

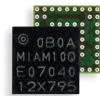


# MIA-M10Q

**Standard precision GNSS module**

**Professional grade**

Data sheet



## **Abstract**

This data sheet describes the MIA-M10Q module, an ultra-small form factor and ultra-low-power GNSS receiver for high-performance wearable and asset-tracking applications.

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# 1 Functional description

## 1.1 Overview

MIA-M10Q has an extremely small footprint to enable miniature product designs. Exceptional sensitivity and acquisition time for all L1 GNSS signals are attributed to its integrated M10 standard precision low power platform.

The M10 platform supports concurrent reception of four GNSS (GPS, GLONASS, Galileo, and BeiDou). The high number of visible satellites enables the receiver to select the best signals. This maximizes the position availability, in particular under challenging conditions such as in deep urban canyons.

u-blox Super-S (Super-Signal) technology offers great RF sensitivity and can improve the dynamic position accuracy with small antennas or in non-line-of-sight scenarios.

The extremely low power consumption of 25 mW in continuous tracking mode allows great power autonomy for all battery-operated devices, such as asset trackers, without compromising on GNSS performance.

For maximum sensitivity in passive antenna designs, MIA-M10Q integrates an LNA followed by a SAW filter in the RF path.

The small footprint and highly integrated System-in-Package (SiP) makes MIA-M10Q suitable for compact designs in wearable and tracking applications.

## 1.2 Performance

Parameter	Specification	Value
Receiver type		u-blox M10 receiver
Accuracy of time pulse signal	RMS	30 ns
	99%	60 ns
Frequency of time pulse signal		Default 1PPS (0.25 Hz to 10 MHz configurable)
Operational limits <sup>1</sup>	Dynamics	≤ 4 g
	Altitude	80,000 m
	Velocity	500 m/s
Velocity accuracy <sup>2</sup>		0.05 m/s
Dynamic heading accuracy <sup>2</sup>		0.3 deg

**Table 1: MIA-M10Q specifications**

Parameter		GPS+GAL	GPS+GAL +GLO	GPS+GAL +BDS B1I (default)	GPS+GAL +BDS B1C	GPS+GAL +BDS B1C +GLO
		Max navigation update rate <sup>3</sup>	Default	10 Hz	6 Hz	3 Hz
	High performance <sup>4</sup>	20 Hz	16 Hz	12 Hz	16 Hz	10 Hz

<sup>1</sup> Assuming Airborne 4 g platform.

<sup>2</sup> 50% at 30 m/s for dynamic operation.

<sup>3</sup> Minimum 98% fix rate under typical conditions.

<sup>4</sup> Configuration required.

Parameter		GPS+GAL	GPS+GAL +GLO	GPS+GAL +BDS B1I (default)	GPS+GAL +BDS B1C	GPS+GAL +BDS B1C +GLO
Position accuracy (CEP) <sup>5, 6</sup>		1.5 m	1.5 m	1.5 m	1.5 m	1.5 m
Time To First Fix (TTFF) <sup>5, 7, 8</sup>	Cold start	28 s	23 s	27 s	28 s	23 s
	Hot start	1 s	1 s	1 s	1 s	1 s
	AssistNow Online <sup>9</sup>	1 s	1 s	1 s	1 s	1 s
	AssistNow Offline <sup>10</sup>	2 s	2 s	3 s	2 s	2 s
	AssistNow Autonomous <sup>11</sup>	3 s	4 s	4 s	4 s	4 s
Sensitivity <sup>12</sup>	Tracking and nav.	-167 dBm	-167 dBm	-167 dBm	-167 dBm	-167 dBm
	Reacquisition	-160 dBm	-160 dBm	-160 dBm	-160 dBm	-160 dBm
	Cold Start	-148 dBm	-148 dBm	-148 dBm	-148 dBm	-148 dBm
	Hot start <sup>7</sup>	-159 dBm	-159 dBm	-159 dBm	-159 dBm	-159 dBm

**Table 2: MIA-M10Q typical performance in multi-constellation GNSS modes.**

Parameter		GPS	GLONASS	BDS B1I	GALILEO	BDS B1C
Max navigation update rate <sup>3</sup>	Default	18 Hz	18 Hz	18 Hz	18 Hz	18 Hz
	High performance <sup>4</sup>	25 Hz	25 Hz	25 Hz	25 Hz	25 Hz
Position accuracy (CEP) <sup>5, 6</sup>		1.5 m	4 m	2 m	3 m	2 m
Time To First Fix (TTFF) <sup>5, 7, 8</sup>	Cold start	29 s	27 s	30 s	41 s	56 s
	Hot start	1 s	1 s	1 s	1 s	1 s
	AssistNow Online <sup>9</sup>	1 s	1 s	1 s	5 s	N/A
Sensitivity <sup>12</sup>	Tracking and nav.	-167 dBm	-166 dBm	-160 dBm	-161 dBm	-163 dBm
	Reacquisition	-160 dBm	-158 dBm	-158 dBm	-154 dBm	-156 dBm
	Cold Start	-148 dBm	-147 dBm	-146 dBm	-141 dBm	-136 dBm
	Hot start <sup>7</sup>	-159 dBm	-159 dBm	-159 dBm	-155 dBm	-157 dBm

**Table 3: MIA-M10Q typical performance in single-GNSS modes**

### 1.3 Supported GNSS constellations

MIA-M10Q is a concurrent GNSS receiver that can receive and track multiple GNSS systems. The single RF front-end architecture enables concurrent reception of multiple GNSS constellations. The receiver can be configured for a subset of GNSS constellations to achieve lower power consumption.

