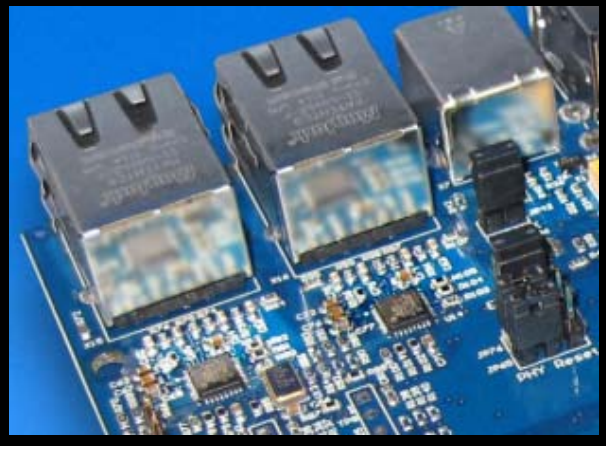
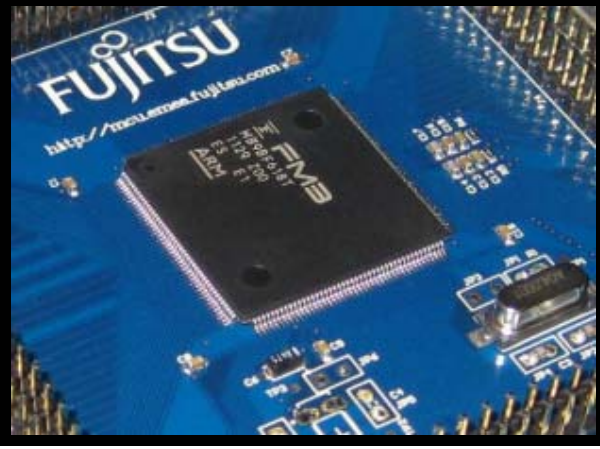
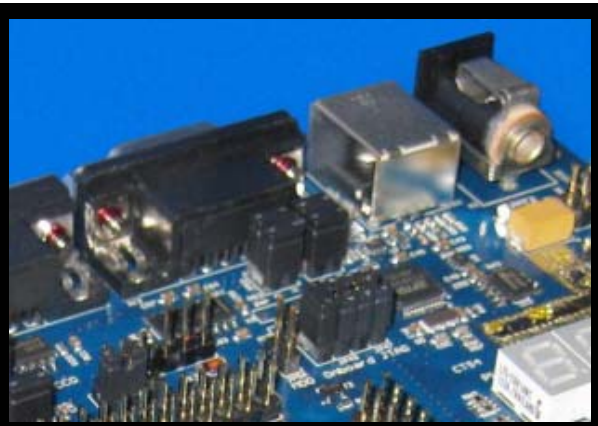
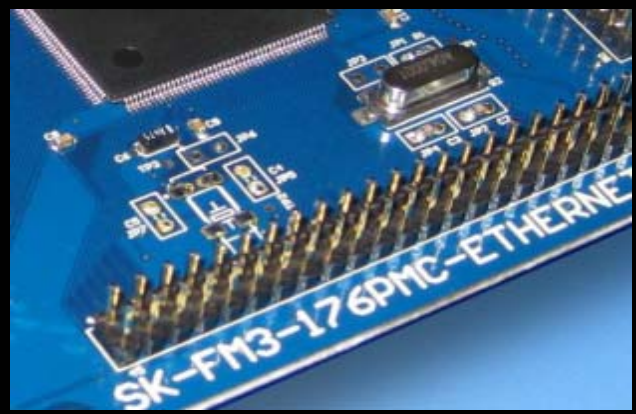
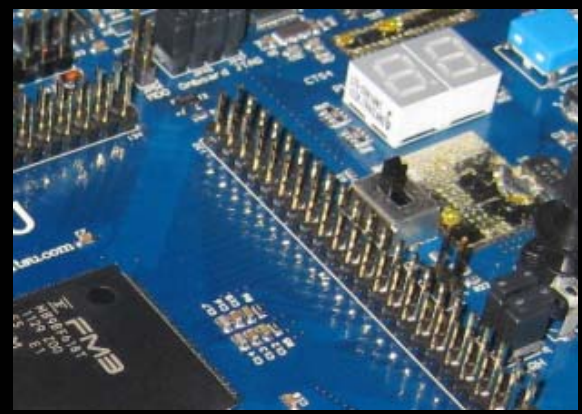



FUJITSU FM3

SK-FM3-176PMC-ETHERNET



CD V 1.2

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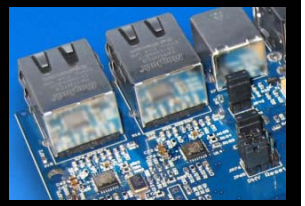
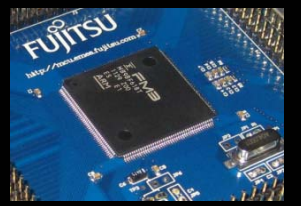
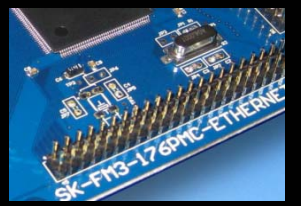
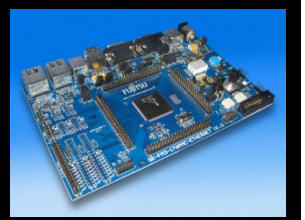
Warranty and Disclaimer









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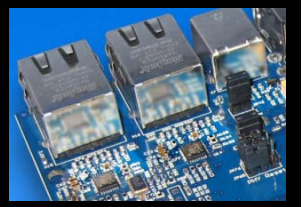
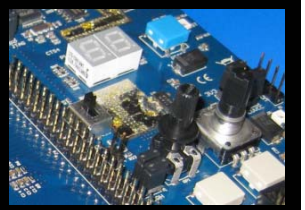
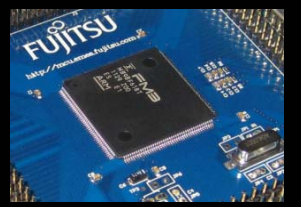
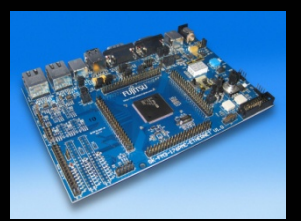
Updates and Support









Download the latest version from the following website:
http://mcu.emea.fujitsu.com/mcu_tool/detail/SK-FM3-176PMC-ETHERNET.htm

Open Questions? Contact: mcu_ticket.FSEU@de.fujitsu.com

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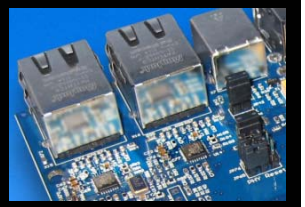
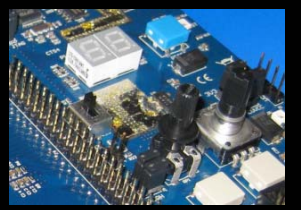
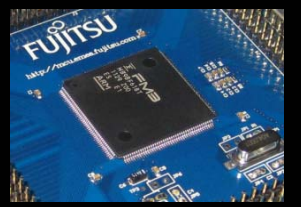

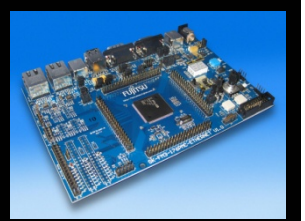

Overview

- **Introduction**
  - About the SK-FM3-176PMC-ETHERNET
  - SK-FM3-176PMC-ETHERNET box content
  - SK-FM3-176PMC-ETHERNET CD content
  - Test it
  - The hardware
  - The software
- **Try yourself**
  - Software examples
  - Program download
  - IAR-Embedded Workbench
  - KEIL µVision
  - Free open-source Toolchain
- **Contacts**

- **Additional documents**
  - Schematic ‘SK-FM3-176PMC-ETHERNET’
  - Data sheet MB9BD10T Series , Fact sheet
  - Peripheral Manual
    - Timer part
    - Analog Macro part
    - Communication Macro part
    - Ethernet part
      - Errata sheet
  - Technical reference manual (r2p0)
    - revision r2p1
  - Flash programming manual
    - Errata sheet

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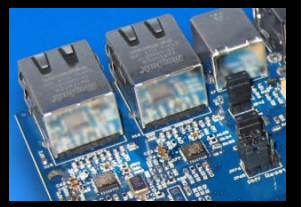
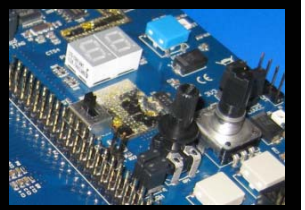
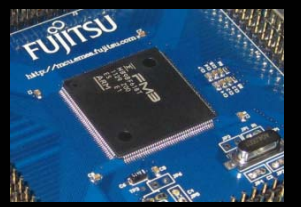
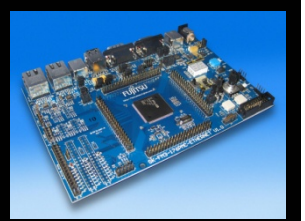
About the SK-FM3-176PMC-ETHERNET



- **The SK-FM3-176PMC-ETHERNET is a versatile evaluation board based on the Fujitsu FM3 microcontroller MB9BD10T Series**
- **The MB9BD10T Series includes the following features:**
  - 32-bit ARM Cortex-M3 Core with up to 144MHz operation
  - Up to 1 Mbyte high-speed flash memory with true 72MHz and Flash Accelerator System
  - Up to 128Kbyte on-chip SRAM memory
  - Wide supply voltage range from 2.7 to 5.5 V
  - 2 Ethernet - MAC channels
  - 2 USB interface channels
  - 8 Multi-function Serial Interface channels (for UART, CSIO (SPI), I2C and LIN)
  - 8 DMA Controller channels
  - 3 12-bit A/D Converters, 1MSp, 32 channels max.
  - External bus interface
  - 16 Base Timer channels (PWM, PPG, reload or PWV timers selectable)
  - Up to 154 fast General Purpose I/O Ports
  - 3 Multi-function Timer units(can be used to achieve the motor control)
  - 3 Quadrature Position/Revolution Counter (QPRC) channels
  - Dual Timer (32/16bit Down Counter)
  - Resource Pin Relocation
  - Hardware Watchdog
  - CRC (Cyclic Redundancy Check) Accelerator
  - Five dynamically selectable clock sources (2 external oscillator, 2 internal CR oscillator, Main PLL)
  - Clock Supervisor (CSV)
  - Low Voltage Detector (LVD) and Low Power Mode

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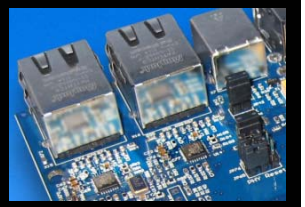
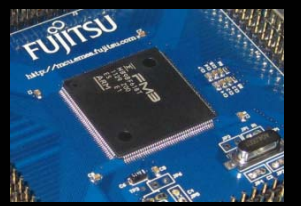
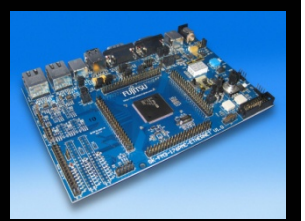
About the SK-FM3-176PMC-ETHERNET







Features of the SK-FM3-176PMC-ETHERNET board:

- Microcontroller MB9BFD18T
- 2x Ethernet connectors
- 2x USB-Host (Type-A connector)
- 1x USB-Device (Type-B connector)
- 1x USB-to-serial converter (Type-B connector)
  - UART and OpenOCD JTAG simultaneously
- 1x High-speed CAN-Transceiver
- 1x UART-Transceiver (SUB-D9 connector)
- JTAG and Trace Interface each on a 20 pin-header
- 2x LED-Display (7-Segment)
- 2x pushbutton (*User* buttons), rotary encoder, potentiometer
- 1x *Reset*-button, *Reset*-LED
- All 176 pins routed to pin-header
- On-board 5V and 3V voltage regulators to supply MCU, *Power*-LED
- 4x Power supply options: USB, USB-Device, JTAG or external 8V to 12V
- Voltage filter for ADC
- 3x Motor-Control-Interface for e.g. SK-POWER-3P-LV2-MC
- TSC-Interface to connect e.g. the Fujitsu SK-TSC-1127S-SB

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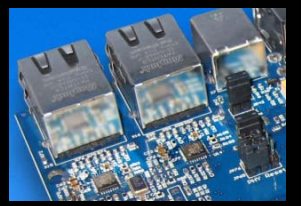
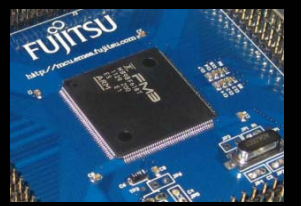
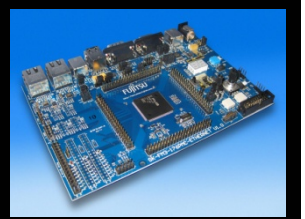
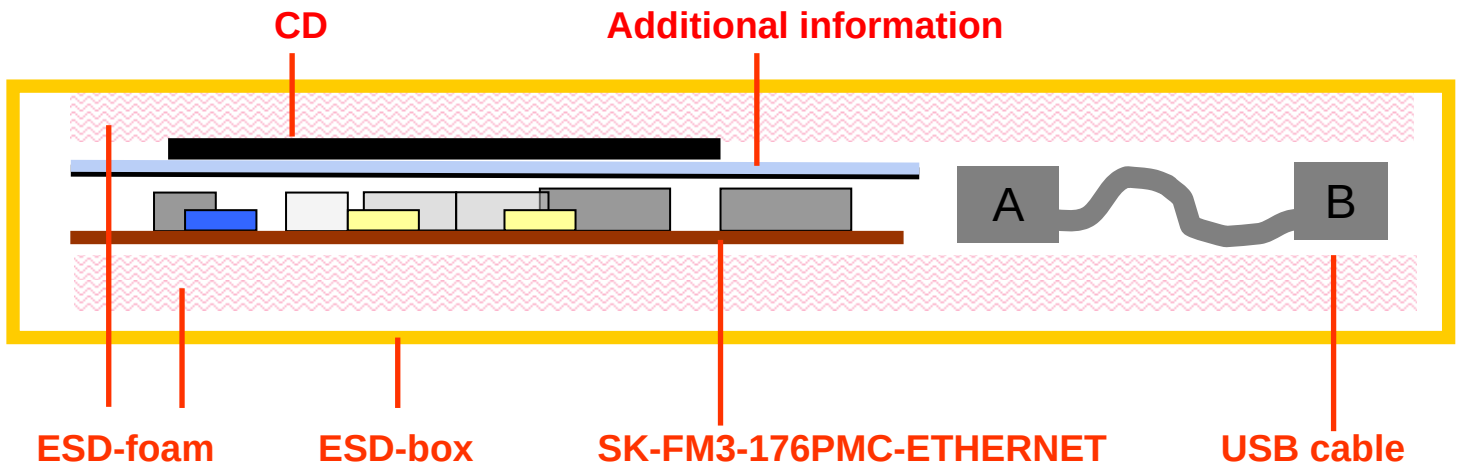
SK-FM3-176PMC-ETHERNET box content







- The SK-FM3-176PMC-ETHERNET kit contains
  - SK-FM3-176PMC-ETHERNET evaluation board with MB9BFD18T
  - USB cable
  - CD: Documentation, software examples and development utilities



- **The SK-FM3-176PMC-ETHERNET kit may be used for test applications in an evaluation laboratory environment only!**

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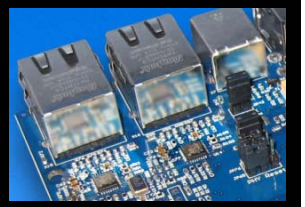
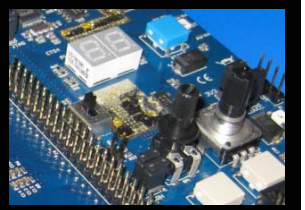
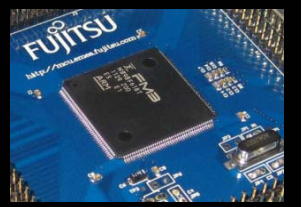
SK-FM3-176PMC-ETHERNET CD content

- **Software**
  - FUJITSU FLASH MCU Programmer
  - FLASH USB DIRECT Programmer
  - FUJITSU USB Assistant
  - FUJITSU OpenOCD Starter GUI
    (including USB driver for on-board USB-to-RS232 converter)
  - SerialPortViewerAndTerminal
- **Examples**
  - mb9bfd1xt_template
  - Further examples are available on the CD and on our website

  Note:
  Please copy the examples to your local drive!
- **Documentation**
  - Schematic ‘SK-FM3-176PMC-ETHERNET’
  - Data sheet MB9BD10T Series, Fact sheet
  - Peripheral Manual
    - Timer part, Analog Macro part, Communication Macro part
    - Ethernet part, Errata sheet
  - Cortex-M3 Technical reference manual (r2p0), revision r2p1
  - Flash programming manual, Errata sheet

  Download the latest version from the following website:
  http://mcu.emea.fujitsu.com

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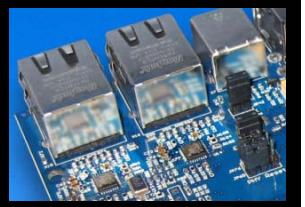
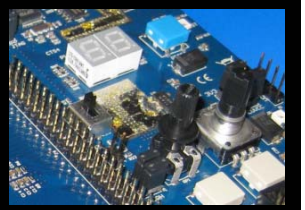
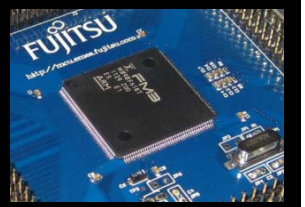
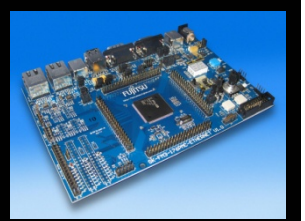
Test it









- **The microcontroller on the SK-FM3-176PMC-ETHERNET is already preprogrammed with a simple application.**
  - Connect the SK-FM3-176PMC-ETHERNET via USB (X11) with the PC
  - Verify that jumper J5 is in the *USBPWR* position
  - Switch SW1 is set to *RUN*
  - Press the *Reset*-button
  - The SK-FM3-176PMC-ETHERNET will automatically start counting

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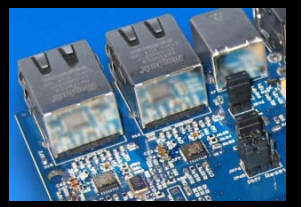
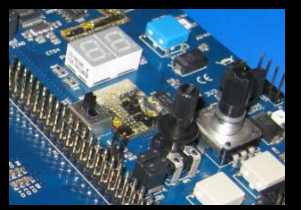
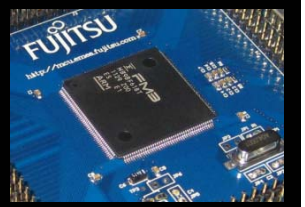
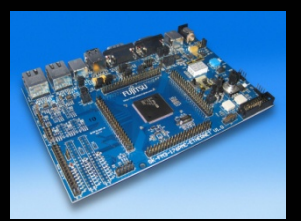
Test it









Congratulations!

