Inpixon Swarm UWB V3 Dev Board

Preliminary User Guide

USG-0395-0001-A2

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Document History

Rev	Date	Change	Changed By
A1	2024-02-02	Initial Version	CGUE / ESUN
A2	2024-02-15	Corrected several specs	CGUE / ESUN

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1. Introduction

The Inpixon Swarm UWB V3 Dev Board is a tool to develop, test and debug software based on the Inpixon Swarm UWB V3 module. Several connectors and test points help to measure particular parameters, such as RF output power or current consumption.

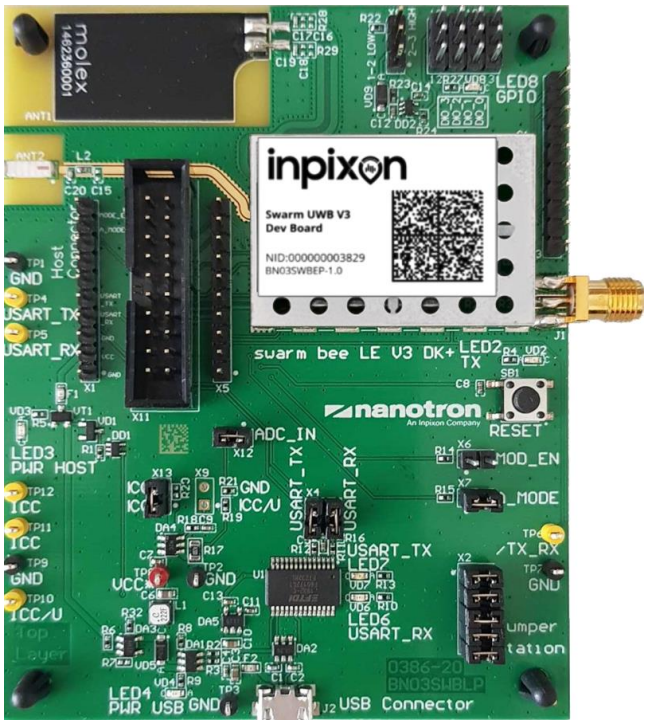

Figure 1-1: Inpixon Swarm UWB V3 Dev Board, Top View

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2. Technical Data

Property	Value
User and debugging interface 1	Swarm module USART, 500 bps to 1 Mbps, default 115.2kbps*
User and debugging interface 2	USB, converted to USART by FTDI chip, 115.2kbps
Radiated TX output spectral power density	max. -41.3 dBm / MHz **
Supply voltage via host connector	+3.3 V...+5.5 V
Power consumption over host connector (@ 3.3 V)	max. 250 mA
Maximum supply voltage ripple when supplied via host connector	30 mVpp
Supply via micro USB	standard 5 V USB power supply
Power consumption over USB	max. 200 mA
Operating temperature	-30°C to +85°C
Dimensions (L x W x H)	80 mm x 100 mm x 22 mm
Weight	46 grams
Certification CE, FCC, ISED	ongoing

*Discrete value selection in [Baud]: 115200; 230400; 250000; 460800; 921600; 1000000
** With supplied UWB antenna

Note: All technical data related to the Inpixon Swarm UWB V3 module can be found in the Technical Reference of the Inpixon Swarm UWB V3.

