

ULINK™ Debug Adapters

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ULINK2 Debug Adapter



The Keil ULINK2 Debug Adapter connects your PC's USB port to your target system (via JTAG, SWD, or OCDS) and allows you to program and debug embedded programs on target hardware.

Features

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- Supports various ARM7, ARM9, Cortex-M, 8051, and C166 devices
- JTAG speed up to 10MHz
- Serial Wire Debug (SWD) support for ARM Cortex-M based devices
- Serial Wire Viewer (SWV) Data Trace for Cortex-M up to 1Mbit/s (UART mode)
- [Real-Time Agent](#) with memory R/W during execution, terminal emulation, and serial debug output
- Seamless integration with the Keil [µVision IDE & Debugger](#)
- Wide target voltage range: 2.7V - 5.5V
- USB powered (no power supply required)
- Plug-and-Play installation using [standard Windows USB drivers](#)
- Target [Connectors](#)
 - 10-pin (0.05") - Cortex Debug Connector
 - 20-pin (0.10") - ARM Standard JTAG Connector

ULINK2 may be used for:

- [On-chip Debugging](#) (using on-chip JTAG, SWD, or SWV),
- [Flash Memory Programming](#) (using user-configurable Flash programming algorithms).

Using the ULINK2 adapter together with the Keil [µVision IDE/Debugger](#), you can easily create, download, and test embedded applications on target hardware.

Note

- ULINK2 support is available in:
 - MDK 3.04 or higher,
 - C51 8.15 or higher,
 - C166 6.06 or higher.

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The ULINK2 User's Guide describes the Keil ULINK[®]2 USB-JTAG Interface Adapter and contains detailed instructions for the hardware and software configuration. ULINK2 is a small hardware adapter that connects the USB port of the PC to the JTAG or OCDS debugging port of the target hardware. Use ULINK2 to:

- Debug and test programs on target hardware.
- Program on-chip or external Flash memory of [many devices](#).

This book contains the following chapters:

- [Introduction](#) gives an overview of the ULINK2 USB-JTAG Adapter features, requirements, limitations, supported devices, and CoreSight™ Technology.
- [Hardware Description](#) describes the ULINK2 Adapter components, and the start and reset sequences.
- [Setup ULINK2](#) shows the ULINK2 connection interfaces, how to install ULINK2, and the configuration settings needed to debug on ARM or Cortex-M devices.
- [Setup Flash Programming](#) describes the Flash download configuration and explains how to create a new Flash Programming Algorithm. Lists the existing Flash algorithms.
- [Using ULINK2](#) describes how to download and debug programs on target devices, and explains target chaining.
- [Configure Cortex-M Devices for Tracing](#) explains the settings needed for enabling trace by means of certain devices.
- [µVision Windows](#) shows the trace capturing and displaying capabilities of ULINK2, and the µVision windows used to visualize and analyze data.
- [Real-Time Agent](#) allows to view and modify the target board's memory contents on-the-fly. Step-by-step instructions explain how to add this feature to the application.
- [Appendix](#) with information about error messages and a troubleshooting guide.

Revision History

- July 2012: Support of debugging multi-core devices. Refer to [SW Device](#).
- January 2011: Documentation adapted to µVision4 look and feel.
- May 2010: Configure Cortex-M Devices for Tracing added.
- April 2010: Appendix with error messages added.
- November 2006: Initial revision.

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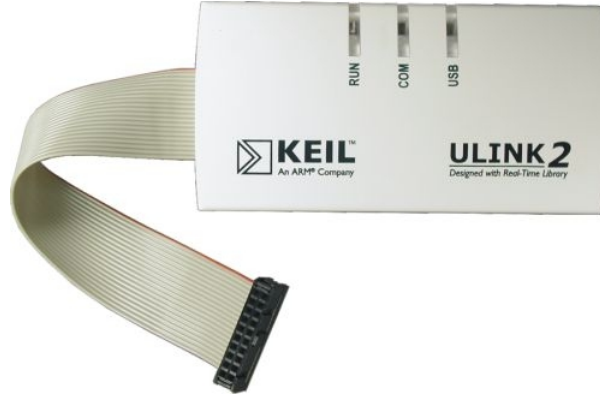
Introduction

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The Keil ULINK2 USB-JTAG Adapter connects your PC's USB port to your target hardware (via JTAG, OCDS or Serial Wire) and allows you to:

- Download programs and test them on your target hardware.
- Program the on-chip FLASH memory of [many devices](#).
- Program external FLASH memory of many target systems.



ULINK2 Adapter

The Keil µVision® IDE/Debugger is the front-end you use with ULINK2 to create, download, and test embedded applications on target hardware.

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Kit Contents

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The ULINK2 USB-JTAG Adapter is distributed in two distinct configurations:

Standard Product

The standard distribution of ULINK2 available from Keil includes the:

1. ULINK2 USB-JTAG Adapter.
2. Adapter cables for:
 - ARM devices.
 - µPSD devices.
 - C16x devices.
 - XC16x devices
 - C8xx devices.
 - Cortex-M 10-pin connector.
 - Cortex-M 10-to-20 pin connector.
3. USB cable.

Chip-Specific Product

This customized distribution package is provided with many vendor-specific evaluation boards. Additional adapter cables are excluded.

















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Features

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The ULINK2 Adapter has the following features:

- Flash programming via the on-chip debug interface.
- Real-time in-circuit emulation using an on-chip debug interface.
- Supports debugging on multi-core devices based on Cortex-M microcontrollers.
- Three LEDs that display the RUN, COM, and USB status.
- A USB interface that provides power and fast PC communication.

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Supported Devices

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ULINK2 supports a wide variety of devices from several companies. The most current list of [supported devices](#) is available on the Keil web site.

