

REC Wi-Fi MODULE



 **REC**
Control your power!

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Description

REC Wi-Fi module is a device that connects to REC BMS devices via RS-485 and connects to an existing network or sets up its own. Battery pack parameters such as cell voltages, current, temperatures, state of charge and state of health are displayed. **General tab** is used to display important parameters while dedicated tabs can be used to display advanced battery pack information. An **alarm pop-up** sign informs the user in case of any system error or alarm, containing its diagnostics. **Charging tab** enables the user to set charging voltage and current. Parameters and error logging interval can be set in the **Settings tab** – application logs all battery parameters and makes 24 h based folders on the build-in SD memory card. Data can be easily transferred to any connected device for further analysis.

System overview

Default settings

By pressing the factory reset button and hold it for 20 s, all device settings will be reset to default.

Wi-Fi SSID	REC_BMS
Wi-Fi password	<i>none</i>
IP	192.168.1.184
Send address	16
Receive address	0
Log interval	10 min
Temperature units	in Celsius

Setup

1. Make sure all connections are as described in **Electrical properties** section.
2. Connect the module to supported device's RS-485 connection.
3. Connect the power supply to the module.
4. If connecting the module for the first time, the device will set up an access point, with default credentials (SSID: REC_BMS, PASS: *none*). If this does not happen, please reset the device by holding factory reset button for 20 s.
5. Using a Wi-Fi supported device, connect to the access point.
6. Open your browser and go to IP address 192.168.1.184. If the „REC BMS not found“ is present, go to firmware tab and set Send and Receive address in communication settings accordingly. More in **Communication settings** section.

Setting the device to access point (AP mode)

1. Connect to the device.
2. Go to its page on the **Firmware** tab.
3. Change the **Wi-Fi name** and **Wi-Fi password** to desired credentials and confirm it with **Submit** button.
4. Device will restart and set up the new access point.

Connecting the device to an existing network (STA mode)

1. Connect to the device.
2. Go to its page on the **Firmware** tab.
3. Change the **Wi-Fi name** and **Wi-Fi password** to the network credentials and confirm it with **Submit** button.
4. If existing network is not found it will set up an access point with set credentials.

Functionality

Tabs

Home

BMS serial number is shown, all main parameters of BMS are monitored, capacity in Ah and used capacity are also shown. To see the individual cell voltage, cell resistance, BMS and sensor temperatures choose corresponding tab in the menu.

In case an error is present, an exclamation triangle appears in the middle of the battery icon. User may press the sign for error description.

Numbers near the maximum, minimum cell and temperature describe their location in the battery pack. If connected to a unit that supports IO tasks, state of all outputs is displayed. General-purpose output indicates the state of integrated optorelay – OFF indicates the relay is open and ON the relay is closed. You can change its state by pressing **turn on** or **turn off** button.

Tasks

Supported devices: there are no supported devices yet.

Automatically controls the devices outputs. You can select desired output and choose the parameter to compare to.

If you want to control the outputs with errors, tick desired errors and select wanted output logic.

Table 1: Output logic

Output logic	Output state without ERROR	Output state on ERROR
Negative with ERROR off	OFF if value higher than compare value, ON if lower	OFF
Positive with ERROR off	ON if value higher than compare value, OFF if lower	OFF
Negative with ERROR on	OFF if value higher than compare value, ON if lower	ON
Positive with ERROR on	ON if value higher than compare value, OFF if lower	ON

