AirPrime XM1110

Product Technical Specification

SIERRA WIRELESS

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Rev 6.0

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Due to the nature of wireless communications, transmission and reception of data can never be guaranteed. Data may be delayed, corrupted (i.e., have errors) or be totally lost. Although significant delays or losses of data are rare when wireless devices such as the Sierra Wireless modem are used in a normal manner with a well-constructed network, the Sierra Wireless modem should not be used in situations where failure to transmit or receive data could result in damage of any kind to the user or any other party, including but not limited to personal injury, death, or loss of property. Sierra Wireless accepts no responsibility for damages of any kind resulting from delays or errors in data transmitted or received using the Sierra Wireless modem, or for failure of the Sierra Wireless modem to transmit or receive such data.

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Revision History

Revision number	Release date	Changes
1	June 23, 2017	Initial revision in SWI template.
2	January 18, 2018	Changes throughout.
3.0	April 30, 2018	Updated: • Pin Assignment on page 15 • Figure 5-3 on page 32
3.1	May 07, 2018	Fixed typo in Drying on page 33
4.0	October 04, 2018	Updated: • Specifications on page 14 • Table 3-5 on page 22

Revision number	Release date	Changes
5.0	February 12, 2019	Updated Figure 2-2 on page 14
		Deleted: • section 5 Packing and Handling • section 6 Reflow Soldering Temperature Profile
6.0	November 05, 2019	Fixed typo in Figure 2-3 on page 15

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1: Function Description

Overview

The XM1110 is a multi-GNSS receiver that is capable of tracking GPS and Glonass[1] systems simultaneously. The module provides an external antenna interface that supports both active and passive GNSS antennas.

The XM1110 is one of the smallest multi-GNSS modules on the market with an ultra-compact size of 9.0 x 9.5 x 2.2 mm in a QFN Package. It supports multiple interfaces such as I2C, SPI that can be used instead of UART.

The module is integrated with SMPS (switched-mode power supply) which allows for the lowest possible power consumption while offering optimum GNSS sensitivity and performance.

The XM1110 is based on latest MT3333 chipset and supports all standard GNSS features including QZSS, SBAS, Anti-Jamming, EASY™, PPS sync NMEA, LOCUS™, GLP™ and AGPS.

Target Applications

- Handheld Devices
- M2M applications
- Asset management
- Surveillance systems
- Wearable products

Figure 1-1: XM1110

1. XM1110 is capable of supporting other system combinations such as: GPS+Beidou, GPS+Galileo and GPS+Glonass+Galileo. To change the default system please refer to “AirPrime XM-XA Series Software User Guide”.

Product Highlights and Features

- 33 tracking/ 99 acquisition-channel GPS +GLONASS receiver
- Supports QZSS & SBAS (WAAS, EGNOS, MSAS, GAGAN)[1]
- Sensitivity: -165dBm
- Update Rate: up to 10Hz[2]
- 12 multi-tone active interference canceller
- High accuracy 1-PPS timing (±20ns RMS) and the pulse width is 100ms
- AGPS Support for Fast TTFF (EPO in flash™; choose from 6 hours, 3, 7, 14, or 30 days)
- EASY™: Self-Generated Orbit Prediction for instant positioning fix
- AlwaysLocate™ Intelligent Algorithm (Advance Power Periodic Mode) for power saving
- PPS sync NMEA
- LOCUS (Embedded Logger Function)
- Consumption current(@3.3V):
- For GPS+GLONASS
  - Acquisition: 23mA/ 26mA /29mA (min / typical / max)
  - Full Power Tracking: 23mA / 28mA /32mA (min / typical / max)
  - GLP (GNSS low-power) Tracking: 7mA / 15mA / 31mA (min / typical / max)
- RoHS

1. GAGAN will be supported upon its starting date of service.
2. SBAS can only be enabled when update rate is less than or equal to 5Hz.

System Block Diagram

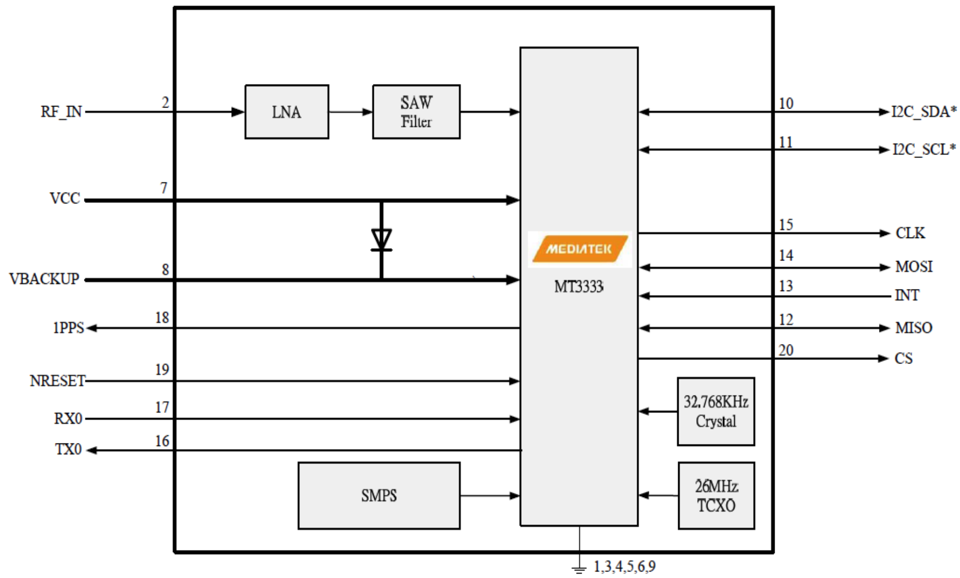

Figure 1-2: System Block Diagram[1]

Multi-tone Active Interference Canceller

Many GNSS systems today also integrate various other RF systems such as Wi-Fi, Cellular and Bluetooth. These other radios can often generate RF harmonics which can influence GPS reception and performance.

The embedded Multi-tone Active Interference Canceller (MTAIC) also known as Anti-Jamming can reject such unwanted RF harmonics from the nearby on-board active components. Anti-Jamming can improve the capacity of GPS reception, eliminating the need for additional hardware engineering to compensate for these interferences. This built-in feature can cancel up to 12 independent channels of continuous interference waves.