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3. Block Diagram

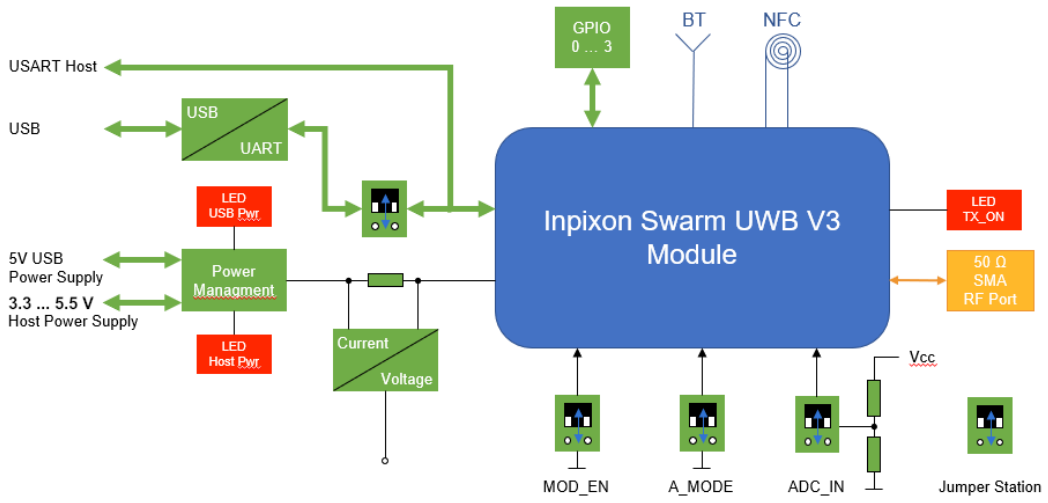

Figure 3-1: Block diagram of Inpixon Swarm UWB V3 Dev Board

Note: Bluetooth and NFC are currently not supported with firmware version 1.0 and will be enabled in the future by firmware update.

