UC20&M10 Reference Design Explanation

1. Revision History

Revision	Date	Description
V1.01	2013.05	Initial.
V1.02	2013.07	1. Updated the name of UC20 Pins 1, 3, 4, 10, 13~17, 34, 47 and 55. 2. Reserved capacitor C801 between USB_DP and USB_DM signal lines. 3. Updated U301 circuit, added R307 and D302. 4. Updated GNSS reference circuit. 5. Updated the description of firmware upgrade and reserved testpoints. 6. Updated UC20 ADC voltage range. 7. Added SLEEP_IND, WAKEUP_IN and W_DISABLE# connections, removed the pin connected with Pin 55. 8. Changed R408 from NM to 15K.

2. The Difference on the Voltage Level between UC20 and M10.

	VBAT	VDD_EXT	VRTC	PWRKEY	RESET&EMERG_OFF	NET_STATUS/NETLIGHT	ADC	UART	ANT_MAIN
UC20	3.4~4.3	1.8	1.5~3.25	1.8	1.8	1.8	0.2~2.1/4.2	1.8	GSM+WCDMA
M10	3.3~4.6	2.8	1.5~3.3	VBAT	2.8	2.8	0~2.8	2.8	GSM Quad-band

About the interface difference, refer to <UC20&M10_Compatibility_Design> and hardware design for details.

About the module dimension, refer to our reference footprint or hardware design for details.

3. Index of Reference Design.

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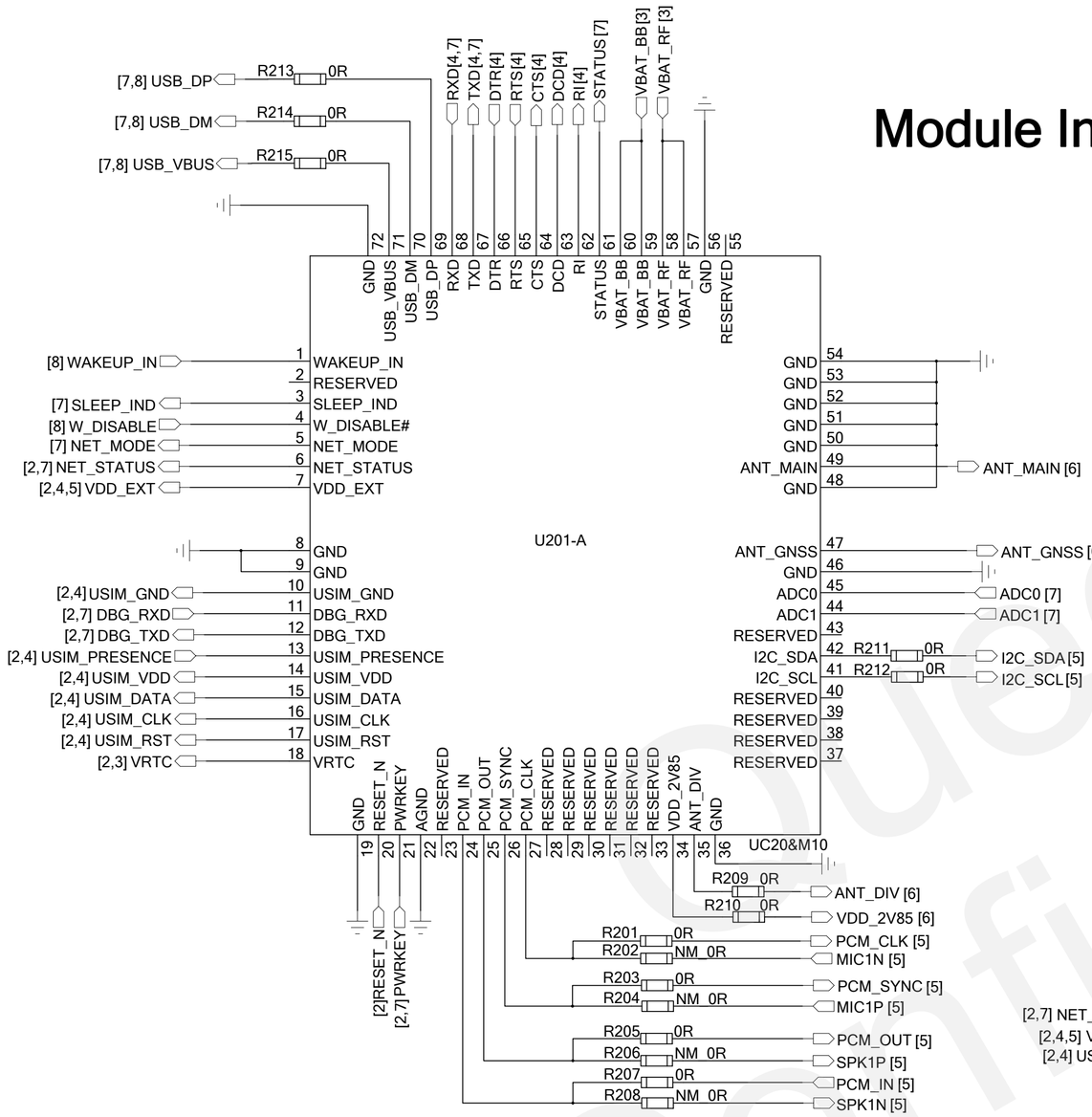
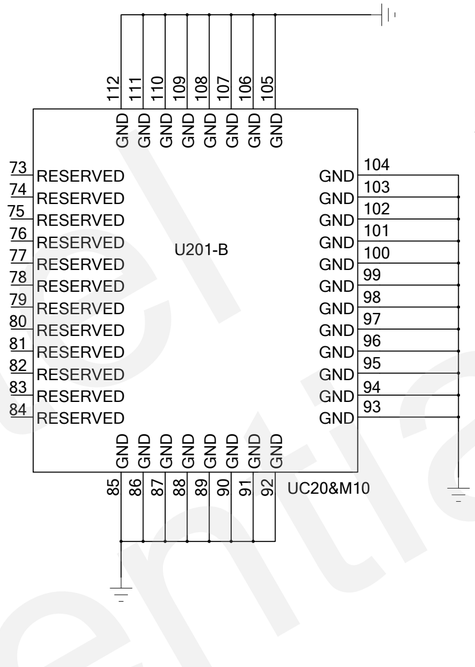
	SHEET 1 of 8	<2013.07>

