Wireless Module Expert

GPS Modules With SiRFIV Engine

Application Note

GPS Module Series

Rev. GPS_Modules_With_SiRFIV_Engine_Application_Note_V1.1

Date: 2013-09-27

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About the Document

History

Revision	Date	Author	Description
1.0	2012-06-14	Crystal HE	Initial
1.1	2013-09-27	Ray XU	Added SiRFIV ROM2.2 series.

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1 Introduction

This document mainly introduces how to recover from acquisition failure which rarely occurs in SiRF starIV ROM 1.3 and ROM 2.2.

2 Problem Description

The failure occurs only on the modules with SiRF starIV ROM 1.3 and ROM 2.2.

The failure happens after the following operations are carried out:

1. Switch on the module, wait until it fixed.
2. Once powered on and operated correctly, the module can function exactly for several months without any problems.
3. Then remove VCC and make sure V_BCKP is supplied continuously.
4. Wait for several hours (more than 6 hours).
5. Restore VCC.

After point 5, the module starts to acquire data from satellites but it takes a long time to make a fix. On point 4, it is found that such behavior occurs during the scene changes.

NOTE

After lots of tests, it rarely happened that the GPS modules with SiRF starIV ROM 1.3 and ROM 2.2 run across the acquisition failure.

3 Root Cause

When the scene changes, the ephemeris stored in SRAM before VCC is removed will be materially different from the ephemeris which will be received after VCC is turned on again. The difference between ephemeris may disturb algorithm of SiRF starIV ROM 1.3 and ROM 2.2 chipset. In this way, the GPS module is incapable to reacquire for a long time.

4 Solutions

Directed towards the problem, a useful solution is recommended as below.

4.1. System Design

The figure below shows the reference design of L20. In UART mode, the RXD of the GPS module must be used, because the host needs to send control commands to the GPS module as occasion requires. For L20,you can turn off the VCC for low power consumption.

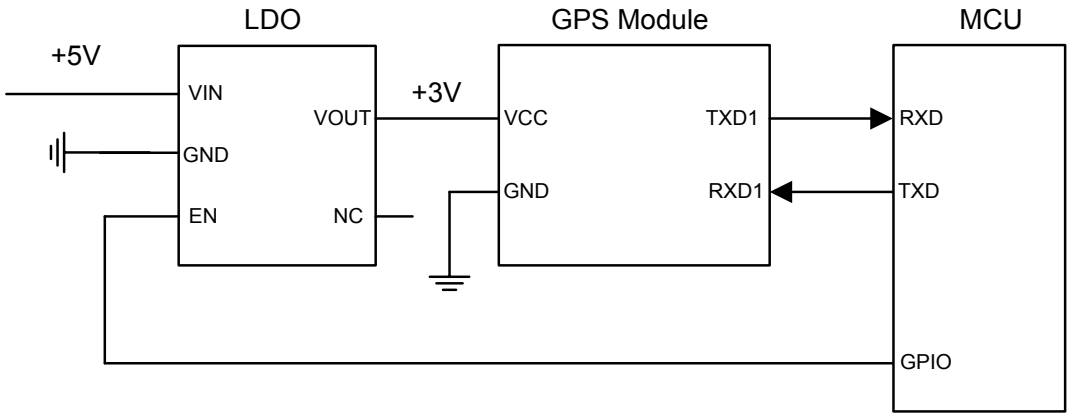

Figure 1: Reference Design of L20

The physical connection of L30 and L50 in UART mode is designed as below. In UART mode, the RXD of the GPS module must be used, because the host needs to send control commands to the GPS module as occasion requires. In addition, if you want to turn off VCC for low power consumption, the GPS module must be switched to Hibernate mode firstly.

