UM2910

User manual

STLINK-V3MINIE debugger/programmer tiny probe for STM32 microcontrollers

Introduction

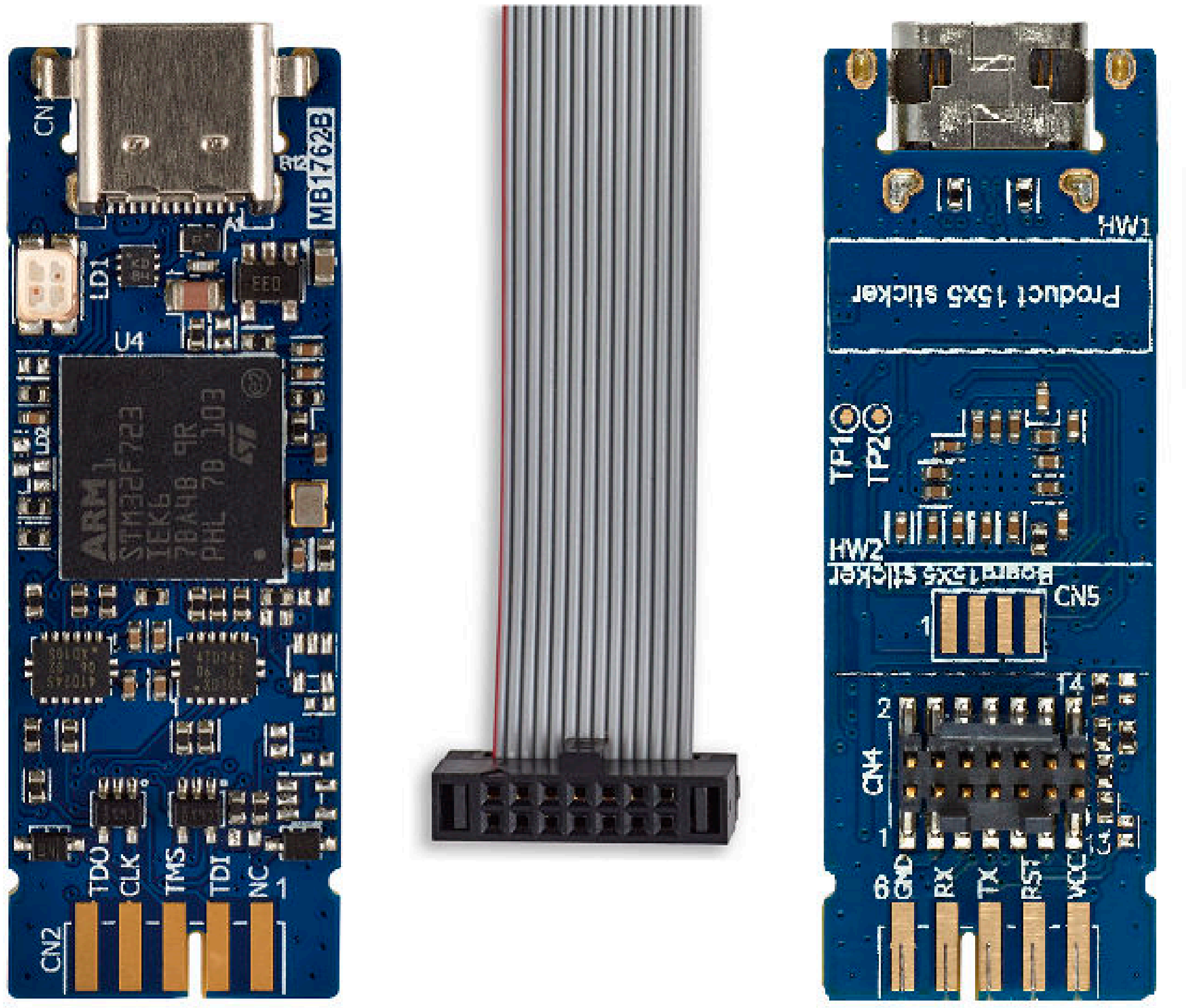
STLINK-V3MINIE is a standalone debugging and programming tiny probe for STM32 microcontrollers.

The JTAG/SWD interfaces are used to communicate with any STM32 microcontroller located on an application board.

STLINK-V3MINIE also provides a Virtual COM port interface for the host PC to communicate with the target microcontroller through one UART.

STLINK-V3MINIE is a portable version easy-to-use debugger and programmer including an STDC14 interface with its flat cable and on-board pads for a board-to-board (BTB) card edge connector.

