UC15&UC20

Compatibility Design

UMTS/HSDPA Module Series

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About the document

History

Revision	Date	Author	Description
1.0	2013-09-17	Felix YIN	Initial

Contents

Table Index

Figure Index

1 Introduction

UC15 module is compatible with UC20 module. This document briefly describes the compatibility design of UC15 and UC20. UC15 and UC20 can be substituted each other in user's design and manufacturing.

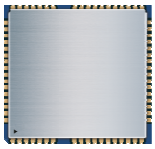
2 General Descriptions

2.1. Product Description

The UC15 is a HSDPA/EDGE module supporting GSM/GPRS Quad-band and UMTS Dual-band. UC20 is a HSPA+/EDGE module supporting GSM/GPRS Quad-band and UMTS Dual-band. UC15 includes two series, UC15-A and UC15-E. UC20 includes two series as well, UC20-A and UC20-E. UC15-A and UC20-A supports UMTS 850/1900MHz. UC15-E and UC20-E supports UMTS 900/2100MHz.

UC15 and UC20 are designed as compatible products. You can choose the right module for your applications. Under the help of the compatibility design guideline, you can migrate your products from UC20 to UC15 3G module smoothly.

Table 1: Module General Information

Module Name	Picture	Packaging	Dimensions	Description
UC15		68-pin LCC + 40 other pads	29 x 29 x 2.5mm	UMTS/HSDPA module
UC20		72-pin LCC + 40 other pads	29 x 32 x 2.5mm	UMTS/HSPA module

2.2. Pin Assignment

The following figures show the pin assignment of UC15 and UC20.

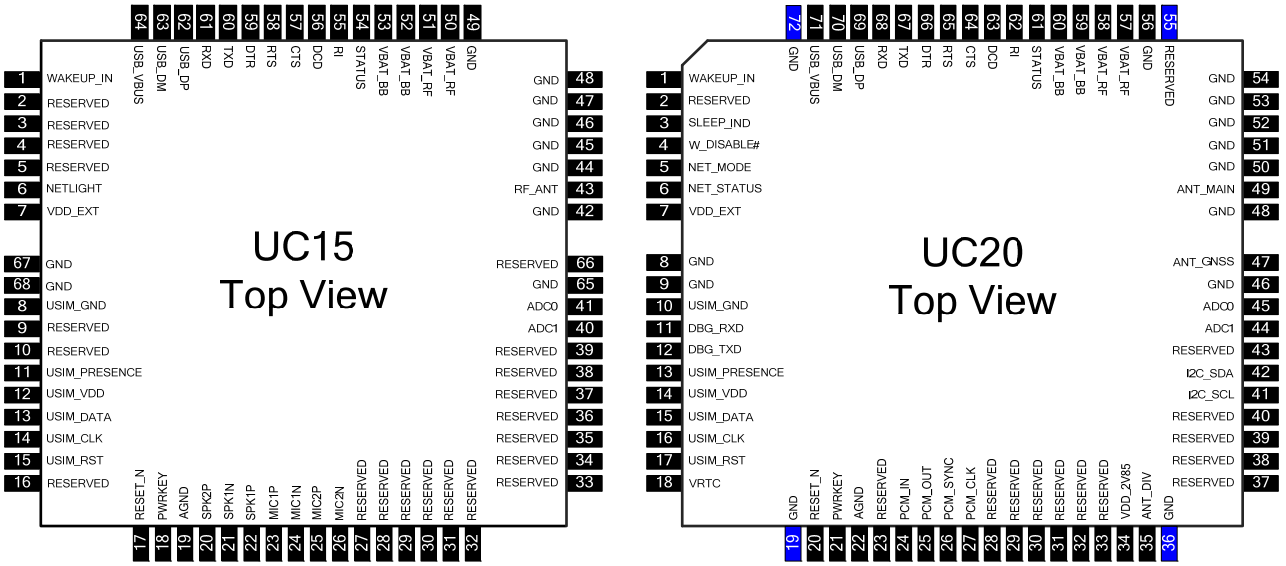


Figure 1: UC15&UC20 Pin Assignment

NOTE

The blue pins of UC20 are not included in the UC15.

Figure 2 shows the combination of pin assignment of UC15 and UC20.

