8/3.0V	14	SIM_CLK	DO	1.8/3.0V
15	USIM_RST	DO	1.8/3.0V	15	SIM_RST	DO	1.8/3.0V
17	RESET_N	DI	1.8V	17	EMERG_OFF	DI	2.8V
18	PWRKEY	DI	1.8V	18	PWRKEY	DI	Pull up to VBAT
19	AGND	-	Ground	19	AGND	-	Ground
20	SPK2P	AO	-	20	SPK2P	AO	-
21	SPK1N	AO	-	21	SPK1N	AO	-
22	SPK1P	AO	-	22	SPK1P	AO	-
23	MIC1P	AI	-	23	MIC1P	AI	-
24	MIC1N	AI	-	24	MIC1N	AI	-
25	MIC2P	AI	-	25	MIC2P	AI	-
26	MIC2N	AI	-	26	MIC2N	AI	-
27	RESERVED			27	RESERVED		
28	RESERVED			28	RESERVED		
29	RESERVED			29	RESERVED		
30	RESERVED			30	RESERVED		
31	RESERVED			31	RESERVED		
32	RESERVED			32	RESERVED		
33	RESERVED			33	RESERVED		
40	ADC1	AI	0~2.1V	40	ADC1	AI	0~2.8V
41	ADC0	AI	0~2.1V	41	ADC0	AI	0~2.8V
42	GND	-	Ground	42	GND	-	Ground

43	RF_ANT	IO	-	43	RF_ANT	IO	-
44	GND	-	Ground	44	GND	-	Ground
45	GND	-	Ground	45	GND	-	Ground
46	GND	-	Ground	46	GND	-	Ground
47	GND	-	Ground	47	GND	-	Ground
48	GND	-	Ground	48	GND	-	Ground
49	GND	-	Ground	49	GND	-	Ground
50	VBAT_RF	PI	3.3~4.3V	50	VBAT	PI	3.3-4.6V
51	VBAT_RF	PI	3.3~4.3V	51	VBAT	PI	3.3-4.6V
52	VBAT_BB	PI	3.3~4.3V	52	VBAT	PI	3.3-4.6V
54	STATUS	DO	2.6V	54	STATUS	DO	2.8V
55	RI	DO	2.6V	55	RI	DO	2.8V
56	DCD	DO	2.6V	56	DCD	DO	2.8V
57	CTS	DO	2.6V	57	CTS	DO	2.8V
58	RTS	DI	2.6V	58	RTS	DI	2.8V
59	DTR	DI	2.6V	59	DTR	DI	2.8V
60	TXD	DO	2.6V	60	TXD	DO	2.8V
61	RXD	DI	2.6V	61	RXD	DI	2.8V

3.2. Different Functional Pins

The following table shows the different functional pins of UC15 compared with M10 at the same pin location.

Table 5: Different Functional Pins

UC15				M10			
Pin NO.	**Pin Name**	**IO**	**Power Domain**	**Pin NO.**	**Pin Name**	**IO**	**Power Domain**

1	RESERVED	-	-	1	SD_DATA	IO	2.8V
2	AP_READY	DO	2.6V	2	SD_CLK	DO	2.8V
3	RESERVED	-	-	3	SD_CMD	DO	2.8V
9	RESERVED	-	-	9	DBG_RXD	DI	2.8V
10	RESERVED	-	-	10	DBG_TXD	DO	2.8V
16	RESERVED	-	-	16	VRTC	IO	1.5~3.3V
34	PCM_DOUT	DO	2.6V	34	RESERVED	-	-
35	PCM_DIN	DI	2.6V	35	RESERVED	-	-
36	PCM_CLK	IO	2.6V	36	RESERVED	-	-
37	PCM_SYNC	IO	2.6V	37	RESERVED	-	-
38	I2C_SDA	IO	2.6V	38	GPIO1	IO	2.8V
39	I2C_SCL	DO	2.6V	39	RESERVED	-	-
53	VBAT_BB	PI	3.3~4.3V	53	RESERVED		
62	USB_DP	IO	-	62	TXD3	DO	2.8V
63	USB_DM	IO	-	63	RXD3	DI	2.8V
64	USB_VBUS	PI	Typ.5V	64	GPIO0	IO	2.8V

NOTE

For different functional pins, if necessary, reserve 0 ohm resistors.

3.3. Additional Pins

Table 6: UC15 Additional Pins

PIN NO.	Pin Name	IO	Pin Description
65, 67~68, 81~108	GND	-	Ground
66, 69~80	RESERVED	-	-

NOTES

1. All of GND pins should be connected to ground.
2. Keep all RESERVED and unused pins unconnected except pin 53 on M10.

4 Recommended Footprint

The following figure shows the recommended compatible footprint of UC15 and M10.