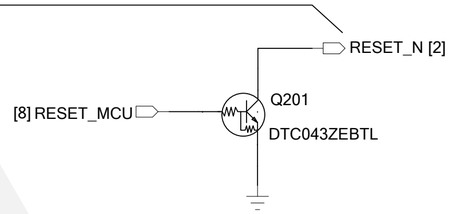
Module Interface



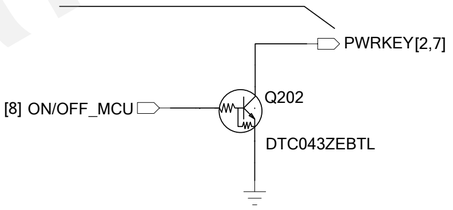


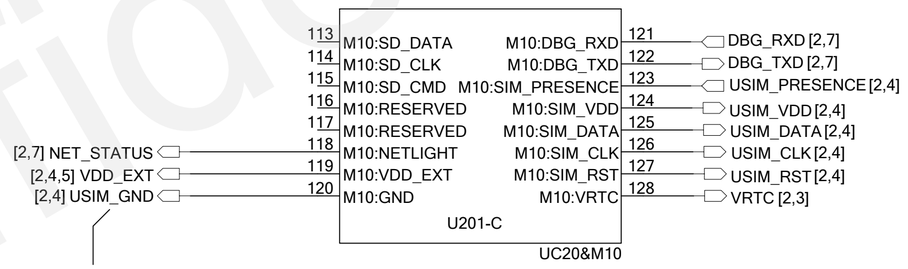
For UC20, RESET_N is used to reset the module.

For M10, EMERG_OFF is used to turn off the module.



It is used to turn on and off the module.





When M10 is applied, USIM_GND connects to M10 GND pin.

Notes:

1.The SMD difference between UC20 and M10.