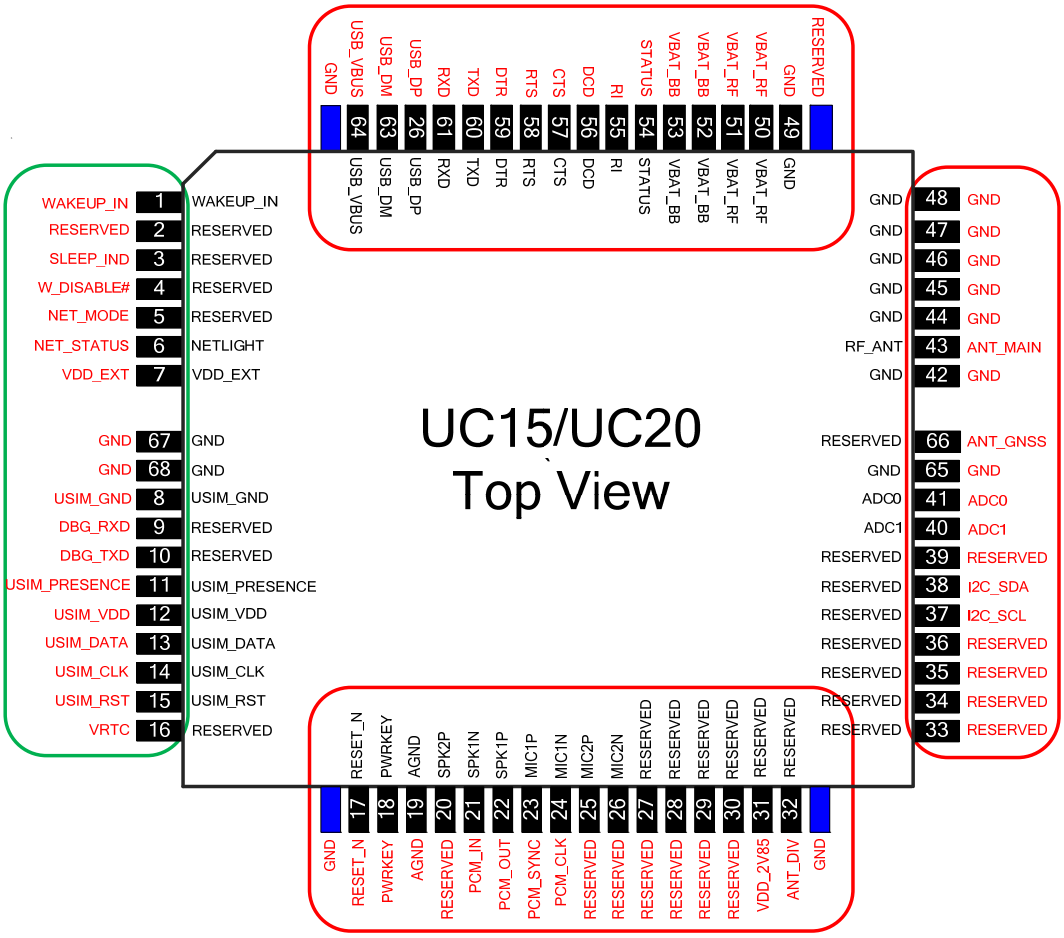


Figure 2: Combined Pin Assignment of UC15&UC20

NOTES

1. The blue pins of UC20 are not included in the UC15.
2. The pin names marked in red in the outside area are UC20's.
3. The pins of main function in red pane are compatible pins of UC15 and UC20.
4. The pins in green pane are compatible pins of UC15 and UC20 on main functionality. However, please pay attention to the recommended footprint and reference design of the compatibility when users design their applications.

3 Pin Description

This chapter describes the pin definition and assignment of UC15 and UC20.

Table 2: 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 Output

3.1. Common Pins

The following table shows UC15 and UC20's common pins with the same function.

Table 3: Common Pins

UC15				UC20			
Pin NO.	Pin Name	IO	Power Domain	Pin NO.	Pin Name	IO	Power Domain
1	WAKEUP_IN	DI	2.6V	1	WAKEUP_IN	DI	1.8V
2	RESERVED	-	-	2	RESERVED	-	-
6	NETLIGHT	DO	2.6V	6	NET_STATUS	DO	1.8V
7	VDD_EXT	PO	2.6V	7	VDD_EXT	PO	1.8V