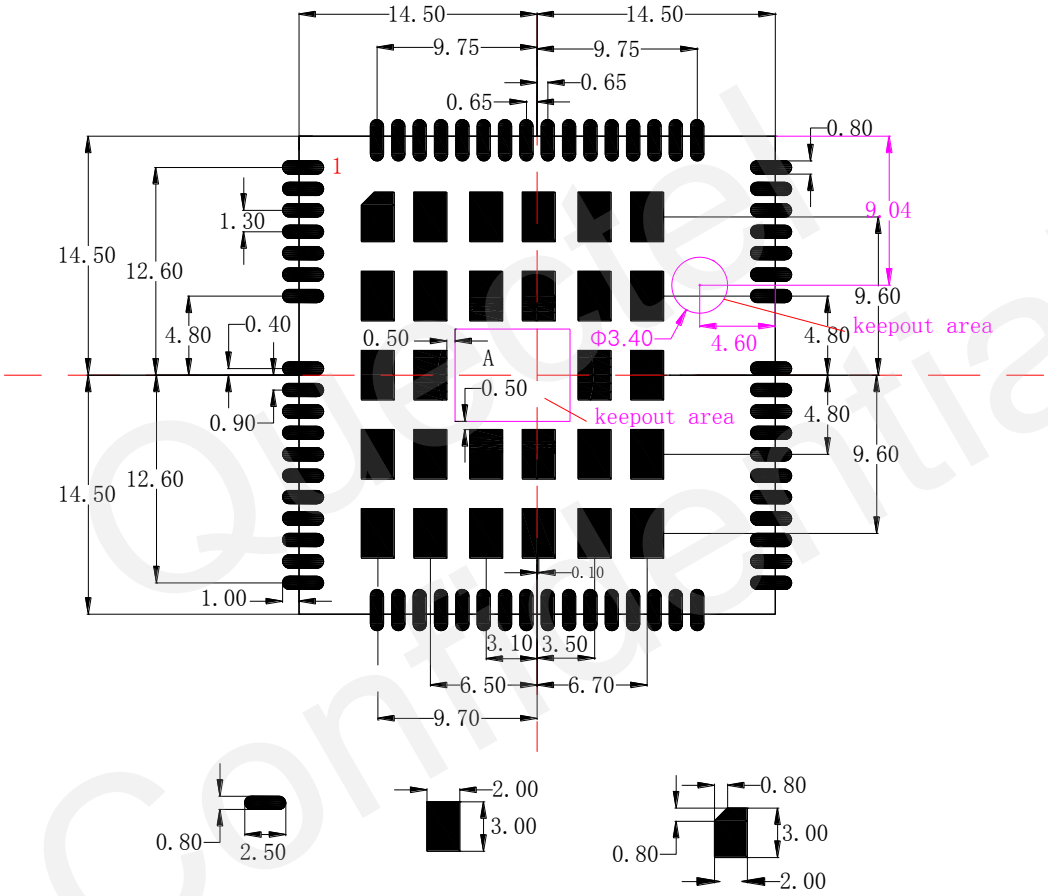

Figure 3: Recommended Footprint (Unit: mm)

NOTES

1. The area in the circle should be kept out.
2. The area in the rectangle is the pins 69~80 of UC15 used for factory test. It is recommended to keep this area out in PCB decal.

The following figure shows the sketch map of installation between UC15 and M10.