The default configuration on MIA-M10Q is concurrent reception of GPS, Galileo, and BeiDou B1I with QZSS and SBAS enabled.

The following GNSS and their signals are supported:

<sup>5</sup> GPS is always in combination with SBAS and QZSS.

<sup>6</sup> CEP, 50%, 24 hours static, -130 dBm, > 6 SVs for each GNSS system.

<sup>7</sup> Commanded starts.

<sup>8</sup> All satellites at -130 dBm. Measured at room temperature.

<sup>9</sup> Dependent on the speed and latency of the aiding data connection, commanded starts.

<sup>10</sup> Using seven days old AssistNow Offline data. External memory may be required.

<sup>11</sup> Using two days old orbital predicted data. External memory may be required.

<sup>12</sup> Demonstrated with a good external LNA. Measured at room temperature.

System	Signals
GPS / QZSS	L1C/A (1575.42 MHz)
Galileo	E1-B/C (1575.42 MHz)
GLONASS	L1OF (1602 MHz + $k \cdot 562.5$ kHz, $k = -7, \dots, 5, 6$ )
BeiDou <sup>13</sup>	B1I (1561.098 MHz), B1C (1575.42 MHz)

**Table 4: Supported GNSS and signals on MIA-M10Q**

The following GNSS assistance services are supported:

Service	Support
AssistNow™ Online	GPS L1C/A, QZSS L1C/A, Galileo E1, GLONASS L1OF, BeiDou B1I
AssistNow™ Offline	GPS L1C/A, GLONASS L1OF
AssistNow™ Autonomous	GPS L1C/A, QZSS L1C/A, Galileo E1, GLONASS L1OF, BeiDou B1I

**Table 5: Supported Assisted GNSS (A-GNSS) services**

The following augmentation systems are supported:

System	Support
SBAS	EGNOS, GAGAN, MSAS and WAAS
QZSS	L1S (SLAS)

**Table 6: Supported augmentation systems**

The augmentation systems SBAS and QZSS can be enabled only if GPS operation is also enabled.

## 1.4 Supported protocols

MIA-M10Q supports the following interface protocols:

Protocol	Type
UBX	Input/output, binary, u-blox proprietary
NMEA versions 2.1, 2.3, 4.0, 4.10 and 4.11 (default).	Input/output, ASCII

**Table 7: Supported protocols**

## 1.5 Firmware features

Feature	Description
Antenna supervisor <sup>14</sup>	Antenna supervisor for active antenna control and short detection
CloudLocate GNSS	Extends the life of energy-constrained IoT applications. Small payload messages supported.
Assisted GNSS	AssistNow Online, AssistNow Offline and AssistNow Autonomous
Backup modes	Hardware backup mode and software standby mode, both with optional RTC
Power save modes <sup>15</sup>	On/off, cyclic tracking
Super-S	Improved dynamic position accuracy with small antennas

<sup>13</sup> BeiDou B1I cannot be enabled simultaneously with BeiDou B1C or GLONASS L1OF.

<sup>14</sup> External components required, some pins need to be reconfigured.

<sup>15</sup> The power save modes are not available if BeiDou B1C is enabled.

Feature	Description
Protection level	Real-time position accuracy estimate with 95% confidence level <sup>16</sup>
Galileo return link messages	Galileo search and rescue (SAR) return link messages (RLM) via Galileo satellite signal
Data batching	Autonomous tracking up to 10 minutes at 1 Hz
Odometer	Measure traveled distance with support for different user profiles

**Table 8: Firmware features**

Feature	Description
Anti-jamming	RF interference and jamming detection and reporting
Anti-spoofing	Spoofing detection and reporting
Configuration lockdown	Receiver configuration can be locked by command
Message integrity	All messages can be cryptographically signed
Secure boot	Only signed firmware images executed

**Table 9: Security features**

<sup>16</sup> Verified for automotive environment only.