- **You finished successfully the first test**
- **Now you will get more details about the SK-FM3-176PMC-ETHERNET**
- **You will learn more about**
  - The on-board features
  - How to program the Flash
  - How to start with IAR-Embedded-Workbench and KEIL µVision

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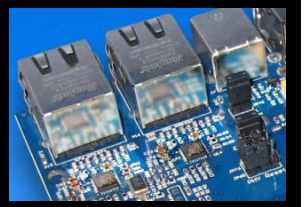
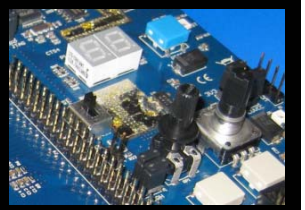
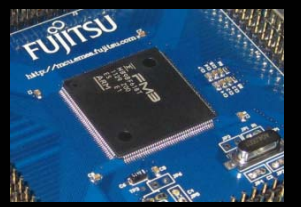
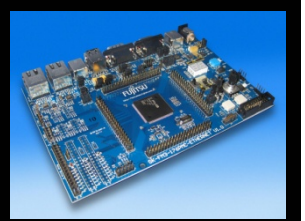
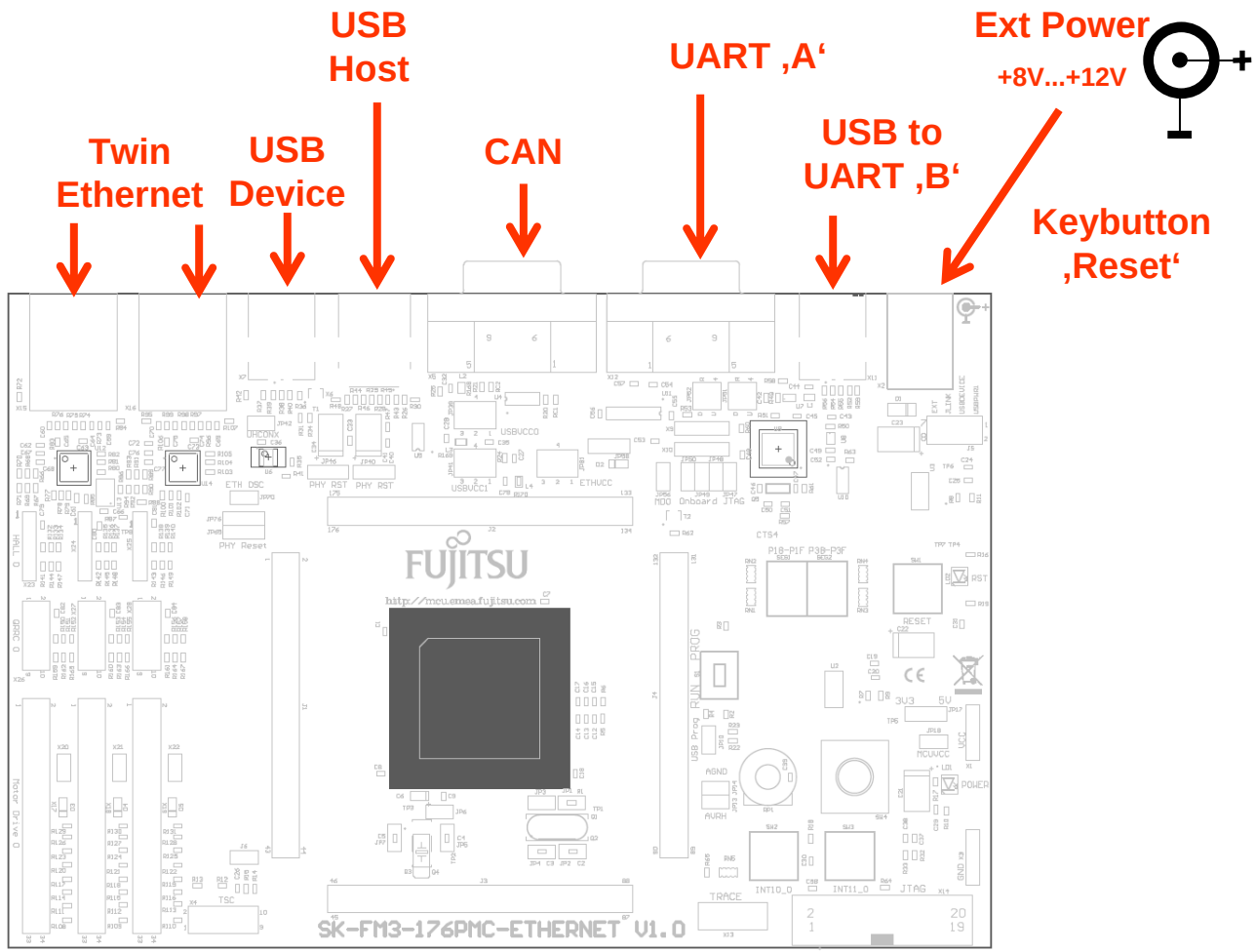
The Hardware



- **Main features: Connectors**



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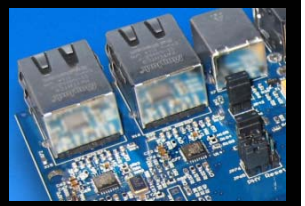
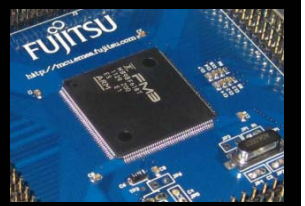
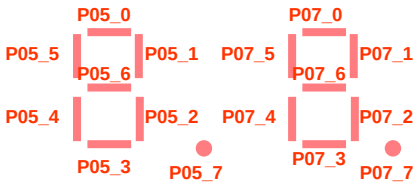




- **Main features: Human Interface**

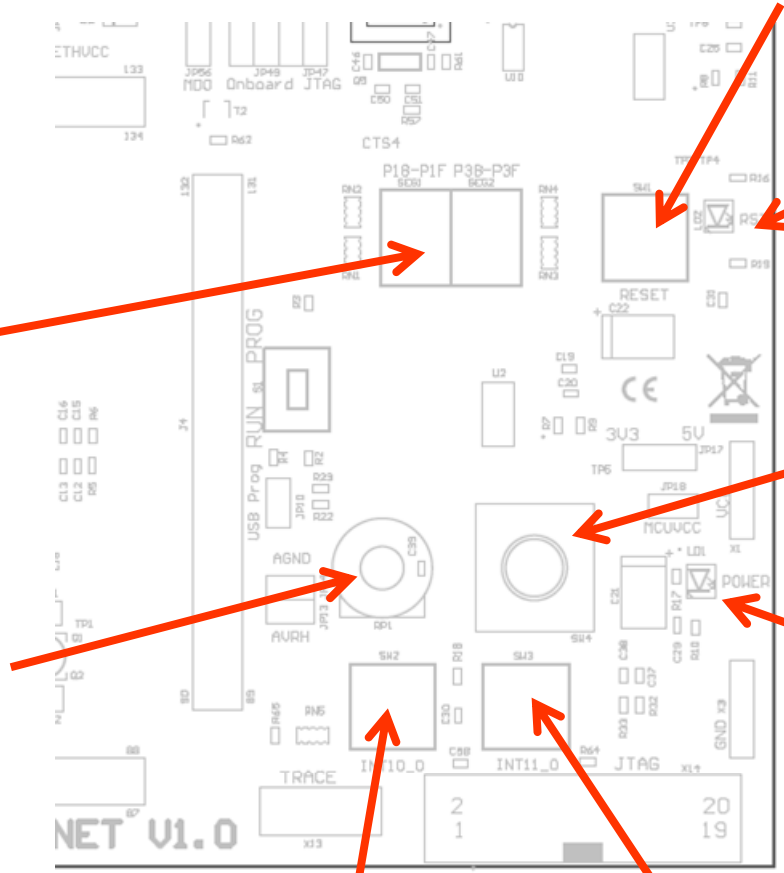
7-Segment Display



SEG1: Port50-57 SEG2: Port70-77

Potentiometer

AN30



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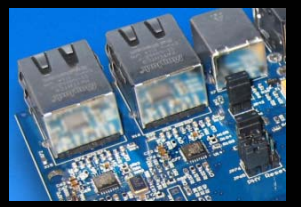
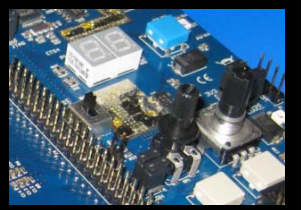
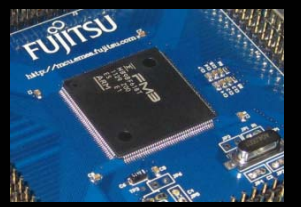
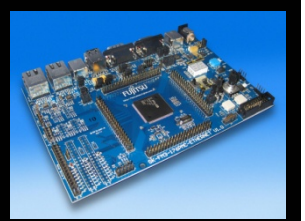
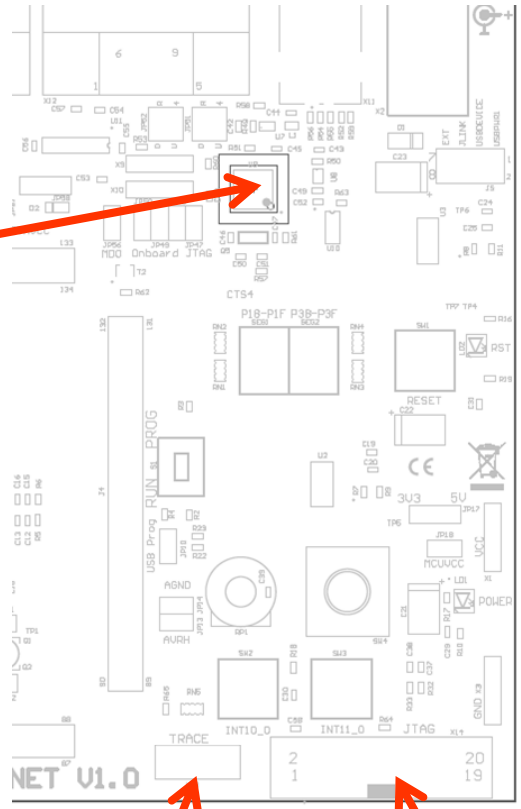






- **Main features: Debugging**

On-Board JTAG



Trace

JTAG

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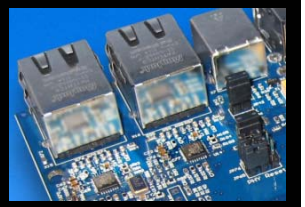
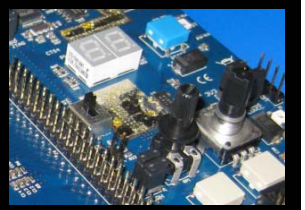
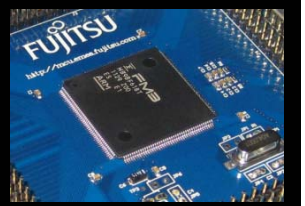
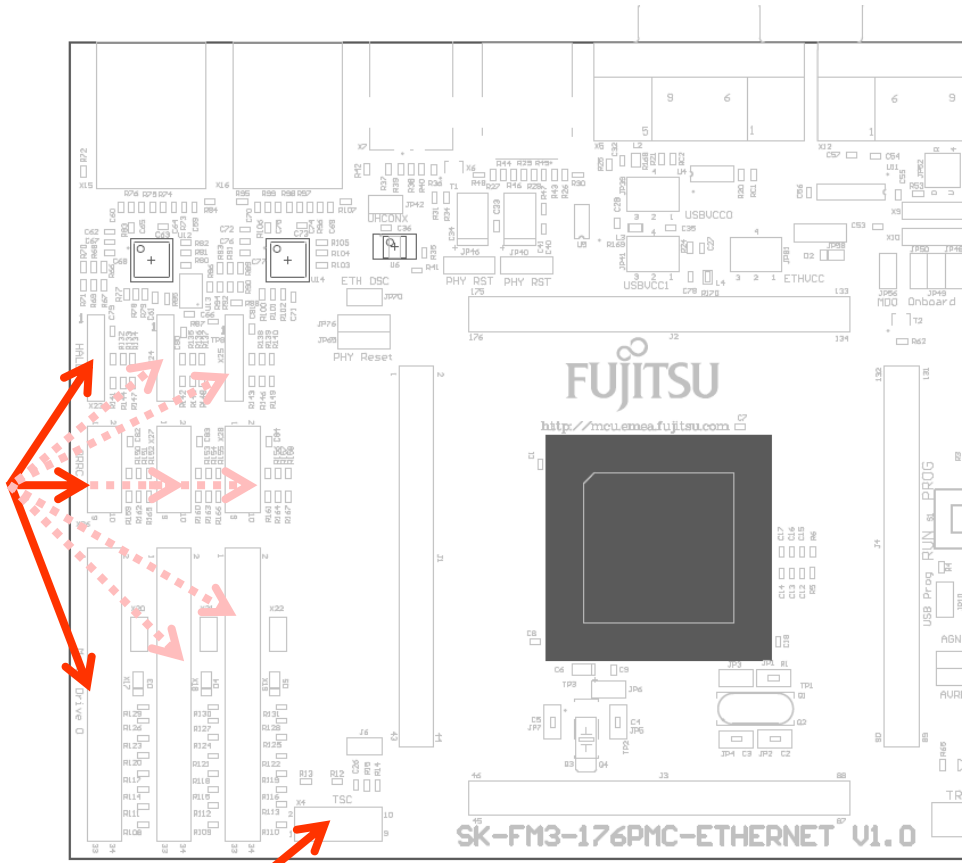