67	GND	-	Ground	8	GND	-	Ground
68	GND	-	Ground	9	GND	-	Ground
8	USIM_GND	-	Ground	10	USIM_GND	-	Ground
11	USIM_PRESENCE	DI	2.6V	13	USIM_PRESENCE	DI	1.8V
12	USIM_VDD	PO	1.8/3.0V	14	USIM_VDD	PO	1.8/3.0V
13	USIM_DATA	IO	1.8/3.0V	15	USIM_DATA	IO	1.8/3.0V
14	USIM_CLK	DO	1.8/3.0V	16	USIM_CLK	DO	1.8/3.0V
15	USIM_RST	DO	1.8/3.0V	17	USIM_RST	DO	1.8/3.0V
17	RESET_N	DI	1.8V	20	RESET_N	DI	1.8V
18	PWRKEY	DI	1.8V	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	0~2.2V	44	ADC1	AI	0.2~4.2V
41	ADC0	AI	0~2.2V	45	ADC0	AI	0.2~2.1V
65	GND	-	Ground	46	GND	-	Ground
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_RF	PI	3.4~4.3V	57	VBAT_RF	PI	3.4~4.3V
51	VBAT_RF	PI	3.4~4.3V	58	VBAT_RF	PI	3.4~4.3V
52	VBAT_BB	PI	3.4~4.3V	59	VBAT_BB	PI	3.4~4.3V
53	VBAT_BB	PI	3.4~4.3V	60	VBAT_BB	PI	3.4~4.3V
54	STATUS	DO	2.6V	61	STATUS	OD	-
55	RI	DO	2.6V	62	RI	DO	1.8V
56	DCD	DO	2.6V	63	DCD	DO	1.8V
57	CTS	DO	2.6V	64	CTS	DO	1.8V
58	RTS	DI	2.6V	65	RTS	DI	1.8V
59	DTR	DI	2.6V	66	DTR	DI	1.8V
60	TXD	DO	2.6V	67	TXD	DO	1.8V
61	RXD	DI	2.6V	68	RXD	DI	1.8V
62	USB_DP	IO	-	69	USB_DP	IO	-
63	USB_DM	IO	-	70	USB_DM	IO	-
64	USB_VBUS	PI	Typ.5V	71	USB_VBUS	PI	Typ.5V

3.2. Different Functional Pins

The following table shows the different functional pins of UC15 compared with UC20 at the same pin location.

Table 4: Different Functional Pins

UC15				UC20			
Pin NO.	**Pin Name**	**IO**	**Power Domain**	**Pin NO.**	**Pin Name**	**IO**	**Power Domain**
3	RESERVED	-	-	3	SLEEP_IND	DO	1.8V
4	RESERVED	-	-	4	W_DISABLE#	DI	1.8V
5	RESERVED	-	-	5	NET_MODE	DO	1.8V
9	RESERVED	-	-	11	DBG_RXD	DI	1.8V
10	RESERVED	-	-	12	DBG_TXD	DO	1.8V
16	RESERVED	-	-	18	VRTC	IO	1.5~3.25V
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	DO	1.8V
38	RESERVED	-	-	42	I2C_SDA	IO	1.8V
66	RESERVED	-	-	47	ANT_GNSS	AI	GNSS Antenna

NOTES

1. Keep all reserved and unused pins unconnected.
2. For different functional pins, if necessary, please reserve 0 ohm resistors.

4 Recommended Footprint

The following figure shows the recommended compatible footprint of UC15 and UC20.