## 2 System description

### 2.1 Block diagram

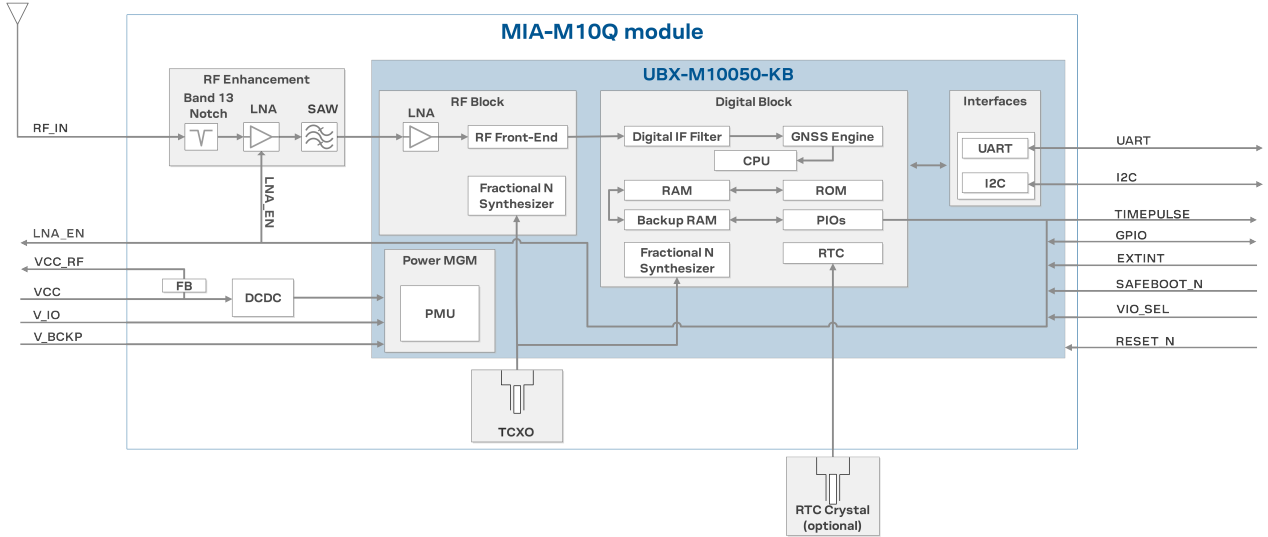


Figure 1: MIA-M10Q block diagram



## 3 Pin definition

### 3.1 Pin assignment

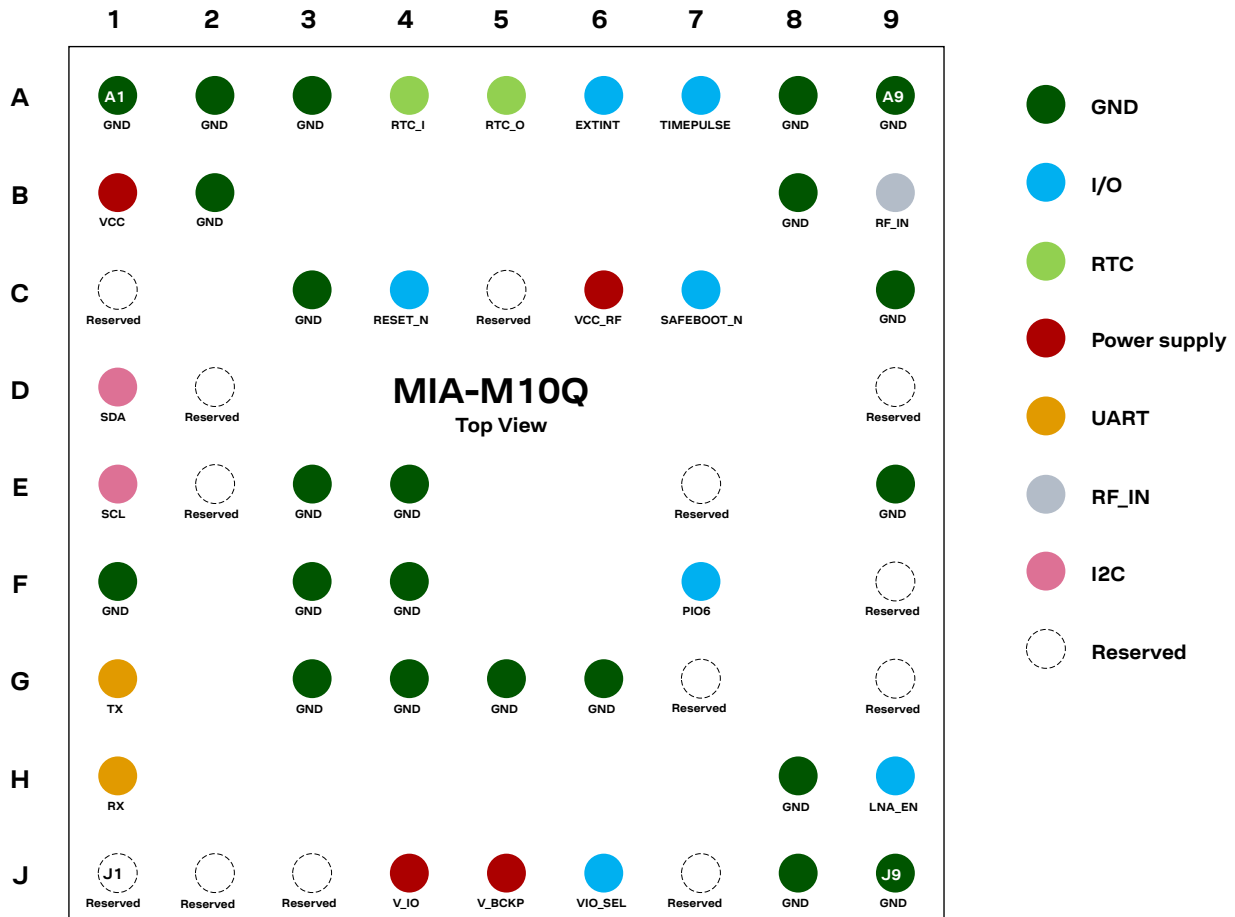


Figure 2: MIA-M10Q pin assignment

Pin no.	Name	PIO no.	I/O	Description
A1	GND	-	-	Connect to GND
A2	GND	-	-	Connect to GND
A3	GND	-	-	Connect to GND
A4	RTC_I	-	I	RTC input (leave open if not used)
A5	RTC_O	-	O	RTC output (connect to GND if not used)
A6	EXTINT	5	I	External interrupt
A7	TIMEPULSE	4	O	Time pulse signal (shared with SAFEBOOT_N pin) <sup>17</sup>
A8	GND	-	-	Connect to GND
A9	GND	-	-	Connect to GND
B1	VCC	-	I	Main power supply input
B2	GND	-	-	Connect to GND
B8	GND	-	-	Connect to GND

