WM_W800_Low Power Consumption Guide

V1.0

Beijing Lianshengde Microelectronics Co., Ltd. (winner micro)

Address: Floor 18, Yindu Building, No. 67, Fucheng Road, Haidian District, Beijing

Tel: +86-10-62161900

Company website: www.winnermicro.com

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Table of contents

1 Introduction

1.1 Purpose of writing

Introduce the low power consumption configuration of the W800 chip and the corresponding applicable scenarios, and provide corresponding test examples.

1.2 Intended audience

All W800 users.

1.3 Definition of terms

AP: Access Point, similar to an ordinary wireless router

Station: wireless client connected to AP

RTC: Real Time Clock, real time clock

DTIM: Delivery Traffic Indication Message, AP broadcast frame temporary storage period

PMU: power management unit, power management unit

GPIO: General-purpose input/output, general-purpose input and output

MCU: Micro Control Unit, single-chip microcomputer (host computer)

1.4 References

2 Overview

At present, W800 series chips have three low modes: PS-Mode (Power Sleep), Sleep and Standby in Station mode.

For the power consumption mode, we provide a variety of configuration methods for these three modes. Users can select the corresponding mode and configure it according to their specific needs.

The three low-power modes differ as follows:

project	PS-Mode	Sleep	Standby
WiFi connection	Keep	Keep	disconnected
way of entry	automatic entry	manual entry	manual entry
wake up method	auto wake up	GPIO or Timer	GPIO or Timer
WiFi	closure	closure	closure
system clock	turn on	closure	closure
CPU	turn on	closure	closure
Memory	turn on	turn on	closure
RTC	turn on	turn on	turn on
bottom current	TBD	TBD	TBD
average current ÿDTIM=1ÿ	TBD	TBD	TBD

Note: 1. DTIM can be configured on some APs. The larger the value is set, the Station can sleep for a longer time to reduce power consumption.

2. WiFi is off when not connected to the Internet in PS-Mode mode.

3 Wi-Fi OFF mode

After the W800 is started, when it is not in the state of networking, scanning or network configuration, WiFi is turned off. At this time, only the CPU and some peripherals are in working status.

Wi-Fi OFF can be regarded as a working mode where W800 only works as MCU.

4 PS-Mode mode

After the W800 connects to the AP, it will turn off the WiFi in the interval between two DTIMs when the AP broadcasts the Beacon frame to save power.

If so, it will automatically wake up and turn on WiFi before the next Beacon frame arrives, and the sleep time is determined by the DTIM time of the AP.

4.1 Enter PS-Mode

4.1.1 API SDK

Set by using the interface void tls_wifi_set_psflag(bool enable, bool alwaysflag), please refer to the interface description

API description.

This interface needs to be set up after the chip is connected to the Internet and gets the IP. After sleep, the system decides when to wake up.

4.1.2 AT command

The setting is completed by using the AT command AT+WPSM. For the command description, please refer to the AT command manual.

Test in network mode, if you want to save the energy saving mark, AT+WPSM=!1

Command: AT+WPSM (STA PS-POLL function enable/disable)

Function:

Turn on/off the automatic energy saving mode.

Format (ASCII):

AT+WPSM=[!?][enable]<CR>
+OK[=enable]<CR><LF><CR><LF>

parameter:

enable: enable flag, defined as follows:

value	meaning
0	not enabled
1	Enable

4.2 Usage Scenarios

This mode is suitable for scenarios that require the CPU to work all the time.

5 Sleep mode

Sleep mode is a low-power operating mode that can wake up quickly. In this mode, the power supply of the digital circuit will remain on

state, so memory, registers, etc. will remain, enabling fast connection after wake-up. But the start-up circuit and DPLL will be turned off, the whole

The system clock will be stopped to reduce dynamic power consumption in the circuit.

Wake-up can be done through GPIO, connect W800's wakeup (GPIO_A4) pin, and pull the wakeup pin high to complete

become awakened.

