

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

- 1 Features 5**
- 2 Product contents 6**
- 3 Hardware configuration 7**
 - 3.1 Connection with STM8 applications 8
 - 3.1.1 SWIM flat ribbon 8
 - 3.2 Connection with STM32 applications 11
 - 3.3 ST-LINK/V2 status 13
- 4 Software configuration 14**
 - 4.1 STM8 application development 14
 - 4.2 STM32 application development and Flash programming 14
- 5 Schematics 15**
- 6 Revision history 17**

List of tables

Table 1.	SWIM flat ribbon connections	10
Table 2.	JTAG cable connections	11
Table 3.	How third party toolchains support ST-LINK/V2	14
Table 4.	Document revision history	17

List of figures

Figure 1.	ST-LINK/V2	1
Figure 2.	ST-LINK/V2 product contents	6
Figure 3.	Connectors of the ST-LINK/V2	7
Figure 4.	ERNI connection	8
Figure 5.	Low cost connection	9
Figure 6.	Target SWIM connector	10
Figure 7.	JTAG connection	12
Figure 8.	JTAG debugging flat ribbon layout	13
Figure 9.	SWIM ST-LINK/V2 standard ERNI cable	15
Figure 10.	SWIM ST-LINK/V2 low-cost cable	16

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](#)

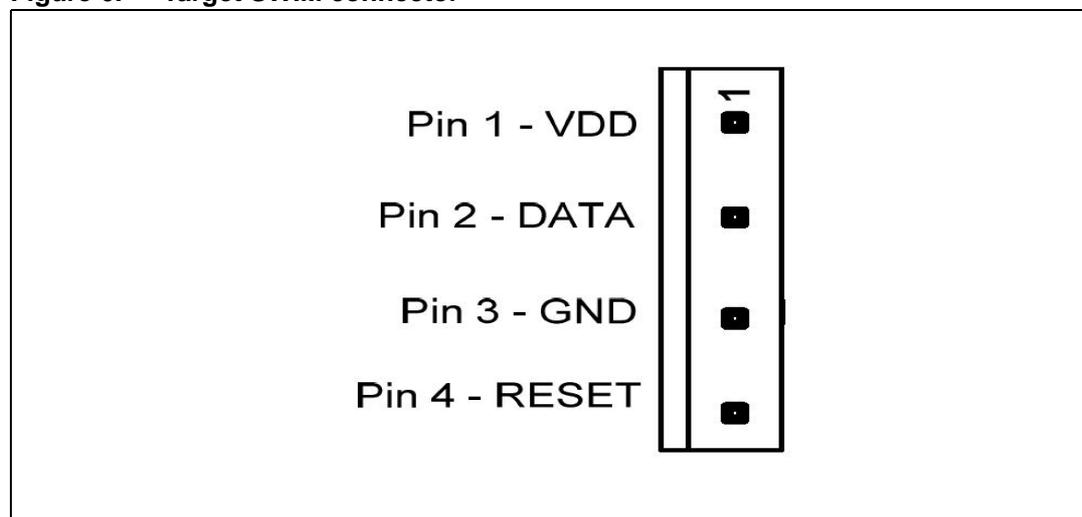
[Table 1](#) summarizes the signal names, functions, and target connection signals of the 4-pin, 2.54 mm, low-cost cable.

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.