Pin no.	Name	PIO no.	I/O	Description
B9	RF_IN	-	I	RF signal input
C1	Reserved	-	-	Leave open
C3	GND	-	-	Connect to GND
C4	RESET_N	-	I	System reset (active low). Has to be low for at least 1 ms to trigger a reset.
C5	Reserved	-	-	Leave open
C6	VCC_RF	-	O	Filtered power supply for RF active components like external active antenna or LNA, both optional
C7	SAFEBOOT_N	-	I	Safeboot mode (leave open) <sup>17</sup>
C9	GND	-	-	Connect to GND
D1	SDA	2	I/O	I2C data. If not used, leave open.
D2	Reserved	-	-	Connect to E2
D9	Reserved	-	-	Leave open
E1	SCL	3	I	I2C clock. If not used, leave open.
E2	Reserved	-	-	Connect to D2
E3	GND	-	-	Connect to GND
E4	GND	-	-	Connect to GND
E7	Reserved	-	-	Leave open
E9	GND	-	-	Connect to GND
F1	GND	-	-	Connect to GND
F3	GND	-	-	Connect to GND
F4	GND	-	-	Connect to GND
F7	PIO6	6	I/O	Digital I/O
F9	Reserved	-	-	Connect to GND <sup>18</sup>
G1	TX	1	O	UART TX. If not used, leave open.
G3	GND	-	-	Connect to GND
G4	GND	-	-	Connect to GND
G5	GND	-	-	Connect to GND
G6	GND	-	-	Connect to GND
G7	Reserved	-	-	Connect to GND <sup>19</sup>
G9	Reserved	-	-	Leave open
H1	RX	0	I	UART RX. If not used, leave open.
H8	GND	-	-	Connect to GND
H9	LNA_EN	-	O	On/Off external LNA or active antenna
J1	Reserved	-	-	Leave open
J2	Reserved	-	-	Leave open
J3	Reserved	-	-	Leave open
J4	V_IO	-	I	IO voltage supply
J5	V_BCKP	-	I	Backup voltage supply. Leave open if no external backup supply.

<sup>17</sup> The receiver enters safeboot mode if this pin is low at start up. The SAFEBOOT\_N pin is internally connected to TIMEPULSE pin through a 1 k $\Omega$  series resistor.

<sup>18</sup> For future compatibility with the MIA dual-band version, connect this pin to ground by placing a 0  $\Omega$  resistor to GND.

<sup>19</sup> For compatibility with the MIA crystal-based version, connect this pin to ground by placing a 0  $\Omega$  resistor to GND.

Pin no.	Name	PIO no.	I/O	Description
J6	VIO_SEL	-	I	Voltage selector for V <sub>IO</sub> supply. Connect to GND for 1.8 V supply, or leave open for 3.3 V supply.
J7	Reserved	-	-	Leave open
J8	GND	-	-	Connect to GND
J9	GND	-	-	Connect to GND



**Table 10: MIA-M10Q pin assignment**

## 3.2 Pin state


**Table 11** defines the state of the PIOs and RESET\_N pins in different modes. The functions of the PIOs are as defined in the default configuration.


PIO no.	Pin no.	Default function	Continuous mode	Software standby mode	Safe boot mode
0	H1	RXD	Input pull-up	Input pull-up	Input pull-up
1	G1	TXD	Output	Input pull-up	Output
2	D1	SDA	Input pull-up	Input pull-up	Input pull-up
3	E1	SCL	Input pull-up	Input pull-up	Input pull-up
4	C7	SAFEBOOT_N	Output	Input pull-down	High Z
	A7	TIMEPULSE	Output	Input pull-down	High Z
5	A6	EXTINT	Input pull-up	Input pull-up	Input pull-up
6	F7	Digital input	Input pull-up	Input pull-up	Input pull-up
7	H9	LNA_EN	Output high	Input pull-down	High Z

**Table 11: Pins state**

-  In reset mode (RESET\_N = low), all PIOs are configured as input pull-up.
-  In hardware backup mode (VCC = 0 V and V<sub>IO</sub> = 0 V), PIOs must not be driven.

## 4 Electrical specifications


 **CAUTION** Operating the device above one or more of the limiting values may cause permanent damage to the device. The values provided in this chapter are stress ratings. Extended exposure to the values outside the limits may effect the device reliability.


 Where application information is given, it is advisory only and does not form part of the specification.

