SL869 Low Power Operation Application Note

80405NT11213A Rev.1 – 2013-12-03

APPLICABILITY TABLE

PRODUCT
SL869

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

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Contents

1. Introduction

1.1. Scope

This document provides an overview of the low power features of the Telit SL869 GNSS receiver module.

1.2. Audience

This document is intended for potential GNSS module customers who are interested in demonstrating the low power features of the SL869.

1.3. Contact Information, Support

For general contact, technical support, to report documentation errors and to order manuals, contact Telit Technical Support Center (TTSC) at:

TS-EMEA@telit.com
TS-NORTHAMERICA@telit.com
TS-LATINAMERICA@telit.com
TS-APAC@telit.com

Alternatively, use:

http://www.telit.com/en/products/technical-support-center/contact.php

For detailed information about where you can buy the Telit modules or for recommendations on accessories and components visit:

http://www.telit.com

To register for product news and announcements or for product questions contact Telit Technical Support Center (TTSC).

Our aim is to make this guide as helpful as possible. Keep us informed of your comments and suggestions for improvements.

Telit appreciates feedback from the users of our information.

1.4. Document Organization

This document contains the following chapters:

Chapter 1: "Introduction" provides a scope for this document, target audience, contact and support information, and text conventions.

Chapter 2: "Overview" gives an overview of the low power features of the SL869.

Chapter 3: "Demonstration Examples" provides command examples for demonstrating the SL869 low power feature.

Chapter 4: "Document History" provides a revision history of this Application Note.

1.5. Text Conventions

Danger – This information MUST be followed or catastrophic equipment failure or bodily injury may occur.

Caution or Warning – Alerts the user to important points about integrating the module, if these points are not followed, the module and end user equipment may fail or malfunction.

Tip or Information – Provides advice and suggestions that may be useful when integrating the module.

All dates are in ISO 8601 format, i.e. YYYY-MM-DD.

1.6. Related Documents

1. SL869 Product Description, 80405ST10105A
2. SL869 Hardware User Guide, 1VV0301001
3. SL869 Software User Guide, 1VV0301002
4. SL869 EVK User Guide, 1VV0301004

2. Overview

The SL869 GNSS receiver module supports low power operation using an adaptive power management algorithm that switches off RF hardware resources whenever possible while maintaining a specified performance level. During low power operation the SL869 actively manages the receiver channels to track and use only the highest satellites for navigation, and to switch off the GLONASS constellation when it is not needed. The SL869 is also able to reduce power consumption by cycling power and tracking satellites for shorter periods of time between navigation updates.

NOTE:

Low power operation is not supported in modules with firmware version 3.1.5.1 or older.

2.1. Low Power Mode Transitions

There are several criteria used by the adaptive power management algorithm for transitioning into low power mode. The performance criteria used is the estimated horizontal position error (EHPE) as determined by the SL869. In addition, the SL869 module must be in a "steady state" condition, whereby satellite acquisitions are no longer needed. This condition is reached when the GNSS firmware has a position fix, when all required satellite ephemeris have been obtained, and when a complete almanac has been obtained.

The adaptive power management algorithm periodically transitions to full power mode in order to refresh satellite ephemeris data. This maintenance activity occurs every thirty minutes and can take up to three minutes to complete.

2.2. Low Power Configuration

Various aspects of the low power management algorithm can be controlled in order to balance horizontal position accuracy against current consumption. These aspects are described in the subsections below.

2.2.1. EHPE Threshold

The SL869 determines the estimated horizontal position error (EHPE) at each navigation update, and maintains an EHPE value smoothed by averaging. A threshold on this averaged value is used to determine when to transition into and out of low power mode.

2.2.2. Active Channel Management

Active channel management refers to the limitation of the satellites tracked and used for navigation to a specified number, rather than using all visible satellites. In low power mode the SL869 enables only enough channels to track the specified number of satellites. Satellites with the highest elevation are chosen in order to mitigate satellite signal attenuation and blockages in the operating environment.

Active channel management is always enabled during low power mode, but the number of satellites to use can be set.

2.2.3. Constellation Switching

In low power mode, the GLONASS constellation can be automatically disabled such that the SL869 only tracks the highest GPS satellites. This allows the SL869 to power off the GLONASS RF chain.

2.2.4. Power Cycling

In low power mode the SL869 supports power cycling of the RF channels such that the satellites are only tracked for a portion of the time between navigation updates. To a certain degree the duty cycle of the RF hardware power can be controlled.

3. Demonstration Examples

The adaptive power management algorithm, and thus low power operation, in the SL869 module is disabled at start-up. The algorithm can be enabled using a proprietary NMEA command. The following command examples are given in order that potential module customers may demonstrate the low power features using the SL869 Evaluation Kit (EVK). Refer to the EVK User Guide for information regarding the location of the module power supply input.

Note that a detailed explanation of the NMEA command is provided in the Software Authorized User Guide, Doc. No. 1VV0301052, which is available to customers who have executed a Non-Disclosure Agreement (NDA) with Telit Wireless.

In each of the examples, the EHPE threshold is set to 15 meters.

3.1. Power Cycling

The following command enables power cycling at a 50% duty cycle during low power operation, but sets the satellites to use at a high number (18). This effectively limits low power operation to power cycling only.

```
$PSTMLOWPOWERONOFF,1,3,15,18,0,1,500
```

3.2. Constellation Switching

The following command enables constellation switching only and sets the number of satellites to use to eight. Thus when the SL869 transitions to low power mode, it uses the highest eight GPS satellites.

```
$PSTMLOWPOWERONOFF,1,3,15,8,1,0,0
```

3.3. Combination

The following command enables both constellation switching and power cycling during low power mode. When the SL869 transitions to low power mode, it uses the highest eight GPS satellites and power cycles the tracking channels at 50%.

```
$PSTMLOWPOWERONOFF,1,3,15,8,1,1,500
```

3.4. Cautions

If the adaptive low power algorithm is enabled, multiple software reset commands should not be sent to the SL869 module. If a second software reset command is sent before the module has performed a GNSS engine reset in response to a previous software reset command, it is possible for NMEA communication to be halted. Note that if the firmware is version 3.1.12.5, it is possible for there to be a delay of up to 20 seconds before the reset is performed in response to a command. The applicable reset commands include $PSTMCOLD, $PSTMWARM, $PSTMHOT and $PSTMGPSRESET.

If NMEA communication is halted as described above, the module must be given a system reboot (e.g. power cycle) to recover.

4. Document History

Revision	Date	Changes
0	2013-11-12	First issue
1	2013-12-03	Added cautions regarding software reset commands