

# NEO-6V

## u-blox 6 dead reckoning GPS module

### Highlights

- Automotive Dead Reckoning (ADR) technology:
  - 100% coverage, continuous positioning even in tunnels
  - Highly accurate and reliable navigation performance
  - Automatic sensor calibration
- ROM-based for cost effectiveness
- Uses vehicle's onboard sensors
- UART, USB, DDC (I<sup>2</sup>C compliant) and SPI interfaces
- Onboard RTC crystal for faster warm and hot starts



NEO-6V:  
12.2 x 16.0 x 2.4 mm

### Features

- u-blox 6 position engine:
  - Navigate down to -161 dBm and -147 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
- LCC package for reliable and cost effective manufacturing
- Based on GPS chips qualified according to AEC-Q100
- Manufactured in ISO/TS 16949 certified production sites
- Qualified according to ISO 16750

### Product description

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

The NEO-6V provides ADR functionality over its software sensor interface. A variety of sensors (such as wheel ticks and gyroscope) are supported, with the sensor data received via UBX messages from the application processor. This allows for easy integration and a simple hardware interface, lowering costs. By using digital sensor data available on the vehicle bus, hardware costs are minimized 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. with or without gyroscope) and vehicle variants, and is completely self-calibrating.

All NEO-6 modules are manufactured in ISO/TS 16949 certified sites. Each module is tested and inspected during production. Qualification tests are performed as stipulated in the ISO16750 standard: "Road vehicles – Environmental conditions and testing for electrical and electronic equipment".

### Product selector

Model	Type	Supply	Interfaces	Features
NEO-6V <sup>1</sup>	<ul style="list-style-type: none"> <li>• GPS / QZSS</li> <li>• GLONASS</li> <li>• Galileo</li> <li>• BeiDou</li> <li>• Timing &amp; Frequency</li> <li>• Dead Reckoning</li> <li>• Precise Point Positioning</li> </ul>	<ul style="list-style-type: none"> <li>• 1.65 V – 3.6 V</li> <li>• 2.7 V – 3.6 V</li> </ul>	<ul style="list-style-type: none"> <li>• UART</li> <li>• USB</li> <li>• SPI</li> <li>• DDC (I2C compliant)</li> </ul>	<ul style="list-style-type: none"> <li>• Programmable (Flash)</li> <li>• Data logging</li> <li>• Extra front-end LNA</li> <li>• Front-end SAW filter</li> <li>• RTC crystal</li> <li>• Internal oscillator</li> <li>• Antenna supply</li> <li>• Antenna short circuit detection / protection</li> <li>• Antenna open circuit detection pin</li> <li>• Timepulse output</li> <li>• External interrupt / Wakeup</li> </ul>

<sup>1</sup> = Software interface for sensor data  
C = Crystal

◦ = Optional, not activated per default or requires 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	Cold starts:	27 s
	Aided starts:	< 3 s
	Hot starts:	1 s
Sensitivity	Tracking:	-161 dBm
	Cold starts:	-147 dBm
	Hot starts:	-156 dBm

## Electrical data

Power supply	2.7 V – 3.6 V
Power consumption	117 mW @ 3.0V (continuous)
Backup power	1.4 V – 3.6V, 22 $\mu$ A
Antenna supervision	Short and open circuit detection supported with external circuit
Supported antennas	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 timepulse 1 EXTINT input for Wakeup
Serial and I/O	Voltages 2.7 – 3.6 V
Timepulse	Configurable 0.25 Hz to 1 kHz
Protocols	NMEA, UBX binary, RTCM

## Support products

EVK-6V:	u-blox6 Evaluation Kit Dead Reckoning SW sensor
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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)	
Qualification according to ISO 16750	
Manufactured in ISO/TS 16949 certified production sites	

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## Package

24 pin LCC (Leadless Chip Carrier): 12.2 x 16.0 x 2.4 mm, 1.6 g  
Pinout

13	GND	GND	12
14	MOSI/CFG_COM0	RF_IN	11
15	MISO/CFG_COM1	GND	10
16	CFG_GPS0/SCK	VCC_RF	9
17	Reserved	Reserved	8
<b>NEO-6V</b> Top View			
18	SDA2	VDDUSB	7
19	SCL2	USB_DP	6
20	TxD1	USB_DM	5
21	RxD1	EXTINT0	4
22	V_BCKP	TIMEPULSE	3
23	VCC	SS_N	2
24	GND	Reserved	1

## 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>1, 2</sup>

Rear wheels:	12% <sup>3</sup>
Front wheels:	13% <sup>3</sup>
Four wheels:	10% <sup>3</sup>
Gyro + speedpulse:	5% <sup>3</sup>

<sup>1</sup> Values obtained with typical sensor latency of 40 ms and expected jitter of <5 ms.

<sup>2</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>3</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: $\pm 60^\circ/s$ to $\pm 125^\circ/s$
	Linearity: $\pm 0.5^\circ/s$ (full scale)

## Ordering information

NEO-6V-0	u-blox 6 GPS Module, Dead Reckoning software sensor interface, 12.2x16 mm, 250 pcs/reel
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Available as samples and tape on reel

## Contact us

For contact information, see [www.u-blox.com/contact-us](http://www.u-blox.com/contact-us).