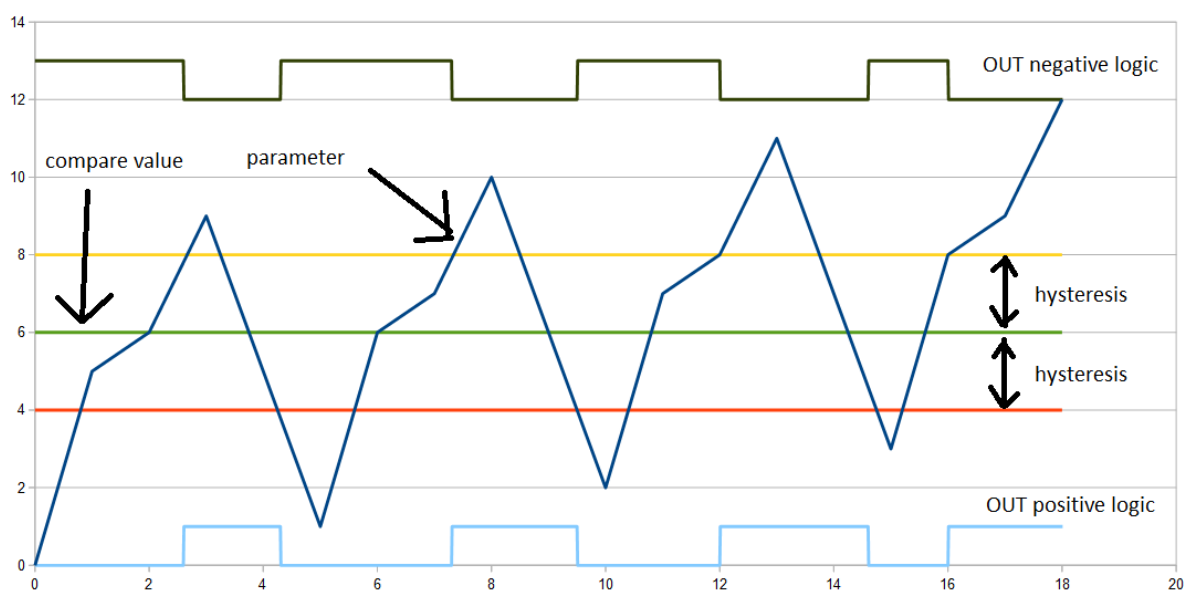


Figure 1: Output logic.

Voltage

All of the battery pack cell's voltages are displayed.

Impedance

All of the battery pack cell's impedance values are displayed.

Temperature

All of the BMS temperature sensors values are displayed. If one of the temperature sensor's temperature is too high, it is highlighted with red (over-temperature error on cells).

Settings

Please note that a decimal comma is used when entering parameter values.

Table 2: Description of parameters.

Parameter	Description
Cell END balancing voltage	Sets the balancing voltage above which the individual cell is balanced 100 %.
Balancing START voltage	Sets the average battery pack's voltage above which the BMS performs the balancing while charging. Special balancing algorithm is used to determine which cells have to be balanced until the Balance Voltage END is reached.
END of charging	Sets the end of charge voltage of the individual cell.
END of charging voltage hysteresis per cell	Sets the charging hysteresis of individual cell.
Max allowed cell voltage	Max allowed cell voltage.
Min allowed cell voltage	Min allowed cell voltage.
Max allowed cell voltage hysteresis	Max allowed cell voltage hysteresis.
Min allowed cell voltage hysteresis	Min allowed cell voltage hysteresis.
Current sensor shunt	Current sensor shunt is used in the system; input its current coefficient in Current sensor coefficient window.
Current sensor coefficient	Current sensor's coefficient can be changed when changing the current sensor's value.
Current sensor offset	Current offset compensation.
Max device charging current	Limit device's charging current.
Max device discharge current	Limit device's discharging current.

Charging coefficient	Charging coefficient can be changed manually.
Discharging coefficient	Discharging coefficient can be changed manually.
Units	Displayed temperature units.
Min allowed temperature for charging	Charging is not allowed under Tbat. MIN Tcharge hysteresis is set to 2 °C/K.
Max allowed cell temperature	Battery pack is disconnected from the system, if the Tbat temperature is higher than the MAX Tbat. MAX Tbat hysteresis is set to 2 °C/K.
Max allowed BMS temperature	Sets the maximum allowed temperature of the BMS – TBMS due to the passive balancing in REC Q BMS. The balancing and charging is stopped until the temperature does not drop under the set value.
Max allowed BMS temperature hysteresis	Sets the maximum allowed BMS temperature hysteresis.
Capacity	Battery capacity (Single string), if desired chemistry is not on the list, use ' Ideal ' or if you had it pre-programmed, use ' Custom '.
Battery cycles	Number of effective battery cycles.
Number of parallel devices	Number of parallel strings in the battery pack.
Chemistry	Select cell chemistry (Ideal LTO and Custom option may not be programmed into the BMS firmware – if set error 13 will alarm)
System connection	Slave connection only.
Charger/inverter	Pre-programmed CAN protocols, if you cannot select desired one or had a custom protocol programmed, use ' Custom '.