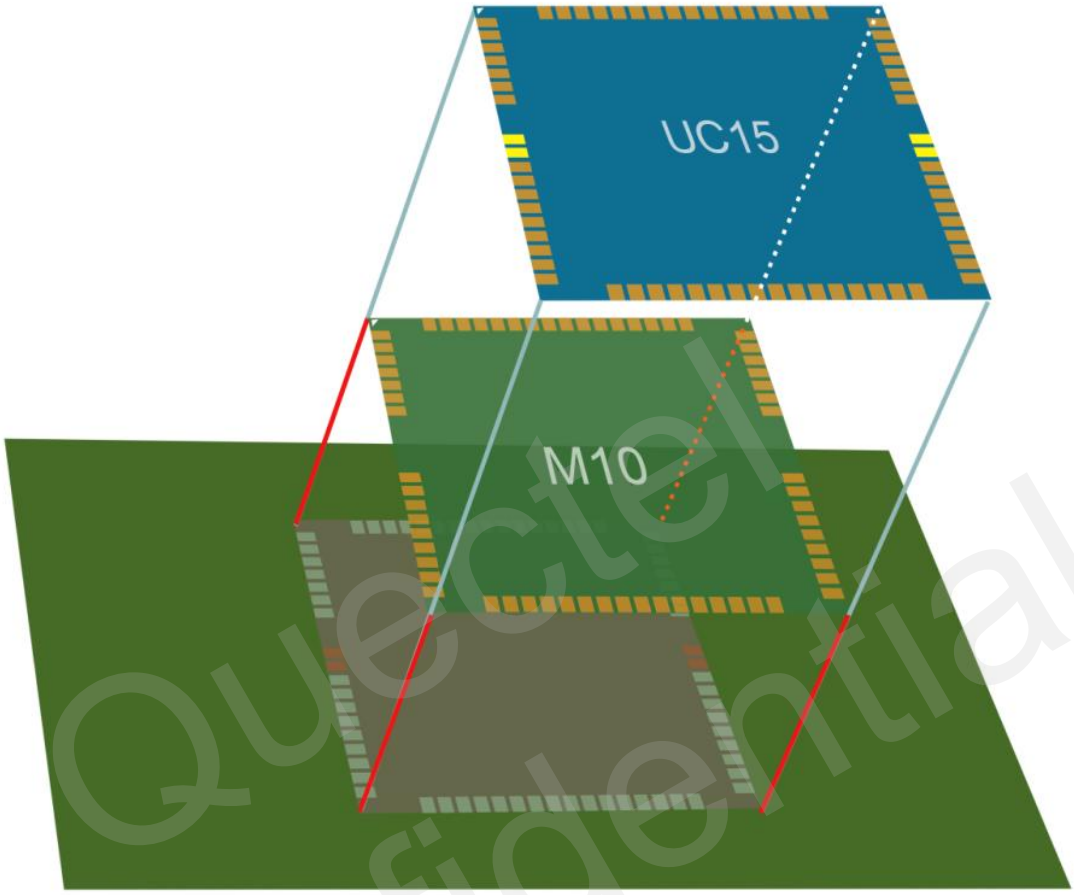

Figure 4: Renderings of Installation

5 Hardware Reference Design

The following chapters describe compatible design of UC15 and M10 on main functionalities.

5.1. Power on and off Circuit

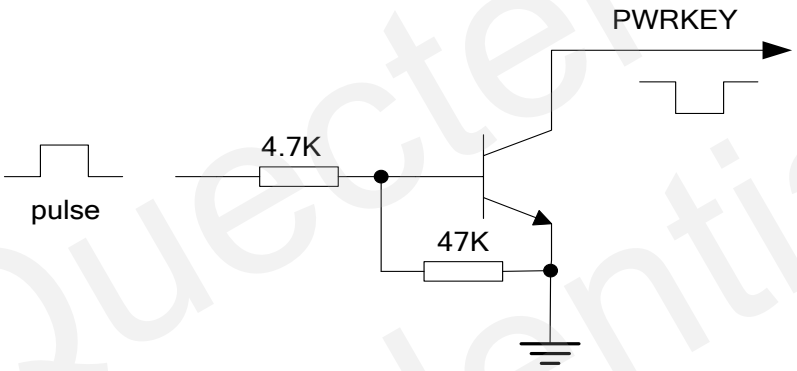

Figure 5: Power on/off the Module Using Driving Circuit

5.2. RESET_N or EMERG_OFF Circuit

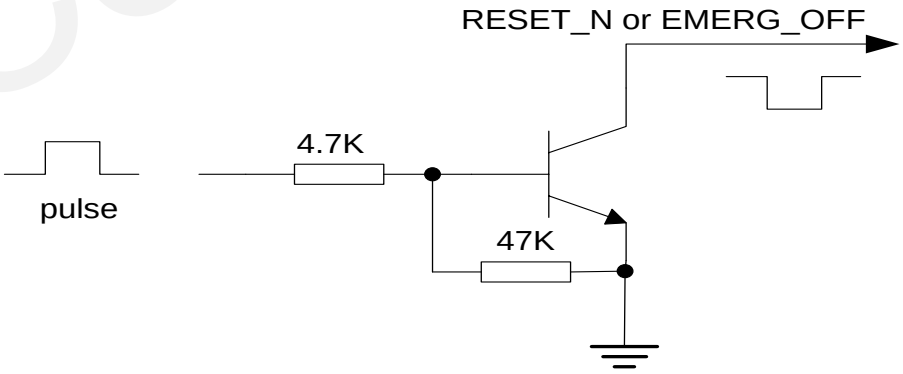

Figure 6: Driving Circuit of RESET_N or EMERG_OFF

NOTE

As to UC15, the pulse time of reset must be between 50ms and 200ms, otherwise the module will be powered off.