Wake-up can also be done through a timer (PMU-Timer or RTC timer), and the wake-up can be completed after the timer expires.

5.1 Enter Sleep

5.1.1 API SDK

Go to sleep by using the interface void tls_pmu_sleep_start(void).

In this mode, it can only be woken up by GPIO and timer:

GPIO is woken up by a high level wakeup pin;

The PMU timer wakes up through the interface void tls_pmu_timer0_start(u16 second) or void

tls_pmu_timer1_start(u16 msec) setting is used.

The time unit that can be set by the interface void tls_pmu_timer0_start(u16 second) is seconds;

Interface void tls_pmu_timer1_start(u16 msec) The time unit that can be set is milliseconds;

5.1.2 AT command

The setting is completed by using the AT command AT+ENTS. For the command description, please refer to the AT command manual.

Command: AT+ENTS (low power consumption test)

Function:

Set the system to enter power-saving mode (sleep/standby state).

Format (ASCII):

AT+ENTS=[ps_type],[wake_type],[delay_time],[wake_time]<CR> +OK<CR><LF><CR><LF>

parameter:

ps_type: energy-saving mode, defined as follows:

value	meaning
0	Wi-Fi ON/OFF
1	Standby
2	Sleep

wake_type: Standby/Sleep wake-up mode, defined as follows:

Value	Standby/Sleep wakeup mode
0	GPIO mode
1	Timer mode

delay_time: the delay time for entering Standby/Sleep mode, unit 10ms, effective value

100 ÿ10000msÿ

wake_time: wake-up time in Standby/Sleep mode, only available when Timer wakes up

Effective, unit ms, effective value 1000 ~ 65535ms.

5.2 Usage Scenarios

This mode is suitable for scenarios that require lower power consumption while maintaining a WiFi connection. The device can wake up from the Sleep state to the

After the MCU completes the interaction, it continues to enter Sleep.

Note: PS-Mode can still be enabled while networking in Sleep mode to reduce power consumption during networking communications.

6 Standby mode

Standby mode is the lowest power consumption mode. In this mode, except for the circuits in the PMU power domain, all on-chip

circuits will be closed. So in this mode, only RTC is still working on W800, and everything else is unavailable. After each wake-up

The W800 will reboot.

Wake-up can be done through GPIO, connect W800's wakeup (GPIO_A4) pin, and pull the wakeup pin high to complete

become awakened.

Wake-up can also be done through a timer (PMU-Timer or RTC timer), and the wake-up can be completed after the timer expires.

6.1 Enter Standby

6.1.1 API SDK

Go to sleep by using the interface void tls_pmu_standby_start(void).

In this mode, it can only be woken up by GPIO and timer:

GPIO is woken up by a high level wakeup pin;

The PMU timer wakes up through the interface void tls_pmu_timer0_start(u16 second) or void

tls_pmu_timer1_start(u16 msec) setting is used.

The time unit that can be set by the interface void tls_pmu_timer0_start(u16 second) is seconds;

Interface void tls_pmu_timer1_start(u16 msec) The time unit that can be set is milliseconds;

6.1.2 AT command

The setting is completed by using the AT command AT+ENTS. For the command description, please refer to the AT command manual.

Command: AT+ENTS (low power consumption test)

Function:

Set the system to enter power-saving mode (sleep/standby state).

Format (ASCII):

AT+ENTS=[ps_type],[wake_type],[delay_time],[wake_time]<CR>
+OK<CR><LF><CR><LF>

parameter:

ps_type: energy-saving mode, defined as follows:

value	meaning
0	Wi-Fi ON/OFF
1	Standby
2	Sleep

wake_type: Standby/Sleep wake-up mode, defined as follows:

Value	Standby/Sleep wakeup mode
0	GPIO mode
1	Timer mode

delay_time: the delay time for entering Standby/Sleep mode, unit 10ms, effective value

100 ÿ10000msÿ

wake_time: wake-up time in Standby/Sleep mode, only available when Timer wakes up

Effective, unit ms, effective value 1000 ~ 65535ms.