* Please note that a decimal comma is used when entering parameter values.

Logs

REC Wi-Fi module logs all BMS data in detail. User can select logging interval in steps from 5 s to 60 min. Every new day or the maximum size of the log (set to 5 MB) is reached; a new log will be created.

Logs can be viewed by clicking **VIEW** button or downloaded by clicking **DOWNLOAD** button. If you want to view a saved log that is no longer present on the device, click **Import external log** and choose the one you desire to view.

When viewing the log, select the parameter you want to display. With some parameters, you can also view the data of a specific BMS Slave unit (if using Master-Slave configuration) by choosing it in top right corner '**BMS selector**' (Fig. 2).

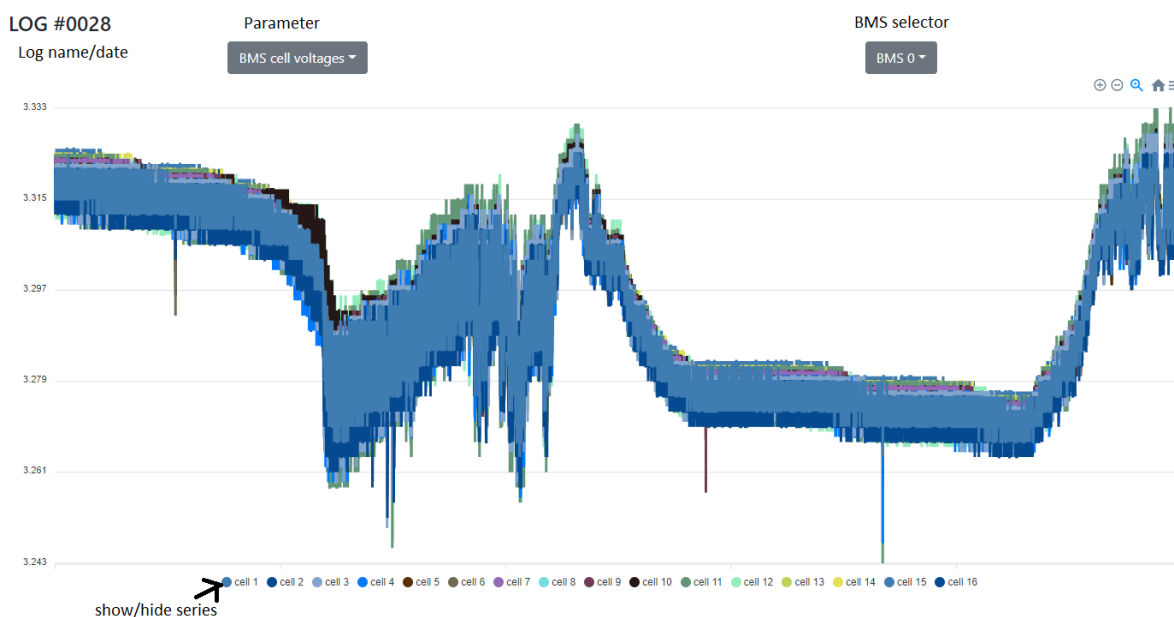


Figure 2: example of cell voltages graphics.

Firmware

Unlock communication

If you want to change the settings/parameters of your REC BMS, the communication has to be established and the BMS needs to be unlocked. To unlock it enter the password. The password for REC Q BMS unlock is its serial number in format: 1Q-XXXX or for REC Active BMS: 1A-XXXX. Once the communication is unlocked, you can adjust the settings.

