

1. SIM808 Description

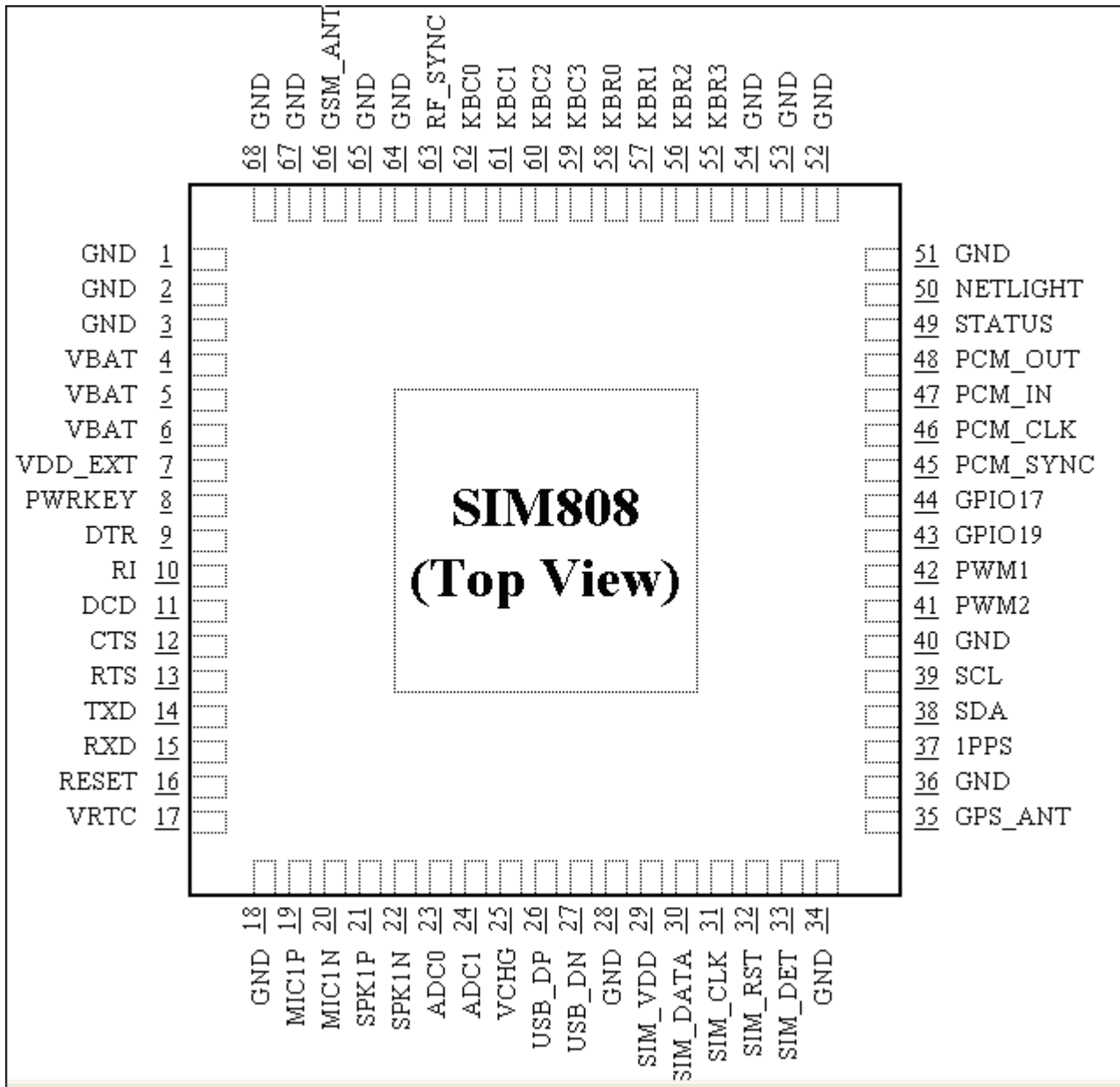
1.1. Summarize

SIM808 designed by SIMCom is a quad band module which supports GSM/GPRS. The baseband circuit is based on MTK and RF circuit is based on RFMD. It works at quad bands-----GSM850, EGSM900, DCS1800, and PCS1900. CPU clock is based on 26MHz crystal. The main IC includes MT6261D and RF7198. SIM808 is in compliance with the essential requirements and other relevant provisions of Directive1999/5/EC .

