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# Tachyon Datasheet

# Overview

Tachyon is a 5G-connected single-board computer (SBC) that takes the technology inside a modern smartphone and packs it into a Raspberry Pi form factor to power portable and remote computing devices. With a powerful Qualcomm Dragonwing™ SoC, an AI accelerator, and Particle's application infrastructure, Tachyon combines all of the edge computing power, connectivity, and software necessary to embed intelligence into anything, anywhere.

- Qualcomm QCM6490 8-core Kryo™ 670 CPU (1x 2.7GHz, 3x 2.4GHz, 4x 1.9GHz).
- 5G sub-6Hz cellular connectivity and Wi-Fi 6E with on-device antennas
- 8GB RAM/128GB flash with built-in UFS storage (TACH8NA, TACH8ROW)
- 4GB RAM/64 GB flash with built-in UFS storage (TACH4NA)
- Adreno 643 GPU and 12 TOPS NPU
- USB-C 3.1 PD with DisplayPort and PD, 2x PCIe lanes, and DSI 4-lane
- 2 x CSI 4-lane with ISP, supporting 20+ pre-integrated camera sensors
- Powered by USB-C or lithium-ion battery with integrated battery charger
- Secure boot and encrypted filesystem

## ADDITIONAL RESOURCES

- [Tachyon developer documentation](#)
- [Tachyon setup instructions](#)

## CPU INFORMATION

### AI Engine

GPU Name	Qualcomm® Adreno™ 643L
CPU Name	Qualcomm® Adreno™ 643L
GPU Name	Qualcomm® Kryo™ 670
Qualcomm® Hexagon™ Processor Name	Qualcomm® Hexagon™ 770
Qualcomm® Hexagon™ Processor Features	Qualcomm® Hexagon™ Tensor Accelerator Qualcomm® Hexagon™ Scalar Accelerator Qualcomm® Hexagon™ Vector eXtensions (HVX) Qualcomm® Hexagon™ Voice Assistant Accelerator Large shared AI memory
Qualcomm® Sensing Hub Generation	2nd
Qualcomm® Sensing Hub Features	Qualcomm® Sensing Hub
Tera Operations Per Second (TOPS)	12 TOPS

### CPU

Name	Qualcomm® Kryo™ CPU, Qualcomm® Kryo™ 670
Number of cores	8
Architecture	64-bit
Clock speed	1x 2.7GHz, 3x 2.4GHz, 4x 1.9GHz

### GPU

Name	Qualcomm® Adreno™ 643L
Clock Speed	Up to 812 MHz
APIs	OpenGL® ES 3.2 DirectX® FL 12 OpenCL™ 2.0 FP Vulkan® 1.1

DSP

Name	Qualcomm® Hexagon™
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Location

Sensor-assisted Positioning	Sensor-assisted Positioning
Satellite Systems	GLONASS, NavIC, QZSS, Galileo, Beidou, SBAS, GPS
Frequency Support	Dual (L1/L5)
Accuracy	Lane-level, Sidewalk-level
Features	Global Freeway Vehicle Navigation

Radio

- Quectel SG560D-NA or SG560D-EM radio module
- 3GPP Rel-15 specification, and supports both 5G NSA and SA modes with 4G/ 3G fallback
- 5G & LTE cellular technology
- Wi-Fi 6E & DBS, IEEE 802.11a/ b/ g/ n/ ac/ ax, Wi-Fi 2
- Bluetooth 5.2

{{!--

BLOCK DIAGRAM

imageOverlay src="../../assets/images/tachyon/block-diagram.svg" alt="Block diagram" --}}

# Antennas

The Tachyon includes built-in antennas for:

- Cellular
- Wi-Fi (2.4 GHz and 5 GHz) and BLE

The Tachyon includes a U.FL connector for:

- GNSS (GPS)

Wi-Fi operation in the 5150-5250 MHz band is only for indoor use to reduce the potential for harmful interference to co-channel mobile satellite systems.

## POWER

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Power can be supplied by:

- Primary USB-C (USB1)
- LiPo battery (3-pin JST-PH connector)
- 40-pin expansion HAT connector (5V)

When powering from the HAT connector you cannot use Primary USB-C (USB1) at the same time.

The HAT as a power source can be used in two ways:

- A minimum of 5A is required (at 5VDC) to use Tachyon with only HAT power (no battery).
- It is also possible to use HAT power to charge a battery, for example using a 5V solar battery charger.

For additional details, see [power requirements](#), below.