- **Main features: Other Pin-Headers**



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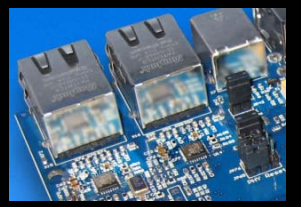
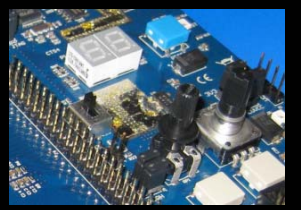
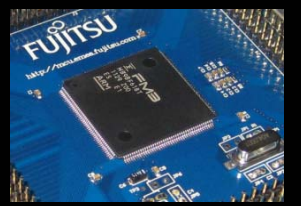
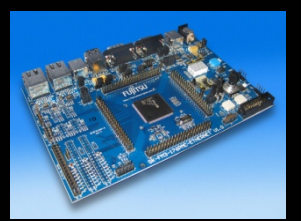
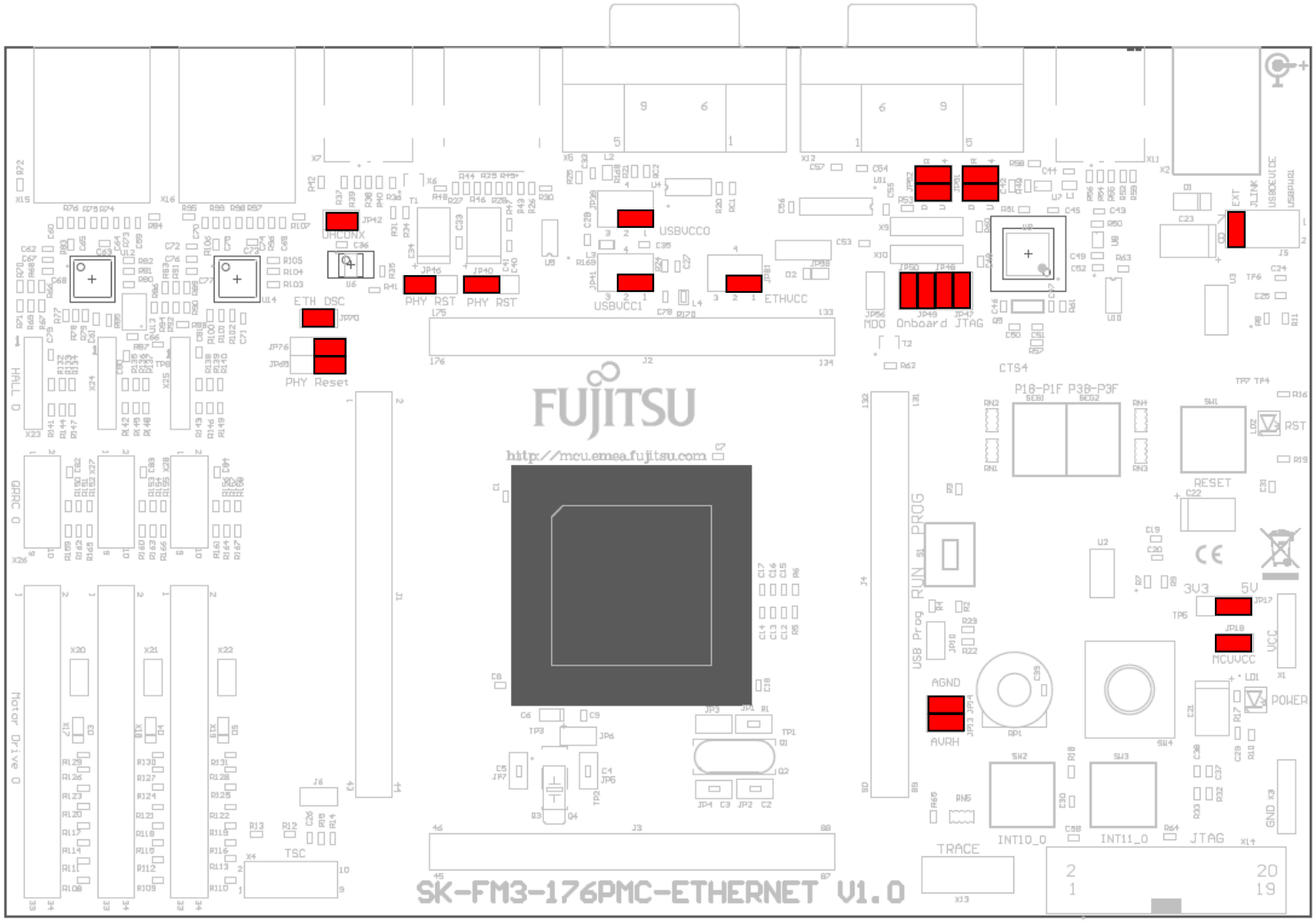








- **The jumpers: Default Settings**



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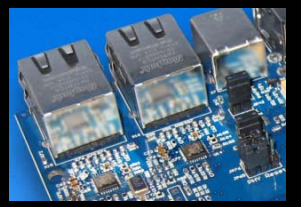

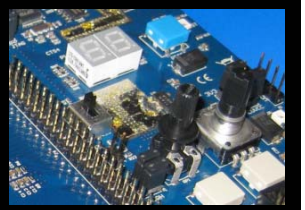

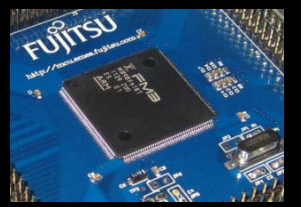

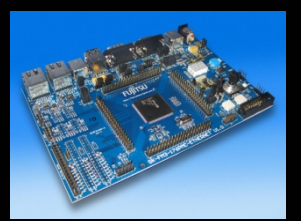

The jumpers

Number	Description	Special Type	Default
JP1	Main Clock Oscillator		open
JP2	Main Clock Oscillator		open
JP3	Main Clock Oscillator		open
JP4	Main Clock Oscillator		open
JP5	Sub Clock Oscillator		open
JP6	Sub Clock Oscillator		open
JP7	Sub Clock Oscillator		open
JP8	C-Pin	Solder Jumper	closed
JP9	C-Pin	Solder Jumper	closed
JP10	USB/UART programming		open
JP11	Sub Clock Oscillator	Solder Jumper	closed
JP12	Sub Clock Oscillator	Solder Jumper	closed
JP13	AVRH		closed
JP14	AGND		closed
JP15	Main Clock Oscillator	Solder Jumper	closed
JP16	Main Clock Oscillator	Solder Jumper	closed
JP17	5V/3V3		1-2
JP18	MCUVCC		closed

Number	Description	Special Type	Default
JP19	SEG1 - P50	Solder Jumper	closed
JP20	SEG1 - P51	Solder Jumper	closed
JP21	SEG1 - P52	Solder Jumper	closed
JP22	SEG1 - P53	Solder Jumper	closed
JP23	SEG1 - P54	Solder Jumper	closed
JP24	SEG1 - P55	Solder Jumper	closed
JP25	SEG1 - P56	Solder Jumper	closed
JP26	SEG1 - P57	Solder Jumper	closed
JP27	TSC / I2C / SCL-Pullup		closed
JP28	TSC / I2C / SDA-Pullup		closed
JP29	SEG2 - P70	Solder Jumper	closed
JP30	SEG2 - P71	Solder Jumper	closed
JP31	SEG2 - P72	Solder Jumper	closed
JP32	SEG2 - P73	Solder Jumper	closed
JP33	SEG2 - P74	Solder Jumper	closed
JP34	SEG2 - P75	Solder Jumper	closed
JP35	SEG2 - P76	Solder Jumper	closed
JP36	SEG2 - P77	Solder Jumper	closed

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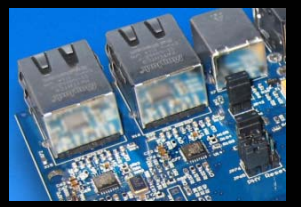

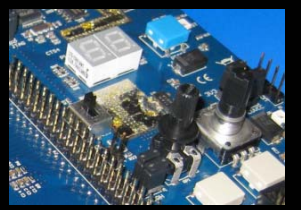

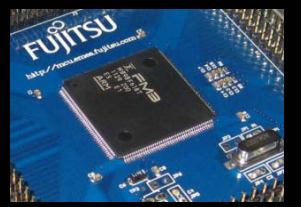

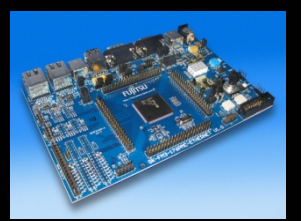

The jumpers

Number	Description	Special Type	Default
JP37	SPI / SIN-Pin	Solder Jumper	open
JP38	CAN MCUVCC / VCC5V	Solder Jumper	2-3
JP39	USBVCC0		1-2
JP40	VBUS USBH0		2-3
JP41	USBVCC1		1-2
JP42	USB UHCONX		closed
JP43	Rotary Encoder	Solder Jumper	closed
JP44	Rotary Encoder	Solder Jumper	closed
JP45	Potentiometer	Solder Jumper	closed
JP46	VBUS USBH1		1-2
JP47	FTDI JTAG		closed
JP48	FTDI JTAG		closed
JP49	FTDI JTAG		closed
JP50	FTDI JTAG		closed
JP51	UART / SOT USB <-> RS232		U-0
JP52	UART / SIN USB <-> RS232		R-1
JP53	Flow control		open
JP54	CTS4		open

Number	Description	Special Type	Default
JP47	FTDI JTAG		closed
JP48	FTDI JTAG		closed
JP49	FTDI JTAG		closed
JP50	FTDI JTAG		closed
JP51	UART / SOT USB <-> RS232		U-0
JP52	UART / SIN USB <-> RS232		R-1
JP53	Flow control		open
JP54	CTS4		open
JP55	MAX3232 VCC	Solder Jumper	closed
JP56	UART MD0	Solder Jumper	open
JP57	RTS		open
JP58	UART-RST		open
JP59	Flow control	Solder Jumper	1-2
JP60	Flow control	Solder Jumper	2-2
JP61	Ethernet PHY0	Solder Jumper	closed
JP62	Ethernet PHY0	Solder Jumper	closed
JP63	Ethernet PHY0	Solder Jumper	closed
JP64	Ethernet PHY0	Solder Jumper	closed

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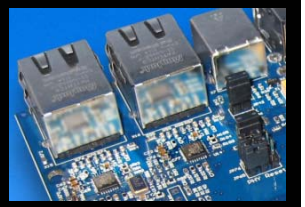

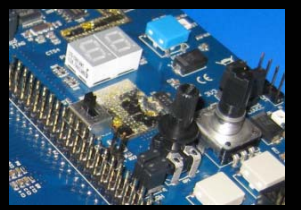

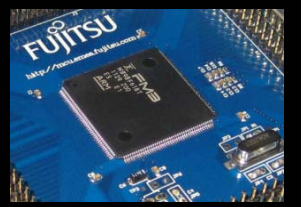

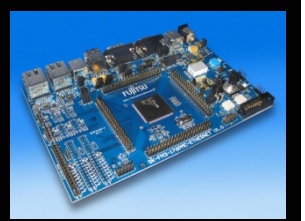

The jumpers

Number	Description	Special Type	Default
JP65	Ethernet PHY0 Reset		1-2
JP66	Ethernet PHY0	Solder Jumper	closed
JP67	Ethernet PHY0	Solder Jumper	closed
JP68	Ethernet PHY0	Solder Jumper	closed
JP69	Ethernet PHY0	Solder Jumper	closed
JP70	Ethernet Clock Enabled		closed
JP71	Ethernet Reference Clock	Solder Jumper	closed
JP72	Ethernet PHY1	Solder Jumper	closed
JP73	Ethernet PHY1	Solder Jumper	closed
JP74	Ethernet PHY1	Solder Jumper	closed
JP75	Ethernet PHY1	Solder Jumper	closed
JP76	Ethernet PHY1 Reset		1-2
JP77	Ethernet PHY1	Solder Jumper	closed
JP78	Ethernet PHY1	Solder Jumper	closed
JP79	Ethernet PHY1	Solder Jumper	closed
JP80	Ethernet PHY1	Solder Jumper	closed
JP81	Ethernet VCC		1-2
JP82	Motor Control 0	Solder Jumper	closed

Number	Description	Special Type	Default
JP83	Motor Control 1	Solder Jumper	open
JP84	Motor Control 2	Solder Jumper	open
JP85	Motor Control 0	Solder Jumper	closed
JP86	Motor Control 1	Solder Jumper	open
JP87	Motor Control 2	Solder Jumper	open
JP88	Motor Control 0	Solder Jumper	closed
JP89	Motor Control 1	Solder Jumper	open
JP90	Motor Control 2	Solder Jumper	open
JP91	Motor Control 0	Solder Jumper	closed
JP92	Motor Control 1	Solder Jumper	open
JP93	Motor Control 2	Solder Jumper	open
JP94	Motor Control 0	Solder Jumper	closed
JP95	Motor Control 1	Solder Jumper	open
JP96	Motor Control 2	Solder Jumper	open
JP97	Motor Control 0	Solder Jumper	closed
JP98	Motor Control 1	Solder Jumper	open
JP99	Motor Control 2	Solder Jumper	open
JP100	Motor Control 0	Solder Jumper	closed

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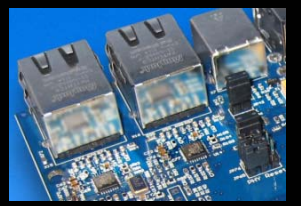
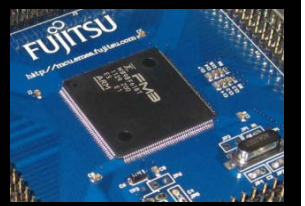
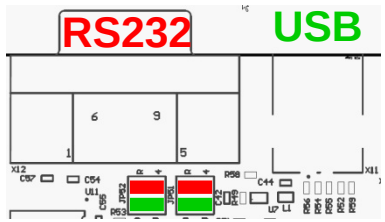


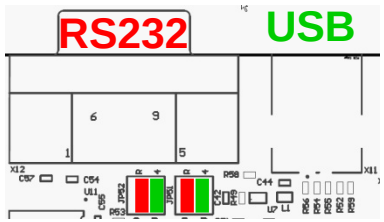


- **JP51, JP52 : UART selection**
  - UART0 and UART4 of the microcontroller can be used together with a standard RS232 SUB-D9 connector and a serial/USB converter
  - The jumpers JP51 and JP52 routes the channel to the connector
  - The interface is selected by the jumpers‘ alignment
  - UART0 = USB-connector (X11), UART4 = Sub-D9 (X12) (default)
    - Setting of Jumper JP51 and JP52: U-0 / R-4



(default)

  - UART0 = Sub-D9 (X12), UART4 = USB-connector (X11)
    - Setting of Jumper JP51 and JP52: U-4 / R-0



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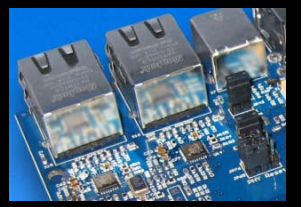
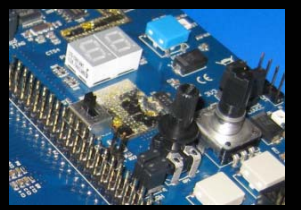
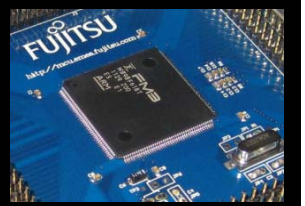
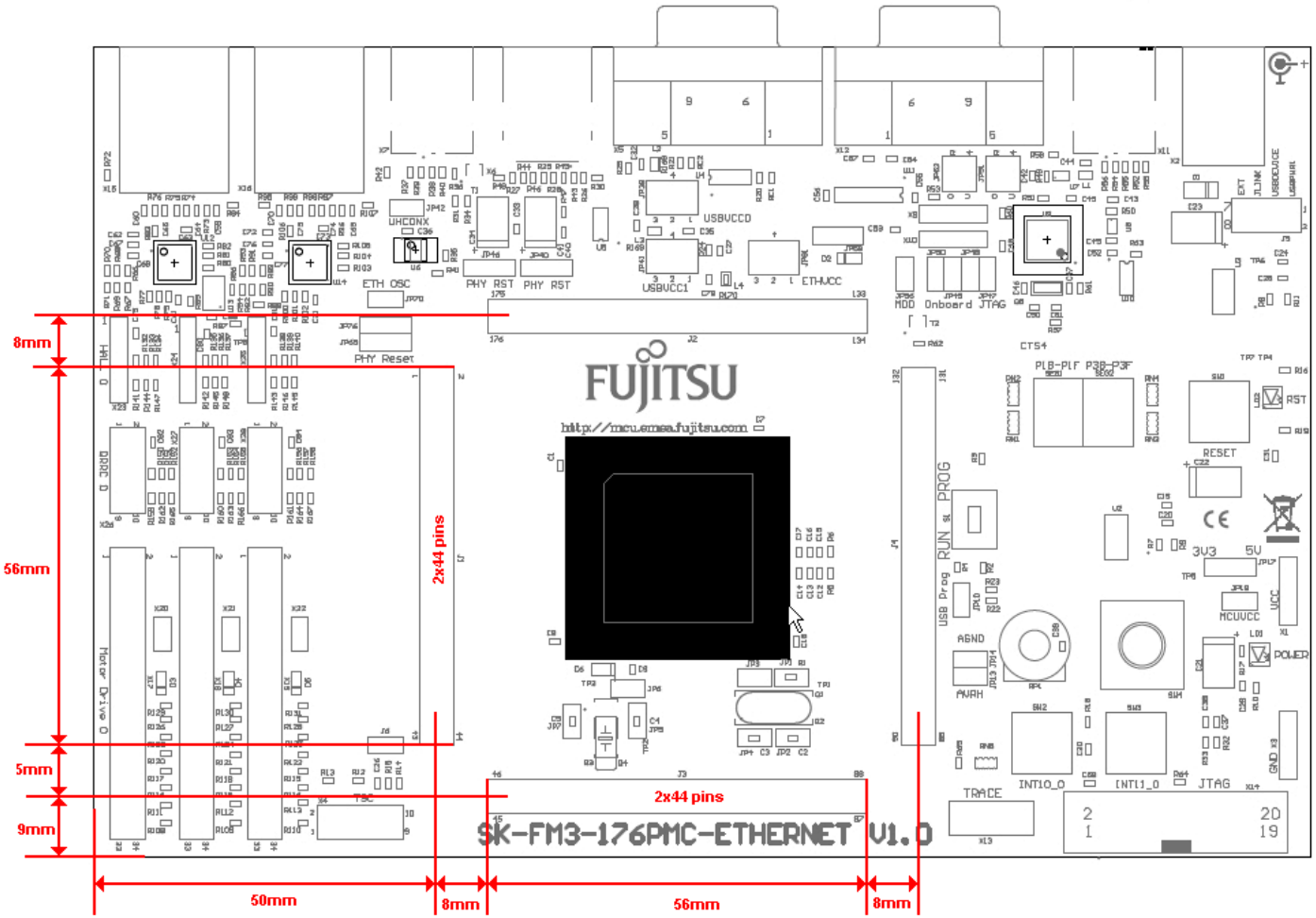






