
# STMicroelectronics STM32WB5MMG Bluetooth Low Energy Module Owner's Manual

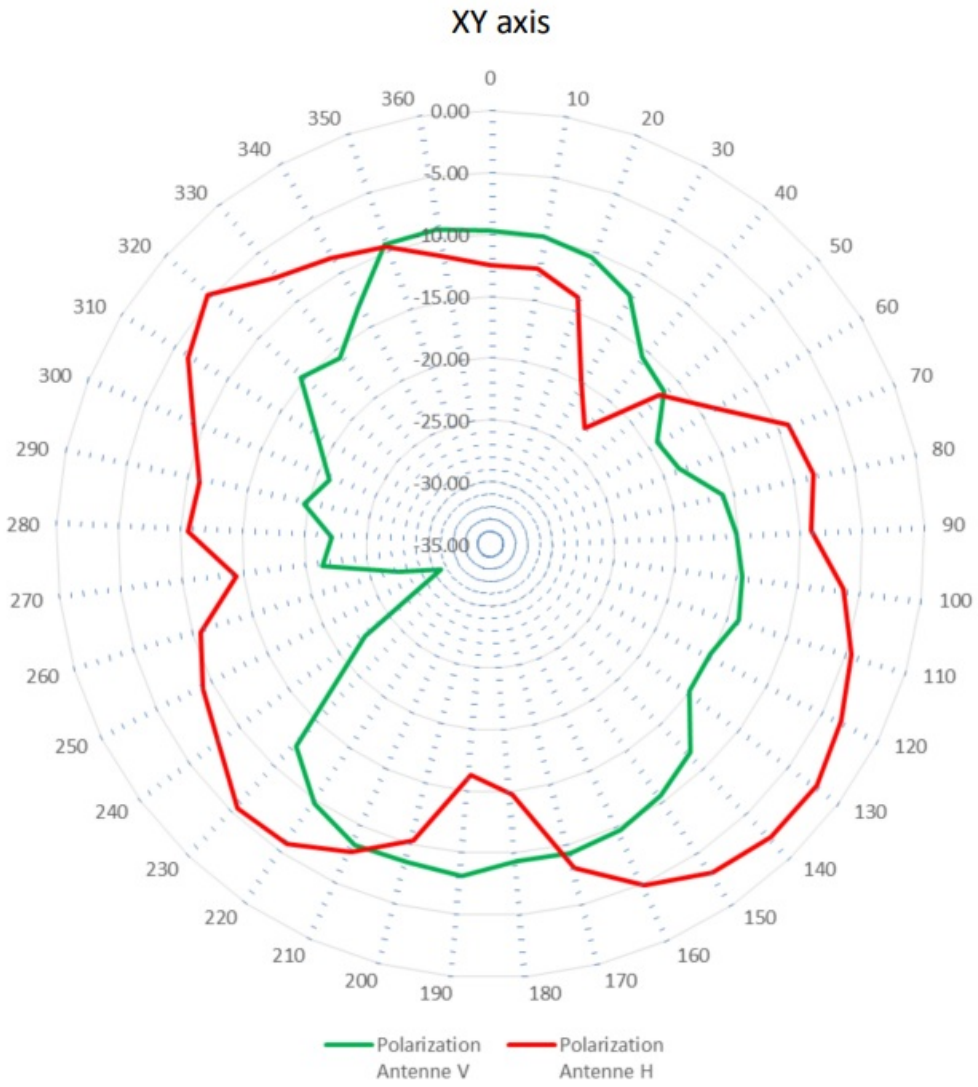


Contents

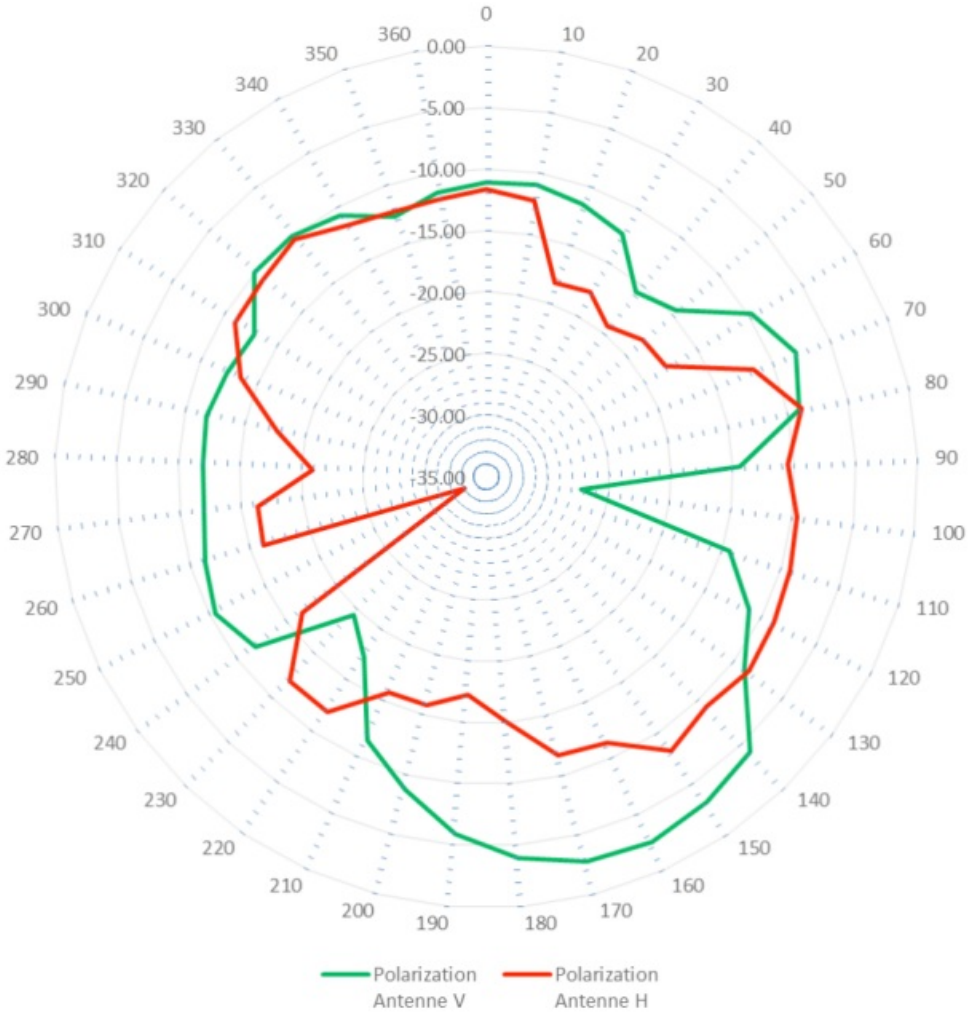
1 STMicroelectronics STM32WB5MMG Bluetooth Low Energy Module
2 Thermal characteristics
3 FCC certification
4 ISED certification
5 Important security notice
6 Documents / Resources
6.1 References

## STMicroelectronics STM32WB5MMG Bluetooth Low Energy Module


**Figure 13.** Antenna radiation patterns




**Z axis**




## Thermal characteristics

The thermal characteristics of the STM32WB5MMG are defined below and the constant values are given in

**Table 4 where**

- JA is the junction-to-ambient thermal resistance (EIA/JESD51-2 and EIA/JESD51-6).
- JA represents the resistance to the heat flow from the chip to ambient air. It is an indicator of package heat dissipation capability. Lower JA means better overall thermal performance and is calculated as follows:
  - JA, = (TJ
  - TA) / PH

**where**

- TJ = junction temperature
- TA = ambient temperature
- PH = power dissipation.
  - ΨJT is the junction-to-top-centre thermal characterization parameter (EIA/JESD51-2 and EIA/JESD51-6).
  - ΨJT is used for estimating the junction temperature by measuring TT in an actual environment and is calculated as follows:
  - ΨJT = (TJ – TT) / PH

where TT = temperature at the top-centre of the package.

- JC is the junction-to-case thermal resistance.
- JC represents the resistance to the heat flow from the chip to the package top case. JC is important when the external heat sink is attached to the package top and is calculated as follows:
  - JC = (TJ – TC) / PH
- where TC = case temperature attached with a cold plate.
  - JB is the junction-to-board thermal resistance (EIA/JESD51-8).
  - JB represents the resistance to the heat flow from the chip to the PCB. JB is used in compact thermal models for system-level thermal simulation and is calculated as follows:
    - JB = (TJ – TB) / PH
    - where TB = board temperature with ring cold plate fixture applied.