# Connections



Label	Description
1	Primary USB (USB1)
2	Secondary USB (USB2)
4	Activity LED
5	LiPo battery connector
6	DSI/CSI connector - DISP_CAM1 (display or camera)
7	CSI connector - CAM2 (camera only)
8	GNSS antenna
9	Built-in cellular antenna
10	QWIIIC connector (3.3V I2C)
11	SD card (optional)
12	Debug connector (optional)
13	Raspberry Pi 40-pin expansion HAT connector
15	Wi-Fi chip antenna
16	PCIe expansion connector
18	Button (power and mode)
19	Primary LED
20	Audio card connector
21	RTC battery connector (optional)
22	Connection for external button (optional)

**PRIMARY USB (USB1) (1)**

- Supports USB 3.1 (Key Port)
- Power & Data
  - Supports USB Power Delivery (USB PD) for powering the device.
  - Functions as a USB host or USB device depending on connection type.
- Video Output & Adapter Support
  - Supports USB-C adapters that combine USB, power, and HDMI output.
  - Acts as a PD sink when using a usb-c hub adapter.
- Can output HDMI over USB-C hub.
- For additional details, see [power requirements](#), below.

**SECONDARY USB (USB2) (2)**

- USB 2.0 only.
- Standard USB-C connectivity.
- Supports USB hubs and can provide 5V power to connected devices.

**ACTIVITY LED (4)**

The Activity LED (4), located near the USB ports, provides system-level feedback, including disk operations, network activity, and battery charging status.

**LIPO BATTERY CONNECTOR (5)**

The Tachyon uses a 3.7V LiPo battery with a 3-pin JST-PH connector. The pack contains a 10K NTC thermistor temperature sensor.



*Facing the plug on the battery side*

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#### **DSI/CSI CONNECTOR - DISP\_CAM1 (DISPLAY OR CAMERA) (6)**

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- This MIPI connection port supports either a camera or display
- Aligns with Raspberry Pi implementations for MIPI camera/display adapters.
- You can either use two cameras or one camera and one display using the two MIPI ports
- Based on 4-lane MIPI DSI, supports up to 2.5 Gbps/ lane, (1200 × 2520) @ 144 fps
- Supports DisplayPort 1.4, up to 4K (3840 × 2160) @ 60 fps
- Supports Wi-Fi Miracast 4K @ 60 fps

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#### **CSI CONNECTOR - CAM2 (CAMERA ONLY) (7)**

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- This MIPI connection port supports a camera
- Aligns with Raspberry Pi implementations for MIPI camera/display adapters.
- 4 × 4-lane MIPI CSI, up to 2.5 Gbps/ lane
- 3 × ISP, up to 3 × 27 MP @ 24 fps or 3 × 22 MP @ 30 fps; 36 MP + 27 MP @ 24 fps or 36 MP + 22 MP @ 30 fps; 36 MP @ 30 fps

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#### **GNSS ANTENNA (8)**

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- The recommended antenna is the PARANTGN1, included in your alpha tester kit.
- If using your own active antenna, the LNA gain must be less than 17dB.
- Software support will be provided in a future release.

---

#### **BUILT-IN CELLULAR ANTENNA (9)**

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- This module contains the Wi-Fi and cellular antennas.
- Do not attempt to open the antenna module as it is very difficult to reassemble.

---

#### **QWIIIC CONNECTOR (3.3V I2C) (10)**

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- Follows the SparkFun Qwiic/Adafruit STEMMA QT standard for easy I2C expansion.
- Enables connection to various sensors and peripherals.
- Sensors and peripherals can generally be daisy-chained together.
- 4-pin JST 1mm connector, keyed.
- 3.3V I2C.

There is additional information on the Qwiic ecosystem in the [Qwiic page in the Particle docs](#). Note that since Tachyon is Linux-based, you will need different libraries than you would for Particle or Arduino, but there are libraries for many popular Qwiic boards.

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#### **SD CARD (OPTIONAL) (11)**

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- Plug in any standard SD card into this slot.
- Optional for user data storage; operating system is stored on internal flash memory.
- SD 3.0, supports 4-bit SDIO

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#### **DEBUG CONNECTOR (OPTIONAL) (12)**