Figure 1. STLINK-V3MINIE top, bottom, and cable views



Pictures are not contractual.

1 Features

- Tiny 15 mm × 42 mm standalone debugging and programming probe for STM32 microcontrollers
- Self-powered through a USB Type-C® connector
- USB 2.0 high-speed interface
- Probe firmware update through USB
- Optional drag-and-drop flash memory programming of binary files
- Communication bicolor LED
- JTAG communication support up to 21 MHz
- SWD (Serial Wire Debug) and SWV (Serial Wire Viewer) communication support up to 24 MHz
- Virtual COM port (VCP) up to 16 Mbps
- 1.65 to 3.60 V application voltage support
- Board connectors:
  - USB Type-C® connector
  - 1.27 mm pitch STDC14 debug connector with STDC14 to STDC14 flat cable
  - 2.0 mm pitch on-board pads for BTB (Board-to-board) card edge connector

Note: *STLINK-V3MINIE does not provide any power supply to the target application.*

2 Ordering information

To order the STLINK-V3MINIE tiny probe, refer to Table 1.

Table 1. **Ordering information**

Order code	Board reference	Description
STLINK-V3MINIE	- MB1762(1) - FFC(2)	- STLINK-V3 in-circuit debugger and programmer for STM32 microcontrollers with level shifter

1. *Tiny probe board*
2. *Flexible flat cable*

3 Development environment

STLINK-V3MINIE runs with an STM32 32-bit microcontroller based on the Arm® Cortex®-M core.

Note: Arm is a registered trademark of Arm Limited (or its subsidiaries) in the US and/or elsewhere.

3.1 System requirements

- Multi-OS support: Windows® 10, Linux® 64-bit, or macOS®
- USB Type-A or USB Type-C® to USB Type-C® cable

Note: macOS® is a trademark of Apple Inc., registered in the U.S. and other countries and regions.

Linux® is a registered trademark of Linus Torvalds.
Windows is a trademark of the Microsoft group of companies.

3.2 Development toolchains

- IAR Systems® - IAR Embedded Workbench®(1)
- Keil® - MDK-ARM(1)
- STMicroelectronics - STM32CubeIDE

1. On Windows® only.

3.3 Firmware upgrade

The STLINK-V3MINIE tiny probe embeds firmware that needs to be frequently updated from the *www.st.com* website to benefit from new functionality or corrections. Refer to the technical note *Overview of ST-LINK derivatives* (TN1235) for details.

4 Quick start

This section describes how to start development quickly using STLINK-V3MINIE.

Before installing and using these products, accept the evaluation product license agreement from the www.st.com/epla web page.

The STLINK-V3MINIE tiny probe is a standalone debugging and programming probe for STM32 microcontrollers:

- It supports JTAG and SWD protocols to communicate with any STM32 microcontroller.
- It provides a Virtual COM port interface allowing the host PC to communicate with the target microcontroller through one UART

To start using STLINK-V3MINIE, follow the steps below:

1. Check that the STDC14 to STDC14 flat cable is present inside the box.
2. Install or update the IDE or STM32CubeProgrammer (STM32CubeProg) to support the STLINK-V3MINIE with the necessary drivers.
3. Connect the flat cable or BTB card edge connector between STLINK-V3MINIE and the application.
4. Connect a USB Type-A to USB Type-C® cable between STLINK-V3MINIE and the PC.
5. Check that the COM LED is red.
6. Open the development toolchain or STM32CubeProgrammer software utility. For more details, refer to the STLINK-V3MINIE website.

5 STLINK-V3MINIE functional description

5.1 STLINK-V3MINIE overview

STLINK-V3MINIE is a standalone debugging and programming tiny probe for the STM32 microcontrollers. The product supports many functions and protocols for debugging, programming, or communicating with one or several targets.

The modules are fully powered by the PC. If the COM LED blinks red, refer to the technical note *Overview of ST-LINK derivatives* (TN1235) for details.

5.2 STLINK-V3MINIE frequency selection

The STLINK-V3MINIE tiny probe runs internally at three different frequencies:

- High-performance frequency
- Standard frequency, compromising between performance and consumption
- Low-consumption frequency

By default, STLINK-V3MINIE starts at a high-performance frequency. It is the responsibility of the toolchain provider to propose or not the frequency selection at the user level.

