

### Introduction

The ST-LINK/V2 is an in-circuit debugger/programmer for the STM8 and STM32 microcontroller families. The single wire interface module (SWIM) and JTAG/serial wire debugging (SWD) interfaces, facilitate communication with any STM8 or STM32 microcontroller located on an application board.

The USB full-speed interface allows communication with a PC and:

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

**Table 1. Applicable tools**

Type	Part number
Development tools	ST-LINK/V2

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



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# 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/serial wire debugging (SWD) specific features
  - 1.65 V to 3.6 V application voltage supported on the JTAG/SWD 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/SWD and SWV 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.

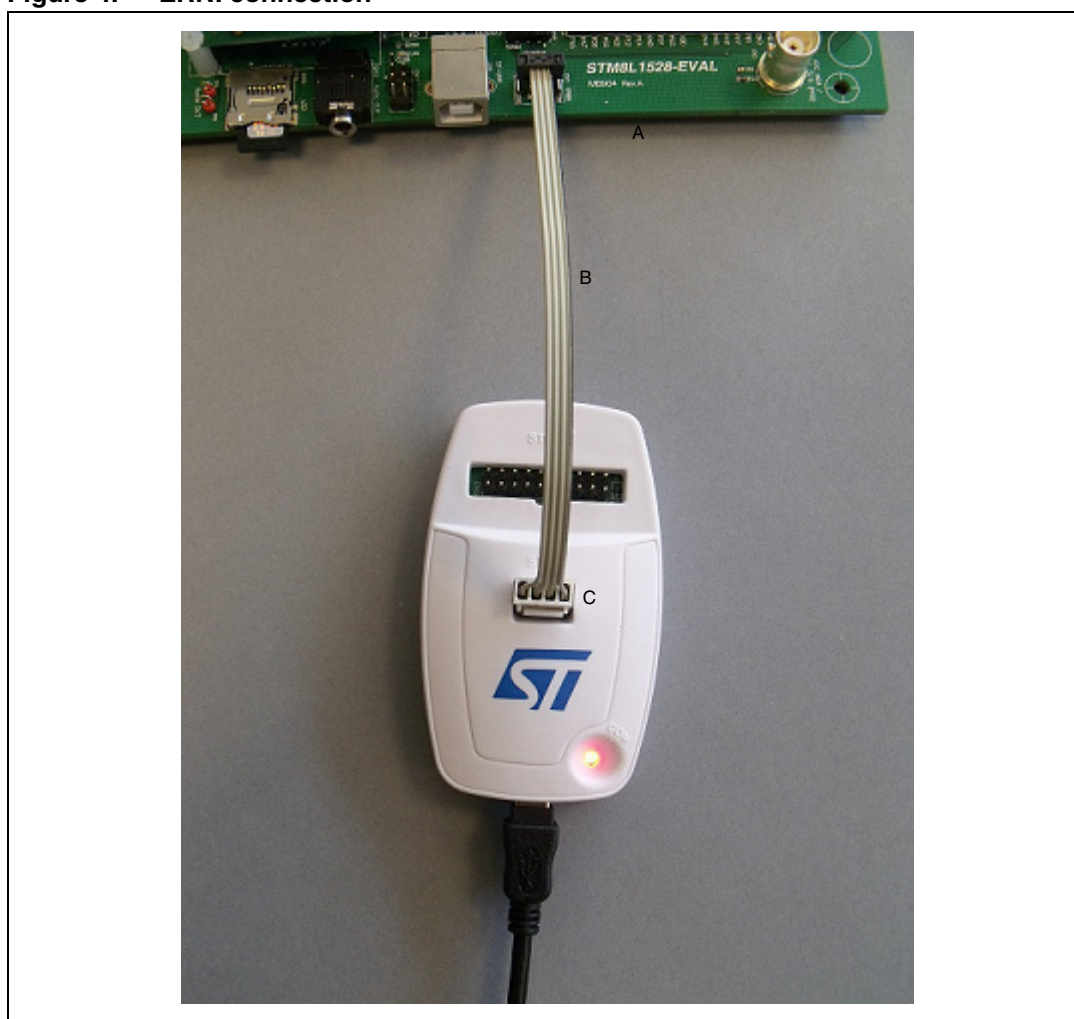
These cables are:

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

### 3.1.1 Standard ERNI connection with 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](#)



### 3.1.2 Low-cost SWIM connection

*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 with a 4-pin connector
3. C = STM8 SWIM target connector
4. See [Figure 10: SWIM ST-LINK/V2 low-cost cable](#)