- **Extension headers X20-X23**
  - Standard 0.1” / 2.54mm grid for use with prototype boards _



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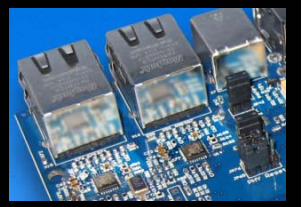

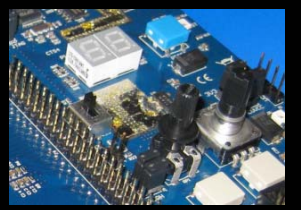

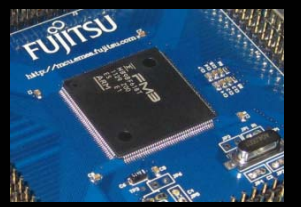

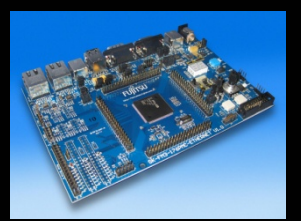

The microcontroller pins

Pin	Pin-name	Pin-Function on SK-FM3-176PMC-ETHERNET
1	VCC	MCUVCC
2	PA0/RTO20_0/TIOA08_0/FRCK1_0	Reset TS C Connector / INT0
3	PA1/RTO21_0/TIOA09_0/IC10_0	Hall Sensor1-3 /INT1
4	PA2/RTO22_0/TIOA10_0/IC11_0	Hall Sensor1-4
5	PA3/RTO23_0/TIOA11_0/IC12_0	Hall Sensor1-5
6	PA4/RTO24_0/TIOA12_0/IC13_0/INT03_0	TINT TSC Connector
7	PA5/RTO25_0/TIOA13_0/INT10_2	GINT TSC Connector
8	P05/TRACED0/TIOA05_2/SIN4_2/INT00_1	UART4 (RXD)/ TRACED0
9	P06/TRACED1/TIOB05_2/SOT4_2/INT01_1	UART4 (TXD)/ TRACED1
10	P07/TRACED2/ADTG_0/SCK4_2	TRACED2
11	P08/TRACED3/TIOA00_2/CTS4_2	CTS4/TRACED3

Pin	Pin-name	Pin-Function on SK-FM3-176PMC-ETHERNET
12	P09/TRACECLK/TIOB00_2/RTS4_2/DTTI2X_0	RTS/TRACECLK
13	P50/INT00_0/AIN0_2/SIN3_1//RTO10_0/IC20_0/MOEX_0	MotorDrive1 PWM1H / SEG1-A
14	P51/INT01_0/BIN0_2/SOT3_1/RTO11_0/IC21_0/MWEX_0	MotorDrive1 PWM1L /SEG1-B
15	P52/INT02_0/ZIN0_2/SCK3_1/RTO12_0/IC22_0/MDQM0_0	MotorDrive1 PWM2H /SEG1-C
16	P53/SIN6_0/TIOA01_2/INT07_2/RTO13_0/IC23_0/MDQM1_0	MotorDrive1 PWM2L / SEG1-D
17	P54/SOT6_0/TIOB01_2/RTO14_0/MALE_0	MotorDrive1 PWM3H /SEG1-E
18	P55/SCK6_0/ADTG_1/RTO15_0/MRDY_0	MotorDrive1 PWM3L /SEG1-F
19	P56/SIN1_0/INT08_2/TIOA09_2/DTTI1X_0/MNALE_0	MotorDrive1 FAULT /SEG1-G
20	P57/SOT1_0/TIOB09_2/INT16_1/MNCLE_0	SEG1-DP
21	P58/SCK1_0/TIOA11_2/INT17_1/MNWEX_0	
22	P59/SIN7_0/TIOB11_2/INT09_2/MNREX_0	

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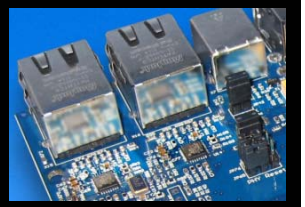
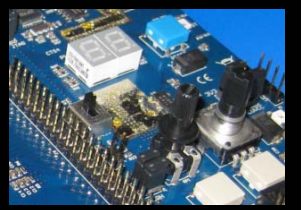
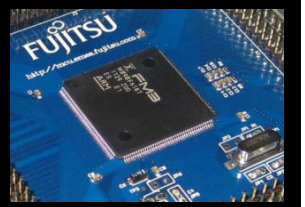

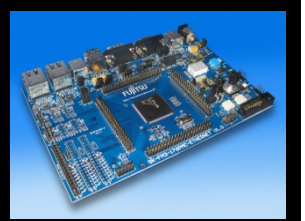

The microcontroller pins (cont'd)

Pin	Pin-name	Pin-Function on SK-FM3-176PMC-ETHERNET
23	P5A/SOT7_0/TIOA13_1/INT18_1/MCSX0_0	
24	P5B/SCK7_0/TIOB13_1/INT19_1/MCSX1_0	
25	P5C/TIOA06_2/INT28_0/IC20_1	
26	P5D/TIOB06_2/INT29/DTTI2X_1	MotorDrive2 FAULT
27	VSS	GND
28	P30/AIN0_0/TIOB0_1/INT03_2	QPRC0-A
29	P31/BIN0_0/TIOB1_1/SCK6_1/INT04_2	QPRC0-B
30	P32/ZIN0_0/TIOB2_1/SOT6_1/INT05_2	QPRC0-Z
31	P33/INT04_0/TIOB3_1/SIN6_1/ADTG_6	
32	P34/FRCK0_0/TIOB04_1	CANL
33	P35/IC03_0/TIOB05_1/INT08_1	CANH

Pin	Pin-name	Pin-Function on SK-FM3-176PMC-ETHERNET
34	P36/IC02_0/SIN5_2/INT09_1/TIOA12_2/MCSX2_0	Hall Sensor0-5
35	P37/IC01_0/SOT5_2/INT10_1/TIOB12_2/MCSX3_0	Hall Sensor0-4
36	P38/IC00_0/SCK5_2/INT11_1/MCLKOUT_0	Hall Sensor0-3
37	P39/DTTI0X_0/ADTG_2	MotorDrive0 FAULT
38	P3A/RTO00_0/TIOA0_1	MotorDrive0 PWM1H
39	P3B/RTO01_0/TIOA1_1	MotorDrive0 PWM1L
40	P3C/RTO02_0/TIOA02_1	MotorDrive0 PWM2H
41	P3D/RTO03_0/TIOA03_1	MotorDrive0 PWM2L
42	P3E/RTO04_0/TIOA4_1	MotorDrive0 PWM3H
43	P3F/RTO05_0/TIOA5_1	MotorDrive0 PWM3L
44	VSS	GND

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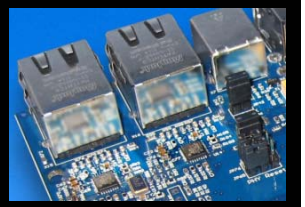
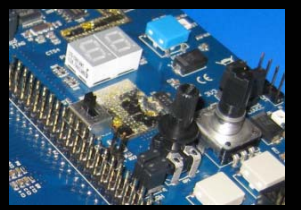
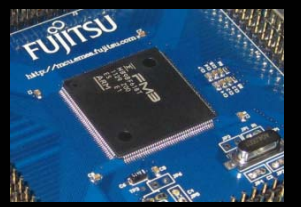

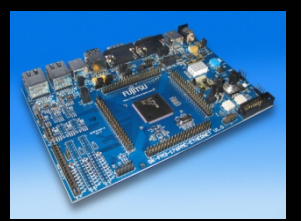

The microcontroller pins (cont‘d)

Pin	Pin-name	Pin-Function on SK-FM3-176PMC-ETHERNET
45	VCC	MCUVCC
46	P40/TIOA00_0/RTO10_1/INT12_1	
47	P41/TIOA01_0/RTO11_1/INT13_1	
48	P42/TIOA02_0/RTO12_1	
49	P43/TIOA03_0/RTO13_1/ADTG_7	
50	P44/TIOA04_0/RTO14_1	U14 LAN reset ‘nRST’
51	P45/TIOA05_0/RTO15_1	U12 LAN reset ‘nRST’
52	C	C-pin
53	VSS	GND
54	VCC	MCUVCC
55	P46/X0A	Subclock (optional)

Pin	Pin-name	Pin-Function on SK-FM3-176PMC-ETHERNET
56	P47/X1A	Subclock (optional)
57	INTX	Key button ‘Reset’
58	P48/DTTI1X_1/INT14_1/SIN3_2	
59	P49/TIOB00_0/IC10_1/AIN0_1/SOT3_2	
60	P4A/TIOB01_0/IC11_1/BIN0_1/SCK3_2/MADATA00_0	
61	P4B/TIOB02_0/IC12_1/ZIN0_1/MADATA01_0	
62	P4C/TIOB03_0/IC13_1/SCK7_1/AIN1_2/MADATA02_0	
63	P4D/TIOB04_0/FRCK1_1/SOT7_1/BIN1_2/MADATA03_0	
64	P4E/TIOB05_0/INT06_2/SIN7_1/ZIN1_2/MADATA04_0	
65	P70/TIOA04_2/MADATA05_0	SEG2-A
66	P71/INT13_2/N8/MADATA06_0	SEG2-B

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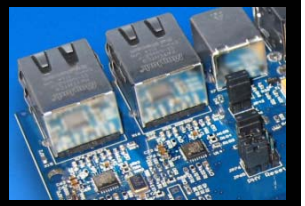

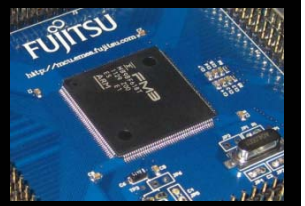

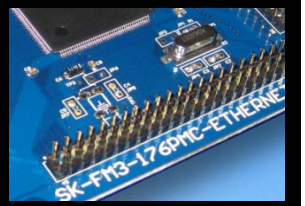

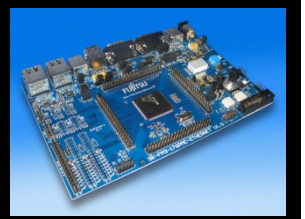

The microcontroller pins (cont'd)

Pin	Pin-name	Pin-Function on SK-FM3-176PMC-ETHERNET
67	P72/SIN2_0/INT14_2/AIN2_0/MADATA07_0	SEG2-C / QPRC2-A
68	P73/SOT2_0/INT15_2/BIN2_0/MADATA08_0	SEG2-D/ QPRC2-B
69	P74/SCK2_0/K8/MADATA09_0	SEG2-E/ QPRC2-Z
70	P75/SIN3_0/ADTG_8/INT07_1/MADATA10_0	SEG2-F
71	P76/SOT3_0/TIOA07_2/INT11_2/MADATA11_0	SEG2-G
72	P77/SCK3_0/TIOB07_2/INT12_2/MADATA12_0	SEG2-DP
73	P78/AIN1_0/N9/MADATA13_0	SW Rotary-A /QPRC1-A
74	P79/BIN1_0/TIOB15_0/INT23_1/MADATA14_0	SW Rotary-B /QPRC1-B
75	ZIN1_0/L9/MADATA15_0	QPRC1-Z
76	P7B/TIOB07_0/INT10_0	
77	P7C/TIOA07_0/INT11_0	

Pin	Pin-name	Pin-Function on SK-FM3-176PMC-ETHERNET
78	P7D/TIOA14_1/FRCK2_1/INT12_0	USB Host-Overcurrent
79	P7E/TIOB14_1/IC21_1/INT24_0	Hall Sensor2-3
80	P7F/TIOA15_1/IC22_1/INT25_0	Hall Sensor2-4
81	PF0/TIOB15_1/SIN1_2/INT13_0/IC23_1	Hall Sensor2-5 / SIN TSC Connector
82	PF1/TIOA08_1/SOT1_2/INT14_0	SDA1 TSC Connector
83	PF2/TIOB08_1/SCK1_2/INT15_0	SCL1 TSC Connector
84	PE0/MD1	
85	MD0	Programming Switch S1
86	PE2/X0	4MHz Crystal
87	PE3/X1	4MHz Crystal
88	VSS	GND

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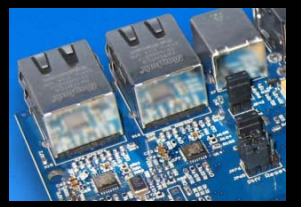
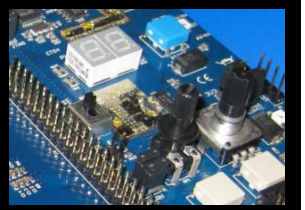
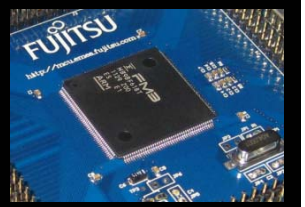

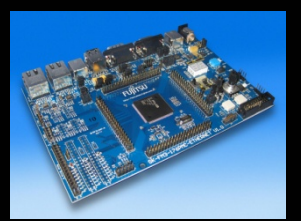

The microcontroller pins (cont'd)

Pin	Pin-name	Pin-Function on SK-FM3-176PMC-ETHERNET
89	VCC	MCUVCC
90	P10/AN00/MCSX7_0	Motor Drive0-U_DC_BUS
91	P11/AN01/SIN1_1/INT02_1/FRCK0_2/MCSX6_0	Motor Drive0-U_PH_A
92	P12/AN02/SOT1_1/IC00_2/MCSX5_0	Motor Drive0-U_PH_B
93	P13/AN03/SCK1_1/IC01_2/MCSX4_0	Motor Drive0-U_PH_C
94	P14/AN04/SIN0_1/INT03_1/IC02_2/MAD00_0	Motor Drive0-I_DC_BUS
95	P15/AN05/SOT0_1/IC03_2/MAD01_0	Motor Drive0-I_PH_A
96	P16/AN06/SCK0_1/INT20_1/MAD02_0	Motor Drive0-I_PH_B
97	P17/AN07/SIN2_2/INT04_1/MAD03_0	Motor Drive0-I_PH_C
98	P18/AN08/SOT2_2/INT21_1/MAD04_0	Motor Drive1-U_DC_BUS
99	P19/AN09/SCK2_2/INT22_1/MAD05_0	Motor Drive1-U_PH_A

Pin	Pin-name	Pin-Function on SK-FM3-176PMC-ETHERNET
100	P1A/AN10/SIN4_1/INT05_1/TIOA13_2/IC00_1/MAD06_0	Motor Drive1-U_PH_B
101	P1B/AN11/SOT4_1/INT25_1/TIOB13_2/IC01_1/MAD07_0	Motor Drive1-U_PH_C
102	P1C/AN12/SCK4_1/INT26_1/TIOA14_2/IC02_1/MAD08_0	Motor Drive1-I_DC_BUS
103	P1D/AN13/CTS4_1/INT27_1/TIOB14_2/IC03_1/MAD09_0	Motor Drive0-I_PH_A
104	P1E/AN14/RTS4_1/INT28_1/TIOA15_2/DTTI0X_1/MAD10_0	Motor Drive0-I_PH_B
105	P1F/AN15/ADTG_5/INT29_1/TIOB15_2/FRCK0_1/MAD11_0	Motor Drive0-I_PH_C
106	AVCC	AVCC
107	AVRH	AVRH
108	AVSS	GND
109	VSS	GND
110	PB0/AN16/TIOA09_1/SIN7_2/INT16_0	Motor Drive2-U_DC_BUS