- **Actel** (ARM7/ARM9/Cortex Family)
[A2F200M3E](#), [A2F500M3G](#), [COREMP7](#), [Cortex-M1](#)
- **Analog Devices** (ARM7/ARM9/Cortex Family)
[ADuC7019](#), [ADuC7020](#), [ADuC7021](#), [ADuC7022](#), [ADuC7023](#), [ADuC7024](#), [ADuC7025](#), [ADuC7026](#), [ADuC7027](#), [ADuC7028](#), [ADuC7030](#), [ADuC7032](#), [ADuC7033](#), [ADuC7034](#), [ADuC7036](#), [ADuC7037](#), [ADuC7038](#), [ADuC7039](#), [ADuC7060](#), [ADuC7061](#), [ADuC7122](#), [ADuC7124](#), [ADuC7126](#), [ADuC7128](#), [ADuC7129](#), [ADuC7229](#), [ADUCM360](#), [ADUCRF101](#)
- **ARM** (ARM7/ARM9/Cortex Family)
[Cortex-M0](#), [Cortex-M1 \(Altera\)](#), [Cortex-M3](#), [Cortex-M4](#), [Cortex-M4 FPU](#)
- **Atmel** (ARM7/ARM9/Cortex Family)
[AT91C140](#), [AT91F40416](#), [AT91F40816](#), [AT91FR40162](#), [AT91FR4042](#), [AT91FR4081](#), [AT91M40400](#), [AT91M40800](#), [AT91M40807](#), [AT91M42800A](#), [AT91M43300](#), [AT91M55800A](#), [AT91M63200](#), [AT91R40008](#), [AT91R40807](#), [AT91RM3400](#), [AT91RM9200](#), [AT91SAM3S1A](#), [AT91SAM3S1B](#), [AT91SAM3S1C](#), [AT91SAM3S2A](#), [AT91SAM3S2B](#), [AT91SAM3S2C](#), [AT91SAM3S4A](#), [AT91SAM3S4B](#), [AT91SAM3S4C](#), [AT91SAM3U1C](#), [AT91SAM3U1E](#), [AT91SAM3U2C](#), [AT91SAM3U2E](#), [AT91SAM3U4C](#), [AT91SAM3U4E](#), [AT91SAM7A1](#), [AT91SAM7A2](#), [AT91SAM7A3](#), [AT91SAM7L128](#), [AT91SAM7L64](#), [AT91SAM7S128](#), [AT91SAM7S16](#), [AT91SAM7S161](#), [AT91SAM7S256](#), [AT91SAM7S32](#), [AT91SAM7S321](#), [AT91SAM7S512](#), [AT91SAM7S64](#), [AT91SAM7SE256](#), [AT91SAM7SE32](#), [AT91SAM7SE512](#), [AT91SAM7X128](#), [AT91SAM7X256](#), [AT91SAM7X512](#), [AT91SAM7XC128](#), [AT91SAM7XC256](#), [AT91SAM7XC512](#), [AT91SAM9260](#), [AT91SAM9261](#), [AT91SAM9261S](#), [AT91SAM9263](#), [AT91SAM9M10](#), [AT91SAM9R64](#), [AT91SAM9RL64](#), [AT91SAM9XE128](#), [AT91SAM9XE256](#), [AT91SAM9XE512](#), [SAM3A2C](#), [SAM3A4C](#), [SAM3A8C](#), [SAM3N1A](#), [SAM3N1B](#), [SAM3N1C](#), [SAM3N2A](#), [SAM3N2B](#), [SAM3N2C](#), [SAM3N4A](#), [SAM3N4B](#), [SAM3N4C](#), [SAM3S8B](#), [SAM3S8C](#), [SAM3SD8B](#), [SAM3SD8C](#), [SAM3X4C](#), [SAM3X4E](#), [SAM3X8C](#), [SAM3X8E](#), [SAM3X8H](#), [SAM4S16A](#), [SAM4S16B](#), [SAM4S16C](#), [SAM4S8A](#), [SAM4S8B](#), [SAM4S8C](#), [SAM9G10](#), [SAM9G15](#), [SAM9G20](#), [SAM9G25](#), [SAM9G35](#), [SAM9G45](#), [SAM9X25](#), [SAM9X35](#)
- **AustriaMicroSystems** (ARM7/ARM9/Cortex Family)
[AS3525](#)
- **Cirrus Logic** (ARM7/ARM9/Cortex Family)
[CS740110-IQZ](#), [CS740120-IQZ](#), [CS740130-IQZ](#)
- **Cypress** (ARM7/ARM9/Cortex Family)
[CY8C5246AXI-054](#), [CY8C5246LTI-029](#), [CY8C5247AXI-051](#), [CY8C5247LTI-089](#), [CY8C5248AXI-047](#), [CY8C5248LTI-030](#), [CY8C5365AXI-043](#), [CY8C5365LTI-104](#), [CY8C5366AXI-001](#), [CY8C5366LTI-053](#), [CY8C5367AXI-108](#), [CY8C5367LTI-003](#), [CY8C5368AXI-106](#), [CY8C5368LTI-026](#), [CY8C5466AXI-064](#), [CY8C5466LTI-063](#), [CY8C5467AXI-011](#), [CY8C5467LTI-007](#), [CY8C5468AXI-018](#), [CY8C5468LTI-037](#), [CY8C5566AXI-061](#), [CY8C5566LTI-017](#), [CY8C5567AXI-019](#), [CY8C5567LTI-079](#), [CY8C5568AXI-060](#), [CY8C5568LTI-114](#)
- **Ember** (ARM7/ARM9/Cortex Family)
[EM351](#), [EM357](#)
- **Energy Micro** (ARM7/ARM9/Cortex Family)
[EFM32G200F16](#), [EFM32G200F32](#), [EFM32G200F64](#), [EFM32G210F128](#), [EFM32G222F128](#), [EFM32G222F32](#), [EFM32G222F64](#), [EFM32G230F128](#), [EFM32G230F32](#), [EFM32G230F64](#), [EFM32G232F128](#), [EFM32G232F32](#), [EFM32G232F64](#), [EFM32G280F128](#), [EFM32G280F32](#), [EFM32G280F64](#), [EFM32G290F128](#), [EFM32G290F32](#), [EFM32G290F64](#), [EFM32G840F128](#), [EFM32G840F32](#), [EFM32G840F64](#), [EFM32G842F128](#), [EFM32G842F32](#), [EFM32G842F64](#), [EFM32G880F128](#), [EFM32G880F32](#), [EFM32G880F64](#), [EFM32G890F128](#), [EFM32G890F32](#), [EFM32G890F64](#), [EFM32GG230F1024](#), [EFM32GG230F512](#), [EFM32GG232F1024](#), [EFM32GG232F512](#), [EFM32GG280F1024](#), [EFM32GG280F512](#), [EFM32GG290F1024](#), [EFM32GG290F512](#), [EFM32GG295F1024](#), [EFM32GG295F512](#), [EFM32GG330F1024](#), [EFM32GG330F512](#), [EFM32GG332F1024](#), [EFM32GG332F512](#), [EFM32GG380F1024](#), [EFM32GG380F512](#), [EFM32GG390F1024](#), [EFM32GG390F512](#), [EFM32GG395F1024](#), [EFM32GG395F512](#), [EFM32GG840F1024](#), [EFM32GG840F512](#), [EFM32GG842F1024](#), [EFM32GG842F512](#), [EFM32GG880F1024](#), [EFM32GG880F512](#), [EFM32GG890F1024](#), [EFM32GG890F512](#), [EFM32GG895F1024](#), [EFM32GG895F512](#), [EFM32GG940F1024](#), [EFM32GG940F512](#), [EFM32GG942F1024](#), [EFM32GG942F512](#), [EFM32GG980F1024](#), [EFM32GG980F512](#), [EFM32GG990F1024](#), [EFM32GG990F512](#), [EFM32GG995F1024](#), [EFM32GG995F512](#), [EFM32LG230F128](#), [EFM32LG230F256](#), [EFM32LG230F64](#), [EFM32LG232F128](#), [EFM32LG232F256](#), [EFM32LG232F64](#), [EFM32LG280F128](#), [EFM32LG280F256](#), [EFM32LG280F64](#), [EFM32LG290F128](#), [EFM32LG290F256](#), [EFM32LG290F64](#), [EFM32LG295F128](#), [EFM32LG295F256](#), [EFM32LG295F64](#), [EFM32LG330F128](#), [EFM32LG330F256](#), [EFM32LG330F64](#), [EFM32LG332F128](#), [EFM32LG332F256](#), [EFM32LG332F64](#), [EFM32LG380F128](#), [EFM32LG380F256](#), [EFM32LG380F64](#), [EFM32LG390F128](#), [EFM32LG390F256](#), [EFM32LG390F64](#), [EFM32LG395F128](#), [EFM32LG395F256](#), [EFM32LG395F64](#), [EFM32LG840F128](#), [EFM32LG840F256](#), [EFM32LG840F64](#), [EFM32LG842F128](#), [EFM32LG842F256](#), [EFM32LG842F64](#), [EFM32LG880F128](#), [EFM32LG880F256](#), [EFM32LG880F64](#), [EFM32LG890F128](#), [EFM32LG890F256](#), [EFM32LG890F64](#), [EFM32LG895F128](#), [EFM32LG895F256](#), [EFM32LG895F64](#), [EFM32LG940F128](#), [EFM32LG940F256](#), [EFM32LG940F64](#), [EFM32LG942F128](#), [EFM32LG942F256](#), [EFM32LG942F64](#), [EFM32LG980F128](#), [EFM32LG980F256](#), [EFM32LG980F64](#), [EFM32LG990F128](#), [EFM32LG990F256](#), [EFM32LG990F64](#), [EFM32LG995F128](#), [EFM32LG995F256](#), [EFM32LG995F64](#), [EFM32TG108F16](#), [EFM32TG108F32](#), [EFM32TG108F64](#), [EFM32TG108F8](#), [EFM32TG110F16](#), [EFM32TG110F32](#), [EFM32TG110F64](#), [EFM32TG110F8](#), [EFM32TG210F16](#), [EFM32TG210F32](#), [EFM32TG210F8](#), [EFM32TG222F16](#), [EFM32TG222F32](#), [EFM32TG222F8](#), [EFM32TG230F16](#), [EFM32TG230F32](#), [EFM32TG230F8](#), [EFM32TG232F16](#), [EFM32TG232F32](#), [EFM32TG232F8](#), [EFM32TG822F16](#), [EFM32TG822F32](#), [EFM32TG822F8](#), [EFM32TG840F16](#), [EFM32TG840F32](#), [EFM32TG840F8](#), [EFM32TG842F16](#), [EFM32TG842F32](#), [EFM32TG842F8](#)
- **Freescale Semiconductor** (ARM7/ARM9/Cortex Family)
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- **Fujitsu Semiconductor (ARM7/ARM9/Cortex Family)**
