# UM1075
# User manual

## ST-LINK/V2 in-circuit debugger/programmer for STM8 and STM32

## Introduction

The ST-LINK/V2 is an in-circuit debugger/programmer for the STM8 and STM32 microcontroller families. Thanks to the single wire interface module (SWIM) and JTAG interfaces, it can communicate with any STM8 or STM32 microcontroller located on an application board.

On the PC side, the USB full-speed interface allows communication with:

- STM8 devices via ST Visual Develop (STVD) or ST Visual Program (STVP) software (which are available from STMicroelectronics)
- STM32 devices via Attolic, IAR, Keil, and TASKING integrated development environments.

**Figure 1. ST-LINK/V2**

# Contents

# List of tables

# List of figures

# 1 Features

- 5 V power supplied by a USB connector
- USB 2.0 full speed compatible interface
- USB standard A to mini B cable
- SWIM specific features
  - 1.65 V to 5.5 V application voltage supported on SWIM interface
  - SWIM low-speed and high-speed modes supported
  - SWIM programming speed rate: 9.7 Kbytes/s in low speed and 12.8 Kbytes/s in high speed
  - SWIM cable for connection to the application via an ERNI standard vertical (ref: 284697 or 214017) or horizontal (ref: 214012) connector
  - SWIM cable for connection to the application via a pin header or a 2.54 mm pitch connector
- JTAG specific features
  - 1.65 V to 3.6 V application voltage supported on the JTAG interface and 5 V tolerant inputs
  - JTAG cable for connection to a standard JTAG 20-pin pitch 2.54 mm connector
  - Supports JTAG communication
  - Supports serial wire debug (SWD) and serial wire viewer (SWV) communication
- Direct firmware update feature supported (DFU)
- Status LED which blinks during communication with the PC
- Operating temperature 0 to 50 °C

# 2 Product contents

*Figure 2: ST-LINK/V2 product contents* shows the various cables delivered within the product. They include (from left to right in *Figure 2*):

- USB standard A to mini B cable (A)
- ST-LINK/V2 debugging and programming (B)
- SWIM flat ribbon ended with a 4-pin, 2.54 mm, low-cost connector on two sides (C)
- SWIM flat ribbon with a standard ERNI connector at one end and 4-pin connector at the other end (D)
- JTAG or SWD and SWV flat ribbon with a 20-pin connector at one end (E)

**Figure 2. ST-LINK/V2 product contents**

# 3 Hardware configuration

The ST-LINK/V2 is designed around the STM32F103C8 device which incorporates the high-performance ARM®, Cortex™-M3 core. It is available in a TQFP48 package.

As shown in *Figure 3*, the ST-LINK/V2 provides two connectors:

- an STM32 connector for the JTAG interface
- an STM8 connector for the SWIM interface

**Figure 3. Connectors of the ST-LINK/V2**


1. A = STM32 JTAG and SWD target connector
2. B = STM8 SWIM target connector
3. C = Communication activity LED

## 3.1 Connection with STM8 applications

For STM8 developments, the ST-LINK/V2 can be connected to the target board by two different cables depending on the connector available on the application board. These cables are:

- SWIM flat ribbon with a standard ERNI connector at one end and a 4-pin connector at the other end
- SWIM flat ribbon ended with a 4-pin, 2.54 mm connector

### 3.1.1 SWIM flat ribbon

*Figure 4* shows how to connect the ST-LINK/V2 if a standard ERNI 4-pin SWIM connector is present on the application board.

**Figure 4. ERNI connection**


1. A = Target application board with ERNI connector
2. B = Wire cable with ERNI connector at one end and 4-pin connector at the other end
3. C = STM8 SWIM target connector
4. See *Figure 9: SWIM ST-LINK/V2 standard ERNI cable*

*Figure 5* shows how to connect the ST-LINK/V2 if a 4-pin, 2.54 mm, low-cost SWIM connector is present on the application board.

