

BG95&BG77&BG600L Series

Fast Shutdown

Application Note

LPWA Module Series

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About the Document

Revision History

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1 Introduction

Usually, shutdown takes too long, and sometimes the module may be powered off abnormally, which may cause file system damage. In order to resolve this issue, Quectel has implemented a fast shutdown feature which can reduce shutdown time to less than 100 ms without damaging the file system. However, note that the data to be written into the internal flash may be lost due to fast shutdown.

Two methods for enabling the fast shutdown feature are introduced in this document.

- One is by running the **AT+QCFG="fast/poweroff"** command and pulling down the pin of the module. When the module detects a falling edge, it will complete the current access and stop writing new data into the file system, and then cut off the power supply.
- The other is by running the **AT+QPOWD=2** command to shut down the module immediately without waiting for pin pull-down.

This document explains the fast shutdown feature and how to use it.

1.1. Applicable Modules

Table 1: Applicable Modules

Module Series	Model	Description
BG95	BG95-M1	Cat M1 only
	BG95-M2	Cat M1/Cat NB2
	BG95-M3	Cat M1/Cat NB2/EGPRS
	BG95-M4	Cat M1/Cat NB2, 450 MHz Supported
	BG95-M5	Cat M1/Cat NB2/EGPRS, Power Class 3
	BG95-M6	Cat M1/Cat NB2, Power Class 3
	BG95-MF	Cat M1/Cat NB2, Wi-Fi Positioning
BG77	BG77	Cat M1/Cat NB2
BG600L	BG600L-M3	Cat M1/Cat NB2/EGPRS

2 Fast Shutdown Mechanism

2.1. Fast Shutdown Triggered by Pin

`AT+QCFG="fast/poweroff"` configures a dedicated GPIO pin (see *document [3] to [5]* for details) as an input pin with internal pull-up and interrupt features. The interrupt feature is triggered by a falling edge. The module will finish the current process of writing the data into the flash block, and the other data that are waiting to be written will be discarded. After the current data writing process is completed, the file system cannot be accessed anymore, and the power supply will be cut off.

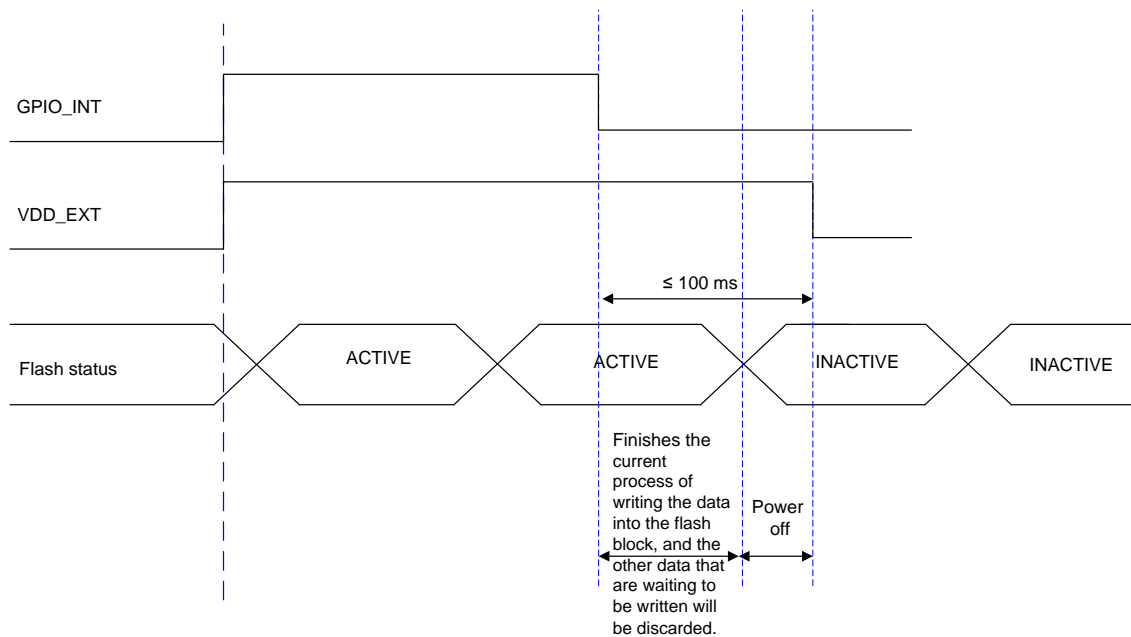


Figure 1: Fast Shutdown Timing

2.2. Fast Shutdown Triggered by AT Command

`AT+QPOWD` also triggers fast shutdown. When this command executes, the fast shutdown procedure is the same as above.

3 Fast Shutdown AT Commands

3.1. AT Command Syntax

3.1.1. Definitions

- **<CR>** Carriage return character.
- **<LF>** Line feed character.
- **<...>** Parameter name. Angle brackets do not appear on the command line.
- **[...]** Optional parameter of a command or an optional part of TA information response. Square brackets do not appear on the command line. When an optional parameter is not given in a command, the new value equals to its previous value or the default settings, unless otherwise specified.
- **Underline** Default setting of a parameter.