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4. Connector Configuration

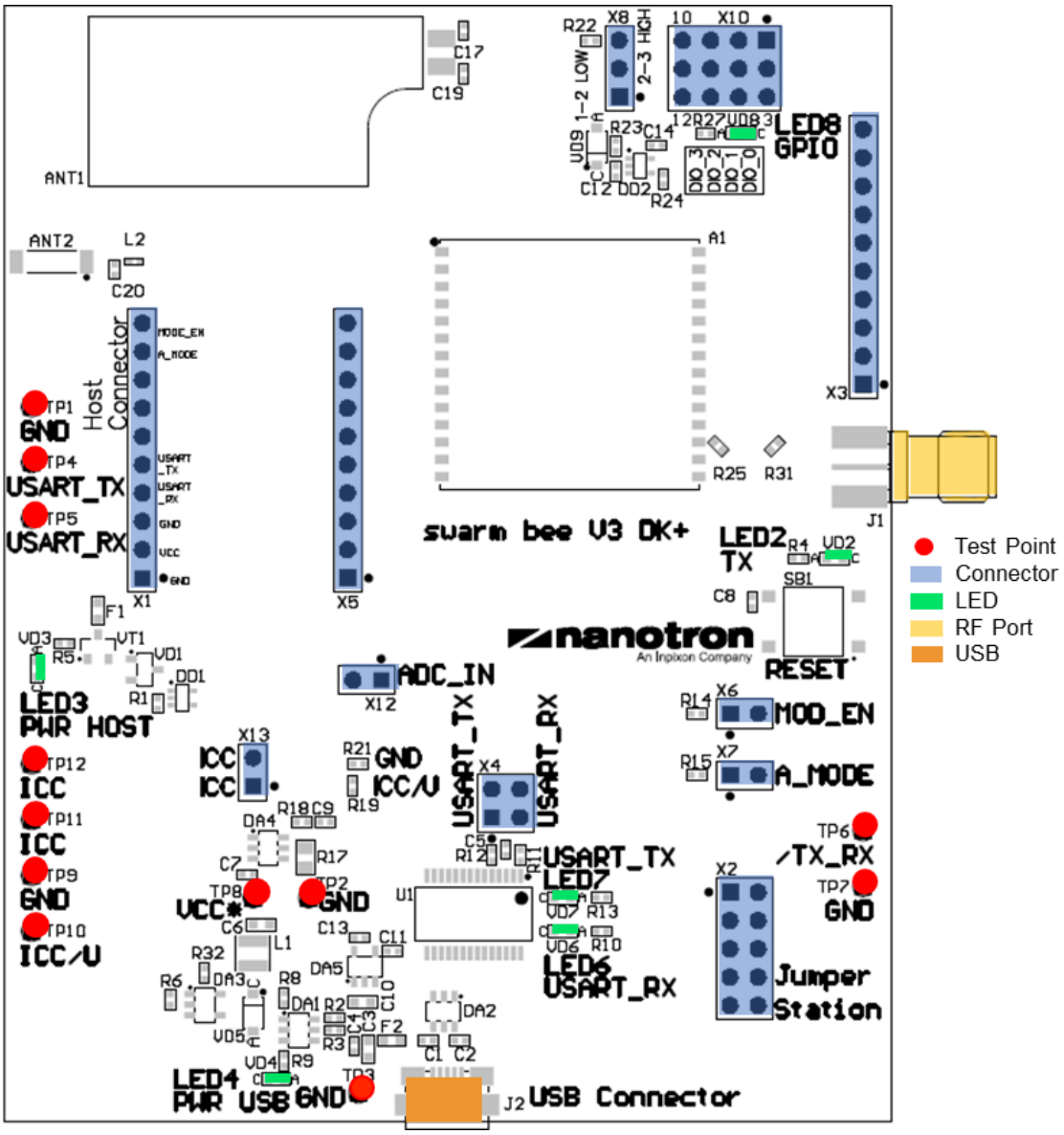

Figure 4-1: Inpixon Swarm UWB V3 Dev Board, assembly and connector configuration

Note: ANT1 and ANT2 are for future use

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Table 4-1: Inpixon Swarm UWB V3 Dev Board connector configuration

Connector No.	Description	Type	Default State
J1	RF port	SMA type, 50 Ohm impedance	Open
J2	USB	micro-USB	Open
X1	Host connector	Pin connector, 10 poles	Open
X2	Jumper station	Pin connector, 2 x 5 poles	Spare jumpers
X3	Inpixon Swarm UWB V3 pin header	Pin connector, 10 poles	Open
X4	USB to Serial bridge	Pin connector, 2 x 2 poles, jumper	Closed
X5	Inpixon Swarm UWB V3 pin header	Pin connector, 10 poles	Open
X6	Enable Inpixon Swarm UWB V3 module	Pin connector, 2 poles, jumper	Open
X7	Enable autonomous mode	Pin connector, 2 poles, jumper	Closed
X8	Pull-up or pull-down bridge	Pin connector, 3 poles, jumper	Open
X9	I/U measurement	Pin connector, 2 poles, jumper	Not installed
X10	GPIO Jumper Matrix	Pin connector, 3 x 4 poles, jumper	Open
X11	SWD connector	Pin box connector, 2 x 10 poles	Not installed
X12	ADC input for measuring supply voltage	Pin connector, 2 poles, jumper	Closed
X13	Measurement of current profile	Pin connector, 2 poles, jumper	Closed

4.1. Connector Description

All electrical parameters except those explicitly stated in this document refer to the ones specified in the Inpixon Swarm UWB V3 Technical Reference.

4.1.1. Connector J1

J1 is a SMA connector with 50 Ohm impedance. It is terminated directly to the RF port of the Inpixon Swarm UWB V3 module. The output power is calibrated that the radiated output spectral power density at the provided antenna is close to but never exceeds -41.3 dBm / MHz.

Note: When using another antenna and to be in accordance with CE, FCC and ISED it is required to adapt the emitted power by the gain of the antenna by using the STOD API command.

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4.1.2. Connector J2

J2 is a standard micro-USB-B connector to connect the Inpixon Swarm UWB V3 Dev Board to a host PC (data and power) or a USB power pack or supply.

4.1.3. Connector X1

The Host Connector serves to connect the serial interface of a host controller to the Inpixon Swarm UWB V3. It can also be used as alternative power supply instead of the USB one. When supplied via pin 2 it takes precedence to the USB power supply. The A_MODE and MOD_EN can also be controlled over this connector.

Table 4-2: X1 connector pin assignment

Pin No.	Description	Type	Module Pin	Comments
1	Ground			
2	Vcc	Supply voltage		+3.3V...+5.5V
3	Ground			
4	USART_RX	Input: Serial receiving line	19	If connected to a Host remove jumpers on X4. See Figure 4-2
5	USART_TX	Output: Serial transmission line	12	
6	Not connected			
7	Not connected			
8	Not connected			
9	A_MODE	Input: Autonomous (high) or host-controlled mode (low)	9	Default high
10	MOD_EN	Input: Module enabled (high) or disable (low)	11	Default high

Note: All levels except Vcc and MODE_EN refer to 3.3 V. MOD_EN refers to Vcc. In any case refer to the Inpixon Swarm UWB V3 Technical Reference.