**Figure 5. Low cost connection**


1. A = Target application board with 4-pin, 2.54 mm, low-cost connector
2. B = Wire cable ended with a 4-pin connector
3. C = STM8 SWIM target connector
4. See *Figure 10: SWIM ST-LINK/V2 low-cost cable*

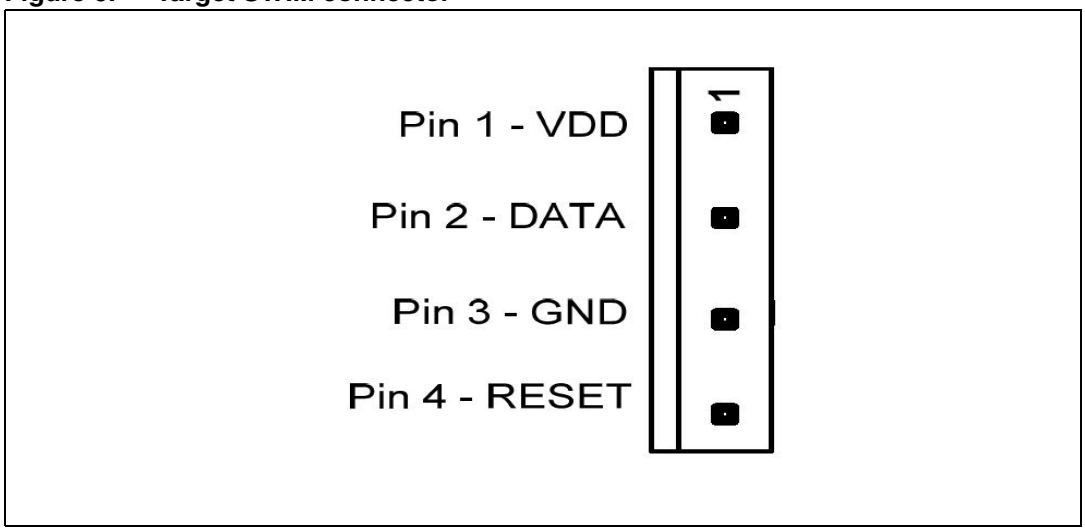
*Table 1* summarizes the signal names, functions, and target connection signals of the 4-pin, 2.54 mm, low-cost cable.

**Table 1. SWIM flat ribbon connections**

| Pin no. | Name | Function | Target connection |
|---|---|---|---|
| 1 | VDD | Target VCC(1) | MCU VCC |
| 2 | DATA | SWIM | MCU SWIM pin |
| 3 | GND | GROUND | GND |
| 4 | RESET | RESET | MCU RESET pin |

1. The power supply from the application board is connected to the ST-LINK/V2 debugging and programming board to ensure signal compatibility between both boards.

**Figure 6. Target SWIM connector**



## 3.2 Connection with STM32 applications

For STM32 developments, the ST-LINK/V2 needs to be connected to the application using the standard 20-pin JTAG flat ribbon provided.

*Table 2* summarizes the signals names, functions, and target connection signals of the standard 20-pin JTAG flat ribbon.

**Table 2. JTAG cable connections**

| Pin no. | Name | ST-LINK/V2 function | Target connection |
|---|---|---|---|
| 1 | TVCC | Target VCC(1) | MCU VCC |
| 2 | | | |
| 3 | TRST | GROUND | GND |
| 4 | UART-RX | Unused | GND |
| 5 | TDI | JTAG TDO, SWO | TDI |
| 6 | UART-TX | Unused | GND |
| 7 | TMS | JTAG TMS, SW IO | TMS |
| 8 | BOOT0 | Unused | GND |
| 9 | TCK | JTAG TCK, SW CLK | TCK |
| 10 | SWIM | Unused | GND |
| 11 | NC | Not connected | Not connected |
| 12 | GND | GROUND | GND |
| 13 | TDO | JTAG TDI | TDO |
| 14 | SWIM-RST | Unused | GND |
| 15 | RESET | RESET | RESET (optional) |
| 16 | KEY | No pin | Not connected |
| 17 | NC | Not connected | Not connected |
| 18 | GND | GROUND | GND |
| 19 | VDD | VDD (3.3V) | Not connected |
| 20 | GND | GROUND | GND |

1. The power supply from the application board is connected to the ST-LINK/V2 debugging and programming board to ensure signal compatibility between both boards.

