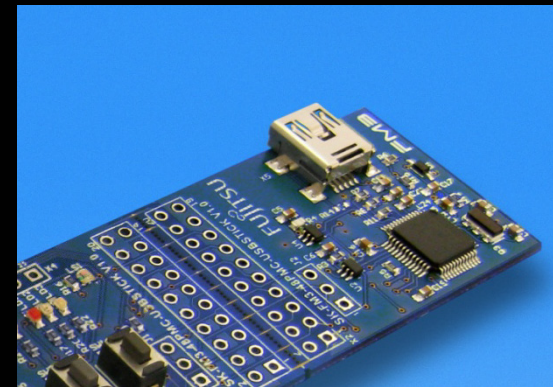
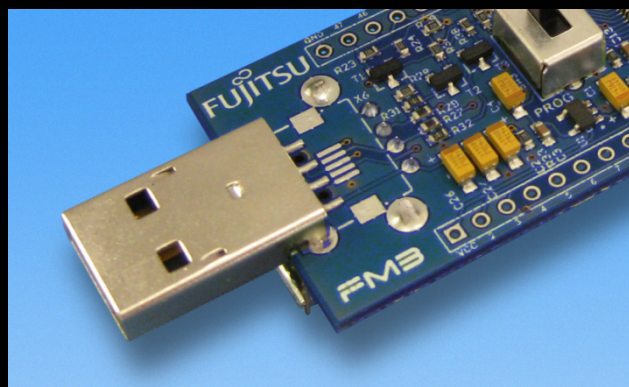
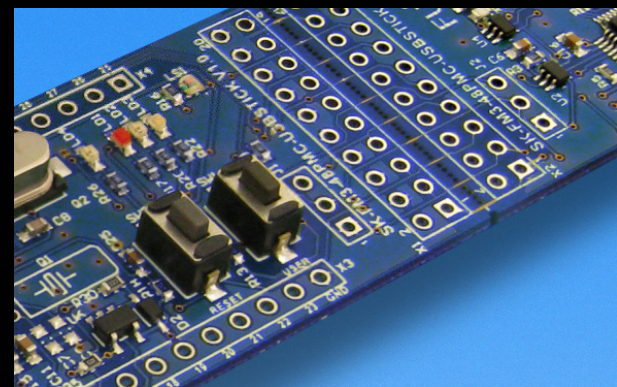
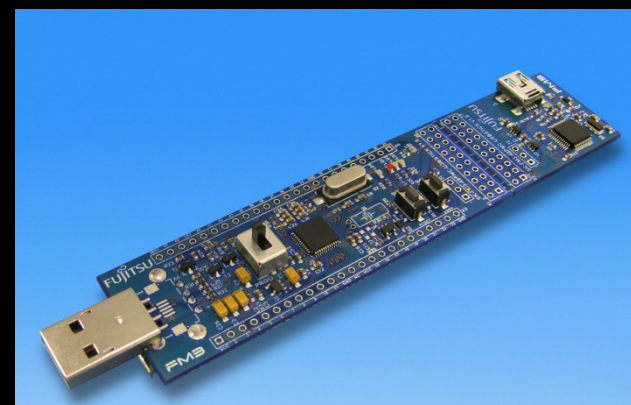
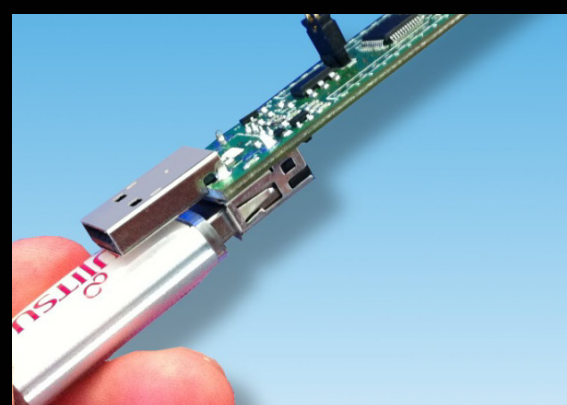
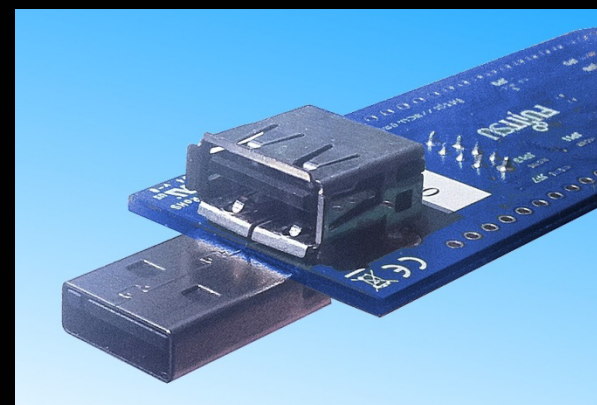


FUJITSU

SK-FM3-48PMC-USBSTICK

Quick Start





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The software deliverables are provided on an as-is basis without charge and are subject to alterations. It is the user's obligation to fully test the software in its environment and to ensure proper functionality, qualification and compliance with component specifications.

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Information

Note:

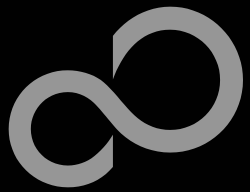
For viewing PDFs on this CDROM / softwarepackage "PDF XChange Viewer" is included. PDF XChange is used as PDF viewer to support hyperlinks to content located at CDROM or this softwarepackage.

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<http://www.tracker-software.com>



CD Contents

■ Software (Installation)

- FLASH USB DIRECT Programmer (utilities\programmer_usb\setup.exe)
- FLASH Serial Programmer (utilities\programmer_uart\setup.exe)
- SerialPortViewerAndTerminal (utilities\serial_port_viewer\setup.exe)
- Fujitsu OpenOCD Starter (GUI) (utilities\openocd_starter\setup.exe)
- Fujitsu USB Wizard download via <http://emea.fujitsu.com/fm3>

■ Documents

- Schematic: 'SK-FM3-48PMC-USBSTICK'
- User Guide: 'SK-FM3-48PMC-USBSTICK'
- Data Sheet: MB9A310K Series
- Manual: Peripheral Manual
- Manual: Technical Reference Manual
- Manual: Flash Programming Manual
- Application Note: Virtual Com Port; Example Files: Virtual Com Port
- Application Note: FSEU USB Host
- Application Note: FujitsuUsbLib (PC)
- Application Note: FSEU Embedded USB Device Library
- Application Note: OpenOCD GUI Frontend
- Application Note: USB Host Mass Storage Bootloader; Example Files: Firmware
- Doxygen Documentation USB

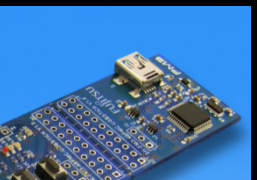
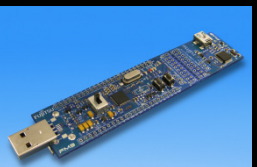
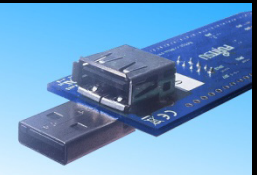
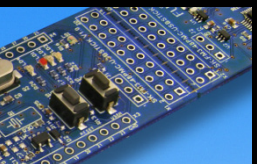
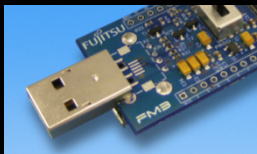


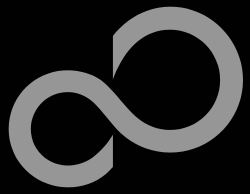
CD Contents (continued)

■ Examples

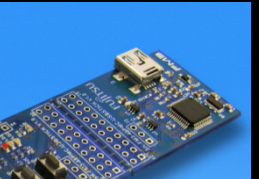
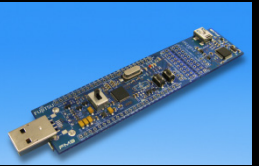
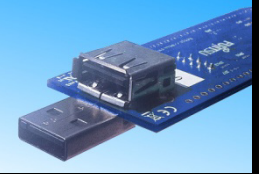
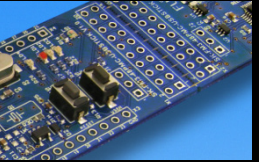
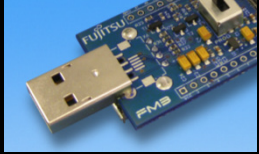
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[sk-fm3-48pmc-usbstick_usb_device_libusb_communication-v12](#) [Driver](#) / [Win-Exe](#) / [Firmware](#)
- Host / Device switchable: Host: Mass Storage, Keyboard, Mouse; Device: Virtual Com Port
[sk-fm3-48pmc-usbstick_usb_device_virtual_com_port-v12](#) [Driver](#) / [Firmware](#)
- Host / Device switchable: Host: Mass Storage, Keyboard, Mouse; Device: HID communication
[sk-fm3-48pmc-usbstick_usb_device_hid_communication-v12](#) [Win-Exe](#) / [Firmware](#)
- USB Host Mass Storage Bootloader:
[sk-fm3-48pmc-usbstick_usb_host_massstorage_bootloader-v10](#) [Firmware](#)
- Compiled code can be found in subfolder *example\IAR\output\release\exe*
- Please copy **examples** folder on **CD** to harddrive before using them!
- Click [here](#) to start installation of contents from CD to hard drive
- Have a look for the latest version: <http://emea.fujitsu.com/fm3>

default flashed





CD Contents (continued)

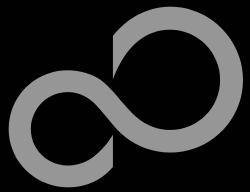


Download the latest version from the following website

<http://emea.fujitsu.com/fm3>

Direct Tool URL:

http://mcu.emea.fujitsu.com/mcu_tool/detail/SK-FM3-48PMC-USBSTICK.htm



Overview

■ Introduction

- About the SK-FM3-48PMC-USBSTICK
- Requirements
- The hardware
- Installation of Serial Port Viewer & Terminal
- Installation of USB drivers

■ Try yourself

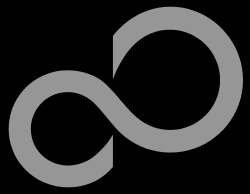
- MCU Programming via USB
- USB Host and Device
- Debugging
- IAR-Embedded Workbench
- Keil μ Vision

NEW

Create Own USB Applications using Fujitsu USB Wizard



■ Contacts

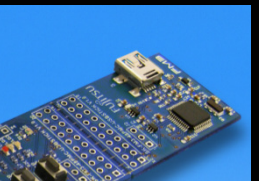
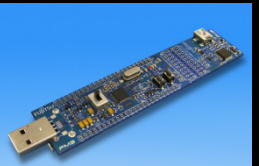
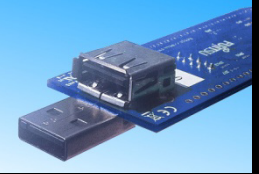
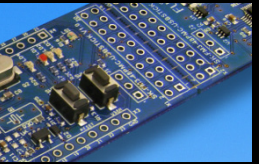
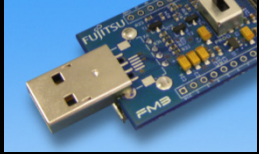


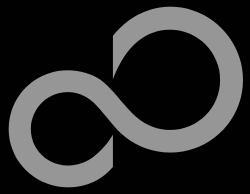
About the **SK-FM3-48PMC-USBSTICK**

- The **SK-FM3-48PMC-USBSTICK** includes a low-cost evaluation board based on the Fujitsu FM3 microcontroller MB9A310k Series

- The **MB9A310K Series** includes the following features:

- Up to 128 KByte Flash Memory
- Up to 16 KByte RAM
- Up to 4 LIN-USART-I²C interfaces
- USB-Host/-Device interface
- Timers (ICUs, OCUs, PPGs, others)
- Up to three 12 bit ADC
- External interrupts
- Low Power Mode
- DMA Controller (8 channels)
- Quadrature Position/Revolution Counter

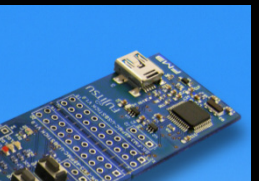
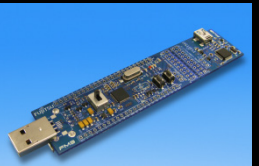
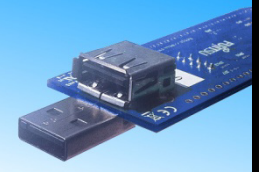
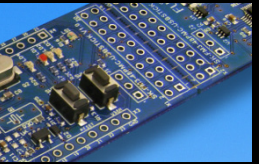
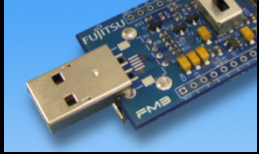




About the SK-FM3-48PMC-USBSTICK

■ Features of the SK-FM3-48PMC-USBSTICK board:

- Microcontroller MB9AF312K
- 1x USB to serial converter (Type-B connector)
- JTAG integrated
- 1x USB-MiniHost (Type-A connector)
- 1x USB-Device (Type-B connector)
- Optional USB On-The-Go (assembly option for USB Mini connector)
- 3x LED controlled with PWM
- 1x 'User'-button
- 1x 'Reset'-button
- All 48 pins routed to pin-header
- Power supply via USB
- Voltage filter for ADC
- Light sensor





Requirements

■ Embedded Development & MCU Flash Programming

- Windows 2000 , Windows XP or Windows7
- Administrator Rights
- For some applications .NET Framework 2.0 and higher is required

■ PC Frontend Development

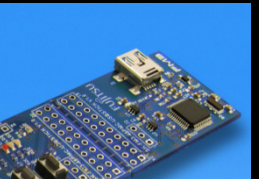
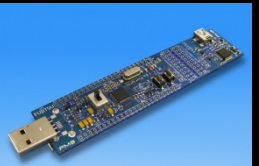
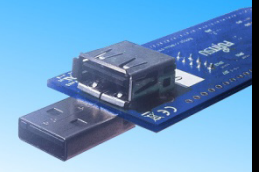
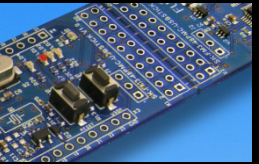
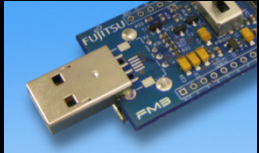
- Microsoft Visual C# Express
- Microsoft .NET Framework 2.0 and higher

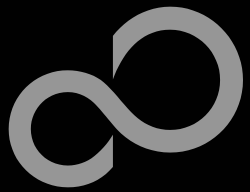
■ Virtual Com Port Example

- Windows 2000,XP, Vista or Windows 7 (32-bit)
- Mac OS X or Linux

■ HID Communication Example

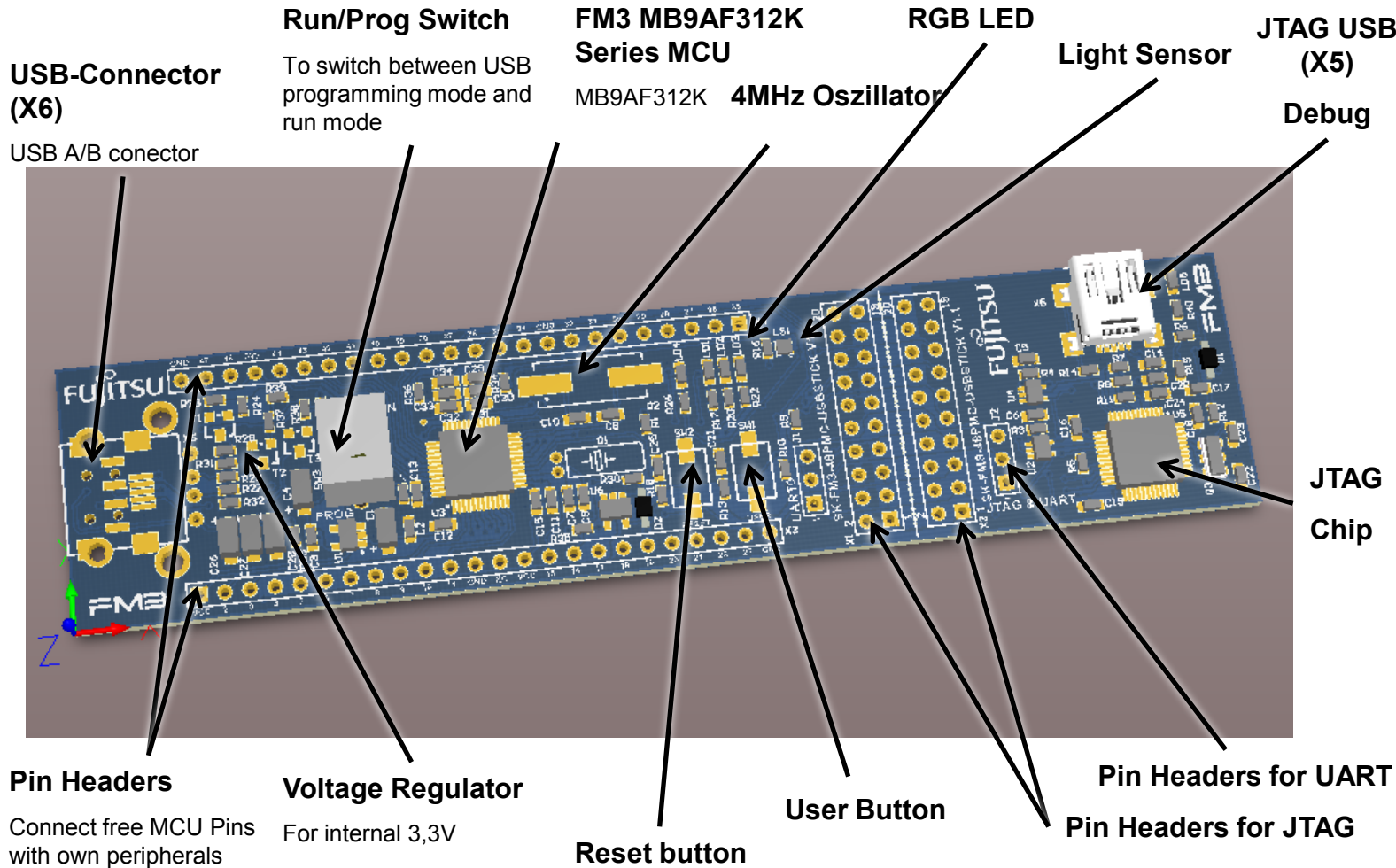
- Windows 2000,XP, Vista or Windows 7 (32- and 64-bit)
- Microsoft .NET Framework 3.5 and higher





The Hardware

Top side





The Hardware

- The microcontroller pins

Pin	Pin-name	Pin-Function on SK-FM-100PMC
1	VCC	VCC
2	P50/ INT00_0/AIN0_2/ SIN3_1	
3	P51/INT01_0/BIN0_2/SOT3_1	
4	P52/INT02_0/ZIN0_2/SCK3_1	
5	P39/DTT10X_0/ADTG_2	
6	P3A/RTO00_0/TIOA0_1/RTCCO_2/SUBOUT_2	R-RGB LED
7	P3B/RTO01_0/TIOA1_1	
8	P3C /RTO02_0 /TIOA2_1	G-RGB LED
9	P3D/ RTO03_0/ TIOA3_1	
10	P3E/ RTO04_0/ TIOA4_1	B-RGB LED
11	P3F/ RTO05_0/ TIOA5_1	
12	VSS	GND

Pin	Pin-name	Pin-Function on SK-FM-100PMC
13	C	N.C.
14	VCC	VCC
15	P46/ X0A	32KHz Crystal
16	P47/ X1A	32KHz Crystal
17	INITX	Reset
18	P49/ TIOB0_0	
19	P4A/ TIOB1_0	
20	PE0/ MD1	
21	MD0	SW3 Run Mode
22	PE2 X0	4MHz Crystal
23	PE3 X1	4MHz Crystal
24	VSS	GND

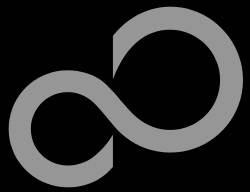


The Hardware

• The microcontroller pins (continued)

Pin	Pin-name	Pin-Function on SK-FM-100PMC
25	P10/ AN00	Fotoreistor LDR 03
26	P11/ AN01/SIN1_1 /INT02_1/ FRCK0_2/ IC02_0/ WKUP1	USB Overcurrent
27	P12/ AN02/ SOT1_1/ IC00_2	USB HOST Pull-Down
28	P13/ AN03/ SCK1_1/ IC01_2/ RTCCO_1/ SUBOUT_1	USB VBUS EN
29	P14/ AN04/ SIN0_1/ INT03_1/ IC02_2	
30	P15/ AN05/ SOT0_1/ IC03_2	USB ID
31	AVCC	VCC
32	AVRH	VCC
33	AVSS	GND
34	P23/ AN06/ SCK0_0/ TIOA7_1	
35	P22 / AN07 / SOT0_0 / TIOB7_1	UART0 (TXD)
36	P21 / SIN0_0 / INT06_1 / WKUP2	UART0 (RXD)

Pin	Pin-name	Pin-Function on SK-FM-100PMC
37	P00/ TRSTX	TRSTX
38	P01 /TCK / SWCLK	TCK
39	P02 /TDI	TDI
40	P03 / TMS / SWDIO	TMS
41	P04 /TDO /SWO	TDO
42	P0F/ NMIX / CROUT_1 / RTCCO_0 /SUBOUT_0 / WKUP0	SW2 Switch
43	P61 / SOT5_0 / TIOB2_2 / UHCONX /DTTIOX_2	UHCONX
44	P60 / SIN5_0/ TIOA2_2 / INT15_1/ IC00_0/ WKUP3	USB VBUS INT
45	USBVCC	VCC
46	P80/ UDM0	UDM0
47	P81 /UDP0	UDP0
48	VSS	GND



The Hardware

The jumpers (bottom side)

