





### SK-FM3-48PMC-USBSTICK Quick Start





### **Warranty and Disclaimer**









The use of the deliverables (e.g. software, application examples, target boards, evaluation boards, starter kits, schematics, engineering samples of IC's etc.) is subject to the conditions of Fujitsu Semiconductor Europe GmbH ("FSEU") as set out in (i) the terms of the License Agreement and/or the Sale and Purchase Agreement under which agreements the Product has been delivered, (ii) the technical descriptions and (iii) all accompanying written materials.

Please note that the deliverables are intended for and must only be used for reference in an evaluation laboratory environment.

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.

Regarding hardware deliverables, FSEU warrants that they will be free from defects in material and workmanship under use and service as specified in the accompanying written materials for a duration of 1 year from the date of receipt by the customer.

Should a hardware deliverable turn out to be defect, FSEU's entire liability and the customer's exclusive remedy shall be, at FSEU's sole discretion, either return of the purchase price and the license fee, or replacement of the hardware deliverable or parts thereof, if the deliverable is returned to FSEU in original packing and without further defects resulting from the customer's use or the transport. However, this warranty is excluded if the defect has resulted from an accident not attributable to FSEU, or abuse or misapplication attributable to the customer or any other third party not relating to FSEU or to unauthorised decompiling and/or reverse engineering and/or disassembling.

FSEU does not warrant that the deliverables do not infringe any third party intellectual property right (IPR). In the event that the deliverables infringe a third party IPR it is the sole responsibility of the customer to obtain necessary licenses to continue the usage of the deliverable.

In the event the software deliverables include the use of open source components, the provisions of the governing open source license agreement shall apply with respect to such software deliverables.

To the maximum extent permitted by applicable law FSEU disclaims all other warranties, whether express or implied, in particular, but not limited to, warranties of merchantability and fitness for a particular purpose for which the deliverables are not designated.

To the maximum extent permitted by applicable law, FSEU's liability is restricted to intention and gross negligence. FSEU is not liable for consequential damages.

Should one of the above stipulations be or become invalid and/or unenforceable, the remaining stipulations shall stay in full effect.

The contents of this document are subject to change without a prior notice, thus contact FSEU about the latest one.

Fujitsu Semiconductor Europe - http://emea.fujitsu.com/microelectronics



### 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.

PDF XChange Viewer is free of charge and can be downloaded at the website of the manufacturer "Tracker Software":

http://www.tracker-software.com/product/pdf-xchange-viewer

Fujitsu Semiconductor Europe (FSEU) is NOT selling or reselling PDF XChange. Please directly contact the manufacturer: <u>http://www.tracker-software.com</u>



### **CD** Contents











#### Software (Installation)

- FLASH USB DIRECT Programmer
- FLASH Serial Programmer
- <u>SerialPortViewerAndTerminal</u>
- Fujitsu OpenOCD Starter (GUI)
  - Fujitsu USB Wizard download via http://emea.fujitsu.com/fm3

#### Documents

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

(utilities\programmer\_usb\setup.exe)
(utilities\programmer\_uart\setup.exe)
(utilities\serial\_port\_viewer\setup.exe)
(utilities\openocd\_starter\setup.exe)



All Rights Reserved.© Fujitsu Limited 2012



# **CD Contents (continued)**









default flashed





- Host / Device switchable: Host: Mass Storage, Keyboard, Mouse; Device: LibUSB <u>sk-fm3-48pmc-usbstick\_usb\_device\_libusb\_communication-v12</u> <u>Driver</u> / <u>Win-Exe</u> / <u>Firmware</u>
- 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: <u>sk-fm3-48pmc-usbstick\_usb\_host\_massstorage\_bootloader-v10</u>

**Firmware** 

- Compiled code can be found in subfolder *example*\*IAR*\*output*\*release*\*exe*
- Please copy <u>examples</u> folder on <u>CD</u> to harddrive before using them!
- Click <u>here</u> to start installation of contents from CD to hard drive
- Have a look for the latest version: <u>http://emea.fujitsu.com/fm3</u>

