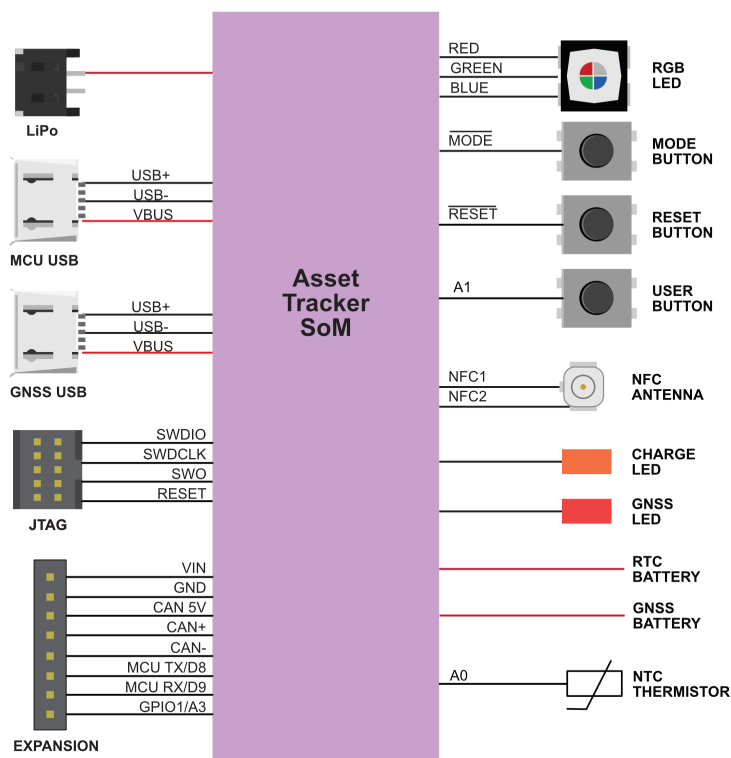# Tracker One⁽⁰⁰⁸⁾

The Tracker One is a ready-to-go Tracker SoM carrier board with optional weatherproof enclosure.

- **Ready to go** with IP67-rated enclosure.
- **GNSS Antenna Onboard:** convenient high-gain GNSS antenna for easy access to GNSS signals.
- **Flexible Power Supply:** easily add asset tracking to most devices. A wide 6-30V power supply copes with most power delivery systems. Also accepts 5V supply via USB-C. LiPo battery connector, charge LED, backup battery for GPS and battery-backed RTC. Supports up to 90V when connecting directly to the carrier board.
- **High-precision Thermistor** with accuracy to 1%.
- **Extensible:** IP67-rated M8 connector includes CAN Bus, UART, GPIO, and power for simple expansion.
- **USB-C** for flashing, debugging and power with higher charging rates than Micro-USB or for use without an internal battery.
- **RGB LED** for use as both a user-configurable device as well as Particle status information.

Block Diagram

LiPo

MCU USB
USB+
USB-
VBUS

GNSS USB
USB+
USB-
VBUS

JTAG
SWDIO
SWDCLK
SWO
RESET

EXPANSION
VIN
GND
CAN 5V
CAN+
CAN-
MCU TX/D8
MCU RX/D9
GPIO1/A3

Asset Tracker SoM

RED
GREEN
BLUE
RGB LED

MODE
MODE BUTTON

RESET
RESET BUTTON

A1
USER BUTTON

NFC1
NFC2
NFC ANTENNA

CHARGE LED

GNSS LED

RTC BATTERY

GNSS BATTERY

A0
NTC THERMISTOR

Description

Num	ID	Description
1		GNSS Antenna
2		Wi-Fi Antenna (mounted on side of case)
3		NFC Antenna (mounted on lid) [1]
4		Power and I/O connector (B8B-PH)
5		BLE Antenna (mounted on side of case)
6		LiPo Connector
7		M8 8-pin male connector (mounted on side of case)
8		USB-C [2]
9		NFC connector (connects to NFC antenna on lid)
10		RGB Status LED
11	GNSS LED	GNSS Status LED
12	CHRG	LiPo charge status LED
13	USER	User Button
14	RESET	RESET Button
15	MODE	MODE button
16		Cellular Antenna (mounted on side of case)
17		USB-C switch [3]
18		Thermistor
19		JTAG connector (not populated) [4]

[1]When disassembling the Tracker One, be careful when removing the lid. The NFC antenna and LiPo battery are mounted on the lid, and the NFC antenna cable is short. Carefully remove the NFC U.FL connector before fully removing the lid of the case. Reconnect to (9).

[2]The USB-C connector is normally connected to the nRF52840 MCU. It can be connected to the GNSS module by using the USB-C switch (17).