1PPS

The XM1110 generates a-pulse-per-second signal (1 PPS). It is an electrical signal which precisely indicates the start of a second within an accuracy of ±20ns RMS (Root Mean Square). The PPS signal is provided through a designated output pin for external applications.

1. I2C disabled in XM1110 by default, keep pin floating.

AGPS for faster TTFF (EPO in flash™)

The AGPS (EPO in flash™) provides predicated EPO (Extended Prediction Orbit) data to speed up TTFF (Time To First Fix). This feature is useful when a satellite signal is weak. AGPS can be downloaded from an FTP server via the Internet or through a wireless network. The GPS engine in the module will use EPO data to assist with position calculation when navigation information from satellites is insufficient. For more details on EPO, please refer to our AGPS application note.

EASY™

EASY™ (Embedded Assist System) is for quick positioning/TTFF when information received from the satellites is insufficient (e.g. in weak signal). When EASY™ is enabled, the GPS engine will automatically calculate and then predict single ephemeris up to three days. The predicted information will be saved into the memory and the GPS engine will then use the saved information for later positioning. Backup power (VBACKUP) is required for EASY™.

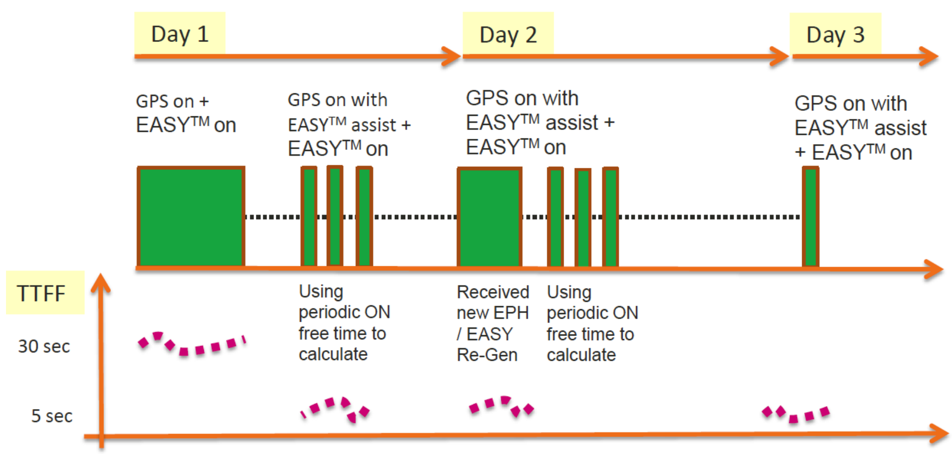

Figure 1-3: Operation of EASY™

Figure 1-3 shows that when the module obtains information from GPS satellites, the GPS engine will start to pre-calculate and predict orbits automatically for the next three days.

AlwaysLocate™

In *AlwaysLocate*™ mode, the on/off time can be adjusted adaptively to achieve a balance between positioning accuracy and power consumption depending on various environmental conditions.

Figure 1-4 gives some insight on power savings in different cases when AlwaysLocate™ mode is enabled.

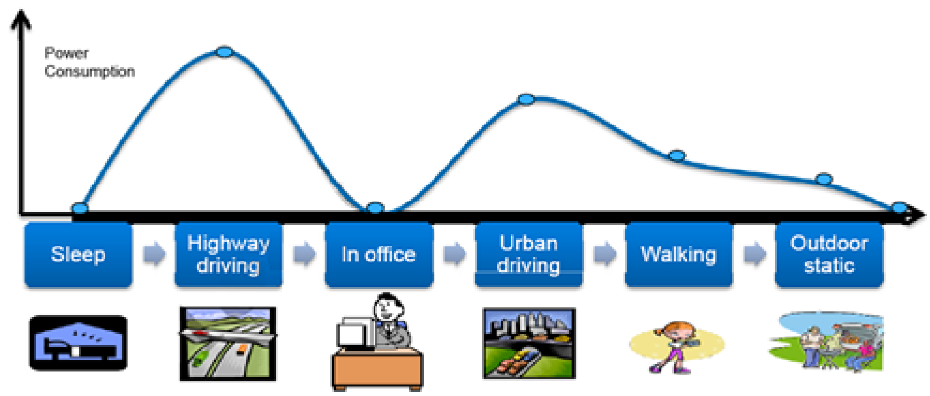

Figure 1-4: AlwaysLocate

LOCUS

LOCUS (Embedded Logger) function enables the GNSS module to become a logger-capable device. It does not need any host or external flash data format such as UTC, latitude, longitude, valid or checksum for GPS data logging. The maximum log duration is up to two days under AlwaysLocate™.

PPS sync NMEA

Pulse-Per-Second (PPS) VS. NMEA can be used in the time service. The latency range of the beginning of UART Tx is between 465ms to 485 ms at the MT3333 platform and behind the rising edge of PPS.

The PPS sync NMEA only supports 1Hz NMEA output and baud rate of 115200 to 14400 bps. For baud rates of 9600 bps and 4800 bps, only the RMC NMEA sentence is supported. If NMEA sentence outputs are supported even at the low baud rate, per-second transmission may exceed the threshold of one second.

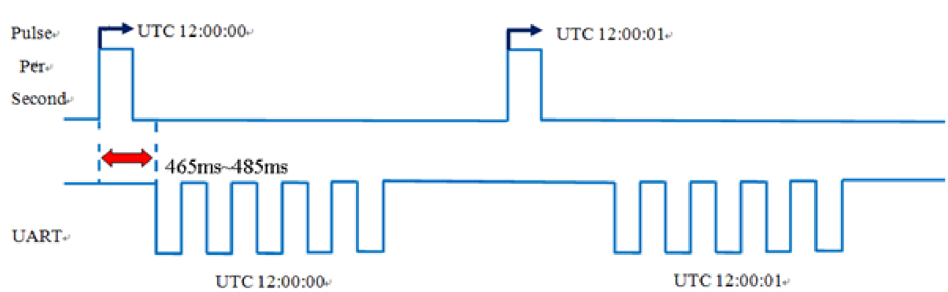

Figure 1-5: PPS sync NMEA

2: Specifications

Mechanical Dimensions

Dimension: (Unit: mm, Maximum height: 2.3mm)