6.2 Usage Scenarios

This mode is suitable for sensor applications or scenarios where data transmission is not required most of the time. The device can periodically change from Standby state wakes up and uploads the measurement data, and then continues to enter Standby.

7 Other configurations of low power consumption

When networking, we can also reduce the power consumption through the following configurations:

7.1 Reduce CPU frequency

Use the interface void tls_sys_clk_set(u32 clk) to set the CPU to a lower frequency. The currently available frequencies are:

CPU clocks when Wi-Fi is available: 240MHz, 160MHz, 80MHz, 40MHz

When Wi-Fi is not available, the CPU clock can be configured as a clock less than 40MHz, and the minimum can be configured to 2MHz

7.2 Turn off unused peripheral clocks

When using the interface void tls_close_peripheral_clock(tls_peripheral_type_s devices) to close unused peripherals bell;

The parameters in this interface can use "|" to turn off multiple peripheral clocks at the same time. For specific items that can be turned off, see tls_peripheral_type_s Defined enumeration types.

8 Test examples for each power consumption mode

8.1 Test related equipment and instructions

ÿW800 development board

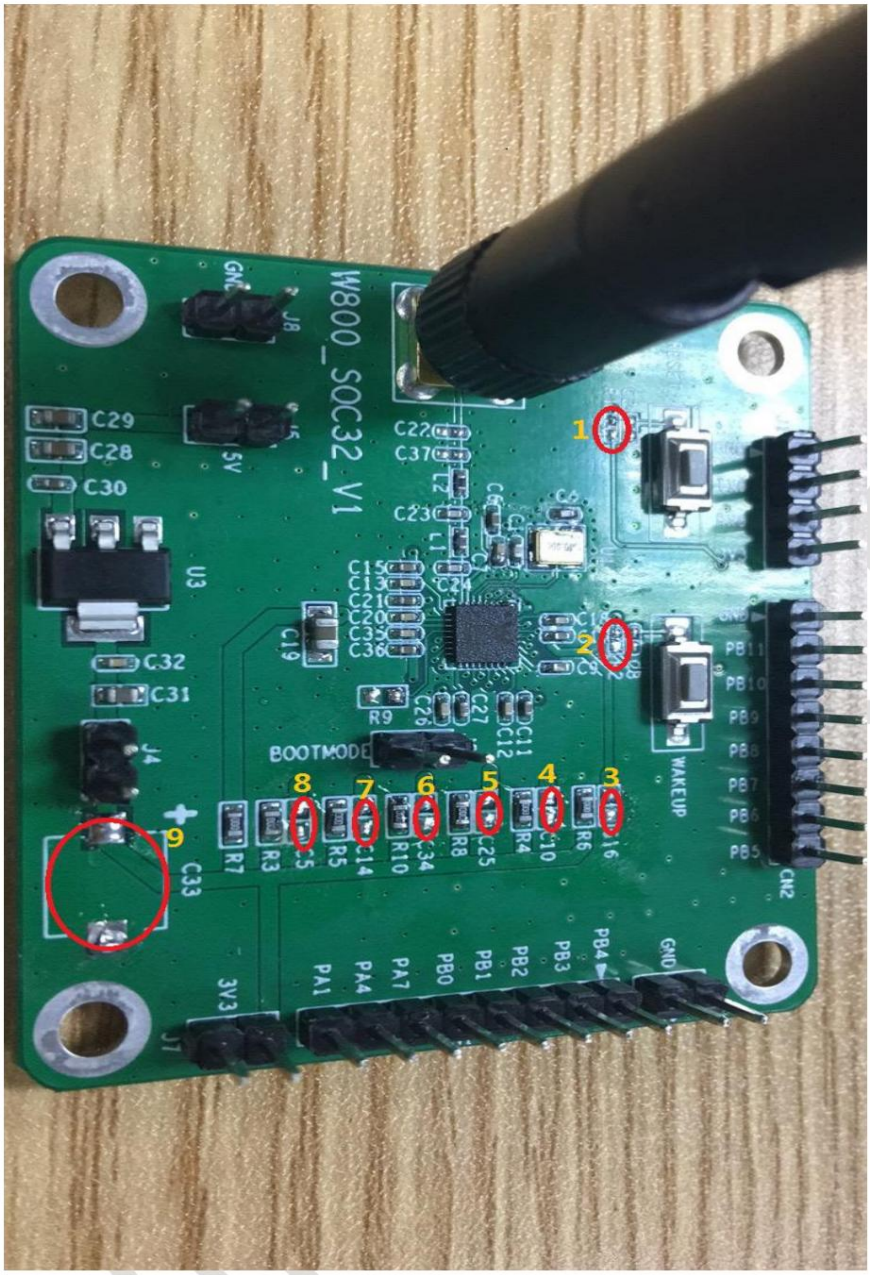

Figure 1---W800 development board

Since the power consumption of the W800 SOC itself is tested, before the test, the power consumption of the W800 development board itself

Removal of related devices that have an impact, as follows:

A ÿ Remove the pull-up resistors at the Reset and Wakeup buttons, as shown in Figure 1, marked with serial numbers 1 and 2;

Bÿ In order to avoid the interference of the capacitor charging and discharging process on the test power consumption, remove the relevant capacitors on the W800 open board, such as

Numbers 3~9 are marked in Figure 1.

Special Note:

Since the pull-up resistor of the Wakeup button is removed, the board cannot pass the GPIO mode and will be in Standby Or wake up W800 in Sleep state.

ÿPower input device

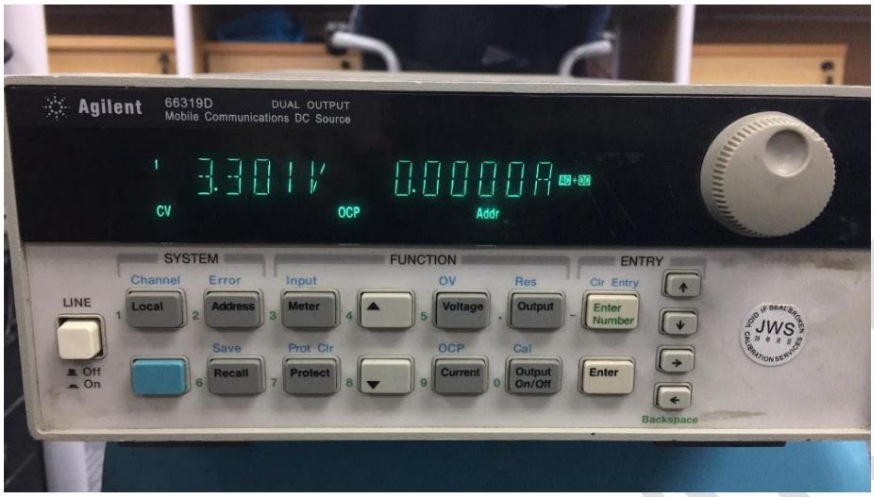

Figure 2---Agilent 66319D front view

Use Agilent 66319D to provide 3.3V stable power input to W800.