Fujitsu Semiconductor Europe - http://emea.fujitsu.com/microelectronics



# **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

Fujitsu Semiconductor Europe - http://emea.fujitsu.com/microelectronics 6 A



### **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 µVision



Create Own USB Applications using Fujitsu USB Wizard

### Contacts

Fujitsu Semiconductor Europe - http://emea.fujitsu.com/microelectronics



### 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-I<sup>2</sup>C 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

Fujitsu Semiconductor Europe - http://emea.fujitsu.com/microelectronics















#### • The microcontroller pins











Pin	Pin-name	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/DTTI0X_0/ADTG_2	
6	P3A/RTO00_0/TIOA0_1/RTCCO_2/SUBOU T_2	R-RGB LED
7	P3B/RTO01_0/TIOA1_1	
8	P3C /RTO02_0 /TIOA2_1	G-RGB LED
9	P3D/ RT003_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	ΙΝΙΤΧ	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

Fujitsu Semiconductor Europe - http://emea.fujitsu.com/microelectronics



### • The microcontroller pins (continued)

Pin	Pin-name	Pin-Function on SK-FM-100PMC		Pin	Pin-name	Pin-Function on SK-FM-100PMC
25	P10/ AN00	Fotoresistor LDR 03		37	P00/ TRSTX	TRSTX
26	P11/ AN01/SIN1_1 /INT02_1/ FRCK0_2/ IC02_0/ WKUP1	USB Overcurrent		38	P01 /TCK / SWCLK	тск
27	P12/ AN02/ SOT1_1/ IC00_2	USB HOST Pull- Down		39	P02 /TDI	TDI
28	P13/ AN03/ SCK1_1/ IC01_2/ RTCCO_1/ SUBOUT_1	USB VBUS EN		40	P03 / TMS / SWDIO	TMS
29	P14/ AN04/ SIN0_1/ INT03_1/ IC02_2		Ĩ	41	P04 /TDO /SWO	TDO
30	P15/ AN05/ SOT0_1/ IC03_2	USB ID	Ĩ	42	P0F/ NMIX / CROUT_1 / RTCCO_0 /SUBOUT_0 / WKUP0	SW2 Switch
31	AVCC	vcc		43	P61 / SOT5_0 / TIOB2_2 / UHCONX /DTTI0X_2	UHCONX
32	AVRH	vcc		44	P60 / SIN5_0/ TIOA2_2 / INT15_1/ IC00_0/ WKUP3	USB VBUS INT
33	AVSS	GND		45	USBVCC	vcc
34	P23/ AN06/ SCK0_0/ TIOA7_1			46	P80/ UDM0	UDM0
35	P22 / AN07 / SOT0_0 / TIOB7_1	UART0 (TXD)		47	P81 /UDP0	UDP0
36	P21 / SIN0_0 / INT06_1 / WKUP2	UART0 (RXD)		48	VSS	GND











Fujitsu Semiconductor Europe - http://emea.fujitsu.com/microelectronics



#### The jumpers (bottom side)



Fujitsu Semiconductor Europe - http://emea.fujitsu.com/microelectronics













• 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

Fujitsu Semiconductor Europe - http://emea.fujitsu.com/microelectronics













#### 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.



#### 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_DIM	MABLE 1 in led.h */
LED DUTY(LED RED, 128);	<pre>// Set duty of red LED to 128(0255)</pre>
LED DUTY(LED GREEN, 128);	<pre>// Set duty of green LED to 128(0255)</pre>
LED_DUTY(LED_BLUE, 128);	// Set duty of blue LED to 128(0255)
Figure 3-5: How to use the user R	GB 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

Fujitsu Semiconductor Europe - http://emea.fujitsu.com/microelectronics













### Step 1

- Insert the CD ROM
- Switch SW3 to Prog Mode



 Connect the evaluation board to the PC

















### 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"















### Step 3 (continued)

 While asking for Windows Logo certification, click "Continue Anyway"

• The driver installation was successful.

