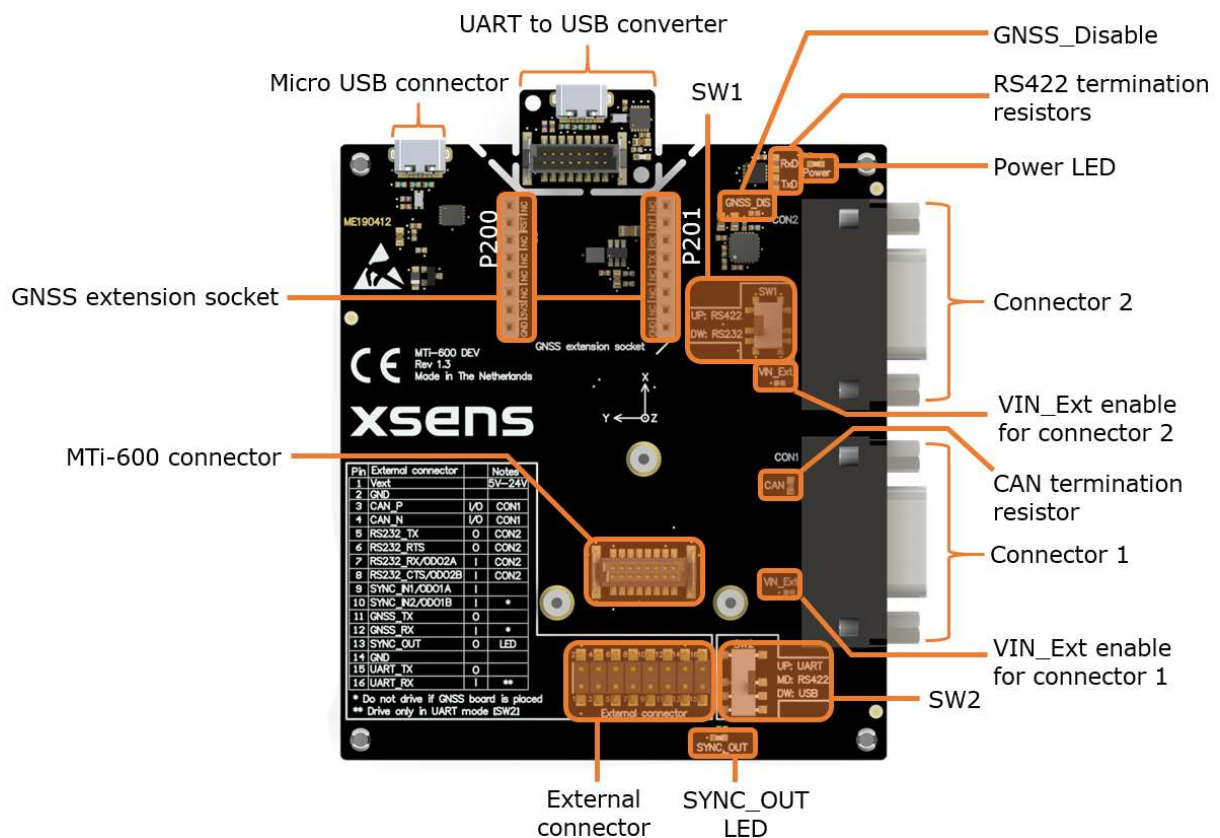# Development board

The MTi 600-series Development Board (MTi-600 DEV) exposes the pins of the MTi-600 on the *External connector,* a 2.54 mm pitch header, making it easier for the user to test all the features and the peripherals offered by the MTi-600. Next to that, the MTi-600 DEV has a micro USB connector and two *DSUB9* connectors for testing different communication protocols. It also includes a mikroBUS™ compatible *GNSS extension socket* to connect a GNSS module for the MTi-670-DK and MTi-680-DK. This chapter discusses in more detail the connections and peripherals available on the MTi-600 DEV.