ÿCurrent metering equipment

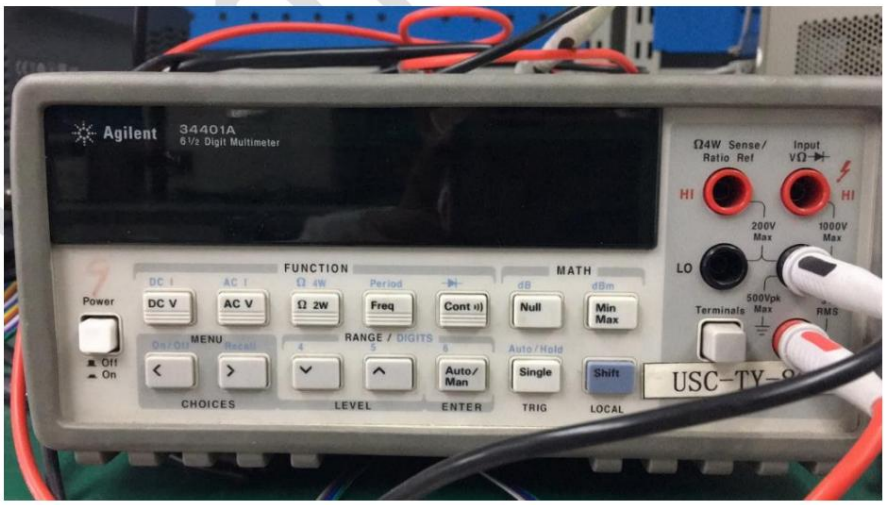

Figure 3---Agilent 34401A front view

Use Agilent 34401A to connect 66319D to the power supply circuit of W800 in series, so as to accurately record the passing through W800 current.

ÿAgilent 14565A DCS software

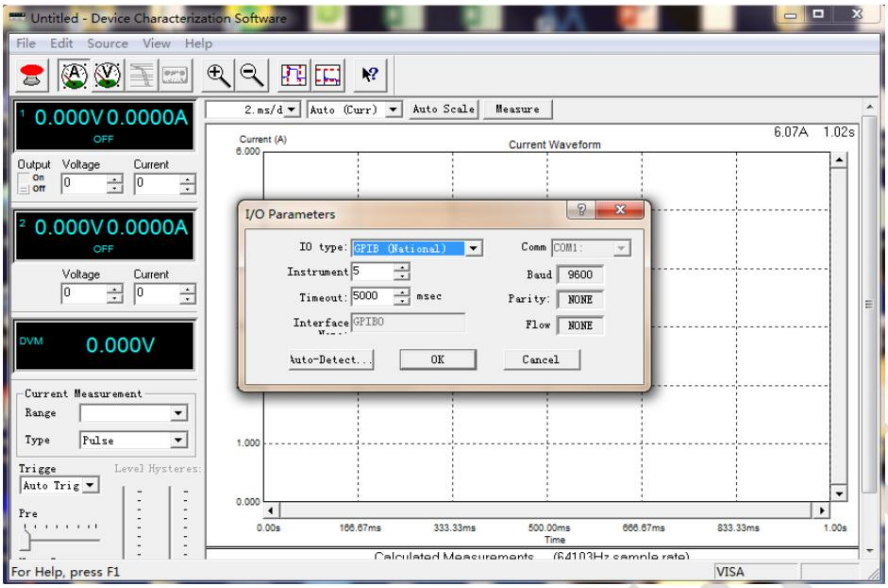

Figure 4--- Agilent 14565A DCS software

Through the control of 66319D equipment by this software, the accurate current data of W800 can be recorded and calculated automatically.

8.2 Standby mode test

The test connection diagram of this mode is as follows, that is, 34401A is connected in series to the power supply circuit of 66319D to W800, as shown in the diagram below:

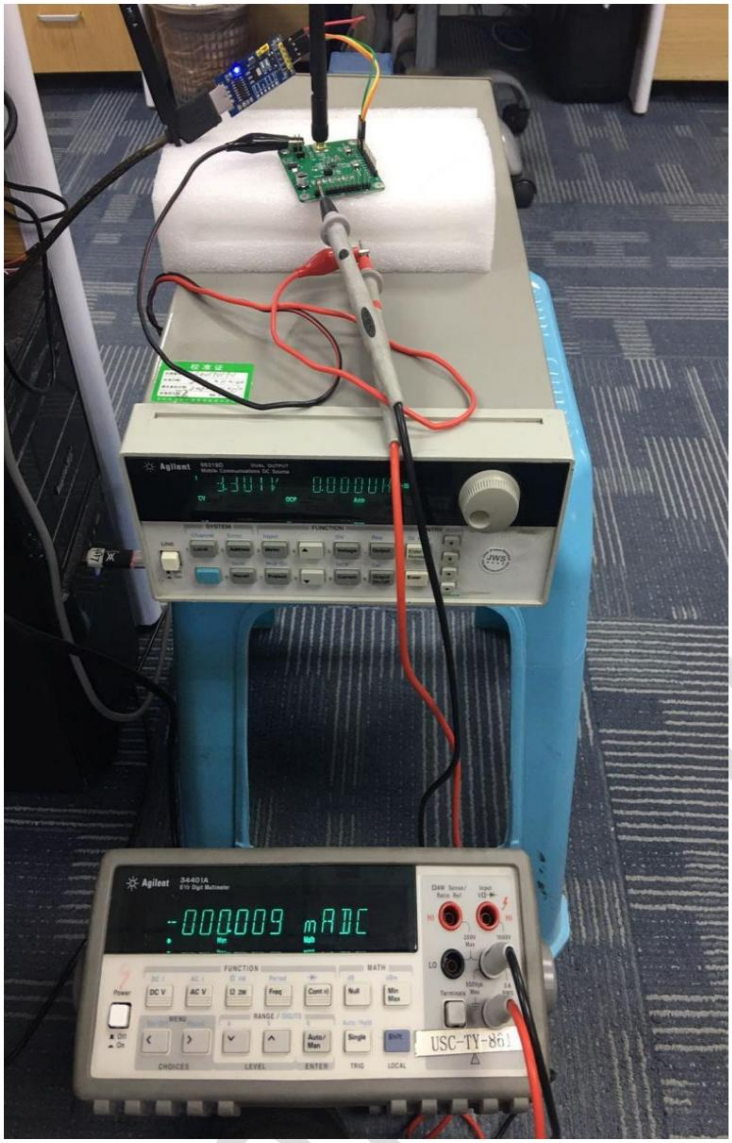

Figure 5---Standby test instrument connection diagram

8.2.1 Test procedure

Connect to W800 through the serial port, and input the following AT commands in sequence:

AT+RSTF ---Restore W800 to factory settings

AT+Z ---Reset W800

AT+ENTS=1, 1, 5000, 30000 ---Set W800 to enter Standby state after 5 seconds and keep for 30 seconds

8.2.2 Test results

After completing the above command and waiting for 8 seconds, adjust the RNAGE Level to the mA position on the 34401A, and you can see to 9uA as shown in Figure 5.

8.3 Sleep mode test

The test connection diagram of this mode is as follows, that is, 66319D directly supplies power to W800.

