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Tracker One

The Tracker One is a ready-to-go Particle gateway device with a Tracker SoM carrier board and 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 with charge LED. 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.
- **RGB LED** for use as both a user-configurable device as well as Particle status information.

Particle gateway device like the Monitor One and Tracker One are designed to be used off-the-shelf to interface to other devices and sensors using standard protocols such as CAN bus, I2C, and serial.

MODEL COMPARISON

| | ONE404 | ONE402 | ONE524 | ONE523 | | :--- | :---: | :---: | :---: | :---: | :---: | | Region | NorAm | NorAm | EMEAA | Europe | | EtherSIM | ✓ | | ✓ | | | Supply Secure | ✓ | | ✓ | | | Lifecycle | GA | Deprecated | GA | Deprecated |

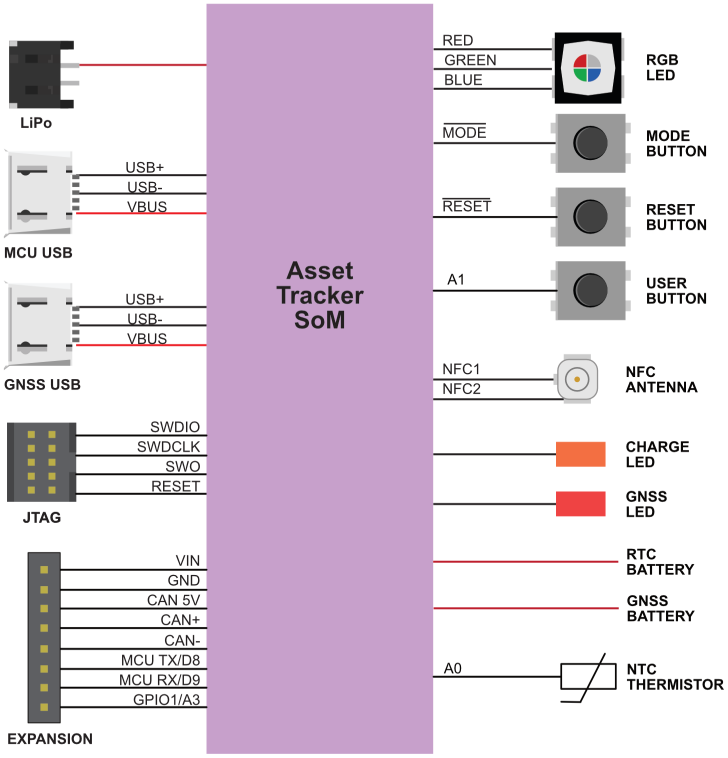
- EtherSIM devices generally have a larger number of carriers and more may be added in the future

- NorAm: North America (United States, Canada, and Mexico)
- EMEAA: Europe, Middle East, Africa, and Asia (not all countries supported)
- See the Carrier list for specific carrier and country compatibility
- See the Supply secure FAQ for more information
- See Lifestyle stages for more information

DEVICE OS SUPPORT

For information on upgrading Device OS, see Version information. For the latest version shipped from the factory, see Manufacturing firmware versions page. See also Long Term Support (LTS) releases.

Block diagram



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).

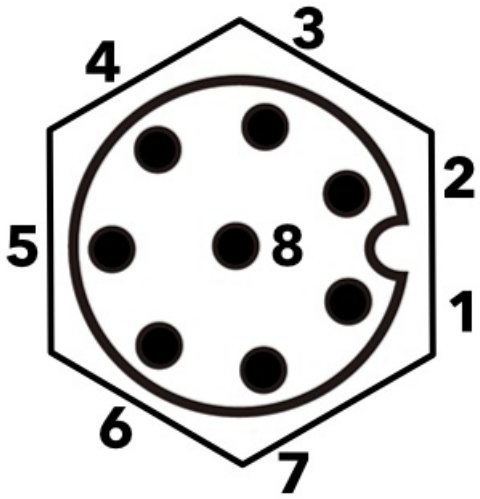
[3]The normal state is 1-4 OFF and 5-6 ON to connect the USB to the nRF52840. To connect the USB-C to the u-blox GNSS, turn 1-4 ON and 5-6 OFF. Disconnect the USB-C and the LiPo battery before changing the switch settings.

[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.

POWER AND I/O CONNECTOR (M8)

M8 Pin	Function	Function	Function	I/O	Color
1	CAN_P / CANH			IO[2]	Yellow
2	VIN[3]			I	Red
3	Analog A3		GPIO D3	IO[1]	White
4	Serial1 RX	Wire3 SDA	GPIO D9	IO[1]	Green
5	Serial1 TX	Wire3 SCL	GPIO D8	IO[1]	Brown
6	CAN_5V[4]		CAN_PWR	O	Orange
7	CAN_N / CANL			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.

[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, 370 mA maximum. Controlled by the CAN_PWR GPIO.

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

You must enable CAN_5V in order to use GPIO on M8 pins 3, 4, and 5 (A3, D9/RX/SDA, D8/TX/SCL) on the Tracker One. If CAN_5V is not powered, these pins are isolated from the MCU starting with version 1.1 of the Tracker One/Tracker Carrier Board (September 2020 and later). This is necessary to prevent an issue with shipping mode, see technical advisory note TAN002.

Note that CAN bus is differential and consists of two lines:

- CAN_P (positive), CANH (high), or CAN+
- CAN_N (negative), CANL (low), or CAN-

As the signals are differential you don't need to connect GND for CAN bus, but you do still need to connect it for Serial, I2C, or GPIO.