Overview

The MTi-600 DEV has the following connections as shown in the figure below:

- *External connector*.
- Main connector for the MTi-600.

- *DSUB9* female connector 1 for CAN interface.
- *DSUB9* female connector 2 for RS232 or RS422 interface.
- *Micro USB connector*.
- Peripheral selection switches (*SW1* & *SW2*).
- *GNSS extension socket* (*P200* and *P201* female sockets).
- Zero-Ohm resistor positions for disabling the GNSS UART and enabling VIN_Ext.

- 120-Ohm termination resistors for CAN and RS422.

- UART to USB breakout board.

MTi 600-series Development Board overview with connector designators

External Connector

The External Connector makes all of the MTi-600 pins available on a 2.54 mm pitch header. The pin numbering is an exact copy of the MTi-600 pinning itself. All pins have a direct connection to the MTi-600 except for pin 1 (Vext). Pin 1 is connected through a diode and can only be used to power the MTi-600 (not for monitoring). The pinning can be seen in the following table.

Pin descriptions of External Connector

Pin	Name	I/O	Description
1	Vext	PWR	Power input
2	GND	PWR	Ground
3	CAN_H	I/O	CAN bus differential low side

4	CAN_L	I/O	CAN bus differential high side
5	RS232_TxD	O	RS232 transmitter output to host
6	RS232_RTS	O	RS232 Ready To Send output to host
7	RS232_RxD	I	RS232 receiver input from host
8	RS232_CTS	I	RS232 Clear To Send input from host
9	SYNC_IN1	I	Multifunctional synchronization input
10	SYNC_IN2	I	Multifunctional synchronization input
11	GNSS_TxD	O	RS232 transmitter output to GNSS module
12	GNSS_RxD	I	RS232 receiver input from GNSS module
13	SYNC_OUT	O	Configurable synchronization output
14	GND	PWR	Ground
15	UART_TxD	O	UART transmitter output
16	UART_RxD	I	UART receiver input

Power

The MTi-600-DK can be supplied by USB or through the External Connector. In case the External Connector is used to power the board, the USB power will be disconnected from the MTi-600. Additionally, pin 9 of both DSUB9 connectors can be connected directly to pin 1 (Vext) of the External connector by placing the corresponding zero-Ohm resistor.

The DSUB9 VIN_Ext pins are directly connected to pin 1 of the External connector when the zero-Ohms resistors are placed. Do not supply power to more than one of these pins at the same time!

Host connections

USB

The micro USB port on the main board can be used to connect the MTi-600 to a host though the included micro USB cable. The USB device requires the drivers that are automatically included when downloading the MT Software Suite. The following table shows the required switch configuration for this connection.

Switch configuration USB

Switch	Position
SW1	-
SW2	Down (default)

CAN

Connector 1 can be used to connect a CAN bus to the MTi-600 with a DSUB9 connector. The table below shows the pinning of this connector. The DSUB9 connector connects directly to the MTi-600 without relying on any switch. The CAN bus interface includes a 120 Ohm termination resistor on the MTi-600 DEV.
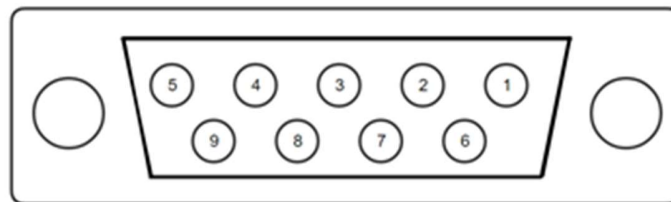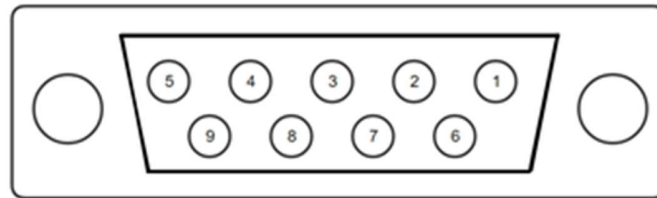