Step 4

Click finish



Fujitsu Semiconductor Europe - http://emea.fujitsu.com/microelectronics













### 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"

















### 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















### Step 5

- Start the installation (utilities\ programmer\_usb\setup.exe)
   USB DIRECT Programmer
- Click "Next"

Choose a optional installation
directory and click "Next"

InstallShield Wizard		×
	Welcome to the InstallShield Wizard for FUJITSU USB DIRECT Programmer The InstallShield® Wizard will install FUJITSU USB DIRECT Programmer on your computer. To continue, click Next.	
InstallShield Wizard		x
Choose Destination Location Select folder where Setup will inst	all files.	
Setup will install FUJITSU USB DI	RECT Programmer in the following folder.	
To install to this folder, click Next. another folder.	To install to a different folder, click Browse and select	
Destination Folder		
C:\\Fujitsu\FUJITSU USB DIF	ECT Programmer Browse	
InstallShield		_
	< <u>B</u> ack <u>Next</u> Cancel	











 The USB DIRECT Programmer was now succesfull installed.

InstallShield Wizard	
	InstallShield Wizard Complete Setup has finished installing FUJITSU USB DIRECT Programmer on your computer.
	< Back Finish Cancel





#### Step 6

 Start the USB DIRECT Programmer from Start Menu

FLASH USB DIRECT Pr     SELECT	ogrammer		- FLASH INFORM	ATION-		
Target MCU       Hex File       COM (1-255)	Start Addr 00000000H 00100000H 200C0000H	End A 0001F 00100 200C7	Addr FFFH 001H FFFH	Size 00020000H 00000002H 00008000H		
Command to COM4 Full Operation(D+E+B+P)			<u>S</u> et Environr	nent		Help
<u>D</u> ownload	Erase	Blank Check	Check SU	м	⊻e	rsion Info
Program & Verify	<u>R</u> ead & Compare	<u>C</u> opy	USB DIRECT programmer			



😈 FLASH USB DIRECT Progr

MB9AF312K

Read & Compare

sk-fm3-48pmc-usbstick\_usb

Eull Operation(D+E+B+P)

SELECT

Hex F

Commar

Download

Program & Verify











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



#### Fujitsu Semiconductor Europe - http://emea.fujitsu.com/microelectronics

#### All Rights Reserved.© Fujitsu Limited 2012

FLASH INFORMATION

End Addr

0001FFFFH

00100001H

200C7FFFH

Start Addr

пппппппн

00100000H

200C0000H

Set Environment

Check SUM

USB DIRECT

Open

Blank Check

\_ 🗆 🗙

Size

00020000H

00000002H

00008000H

Help

Version Info













Step 7 (continued)

• Click at "Full Operation"

SELECT			- FLASH INFORM	ATION	
Target MCU	MB9AF312K	Start Addr 00000000H	End Addr 0001FFFFH	Size	
Hex File	sk-fm3-48pmc-usbs	tick_usb <u>O</u> pen	00100000H	00100001H	00000002H
СОМ (1-255)	4		200C0000H	200C7FFFH	00008000H
-Command in COI	w4				
	<u>F</u> ull Operation	on(D+E+B+P)	<u>S</u> et Environr	nent	<u>H</u> elp
<u>D</u> ownload	Erase	Blank Check	Check SU	м	⊻ersion Info
l	ļ			RECT	irtual COM
		-			

Reset the MCU and click at "OK"
 fish I Please reset the microcontroller on userboard. Then push OK button.
 OK Cancel
 The firmware was programmed.