5.3 High-performance modules

The STLINK-V3MINIE tiny probe supports a high-performance configuration for STM32 microcontrollers. The working voltage range goes from 1.65 to 3.6 V. The protocols and functions supported are:

- SWD with SWO (Up to 24 MHz)
- JTAG (Up to 21 MHz)
- VCP (From 736 bps to 16 Mbps)

A double-row, 14-pin (2 × 7) 1.27 mm pitch male STDC14 connector is located in STLINK-V3MINIE for connection to the application target. An STDC14 to STDC14 flat cable is included in the packaging.

5.4 Hardware layout

The STLINK-V3MINIE tiny probe is designed around the STM32F723 microcontroller. Figure 2 shows STLINK-V3MINIE. Figure 3 and Figure 4 show the MB1762 top and bottom layouts, as MB1762 is the common board reference for STLINK-V3MINIE.

Figure 2. **STLINK-V3MINIE hardware board**

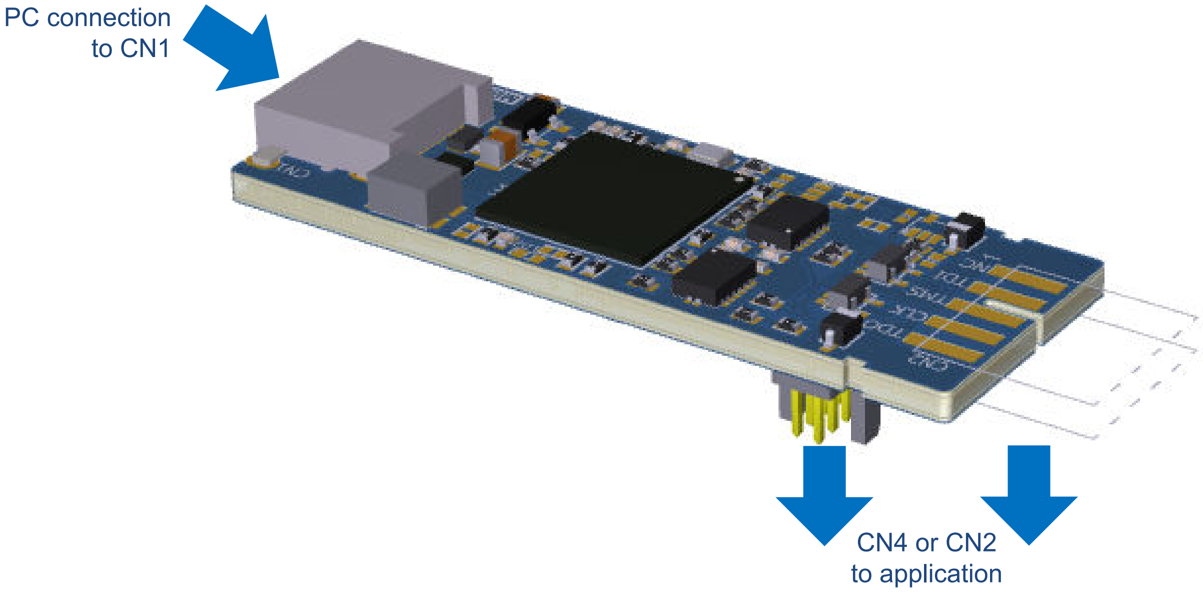


Figure 3. **MB1762 top layout**

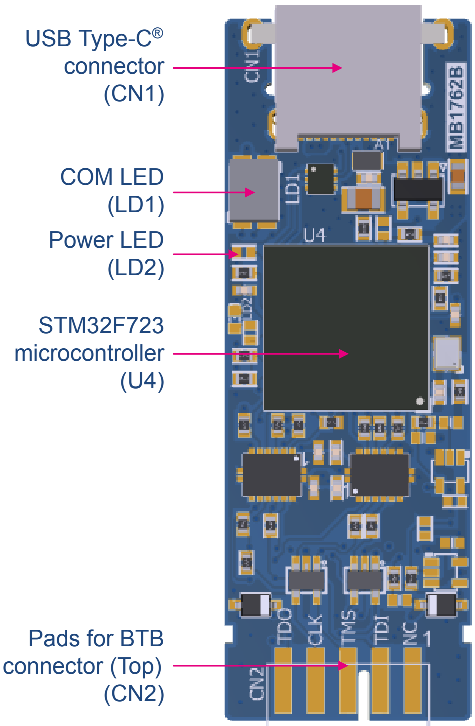


Figure 4. **MB1762 bottom layout**

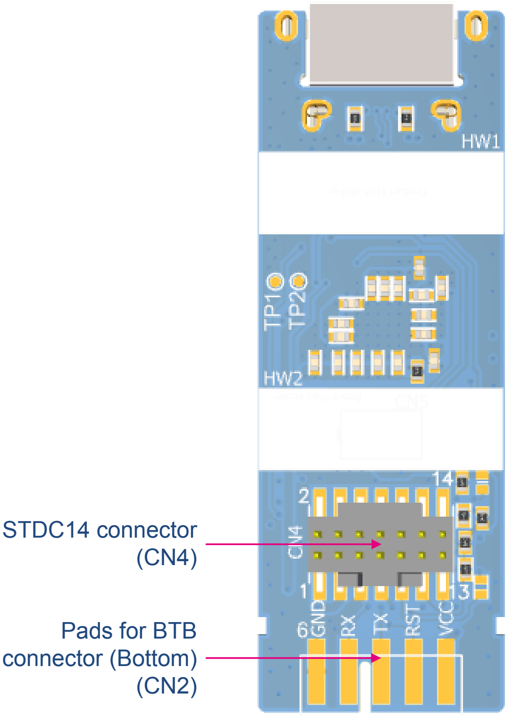
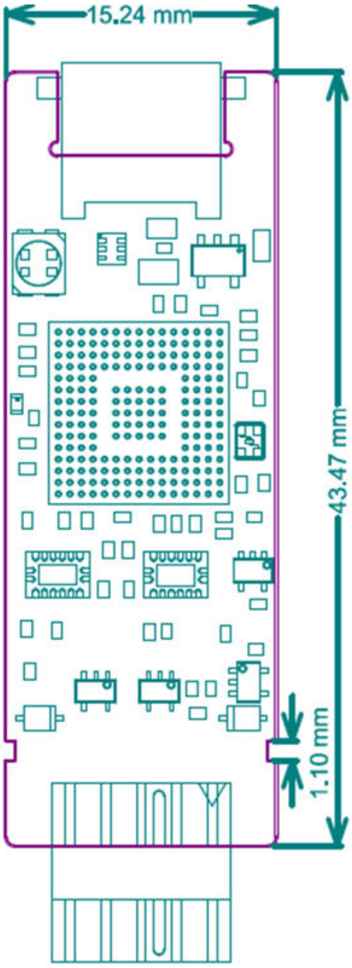


Figure 5. MB1762 mechanical drawing (in millimeters)



5.5 STLINK-V3MINIE functions

All functions are designed for high performance. All signals are 1.65 to 3.6 V compatible. The following description concerns STLINK-V3MINIE except for some mentioned sections and indicates where to find the functions on the boards and connectors.

5.5.1 SWD with SWV

SWD protocol is a debugging and programming protocol used for STM32 microcontrollers with SWV as a trace. The signals can perform up to 24 MHz. This function is available on the CN4 connector or the CN2 pad.

5.5.2 JTAG