[MB9AF102N](#), [MB9AF102R](#), [MB9AF104N](#), [MB9AF104R](#), [MB9AF111L](#), [MB9AF111M](#), [MB9AF111N](#), [MB9AF112L](#), [MB9AF112M](#), [MB9AF112N](#), [MB9AF114L](#), [MB9AF114M](#), [MB9AF114N](#), [MB9AF115M](#), [MB9AF115N](#), [MB9AF116M](#), [MB9AF116N](#), [MB9AF131K](#), [MB9AF131L](#), [MB9AF132K](#), [MB9AF132L](#), [MB9AF311L](#), [MB9AF311M](#), [MB9AF311N](#), [MB9AF312L](#), [MB9AF312M](#), [MB9AF312N](#), [MB9AF314L](#), [MB9AF314M](#), [MB9AF314N](#), [MB9AF315M](#), [MB9AF315N](#), [MB9AF316M](#), [MB9AF316N](#), [MB9BF104R](#), [MB9BF105N](#), [MB9BF105R](#), [MB9BF106N](#), [MB9BF106R](#), [MB9BF112R](#), [MB9BF114R](#), [MB9BF115R](#), [MB9BF116R](#), [MB9BF116S](#), [MB9BF116T](#), [MB9BF117S](#), [MB9BF117T](#), [MB9BF118S](#), [MB9BF118T](#), [MB9BF216S](#), [MB9BF216T](#), [MB9BF217S](#), [MB9BF217T](#), [MB9BF218S](#), [MB9BF218T](#), [MB9BF304N](#), [MB9BF304R](#), [MB9BF305N](#), [MB9BF305R](#), [MB9BF306N](#), [MB9BF306R](#), [MB9BF316N](#), [MB9BF316S](#), [MB9BF316T](#), [MB9BF317S](#), [MB9BF317T](#), [MB9BF318S](#), [MB9BF318T](#), [MB9BF404N](#), [MB9BF404R](#), [MB9BF405N](#), [MB9BF405R](#), [MB9BF406N](#), [MB9BF406R](#), [MB9BF412R](#), [MB9BF414R](#), [MB9BF415R](#), [MB9BF416R](#), [MB9BF416S](#), [MB9BF416T](#), [MB9BF417S](#), [MB9BF417T](#), [MB9BF418S](#), [MB9BF418T](#), [MB9BF500N](#), [MB9BF500R](#), [MB9BF504N](#), [MB9BF504R](#), [MB9BF505N](#), [MB9BF505R](#), [MB9BF506N](#), [MB9BF506R](#), [MB9BF512N](#), [MB9BF512R](#), [MB9BF514N](#), [MB9BF514R](#), [MB9BF515R](#), [MB9BF515R](#), [MB9BF516N](#), [MB9BF516R](#), [MB9BF516S](#), [MB9BF516T](#), [MB9BF517S](#), [MB9BF517T](#), [MB9BF518S](#), [MB9BF518T](#), [MB9BF616S](#), [MB9BF616T](#), [MB9BF617S](#), [MB9BF617T](#), [MB9BF618S](#), [MB9BF618T](#)
- **Holtek (ARM7/ARM9/Cortex Family)**
[HT32F1251](#), [HT32F1251B](#), [HT32F1252](#), [HT32F1253](#), [HT32F1755](#), [HT32F1765](#), [HT32F2755](#)
- **Infineon (8051 Family)**
[TLE7809](#), [TLE7810](#), [TLE7824](#), [TLE7826](#), [XC822-1F](#), [XC822M-1F](#), [XC822MT-1F](#), [XC822T-0F](#), [XC822T-1F](#), [XC824M-1F](#), [XC824MT-1F](#), [XC835MT-2F](#), [XC836-2F](#), [XC836M-1F](#), [XC836M-2F](#), [XC836MT-2F](#), [XC836T-2F](#), [XC864-1FR1](#), [XC866-1FR](#), [XC866-2FR](#), [XC866-4FR](#), [XC866L-1FR](#), [XC866L-2FR](#), [XC866L-4FR](#), [XC878-13FE](#), [XC878-16FE](#), [XC878C-13FF](#), [XC878C-16FE](#), [XC878CM-13FF](#), [XC878CM-16FF](#), [XC878L-13FE](#), [XC878L-16FE](#), [XC878M-13FF](#), [XC878M-16FE](#), [XC886-6FF](#), [XC886-8FF](#), [XC886C-6FF](#), [XC886C-8FF](#), [XC886CLM-6FF](#), [XC886CLM-8FF](#), [XC886CM-6FF](#), [XC886CM-8FF](#), [XC886LM-6FF](#), [XC886LM-8FF](#), [XC888-6FF](#), [XC888-8FF](#), [XC888C-6FF](#), [XC888C-8FF](#), [XC888CLM-6FF](#), [XC888CLM-8FF](#), [XC888CM-6FF](#), [XC888CM-8FF](#), [XC888LM-6FF](#), [XC888LM-8FF](#)
- **Infineon (ARM7/ARM9/Cortex Family)**
[XMC4400-512](#), [XMC4500-1024](#), [XMC4500-768](#), [XMC4502-768](#), [XMC4504-512](#)
- **Infineon (C16x/ST10/XC16x Family)**
[XC161CJ-16F](#), [XC161CS-32F](#), [XC164CM-16F](#), [XC164CM-4F](#), [XC164CM-8F](#), [XC164CS-16F](#), [XC164CS-16R](#), [XC164CS-32F](#), [XC164CS-32R](#), [XC164CS-8F](#), [XC164CS-8R](#), [XC164D-16F](#), [XC164D-32F](#), [XC164D-8F](#), [XC164GM-16F](#), [XC164GM-4F](#), [XC164GM-8F](#), [XC164KM-4F](#), [XC164KM-8F](#), [XC164LM-4F](#), [XC164LM-8F](#), [XC164N-16F](#), [XC164N-32F](#), [XC164N-8F](#), [XC164S-16F](#), [XC164S-32F](#), [XC164S-8F](#), [XC164SM-4F](#), [XC164SM-8F](#), [XC164TM-4F](#), [XC164TM-8F](#), [XC167CI-32F](#), [XC2210U-4F](#), [XC2210U-8F](#), [XC2220L-12F](#), [XC2220L-20F](#), [XC2220U-4F](#), [XC2220U-8F](#), [XC2224L-12F](#), [XC2224L-20F](#), [XC2230L-12F](#), [XC2230L-20F](#), [XC2232N-24F](#), [XC2232N-40F](#), [XC2234L-12F](#), [XC2234L-20F](#), [XC2234N-16F](#), [XC2234N-24F](#), [XC2234N-40F](#), [XC2236N-16F](#), [XC2236N-24F](#), [XC2236N-40F](#), [XC2237M-104F](#), [XC2237M-56F](#), [XC2237M-72F](#), [XC2238N-24F](#), [XC2238N-40F](#), [XC2261N-24F](#), [XC2263M-104F](#), [XC2263M-56F](#), [XC2263M-72F](#), [XC2263N-16F](#), [XC2263N-24F](#), [XC2263N-40F](#), [XC2264-56F](#), [XC2264-72F](#), [XC2264-96F](#), [XC2264N-16F](#), [XC2264N-40F](#), [XC2265M-104F](#), [XC2265M-56F](#), [XC2265M-72F](#), [XC2265N-24F](#), [XC2265N-40F](#), [XC2267-56F](#), [XC2267-72F](#), [XC2267-96F](#), [XC2267M-104F](#), [XC2267M-56F](#), [XC2267M-72F](#), [XC2268I-136F](#), [XC2268N-24F](#), [XC2268N-40F](#), [XC2269I-136F](#), [XC2285-56F](#), [XC2285-72F](#), [XC2285-96F](#), [XC2285M-104F](#), [XC2285M-56F](#), [XC2285M-72F](#), [XC2286-56F](#), [XC2286-72F](#), [XC2286-96F](#), [XC2287-56F](#), [XC2287-72F](#), [XC2287-96F](#), [XC2287M-104F](#), [XC2287M-56F](#), [XC2287M-72F](#), [XC2288H-136F](#), [XC2288H-200F](#), [XC2288I-136F](#), [XC2289H-136F](#), [XC2289H-200F](#), [XC2289I-136F](#), [XC2289H-136F](#), [XC2289H-200F](#), [XC2299H-136F](#), [XC2299H-200F](#), [XC2310S-4F](#), [XC2310S-8F](#), [XC2320D-12F](#), [XC2320D-20F](#), [XC2320S-4F](#), [XC2320S-8F](#), [XC2321D-12F](#), [XC2321D-20F](#), [XC2330D-12F](#), [XC2331D-12F](#), [XC2331D-20F](#), [XC2336A-56F](#), [XC2336A-72F](#), [XC2336B-24F](#), [XC2336B-40F](#), [XC2338B-24F](#), [XC2338B-40F](#), [XC2361A-56F](#), [XC2361A-56F](#), [XC2361A-72F](#), [XC2361B-40F](#), [XC2361E-104F](#), [XC2361E-136F](#), [XC2363A-56F](#), [XC2363A-72F](#), [XC2364A-104F](#), [XC2364A-104F](#), [XC2364A-56F](#), [XC2364A-72F](#), [XC2364B-24F](#), [XC2364B-40F](#), [XC2365-48F](#), [XC2365-56F](#), [XC2365-72F](#), [XC2365A-104F](#), [XC2365A-56F](#), [XC2365A-72F](#), [XC2365B-40F](#), [XC2365E-136F](#), [XC2368E-104F](#), [XC2368E-136F](#), [XC2387-72F](#), [XC2387A-104F](#), [XC2387A-56F](#), [XC2387A-72F](#), [XC2387C-136F](#), [XC2388C-136F](#), [XC2388C-200F](#), [XC2388E-104F](#), [XC2388E-136F](#), [XC2712X-8F](#), [XC2722X-8F](#), [XC2723X-20F](#), [XC2733X-20F](#), [XC2734X-32F](#), [XC2734X-40F](#), [XC2764X-32F](#), [XC2764X-40F](#), [XC2765X-104F](#), [XC2765X-20F](#), [XC2765X-96F](#), [XC2766X-96F](#), [XC2768X-104F](#), [XC2768X-136F](#), [XC2785X-104F](#), [XC2785X-72F](#), [XC2786X-96F](#), [XC2787X-136F](#), [XC2787X-200F](#), [XC2788X-104F](#), [XC2788X-136F](#), [XC2797X-136F](#), [XC2797X-200F](#), [XE162FM-24F](#), [XE162FM-48F](#), [XE162FM-72F](#), [XE162FN-16F](#), [XE162FN-24F](#), [XE162FN-40F](#), [XE162HM-24F](#), [XE162HM-48F](#), [XE162HM-72F](#), [XE162HN-16F](#), [XE162HN-24F](#), [XE162HN-40F](#), [XE164F-24F](#), [XE164F-48F](#), [XE164F-72F](#), [XE164F-96F](#), [XE164FM-24F](#), [XE164FM-48F](#), [XE164FM-72F](#), [XE164FN-16F](#), [XE164FN-24F](#), [XE164FN-40F](#), [XE164G-24F](#), [XE164G-48F](#), [XE164G-72F](#), [XE164G-96F](#), [XE164GM-24F](#), [XE164GM-48F](#), [XE164GM-72F](#), [XE164GN-16F](#), [XE164GN-24F](#), [XE164GN-40F](#), [XE164H-24F](#), [XE164H-48F](#), [XE164H-72F](#), [XE164H-96F](#), [XE164HM-24F](#), [XE164HM-48F](#), [XE164HM-72F](#), [XE164HN-16F](#), [XE164HN-24F](#), [XE164HN-40F](#), [XE164K-24F](#), [XE164K-48F](#), [XE164K-72F](#), [XE164K-96F](#), [XE164KM-24F](#), [XE164KM-48F](#), [XE164KM-72F](#), [XE164KN-16F](#), [XE164KN-24F](#), [XE164KN-40F](#), [XE167F-48F](#), [XE167F-72F](#), [XE167F-96F](#), [XE167FH-136F](#), [XE167FH-200F](#), [XE167FM-48F](#), [XE167FM-72F](#), [XE167G-48F](#), [XE167G-72F](#), [XE167G-96F](#), [XE167GM-48F](#), [XE167GM-72F](#), [XE167H-48F](#), [XE167H-72F](#), [XE167H-96F](#), [XE167HM-48F](#), [XE167HM-72F](#), [XE167K-48F](#), [XE167K-72F](#), [XE167K-96F](#), [XE167KM-48F](#), [XE167KM-72F](#), [XE169FH-136F](#), [XE169FH-200F](#)
- **Lapis Semiconductor (ARM7/ARM9/Cortex Family)**
[ML674000](#), [ML674001](#), [ML674002](#), [ML674003](#), [ML675001](#), [ML675002](#), [ML675003](#), [ML675011](#), [ML67Q4050](#), [ML67Q4051](#), [ML67Q4060](#), [ML67Q4061](#), [ML67Q5250](#), [ML67Q5260](#), [ML696201](#), [ML69Q6203](#)
- **Luminary Micro (ARM7/ARM9/Cortex Family)**
[moved to Texas Instruments](#)
- **Milandr (ARM7/ARM9/Cortex Family)**