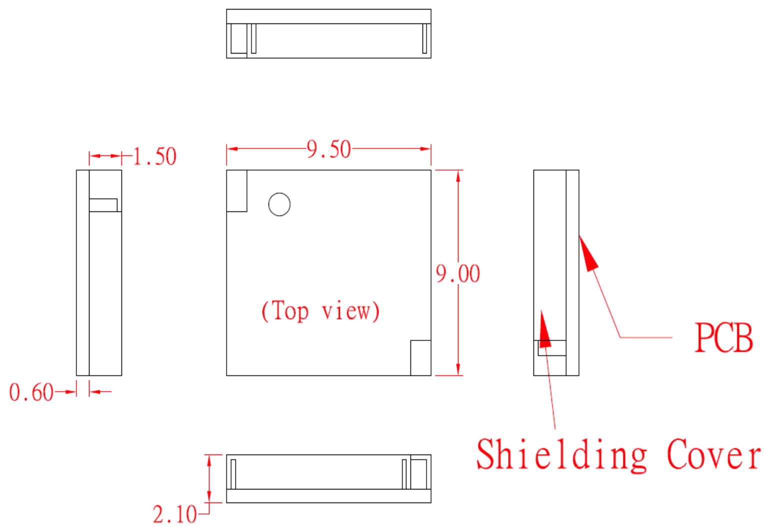

Figure 2-1: Mechanical Dimensions

PCB Copper Pad Definition

(Unit: mm, Tolerance: ±0.1mm)

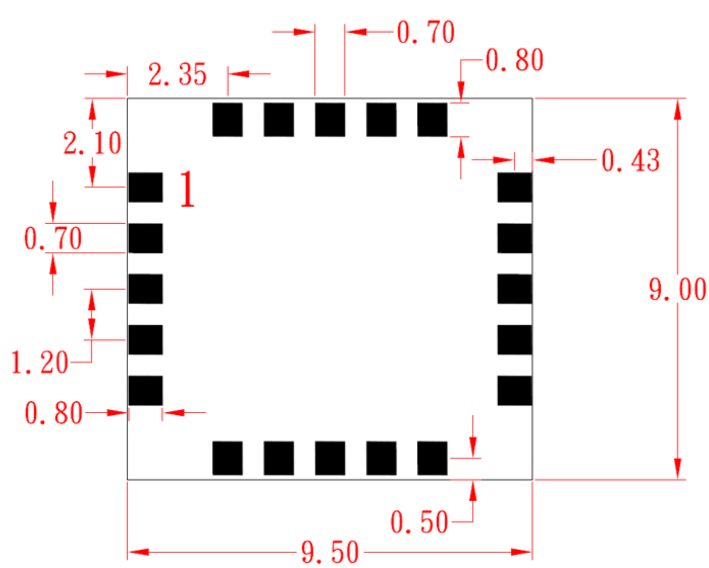

Figure 2-2: PCB Copper Pad

Pin Configuration

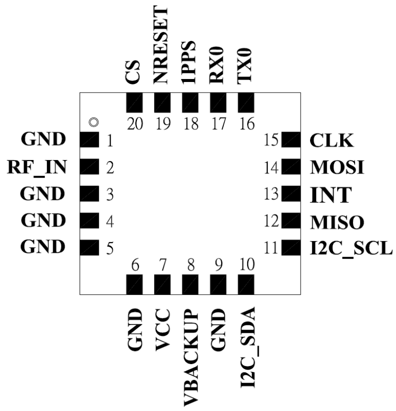

Figure 2-3: Pin Configuration

Pin Assignment

Table 2-1: Pin Assignment

Pin	Name	I/O	Description and Note	Active Low / High	IO Voltage Domain	Reset State[a]	Recommendation for Unused Pad
1	GND	P	Ground		0V		Mandatory connection
2	RF_IN	I	GPS RF signal input				Mandatory connection
3	GND	P	Ground		0V		Mandatory connection
4	GND	P	Ground		0V		Mandatory connection
5	GND	P	Ground		0V		Mandatory connection
6	GND	P	Ground		0V		Mandatory connection
7	VCC	PI	Main DC power input		3.3V		Mandatory connection
8	VBACKUP	PI	Backup power input for RTC and navigation data keep		3.0V		Connection to C=1µF
9	GND	P	Ground		0V		Mandatory connection
10	I2C_SDA	I/O	I2C Serial data (in slave mode)		2.8V	O, PU	Left open
11	I2C_SCL	I	I2C Serial clock (in slave mode)		2.8V	I, PU	Left open
12	MISO	O	SPI serial data output (in slave mode)		2.8V	O, PU	Left open
13	INT	O	Interrupt pin for SPI or I2C		2.8V	O, PU	Left open
14	MOSI	I	SPI serial data input (in slave mode)		2.8V	I, PU	Left open

Table 2-1: Pin Assignment (Continued)

Pin	Name	I/O	Description and Note	Active Low / High	IO Voltage Domain	Reset State[a]	Recommendation for Unused Pad
15	CLK	I	SPI serial clock		0V	I, PD	Left open
16	TX0	O	Serial Data Output for NMEA output (TTL)		2.8V	O, PU	Mandatory connection
17	RX0	I	Serial Data Input for Firmware update (TTL)		2.8V	I, PU	Mandatory connection
18	1PPS	O	1PPS Time Mark Output		2.8V	O, PU	Left open
19	NRESET	I	Reset Input	L	2.8V	I, PU	Left open
20	CS	I	SPI serial chip select	L	2.8V	I, PU	Left open

a. I = Input, O = Output, PU = Pull up, PD = Pull Down, H = High, T = High Impedance