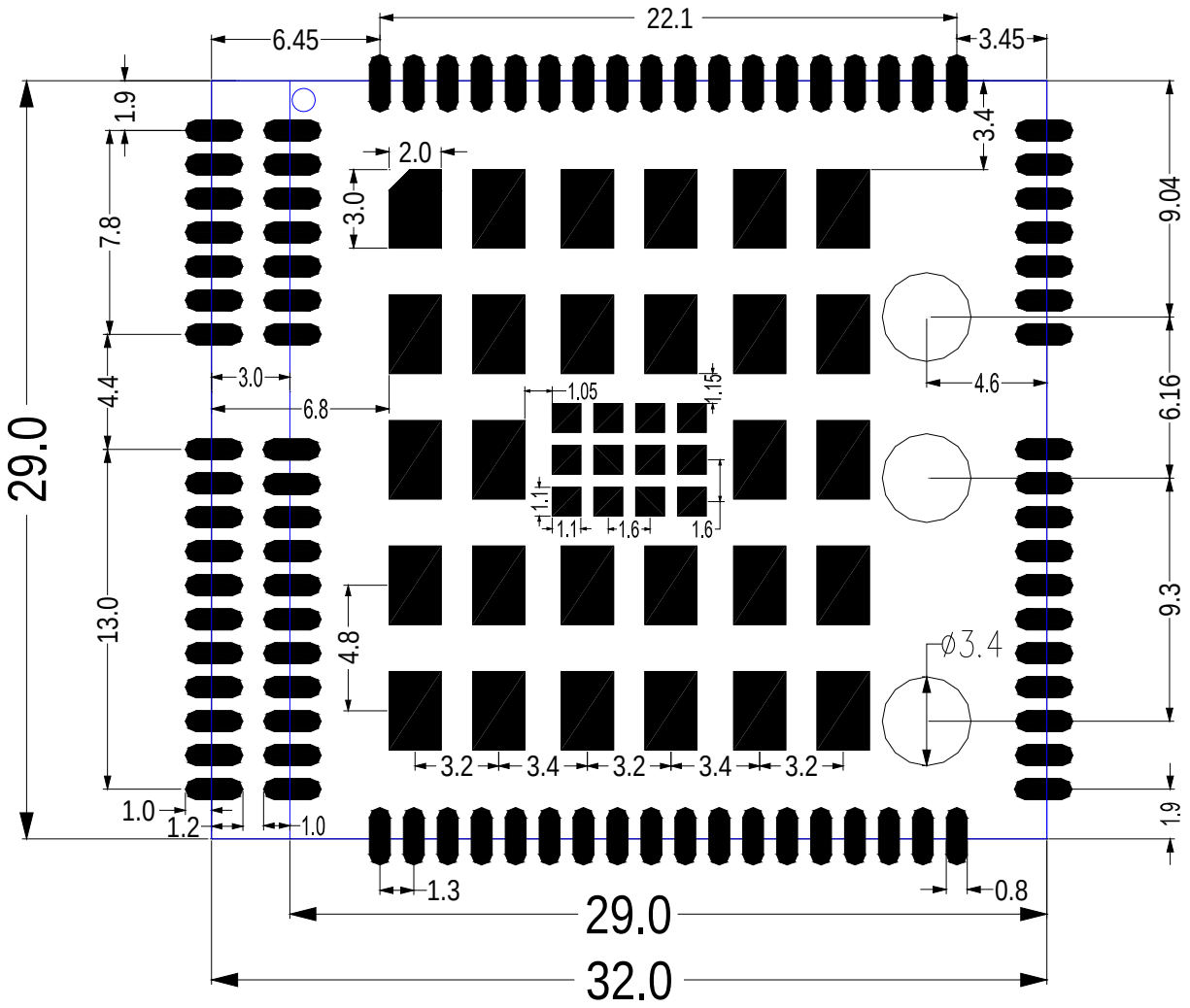


Figure 3: Recommended Footprint (Unit: mm)

The following figures show the sketch map of installation between UC15 and UC20.

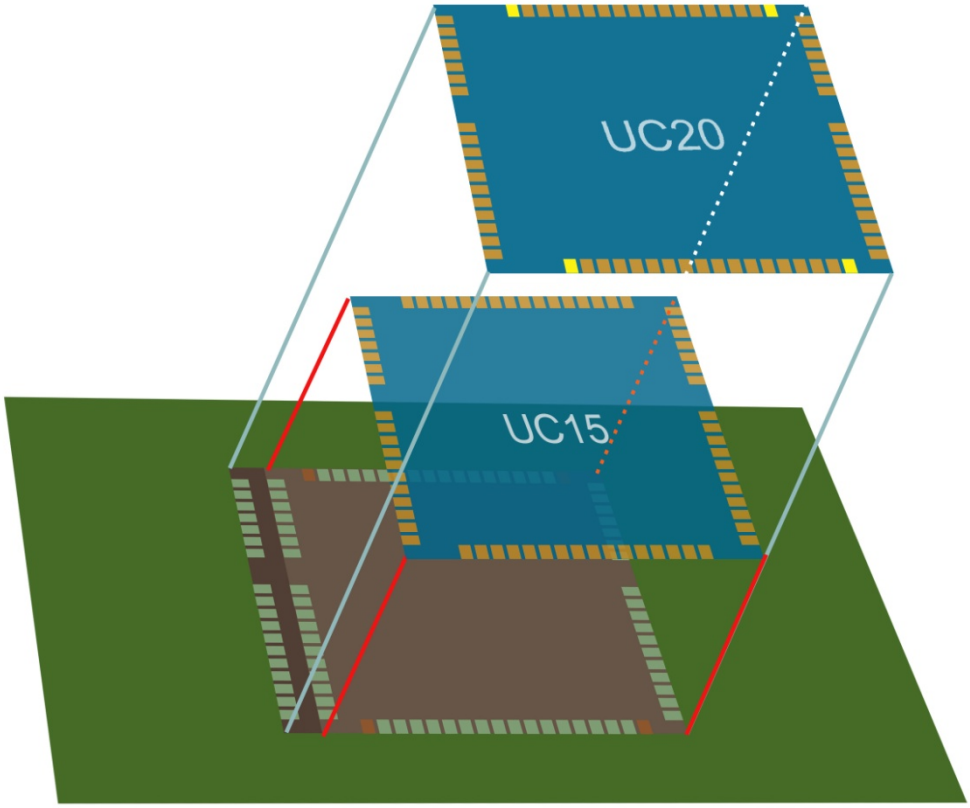


Figure 4: Renderings of Installation

5 Hardware Reference Design

The following chapters describe compatibility design of UC15 and UC20 on main functionalities.

