

UM11931

MCU-Link Base standalone Debug Probe

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User manual

Document information

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Rev	Date	Description
1.0	20220410	First release.

Contact information

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1. Introduction

Jointly developed by NXP and Embedded Artists, MCU-Link is a powerful and cost effective debug probe that can be used seamlessly with MCUXpresso IDE, and is also compatible with 3rd party IDEs that support CMSIS-DAP protocol. MCU-Link includes many features to facilitate embedded software development, from basic debug to profiling and a UART to USB bridge (VCOM). MCU-Link is one of a range of debug solutions based on the MCU-Link architecture, which also includes a Pro model and implementations built into NXP evaluation boards (see <https://nxp.com/mculink> for more information). MCU-Link solutions are based on the powerful, low power LPC55S69 microcontroller and all versions run the same firmware from NXP.

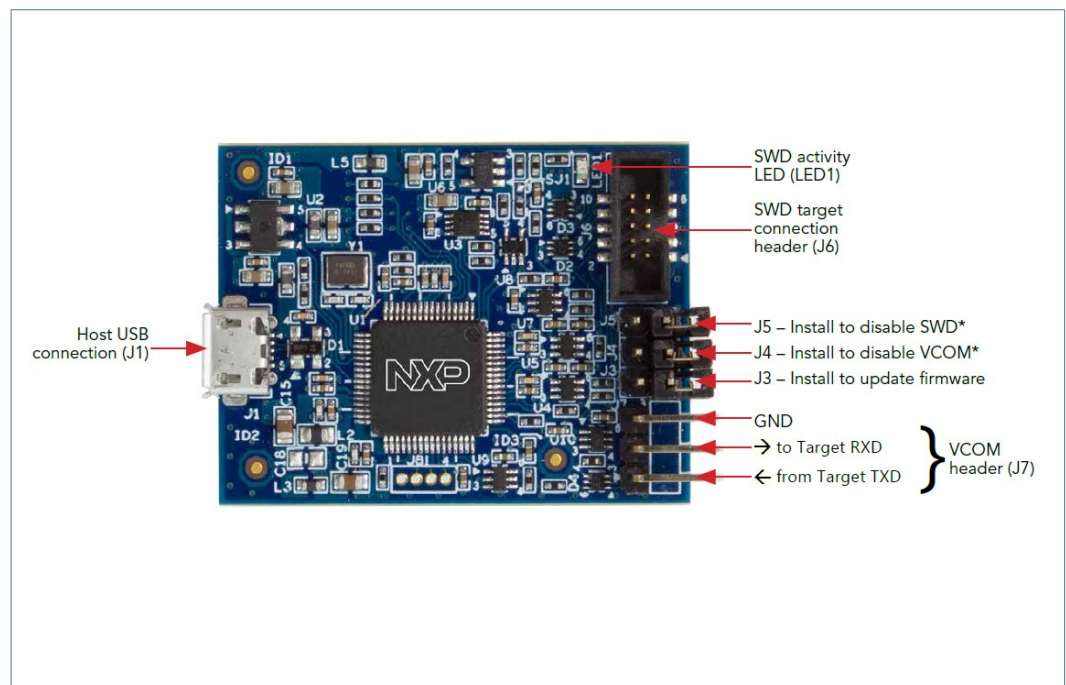


Figure 1 MCU-Link layout and connections

The MCU-Link includes following features:

- CMSIS-DAP firmware to support all NXP Arm® Cortex®-M based MCUs with SWD debug interfaces
- High speed USB host interface
- USB to target UART bridge (VCOM)
- SWO profiling and I/O features
- CMSIS-SWO support
- Analog signal monitoring input

2. Board layout and Settings

The connectors and jumpers on the MCU-Link are shown in [Figure 1](#) and descriptions of these are shown in [Table 1](#).

Table 1 Indicators, jumpers, buttons and connectors

Circuit ref	Description	Default
LED1	Status LED	n/a
J1	Host USB connector	n/a
J2	LPC55S69 SWD connector (for development of custom debug probe code only)	Not installed
J3	Firmware update jumper (install and re-power to update firmware)	Open
J4	VCOM disable jumper (install to disable)	Open
J5	SWD disable jumper (install to disable)	Open
J6	SWD connector for connection to target system	n/a
J7	VCOM connection	n/a
J8	Digital expansion connector Pin 1: Analog input Pins 2-4: Reserved	Not installed

3. Installation and firmware options

MCU-Link debug probes are factory programmed with NXP's CMSIS-DAP protocol based firmware, which also supports all other features supported in hardware. (Note that this model of MCU-Link cannot run the version of J-Link firmware from SEGGER that is available for other MCU-Link implementations.)

Some early production units may not have a debug probe firmware image installed. If this is the case none of the LEDs will light when the board is connected to a host computer. In this situation the board firmware can still be updated by following the instructions in Section 3.2 below.

3.1 Host driver and utility installation

A step-by-step installation guide for MCU-Link is provided at the board web page on [nxp.com](https://www.nxp.com/demoboard/MCU-LINK) (<https://www.nxp.com/demoboard/MCU-LINK>.) The rest of this section explains the same steps as can be found on that page.