Fujitsu Semiconductor Europe - http://emea.fujitsu.com/microelectronics













Step 8

• Switch SW3 to RUN

Press the reset button



All Rights Reserved.© Fujitsu Limited 2012

Fujitsu Semiconductor Europe - http://emea.fujitsu.com/microelectronics



### Installation of Serial Port Viewer & Terminal











Serial Port Viewer & Terminal (utilities\serial\_port\_viewer\setup.exe)

Click "Next"

Read and accept the disclaimer and click "Next"

🐻 Setup - Serial Port Viewe	r & Terminal				
Serial Com Port Viewer & Terminal	Welcome to the Serial Port Viewer & Terminal Setup Wizard This will install Serial Port Viewer & Terminal V3.9 on your computer. It is recommended that you close all other applications before continuing. Click Next to continue, or Cancel to exit Setup.				
FUĴĨTSU	Next > Cancel				
Parial Port Viewer License Agreement Please read the following	* & Terminal				
Please read the following agreement before continu	License Agreement. You must accept the terms of this ing with the installation.				
Warranty and Disclaimer					
The use of the deli target hoards ev i accept the agreement i govern accept the agreement	verables (e.g. software, application examples, aluation boards, starter kits, schematics,				
	(Back Next) Cancel				



### Installation of Serial Port Viewer & Terminal











 Choose a optional installation directory and click "Next"

Click "Next"



🚰 Setup - Serial Port Viewer & Terminal	
Select Additional Tasks Which additional tasks should be performed?	Serial Com Port Network Jonnet
Select the additional tasks you would like Setup to perform while installing Serial Port Viewer $\&$ Terminal, then click Next.	
Additional icons:	
Create a desktop icon	
Create a Quick Launch icon	
< <u>Back</u>	Cancel



### Installation of Serial Port Viewer & Terminal











	Click	"Instal	"
--	-------	---------	---

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

🚏 Setup - Serial Port Viewer & Terminal	_ 🗆 🗵
Ready to Install Setup is now ready to begin installing Serial Port Viewer & Terminal on your computer.	Serial Com Port Nexor & Jone 1
Click Install to continue with the installation, or click Back if you want to review or change any settings.	
Destination location: C:\Program Files\Fujitsu Semiconductor Europe	A
Start Menu folder: Serial Port Viewer & Terminal	
x	×
< <u>B</u> ack	Cancel



Fujitsu Semiconductor Europe - http://emea.fujitsu.com/microelectronics

# $\mathbf{O}$

# 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

Fujitsu Semiconductor Europe - http://emea.fujitsu.com/microelectronics



# **Virtual Com Port Example**











- Used to communicate via CDC class
- MCU source & binary <u>Examples\ sk-fm3-48pmc-</u> <u>usbstick usb device virtual</u> <u>com port-v12</u>

🙀 FSEU Virtual Communications Port (CO	M10)	<u>×</u>
СОМ10	📨 📟 ASCII / HEX 🛛 🏲 峝 🛛 Baud Rate: 👖	15200 🔹 🌒 Connected 💷 🛷
Welcome to FSEU Virtual waiting for your messag Hello World!	Comm Port Example for 16 e:	\$FX, FR80 & FM3!
		(c) Fujitsu Semiconductor Europe Gmb



# **USB Host and Device (1)**







- Mass Storage
- Mouse
- Keyboard

**Device Mode:** 

**HID** Communication





### Example:

sk-fm3-48pmc-usbstick\_usb\_host\_device-vXX







Fujitsu Semiconductor Europe - http://emea.fujitsu.com/microelectronics



# **USB Host and Device (2)**

### USB Device connected to PC

- LEDs turns off
- Within example <u>sk-fm3-48pmc-usbstick\_usb\_device\_hid\_communication-v12</u> in folder "<u>forwindows\Binary</u>" the PC Demo can be found: "<u>Fujitsu\_UsbCom\_Demo.exe</u>"
- LEDs, Sensors, Buttons and UART can be used via GUI









묥 Fujitsu UsbCom Demo		
Driver Type: HID	-	
LEDs	Light Sensor	
Hello World!	Se	end
Usb Device: Disconnected		.::