### 4.1 Absolute maximum ratings

Symbol	Parameter	Min	Max	Unit
VCC	Main supply voltage	-0.3	3.6	V
V <sub>IO</sub>	IO supply voltage	-0.3	VCC + 0.3 (max 3.6)	V
	Voltage ramp on V <sub>IO</sub> <sup>20</sup>	25	35000	µs/V
V <sub>BCKP</sub>	Backup supply voltage	-0.3	3.6	V
RTC_I	Voltage on RTC_I	-0.3	1.155	V
V <sub>PIO</sub>	Input voltage on RESET_N and digital pins. VIO_SEL = GND.	-0.3	V <sub>IO</sub> + 0.3 (max 1.98)	V
	Input voltage on RESET_N and digital pins. VIO_SEL = open.	-0.3	V <sub>IO</sub> + 0.3 (max 3.6)	V
I <sub>PIO</sub>	Max source / sink current, digital pins <sup>21</sup>	-10	10	mA
ICC <sub>RF</sub>	Max source current, VCC <sub>RF</sub>		200	mA
P <sub>rfin</sub>	RF input power on RF_IN <sup>22</sup>		0	dBm
T <sub>amb</sub>	Ambient temperature	-40	+85	°C
T <sub>s</sub>	Storage temperature	-40	+85	°C


**Table 12: Absolute maximum ratings**


 V<sub>IO</sub> supply voltage must not be higher than VCC + 0.3 V.

 The product is not protected against overvoltage or reversed voltages. Voltage spikes exceeding the power supply voltage specification, given in the table above, must be limited to values within the specified boundaries by using appropriate protection diodes.

### 4.2 Operating conditions

Table 13 shows the general operating conditions. Table 14 shows the electrical parameters for digital I/O.

 The V<sub>IO</sub> voltage range is selected with the VIO\_SEL pin.

 For designs with 1.8 V supply at V<sub>IO</sub> and V<sub>BCKP</sub> supplied, switch off V<sub>IO</sub> supply 100 ms before VCC when transitioning to hardware backup mode. Alternatively, put the receiver to software standby mode by sending UBX-RXM-PMREQ message before switching off V<sub>IO</sub> and VCC. For designs with 3 V supplies, both supplies can be switched off simultaneously or ensure that V<sub>IO</sub> is switched off before VCC.

<sup>20</sup> Exceeding the voltage ramp speed may permanently damage the device.

<sup>21</sup> The SAFEBOOT\_N pin has an internal 1 kΩ series resistor.

<sup>22</sup> Test conditions: source impedance = 50 Ω, continuous wave.

Symbol	Parameter	Min	Typical	Max	Unit
VCC	Main supply voltage	1.76	1.8, 3.3	3.6	V
V <sub>IO</sub>	IO supply voltage, V <sub>IO_SEL</sub> = GND	1.76	1.8	VCC (max 1.98)	V
	IO supply voltage, V <sub>IO_SEL</sub> = open	2.7	3.3	VCC (max 3.6)	V
V <sub>BCKP</sub>	Supply voltage, backup domain	1.65		3.6	V
V <sub>IO<sub>SWITCH</sub></sub>	V <sub>IO</sub> voltage threshold to switch an internal supply for the backup domain from V <sub>IO</sub> to V <sub>BCKP</sub>		1.45		V
VCC <sub>RF</sub>	VCC <sub>RF</sub> output voltage		VCC - 0.1		V
ICC <sub>RF</sub>	VCC <sub>RF</sub> output current			50	mA
NF <sub>tot</sub>	Receiver chain noise figure		1.5		dB
Ext <sub>gain</sub> <sup>23</sup>	External gain at RF <sub>IN</sub> , low gain mode (default)			30	dB
	External gain at RF <sub>IN</sub> , bypass mode	10	25	40	dB
T <sub>opr</sub>	Operating temperature	-40		+85	°C

**Table 13: General operating conditions**

Symbol	Parameter	Min	Typical	Max	Unit
I <sub>leak</sub>	Leakage current input pins <sup>24</sup>		25		nA
V <sub>in</sub>	Input pin voltage range	0		V <sub>IO</sub>	V
V <sub>il</sub>	Low-level input voltage			0.63	V
V <sub>ih</sub>	High-level input voltage	0.68 x V <sub>IO</sub>			V
V <sub>ol</sub>	Low-level output voltage, I <sub>out</sub> = -2 mA <sup>25</sup>			0.4	V
V <sub>oh</sub>	High-level output voltage, I <sub>out</sub> = 2 mA <sup>25</sup>	V <sub>IO</sub> - 0.4			V
R <sub>pu, IO</sub>	Pull-up resistance, Digital IO <sup>26</sup> . V <sub>IO_SEL</sub> = GND	6	17	72	kΩ
R <sub>pu, IO</sub>	Pull-up resistance, Digital IO <sup>26</sup> . V <sub>IO_SEL</sub> = open	8	18	40	kΩ
R <sub>pd, IO</sub>	Pull-down resistance, Digital IO	21	80	180	kΩ
R <sub>pu, SAFEBOOT_N</sub>	Pull-up resistance, SAFEBOOT_N <sup>27</sup>	6	17	72	kΩ
R <sub>pu, RESET_N</sub>	Pull-up resistance, RESET_N	7	10	13	kΩ

**Table 14: Digital IO**


Operation beyond the specified operating conditions can affect device reliability.

## 4.3 Oscillator parameters

Table 15 shows the electrical parameters for the RTC (optional).

Parameter	Min	Typical	Max	Unit
RTC oscillator frequency		32768		Hz
RTC startup time		250	700	ms
RTC crystal ESR			100	kΩ
RTC input capacitance at RTC_I, RTC_O (per pin to GND)	7	10	14	pF

<sup>23</sup> The internal LNA gain is configurable.

<sup>24</sup> V<sub>in</sub> = V<sub>IO</sub>, at room temperature.

<sup>25</sup> TIMEPULSE (PIO4) has 4 mA current drive/sink capability.