5.3. Network Status Indication

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

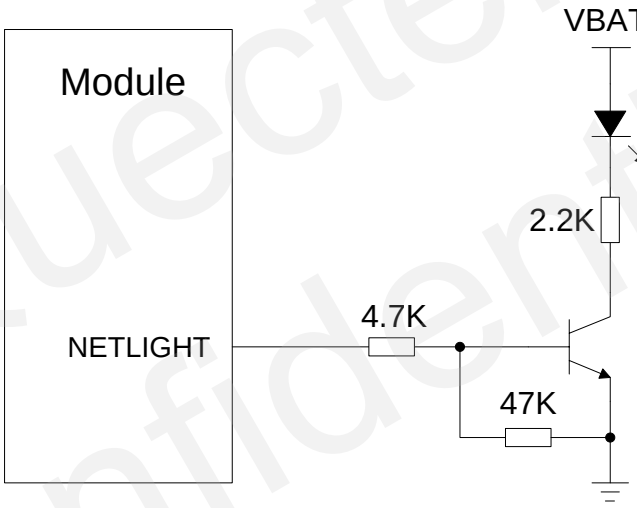

Figure 7: Reference Circuit of the NETLIGHT

5.4. Operating Status Indication

STATUS outputs high level after module is turned on successfully. The following figure shows the reference circuit of LED driving for module.

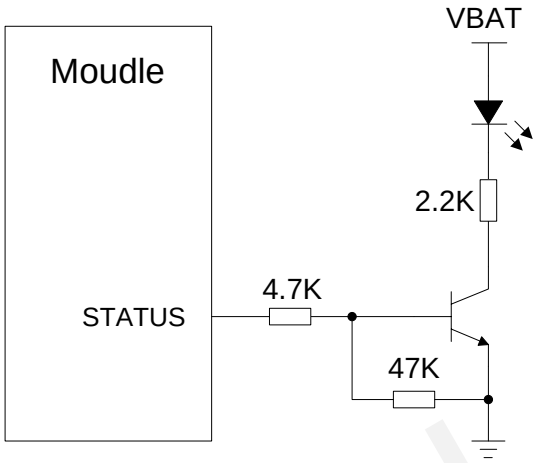

Figure 8: Reference Circuit of the STATUS

5.5. USIM Interface

USIM interface of UC15 and M10 supports 1.8V or 3.0V USIM/SIM cards automatically. The following figure shows the USIM reference design with USIM card detection function.

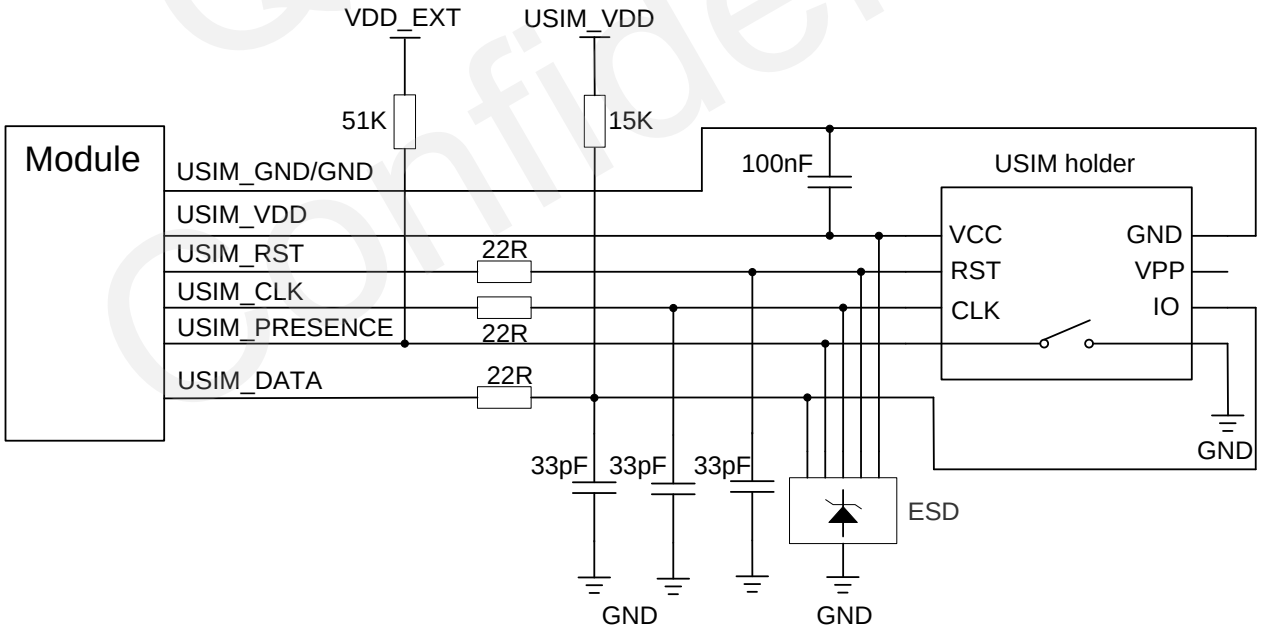

Figure 9: Reference Design of USIM Interface

5.6. UART Interface

The following circuit shows reference design of UART interface level match between UC15 and 3.3V system. When M10 is applied, these 3.6K resistors should be changed to 5.6K.