3.1.2. AT Command Syntax

All command lines must start with **AT** or **at** and end with **<CR>**. Information responses and result codes always start and end with a carriage return character and a line feed character: **<CR><LF><response><CR><LF>**. In tables presenting commands and responses throughout this document, only the commands and responses are presented, and **<CR>** and **<LF>** are deliberately omitted.

Table 2: Types of AT Commands

Command Type	Syntax	Description
Test Command	AT+<cmd>=?	Test the existence of corresponding Write Command and return information about the type, value, or range of its parameter.
Read Command	AT+<cmd>?	Check the current parameter value of a corresponding Write Command.
Write Command	AT+<cmd>=<p1>[,<p2>[,<p3>[...]]]	Set user-definable parameter value.
Execution Command	AT+<cmd>	Return a specific information parameter or perform a specific action.

3.2. Declaration of AT Command Examples

The AT command examples in this document are provided to help you familiarize with AT commands and learn how to use them. The examples, however, should not be taken as Quectel’s recommendation or suggestions about how you should design a program flow or what status you should set the module into. Sometimes multiple examples may be provided for one AT command. However, this does not mean that there exists a correlation among these examples and that they should be executed in a given sequence.

3.3. Description of Fast Shutdown AT Commands

3.3.1. AT+QCFG="fast/poweroff" Enable/Disable Fast Shutdown Function

This command enables/disables the fast shutdown function triggered by a dedicated pin.

AT+QCFG="fast/poweroff" Enable/Disable Fast Shutdown Function	
Test Command AT+QCFG=?	Response ... +QCFG: "fast/poweroff",<pin>,(list of supported <enable>s) OK
Write Command AT+QCFG="fast/poweroff" [<pin>,<enable>]	Response If the optional parameters are omitted, query the current configuration: +QCFG: "fast/poweroff",<pin>,<enable> OK If the optional parameters are specified, configure GPIO for fast shutdown: OK If there is an error: ERROR
Maximum Response Time	300 ms
Characteristics	The command takes effect immediately. The configuration is saved automatically.

Parameter

<pin>	Integer type. Pin number of a dedicated GPIO which is configured as an input pin with internal pull-up and interrupt features. The dedicated pin is triggered by a falling edge for fast shutdown. 25 Pin 25 (GPIO1), valid for BG95 series only 63 Pin 63 (GOIO7), valid for BG77 only 11 Pin 11 (GPIO3), valid for BG600L-M3 only
<enable>	Integer type. Enable/Disable fast shutdown function. <u>0</u> Disable 1 Enable

Example

```
//For BG95 series module
AT+QCFG="fast/poweroff",25,1 //Configure pin 25 (GPIO1) as the fast shutdown pin and enable
                              //the fast shutdown function.

OK
AT+QCFG="fast/poweroff" //Query the current configuration.
+QCFG: "fast/poweroff",25,1 //Pin 25 is configured as the fast shutdown pin, and the fast
                              //shutdown function is enabled.

OK
```

3.3.2. AT+QPOWD Power off the Module

This command powers off the module. When the command is executed successfully, the UE immediately returns **OK** and deactivates the network. After that, the UE sends the **POWERED DOWN** message and enters power-off state. The maximum time for unregistering from the network is 60 s. If you use immediate or normal power-down, to avoid data loss, the module needs to remain connected to the power supply until it sends the **POWERED DOWN** message and sets the STATUS pin to low.

AT+QPOWD Power off the Module	
Test Command AT+QPOWD=?	Response +QPOWD: (list of supported <n>s) OK
Write/Execution Command AT+QPOWD[=<n>]	Response OK POWERED DOWN
Maximum Response Time	300 ms
Characteristics	The command takes effect immediately.

The configuration is not saved.

Parameter

<n>	Integer type. Shutdown mode.
0	Immediate power-down
<u>1</u>	Normal power-down
2	Fast shutdown

NOTES

1. The fast shutdown time is less than 100 ms.
2. If <n> is 2, there is no **POWERED DOWN** response.

4 Typical Application

In some usage scenarios, the power supply of the module may be cut off suddenly during the writing of the data into the file system. It may cause file system damage. In order to avoid this issue, you can add a super capacitor, which can extend discharge time in the event of external voltage drop, to ensure that the module continues to work for more than 100 ms after the power supply is cut off. When the external MCU detects the powering down, it must pull down the fast shutdown pin and the module will be powered off within 100 ms.

5 Appendix A References

Table 3: Related Documents

SN	Document Name	Description
[1]	Quectel_BG95&BG77&BG600L_Series_QCFG_AT_Commands_Manual	AT+QCFG Command Manual for BG95 Series, BG77 and BG600L-M3 Modules
[2]	Quectel_BG95&BG77&BG600L_Series_AT_Commands_Manual	AT Commands Manual for BG95 Series, BG77 and BG600L-M3 Modules
[3]	Quectel_BG95_Series_Hardware_Design	BG95 Series Hardware Design
[4]	Quectel_BG600L-M3_Hardware_Design	BG600L-M3 Hardware Design
[5]	Quectel_BG77_Hardware_Design	BG77 Hardware Design

Table 4: Terms and Abbreviations

Abbreviation	Description
EGPRS	Enhanced General Packet Radio Service
GPIO	General Purpose Input/Output
LPWA	Low-Power Wide-Area
MCU	Microcontroller Unit
UE	User Equipment
Wi-Fi	Wireless Fidelity