USART default settings are: 115.2 Kbps, 1 start bit, 8 data bits, 1 stop bit, no parity, no flow control

4.1.4. Connector X2

The Jumper Station is a storage area that serves to park spare jumpers. It has neither electrical nor logical function.

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4.1.5. Connector X3

Table 4-3: X3 connector pin assignment

Pin No.	Description	Type	Module Pin	Comments
1	Ground			
2	ADC_IN	Input: Measures the voltage referred to 3.3 V	21	3.3 V max
3	DIO_0	Input or Output. Can be used for wake-up and interrupt source	22	If connected to an external device remove jumpers on X10. See Figure 4-3
4	DIO_1	Input or Output. Can be used as interrupt source	23	
5	DIO_2	Input or Output. Can be used as interrupt source	24	
6	DIO_3	Input or Output. Can be used as interrupt source	25	
7	USART_TX	Output: Serial transmission line	12	If connected to a Host remove jumpers on X4. See Figure 4-2
8	USART_RX	Input: Serial receiving line	19	
9	TX_ON	Transmitter on (min. on time 50 ms)	26	
10	DIV_COEX	Can be used for co-existence purposes with external BT or Wi-Fi systems	27	

Note: All levels refer to 3.3 V. In any case refer to the Inpixon Swarm UWB V3 Technical Reference.

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4.1.6. Connector X4

The USB to Serial bridge serves to connect or disconnect the USB-to-serial converter to the USART lines. The jumpers shall be removed if a serial interface is connected to the Host connector X1. See Figure 4-2.

Table 4-4: X4 connector pin assignment

Pin No.	Description	Type	Module Pin	Comments
1-2	USART_TX	Output: Serial transmission line	12	If closed do not connect to X1 or X3
3-4	USART_RX	Input: Serial receiving line	19	

USART settings are: 115.2 Kbps, 1 start bit, 8 data bits, 1 stop bit, no parity, no flow control

Note: All levels refer to 3.3 V. In any case refer to the Inpixon Swarm UWB V3 Technical Reference.

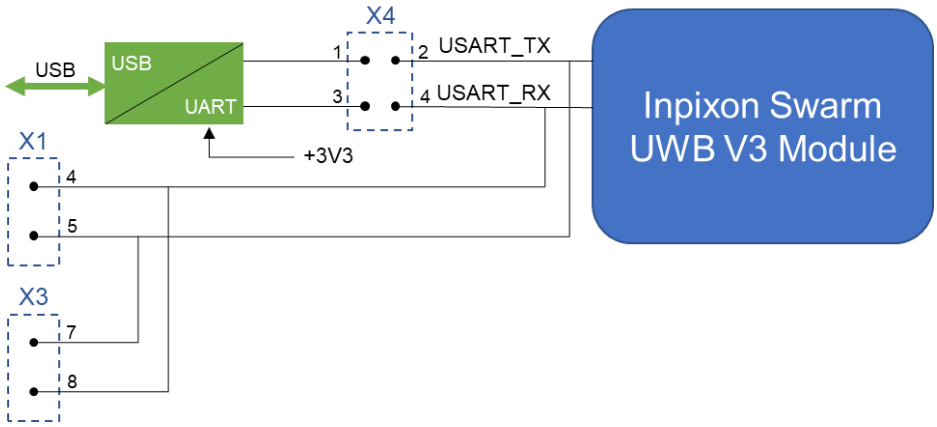

Figure 4-2: USART connectors

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4.1.7. Connector X5

Table 4-5: X5 connector pin assignment

Pin No.	Description	Type	Module Pin	Comments
1	Ground			
2	SYNC	External clock synchronisation	15	For 38.4 MHz of DW1000
3	Reserved		-	Do not use
4	+3V3	Output: µController voltage.	13	Can be used for level shifters
5	MOD_EN	Input: Module enabled (high) or disable (low)	11	
6	\NRST	Input: Resets µController, active (low)	10	
7	A_MODE	Input: Autonomous (high) or Host-controlled mode (low)	9	
8	VIN	Output: Supply voltage of Inpixon Swarm UWB V3 module	7	
9	Reserved		-	Do not use
10	Reserved		-	Do not use

Note: All levels refer to 3.3 V. In any case refer to the Inpixon Swarm UWB V3 Technical Reference.