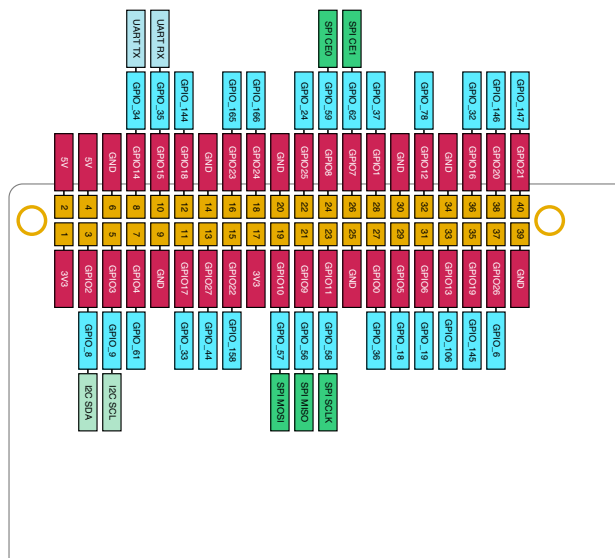
---



- Provides UART access for system debugging and interaction.
- Used for:
  - SysCon UART (system controller communication).
  - Linux module UART (direct serial console access).
  - Battery communication (if applicable).

This connectors attaches to the debug adapter using a 10-pin (2x5) ribbon cable.

#### RASPBERRY PI 40-PIN EXPANSION HAT CONNECTOR (13)



- I2C (also connected to Qwiic port)
- SPI
- UART serial
- All GPIO are 3.3V only (not 5V tolerant outside of the 5V power pin)

The 5V pins on the 40-pin HAT connector can be used as an output (when powered by battery or USB), or as an input (powering Tachyon from the HAT). See [Power](#), above.

When supplying power to the HAT, the 5V power is limited to 1.5A. It can operate most peripheral cards, but high current cards like motor HATs may not work.

For additional details about using 5V as a power input, see [power requirements](#), below.

#### WI-FI CHIP ANTENNA (15)

- Dual-band Wi-Fi and BLE chip antenna.

Alpha versions of the Tachyon have a U.FL connector marked **Wi-Fi/BLE**. This connector is not operational and will be removed in future versions of the Tachyon.

#### PCIE EXPANSION CONNECTOR (16)

- PCIe 3.0 x1 slot
- Matches the Raspberry Pi PCIe implementation.
- 2-lane PCIe Gen 3, supports NVMe

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#### **BUTTON (POWER AND MODE) (18)**

The Tachyon board has a single button (18), located next to the primary LED, which is used for managing device states. It allows users to power on, enter programming mode, suspend, wake up, force power off, and trigger custom actions in user space.

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#### **PRIMARY LED (19)**

The primary LED (19) on the Tachyon board provides critical information about the device's current mode and status.

The LED indicates:

- The Tachyon's core mode (e.g., off, standby, update, or operation).
- The Tachyon's status within that mode (e.g., booting, connected, or error states).

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#### **AUDIO CARD CONNECTOR (20)**

- This is a 4 pin connector that gives analog audio in / out on the Tachyon board
- Software support will be added in a future release

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#### **RTC BATTERY CONNECTOR (OPTIONAL) (21)**

- Uses RTC modules for the Raspberry Pi that typically contain a Lithium coin cell battery.
- Helps retain time between power cycles but does not provide full power-loss protection.

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#### **CONNECTION FOR EXTERNAL BUTTON (OPTIONAL) (22)**

- Connect these two pads to an external momentary switch to allow the button operations to be done from an external button.

# Power requirements

The Tachyon supports three power inputs:

- USB1 (primary USB-C)
- 5V IN (input from the 40-pin expansion HAT connector)
- VBAT (LiPo battery)

It supports different USB power modes:

- PD (Power Delivery)
- DCP (Dedicated Charge Port)
- CDP (Charging Downstream Port).

Power from USB1 can be added or removed while the Tachyon is running.

You should avoid adding or removing 5V IN or the battery while the system is running as the change may not be detected, or the device may turn off unexpectedly.

The USB1 port has a DP (DisplayPort) function for connecting to an external monitor via an USB-C to C cable. It is highly recommended the monitor have its own power supply to prevent high current from the USB1 port. The port can supply about 5V/1.5A to USB devices.

## POWER INPUT REQUIREMENTS

---

- USB1: There are different modes for supplying power to the USB-C port and its power capability from a USB-C power adapter and USB port of a computer
  - DCP: 5V/3A or 9V/3A
  - CDP: 5V/1.5A
  - PD: 5V/5A or 9V/3A
- 5V IN: Input from the 40-pin HAT connector
  - 5V/5A (do not provide voltage higher than 5V from the 40-pin connector)
- VBAT: Battery
  - 3.5V - 4.2V

Notes:

- If both the USB1 and 5V (as input) have power to supply to the board at the same time without battery attached, the 5V power will supply to VBAT (simulates battery).
- If 5V is used as power input with battery attached, the USB1 port cannot be used.
- If 5V is not used for power input, it is set to power output and supplies 5V/1.5A to the 40-pin expansion HAT connector.