Description of I/O Pins

- **Pin1**: GND (Ground)
- **Pin2**: RF_IN
  - The GPS RF signal input which can be connected to a passive antenna or an active antenna.
- **Pin3**: GND (Ground)
- **Pin4**: GND (Ground)
- **Pin5**: GND (Ground)
- **Pin6**: GND (Ground)
- **Pin7**: VCC
  - Main DC power supply (3.0V to 4.3V; typical: 3.3V). The ripple must be controlled under 50mVpp.
- **Pin8**: VBACKUP
  - This connects to the backup power of the GNSS module. A power source (such as a battery) connected to this pin will help the GNSS chipset in keeping its internal RTC running when the main power source is turned off. The voltage ranges from 2.0V to 4.3V (typical: 3.0V).
  - This pin is also available when VCC is connected to a power supply.
  - VBACKUP functions with a shottky diode and limited-current resistor.
  - If VBACKUP power is not reserved, the GNSS module will perform a lengthy cold start each time it is powered on, as previous satellite information is not retained and needs to be re-transmitted.
  - If not used, keep this pin floating.
- **Pin9**: GND (Ground)
- **Pin10**: I^2C_SDA (I^2C; outputs GPS information/RTCM_TX)

- **Pin11**: I^2C_SCL (RTCM_RX)
  - This pin can be modified through firmware customization.
  - The *default* of this pin is defined to I^2C_SCL. It will receive the clock for I^2C application.
  - If the pin is customized to RTCM, it will receive DGPS data of RTCM protocol (TTL level).
  - If not used, keep this pin floating.
- **Pin12**: MISO (SPI; outputs GPS information)
- **Pin13**: INT
  - This is the interrupt sync pin of the module. It is used to determine whether NMEA is stored in SPI/ I^2C buffer.
  - If NMEA data is ready and stored in SPI/ I^2C buffer, the pin will pull high.
  - After entire NMEA packet of one second is read, the pin will pull low.
  - When this interrupt is used and an IRQ routine is registered, the CPU usage must be checked and the programming routine adjusted
- **Pin14**: MOSI (SPI; to receive commands from system)
- **Pin15**: CLK (SPI; to receive clock time from system)
- **Pin16**: TX0 (UART 0 transmitter; outputs GPS information for application)
- **Pin17**: RX0 (UART 0 receiver; to receive commands from system)
- **Pin18**: 1PPS
  - This pin provides one pulse-per-second signal output. If not used, keep this pin floating.
- **Pin19**: NRESET
  - **Active** on Low for the module to reset. If not used, keep this pin floating.

Table 2-2: NRESET

Symbol	Min (V)	Typ (V)	Max (V)
Low	0	0	1.5
High	2	2.8	3.3

- **Pin20**: CS (SPI; to select chip for system)
  - Active on Low to enable SPI

Specifications

Table 2-3: Specification Data

Description	
GNSS Solution	MTK MT3333
Frequency	GPS L1, 1575.42MHz GLONASS L1, 1598.0625~1605.375MHz Galileo E1, 1575.42MHz BEIDOU B1, 1561.098MHz
Sensitivity (GPS portion)	Acquisition: -148dBm, cold start Reacquisition: -163dBm, Hot start Tracking: -165dBm

Table 2-3: Specification Data (Continued)

Description	
SV Number	GPS #1~32 GLONASS #65~88 BEIDOU #1~30 GALILEO # 1~30
TTFF (GPS, No. of SVs>4, C/N>40dB, PDop<1.5)	Hot start: 1 second typical Warm start: 33 seconds typical Cold start: 35 seconds typical, 60 seconds Max
Position Accuracy	Without aid:3m (50% CEP) DGPS(SBAS(WAAS,EGNOS,MSAS, GAGAN)):2.5m (50% CEP)
Velocity Accuracy	Without aid : 0.1m/s DGPS(SBAS(WAAS,EGNOS,MSAS, GAGAN)):0.05m/s
Timing Accuracy (1PPS Output)	±20ns RMS within 100ms in one pulse
Altitude	10,000m maximum (Normal mode: car/pedestrian/ aviation) 80,000m maximum (Balloon mode)
Velocity	Maximum 515m/s (1000 knots)
Acceleration	Maximum 4G
Update Rate	1Hz (default), maximum 10Hz
Baud Rate	115200 bps (default)
DGPS	SBAS (default) [WAAS, EGNOS, MSAS, GAGAN]
Power Supply	VCC: 3V to 4.3V; VBACKUP: 2.0V to 4.3V
Current Consumption @ 3.3V,1Hz Update Rate	GPS+GLONASS: Acquisition: 23mA/ 26mA /29mA (min / typical / max) Full Power Tracking: 23mA / 28mA /32mA (min / typical / max) GLP (GNSS low-power) Tracking: 7mA / 15mA / 31mA (min / typical / max)
Backup Power Consumption@ 3V	17µA (TYP)
Power Saving (Periodic)	Backup mode: 9µA (TYP) Standby mode: 350µA (TYP)
NRESET Current @ 3.3V	9mA (TYP)
Working Temperature	-40 °C to +85 °C
Dimension	9.0x9.5 x 2.1 mm, SMD
Weight	0.4g

Absolute Maximum Ranges

Table 2-4: Maximum Ranges

	Symbol	Min	Typ	Max	Unit
Power Supply Voltage	VCC	3.0	3.3	4.3	V
Backup Battery Voltage	VBACKUP	2.0	3.0	4.3	V

Operating Conditions

Table 2-5: Operating Conditions

	Condition	Min	Typ	Max	Unit
Operation Supply Ripple Voltage	-	-	-	50	mVpp
RX0 TTL H Level	-	2.0	-	3.3	V
RX0 TTL L Level	-	0	-	0.8	V
TX0 TTL H Level	-	2.4	-	3.3	V
TX0 TTL L Level	-	0	-	0.4	V

3: Protocols

NMEA Output Sentences

Table 3-1 lists all NMEA output sentences specifically developed and defined by MTK for MTK's products.

Table 3-1: Position Fix Indicator

Option	Description
GGA	Time, position and fix type data.
GSA	GNSS receiver operating mode, active satellites used in the position solution and DOP values.
GSV	The number of GPS satellites in view, satellite ID numbers, elevation, azimuth, and SNR values.
RMC	Time, date, position, course and speed data. The recommended minimum navigation information.
VTG	Course and speed information relative to the ground.