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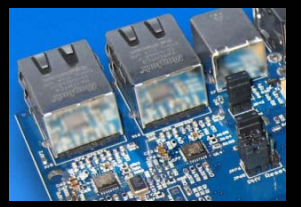
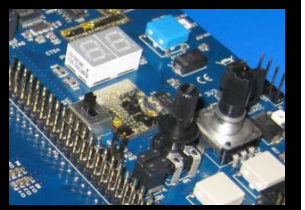
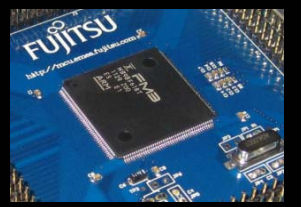

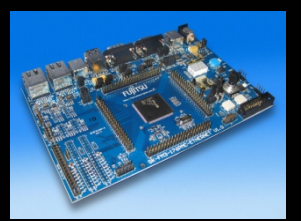

The microcontroller pins (cont'd)

Pin	Pin-name	Pin-Function on SK-FM3-176PMC-ETHERNET
111	PB1/AN17/TIOB09_1/SOT7_2/INT17_0	Motor Drive2-U_PH_A
112	PB2/AN18/TIOA10_1/SCK7_2/INT18_0	Motor Drive2-U_PH_B
113	PB3/AN19/TIOB10_1/INT19_0	Motor Drive2-U_PH_C
114	PB4/AN20/TIOA11_1/SIN0_2/INT20_0	Motor Drive2-I_DC_BUS
115	PB5/AN21/TIOB11_1/SOT0_2/INT21_0/AIN2_2	Motor Drive2-I_PH_A
116	PB6/AN22/TIOA12_1/SCK0_2/INT22_0/BIN2_2	Motor Drive2-I_PH_B
117	PB7/AN23/TIOB12_1/INT23_0/ZIN2_2	Motor Drive2-I_PH_C
118	P29/AN24/MAD12_0	
119	P28/AN25/ADTG_4/INT09_0/RTO05_1/MAD13_0	
120	P27/AN26/INT02_2/RTO04_1/MAD14_0	
121	P26/AN27/SCK2_1/RTO03_1/MAD15_0	

Pin	Pin-name	Pin-Function on SK-FM3-176PMC-ETHERNET
122	P25/AN28/SOT2_1/RTO02_1/MAD16_0	
123	P24/AN29/SIN2_1/INT01_2/RTO01_1/MAD17_0	
124	P23/AN30/SCK0_0/TIOA07_1/RTO00_1	Potentiometer
125	P22/AN31/SOT0_0/TIOB07_1/ZIN1_1	UART0 (TXD)
126	P21/SIN0_0/INT06_1/BIN1_1	UART0 (RXD)
127	P20/INT05_0/CROUT_0/UHCONX1/AIN1_1/MAD18_0	
128	PF6/FRCK2_0/NMIX	
129	USBVCC1	USB- Power supply
130	P82/UDM1	USB Data -
131	P83/UDP1	USB Data +
132	VSS	GND

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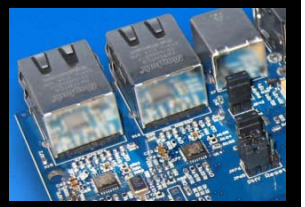
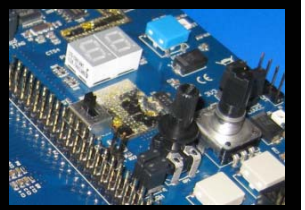
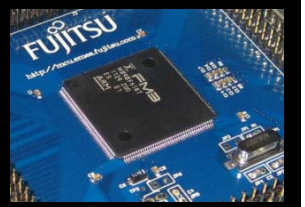

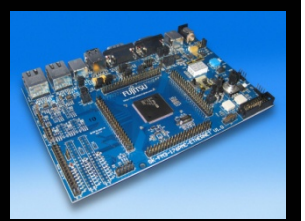

The microcontroller pins (cont'd)

Pin	Pin-name	Pin-Function on SK-FM3-176PMC-ETHERNET
133	VCC	MCUVCC
134	P00/TRSTX	JTAG TRSTX
135	P01/TCK	JTAG TCK / TRACE TCK
136	P02/TDI	JTAG TDI/ TRACE TDI
137	P03/TMS	JTAG TMC/ TRACE TMC
138	P04/TDO	JTAG TMC/ TRACE TMC
139	P90/TIOB08_0/RTO20_1/INT30_0/MAD19_0	Motor Drive2-PWM1H
140	P91/TIOB09_0/RTO21_1/INT31_0/MAD20_0	Motor Drive2-PWM1L
141	P92/TIOB10_0/RTO22_1/SIN5_1/MAD21_0	Motor Drive2-PWM2H
142	P93/TIOB11_0/RTO23_1/SOT5_1/MAD22_0	Motor Drive2-PWM2L
143	P94/TIOB12_0/RTO24_1/SCK5_1/INT26_0/MAD23_0	Motor Drive2-PWM3H

Pin	Pin-name	Pin-Function on SK-FM3-176PMC-ETHERNET
144	P95/TIOB13_0/RTO25_1/INT27_0/MAD24_0	Motor Drive2-PWM3L
145	PC0/E_RXER0_RXDV1	U14 LAN RXDV
146	PC1/E_RX03_RX11	U14 LAN RXD1
147	PC2/E_RX02_RX10	U14 LAN RXD0
148	PC3/E_RX01/TIOA06_1	U12 LAN RXD1
149	PC4/E_RX00/TIOA08_2	U12 LAN RXD0
150	PC5/E_RXDV0/TIOA10_2	U12 LAN RXDV
151	PC6/E_MDIO0/TIOA14_0	U12 LAN MDIO
152	PC7/E_MDC0/CROUT_1	U12 LAN MDC
153	PC8/E_RXCK0_REFCK	Ethernet clock
154	PC9/E_COL0	Host/Device USB switch

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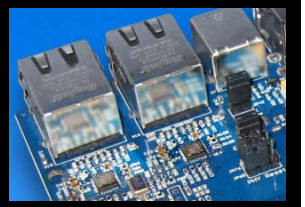
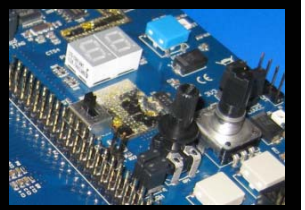
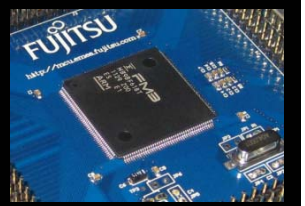
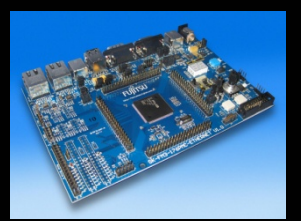
The Hardware









The microcontroller pins (cont'd)

Pin	Pin-name	Pin-Function on SK-FM3-176PMC-ETHERNET
155	PCA/E_CRS0	USB Host enable
156	ETHVCC	Ethernet VCC
157	VSS	GND
158	PCB/E_COUT	
159	PCC/E_MDIO1	U14 LAN MDIO
160	PCD/E_TCK0_MDC1	U14 LAN MDC
161	PCE/E_TXER0_TXEN1/D7/TIOB06_1	U14 LAN TXEN
162	PCF/E_TX03_TX11/E7/TIOB08_2	U14 LAN TXD1
163	PD0/E_TX02_TX10/SCK4_0/TIOB10_2/INT30_1	U14 LAN TXD0
164	PD1/E_TX01/SOT4_0/TIOB14_0/INT31_1	U12 LAN TXD1
165	PD2/E_TX00/SIN4_0/TIOA03_2/INT00_2	U12 LAN TXD0

Pin	Pin-name	Pin-Function on SK-FM3-176PMC-ETHERNET
166	PD3/E_TXEN0/TIOB03_2	U12 LAN TXEN
167	P62/E_PPS0_PPS1/SCK5_0/ADTG_3	
168	P61/SOT5_0/TIOB02_2/UHCONX0	USB UHCONX
169	P60/SIN5_0/TIOA02_2/INT15_1	Programming Switch S1
170	PF3/TIOA06_0/SIN6_2/INT06_0/AIN2_1	
171	PF4/TIOB06_0/SOT6_2/INT07_0/BIN2_1	
172	PF5/SCK6_2/B3/ZIN2_1	
173	USBVCC0	USBVCC
174	P80/UDM0	USB Switch
175	P81/UDP0	USB Switch
176	VSS	GND

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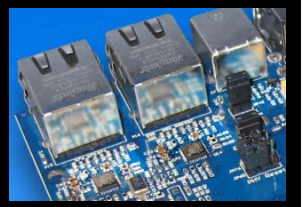
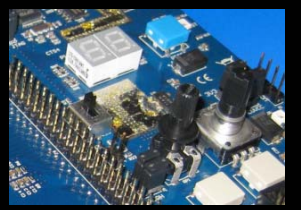
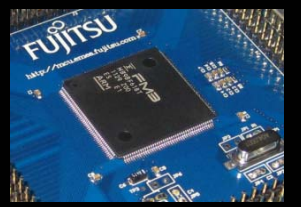
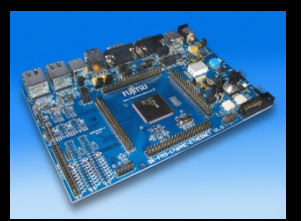
The Software



- **The SK-FM3-176PMC-ETHERNET CD includes the following software:**
  - MCU Flash programming tools
    - FUJITSU FLASH MCU Programmer for FM3
    - FLASH USB DIRECT Programmer
  - The FUJITSU USB Assistant
  - The FUJITSU OpenOCD Starter GUI (including USB driver for on-board USB-to-RS232 converter)
  - The terminal program SerialPortViewerAndTerminal
  - Free open-source development toolchain
  - Software examples for the SK-FM3-176PMC-ETHERNET
- **Please check our dedicated microcontroller website:**

http://mcu.emea.fujitsu.com

  - for updates of the Flash programmer tool, utilities and examples
  - for data sheets, hardware manuals, application notes, etc.

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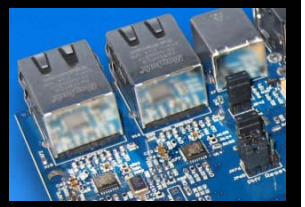
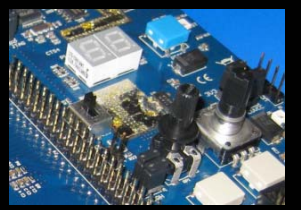
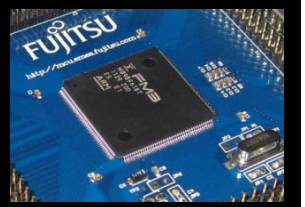
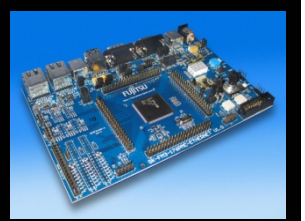
Source Code Examples



- **Following examples are provided with SK-FM3-176PMC-ETHERNET for IAR Embedded Workbench V6.2 and KEIL µVision4:**
  - mb9bfd18t_template-v12
    - ‚Empty' project as base for user applications
  - mb9bfd18t_adc_dvm-v10
    - Digital voltage meter based on the A/D-converter
  - mb9bfd18t_uart-v10
    - Simple UART example (UART0)
  - mb9bfd18t_ioport_counter-v10
    - Counts from 0 to 99 on the 7-segment display
  - sk-fm3-176pmc-ethernet_ethernet_uip-v12
    - Port of the free µIP (micro-IP) TCP/IP stack including small webserver

Further and updated examples are available on this CD,
our MCU website and our starterkit website.

You can find a demonstration firmware and additional product information
of the commercially supported TCP/IP stack by SEVENSTAX on this CD.

Note: Please copy the examples to your local drive!

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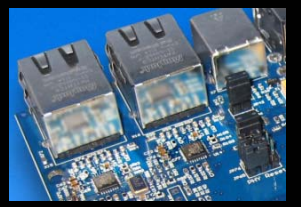
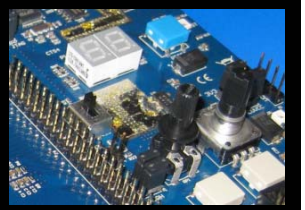
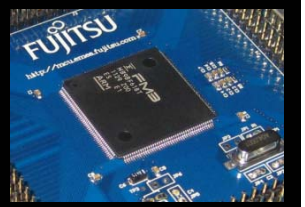
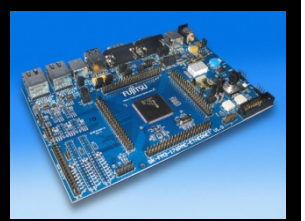
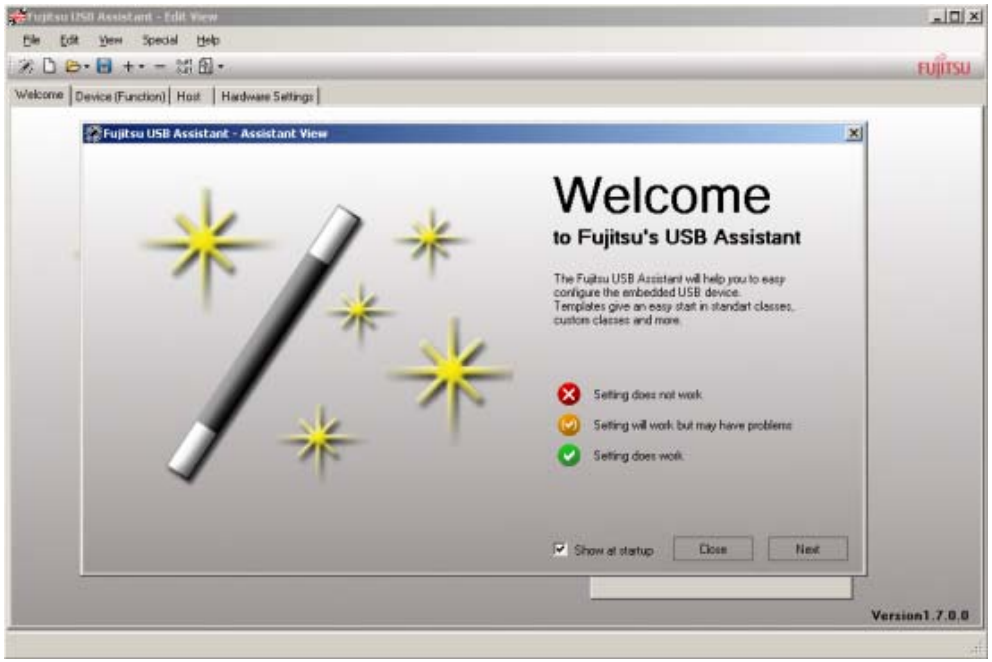






Create own USB Applications

- **Using the Fujitsu USB Assistant**
  - Easy to use, step by step
  - Creates USB Host / Device Projects
  - Combines microcontroller templates, board support and USB use case
  - Start installation of Fujitsu USB Assistant



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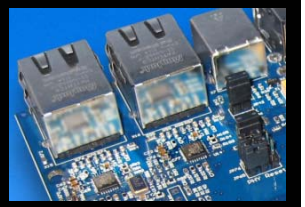
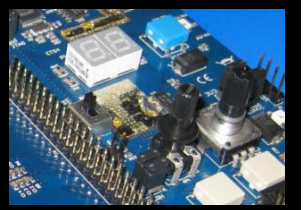
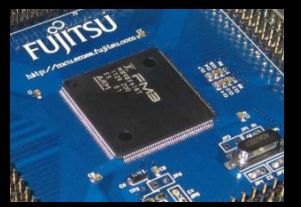
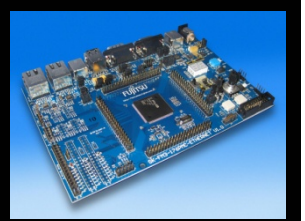
OpenOCD









- **OpenOCD (*Open On-Chip Debugging*) is an open-source software, which provides JTAG debugging with GDB**
- **On the SK-FM3-176PMC-ETHERNET is a dual UART-to-USB converter that serves two purposes:**
  - JTAG interface to be used with OpenOCD
  - Virtual COM port
- **However, this converter chip needs a special driver on the connected Personal Computer and for debugging with OpenOCD, a GDB (GNU Debugger) server must be started.**
- **FUJITSU OpenOCD Starter GUI is a dedicated application to ease the handling with OpenOCD and GDB and a convenient way to install all the necessary drivers.**