## POWER MODES

---

The Tachyon supports the following power modes of operation

- DCP
  - Powered by power adapter with DCP capability
  - This mode can work without battery attached
  - `POWER_SUPPLY_TYPE=USB_DCP`
- CDP

- Powered by computer USB-A port, data communication is functional
- Powered by computer USB-C to A adapter and A to C cable to the board, data communication is functional
- Limited power but useful for sending data or debugging, e.g. adb shell
- POWER\_SUPPLY\_TYPE=USB\_CDP
- PD
  - Powered by power adapter with USB-PD capability
  - Powered by computer USB-C Port, data communication is functional
  - This mode can work without battery attached, see [Older power requirements](#), below.
  - POWER\_SUPPLY\_TYPE=USB\_PD
- Battery
  - Battery is discharging

#### Known issues:

- CDP/PD: If the board has no battery attached and connects to the computer USB-C port via USB-C to C cable, the Tachyon will use PD instead of CDP.
- DCP: The power adapter shipped with beta devices supports PD only and is not DCP capable, so it must be used with a battery or 5V input.

#### POWER SUPPLY SCENARIOS

USB1	5V IN	VBAT	Power Requirements	Notes
Power Adapter	NO	NO	PD: Not Supported	5V is set to power output - 5V/1.5A
			DCP: 9V/3A or 5V/5A	Power adapter with PD only see <sup>4</sup>
Power Adapter	YES	NO	PD: 9V/3A	Power comes from USB1
			DCP: 9V/3A or 5V/5A	Remove USB1, power will change to 5V <sup>2</sup>
Power Adapter	YES	YES	PD: 9V/3A	Power comes from USB1
			DCP: 9V/3A or 5V/5A	Remove USB1, power will change to use VBAT <sup>13</sup>
Power Adapter	NO	YES	PD: 9V/3A	
			DCP: 9V/3A or 5V/5A	
PC USB (A to C cable)	NO	NO	CDP: 5V/1.5A	Power comes from USB1 Limited power supply for peripherals
PC USB (A to C cable)	YES	NO	CDP: 5V/1.5A	Power comes from 5V (via VBAT as fake battery)
				Limited power supply for peripherals
PC USB (A to C cable)	YES	YES	CDP: 5V/1.5A	Power comes from USB1
				Remove USB1, power will change to use VBAT 5V <sup>13</sup>
PC USB (A to C cable)	NO	YES	CDP: 5V/1.5A	Power comes from USB1 and to VBAT
PC USB (C to C cable)	YES	YES	PD: 5V/3A	Power comes from USB1 Remove USB1, power will change to use VBAT <sup>13</sup>
PC USB (C to C cable)	YES	NO	PD: 5V/3A	Power comes from USB1 Remove USB1, power will change to use 5V <sup>2</sup>
PC USB (C to C cable)	NO	NO	PD: See <sup>4</sup>	

PC USB (C to C cable)	NO	YES	PD: 5V/3A	Power comes from USB1 and to VBAT
NO	YES	YES	5V/5A	Power supplies to VBAT
				After boot-up, USB1 will not be functional
				System only reports DCP 5V/3A
NO	YES	NO	5V/5A	Power supplies to VBAT
				After boot-up, USB1 will be functional for USB device and display
N/A	N/A	YES	3.5V - 4.2V / 5A	

<sup>1</sup>Battery will be discharging in this mode.

<sup>2</sup>VBAT is powered, simulating a battery, even though a battery is not connected.

<sup>3</sup>5V input is not used.

<sup>4</sup>Requires 24.04 (Release v1.1.32), 20.04 (Release v1.0.180), or later. Earlier versions will not boot.

Connect power input(s) before booting Tachyon to insure proper detection.

## OLDER POWER REQUIREMENTS

In version 24.04 (Release v1.1.32) and 20.04 (Release v1.0.180) support was added for powering in USB-C PD mode without requiring a battery:

No-battery (USB-Powered) mode: The device can be powered via the USB1 port (USB-C) without a battery attached. USB-C Power Delivery is supported for negotiating adequate power from a host or charger, and this does not require an external Power Delivery controller chip on the accessory. This mode is useful for bench testing or situations where the device is stationary and can be powered continuously via USB-C.

The information above has been updated to reflect this. You may see references elsewhere to a battery being required when using USB-C PD mode. This is no longer necessary once you've upgraded to these releases, but will still be required when using an older version, or upgrading from an older version.