Intended audience	Installed	Not installed
M10	R202, R204, R206, R208	R201, R203, R205, R207, R209~R215
UC20	R201, R203, R205, R207, R209~R215	R202, R204, R206, R208

2.Please refer to sheet 1 and M10 and UC20 Hardware Design respectively for further details about the difference between them.

3.Keep all reserved pins unconnected.

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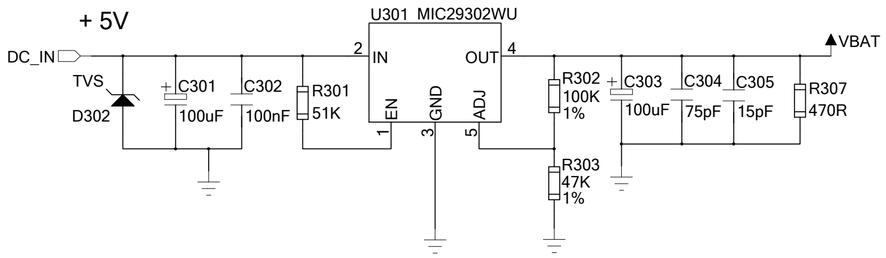
	SHEET 2 of 8	<2013.07>

Power Supply Design

LDO Application

It is used when the input voltage is below 7V.



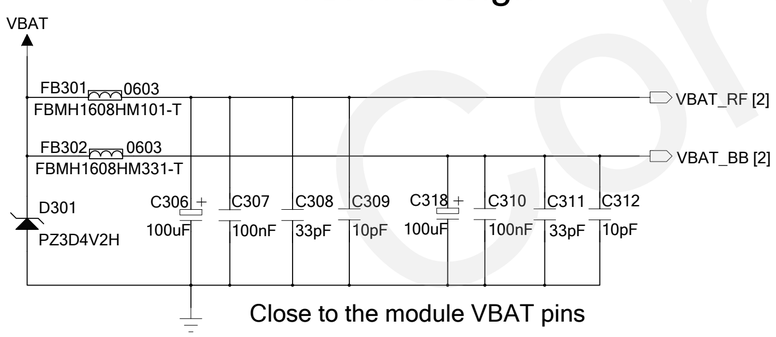
VBAT = (R302/R303+1)*1.24 = 3.88V

DC-DC Application

1.It is used when the input voltage is above 9V in the vehicle application.

2.Use DC-DC to convert high input voltage to 5V,
and LDO will generate 3.8V typical voltage for the module.

VBAT Design



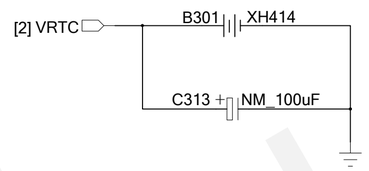
Close to the module VBAT pins

Notes:

1.VBAT should be routed in star mode to VBAT_BB and VBAT_RF net.

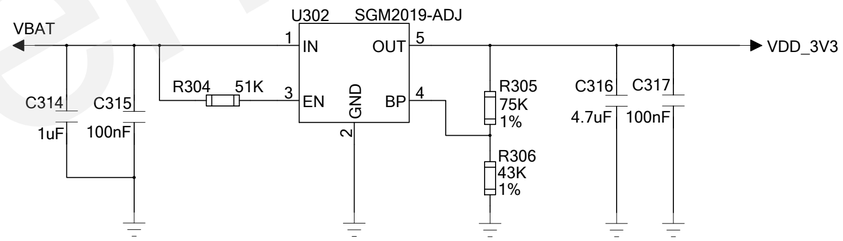
2.The rated current of FB301 should be more than 2.0A, and FB302 more than 0.8A.

VRTC Design



If VRTC function is not used, keep VRTC pin open.