The JTAG protocol is a debugging and programming protocol used for STM32 microcontrollers. The signals can perform up to 21 MHz. This function is available on the CN4 connector or the CN2 pad.

5.5.3 Virtual COM port (VCP)

The serial interface VCP is directly available as a Virtual COM port of the PC, connected to the STLINK-V3MINIE USB connector (CN1). STM32 microcontrollers can use this function. The signals can operate from 736 bps to 16 Mbps. This function is available on the CN4 connector or the CN2 pad.

For details on baud rate, refer to Section 14.2. of the user manual *STLINK-V3SET debugger/programmer for STM8 and STM32* (UM2448).

5.5.4 Mass-storage interface

STLINK-V3MINIE implements a virtual mass-storage interface allowing the programming of an STM32 target flash memory with the drag-and-drop action of a binary file from a file explorer. This ability requires the STLINK-V3MINIE tiny probe to identify the connected target before enumerating it on the USB host. As a consequence, this functionality is available only if the target is connected to the STLINK-V3MINIE tiny probe when it powers up.

The mass storage interface might be disabled or enabled again by reprogramming the ST-LINK firmware. This can be performed with the *STLinkUpgrade* application. Activate the *<change type> checkbox* then select the firmware with or without mass storage and launch the update. The action is reversible.

5.5.5 LEDs

Power LED: This green light indicates that 5 V is enabled (Not fitted as default).

COM LED: Refer to the technical note *Overview of ST-LINK derivatives* (TN1235) for details.