Unlock REC BMS unit communication

A screenshot of the 'Unlock REC BMS unit communication' window. It features a light gray rectangular input field on the left with the placeholder text 'Password' in a light blue font. To the right of this field is a dark gray rectangular button with the word 'Unlock' in white text.

Figure 3: Unlock communication window.

BMS info

Communication settings

Communication settings

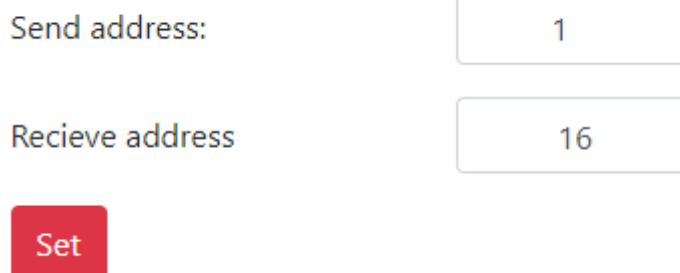
A screenshot of the 'Communication settings' window. It has a light gray background. At the top, the title 'Communication settings' is displayed in a large, bold, dark blue font. Below the title, there are two rows of settings. The first row consists of the label 'Send address:' in a light blue font, followed by a light gray rectangular input field containing the number '1'. The second row consists of the label 'Recieve address' in a light blue font, followed by a light gray rectangular input field containing the number '16'. At the bottom left of the window is a red rectangular button with the word 'Set' in white text.

Figure 4: Communication settings window.

Set the connected BMS's address.

Send address:

1. REC BMS 1Q unit has a default address of 1 (change if set differently on the BMS device),
2. REC Active BMS unit has a default address of 2 (change if set differently on the BMS device) and
3. REC BMS Master unit, set the Send address to 16.

Receive address:

1. Always set to 0, except when
2. using Master-Slave configuration to communicate with the Slaves units: set **Send address** of the connected BMS slave unit and set the **Receive address** to 16.

Wi-Fi settings

Information about the wireless network is displayed. **Wi-Fi mode** indicates if the device is working in **Access Point** mode or **Stationary** mode. Devices MAC and signal strength are displayed, along with IP address, which can be changed if using multiple devices or if IP is already taken.

WiFi settings

WiFi mode:	Stationary
WiFi MAC	
Signal strength	-48 dB
IP	192.168.1. 184 <input type="button" value="Submit"/>

WiFi name:

WiFi password:

Figure 5: Wi-Fi settings window.

Read more about **Setting the device to access point** and **Connecting the device to an existing network** in further chapters.

Login page settings

Additional login credentials, which provide another layer of safety, can be set to lock the access to the device. This is useful if connected to a Wi-Fi network with multiple users or if using tunneling to a local host.

Login page settings

Enable page Login name: Login password:

Figure 6: Additional login page settings window.

SD memory card info

Information about internal SD memory card. 16MB, class 10 SD card is usually used in the module. Some of the SD card memory is reserved for other purposes. If the size of the saved logs exceeds the space required for logging, the oldest log will be deleted. In case of SD card problems, unplug the WiFi module wiring, disabling its operation. Open the module and take the SD card out of the slot by sliding the slot sideways. Inspect card and slot contacts - there is a possibility of oxidation in rush environment. Put the card back in the card slot, secure the slot and reverse the rest of the procedure. If this does not help, download card data to a computer, format the card and put it back in.

Firmware updates

BMS Firmware update

Used for updating REC Wi-Fi module firmware and devices connected to it. Make sure the hardware (HW) version matches the version of the update file.

hardware version	software version	update the device connected to the WiFi module	update all slaves connected to the master
Firmware update HW:1.0 SW:1.1			
<input type="text" value="Choose file"/>	<input type="button" value="Browse"/>	<input type="button" value="Update"/>	<input type="button" value="Update slaves"/>
file input			

Figure 7: BMS firmware update window.