1.2. Feature

- Quad-Band 850/900/1800/1900MHz
- GPRS multi-slot class 12
- GPRS mobile station class B
- Compliant to GSM phase 2/2+
 - Class 4 (2 W @ 850/900 MHz)
 - Class 1 (1 W @ 1800/1900MHz)
- 22 tracking/66 acquisition-channel GPS L1 receiver
- Dimensions: 24*24*2.6 mm
- Weight: 3.3 g
- Control via AT commands (3GPP TS 27.007, 27.005 and SIMCom enhanced AT Commands)
- Supply voltage range 3.4~4.4 V
- Low power consumption
- Operation temperature:-40~85°C
- 68 SMT pads include
 - Interface to external SIM 3V/1.8V
 - Analog audio interface
 - RTC backup
 - Serial interface
 - I2C interface
 - USB interface
 - Keypad interface
 - Antenna pad
 - PCM interface
 - PWM
 - GPIO
 - ADC
 - Other signal

1.3. Pin



1.4. Picture

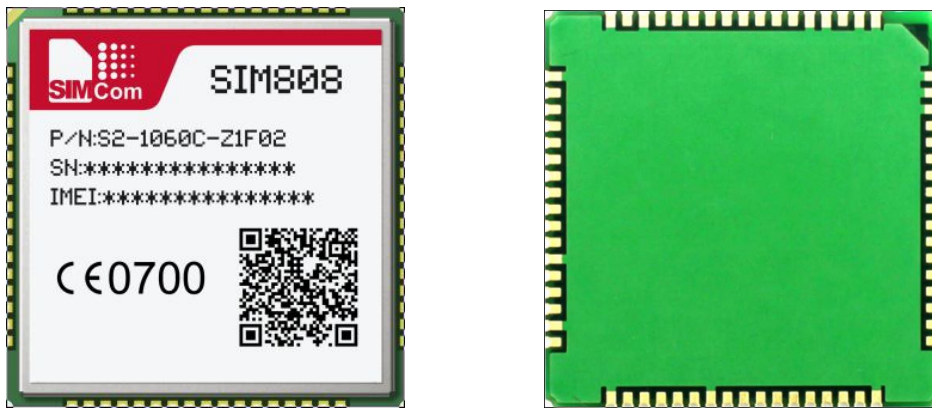


Figure 1: Top and Bottom view of SIM808

1.5. Dimension

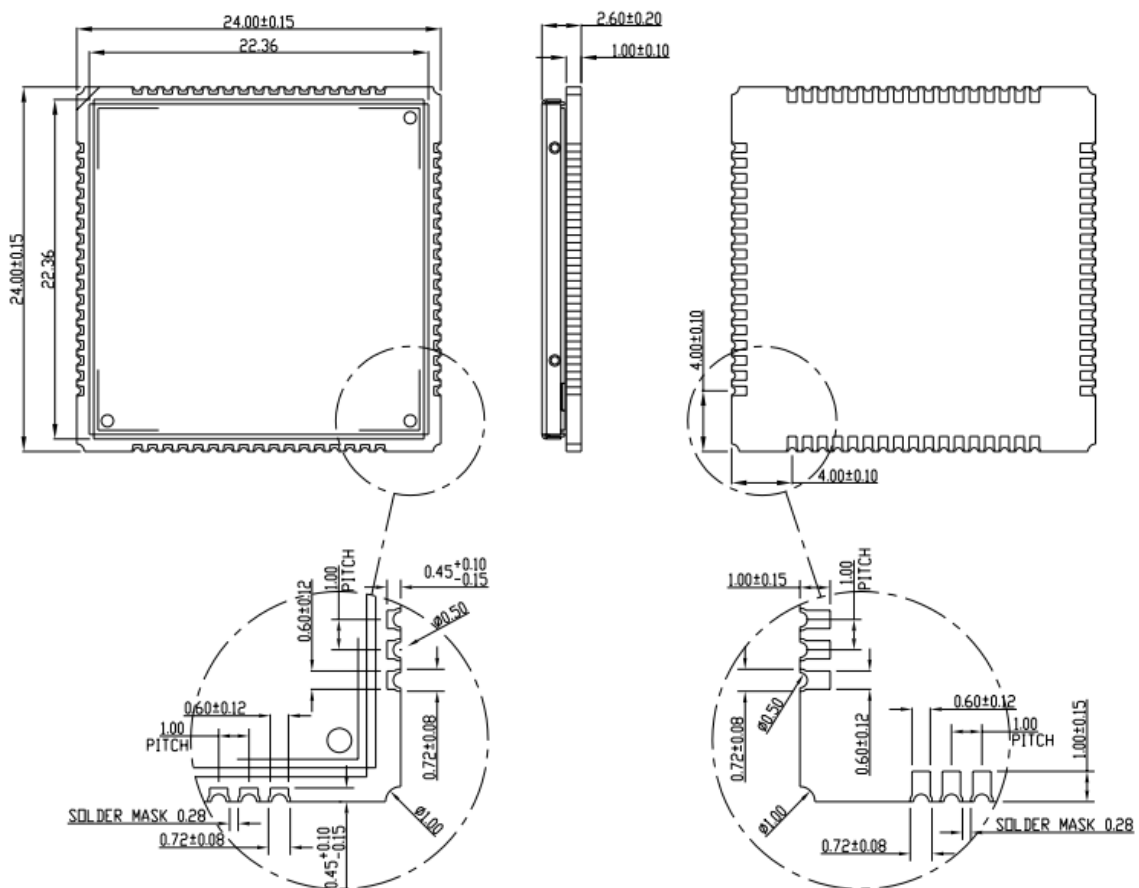


Figure 2: Dimension

2. Detail Block Diagram

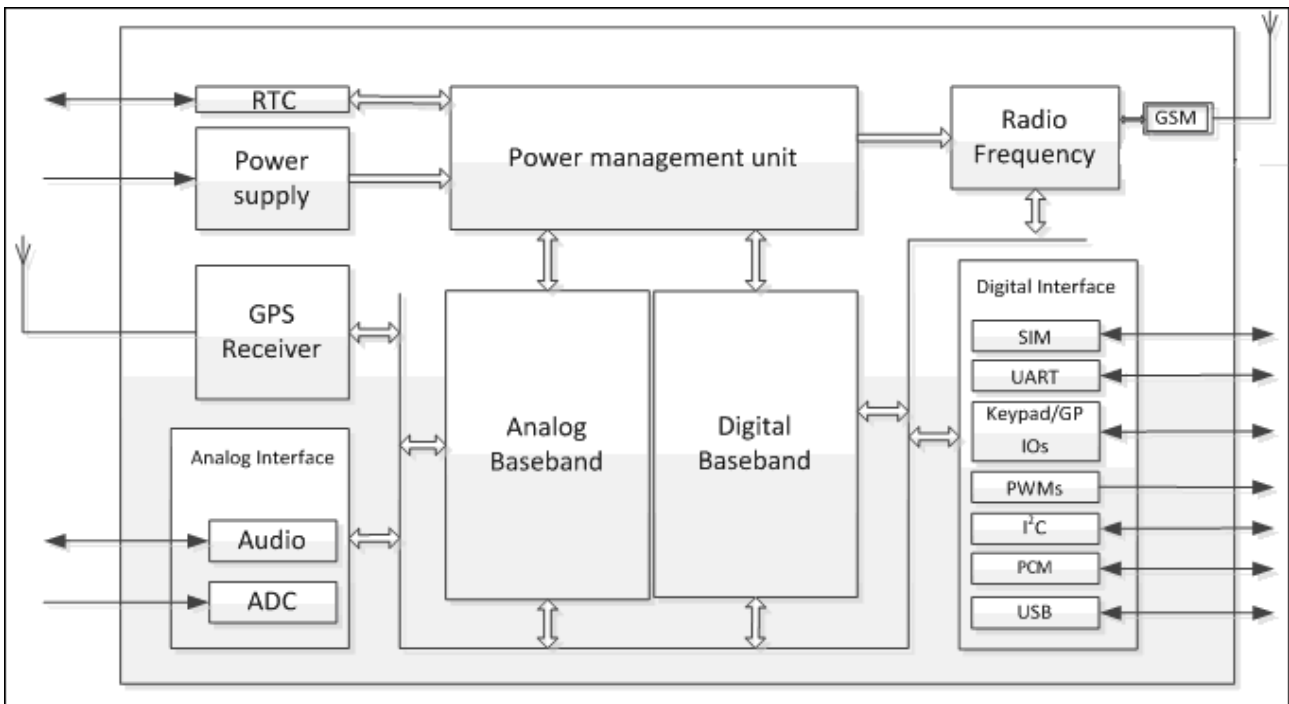


Figure 3: Block diagram of SIM808

3. Electrical and Reliability Characteristics

3.1. Absolute Maximum Ratings

The absolute maximum ratings stated in following table are stress ratings under non-operating conditions. Stresses beyond any of these limits will cause permanent damage to SIM808.