[3]The normal state is 1-4 OFF and 5-6 ON to connect the USB to the nRF52840. To connect the USB-C to the u-blox GNSS, turn 1-4 ON and 5-6 OFF. Disconnect the USB-C and the LiPo battery before changing the switch settings.

[4]The JTAG connector is not populated at the factory. The connector is a [Samtec FTSH-105-01-F-DV-K](#) 10 position (2x5), 1.27mm pitch.

M8 Pin	Function	Function	Function	I/O	Color
1	CAN_P			IO^2	Yellow
2	VIN^3			I	Red
3	Analog A3		GPIO D3	IO^1	White
4	Serial1 RX	Wire3 SDA	GPIO D8	IO^1	Green
5	Serial1 TX	Wire3 SCL	GPIO D9	IO^1	Brown
6	CAN_5V^4		CAN_PWR	O	Orange
7	CAN_N			IO^2	Blue
8	GND				Black

The IP67 M8, 8-pin, male pins with threaded barrel connector is accessible from the outside of the enclosure.
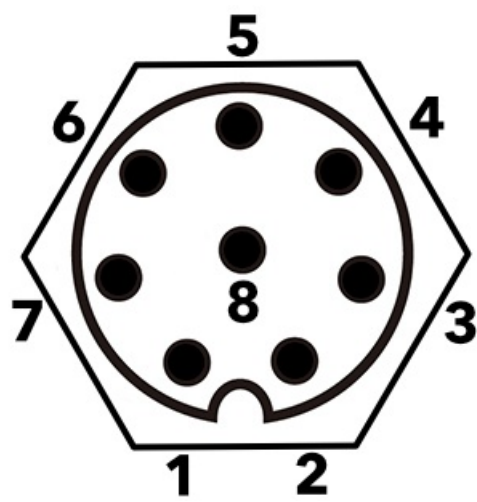
View as looking into the M8 connector on the outside of the enclosure.

Note: Version 003 and earlier of this datasheet had a different pin numbering for M8 connector that didn't match the connector manufacturer's numbering. Only the numbering has changed; the function of the pin at a given location is unchanged and the change should not affect existing designs.

[1]MCU GPIO is limited to 3.3V maximum.

[2]CAN Bus specifications can be found in the Tracker SoM datasheet. CAN Bus termination is provided on the carrier board.

[3]6.0 to 30 VDC at 2A when using the M8 connector. 6.0 - 90 VDC at 2A when connecting directly to the board.

[4]5V, 400 mA maximum. Controlled by the CAN_PWR GPIO.

Additional information on M8 cables and connectors can be found in the M8 Accessories Datasheet.

CARRIER BOARD POWER AND I/O CONNECTOR

The connector on the carrier board itself is is a JST B8B-PH-SM4-TB(LF)(SN), 8-position, 2mm pitch, male pins, shrouded. The mating connector is the JST PHR-8. The female sockets are available plain, with leads, and in pre-manufactured ribbon cable formats.

PHR-8 Pin	M8 Pin	Function	Color
1	2	VIN	Red
2	1	CAN_P	Yellow
3	7	CAN_N	Blue
4	6	CAN_5V	Orange
5	5	TX_SCL_D9	Brown
6	4	TX_SDA_D8	Green
7	3	A3	White
8	8	GND	Black

ADDITIONAL PERIPHERALS

Signal	Device OS	Description
THERM	A0	NTC Thermistor
USER	A1	USER button
GNSS_LOCK	A2	GNSS lock indicator
GPIO1	A3	GPIO on power and I/O connector
MCU TX	TX	MCU serial TX, GPIO D9, Wire3 SCL
MCU RX	RX	MCU serial RX, GPIO D8, Wire3 SDA

Note: While the USER button exists inside the Tracker One, the Tracker One is a sealed unit and opening it will void the warranty and may affect certifications, thus it is not practical to use. It can be used with the Tracker Carrier Board.

POWERING THE TRACKER CARRIER BOARD

There are several options for powering the carrier board:

The **MCU USB** connector (USB-C). If using a laptop with a USB-A to USB-C cable and a 500 mA USB port, you should also use the LiPo battery. With an true USB-C port and cable, or a 2A tablet charger, you can power only by USB.

The **VIN** connector (6 to 30 VDC at 2A on the M8 connector, or 6 to 90 VDC at 2A to the B8B-PH connector on the board). This is useful with an external power supply.

The **LiPo** connector. This is typically used with a LiPo battery.

USB CONNECTOR

There is a single USB C connector on the carrier board. On the Tracker One, this exits the enclosure and is IP67 rated.

