SIM65M Series Power Consumption Description

GNSS Module

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About document

Version History

Version	Date	Author	Description of change
V1.00	2022.11.16	Xinao LIU、QIU Lei	Original
V1.01	2023.09.05	Qiu Lei	1. Update the consumption data 2. Increase SIM65M-W current consumption 3. Added the description of ALP mode consumption in Section 2.7

Scope of application

This document applies to the following products

Module	Size	Description
SIM65M	10.1x 9.7 x 2.5mm	VCC power supply range: 2.8~4.3V I/O voltage domain 2.8V
SIM65M-W	10.1x 9.7 x 2.5mm	VCC power supply range: 1.75~1.95V, I/O voltage domain 2.8V

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1 Introduction

1.1 Purpose of the document

This document introduces the current consumption of the module in each mode.

1.2 Related documents

[1] SIM65M Series_NMEA Message_User Guide
[2] SIM65M Series_Power Saving_Application Note

2 Current Consumption

SIM65M series has different current consumption in different modes. Customers can choose different modes according to application scenarios to reduce power consumption.

Table 1: Classification of power operation mode

Mode	Description
Normal	Power consumption will vary depending on the amount of satellite acquisitions and number of satellites in track.
Sleep	Low quiescent power state. Only non-volatile RTC, and backup RAM block is powered on.
Fitness	For low-speed sports such as walking and running.
GLP	1-Hz PVT, GPS L1 only, and Fitness
RTC	Lower current consumption than other mode
FLP	The module operates in full-power mode and sleep mode according to the set cycle.
ALP	Depending on the signal quality, the module automatically switches between full power mode and sleep mode.

2.1 Normal Mode

The module will enter normal mode after first power up with factory configuration settings. Power consumption will vary depending on the amount of satellite acquisitions and number of satellites in track. This mode is also referenced as full on, full power or navigation mode.

$PAIR066,1,0,0,0,0,0*3B\r\n ==> Search GPS satellites only

Table 2: Current consumption in Normal Mode

Model	Test condition	Description	Performance	
			Type	Unit
SIM65M	GPS, GLONASS, GALILEO and BDS. @VCC=3.3V, Passive antenna under real network	Acquisition	12.5	mA
		Tracking	12.5	mA
	GPS only @VCC=3.3V, Passive antenna under real network	Acquisition	10.5	mA
		Tracking	9	mA

SIM65M-W	GPS, GLONASS, GALILEO and BDS. @VCC=1.8V, Passive antenna under real network	Acquisition	15	mA
		Tracking	15	mA
	GPS only @VCC=1.8V, Passive antenna under real network	Acquisition	13	mA
		Tracking	9	mA

2.2 Sleep Mode

Sleep mode means a low quiescent power state, non-volatile RTC, and backup RAM block is powered on. Entering into sleep mode is controlled by UART interface, send **$PAIR003*39\r\n** to enter sleep mode and send **$PAIR002*38\r\n** to exit sleep mode.

Table 3: Current consumption in Sleep Mode

Model	Test condition	Description	Performance	
			Type	Unit
SIM65M	@VCC=3.3V, disable the uart sleep function	Current consumption in sleep mode	2.2	mA
SIM65M-W	@VCC=1.8V, disable the uart sleep function		2.4	mA

If lower power consumption is required, you can send **$PAIR382,0*2F** command to turn on the UART Sleep function. Pull down “EINT-IN” pin 10ms at least, in the process of pulling down EINT 10ms, SIM65M will return **$PAIR012*39**, and send command within 100ms after returning **$PAIR012*39**.

Table 4: Current consumption in Sleep Mode with UART sleep

Model	Test condition	Description	Performance	
			Type	Unit
SIM65M	@VCC=3.3V, enable the uart sleep function	Current consumption in sleep mode	250	uA
SIM65M-W	@VCC=1.8V, enable the uart sleep function		210	uA

2.3 Fitness Mode

This mode is used for running and walking activities so that the low-speed (< 5 m/s) movement will have more of an effect on the position calculation.

$PAIR080,1*2F ==> Enter fitness mode

Table 5: Current consumption in Fitness Mode

Model	Test condition	Description	Performance	
			Type	Unit
SIM65M	GPS, GLONASS, GALILEO and BDS. @VCC=3.3V Passive antenna under real network	Tracking	11.8	mA
	GPS only @VCC=3.3V Passive antenna under real network		13.2	mA
SIM65M-W	GPS, GLONASS, GALILEO and BDS. @VCC=1.8V Passive antenna under real network		8	mA
	GPS only @VCC=1.8V Passive antenna under real network		14	mA

2.4 GLP Mode

GLP mode supports 1-Hz PVT, GPS L1 only, and Fitness mode. Send the following command is to activate low-power GLP mode

a) Send **$PAIR066,1,0,0,0,0,0*3B\r\n** to search GPS satellites only
b) Send **$PAIR080,1*2F\r\n** to enter fitness mode
c) Send **$PAIR680,1*29\r\n** to enter GLP mode

Table 6: Current consumption in GLP Mode

Model	Test condition	Description	Performance	
			Type	Unit
SIM65M	GPS only @VCC=3.3V, passive antenna under real network	Tracking	6.3	mA
SIM65M-W	GPS only @VCC=1.8V, passive antenna under real network		3.6	mA

※ Note

GLP mode can only be entered in single GPS mode.