I/O CHARACTERISTICS (M8)

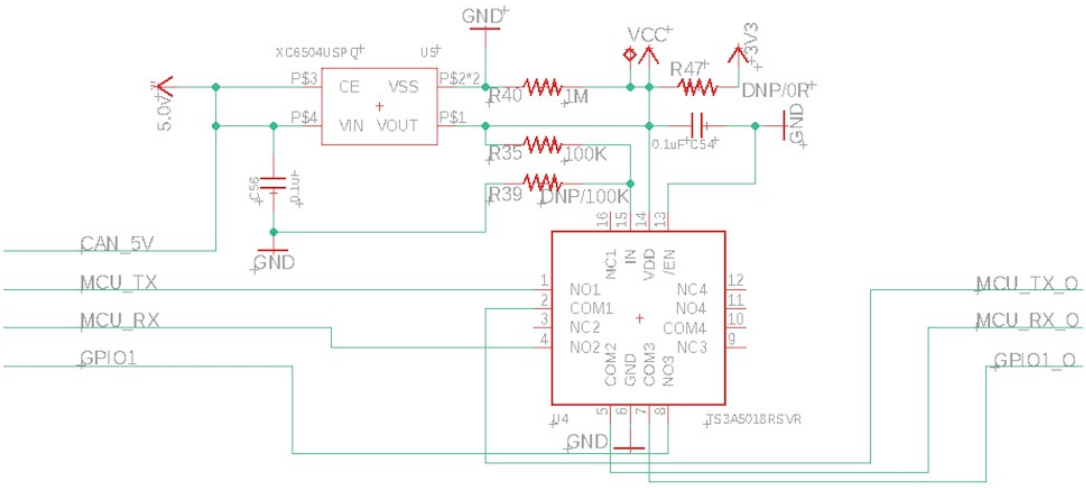
The three GPIO and port pins (A3/D3, RX/SDA/D9, TX/SCL/D8) have the following characteristics:

Symbol	Parameter	Min	Typ	Max	Unit
VIH	Input high voltage	0.7 xVDD		VDD	V
VIL	Input low voltage	VSS		0.3 xVDD	V
VOH,SD	Output high voltage, standard drive, 0.5 mA, VDD ≥1.7	VDD - 0.4		VDD	V
VOH,HDH	Output high voltage, high drive, 5 mA, VDD >= 2.7 V	VDD - 0.4		VDD	V
VOH,HDL	Output high voltage, high drive, 3 mA, VDD >= 1.7 V	VDD - 0.4		VDD	V
VOL,SD	Output low voltage, standard drive, 0.5 mA, VDD ≥1.7	VSS		VSS + 0.4	V
VOL,HDH	Output low voltage, high drive, 5 mA, VDD >= 2.7 V	VSS		VSS + 0.4	V
VOL,HDL	Output low voltage, high drive,3 mA, VDD >= 1.7 V	VSS		VSS + 0.4	V
IOL,SD	Current at VSS+0.4 V, output set low, standard drive, VDD≥1.7	1	2	4	mA
IOL,HDH	Current at VSS+0.4 V, output set low, high drive, VDD >= 2.7V	6	10	15	mA
IOL,HDL	Current at VSS+0.4 V, output set low, high drive, VDD >= 1.7V	3			mA
IOH,SD	Current at VDD-0.4 V, output set high, standard drive, VDD≥1.7	1	2	4	mA
IOH,HDH	Current at VDD-0.4 V, output set high, high drive, VDD >= 2.7V	6	9	14	mA
IOH,HDL	Current at VDD-0.4 V, output set high, high drive, VDD >= 1.7V	3			mA
RPU	Pull-up resistance	11	13	16	kΩ
RPD	Pull-down resistance	11	13	16	kΩ

- GPIO default to standard drive (2mA) but can be reconfigured to high drive (9mA) in Device OS 2.0.0 and later using the `pinSetDriveStrength()` function.

The Tracker One has a TI TS3A5018 Quad SPDT Analog Switch on the three GPIO pins (A3, D9/RX/SDA, D8/TX/SCL). The switch is normally open, and is closed when the `CAN_5V` is powered. By default, Tracker Edge enables `CAN_5V` when in normal operating mode and turns it off during sleep, however this behavior can be changed by using `enableIoCanPower()` and `enableIoCanPowerSleep()` in the `TrackerConfiguration` object.

The circuit looks like this:



Because this is an analog switch, the nRF52840 current limitations, 2 mA in standard drive (the default), and 9 mA in high drive also apply on the M8 side of the analog switch. The switch is rated up to 300 MHz, higher than the highest UART or I2C baud rate. The 3.3V recommended maximum for GPIO also applies on the M8 connector.

The CAN bus has a separate hardware transceiver and is not considered to be GPIO and does not have a 3.3V limitation.

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_D8	Brown
6	4	RX_SDA_D9	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 D8, Wire3 SCL
MCU RX	RX	MCU serial RX, GPIO D9, 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:

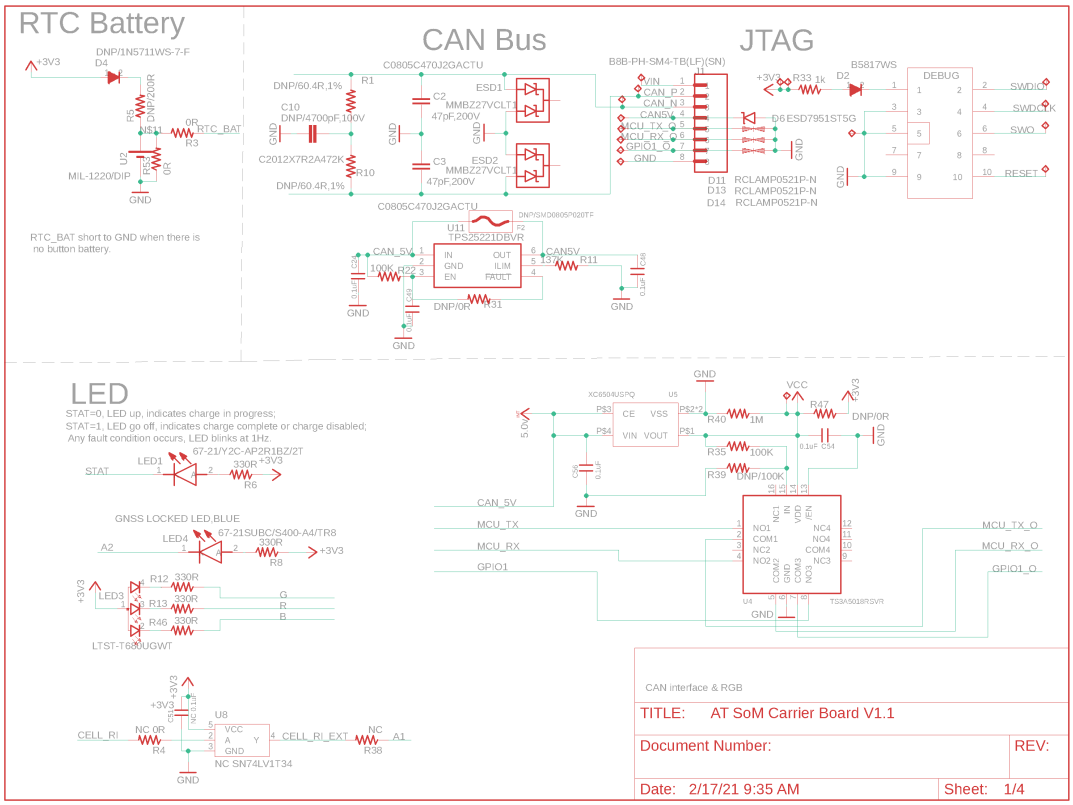
- Off: GNSS is powered off.
- Blinking (1 Hz): Attempting to get a GNSS fix
- On: Has a GNSS fix.

