SWD Isolator

User manual for the SWD Isolator Plugin and SWD Isolator Box

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Manual versions

This manual describes hardware version V2 of the SWD Isolator Plugin and SWD Isolator Box. An overview of all variants and hardware versions is available in the *SEGGER Knowledge Base*. If you find an error in the manual or a problem with the hardware, please report it to us and we will try to assist you as soon as possible.

Contact us for further information on topics that are not yet documented.

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Revision	Date	By	Description
3	261016	YE	Renamed product to SWD Isolator. Added SWD Isolator Plugin and SWD Isolator Box variants. Updated pictures and product naming. Restructured the manual.
2	250808	TFI	Updated for hardware revision V2.
1	201013	MK	Updated pictures and contact address.
0	120726	EL	Initial version.

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Chapter 1

Introduction

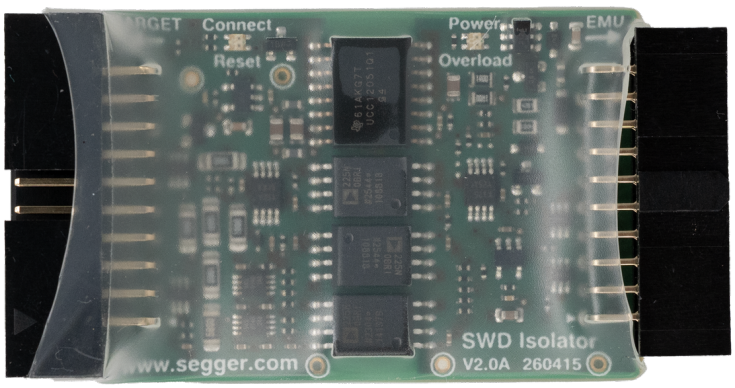
The SWD Isolator can be connected between an emulator (*J-Link*, *J-Trace* or *Flasher*) and any SWD target to provide electrical isolation. This is essential when the development tools are not connected to the same ground as the application. It is also useful to protect the development tools from electrical spikes that can occur in applications such as motor control. Another typical field of application is the development of products with sensors or other analog circuitry, in which case the target hardware is protected from electrical noise originating from the development PC.

1.1 Variants

The SWD Isolator is available in two variants: the SWD Isolator Plugin and the SWD Isolator Box. The two variants differ in their housing, their emulator-side connector, their mechanical dimensions and their package contents. All electrical specifications are identical for both variants.

1.1.1 SWD Isolator Plugin

The SWD Isolator Plugin is attached directly to the 20-pin connector of the emulator without a cable. The target is connected with a 20-pin flat cable.



SWD Isolator Plugin

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1.1.2 SWD Isolator Box

The SWD Isolator Box is connected with one 20-pin flat cable on each side and is not attached directly to the emulator.

SWD Isolator Box

1.2 Comparison of the variants

Feature	SWD Isolator Plugin	SWD Isolator Box
Housing	None (bare PCB)	Plastic enclosure
Emulator-side connector	20-pin 0.1-inch female	20-pin 0.1-inch male
Target-side connector	20-pin 0.1-inch male	20-pin 0.1-inch male
Connection to the emulator	Directly, without a cable	20-pin flat cable
Dimensions (L x W x H)	67 mm x 36 mm x 15 mm	73 mm x 46 mm x 19 mm
Package contents	SWD Isolator Plugin	SWD Isolator Box, 20-pin flat cable

In both variants, the target is connected with a 20-pin flat cable.

1.3 Safety information

The SWD Isolator provides basic isolation only. Do not use it with hazardous voltages without further protection measures, to avoid the risk of electric shock or fire.

This basic isolation withstands high voltages as specified in chapter 2. To ensure personal safety when dealing with potentially hazardous voltages, a second protection measure must be in place in case the first insulation barrier fails. This is called double or reinforced isolation. How double isolation can be achieved depends on the use case or application setup. Also check the safety regulations applicable in your country to ensure that all requirements are met.

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Chapter 2

Specifications

This chapter contains the technical data of the SWD Isolator for both variants.

2.1 Electrical

- Basic isolation: 1 kV DC
- Supported target operating voltage: 1.2 V to 5 V
- SWD frequency: up to 4 MHz
- Supported interfaces: SWD with SWO, cJTAG (4-wire JTAG is not supported)
- Power supply: from the emulator side via pin 19; < 25 µA drawn from VTref (pin 1)
- Signal isolation: high-speed digital isolators with low propagation delay

2.2 Indicators

LED	Color	Meaning
Power/Overload (emulator side)	Green	Power on the emulator side
Power/Overload (emulator side)	Red	Power overload on the emulator side
Connect/Reset (target side)	Green	Power on the target side
Connect/Reset (target side)	Red	Target is in reset or powered off

2.3 Protection

- Overvoltage and overcurrent protection on the emulator side
- Overvoltage protection on the VTref pin of the target connector
- ESD protection

2.4 Operating conditions

- Temperature: +5 °C to +60 °C (operating), -20 °C to +65 °C (storage)
- Relative humidity: below 90 percent, non-condensing