Fujitsu Semiconductor Europe - http://emea.fujitsu.com/microelectronics

All Rights Reserved.© Fujitsu Limited 2012



# **USB Host and Device (3)**



- 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 turs 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
- <u>Download</u> the newest version from internet (<u>http://emea.fujitsu.com/fm3</u>)
- Start Installation (utilities\usb wizard\setup.exe)





### **Installation of the USB-driver**

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

<u>Run Installation</u> (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)



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"

























## 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 <u>Install Drivers</u>
- 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



# CO

# IAR-Embedded Workbench / KEIL µVision IDE and Debugger













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





Fujitsu Semiconductor Europe - http://emea.fujitsu.com/microelectronics

All Rights Reserved.© Fujitsu Limited 2010



### **IAR Workbench Getting Started**











- Install EWARM from IAR-CD or download latest version from IAR Website
  - EWARM 30-day Evaluation Version
    - <u>http://supp.iar.com/Download/SW/?item=EWARM-EVAL</u>
  - EWARM 32K Kickstart Version
    - <u>http://supp.iar.com/Download/SW/?item=EWARM-KS32</u>

#### Start EWARM Workbench



### **IAR Workbench Getting Started**

- Choose *File → Open → Workspace*
- Select e.g.\Examples\sk-fm3-48pmcusbstick\_usb\_device\_hid\_communication-vXX\example\IAR\skfm3-48pmc-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 Embedded Workbench IDE	
<u>Eile Edit View Project Tools Winc</u>	low Help
<u>  D 🛩 E 🗗 🕘 X h R</u>	
Rahl Debug	Information Center for ARM
Files \$ @ @; GettingStar @ modules • @ min c • @ readme.txt	Information Center for ARM
	Example description
	######################################
	# # ##################################
	DESCRIPTION
	This example project shows how to use the IAR Embedded Workbench for ARM to develop code for IAR KSK-MB9BF506 board. It shows basic use of I/O, Dual timer and the interrupt controller.
	COMPATIBILITY
	The example project is compatible with IAR KSK-MB9BF506 board. By default, the project is configured to use the J-Link SWD interface.
	The GettingStarted application is downloaded to the iFlash or iRAM memory depending on selected configuration and executed.
	GETTING STARTED
	1) Start the IAR Embedded Workbench for ARM.
GettingStarted	fo v
Ready	



#### IAR Workbench – Menu Bar













### IAR Workbench – Workspace





### IAR Workbench - OpenOCD (GDB)



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



Fujitsu Semiconductor Europe - http://emea.fujitsu.com/microelectronics

#### All Rights Reserved.© Fujitsu Limited 2010



### IAR Workbench - OpenOCD (GDB)











#### OpenOCD / GDB Server usage

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



#### Fujitsu Semiconductor Europe - http://emea.fujitsu.com/microelectronics

#### All Rights Reserved.© Fujitsu Limited 2010



### **IAR Workbench – Making Project**











#### Making the Project

- Use Make-Icon (<sup>□</sup>), <F7> or Menu: *Project→Make*
- Check for no errors in Output window below
- Build errors are indicated by <sup>1</sup>/<sub>4</sub> or <sup>3</sup>/<sub>2</sub>
  In Output window and Source view





#### IAR Workbench – Download to Target

#### Download to Target and Start Debugging

- Use Lcon, <Ctrl>-D, or *Project→Download and Debug*
- A new menu bar will occur on sucessful 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):

#### Disassembly Window

- Shows 'pure' disassebly view
- Shows mixed mode view



	assembly		· · · · · · · · · · · · · · · · · · ·
	Go to Memory	•	
Γ	0x1fffc3bc: 0x6001	STR	r1, [r0]
	??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.Timer	En = 1;	_
	0x1fffc3c6: 0x4821	LDR.N	r0, ??DataTable10_32 [0x1fffc44c] ; Timer1Control
	0x1fffc3c8: 0x6800	LDR	r0, [r0]
	0v1fffc3ca 0vf050 0v0080	OPRS M	r0 r0 #128 · 0¥80
•			F
_			