Supply Power to PCM Codec and ADC Circuit



Vout = (R305/R306+1)*1.207 = 3.3V

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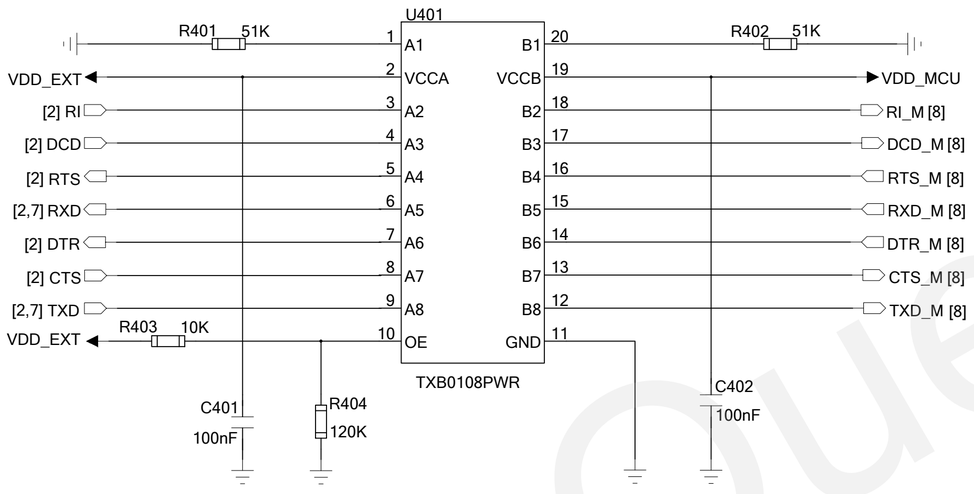
	SHEET 3 of 8	<2013.07>

UART and SIM Design

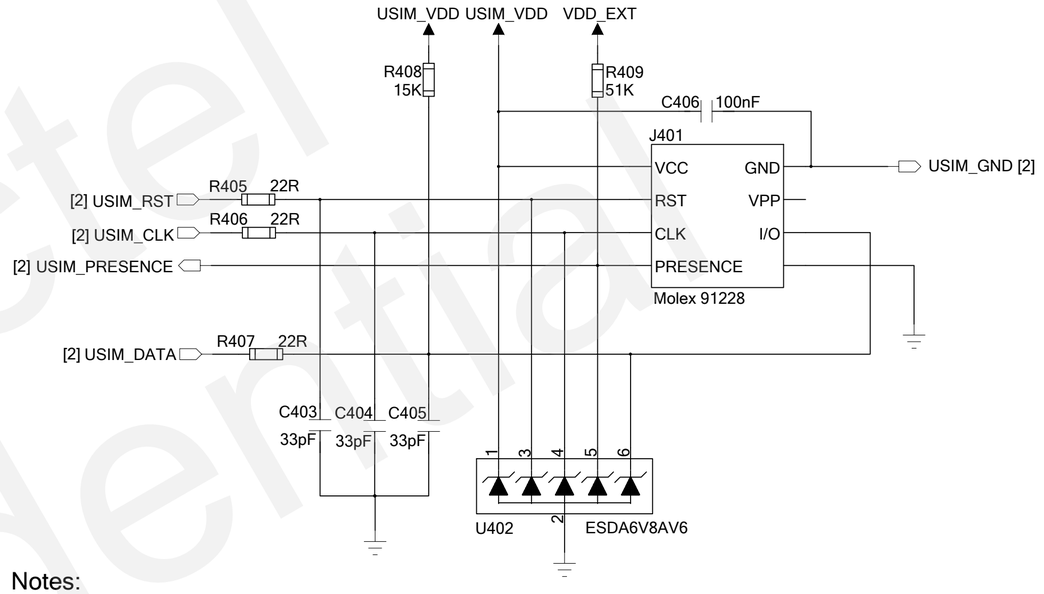
UART Level Translator



Notes:

1. TXB0108 is to realize the voltage level translation between UC20/M10 and MCU.
2. This circuit is available for both UC20 and M10 UART voltage level translation design.
3. VCCA should not exceed VCCB.
   For more information about TXB0108, please refer to the datasheet.

USIM Design



Notes:

1. R405~R407 are applied to suppress the EMI spurious transmission and enhance the ESD protection.
2. R408 can improve anti-jamming capability of the USIM circuit.
3. USIM_PRESENCE is used to detect USIM card, which will be low when the USIM card is inserted. UC20 does not support this function currently.
4. The value of C406 should be less than 1uF.