A set of DIP switches on the carrier board allow this port to be connected to either the MCU (normal) or u-blox GNSS (for firmware updates). The normal state is 1-4 OFF and 5-6 ON to connect the USB to the nRF52840. To connect the USB-C to the u-blox GNSS, turn 1-4 ON and 5-6 OFF. Disconnect the USB-C and the LiPo battery before changing the switch settings.

LED INDICATORS

The **RGB LED** default behavior is:

- Red breathing: Attempting to connect to the cellular network
- Yellow breathing: Connecting to the cloud, weaker cellular signal
- Green breathing: Connecting to the cloud, good cellular signal
- Yellow solid: Connected to the cloud, weaker cellular signal
- Green solid: Connected to the cloud, good cellular signal

Alternatively the LED can be configured to the typical Particle color scheme (blinking green, blinking cyan, breathing cyan) via device or cloud configuration. Custom device firmware can provide other color schemes if desired.

The **CHRG** LED indicates the charge status:

- Off: Not charging or no power
- On: Charging
- Blinking: Charge fault
- Flickering: No battery

The **GNSS** LED indicates the GNSS fix status:

- Off: GNSS is powered off.
- Blinking (1 Hz): Attempting to get a GNSS fix
- On: Has a GNSS fix.

Antennas

Antenna	Location
GNSS	Carrier Board (faces top of case)
Wi-Fi	Left Side
BLE	Left Side
NFC	Top
Cellular	Right Side

As the GNSS antenna faces the top of the case, you also want the top of the case facing the sky to the greatest extent possible. You will likely be be unable to get a GNSS lock with the top facing down.
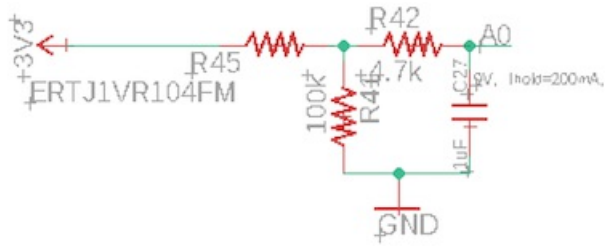
Tracker One Schematics

Will be provided at a later date.

Peripheral Details

THERMISTOR

The Tracker Carrier Board contains a 100K NTC thermistor, connected to A0. It is a Panasonic ERT-J1VR104FM connected high-side.

It can be read using the getTemperature() API.

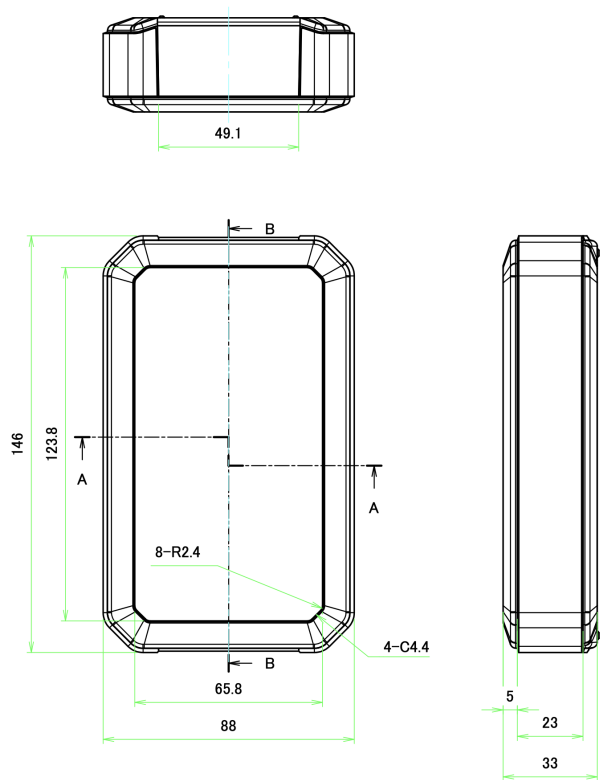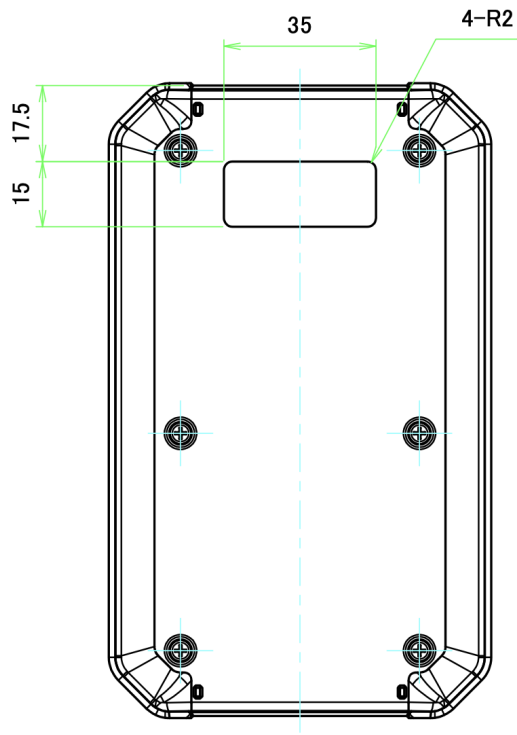# Mechanical specifications