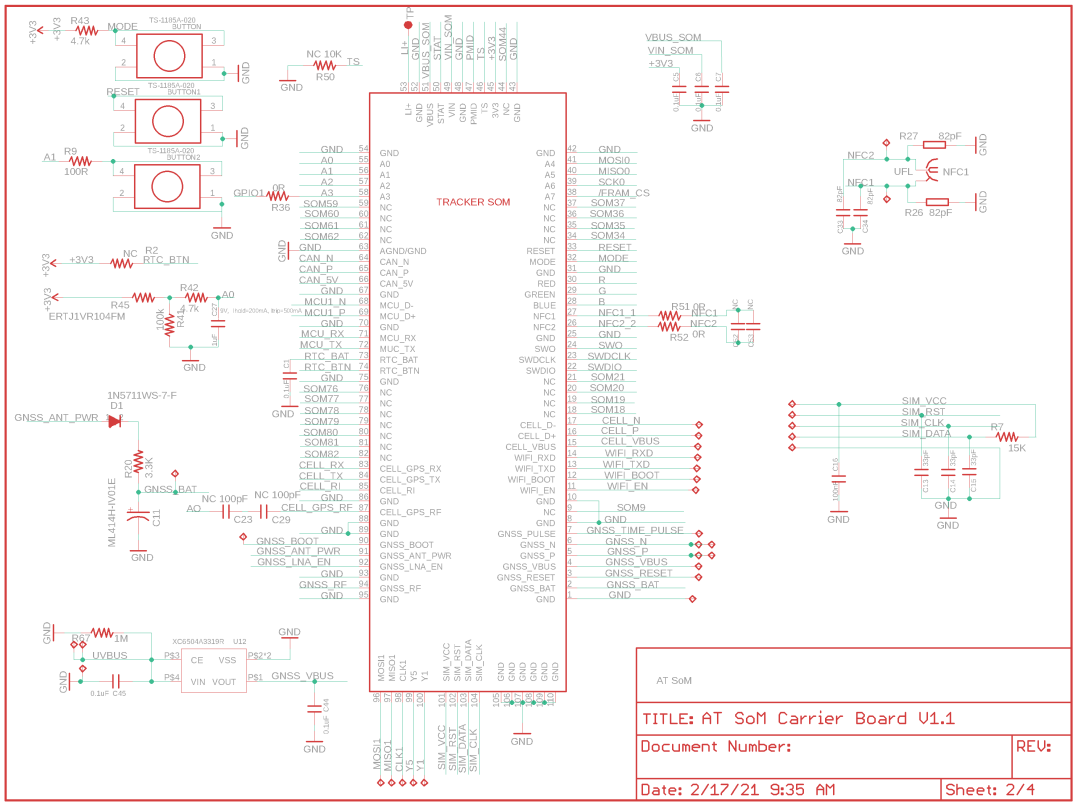
Antennas

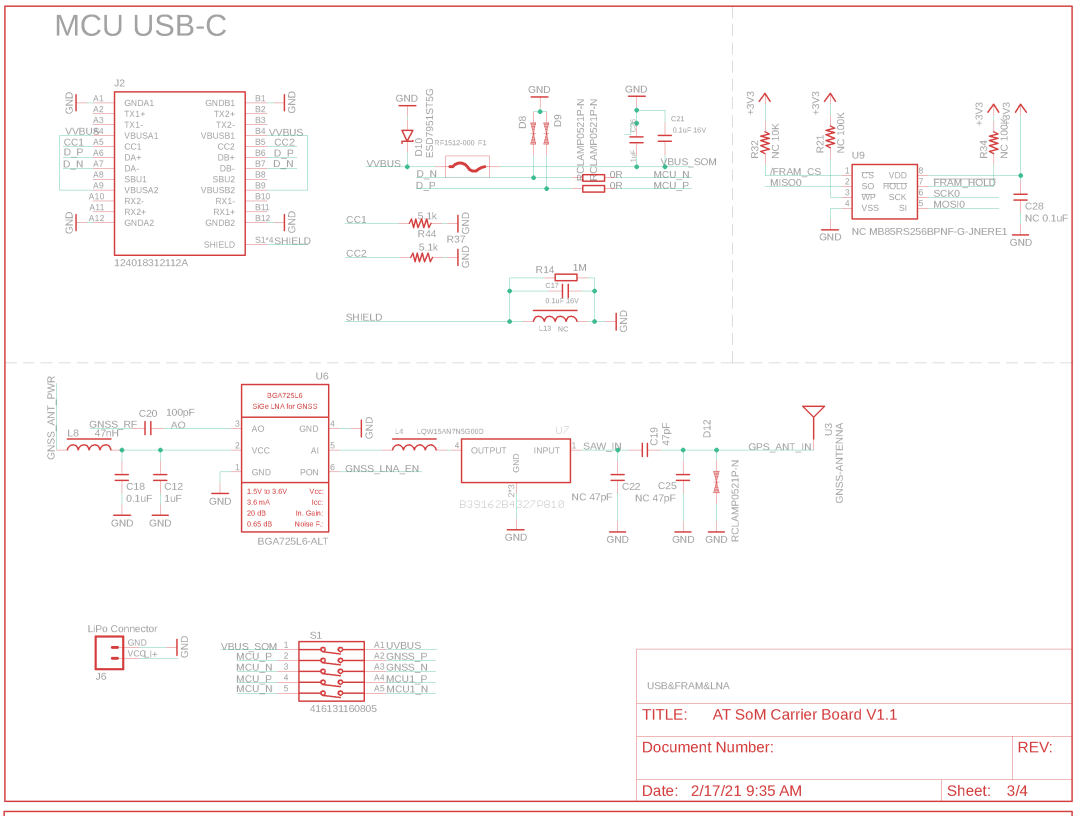
Antenna	Location
GNSS	Carrier Board (faces top of case)
Wi-Fi	Left Side
BLE	Left Side
NFC	Top
Cellular	Right Side

