L76 Series GNSS Module Presentation

November, 2015
Contents

Highlights

Advanced Features

Quectel L76 Vs. Competitor’s Product

Support Package
**Highlights**

**Support Multi-GNSS Systems**
- L76: GPS+GLONASS
- L76B: GPS+BeiDou
- L76G: GPS+GLONASS+Galileo (Note1)

**Ultra Low Power Consumption**
- 18mA@Tracking mode (Note2)
- 25mA@Acquisition mode (Note2)

**AlwaysLocate™**
An intelligent controller of power Consumption

**LOCUS**
Innate logger solution with no need of host and external flash

**Extremely Compact Size**
- 10.1 x 9.7 x 2.5 mm

**EASY™**
Advanced AGPS technology
Without external memory

**Anti-Jamming**
Multi-tone Active Interference Canceller

**Highest Sensitivity**
- -165dBm@Tracking mode
- -148dBm@Acquisition mode

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**Notes:**
- Note1: L76G is under development.
- Note2: Measured in GPS+GLONASS system.
Mechanical Dimensions

Length: 10.1 mm
Width: 9.7 mm
Height: 2.5 mm
Weight: 0.6 g
Hardware Architecture

- RF_IN
- Saw filter
- Integrated LNA
- Fractional-N Synthesizer
- RF Front-End
- Active Interference Cancellation
- GNSS Engine
- ARM7 Processor
- RAM
- Flash
- ROM
- TCXO
- 32.768K XTAL

Connections:
- VCC
- VCC_RF
- V_BCKP
- UART
- FORCE_ON
- UART
- RESET
- STANDBY
- 1PPS
- ANTON
- Antenna
Firmware

- **Protocol**
  - NMEA 0183 standard V3.01
  - MTK Private Protocol: PMTK

- **Configurable Operating Modes**
  - UART: Adjustable 4800~115200bps (default: 9600bps)
  - Update rate: 1Hz (default), up to 10Hz
  - Selectable output NMEA messages
  - Configurable Periodic Standby Mode
  - Selectable navigation mode
Target Applications

- Portable Devices
- Vehicle Management
- Asset Tracking
- Security System
- Connected PND
- GIS Application
- Industrial PDA
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Advanced Features

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Receiver Performance

- EASY™, advanced AGPS technology without the need of external memory
- Extremely low power consumption, 18mA@Tracking
- AlwaysLocate™, an intelligent algorithm for power saving
- LOCUS, innate logger solution with no need of host and external flash
- High sensitivity, -165dBm@Tracking, -148dBm@Acquisition
- Support DGPS, QZSS, SBAS (WASS/EGNOS/MSAS/GAGAN)
- Anti-Jamming, Multi-tone Active Interference Canceller
- Balloon mode, for high altitude up to 80km
- PPS VS. NMEA can be used in time service
## Specifications

