

# UBX-G6010-SA-DR/UBX-G6010-ST-DR

## u-blox 6 Dead Reckoning GPS chips

### Highlights

- ADR (Automotive Dead Reckoning) technology:
  - 100% coverage, continuous positioning even in tunnels
  - Highly accurate and reliable navigation performance
  - Automatic sensor calibration
- Pin compatible with u-blox UBX-G6010-SA/ST GPS chips
- ROM-based for cost effectiveness
- Requires no additional sensors<sup>1</sup>
- Qualified according to AEC-Q100
- Manufactured in ISO/TS 16949 certified production sites



UBX-G6010-SA-DR/  
UBX-G6010-ST-DR  
8.0 x 8.0 x 0.85 mm

### Features

- u-blox 6 position engine:
  - Navigate down to -162 dBm and -148 dBm coldstart
  - Hybrid GPS/SBAS engine (WAAS, EGNOS, MSAS)
  - 1 Hz combined ADR+GPS navigation rate
  - Anti-jamming technology
- Simple integration with u-blox wireless modules
- A-GPS: AssistNow Online and AssistNow Offline services, OMA SUPL compliant
- Operating temperature range: -40°C to 85°C
- 3GPP compliant
- Compatible with u-blox GPS Solution for Android

<sup>1</sup> When onboard sensors are accessible to application processor.

### Product description

ADR (Automotive Dead Reckoning) is u-blox' industry proven off-the-shelf Dead Reckoning solution. u-blox ADR combines GPS and sensor digital data using a tightly coupled Kalman filter. This improves position accuracy during periods of no or degraded GPS signal.

ADR supports a variety of sensors (such as wheel ticks and gyroscope) and receives the sensor data via UBX messages from the application processor. Digital sensor data is available on the vehicle bus. This reduces hardware costs since no extra sensors are required for Dead Reckoning functionality. ADR is designed for simple integration and easy configuration of different sensor options (e.g. DR with or without gyroscope) and vehicle variants, and is completely self-calibrating.

u-blox ADR is available with UBX-G6010 single chips, or as an optional FW upgrade with the UBX-G6000/G0010 chipset. The automotive grade UBX-G6010-SA-DR is intended for tier-one automotive customers. UBX-G6010-SA-DR and UBX-G6010-ST-DR chips are pin compatible with standard UBX-G6010 chips.

### Solution overview

The u-blox ADR solution consists of four functional elements:

- Sensors: Various combinations available in cars supported (e.g. gyroscope & speedpulse or differential wheel tick)
- Vehicle bus: Transmits the digital sensor data
- Application processor: Converts sensor data to UBX messages
- ADR chip: Processes GPS and sensor data into position

### Product selector

Model	Package	Type	Supply	Interfaces	Features
	Package	GPS QZSS GLONASS Timing Dead Reckoning Precise Point Positioning	1.4 V - 3.6 V 1.75 V - 2.0 V 2.5 V - 3.6 V	UART USB SPI DDC (I <sup>2</sup> C compliant)	Programmable (Flash) DC/DC Converter Data logger RTC crystal Oscillator Antenna supply and supervisor Timepulse External interrupt / Wakeup
UBX-G6010-SA-DR/ UBX-G6010-ST-DR	QFN56	•	•	•	S C/T S •

C/T = Crystal and TCXO supported

S = supported, may require external components

## Receiver performance data

Receiver type	50-channel u-blox6 engine GPS L1 C/A code SBAS: WAAS, EGNOS, MSAS		
Navigation update rate	1 Hz (GPS + ADR)		
Accuracy <sup>1</sup>	Position	2.5 m CEP	
	SBAS	2.0 m CEP	
Acquisition <sup>1</sup>		TCXO	Crystal
	Cold starts:	26 s	27 s
	Aided starts <sup>2</sup> :	1 s	< 3 s
	Hot starts:	1 s	1 s
Sensitivity <sup>3</sup>		TCXO	Crystal
	Tracking:	-162 dBm	-161 dBm
	Cold starts:	-148 dBm	-147 dBm
	Hot starts:	-157 dBm	-156 dBm
Operational limits	Velocity:	500 m/s	
	Altitude:	50,000 m	