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





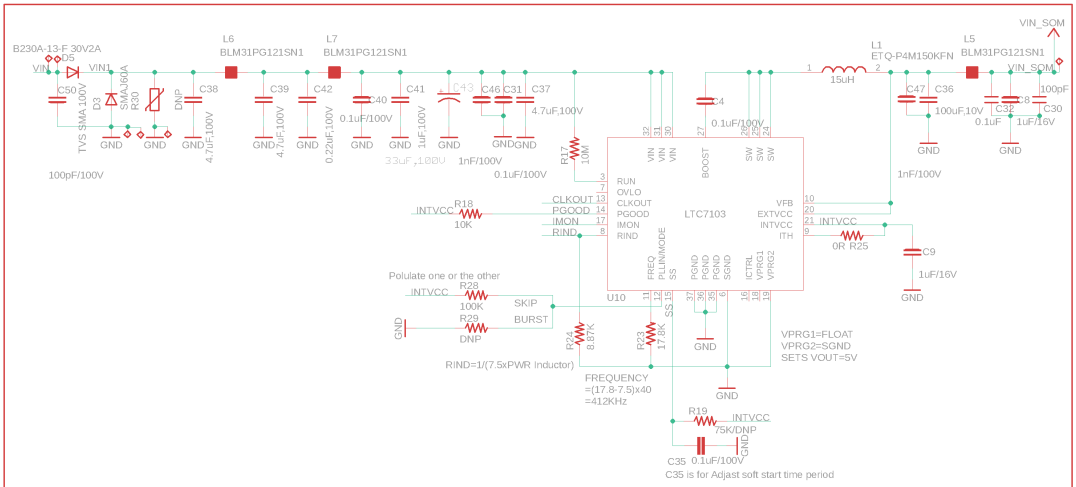


USB&FRAM&LNA

TITLE: AT SoM Carrier Board V1.1

Document Number: REV:

Date: 2/17/21 9:35 AM Sheet: 3/4



POWER

TITLE: AT SoM Carrier Board V1.1

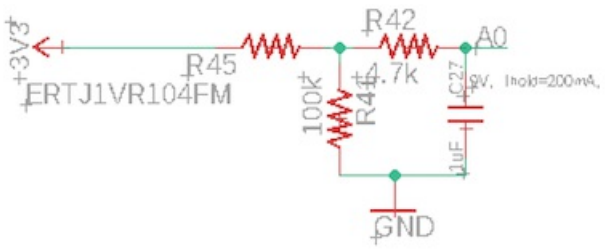
Document Number: REV:

Date: 2/17/21 9:35 AM Sheet: 4/4

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. Note that this is the temperature on the board, within the enclosure, and will typically be several degrees warmer than the ambient temperature.

Design files

The Tracker Carrier Board in the Tracker One is open-source and the Eagle CAD design files are available in GitHub:

https://github.com/particle-iot/tracker-hardware

Mechanical specifications

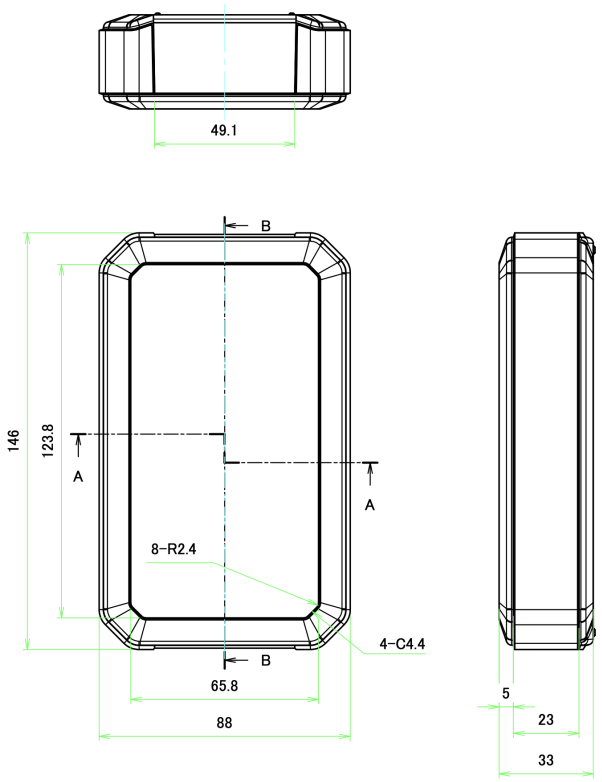
OPERATING TEMPERATURE

Parameter	Minimum	Maximum	Units
Operating temperature	-10	60	°C
Battery charging enabled	0	50	°C

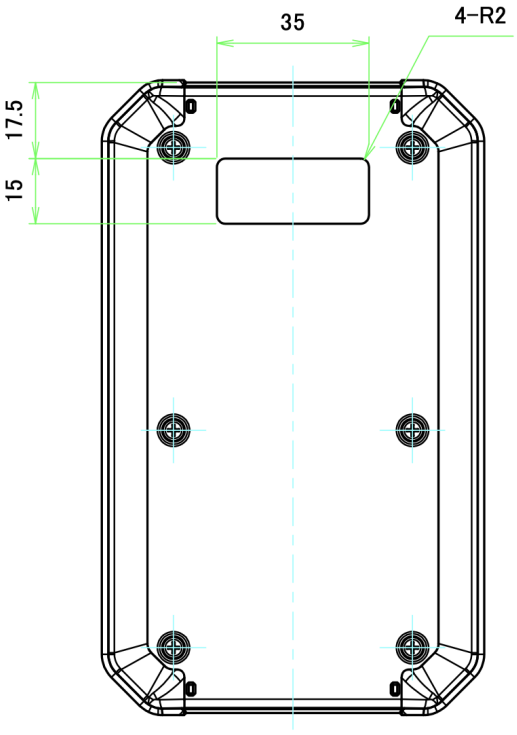
DIMENSIONS AND WEIGHT

Parameter	Value	Units
Width	88	mm
Length (case only)	146	mm
Length (including M8 connector)	154	mm
Thickness	33	mm
Weight	290	g