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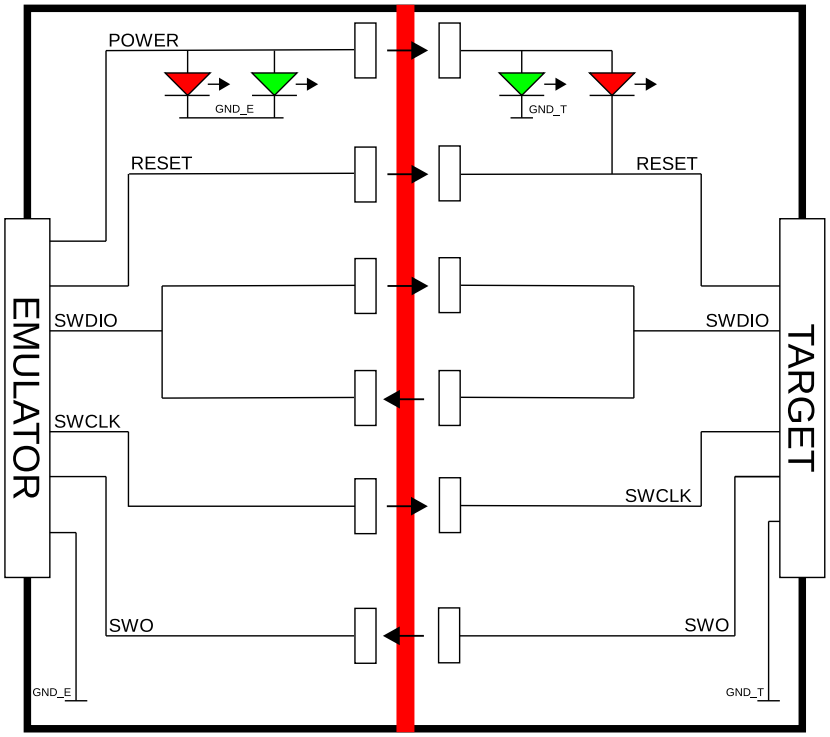
2.5 Block diagram

The red line marks the isolation barrier between the emulator side and the target side. Each signal crosses this barrier through a digital isolator.



Functional block diagram

2.6 Pinout

Both connectors use the 20-pin J-Link pinout; only the pins for SWD and cJTAG are connected. Signal directions are given as seen from the SWD Isolator.

Pin	Signal	Emulator side	Target side	Description
1	VTref	Output	Input	Emulator side: 5 V output (shown as target voltage by J-Link). Target side: reference voltage, < 25 µA.
7	SWDIO / TMSC	I/O	I/O	SWD data (cJTAG: TMSC). Pull high on the target.
9	SWCLK / TCKC	Input	Output	SWD clock (cJTAG: TCKC).
13	SWO	Output	Input	Serial Wire Output (trace data). Optional.
15	RESET	Input	Output	Target CPU reset signal (typically nRST, nRESET or RESET).
19	VCC	Input	NC	Emulator side: power supply input. Target side: not connected.
2, 3, 5, 11, 17	NC	NC	NC	Not connected.

Pins 4, 6, 8, 10, 12, 14, 16, 18 and 20 are GND pins. The grounds of the emulator-side connector and the target-side connector are isolated from each other.

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Chapter 3

Using the SWD Isolator

Before using the SWD Isolator, read the safety information in section 1.3.

3.1 Preparing the emulator to supply power

All J-Link, J-Trace and Flasher models can supply 5 V on pin 19, which powers the SWD Isolator. To enable this, configure the emulator once as follows:
1. Make sure that the *J-Link Software and Documentation Package* is installed.
2. Start J-Link Commander (JLink.exe on Windows, JLinkExe on Linux and macOS).
3. Enter the following command: `power on perm` (to revert: `power off perm`).

3.2 Connecting the SWD Isolator

1. Connect the SWD Isolator to the emulator: attach the SWD Isolator Plugin directly to the 20-pin connector of the emulator, or connect the SWD Isolator Box via a 20-pin flat cable.
2. Power the emulator.
3. Check that the green Power LED on the emulator side is lit. If not, see section 3.1.
4. Connect the target with a 20-pin flat cable. The target must be self-powered, as the SWD Isolator does not supply power to it.
5. If the target is powered, the green Connect LED on the target side is lit.
6. In the software, select SWD (or cJTAG) and set the interface speed to 4 MHz or less.

> **Note**
>
> The SWD Isolator supports SWD and cJTAG. 4-wire JTAG is not supported, as TDI is not connected. cJTAG requires the J-Link cJTAG pinout (TMSC on pin 7, TCKC on pin 9).

3.3 Using a third-party emulator

The SWD Isolator has been designed for *J-Link*, *J-Trace* and *Flasher*, but can also be used with other emulators with the same pinout. In this case, make sure that 5 V is supplied to pin 19 of the emulator-side connector and that your emulator tolerates 5 V on this pin. Do this at your own risk!

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