UM11931

MCU-Link Base standalone Debug Probe

Rev. 1.1 — 7 January 2025 User manual

Document information

Information	Content
Keywords	UM11931, MCU-Link, MCU-Link Pro, debug probe, J-Link, Debug probe, CMSIS-DAP
Abstract	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.

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.

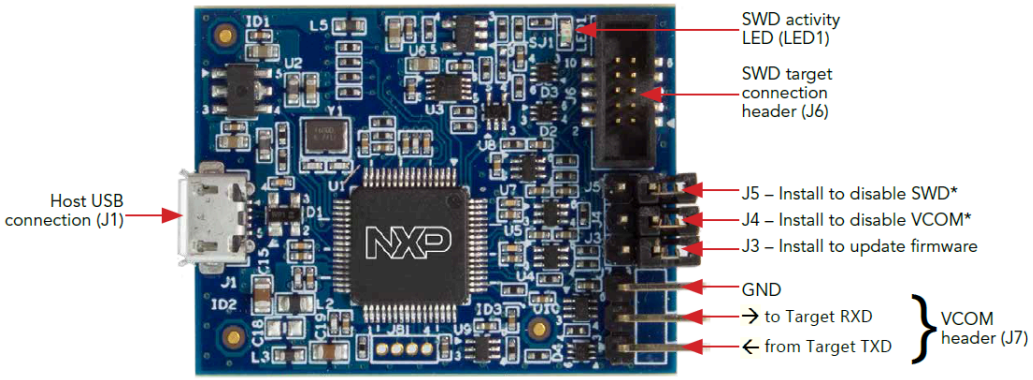

Figure 1. MCU-Link layout and connections

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

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	Not installed

Table 1. Indicators, jumpers, buttons, and connectors...*continued*

Circuit ref	Description	Default
	Pins 1-4: Reserved	

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.

3.1 Host driver and utility installation

A step-by-step installation guide for MCU-Link is at the board webpage (https://www.nxp.com/demoboard/mcu-link). The rest of this section explains the same steps as on that page. MCU-Link debug probes are supported on host computers running a Windows 10/11, MacOS X, or Ubuntu Linux operating systems. The debug probe works with standard OS drivers.

The LinkServer utility package provides all the required software to use these probes. For Windows platforms, it also includes information files to provide user-friendly device names utilities. LinkServer itself provides a GDB server, flash programming, and other features, along with the MCU-Link firmware update capability. The MCU-Link firmware update utility for version 2.263 is also on the LinkServer webpage, however, only install this if you cannot use the WinUSB drivers for MCU-Link or if you are using MCUXpresso 11.6.1 (or an earlier version).

If the MCU-Link firmware version is 3.122 or later, an automatic firmware update can be done using the LinkServer installer (version 1.4.85 or later). Otherwise, a manual update is necessary after placing the MCU-Link into the In-System Programming (ISP) mode. The ISP jumper for MCU-Link has the silkscreen marking/ circuit reference J3.

Download and install the LinkServer utility package, change the directory to the installation directory, and perform the following steps:

- Plug in your MCU-Link and use the LinkServer application to ensure that it is detected using the LinkServer probes command:

Figure 2. LinkServer probes command

- Use the LinkServer auto-update command to update the firmware, using the probe identifier number (#) from the previous step:

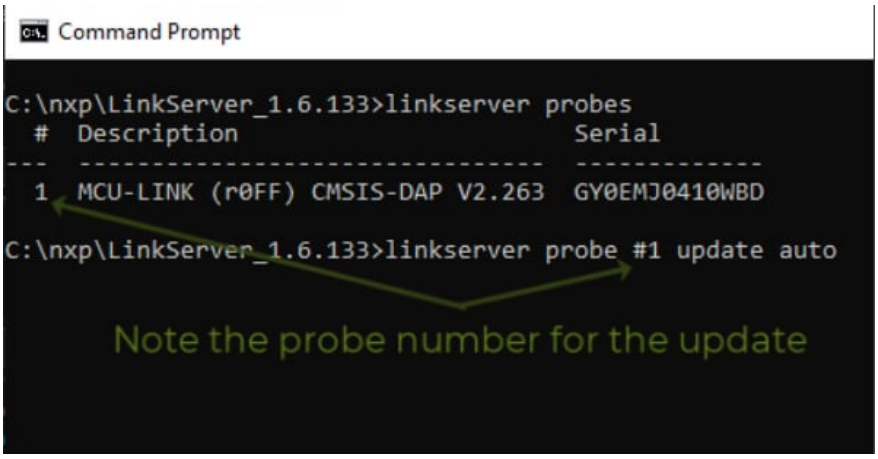

Figure 3. LinkServer auto-update command

If the update is successful, the new version is reported and you are ready to use your MCU-Link. If it fails (due to an older firmware version being present), perform the steps in the next section.

3.2 Manually updating MCU-Link firmware

Automated firmware update may not be possible if the firmware version in the MCU-Link probe is too old, if other firmware has been installed, or if there is no firmware present. In these situations, it is necessary to perform a manual update using scripts provided in the LinkServer installation.

To update the MCU-Link's firmware manually, it must be powered up in the ISP mode. To do this, insert jumper J3 and connect MCU-Link to your host computer using a micro-B USB cable connected to J1. The red STATUS LED (LED3) should light up and stay on. The board enumerates on the host computer as an HID class USB device.

Navigate to the *MCU-LINK_installer\scripts* subdirectory, run the program_CMSIS.cmd script, and follow the installation instructions from this script. After updating the firmware using this script, unplug the board from the host computer, remove J3, and reconnect the board.