2.5 RTC Mode

RTC mode provides a lower current consumption than other mode. it is suitable for applications that remain idle for a long period. RTC mode can be triggered either in software or in hardware.

The trigger method is as follows：

① Software RTC Mode

- Enter software RTC mode

1. Entering into RTC mode is controlled by UART interface, send **$PAIR650,0*25\r\n** to enter RTC mode.
2. Receive **$PAIR001,650,0*38\r\n** and **$PAIR650,0*25\r\n**
3. Disconnect the VCC separately and keep the V_BACKUP powered on after receiving **$PAIR650,0*25** at least 50ms.

- Exit software RTC Mode

1. Reconnect the VCC and module will exit RTC mode automaticly.

② Hardware RTC Mode

The current consumption in hardware RTC mode is twice as high as that in software RTC mode.

- Enter hardware RTC mode

1. Disconnect the VCC separately and keep the V_BACKUP powered.

- Exit hardware RTC Mode

1. Reconnect the VCC and module will exit RTC mode automaticly.

Table 7: Current consumption in RTC Mode

Model	Test condition	Description	Performance	
			Type	Unit
SIM65M	@V_BACKUP=2.8V, software RTC	Current consumption in RTC mode	15	uA
	@V_BACKUP=2.8V, hardware RTC		36	uA
SIM65M-W	@V_BACKUP=2.8V, software RTC		15	uA
	@V_BACKUP=2.8V, hardware RTC		36	uA

2.6 Periodic Power Saving Mode(FLP Mode)

This command is used to set Periodic Power Saving Mode Settings. There are two stages in periodic power saving mode (Run stage and Sleep stage), and it will change periodically according to the setting.

- Run stage: the GNSS module measures and calculates the position.
- Sleep stage: the GNSS module may enter power saving modes.

The run state and sleep state duration can be configured.

Send **$PAIR690,1,<FirstRun>,<FirstSleep>,<SecondRun>,<SecondSleep>*CS<CR><LF>** into FLP mode, set the duty cycle for different operating stages, and the power consumption difference is as follows::

Table 8: Set the current consumption for different duty cycles in FLP mode

Model	Test condition	Description	Performance	
			Type	Unit
SIM65M	GPS, GLONASS, GALILEO and BDS. @VCC=3.3V. Passive antenna under real network. 90% duty cycle during the run stage.	Current consumption in FLP mode	11.5	mA
	GPS, GLONASS, GALILEO and BDS. @VCC=3.3V. Passive antenna under real network. 75% duty cycle during the run stage.		10	mA
	GPS, GLONASS, GALILEO and BDS. @VCC=3.3V. Passive antenna under real network. 50% duty cycle during the run stage.		8	mA
	GPS, GLONASS, GALILEO and BDS. @VCC=3.3V. Passive antenna under real network. 25% duty cycle during the run stage.		5	mA
	GPS, GLONASS, GALILEO and BDS. @VCC=3.3V. Passive antenna under real network. 10% duty cycle during the run stage.		3.5	mA
SIM65M-W	GPS, GLONASS, GALILEO and BDS. @VCC=1.8V. Passive antenna under real network. 90% duty cycle during the run stage.		13.5	mA
	GPS, GLONASS, GALILEO and BDS.		12	mA

	@VCC=1.8V. Passive antenna under real network. 75% duty cycle during the run stage.			
	GPS, GLONASS, GALILEO and BDS. @VCC=1.8V. Passive antenna under real network. 50% duty cycle during the run stage.		9	mA
	GPS, GLONASS, GALILEO and BDS. @VCC=1.8V. Passive antenna under real network. 25% duty cycle during the run stage.		5.5	mA
	GPS, GLONASS, GALILEO and BDS. @VCC=1.8V. Passive antenna under real network. 10% duty cycle during the run stage.		3.5	mA

※ Note

You can configure the duration of the running phase and sleep phase by changing the command parameters, the parameter range is 3~518400 s, please refer to "SIM65M Series_NMEA Message_User Guide" for more information on the $PAIR690 command.

2.7 Adaptive low power consumption(ALP Mode)

Adaptive Low Power mode is a concept that guarantees good performance and low power consumption in different environments. The $PAIR732 command is used to enable the adaptive low-power mode and automatically switch between the normal mode and the sleep mode according to the signal quality in the current environment. Therefore, the flow consumption depends more on the signal quality. This command is supported only in the NORMAL and FITNESS navigation modes.

$PAIR732,1*21\r\n ==> Enter ALP mode.

Table 9: Current consumption in ALP Mode

Model	Test condition	Description	Performance	
			Type	Unit
SIM65M	GPS, GLONASS, GALILEO and BDS. @VCC=3.3V. Passive antenna under real network.	Current consumption in ALP mode	6.5	mA
SIM65M-W	GPS, GLONASS, GALILEO and BDS. @VCC=1.8V. Passive antenna under real network.		7.5	mA

※ Note

The test data is measured in the indoor amplifier environment, the signal quality is relatively stable, and the current consumption in ALP mode has a great relationship with the signal quality in the current environment.