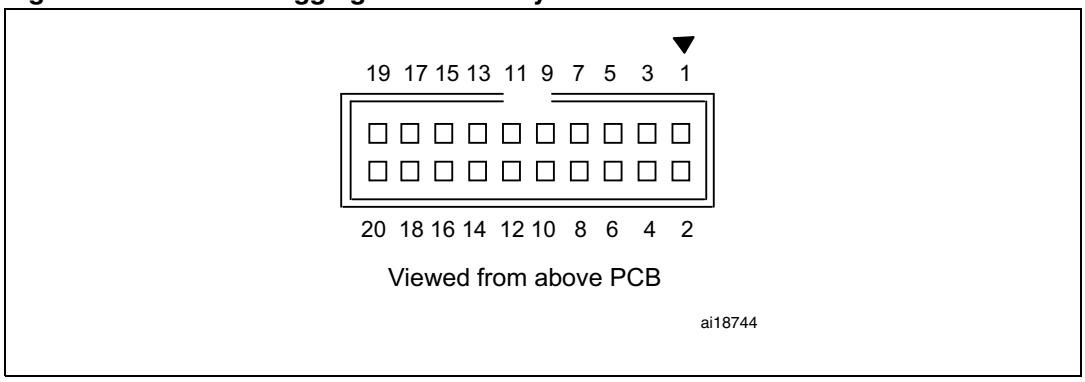
*Figure 7* shows how to connect the ST-LINK/V2 to a target using the JTAG cable.

**Figure 7. JTAG connection**


1. A = Target application board with JTAG connector
2. B = JTAG/SWD 20-wire flat cable
3. STM32 JTAG and SWD target connector

The reference of the connector needed on the target application board is:
2x10C header wrapping 2x40C H3/9.5 (pitch 2.54) - HED20 SCOTT PHSD80.

**Figure 8. JTAG debugging flat ribbon layout**




## 3.3 ST-LINK/V2 status

The LED labeled ‘COM’ on top of the ST-LINK/V2 shows the ST-LINK/V2 status (whatever the connection type). When the:

- LED is blinking RED: the first USB enumeration with the PC is taking place.
- LED is RED: communication between the PC and ST-LINK/V2 is established (end of enumeration).
- LED is blinking GREEN/RED: data are being exchanged between the target and the PC.
- LED is GREEN: the last communication has been successful.
- LED is ORANGE: ST-LINK/V2 communication with the target has failed.

# 4 Software configuration

## 4.1 STM8 application development

Please refer to ST Toolset Pack24 with Patch 1 which includes ST Visual Develop (STVD) and ST Visual Programmer (STVP).

## 4.2 STM32 application development and Flash programming

Third party toolchains, Atollic TrueSTUDIO, IAR EWARM, Keil ARM-MDK, and TASKING VX-toolset support ST-LINK/V2 according to the versions given in *Table 3* or the most recent version available.