Updating Wi-Fi module's firmware

1. Connect to the device.
2. Go to its page on the **Firmware** tab.
3. Check the HW version next to **Firmware update**.
4. Download a matching update.
5. Go back to the **Firmware** -> **Firmware update** and choose the update file.
6. Click update and wait until it uploads.
7. **Reset the device.**

Updating firmware of RS-485 connected device

1. Connect to the device.
2. Go to its page on the **Firmware** tab.
3. Choose the update file and follow displayed instructions.

Updating whole BMS Master-slave system's firmware

This is possible only with system of slaves connected to the REC BMU Master unit.

1. Connect to the device.
2. Go to its page on the **Firmware** tab.
3. Choose the update file.
4. Click update slaves and follow displayed instructions.

Electrical properties

Device

Table 3: Wi-Fi module properties.

Parameter		Value	Unit
Supply voltage		12 - 90	V
Supply current (Access point)	V _{CC} = 12 V	62,6	mA
	V _{CC} = 24 V	30,9	
	V _{CC} = 48 V	16,2	
	V _{CC} = 60 V	13,4	
	V _{CC} = 90 V	9,6	
Supply current (Stationary mode)	V _{CC} = 12 V	32,7	mA
	V _{CC} = 24 V	16,5	
	V _{CC} = 48 V	8,9	
	V _{CC} = 60 V	7,4	
	V _{CC} = 90 V	5,6	
Low voltage disconnect		9,8	V
Enclosure dimensions (w x l x h)		127 x 71 x 36	mm
Weight		300	g

DC switch

Switch can be controlled by the button on the home page. An indicator is present displaying its state, OFF meaning, the switch is open and ON meaning, the switch is closed. Make sure the switch is wired according to the diagram below (Fig. 8).

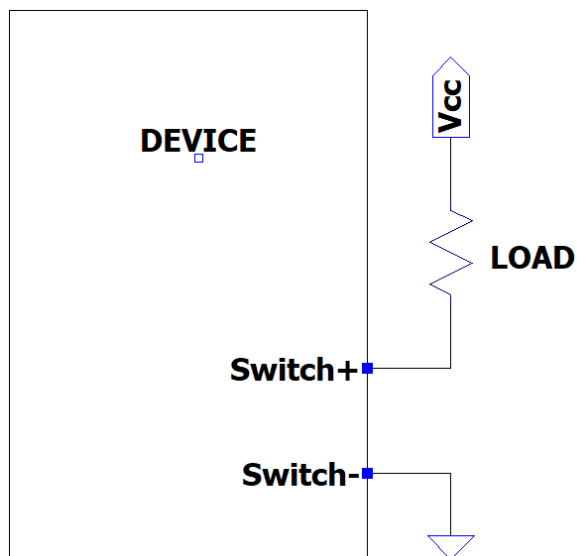


Figure 8: wiring diagram of DC switch.

Table 4: Parameter's values.

Parameter	Value	Unit
I_{\max} (fused)	3	A
V_{\max}	100	V
$t_{\text{off} \rightarrow \text{on}}$	5	ms
$t_{\text{on} \rightarrow \text{off}}$	1	ms
Output reverse voltage	-0.4	V

Power saving

If a REC BMS device is not detected, the device will go into standby mode after 1 hour to reduce power consumption. Every 2 hours it will wake up and check if there is a device present. Same applies if a low cell voltage is detected. To wake up the BMS, turn the device OFF and ON again manually.