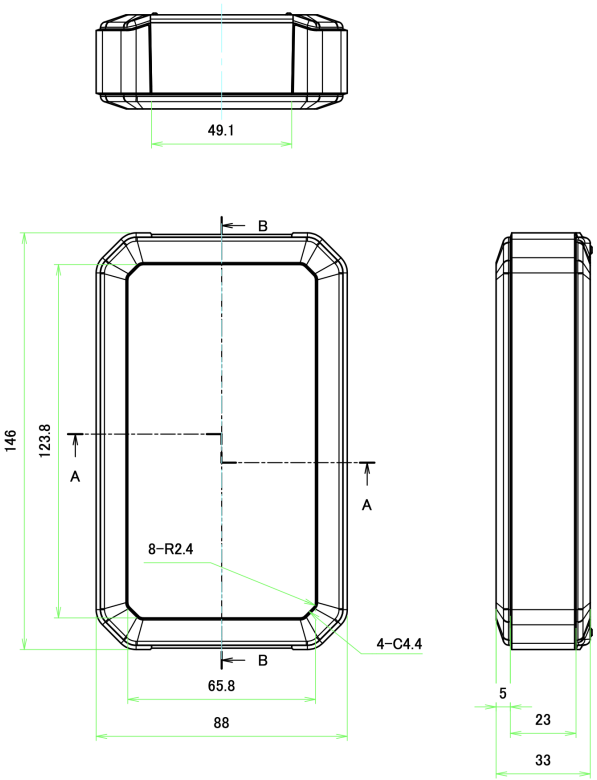
Case Dimensions (mm):



Bottom:



Maximum Carrier Board Dimensions (mm):



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

3D MODELS

3D models of the Tracker One enclosure are available in the hardware-libraries Github in step format.

POWER CONSUMPTION (TRACKER ONE ONE402 AND ONE404)

Parameter	Symbol	Min	Typ	Peak	Unit
Operating Current (uC on, peripherals and radio disabled)	$I_{startup}$				mA
Operating Current (uC on, cellular connecting to cloud)	$I_{cell_conn_cloud}$				mA
Operating Current (uC on, cellular connected but idle)	I_{cloud_idle}				mA
Operating Current (uC on, cellular connected and transmitting)	I_{cloud_pub}				mA
STOP mode sleep, GPIO wake-up	I_{stop_gpio}	911	1140	1530	uA
STOP mode sleep, analog wake-up	I_{stop_analog}	920	1120	1480	uA
STOP mode sleep, RTC wake-up	I_{stop_intrtc}	919	1130	1500	uA
STOP mode sleep, BLE wake-up, advertising	$I_{stop_ble_adv}$	136	1190	2880	uA
STOP mode sleep, BLE wake-up, connected	$I_{stop_ble_conn}$	772	1180	1790	uA
STOP mode sleep, serial wake-up	I_{stop_usart}	993	1120	1510	uA
STOP mode sleep, cellular wake-up	I_{stop_cell}	11.2	17.3	116	mA
STOP mode sleep, IMU wake-up	I_{stop_imu}	850	1150	1590	uA
STOP mode sleep, CAN wake-up	I_{stop_can}	981	1200	1600	uA
STOP mode sleep, GPS wake-up	I_{stop_gps}	29.3	36.1	50.2	mA
ULP mode sleep, GPIO wake-up	I_{ulp_gpio}		201	552	uA
ULP mode sleep, analog wake-up	I_{ulp_analog}		190	593	uA
ULP mode sleep, RTC wake-up	I_{ulp_intrtc}		188	558	uA
ULP mode sleep, BLE wake-up, advertising	$I_{ulp_ble_adv}$		270	2150	uA
ULP mode sleep, BLE wake-up, connected	$I_{ulp_ble_conn}$		258	990	uA
ULP mode sleep, serial wake-up	I_{ulp_usart}	638	842	1200	uA
ULP mode sleep, cellular wake-up	I_{ulp_cell}	13.9	16.9	86.0	mA
ULP mode sleep, IMU wake-up	I_{imu_imu}		225	642	uA
ULP mode sleep, CAN wake-up	I_{can_can}	75.3	270	631	uA
ULP mode sleep, GPS wake-up	I_{ulp_gps}	28.0	35.3	49.5	mA
HIBERNATE mode sleep, GPIO wake-up	I_{hib_gpio}		161	564	uA
HIBERNATE mode sleep, analog wake-up	I_{hib_analog}		151	557	uA
HIBERNATE mode sleep, external RTC wake-up	I_{hib_extrtc}		151	562	uA
HIBERNATE mode sleep, IMU wake-up	I_{hib_imu}		185	669	uA
HIBERNATE mode sleep, CAN wake-up	I_{hib_can}		230	636	uA

[1]The min, and particularly peak, values may consist of very short transients. The typical (typ) values are the best indicator of overall power consumption over time. The peak values indicate the absolute minimum capacity of the power supply necessary, not overall consumption.

POWER CONSUMPTION (TRACKER ONE ONE523 AND ONE524)