6 Board connectors

6.1 Connectors

Per convention, refer to Table 2 for the I/O type definition:

Table 2. **I/O type definition**

Type	Definition
S	Supply pin
I	Input-only pin
O	Output-only pin
I/O	Input and output pin

6.2 Pads on board to BTB card edge connector (CN2)

The pads on the board have the same function as the STDC14 connector. The user can select a BTB card edge connector to connect STLINK-V3MINIE and the target board. The board-to-board card edge connector reference is 009159010061911 from AVX.

Table 3. **Pads on board to BTB card edge connector (CN2)**

Side	Pin number	Pin description	Type
TOP	1	Reserved(1)	-
	2	T_JTDI/NC(2)	O
	3	T_JTMS/T_SWDIO	I/O
	4	T_JCLK/T_SWCLK	O
	5	T_JTDO/T_SWO(3)	I
BOTTOM	6	GND	S
	7	T_VCP_RX	O
	8	T_VCP_TX	I
	9	T_NRST	O
	10	T_VCC	I

1. *Do not connect on target.*
2. *NC means is not required for SWD (Serial Wire Debug) connection.*
3. *SWO (Serial Wire Output) is optional and only required for SWV (Serial Wire Viewer) trace.*

6.3 STDC14 connector (CN4)

The STDC14 connector (CN4) enables the connection to an STM32 target using the JTAG or SWD protocol, respecting from pin 3 to pin 12 the MIPI10 (Arm® Cortex® debugging connector) pinout. It also advantageously provides two UART signals for the Virtual COM port. The related pinout for the STDC14 connector is listed in Table 4.

Figure 6. **STDC14 connector (CN4) top view**

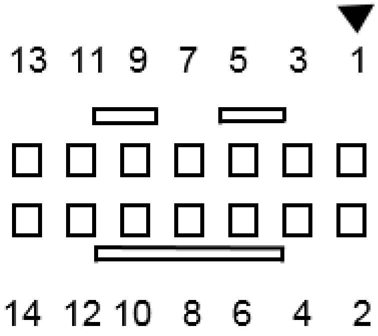


Table 4. **STDC14 connector (CN4) pinout**

STDC14 pin number	MIPI10 pin number	Pin description	Type
1	-	Reserved(1)	-
2	-	Reserved(1)	-
3	1	T_VCC	I
4	2	T_JTMS/T_SWDIO	I/O
5	3	GND	S
6	4	T_JCLK/T_SWCLK	O
7	5	GND	S
8	6	T_JTDO/T_SWO(2)	I
9	7	Reserved(1)	-
10	8	T_JTDI/NC(3)	O
11	9	GNDDETECT	O
12	10	T_NRST	O
13	-	T_VCP_RX	O
14	-	T_VCP_TX	I

1. *Do not connect on target.*
2. *SWO is optional, required only for Serial Wire Viewer (SWV) trace.*
3. *NC means is not required for SWD connection.*

7 Performance figures

Table 5 gives an overview of the achievable maximal performances with STLINK-V3MINIE on different communication channels. Those performances are also depending on the overall system context (target included), so they are not guaranteed to be always reachable. For instance, a noisy environment or the connection quality can impact system performance.

Table 5. Achievable maximal performance with STLINK-V3MINIE on different channels

Board	Target voltage	Maximum frequency (in MHz)			
		SWD	JTAG	SWV	VCP
STLINK-V3MINIE	3.3 V	24	21	12	16
STLINK-V3MINIE	1.8 V	8	8	12	12

8 STLINK-V3MINIE product information

8.1 Product marking

The product and each board composing the product are identified with one or several stickers. The stickers, located on the top or bottom side of each PCB, provide product information:

- Main board featuring the target device: product order code, product identification, serial number, and board reference with revision.

  Single-sticker example:

  Product order code
  Product identification
  syywwxxxxx
  MBxxxx-Variant-yzz

  Dual-sticker example:

  Product order code
  Product identification

  and

  MBxxxx-Variant-yzz
  syywwxxxxx

- Other boards if any: board reference with revision and serial number.

  Examples:

  syywwxxxxx
  MBxxxx-Variant-yzz

  or

  MBxxxx-Variant-yzz
  syywwxxxxx

  or

  or

On the main board sticker, the first line provides the product order code, and the second line the product identification.

On all board stickers, the line formatted as *"MBxxxx-Variant-yzz"* shows the board reference *"MBxxxx"*, the mounting variant *"Variant"* when several exist (optional), the PCB revision *"y"*, and the assembly revision *"zz"*, for example B01. The other line shows the board serial number used for traceability.