4.1.8. Connector X6

Is a jumper bridge which enables or disables the Inpixon Swarm UWB V3 module.

Table 4-6: X6 connector pin assignment

Pin No.	Description	Type	Module Pin	Comments
1-2	MOD_EN	Jumper	11	Closed: disabled, Open: enabled

Note: MOD_EN level refers to Vcc. In any case refer to the Inpixon Swarm UWB V3 Technical Reference.

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4.1.9. Connector X7

Is a jumper bridge which sets the Inpixon Swarm UWB V3 module into autonomous or Host-controlled mode.

Table 4-7: X7 connector pin assignment

Pin No.	Description	Type	Module Pin	Comments
1-2	A_MODE	Jumper	9	Closed: Host controlled Open: autonomous mode

Note: All levels refer to 3.3 V. In any case refer to the Inpixon Swarm UWB V3 Technical Reference.

4.1.10. Connector X8

The pull-up or pull-down bridge serves in conjunction with jumper matrix X10 to determine the logical level of the GPIOs if configured as input. See Figure 4-3.

Table 4-8: X8 connector pin assignment

Pin No.	Description	Type	Module Pin	Comments
1-2	Pull-up	+3.3V	-	Logic low
2-3	Pull-down	Ground	-	Logic high

4.1.11. Connector X9

Reserved and for future use.

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4.1.12. Connector X10

This jumper matrix can be used to either set a GPIO pin to logical high or low if configured as input or to display the state of a GPIO through a LED when configured as output. Figure 4-3 shows the principle. The RC element 100K/100nF composes an elementary debouncing circuit.

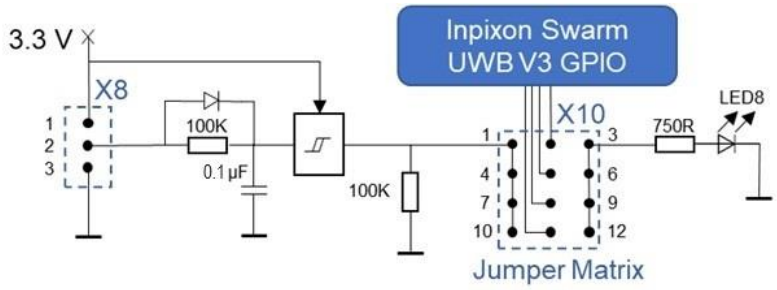

Figure 4-3: Jumper matrix with pull-up and pull-down jumper

How to configure each GPIO is explained in detail in the *swarm* API3.0 User Guide.

Note: For a proper debouncing, always connect the jumper as input on X10 first and then change the polarity on X8. Otherwise, an unpredictable behavior will occur.

4.1.13. Connector X11

Reserved and for future use.

4.1.14. Connector X12

When the jumper is closed, the input voltage of the Inpixon Swarm UWB V3 module can be measured by the µController with the corresponding API 3.0 commands GBAT. If a voltage (max 3.3 V) is injected at pin 2 of X3 leave the connector open.

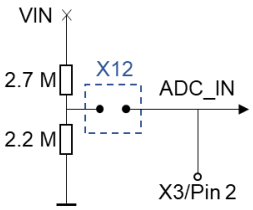

Figure 4-4: Voltage divider

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4.1.15. Connector X13

This jumper bridge when opened allows to connect a current measuring device, like an Amperemeter, in series to the main power supply of the Inpixon Swarm UWB V3 module VIN. It measures the sum of all currents consumed by the module.

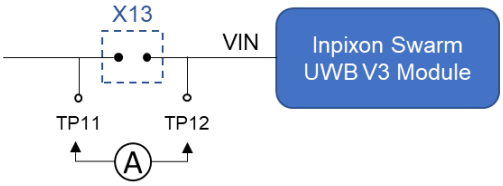

Figure 4-5: Current measurement

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5. Test Points

The Inpixon Swarm UWB V3 Dev Board provides test points for measurements. The test points are suited to connect oscilloscope or multimeter probes.