### 3.1.3 SWIM signals and connections

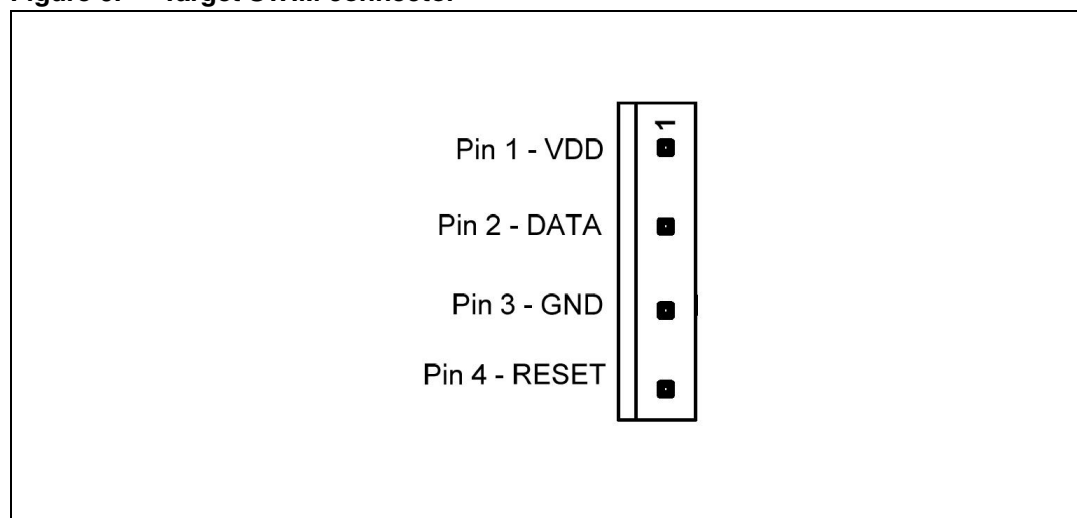
*Table 2* summarizes the signal names, functions, and target connection signals.

**Table 2. SWIM flat ribbon connections**

Pin no.	Name	Function	Target connection
1	VDD	Target VCC <sup>(1)</sup>	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 3* summarizes the signals names, functions, and target connection signals of the standard 20-pin JTAG flat ribbon.

**Table 3. JTAG/SWD cable connections**

Pin no.	ST-LINK/V2 connector (CN3)	ST-LINK/V2 function	Target connection (JTAG)	Target connection (SWD)
1	VAPP	Target VCC	MCU VDD <sup>(1)</sup>	MCU VDD <sup>(1)</sup>
2				
3	TRST	JTAG TRST	JNTRST	GND <sup>(2)</sup>
4	GND	GND	GND <sup>(3)</sup>	GND <sup>(3)</sup>
5	TDI	JTAG TDO	JTDI	GND <sup>(2)</sup>
6	GND	GND	GND <sup>(3)</sup>	GND <sup>(3)</sup>
7	TMS_SWDIO	JTAG TMS, SW IO	JTMS	SWDIO
8	GND	GND	GND <sup>(3)</sup>	GND <sup>(3)</sup>
9	TCK_SWCLK	JTAG TCK, SW CLK	JTCK	SWCLK
10	GND	GND	GND <sup>(3)</sup>	GND <sup>(3)</sup>
11	NC	Not connected	Not connected	Not connected
12	GND	GND	GND <sup>(3)</sup>	GND <sup>(3)</sup>
13	TDO_SWO	JTAG TDI, SWO	JTDO	TRACESWO <sup>(4)</sup>
14	GND	GND	GND <sup>(3)</sup>	GND <sup>(3)</sup>
15	NRST	NRST	NRST	NRST
16	GND	GND	GND <sup>(3)</sup>	GND <sup>(3)</sup>
17	NC	Not connected	Not connected	Not connected
18	GND	GND	GND <sup>(3)</sup>	GND <sup>(3)</sup>
19	VDD	VDD (3.3V)	Not connected	Not connected
20	GND	GND	GND <sup>(3)</sup>	GND <sup>(3)</sup>

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.
2. Connect to GND for noise reduction on the ribbon
3. At least one of this pin must be connected to the ground for correct behavior (connecting all of them is recommended)
4. Optional: for Serial Wire Viewer (SWV) trace