5.1. Power on Circuit

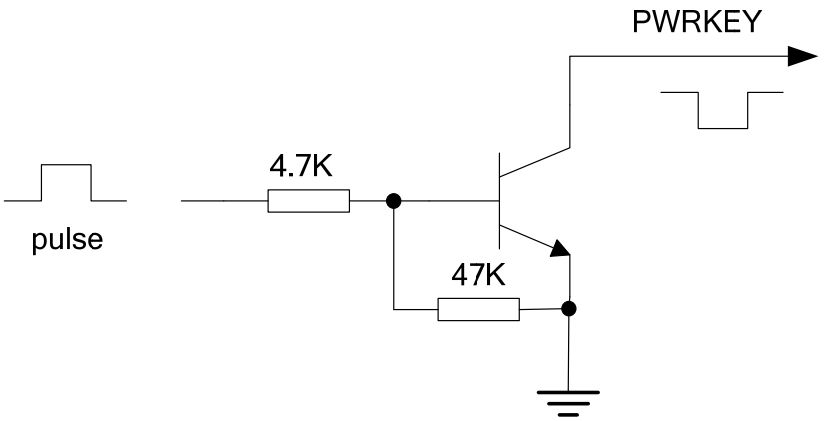


Figure 5: Turn on the Module Using Driving Circuit

5.2. RESET Circuit

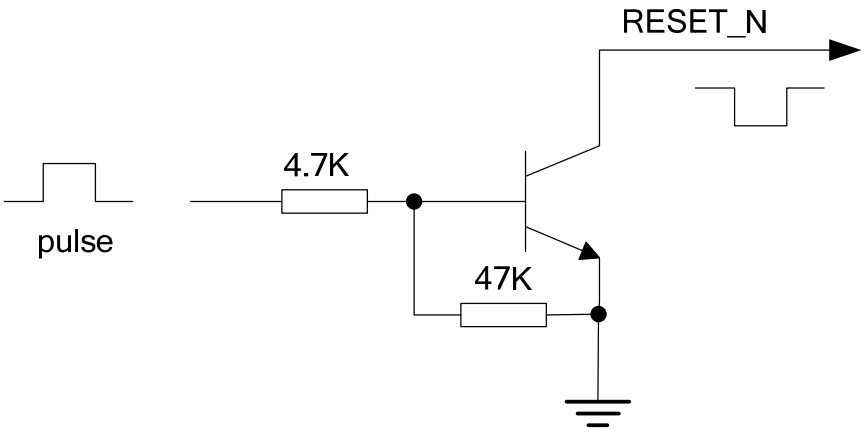


Figure 6: Driving Circuit of Reset the Module

5.3. Network Status Indication

The NETLIGHT (the NET_STATUS on UC20) signal can be used to drive a network status indicator LED. The following circuit is the reference design of NETLIGHT.

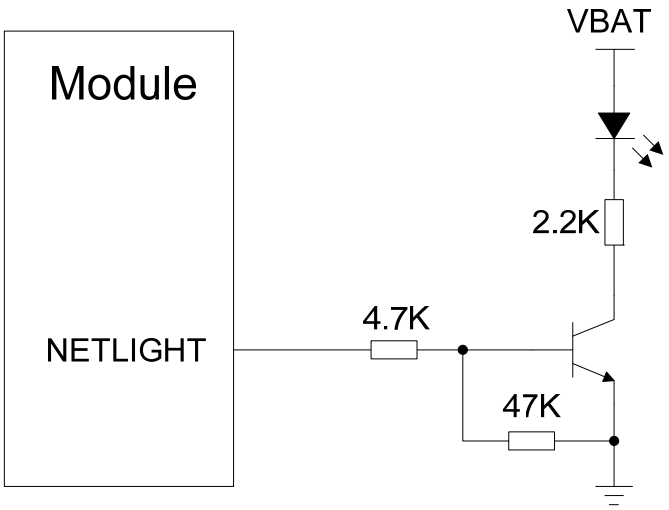


Figure 7: Reference Circuit of the NETLIGHT

5.4. Operating Status Indication

The STATUS pin is set as the module status indicator and can be used to judge whether module is power-on or not. UC15'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 UC15 and UC20 modules.