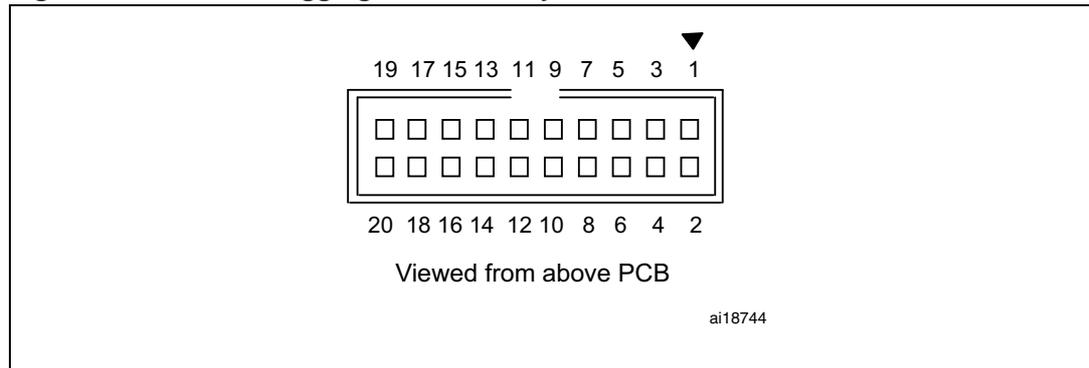
Figure 7 shows how to connect the ST-LINK/V2 to a target using the JTAG cable.

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

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:

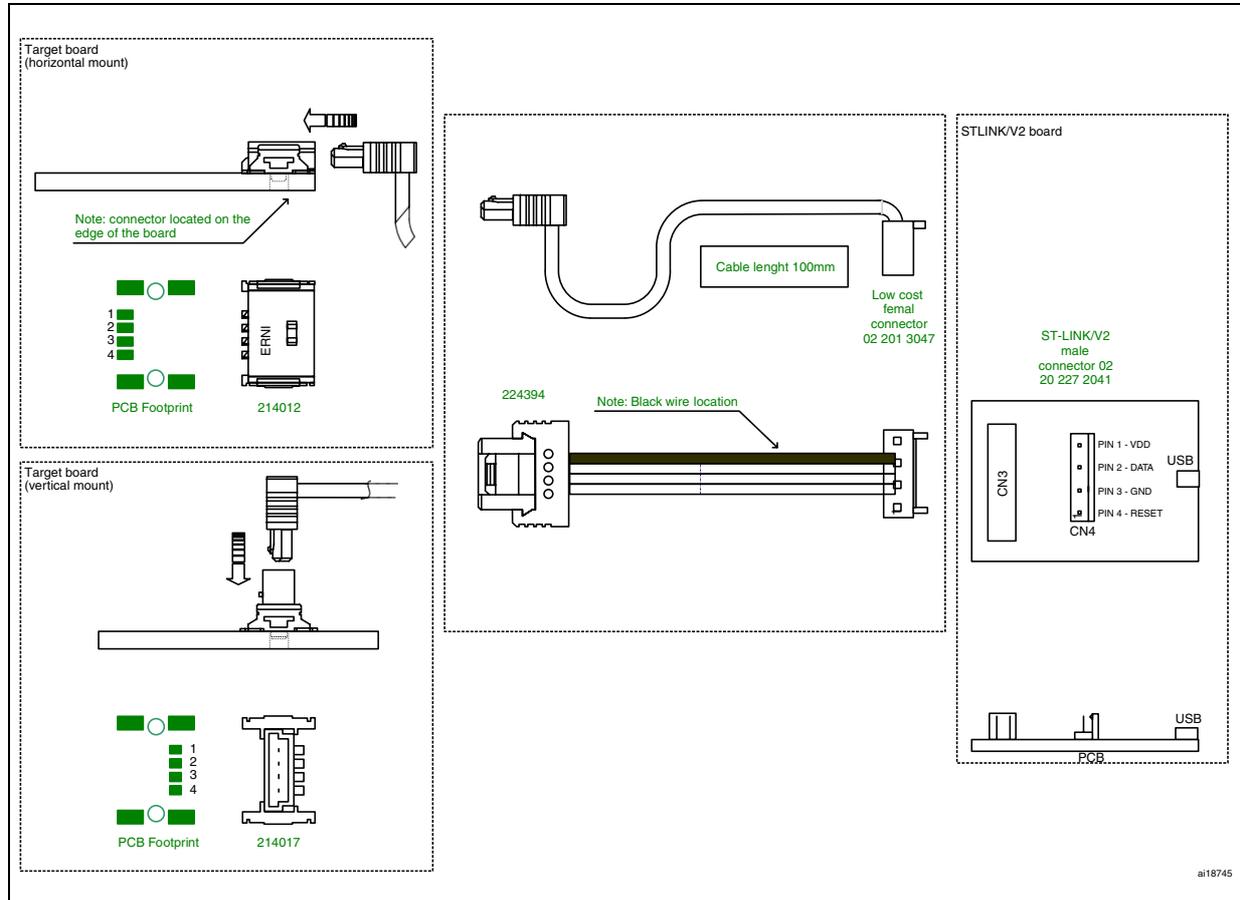
1. Connect to www.st.com
2. In the search tab, part number field, look for **ST-Link/V2**.
3. Click on the **Generic Part Number** column's hyperlink to ST-Link/V2.
4. In the **Design support** tab, **SW drivers** section, click on the icon to download st-link_v2_usbdriver.zip.
5. Unzip and run ST-Link_V2_USBdriver.exe.