Table 3-2 lists NMEA output sentences used in GPS system and GLONASS system

Table 3-2: NMEA Output Sentence for GPS and GNSS

System	GGA	GSA	GSV	RMC	VTG
GPS	GPGGA	GPGSA	GPGSV	GPRMC	GPVTG
GNSS	GNGGA	GPGSA GLGSA	GPGSV GLGSV[a]	GNRMC	GNVTG
(GPS+GLONASS)					
GNSS	GNGGA	GPGSA	GPGSV	GNRMC	GNVTG
(GPS+BEIDOU)		BDGSA	GAGSV[a]		
GNSS	GNGGA	GPGSA	GPGSV	GNRMC	GNVTG
(GPS+ Galileo)		GAGSA	GAGSV[a]		
GNSS	GNGGA	GPGSA	GPGSV	GNRMC	GNVTG
(GPS+GLONASS + Galileo)		GLGSA	GLGSV		
		GAGSA	GAGSV		

a. In Talker ID, GP is a short term of “GPS”; GL is “GLONASS” ; BD is “BEIDOU; GA is “Galileo”” and GN is “GNSS”.

GGA—Time, Position and Related Data of Navigation Fix

Table 3-3 explains the NMEA sentence below:

```
$GNGGA, 064951.000, 2307.1256, N, 12016.4438, E, 1, 8, 0.95,
39.9, M, 17.8, M, *65
```

Table 3-3: GGA Data Format

Name	Example	Units	Description
Message ID	$GNGGA		GGA protocol header
UTC Time	064951.000		hhmmss.sss
Latitude	2307.1256		ddmm.mmmm
N/S Indicator	N		N North or S South
Longitude	12016.4438		dddmm.mmmm
E/W Indicator	E		E East or W West
Position Fix Indicator	1		See Table 3-4
Satellites Used	8		
HDOP	0.95		Horizontal Dilution of Precision
MSL Altitude	39.9	meters	Antenna Altitude above/below mean-sea-level
Units	M	meters	Units of antenna altitude
Geoidal Separation	17.8	meters	
Units	M	meters	Units of geoids separation
Age of Diff. Corr.		second	Null fields when DGPS is not used
Checksum	*65		
<CR> <LF>			End of message termination

Table 3-4: Position Fix Indicator

Value	Description
0	Fix not available
1	GPS Fix
2	Differential GPS Fix

GSA—GNSS DOP and Active Satellites, Including GPS (GPGSA), GLONASS (GLGSA), Galileo (GAGSA) and BEIDOU (BDGSA)

Table 3-5 explains the example NMEA sentence below:

GPS satellite system:

`$GPGSA,A,3,29,21,26,15,18,09,06,10,,,,,2.32,0.95,2.11*00`

GPS+GLONASS satellite system:

`$GPGSA,A,3,08,28,20,04,32,17,11,,,,,,1.00,0.63,0.77*1B (GPS satellite)`

`$GLGSA,A,3,77,76,86,78,65,88,87,71,72,,,,1.00,0.63,0.77*17 (GLONASS satellite)`

GPS+Galileo satellite system:

`$GPGSA,A,3,08,28,20,04,32,17,11,,,,,,1.00,0.63,0.77*1B (GPS satellite)`

`$GAGSA,A,3,01,26,,,,,,,,,,,1.23,0.91,0.83*15 (Galileo satellite)`

Beidou satellite system:

`$BDGSA,A,3,14,08,10,06,,,,,,,,,1.24,0.87,0.88*11`

Table 3-5: GGA Data Format

Name	Example	Units	Description
Message ID	$GPGSA, or $GLGSA		GSA protocol header
Mode 1	A		See Table 3-6
Mode 2	3		See Table 3-7
Satellite Used[a]	8		SV on Channel 1
Satellite Used	28		SV on Channel 2
....	....	....	....
Satellite Used			SV on Channel 12
PDOP	1		Position Dilution of Precision
HDOP	0.63		Horizontal Dilution of Precision
VDOP	0.77		Vertical Dilution of Precision
Checksum	*1B		
<CR> <LF>			End of message termination

a. GPS SV No. #01~#32
GLONASS SV No. #65~#88
BEIDOU SV No. #1~#30
GALILEO SV No. #1~#30

Table 3-6: Mode 1

Value	Description
M	Manual—forced to operate in 2D or 3D mode
A	2D Automatic—allowing to switch to 2D/3D mode automatically

Table 3-7: Mode 2

Value	Description
1	Fix not available
2	2D (<4 SVs used)
3	3D (>=4 SVs used)

GSV— Satellites in View, Including GPS (GPGSV), GLONASS (GLGSV), Galileo (GAGSA) and BEIDOU (BDGSA)

Table 3-8 explains the example NMEA sentences below:

```
$GPGSV,4,1,14,28,75,321,44,42,54,137,39,20,53,080,44,17,40,3
30,44*77

$GPGSV,4,2,14,04,33,253,43,32,28,055,41,08,26,212,40,11,14,0
55,33*7F

$GPGSV,4,3,14,10,12,198,,07,06,179,38,23,04,125,44,27,02,314
,*7E

$GPGSV,4,4,14,193,,,42,01,,,36*45
```

Table 3-8: GPGSV Data Format

Name	Example	Units	Description
Message ID	$GPGSV		GSV protocol header
Number of Messages	4		(Depending on the number of satellites tracked, multiple messages of GSV data may be required) [a]
Message Number	1		
Satellites in View	14		
Satellite ID	28		Channel 1 (Range 1 to 32)
Elevation	75	degrees	Channel 1 (Maximum 90)
Azimuth	321	degrees	Channel 1 (True, Range 0 to 359)

Table 3-8: GPGSV Data Format (Continued)

Name	Example	Units	Description
SNR (C/No)	44	dB-Hz	Range 0 to 99, (null when not tracking)
....	....	....	....
Satellite ID	17		Channel 4 (Range 1 to 32)
Elevation	40	degrees	Channel 4 (Maximum 90)
Azimuth	330	degrees	Channel 4 (True, Range 0 to 359)
SNR (C/No)	44	dB-Hz	Range 0 to 99, (null when not tracking)
Checksum	*77		
<CR> <LF>			End of message termination

a. One GSV sentence can only receive up to four SVs

Table 3-9 explains the example NMEA sentences below:

```
$GLGSV,4,1,15,72,45,084,40,77,39,246,44,87,36,014,44,65,33,1
57,36*62
```

```
$GLGSV,4,2,15,78,26,306,41,88,23,315,42,76,15,192,38,86,13,0
67,38*64
```

```
$GLGSV,4,3,15,71,12,035,38*54
```