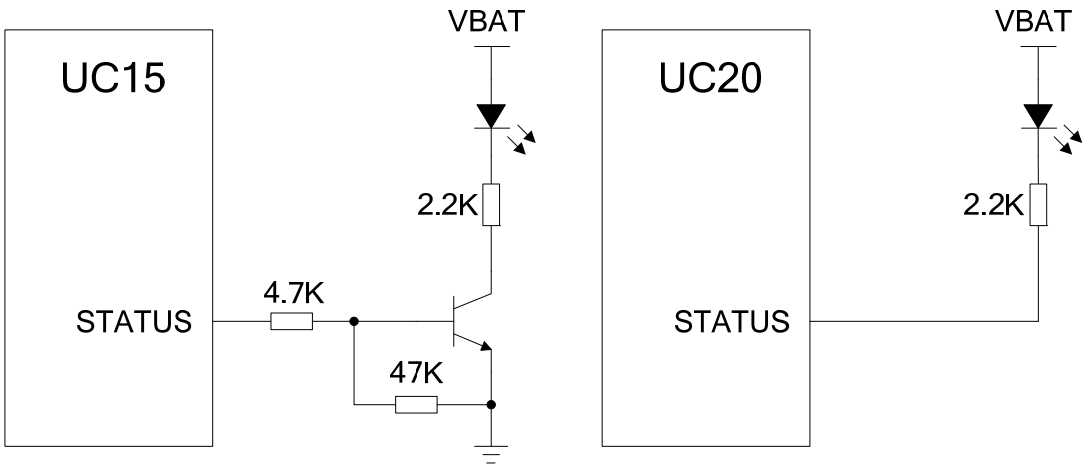


Figure 8: Reference Circuit of the STATUS

5.5. USB Interface

UC15 and UC20 contains one integrated Universal Serial Bus (USB) transceiver which complies with the USB 2.0 specification and supports high speed (480 Mbps), full speed (12 Mbps) and low speed (1.5 Mbps) mode. The USB interfaces of UC15 and UC20 are primarily used for AT command, data transmission, software debug and firmware upgrade. Besides, the USB interface of UC20 can be used as GNSS NMEA output. The following table shows the pin definition of USB interface. More details about the USB 2.0 specifications, please visit http://www.usb.org/home.

The following figure shows the reference circuit of USB interface.

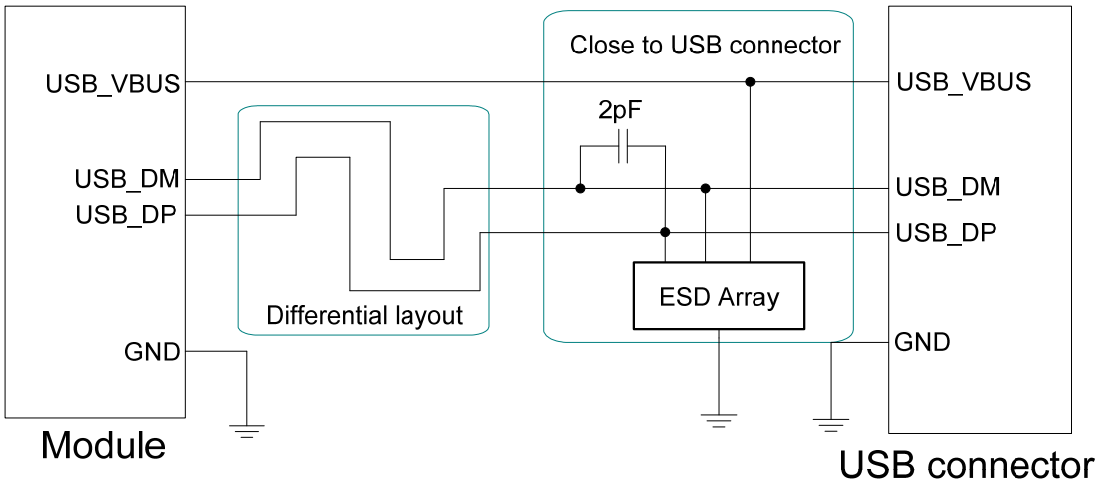


Figure 9: Reference Circuit of the USB Application

In order to ensure the USB interface design corresponding with the USB 2.0 specification, please do remember to comply with the following principles.

- It is important to route the USB signal traces as differential pairs with total grounding. The impedance of USB differential trace is 90ohm.
- Pay attention to the influence of junction capacitance of ESD component on USB data lines. Typically, the capacitance value should be less than 2pF.
- Do not route signal traces under crystals, oscillators, magnetic devices and RF signal traces. It is important to route the USB differential traces in inner-layer with ground shielding not only upper and lower layer but also right and left side.
- Keep the ESD components as closer to the USB connector as possible.

NOTE

UC15 and UC20 module only can be used as slave device.

5.6. SIM Interface

SIM interfaces of UC15 and UC20 support 1.8V or 3.0V SIM cards automatically.

You can tie UC20's SIM pins to UC15's directly and then route to SIM card cassette. The following figure shows the SIM reference design with SIM card detection function.