### IAR Workbench – Debug (2)











#### Watch Window

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

Expression	Value	Location	Туре
Tmr1Tick	0	0x20000804	int
[]			

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

Quick Watch			×
G Tmr1Tick + 0xAA - 123			•
Expression	Value	Location	Туре
Tmr1Tick + 0xAA - 123	0×00000030		int
Watch   Locals   Statics   Auto   I	Live Watch Quick	« Watch	×

• The drop down menu memorizes the last typed contents

Fujitsu Semiconductor Europe - http://emea.fujitsu.com/microelectronics



### **IAR Workbench – Simulator**











Simulator

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



### KEIL µVision IDE and Debugger Getting Started











- Install µVision from KEIL-CD or download latest version from KEIL Website
  - Evaluation Version
    - <u>https://www.keil.com/demo/eval/arm.htm</u>
    - Registration required
- Install Colink Plugin for Keil RealView MDK (for OpenOCD usage)
  - <u>http://www.coocox.net/CoLinkGuide/CoMDKPlugin.html</u>

Start µVision



### **KEIL µVision – Getting Started**

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

- Browse to: Examples\mb9afb4xn\_lcd\_counter-vXX\example\ARM\
- Choose mb9afb4xn\_lcd\_counter.uvproj









🔣 Blinky - µ¥ision4		
<u>File Edit View Project Flash Debu</u>	g Pe <u>ri</u> pherals <u>T</u> ools <u>S</u> VCS <u>W</u> indow <u>H</u> elp	
📘 🗋 🚰 🛃 🗿 👗 🛍 🛍 🔍 🗠	😔 🖗 魯 魯 澤 連 進 版 🖄 🔹 🔹 🔜 🔹 🔍 🔍 🔹 🖉 🔞	
🛛 🧼 🎬 🧼 🔜 📫 MB9BF50× F	ash 🔹 🕺 🚠 🗟	
Project A ×	Abstract.txt X 🖹 Blinky.c	-
MB90F50x Flash  StartUp  StartUp  StartUp  StartUp  System_M590F50x.k  mb90F50x.h  core_cm3.h  mb90F50x.h  mb	The Blinky project is a simple demo program for the Fujitsu 'MB9BF506' microcontroller using Keil 'MC9BF500' Evaluation Board, compliant to Cortex Microcontroller software Interface Standard (CMSIS v1.30). Example functionality: - Clock Settings: - XTAL = 4 MHz - PLLO = 80 MHz - Systick Timer is used in interrupt mode - 8 LEDs blinklwith speed depending on potentiometer position - AD conversion is done in interrupt mode - AD settings: 10 bit resolution - AD value is output onto ITM debug port #0 The Blinky program is available in different targets: MB9BF50x RAM: runs from Internal RAM located on chip (used for target debugging) MB9BF50x Flash: runs from Internal Flash located on chip	
	III TNK Cartey Debugger	
	CLINK Cortex Debugger	CAI



### KEIL µVision – Main Window











#### KEIL µVision

- 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 µVision – Menu Bars (1)

#### Menu Bar 1

Can be moved in bar window area or set floating















### KEIL µVision – Menu Bars (2)











#### Menu Bar 2

Can be moved in bar window area or set floating





### KEIL µVision – Project Window

















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

Fujitsu Semiconductor Europe - http://emea.fujitsu.com/microelectronics

All Rights Reserved.© Fujitsu Limited 2010























#### Setup OpenOCD Debugger

- Open Project Settings *Project→Options for Target ,MB9AF312K\_...*<sup>·</sup>...
- Select *Debug* Tab
- Select CooCox Debugger
- Click Settings
- Choose Adapter Olimex-OpenOCD



