Pin out of DSUB9 connector CAN

DSUB9 connector 1 pinning for CAN

Pin	Name	Description
2	CAN_L	CAN bus differential low side
3	GND	Ground

5	GND	Ground
7	CAN_H	CAN bus differential high side
9	VIN_Ext	Supply input (requires zero-Ohm resistor)

RS232

Switch SW1 needs to be set in the downward position to enable the RS232 connections on DSUB9 connector 2. The table below shows the pinning of DSUB9 connector 2 if the RS232 interface is enabled.

Pin out of DSUB9 connector RS232

DSUB9 connector 2 pinning for RS232

Pin	Name	Description
2	RS232_TxD	RS232 transmitter output to host
3	RS232_RxD	RS232 receiver input from host
5	GND	Ground
7	RS232_CTS	RS232 Clear To Send input from host
8	RS232_RTS	RS232 Ready To Send output to host
9	VIN_Ext	Supply input (requires zero-Ohm resistor)

Switch configuration for enabling RS232

Switch	Position
SW1	Down (default)
SW2	-

RS422

To activate the RS422 interface, switch SW1 should be in the upward position and switch SW2 in the middle position. The table below shows the pinning of DSUB9 connector 2 if the RS422 connections are enabled. The RS422 interface includes a 120 Ohm termination resistor on both the RxD and TxD lines.

Connector 2 pinning for RS422

Pin	Name	Description
1	RS422_RxD-	RS422 negative receiver input from host
2	RS422_RxD+	RS422 positive receiver input from host
3	RS422_TxD+	RS422 positive transmitter output to host
4	RS422_TxD-	RS422 negative transmitter output to host
5	GND	Ground
9	VIN_Ext	Supply input (requires zero-Ohm resistor)

Switch configuration for enabling RS422

| Switch	Position
SW1	Up

SW2	Mid

UART

To be able to use the UART pins on the External Connector, switch SW2 needs to be set in the upward position. This will ensure that the UART_RxD is not controlled by any of the transceivers of the MTi-600 DEV. The UART_TxD will still transmit over USB and RS422 (when enabled), allowing to monitor the MTi-600 output. The UART pinning on the External Connector can be seen in table #Pin descriptions of External Connector.

Switch configuration for enabling UART

Switch	Position
SW1	-
SW2	Up

External GNSS extension socket and daughter card (MTi-670/680 DK only)