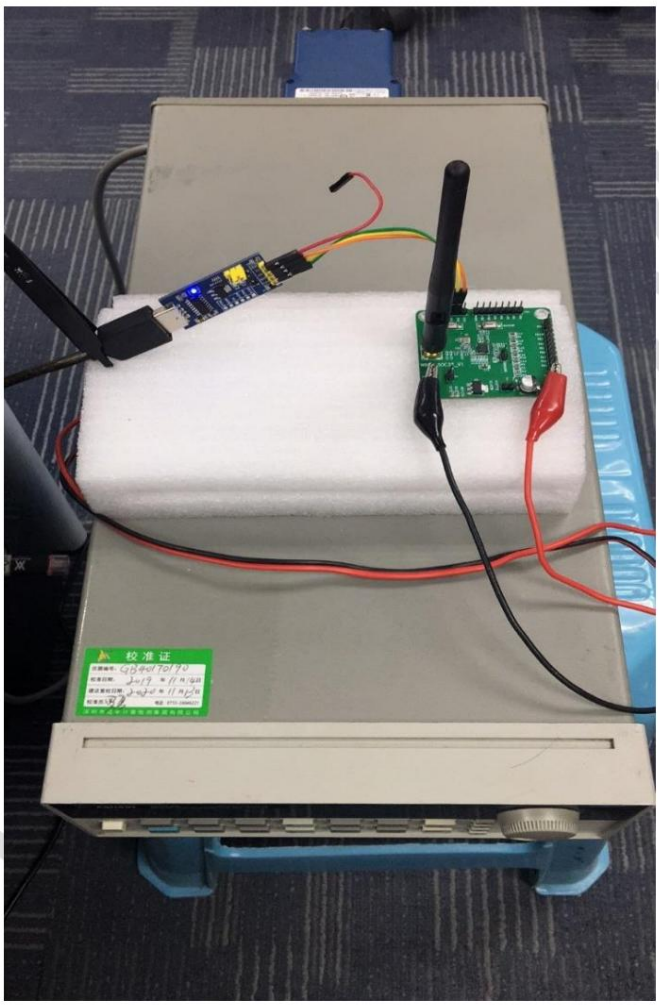

Figure 6---Sleep test connection diagram

8.3.1 Test procedure

* After 66319D is powered on, press Recall and Enter in turn;

* Open the 14565A DCS software, select the IO type and click the Auto-Detect button to enter the control interface.

Set the execution sequence number to 6 in turn according to Figure 7, then connect to W800 through the serial port, and input the following AT in sequence instruction:

AT+RSTF ---Restore W800 to factory settings

AT+Z ---Reset W800

AT+ENTS=2, 1, 5000, 30000 ---Set W800 to enter Sleep state after 5 seconds and keep 30 seconds.

After completing the above command, after waiting for 8 seconds, execute sequence numbers 7 and 8 in Figure 7, and you can get W800 in sleep mode state current data.