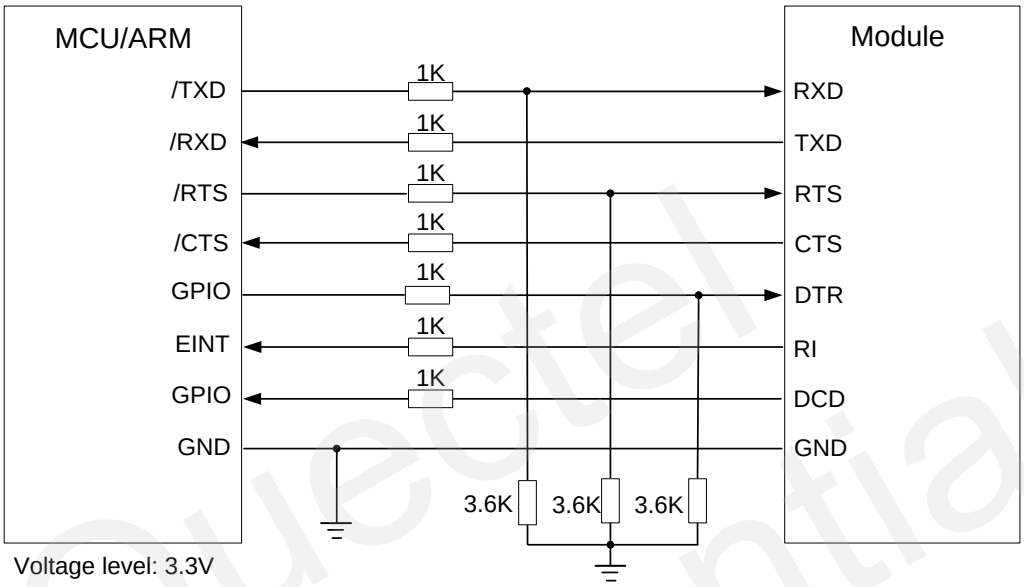

Figure 10: Reference Design of UART Interface

NOTES

1. UC15's UART pins belong to 2.6V power domain.
2. M10's UART pins belong to 2.8V power domain.

5.7. ADC Interface

Both UC15 and M10 have two ADC pins for general purpose analog-to-digital converter. But there are some differences in voltage range. The following table shows the differences between UC15 and M10.

Table 7: ADC Voltage Range

Channel	UC15	M10
ADC0	0~2.1V	0~2.8V

ADC1	0~2.1V	0~2.8V

5.8. RF Interface

Pin 43 is the RF antenna pad. The RF interface has an impedance of 50Ω. 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.

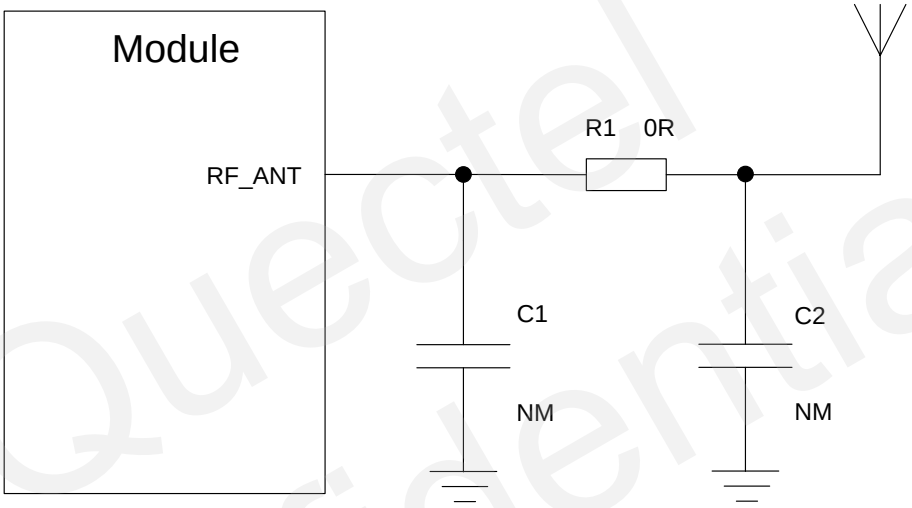

Figure 11: Reference Circuit of RF Interface

5.9. Power Supply

The power supply range of the M10 module is 3.3V to 4.6V and the power supply range of the UC15 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, and the typical power supply of UC15 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 UC15 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.