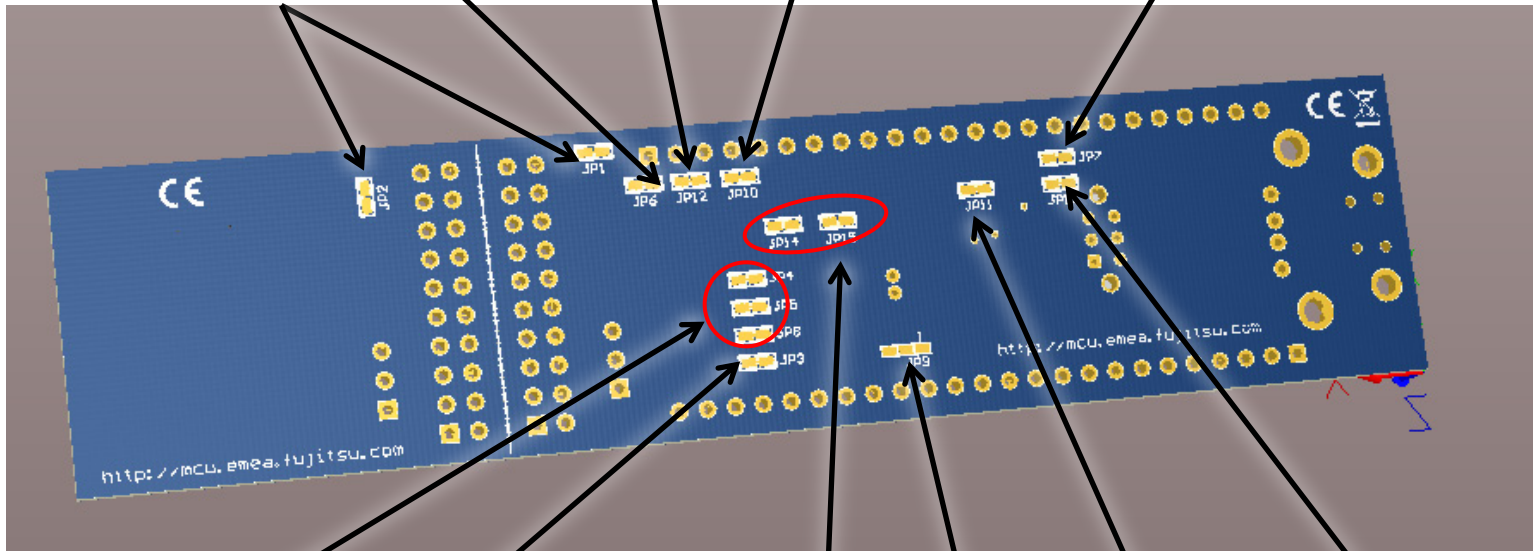
JP6: Light Sensor
Default: Closed

JP12: USB Overcurrent
Default: Closed

JP10: USB BUS Enable
Default: Closed

JP7: USB ID-Pin
Default: Closed

JP1- JP2: JTAGPWR
Default: Closed



JP4, JP5, JP8: RGB LEDs
Default: Closed

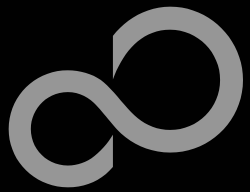
JP14-JP15: Use 32KHz Quartz
Default: Open

JP13: USB Host Low
Default: closed

JP11: AVRH Enable
Default: Closed

JP3: Use SW1
Default: Closed

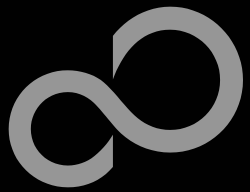
JP9: USB BUS low/high
Default: 2-3



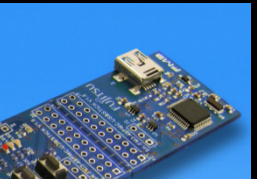
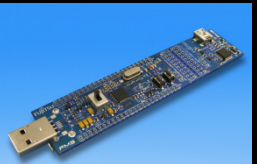
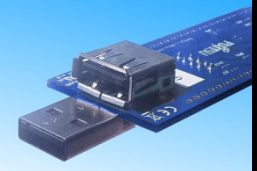
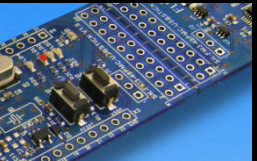
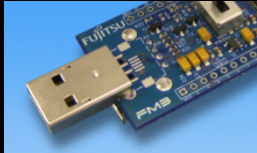
The Hardware

- The Jumpers

Jumper	Function	Default
JP1	JTAGPWR	Closed
JP2	JTAGPWR	Closed
JP3	Use SW1	Closed
JP4	RGB LEDs	Closed
JP5	RGB LEDs	Closed
JP6	Light sensor	Closed
JP7	USB ID Pin	Closed
JP8	RGB LEDs	Closed
JP9	USB BUS low/high	2-3
JP10	USB BUS enable	Closed
JP11	AVRH Enable	Closed
JP12	USB Overcurrent	Closed
JP13	USB Host	Closed
JP14	Use 32KHz Crystal	Open
JP15	Use 32KHz Crystal	Open



The Hardware



3.3 User RGB LED (LD1, LD2, LD3)

As visual output interface three RGB LEDs are placed on the evaluation board. They can be driven via port pin P3A (port 3, bit 10), P3C (port 3, bit 12) and P3E (port 3, bit 14). The used IO-Pins can be cut via Solder-Cut-Jumpers JP4, JP5 and JP8.

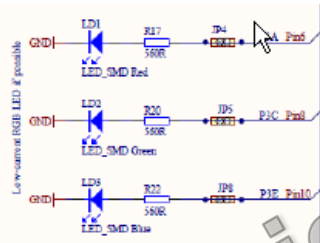


Figure 3-4: User RGB LED

3.3.1 User LED Routines

The user LED routines need the include file `board.h`. Before the user LED can be used, the `Board_Init()` must be executed. This is normally called in `main.c`.

The LEDs can be dimmed or used as normal GPIO. This can be set in `led.h` with:

```
#define LEDS_DIMMABLE 1
```

After the initialization, following functions are available from source code:

```
LED_ON(LED_RED);           // Red LED on
LED_ON(LED_GREEN);         // Green LED on
LED_ON(LED_BLUE);          // Blue LED on

LED_OFF(LED_RED);          // Red LED off
LED_OFF(LED_GREEN);        // Green LED off
LED_OFF(LED_BLUE);         // Blue LED off

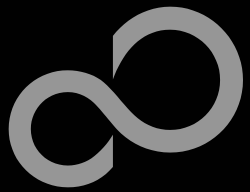
/* usable if #define LEDS_DIMMABLE 1 in led.h */
LED_DUTY(LED_RED, 128);    // Set duty of red LED to 128 (0..255)
LED_DUTY(LED_GREEN, 128);  // Set duty of green LED to 128 (0..255)
LED_DUTY(LED_BLUE, 128);   // Set duty of blue LED to 128 (0..255)
```

Figure 3-5: How to use the user RGB LEDs

Note:

Have also a look into the tools user guide to have detailed information about hardware components and how to use it.

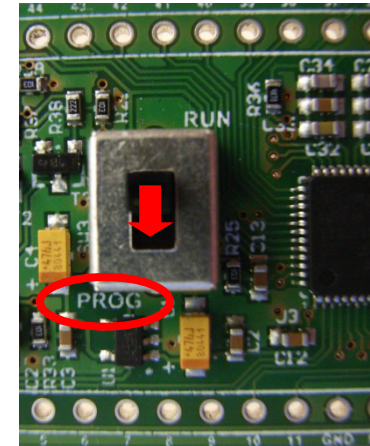
[User Guide SK-FM3-48PMC-USBSTICK](#)



MCU Programming via USB

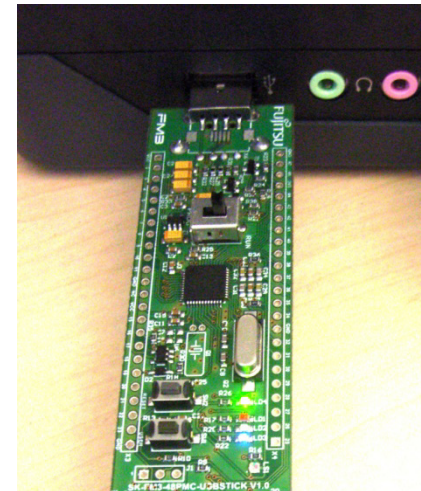
■ Step 1

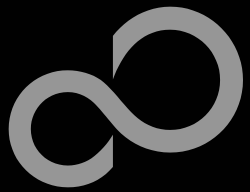
- Insert the CD ROM
- Switch SW3 to Prog Mode



■ Step 2

- Connect the evaluation board to the PC

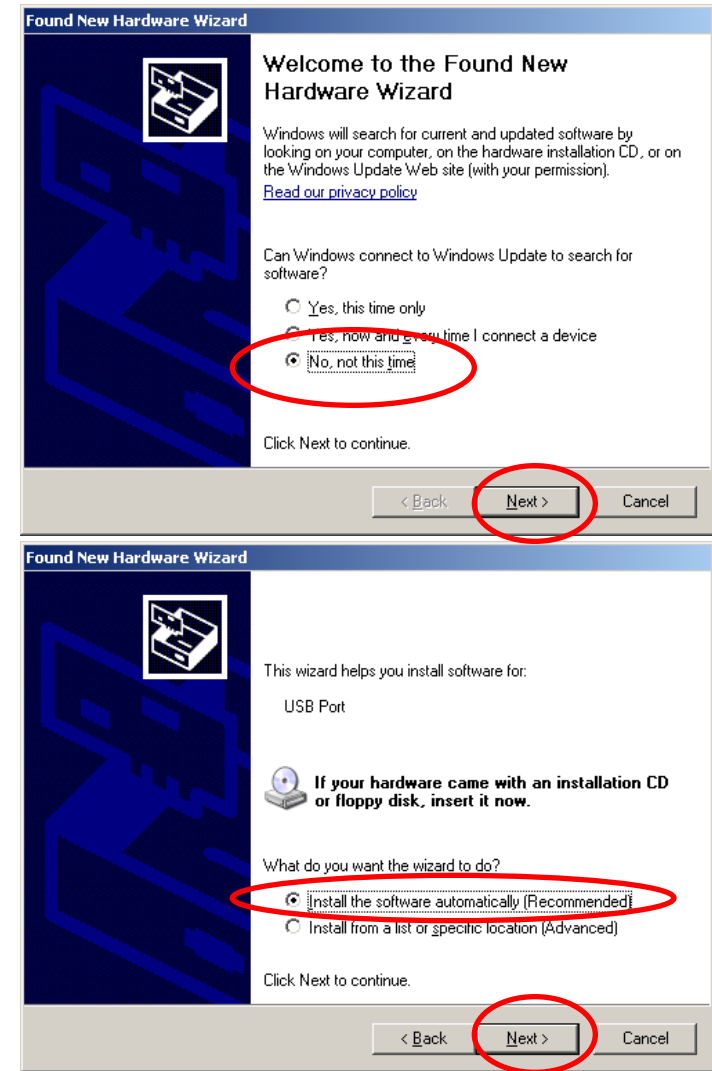


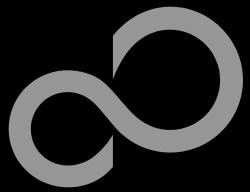


MCU Programming via USB

■ Step 3

- The hardware wizard will be opened.
- Select "No, not this time" and click "Next"
- Select "Install the software automatically (Recommended)" and click "Next"

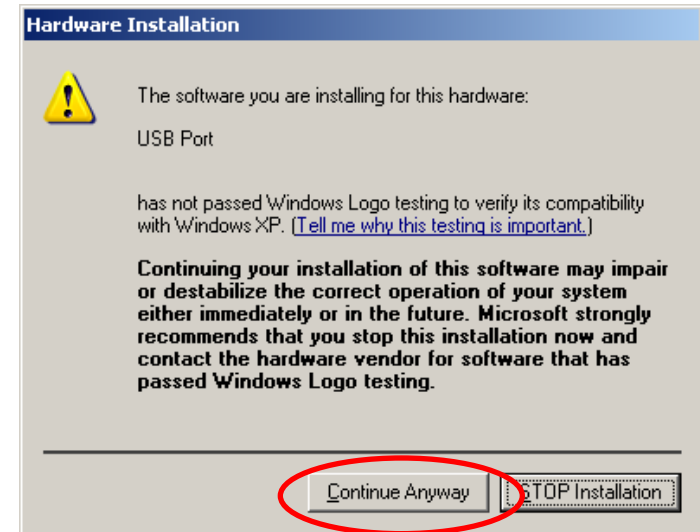




MCU Programming via USB

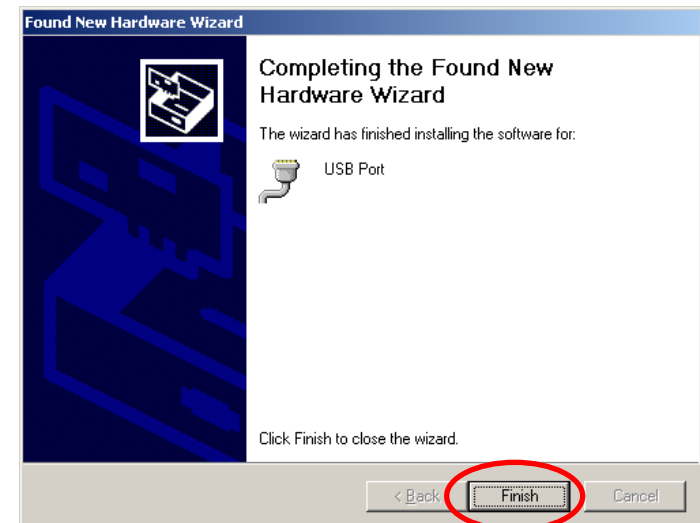
■ Step 3 (continued)

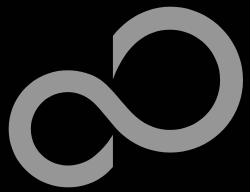
- While asking for Windows Logo certification, click "Continue Anyway"
- The driver installation was successful.



■ Step 4

- Click finish

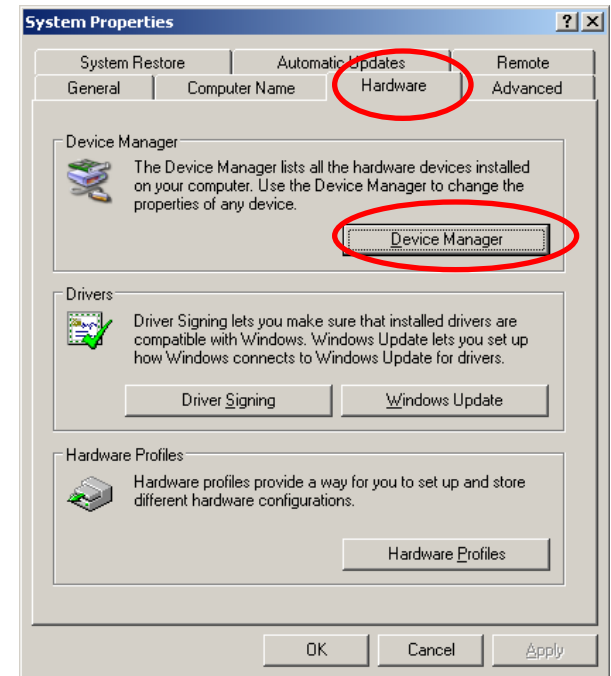
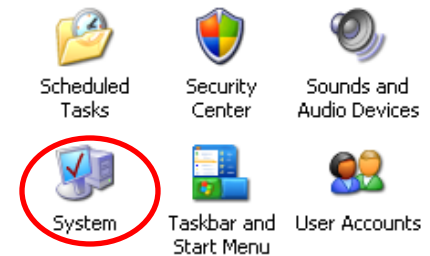




MCU Programming via USB

■ Step 5

- Find the virtual com port number via the device manager. It can be found in the "System" Control Panel.
- Select the "Hardware" and click at "Device Manager"

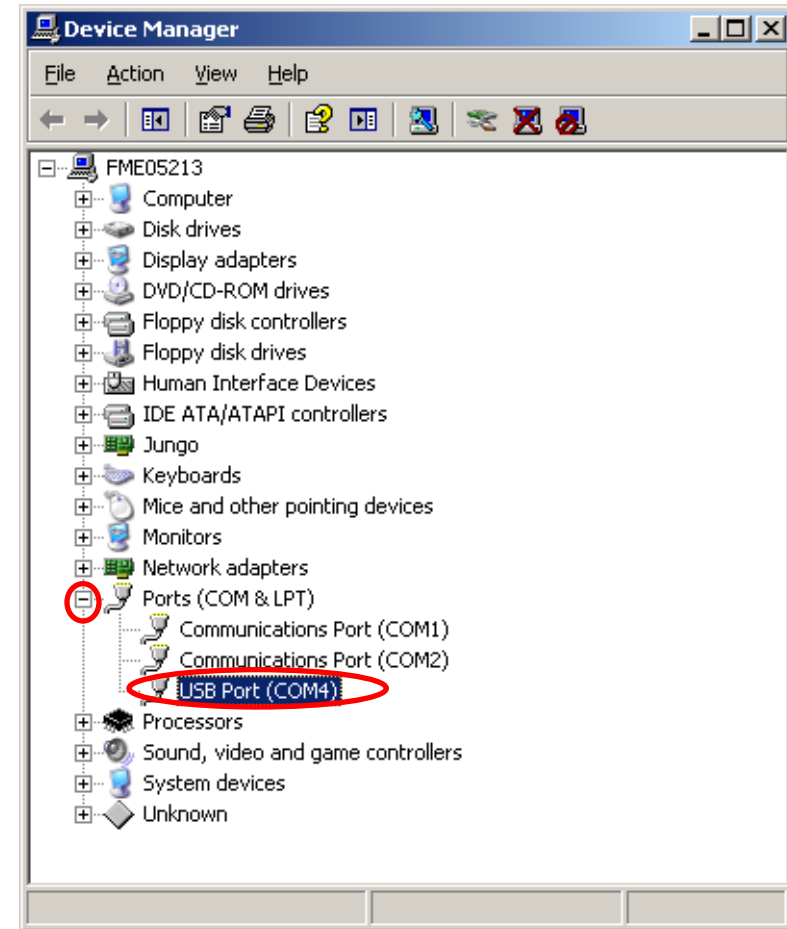


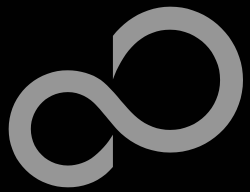


MCU Programming via USB

■ Step 5 (continued)

- Open the tree "Ports (COM & LPT)" by clicking on the "+".
- Look for the "USB Port" entry. In this case it is com port 4

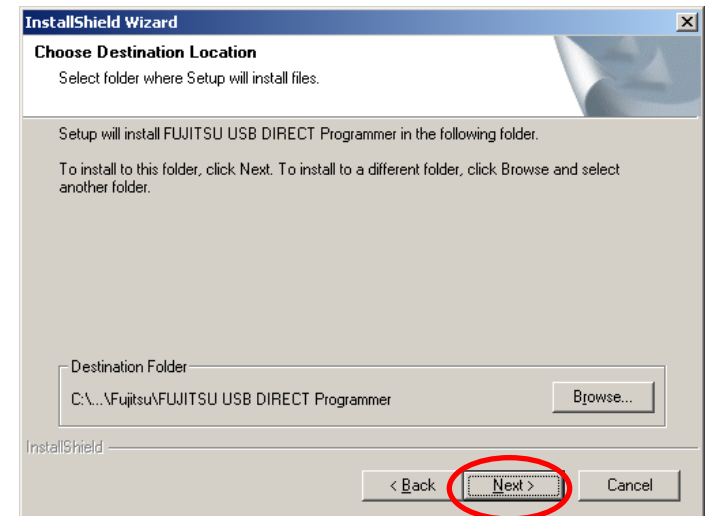
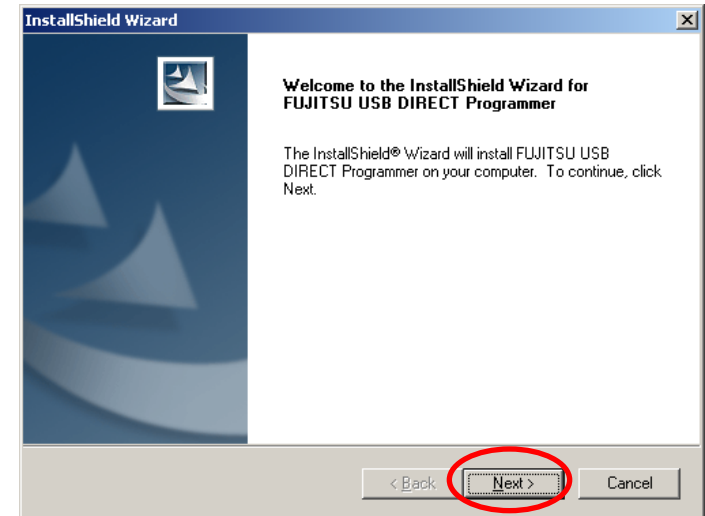


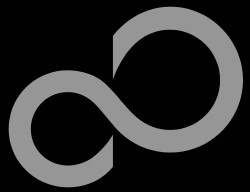


MCU Programming via USB

■ Step 5

- Start the installation
(utilities\ programmer_usb\setup.exe)
USB DIRECT Programmer
- Click "Next"
- Choose a optional installation directory and click "Next"

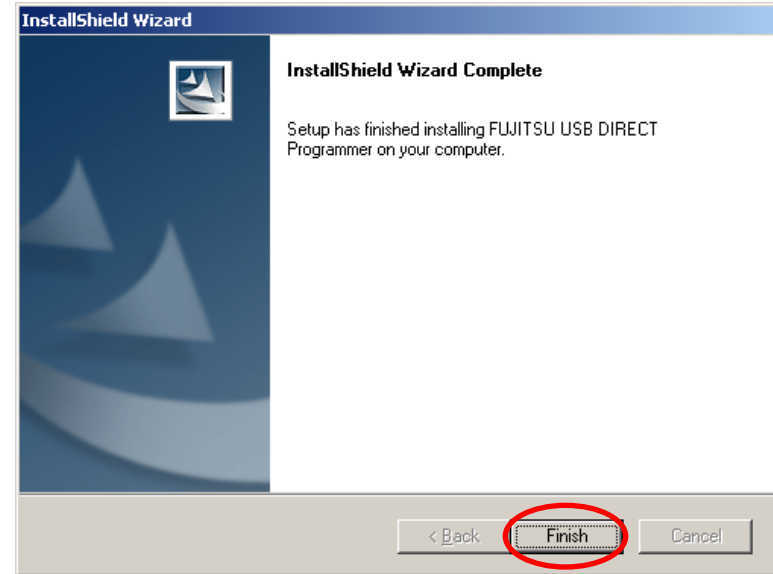




MCU Programming via USB

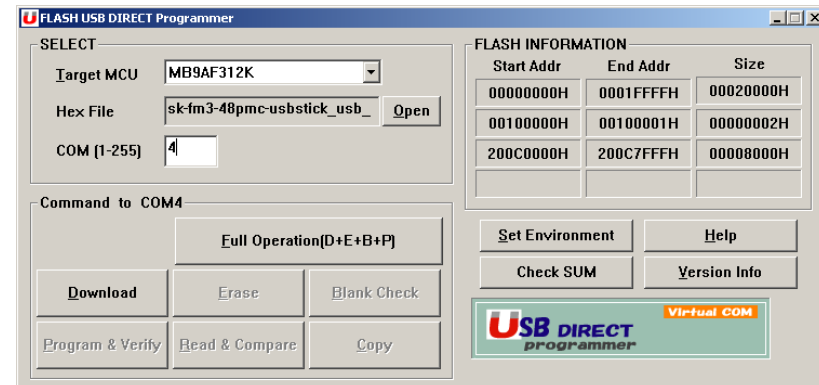
■ Step 5 (continued)

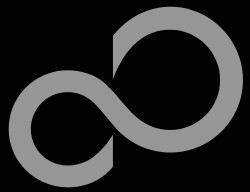
- The USB DIRECT Programmer was now successfully installed.