Products and parts labeled as *"ES"* or *"E"* are not yet qualified or feature devices that are not yet qualified. STMicroelectronics disclaims any responsibility for consequences arising from their use. Under no circumstances will STMicroelectronics be liable for the customer's use of these engineering samples. Before deciding to use these engineering samples for qualification activities, contact STMicroelectronics' quality department.

"ES" or *"E"* marking examples of location:

- On the targeted STM32 that is soldered on the board (for an illustration of STM32 marking, refer to the STM32 datasheet *Package information* paragraph at the www.st.com website).
- Next to the ordering part number of the evaluation tool that is stuck, or silk-screen printed on the board.

Some boards feature a specific STM32 device version, which allows the operation of any bundled commercial stack/library available. This STM32 device shows a *"U"* marking option at the end of the standard part number and is not available for sales.

To use the same commercial stack in their applications, the developers might need to purchase a part number specific to this stack/library. The price of those part numbers includes the stack/library royalties.

8.2 STLINK-V3MINIE product history

Table 6. **Product history**

Order code	Product identification	Product details	Product change description	Product limitations
STLINK-V3MINIE	LKV3MINIE$KT1 LKV3MINIE$KR1	Board: • MB1762-V3MINIE-B01 (tiny probe board)	Initial revision	A USB cable with a ferrite clamp (magnetic ring) is mandatory to ensure compliance with radiated emission.
	LKV3MINIE$SR1	Board: • MB1762-V3MINIE-B01 (tiny probe board)	Board format sticker changed	A USB cable with a ferrite clamp (magnetic ring) is mandatory to ensure compliance with radiated emission.

8.3 Board revision history

Table 7. **Board revision history**

Board reference	Board variant and revision	Board change description	Board limitations
MB1762 (tiny probe board)	V3MINIE-B01	Initial revision	No limitation

9 Federal Communications Commission (FCC) and ISED Canada Compliance Statements

9.1 FCC 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.

Part 15.21

Any changes or modifications to this equipment not expressly approved by STMicroelectronics may cause harmful interference and void the user's authority to operate this equipment.

Part 15.105

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 instruction, 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 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.

Note: *Use only shielded cables.*

To satisfy FCC RF exposure requirements, a separation distance of 20 cm or more should be maintained between the antenna of this device and persons during operation. To ensure compliance, operation at a closer distance than this is not recommended. This transmitter must not be collocated or operating in conjunction with any other antenna or transmitter.

Responsible Party – U.S. Contact Information:

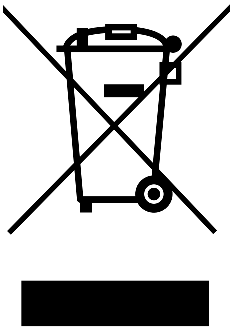
Francesco Doddo
STMicroelectronics, Inc.
200 Summit Drive | Suite 405 | Burlington, MA 01803
USA
Telephone: +1 781-472-9634

9.2 ISED Compliance Statement

ISED Canada ICES-003 Compliance Label: CAN ICES-3 (B) / NMB-3 (B).

Étiquette de conformité à la NMB-003 d'ISDE Canada : CAN ICES-3 (B) / NMB-3 (B).

10 Product disposal



Disposal of this product: WEEE (Waste Electrical and Electronic Equipment)

(Applicable in Europe)

This symbol on the product, accessories, or accompanying documents indicates that the product and its electronic accessories should not be disposed of with household waste at the end of their working life.

To prevent possible harm to the environment and human health from uncontrolled waste disposal, please separate these items from other type of waste and recycle them responsibly to the designated collection point to promote the sustainable reuse of material resources.

Household users:

You should contact either the retailer where you buy the product or your local authority for further details of your nearest designated collection point.

Business users:

You should contact your dealer or supplier for further information.

Revision history

Table 8. **Document revision history**

Date	Revision	Changes
20-Oct-2021	1	Initial release.
19-Jan-2022	2	Added: • *Performance figures* Updated: • *Features* • *Ordering information* • *Section 3.3: Firmware upgrade* • *Figure 2, Figure 3, Figure 4, and Figure 5* • *Section 5.5.4: Mass-storage interface* Removed *USB Type-C®* section
19-Mar-2024	3	Disconnected STDC14 pin 9 in *Table 4*. Updated *STLINK-V3MINIE product information* including *Product marking*, *Product history*, and *Board revision history*.
25-Mar-2025	4	Added: • LKV3MINIE$KR1 and LKV3MINIE$SR1 product identifications to Table 6 • Product disposal Updated: • Product marking • Federal Communications Commission (FCC) and ISED Canada Compliance Statements to Class B product

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