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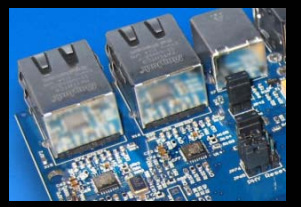
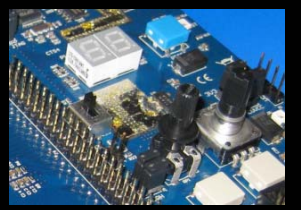
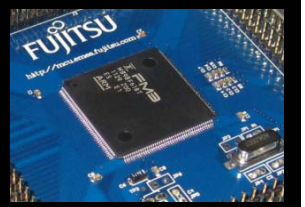
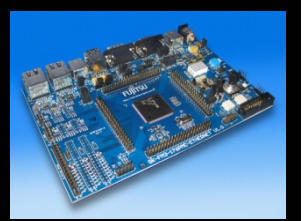
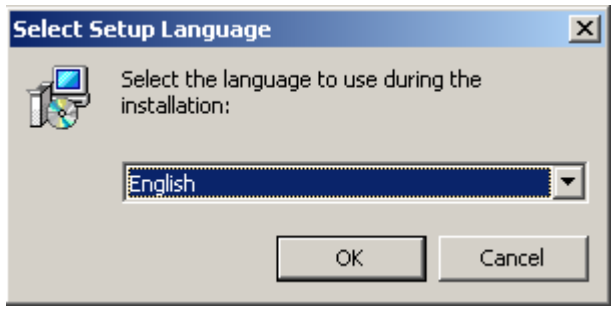
Installation of OpenOCD Debugger

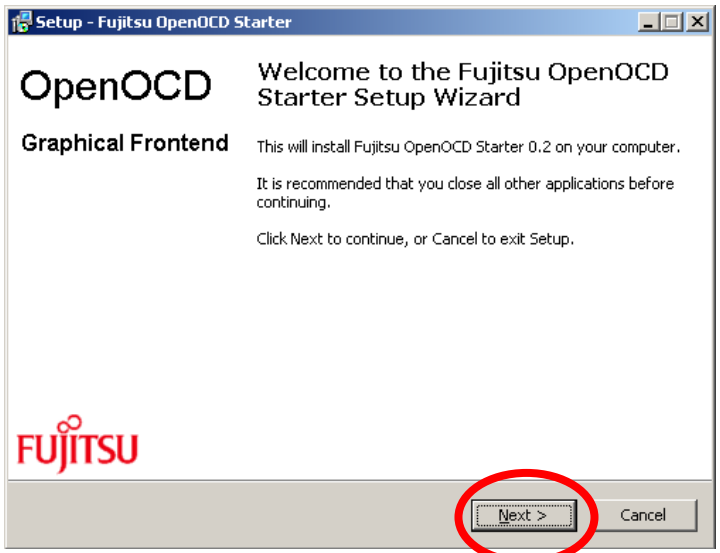


1) Start installation of Fujitsu OpenOCD Starter (GUI)

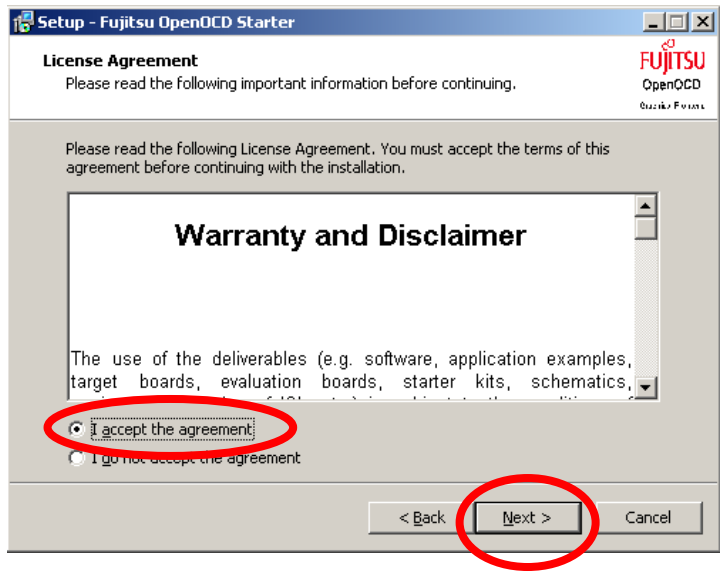
2) The following window should appear.
Select your preferred language



3) Press *Next*



4) Select „I accept agreement“ and press *Next*



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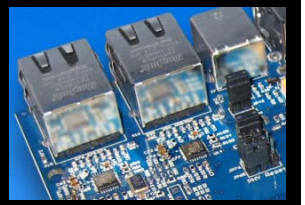
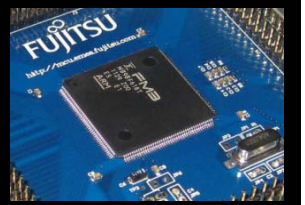
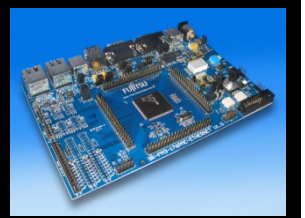
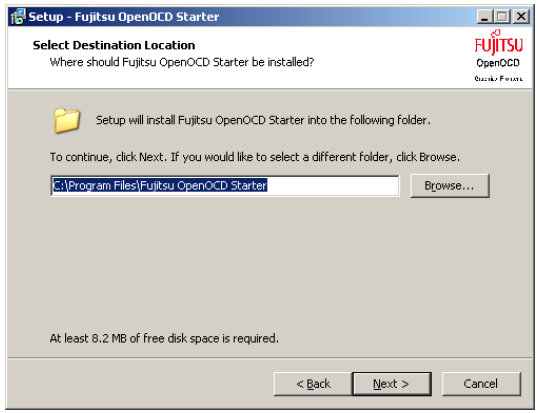
Installation of OpenOCD Debugger



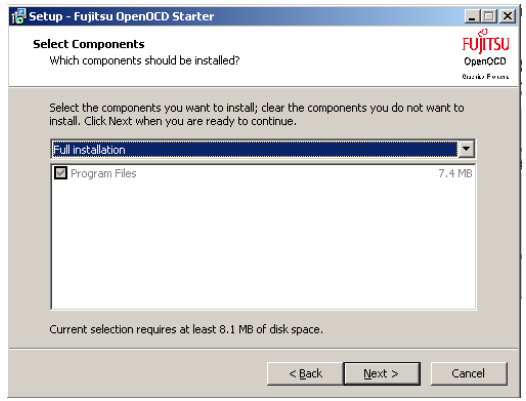




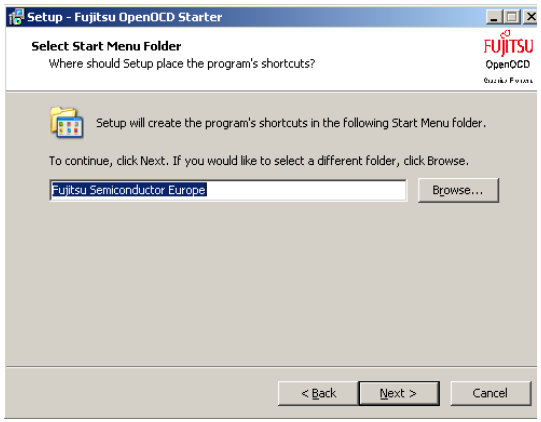
5) Select the installation folder and press *Next*



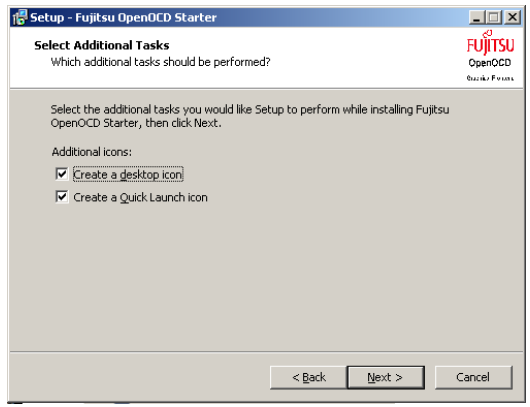
6) Select *Full installation,* press *Next*



7) Select shortcuts folder and press *Next*



8) Select „Create a desktop icon“ and *Create Quick Launch Icon* and press *Next*



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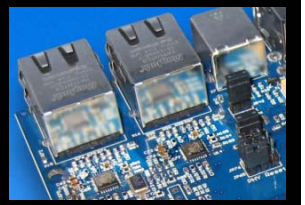
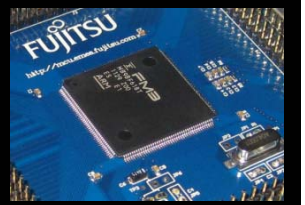
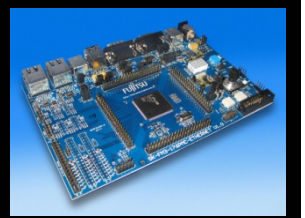
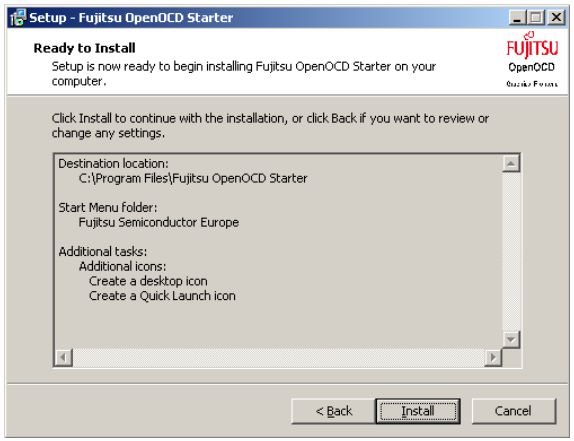
Installation of OpenOCD Debugger



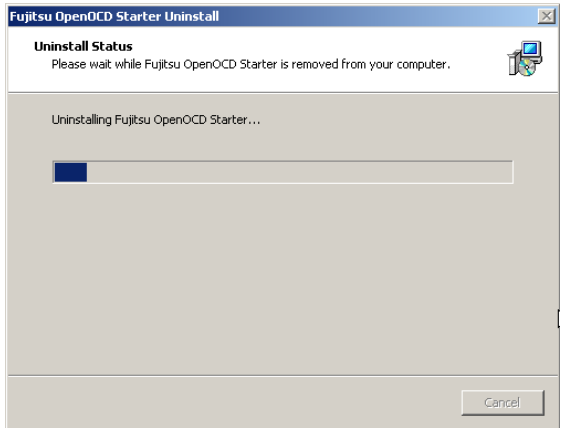




9) Press *Install*

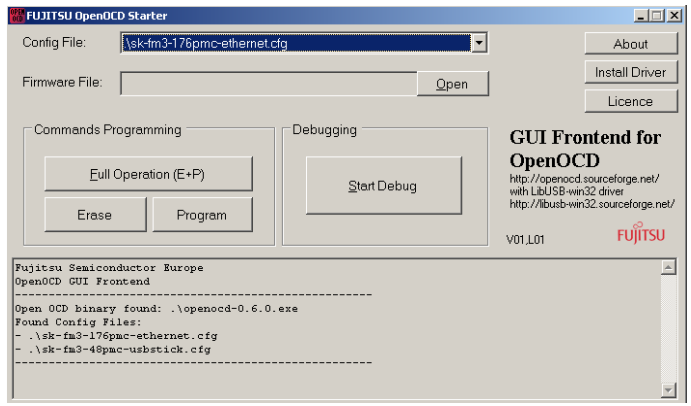


10) Installation will begin



11) Select *Install Drivers* and push *Finish*

12) Open the application



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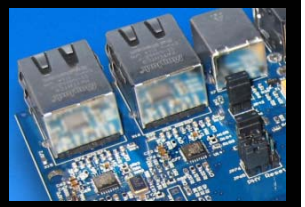
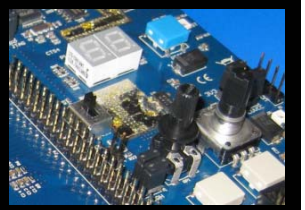
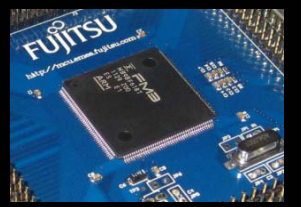
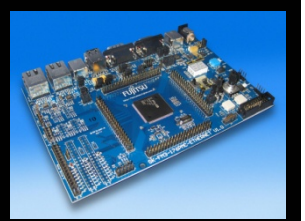
Installation of the USB-driver



- **Connect the SK-FM3-176PMC-ETHERNET via UARTB (X11) to your PC**
- **The Installation of the drivers will be done through OpenOCD. Only in case the following dialog box appears, follow the next steps.**
  - Windows will tell *Found New Hardware: FT232R USB UART* and the Hardware Wizard should start automatically
    - **Note: The dialog box may differ with different operating systems**

1) Ignore this dialog box

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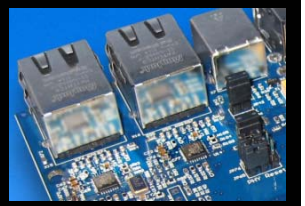
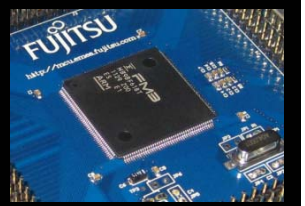
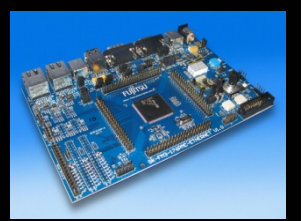
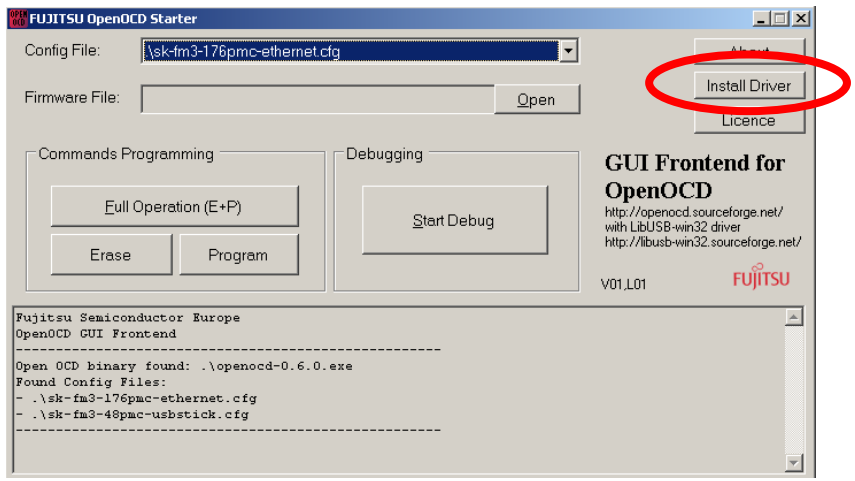
Installation of the USB-driver



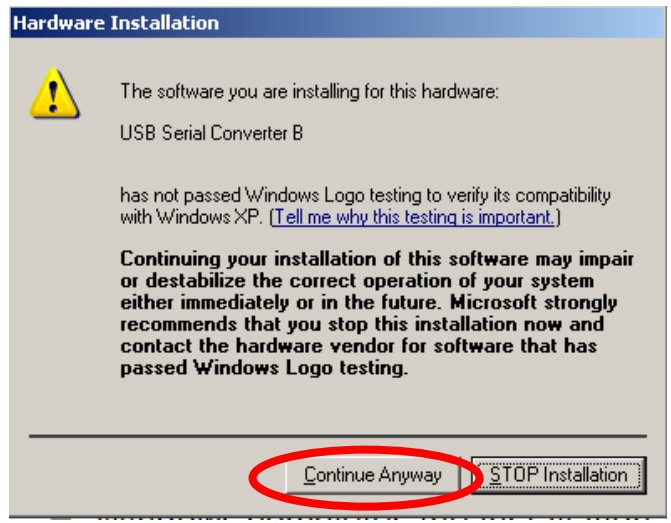




2) Open OpenOCD
3) Press the button *Install Driver*



4) If a warning window appears, press *Continue Anyway*. This window could appear more than once



5) READY!!!!