[MDR32F9Q01](#), [MDR32F9Q02](#), [MDR32F9Q31](#)

- **Nuvoton** (ARM7/ARM9/Cortex Family)
[M0516LAN](#), [M0516ZAN](#), [M052LAN](#), [M052ZAN](#), [M054LAN](#), [M054ZAN](#), [M058LAN](#), [M058ZAN](#), [MINI51LAN](#), [MINI51ZAN](#), [MINI52LAN](#), [MINI52ZAN](#), [MINI54LAN](#), [MINI54ZAN](#), [NUC100LC1AN](#), [NUC100LD1AN](#), [NUC100LD2AN](#), [NUC100LD3AN](#), [NUC100LE3AN](#), [NUC100RC1AN](#), [NUC100RD1AN](#), [NUC100RD2AN](#), [NUC100RD3AN](#), [NUC100RE3AN](#), [NUC100VD2AN](#), [NUC100VD3AN](#), [NUC100VE3AN](#), [NUC101LC1AN](#), [NUC101LD2AN](#), [NUC101LE3AN](#), [NUC101RC1AN](#), [NUC101RD2AN](#), [NUC101RE3AN](#), [NUC101VC1AN](#), [NUC101VD2AN](#), [NUC101VE3AN](#), [NUC120LC1AN](#), [NUC120LD1AN](#), [NUC120LD2AN](#), [NUC120LD3AN](#), [NUC120LE3AN](#), [NUC120RC1AN](#), [NUC120RD1AN](#), [NUC120RD2AN](#), [NUC120RD3AN](#), [NUC120RE3AN](#), [NUC120VD2AN](#), [NUC120VD3AN](#), [NUC122LC1AN](#), [NUC122LD2AN](#), [NUC122SD2AN](#), [NUC122ZC1AN](#), [NUC122ZD2AN](#), [NUC130LD2AN](#), [NUC130LD3AN](#), [NUC130LE3AN](#), [NUC130RD2AN](#), [NUC130RD3AN](#), [NUC130RE3AN](#), [NUC130VD2AN](#), [NUC130VD3AN](#), [NUC130VE3AN](#), [NUC140LD2AN](#), [NUC140LD3AN](#), [NUC140LE3AN](#), [NUC140RD2AN](#), [NUC140RD3AN](#), [NUC140RE3AN](#), [NUC140VD2AN](#), [NUC140VD3AN](#), [NUC140VE3AN](#), [NUC501ADN](#), [NUC710](#), [NUC740](#), [NUC745](#)
- **NXP** (founded by Phillips) (8051 Family)
[P89LPC952](#), [P89LPC954](#)
- **NXP** (founded by Phillips) (ARM7/ARM9/Cortex Family)
[LH75400](#), [LH75401](#), [LH75410](#), [LH75411](#), [LH79520](#), [LH79524](#), [LH79525](#), [LH7A400](#), [LH7A404](#), [LPC1102UK](#), [LPC1110](#), [LPC1111/002](#), [LPC1111/101](#), [LPC1111/102](#), [LPC1111/103](#), [LPC1111/201](#), [LPC1111/202](#), [LPC1111/203](#), [LPC1112/101](#), [LPC1112/102](#), [LPC1112/103](#), [LPC1112/201](#), [LPC1112/202](#), [LPC1112/203](#), [LPC1112LV/003](#), [LPC1112LV/103](#), [LPC1113/201](#), [LPC1113/202](#), [LPC1113/203](#), [LPC1113/301](#), [LPC1113/302](#), [LPC1113/303](#), [LPC1114/102](#), [LPC1114/201](#), [LPC1114/202](#), [LPC1114/203](#), [LPC1114/301](#), [LPC1114/302](#), [LPC1114/303](#), [LPC1114/323](#), [LPC1114/333](#), [LPC1114LV/103](#), [LPC1114LV/303](#), [LPC1115/303](#), [LPC11A11/001](#), [LPC11A12/101](#), [LPC11A13/201](#), [LPC11A14/301](#), [LPC11C12/301](#), [LPC11C14/301](#), [LPC11C22/301](#), [LPC11C24/301](#), [LPC11D14/302](#), [LPC11E11/101](#), [LPC11E12/201](#), [LPC11E13/301](#), [LPC11E14/401](#), [LPC11U12/201](#), [LPC11U13/201](#), [LPC11U14/201](#), [LPC11U23/301](#), [LPC11U24/301](#), [LPC11U24/401](#), [LPC11U34/311](#), [LPC11U34/421](#), [LPC11U35/401](#), [LPC11U35/501](#), [LPC11U36/401](#), [LPC11U37/501](#), [LPC1224/101](#), [LPC1224/121](#), [LPC1225/301](#), [LPC1225/321](#), [LPC1226/301](#), [LPC1227/301](#), [LPC1227/301](#), [LPC1311](#), [LPC1311/01](#), [LPC1313](#), [LPC1313/01](#), [LPC1315](#), [LPC1316](#), [LPC1317](#), [LPC1342](#), [LPC1343](#), [LPC1345](#), [LPC1346](#), [LPC1347](#), [LPC1751](#), [LPC1752](#), [LPC1754](#), [LPC1756](#), [LPC1758](#), [LPC1759](#), [LPC1763](#), [LPC1764](#), [LPC1765](#), [LPC1766](#), [LPC1767](#), [LPC1768](#), [LPC1769](#), [LPC1774](#), [LPC1776](#), [LPC1777](#), [LPC1778](#), [LPC1785](#), [LPC1786](#), [LPC1787](#), [LPC1788](#), [LPC1810](#), [LPC1820](#), [LPC1830](#), [LPC1833](#), [LPC1837](#), [LPC1850](#), [LPC1853](#), [LPC1857](#), [LPC2101](#), [LPC2102](#), [LPC2103](#), [LPC2104](#), [LPC2104/01](#), [LPC2105](#), [LPC2105/01](#), [LPC2106](#), [LPC2106/01](#), [LPC2109](#), [LPC2109/01](#), [LPC2114](#), [LPC2114/01](#), [LPC2119](#), [LPC2119/01](#), [LPC2124](#), [LPC2124/01](#), [LPC2129](#), [LPC2129/01](#), [LPC2131](#), [LPC2131/01](#), [LPC2132](#), [LPC2132/01](#), [LPC2134](#), [LPC2134/01](#), [LPC2136](#), [LPC2136/01](#), [LPC2138](#), [LPC2138/01](#), [LPC2141](#), [LPC2142](#), [LPC2144](#), [LPC2146](#), [LPC2148](#), [LPC2194](#), [LPC2194/01](#), [LPC2210](#), [LPC2210/01](#), [LPC2212](#), [LPC2212/01](#), [LPC2214](#), [LPC2214/01](#), [LPC2220](#), [LPC2290](#), [LPC2290/01](#), [LPC2292](#), [LPC2292/01](#), [LPC2294](#), [LPC2294/01](#), [LPC2361](#), [LPC2362](#), [LPC2364](#), [LPC2366](#), [LPC2367](#), [LPC2368](#), [LPC2377](#), [LPC2378](#), [LPC2387](#), [LPC2388](#), [LPC2420](#), [LPC2458](#), [LPC2460](#), [LPC2468](#), [LPC2470](#), [LPC2478](#), [LPC2880](#), [LPC2888](#), [LPC2917](#), [LPC2917/01](#), [LPC2919](#), [LPC2919/01](#), [LPC2921](#), [LPC2923](#), [LPC2925](#), [LPC2926](#), [LPC2927](#), [LPC2929](#), [LPC2930](#), [LPC2939](#), [LPC3130](#), [LPC3131](#), [LPC3141](#), [LPC3143](#), [LPC3152](#), [LPC3154](#), [LPC3180](#), [LPC3220](#), [LPC3230](#), [LPC3240](#), [LPC3250](#), [LPC4072](#), [LPC4074](#), [LPC4076](#), [LPC4078](#), [LPC4088](#), [LPC4310](#), [LPC4320](#), [LPC4330](#), [LPC4350](#), [LPC4353](#), [LPC4357](#), [SJA2010](#)
- **OKI SEMICONDUCTOR CO.,LTD.** (ARM7/ARM9/Cortex Family)
moved to LAPIS
- **ROHM** (ARM7/ARM9/Cortex Family)
[BU1511KV2](#)
- **Samsung** (ARM7/ARM9/Cortex Family)
[S3C2410A](#), [S3C2416](#), [S3C2440A](#), [S3C44BOX](#), [S3C4510B](#), [S3F4A0KR](#), [S3F4A1HR](#), [S3F4A2FR](#), [S3FM02G](#), [S3FN429](#)
- **Silicon Laboratories, Inc.** (ARM7/ARM9/Cortex Family)
[SIM3C134](#), [SIM3C136](#), [SIM3C144](#), [SIM3C146](#), [SIM3C154](#), [SIM3C156](#), [SIM3C157](#), [SIM3C164](#), [SIM3C166](#), [SIM3C167](#), [SIM3L134](#), [SIM3L136](#), [SIM3L144](#), [SIM3L146](#), [SIM3L154](#), [SIM3L156](#), [SIM3L157](#), [SIM3L164](#), [SIM3L166](#), [SIM3L167](#), [SIM3U134](#), [SIM3U136](#), [SIM3U144](#), [SIM3U146](#), [SIM3U154](#), [SIM3U156](#), [SIM3U164](#), [SIM3U166](#), [SIM3U167](#)
- **Socle Technology Corp.** (ARM7/ARM9/Cortex Family)
[PC7130](#), [PC7230](#)
- **SONIX** (ARM7/ARM9/Cortex Family)
[SN32F706](#), [SN32F707](#)
- **STMicroelectronics** (8051 Family)
[uPSD3212A](#), [uPSD3212C](#), [uPSD3212CV](#), [uPSD3233B](#), [uPSD3233BV](#), [uPSD3234A](#), [uPSD3234BV](#), [uPSD3253B](#), [uPSD3253BV](#), [uPSD3254A](#), [uPSD3254BV](#), [uPSD3312D](#), [uPSD3312DV](#), [uPSD3333D](#), [uPSD3333DV](#), [uPSD3334D](#), [uPSD3334DV](#), [uPSD3354D](#), [uPSD3354DV](#), [uPSD3422E](#), [uPSD3422EV](#), [uPSD3433E](#), [uPSD3433EV](#), [uPSD3434E](#), [uPSD3434EV](#), [uPSD3454E](#), [uPSD3454EV](#)
- **STMicroelectronics** (ARM7/ARM9/Cortex Family)
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■ **Toshiba (ARM7/ARM9/Cortex Family)**