The MTi-670-DK comes with the GNSS daughter card installed in the *GNSS extension socket*. As shown in the figures below, the GNSS daughter card consists of a GNSS receiver and a barometer sensor component. The barometer is not used/connected for the MTi-670-DK, since the MTi-600 has an internal barometer. The LEDs (Power and PPS) give indication of proper functioning of the GNSS daughter card. The supplied GNSS antenna can be connected to the SMA connector.
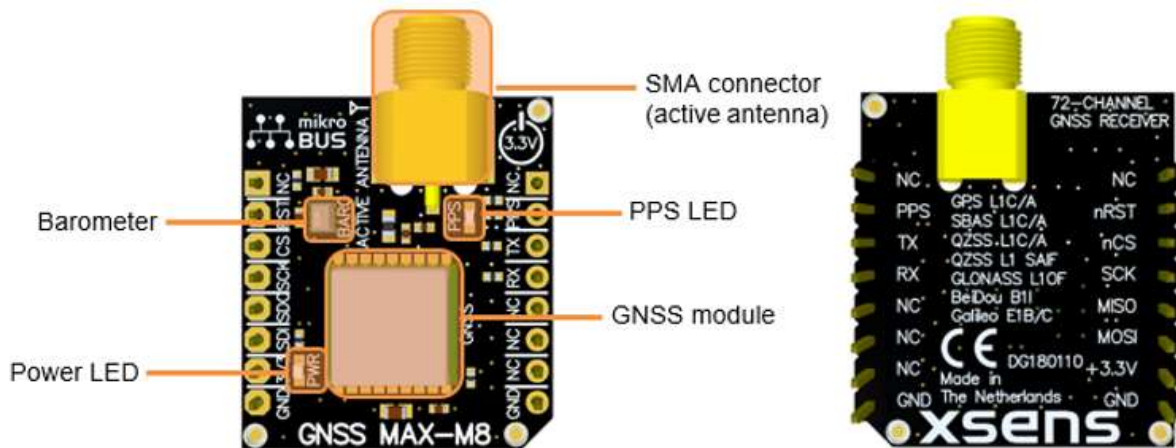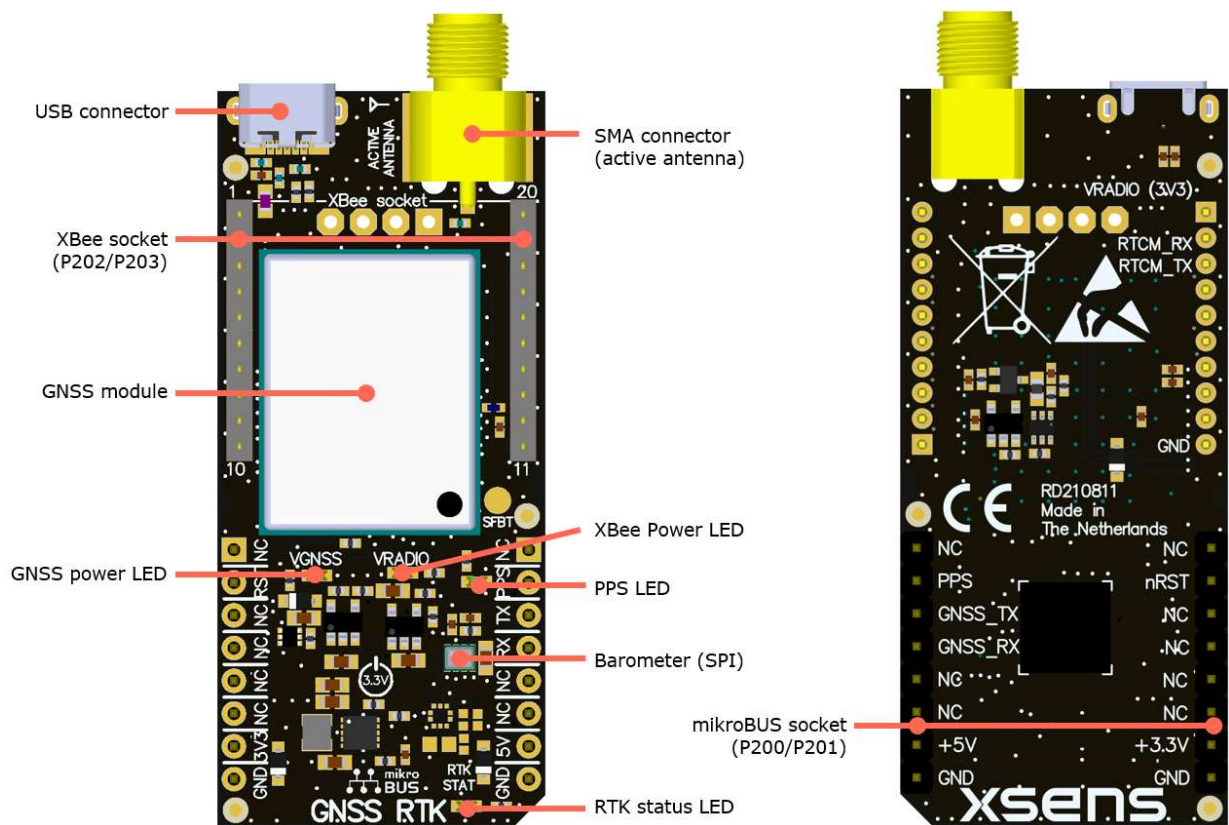
Top view (left) and the bottom view (right) of the MTi-670-DK GNSS daughter card

The MTi-600 DEV board translates the RS232 signal levels from the MTi-600 to the 3V3 UART levels used on the extension board. This transceiver can be disabled by placing a zero-Ohm resistor on the *GNSS_Disable* resistor position (see [#MTi 600-series Development Board overview with connector designators](#)). In this case, the GNSS pins on the *External connector* can be used to connect a RS232 level enabled GNSS receiver.