Connector pin-out

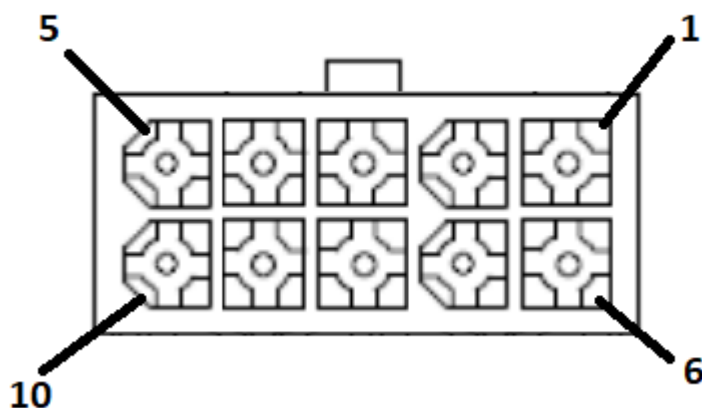


Figure 9: 10-pin connector front view.

Table 5: 10-pin connector designator.

Pin	Designator
1	Switch –
2	Switch +
3	N/C
4	RS-485 - B
5	RS-485 - A
6	Power +
7	Power –
8	N/C
9	RS-485 – GND
10	RS-485 – 3.3V

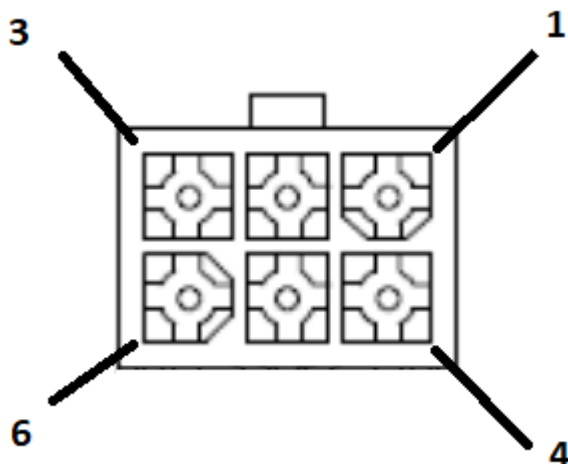


Figure 10: 6-pin connector front view.

Table 6: 6-pin connector designator.

Pin	Designator
1	LCD – B
2	LCD – A
3	N/C
4	N/C
5	LCD – GND
6	N/C

Table 7: TE connector's manufacturer's number.

Connector	Number
10 pin Wi-Fi module	794196-1
6 pin Wi-Fi module	794190-1
10 pin cable	1-770971-0
6 pin cable	1-770969-0
crimps	794229-1

Wiring harness

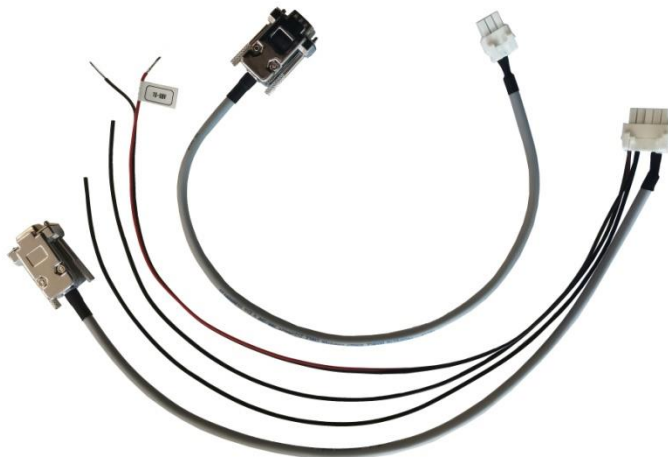


Figure 11: Wi-Fi wiring kit.

Table 8: Wiring kit.

Cable	Length	Type	End connection
Power supply cable 10-90V	0.5 m	2 x 0.35 mm ²	-
BMS to Wi-Fi connection	0.5 m	2 x 2x 0.25 mm ² 2-pair cable with shield	DB9 female: Pin 2: RS-485 – GND Pin 3: RS-485 - B Pin 4: RS-485 - A Pin 6: RS-485 – 3.3V
Wi-Fi to LCD connection	0.5 m	2 x 2x 0.25 mm ² 2-pair cable with shield	DB9 male: Pin 2: LCD – GND Pin 3: LCD - B Pin 4: LCD - A
Opto-relay output	0.5 m	2 x 1 mm ²	-

