Universal Probe

IDE Connection Manual

MDK-ARM Edition

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NOTES

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Operating Precautions

	Failure to observe the following precautions may lead to human death or severe injury.
Do	Avoid supplying voltage out of the range specified in the specifications of this product. Supplying the voltage out of the range may cause damage or fire.
Do	When using the target equipped with the ground terminal, ensure that the ground terminals of the target and peripheral equipment are connected. Failure to do so may cause an equipment failure or electric shock. Avoid connecting the ground terminal to the gas pipe. This causes a fire or explosion.
Don't	Do not transport this product with equipment connected. In particular, hold the plug when removing or inserting the cable. Failure to do so may damage the cable, causing a fire or electric shock.
Don't	Observe the following points when handling the cable. Do not damage, process, forcibly bend, twist, pull, putting any object on or heat the cable, moving the cable close to the heating device, or touch the cable with a wet hand. Failure to observe these precautions may cause a fire or electric shock. If the cable is damaged, stop using it.
Don't	When you hear thunders, do not touch the power plug. This causes an electric shock. If the product seems to be damaged by lightning strike, stop using it.
Don't	Do not let a staple, clip or other metal items enter into the product. This may cause a fire or failure.
On't	Do not use or leave the product in direct sunlight, near heating devices, in an extremely hot or cold environment, under hard vibrations, in dusty area with a large amount of metal dust or oily dust, or noisy area full of spike noise. Do not apply a strong shock to the product.
Do not disassemble	Do not disassemble, alter or repair the product. This may cause a fire or electric shock.
No wetting	Do not use the product at a place where there is liquid or at a humid place such as bathroom or in vicinity to glasses. This may cause an electric shock. If liquid enters into this product, immediately turn it off and stop using it.
Caution	Touching the energized product for a long time may cause low-temperature burns. Do not use this product covering with comforter or other cloth.
Pull out the plug.	Immediately turn the power off if unusual smell, noise, smoke or fire is detected or if the product is or may be damaged due to a fall or strong shock. Continuing to use it may lead to a serious accident. Stop using the product.



Abbreviations, Terms and Conventions

This section describes the abbreviations, terms and conventions used in this document.

- About numeric values ... All the numeric values are positive unless otherwise specified.
- K (capital letter) ... Repres
- ... Represents 2¹⁰=1024. (Example: 16 K=16384)
 - k (small letter)
- ... Represents 1000. (Example: 1 kHz=1000 Hz) ... Represents the window title, xxxxx.
- [xxxxx]
 <xxxxx>
- ... Represents the item named xxxxx in the window.

The annotations and notes used in this document are as shown in Figure 1.



Figure 1

The abbreviations and terms are as shown in Table 1.

	Table 1
Abbreviations and terms	Description
This product	Universal Probe including accessories.
Probe	Universal Probe itself.



1. Preparation



The software versions and download URLs are as of the preparation of this document. We do not guarantee that software version, download URLs, compatibility, and screen configurations will remain unchanged at the time that the user creates an environment.

1.1. System Requirements and Software Installation

For the system requirements and the software installation method, refer to the MDK-ARM website or relevant manual.

1.2. Starting up MDK-ARM

Click the Keil uVision icon in the Start menu or on the desktop to start up the software. When the software has started up, the screen as shown below is displayed.

Xa µVision4	
<u>File Edit View Project Flash D</u> ebug Peripherals <u>I</u> ools <u>S</u> VCS <u>Window H</u> elp	
□ 🖆 🖬 🗿 8 咱 🛍 ク P ← → 控 整 整 数 準 準 /// /版 💆 gpio 🕢 🕞 🔍 🧖 Q ● O	🔿 🏨 🔳 🔧
Project 🕈 🖬	
Г Е Рго	
Build Output	P 🗵
	*
	•
I ∢	4
	18

Figure 2



1.3. Connecting Probe

After starting up MDK-ARM, connect the probe to the PC.

Then, connect the probe to the target using the flat cable that comes with the probe.



Figure 3

For details of the use of the probe, refer to "Universal Probe Hardware Users Manual."