<sup>26</sup> TXD, RXD, TIMEPULSE, EXTINT, SCL, SDA, and LNA\_EN.

<sup>27</sup> The SAFEBOOT\_N pin has an additional 1 kΩ series resistor.

Parameter	Min	Typical	Max	Unit
RTC_I input voltage, external clock				
$V_{il\_RTC}$	0		0.22	V
$V_{ih\_RTC}$	0.71		1.1	V

**Table 15: RTC parameters**

## 4.4 Indicative power requirements

Table 16 shows indicative current consumption for VCC and V\_IO with a 3.0 V supply.

Symbol (Parameter)	Conditions	GPS	GPS+GAL	GPS+GAL +GLO	GPS+GAL +BDS B1I (default)	GPS+GAL +BDS B1C	GPS+GAL +BDS B1C +GLO	Unit
$I_{VCC}$ <sup>28, 29</sup> (Current at VCC)	Acquisition <sup>30</sup>	8.5	11.5	13	12.5	12.5	14.5	mA
	Tracking (Continuous mode)	8	8.5	10	10.5	9.5	10.5	mA
	Tracking (Power save mode) <sup>31</sup>	5	5	5.5	5.5	-	-	mA
$I_{V\_IO}$ <sup>28</sup> (Current at V_IO)	Acquisition and Tracking (Continuous mode)	2.2	2.3	2.4	2.4	2.3	2.4	mA
	Tracking (Power save mode) <sup>31</sup>	2	2.1	2.1	2.1	-	-	mA

**Table 16: Typical currents for 3.0 V supply at VCC and V\_IO**

Table 17 shows indicative current consumption for VCC and V\_IO with a 1.8 V supply.

Symbol (Parameter)	Conditions	GPS	GPS+GAL	GPS+GAL +GLO	GPS+GAL +BDS B1I (default)	GPS+GAL +BDS B1C	GPS+GAL +BDS B1C +GLO	Unit
$I_{VCC}$ <sup>28, 29</sup> (Current at VCC)	Acquisition <sup>30</sup>	12	15	18.5	18.5	18	21.5	mA
	Tracking (Continuous mode)	11	12	14.5	15	13.5	15.5	mA
	Tracking (Power save mode) <sup>31</sup>	6	6.5	7	7	-	-	mA
$I_{V\_IO}$ <sup>28</sup> (Current at V_IO)	Acquisition and Tracking (Continuous mode)	2.1	2.2	2.3	2.3	2.2	2.4	mA
	Tracking (Power save mode) <sup>31</sup>	2	2	2	2	-	-	mA

**Table 17: Typical currents for 1.8 V supply at VCC and V\_IO**


These values are provided for customer information only, as an example of typical current requirements. They are characterized on samples using a cold start command. Actual power requirements can vary depending on firmware version used, external circuitry, number of satellites tracked, signal strength, type and time of start, duration, internal LNA gain mode, and test conditions.

<sup>28</sup> 1 Hz navigation update rate.

<sup>29</sup> Internal LNA set to low gain. Simulated signal using power levels of -130 dBm.

<sup>30</sup> Average current from start-up until the first fix.

<sup>31</sup> Cyclic tracking operation. BeiDou B1C is not supported in this mode.


 The inrush current at startup can go up to 100 mA. Ensure that the external power supply is able to deliver up to 100 mA.

Table 18 shows current consumptions for the backup modes.

Symbol	Parameter	Conditions	Typ.	Unit
$I_{V\_BCKP}$ <sup>32</sup>	Total current in hardware backup mode	$V\_BCKP = 3.3\text{ V}, V\_IO = VCC = 0\text{ V}$	28	$\mu\text{A}$
$I_{V\_IO}$	$V\_IO$ current in software standby mode	$V\_IO = 1.8\text{ V}$	37	$\mu\text{A}$
		$V\_IO = 3.3\text{ V}$	46	$\mu\text{A}$
$I_{VCC}$	VCC current in software standby mode	$VCC = 3.3\text{ V}$	120	nA

**Table 18: Backup currents**

All values in Table 16, Table 17, and Table 18 are measured at 25 °C ambient temperature and with the internal LNA set to low gain. SBAS and QZSS are activated in all measurements.

<sup>32</sup>  $I_{V\_BCKP}$  current in normal operation ( $V\_BCKP = 3.3\text{ V}, V\_IO = VCC = 3.3\text{ V}$ ) is  $\sim 3\text{ }\mu\text{A}$ .

## 5 Communication interfaces

The receiver supports communication over UART and I2C interfaces.

All the inputs have an internal pull-up resistor in normal operation and can be left open if not used. The voltage level at the PIO pins is related to the V<sub>IO</sub> supply voltage.

### 5.1 UART

The UART interface supports configurable baud rates. Hardware flow control is not supported. UART specifications are described in [Table 19](#).

Symbol	Parameter	Min	Max	Unit
R <sub>u</sub>	Baud rate	4800	921600	bit/s
Δ <sub>Tx</sub>	Tx baud rate accuracy	-1%	+1%	-
Δ <sub>Rx</sub>	Rx baud rate tolerance	-2.5%	+2.5%	-

**Table 19: UART specifications**

### 5.2 I2C

An I2C interface is available for communication with an external host CPU in I2C Fast-mode. Backwards compatibility with Standard-mode I2C bus operation is not supported. The interface can be operated only in slave mode with a maximum bit rate of 400 kbit/s<sup>33</sup>.