When using **older** releases, the following power requirements apply:

- With older versions when using USB-PD mode, a battery (or 5V in) must also be used or the Tachyon will not boot properly.
- The USB-DCP mode can be used without a battery as the sole power source.
- If the Tachyon is connected to a HDMI dock, USB hub, or monitor via the USB1 connector, USB-PD mode will be used, and a battery is required when using older versions.

## POWER REQUIREMENTS SUMMARY

- USB power adapter can support
  - USB-PD at 9V/3A (must use with battery or 5V at the same time)
  - USB-DCP at 9V/3A
- Supply 5V/5A to the 40-pin header for power input
- Use a battery if possible (with capacity from a minimum of 3.5V to a maximum 4.2V with 5A capability)

# Technical specification

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## ABSOLUTE MAXIMUM RATINGS

## RECOMMENDED OPERATING CONDITIONS

## WI-FI SPECIFICATIONS

--}}

## I/O CHARACTERISTICS

The CPU runs at 1.8V, but I/O on the expansion HAT connector is is 3.3V. Levels are translated using TI TXS0108E bidirectional level translators.

- Maximum data rates:
  - 110Mbps (push-pull)
  - 1.2Mbps (open-drain)
- 1.65V to 5.5V on B port
- ESD protection exceeds JESD 22 (A port, CPU-side):
  - 2000 V Human Body Model (A114-B)
  - 150 V Machine Model (A115-A)
  - 1000 V Charged-Device Model (C101)
- IEC 61000-4-2 ESD (B port, expansion connector side):
  - ± 8kV Contact Discharge
  - ± 6kV Air Discharge

## ABSOLUTE MAXIMUM RATINGS

These values are from the TXS0108E datasheet and assume  $V_{CCB}$  is 3.3V.

Parameter	Min	Max	Unit
Input voltage	-0.5	6.5	V
Voltage applies to any output in high or low state	-0.5	3.8	V
Input clamp current $I_K$	-50		mA
Output clamp current $I_{OK}$	-50		mA
Continuous output current $I_O$	-50	50	mA
Continuous output current $I_O$	-50	50	mA

## RECOMMENDED OPERATING CONDITIONS

Parameter	Min	Max	Unit
High-level input voltage $V_{IH}$	2.9	3.3	V
Low-level input voltage $V_{IL}$	0	0.15	V
Input transition rise or fall rate $\Delta t/\Delta v$	10		ns/V

## Timing requirements

Parameter	Test Conditions	Min	Max	Unit
-----------	-----------------	-----	-----	------

Data rate	Push-pull driving	70	Mbps
	Open-drain driving	0.8	
t <sub>W</sub> Pulse duration, data inputs	Push-pull driving	15.3	ns
	Open-drain driving	1250	

SWITCHING CHARACTERISTICS

	Parameter	Test Conditions	Min	Max	Unit
t <sub>PHL</sub>	Propagation delay time	Push-pull driving	5.7		ns
	(high-to-low output) Output	Open-drain driving	3.1	9.3	
t <sub>PLH</sub>	Propagation delay time	Push-pull driving	6.5		ns
	(low-to-high output) Output	Open-drain driving	126	486	
t <sub>PHL</sub>	Propagation delay time	Push-pull driving	7.4		ns
	(high-to-low output) Input	Open-drain driving	2.5	7.3	
t <sub>PLH</sub>	Propagation delay time	Push-pull driving	5.8		ns
	(low-to-high output) Input	Open-drain driving	129	459	
t <sub>rB</sub>	Input rise time	B-port rise time	1.2	5.2	ns
			73	546	
t <sub>fB</sub>	Input fall time	B-port fall time	0.9	3.9	ns
			1	9.6	
t <sub>SK(O)</sub>	Skew (time), output	Channel-to-channel	1		ns
	Maximum date rate	A or B	Push-pull driving	60	Mps
			Open-drain driving	0.8	

