BLESTM32VE Bluetooth Module

Introduction

BLESTM32VE is a Bluetooth module designed by Victron Energy B.V. and is meant to be used only within Victron Energy B.V. product range.
It will be mounted within the enclosure of our products and won't be visible or accessible from the end user.
It won't be sold to end users directly.

Description

The module uses the STM32WB55CEU6 multiprotocol wireless and ultra-low-power device that embeds a powerful and ultra-low-power radio compliant with the Bluetooth® Low Energy SIG specification 5.3 and with IEEE 802.15.4-2011. It contains a dedicated Arm® Cortex®-M0+ for performing all the real-time low layer operation. For more detailed information on the MCU used, please refer to its datasheet (https://www.st.com/stm32wb55xx).

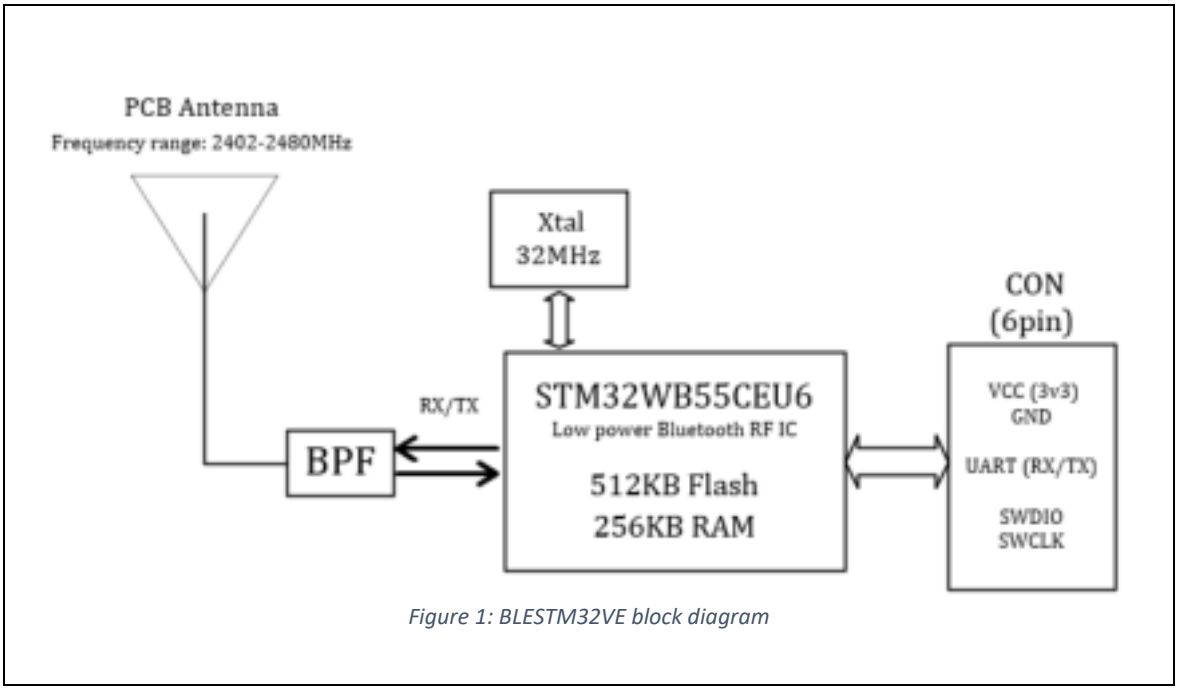


Figure 1: BLESTM32VE block diagram

Electrical Characteristics

Parameter	Min.	Typ.	Max.	Unit
Supply Voltage (Vdd)	1.71	3.3	3.6	V
Operating Current (Networking Rx on)		11		mA
Operating Current (Networking Rx off)		3.5		mA
Operating ambient temperature range	-40		85	°C
Storage temperature range	-65		150	°C