Parameter	Symbol	Min	Typ	Peak	Unit
Operating Current (uC on, peripherals and radio disabled)	$I_{startup}$	24.2	132	689	mA
Operating Current (uC on, cellular connecting to cloud)	$I_{cell_conn_cloud}$	51.2	112	594	mA
Operating Current (uC on, cellular connected but idle)	I_{cloud_idle}	50.9	60.2	197	mA
Operating Current (uC on, cellular connected and transmitting)	I_{cloud_pub}	57.2	173	702	mA
STOP mode sleep, GPIO wake-up	I_{stop_gpio}	778	1010	1390	uA
STOP mode sleep, analog wake-up	I_{stop_analog}	740	995	1390	uA
STOP mode sleep, RTC wake-up	I_{stop_intrtc}	758	993	1420	uA
STOP mode sleep, BLE wake-up, advertising	$I_{stop_ble_adv}$		1050	2500	uA
STOP mode sleep, BLE wake-up, connected	$I_{stop_ble_conn}$	521	1050	1920	uA
STOP mode sleep, serial wake-up	I_{stop_usart}	729	995	1390	uA
STOP mode sleep, cellular wake-up	I_{stop_cell}	19.2	21.5	151	mA
STOP mode sleep, IMU wake-up	I_{stop_imu}	741	1020	1460	uA
STOP mode sleep, CAN wake-up	I_{stop_can}	884	1080	1490	uA
STOP mode sleep, GPS wake-up	I_{stop_gps}	28.0	34.8	49.0	mA
ULP mode sleep, GPIO wake-up	I_{ulp_gpio}		172	556	uA
ULP mode sleep, analog wake-up	I_{ulp_analog}		165	526	uA
ULP mode sleep, RTC wake-up	I_{ulp_intrtc}		164	561	uA
ULP mode sleep, BLE wake-up, advertising	$I_{ulp_ble_adv}$		228	1810	uA
ULP mode sleep, BLE wake-up, connected	$I_{ulp_ble_conn}$		231	1100	uA
ULP mode sleep, serial wake-up	I_{ulp_usart}	503	731	1169	uA
ULP mode sleep, cellular wake-up	I_{ulp_cell}	18.6	20.9	212	mA
ULP mode sleep, IMU wake-up	I_{imu_imu}		194	534	uA
ULP mode sleep, CAN wake-up	I_{can_can}	45.1	247	609	uA
ULP mode sleep, GPS wake-up	I_{ulp_gps}	27.4	33.9	48.0	mA
HIBERNATE mode sleep, GPIO wake-up	I_{hib_gpio}		148	519	uA
HIBERNATE mode sleep, analog wake-up	I_{hib_analog}		141	515	uA
HIBERNATE mode sleep, external RTC wake-up	I_{hib_extrtc}		140	525	uA
HIBERNATE mode sleep, IMU wake-up	I_{hib_imu}		178	544	uA
HIBERNATE mode sleep, CAN wake-up	I_{hib_can}		222	608	uA

[1]The min, and particularly peak, values may consist of very short transients. The typical (typ) values are the best indicator of overall power consumption over time. The peak values indicate the absolute minimum capacity of the power supply necessary, not overall consumption.

Country compatibility

Country	Model	Technologies	Carriers
Albania	ONE524	2G, 3G, Cat1	ALBtelecom, Telekom, Vodafone
Algeria	ONE524	2G, 3G, Cat1	Mobilis, Ooredoo
Aruba	ONE524	2G, 3G, Cat1	Setar
Australia	ONE524	3G, Cat1	Optus, Telstra, Vodafone
Austria	ONE524	2G, 3G, Cat1	3 (Drei), A1, T-Mobile
Bahrain	ONE524	2G, 3G, Cat1	Zain
Bangladesh	ONE524	2G, 3G, Cat1	Bangalink, GrameenPhone
Belarus	ONE524	2G, 3G, Cat1	A1
Belgium	ONE524	2G, 3G, Cat1	Base, Orange, Proximus
Bosnia and Herzegovina	ONE524	2G, 3G	BH Telecom, HT Eronet
Botswana	ONE524	2G, 3G, Cat1	BeMobile
Brunei	ONE524	3G, Cat1	DST
Bulgaria	ONE524	2G, 3G	A1, Telenor, Vivacom
Burkina Faso	ONE524	2G, 3G, Cat1	Orange
Cabo Verde	ONE524	2G, 3G, Cat1	CVMóvel, Unitel T+
Cambodia	ONE524	2G, 3G	Metfone
Canada	ONE404	M1	Bell Mobility, Rogers Wireless, Telus
Chad	ONE524	2G, 3G, Cat1	Airtel
Chile	ONE524	2G, 3G, Cat1	Claro, Entel, Movistar
Congo (Brazzaville)	ONE524	2G, 3G, Cat1	Airtel
Congo (Kinshasa)	ONE524	2G, 3G, Cat1	Airtel
Côte d'Ivoire	ONE524	2G, 3G, Cat1	MTN
Croatia	ONE524	2G, 3G, Cat1	Hrvatski Telekom, Tele2
Cyprus	ONE524	2G, 3G, Cat1	Cytamobile-Vodafone, MTN, PrimeTel
Czechia	ONE524	2G, Cat1	O2, T-Mobile, Vodafone
Denmark	ONE524	2G, 3G, Cat1	3 (Tre), TDC, Telenor, Telia
Egypt	ONE524	2G, 3G, Cat1	Etisalat, Orange
Estonia	ONE524	2G, 3G, Cat1	Elisa, Tele2, Telia
eSwatini	ONE524	2G, 3G, Cat1	MTN
Ethiopia	ONE524	2G, 3G, Cat1	Ethio Telecom
Faroe Islands	ONE524	2G, 3G	Faroese Telecom, Vodafone
Finland	ONE524	2G, Cat1	DNA, Elisa, Telia
France	ONE524	2G, 3G, Cat1	Bouygues, Free Mobile, Orange, SFR
French Guiana	ONE524	2G, 3G	Digicel
Gabon	ONE524	2G, 3G, Cat1	Airtel
Germany	ONE524	2G, 3G, Cat1	O2, Telekom, Vodafone
Ghana	ONE524	2G, 3G, Cat1	AirtelTigo, MTN, Vodafone
Gibraltar	ONE524	2G, 3G, Cat1	Gibtel
Greece	ONE524	2G, Cat1	Cosmote, Vodafone, Wind
Guinea	ONE524	2G, 3G, Cat1	MTN
Guinea-Bissau	ONE524	2G, 3G, Cat1	MTN
Guyana	ONE524	2G	Digicel