The interface can make use of clock stretching by holding the SCL line LOW to pause a transaction. In this case, the bit transfer rate is reduced. The maximum clock stretching time is 20 ms.

### 5.3 Default interface settings

Interface	Settings
UART	<ul style="list-style-type: none"> <li>38400 baud<sup>34</sup>, 8 bits, no parity bit, 1 stop bit.</li> <li>Input messages: NMEA and UBX.</li> <li>Output messages: NMEA GGA, GLL, GSA, GSV, RMC, VTG and TXT.</li> </ul>

**Table 20: Default interface settings**

<sup>33</sup> External pull-up resistors may be needed to achieve 400 kbit/s communication speed, as the internal pull-up resistance can be very large.

<sup>34</sup> 9600 baud in safe boot mode.



# 6 Mechanical specifications

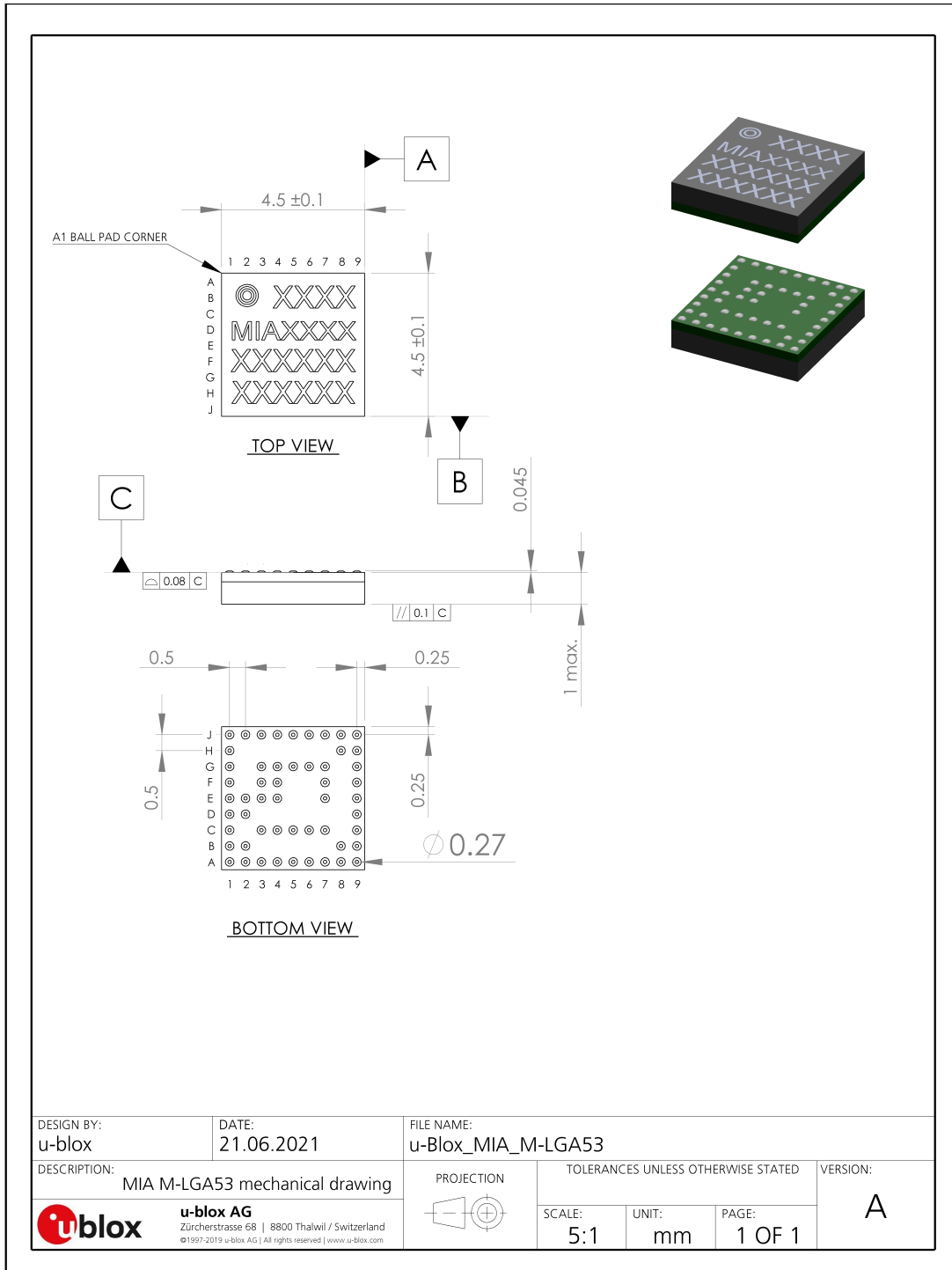


Figure 3: MIA-M10Q mechanical drawing

## 7 Approvals

The MIA-M10Q is designed for the presumption of conformity with the essential requirements and other relevant provisions of Radio Equipment Directive (RED) 2014/53/EU.

The MIA-M10Q complies with the Directive 2011/65/EU (EU RoHS 2) and its amendment Directive (EU) 2015/863 (EU RoHS 3).

The Declaration of Conformity (DoC) is available at [u-blox website](#) within Support > File Category > Conformity and Certification.

