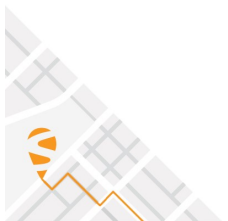




# **AsteRx4 to AsteRx-m3 transition: technical considerations**

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Version 1.0.0



AsteRx4 to AsteRx-m3 transition: technical considerations

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## 2 Introducing the AsteRx-m3

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The AsteRx-m3 is a state-of-the-art GNSS receiver family using triple frequency and multi-constellation GNSS technology both for maximal positioning availability and reliability in challenging conditions. The AsteRx-m3 product family includes both base station and rover receivers in single or dual antenna configuration.

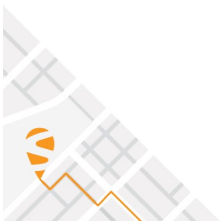
The AsteRx-m3 product family provides RTK positioning at the lowest power consumption of any comparable device on the market,

The new product family includes 3 types of GNSS OEM boards.

AsteRx-m3 Pro is the rover receiver tracking signals from all available GNSS constellations on 3 frequencies. Simple and powerful, it operates both in single and dual antenna modes.

The AsteRx-m3 ProBase, as its name suggests, is a product designed to operate as a base station for RTK and PPP-RTK networks.

Last but not least is the AsteRx-m3 Pro+, the best-in-class full-feature OEM receiver board flexible enough to fit into any application and to be used either as a rover or a base station in a single or a dual antenna mode.



### 3 What does the AsteRx-m3 bring?

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Compared to the current AsteRx4 the AsteRx-m3 product family brings significant SWaP improvements reducing the footprint to 47 mm by 70 mm and the maximum power consumption about 4 W to ~1.8 W. The size and power reduction is obtained with no performance compromise.

## 4 AsteRx4 to AsteRx-m3 transition: technical considerations

The AsteRx-m3 product family is designed to provide a functional equivalent of the AsteRx4 but on a reduced footprint and a lower power consumption. In particular the AsteRx-m3 Pro+, which is the top of the line receiver, provides the same number of channels and the same flexibility to work in single or dual antenna..

### 4.1 Product comparison

	AsteRx4	AsteRx-m3 Pro+	AsteRx-m3 Pro	AsteRx-m3 ProBase
Dimensions	76.4 x 100 mm 3.03 x 3.93 in No break off edges 61 x 88.5 mm 2.4 x 3.48 in	47.5 x 70 x 9.32 mm 1.87 x 2.75 x 0.36 in		
Weight	55 g / 1.94 oz	27 g / 0.952 oz		
Input Voltage	3 - 5.5 VDC	3.3 VDC $\pm$ 5%		
Maximum antenna current	200 mA	150 mA		
Max power consumption	4.3 W	1.86 W		1.18 W
Heading	Optional	Yes	Optional	NA
Max data rate (measurements)	100 Hz	100 Hz	10 Hz	10 Hz
Ethernet	PHY on board	RMII interface <sup>1</sup>	RMII interface <sup>1</sup>	RMII interface <sup>1</sup>
PPSOut	1	1 HW ready for 2	1 HW ready for 2	1 HW ready for 2
RF connectors	2 MMCX 90 deg	2 MMCX straight <sup>2</sup>	2 MMCX straight <sup>2</sup>	MMCX straight <sup>2</sup>
Ref In	NA	Yes	NA	NA
Ref Out	On 80 pin	Dedicated uFL		

<sup>1</sup> refer to the AsteRx-m3 hardware manual for a reference design and recommendations for the PHY selection and integration.

<sup>2</sup> Variants with u.FL connectors and 90 deg MMCX connectors are foreseen for volume integrations. Contact your sales representative ([sales@septentrio.com](mailto:sales@septentrio.com)) for MOQ, pricing, part numbers and availability

### 4.2 Connectivity

The AsteRx4 features an 80 pin connector while the AsteRx-m3 product family connectivity is brought via a 30 pin connector (for basic interfacing) and a 60 pin connector for a more advanced usage.

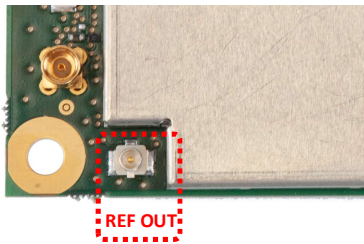
The detailed mapping of the 80 pin connector of the AsteRx4 to the 30 and 60 pin connectors of the AsteRx-m3 can be found in Appendix.