**Table 4.** STM32WB5MMG thermal characteristics

| **Symbol** | **TJ(°C)** | **TT(°C)** | **ΨJT(°C/W)** | **JA(°C/W)** | **JB(°C/W)** | **JC(°C/W)** |
|---|---|---|---|---|---|---|
| Value | 97.36 | 96.98 | 0.38 | 37.36 | 24.58 | 16.21 |

**Package information**
To meet environmental requirements, ST offers these devices in different grades of ECOPACK packages, depending on their level of environmental compliance. ECOPACK specifications, grade definitions and product status are available at: www.st.com. ECOPACK is an ST trademark.

**SiP-LGA86 package information**
This SiP-LGA is an 86-pin, 7.3 x 11mm, system in package land grid array package.
**Figure 14**. SiP-LGA86 – Outline

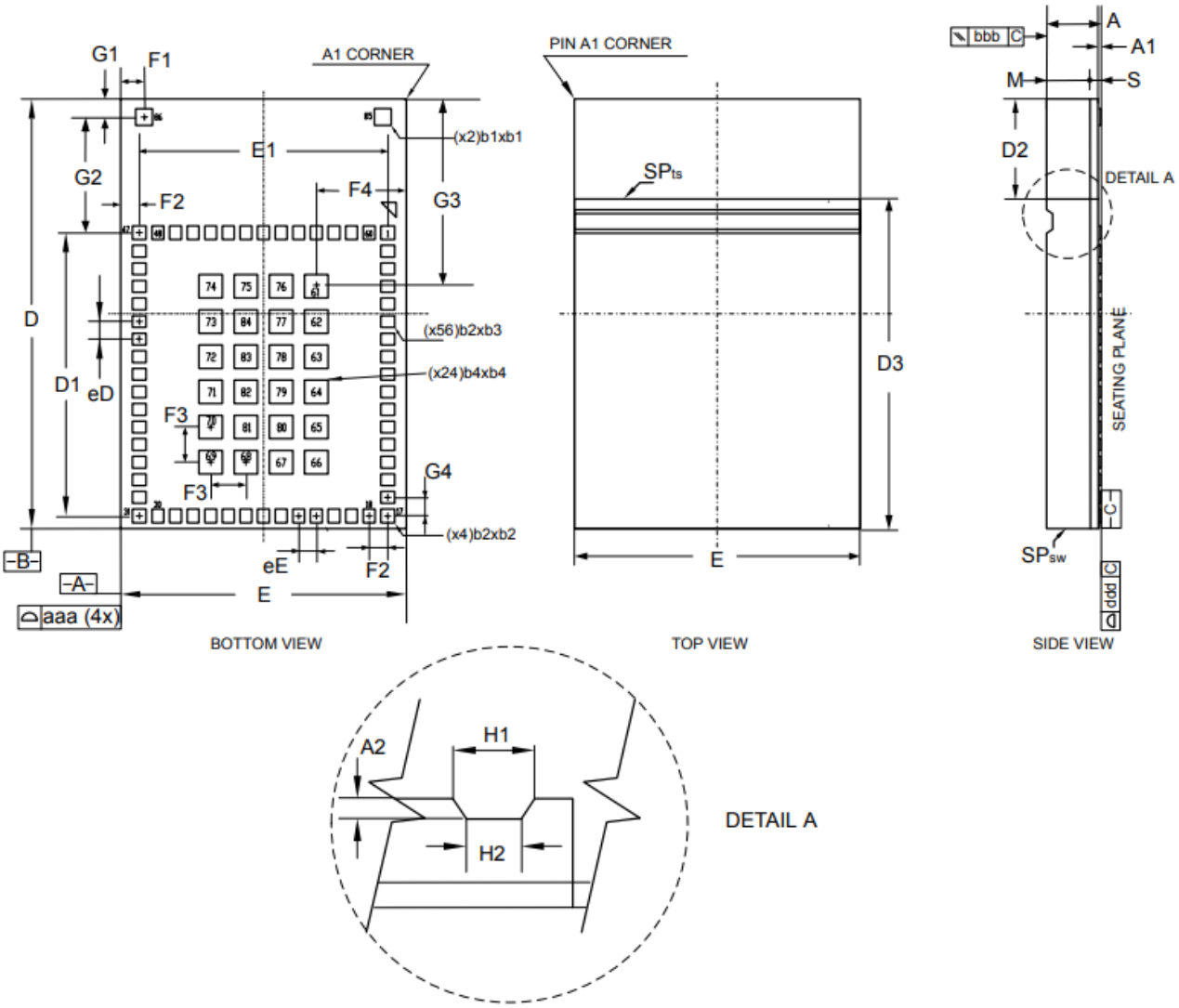



**Table 5.** SiP-LGA86 – Mechanical data

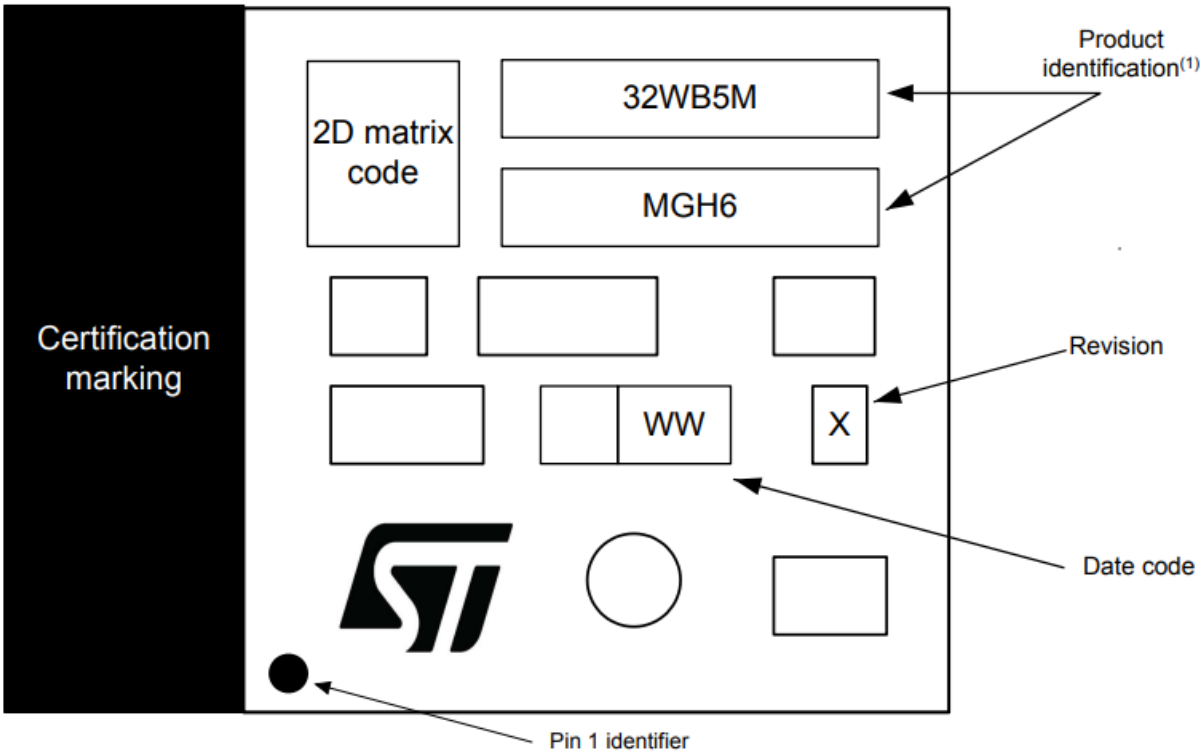
| Symbol | Description | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| A | Total thickness | 1.382±0.046 | | | mm |
| A1 | Pre-solder | 40±20(1) | | | µm |
| | | 30±20(2) | | | |