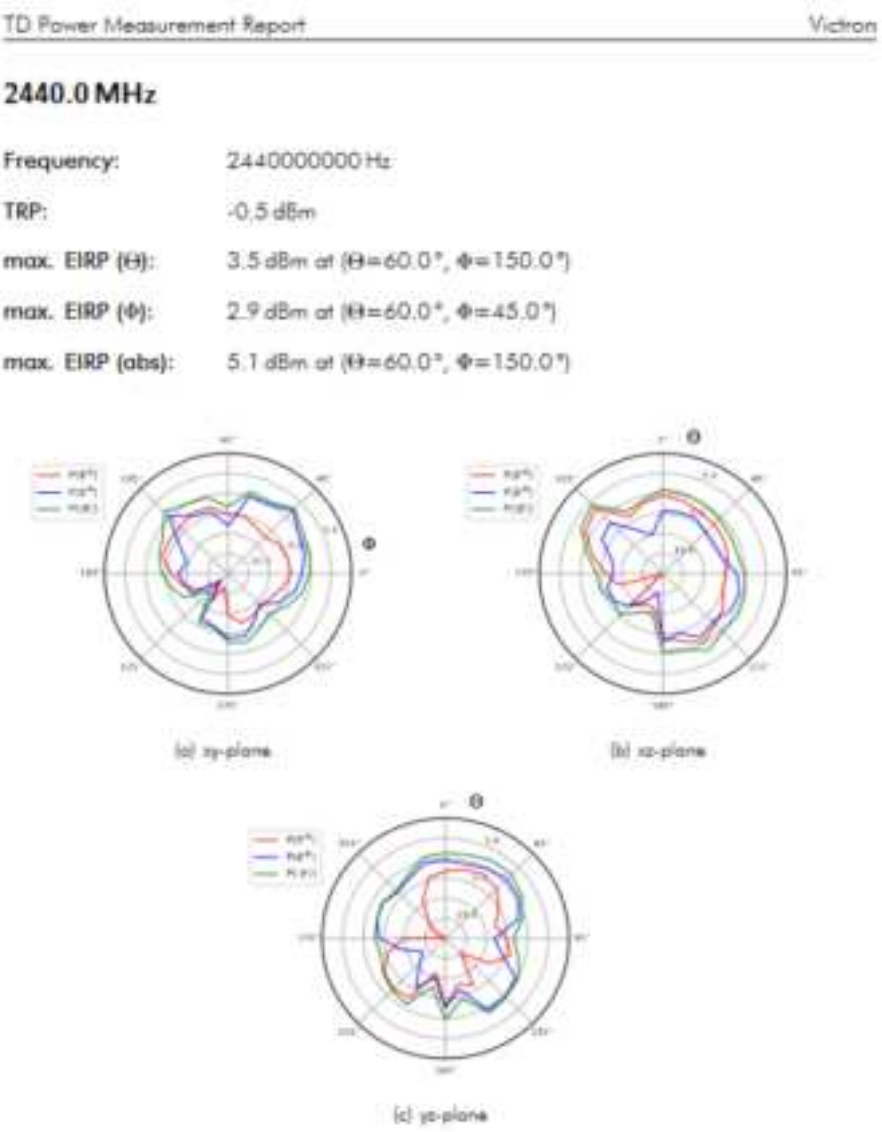
Antenna and Radio Specifications

Parameter	Value
Bluetooth Version	Bluetooth Low Energy (BLE) 5.0
Frequency Band	2402 MHz – 2480 MHz
Occupied channel width	1-2 MHz
Modulation	GFSK (Gaussian Frequency Shift Keying)
RF Output Power (typical)	+6 dBm
RX sensitivity (@1Mbps)	-96 dBm
Antenna Type	Integrated PCB antenna
Max EIRP (in the horizontal plane)	3.5 dBm (1)
Antenna gain	0dBi (2)
Compliance Standards	FCC CFR 47 Part 15, CE RED, IC RSS-247

(1) The maximum polarization dependent EIRP is 3.5 dBm in the horizontal plane. This is the highest EIRP value for the highest frequency dependent correlated antenna gain and output power.

(2) The measurement of the EIRP gives a maximum value of 3.5 dBm in the horizontal plane. The conducted RF-output power (Pcond) was measured as 3.5 dBm. The maximum isotropic antenna gain is calculated as:

3.5 dBm EIRP – 3.5 dBm Pcond = 0 dBi Antenna gain


TD Power Measurement Report Victron

2440.0 MHz

Frequency:	2440000000 Hz
TRP:	-0.5 dBm
max. EIRP (Θ):	3.5 dBm at (Θ=60.0°, Φ=150.0°)
max. EIRP (Φ):	2.9 dBm at (Θ=60.0°, Φ=45.0°)
max. EIRP (abs):	5.1 dBm at (Θ=60.0°, Φ=150.0°)

(a) xy-plane (b) xz-plane

(c) yz-plane

Pin description and Installation information

This module will be installed in the host devices according to the interface specification:

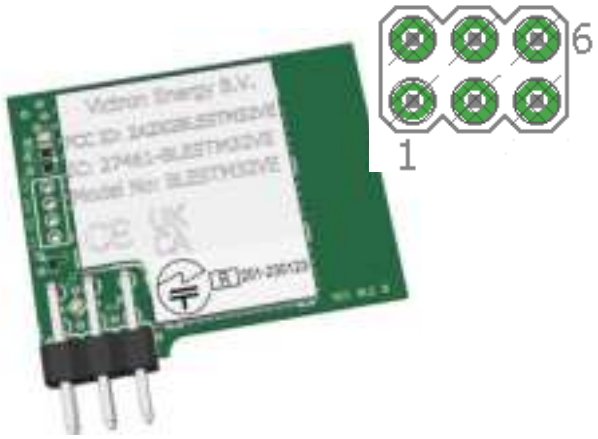
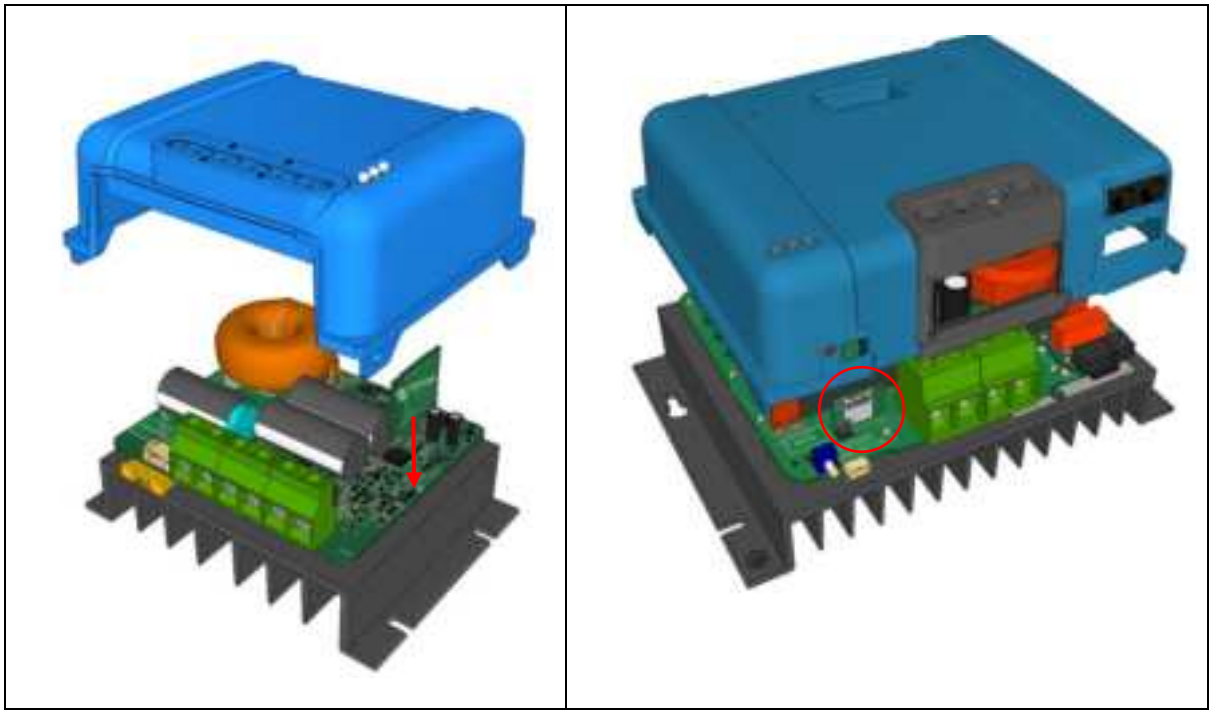


Figure 2: Pin definition

Pin1	**VDD**
Pin2	**SWLCK**
Pin3	**Rx**
Pin4	**GND**
Pin5	**Tx**
Pin6	**SWDIO**

The module will be used in several products, below two examples of how it will be mounted on two different VE Solar Charge Controllers MPPT models:



Module dimensions

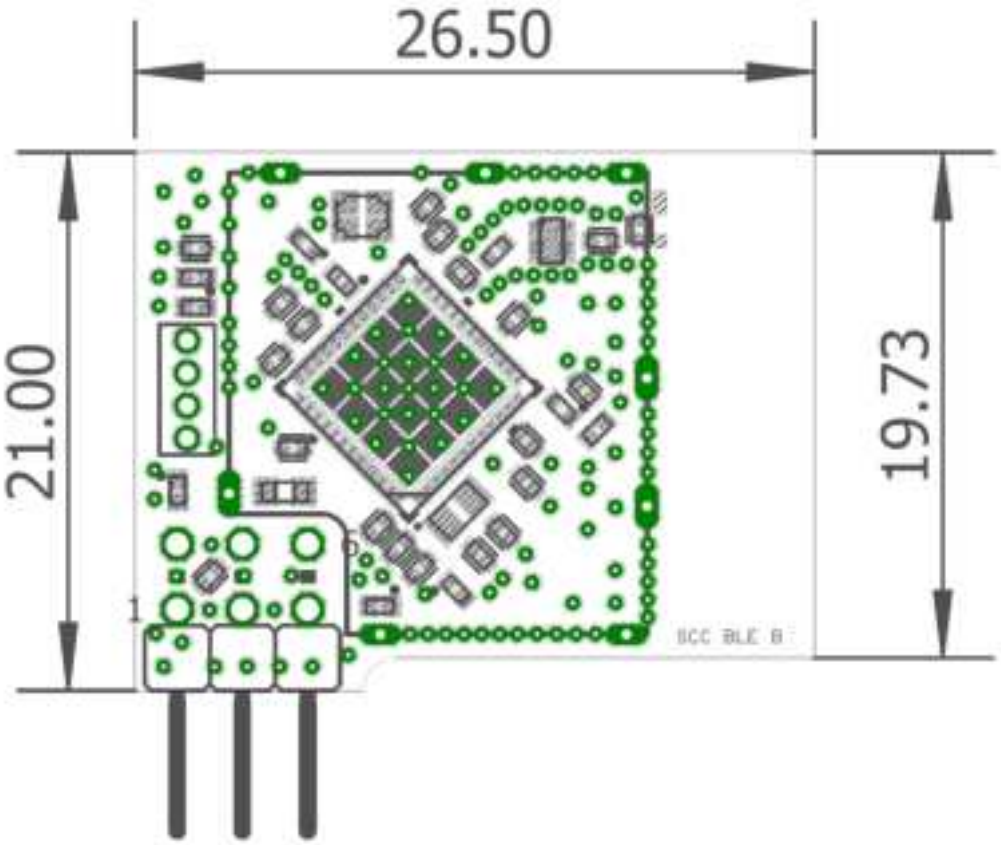


Figure 3: Module dimensions (in mm)

Host integration considerations

For the RED in the European Union, it is advised to test the host for at least the following clauses from article 3.2 [EN 300 328 v2.2.2]:

- Clause 4.3.2.2: RF output power, consider this test for the following conditions.
  - If the antenna is potted
  - If the enclosure is metallic
- Clause 4.3.2.9: TX radiated Spurious emissions,
- Clause 4.3.2.10: RX radiated Spurious emissions.

*check with the test house if any particular tests need to be performed for each host.

Labeling and Information requirements

- United States (FCC)

As the module will be installed within the final product, its FCC ID number won't be visible. Thus, it is required that the outside of the final product must display a label referring to the enclosed module. On the exterior label, wording as stated below can be used:

Contains Transmitter Module FCC ID: 2A2XGBLESTM32VE **or** **Contains FCC ID: 2A2XGBLESTM32VE**

A user's manual of the final product must include the following statement:

Compliance Statement (Part 15.19)

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.

Warning (Part 15.21)

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

FCC Interference Statement (Part 15.105 (b))

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.

RF exposure warning

To comply with FCC and Industry Canada RF radiation exposure limits for general population/uncontrolled exposure, the antenna(s) used for this transmitter must be installed such that a minimum separation distance of 20 cm is maintained between the radiator (antenna) and all persons at all times and must not be co-located or operating in conjunction with any other antenna or transmitter."

- Canada (ISED)

Contains IC: 27461-BLESTM32VE

A user's manual of the final product must include the following statement:

Canada, Innovation, Science and Economic Development Canada (ISED) Notices
This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s). 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.

Avis du Canada, Innovation, Sciences et Développement économique Canada (ISED)
L'émetteur/récepteur exempt de licence contenu dans 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, et (2) L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Radio Frequency (RF) Exposure Information
The radiated output power of the Wireless Device is below the Innovation, Science and Economic Development Canada radio frequency exposure limits. The Wireless Device should be used in such a manner such that the potential for human contact during normal operation is minimized.

This device has also been evaluated and shown compliant with the IC RF Exposure limits under portable exposure conditions. (antennas are less than 20 cm of a person's body).

Informations concernant l'exposition aux fréquences radio (RF)
La puissance de sortie émise par l'appareil de sans fil est inférieure à la limite d'exposition aux fréquences radio d'Innovation, Sciences et Développement économique Canada. Utilisez l'appareil de sans fil de façon à minimiser les contacts humains lors du fonctionnement normal.

Ce périphérique a également été évalué et démontré conforme aux limites d'exposition aux RF d'IC dans des conditions d'exposition à des appareils portables. (les antennes sont moins de 20 cm du corps d'une personne).