For more information on third party tools, please visit:

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

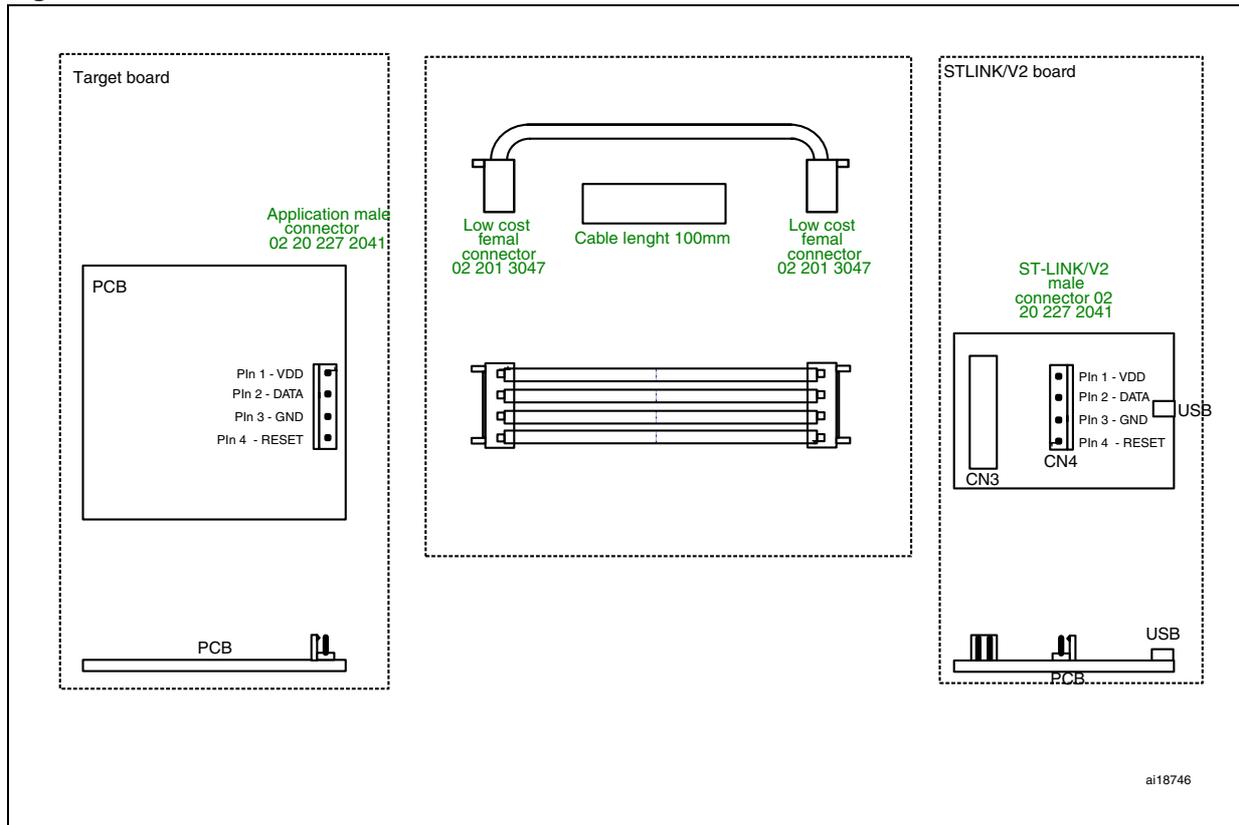
5 Schematics

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 4. Document revision history

Date	Revision	Changes
22-Apr-2011	1	Initial release.
03-Jun-2011	2	<i>Table 1: SWIM flat ribbon connections</i> : added footnote <i>1</i> to the function "Target VCC". <i>Table 2: JTAG cable connections</i> : added footnote <i>1</i> to the function "Target VCC". <i>Table 3: 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> .

Please Read Carefully:

Information in this document is provided solely in connection with ST products. STMicroelectronics NV and its subsidiaries ("ST") reserve the right to make changes, corrections, modifications or improvements, to this document, and the products and services described herein at any time, without notice.

All ST products are sold pursuant to ST's terms and conditions of sale.

Purchasers are solely responsible for the choice, selection and use of the ST products and services described herein, and ST assumes no liability whatsoever relating to the choice, selection or use of the ST products and services described herein.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted under this document. If any part of this document refers to any third party products or services it shall not be deemed a license grant by ST for the use of such third party products or services, or any intellectual property contained therein or considered as a warranty covering the use in any manner whatsoever of such third party products or services or any intellectual property contained therein.