| A2 | – | 0.150 | | | mm |
| M | Mould thickness | 1.100 | | | |
| S | Substrate thickness | 0.242 | | | |
| D | Body length | 10925 | 11.000 | 11.075 | |
| D1 | Lead pitch length | 7.250 | | | |
| D2 | – | 2.563 | | | |
| D3 | – | 8.438 | | | |
| eD | Lead pitch length | 0.450 | | | |
| E | Body width | 7.225 | 7.300 | 7.375 | |

| | | | | | |
|---|---|---|---|---|---|
| eE | Lead pitch width | 0.450 | | | |
| b1 | – | 0.430 | | | |
| b2 | – | 0.350 | | | |
| b3 | – | 0.300 | | | |
| b4 | – | 0.600 | | | |
| F1 | – | 0.600 | | | |
| F2 | – | 0.475 | | | |
| F3 | – | 0.900 | | | |
| F4 | – | 2.300 | | | |
| G1 | – | 0.465 | | | mm |
| G2 | – | 2.960 | | | |
| G3 | – | 4.800 | | | |
| G4 | – | 0.475 | | | |
| H1 | – | 0.600 | | | mm |
| H2 | – | 0.400 | | | mm |
| (3) SPts | Top surface sputter | 3 | – | 6 | µm |
| (4) SPsw | Sidewall sputter | 1 | – | 3 | µm |
| aaa | Package edge tolerance | 0.075 | | | |
| by | Mould flatness | 0.100 | | | mm |
| and | Coplanarity | 0.100 | | | |