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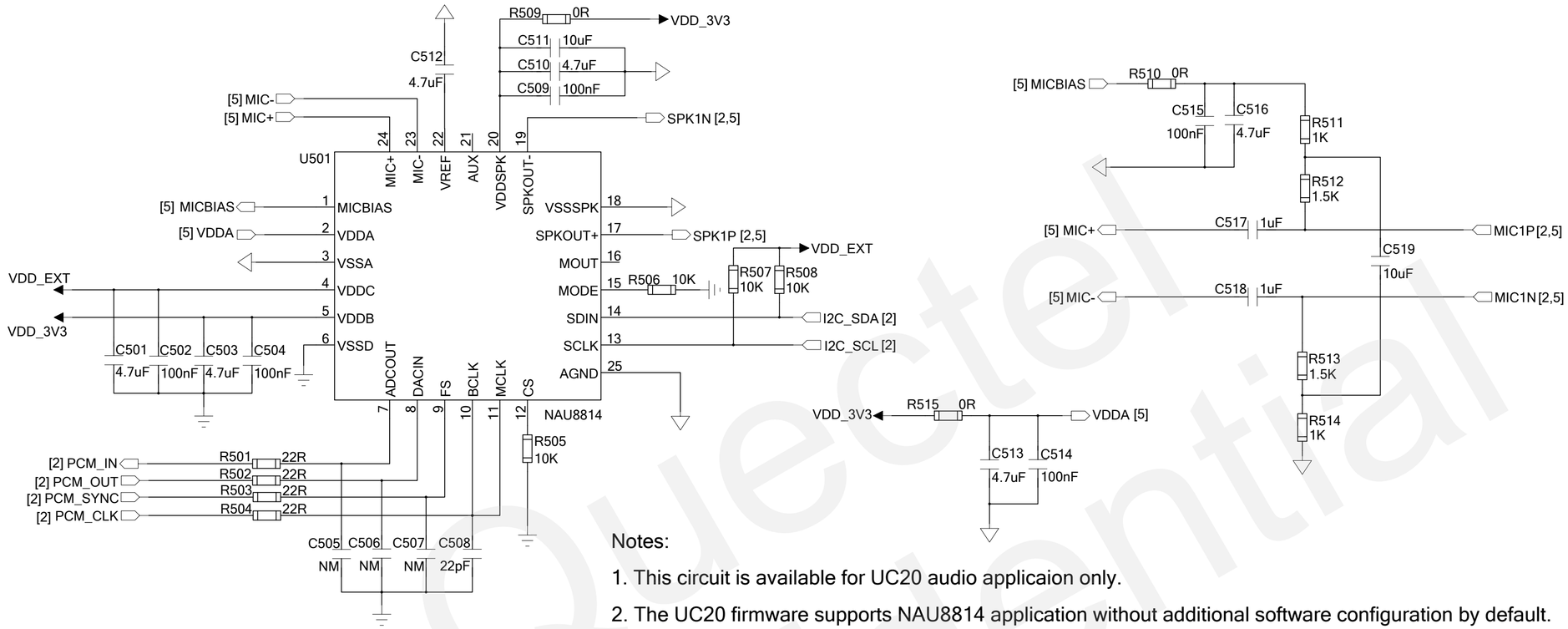
	SHEET 4 of 8	<2013.07>