Hong Kong	ONE524	2G, 3G, Cat1	CMHK, CSL, SmarTone
Hungary	ONE524	2G, 3G, Cat1	Magyar Telekom, Telenor, Vodafone
Iceland	ONE524	2G, 3G, Cat1	Nova, Siminn, Vodafone
Indonesia	ONE524	2G, 3G, Cat1	Indosat, Telkomsel, XL Axiata
Ireland	ONE524	2G, 3G, Cat1	3 (Tre), Meteor, O2, Vodafone
Israel	ONE524	2G, 3G, Cat1	Hot Mobile, Orange, Pelephone
Italy	ONE524	2G, 3G, Cat1	TIM, Vodafone, Wind
Jordan	ONE524	2G, 3G, Cat1	Zain
Kazakhstan	ONE524	2G, 3G, Cat1	Beeline, K-Cell
Kenya	ONE524	2G, 3G, Cat1	Airtel
Kuwait	ONE524	2G, 3G, Cat1	Viva, Zain
Latvia	ONE524	2G, 3G, Cat1	Bite, LMT, Tele2
Liechtenstein	ONE524	2G, 3G, Cat1	Mobilkom, Orange
Lithuania	ONE524	2G, 3G, Cat1	Bite, Omnitel, Tele2
Luxembourg	ONE524	2G, 3G, Cat1	Orange, POST, Tango
Macao	ONE524	2G, 3G, Cat1	CTM
Madagascar	ONE524	2G, 3G, Cat1	Airtel
Malawi	ONE524	2G, 3G, Cat1	Airtel
Malaysia	ONE524	2G, 3G, Cat1	Celcom, DiGi, Maxis
Malta	ONE524	2G, 3G, Cat1	Go Mobile, Vodafone
Mexico	ONE404	M1	AT&T, Telcel
Moldova	ONE524	2G, 3G, Cat1	Moldcell, Orange
Mongolia	ONE524	2G, 3G	Mobicom, Unitel
Montenegro	ONE524	2G, 3G, Cat1	Mtel, T-Mobile, Telenor
Morocco	ONE524	2G, 3G, Cat1	Inwi, Medi Telecom
Mozambique	ONE524	2G, 3G, Cat1	Vodacom
Myanmar	ONE524	2G, 3G, Cat1	MPT, Telenor
Namibia	ONE524	2G, 3G, Cat1	Telecom Namibia
Netherlands	ONE524	2G, 3G, Cat1	KPN, T-Mobile, Vodafone
New Zealand	ONE524	2G, 3G, Cat1	2degrees, Spark, Vodafone
Nigeria	ONE524	2G, 3G, Cat1	9mobile, Airtel, Glo, MTN
Norway	ONE524	2G, 3G, Cat1	TDC, Telenor, Telia
Pakistan	ONE524	2G, 3G, Cat1	Mobilink, Telenor, Ufone, Warid
Palestine	ONE524	2G, 3G	Jawwal
Papua New Guinea	ONE524	2G, 3G	bmobile
Poland	ONE524	2G, 3G, Cat1	Orange, Play, Plus, T-Mobile
Portugal	ONE524	2G, 3G, Cat1	NOS, TMN, Vodafone
Qatar	ONE524	2G, 3G, Cat1	Ooredoo, Vodafone
Romania	ONE524	2G, 3G, Cat1	Orange, Telekom Romania, Vodafone
Rwanda	ONE524	2G, 3G, Cat1	Airtel, MTN
Serbia	ONE524	2G, 3G, Cat1	Telenor, VIP
Seychelles	ONE524	2G, 3G, Cat1	Airtel
Sint Maarten	ONE524	2G, 3G, Cat1	TelCell
Slovakia	ONE524	2G, 3G, Cat1	O2, Orange, Telekom
Slovenia	ONE524	2G, 3G, Cat1	A1, Mobitel

South Africa	ONE524	2G, 3G, Cat1	Cell C, MTN, Vodacom
South Korea	ONE524	3G, Cat1	KT, LG U+, SK Telecom
South Sudan	ONE524	2G, 3G, Cat1	MTN
Spain	ONE524	2G, 3G, Cat1	Orange, Telefonica, Vodafone, Yoigo
Sri Lanka	ONE524	2G, 3G, Cat1	Dialog, Mobitel
Suriname	ONE524	2G, 3G	Telesur
Sweden	ONE524	2G, 3G, Cat1	3 (Tre), Tele2, Telenor, Telia
Switzerland	ONE524	3G, Cat1	Salt, Sunrise, Swisscom
Taiwan	ONE524	3G, Cat1	Chunghwa, FarEasTone, T Star, Taiwan Mobile
Tanzania	ONE524	2G, 3G, Cat1	Airtel
Thailand	ONE524	2G, 3G, Cat1	AIS, DTAC, True Move
Tunisia	ONE524	2G, 3G, Cat1	Orange Tunisie, Tunisie Telecom
Uganda	ONE524	2G, 3G, Cat1	Africell, Airtel, MTN
United Kingdom	ONE524	2G, 3G, Cat1	3, EE, Manx, O2, Sure, Vodafone
United States	ONE404	M1	AT&T, T-Mobile (USA), Verizon[7]
Vietnam	ONE524	2G, 3G, Cat1	MobiFone, Viettel, Vinaphone
Zambia	ONE524	2G, 3G, Cat1	Airtel

[7]Verizon in the United States is only supported on enterprise plans.

Ordering information

SKU	Description	Region	Modem	EtherSIM	Lifecycle	Replacement
ONE404MEA	Tracker One LTE M1 (NorAm, EtherSIM), [x1]	NORAM	BG96-MC	✓	GA	
ONE404MTY	Tracker One LTE M1 (NorAm, EtherSIM), Bulk [x40]	NORAM	BG96-MC	✓	GA	
ONE523MEA	Tracker One LTE CAT1/3G/2G (Europe), [x1]	EMEAA	EG91-EX		GA	ONE524MEA
ONE523MTY	Tracker One CAT1/3G/2G (Europe), Bulk [x40]	EMEAA	EG91-EX		GA	ONE524MTY
ONE524MEA	Tracker One LTE CAT1/3G/2G (Europe, EtherSIM), [x1]	EMEAA	EG91-EX	✓	GA	
ONE524MTY	Tracker One CAT1/3G/2G (Europe, EtherSIM), Bulk [x40]	EMEAA	EG91-EX	✓	GA	
ONE402MEA	Tracker One LTE M1 (NorAm), [x1]	NORAM	BG96-MC		Deprecated	ONE404MEA
ONE402MTY	Tracker One LTE M1 (NorAm), Bulk [x40]	NORAM	BG96-MC		Deprecated	ONE404MTY

- EMEAA: Selected countries in Europe, Middle East, Africa, and Asia, including Australia and New Zealand. See the cellular carrier list for more information.