1. Peripheral pads
2. Inner pads
3. Top surface sputter
4. Sidewall sputter

**Board design**
For information and recommendations related to board design, landing pads, stencils and the solder reflow pro

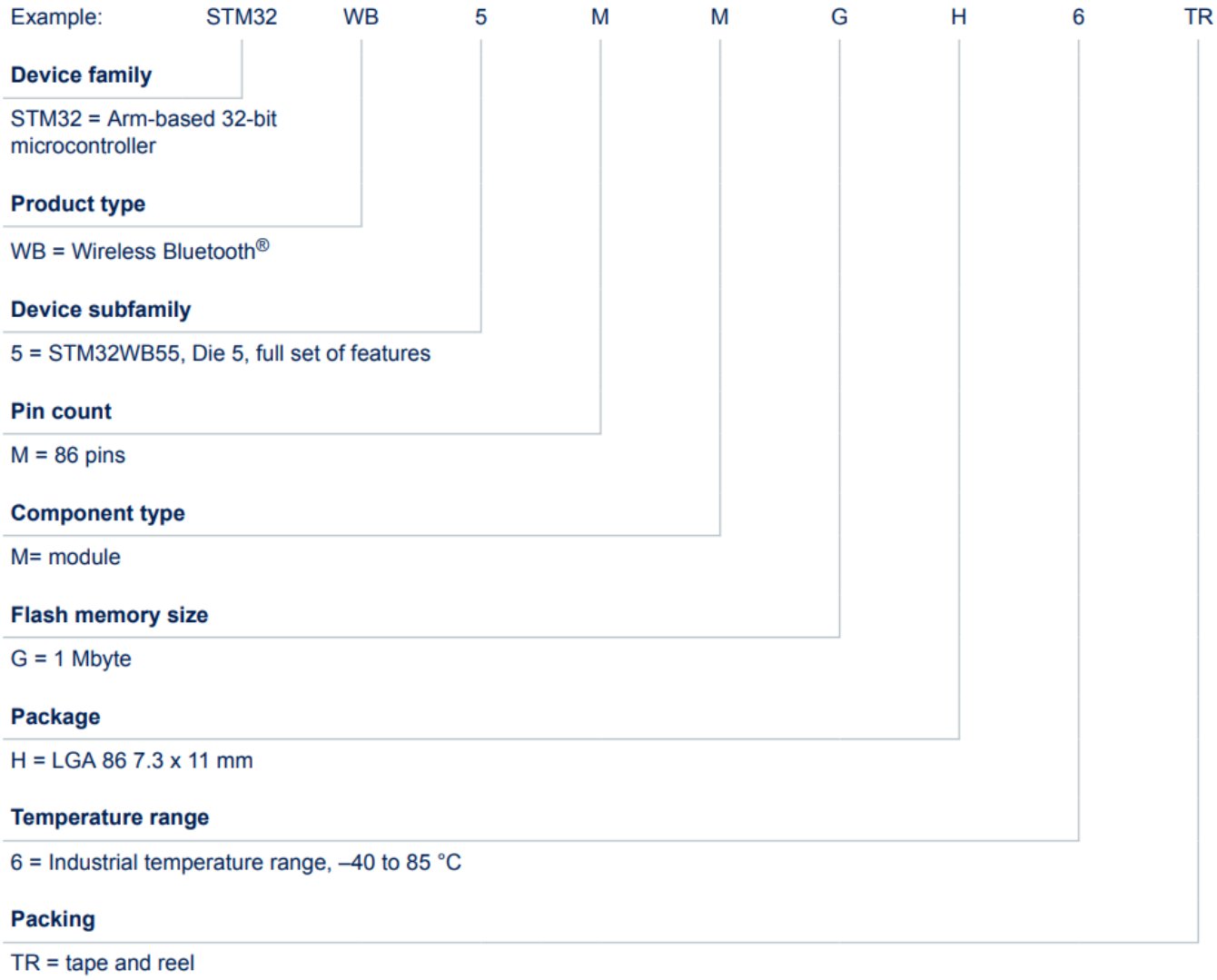
**Device marking for SiP-LGA86**
The following figure gives an example of topside marking versus pin 1 position identifier location. The printed markings may differ depending on the supply chain. Other optional markings or inset/upset marks, which depend on supply chain operations, are not indicated below.
**Figure 15.** SiP-LGA86 marking example