Audio Design

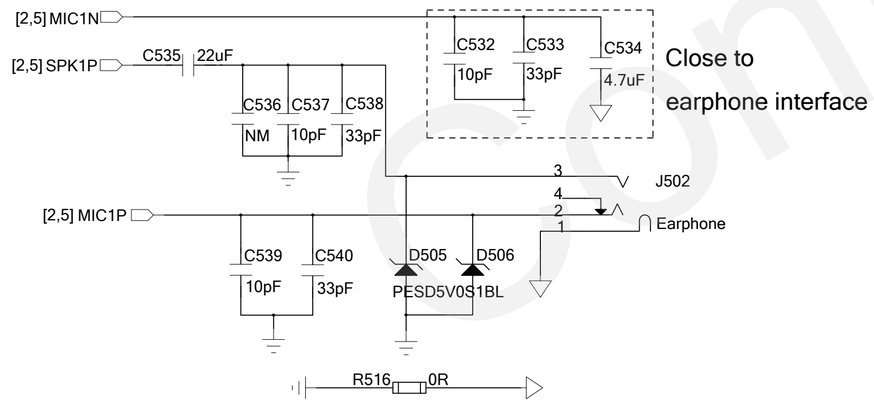
PCM Codec Circuit



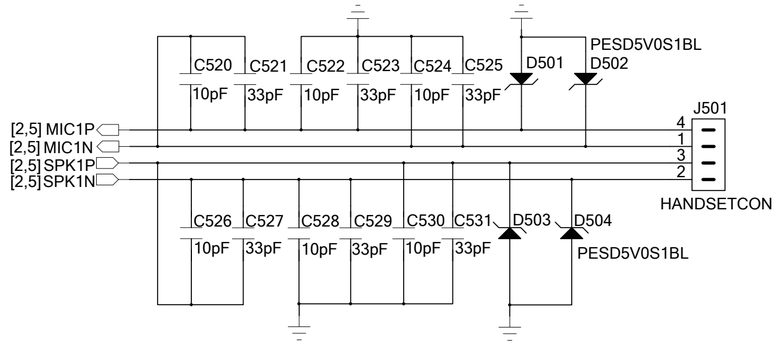
Notes:

1. This circuit is available for UC20 audio applicaion only.
2. The UC20 firmware supports NAU8814 application without additional software configuration by default. Refer to the document <UC20_AT_Commands_Manual> for details.

Audio Channel - Earphone



Audio Channel - Handset



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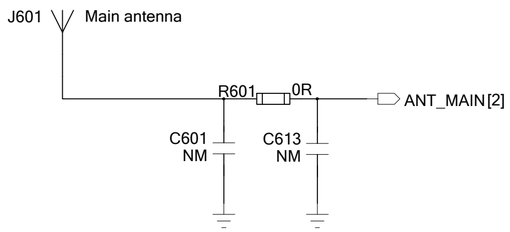
	SHEET 5 of 8	<2013.07>

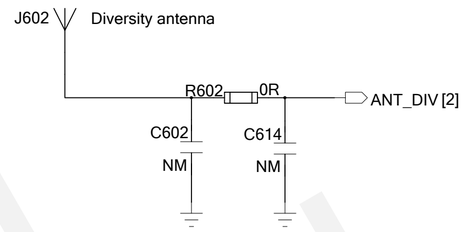
RF and GNSS Design

Main Antenna Interface



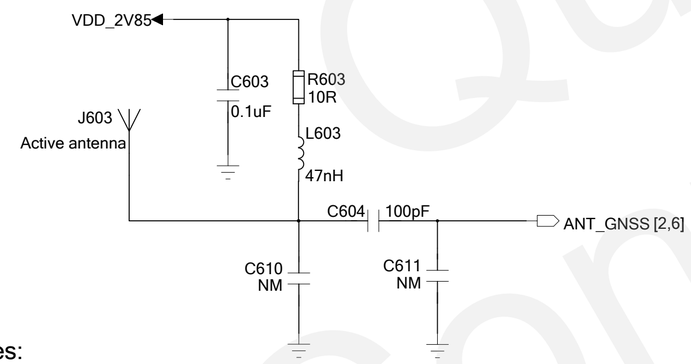
C601 and C613 are reserved for impedance matching.

Diversity Antenna Interface



ANT_DIV is used to improve UMTS receiving performance.

