Two-chip GPS receiver solutions:

❖ uN9011: uN8021 RFIC, uN8130 Baseband IC
❖ uN9111: uN8021 RFIC, uN2110 Baseband IC with 8Mbit embedded flash

Features

High Sensitivity Performance

❖ Dedicated QwikLock™ search engine
  ➢ Four (4) frequency bins searched in parallel
  ➢ Programmable frequency bin width
  ➢ Less than 40 second cold TTFF

❖ 12-channel Zoom Correlators™ enable robust high sensitivity tracking
  ➢ Four (4) programmable fingers per correlator

Low Power

❖ Integrated low-power 32MHz 16-bit proprietary VS_DSP core
❖ PowerMiser™ low power architecture
  ➢ Less than 75mW full tracking power
  ➢ Less than 10uW sleep mode

Complete navigation software package with available software development kit (SDK) 3V analog, 1.8V digital power supplies.

Small form factor:

❖ uN8021 RFIC: 4x4x0.9mm 20-QLP
❖ uN8130 BBIC: 10x10x1.4mm 144-BGA
❖ uN2110 BBIC: 8.5x8.5x1.4mm 49-BGA

Description

The u-NAV Microelectronics uN9011 and uN9111 GPS chipsets form the heart of highly integrated two-chip GPS receiver solutions for embedded portable applications. The RF front-end chip (uN8021) utilizes a direct conversion architecture with a very low intermediate frequency (IF) output. The uN8021 includes a complete integrated PLL, variable gain amplifiers and baseband filtering, and a 2-bit I/Q digital output. The baseband processor chips (uN8130 or uN2110) include all baseband functions needed for GPS signal acquisition, tracking and navigation. The uN2110 features an integrated eight (8) megabit flash memory array along with the baseband functionality of the standard uN8130. The standard uN8130 baseband includes a dedicated high-performance search engine using patented QwikLock™ architecture that rapidly searches all 1023 code phases in four adjacent frequency bins with a resolution of ½ chip, greatly speeding acquisition. An advanced twelve channel tracking unit employing Zoom Correlators™ insures that positioning is possible even in severe conditions such as in urban canyons and under foliage.

A complete GPS receiver built with either the uN9011 or uN9111 chipset needs only a handful of external components, keeping the overall bill of materials to a minimum. A reference design including schematics, BOM, and sample boards, is available now. The total Active PCB area of the reference design is less than 350 mm^2.
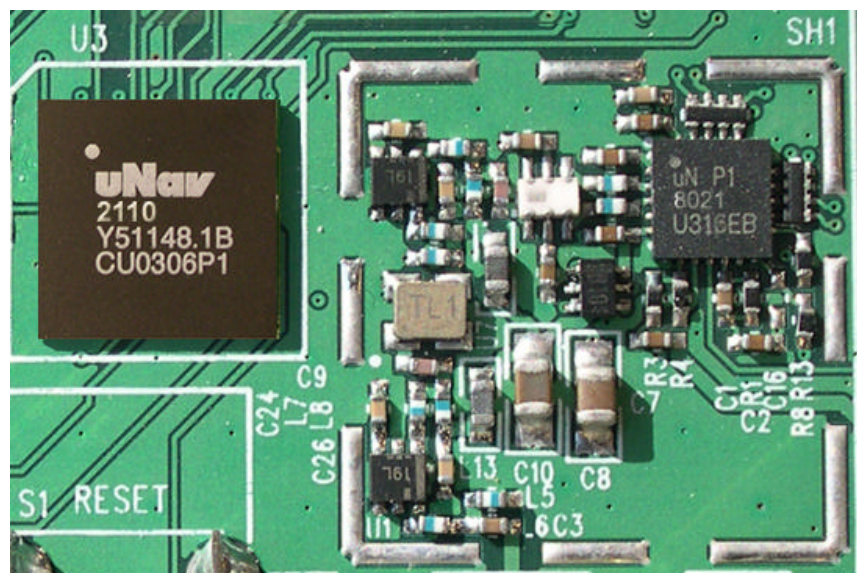
GPS Baseband Processor

The uN8130 or uN2110 are complete GPS baseband processing engines fabricated in standard CMOS technology. Each device includes a dedicated search engine, 12-channel tracking engine, DSP, SRAM, and a variety of peripherals. The uN2110 also includes eight (8) Mbits of embedded flash memory.

QwikLock™ Search Engine: The search engine block implements the acquisition time frequency analysis and signal integration. It has the following main features:

- 2046 sample time axis giving ½ chip resolution
- Four adjacent, parallel frequency bins
- Programmable Doppler frequency
- 1–128 ms pre-detection integration time
- 1–512 post-detection integration rounds
- On-chip dedicated integration memory, accessible also by the VS_DSP
- Synchronizable to known bit timing

12-channel Tracking Engine: The tracking engine is implemented via 12 parallel hardware correlator channels using Zoom Correlators™. The main features of the receiver unit are:

- 12 parallel tracking channels
- 4 Zoom Correlators™ per channel
- Individual channels can be enabled or disabled for saving power
- Easy setting of tracking state for rapid signal acquisition

DSP and Flash Memory: The baseband device includes a custom digital signal processor for receiver control, data communications and navigation solution calculation. The DSP is a low-power, 32MHz 16-bit processor core with a single-cycle multiply-accumulate and several other DSP features. It has a modified Harvard architecture containing two data memories and a separate program memory. The uN2110 includes an eight megabit flash memory intended to hold all firmware necessary to operate the receiver and logging way-points.

Interfaces and Peripherals: The baseband chip includes the following interfaces and peripherals:

- Two UARTs
- One Pulse-Per-Second pulse generator
- SPI serial interface
- 28 configurable, general purpose I/O
- IF signal bit counter and digital mixer
- Nine separate timers
- Watch-dog timer
- 24-bit real time clock
- One pulse measurement unit
- Timer input and capture function
- PowerMiser™ power controller

RF Front-end

The uN8021 is a single-chip GPS RF front-end fabricated in standard CMOS technology. The uN8021 down converts the L-band input to a very low IF. Dual mixers are used to create in-phase (I) and quadrature (Q) baseband signals. The resulting I/Q signals are low-pass filtered and digitized using 2-bit A/D converters. The gain of both the I and Q paths can be individually adjusted to maintain accurate matching. Functions of the RFIC are controlled through an SPI serial interface.

Packaging:
The uN8130 is offered in a full I/O version using the 10x10x1.4mm 144-BGA package, or a reduced I/O version using the 7x7x1.4mm 49-BGA for host-based applications. The uN2110 is offered in a 8.5x8.5x1.4mm 49-BGA that is pin compatible with the uN8130-49BGA. This allows a single PCB design to support both host-based and full autonomous applications. The uN8021 is offered in a $4x4x0.9mm^3$ 20-QLP package.

Software

u-Nav provides several software options for the uN9011/uN9111 chipsets. Contact u-Nav for the latest information on available software packages and associated software development tools.