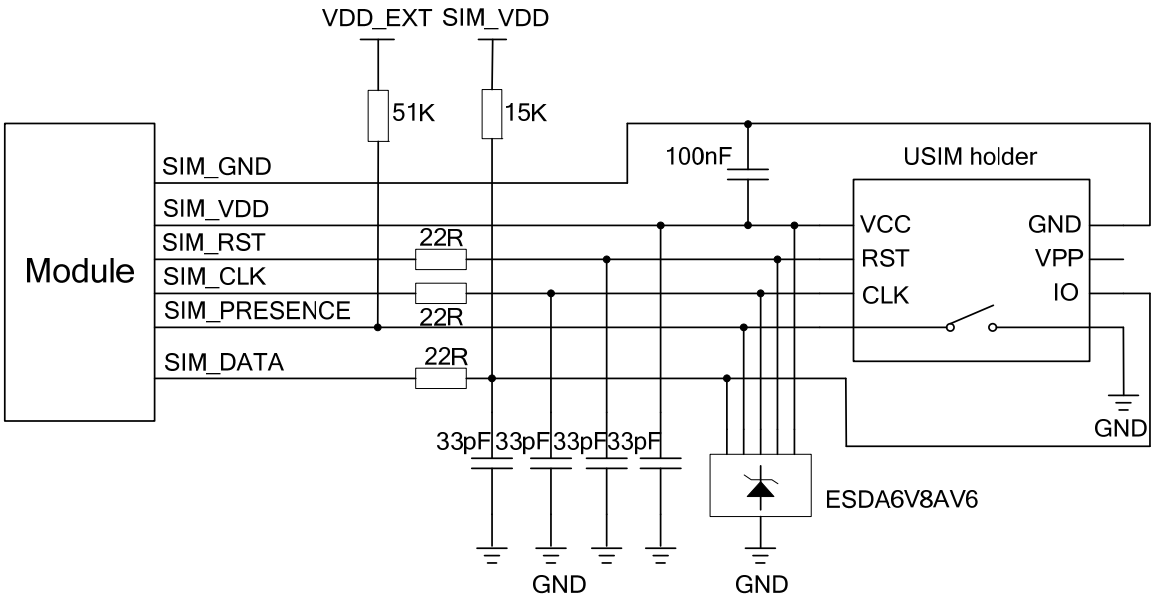


Figure 10: Reference Design of SIM Interface

5.7. UART Interface

Because of the different power domain of the UART interface, you need to add level match circuit between UC15 or UC20 module and MCU.

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

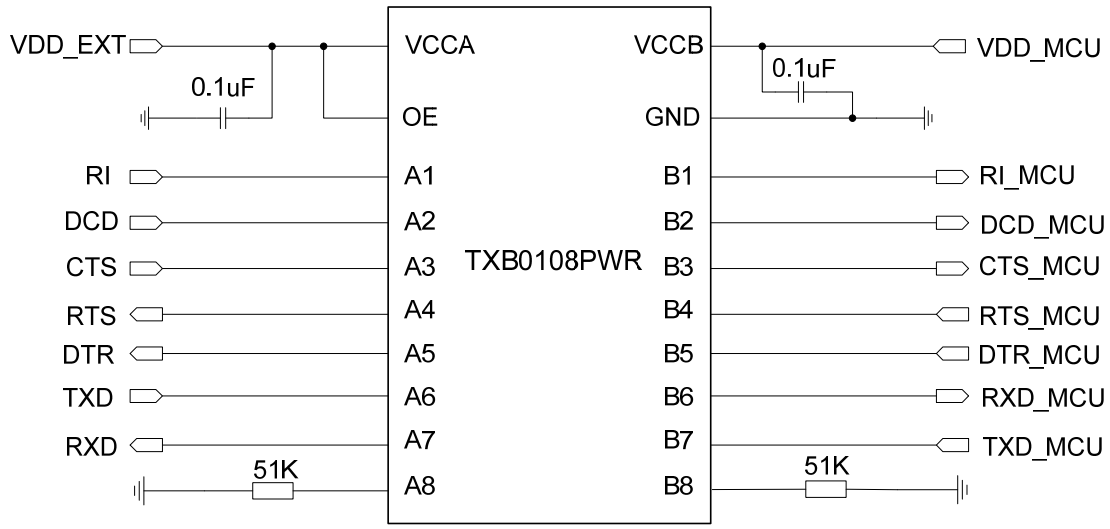


Figure 11: Reference Design of UART Interface

NOTES

1. UC15's UART pins belong to 2.6V power domain.
2. UC20's UART pins belong to 1.8V power domain.

5.8. ADC Interface

Both UC15 and UC20 have two ADC pins for general purpose analog-to-digital converter. UC15's ADC pins are compatible with UC20's. But there are some differences in their voltage range. The following table shows the differences between UC15 and UC20.

Table 5: ADC Voltage Range

Channel	UC15	UC20
ADC0	0~2.2V	0.2~2.1V
ADC1	0~2.2V	0.2~4.2V

5.9. RF Interface

The UC15 pin 43 (UC20 pin 49) is the RF antenna pad. The RF interface has an impedance of 50Ω. Because UC15 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 soldered.