MCU-Link is now also supported by the Linkserver utility (<https://nxp.com/linkserver>), and running the Linkserver installer will also install all the required drivers and firmware

update utilities mentioned in the remainder of this section. It is recommended that this installer is used unless you are using an MCUXpresso IDE version of 11.6.1 or older. Please check the MCUXpresso IDE compatibility (see **Table 2**) before updating the MCU-Link firmware.

MCU-Link debug probes are supported on Windows 10, MacOS X and Ubuntu Linux platforms. MCU-Link probes use standard OS drivers but the installation program for Windows includes information files to provide user friendly device names. If you do not want to use the Linkserver installer package you may install these information files and the firmware MCU-Link update utility, by going to the Design Resources section of the board web page and selecting “Development software” from the SOFTWARE section. Installation packages for each host OS will be shown. Download the package for your host OS install (Linux or MacOS) or run the installer (Windows). After setting up the OS drivers, your host computer will be ready to use with MCU-Link. It is usually advisable to update to the latest version of the firmware as this may have changed since your MCU-Link was manufactured but first check **Table 2** to confirm compatibility with the MCUXpresso IDE version you are using. See [Section 3.2](#) for the steps to do perform a firmware update.

3.2 Updating MCU-Link firmware

To update the MCU-Link’s firmware it must be powered up in (USB) ISP mode. To do this insert jumper J4 then connect MCU-Link to your host computer using a micro B USB cable connected to J1. The red STATUS LED (LED3) should light and stay on (for further information on LED status information refer to [Section 4.7](#)). The board will enumerate on the host computer as a HID class device. Navigate to the MCU-LINK_installer_Vx_xxx directory (where Vx_xxx indicates the version number, e.g. V3.108), then follow the installation instructions in the readme.txt to find and run the firmware update utilities for CMSIS-DAP. After updating the firmware using one of these scripts, unplug the board from the host computer, remove J4 and then reconnect the board.

NOTE: From version V3.xxx onwards, the MCU-Link firmware uses WinUSB instead of HID for higher performance, but this is not compatible with earlier version of MCUXpresso IDE. CMSIS-SWO support will also be introduced from V3.117, enabling SWO-related features in non-NXP IDEs, but also requiring an updated IDE. Please check the table below for compatibility between version of MCU-Link firmware and MCUXpresso IDE. The last V2.xxx firmware release (2.263) is available at <https://nxp.com/mcu-link> for developers using older IDE versions.

Table 2 Firmware features and MCUXpresso IDE compatibility

MCU-Link firmware version	USB driver type	CMSIS-SWO support	LIBUSBSIO	MCUXpresso IDE versions supported
V1.xxx and V2.xxx	HID	No	Yes	MCUXpresso 11.3 onwards
V3.xxx up to and including V3.108	WinUSB	No	No	MCUXpresso 11.7 onwards REQUIRED
V3.117 and onwards	WinUSB	Yes	No	MCUXpresso 11.7.1 or later REQUIRED

After programming the MCU-Link with the CMSIS-DAP firmware, a USB serial bus device and a virtual com port will enumerate, as shown below (for Windows hosts):

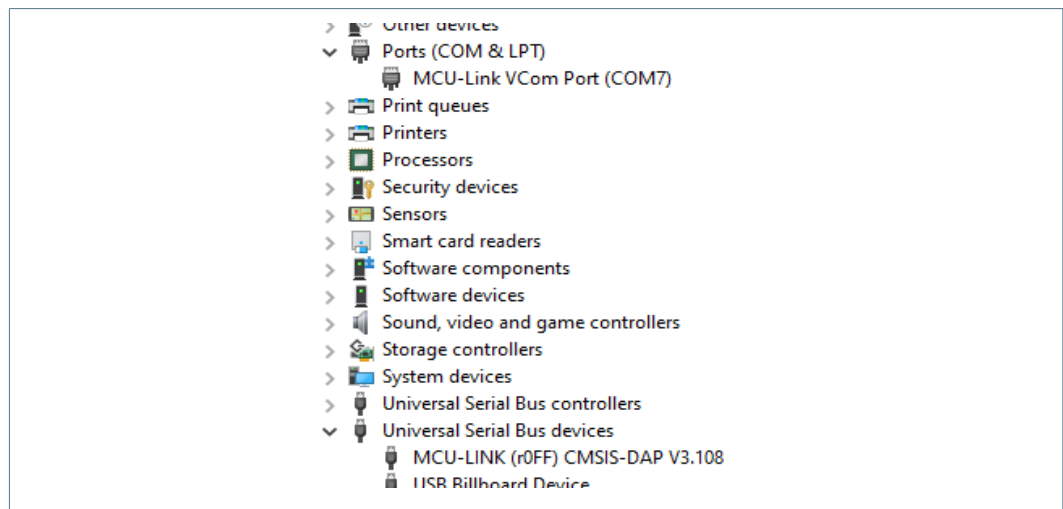


Figure 2 MCU-Link USB devices (from V3.xxx firmware, VCOM port enabled)

If you are using firmware V2.xxx or earlier you will see an MCU-Link CMSIS-DAP device under the USB HIB devices rather than Universal Serial Bus devices.