{{!--

POWER CONSUMPTION

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RADIO SPECIFICATIONS

Frequency bands

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Frequency Bands	North America (TACH4NA/TACH8NA)	Rest of World (TACH8ROW)
5G SA/NSA	n2/ 5/ 7/ 12/ 13/ 14/ 25/ 26/ 29/ 30/ 38/ 41/ 48/ 66/ 70/ 71/ 77/ 78	n1/ 3/ 5/ 7/ 8/ 20/ 28/ 38/ 40/ 41/ 77/ 78/ 79
LTE	B2/ 4/ 5/ 7/ 12/ 13/ 14/ 17/ 25/ 26/ 29/ 30/ 38/ 41/ 42/ 43/ 46/ 48/ 66/ 71	B1/ 2/ 3/ 4/ 5/ 7/ 8/ 12/ 17/ 18/ 19/ 20/ 26/ 28/ 32/ 34/ 38/ 39/ 40/ 41/ 42
LTE MIMO	4 × 4 MIMO (DL): B2/ 4/ 7/ 25/ 30/ 38/ 41/ 42/ 43/ 48/ 66	4 × 4 MIMO (DL): B1/ 3/ 7/ 38/ 40/ 41/ 42
WCDMA	-	B1/ 2/ 4/ 5/ 6/ 8/ 19
GSM/EDGE	-	B2/ 3/ 5/ 8
WLAN	2.4 & 5 & 6 GHz 802.11a/ b/ g/ n/ ac/ ax, Supports DBS	2.4 & 5 & 6 GHz 802.11a/ b/ g/ n/ ac/ ax, Supports DBS
Bluetooth	Bluetooth 5.2	Bluetooth 5.2
GNSS	GPS/ GLONASS/ BDS/ NavIC/ Galileo/ QZSS/ SBAS; L1 + L5	GPS/ GLONASS/ BDS/ NavIC/ Galileo/ QZSS/ SBAS; L1 + L5

**Data rate**

Data rate	North America (TACH4NA/TACH8NA)	Rest of World (TACH8ROW)
5G SA	2.1 Gbps (DL)/ 900 Mbps (UL)	2.1 Gbps (DL)/ 900 Mbps (UL) 9
5G NSA	2.5 Gbps (DL)/ 550 Mbps (UL)	2.5 Gbps (DL)/ 550 Mbps (UL)
LTE	1.2 Gbps (DL)/ 200 Mbps (UL)	1.2 Gbps (DL)/ 200 Mbps (UL)
DC-HSPA+	42 Mbps (DL)/ 5.76 Mbps (UL)	42 Mbps (DL)/ 5.76 Mbps (UL) 2
WCDMA	-	384 kbps (DL)/ 384 kbps (UL)
EDGE	-	296 kbps (DL)/ 236.8 kbps (UL)
GSM	-	107 kbps (DL)/ 85.6 kbps (UL)



# Mechanical specifications

## OPERATING TEMPERATURE

Parameter	Minimum	Maximum	Notes
Recommended operating temperature	-17°C	+65°C	1
Battery charging enabled	0°C	+55°C	
Storage temperature	-40°C	+85°C	

<sup>1</sup>Device will perform thermal shutdown below -20°C or above +70°C.

## DIMENSIONS AND WEIGHT

- Dimensions: 85mm x 56mm
- Weight: 55g (approximate)
- Height: 18.5mm (from top of antenna to bottom of feet)

Dimensions are in millimeters.

## 3D MODELS

A 3D model of the Tachyon is available in the [hardware-libraries Github](#).

# Product Handling

## **ESD PRECAUTIONS**

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The M-SoM contains highly sensitive electronic circuitry and is an Electrostatic Sensitive Device (ESD). Handling an M-SoM 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 Particle M-SoM. ESD precautions should be implemented on the application board where the M-SoM is mounted. Failure to observe these precautions can result in severe damage to the M-SoM!

## **CONNECTORS**

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The 40-pin expansion had connector is static sensitive and should be handled carefully.

# FCC ISED CE Warnings and End Product Labeling Requirements

## FCC Supplier's Declaration of Conformity

47 CFR § 2.1077 Compliance Information

Responsible party:

Particle Industries, Inc.

325 9th St

San Francisco, CA 94103

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.

## FCC Radiation Exposure Statement

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 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.

**FCC Radiation Exposure Statement:** This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This transmitter module must not be co-located or operating in conjunction with any other antenna or transmitter. This End equipment should be installed and operated with a minimum distance of 20 centimeters between the radiator and your body.

This Transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

## FCC Indoor Use

FCC regulations restrict the operation of this device to indoor use only. This device is prohibited from being operated on oil platforms, cars, trains, boats, and aircraft, except it can be operated in large aircraft while flying above 10,000 feet in the 5.925-6.425 GHz band.

Transmitters in the 5.925-7.125 GHz band are prohibited from operating to control or communicate with unmanned aircraft systems

**IMPORTANT NOTE:** In the event that these conditions can not be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization is no longer considered valid and the FCC ID can not be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

**End Product Labeling** The final end product must be labeled in a visible area with the following:

- Contains FCC ID: 2AEMI-TACHYON

**Manual Information to the End User** The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module.

### **Outdoor Use (US)**

To be compliant to FCC §15.407(a) the EIRP is not allowed to exceed 125 mW (21 dBm) at any elevation angle above 30° (measured from the horizon) when operated as an outdoor access point in U-NII-1 band, 5.150-5.250 GHz.