DIMENSIONS AND WEIGHT

Parameter	Value	Units
Width	88	mm
Length (case only)	146	mm
Length (including M8 connector)	154	mm
Thickness	33	mm
Weight		g

Weight will be provided at a later date.

Case Dimensions (mm):

Bottom:

35

4–R2

17.5

15

Maximum Carrier Board Dimensions (mm):

49.1

B

146

123.8

A

A

8–R2.4

4–C4.4

B

65.8

88

5

23

33
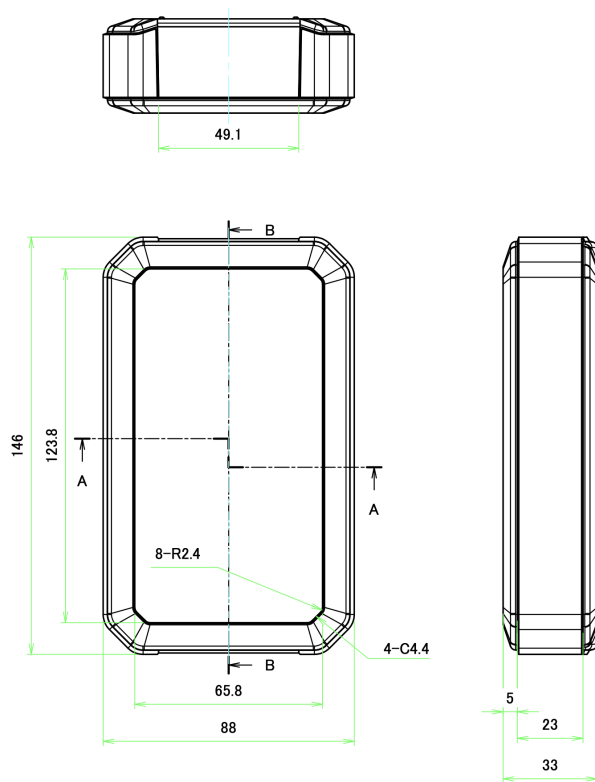
Note: The Tracker Carrier Board has a smaller bottom tab to provide space for the M8 connector.

Product Handling

ESD PRECAUTIONS

The Tracker SoM contains highly sensitive electronic circuitry and is an Electrostatic Sensitive Device (ESD). Handling an module without proper ESD protection may destroy or damage it permanently. Proper ESD handling and packaging procedures must be applied throughout the processing, handling and operation of any application that incorporates the module. ESD precautions should be implemented on the application board where the B series is mounted. Failure to observe these precautions can result in severe damage to the module!

DISPOSAL

This device must be treated as Waste Electrical & Electronic Equipment (WEEE) when disposed of.

Any WEEE marked waste products must not be mixed with general household waste, but kept separate for the treatment, recovery and recycling of the materials used. For proper treatment, recovery and recycling; please take all WEEE marked waste to your Local Authority Civic waste site, where it will be accepted free of charge. If all consumers dispose of Waste Electrical & Electronic Equipment correctly, they will be helping to save valuable resources and preventing any potential negative effects upon human health and the environment of any hazardous materials that the waste may contain.

Ordering Information

SKU	Description	Packaging
ONE402M	Tracker One LTE M1/2G (NorAm), [x1]	Each
ONE523M	Tracker One LTE CAT1/3G/2G (Europe), [x1]	Each
TCAR	Tracker Carrier Board, [x1]	Each

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Revision history

Revision	Date	Author	Comments
pre1	2020 Apr 20	RK	Preview Release1
pre2	2020 May 12	RK	Added partial dimensions
001	2020 Jun 29	RK	First release
002	2020 Jun 30	RK	CAN 5V is limited to 400 mA, not 500 mA
003	2020 Jul 16	RK	Corrected M8 pinouts
004	2020 Aug 06	RK	Corrected M8 pin numbering
005	2020 Aug 09	RK	Updated VIN voltages
006	2020 Aug 10	RK	Updated carrier board diagram
007	2020 Sep 01	RK	Added antenna diagram
008	2020 Sep 08	RK	Corrected USB connector description