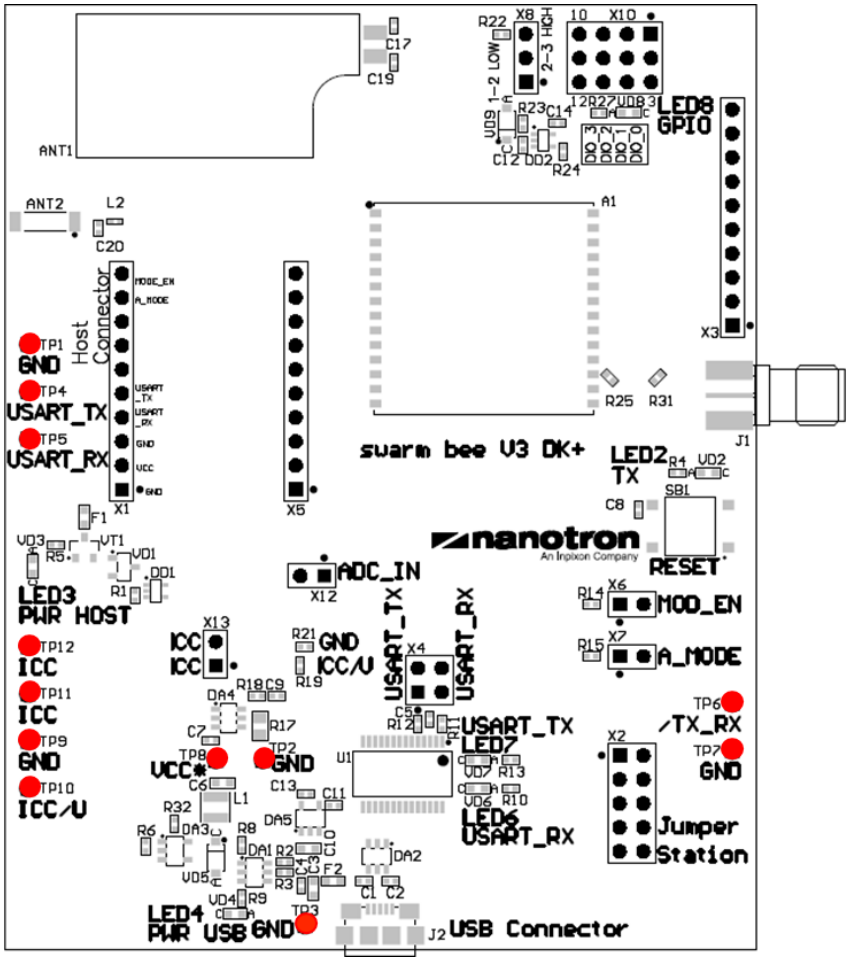

Figure 5-1: Test points position

Table 5-1: Test points pin assignment

TP No.	Description	Function	Comments
TP1	GND	Ground	
TP2	GND	Ground	
TP3	GND	Ground	
TP4	USART_TX	Output: Serial transmission line	
TP5	USART_RX	Input: Serial receiving line	
TP6	SYNC	Input: External clock synchronisation	For 38.4 MHz of DW1000

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TP No.	Description	Function	Comments
TP7	GND	Ground	
TP8	VCC*	Supply voltage	Supply voltage of the *Inpixon* Swarm UWB V3 module applied either on X1 pin2 or on USB
TP9	GND	Ground	
TP10	ICC/U	Supply current converted to voltage	Supply current is converted to a voltage, ratio is 1:10 (100mA/1V), see sect. 5.1
TP11	ICC	Current measurement	Same function as X13, see chap. 4.1.15
TP12	ICC	Current measurement	Same function as X13, see chap. 4.1.15

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5.1. Test point TP10 Current Measurement

On test point 10 (TP10) the supply current of the Inpixon Swarm UWB V3 module is converted to an equivalent voltage. The ratio between the supply current and the equivalent voltage is 100mA/1V. This means, the current of the different operating states of the Inpixon Swarm UWB V3 module like the TX current and the RX current, can be measured at this point. With an oscilloscope, a current profile can be measured over the time, which allows to optimize the power consumption of the module to the needs in relation to the configurable parameters via the API.