1. Parts marked as “ES”, or “E” or accompanied by an Engineering Sample notification letter, are not yet qualified and therefore not approved for use in production. ST is not responsible for any consequences resulting from such use. In no event will ST be liable for the customer using any of these engineering samples in production. ST’s Quality department must be contacted before any decision to use these engineering samples to run a qualification activity.

**Ordering information**

**Note:** For a list of available options (such as speed and package) or further information on any aspect of this device, contact your nearest ST sales office.




**Certification**

The STM32WB5MMG module certification status is detailed in the table below:

**Table 6.** Certification status

| Certification | | Revision Y | Revision X |
|---|---|---|---|
| Bluetooth Low Energy | RF-PHY | X | X |
| 802.15.4 (Zigbee) | RF-PHY | X | X |
| EU | RED | X | X |
| USA | FCC | X | X |
| Canada | ISED-PCB | X | X |
| China | SRRC | Pending | X |
| Japan | JRF | X | X |
| Korea | KC or MSIP | X | X |
| Taiwan | NCC | X | X |
| EU | ROHS | X | X |
| EU | REACH | X | X |
| Russia | COST | X | Pending |

The following sections detail some of the module certifications from sample regions. All certification reports are available on the STM32WB5MMG page.

**BLE(RF_PHY) certification**

- The STM32WB5MMG module has obtained BLE RF_PHY certification.
- The module is published under the BLE SIG website.

**CE certification**

- The STM32WB5MMG module has obtained CE certification.
- The module is provided with CE marking.
- **Figure 16.** CE certification logo

**UKCA certification**

- The STM32WB5MMG module has obtained UKCA certification.
- The module is provided with UKCA marking.
- Figure 17. UKCA certification logo

## FCC certification

The STM32WB5MMG module complies with part 15 of the FCC Rules. The FCC ID is YCP-STM32WB5M001 for version Y and YCP-32WB5MMGH02 for version X. The module label includes the corresponding FCC ID. The operation is subject to the following two conditions:

- This device may not cause harmful interference

- This device must accept any interference received, including interference that may cause undesired operation.

  **Note:** This equipment has been tested and found to comply with the limits for a Class B digital device, under part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation.

**Label requirements**
If the identification number is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module. This label must contain the FCC ID that matches the one on the module.

**Documentation requirements**
The user manual or instruction manual for an intentional or unintentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

**Integration requirements**
The co-location of this module with other transmitters that operate simultaneously is required to be evaluated using the multi-transmitter procedures. The host integrator must follow the integration instructions provided in this document and ensure that the composite-system end product complies with the requirements by a technical assessment or evaluation of the rules and KDB Publication 996369. The host integrator installing this module into their product must ensure that the final composite product complies with the requirements by a technical assessment or evaluation of the rules, including the transmitter operation and should refer to the guidance in KDB 996369.

## ISED certification

- The STM32WB5MMG module has been tested and found compliant with the ISED RSS-247 and RSS-Gen rules.
- The IC ID is 8976A-STM32WB5M01 for version Y and 8976A-32WB5MMGH02 for version X.
- This module contains license-exempt transmitter(s) that comply with Innovation, Science and Economic
- Development Canada's license-exempt RSS(s). Operation is subject to the following two conditions:

**JRF certification**
The STM32WB5MMG is certified in Japan with the certification number:

- 005-102490 for rev Y
- 217-220682 for rev X.
- The JRF logo is the following:
- Figure 18. JRF certification logo

**NCC certification**
The STM32WB5MMG rev X is certified in Taiwan with NCC certification number: CCAJ23LP3C40T2.
The STM32WB5MMG rev Y is certified in Taiwan with NCC certification number: CCAN20LP0740T3.
Figure 19. NCC certification logo

For low-power radio frequency equipment that has obtained certification, companies, firms or users are not allowed to change the frequency, increase the power, or change the characteristics and functions of the original design without approval. The use of low-power radio-frequency equipment must not affect flight safety and interfere with legal communications; if any interference is found, it should be stopped immediately, and it can only be used after improvement to no interference.