**Table 3. How third party toolchains support ST-LINK/V2**

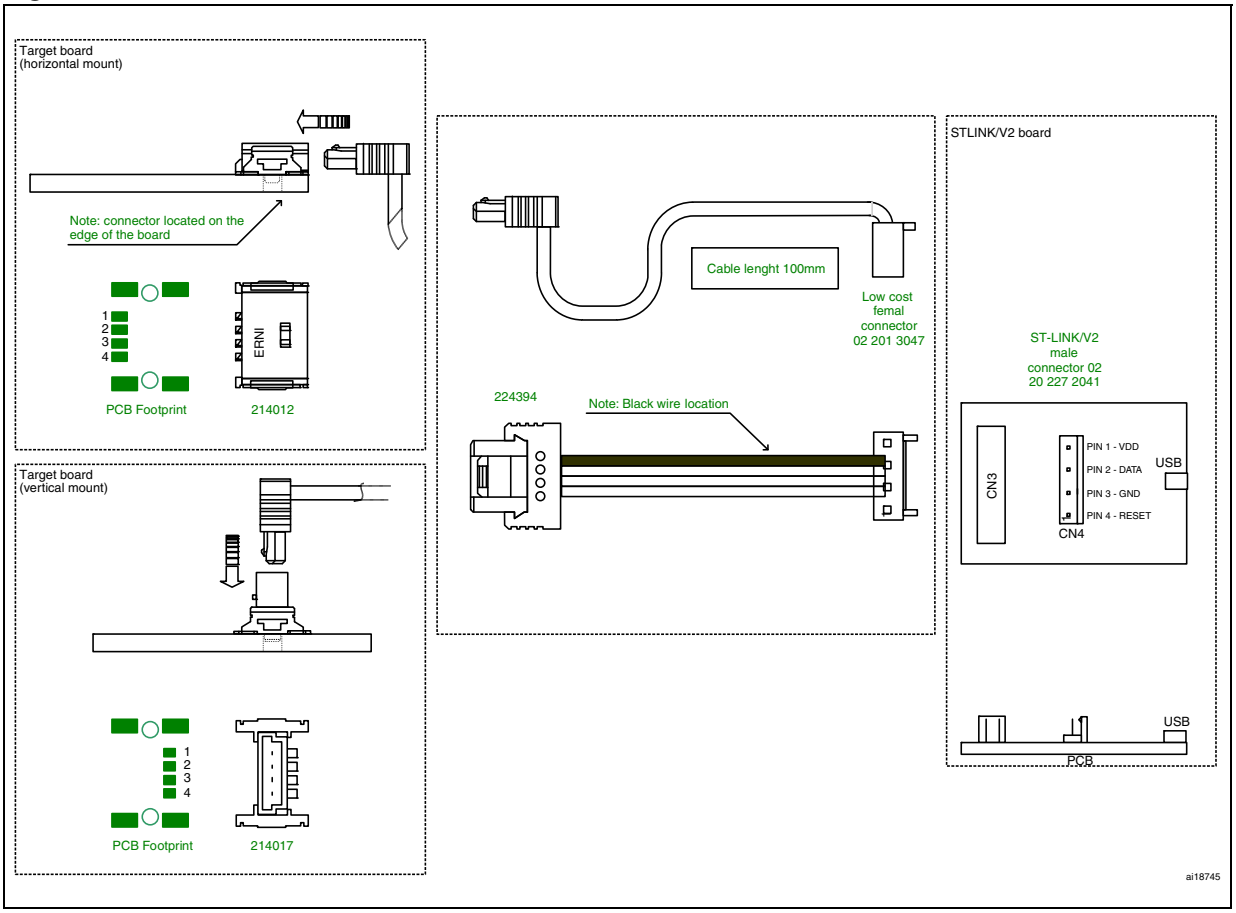
| Third party | Toolchain | Version |
|---|---|---|
| Atollic | TrueSTUDIO | 2.1 |
| IAR | EWARM | 6.20 |
| Keil | ARM-MDK | 4.20 |
| TASKING | VX-toolset for ARM Cortex-M | 4.0.1 |

For more information on third party tools, please visit:

- www.atollic.com
- www.iar.com
- www.keil.com
- www.tasking.com

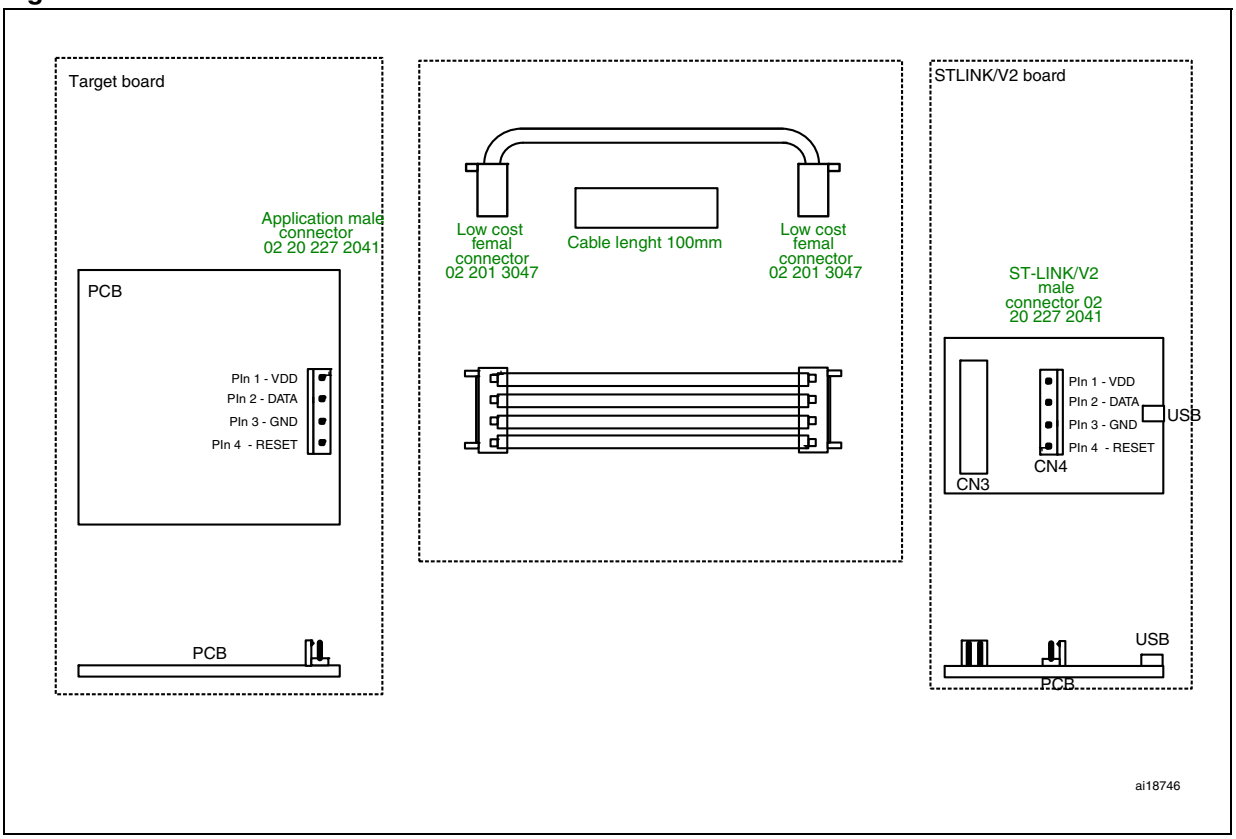
# 5 Schematics

**Figure 9. SWIM ST-LINK/V2 standard ERNI cable**




1. Legend for pin descriptions:
   VDD = Target voltage sense
   DATA = SWIM DATA line between target and debug tool
   GND = Ground voltage
   RESET = Target system reset

**Figure 10. SWIM ST-LINK/V2 low-cost cable**




1. Legend for pin descriptions:
   VDD = Target voltage sense
   DATA = SWIM DATA line between target and debug tool
   GND = Ground voltage
   RESET = Target system reset

# 6 Revision history

**Table 4. Document revision history**

| Date | Revision | Changes |
|---|---|---|
| 22-Apr-2011 | 1 | Initial release. |
| 03-Jun-2011 | 2 | *Table 1: SWIM flat ribbon connections*: added footnote *1* to the function “Target VCC”.<br>*Table 2: JTAG cable connections*: added footnote *1* to the function “Target VCC”.<br>*Table 3: How third party toolchains support ST-LINK/V2*: updated the “Versions” of IAR and Keil. |

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