[TMPA900CMXBG](#), [TMPA910CRAXBG](#), [TMPM061FWFG](#), [TMPM320C1DFG](#), [TMPM321F10FG](#), [TMPM322F10FG](#), [TMPM323F10FG](#), [TMPM324F10FG](#), [TMPM330DFG](#), [TMPM330FWFG](#), [TMPM330FYFG](#), [TMPM332FWUG](#), [TMPM333DFG](#), [TMPM333FWFG](#), [TMPM333FYFG](#), [TMPM341FDXBG](#), [TMPM341FYXBG](#), [TMPM342FYXBG](#), [TMPM360F20FG](#), [TMPM361F10FG](#), [TMPM362F10FG](#), [TMPM363F10FG](#), [TMPM364F10FG](#), [TMPM365FYXBG](#), [TMPM366DFG](#), [TMPM366FWFG](#), [TMPM366FYFG](#), [TMPM369DFG](#), [TMPM369FDXBG](#), [TMPM369FYFG](#), [TMPM369FYXBG](#), [TMPM370FYDFG](#), [TMPM370FYFG](#), [TMPM372FWUG](#), [TMPM373FWDUG](#), [TMPM374FWUG](#), [TMPM376FDDFG](#), [TMPM376FDFG](#), [TMPM380DFG](#), [TMPM380FWDG](#), [TMPM380FWFG](#), [TMPM380FYDFG](#), [TMPM380FYFG](#), [TMPM382FDFG](#), [TMPM382FWFG](#), [TMPM384DFG](#), [TMPM390FWFG](#), [TMPM395FWXBG](#), [TMPM440F10XBG](#), [TMPM440FEXBG](#)

