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
- Qualified according to AEC-Q100
- Manufactured in ISO/TS 16949 certified production sites

**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
- Requires no additional sensors
- 1.4 V – 3.6 V
- 1.75 V – 2.0 V
- 2.5 V – 3.6 V
- UART
- SPI
- DC/DC Converter
- Data logger
- RTC
- DDC (I²C compliant)
- Antenna supply and supervisor
- External interrupt / Wakeup

**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**

<table>
<thead>
<tr>
<th>Model</th>
<th>Package</th>
<th>Type</th>
<th>Supply</th>
<th>Interfaces</th>
<th>Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>UBX-G6010-SA-DR/ UBX-G6010-ST-DR</td>
<td>QFN56</td>
<td>•</td>
<td>•</td>
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<td>S C/T S</td>
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</table>

C/T = Crystal and TCXO supported
S = supported, may require external components
Receiver performance data

**Receiver type**
- 50-channel u-blox 6 engine
- GPS L1 C/A code
- SBAS: WAAS, EGNOS, MSAS

**Navigation update rate**
- 1 Hz (GPS + ADR)

**Accuracy**
- Position: 2.5 m CEP
- SBAS: 2.0 m CEP

**Acquisition**
- TCXO
  - Cold starts: 26 s
  - Aided starts: 1 s
- Crystal
  - Cold starts: 27 s
  - Aided starts: < 3 s

**Sensitivity**
- Tracking: –162 dBm
  - Cold starts: –148 dBm
  - Hot starts: –157 dBm
- Crystal
  - Tracking: –161 dBm
  - Cold starts: –147 dBm
  - Hot starts: –156 dBm

**Operational limits**
- Velocity: 500 m/s
- Altitude: 50,000 m

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**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

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**Interfaces**

- **Serial interfaces**
  - 1 UART
  - 1 USB V2.0 full speed 12 Mbit/s
  - 1 DDC (I²C compliant)
  - 1 SPI
- **Digital I/O**
  - Configurable time pulse
  - 2 EXTINT interrupt inputs
  - 10 configuration pins

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Specification applies to FW 7

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**Packages**

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<td>56 Pin MLF: 8.0 x 8.0 x 0.85 mm</td>
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**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
  - Rear wheels: 12 %
  - Front wheels: 13 %
  - Four wheels: 10 %
  - Gyro + speedpulse: 5 %

  - Values obtained with typical sensor latency of 40 ms and expected jitter of < 5 ms.
  - Dependent on aiding data connection speed and latency.

  - Demonstration with a good active antenna

**Support products**

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

**Ordering information**

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