### 4.3 RF Interface

The following changes apply to the RF interface.

- ▶ Antenna net gain range of the AsteRx-m3 is 15-45 db as opposed to 15-50 db for AsteRx4
- ▶ The antenna current limit has changed from 200 mA per antenna to 150 mA.

### 4.4 Frequency Reference Output (REF OUT)



The frequency reference used by the receiver is available at the REFOUT u.FL connector. The signal on this pin provides a 10MHz square wave between 0 - 2.8 V with a 50 Ohm impedance.

The REFOUT signal – enabled by default - can be switched on and off via the **setREFOUTmode** command.

## 4.5 USB

By default, AsteRx-m3 is configured in USB 2.0 mode. AsteRx4 is configured in 1.1 mode by default.

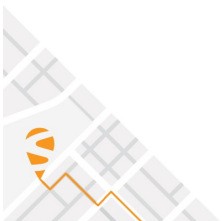
We recommend USB 2.0 when designing in the AsteRx-m3.

## 4.6 Ethernet

The AsteRx4 receiver features an on board Ethernet PHY. The AsteRx-m3 product family requires the integration of an external PHY. Please refer to the AsteRx-m3 hardware manual for a reference design and recommendations for the PHY selection and integration.

## 4.7 GPIO

While the AsteRx4 has 3 General Purpose output pins, the AsteRx-m3 product family features only 2. Please see details on the AsteRx-m3 Hardware Manual.





## 5 Software

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The following aspects should be accounted for in the software integration:

- ▶ The list of RTCM3 messages enabled by default in an output stream has changed:

AsteRx-m3: 1006, 1033, 1230, 1074, 1084, 1094 and 1194

AsteRx-m2/m2a: 1006, 1033, 1230, 1004, 1012

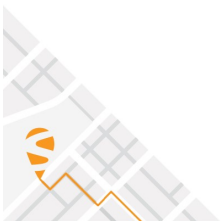
While different product names differentiate the AsteRx-m3 product variants, the hostname follows the same syntax as all our products, i.e. asterx-m3-1234567 with 1234567 representing the serial number of the receiver.

- ▶ Wakeup on COM1 activity is not available on the AsteRx-m3 product family

## 6 What AsteRx-m3 product fits the best my AsteRx-4?

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The AsteRx-m3 Pro+ is the product that matches the best the current AsteRx-4 use cases, but in order to make sure that you do purchase the best option for your platform we advice you to contact your local sales representative.



## Appendix: AsteRx4 80 pin connector remap

AsteRx4					AsteRx-m3			
Pin#	Name	Type	Level	Description	Connector	Pin#	Corresponding pin name	Remark
1	Gnd	Gnd	0	Ground.			GND	
3	USB_D-	I/O	USB	USB data signal negative D-.	30-pin	6	USB_D-	USB 2.0 default
5	USB_D+	I/O	USB	USB data signal positive D+.	30-pin	5	USB_D+	USB 2.0 default
7	Gnd	Gnd	0	Ground.			GND	
9	Reserved			Reserved for future use				
11	LANLED	O	LVTTL	LAN link and activity indicator, see Appendix A of the AsteRx4 HW manual				Not available, Ethernet PHY not installed on the AsteRx-m3 board.
13	Reserved			Reserved for future use				
15	Vin	P	3.0V <Vin <5.5V	Main power supply input.	30-pin	1	Vin	Voltage range reduced to 3.3V +/-5%. Shall also be connected to pin 2.
17	Gnd	Gnd	0	Ground.			GND	
19	SCOM_RX1	I	LVTTL	Serial COM 1 receive line (inactive state is high). Disabled when pin#69 is tied to ground.	30-pin	10	RX1	
21	SCOM_RX2	I	LVTTL	Serial COM 2 receive line (inactive state is high). Disabled when pin#69 is tied to ground.	30-pin	14	RX2	
23	SCOM_RX3	I	LVTTL	Serial COM 3 receive line (inactive state is high)	30-pin	16	RX3	
25	SCOM_RX4	I	LVTTL	Serial COM 4 receive line (inactive state is high).	60-pin	16	RX4	
27	Gnd	Gnd	0	Ground.			GND	
29	VCC_3V3_OUT	P	3.3V	3.3V power supply output (10mA max), or 0V if the receiver is in sleep or stand-by mode.				the VCC_3V3_OUT pin is taken over by the IO_EN pin on AsteRx-m3. It is the pin that can be used to enable input buffers (see warning in both manuals)
31	Reserved			Reserved for future use				
33	Gnd	Gnd	0	Ground.			GND	
35	EVENT_B	I	LVTTL	Event B input (see Firmware User Manual for operation instructions)	60-pin	57		For both events: the pin is pulled-down on AsteRx-m3.
37	Gnd	Gnd	0	Ground.			GND	