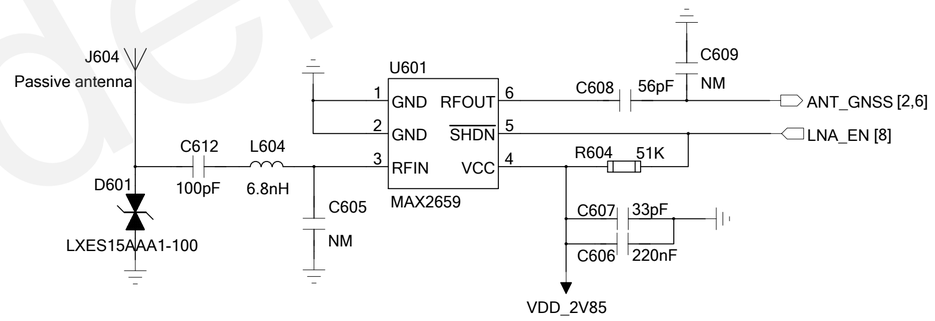
GNSS Active Antenna Circuit



Notes:

1. If customers design antenna circuit with passive antenna, the R603 and L603 are not needed.
2. Customer can choose an external LDO to supply power to the active antenna, if VDD_2V85 cannot meet the power requirement of the active antenna.

GNSS Passive Antenna Circuit



Notes:

1. One typical reference circuit based on MAX2659 is shown above.
2. Customers can use one GPIO turning on and off the LNA U601.
3. The capacitance value of D601 should be less than 1pF.

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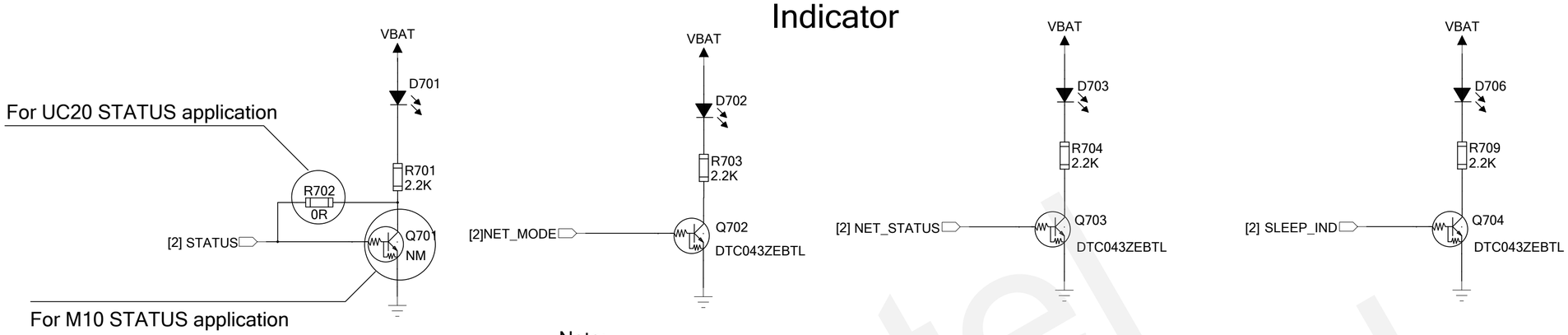
	SHEET 6 of 8	<2013.07>

Other Designs

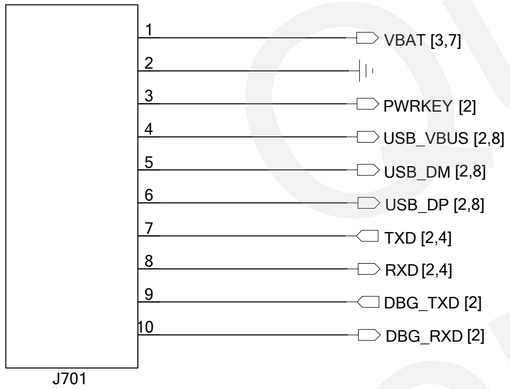
Indicator



Note:

Refer to the document <UC20_Hardware_Design> for more details about NET_MODE, NET_STATUS and SLEEP_IND.

