

# CXD2931R

Sony will soon be releasing the CXD2931R special-purpose GPS LSI that integrates the GPS digital signal-processing block on a single chip. The CXD2931R integrates a high-performance 32-bit RISC CPU, 2-megabits of mask ROM, SRAM, UART and RTC circuits, and all the functions required in a GPS system on a single chip. A GPS receiver can be implemented with just two chips by combining the CXD2931R with an RF LSI.

The CXD2931R supports further miniaturization and reduced power consumption in GPS systems, and can be easily applied not only to in-car navigation systems, but to any type of portable equipment.

- GPS digital block integrated on a single chip
- Parallel 16-channel GPS receiver that can receive from up to 16 satellites at the same time.
- Fast cold start
- Supports both all-in-view and 2-satellite measurements
- Support for DGPS

## ■ GPS Digital Block Integrated on a Single Chip

Figure 1 shows the structure of a CXD2931R system. The CXD2931R features a Sony developed high-performance 32-bit RISC CPU, 2-megabits of mask ROM, 36K of BSRAM, a UART, and RTC, and all the functions required by a GPS system integrated on a single chip. The 2-megabits of mask ROM holds a high-performance GPS software system that was developed by Sony. This allows a high-performance GPS receiver to be built from just two chips, the CXD2931R and an RF LSI.

## ■ 16-Channel GPS Receiver

The CXD2931R can receive signals from up to 16 satellites at the same time. These 16 channels will become useful as the number of GPS satellites is increased in the future. (There are currently a total of 27 satellites.) The provision of multiple channels allows the time to first fix (TTFF) to be reduced.

## ■ Fast Cold Start

Table 1 lists the time until the first measurement after power is first applied. Cold start refers to the state where the device has no almanac, ephemeris, or initial position, and the time required when the device is in that state until the first measurement is completed. Previously, several minutes were required at cold start, but the newly-developed software used in this device allows the first measurement to be made in 50 seconds on average. This allows systems to be designed without a backup battery.

## ■ All-in-View and 2-Satellite Measurements

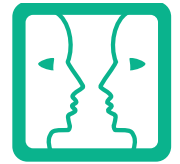
The CXD2931R adopts the all-in-view position measurement technique in which position calculations use information from all satellites from which signals can be received. This increases the positioning accuracy. The CXD2931R also implements the 2-satellite measurement technique in which measurement is possible in adverse measurement conditions, such as between buildings in a city, where signals can only be received from two satellites. This increases the number of locations where measurement is possible.

## ■ Support for DGPS

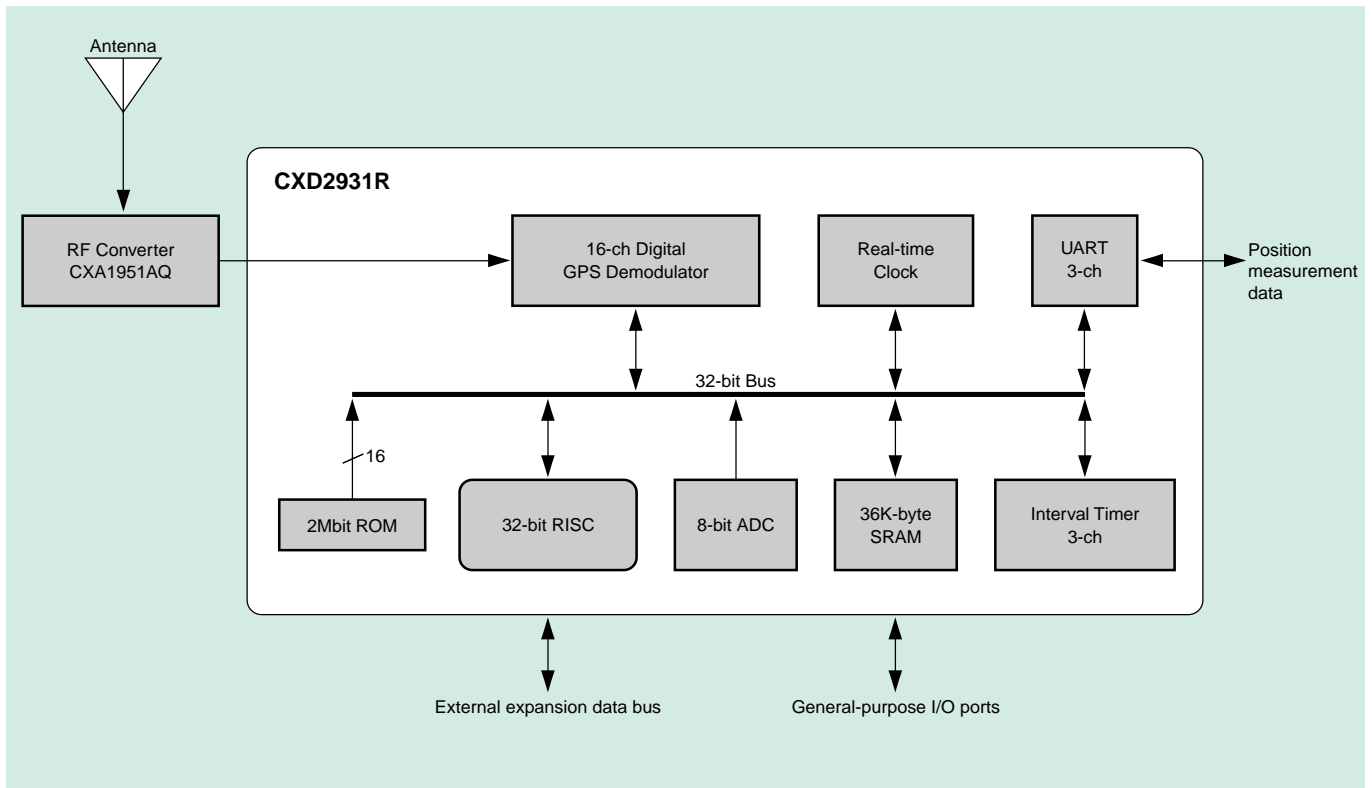
DGPS allows the positioning accuracy to increase approximately 10 times compared with GPS alone by converting the correction data from the GPS satellites obtained at the base stations in the DARC or RTCM format.

## V O I C E

The CXD2931R is truly a “system-on-a-chip” LSI. The recent appearance of other GPS applications in addition to in-car navigation systems means that there will be expanding demand for this LSI. Our next challenge will be to integrate both the RF circuits as well as the digital system on a single chip.



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■ Figure 1 System Structure

■ Table 1 Time to First Fix

(The time from the point the power is turned on to the point the first position measurement is made.)

<b>Cold start</b> (No ephemeris or almanac)	35 to 60 seconds
<b>Warm start</b> (No ephemeris, but almanac present)	35 to 50 seconds
<b>Hot start</b> (Both ephemeris and almanac present)	6 to 20 seconds
<b>Reacquisition time</b> (Interrupt recovery time)	Less than 5 minutes: 2 to 6 seconds Over 5 minutes: 6 to 10 seconds

**Positioning accuracy**

- Independent GPS
  - 1 $\sigma$  (68%) : <30m
  - 3 $\sigma$  (95%) : <90m
- DGPS
  - 1 $\sigma$  (68%) : <6m
  - 3 $\sigma$  (95%) : <18m