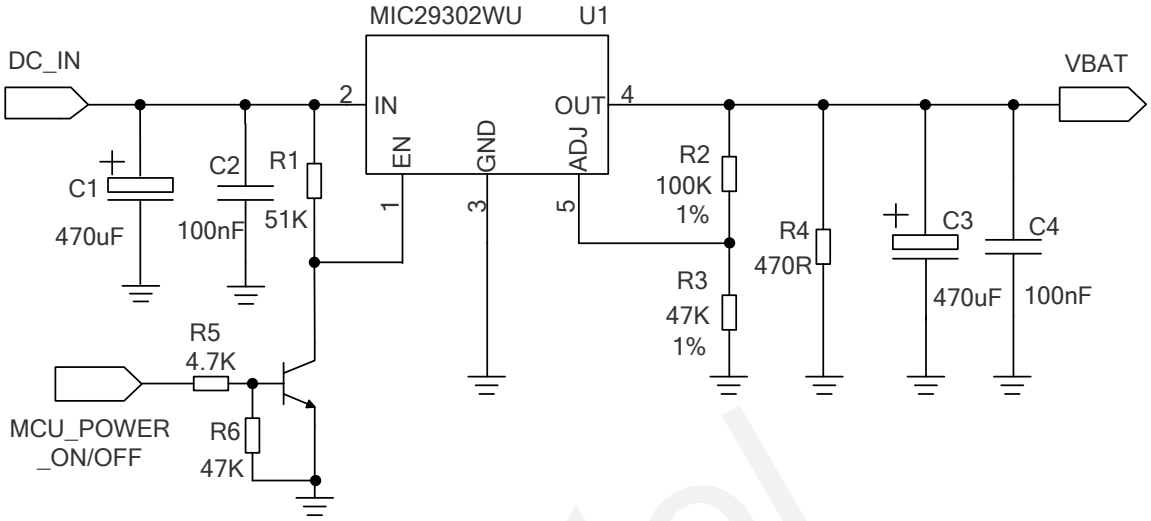

Figure 12: Reference Circuit of Power Supply

NOTE

When the module cannot be turned off by PWRKEY pin or in other abnormal status, it is suggested to switch off the power supply for module, and power it on later.

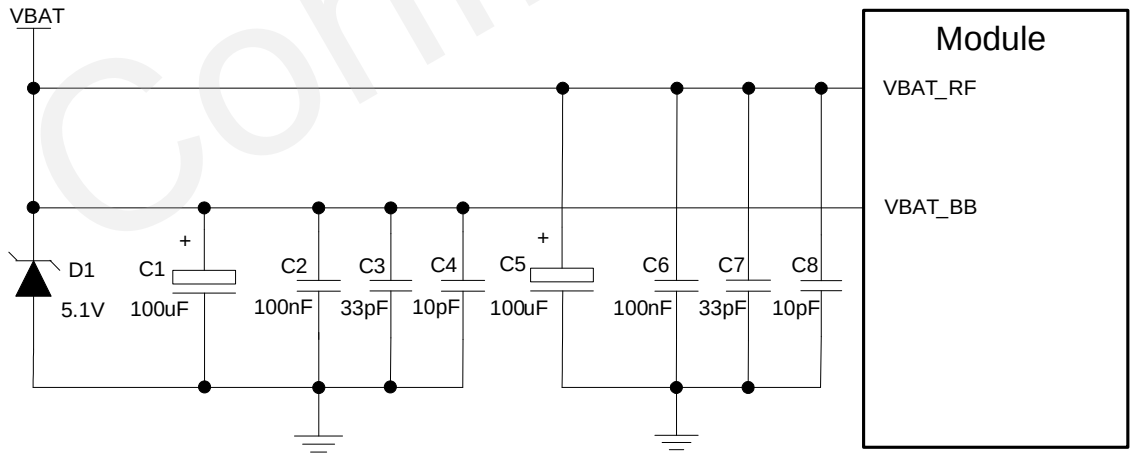

Figure 13: Reference Circuit of Star Structure

NOTE

When M10 is applied, pin 53 of M10 can be connected to VBAT_BB here.

5.10. Analog Audio interface

Both UC15 and M10 module provide two analog input channels and two output channels. They are fully compatible with each other. A reference design circuit of input channel is shown in following figure：