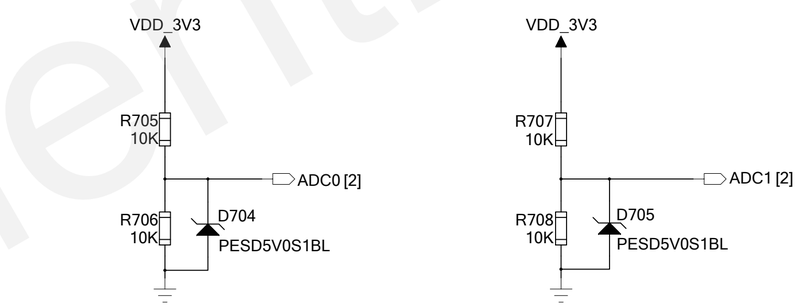
Reserved Testpoints



Notes:

1. USB and main UART interface are reserved for firmware upgrade, refer to the hardware design for details.
2. Debug UART interface can be used to catch log. As to UC20, the default log port is USB interface, refer to the document <UC20_AT_Commands_Manual> for details.
3. It is recommended to add ESD protection components (e.g. ESDA6V8AV6) on these reserved testpoints. In addition, the ESD diodes used on USB data lines should have less than 2 pF of capacitance.

ADC Design



Notes:

1.Input voltage range of UC20 ADC0 is 0.2~2.1V, and ADC1 is 0.2~4.2V.

2.Input voltage range of M10 ADC0 and ADC1 are both 0~2.8V.

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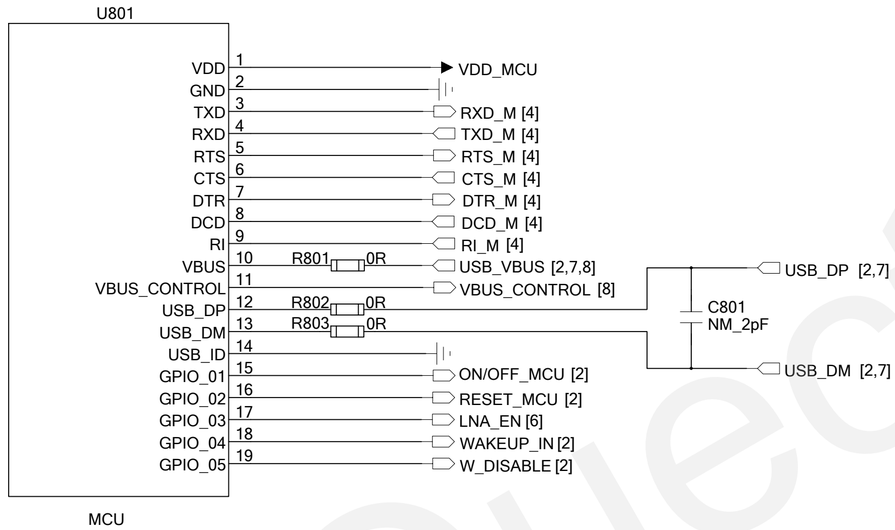
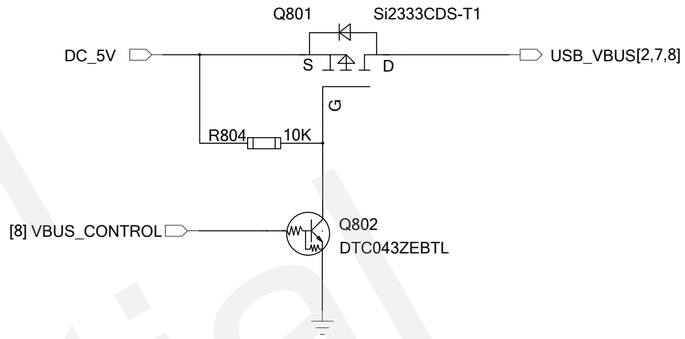
	SHEET 7 of 8	<2013.07>

MCU Interface





VBUS_CONTROL = High level, Q801 conducts.

Notes:

1.U801 represents customer's MCU.

2.Pay attention to the UART connection of RTS/CTS.

3.UC20 can only work as a USB device and supports FS/HS mode. To communicate with USB interface, MCU needs to support USB host or OTG function.

The VBUS pins of MCU and UC20 need to be provided 5V power for USB detection, and VBUS_CONTROL turns on and off VBUS power supply.

4.Customers can determine to use USB or UART communication according to their needs.

Application	Installed	Not installed
USB	R801~R804, Q801~Q802	U401 circuit
UART	U401 circuit	R801~R804, Q801~Q802

5.Please pay attention to LNA_EN voltage level translation for LNA, if the voltage domain of MCU is 5V.

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	SHEET 8 of 8	<2013.07>