39	REF_O	O	LVTTL	Output depends on the EXTREF_STAT pin level: EXTREF_STAT left open: 10-MHz square wave output from the internal frequency reference. EXTREF_STAT tied to ground: REF_O is disabled.	u.FL			Signal now available on a dedicated u.FL connector.
41	Gnd	Gnd	0	Ground.			GND	
43	REF_I	I	LVTTL	10-MHz square wave frequency reference input. Input ignored when EXTREF_STAT is left open.	60-pin	60	REF_IN	Sine wave or a square wave with a peak-to-peak amplitude between 2V and 5V. Always used when provided. Not hot-swappable.
45	SCOM_CTS2	I	LVTTL	Serial COM 2 CTS line	60-pin	12	CTS2	
47	SCOM_CTS3	I	LVTTL	Serial COM 3 CTS line	60-pin	14	CTS3	
49	LOGLED	O	LVTTL	Internal logging status indicator, see Appendix A.	30-pin	27	LOGLED	Max output current: 10mA.
51	TRACKLED	O	LVTTL	Tracking status indicator, see Appendix A.				Not available, GPLED signal can be used.
53	GP1	O	LVTTL	GP1 in setGPIOFunctionality command.	60-pin	9	GP1	
55	EXTREF_STAT	I	LVTTL	Sets the source of the 10-MHz frequency reference (internal or external).				Not available
57	Gnd	Gnd	0	Ground.			GND	
59	Reserved			Reserved for future use				
61	SD_CMD	O	LVTTL	SD card CMD line	30-pin	28	SD_CMD	
63	SD_CLK	O	LVTTL	SD card CLK line	30-pin	26	SD_CLK	
65	Reserved			Reserved for future use				
67	Gnd	Gnd	0	Ground.			GND	
69	TTLnRS232	I	LVTTL	LVTTL vs RS232 selection for COM1 and COM2. Internal pull up.				Not available, the AsteRx-m3 only support LVTTL serial port.
71	Reserved			Reserved for future use				
73	ETH_TX+	O	Ethernet	Ethernet TX+				Not available, Ethernet PHY not installed on the AsteRx-m3 board. Please refer to chapter TBD for a description on how to integrate Ethernet on the AsteRx-m3
75	ETH_TX-	O	Ethernet	Ethernet TX-				Not available, Ethernet PHY not installed on the AsteRx-

								m3 board. Please refer to chapter TBD for a description on how to integrate Ethernet on the AsteRx-m3
77	ETH_RX+	I	Ethernet	Ethernet RX+				Not available, Ethernet PHY not installed on the AsteRx-m3 board. Please refer to chapter TBD for a description on how to integrate Ethernet on the AsteRx-m3
79	ETH_RX-	I	Ethernet	Ethernet RX-				Not available, Ethernet PHY not installed on the AsteRx-m3 board. Please refer to chapter TBD for a description on how to integrate Ethernet on the AsteRx-m3
2	Gnd	Gnd	0	Ground.			GND	
4	USB_Vbus	P	4.35V≤V <sub>high</sub> ≤5.25V	USB Power. Cannot be used to power the receiver.	30-pin	7	USB_Vbus	
6	Gnd	Gnd	0	Ground.			GND	
8	nPWR_TOGGLE	I	LVTTTL	Power toggling input, active negative. Applying a negative pulse to this pin orders the receiver to enter stand-by mode if it was operating, and to start operation if it was in stand-by mode (see section 2.10 of this document).				Not available. The AsteRx-m3 uses a level-based nPDN state signal to define its operation mode instead of a state transition input as a pulse.
10	nRST_IN	I	LVTTTL	Reset input, active negative. Receiver resets when driven low for at least 1ms. The net effect is similar to shortly disconnecting the power supply.	30-pin	8	nRST	TBC: The AsteRx-m3 stays in reset mode as long as the pin is driven low.
12	Reserved			Reserved for future use				
14	Vantenna	P	3.15V<V <sub>ant</sub> <12V	Antenna supply, max current per antenna 200mA. The voltage provided on this pin is transferred to the	30-pin	18	VANT	The AsteRx-m3 allowed voltage input is reduced to 3<VANT<5.5V.