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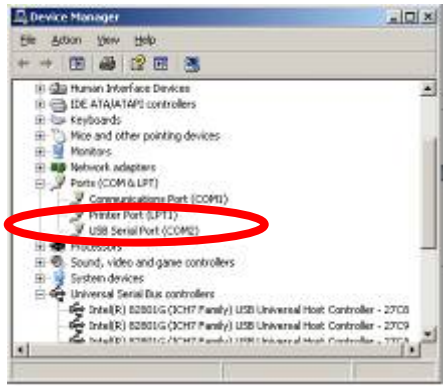
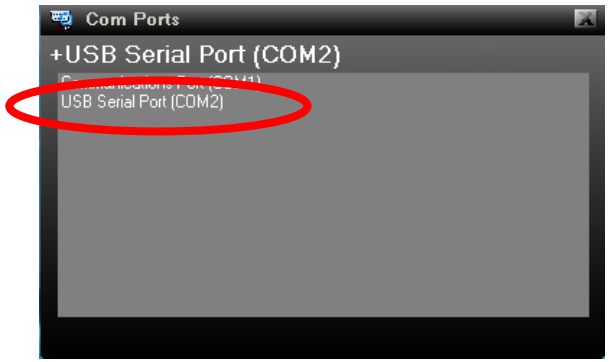
Installation of the USB-driver

There are two ways to check whether your installation was successful:

- **Start the Device Manager of the Windows Control Panel**
  - START -> Settings -> Control Panel
  - Control Panel -> System -> Hardware -> Device Manager
- **Check 'Ports' for the assigned virtual COM-port number**
  - USB Serial Port (e.g.: COM2)



- **Open the Fujitsu *SerialPort Viewer and Terminal***
  - Double click on the icon of the taskbar.
- **It will show the opened ports, check for the assigned virtual COM-port number**
  - USB Serial Port (e.g.: COM2)



Ready!

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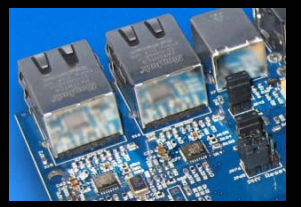
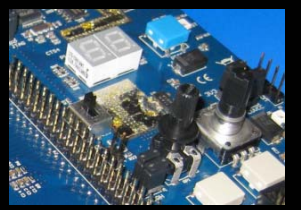
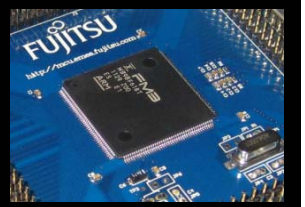
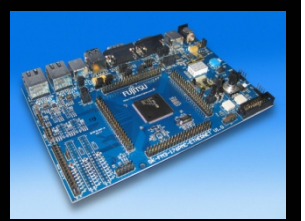
Flash Programming



- **There are two options to program the flash:**

1. **UART Programming (X11, X12)**
   - Check jumper JP10 is opened
   - Connect UART0 of the board to the USB-Port of the PC
     - via USB (JP51, JP52: U-0, R-1)
     - via RS232 (JP51, JP52: U-1, R-0)
   - Use the FUJITSU FLASH MCU Programmer

2. **USB Programming (X7)**
   - Check jumper JP10 is closed
   - Connect the board via USB-Device (X7) to the USB-Port of the PC
   - Use the FLASH USB DIRECT Programmer

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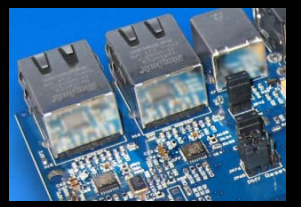
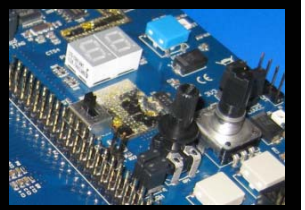
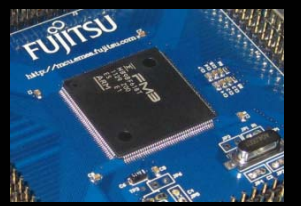
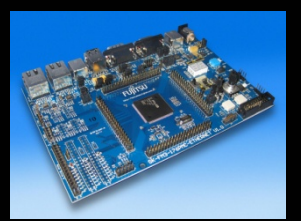
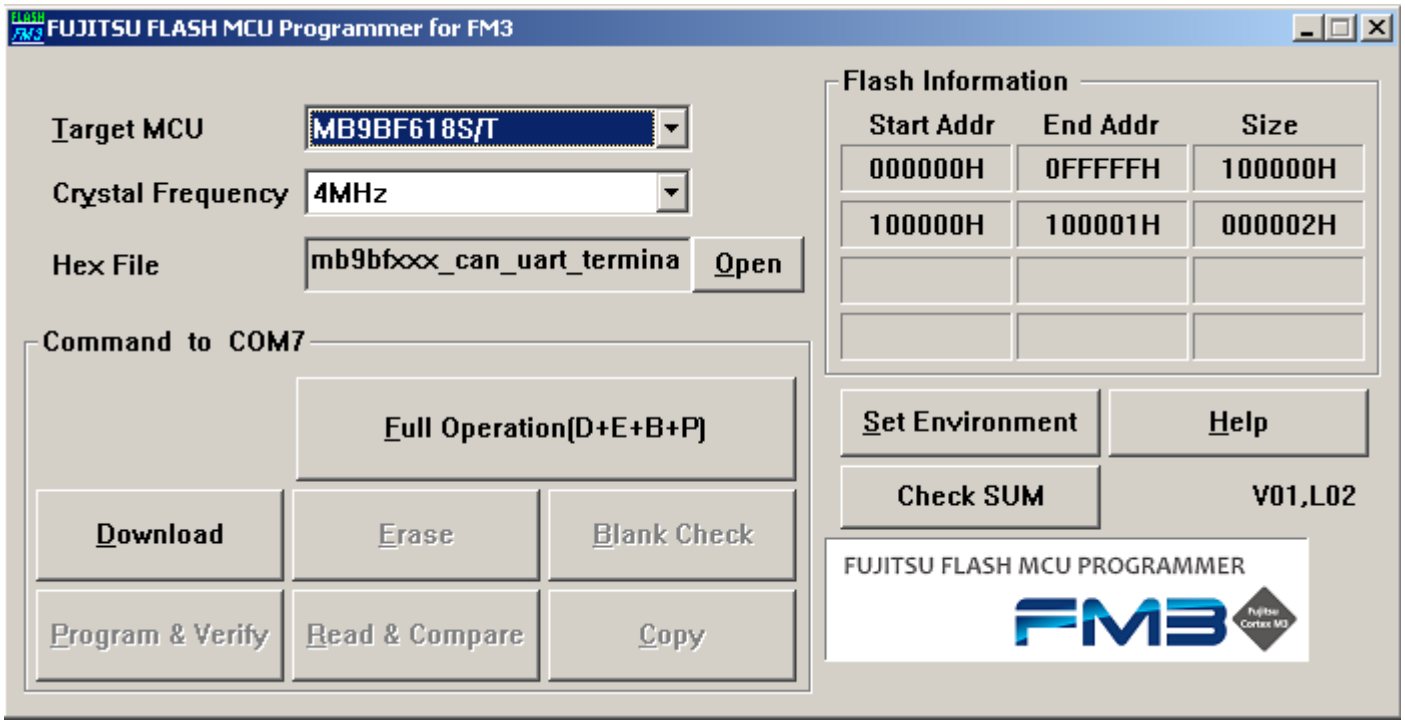
FUJITSU FLASH MCU Programmer for UART Programming



- **FUJITSU FLASH MCU Programmer**
  - Free of charge, no registration required
  - Windows based programming tool for FM3 Fujitsu microcontroller
  - Uses PC serial port COMx (incl. virtual COM port: USB-to-RS232)
  - Start installation



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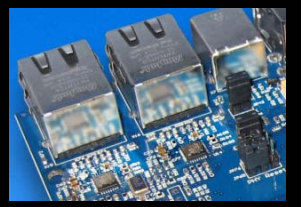
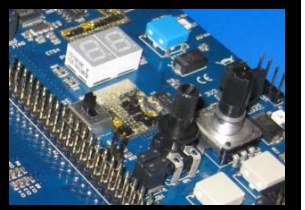
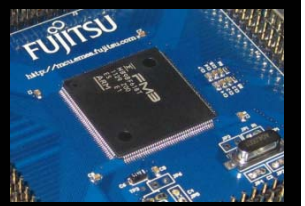
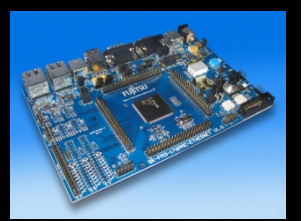
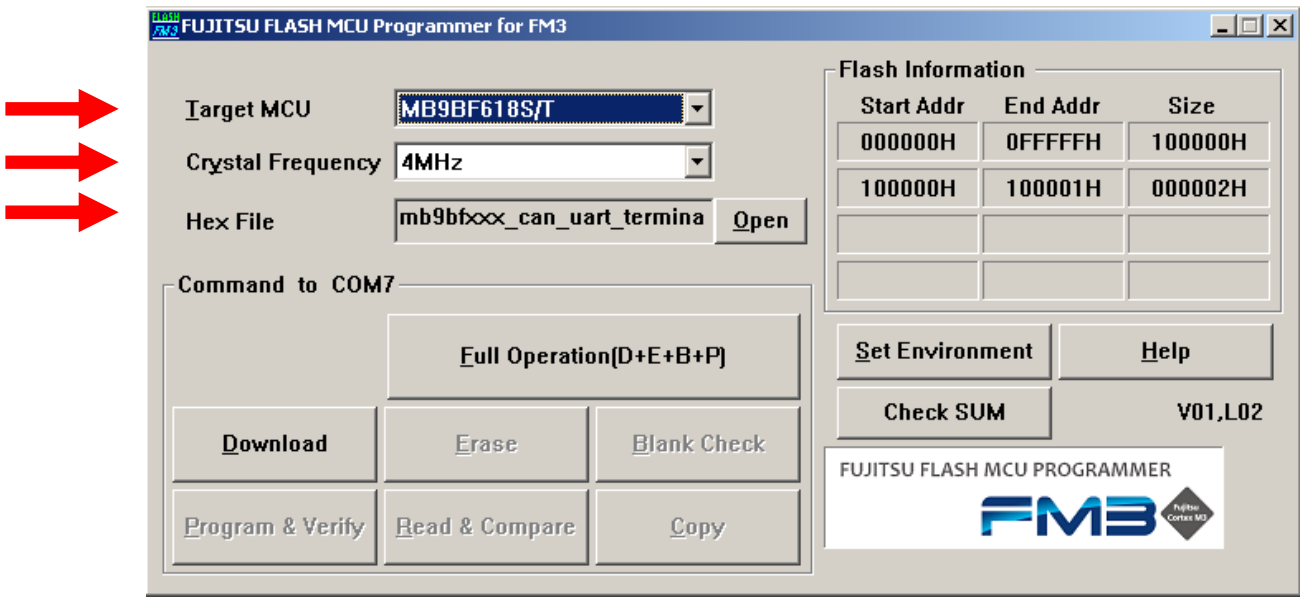
Program Download



- **Start the FUJITSU FLASH MCU Programmer**
- **Select the target microcontroller MB9BD18S/T**
  While MB9BFD18S/T is not available in the programming tool, MB9BF618S/T can be selected
- **Select the crystal frequency (4 MHz)**
- **Choose the software example from the example ‘exe‘-folder**
  (e.g. .\ \Examples\examples\mb9bfd18t_ioport_counter-v10\example\IAR\output\release\exe\mb9bfd18t_ioport_counter.srec)



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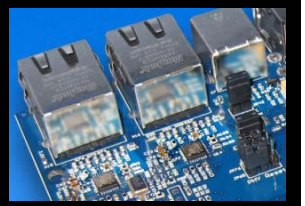
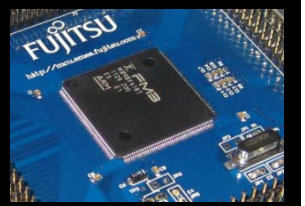
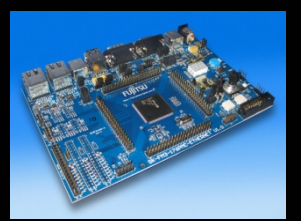
Program Download

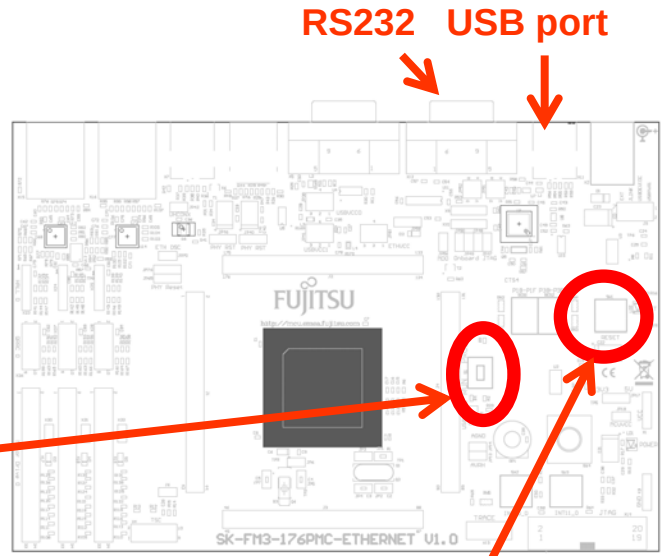






- **Connect to the PC**
  - Connect UART0 to RS232 (X12) or to the USB interface (X11)
  - Select COM port (‚Set Environment‘)
- **Open JP10**
- **Set switch S1 to position *PROG***
- **Press *Reset***
- **Start *Full Operation***

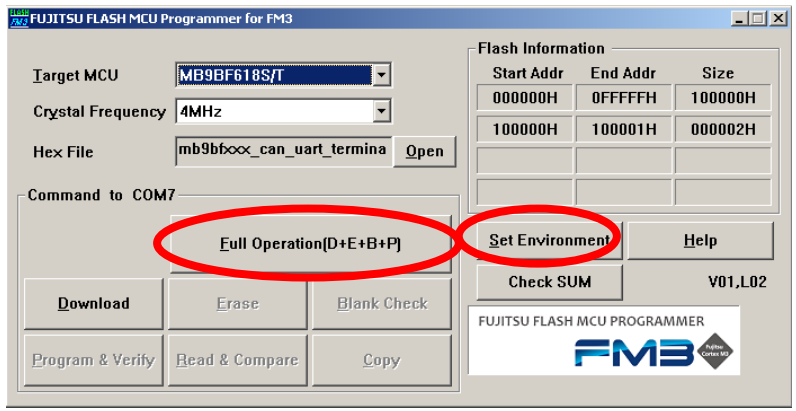
(see JP51, JP52 jumper settings)

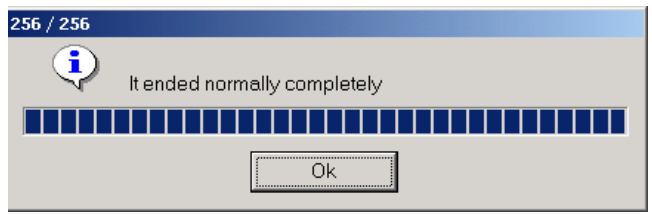


S1: Mode selection

PROG: Set switch to position ‚PROG‘ in order to select the program-mode

Keybutton ‚RESET‘





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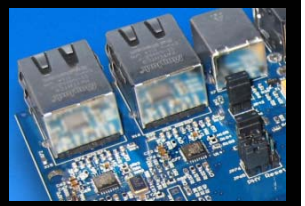
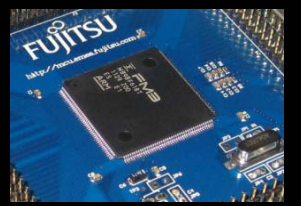
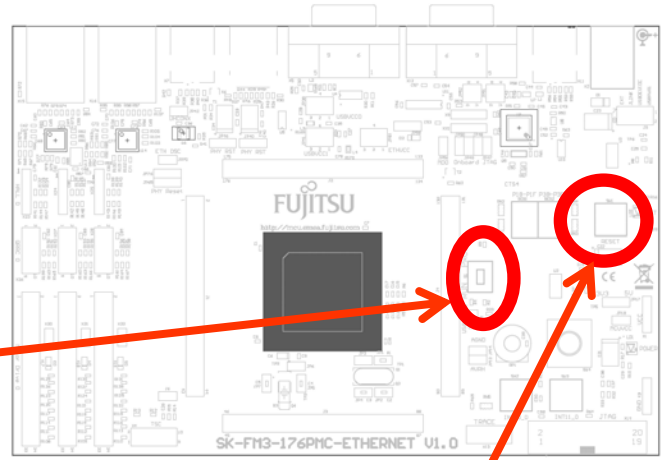
Program Download





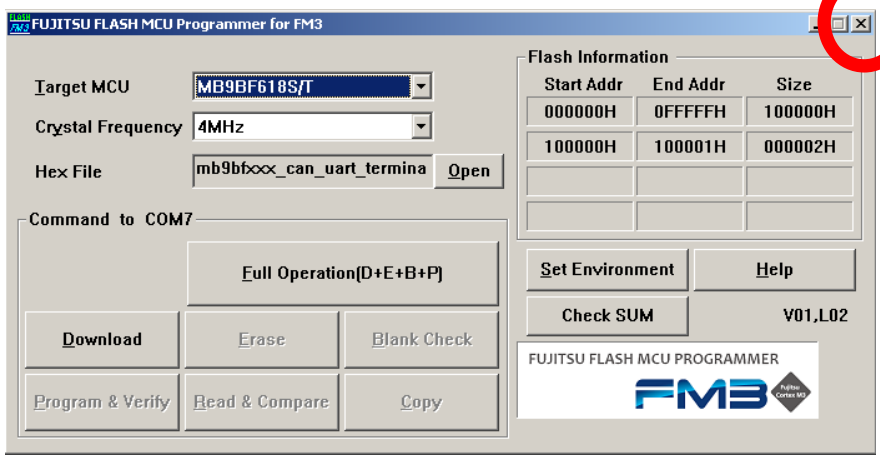
- **Close the FUJITSU FLASH MCU Programmer**
- **Set switch S1 to position *RUN***
- **Press *Reset***