Table 3-9: GLGSV Data Format

Name	Example	Units	Description
Message ID	$GLGSV		GSV protocol header
Number of Messages	4		(Depending on the number of satellites tracked, multiple messages of GSV data may be required)[a]
Message Number	1		
Satellites in View	15		
Satellite ID	72		Channel 1 (Range 1 to 32)
Elevation	45	degrees	Channel 1 (Maximum 90)
Azimuth	84	degrees	Channel 1 (True, Range 0 to 359)
SNR (C/No)	40	dB-Hz	Range 0 to 99, (null when not tracking)
....	....	....	....
Satellite ID	44		Channel 4 (Range 1 to 32)
Elevation	65	degrees	Channel 4 (Maximum 90)
Azimuth	157	degrees	Channel 4 (True, Range 0 to 359)
SNR (C/No)	36	dB-Hz	Range 0 to 99, (null when not tracking)

Table 3-9: GLGSV Data Format (Continued)

Name	Example	Units	Description
Checksum	*62		
<CR> <LF>			End of message termination

a. One GSV sentence can only receive up to four SVs

RMC—Recommended Minimum Navigation Information

Table 3-10 explains the example NMEA sentence below:

```
$GNRMC,064951.000,A,2307.1256,N,12016.4438,E,0.03,165.48,260
406,3.05,W,A*2C
```

Table 3-10: RMC Data Format

Name	Example	Units	Description
Message ID	$GNRMC		RMC protocol header
UTC Time	064951.000		hhmmss.sss
Status	A		A: data valid V: data not valid
Latitude	2307.1256		ddmm.mmmm
N/S Indicator	N		N: North S: South
Longitude	12016.4438		dddmm.mmmm
E/W Indicator	E		E: East W: West
Speed over Ground	0.03	Knots/hr	
Course over Ground	165.48	degrees	TRUE
Date	260406		ddmmyy
Magnetic Variation	3.05, W	degrees	E: East W: West (By Customization)
Mode	A		A: Autonomous mode D: Differential mode E: Estimated mode
Checksum	*2C		
<CR> <LF>			End of message termination
Message ID	$GNRMC		RMC protocol header

VTG—Course and Speed Information Relating to the Ground

Table 3-11 explains the example NMEA sentence below:

`$GNVTG,165.48,T,,M,0.03,N,0.06,K,A*37`

Table 3-11: VTG Data Format

Name	Example	Units	Description
Message ID	$GNVTG		VTG protocol header
Course	165.48	degrees	Measured heading
Reference	T		TRUE
Course		degrees	Measured heading
Reference	M		Magnetic Variation (By Customization)
Speed	0.03	Knots/hr	Measured horizontal speed
Units	N		Knots
Speed	0.06	km/hr	Measured horizontal speed
Units	K		Kilometers per hour
Mode	A		A: Autonomous mode D: Differential mode E: Estimated mode
Checksum	*37		
<CR> <LF>			End of message termination

MTK NMEA Command Protocols

Packet Type: 103 PMTK_CMD_COLD_START

Packet Meaning: Cold Start --- Discarding the data of Time, Position, Almanacs and Ephemeris at re-start.

Example: $PMTK103*30<CR><LF>

Note: Please refer to the XM_XA Software User Guide document for more details.

4: Reference Design

This section introduces the reference schematic design for best performance. For additional design guidelines please refer to the Hardware Design Guide document for the specific model.

Reference Schematic Design for Using the RTCM/I^{2}C/SPI

The XM1110 provides several interfaces to process GNSS NMEA data (by specified firmware):

1. UART0 + RTCM (for DGPS data)
2. UART0 + I^{2}C (for NMEA data)
3. UART0 + SPI (for NMEA data)

Reference Schematic Design for the RTCM

Figure 4-1 provides a schematic reference design for the RTCM:

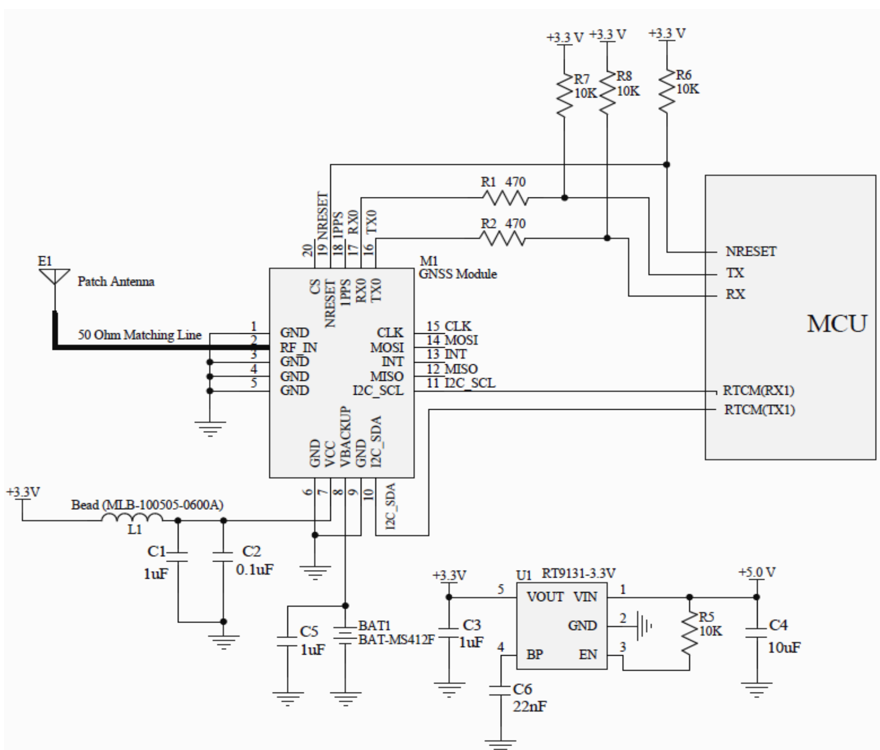

Figure 4-1: UART + RTCM

Notes:

1. Ferrite bead L1 is added for power noise reduction. Use one with an equivalent impedance (600Ω at 100MHz; IDC 200mA).
2. Place C1, C2 and C5 bypass-capacitors as close as possible to the module.
3. Damping resistors R1 and R2 can be modified based on system application for EMI.