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

CooCox Target Driver Setup				×
Debug Flash Download				
Download Function	e Affected 🛛 🔿 Do not Erase	A	dditional Option Run after Download Verify Download	
Programming Algorithm				51
Description	Device Type	Device Size	Address Range	
		1		
	Add	Remove		
			OK Cance	

dd Programming Algorithm		
Description	Device Type	Device Size
MB9BF500 256kB Flash	On-chip Flash Memory	256KB
MB9BF50x 256kB Flash	On-chip Flash Memory	256KB
MB9BF50x 512kB Flash	On-chip Flash Memory	512KB
MB90F30X 312XB Hash	On-chip Flash Memory	64KB
MB9xFxx1 64kB Elash	On-chip Flash Memory	128KB
MB9xFxx4 256kB Flash	On-chip Flash Memory On-chip Flash Memory	256KB 384KB
MB9xFxx6 512kB Flash	On-chip Flash Memory	512KB
MB9xFxx7 768kB Flash	On-chip Flash Memory	768KB
MB9xFxx8 1024kB Flash	On-chip Flash Memory	1MB
MDR32F9x 128kB Flash	On-chip Flash Memory	128KB
MDR32Ex 128kB Flash	On chip Flach Memory	128KB
Mini51 16kB Flash AP	On-chip Flash Memory	16KB
Mini51 4kB Flash AP	On-chip Flash Memory	4KB
	OK Cancel	















#### Setup OpenOCD Debugger (continued)

- Open Project Settings *Project→Options for Target ,MB9AF312K\_...*<sup>·</sup>...
- Select UtilitiesTab
- Select CooCox Debugger
- Click Settings





### **KEIL µVision – Making Project**

#### **Making the Project**

- Use Rebuild Icon 🔤 | ) or *Project→Rebuild all target* files
- Check for no errors in Output window below

Build Output	
Build target 'MB9BF50x Flash'	
assembling startup_MB9BF50x.s	
compiling system_MB9BF50x.c	
compiling Blinky.c	
compiling IRQ.c	2
compiling Serial.c	
compiling Retarget.c	
linking	
Program Size: Code=2604 RO-data=320 RW-data=32 ZI-data=51	12
".\Flash\Blinky.axf" - O Error(s), O Warning(s).	
📰 Build Output 🛛 🙀 Find In Files	

- Build errors are shown in Output window.
  - Can be double-clicked by showing the source line with a blue arrow







## KEIL µVision – 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 ( ④) or Menu: Debug→Start/Stop Debug Session
- Ending Debug Session
  - Use same way as for starting debug session



# **KEIL µVision – Debug (2)**

#### Debugging Icon Bar

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





# **KEIL µVision – Debug (3)**











#### Source View

 The Source windows do not change contents but get additional information





# **KEIL µVision – Debug (4)**

#### Disassembly View

Mixed mode is selectable and deselectable




# **KEIL µVision – 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

Memory 1																L	1 ×
Address: 0x2000	0004															L.	
0x20000004:	34	12	00	00	00	00	00	00	00	00	00	00	01	00	00	00	
0x20000014:	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	
0x20000024:	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	
0x20000034:	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	Ţ
Watch 1	Memo	ory 1	ſ														



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





# **KEIL µVision – 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 backround color
  - Displayed values can be changed by user during break

Watch 1	<b>ч</b> х
Name	Value
\Blinky\AD_dbg	0x01EA
<pre> <double-click add="" f2="" or="" to=""></double-click></pre>	
BLocals Watch 1 Memory 1	

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

Locals							
Name	Value						
AD_value	0x01EA						
AD_print	0x01EA						
Limit ticks	<out ot="" scope=""></out>						
BLocals Watch 1   Memory 1							