The status LED will repeatedly fade from on to off and back on again (“breathing”).

If a more recent firmware version than that programmed into your MCU-Link is available, MCUXpresso IDE (from version 11.3 onwards) will alert you to this when you use the probe in a debug session; take careful note of the version of firmware you install to ensure it is compatible with the IDE version you are using. If you are using another IDE with the MCU-Link it is advisable to update the firmware to ensure the latest version of firmware is installed.

3.3 Setup for use with development tools

The MCU-Link debug probe can be used with IDEs supported within the MCUXpresso ecosystem (MCUXpresso IDE, IAR Embedded Workbench, Keil MDK, MCUXpresso for Visual Studio Code (from July 2023)); for more information on getting started with these IDEs please visit the Getting Started section of the [MCU-Link board page](#) on nxp.com.

3.3.1 Use with MCUXpresso IDE

MCUXpresso IDE will recognize any type of MCU-Link and will show the probe types and unique identifiers of all probes it finds in the probe discovery dialog when starting a debug session. This dialog will also show the firmware version, and will show a warning if the firmware is not the latest version. See Section 3.2 for information on how to update the firmware. MCUXpresso IDE 11.3 or later must be used when using MCU-Link.

3.3.2 Use with other IDEs

MCU-Link should be recognized as a CMSIS-DAP probe by other IDEs (depending on the firmware that is programmed), and should be usable with standard settings for that probe type. Follow IDE vendor instructions for setup and use of CMSIS-DAP.

4. Feature descriptions

This section describes the various features of MCU-Link.

4.1 Target SWD/SWO interface

MCU-Link provides support for SWD-based target debug, including features enabled by SWO. MCU-Link comes with a cable target connection via J2, 10-pin Cortex M connector.

Level shifters are provided between the LPC55S69 MCU-Link processor and the target to enable target processors running at between 1.2V and 5V to be debugged. A reference voltage tracking circuit is used to detect the target voltage at the SWD connector and set the level shifter target-side voltage appropriately (see schematic page 4.)

The Target SWD interface can be disabled by installed jumper J13 but note that the MCU-Link software only checks this jumper at boot up time.

NOTE: The MCU-Link can be back-powered by a target if the MCU-Link itself is not powered via USB. For this reason it is recommended that power be applied to the MCU-Link before the target.

4.2 VCOM (USB to Target UART bridge)

MCU-Link includes a UART to USB bridge (VCOM). A target system UART can be connected to the MCU-Link via connector J7 using the supplied cable. Pin 1 of J7 should be connected to the TXD output of the Target, and pin 2 to the RXD input of the Target.

The MCU-Link VCOM device will enumerate on the host computer system with the name MCU-Link Vcom Port (COMxx) where “xx” will be dependent on the host system. Each MCU-Link board will have a unique VCOM number associated with it. The VCOM function may be disabled by installing jumper J7 before powering the board. Note that installing/removing this jumper after powering the board will have no effect on the feature in terms of how the MCU-Link software behaves since it is only checked at power up. It is not necessary to disable the VCOM function when not in use, although this can save some USB bandwidth.

The VCOM device is configurable via the host computer (e.g. Device Manager in Windows), with the following parameters:

- Word length 7 or 8 bits
- Stop bits: 1 or 2
- Parity: none / odd / even

Baud rates of up to 5.33Mbps are supported.

4.3 Analog probe

MCU-Link includes an analog signal input that can be used with MCUXpresso IDE to provide a basic signal tracing feature. As at version 11.4 of MCUXpresso IDE this feature is included with the energy measurement dialogs.

The analog input for this feature is located at pin 1 of connector J8. The input passes directly into an ADC input of the LPC55S69; refer to the datasheet of the LPC55S69 for input impedance and other characteristics. Care should be taken not to apply voltages >3.3V to this input in order to avoid damage.

4.4 LPC55S69 debug connector

Most users of MCU-Link are expected to use the standard firmware from NXP and so will not need to debug the LPC55S69 processor, however SWD connector J2 may be soldered to the board and used to develop code on this device.

5. Additional information

This section describes other information related to the use of the MCU-Link Base Probe.

5.1 Target operating voltage and connections

The MCU-Link Base Probe cannot power a target system, so uses a sensing circuit (see page 4 of the schematic) to detect the target supply voltage and set up level shifter voltages accordingly. It should not be necessary to make any modifications to this circuit, but there is a pull up resistor (33k Ω) to the 3.3V supply of the MCU-Link. If issues are seen with the target system supply being affected by the MCU-Link being connected then R16 may be removed and SJ1 changed to connect to position 1-2. This will fix the level shifters at the voltage level seen at pin 1 of the SWD connector, and require that the target supply can support the VCCB input requirements of the level shifter devices. It is not recommended to make these modifications until/unless the target system has been carefully checked to see that the correct reference/supply voltage is present on pin 1 of the SWD connector (J6).

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