Figure 5-2 shows the current consumption of the Inpixon Swarm UWB V3 module at different operating states.

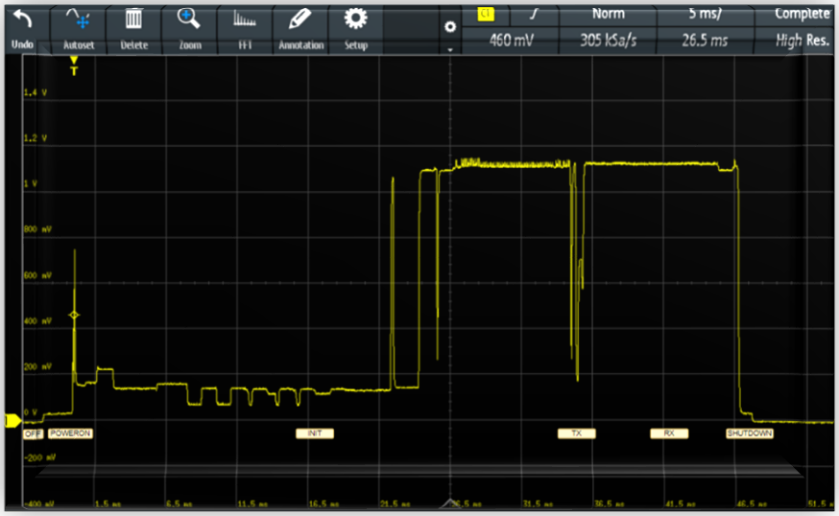

Figure 5-2: Screenshot of a typical Inpixon Swarm UWB V3 module current profile

Table 5-2: Description of operating modes shown in Figure 5-2

State	Description
OFF	Voltage distribution disabled
POWERON	Switching on the voltage distribution
INIT	Initialization of the of the hardware
TX	Transmit
RX	Enable Receiver
SHUTDOWN	Transit into low power mode

6. LEDs

Several LEDs have been placed to display the status of particular functions.

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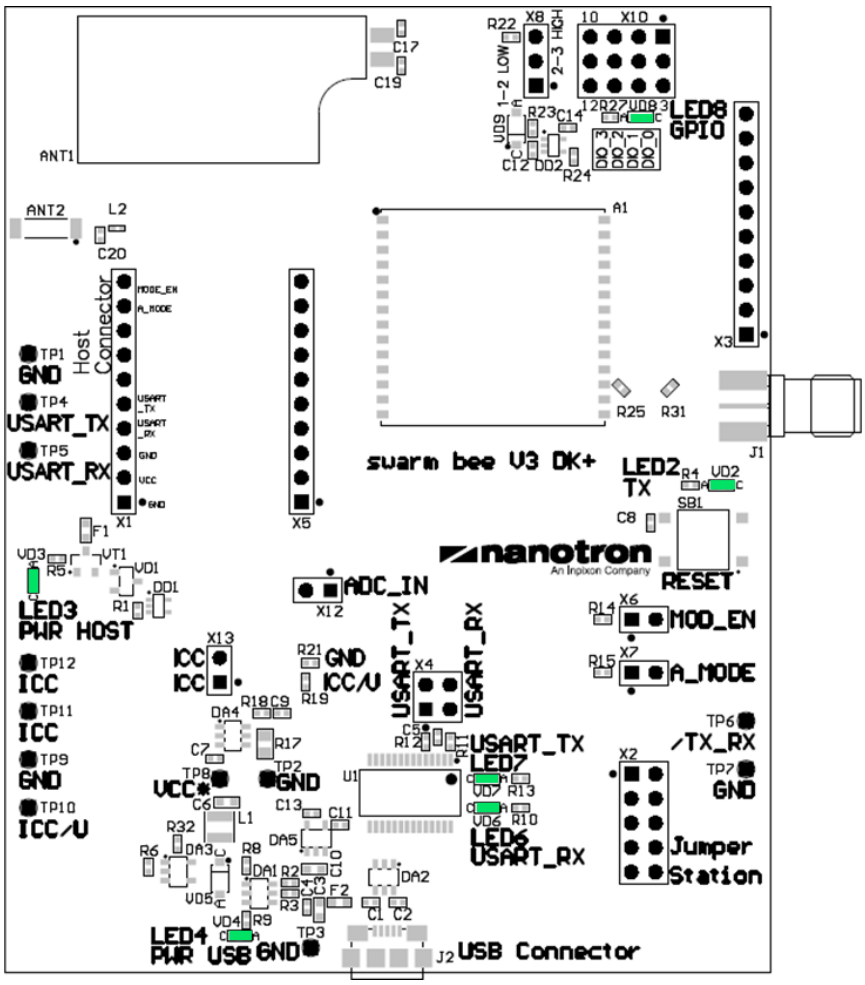