Typical characteristics

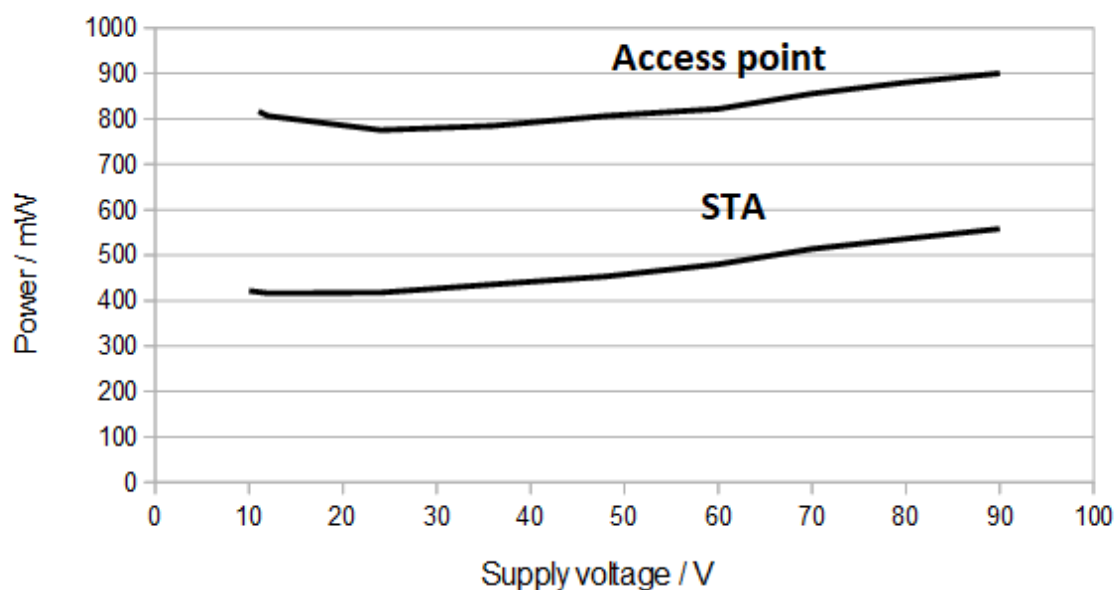


Figure 12: Typical power-to-voltage characteristics of operational Wi-Fi module.

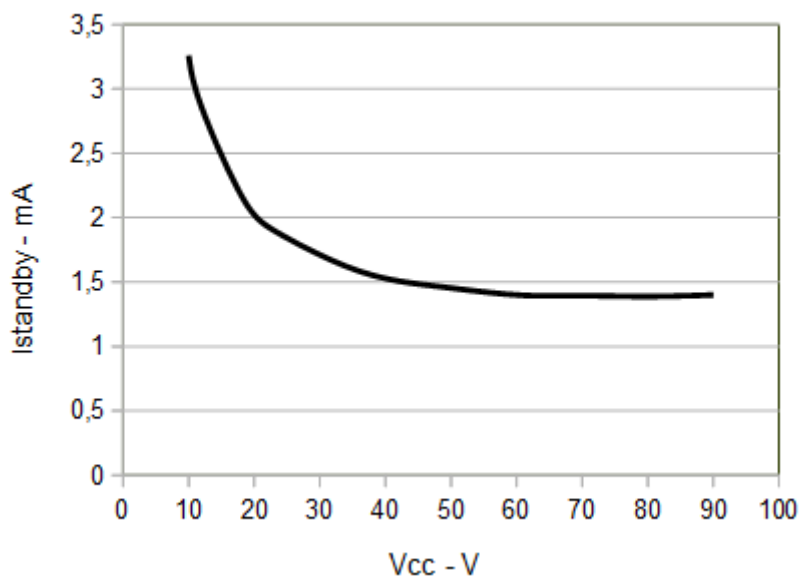


Figure 13: Current-to-voltage characteristics of operational Wi-Fi module.