<table>
<thead>
<tr>
<th>L1 Band Receiver (1575.42MHz)</th>
<th>Channel</th>
<th>33 (tracking) / 99 (acquisition)</th>
</tr>
</thead>
<tbody>
<tr>
<td>C/A code</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SBA</td>
<td></td>
<td>WAAS, EGNOS, MSAS, GAGAN</td>
</tr>
<tr>
<td>Horizontal Position Accuracy</td>
<td>Autonomous</td>
<td>&lt;2.5m CEP</td>
</tr>
<tr>
<td>Velocity Accuracy</td>
<td>Without aid</td>
<td>&lt;0.1m/s</td>
</tr>
<tr>
<td>Acceleration Accuracy</td>
<td>Without aid</td>
<td>0.1m/s²</td>
</tr>
<tr>
<td>Timing Accuracy</td>
<td>1PPS</td>
<td>10ns</td>
</tr>
<tr>
<td>Reacquisition Time</td>
<td></td>
<td>&lt;1s</td>
</tr>
<tr>
<td>TTFF@-130dBm with EASY™</td>
<td>Cold Start</td>
<td>&lt;15s</td>
</tr>
<tr>
<td></td>
<td>Warm Start</td>
<td>&lt;5s</td>
</tr>
<tr>
<td></td>
<td>Hot Start</td>
<td>&lt;1s</td>
</tr>
<tr>
<td>TTFF@-130dBm without EASY™</td>
<td>Cold Start</td>
<td>&lt;35s</td>
</tr>
<tr>
<td></td>
<td>Warm Start</td>
<td>&lt;30s</td>
</tr>
<tr>
<td></td>
<td>Hot Start</td>
<td>&lt;1s</td>
</tr>
<tr>
<td>Sensitivity</td>
<td>Acquisition</td>
<td>-148dBm</td>
</tr>
<tr>
<td></td>
<td>Tracking</td>
<td>-165dBm</td>
</tr>
<tr>
<td></td>
<td>Re-acquisition</td>
<td>-160dBm</td>
</tr>
<tr>
<td>Environmental</td>
<td>Operating Temperature</td>
<td>-40°C to 85°C</td>
</tr>
<tr>
<td></td>
<td>Storage Temperature</td>
<td>-45°C to 125°C</td>
</tr>
<tr>
<td>Dynamic Performance</td>
<td>Maximum Altitude</td>
<td>Max.18000m</td>
</tr>
<tr>
<td></td>
<td>Maximum Velocity</td>
<td>Max.515m/s</td>
</tr>
<tr>
<td></td>
<td>Maximum Acceleration</td>
<td>4G</td>
</tr>
<tr>
<td>Dimensions</td>
<td>10.1 x 9.7 x 2.5mm</td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td>Approx. 0.6g</td>
<td></td>
</tr>
<tr>
<td>Serial Interface</td>
<td>UART: Adjustable 4800~115200 bps</td>
<td>Default: 9600bps</td>
</tr>
<tr>
<td></td>
<td>Update Rate</td>
<td>1Hz by default, up to 10Hz</td>
</tr>
<tr>
<td>I/O Voltage</td>
<td>2.7V ~ 2.9V</td>
<td></td>
</tr>
<tr>
<td>Protocols</td>
<td>NMEA 0183 PMTK</td>
<td></td>
</tr>
<tr>
<td>Power Supply</td>
<td>2.8V ~ 4.3V</td>
<td></td>
</tr>
<tr>
<td>Power Acquisition</td>
<td>25mA (GPS+GLONASS)</td>
<td></td>
</tr>
<tr>
<td>Power Tracking</td>
<td>18mA (GPS+GLONASS)</td>
<td></td>
</tr>
<tr>
<td>Power Saving</td>
<td>2.6mA AlwaysLocate™</td>
<td></td>
</tr>
<tr>
<td></td>
<td>7uA Backup Mode</td>
<td></td>
</tr>
<tr>
<td></td>
<td>500uA Standby Mode</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Periodic Mode</td>
<td></td>
</tr>
<tr>
<td>Antenna Type</td>
<td>Active or Passive</td>
<td></td>
</tr>
<tr>
<td>Antenna Power</td>
<td>External or Internal VCC_RF</td>
<td></td>
</tr>
</tbody>
</table>
EASY™ is the abbreviation for Embedded Assist System for quick positioning. With EASY™ technology, the GNSS engine can calculate and predict automatically single ephemeris (up to 3 days) when the power is on, and then save the predict information into the memory. So the GNSS engine can use the information for positioning later if there are not enough information received from the satellites.

This function will be helpful for positioning and TTFF improvement under indoor or urban conditions.
With EASY™ technology, L76 series accelerates TTFF obviously.