Figure 6-1: LEDs position

Table 6-1: LEDs assignment

TP No.	Description	Function	Comments
LED2	TX_ON	On: RF transmission	Luminescence 50 ms
LED3	PWR Host	External Power connected	PWR Host takes precedence on PWR USB
LED4	PWR USB	USB Power connected	
LED6	USART_RX	Status of serial RX line	
LED7	USART_TX	Status of serial TX line	
LED8	GPIO	If connected to jumper matrix status of the connected GPIO	High: On / Low: Off

7. Dimensions

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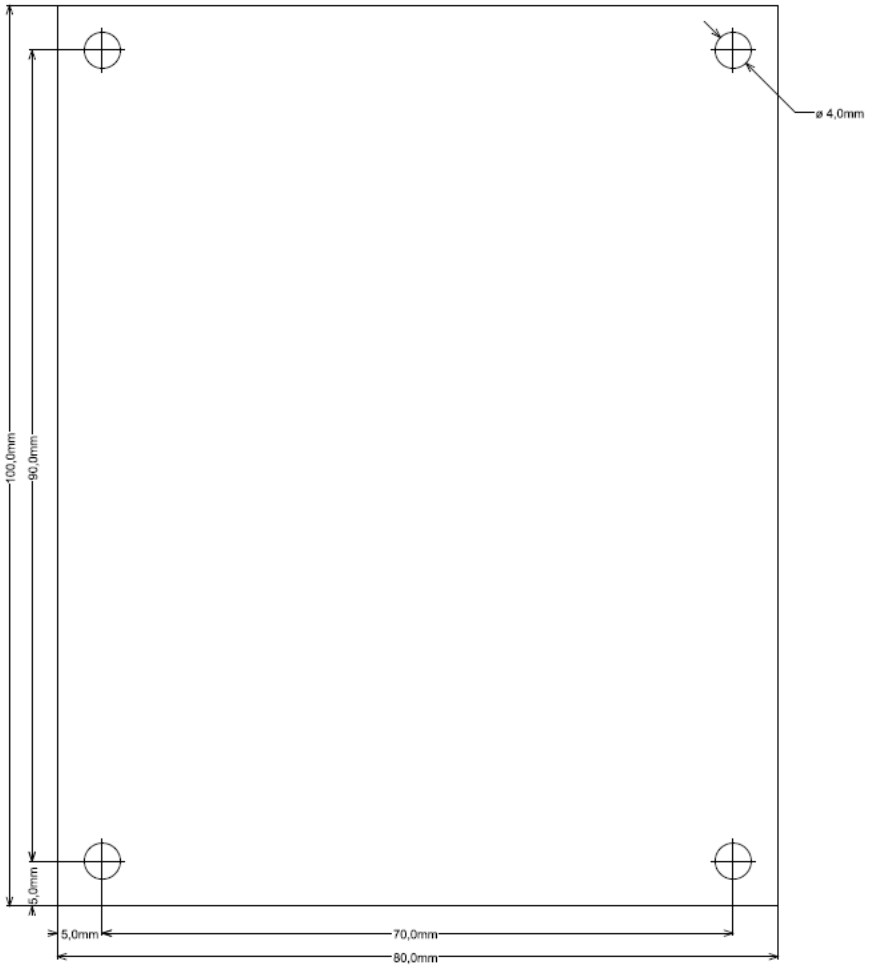

Figure 7-1: Dimensions of the Inpixon Swarm UWB V3 Dev Board

Life Support Policy

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