**Canada Statement** This device complies with Innovation, Science, and Economic Development Canada's licence-exempt RSSs. Operation is subject to the following two conditions:

1. This device may not cause interference; and
2. This device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence.

### **L'exploitation est autorisée aux deux conditions suivantes:**

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

**Caution Exposure:** This device meets the exemption from the routine evaluation limits in section 2.5 of RSS102 and users can obtain Canadian information on RF exposure and compliance. Le dispositif répond à l'exemption des limites d'évaluation de routine dans la section 2.5 de RSS102 et les utilisateurs peuvent obtenir des renseignements canadiens sur l'exposition aux RF et le respect.

**The final end product must be labelled in a visible area with the following:** The Innovation, Science, and Economic Development Canada certification label of a module shall be clearly visible at all times when installed in the host device, otherwise the host device must be labelled to display the Innovation, Science, and Economic Development Canada certification number of the module, preceded by the words "Contains transmitter module", or the word "Contains", or similar wording expressing the same meaning, as follows:

- Contains transmitter module ISED: 20127-TACHYON

This End equipment should be installed and operated with a minimum distance of 20 centimeters between the radiator and your body. Cet équipement devrait être installé et actionné avec une distance minimum de 20 centimètres entre le radiateur et votre corps.

The end user manual shall include all required regulatory information/warning as shown in this manual.

### **Outdoor use (CA)**

- Operation in the bands 5150–5250 MHz, 5250-5350MHz, and 5925-7125MHz is only for indoor use to reduce the potential for harmful interference to co-channel mobile satellite systems;
- Operation in the 5600-5650 MHz band is not allowed in Canada. High-power radars are allocated as primary users (i.e., priority users) of the bands 5250-5350 MHz and 5650-5850 MHz and that these radars could cause interference and/or damage to LE-LAN devices.

- DFS (Dynamic Frequency Selection) products that operate in the bands 5250- 5350 MHz, 5470-5600MHz, and 5650-5725MHz.
- Le dispositif de fonctionnement dans la bande 5150-5250 MHz, 5250-5350MHz, et 5925-7125MHz est réservé à une utilisation en intérieur pour réduire le risque d'interférences nuisibles à la co-canal systèmes mobiles par satellite
- Opération dans la bande 5600-5650 MHz n'est pas autorisée au Canada. Haute puissance radars sont désignés comme utilisateurs principaux (c.-à-utilisateurs prioritaires) des bandes 5250-5350 MHz et 5650-5850 MHz et que ces radars pourraient causer des interférences et / ou des dommages à dispositifs LAN-EL.
- Les produits utilisant la technique d'atténuation DFS (sélection dynamique des fréquences) sur les bandes 5250-5350 MHz, 5470-5600MHz et 5650-5725MHz.

#### **EUROPEAN UNION (CE)**

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Hereby, Particle declares that the radio equipment with the TACH8ROW referenced in the printed setup document for the product is in compliance with Directive 2014/53/EU. The full text of the EU Declaration of Conformity is available at the following internet address: <https://docs.particle.io>

#### **EU Radiation Exposure Statement:**

This device meets the EU requirements (2014/53/EU Article 3.1a) on the limitation of exposure of the general public to electromagnetic fields by way of health protection. The device complies with RF specifications when the device used at 20 cm from your body.

#### **OUTDOOR USE (WORLD)**

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This device is restricted to indoor use when operating in the 5150 to 5350 MHz frequency range. This restriction applies in: AT, BE, BG, CH, CY, CZ, DE, DK, EE, EL, ES, FI, FR, HR, HU, IE, IS, IT, LI, LT, LU, LV, MT, NL, NO, PL, PT, RO, SE, SI, SK, TR, UA, UK(NI).

## Certification documents

# Product handling

## ESD PRECAUTIONS

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The Tachyon 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. Failure to observe these precautions can result in severe damage to the module!

## BATTERY WARNINGS

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### CAUTION

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

- Replacement of a battery with an incorrect type that can defeat a safeguard.
- Disposal of a battery into fire or a hot oven, or mechanically crushing or cutting of a battery, that can result in an explosion.
- Leaving a battery in an extremely high temperature surrounding environment that can result in an explosion or the leakage of flammable liquid or gas.
- A battery subjected to extremely low air pressure that may result in an explosion or the leakage of flammable liquid or gas.