<table>
<thead>
<tr>
<th>Test Condition</th>
<th>TTFF without EASY™</th>
<th>TTFF with EASY™</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cold Start Under GNSS signal Generator, conductive power level -130dBm</td>
<td>&lt;35s</td>
<td>&lt;15s</td>
</tr>
<tr>
<td>Warm Start</td>
<td>&lt;30s</td>
<td>&lt;5 s</td>
</tr>
</tbody>
</table>
Periodic Standby Mode

Periodic standby mode can control power on/off time of GNSS periodically to reduce average power consumption, and on/off time can be configured by using PMTK command. For details, see the figure below. Periodic standby mode can be entered by sending the following PMTK command:

$PMTK255, Type, Run time, Sleep time, Second run time, Second sleep time

Notes:

1. Normally, the GNSS module will enter the periodic mode after successfully fixing position. But if acquisition fails, the GNSS module still can enter this mode.
2. If GNSS acquisition fails during the Run time, in order to ensure the success of reacquisition, it is better to set the longer Second run time.

Example: PMTK225, 1, 3000, 12000, 18000, 72000*16 for periodic mode with 3s in tracking mode and 12s sleep in standby mode. The average current is about 3.7mA.
AlwaysLocate™ Technology

- AlwaysLocate™ is an intelligent controller of periodic mode.

- L76 series can adaptively adjust the on/off time to achieve balance between positioning accuracy and power consumption according to the environmental and motion conditions. So the average power consumption is lower in AlwaysLocate™ power saving mode than that in periodic power saving mode. Typical average power is 2.6mA.
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### Specification Comparison

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<tr>
<th>Product Features</th>
<th>L76</th>
<th>Ucompany LEX-6N</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Power supply</strong></td>
<td>2.8V~4.3V</td>
<td>2.7V~3.6V</td>
</tr>
<tr>
<td><strong>Power Consumption</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acquisition mode</td>
<td><a href="mailto:25mA@3.3V">25mA@3.3V</a></td>
<td><a href="mailto:40mA@3.0V">40mA@3.0V</a> typical</td>
</tr>
<tr>
<td>Tracking mode</td>
<td><a href="mailto:18mA@3.3V">18mA@3.3V</a></td>
<td></td>
</tr>
<tr>
<td><strong>Sensitivity</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acquisition</td>
<td>-148dBm</td>
<td>-148dBm</td>
</tr>
<tr>
<td>Tracking</td>
<td>-165dBm</td>
<td>-162dBm</td>
</tr>
<tr>
<td>Re-acquisition</td>
<td>-160dBm</td>
<td>-157dBm</td>
</tr>
<tr>
<td><strong>TTFF @ -130dBm</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hot start</td>
<td>&lt;1s</td>
<td>1s</td>
</tr>
<tr>
<td>Warm start</td>
<td>&lt;5s (EASY™ )</td>
<td>26s</td>
</tr>
<tr>
<td>Cold start</td>
<td>&lt;15s (EASY™ )</td>
<td>26s</td>
</tr>
<tr>
<td><strong>Position Accuracy</strong></td>
<td>2.5m CEP</td>
<td>4m CEP</td>
</tr>
<tr>
<td><strong>Timing Accuracy</strong></td>
<td>1PPS</td>
<td>10ns</td>
</tr>
<tr>
<td><strong>Data Update Rate</strong></td>
<td>Up to 10Hz</td>
<td>Up to 5Hz</td>
</tr>
</tbody>
</table>
When driving across overpass and making a turn, L76 module can still capture the accurate tracking data. But Ucompany module has a small drift.
When driving under the overpass, L76 module shows its excellent performance. But Ucompany’s module has a bigger drift.
Support Package(1)

Evaluation Board

- Interfaces
  - Serial port
  - Antenna interface
  - Micro-USB interface

- Accessories
  - Micro-USB cable
  - Antenna
Support Package(2)

- **Documents**
  - Hardware Design
  - Protocol Specification
  - Part&Decal in PADS and Protel Format
  - Evaluation Board User Guide
  - Circuit Reference Design

- **PC tool**
  - PowerGPS - GPS/GLONASS testing tool
Q&A...

Thank you