■ Step 6

- Start the USB DIRECT Programmer from Start Menu

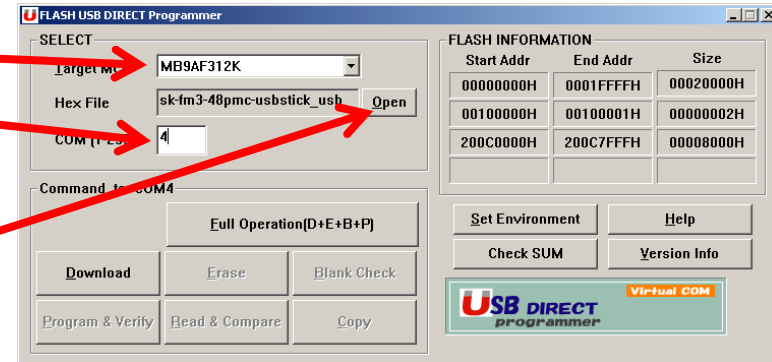




MCU Programming via USB

■ Step 7

- Choose Target MCU
- Enter the com port number



- Open the firmware file
 - Located in:

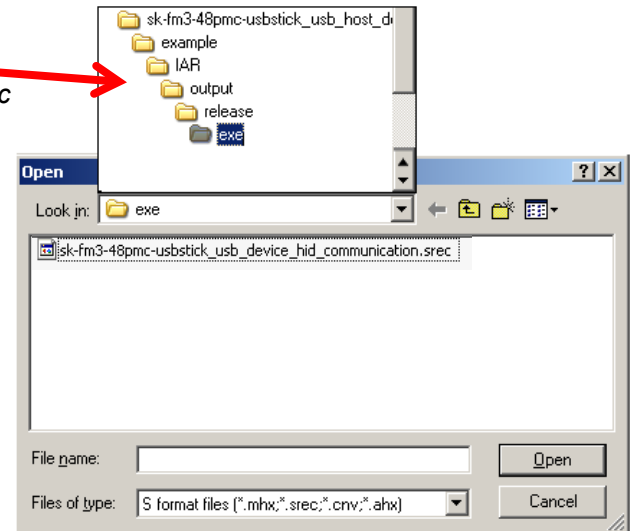
Examples\

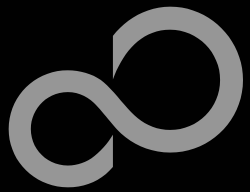
sk-fm3-48pmc-usbstick_usb_device_hid_communication

Example\IAR\output\release\exe

- Choose here

sk-fm3-48pmc-usbstick_usb_device_hid_communication.srec

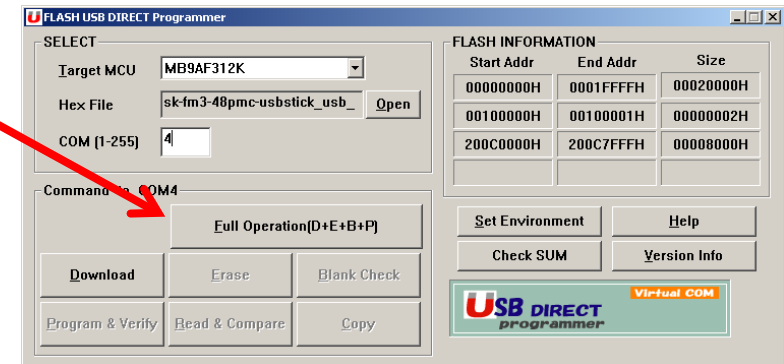




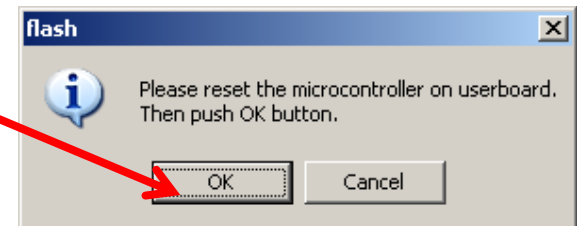
MCU Programming via USB

■ Step 7 (continued)

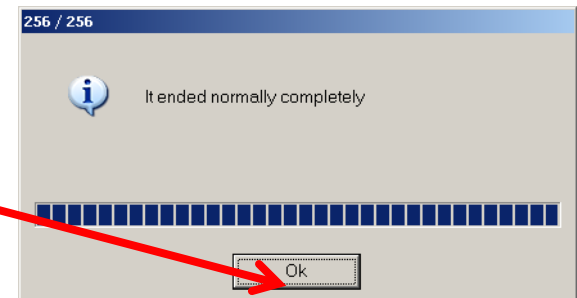
- Click at "Full Operation"

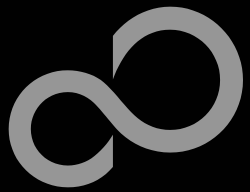


- Reset the MCU and click at "OK"



- The firmware was programmed.

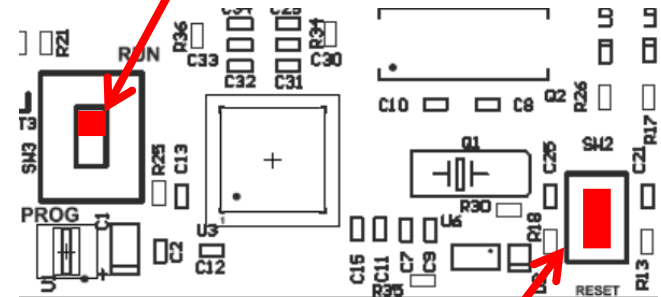
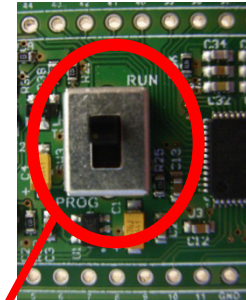




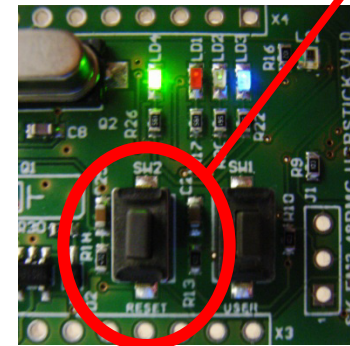
MCU Programming via USB

■ Step 8

- Switch SW3 to RUN



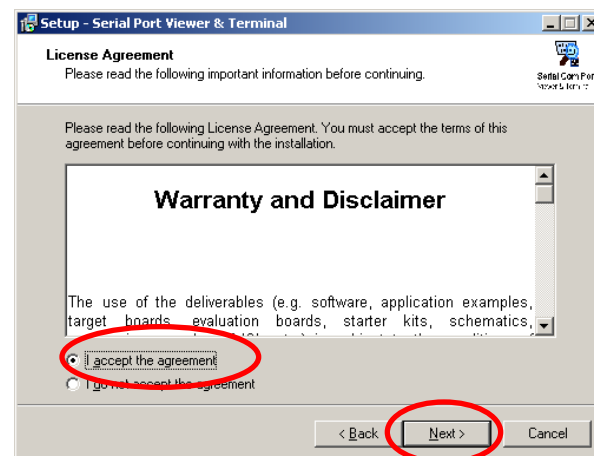
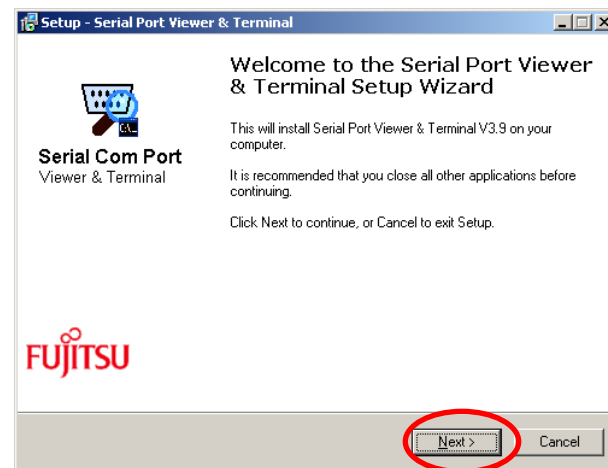
- Press the reset button





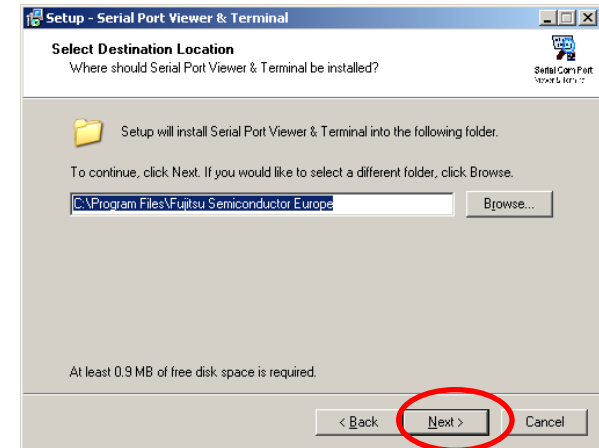
Installation of Serial Port Viewer & Terminal

- Start Installation
Serial Port Viewer & Terminal
(utilities\serial_port_viewer\setup.exe)
- Click "Next"
- Read and accept the disclaimer and click "Next"

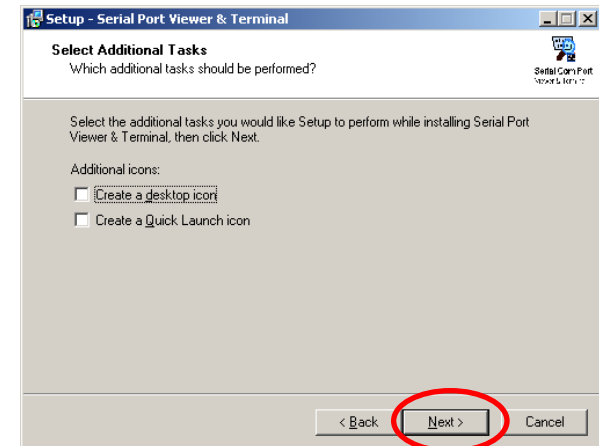


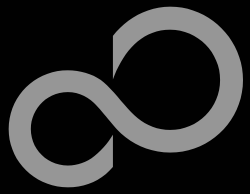
Installation of Serial Port Viewer & Terminal

- Choose a optional installation directory and click "Next"



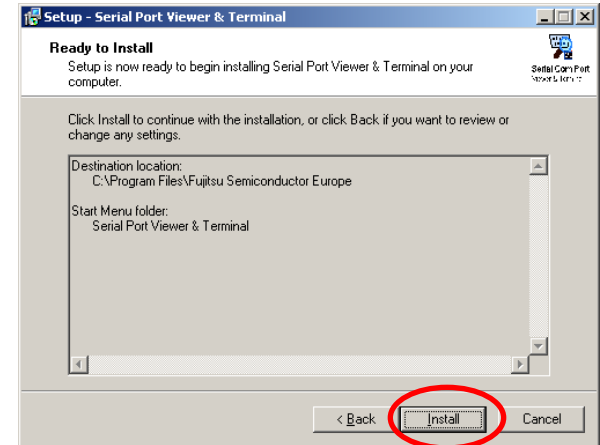
- Click "Next"



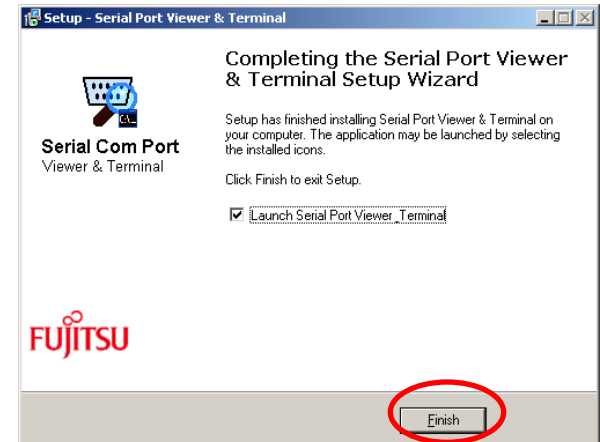


Installation of Serial Port Viewer & Terminal

- Click "Install"

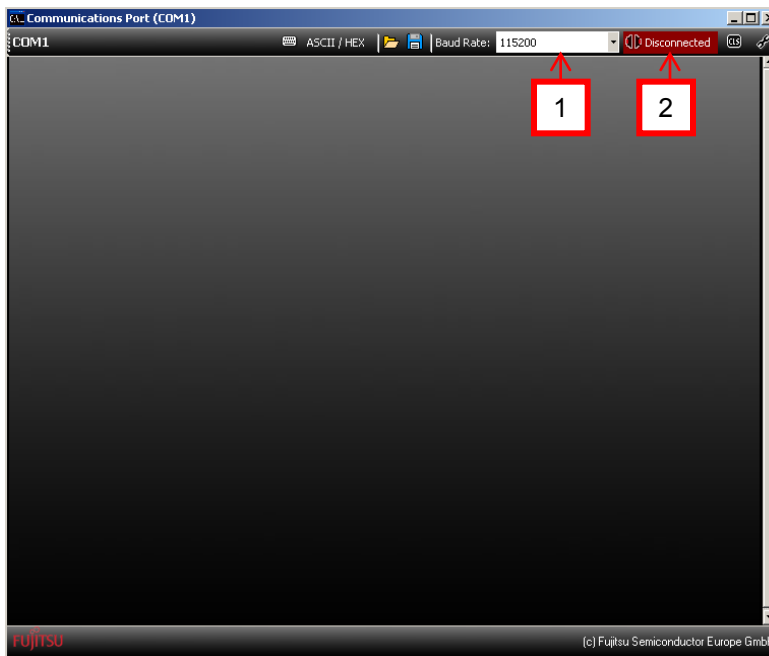


- Click "Finish" and the Serial Port Viewer & Terminal will be opened.

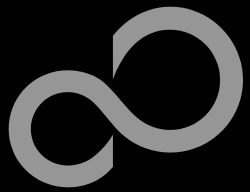


Installation of Serial Port Viewer & Terminal

- The Serial Port Viewer & Terminal can be found as tray icon. Via right-click, the terminal for the specific com port can be opened.



- 1. Select Baud rate (Default baudrate in examples is: 115200)
- 2. Click red blinking "Disconnected" button to connect

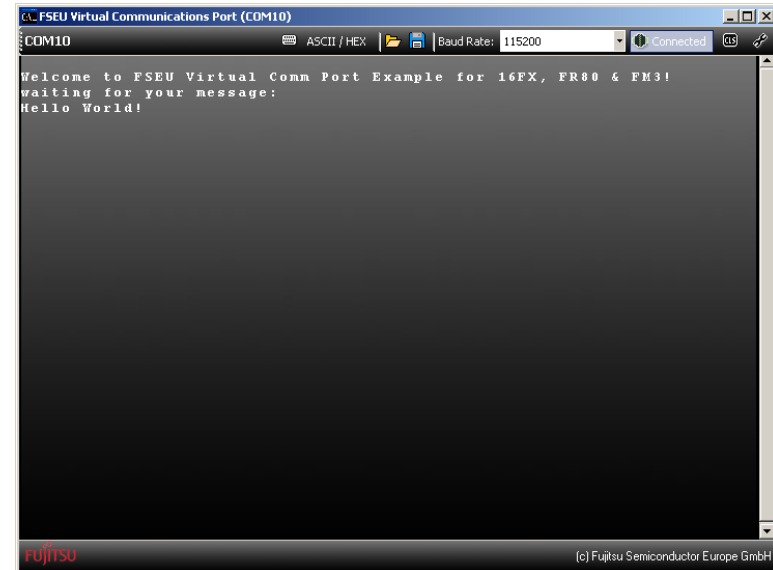


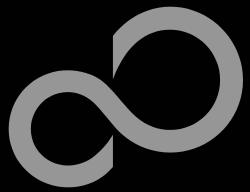
Virtual Com Port Example

- Used to communicate via CDC class

- MCU source & binary

Examples\ sk-fm3-48pmc-
usbstick usb device virtual
com port-v12

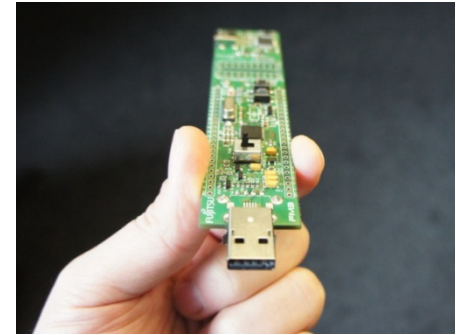
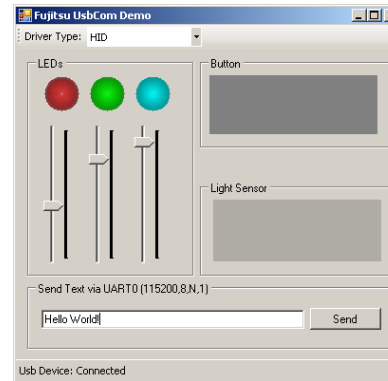




USB Host and Device (1)

■ Device Mode:

- HID Communication



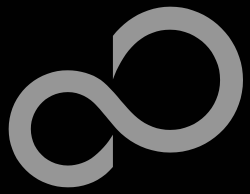
■ Host Mode:

- Mass Storage
- Mouse
- Keyboard



■ Example:

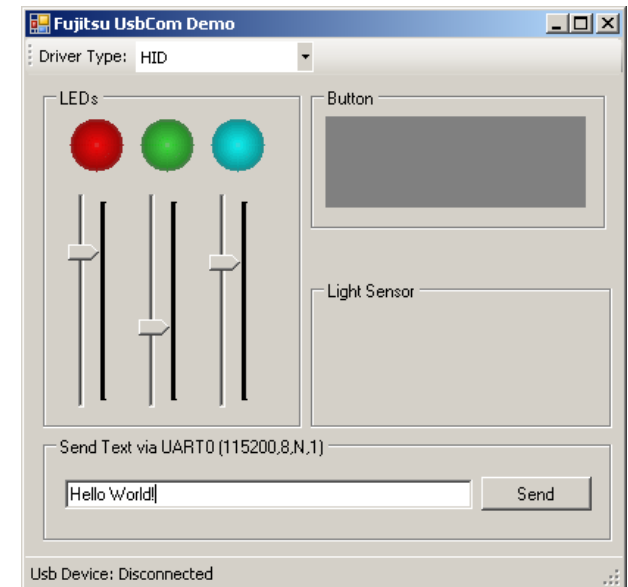
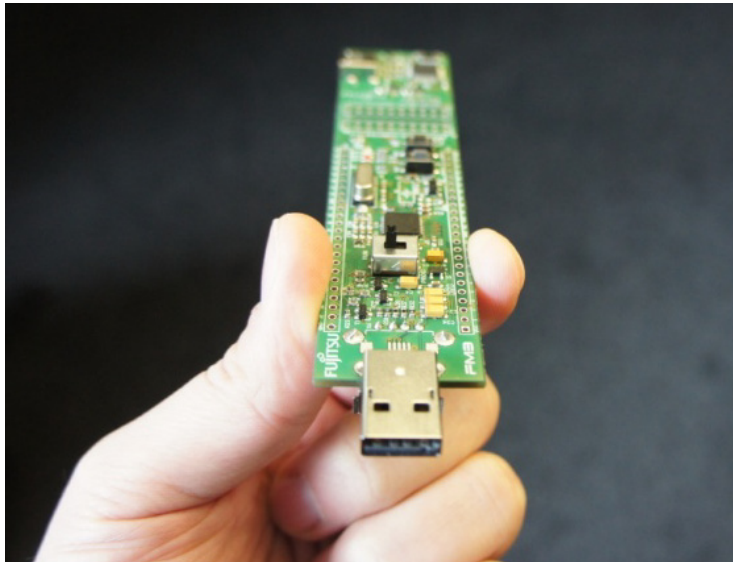
sk-fm3-48pmc-usbstick_usb_host_device-vXX

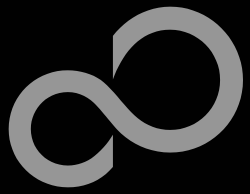


USB Host and Device (2)

■ USB Device connected to PC

- LEDs turns off
- Within example [sk-fm3-48pmc-usbstick usb device hid communication-v12](#) in folder "[forwindows\Binary](#)" the PC Demo can be found:
"[Fujitsu UsbCom Demo.exe](#)"
- LEDs, Sensors, Buttons and UART can be used via GUI