## KEIL µVision – Trace (ULINK ME)









#### Trace via ITM

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

Trace Rec	ords							X
Туре	O∨f 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		Х	82988592	1.03735740	
ITM	0		61H		X	82988592	1.03735740	
ITM VS	<ul> <li>Counter Events</li> </ul>		6CH		×	82988592	1.03735740	
ITM	<ul> <li>Exceptions</li> </ul>		75H			82988592	1.03735740	
ITM	PC Samples		65H		×	82988592	1.03735740	
ITM	JTM Events		20H X			82988592	1.03735740	
ITM	• Data Danda		3DH		×	82988592	1.03735740	
ITM	V Data Reads		20H		×	82988592	1.03735740	
ITM	✓ Data Writes		30H		×	82988592	1.03735740	
ITM	U		78H		×	82988592	1.03735740	
ITM	0		30H			82993831	1.03742289	
ITM	0		31H		×	83001392	1.03751740	
ITM	0		45H		×	83001392	1.03751740	
ITM	0		42H >			83001392	1.03751740	
ITM	0		ODH		Х	83001392	1.03751740	
ITM	0		0AH		Х	83001392	1.03751740	
ITM	0		ODH		Х	83001392	1.03751740	-

### **ΚΕΙL μVision – Trace (ULINK Pro) (1)**











#### Trace via ETM

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



### **ΚΕΙL μVision – 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 transfered to µVision on break

Instruction Tr	ace										ά×
Filter: All				-							<b>_</b>
#	Туре	Flag	Num	PC	Opcode	Instruct	ion	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) {	7* 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	[00x0#,01],01				
											<u> </u>
🛃 🔡 Blir	nky.c ×		Abstract	.txt 🔜 st	:dio.h						-
108	if (A	D_val	ue !=	AD_last)		1	* Make sure that AD	inter	rupt did	*/	
109 110	AD_	value	e = AD	_last;		1	* not interfere with	valu	e reading	*/	
111	if (A	D_val	lue !=	AD_print	) (	1	* Make sure that AD	inter	rupt did	*/	
112 113	AD_ AD_	print dbg	: = AD = AD	_value; _value;		1	* Get unscaled value	for	printout	*/	
											<u> </u>



## **KEIL µVision – 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

Other:

China: <u>fsla.mcu-kit.FSS@sg.fujitsu.com</u>





Japan: https://jp.fujitsu.com/cgi-bin/fjid/formoutput\_cs.cgi?FMT=/contact/csform/csque00901/form0010/1

USA: <u>FSA\_ARMMCU\_TOOL@us.fujitsu.com</u>





mcu\_ticket.FSEU@de.fujitsu.com

Visit our global FM3 microcontroller website http://www.fujitsu.com/global/services/microelectronics/product/micom/roadmap/industrial/fm3/

Fujitsu Semiconductor Europe - http://emea.fujitsu.com/microelectronics



### **Further Steps**











#### In order to learn more about Fujitsu's microcontrollers

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

#### 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
- France 91300 Massy
- **Italy** 20080 Milano
- United Kingdom Maidenhead
- Hungary 1143 Budapest
- Turkey 34180 Istanbul

- Tel: +49 (0) 61 03 69 00
- Tel: +33 (0) 1 64 47 97 00
- Tel: +39 02 90 45 02 1

Tel: +44 (0) 1628 50 46 00

Tel: +36 1 471 21 29

Tel: +90 212 557 18 81

#### World Wide Web

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



All Rights Reserved.© Fujitsu Limited 2012



### **Contacts – Distribution - Europe**

#### European distributors

- EBV Elektronik
- Farnell
- Glyn
- Melchioni Electronica
- MSC
- Rutronik Elektronische Bauelemente
- SpecialIND

<u>www.ebv.com</u> www.farnell.com

www.glyn.de, www.glyn.ch

www.melchioni.it

www.msc-ge.com

www.rutronik.com

www.specialind.it



### EG-Konformitätserklärung / EC declaration of conformity











CE

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



#### **X-ON Electronics**

Authorized Distributor

Click to view similar products for Development Boards & Kits - ARM category:

EV-ADUCM322QSPZ EVAL-ADUC7128QSPZ EWARM MCIMX51EVKJ MIKROE-649 ADZS-CM419F-EZLITE ADZS-UCM3029EZLITE OM13017,598 SAFETI-HSK-RM48 LI-TB01