This symbol indicates DC voltage: 

## DISPOSAL

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The European directive 2012/19/EU On waste Electrical and Electronic Equipment (WEEE), requires that old household electrical appliance must not be disposed of in the normal unsorted municipal waste stream. Old appliances must be collected separately in order to optimize the recovery and recycling of the materials they contain, and reduce the impact on human health and the environment.

The crossed out "wheeled bin" symbol on the product reminds you of your obligation, that when you dispose of the appliance, it must be separately collected. Consumers should contact their local authority or retailer for information concerning the correct disposal of their old appliance.

# Country compatibility

## TACH8NA/TACH4NA - COUNTRY COMPATIBILITY

Country	Technologies	Carriers
Canada	4G, 5G	Telus
Mexico	4G, 5G	Movistar
United States	4G, 5G	AT&T, US Cellular

## TACH8ROW - COUNTRY COMPATIBILITY

Country	Technologies	Carriers
Australia	4G, 5G	Optus
Austria	2G, 3G, 4G, 5G	3 (Drei)
Belgium	2G, 3G, 4G, 5G	Base, Orange, Proximus
Bulgaria	2G, 3G	A1, Telenor, Vivacom
Cyprus	2G, 3G	Cytamobile-Vodafone
Czechia	2G, 4G, 5G	O2, T-Mobile, Vodafone
Denmark	2G, 3G, 4G	3 (Tre), TDC, Telenor, Telia
Estonia	2G, 3G, 4G	Elisa, Tele2, Telia
Finland	2G, 4G	DNA, Elisa, Telia
France	2G, 3G, 4G, 5G	Bouygues, Free Mobile, Orange, SFR
Germany	2G, 3G, 4G, 5G	O2, Telekom, Vodafone
Greece	2G, 4G, 5G	Cosmote, Vodafone, Wind
Hungary	2G, 3G, 4G, 5G	T-Mobile, Telenor, Vodafone
Iceland	2G, 3G, 4G	Nova, Siminn
India	2G, 3G, 4G	Vodafone
Ireland	2G, 4G, 5G	3 (Tre), Vodafone
Italy	2G, 3G, 4G, 5G	TIM, Vodafone, Wind
Japan	4G, 5G	KDDI
Lithuania	2G, 3G, 4G, 5G	Bite
Luxembourg	2G, 3G, 4G	Orange, POST, Tango
Netherlands	2G, 3G, 4G, 5G	KPN, T-Mobile, Vodafone
New Zealand	3G, 4G, 5G	Spark
Norway	2G, 4G	Telenor, Telia
Poland	2G, 3G, 4G, 5G	Orange, Play, Plus, T-Mobile
Portugal	2G, 3G, 4G, 5G	MEO, NOS, Vodafone
Romania	2G, 3G, 4G, 5G	Orange, Telekom Romania, Vodafone
Slovakia	2G, 4G	O2, Orange, Telekom
Slovenia	2G, 3G, 4G, 5G	A1, Mobitel
South Africa	2G, 3G, 4G, 5G	MTN
South Korea	4G, 5G	LG U+
Spain	2G, 3G, 4G, 5G	Orange, Telefonica, Vodafone, Yoigo
Sweden	2G, 3G, 4G, 5G	3 (Tre), Tele2, Telenor, Telia
Switzerland	3G, 4G, 5G	Sunrise, Swisscom
United Kingdom	2G, 3G, 4G, 5G	3, O2, Vodafone



### **TACH8ROW - Additional countries**

The following countries are not officially supported by the TACH8ROW at this time, but may be compatible. In some cases, the device may only be compatible with some carriers, or some bands.

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# Ordering information

SKU	Description
TACH4NA	Tachyon 4GB RAM / 64GB Flash (NorAm), [x1]
TACH8NA	Tachyon 8GB RAM / 128GB Flash (NorAm), [x1]
TACH8ROW	Tachyon 8GB RAM / 128GB Flash (EMEA), [x1]

# Revision history

Revision	Date	Author	Comments
pre	2025-03-03	RK	Initial version
001	2025-06-09	RK	Updated photo
002	2025-06-11	RK	Updates for certification
003	2025-06-16	RK	Added link to 3D models
004	2025-06-24	RK	Updated HAT power; no longer requires a jumper
005	2025-07-30	RK	Include radio module model
006	2025-08-06	RK	Add operating temperature
007	2025-09-03	RK	Added power requirements
008	2025-09-16	RK	Add TACH4NA
009	2025-12-22	RK	Update power requirements
010	2026-01-15	RK	Updates for certification