The aforementioned legal communication refers to radio communication operated by the provisions of the Telecommunications Management Act. Low-power radio frequency equipment must endure the interference of legal communication or industrial, scientific and medical radio wave radiation electrical equipment. System manufacturers should mark the words “This product contains a radio frequency module: XXXyyyLPDzzzz-x” on the platform.

**SRRC certification**
The module STM32WB5MMG has received regulatory approval in China (SRRC) with CMIIT ID 2023DP14302.

- Applicant: STMicroelectronics SAS
- Basic Model Number: STM32WB5MMGH
- Certification No.: R-R-2AS-32WB5MMGH002
- Manufacturer / Country of Origin: STMicroelectronics SAS / France
- Date of manufacture: notation separately

## Important security notice

The STMicroelectronics group of companies (ST) places a high value on product security, which is why the ST product(s) identified in this documentation may be certified by various security certification bodies and/or may implement our security measures as set forth herein. However, no level of security certification and/or built-in security measures can guarantee that ST products are resistant to all forms of attacks. As such, it is the responsibility of each of ST’s customers to determine if the level of security provided in an ST product meets the customer needs both about the ST product alone, as well as when combined with other components and/or software for the customer end product or application. In particular, take note that:

- ST products may have been certified by one or more security certification bodies, such as Platform Security Architecture (**www.psacertified.org**) and/or Security Evaluation Standard for IoT Platforms (**www.trustcb.com**). For details concerning whether the ST product(s) referenced herein have received security certification along with the level and current status of such certification, either visit the relevant certification standards website or go to the relevant product page on **www.st.com** for the most up-to-date information. As the status and/or level of security certification for an ST product can change from time to time, customers should re-check the security certification status/level as needed. If an ST product is not shown to be certified under a particular security standard, customers should not assume it is certified.
- Certification bodies have the right to evaluate, grant and revoke security certification for ST products. These certification bodies are therefore independently responsible for granting or revoking security certification for an ST product, and ST does not take any responsibility for mistakes, evaluations, assessments, testing, or other activity carried out by the certification body concerning any ST product.
- Industry-based cryptographic algorithms (such as AES, DES, or MD5) and other open standard technologies that may be used in conjunction with an ST product are based on standards that were not developed by ST. ST does not take responsibility for any flaws in such cryptographic algorithms or open technologies or for any methods that have been or may be developed to bypass, decrypt or crack such algorithms or technologies.
- While robust security testing may be done, no level of certification can guarantee protection against all attacks, including, for example, against advanced attacks that have not been tested for, against new or unidentified forms of attack, or any form of attack when using an ST product outside of its specification or intended use, or in conjunction with other components or software which are used by the customer to create their end product or

application. ST is not responsible for resistance against such attacks. As such, regardless of the incorporated security features and/or any information or support that may be provided by ST, each customer is solely responsible for determining if the level of attacks tested for meets their needs, both about the e ST product alone and when incorporated into a customer end product or application.

- All security features of ST products (inclusive of any hardware, software, documentation, and the like), including but not limited to any enhanced security features added by ST, are provided on an “AS IS” BASIS. AS SUCH, TO THE EXTENT PERMITTED BY APPLICABLE LAW, ST DISCLAIMS ALL WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, unless the applicable written and signed contract terms specifically provide otherwise.

**Revision history**

**Table 7.** Document revision history

| Date | Revision | Changes |
|---|---|---|
| 12-Nov-2020 | 1 | Initial release. |
| 16-Jul-2021 | 2 | Added:<br>• Power supply<br>• SMPS<br>• Clocks<br>• Antenna<br>• Two-layer reference board design<br>• **BLE(RF_PHY) certification** Updated:<br>• Features<br>• Figure 1. STM32WB5MMG module block diagram<br>• Section 3.3: Clocks<br>• Section 5: Pin description<br>• STM32WB5MMG pin/ball definition<br>• Section 6.2.2: Enclosure effects<br>• Figure 8. Four-layer reference board schematics<br>• Section 7.4: Antenna radiation patterns and efficiency<br>• **Section 9.1: SiP-LGA86 package information**<br>• **Section 11: Certification**<br>• **Section 11.1: BLE(RF_PHY) certification** |