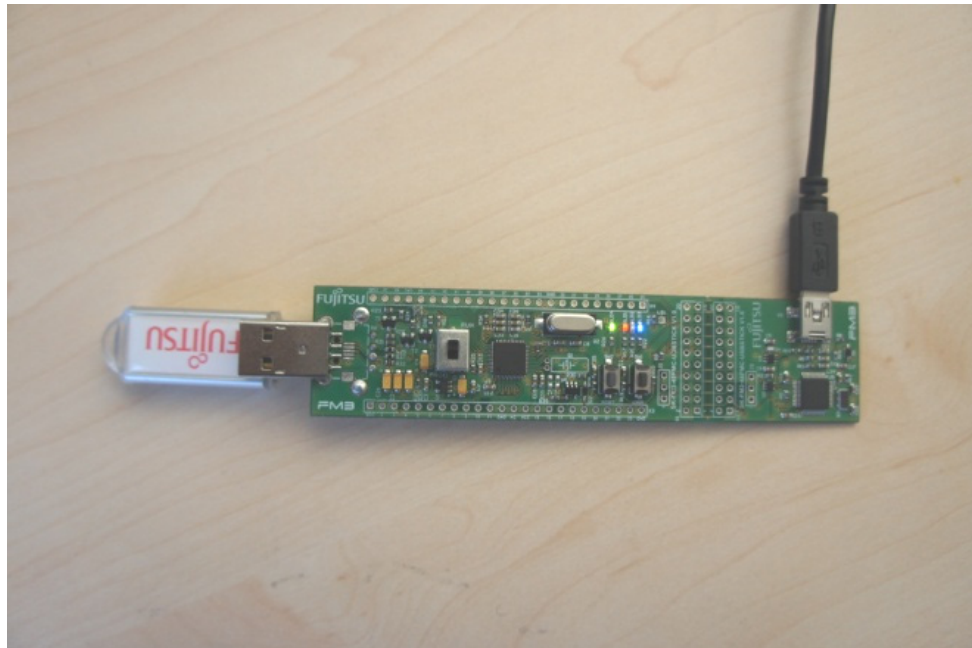


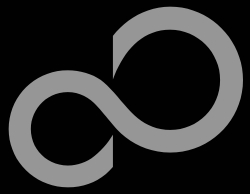


USB Host and Device (3)

■ USB Mass Storage via Host

- Red LED turns on after a few seconds
- Content of USB Stick will be displayed via UART 0 (X5), 115200,8,N,1
- *fujitsu.txt* file will be written
- Red LED turns off and green LED turns on for ready to disconnect

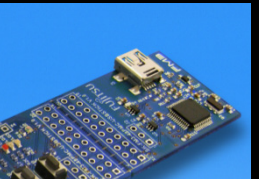
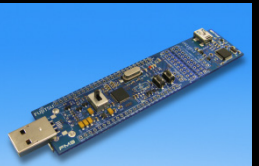
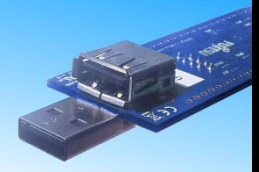
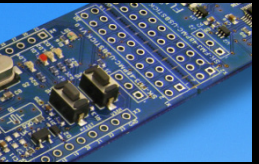
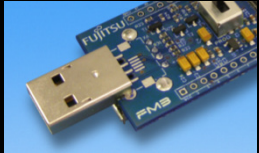


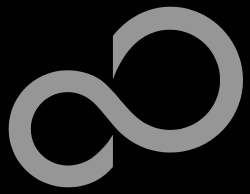


USB Host and Device (4)

■ USB Mouse via Host

- Green LED turns on after a view seconds
- Position will be displayed via UART 0 (X5), 115200,8,N,1
- LEDs can be dimmed via X/Y movement and scroll wheel

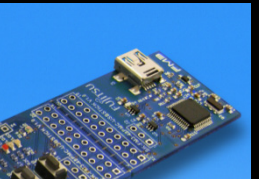
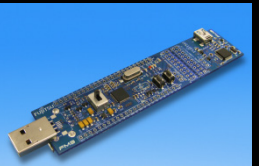
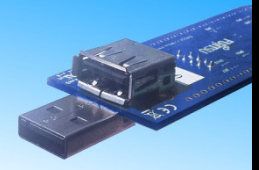
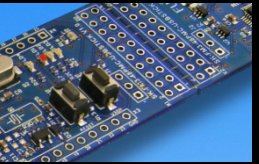
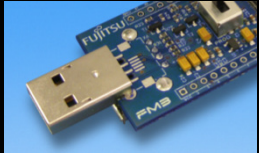


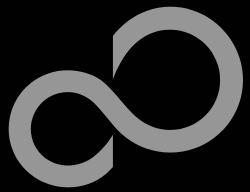


USB Host and Device (5)

■ USB Keyboard via Host

- Green LED turns on after a few seconds
- Text typed will be displayed via UART 0 (X5), 115200,8,N,1
- LEDs can be switched via key 1-3





Create own USB Applications

■ Using the Fujitsu USB Wizard

- Easy to use, step by step
- Creates USB Host / Device Projects
- Combines microcontroller templates, board support and USB use case
- Download the newest version from internet (<http://emea.fujitsu.com/fm3>)
- Start Installation (utilities\usb_wizard\setup.exe)

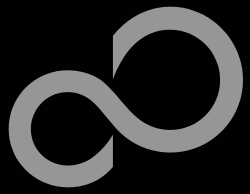


Easy to use
Wizard

Detailed
Configuration

Application
Notes

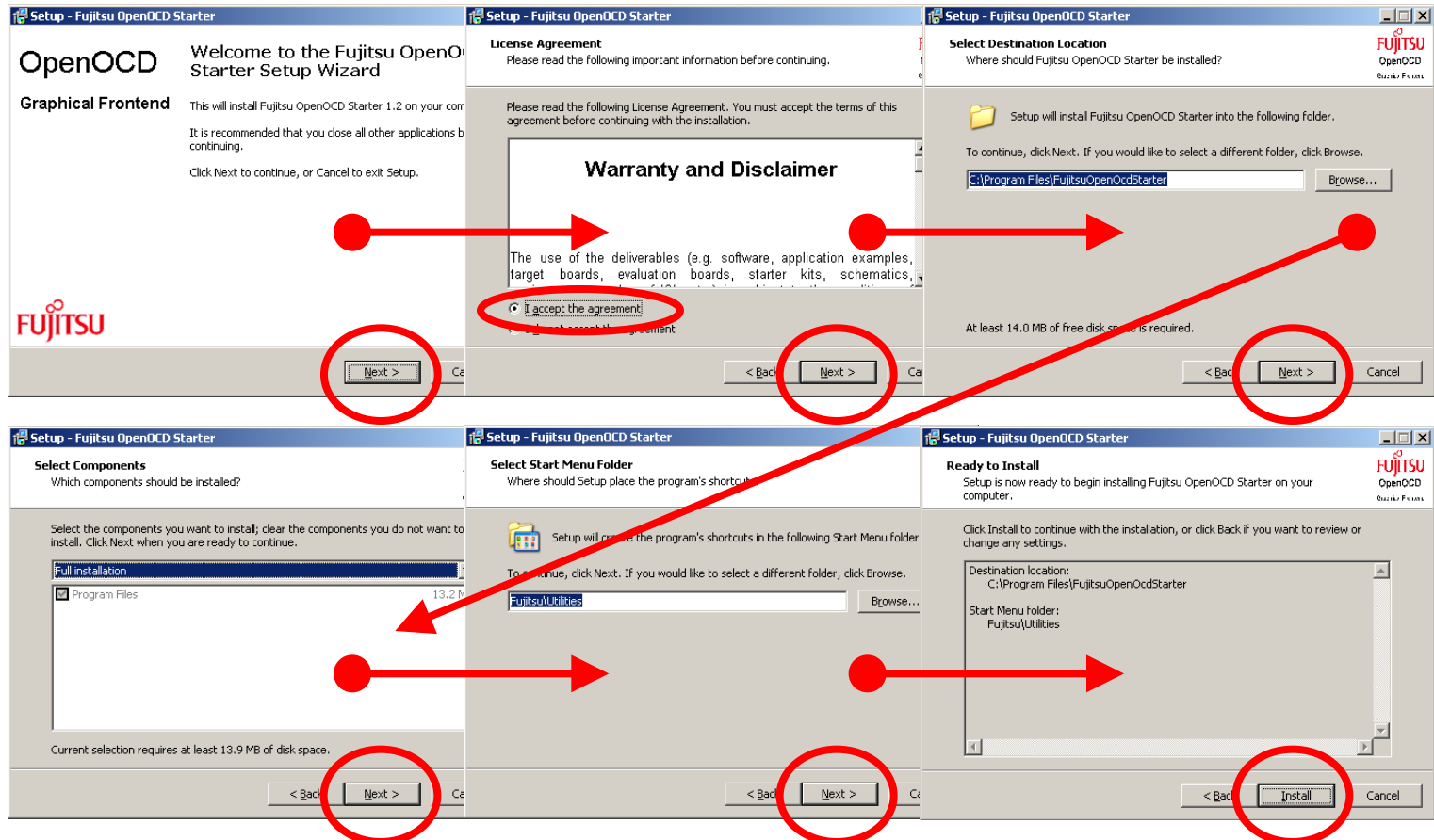
NEW

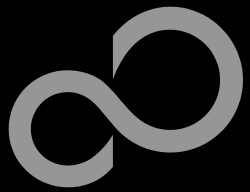


Installation of the USB-driver

■ Install Fujitsu OpenOCD Starter (min. V1.2)

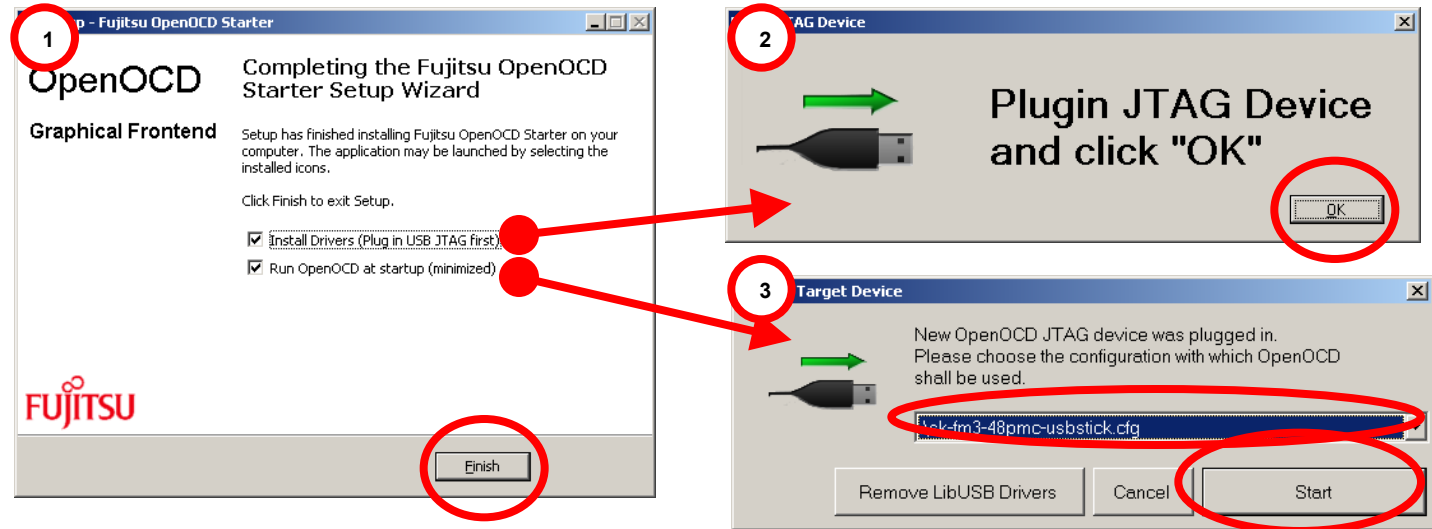
- Run Installation (utilities/openocd_starter/setup.exe)



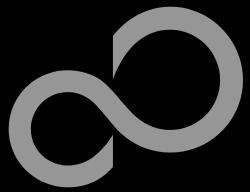


Installation of the USB-driver

■ Install Drivers **during** Installation



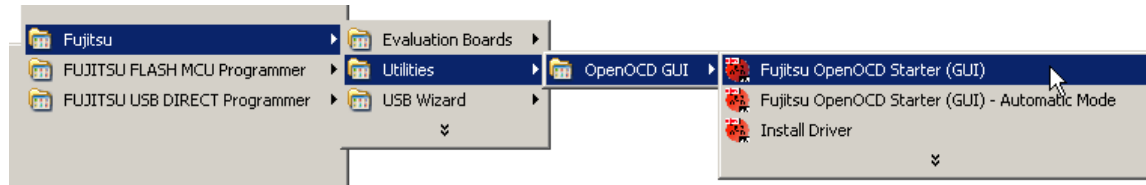
- 1) Select „Install Drivers“ and „Run OpenOCD at startup“
- 2) Plug in the evaluation board at USB DEBUG (X13) and click ,OK‘
- 3) Select target board „.\sk-fm3-48pmc-usbstick.cfg“ and click ,Start‘ to run OpenOCD GDB Server



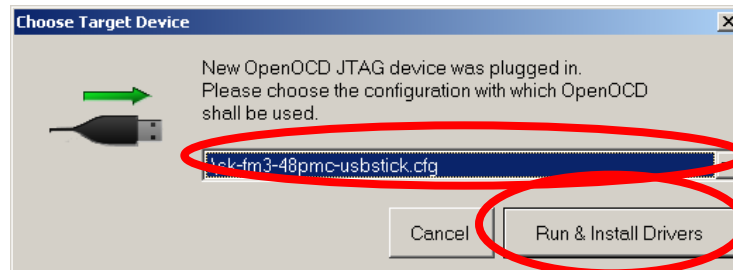
Installation of the USB-driver

■ (Optional) Install Drivers **after** Installation

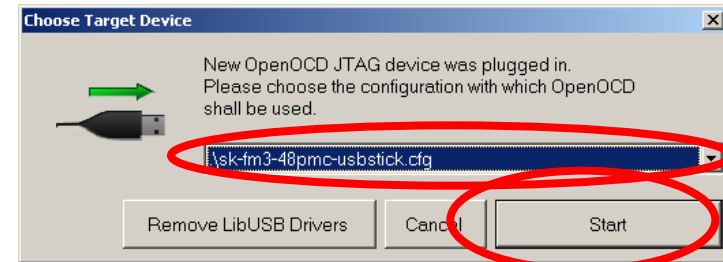
- Run Fujitsu OpenOCD Starter (normally started in background)



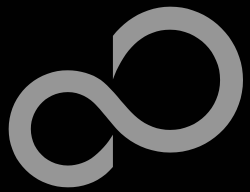
- Connect the evaluation board and wait for following pop-up window (If connected, disconnect and connect again)



OR



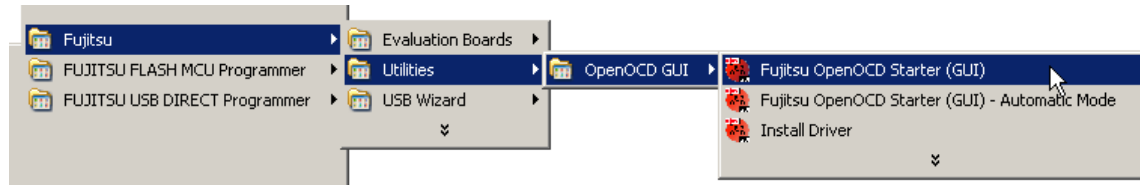
- Select „\sk-fm3-48pmc-usbstick.cfg“ and click „Run & Install Drivers“



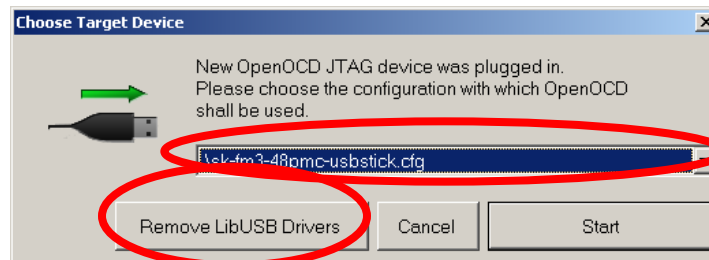
Deinstallation of the USB-driver

■ (Optional) **Uninstall** Drivers after Installation

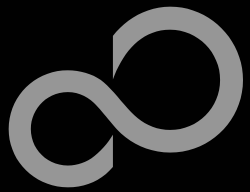
- Run Fujitsu OpenOCD Starter (normally started in background)



- Connect the evaluation board and wait for following pop-up window (If connected, disconnect and connect again)



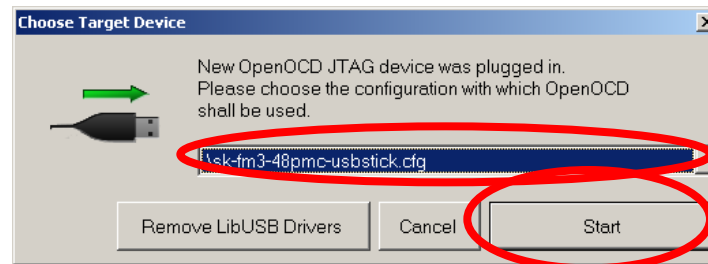
- Select „\\sk-fm3-48pmc-usbstick.cfg“ and click „Remove LibUSB Drivers“



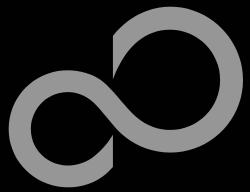
Debugging via JTAG

■ The MB9AF312K microcontroller offers a JTAG-Interface that is supported by SK-FM3-48PMC-USBSTICK.

- To debug your program, the on-board OpenOCD compatible USB to JTAG adapter can be used (X5). It offers USB to one port JTAG interface and one port UART interface.
- See also [Install Drivers](#)
- After connecting the evaluation board to the PC, following dialog should pop-up:



- Choose „sk-fm3-48pmc-usbstick.cfg“ and click „Start“



Debugging via JTAG

■ The MB9AF312K microcontroller offers a JTAG-Interface that is supported by SK-FM3-48PMC-USBSTICK.

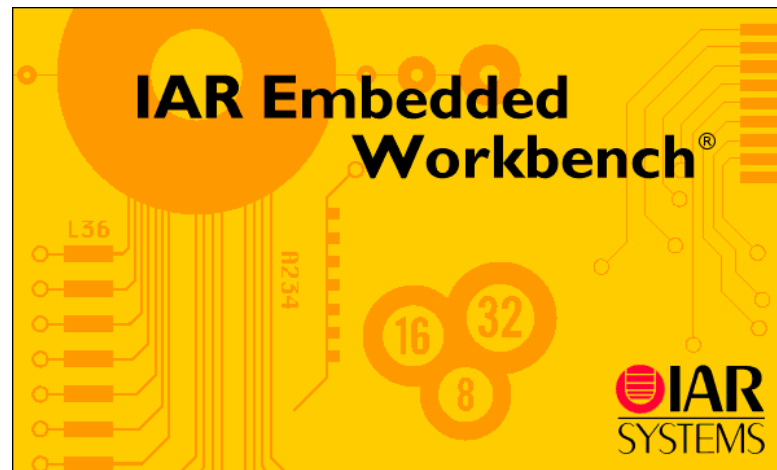
- To debug your program with a JTAG-Adapter e.g. Segger J-Link
- Connect the J-Link to the JTAG-Interface routed to the 20-Pin-Header on X1 and to the USB-Port of your PC



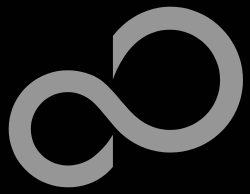


IAR-Embedded Workbench / KEIL μ Vision IDE and Debugger

- Installation
- Getting Started
- Open Project
- Build Project
- Debug Project



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This product is protected by US and international laws.