UNLESS OTHERWISE SET FORTH IN ST'S TERMS AND CONDITIONS OF SALE ST DISCLAIMS ANY EXPRESS OR IMPLIED WARRANTY WITH RESPECT TO THE USE AND/OR SALE OF ST PRODUCTS INCLUDING WITHOUT LIMITATION IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE (AND THEIR EQUIVALENTS UNDER THE LAWS OF ANY JURISDICTION), OR INFRINGEMENT OF ANY PATENT, COPYRIGHT OR OTHER INTELLECTUAL PROPERTY RIGHT.

UNLESS EXPRESSLY APPROVED IN WRITING BY TWO AUTHORIZED ST REPRESENTATIVES, ST PRODUCTS ARE NOT RECOMMENDED, AUTHORIZED OR WARRANTED FOR USE IN MILITARY, AIR CRAFT, SPACE, LIFE SAVING, OR LIFE SUSTAINING APPLICATIONS, NOR IN PRODUCTS OR SYSTEMS WHERE FAILURE OR MALFUNCTION MAY RESULT IN PERSONAL INJURY, DEATH, OR SEVERE PROPERTY OR ENVIRONMENTAL DAMAGE. ST PRODUCTS WHICH ARE NOT SPECIFIED AS "AUTOMOTIVE GRADE" MAY ONLY BE USED IN AUTOMOTIVE APPLICATIONS AT USER'S OWN RISK.

Resale of ST products with provisions different from the statements and/or technical features set forth in this document shall immediately void any warranty granted by ST for the ST product or service described herein and shall not create or extend in any manner whatsoever, any liability of ST.

ST and the ST logo are trademarks or registered trademarks of ST in various countries.

Information in this document supersedes and replaces all information previously supplied.

The ST logo is a registered trademark of STMicroelectronics. All other names are the property of their respective owners.

© 2011 STMicroelectronics - All rights reserved

STMicroelectronics group of companies

Australia - Belgium - Brazil - Canada - China - Czech Republic - Finland - France - Germany - Hong Kong - India - Israel - Italy - Japan - Malaysia - Malta - Morocco - Philippines - Singapore - Spain - Sweden - Switzerland - United Kingdom - United States of America

www.st.com