				central conductor of the antenna MMCX connectors.				The maximum current per antenna is 150mA.
16	Vin	P	3.0V<Vin<5.5V	Main power supply input	30-pin	2		Voltage range reduced to 3.3V +/-5%. Shall also be connected to pin 1.
18	Gnd	Gnd	0	Ground.			GND	
20	SCOM_TX1	O	LVTTL	Serial COM 1 transmit line (inactive state is high)	30-pin	9	TX1	
22	SCOM_TX2	O	LVTTL	Serial COM 2 transmit line (inactive state is high)	30-pin	13	TX2	
24	SCOM_TX3	O	LVTTL	Serial COM 3 transmit line (inactive state is high)	30-pin	15	TX3	
26	SCOM_TX4	O	LVTTL	Serial COM 4 transmit line (inactive state is high)	60-pin	15	TX4	
28	Gnd	Gnd	0	Ground.			GND	
30	Reserved			Reserved for future use				
32	Gnd	Gnd	0	Ground.			GND	
34	EVENT_A	I	LVTTL	Event A input (see Firmware User Manual for operation instructions)	30-pin	19		Both events can be utilized for time-synchronization. Permission dependent.
36	Gnd	Gnd	0	Ground.			GND	
38	PPSout	O	LVTTL	PPS output. See section 2.5.	30-pin	12	PPSout	
40	Gnd	Gnd	0	Ground.			GND	
42	SSNin1	I	LVTTL	Proprietary input				
44	Button	I	LVTTL	Input can be connected to a push button, used to enable and disable internal SBF and NMEA logging. High to low transitions are detected as "button pressed" events.	30-pin	25		
46	SCOM_RTS2	O	LVTTL	Serial COM 2 RTS line	60-pin	11	RTS2	
48	SCOM_RTS3	O	LVTTL	Serial COM 3 RTS line	60-pin	13	RTS3	
50	GPLED	O	LVTTL	General-purpose status indicator, see Appendix A.	30-pin	22	GPLED	
52	GP3	O	LVTTL	GP3 in setGPIOFunctionality command.				Not available, the AsteRx-m3 only features 2 General Purpose pins
54	GP2	O	LVTTL	GP2 in setGPIOFunctionality command.	60-pin	44	GP2	
56	PVTLED	O	LVTTL	PVT status indicator, see Appendix A.				Not available, GPLED can be used to provide the same functionality.
58	Gnd	Gnd	0	Ground.			GND	

60	Reserved			Reserved for future use				
62	SD_DAT0	I/O	LVTTTL	SD card DAT0 line	30-pin	30	SD_DAT0	
64	Reserved			Reserved for future use				
66	Reserved			Reserved for future use				
68	Gnd	Gnd	0	Ground.			GND	
70	Reserved			Reserved for future use				
72	ETH_BIAS	P	Ethernet	Bias pin for centre tap of Ethernet transformer				Not available, Ethernet PHY not installed on the AsteRx-m3 board. Please refer to chapter TBD for a description on how to integrate Ethernet on the AsteRx-m3
74	RS232_TX1	O	RS232	Serial COM 1 transmit line (RS232 level)				Not available, the AsteRx-m3 only support LVTTTL serial port.
76	RS232_RX1	I	RS232	Serial COM 1 receive line (RS232 level)				Not available, the AsteRx-m3 only support LVTTTL serial port.
78	RS232_TX2	O	RS232	Serial COM 2 transmit line (RS232 level)				Not available, the AsteRx-m3 only support LVTTTL serial port.
80	RS232_RX2	I	RS232	Serial COM 2 receive line (RS232 level)				Not available, the AsteRx-m3 only support LVTTTL serial port.