When using MCUXpresso for Visual Studio (VS) Code, it is recommended that the latest version of the MCU-Link firmware is used.

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 versions of MCUXpresso IDE. The CMSIS-SWO support was also introduced from V3.117, enabling SWO-related features in non-NXP IDEs, but also requiring an updated version of the MCUXpresso IDE. See Table 2 for compatibility between a version of the MCU-Link firmware and MCUXpresso IDE. The last V2.xxx firmware release (2.263) is available at https://nxp.com/mculink for developers using older IDE versions.*

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

Table 2. Firmware features and MCUXpresso IDE compatibility

MCU-Link firmware version	USB driver type	CMSIS-SWO support	LIBUSBSIO	MCUXpresso IDE versions supported	MCUXpresso for VS Code versions supported
V1.xxx and V2.xxx	HID	No	Yes	MCUXpresso 11.3 onwards	Not supported
V3.xxx up to and including V3.108	WinUSB	No	No	MCUXpresso 11.7 onwards **REQUIRED**	Supported, but not recommended

Table 2. Firmware features and MCUXpresso IDE compatibility*...continued*

MCU-Link firmware version	USB driver type	CMSIS-SWO support	LIBUSBSIO	MCUXpresso IDE versions supported	MCUXpresso for VS Code versions supported
V3.117 and onwards	WinUSB	Yes	No	MCUXpresso 11.7.1 or later **REQUIRED**	Recommended

After programming the MCU-Link with the CMSIS-DAP firmware, a USB serial bus device and a virtual com port will enumerate, as shown in Figure 4 (for Windows hosts):

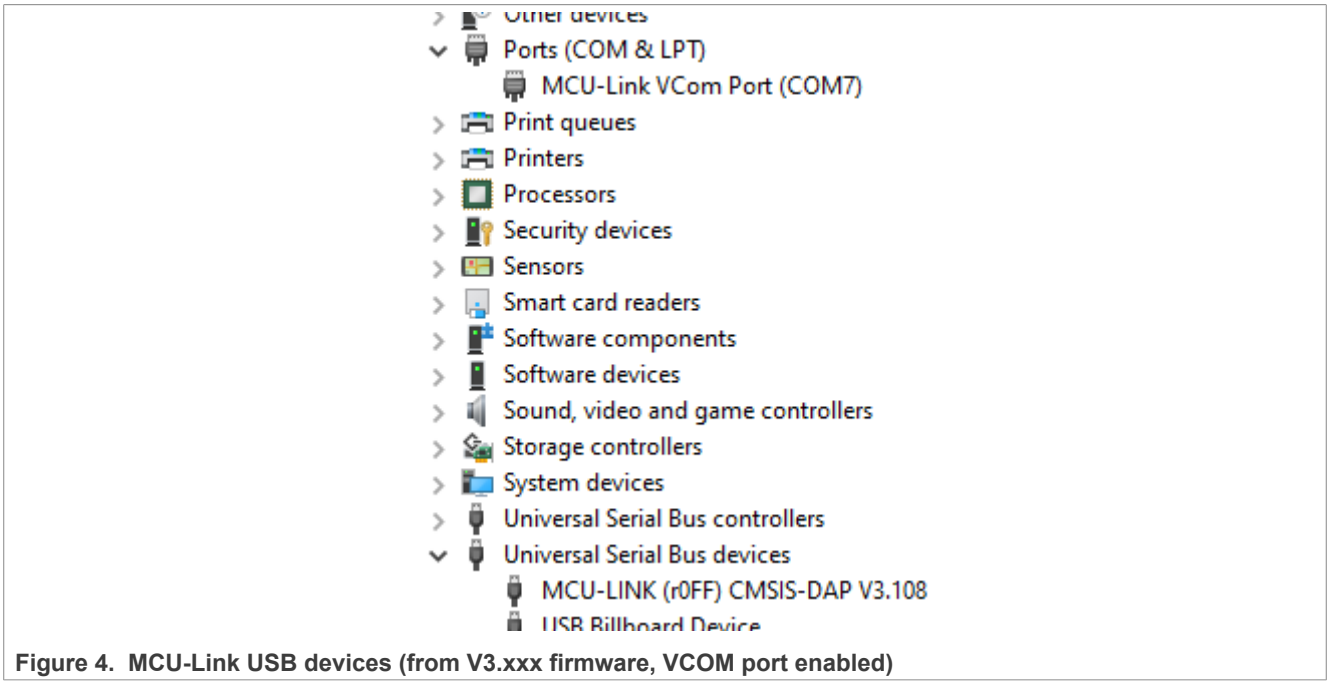

Figure 4. MCU-Link USB devices (from V3.xxx firmware, VCOM port enabled)

The status LED repeatedly fades 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) alerts you to this when you use the probe in a debug session. Take careful note of the version of firmware you install to ensure that 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 that 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); for more information on getting started with these IDEs please visit the Getting Started section of the https://www.nxp.com/demoboard/mcu-link page on http://www.nxp.com.

3.3.1 Use with MCUXpresso IDE (Eclipse) and MCUXpresso for VS Code

MCUXpresso IDEs 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, and version 3.xxx onwards must be used with MCUXpresso for VS Code.

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 a 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 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 (33kΩ) 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).

6 Revision history

Table 3. Revision history

Document ID	Release date	Description
UM11931 v.1.1	07 January 2025	• Updates to installation steps, corrections to DFU jumper reference. Analog input removed.
UM11931 v.1.0	10 April 2024	• Initial version

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