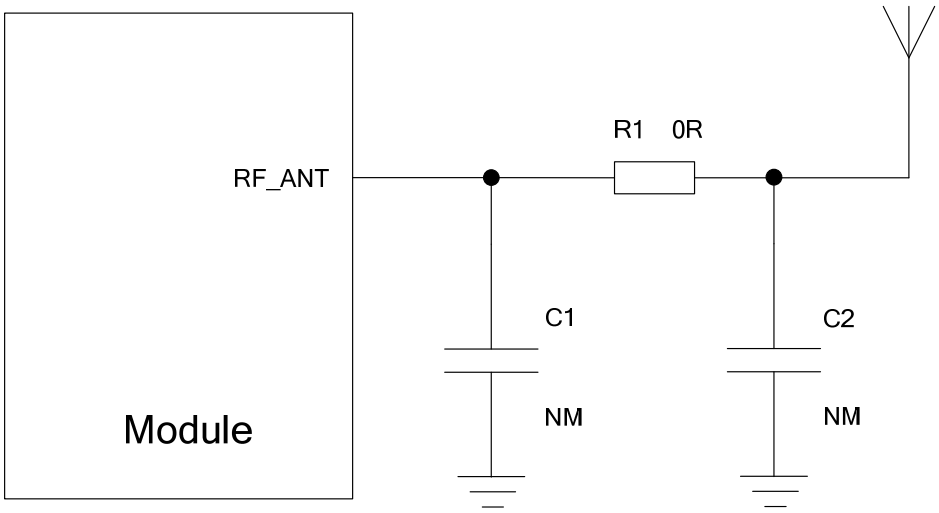


Figure 12: Reference Circuit of RF Interface

5.10. Power Supply

The power supply range of the UC15 and UC20 module is 3.4V 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 3.4V and never exceed 4.3V. The typical power supply of UC15 and UC20 is 3.8V. The following figure shows a reference design for +5V input power source. The designed output for the power supply is 3.88V 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 UC20. 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.

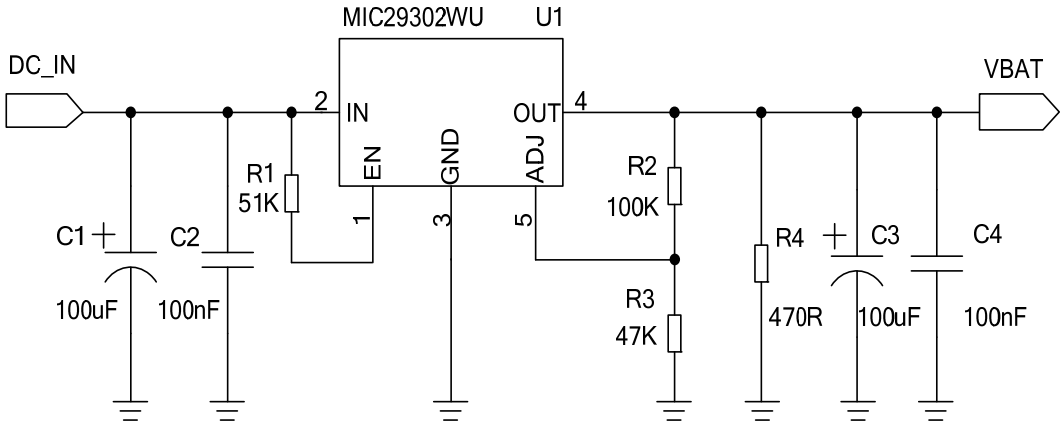


Figure 13: Reference Circuit of Power Supply

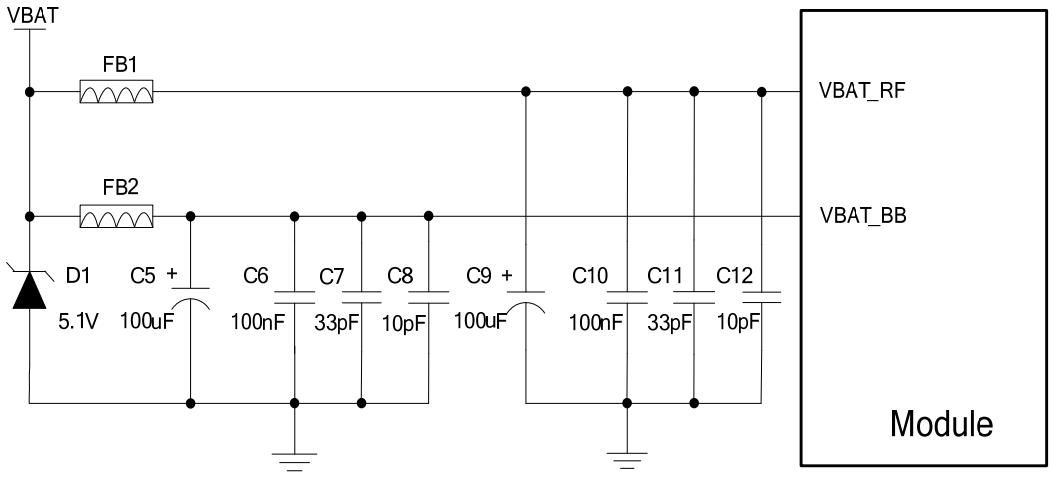


Figure 14: Reference Circuit of Star Structure