■ **Triad Semiconductor (ARM7/ARM9/Cortex Family)**

[TSX-1001](#)

■ **Zilog (ARM7/ARM9/Cortex Family)**

[ZA9L](#)

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Supported Protocols



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ULINK2 supports a wide variety of devices and communication protocols.

ARM7 and ARM9 Devices

These devices provide JTAG programming and debugging signals (known as Embedded ICE) that are brought out to a 20-pin connector.

ARM Cortex-M3 Devices

These devices provide JTAG programming and debugging signals (known as Embedded ICE) that are brought out to a 20-pin connector.

Infineon C16x Devices

These devices (C161U, C165H, and C165UTAH) provide programming and debugging signals (known as OCDS or On-Chip Debugging System) that are brought out to a 16-pin connector.

Infineon XC16x Devices

These devices (XC161, XC164, and XC167) provide programming and debugging signals (known as OCDS or On-Chip Debugging System) that are brought out to a 16-pin connector.

Infineon XC8xx Devices

These devices (XC866, XC886, and XC888) provide programming and debugging signals (known as OCDS or On-Chip Debugging System) that are brought out to a 16-pin connector.

STMicroelectronics µPSD Devices

These devices (µPSD33xx and µPSD34xx) provide JTAG programming and debugging signals that are brought out to a 14-pin connector.

Depending on your device and target hardware configuration, you may be required to connect the one of the supplied target cables to the appropriate [Target Connectors](#).


















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Software Requirements

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ULINK2 requires the following software versions (or later) be installed on the computer:

- MDK-ARM — V3.04
- C166 — V6.06
- C51 — V8.06

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Limitations

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There are a number of limitations when debugging target programs with ULINK2. Many of these are actually limitations of the architecture of the on-chip debugger.

■ ARM7 and ARM9 Devices

The Embedded ICE on these devices supports at most two (2) hardware breakpoints in Flash memory. Breakpoints in RAM are unlimited.

■ ARM Cortex-M3 Devices

The Embedded ICE on these devices supports at most eight (8) hardware breakpoints in Flash memory. Breakpoints in RAM are unlimited.

For the complete list of features and limitations, refer to the web page [ULINK Debugger Comparison](#).

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Technical Data ↶ ↷ ↸

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| Parameter | Description |
|--------------------------------|---|
| Supply Voltage | Provided by the USB bus of a PC |
| I/O Voltage Range ¹ | 2.7V .. 5.5V |
| Peripherals | 1 × USB Interface 1 × JTAG Interface 3 × LEDs (RUN, COM, USB) |
| Overall Dimensions | 107mm x 57mm x 25mm (4.25" x 2.25" x 1.0"). |

Note

1. 5V operation requires [jumper setting VCC-ARM](#), and power via Debug Connector.

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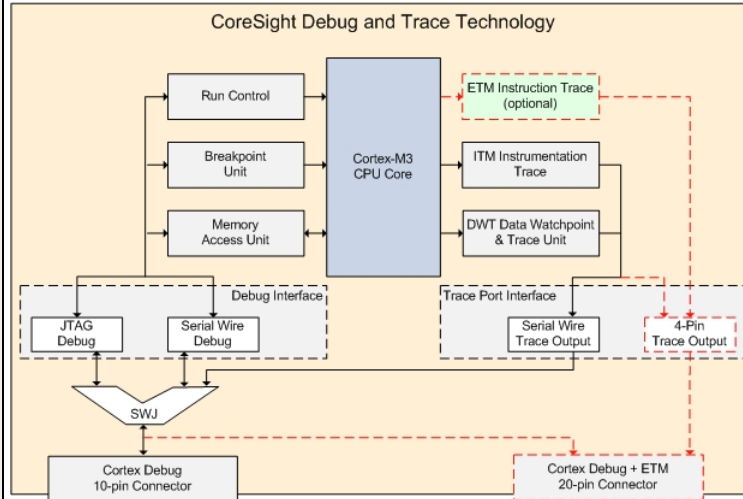
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CoreSight Technology

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CoreSight™ is an on-chip debugging and tracing technology designed by ARM. The device manufacturer can implement CoreSight features in various combinations.



(Though the red-dotted elements can be part of CoreSight, they are not supported by ULINK2.)

CoreSight features can be accessed through a JTAG or Serial Wire interface. Debugging in JTAG and Serial Wire mode at the same time is not possible. Cortex-M processor-based devices can include a:

Debug Interface

The debug interface offers two modes:

- **JTAG Debug** is the industry-standard interface that allows device chaining.
- **Serial Wire Debug** is a 2-pin interface with an optional Serial Wire Trace Output. In contrast to JTAG, devices cannot be chained.

The **Debug Interface** communicates with the following units:

- **Run Control**: allows the user to start, stop, and single-step through the source code.
- **Breakpoint Unit**: allows the user to set breakpoints even while the processor is running.
- **Memory Access Unit**: allows the user to read or write to memory and peripheral registers even while the program is running.

Trace Port Interface

The **Trace Port Interface** encodes and provides trace information via two possible interfaces:

- The **Serial Wire Trace Output** pin (SWO) can be used in Serial Wire Debug mode only.
- The **4-Pin Trace Output** has a greater bandwidth than Serial Wire Trace Output and uses 5 functional pins. It is the only way to output ETM trace data. However, the [ULINKpro](#) USB-JTAG/SW debugger adapter is required to use this feature.

The **Trace Port Interface** communicates with the following units:

- **Embedded Trace Macrocell (ETM)**: can be used for instruction tracing to debug historical sequences, for software profiling, and code coverage analysis. ETM data are output through an extra 4-bit interface ([ULINKpro](#) required).
- **Instrumentation Trace Macrocell (ITM)**: provides application information like debug printf(), RTOS information, unit test, or UML annotation.
- **Data Watchpoint & Trace Unit (DWT)**: provides PC sampling, event counters, timing, and interrupt execution information. In addition, it allows [Access Breakpoints](#) for up to four memory addresses.

Serial Wire-JTAG Switch (SWJ)

This switch is used to synchronize the debugger adapter and the CoreSight debug interface. ULINK2 uses this option to generate sequences for switching between Serial Wire Debug and JTAG Debug mode.

Note

- Check the manufacturer's device data sheet to read which CoreSight features have been implemented.

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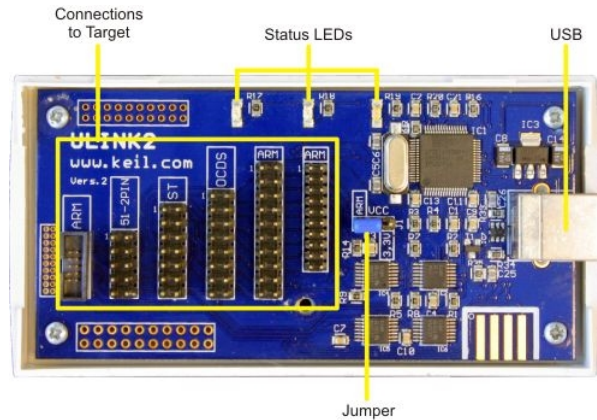
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Appendix

Hardware Description

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The following illustration shows the important interface and hardware components of the ULINK2 Adapter.