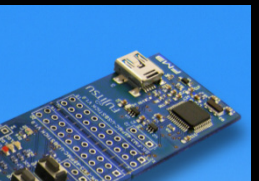
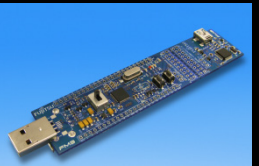
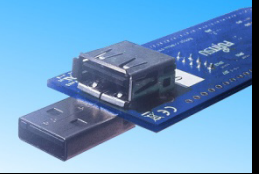
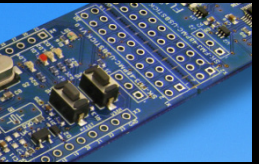
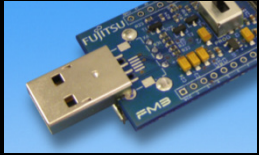


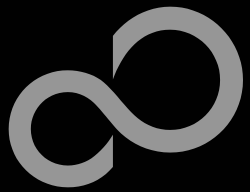
IAR Workbench Getting Started

■ Install EWARM from IAR-CD or download latest version from IAR Website

- EWARM 30-day Evaluation Version
 - <http://supp.iar.com/Download/SW/?item=EWARM-EVAL>
- EWARM 32K Kickstart Version
 - <http://supp.iar.com/Download/SW/?item=EWARM-KS32>

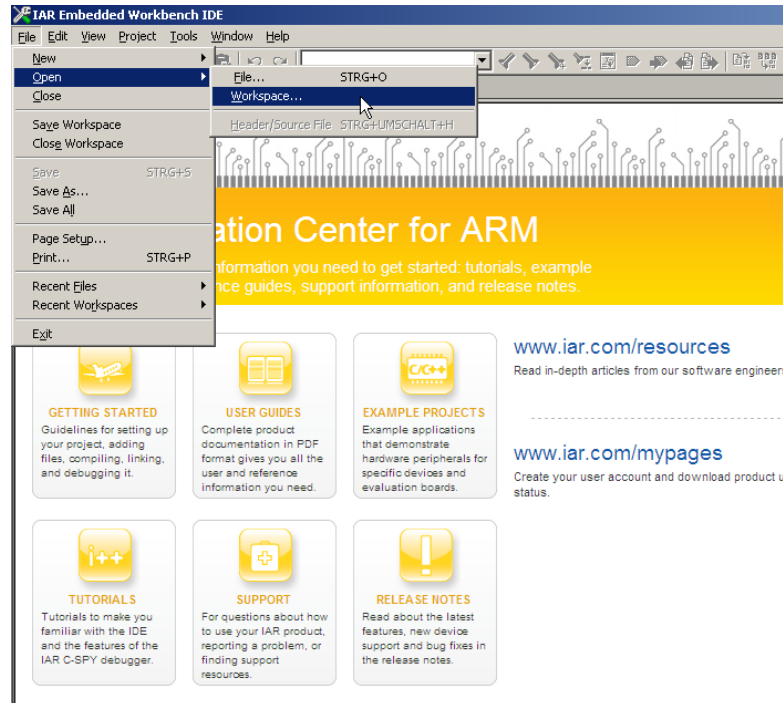
■ Start EWARM Workbench

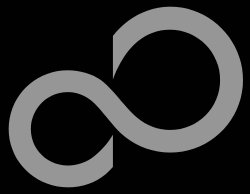




IAR Workbench Getting Started

- Choose *File* → *Open* → *Workspace*
- Select e.g. `\Examples\sk-fm3-48pmc-usbstick_usb_device_hid_communication-vXX\example\IAR\sk-fm3-48pmc-usbstick_usb_device_hid_communication.eww`

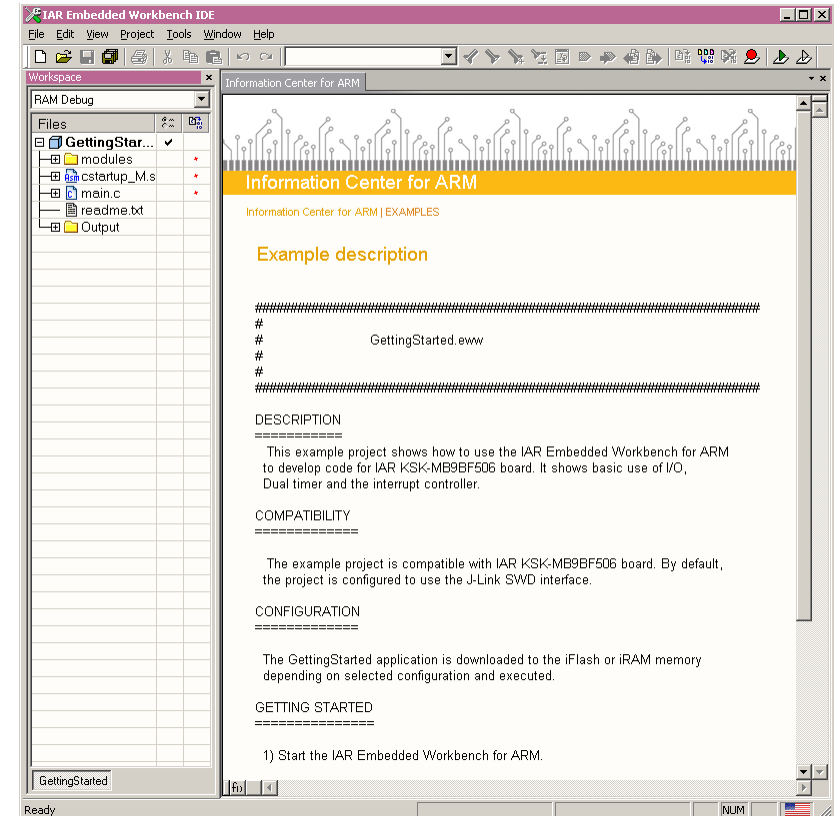


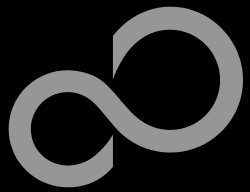


IAR Workbench – Main Window

■ IAR Workbench

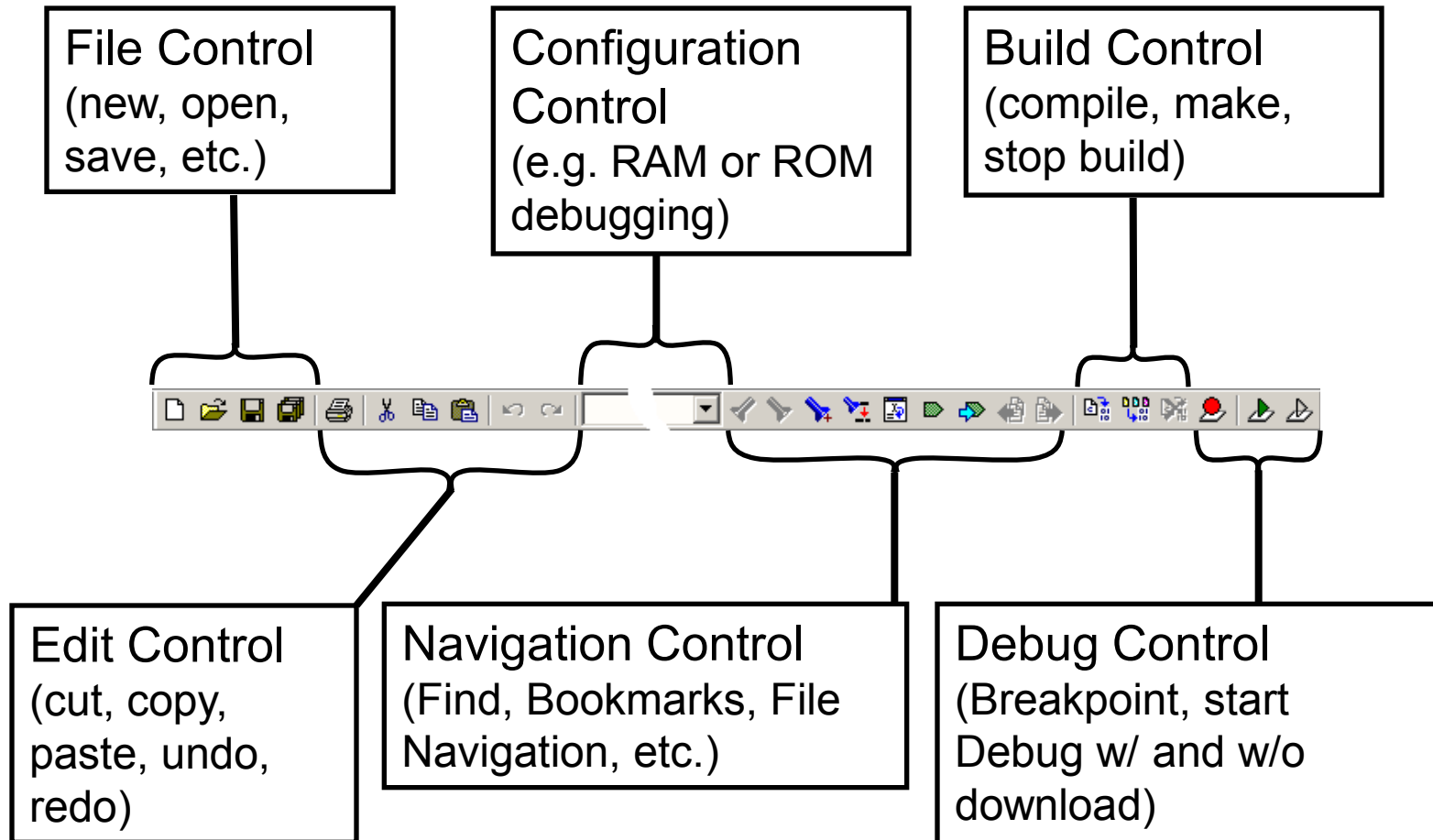
- Workspace on left side of Workbench window
 - Choose:
View→Workspace,
if hidden
- Source files on right side of Workbench window as tabbed windows
- Project can alternatively be opened by:
File→Open→Workspace→.eww*

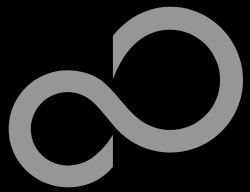




IAR Workbench – Menu Bar

■ Menu Bar





IAR Workbench – Workspace

■ IAR Workspace Window

Project Name

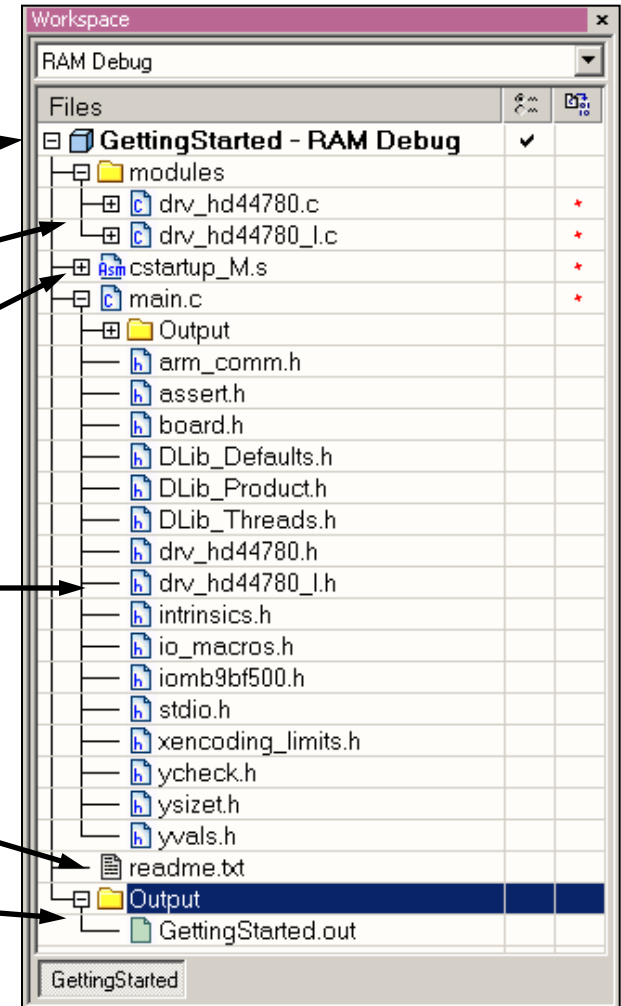
Sub Folder Modules

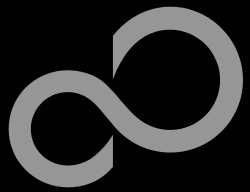
Main Modules

Module Includes

Project Description

Project Built Output

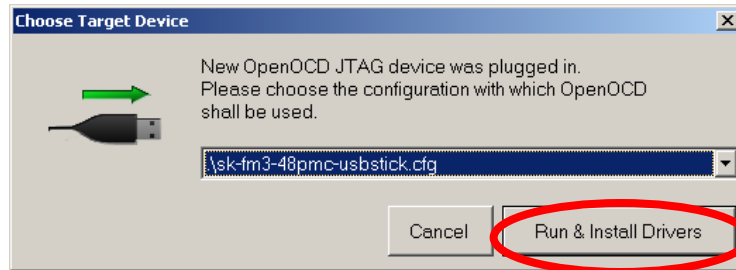




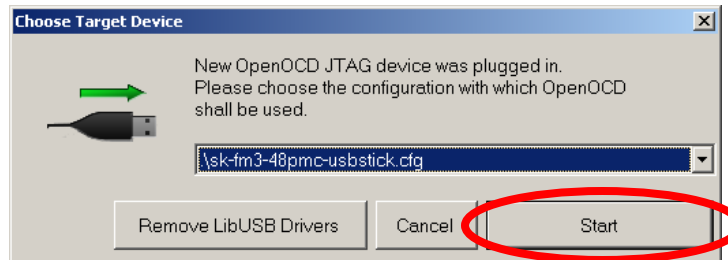
IAR Workbench - OpenOCD (GDB)

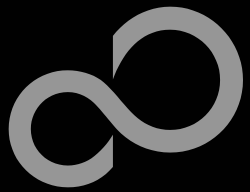
■ Setup OpenOCD Debugger

- Install drivers of OpenOCD Starter
- (A) Run & Install Drivers



- (B) Start OpenOCD GDB Server

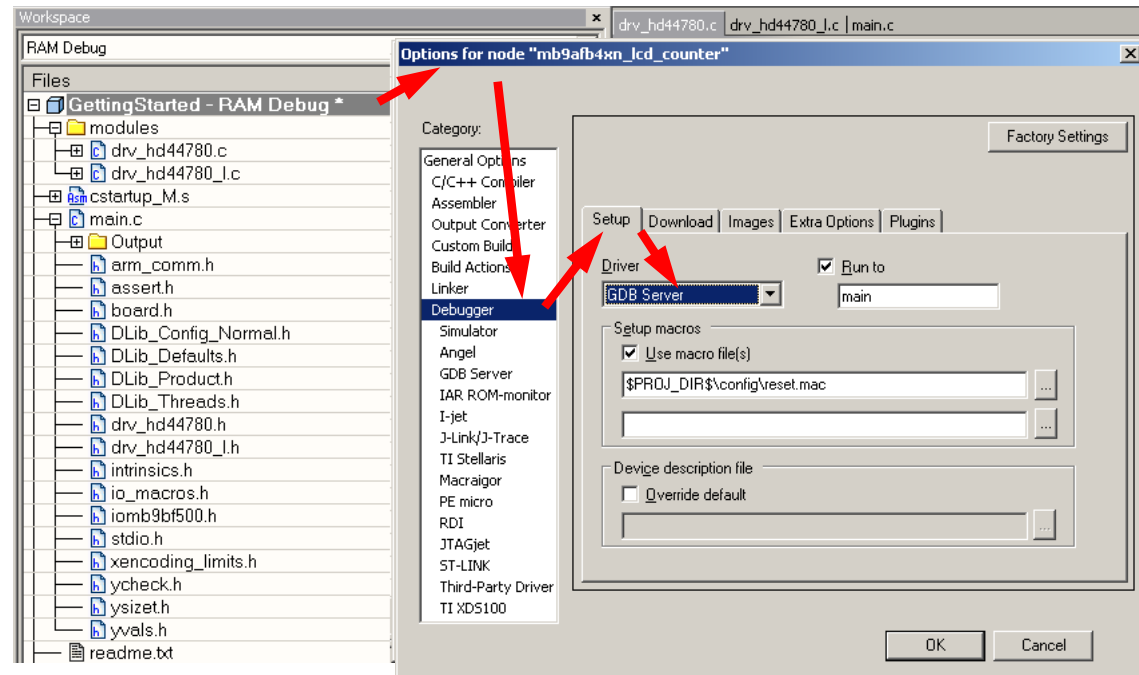


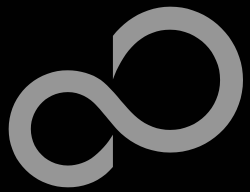


IAR Workbench - OpenOCD (GDB)

■ OpenOCD / GDB Server usage

- Mark Project File in Workspace
- Choose *Project*→*Options*
- Choose GDB Server in Debugger Setup

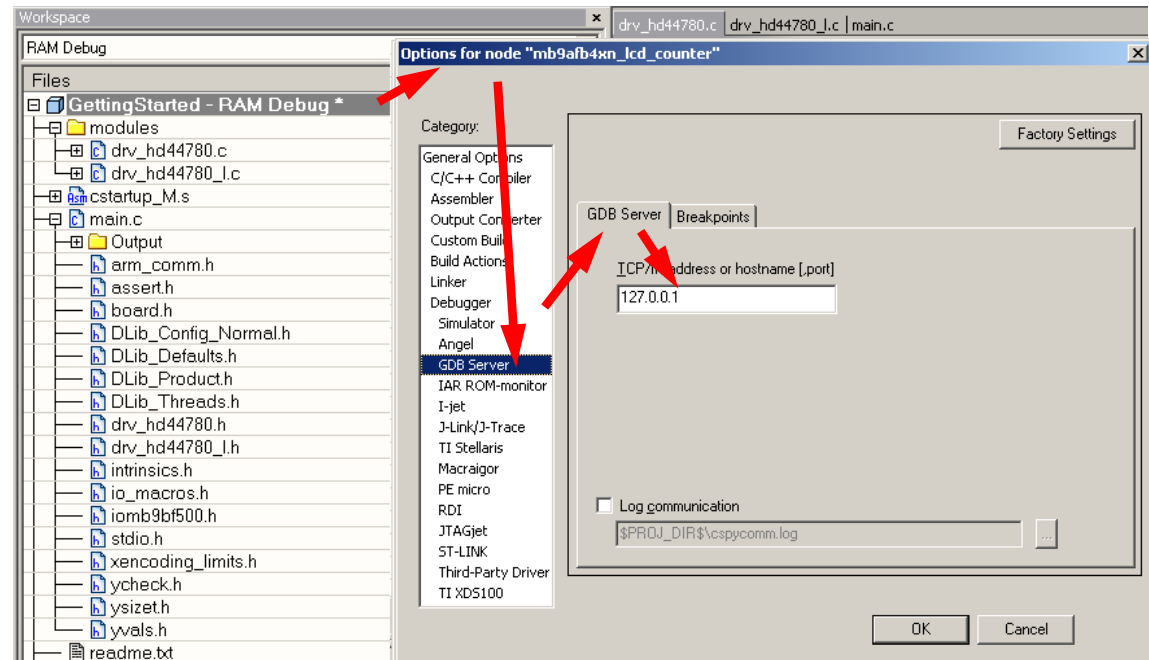


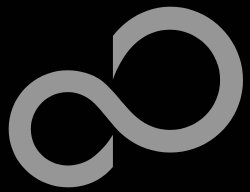


IAR Workbench - OpenOCD (GDB)

■ OpenOCD / GDB Server usage

- Set GDB TCP/IP Address: 127.0.0.1
- Start GDB Debugger with usual  Icon

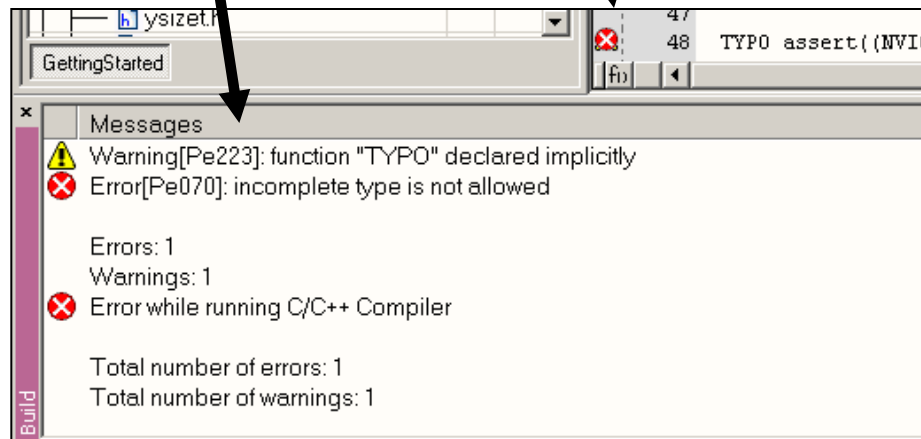
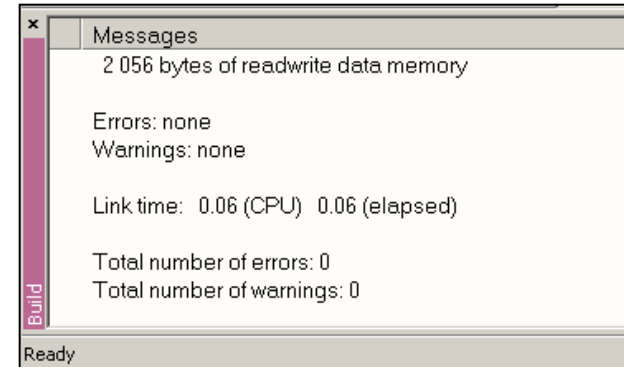


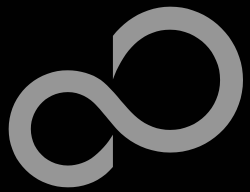


IAR Workbench – Making Project

■ Making the Project

- Use Make-Icon () , <F7> or Menu: *Project*→*Make*
- Check for no errors in Output window below
- Build errors are indicated by  or 
In Output window and Source view

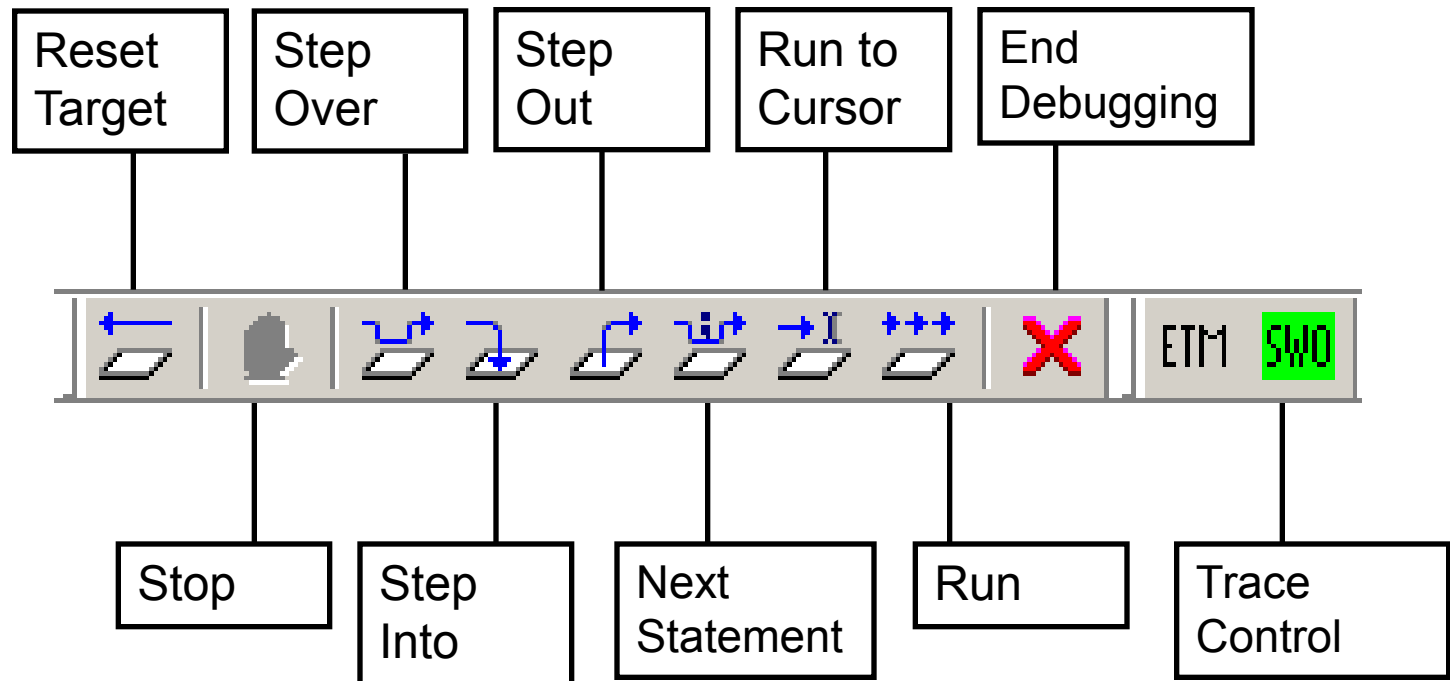


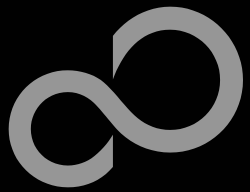


IAR Workbench – Download to Target

■ Download to Target and Start Debugging

- Use  Icon, <Ctrl>-D, or *Project*→*Download and Debug*
- A new menu bar will occur on successful connection to target