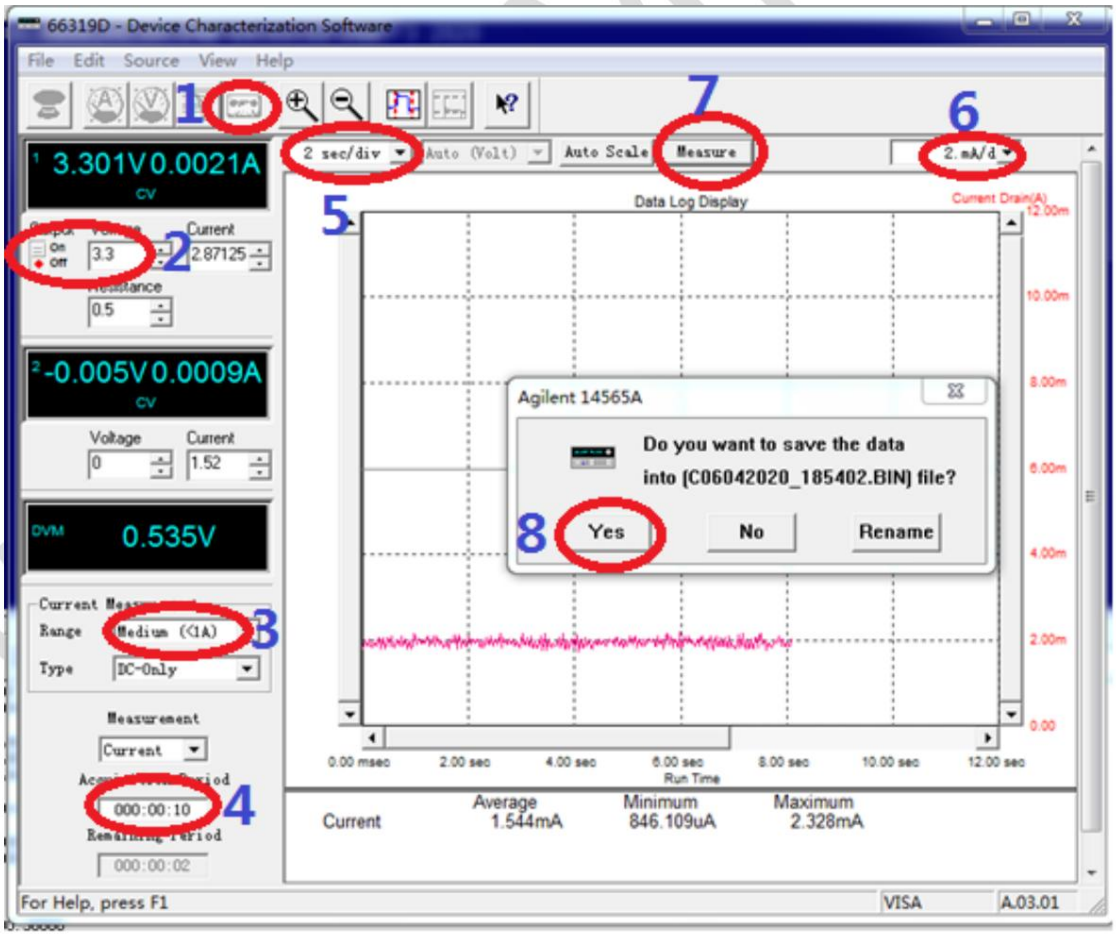

Figure 7---Execution steps on 14565A DCS software

8.3.2 Test results

Open the saved data file and preview it as follows:

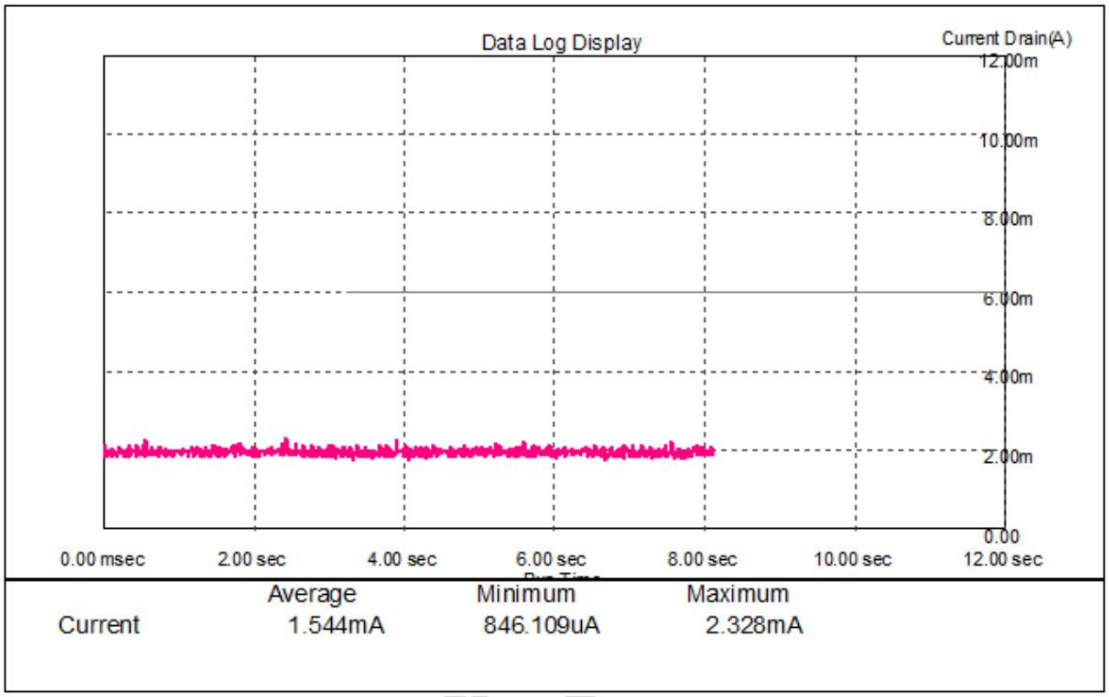

Figure 8---Sleep test result data

8.4 PS-Mode mode test

This mode is under development and debugging and will be provided later.