ULINK Adapter (cover off)

In general, there is very little you must do to configure ULINK for your target system. However, you may be required to:

- Set the ULINK Configuration [Jumpers](#).
- Connect the appropriate cable to the [Target Connectors](#).

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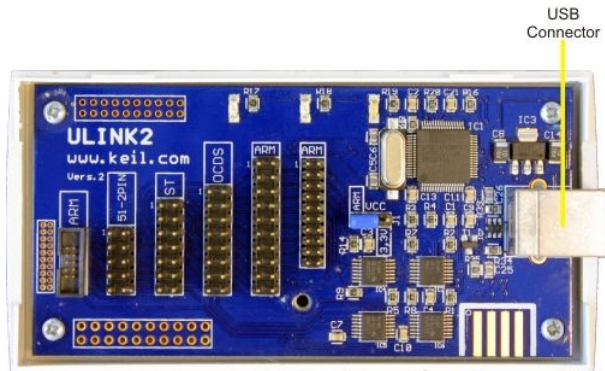
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USB Interface

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The ULINK2 USB Interface uses a standard USB connector to connect to your PC. ULINK2 is a USB-powered device.



ULINK2 Adapter USB Interface

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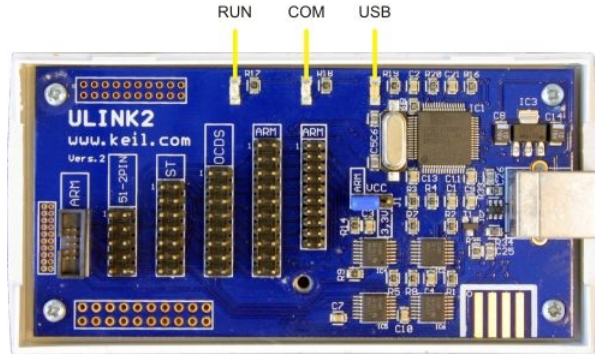
LED Indicators

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The ULINK2 Adapter has the following indicator LEDs.

- The RUN LED indicates that the target board is executing the program.
- The COM LED indicates that there is active communication between the debugger and the target board.
- The USB LED indicates that power is present on ULINK.



ULINK2 Adapter - LEDs (cover off)

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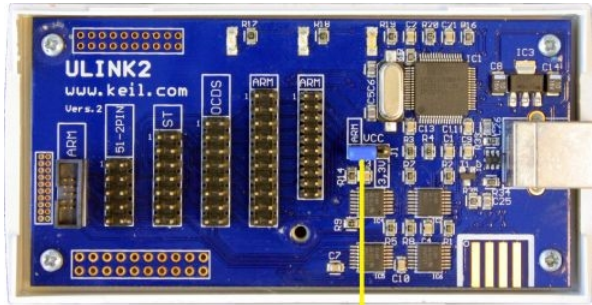
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Jumpers

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ULINK2 has only one set of jumpers: VCC.



JTAG VCC Jumper

ULINK2 Adapter - Jumper (cover off)

The VCC jumper determines the source of VCC power for the JTAG interface.

- If the target hardware provides VCC to the JTAG interface, set the jumper at VCC to the ARM position.
- If the target hardware does not provide VCC to the JTAG interface, set the jumper at VCC to the 3.3V position.

Related Knowledgebase Articles

- [ULINK: SWD COMMUNICATION FAILURE ON STELLARIS BOARD](#)

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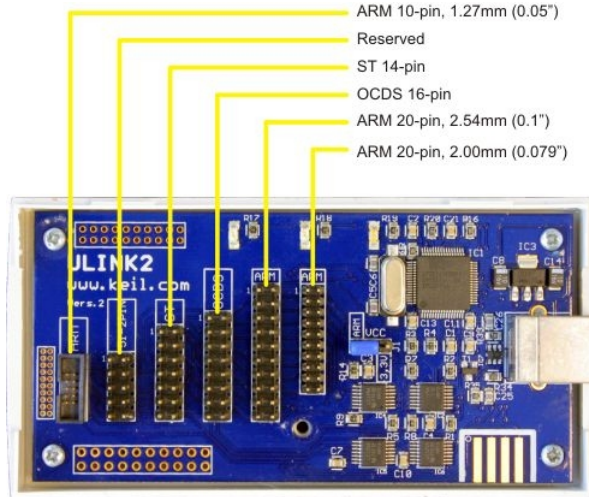
Target Connectors

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ULINK2 provides five JTAG connectors. They support various cable types, which are used for debugging different targets. The connectors provided are:

- A narrow (2.00mm/0.079") pin spacing) 20-pin connector for ARM targets,
- A standard (2.54mm/0.1") 20-pin connector for ARM targets,
- A 16-pin connector for Infineon OCDS (JTAG) targets,
- A 14-pin connector for STMicroelectronics µPSD targets,
- and a 10-pin connector for ARM targets (Mfr: Don Connex P/N: C42 or Samtec P/N: SHF-105-01-L-D-TH). The [Samtec part](#) is available with different options for plating, tail, shroud, and lead style.

A cable for each connector is shipped with the ULINK2 Standard Product. If you must change cables, then make sure to line up the marker stripe on the cable with pin 1 of the connector. Pin 1 is labeled on the board.



ULINK2 Adapter Connectors (cover off)

ULINK2 supports both JTAG and Serial Wire Mode interfaces. Refer to the appropriate pinout diagram for the ULINK2 adapter connectors to make sure they match your target hardware.

JTAG Interface

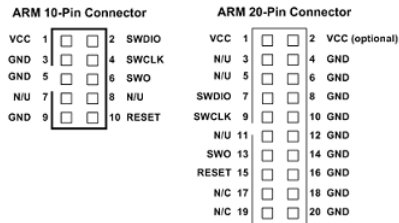
| ARM 10-PIN Interface | ST 14-PIN Interface | OCDS 16-PIN Interface | ARM 20-PIN Interface |
|----------------------|---------------------|-----------------------|----------------------|
| VCC 1 | /JEN 1 | TMS 1 | VCC 1 |
| GND 3 | GND 3 | TDO 3 | TRST 3 |
| GND 5 | TDI 5 | CPUCCLK 5 | TDI 5 |
| RTCK 7 | VCC 7 | TDI 7 | TMS 7 |
| GND 9 | TMS 9 | TRST 9 | TCLK 9 |
| | TCLK 11 | TCLK 11 | RTCK 11 |
| | TDO 13 | BRKIN 13 | TDO 13 |
| | | TRAP 15 | RESET 15 |
| | | | N/C 17 |
| | | | N/C 19 |
| | | | 2 VCC (optional) |
| | | | 4 GND |
| | | | 6 GND |
| | | | 8 RESET |
| | | | 10 BRKOUT |
| | | | 12 GND |
| | | | 14 GND |
| | | | 16 GND |
| | | | 18 GND |
| | | | 20 GND |

| Signal | Connects to... |
|---------|---|
| TMS | Test Mode State pin — Use 100K Ohm pull-up resistor to VCC. |
| TDO | Test Data Out pin. |
| RTCK | JTAG Return Test Clock. (see Note below) |
| TDI | Test Data In pin — Use 100K Ohm pull-up resistor to VCC. |
| TRST | Test ReSeT/ pin — Use 100K Ohm pull-up resistor to VCC. TRST is optional and not available on some devices. You may leave it unconnected. |
| TCLK | Test ClocK pin — Use 100K Ohm pull-down resistor to GND. |
| VCC | Positive Supply Voltage — Power supply for JTAG interface drivers. |
| GND | Digital ground. |
| RESET | RSTIN/ pin — Connect this pin to the (active low) reset input of the target CPU. |
| CPUCCLK | CPU clock (according IEEE Standard 1149.1). |
| OCDS | Enable/Disable OCDS interface (Infineon-specific). |
| TRAP | Trap condition (Infineon-specific). |
| BRKIN | Hardware break in (Infineon-specific). |
| BRKOUT | Hardware break out (Infineon-specific). |
| /JEN | JTAG Enable (STMicroelectronics specific). |
| TSTAT | JTAG ISP Status (STMicroelectronics specific) (optional). |
| /RST | Chip reset (STMicroelectronics specific). |
| /TERR | JTAG ISP Error (STMicroelectronics specific) (optional). |

Serial Wire Mode Interface

The Serial Wire (SW) mode is a different operating mode for the JTAG port where only two pins, TCLK and TMS, are used for the communication. A third pin can be used optionally to trace data. JTAG pins and SW pins are shared.