IAR Workbench – Debug (1)

■ Source Window

- The Source windows do not change contents but get additional information

- Current line (PC):
- Halted on Breakpoint:
- Halted on Data break (example):

165 CSW_TMR_bit.MOWT = 9;

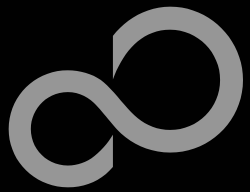
172 PSW_TMR_bit.POWT = 2;

148 Timer1IntClr = 1;

■ Disassembly Window

- Shows 'pure' disassembly view
- Shows mixed mode view

```
Disassembly
Goto [ ] Memory [ ]
0x1fffc3bc: 0x6001 STR r1, [r0]
if(! (BUT_PDIR&PSW2))
??main_4:
0x1fffc3be: 0x4824 LDR.N r0, ??DataTable10_33 [0x1fffc450] ; PDIR5
0x1fffc3c0: 0x6800 LDR r0, [r0]
0x1fffc3c2: 0x0780 LSLS r0, r0, #30
0x1fffc3c4: 0xd4dc BMI.N ??main_2 ; 0x1fffc380
Timer1Control_bit.TimerEn = 1;
0x1fffc3c6: 0x4821 LDR.N r0, ??DataTable10_32 [0x1fffc44c] ; Timer1Control
0x1fffc3c8: 0x6800 LDR r0, [r0]
0x1fffc3ca: 0xf050 0x0080 ORPS.W r0, r0, #128 ; 0x80
```

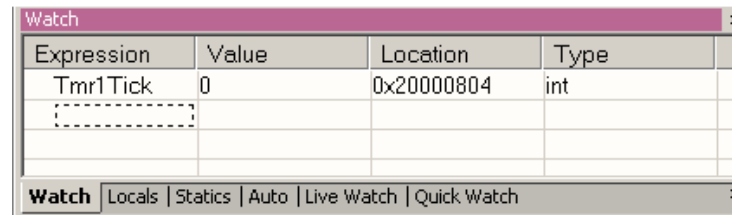


IAR Workbench – Debug (2)

■ Watch Window

- Watch

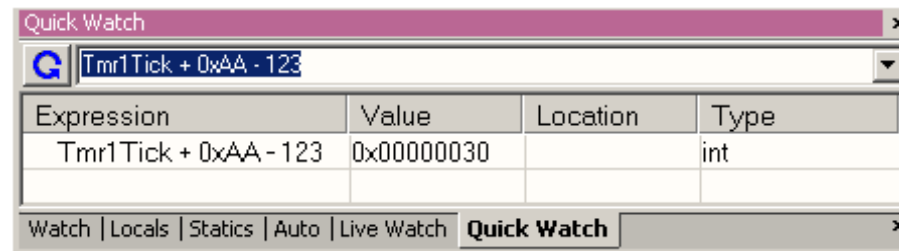
- Expressions/Variables have to be added by user and are updated by Halt/Breakpoint



Expression	Value	Location	Type
Tmr1Tick	0	0x20000804	int

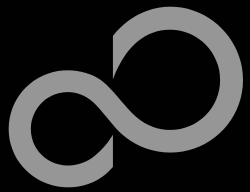
- Quick Watch

- The Quick watch allows the user to calculate and recalculate expressions even with variables



Expression	Value	Location	Type
Tmr1Tick + 0xAA - 123	0x00000030		int

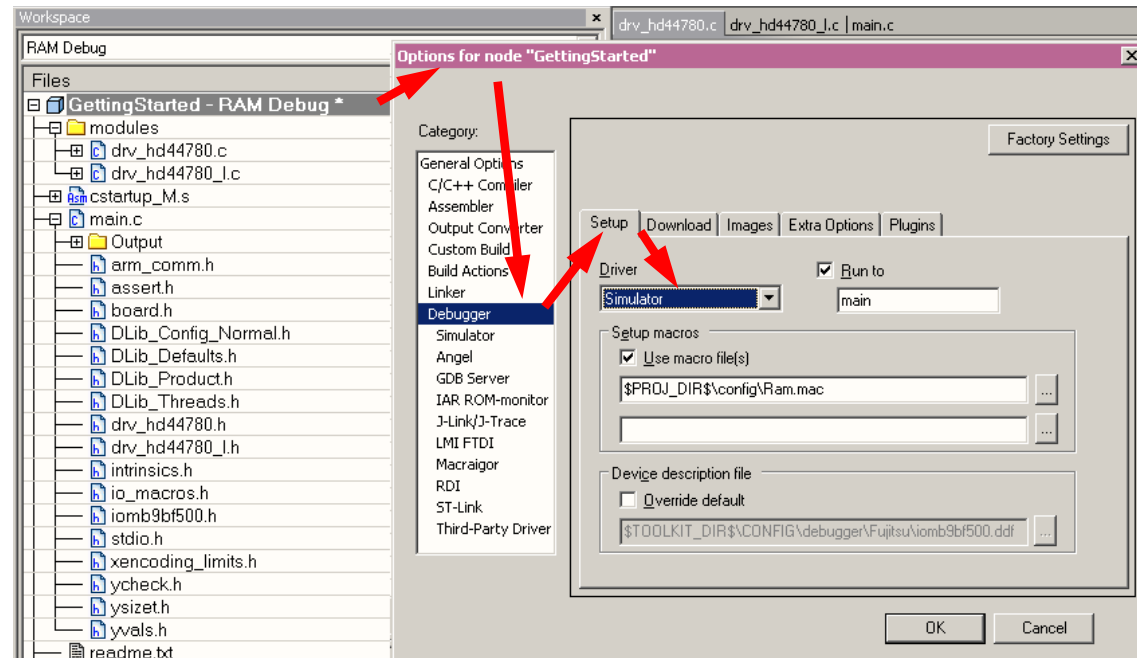
- The drop down menu memorizes the last typed contents

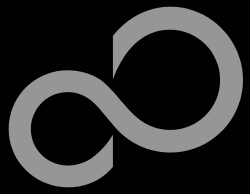


IAR Workbench – Simulator

■ Simulator

- Mark Project File in Workspace
- Choose *Project*→*Options*
- Choose Simulator in Debugger Setup
- Start Simulator with usual  Icon





KEIL μ Vision IDE and Debugger Getting Started

■ Install μ Vision from KEIL-CD or download latest version from KEIL Website

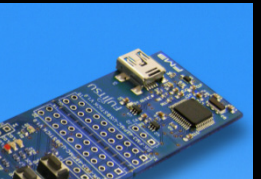
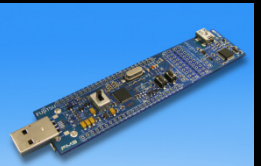
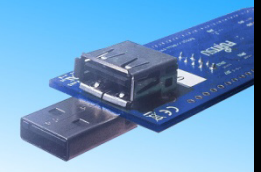
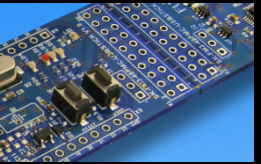
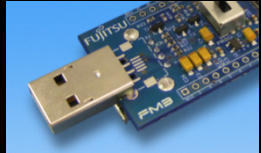
- Evaluation Version

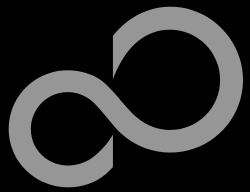
- <https://www.keil.com/demo/eval/arm.htm>
- Registration required

■ Install Colink Plugin for Keil RealView MDK (for OpenOCD usage)

- <http://www.coocox.net/CoLinkGuide/CoMDKPlugin.html>

■ Start μ Vision

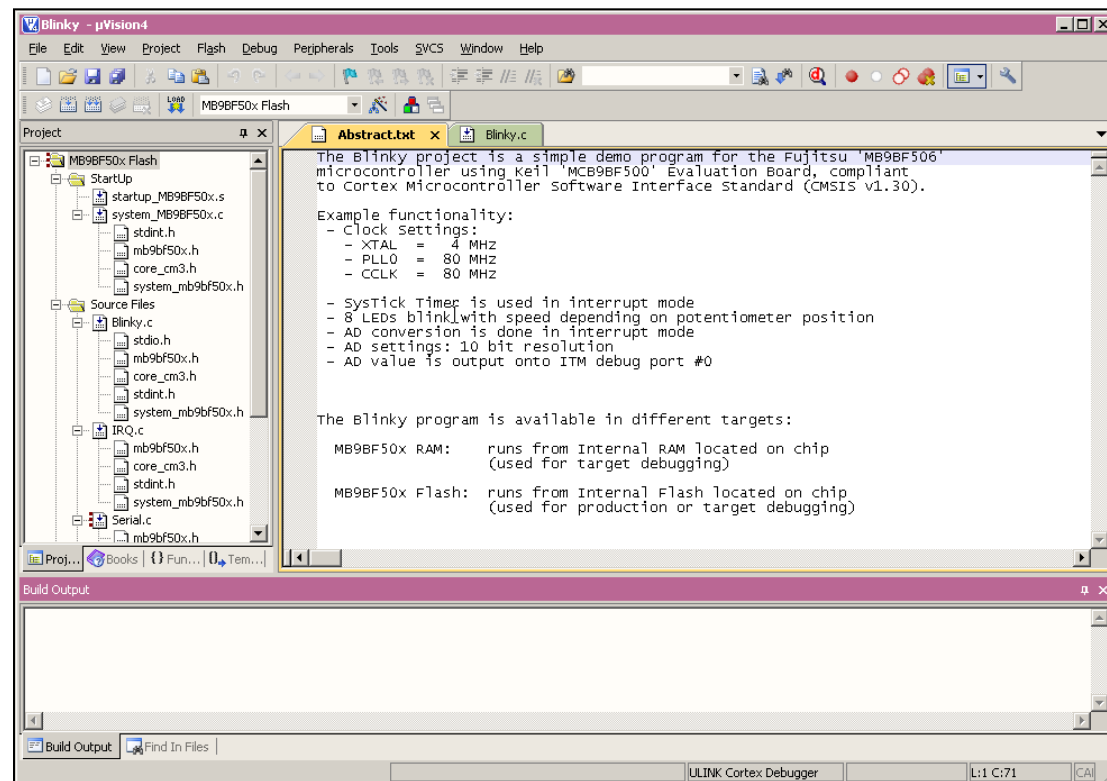


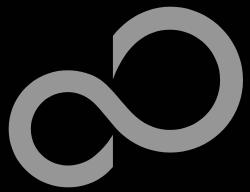


KEIL μ Vision – Getting Started

■ Choose Menu: **Project**→**Open Project...**

- Browse to: Examples\mb9afb4xn_lcd_counter-vXX\example\ARM\
- Choose *mb9afb4xn_lcd_counter.uvproj*

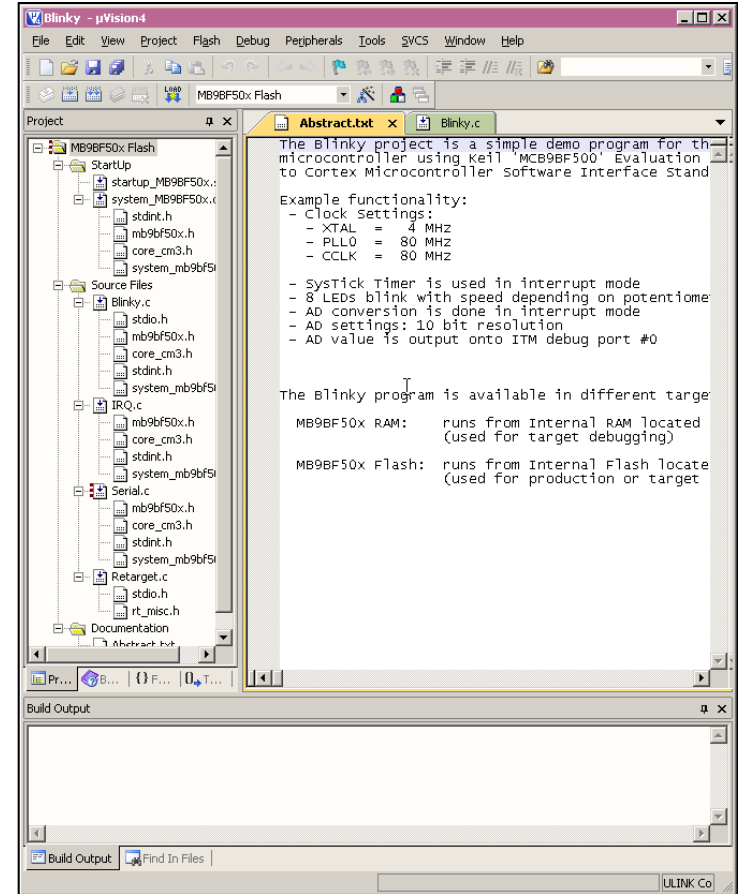


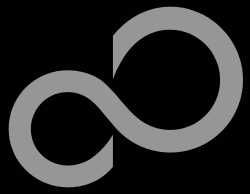


KEIL μ Vision – Main Window

■ KEIL μ Vision

- Project window on left side of IDE window
 - Choose:
View→Project Window
if hidden
- Source files on right side of IDE window as tabbed windows
- Output window on bottom side of IDE window

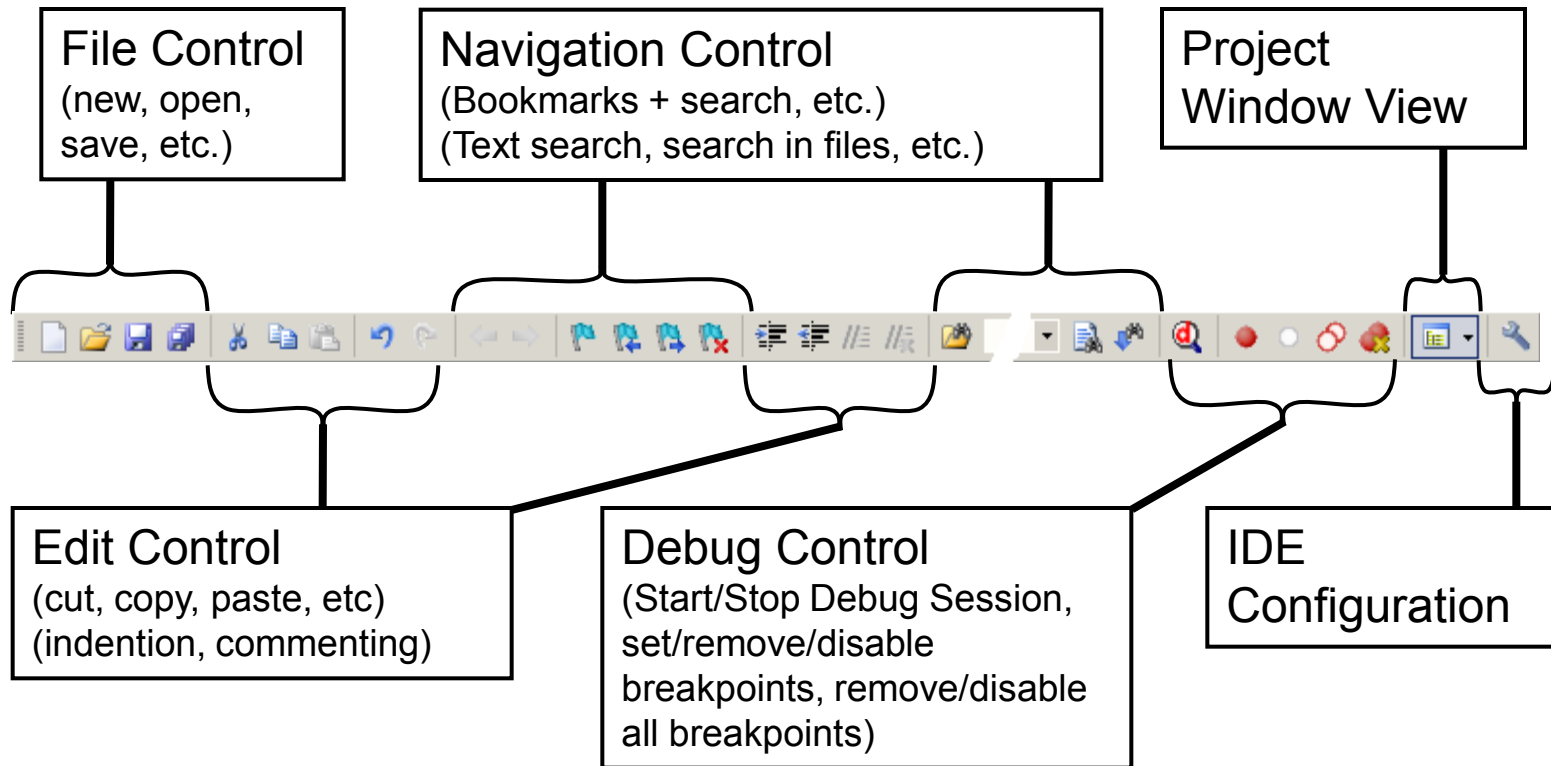




KEIL μ Vision – Menu Bars (1)

■ Menu Bar 1

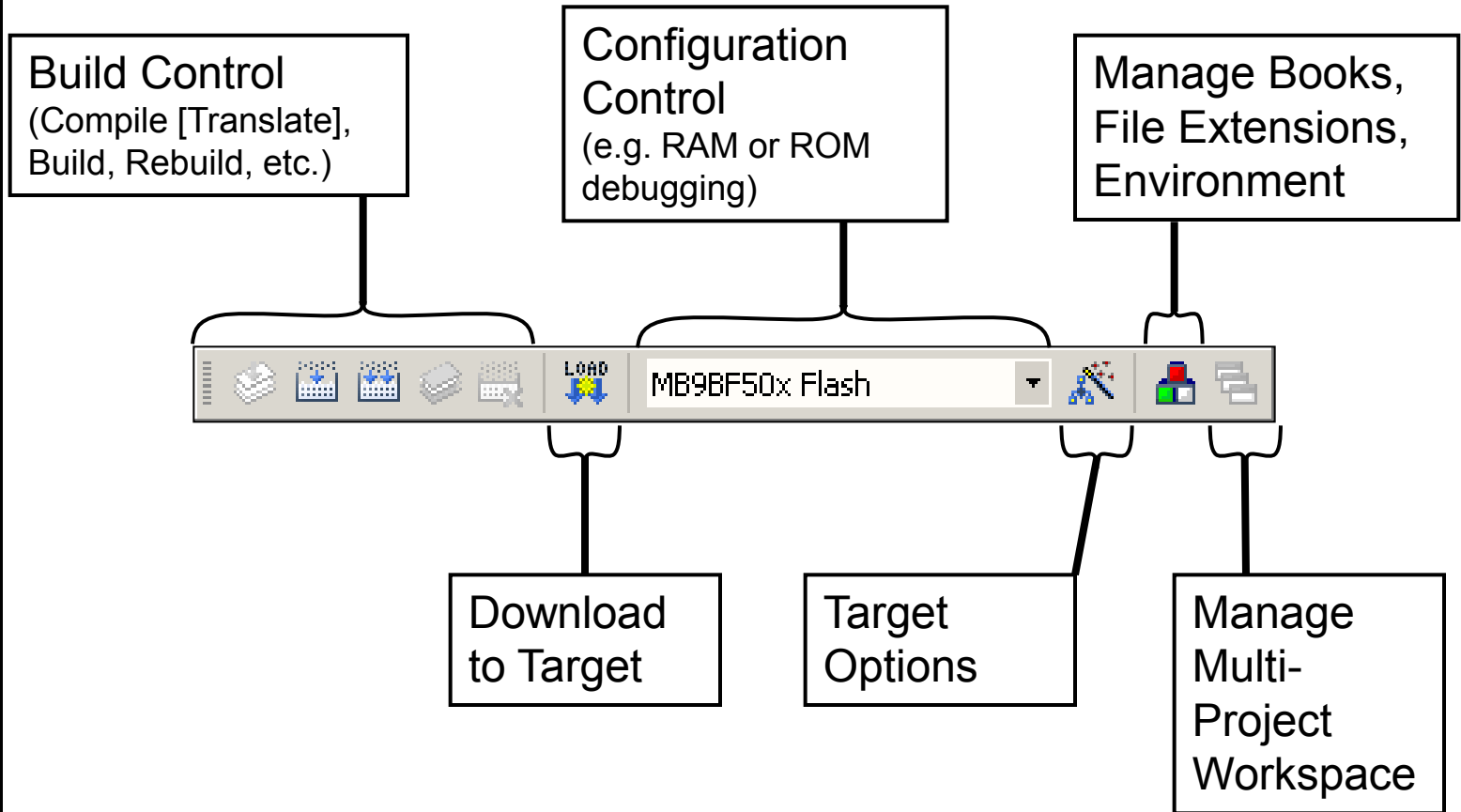
- Can be moved in bar window area or set floating

