

# UBX-M9140-KA-DR



## u-blox M9 dead reckoning GNSS chip

### Continuous accurate navigation under all signal conditions

- Additional GNSS-only output besides dead reckoning position
- Low latency position output for ultimate control up to 50 Hz
- Fully integrated solution for fast time-to-market
- Resilience to loss of speed data by UDR fallback mode



5.00 × 5.00 × 0.59 mm



### Product description

UBX-M9140-KA-DR is a robust u-blox M9 single-band GNSS chip, which provides exceptional sensitivity and acquisition times for all L1 GNSS systems. The u-blox M9 standard precision GNSS platform, delivering meter-level accuracy, succeeds the well-known u-blox M8 product range.

The sophisticated built-in algorithms fuse IMU data, GNSS measurements, wheel ticks, and vehicle dynamics to provide optimal positioning accuracy where GNSS alone would fail. A GNSS-only second output is also available, along with the dead reckoning solution, to support a variety of third-party applications.

The chip supports concurrent reception of four GNSS constellations, increasing the availability of satellite measurements. The high number of visible satellites enables the receiver to select the best signals. This maximizes the position accuracy, in particular under challenging conditions such as in deep urban canyons.

The chip offers good performance even in difficult multipath environments such as tunnels or underground parking garages. UBX-M9140-KA-DR is the ultimate solution for modern automotive applications where control and position availability are keys to success.

In addition to RF-based jamming and spoofing detection, UBX-M9140-KA-DR implements sensor-based spoofing detection and is designed to inform applications about possible security attacks.

UBX-M9140-KA-DR is qualified according to AEC-Q100 and is manufactured in ISO/TS 16949 certified sites.

UBX-M9140-KA-DR

|                                 |        |
|---------------------------------|--------|
| <b>Grade</b>                    |        |
| Automotive                      | •      |
| Professional                    |        |
| Standard                        |        |
| <b>GNSS</b>                     |        |
| GPS / QZSS                      | •      |
| GLONASS                         | •      |
| Galileo                         | •      |
| BeiDou                          | •      |
| Number of concurrent GNSS       | 4      |
| Single-band                     | •      |
| <b>Interfaces</b>               |        |
| UART                            | 1      |
| USB                             | 1      |
| SPI                             | 1      |
| I2C compliant                   | 1      |
| <b>Features</b>                 |        |
| Dual output                     | •      |
| RTC crystal                     | •      |
| Oscillator                      | T      |
| Sensor-based spoofing detection | •      |
| Low-latency sensor data         | 100 Hz |
| Position and attitude           | 50 Hz  |
| Timepulse                       | 1      |
| <b>Power supply</b>             |        |
| 1.8 V – 3.6 V                   | •      |

T = TCXO



## Features

|                               |   |                       |
|-------------------------------|---|-----------------------|
| Receiver type                 | 92-channel u-blox M9 engine<br>GPS L1 C/A, QZSS L1 C/A/S, GLONASS L10F,<br>BeiDou B1I, Galileo E1B/C<br>SBAS L1 C/A: WAAS, EGNOS, MSAS, GAGAN |                       |
| Nav. update rate <sup>1</sup> | up to 50 Hz (4 concurrent GNSS)   |                       |
| Position accuracy             | 1.5 m CEP (with SBAS)<br>2.0 m CEP (without SBAS)   |                       |
| ADR position error            | <2% of distance traveled without GNSS   |                       |
| Acquisition                   | Cold start  | 24 s                  |
|                               | Aided start   | 3 s                   |
|                               | Reacquisition   | 2 s                   |
| Sensitivity                   | Tracking & nav.   | -159 dBm <sup>2</sup> |
|                               | Reacquisition   | -158 dBm              |
|                               | Cold start  | -147 dBm              |
|                               | Hot start   | -159 dBm              |

1 The highest navigation rate can limit the number of supported constellations.  
2 Limited by firmware for best DR performance.

## Tracking features

|                 |   |
|-----------------|---|
| Geofencing      | Up to 4 circular areas; GPIO for waking up the host CPU |
| Sensor raw data | IMU sensor data at 100 Hz                               |

## Security features

|                  |   |
|------------------|---|
| Signal integrity | RF interference and jamming detection and reporting<br>Active GNSS in-band filtering<br>Spoofing detection and reporting (consistency checks based on GNSS and sensors) |
| Device integrity | Secure boot or firmware downloaded from host or flash<br>Receiver configuration lock by command   |
| Secure interface | Signed UBX messages (SHA-256)<br>JTAG debug interface disabled by default   |

## Interfaces

|                 |   |
|-----------------|---|
| Serial          | 1 UART<br>1 USB<br>1 SPI (optional)<br>1 I2C  |
| Digital I/O     | 1 configurable timepulse,<br>2 EXTINT interrupt inputs<br>3 PIO for antenna supervision |
| Timepulse       | Configurable: 0.25 Hz to 10 MHz   |
| Protocols       | NMEA 4.11, UBX binary   |
| Raw data output | Code phase and carrier phase raw data   |

## 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](#).

## Package

40 pin QFN: 5.00 x 5.00 x 0.59 mm

## Environmental data, quality & reliability

|                       |   |
|-----------------------|---|
| Operating temp.       | -40°C to +105°C   |
| Storage temp.         | -40°C to +105°C   |
| Environmental grade   | RoHS compliant (lead free)<br>2015/863/EU   |
| EMC                   | 2014/53/EU RED  |
| Environmental testing | AEC-Q100  |
| Quality management    | Manufactured and fully tested in ISO/TS 16949 certified production sites<br>AEC-Q004 Zero ppm strategy (UBX-M9140-KA) |

## Electrical data

|                   |  |
|-------------------|--|
| Supply voltage    | 1.8 V to 3.6 V   |
| Power consumption | 32 mA at 3.0 V (4 GNSS continuous)<br>29 mA at 3.0 V (2 GNSS continuous)<br>23 mA at 3.0 V (1 GNSS continuous) |
| Backup supply     | 1.65 V to 3.6 V  |

## External components

|   |  |
|---|--|
| Oscillator                                      | TCXO   |
| RTC input                                       | 32.768 kHz (optional)                        |
| Antenna supply and supervisor circuit detection | External circuit required for short and open |
| Flash memory                                    | SPI minimum 16 MBit                          |
| DC/DC converter                                 | Built-in external component required         |

## Services

Assisted GNSS AssistNow Online

## Support products

EVK-M9DR u-blox M9 evaluation kit with I/O interface, supports ADR and UDR operation modes

## Product variants

UBX-M9140-KA-DR u-blox M9 GNSS IC  
3D dead reckoning, up to +105°C operating temperature, automotive grade

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