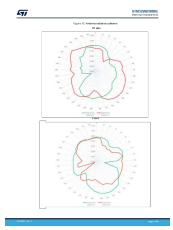
| | | |
|---|---|---|
| 09-Nov-2022 | 3 | Added:<br>• Section 3.1: Versions<br>• Section 3.5: One-time programming (OTP)<br>• Figure 8. Four-layer reference board schematics for version X<br>• Figure 9. Four-layer PCB layout for version X<br>• Figure 10. Two-layer reference board schematics for version X<br>• Figure 11. Two-layer PCB layout for version X<br>• **Section 11.3: UKCA certification**<br>• **Section 11.9: KC certification**<br>• **Section 12: Important security notice** Updated:<br>• Cerfication images<br>• Bluetooth Bluetooth® Low Energy protocol version support throu ghout the document<br>• Document title<br>• Section Features<br>• Certification logo representation<br>• Section 1: Introduction<br>• Section 2: Description<br>• Split Section 3: Module overview into a separate section<br>• Section 3.1: Versions<br>• Figure 1. STM32WB5MMG module block diagram<br>• Section 3.2.1: SMPS<br>• Section 3.3: Clocks<br>• Section 5: Pin description<br>• Table 1. STM32WB5MMG pin/ball definition<br>• Section 6.1: Pin recommendations<br>• Section 6.2.4: Sensitive GPIOs<br>• **Table 5. SiP-LGA86 – Mechanical data**<br>• Figure 8. Four-layer reference board schematics for version Y<br>• Figure 10. Four-layer PCB layout for version Y<br>• Figure 12. Two-layer reference board schematics for version Y<br>• Figure 14. Two-layer PCB layout for version Y |

| Date | Revision | Changes |
|---|---|---|
| 09-Nov-2022 | 3 | • Section 9.3: Device marking for SiP-LGA86<br>– Section 9.1: SiP-LGA86 package information<br>– Table 5. SiP-LGA86 – Mechanical data<br>• Section 9.3: Device marking for SiP-LGA86<br>– Figure 15. SiP-LGA86 marking example<br>• Figure 15. SiP-LGA86 marking example<br>• Section 8: Thermal characteristics<br>• Section 11: Certification<br>• Section 11.4: FCC certification<br>• Section 11.5: ISED certification<br>• Section 11.6: JRF certification<br>• Section 11.7: NCC certification<br>Removed: Solder reflow recommendations section |
| 01-Mar-2023 | 4 | Updated:<br>• Product status<br>• Figure 1. STM32WB5MMG module block diagram<br>• Section 5: Pin description<br>– Figure 2. STM32WB5MMG module pinout: bottom view<br>• Section 6.1: Pin recommendations<br>• Section 6.2.5: Four-layer reference board design<br>– Figure 8. Four-layer reference board schematics for version X<br>• Section 6.2.6: Two-layer reference board design<br>– Figure 10. Two-layer reference board schematics for version X<br>• Section 7.4: Antenna radiation patterns and efficiency<br>– Added Figure 13. Antenna radiation patterns<br>• Section 9.2: Board design Removed:<br>• “Four layer reference board schematics for version Y” figure<br>• “Four layer PCB layout for version Y” figure<br>• “Two-layer reference board schematics for version Y” figure<br>• “Two-layer PCB layout for version Y” figure |

| | | |
|---|---|---|
| 10-Mar-2023 | 5 | Updated:<br>• Figure 11. Two-layer PCB layout for version X<br>• Section 3.2: Power supply<br>• Section 5: Pin description |
| 21-Sep-2023 | 6 | Updated:<br>• Title<br>• Figure 8. Four-layer reference board schematics for version X<br>• Figure 10. Two-layer reference board schematics for version X<br>• References to DS11929 |
| 26-Feb-2024 | 7 | Updated:<br>• Figure 13. Antenna radiation patterns<br>• Table 6. Certification status<br>• Section 11.4: FCC certification<br>• Section 11.5: ISED certification<br>• Section 11.7: NCC certification<br>• Section 11.8: SRRC certification<br>Removed Tape and reel packing |



**Documents / Resources**

| | |
|---|---|
|  | **STMicroelectronics STM32WB5MMG Bluetooth Low Energy Module** [pdf] Owner's Manual<br>STM32WB5MMG Bluetooth Low Energy Module, STM32WB5MMG, Bluetooth Low Energy Module, Low Energy Module, Energy Module, Module |

## References

- Home - TrustCB
- User Manual