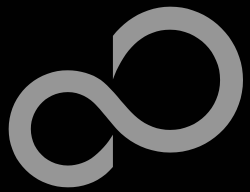


KEIL μ Vision – Menu Bars (2)

■ Menu Bar 2

- Can be moved in bar window area or set floating





KEIL μ Vision – Project Window

■ μ Vision Project Window

Project Name

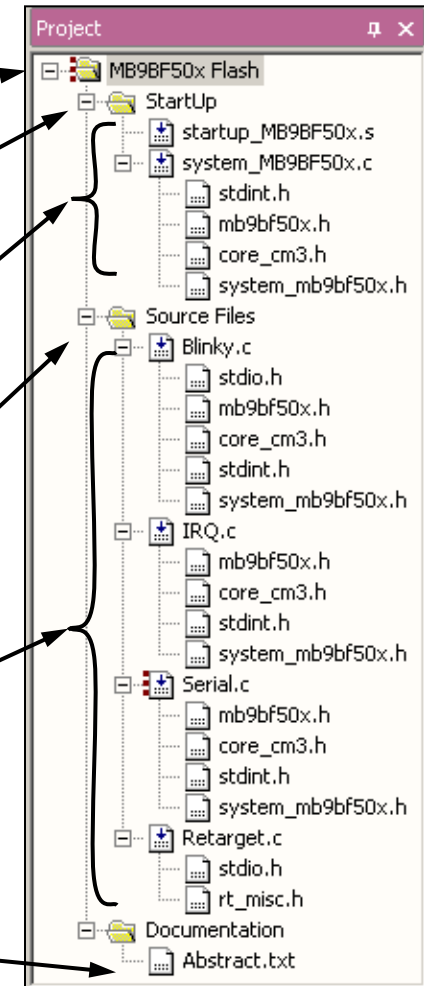
Startup Code Subfolder

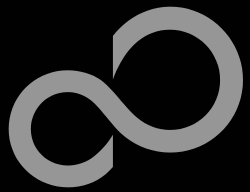
Startup Code Source and Header Files

Main Project Code Subfolder

Main Project Code Source and Header Files

Project Description Subfolder and Abstract File

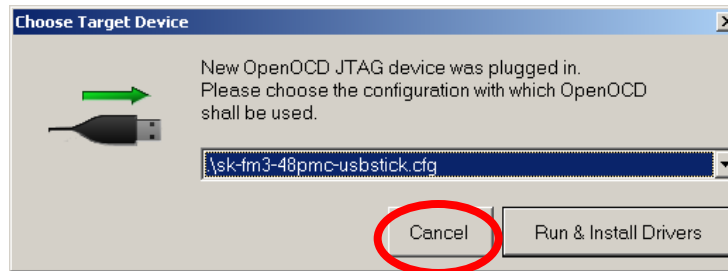




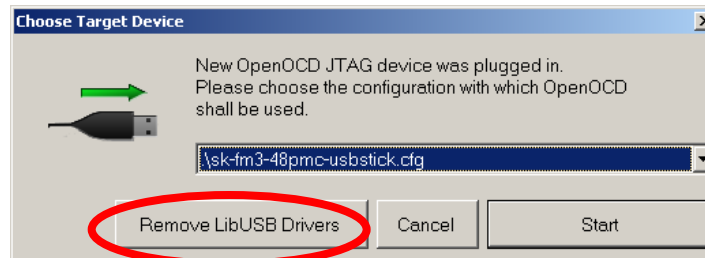
KEIL μ Vision – Setup OpenOCD

■ Setup OpenOCD Debugger

- Deinstall drivers of OpenOCD Starter
- (A) Cancel installation of drivers

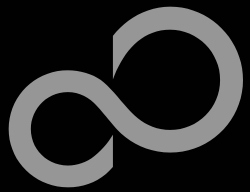


- (B) deinstall drivers at evaluation board connection



- Install Colink Plugin for Keil RealView MDK (for OpenOCD usage)

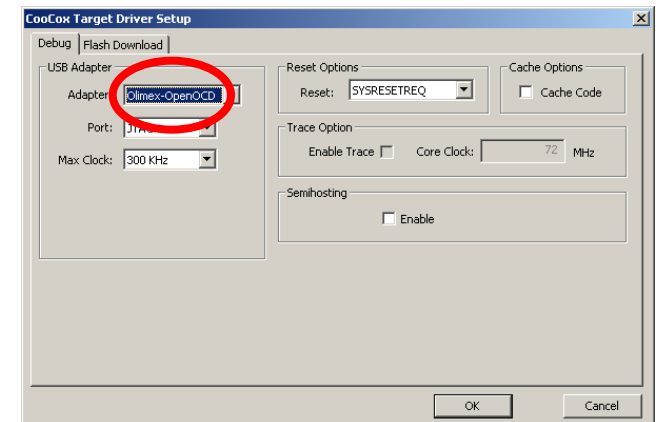
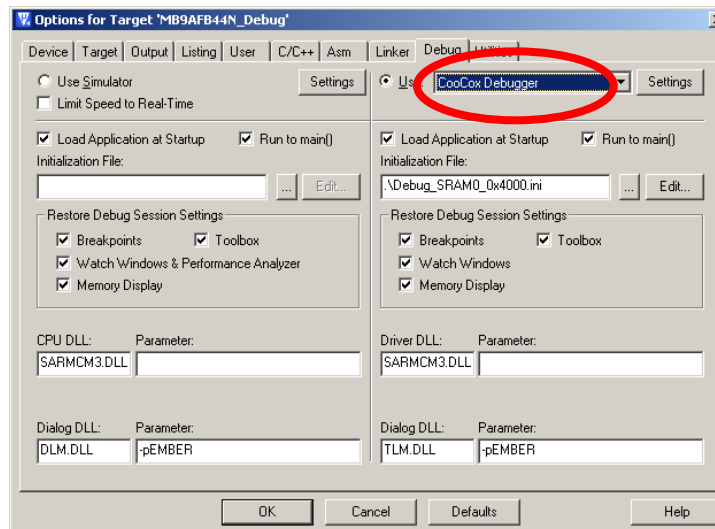
<http://www.coocox.net/CoLinkGuide/CoMDKPlugin.html>

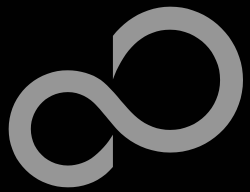


KEIL μ Vision – Setup OpenOCD

■ Setup OpenOCD Debugger

- Open Project Settings
Project→*Options for Target ,MB9AF312K_...‘...*
- Select *Debug* Tab
- Select *CooCox Debugger*
- Click *Settings*
- Choose Adapter *Olimex-OpenOCD*

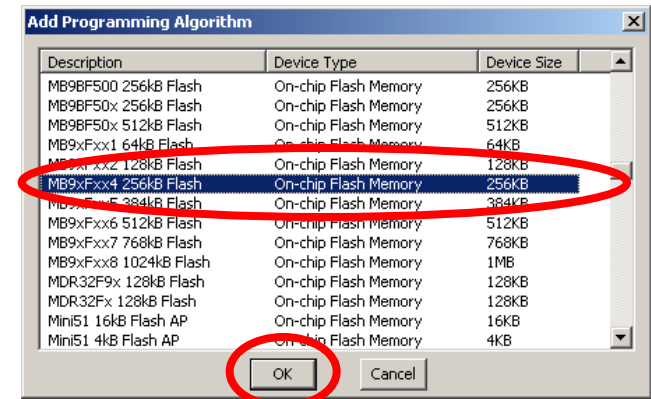
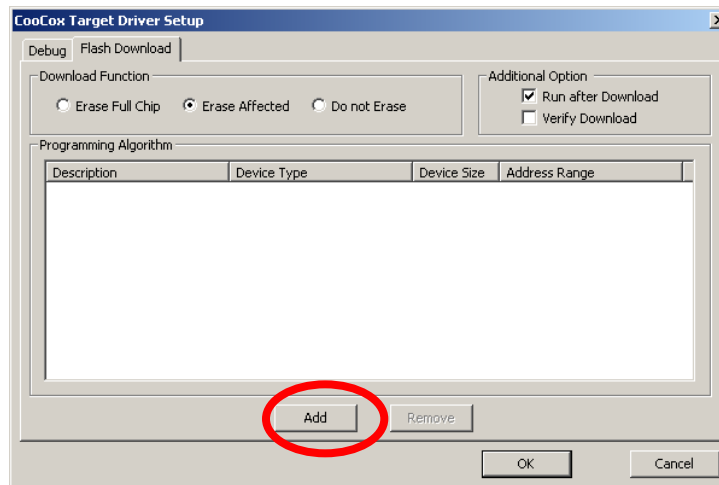


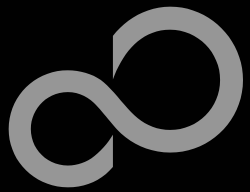


KEIL μ Vision – Setup OpenOCD

■ Setup OpenOCD Debugger (continued)

- Choose *Flash Download* Tab
- Click *Add*
- Choose *MB9xFxx2* device
- Click *OK*

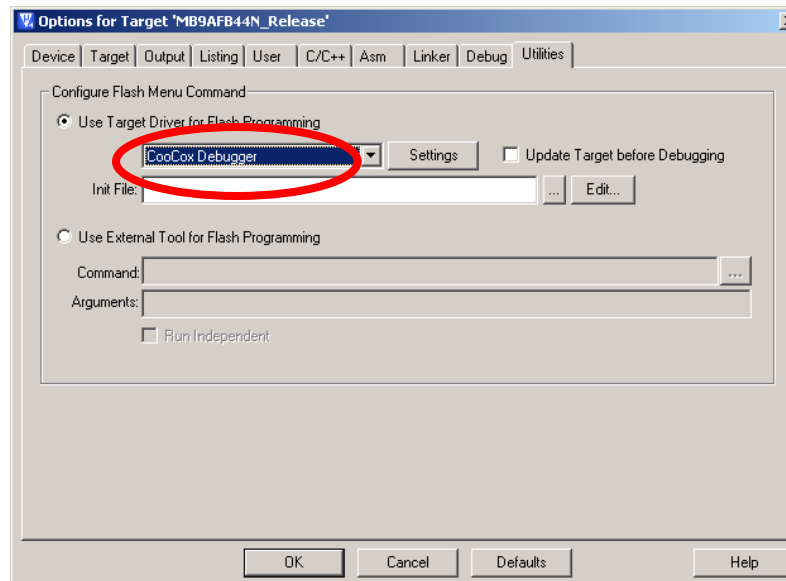


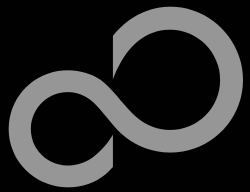


KEIL μ Vision – Setup OpenOCD

■ Setup OpenOCD Debugger (continued)

- Open Project Settings
Project→*Options for Target ,MB9AF312K_...‘...*
- Select *Utilities*Tab
- Select *CooCox Debugger*
- Click *Settings*

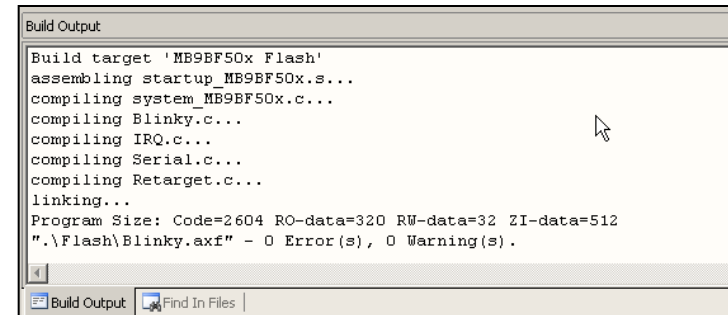




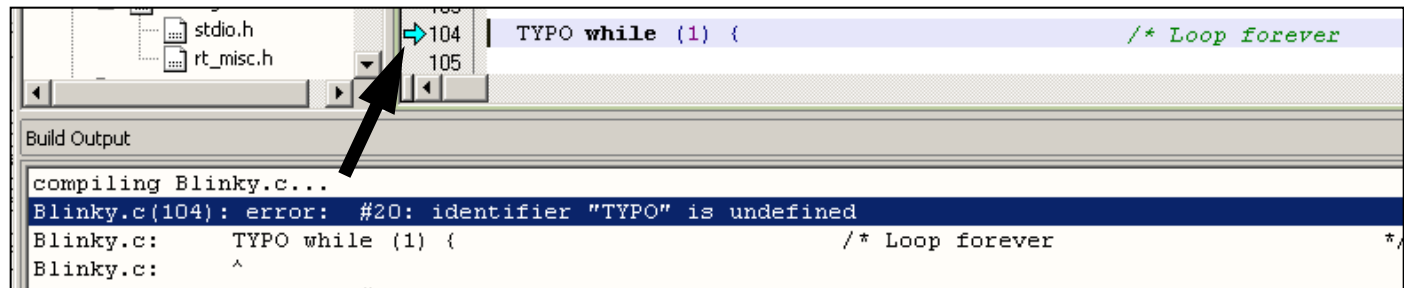
KEIL μ Vision – Making Project

■ Making the Project

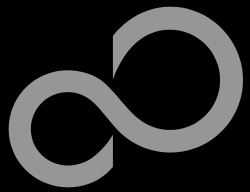
- Use Rebuild Icon () or *Project*→*Rebuild all target files*
- Check for no errors in Output window below
- Build errors are shown in Output window.
 - Can be double-clicked by showing the source line with a blue arrow



```
Build Output
Build target 'MB9BF50x Flash'
assembling startup_MB9BF50x.s...
compiling system_MB9BF50x.c...
compiling Blinky.c...
compiling IRQ.c...
compiling Serial.c...
compiling Retarget.c...
linking...
Program Size: Code=2604 RO-data=320 RW-data=32 ZI-data=512
".\Flash\Blinky.axf" - 0 Error(s), 0 Warning(s).
```



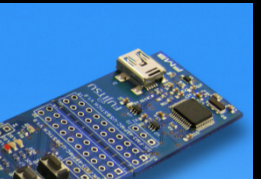
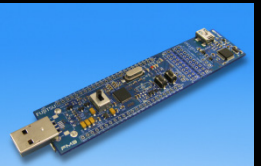
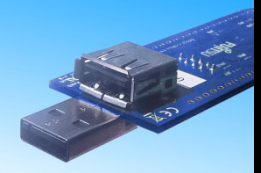
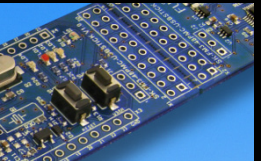
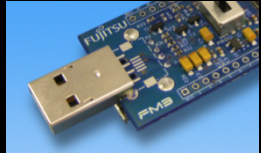
```
stdio.h
rt_misc.h
104 | TYPO while (1) { /* Loop forever
105 |
Build Output
compiling Blinky.c...
Blinky.c(104): error: #20: identifier "TYPO" is undefined
Blinky.c:    TYPO while (1) { /* Loop forever
Blinky.c:    ^
```

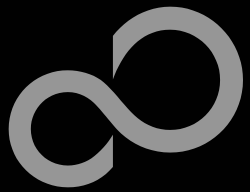


KEIL μ Vision – Debug (1)

■ Start Debugging

- Download to target first, when MCU Flash does not contain the current application openend and built in the IDE
 - Use Download Icon () or Menu: *Flash*→*Download*
- Start Debug Session
 - Use Start/Stop Debug Icon () or Menu: *Debug*→*Start/Stop Debug Session*
- Ending Debug Session
 - Use same way as for starting debug session

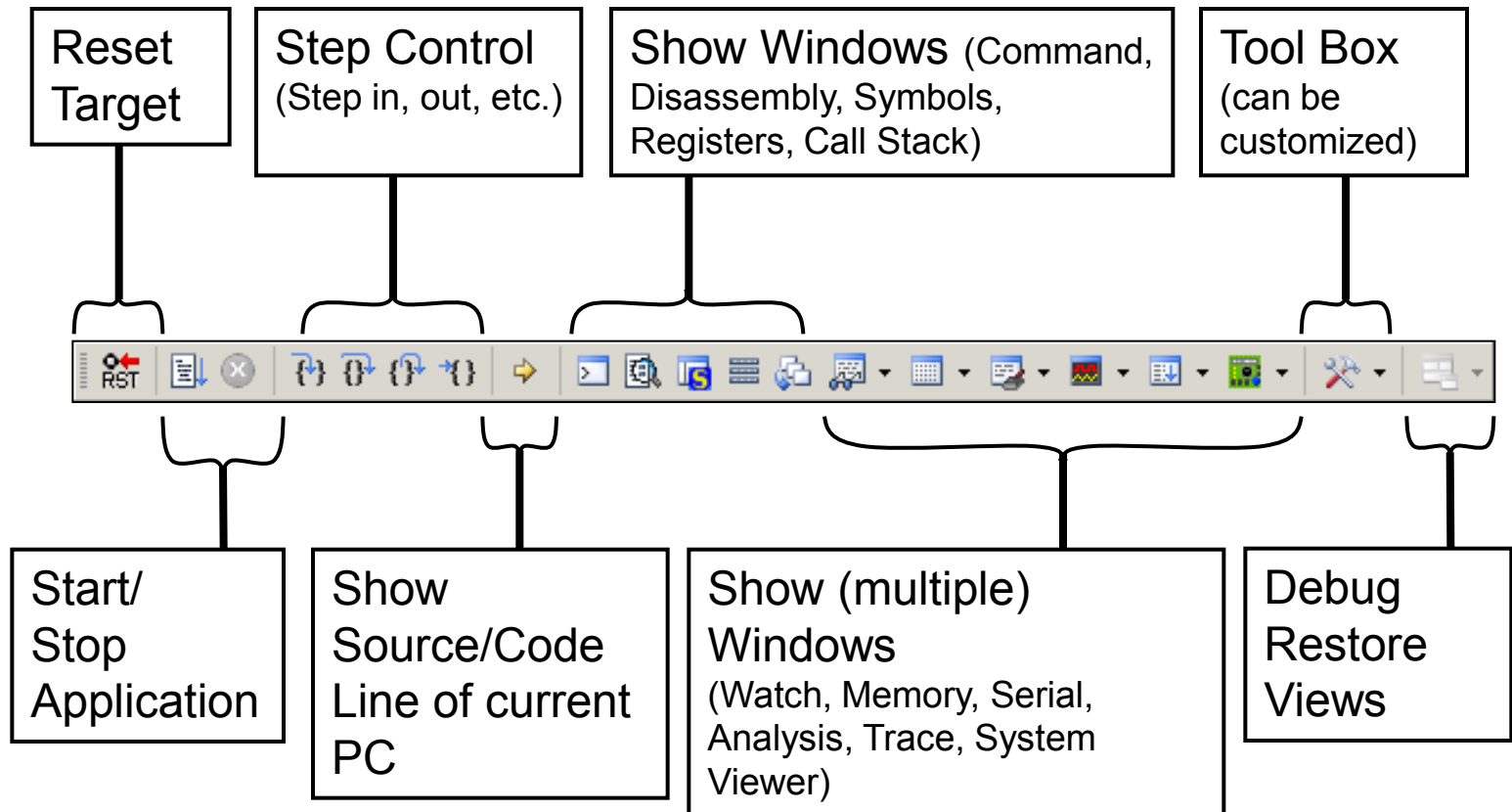


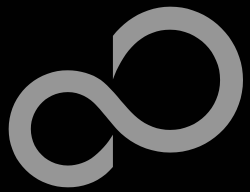


KEIL μ Vision – Debug (2)

■ Debugging Icon Bar

- During a Debug Session there will be visible a new icon bar





KEIL μ Vision – Debug (3)

■ Source View

- The Source windows do not change contents but get additional information

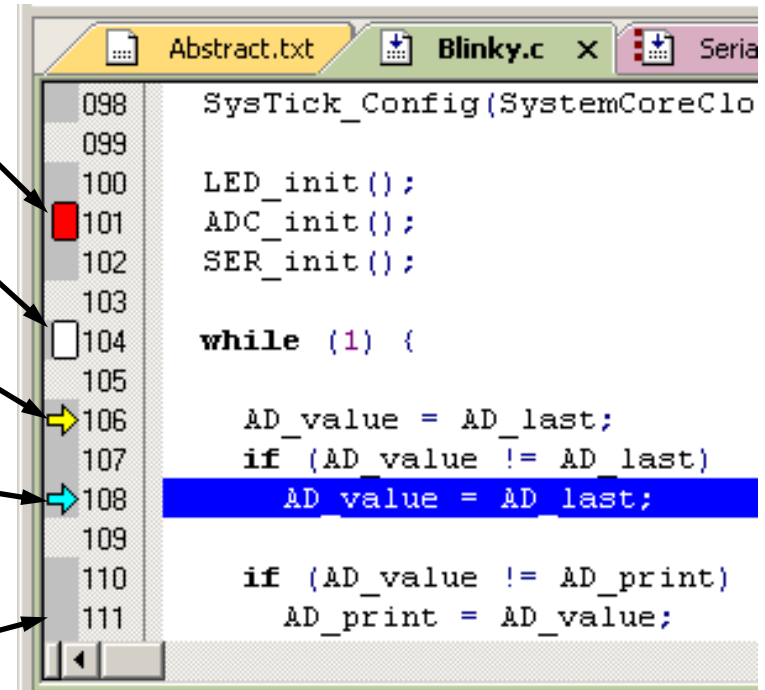
Active Breakpoint

Disabled Breakpoint

Current Program Counter

Current Cursor Line of Source Code

Code Lines with compiled Instructions (dark grey) 

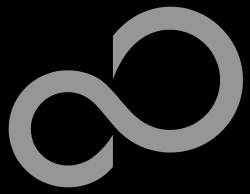


The screenshot shows the KEIL Source View window with the file 'Blinky.c' open. The code is as follows:

```
098 SysTick_Config(SystemCoreClo
099
100 LED_init();
101 ADC_init();
102 SER_init();
103
104 while (1) {
105
106     AD_value = AD_last;
107     if (AD_value != AD_last)
108         AD_value = AD_last;
109
110     if (AD_value != AD_print)
111         AD_print = AD_value;
```

Annotations in the image:

- Active Breakpoint:** Indicated by a red square on line 101.
- Disabled Breakpoint:** Indicated by a white square on line 104.
- Current Program Counter:** Indicated by a yellow arrow pointing to line 106.
- Current Cursor Line of Source Code:** Indicated by a cyan arrow pointing to line 108.
- Code Lines with compiled Instructions:** Lines 106, 107, 108, and 109 are highlighted in dark grey.