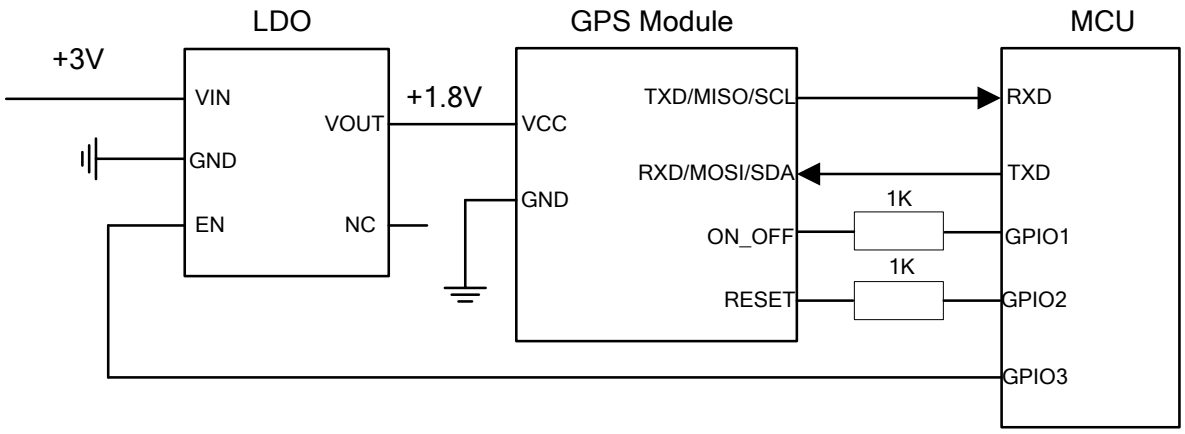

Figure 2: Reference Design of L30&L50

4.2. Flow Chart for Software

After the initialization, the host enables the timer for three minutes and then reads RMC sentence via UART. If the value of the second parameter of RMC sentence is equal to 'A', it means acquisition succeeds. If the value of the second parameter of RMC sentence is equal to 'V', it means acquisition fails.

The following shows NMEA sentences are outputted from the GPS receiver when acquisition succeeds:

*$GPGGA,100309.000,3109.8975,N,12123.5507,E,1,06,1.8,32.6,M,8.0,M,,0000*5B*
*$GPGSA,A,3,28,20,10,32,23,13,,,,,,,3.0,1.8,2.4*35*
*$GPGSV,3,1,12,28,56,189,42,20,41,053,42,10,28,197,40,32,16,041,31*71*
*$GPGSV,3,2,12,23,13,106,37,13,07,131,37,11,03,073,05,17,61,349,*74*
*$GPGSV,3,3,12,04,47,277,,01,15,055,,24,10,056,,02,08,255,*76*
*$GPRMC,100309.000,A,3109.8975,N,12123.5507,E,0.00,315.42,280811,,,A*6A*

The NMEA sentences are listed as below when acquisition fails:

*$GPGGA,114503.554,,,,,0,00,,,M,0.0,M,,0000*50*
*$GPGSA,A,1,,,,,,,,,,,,,,*1E*
*$GPGSV,3,1,12,05,14,259,23,07,27,133,15,13,44,045,32,17,65,341,24*77*
*$GPGSV,3,2,12,10,37,312,,28,36,204,,08,24,161,,04,20,344,*7A*
*$GPGSV,3,3,12,23,19,038,,01,12,088,,11,10,109,,24,07,090,*7B*
*$GPRMC,114503.554,V,,,,,,,290811,,,N*48*

If acquisition failure occurs again after the host has been waited for three minutes, cold start command: ***$PSRF101,-2686727,-4304282,3851642,75000,86400,1311,12,4*26<CR><LF>*** should be sent, which will solve this problem.

The detailed flow chart is shown as below:

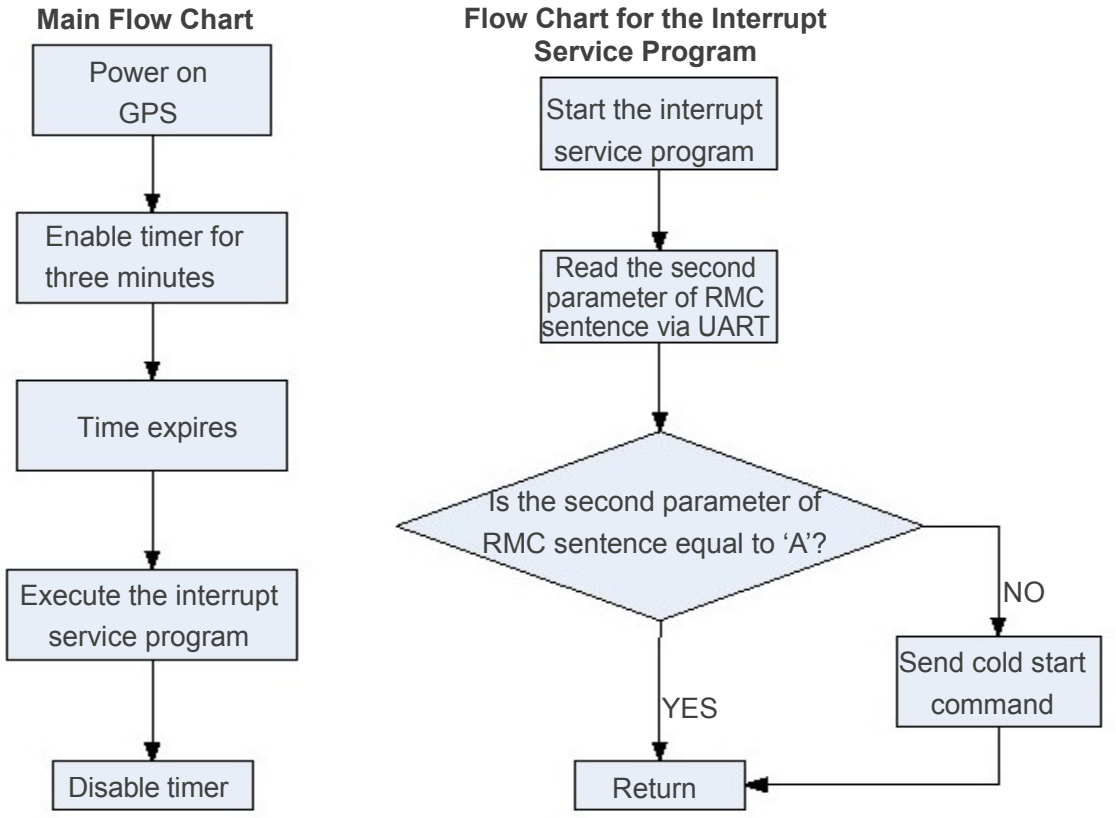

Figure 3: Flow Chart

NOTE

Defining the timer waiting for three minutes is based on lots of tests.

5 Appendix

5.1. Descriptions about RMC

Example:

```
$GPRMC,100309.000,A,3109.8975,N,12123.5507,E,0.00,315.42,280811,,,A*6A
```

Every parameter in RMC sentence is shown as below:

$GPRMC,<1>,<2>,<3>,<4>,<5>,<6>,<7>,<8>,<9>,<10>,<11>,<12><13>*
<1> UTC time, in format' hhmmss.sss'
<2> Fix status, A= Valid, V= invalid
<3> Latitude in format 'ddmm.mmmm' (degree and minutes)
<4> 'N' = North; 'S' = South
<5> Longitude in format 'dddmm.mmmm' (degree and minutes)
<6> 'E' = East; 'W' = West
<7> Speed over ground in knots
<8> Course over ground in degree
<9> UTC date in format 'DDMMYY'
<10> Magnetic variation in degree, not being output
<11> Magnetic variation E/W indicator, not being output
<12> Positioning mode (A= Autonomous GNSS fix, D= Differential GNSS fix, N= No fix)
<13>Checksum

5.2. Descriptions about Cold Start Command

Example:

```
$PSRF101,-2686727,-4304282,3851642,75000,86400,1311,12,4*26<CR><LF>
```

Every parameter in cold start command is shown as below:

$ PSRF<1>, <2>, <3>, <4>, <5>, <6>, <7>, <8>, <9><10>*
<1> Message ID
<2> X coordinate position in meter

<3> Y coordinate position in meter
<4> Z coordinate position in meter
<5> Clock offset of the evaluation unit
<6> Time of week
<7> Week number
<8> Channels
<9> Reset configure
<10>Checksum

NOTE

The checksum is a variable hexadecimal number calculated by exclusive OR of all characters between '$' and '*'.