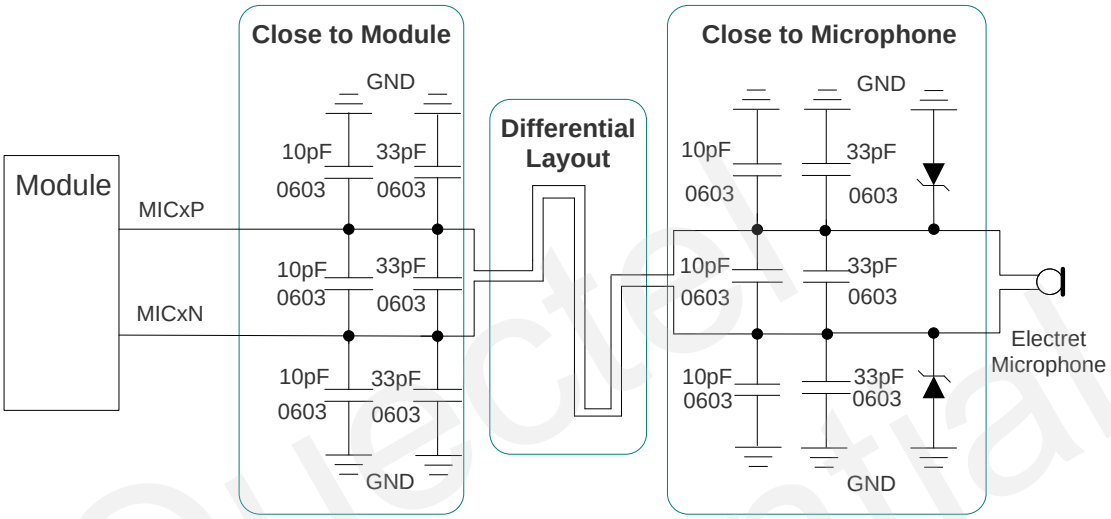

Figure 14: Microphone Reference Design for AIN1&AIN2

Reference design circuit of SPK1P/SPK1N is shown in following figures：

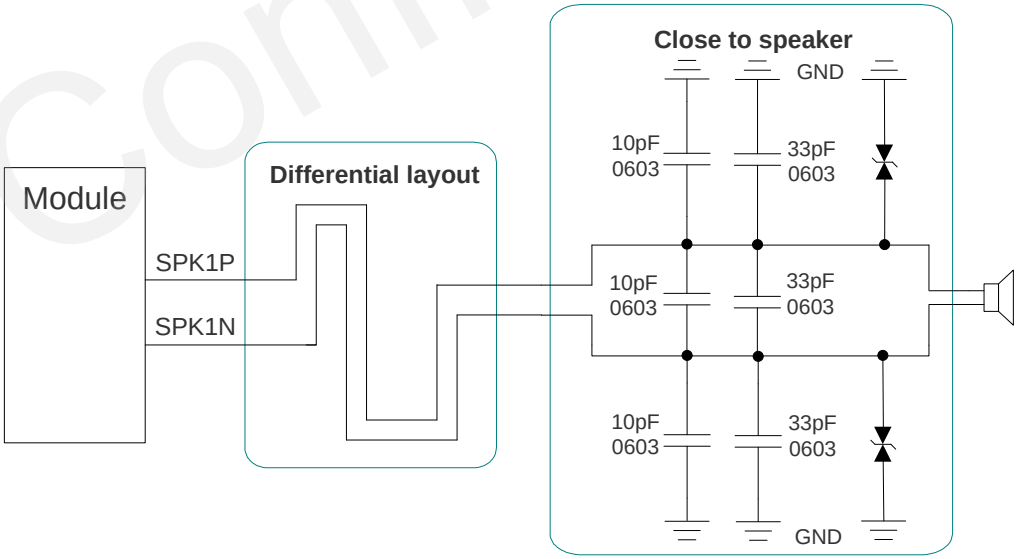

Figure 15: Reference Design for SPK1P/SPK1N

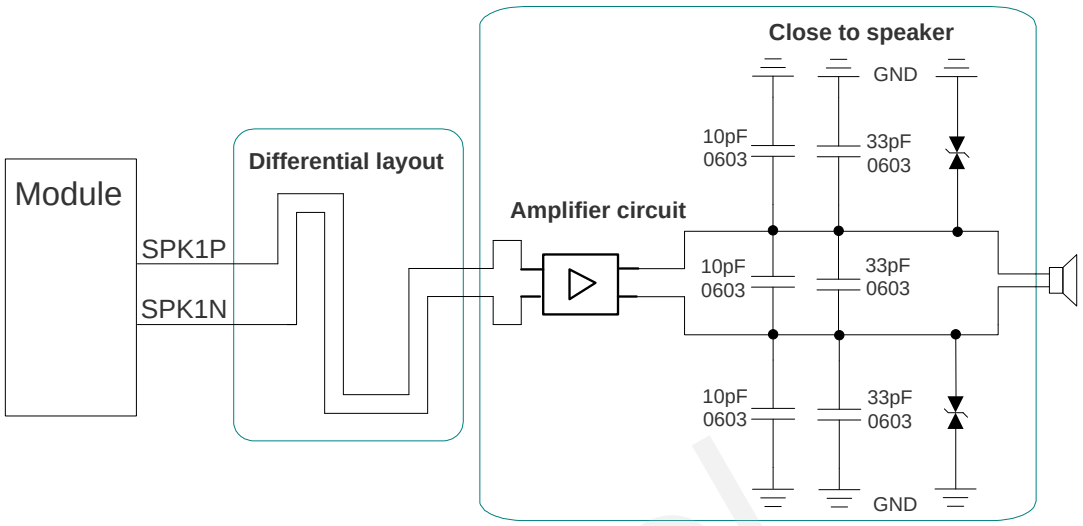

Figure 16: Reference Design with an Amplifier for SPK1P/SPK1N

Reference design circuit of SPK2P/AGND is shown in following figures：

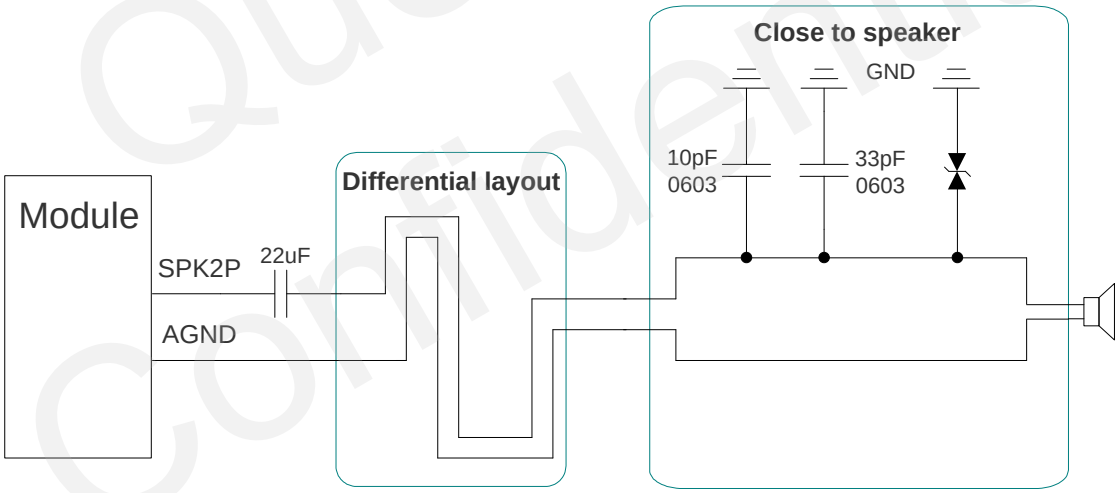