KEIL μ Vision – Debug (4)

■ Disassembly View

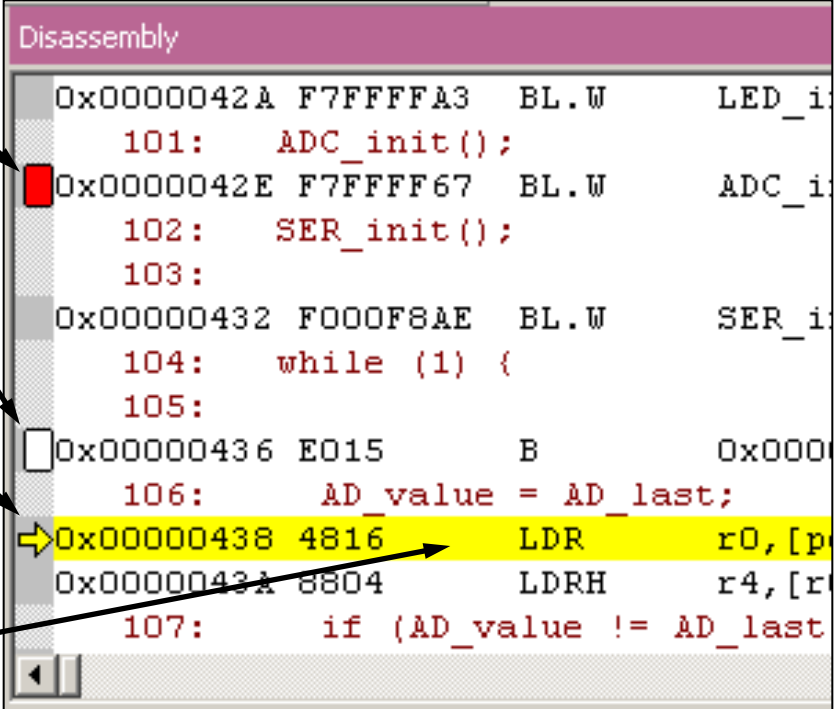
- Mixed mode is selectable and deselectable

Active Breakpoint

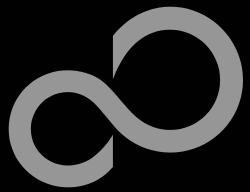
Disabled Breakpoint

Current Program Counter

Current Cursor Line of Code highlighted in yellow background ()



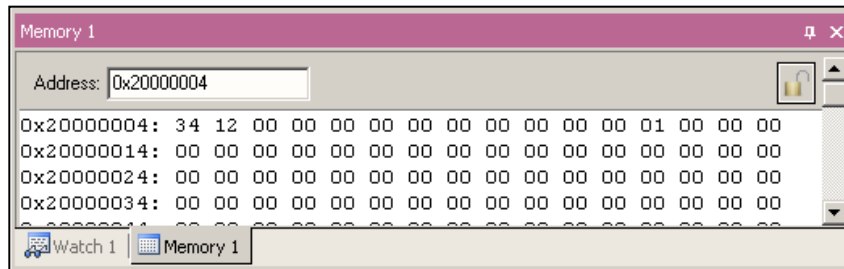
```
Disassembly
0x0000042A F7FFFA3 BL.W LED_i
101: ADC_init();
0x0000042E F7FFF67 BL.W ADC_i
102: SER_init();
103:
0x00000432 F000F8AE BL.W SER_i
104: while (1) {
105:
0x00000436 E015 B 0x0000
106: AD_value = AD_last;
0x00000438 4816 LDR r0,[p
0x0000043A 8804 LDRH r4,[r
107: if (AD_value != AD_last
```



KEIL μ Vision – Debug (5)

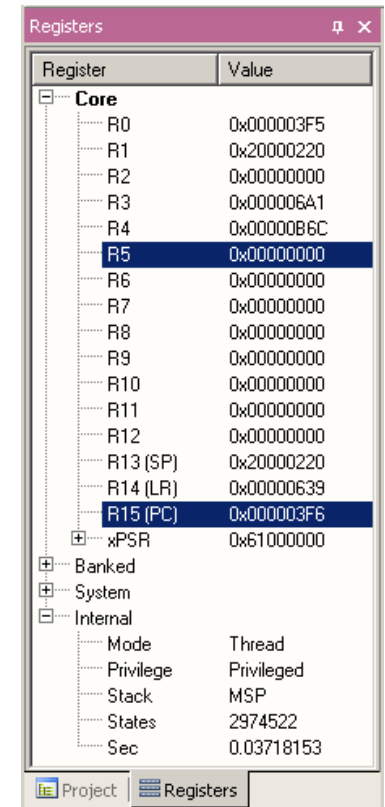
■ Memory Window

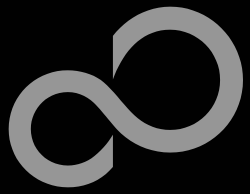
- Up to 4 Memory windows can be displayed in tabs
- Memory is updated during runtime
- Memory window tabs are shared with Watch windows



■ Register View

- Register view is a tab of the Project window
- Changes are highlighted in dark blue text background
- Register tree knots can be expanded



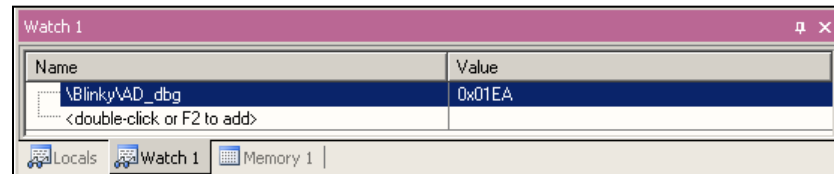


KEIL μ Vision – Debug (6)

■ Variable Windows

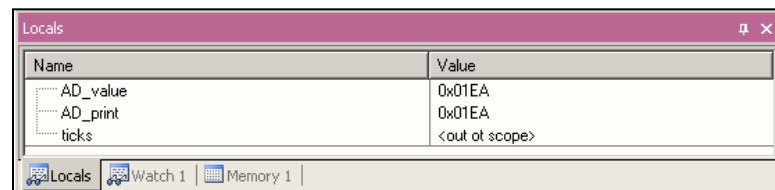
● Watch Windows

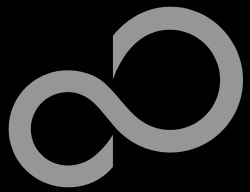
- Up to 2 Watch windows are sharing their tabs with e.g. Memory and Local views
- Updated during runtime
- Any changes are highlighted in dark blue text background color
- Displayed values can be changed by user during break



● Local View

- The local view shares the tab with e.g. Memory and Watch windows
- Any changes are highlighted in dark blue text background color
- Displayed values can be changed by user during break





KEIL μ Vision – Trace (ULINK ME)

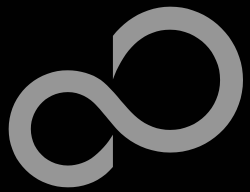
■ Trace via ITM

- Simple Trace views via Instrumentation Trace Macro is supported by μ LINK ME
 - Records
 - Exceptions
 - Counters



Type	Ovf	Num	Address	Data	PC	Dly	Cycles	Time[s]
ITM		0		41H			82975148	1.03718935
ITM		0		44H			82975293	1.03719116
ITM		0		20H		X	82988592	1.03735740
ITM		0		76H		X	82988592	1.03735740
ITM		0		61H		X	82988592	1.03735740
ITM		0		6CH		X	82988592	1.03735740
ITM		0		75H		X	82988592	1.03735740
ITM		0		65H		X	82988592	1.03735740
ITM		0		20H		X	82988592	1.03735740
ITM		0		3DH		X	82988592	1.03735740
ITM		0		20H		X	82988592	1.03735740
ITM		0		30H		X	82988592	1.03735740
ITM		0		78H		X	82988592	1.03735740
ITM		0		30H			82993831	1.03742289
ITM		0		31H		X	83001392	1.03751740
ITM		0		45H		X	83001392	1.03751740
ITM		0		42H		X	83001392	1.03751740
ITM		0		0DH		X	83001392	1.03751740
ITM		0		0AH		X	83001392	1.03751740
ITM		0		0DH		X	83001392	1.03751740

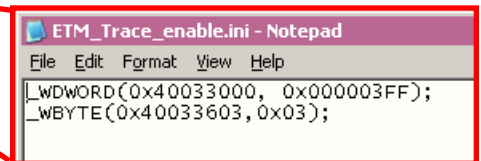
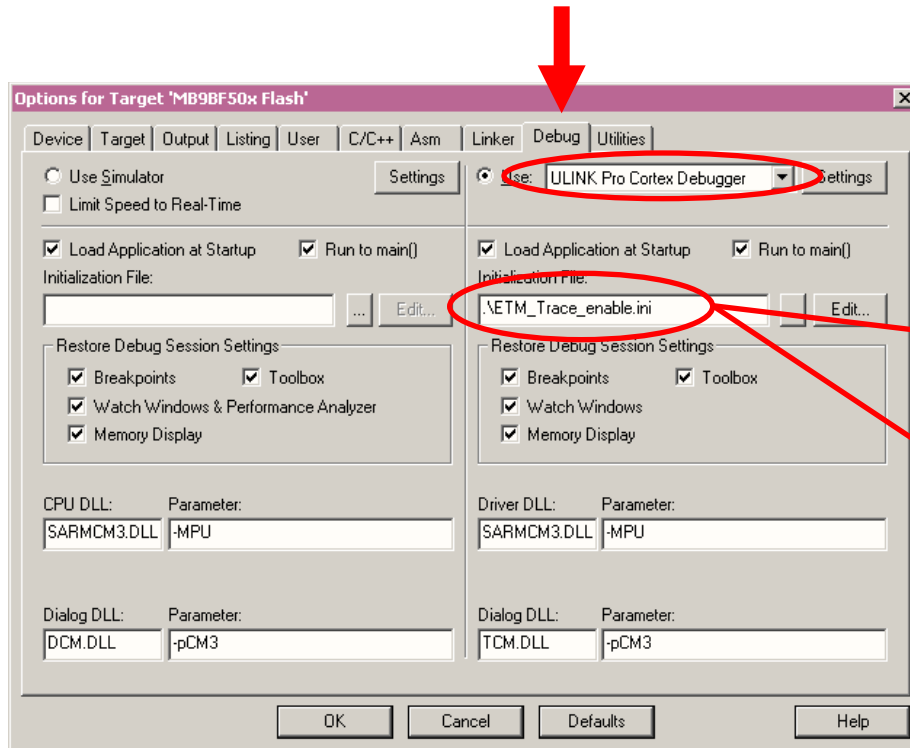
☒ Counter Events
☒ Exceptions
☒ PC Samples
☒ ITM Events
☒ Data Reads
☒ Data Writes



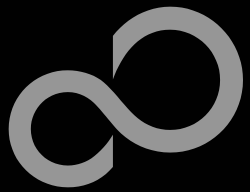
KEIL μ Vision – Trace (ULINK Pro) (1)

■ Trace via ETM

- Check settings in menu:
Flash→Configure Flash Tools... Tab:Debug



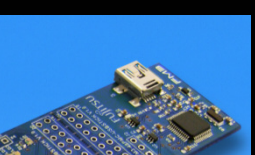
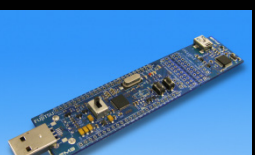
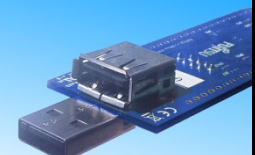
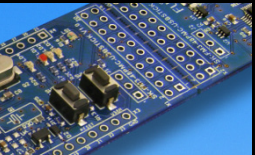
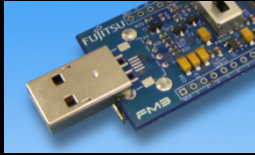
enables ETM pins



KEIL μ Vision – Trace (ULINK Pro) (2)

■ Instruction Trace

- Real Time Trace recording
- Output can be filtered by several ETM and ITM events
- Trace buffer is held in PC memory and transferred to μ Vision on break



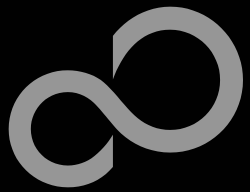
Instruction Trace

Filter: All

#	Type	Flag	Num	PC	Opcode	Instruction	Source Code
1048564	ETM			0x0000043E	4284	CMP r4,r0	
1048565	ETM			0x00000440	D001	BEQ 0x00000446	
1048566	ETM			0x00000446	42AC	CMP r4,r5	111: if (AD_value != AD_print) { /* Make sure that AD inter
1048567	ETM			0x00000448	D002	BEQ 0x00000450	
1048568	ETM			0x00000450	4814	LDR r0,[pc,#80] ;@0x000004A4	116: if (clock_1s) {
1048569	ETM			0x00000452	7800	LDRB r0,[r0,#0x00]	

Blinky.c x Abstract.txt stdio.h

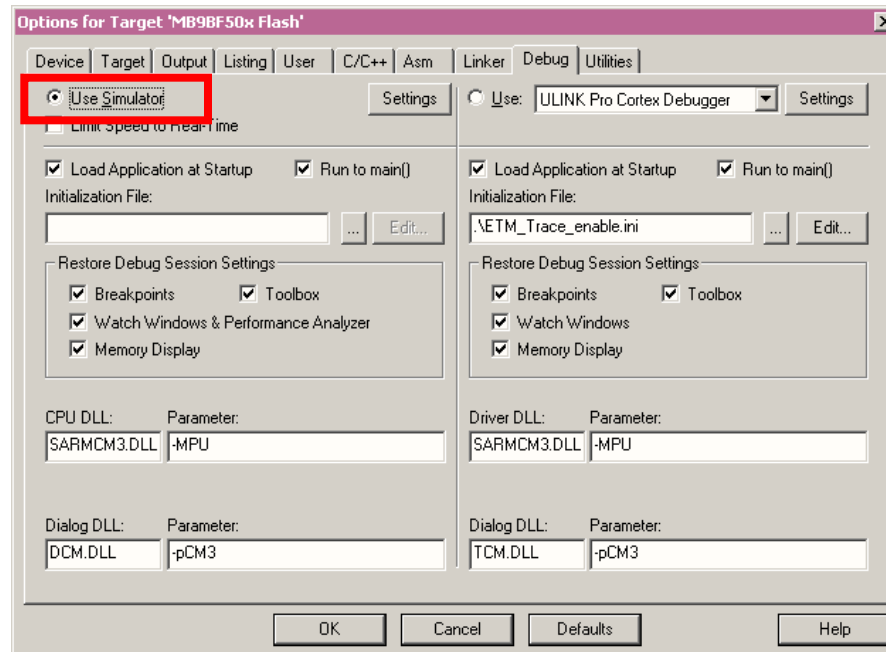
```
108 if (AD_value != AD_last) /* Make sure that AD interrupt did */
109     AD_value = AD_last; /* not interfere with value reading */
110
111 if (AD_value != AD_print) { /* Make sure that AD interrupt did */
112     AD_print = AD_value; /* Get unscaled value for printout */
113     AD_dbg = AD_value;
```

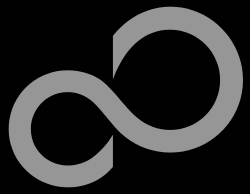


KEIL μ Vision – Simulator

■ Simulator

- The Core Simulator can be selected by the menu: *Flash*→*Configure Flash Tools...* and then choosing *Use Simulator*
- Look & feel is like using ULINK debugger
- Controlable also with *.ini files





Support

■ China:

fsla.mcu-kit.FSS@sg.fujitsu.com

■ Europe / EMEA:

mcu_ticket.FSEU@de.fujitsu.com

■ Japan:

https://jp.fujitsu.com/cgi-bin/fjid/formoutput_cs.cgi?FMT=/contact/csform/csque00901/form0010/1

■ USA:

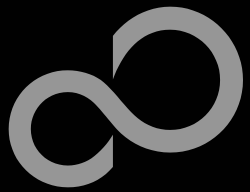
FSA_ARMMCU_TOOL@us.fujitsu.com

■ Other:

mcu_ticket.FSEU@de.fujitsu.com

■ Visit our global FM3 microcontroller website

<http://www.fujitsu.com/global/services/microelectronics/product/micom/roadmap/industrial/fm3/>



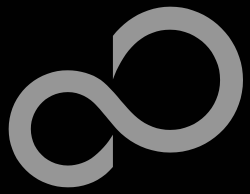
Further Steps

■ In order to learn more about Fujitsu's microcontrollers

- Visit our microcontroller website (Global)
 - <http://www.fujitsu.com/global/services/microelectronics/product/micom/roadmap/industrial/fm3/>
- Visit our microcontroller website (Europe)
 - <http://mcu.emea.fujitsu.com> (General Microcontrollers Website)
 - <http://emea.fujitsu.com/fm3> (FM3 Website)
 - http://mcu.emea.fujitsu.com/mcu_product/detail/MB9AF312KPMC.htm (MCU Website)
 - http://mcu.emea.fujitsu.com/mcu_tool/detail/SK-FM3-48PMC-USBSTICK.htm (EVB Website)
- See our application notes (Europe)
 - http://mcu.emea.fujitsu.com/mcu_product/mcu_all_appnotes.htm
- See our software examples (Europe)
 - http://mcu.emea.fujitsu.com/mcu_product/mcu_all_software.htm

■ Contact your local distributor ...

- for individual support
- to register for our monthly FM3 seminar
- to order the latest 'Fujitsu Micros DVD' containing all information regarding Fujitsu's 8-bit, 16-bit, and 32-bit microcontrollers



Fujitsu Semiconductor Europe

<http://www.fujitsu.com/emea/contact/microelectronics/salesoffices/>

■ Germany (Headquarters)

63225 Langen

Tel: +49 (0) 61 03 69 00

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Tel: +39 02 90 45 02 1

■ United Kingdom

Maidenhead

Tel: +44 (0) 1628 50 46 00

■ Hungary

1143 Budapest

Tel: +36 1 471 21 29

■ Turkey

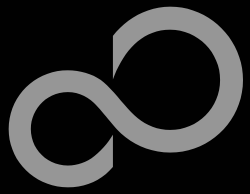
34180 Istanbul

Tel: +90 212 557 18 81

■ World Wide Web

- <http://emea.fujitsu.com/microelectronics>
- <http://mcu.emea.fujitsu.com>
- Contact: mcu_ticket.FSEU@de.fujitsu.com





Contacts – Distribution - Europe

■ European distributors

■ EBV Elektronik

www.ebv.com

■ Farnell

www.farnell.com

■ Glyn

www.glyn.de , www.glyn.ch

■ Melchioni Electronica

www.melchioni.it

■ MSC

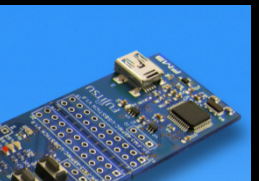
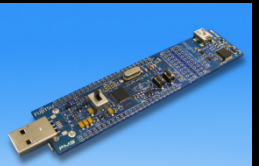
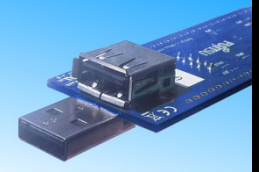
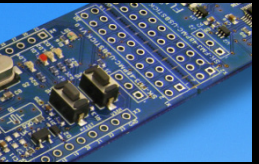
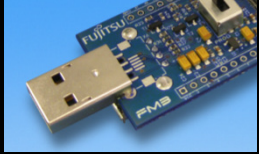
www.msc-ge.com

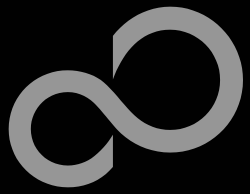
■ Rutronik Elektronische
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www.rutronik.com

■ SpecialIND

www.specialind.it





EG-Konformitätserklärung / EC declaration of conformity



Hiermit erklären wir, Fujitsu Semiconductor Europe GmbH, Pittlerstrasse 47, 63225 Langen, Germany dass dieses Board aufgrund seiner Konzipierung und Bauart sowie in den von uns in Verkehr gebrachten Ausführung(en) den grundlegenden Anforderungen der EU-Richtlinie 2004/108/EC "Elektromagnetische Verträglichkeit" entspricht. Durch eine Veränderung des Boards (Hard- und/ oder Software) verliert diese Erklärung ihre Gültigkeit!

We, Fujitsu Semiconductor Europe GmbH, Pittlerstrasse 47, 63225 Langen, Germany hereby declare that the design, construction and description circulated by us of this board complies with the appropriate basic safety and health requirements according to the EU Guideline 2004/108/EC entitled 'Electro-Magnetic Compatibility'. Any changes to the equipment (hardware and/ or software) will render this declaration invalid!

Note:

All data and power supply lines connected to this starter kit should be kept as short as possible, with a maximum allowable length of 3m. Shielded cables should be used for data lines. As a rule of thumb, the cable length used when connecting external circuitry to the MCU pin header connectors for example should be less than 20cm. Longer cables may affect EMC performance and cause radio interference.



Recycling (Europe)

■ Gültig für EU-Länder:

- Gemäß der Europäischen WEEE-Richtlinie und deren Umsetzung in landesspezifische Gesetze nehmen wir dieses Gerät wieder zurück.
- Zur Entsorgung schicken Sie das Gerät bitte an die folgende Adresse:

■ Valid for European Union Countries:

- According to the European WEEE-Directive and its implementation into national laws we take this device back.
- For disposal please send the device to the following address:

Fujitsu Semiconductor Europe GmbH
Warehouse/Disposal
Monzastraße 4a
D-63225 Langen



■ This board is compliant with China RoHS