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

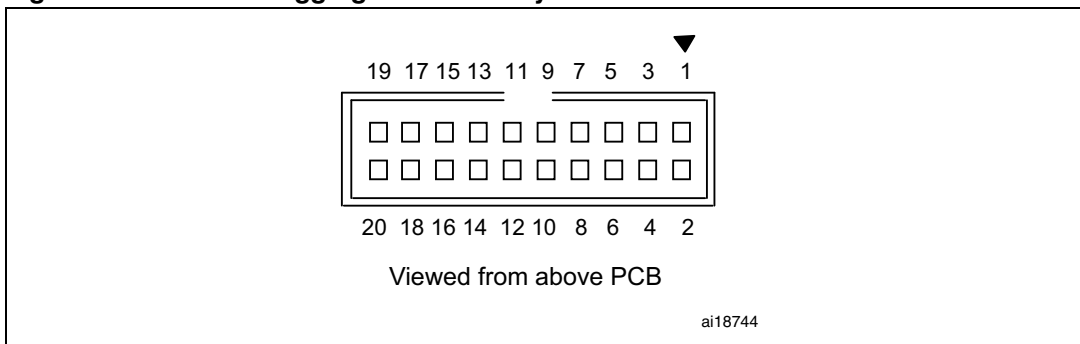
Figure 7. JTAG and SWD connection



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

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 MDK-ARM, and TASKING VX-toolset support ST-LINK/V2 according to the versions given in [Table 4](#) or the most recent version available.

**Table 4. How third party toolchains support ST-LINK/V2**

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

The ST-LINK/V2 requires a dedicated USB driver. If the toolset installed it automatically, file *stlink\_winusb.inf* is installed in *<WINDIR>/inf* (where *<WINDIR>* is typically *C:/Windows*).

If the toolset setup did not install it automatically, the driver can be found on [www.st.com](http://www.st.com):

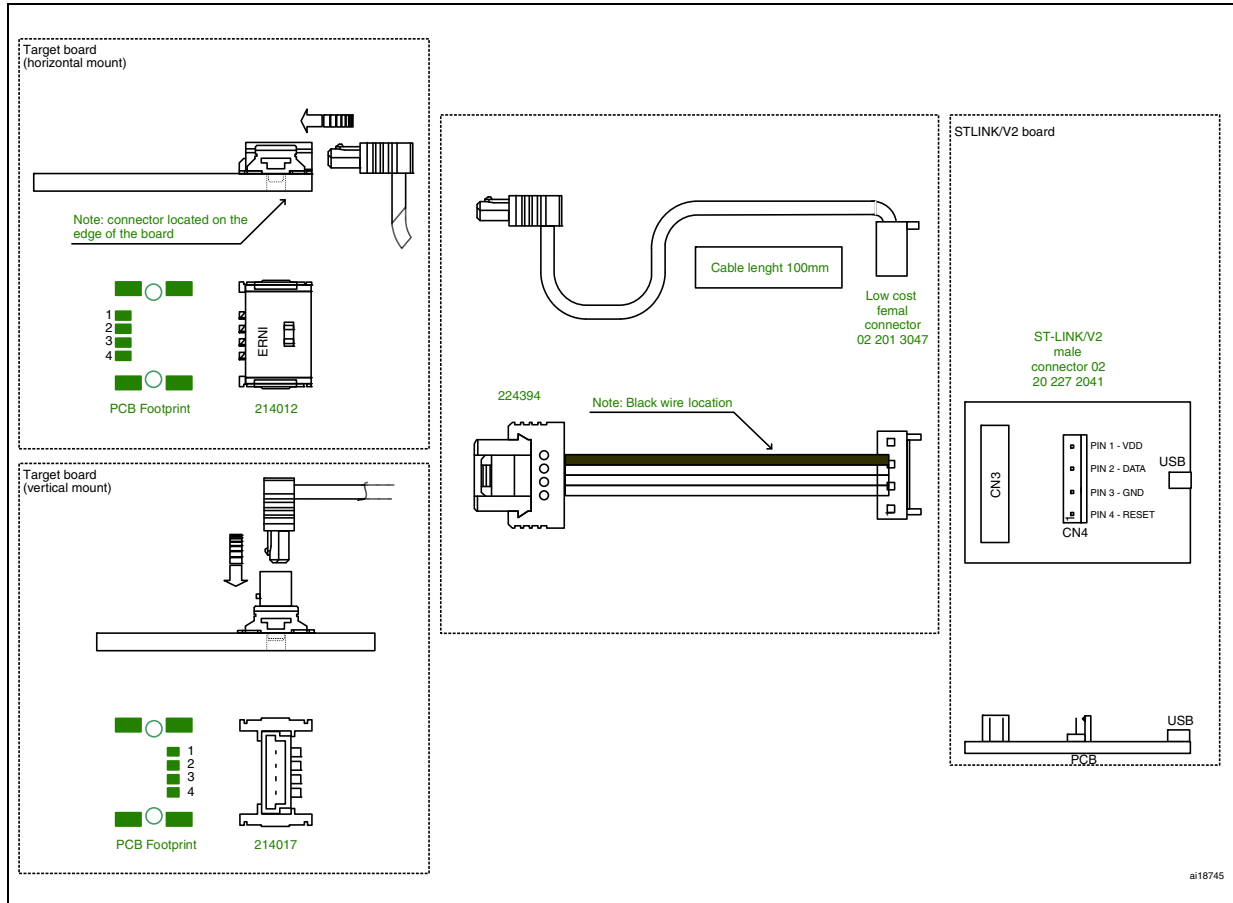
1. Connect to [www.st.com](http://www.st.com).
2. In the search tab, part number field, look for **ST-Link/V2**.
3. Click on the **Generic Part Number** column's hyperlink to ST-Link/V2.
4. In the **Design support** tab, **SW drivers** section, click on the icon to download *st-link\_v2\_usbdriver.zip*.
5. Unzip and run *ST-Link\_V2\_USBdriver.exe*.

