

# NEO-M9V module



## u-blox M9 standard precision GNSS module with dead reckoning

### First GNSS receiver with UDR and ADR for fleet management and micromobility applications

- Three times better positioning accuracy for a smooth urban navigation experience
- Maximum position availability with dead reckoning technology and AssistNow Live Orbits lifetime access
- Easy-to-use UDR and advanced ADR for high flexibility and fast time to market
- Reduced RF design efforts thanks to integrated SAW/LNA
- Pin-compatible with all NEO modules



Standard

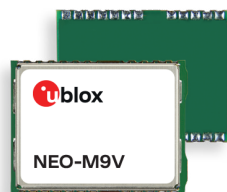


Professional



Automotive

12.2 × 16.0 × 2.4 mm



### Product description

Based on the ultra-robust M9 platform, NEO-M9V is the first u-blox module to include both UDR and ADR options integrated into one receiver. The module also includes various dynamic models for after-market vehicles, motorcycles, and micromobility applications. All the components needed are on the module, including IMU. This makes the dead reckoning technology accessible and easy to use. Furthermore, the whole solution runs on the module which means that it is not necessary to run external libraries on the host.

This innovative u-blox M9 standard precision GNSS module with dead reckoning technology delivers three times better accuracy than GNSS-only receivers, enabling a smooth urban navigation or tracking experience. In challenging environments, GNSS-only receivers typically have many outliers. In such conditions, statistical accuracy can easily exceed 10 meters. With NEO-M9V, there are few or no outliers. In typical urban scenarios, NEO-M9V offers sub-5-meter accuracy.

Maximum position availability is guaranteed, thanks to dead reckoning technology and AssistNow Live Orbits. Lifetime access to the premium-level assistance service is included in NEO-M9V and provides fastest time-to-first-GNSS-fix combined with best position accuracy from the first fix.

UDR enables fast time to market, and ADR improves the accuracy performance if there are long GNSS outages. Excellent RF interference mitigation thanks to SAW/LNA enables simple and fast RF designs including considerable cost savings from reduced design efforts.

NEO-M9V offers backwards pin-to-pin compatibility with previous u-blox generations (NEO-M8L and NEO-M8U), which saves designers time and cost when upgrading their design. Thanks to the continuous support of UBX messages across product generations, software migration requires little effort. u-blox M9 modules use GNSS chips qualified according to AEC-Q100 and are manufactured in ISO/TS 16949 certified sites.

	NEO-M9V
<b>Grade</b>	
Automotive	
Professional	•
Standard	
<b>GNSS</b>	
GPS + QZSS/SBAS	•
GLONASS	•
Galileo	•
BeiDou	•
Number of concurrent GNSS	4
<b>Interfaces</b>	
UART	1
USB	1
SPI	1
DDC (I2C compliant)	1
<b>Features</b>	
Upgradeable firmware	•
AssistNow lifetime access	L
RTC crystal	•
Oscillator	T
Additional SAW	•
Additional LNA	•
Integrated IMU	•
Automotive Dead Reckoning (ADR)	•
Untethered Dead Reckoning (UDR)	•
Wake-on motion	•
IMU data output	•
Automatic alignment	•
Weak signal compensation	•
Timepulse	1
<b>Power supply</b>	
2.7 V – 3.6 V	•

T = TCXO

L = Live Orbits

# NEO-M9V module



## Product performance

Receiver type	92-channel u-blox M9 engine GPS L1 C/A, QZSS L1 C/A/S, GLONASS L1 OF BeiDou B1I (1561.098 MHz) only, Galileo E1B/C SBAS L1 C/A: WAAS, EGNOS, MSAS, GAGAN	
Nav. update rate	Up to 50 Hz (4 concurrent GNSS)	
Horizontal position accuracy	1.5 m CEP (with SBAS) 2.0 m CEP (without SBAS)	
ADR position error	2% of distance traveled without GNSS	
UDR position error	10% of distance traveled without GNSS (duration < 60 s)	
Acquisition <sup>1</sup>	Cold start	24 s
	Aided start	3 s
	Hot start	2 s
Sensitivity <sup>1</sup>	Tracking & Nav.	-159 dBm
	Reacquisition	-158 dBm
	Cold start	-147 dBm
	Hot start	-159 dBm

## Tracking features

Geofencing	Up to 4 circular areas Software message or GPIO for waking up the host CPU
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## Security features

Signal integrity	RF interference and jamming detection and reporting Active GNSS in-band filtering Spoofing detection and reporting (consistency checks based on GNSS and sensors)
Device integrity	Secure boot of firmware Receiver configuration lock by command
Secure interface	Signed UBX messages (SHA-256) JTAG debug interface port locked

## Electrical data

Power supply	2.7 V to 3.6 V
Power consumption	49 mA at 3.0 V (4 GNSS continuous)
	43 mA at 3.0 V (2 GNSS continuous)
	0.5 mA at 3.0 V (Software backup mode)
Backup supply	1.65 V to 3.6 V

<sup>1</sup> = For default mode: GPS/GLONASS/BeiDou/Galileo + SBAS/QZSS

## Package

24 pin LCC (Leadless Chip Carrier): 12.2 x 16.0 x 2.4 mm, 1.6 g
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## Environmental data, quality & reliability

Operating temp.	-40 °C to +85 °C
Storage temp.	-40 °C to +85 °C
Environmental grade	2015/863/EU RoHS-3
EMC	2014/53/EU RED
Environmental testing	ISO 16750
Quality management	Manufactured and fully tested in IATF 16949 certified production sites

## Interfaces

Serial interfaces	1 UART 1 USB 1 SPI (optional) 1 DDC (I2C compliant)
Digital I/O	Configurable timepulse
Raw data output	Code phase data
Timepulse	Configurable: 0.25 Hz to 10 MHz
Supported antennas	Active and passive
Protocols	NMEA 4.11, UBX binary

## Compatible u-blox services

Assistance GNSS	AssistNow Live Orbits with included lifetime access
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## Support products

EVK-M9DR	u-blox NEO-M9V evaluation kit with I/O interface, supports ADR and UDR operation mode
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## Product variants

NEO-M9V	u-blox M9 concurrent GNSS module with dead reckoning, UDR and ADR, multiple dynamic models, upgradeable firmware, SAW filter, LNA, and IMU
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## Further information

For contact information, see [www.u-blox.com/contact-u-blox](http://www.u-blox.com/contact-u-blox).  
For more product details and ordering information, see the product data sheet.

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