Reference Schematic Design for Using I^2C

Figure 4-2 provides a schematic reference design for using I^2C:

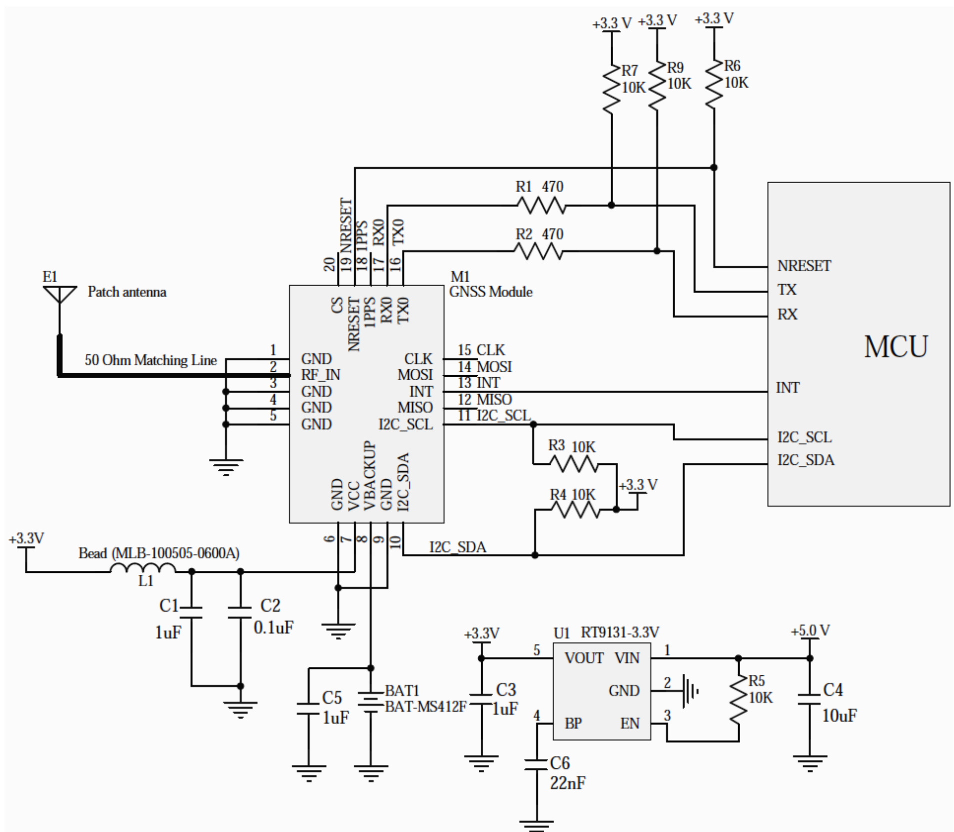

Figure 4-2: UART + I^2C

Notes:

1. Ferrite bead L1 is added for power noise reduction. Use one with an equivalent impedance (600Ω at 100MHz; IDC 200mA).
2. Place C1, C2 and C5 bypass-capacitors as close as possible to the module.
3. Damping resistors R1 and R2 can be modified based on system application for EMI.
4. Pull high resistors, R3 and R4, can be modified based on system application for I^2C.

Reference Schematic Design for the SPI Bus

Figure 4-3 provides a schematic reference design for the SPI bus:

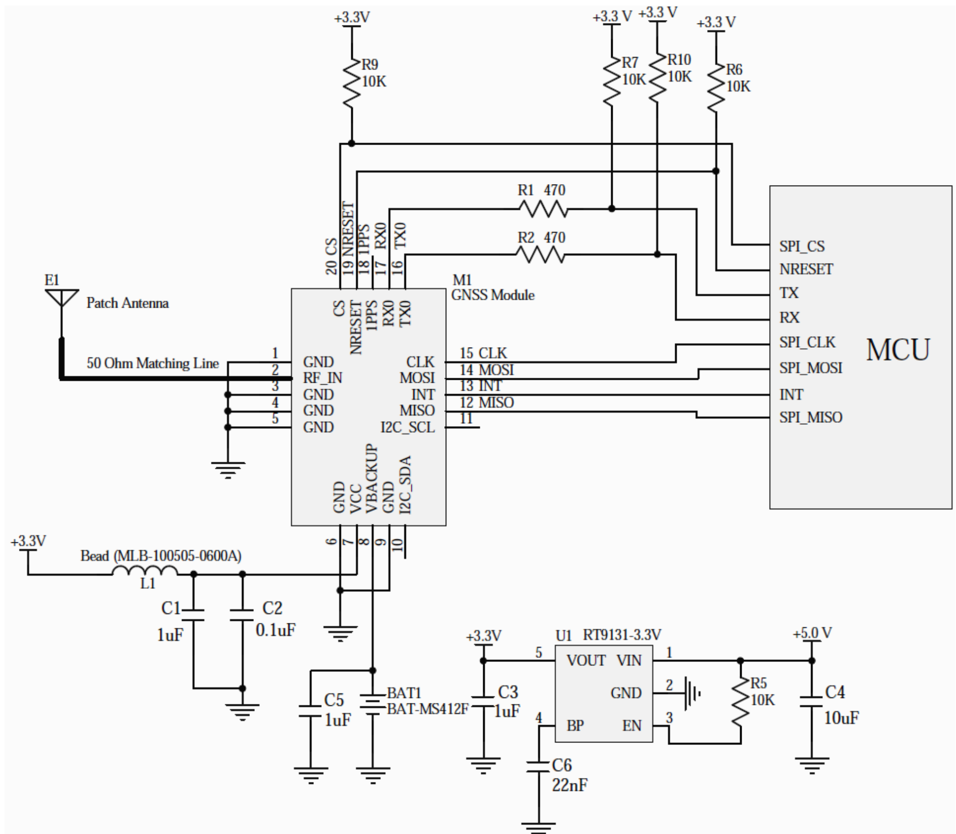

Figure 4-3: UART+SPI Application

Notes:

1. Ferrite bead L1 is added for power noise reduction. Use one with an equivalent impedance (600Ω at 100MHz; IDC 200mA).
2. Place C1, C2 and C5 bypass-capacitors as close as possible to the module.
3. Damping resistors, R1 and R2, can be modified based on system application for EMI.