Figure 17: Reference Design for SPK2P/AGND

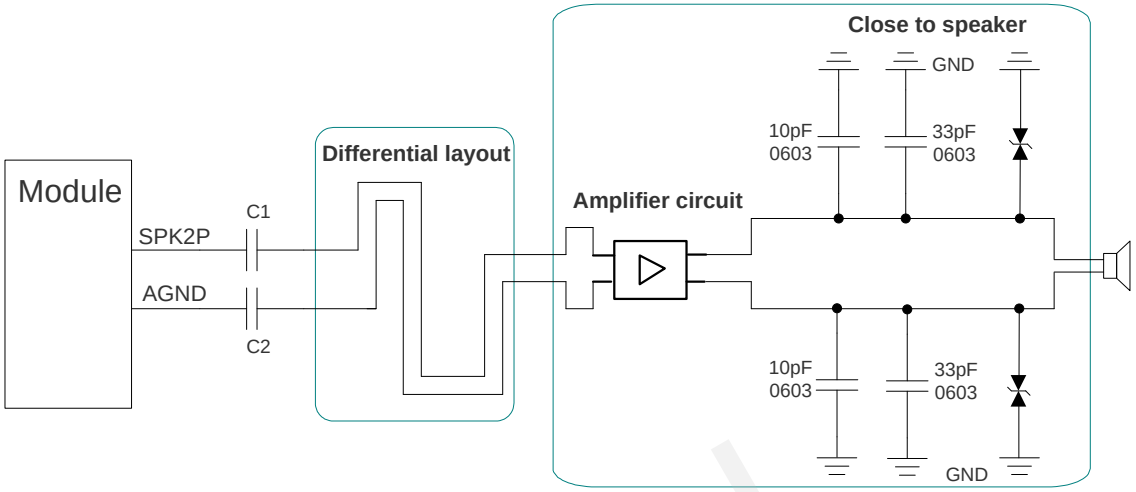

Figure 18: Reference Design with an Amplifier for SPK2P/AGND

NOTE

The value of C1 and C2 depends on the input impedance of audio amplifier.

6 Appendix A

Table 8: Related Documents

SN	Document Name	Remark
[1]	UC15_Hardware_Design	UC15 Hardware Design
[2]	M10_Hardware_Design	M10 Hardware Design
[3]	UC15&M10_Reference_Design	UC15 and M10 Compatible Reference Design