## 8 Product handling

### 8.1 Moisture sensitivity level

The moisture sensitivity level (MSL) relates to the packaging and handling precautions required. MIA-M10Q SiPs are rated at MSL level 3 . For MSL standard, see IPC/JEDEC J-STD-020 [5].

## 9 Labeling and ordering information

This section provides information about product labeling and ordering.

### 9.1 Product labeling

The labeling of MIA-M10Q package provides product information and revision information. For more information contact u-blox sales.

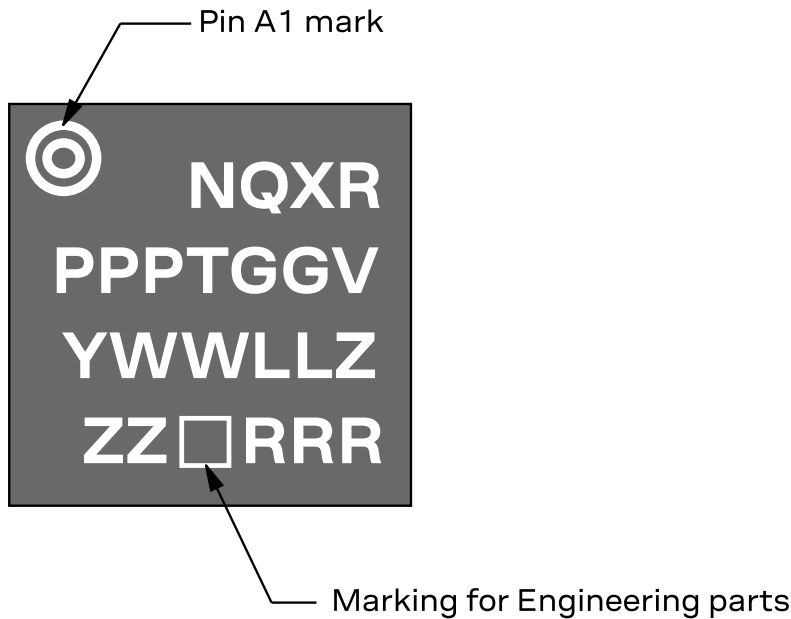


Figure 4: MIA-M10Q label

The parts of the product code are explained in [Table 21](#)

Code	Meaning	Example
PPP	Product family	MIA
TGG	Platform	M10 = u-blox M10
V	Variant	Q = Standard precision, ROM, TCXO, LNA, and SAW filter
N	Option	0 = 00, 1 = 01, ...
Q	Quality grade	A = Automotive, B = Professional
X	Product detail	Describes hardware and firmware versions, 0 = 00, 1 = 01, etc.
R	Other production code	-

Table 21: Part identification code

The eight-digit Date Code and Lot Number includes the production date and lot number information.

Date Code and Lot Number	Meaning
YWWLLZZZ	Y = production year, A = 2017, B = 2018, ..., F = 2022, G = 2023, etc. WW = calendar week LL = lot number ZZZ = other production information
RRR	Other production code

Table 22: Production date and lot number information

## 9.2 Explanation of product codes

Three product code formats are used. The product name is used in documentation such as this data sheet and identifies all u-blox products, independent of packaging and quality grade. The ordering code includes options and quality, while the type number includes the hardware and firmware versions.

Table 23 details these three different formats for MIA-M10Q module.

Format	Structure	Product code
Product name	PPP-TGGV	MIA-M10Q
Ordering code	PPP-TGGV-NNQ	MIA-M10Q-00B
Type number	PPP-TGGV-NNQ-XX	MIA-M10Q-00B-01

**Table 23: Product code formats**

## 9.3 Ordering codes

Ordering code	Product	Remark
MIA-M10Q-00B	u-blox M10 GNSS receiver module, professional grade	

**Table 24: Product ordering codes**



Product changes affecting form, fit or function are documented by u-blox. For a list of Product Change Notifications (PCNs) see our website at: <https://www.u-blox.com/en/product-resources>.

## Related documents

- [1] MIA-M10Q Integration manual, [UBX-21028173](#)
- [2] u-blox M10 SPG 5.10 Release notes, [UBX-22001426](#)
- [3] u-blox M10 SPG 5.10 Interface description, [UBX-21035062](#)
- [4] u-blox Package Information Guide, [UBX-14001652](#)
- [5] MSL standard IPC/JEDEC J-STD-020, [www.jedec.org](http://www.jedec.org)



For regular updates to u-blox documentation and to receive product change notifications please register on our homepage <https://www.u-blox.com>.

## Revision history

Revision	Date	Name	Comments
R01	15-Jun-2022	imar, jesk, msul, oola	Objective specification
R02	31-Aug-2022	oola	Document status replaced by Product status in Document information. Engineering sample. Changed default GNSS configuration to GPS, Galileo and BeiDou B1I with QZSS and SBAS. Updated maximum navigation update rate, AssistNow aided TTFF, and Indicative power requirements.
R03	05-May-2023	oola, mban	Updated maximum navigation update rate in section Performance, ICC_RF in section Absolute maximum ratings, VCC and V_IO supply timing requirements in Operating conditions, and section Indicative power requirements.
R04	26-Jun-2023	msul, mban	Product status changed to initial production Added Pin state section. Updated pin A6 in Pin assignment section.

## Contact

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For further support and contact information, visit us at [www.u-blox.com/support](http://www.u-blox.com/support).