Reference Schematic Design for Using a Patch (Passive) Antenna

Connect the passive antenna directly to RF_IN (Pin 2).

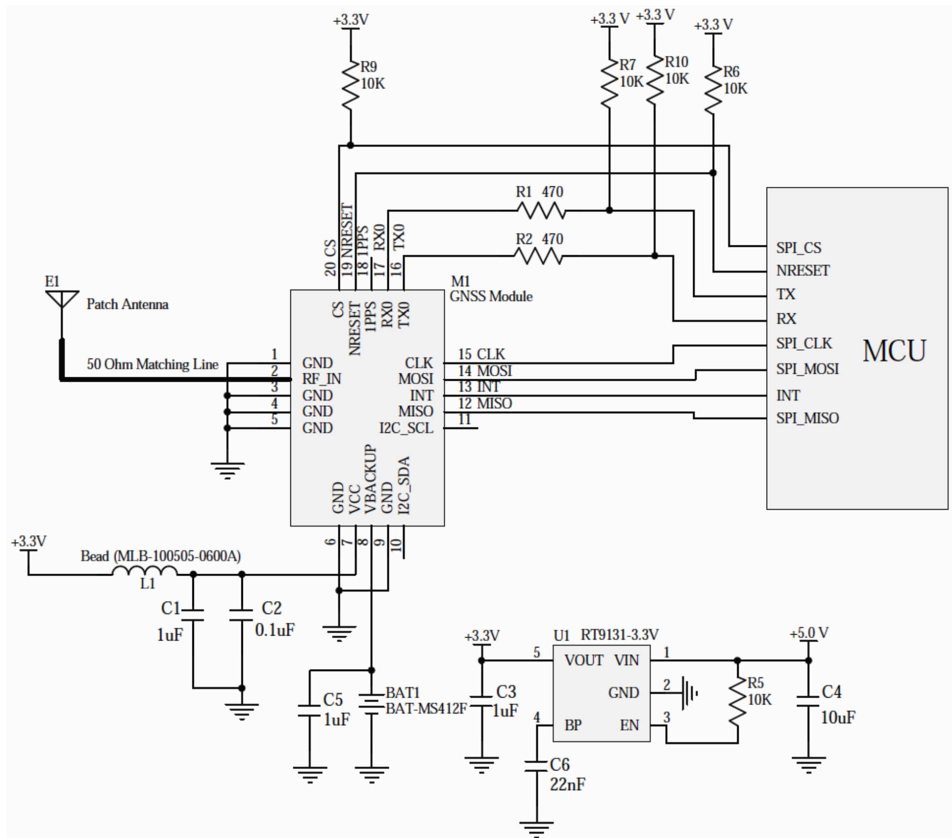

Figure 4-4: Patch Antenna

Notes:

1. Ferrite bead L1 is added for power noise reduction. Use one with an equivalent impedance (600Ω at 100MHz; IDC 200mA).
2. Place C1, C2 and C5 bypass-capacitors as close as possible to the module.
3. Damping resistors, R1 and R2, can be modified based on system application for EMI.

Reference Schematic Design for Using an Active Antenna

Please connect the external antenna to RF_IN (Pin2)

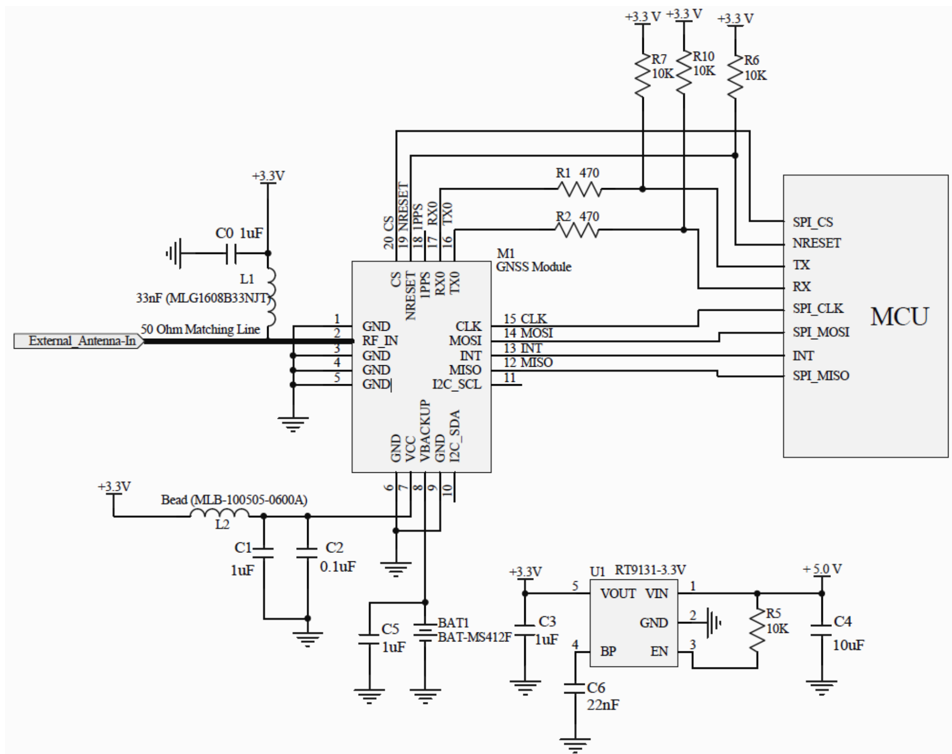

Figure 4-5: Active Antenna Application

Notes:

1.Ferrite bead L1 is added for power noise reduction. Use one with an equivalent impedance (600Ω at 100MHz; IDC 200mA).

2.Place C1, C2 and C5 bypass-capacitors as close as possible to the module.

3.Damping resistors R1 and R2 can be modified based on system application for EMI.