Table 1: Absolute maximum ratings

Symbol	Min	Typ	Max	Unit
V _{BAT}	-	-	4.5	V
Current	0		2.0	A
V _{CHG}	-		12	V
I _I *	-	4	16	mA
I _O *	-	4	16	mA

*These parameters are for digital interface pins, such as keypad, GPIO, I²C, UART, PWMs and PCM.

3.2. Digital Interface Characteristics

Table 2: Digital interface characteristics

Symbol	Parameter	Min	Typ	Max	Unit
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I_{IH}	High-level input current	2.1	-	3.1	V
I_{IL}	Low-level input current	-0.3	-	0.7	V
V_{OH}	High-level input voltage	2.4	2.8	-	V
V_{OL}	Low-level input voltage	-	-	0.4	V

* These parameters are for digital interface pins, such as keypad, GPIO, I²C, UART, PWMs and PCM.

3.3. SIM Card Interface Characteristics

Table 3: SIM card interface characteristics

Symbol	Parameter	Min	Typ	Max	Unit
I_{IH}	High-level input current	-1	-	1	uA
I_{IL}	Low-level input current	-1	-	1	uA
V_{IH}	High-level input voltage	1.4	-	-	V
		2.4	-	-	V
V_{IL}	Low-level input voltage	-	-	0.27	V
		-	-	0.4	V
V_{OH}	High-level output voltage	1.62	-	-	V
		2.7	-	-	V
V_{OL}	Low-level output voltage	-	-	0.36	V
		-	-	0.4	V

3.4. SIM_VDD Characteristics

Table 4: SIM_VDD characteristics

Symbol	Parameter	Min	Typ	Max	Unit
V_O	Output voltage	-	3.0	-	V
		-	1.8	-	V
I_O	Output current	-	-	10	mA

3.5. VRTC Characteristics

Table 5: VRTC characteristics

Symbol	Parameter	Min	Typ	Max	Unit
V_{RTC-IN}	VRTC input voltage	1.2	2.8	3.0	V
I_{RTC-IN}	VRTC input current	-	3.0	5.0-	uA
$V_{RTC-OUT}$	VRTC output voltage	-	2.8	-	V
$I_{RTC-OUT}$	VRTC output current	-	-	2	mA

3.6. Current Consumption

Table 6: Module current consumption (VBAT = 4V, GPS engine is powered down)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit		
VBAT	Voltage		3.4	4.0	4.4	V		
	Voltage drop	PCL=5			350	mV		
	Voltage ripple	PCL=5 @ f<200kHz @ f>200kHz			50 2.0	mV mV		
I _{VBAT}	Average current	Power off mode		134	150	uA		
		Sleep mode (AT+CFUN=1): (BS-PA-MFRMS=9) (BS-PA-MFRMS=5) (BS-PA-MFRMS=2)		1.073 1.167 1.627		mA mA mA		
		Idle mode (AT+CFUN=1): EGSM900		16.80		mA		
		Voice call (PCL=5): GSM850 EGSM900		216.6 221.7		mA mA		
		Voice call (PCL=0): DCS1800 PCS1900		140.3 155.0		mA mA		
		Data mode GPRS (1Rx,4Tx): GSM850 EGSM900 DCS1800 PCS1900		445.5 433.7 287.1 296.5		mA mA mA mA		
		Data mode GPRS (3Rx,2Tx): GSM850 EGSM900 DCS1800 PCS1900		332.9 333.5 222.0 229.8		mA mA mA mA		
		Data mode GPRS (4Rx,1Tx): GSM850 EGSM900 DCS1800 PCS1900		222.6 224.7 158.4 165.2		mA mA mA mA		
		I _{MAX}	Peak current	During TX burst			2.0	A

Table 7: GPS current consumption

Module	Conditions	CNo(dB/Hz)	Current(mA)
By instrument	Leak current when power off	Not accessible	/
	No Fix	/	23.5
	-130dBm/Tracking	38-39	21.8
	-140dBm/Tracking	28-29	21.7
	-150dBm/Tracking	18-19	20.6
	-160dBm/Tracking	13-14	19.8
	-130dBm/Cold start	41-42	24.7
	-140dBm/Cold start	31-32	24.9
	-150dBm/Cold start	/	23.2
Real networking	Leak current when power off	Not accessible	/
	No Fix	/	21
	Searching	/	19.4
	Fixed	35	19.7

* In above table the current consumption value is the typical one of the module tested in laboratory. In the mass production stage, there may be differences among each individual.