The MTi-680-DK comes with the RTK GNSS daughter card installed in the *GNSS extension socket*. As shown in the figures below, the RTK GNSS daughter card consists of an RTK GNSS receiver, a barometer sensor component, an Xbee socket and a USB connector. The barometer is not used/connected for the MTi-680-DK, since the MTi-600 has an internal barometer.

The LEDs (Power, PPS, Xbee and RTK status) give indication of proper functioning of the RTK GNSS daughter card and Xbee power. The supplied GNSS antenna can be connected to the SMA connector.

Top view (left) and the bottom view (right) of the MTi-680-DK RTK GNSS daughter card

The power consumption of the MTi-680 DK RTK GNSS daughter card (MTI-DK-RTK) is higher than the MTi-670 DK GNSS daughter card. Use only with MTi-600-DEV Hardware Revision 1.7 and higher!

The MTi-680-DK is equipped with an XBee module socket. XBee modules are embedded solutions providing wireless end-point connectivity to devices. The XBee socket can be used to feed RTCM correction messages to the MTi-680-DK RTK GNSS receiver or to connect to an XBee wireless module.

XBee socket pinning

Pin	GNSS board
P202-1	VRADIO (3V3)

Pin	
P202-2	RTCM_RxD
P202-3	RTCM_TxD
P202-[4..9]	NC
P202-10	GND
P203-[11..20]	NC

The *GNSS extension socket* has mikroBUS™ compatible pinning. This enables the user to connect alternate GNSS daughter card modules with mikroBUS™ pinning to the MTi-600-DEV. The pinning connections for the *GNSS extension socket* are listed in Table 13. This extension only uses the 3.3V supply pin, which is connected to the 3V3 that is generated on the MTi-600 DEV.

Connections on UART communication GNSS extension sockets.

Pin	Mikro BUS	MTi-670/680	Pin	Mikro BUS	MTi-670/680
P200-1	AN	NC	P201-1	PWM	NC
P200-2	RST	Pull-up	P201-2	INT	SYNC_IN2
P200-3	CS	NC	P201-3	TX	GNSS_RxD
P200-4	SCK	NC	P201-4	RX	GNSS_TxD
P200-5	MISO	NC	P201-5	SCL	NC
P200-6	MOSI	NC	P201-6	SDA	NC
P200-7	3.3V	3V3	P201-7	5V	5V
P200-8	GND	GND	P201-8	GND	GND

Electrical specifications

MTi-600 DEV power supply specifications

	Min	Typ	Max	Unit
V_{USB}	4.5	5	5.5	V
V_{ext}	4.5	-	24	V

Absolute maximum ratings

Absolute maximum ratings MTi-600 DEV

Parameter	Min	Max	Unit	Comments
Operating temperature	-40	+85	ºC	
V_{ext}	-0.3	30	V	Power input on *External connector* or *DSUB9* connectors
V_{USB}	-0.3	6.0	V	USB power input
V_{UART}	-0.3	3.6	V	
$V_{RS232/SYNC}$	-25	25	V	
V_{RS422}	-15	15	V	
V_{CAN_DC}	-58	58	V	Common mode voltage of CAN_H and CAN_L with respect to ground

V_{CAN_DIFF}	-17	17	V	Differential voltage between CAN_H and CAN_L
Acceleration[1]		10,000	g	Any axis, unpowered, for 0.2 ms
ESD protection[2]		±2000	V	Human body model