2. Debugging Procedures



To perform debugging using MDK-ARM, you need to rewrite the firmware for the probe with "CMSIS-DAP Firmware" by using the "Firmware Selector" in advance. For details, refer to "Universal Probe Software Users Manual - Firmware Selector."

2.1. Open a Project

Open an existing workspace or create a new workspace.

- Select "Project" \rightarrow "Open Project" from the menu to open a project.
- Select "Project" \rightarrow "New uVision Project" from the menu to create a new project.

2.2. Performing Programming and Build

Write a program and execute Build to create a binary file.

For settings of the target CPU and other information, refer to the MDK-ARM website or relevant manual.



Figure 4



2.3. Setting Debug Adapter

1) Press the "A" button as shown below on the tool bar.



Figure 5

 Select the Debug tab on the [Options for Target 'XXXX'] window, check the "A" radio button as shown below, and select "CMSIS-DAP Debugger" from the drop-down menu. After selecting "CMSIS-DAP Debugger," press the Settings button.

© Use <u>Simulator</u> Settings □ Limit Speed to Real-Time	© Use CMSIS-DAP Debugger Settings
Coad Application at Startup Run to A Initialization File:	Load Application at Startup Run to main() Initialization File:
Restore Debug Session Settings	Restore Debug Session Settings
CPU DLL: Parameter: SARMCM3.DLL -MPU	Driver DLL: Parameter: SARMCM3.DLL -MPU
Dialog DLL: Parameter:	Dialog DLL: Parameter:

Figure 6



- 3) Confirm that the [XXXX Target Driver Setup] window is displayed as shown below or specify these settings, and the press the OK button.
 - (A) ... "Universal Probe for CMSIS-DAP" is displayed.
 - (B) ... Checkbox is checked.
 - (C) ... A device is displayed.

For other settings, refer to the MDK-ARM website or relevant manual.

Cortex-M Target Driver Setup
Debug Flash Download
CMSIS-DAP - JTAG/SW Adapter
Mar Clock: 1MHz B Add Delete Update AP: 0x00
Debug Connect & Reset Options Download Options Connect: Normal Reset: HW RESET Image: Cache Code Image: Cache Code Image: Reset after Connect Image: Stop after Bootloader Image: Cache Memory Image: Download Options Image: Reset after Connect Image: Stop after Bootloader Image: Cache Memory Image: Download to Flash
OK Cancel Help

Figure 7





4) Next, select the Utilities tab, select "CMSIS-DAP Debugger" from the <Use Target Driver for Flash Programming> drop-down menu, and press the OK button.

🛛 Options for Target 'LPC1768 Flash'			
Device Target Output Listing User C/C++ Asm Linker Debug Utilities			
Configure Flash Menu Command			
Use Target Driver for Flash Programming			
CMSIS-DAP Debugger Settings Update Target before Debugging			
Init File:Edit			
C Use External Tool for Flash Programming			
Command:			
Arguments:			
Run Independent			
OK Cancel Defaults Help			

Figure 8



If you do not reset at the start of debugging→ Refer to (3) in "3. Hot Plug Debugging."
If you do not download binary data→ Refer to (2) and (4) in "3. Hot Plug Debugging."



2.4. Debugging

Pressing the "A" button as shown in Figure 9 starts download of a binary file and a debugging session.