3.7. Electro-Static Discharge

SIM808 is an ESD sensitive component, so more attention should be paid to the procedure of handling and packaging. The ESD test results are shown in the following table.

Table 8: The ESD characteristics (Temperature: 25°C, Humidity: 45 %)

Pin	Contact discharge	Air discharge
VBAT	±5KV	±10KV
GND	±5KV	±10KV

RXD, TXD	±2KV	±8KV
Antenna port	±5KV	±10KV
SPK_P/SPK_N/ MIC_P/MIC_N	±4KV	±8KV
PWRKEY	±4KV	±8KV

Note: It is suggested that customers in serials with 100ohm resistances on UART lines for ESD consideration.

4. Radio Characteristics

4.1. Module GSM/GPRS Output Power

The following table shows the module conducted output power, it is followed by the 3GPP TS 05.05 technical specification requirement.

Table 9: SIM808 GSM 900 and GSM 850 conducted RF output power

GSM850、EGSM900			
PCL	Nominal output power (dBm)	Tolerance (dB) for conditions	
		Normal	Extreme
5	33	±2	±2.5
6	31	±3	±4
7	29	±3	±4
8	27	±3	±4
9	25	±3	±4
10	23	±3	±4
11	21	±3	±4
12	19	±3	±4
13	17	±3	±4
14	15	±3	±4
15	13	±3	±4
16	11	±5	±6
17	9	±5	±6
18	7	±5	±6
19-31	5	±5	±6

Table 10: SIM808 DCS 1800 and PCS 1900 conducted RF output power

DCS1800、PCS1900		
PCL	Nominal output power (dBm)	Tolerance (dB) for conditions

		Normal	Extreme
0	30	±2	±2.5
1	28	±3	±4
2	26	±3	±4
3	24	±3	±4
4	22	±3	±4
5	20	±3	±4
6	18	±3	±4
7	16	±3	±4
8	14	±3	±4
9	12	±4	±5
10	10	±4	±5
11	8	±4	±5
12	6	±4	±5
13	4	±4	±5
14	2	±5	±6
15	0	±5	±6

For the module's output power, the following is should be noted:

At GSM900 and GSM850 band, the module is a class 4 device, so the module's output power should not exceed 33dBm, and at the maximum power level, the output power tolerance should not exceed +/-2dB under normal condition and +/-2.5dB under extreme condition.

At DCS1800 and PCS1900 band, the module is a class 1 device, so the module's output power should not exceed 30dBm, and at the maximum power level, the output power tolerance should not exceed +/-2dB under normal condition and +/-2.5dB under extreme condition.

The device complies with RF specifications when the device used over 20cm form your body.

4.2. Module GSM/GPRS Receive Sensitivity

The following table shows the module's conducted receive sensitivity, it is tested under static condition.

Table 11: SIM808 conducted GSM/GPRS receive sensitivity

Frequency	Receive sensitivity (Typical)	Receive sensitivity(Max)
GSM850	<-108dBm	<-106dBm
EGSM900	<-108dBm	<-106dBm
DCS1800	<-108dBm	<-106dBm
PCS1900	<-108dBm	<-106dBm

4.3. Module GPS Receiver Performance

The following table shows the module's conducted TTFF(Time To First Fix) and receive sensitivity, it is tested under static condition.

Table 12: SIM808 conducted GPS Performance

Parameter	Description	Performance (Type)
Sensitivity	Autonomous acquisition(cold start)	-148dBm
	Re-acquisition	-159dBm
	Tracking	-165dBm
Time To First Fix	Hot start	<1s
	Warm start	28s
	Clod start	30s

4.4. Module Operating Frequencies

The following table shows the module's operating frequency range; it is followed by the 3GPP TS 05.05 technical specification requirement.