For more information on third party tools, please visit:

- [www.atollic.com](http://www.atollic.com)
- [www.iar.com](http://www.iar.com)
- [www.keil.com](http://www.keil.com)
- [www.tasking.com](http://www.tasking.com)

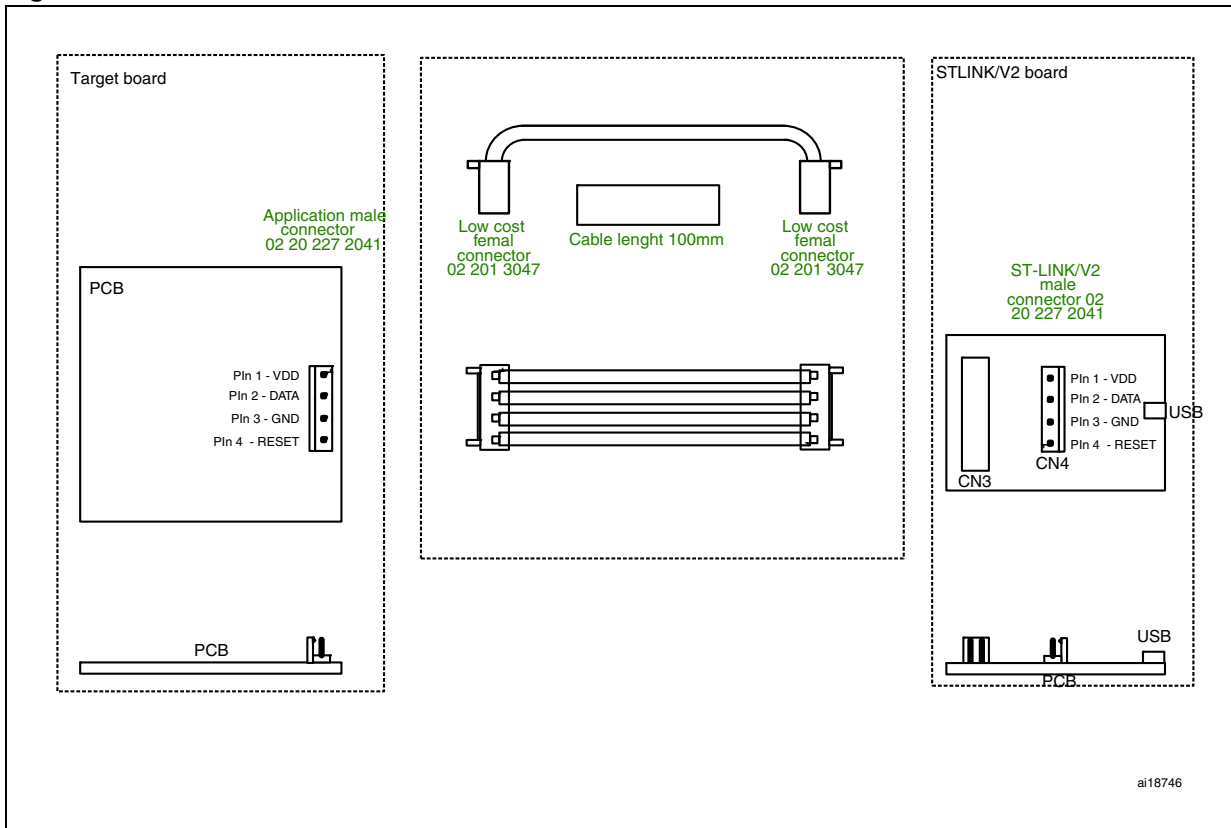
# 5 Schematics

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



- 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



- 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 5. Document revision history**

Date	Revision	Changes
22-Apr-2011	1	Initial release.
03-Jun-2011	2	<i>Table 2: SWIM flat ribbon connections</i> : added footnote <i>1</i> to the function "Target VCC". <i>Table 3: JTAG/SWD cable connections</i> : added footnote to the function "Target VCC". <i>Table 4: How third party toolchains support ST-LINK/V2</i> : updated the "Versions" of IAR and Keil.
19-Aug-2011	3	Added USB driver details to <i>Section 4.2</i> .
11-May-2012	4	Added SWD and SWV to JTAG connection features. Modified <i>Table 3: JTAG/SWD cable connections</i> .

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