<sup>1</sup> All SV @ -130 dBm

<sup>2</sup> Dependent on aiding data connection speed and latency

<sup>3</sup> Demonstrated with a good active antenna

## Electrical data

Supply voltages	1.75 V – 2.0 V 2.5 V – 3.6 V
Digital I/O voltage level	1.65 V – 3.6 V
Power consumption	67 mW @ 1.8 V (continuous) 20 mW @ 1.8 V Power Save Mode (1 Hz)
Backup supply	Voltage range: 1.4 V to 3.6 V
RTC input	32.768 kHz (optional)
Antenna supervision	Short and open circuit detection supported with external circuit
Antenna type	Active and passive

## Interfaces

Serial interfaces	1 UART 1 USB V2.0 full speed 12 Mbit/s 1 DDC (I <sup>2</sup> C compliant) 1 SPI
Digital I/O	Configurable time pulse 2 EXTINT interrupt inputs 10 configuration pins

### Legal Notice

u-blox reserves all rights to this document and the information contained herein. Products, names, logos and designs described herein may in whole or in part be subject to intellectual property rights. Reproduction, use, modification or disclosure to third parties of this document or any part thereof without the express permission of u-blox is strictly prohibited.

The information contained herein is provided "as is". No warranty of any kind, either express or implied, is made in relation to the accuracy, reliability, fitness for a particular purpose or content of this document. This document may be revised by u-blox at any time. For most recent documents, please visit [www.u-blox.com](http://www.u-blox.com).

Copyright © 2012, u-blox AG

Specification applies to FW 7

## Packages

UBX-G6010-SA-DR/	
UBX-G6010-ST-DR:	56 Pin MLF: 8.0 x 8.0 x 0.85 mm

## Environmental data, quality & reliability

Operating temp.	-40°C to 85°C
Storage temp.	-40°C to 85°C
RoHS compliant (lead-free) and green (no halogens)	
Qualification according to ISO 16750	
Manufactured in ISO/TS 16949 certified production sites	

## ADR performance and requirements

u-blox ADR supports four standard sensor configurations: Rear wheel sensors, Front wheel sensors, 4 wheel sensors, and Gyro + speedpulse. The digital data provided by the sensors is converted to proprietary UBX messages by the application processor.

Sensor option	Typ. position error <sup>4, 5</sup>
Rear wheels:	12% <sup>6</sup>
Front wheels:	13% <sup>6</sup>
Four wheels:	10% <sup>6</sup>
Gyro + speedpulse:	5% <sup>6</sup>

<sup>4</sup> Values obtained with typical sensor latency of 40 ms and expected jitter of <5 ms.

<sup>5</sup> With GPS reception: position error with ADR (GPS + Sensor) is as good as or better than u-blox standard GPS receiver (GPS only).

<sup>6</sup> Percentage of distance travelled without GPS.

### Sensor requirements

Wheel tick:	Resolution better than 2 cm/tick.
Wheel info:	Free from deadband behavior and linear with wheel rotation.
Gyro (optional):	Accuracy: < 0.02°/s Dynamic range: ±60°/s to ±125°/s Linearity: ±0.5°/s (full scale)

## Support products

EVK-6V:	u-blox6 Evaluation Kit Dead Reckoning with SW sensor.
---------	---

## Ordering information

UBX-G6010-SA-DR	u-blox6 ADR single chip (automotive grade) , 56 Pin MLF
UBX-G6010-ST-DR	u-blox6 ADR single chip (standard grade) , 56 Pin MLF

## Contact us

HQ Switzerland +41 44 722 7444 info@u-blox.com	China +86 10 68 133 545 info_cn@u-blox.com
--	--

EMEA +41 44 722 7444 info@u-blox.com	Japan +81 3 5775 3850 info_jp@u-blox.com
--	--

Americas +1 703 483 3180 info_us@u-blox.com	Korea +82 2 542 0861 info_kr@u-blox.com
---	---

APAC – Singapore +65 6734 3811 info_ap@u-blox.com	Taiwan +886 2 2657 1090 info_tw@u-blox.com
---	--