Table 13: SIM808 operating frequencies

Frequency	Receive	Transmit
GSM850	869 ~ 894MHz	824 ~ 849 MHz
EGSM900	925 ~ 960MHz	880 ~ 915MHz
DCS1800	1805 ~ 1880MHz	1710 ~ 1785MHz
PCS1900	1930 ~ 1990MHz	1850 ~ 1910MHz
GPS	1575.45 ± 2MHz	N/A

5. Antenna interface

There are three antenna ports for SIM808, GSM antenna port named RF_ANT, GPS antenna port named GPS_ANT, The RF interface of the three antenna ports has an impedance of 50Ω. The maximum gain of the antenna gain should not exceed 3dbi considering the SAR radio.

- The input impedance of the antenna should be 50Ω, and the VSWR should be less than 2.
- It is recommended that the GSM antenna and the GPS antenna be placed as far as better.
- The isolations of the three antenna should be bigger than 30db

5.1 GSM Antenna Interface

There is a GSM antenna pad named RF_ANT for SIM808 the connection of the antenna must be decoupled

from DC voltage. This is necessary because the antenna connector is DC coupled to ground via an inductor for ESD protection.

The external antenna must be matched properly to achieve best performance, so the matching circuit is necessary, the connection is recommended as following:

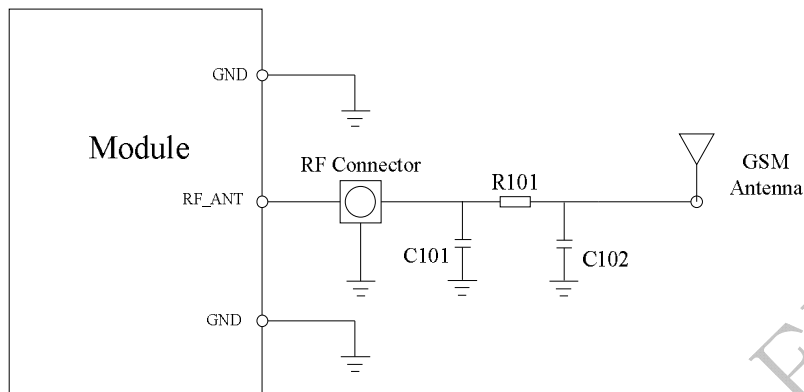


Figure1: GSM antenna matching circuit

R101, C101, C102 are the matching circuit, the value should be defined by the antenna design. normally R101 is 0Ω, C101 和 C102 are not SMD. The RF connector is used for conducted

5.2 GPS antenna interface

The module provides a GPS antenna interface named GPS_ANT. There are two normal options: passive antenna and active antenna.

The external antenna must be matched properly to achieve best performance, so the matching circuit is necessary, the connection is recommended as following figure:

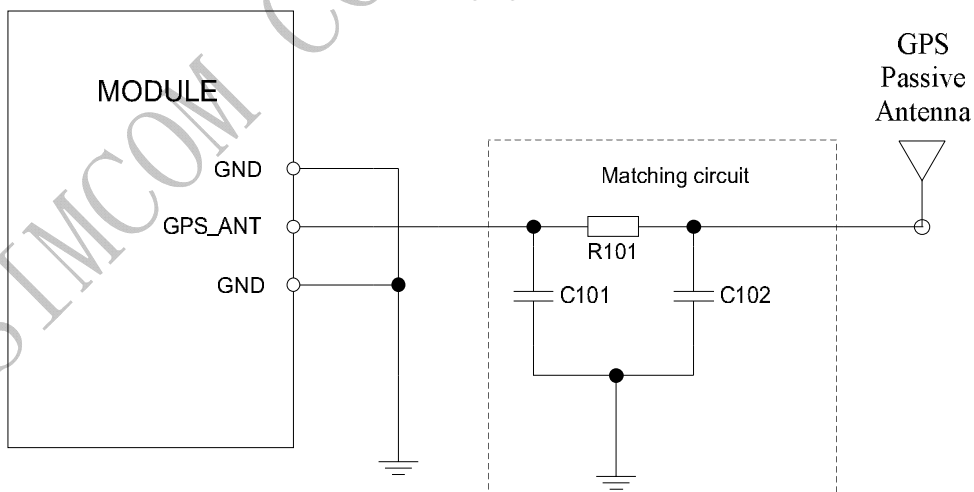


Figure 5: GPS passive antenna matching circuit

The components R101, C101 and C102 are used for antenna matching, the components' value only can be got after the antenna tuning. Normally R101 is 0Ω, C101 and C102 are not mounted.