₩ C:¥Keil¥ARM¥Boards¥Freescale¥TWR-K40X256¥Blinky¥Blinky.uvproj - µVision4	
<u>File E</u> dit <u>V</u> iew <u>P</u> roject Fl <u>a</u> sh <u>D</u> ebug Pe <u>r</u> ipherals <u>T</u> ools <u>S</u> VCS <u>W</u> indow <u>H</u> elp	
] [] 😂 🛃 🗿 X 🐚 🖏 🔊 (> ← → 隆 🎘 🎘 👯 譯 准 //////////////////////////////////	
;#; ■ ◎ ⊕ ⊕ ⊕ > >	*-
Registers 🛛 🗣 🖾 Disassembly	
Register Value 248: if (MCG→C2 & MCG_C2 R) Core 0x000004A6 F000F9D1 BL.W 0x000007 R1 0x000004A6 F000F9D1 BL.W 0x000007 R2 0x000004A6 F000F9D1 BL.W 0x000007 R3 0x00000 MCG VIC 0x000007 R4 0x00000 MCGOUTClock /= 32u 0x00000 R6 0x00000 MCGOUTClock /= 32u 0x00000 R7 0x00000 MCGOUTClock = CPU XTAL CLK HZ; 0x00000 R10 0x00000 243 else f/* (I(SM→SOPT2 & SM SOPT2 MCGCL R11 0x00000 245 1/* (I/GM→SOPT2 & SM SOPT2 MCGCL KEL R12 0x00000 245 1/* (I/GM→SOPT2 & SM SOPT2 MCGCL KEL	A * Y* If * System oscillator drives MCG clock */ * Set_MASK) == 0x00)) */ MASK) == 0x00) */ * RTC 32 kHz oscillator drives MCG clock */ * MASK) >= 0x00) */ * RTC 32 kHz oscillator drives MCG clock */
R13 (SF) 0X FFF 247 MICGOOTOIDEK - (MICGOOTOIDEK - DMIGER), / × 1 R14 (LR) 0x FFFF 2 248 □ if ((MICG->C2 & MICG_C2_RANGE_MASK) != 0x0u)	
Image: second	/* If high range is enabled, additional 32 divider is activ
Command 📮 🔛 Call Stack + Local	s 🕂 🏼
Load "C:\\Keil\\ARM\\Boards\\Freescale\\TWR-K40X256\\Blink: ARM\\Boards\\Freescale\\TWR-K40X256\\Blink: ARM\\Boards\\Freescale\\TWR-K40X256\\Blink: ARM\\Boards\\Freescale\\TWR-K40X256\\Blink: ARM\\Boards\\Freescale\\TWR-K40X256\\Blink: ARM\\Boards\\Freescale\\TWR-K40X256\\Blink: ARM\\Keil\\ARM\\Boards\\Freescale\\TWR-K40X256\\Blink: ARM\\Boards\\Freescale\\TWR-K40X256\\Blink: ARM\\Freescale\\TWR-K40X256\\Blink: ARM\\Boards\\Freescale\\TWR-K40X256\\Blink: ARM\\Boards\\Freescale\\TWR-K40X256\\Blink: ARM\\Freescale\\TWR-K40X256\\Blink: ARM\\Freescale\\TWR-K40X256\\Blink: ARM\\Freescale\\TWR-K40X256\\Blink: ARM\\Freescale\\TWR-K40X256\\Blink: ARM\\Freescale\\TWR-K40X256\\Freescale\\TWR-K40X256\\Freescale\\TWR-K40X256\\Freescale\\TWR-K40X256\\Freescale\\TWR-K40X256\\Freescale\\TWR-K40X256\\Freescale\\TWR-K40X256\\Freescale\\TWR-K40X256\\Freescale\\TWR-K40X256\\Freescale\\TWR-K40X256\\Freescale\	Location/Value Type
>	
ASSIGN BreakDisable BreakEnable BreakKill BreakList BreakSet	ocals Memory 1
	CMSIS-DAP Debugger t1: 114.93

Figure 9



3. Hot Plug Debugging

To connect a probe while the target is operating (hot plugging), specify settings by following the procedures below.

When performing hot plugging, as the binary data are not downloaded and debug symbol information not read at the start of a debugging session, you need to connect to the target by executing "Connect Target" \rightarrow "Read Symbol Information."



A probe cannot always be connected to an operating target. Check by yourself whether hot plugging is possible.

1) After opening a project, press the "A" button shown below.