- TCLK is SWCLK (Serial Wire Clock)
- TMS is SWDIO (Serial Wire debug Data Input/Output)
- TDO is SWO (Serial Wire trace Output)



| Signal | Connects to... |
|--------|--|
| SWDIO | Data I/O pin. Use 100K Ohm pull-up resistor to VCC. |
| SWO | Optional trace output pin. |
| SWCLK | Clock pin. Use 100K Ohm pull-down resistor to GND. |
| VCC | Positive Supply Voltage — Power supply for JTAG interface drivers. |
| GND | Digital ground. |
| RESET | RSTIN/ pin — Connect this pin to the (active low) reset input of the target CPU. |

Additional ARM 10-pin cables with connectors are available directly from Samtec:

- 6" Cable (Samtec P/N: FFSD-05-D-06.00-01-N)
- 12" Cable (Samtec P/N: FFSD-05-D-12.00-01-N)

Note

- ULINK2 is powered through the USB connection.
- ULINK2 operates at 3.3V. All JTAG pins are 5V tolerant.
- Usually, devices do not include pull-up or pull-down resistors on JTAG nor SW pins. Resistors should be added externally onto the board. However, do not add resistors when the device includes them already.
- Some NXP LPC2000 Devices have special pins (RTCK, DBGSEL) that enable the JTAG interface. For example, on the NXP LPC2129 the signal RTCK must be driven low during RESET to enable the JTAG interface. You may want to add jumpers to your hardware to accomplish this.

Related Knowledgebase Articles

- [ULINK: 10-PIN / 20-PIN 1.27MM ARM CORTEX DEBUG CONNECTOR](#)
- [ULINK: CONNECTING ULINK2 TO TI/LUMINARY BOARD](#)
- [RL-ARM: UNDEFINED SPI SYMBOLS IN FS_LIB.O](#)
- [ULINK: JTAG PULL-UP RESISTORS](#)

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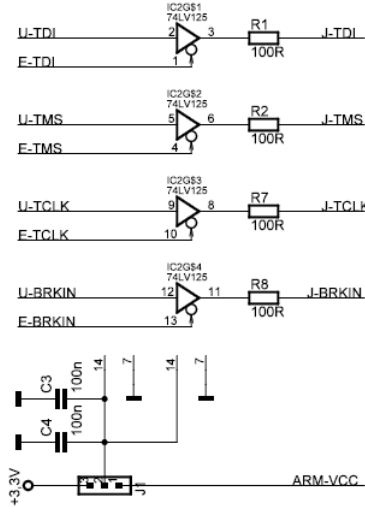
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JTAG Interface Schematics

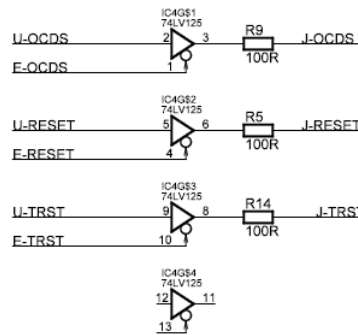
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The following schematics show the JTAG interface circuits that are part of ULINK2. The schematics may help you to analyze potential problems with your target hardware.

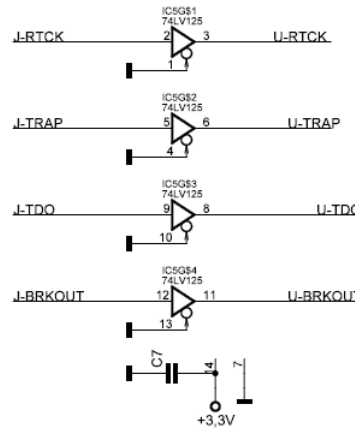
Signal Interface Schematics — IC2



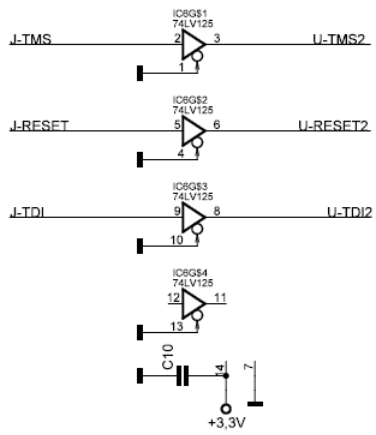
Signal Interface Schematics — IC4



Signal Interface Schematics — IC5



Signal Interface Schematics — IC6



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Start Sequence



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ULINK2 performs a number of operations to begin debugging on a target system. The sequence of these operations depends on the target device and the configuration settings in the µVision IDE.

For OCDS and 8051 Devices:

1. ULINK2 initializes the JTAG interface and detects the Chip ID.
2. Some JTAG registers are programmed to **Halt after Reset**. In this case, ULINK2 drives the JTAG RESET output (pin 8 on the OCDS and ST [connectors](#)) low for 2 mSec.
3. ULINK2 stops the device.
4. If **Project — Options — Debug — Load Application at Startup** is enabled, ULINK2 downloads the code to the target and performs a [Reset Sequence](#).
5. If the **Project — Options — Debug — Initialization File** text box contains the name of an initialization script, the debug commands in this script file are processed.

For ARM Devices:

1. If [Use Reset at Startup](#) is enabled, ULINK2 drives the JTAG RESET output (pin 15 on the ARM JTAG [connector](#), pin 8 on the OCDS and ST [connectors](#)) low for 50mSec.
2. ULINK2 initializes the JTAG interface and detects the Chip ID.
3. If [Use Reset at Startup](#) is enabled, ULINK2 performs a [Reset Sequence](#).
4. ULINK2 stops the device.
5. If **Project — Options — Debug — Load Application at Startup** is enabled, ULINK2 downloads the code to the target and performs a [Reset Sequence](#).
6. If the **Project — Options — Debug — Initialization File** text box contains the name of an initialization script, the debug commands in this script file are processed.

For Cortex-M Devices:

1. ULINK2 initializes the JTAG/SW interface and detects the Chip ID. The HW RESET signal may be activated depending on the [Connect](#) option selected in **Options — Debug — Settings**.
2. If [Reset after Connect](#) is enabled, ULINK2 performs a reset as defined by the [Reset](#) option selected in **Options — Debug — Settings**.
3. ULINK2 stops the device.
4. If **Project — Options — Debug — Load Application at Startup** is enabled, ULINK2 downloads the code to the target and performs a reset as defined by the [Reset](#) option selected in **Options — Debug — Settings**.
5. If the **Project — Options — Debug — Initialization File** text box contains the name of an initialization script, the debug commands in this script file are processed.

Related Knowledgebase Articles

- [ULINK: JTAG RESET LINE FOR CORTEX-M3 DEVICES](#)

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Reset Sequence



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ULINK2's reset sequence is device-specific. To reset most devices, ULINK2 asserts the JTAG RESET signal (pin 15 on the ARM JTAG [connector](#), pin 8 on the OCDS and ST [connectors](#)), then attempts to immediately stop the device.

Some ARM devices do not support an immediate stop after a reset and instruction execution happens before ULINK2 can issue a stop command. For these devices, when ULINK2 gets control, it stops the CPU, and then sets the MCU's program counter (PC) and stack register (CSPR) to simulate an immediate stop after reset.

Side-Effects for ARM Devices

Resetting an ARM device may generate unexpected side-effects. The following [Knowledgebase Articles](#) describe these side effects in more detail:

- [ULINK: RESET BEHAVIOUR](#)
- [ULINK: SINGLE STEP AT RESET APPEARS TO FAIL](#)
- [ULINK: ARM DEVICE DOES NOT REACT](#)
- [ULINK: RECOVER STR71X WHEN JTAG DISABLE](#)