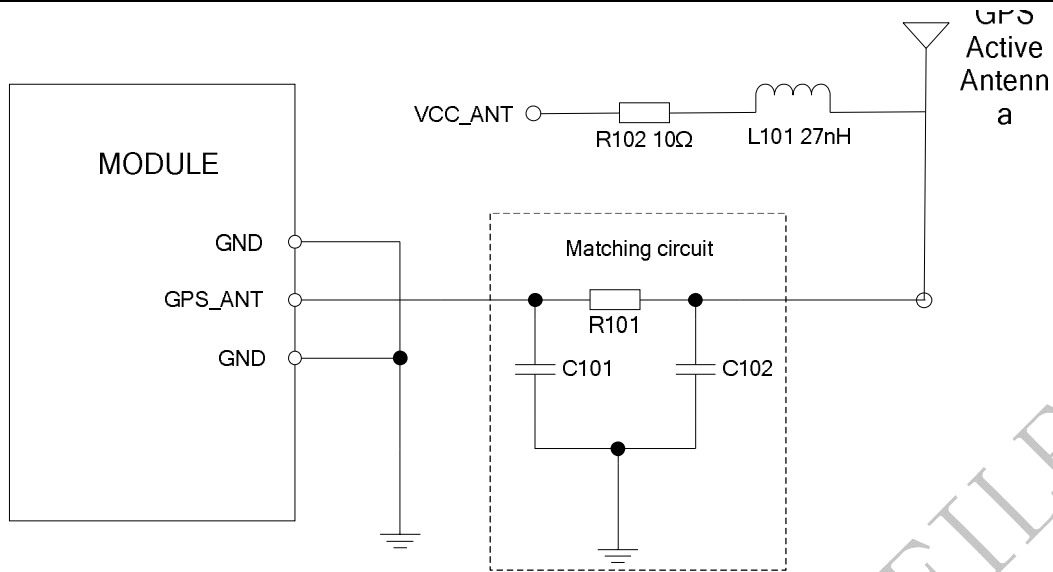


Figure 1: GPS active antenna matching circuit

There are some suggestions to components placing and lying for GSM and Bluetooth RF traces:

- The RF connector is used for conducted test, so keep it as close as pin RF_ANT;
- Antenna matching circuit should be closed to the antenna;
- Keep the RF traces as 50Ω;
- The RF traces should be kept far away from the high frequency signals and strong disturbing source.

5.3.1 GSM antenna

Model GSM antenna: WT-C&G-28-90

Frequency Range (MHz) 824 ~ 960 1710 ~ 1990

VSWR ≤ 1.5 (900MHz) ≤ 2 (1800MHz)

Gain (dBi): 3

Input Impedance (Ω): 50

Polarization Type: Vertical

Connector Type: SMA



Figure 7 GSM antenna

5.3.2 GPS antenna

1. Frequency Range: $1575.42 \pm 3\text{MHz}$
2. Impedance: 50 Ohms nominal
3. VSWR: ≤ 1.5
4. Gain: 3.0dBi
5. Polarization: RHCP
6. Connector Type: SMA P/S



Figure 7 GPS antenna

Federal Communication Commission Interference Statement

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

FCC Caution: Any changes or modifications not expressly approved by the party responsible for Compliance could void the user's authority to operate this equipment.

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

RF Exposure Compliance

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. The antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or Transmitter.

This device is intended only for OEM integrators under the following conditions:

- 1) The antenna must be installed such that 20 cm is maintained between the antenna and users, and
- 2) The transmitter module may not be co-located with any other transmitter or antenna.

As long as 2 conditions above are met, further transmitter test will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed

IMPORTANT NOTE: In the event that these conditions can not be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization is no longer considered valid and the FCC ID can not be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

End Product Labeling:

This transmitter module is authorized only for use in device where the antenna may be installed such that 20 cm may be maintained between the antenna and users. The final end product must be labeled in a visible area with the following: "Contains FCC ID:UDV-20160416".

Manual Information To the End User

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module.

The end user manual shall include all required regulatory information/warning as show in this manual.

RF Exposure Statement:

For the product, under normal use condition is at least 20cm away from the body of the user, the user must keep at least 20cm distance to the product.