🔞 C:¥Keil¥ARM¥Boards¥Keil¥MCB9AFB44N¥Blinky¥Blinky.uvproj - µVision4	- • ×
Eile Edit View Project Fl <u>a</u> sh <u>D</u> ebug Peripherals <u>I</u> ools <u>S</u> VCS <u>W</u> indow <u>H</u> elp	
🗋 😂 🖬 🐉 メ 😘 🛍 ウ や 🗢 → 🎦 🏨 🤼 🔅 津 津 //ミ //ミ 🖄 wdt 🕢 🕞 🗟 🎺 Q 🔹 ○ 🔗 🖪	<u> </u>
🛿 🥸 🕮 🥔 🧮 🗱 MB9AFB44N Flash 🚺 🛣 🚡	
Project 🕈 🖬 📓 🔛 🙀 👘 startup_mb9afb4x.s 👘 Abstract.txt 🔛 system_mb9afb4x.c 🖬 core_cm3.h	▼ ×
B MB9AFB44N Flash	A
e 🚔 StartUp delays number of tick Systicks (happens every 1 ms)	
46 └ **/ 47 ⊟void Delay (uint32_t dlyTicks) {	
48 uint32_t curTicks;	
50 curTicks = msTicks;	
	E
□ 55 □ /* 56 MAIN function	
Abstract.txt 57 L **/	
59 integet idx = -1, dir = 1;	-
E Proj 🚱 Books (D Fun 0 Tem	•
Build Output	д 🔀
	*
CMSIS-DAP Debugge	er at

Figure 10

2) Select the "Debug" tab.

Uncheck the <Load Application at Startup> checkbox ("A") so as **not to download binary data and symbol information**.

😨 Options for Target 'MB9AFB44N Flash'
Device Target Output Listing User C/C++ Asm Linker Debug Utilities
○ Use Simulator Settings ○ Use: CMSIS-DAP Debugger ✓ Settings □ Limit Speed to Real-Time □
Load Application at Startup Run to main() Initialization File:
EA
Restore Debug Session Settings
Figure 11





3) Press the Settings "B" button as shown in Figure 11 to open the [XXXX Target Driver Setup] window. Uncheck the <Reset after Connect> and <Verify Code Download> checkboxes so as not to perform reset immediately after the start of a debugging session. After unchecking the checkboxes, press the OK button.

- Debug	
Connect & Reset Options Connect: Nomal Reset: Autodetect	Cache Options ✓ Cache Code ✓ Cache Memory Cache Memory



4) Select the "Utilities" tab and uncheck the <Update Target before Debugging> checkbox so as **not to automatically download the latest binary data**.

👿 Options for Target 'MB9AFB44N Flash'	×
Device Target Output Listing User C/C++ Asm Linker Debug Utilities	
Configure Flash Menu Command	_
• Use Target Driver for Flash Programming	
CMSIS-DAP Debugger	
Init File:	



5) Press the "A" button as shown in Figure 9 to start a debugging session.



Immediately after the start of a debugging session, the target falls into the break (= stopped) state in most cases.



6) After the debugging session is started, select the "Command" tab as shown in Figure 14 and enter the following command to read the symbol information.

> load %L nocode incremental
States 0 ■ Project ■ Registers
Command
load %L nocode incremental
Enter command here.
ASSIGN BreakDisable BreakEnable BreakKill BreakList BreakSet Break
Command Call Stack Select this.

Figure 14

7) A source code is displayed on the Disassembly window. Now debugging using symbols is possible.

Disassembly				Disassembly		
<mark>⊰>0x</mark> 000004CA 1A	52	SUBS	r2,r2,r1	➡)0x00004CA 1A52	SUBS	r2,r2,r1
0x000004CC 42	82	CMP	r2,r0	0x000004CC 4282	CMP	r2,r0
0x000004CE D3	F9	BCC	0x000004C4	0x000004CE D3F9	BCC	0x00004C4
0x000004D0 47	70	BX	lr	52: }		
0x000004D2 F0	4F34FF	MOV	r4,#0xFFFFFFF	53:		
0x000004D6 25	01	MOVS	r5,#0x01	54:		
0x000004D8 26	500	MOVS	r6,#0x00	55: /*		
0x000004DA F7	FFFE2D	BL.W	0x00000138	56: MAIN fu	nction	
0x000004DE 48	2B	LDR	r0,[pc,#172] ; @0x000(57: *		
0x000004E0 68	00	LDR	r0,[r0,#0x00]	58: int main	(void) {	
0x000004E2 22	64	MOVS	r2,#0x64	0x000004D0 4770	BX	lr

Figure 15



If the source code is not displayed, click the Disassembly window.



Revision History

Ver. No.	Revision date	Contents of revision
01	09/21/2014	Initial Release.
02	11/17/2014	Correction of typographical errors.
03	03/31/2017	Update company information.



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