Certification

FCC INTERFERENCE STATEMENT

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This device must not be co-located or operating in conjunction with any other antenna or transmitter. This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation.

This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

To comply with FCC's RF radiation exposure limits for general population/uncontrolled exposure, this device must be installed to provide a separation distance of at least 20cm from all persons.

WARNING: Any changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This device must not be collocated or operating in conjunction with any other antenna or transmitter.

ISED INTERFERENCE STATEMENT

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions:

- this device may not cause interference.
- this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:

- l'appareil ne doit pas produire de brouillage, et
- l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

This Class B digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.

This device and its antenna(s) must not be co-located or operating in conjunction with any other antenna or transmitter, except tested built-in radios.

Cet appareil et son antenne ne doivent pas être situés ou fonctionner en conjonction avec une autre antenne ou un autre émetteur, exception faites des radios intégrées qui ont été testées.

This equipment complies with IC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.

Cet équipement est conforme aux limites d'exposition aux rayonnements IC établies pour un environnement non contrôlé. Cet équipement doit être installé et utilisé avec un minimum de 20 cm de distance entre la source de rayonnement et votre corps.

EU DECLARATION OF CONFORMITY

We, Particle Industries, Inc., declare under our sole responsibility that the product, ONE523M, ONE524M, ONE523M-NB, and ONE524M-NB, to which this declaration relates, is in conformity with RED Directive 2014/53/EU and (EU) 2015/863 RoHS Directive 2011/65/EU (Recast).

The full text of the EU declaration of conformity is available at the following Internet address https://www.particle.io/.

Radiation Exposure Statement: This equipment complies with radiation exposure limits set forth for an uncontrolled environment.

The operating frequency bands and the maximum transmitted power limit are listed below:

- BLE 2402-2480MHz, 10dBm
- Wi-Fi 2.4GHz band 2412-2484MHz, 21.5dBm
- LTE B1 B3 B7 B8 B20 B28 704.5-959.3MHz 1710.7-2687.5 MHz, 25dBm
- WCDMA 882.4-957.6 MHz 1922.6-2167.4 MHz, 25dBm

UNITED KINGDOM

UKCA Conformity:

Radio Equipment Regulations 2017 (S.I. 2017/1206)

Certification documents

FCC (UNITED STATES) - ONE402 ONE404 TRACKER ONE NORAM

- FCC ID: 2AEMI-T40X
- Attestation 15 Subpart B, Class B (sDoC)
- Test report FCC Part 15 Subpart B, Class B (sDoC)
- RF exposure report FCC Part 2, Section 2.1091
- RF exposure test report FCC Part 2, Section 2.1091
- Test report FCC Part 15 Subpart C, Section 15.247
- Test report FCC Part 22
- Test report FCC Part 24
- Test report FCC Part 27

ISED (CANADA) - ONE402 ONE404 TRACKER ONE NORAM

- ISED: **20127-ONE40X**.
- Certificate of Conformity
- Test Report RS-130
- Test Report RS-132
- Test Report RS-133
- Test Report RS-139
- Test Report RSS-247 Issue 2, RSS-Gen Issue 5
- RF Exposure Report
- ISED RF Exposure Report
- ICES-003 Issue 6:2019
- ICES-003 Issue 6:2019 Test Report

ROHS - ONE402 ONE404 TRACKER ONE NORAM

- RoHS 3.0 Test Reports

CE (EUROPE) - ONE523 ONE524 TRACKER ONE EMEAA

- Summary
- EN 300 328 Test Report (2.4 GHz ISM band) (updated 2022-11-15)
- EN 300 330 Test Report (NFC) (updated 2022-11-15)
- EN 303 413 Test Report
- EN 301 489 Test Report (updated 2022-11-15)
- EN 301 511 Test Report (GSM) (updated 2022-11-15)
- EN 301 908 Test Report (updated 2022-11-15)
- EN-55032, EN 55035, EN 301 498 Test Report (updated 2022-11-15)
- EN-60950-1 Test Report
- EN-62311 Test Report (updated 2022-11-15)
- EN-62311, EN-50665 Test Report (updated 2022-11-15)
- EN-62638-1 Test Report
- EN-62479, EN-50663 Test Report (updated 2022-11-15)
- RoHS 3.0 Test Reports

FCC (UNITED STATES) - ONE523 ONE524 TRACKER ONE EMEAA

The ONE523 and ONE524 are not FCC certified as the cellular modem does not support the cellular bands used in the United States. The ONE404 should be used instead.

ISED (CANADA) - ONE523 ONE524 TRACKER ONE EMEAA

The ONE523 and ONE524 are not ISED certified as the cellular modem does not support the cellular bands used in the Canada. The ONE404 should be used instead.

ROHS - ONE523 ONE524 TRACKER ONE EMEAA

- RoHS 3.0 Test Reports

UKCA (UNITED KINGDOM) - ONE523 ONE524 TRACKER ONE EMEAA

- UKCA Certification (updated 2022-11-15)

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!

BATTERY WARNING

CAUTION

RISK OF EXPLOSION IF BATTERY IS REPLACED BY AN INCORRECT TYPE. DISPOSE OF USED BATTERIES ACCORDING TO THE INSTRUCTIONS.

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.

Revision history

Revision	Date	Author	Comments
pre1	2020 Apr 20	RK	Preview Release
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
009	2020 Sep 25	RK	Add battery warning
010	2020 Oct 14	RK	Add temperature range
011	2020 Nov 05	RK	Add power usage
012	2020 Dec 09	RK	CAN termination resistor is not present
013	2021 Feb 03	RK	Change M8 CAN output current to 370 mA
014	2021 Feb 17	RK	Tracker One v1.1 GPIO note, update schematics
015	2021 Mar 15	RK	Updated model, carrier, ordering information
016	2021 Mar 23	RK	Added FCC and ISED interference statements
017	2021 Mar 29	RK	D8 and D9 were reversed in some tables
018	2021 Sep 10	RK	Changed wording of peak vs. max current
019	2022 Aug 29	RK	Added EU declaration of conformity
020	2022 Sep 16	RK	Added UKCA conformity
021	2022 Sep 23	RK	Added pin drive strengh information
022	2022 Oct 01	RK	Added additional IO characterstic information
023	2023 Jan 31	RK	Add Device OS versions
024	2024 Apr 23	RK	Added links to certification documents