S1: Mode selection

RUN: Set switch to position ‚RUN' in order to select the run-mode

Keybutton ‚RESET'



Close the FUJITSU FLASH MCU Programmer

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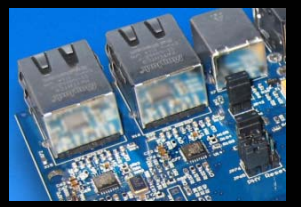
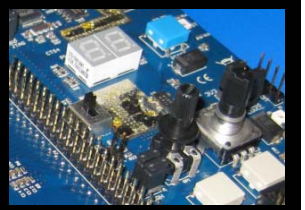
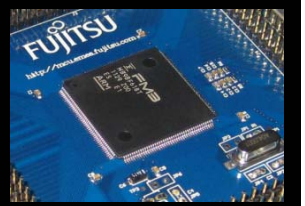
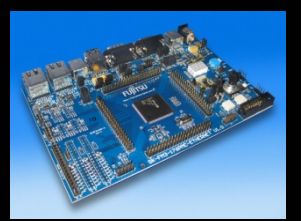
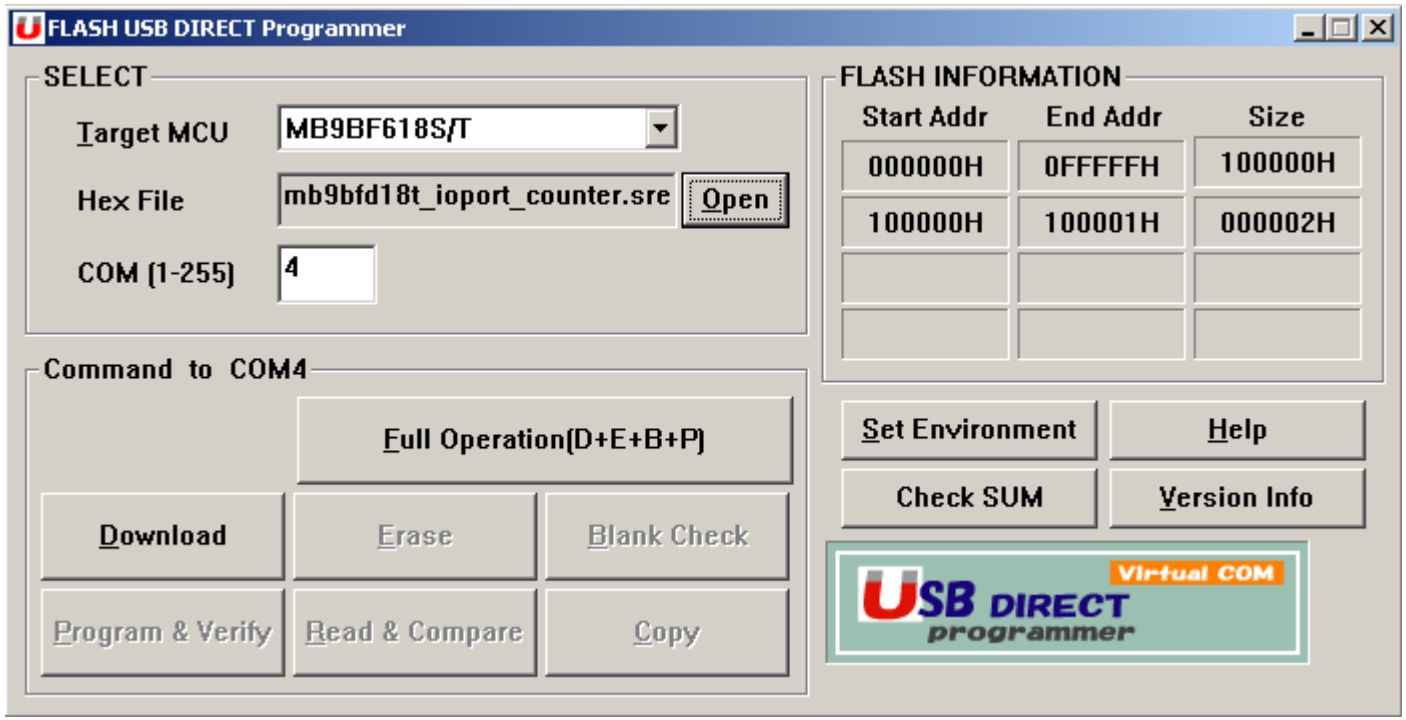
FLASH USB DIRECT Programmer for USB Direct Programming



- **FLASH USB DIRECT Programmer**
  - Windows based programming tool for FM3 Fujitsu microcontroller
  - Uses direct USB connection (via X7)
  - Start installation



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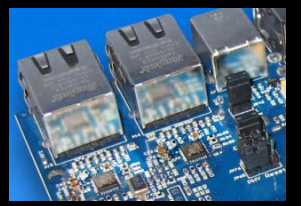
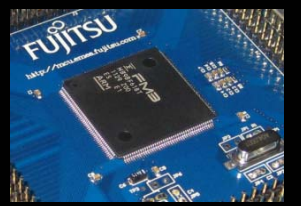
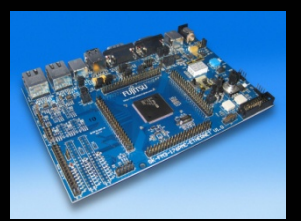
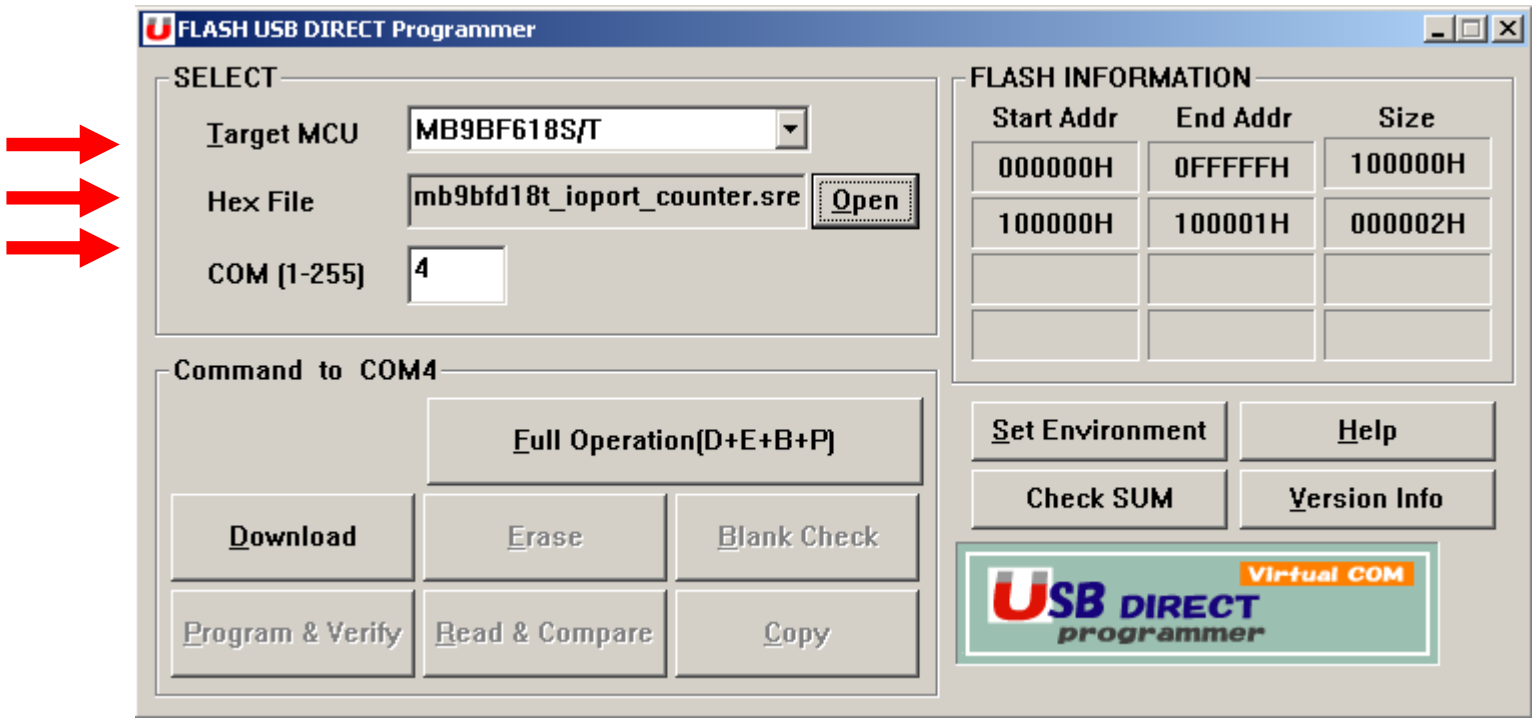
Program Download







- **Start the FLASH USB DIRECT Programmer**
- **Select the target microcontroller (MB9BFD18S/T)**
  While MB9BFD18S/T is not available in the programming tool, MB9BF618S/T can be selected
- **Choose the software example from the example ‘exe‘-folder**
  (e.g. .\ \Examples\examples\mb9bfd18t_ioport_counter-v10\example\IAR\output\release\exe\mb9bfd18t_ioport_counter.srec)



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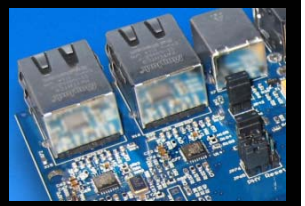
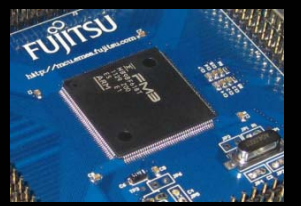
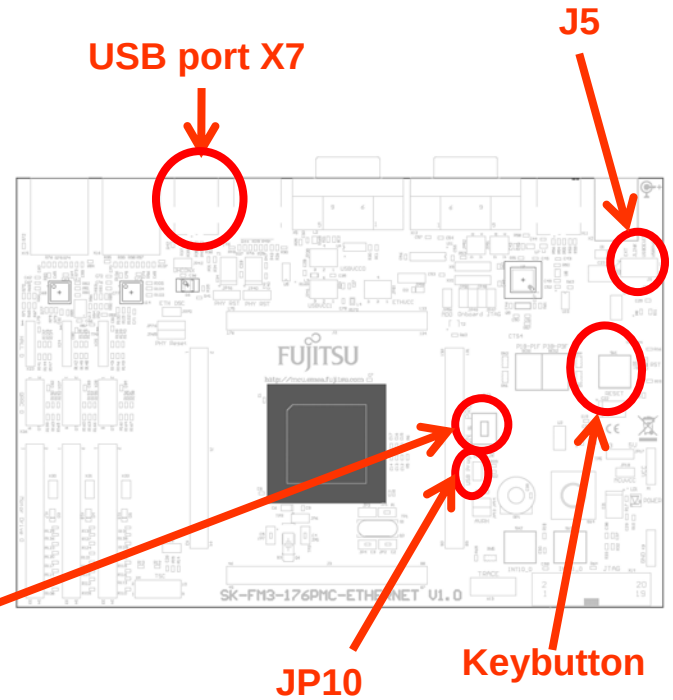
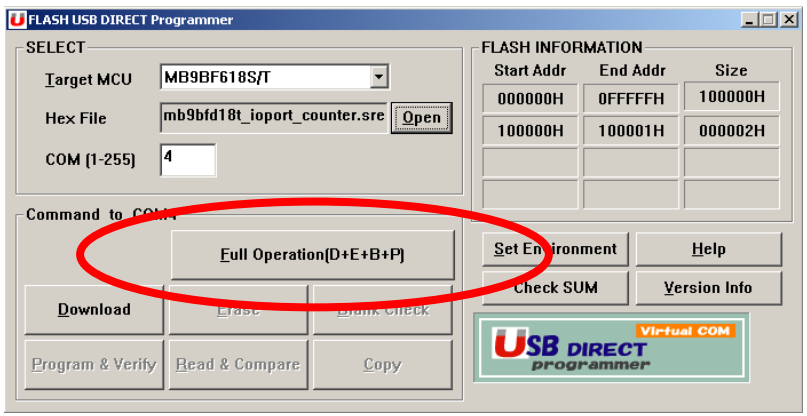
Program Download

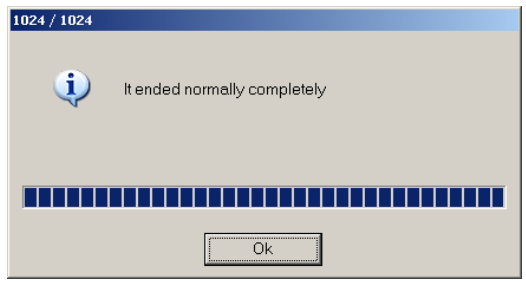




- **Select the MCU power supply (J5)**
- **Close JP10**
- **Set switch S1 to position *PROG***
- **Connect USB port X3 with the PC**
- **Install the USB driver**
  - The driver is in the subfolder *driver* of *installed* programmer
  - E.g.: C:\FUJITSU USB DIRECT Programmer
- **Select the COM port**
- **Press *Reset***
- **Start *Full Operation***







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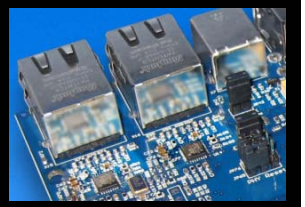
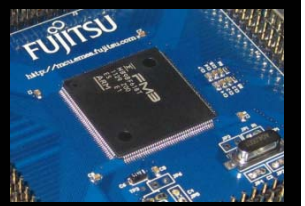
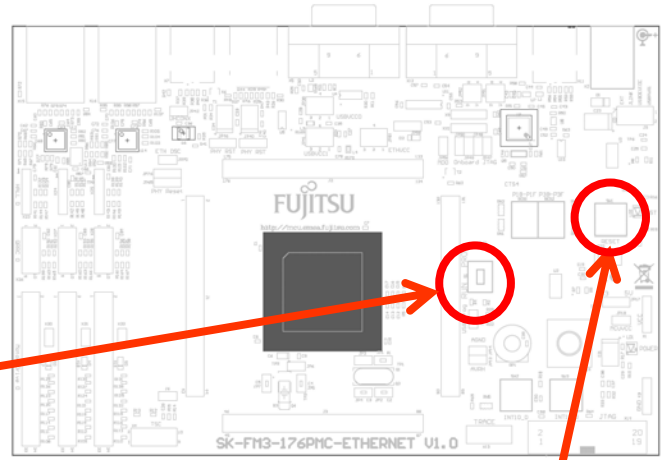
Program Download





- **Close the FLASH USB DIRECT Programmer**
- **Set switch S1 to position *RUN***
- **Press *Reset***

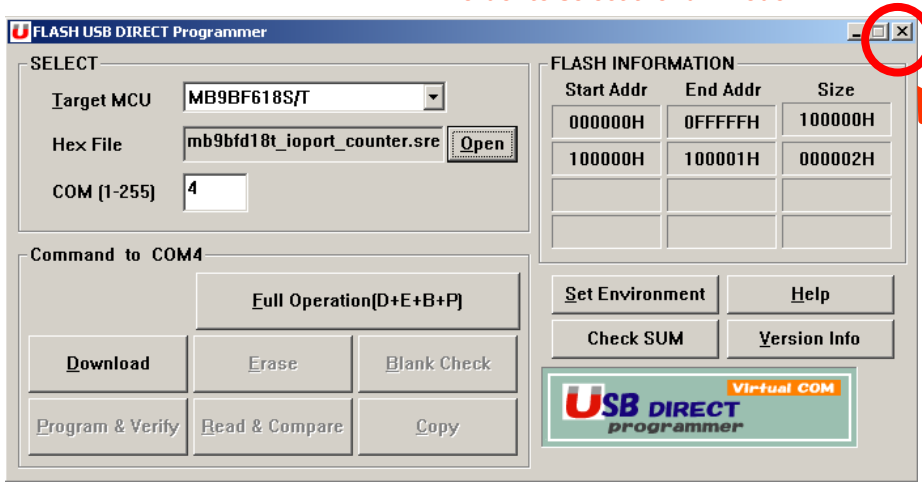


S1: Mode selection

RUN: Set switch to position *RUN* in order to select the run-mode

Keybutton *RESET*

Close the FLASH USB DIRECT Programmer



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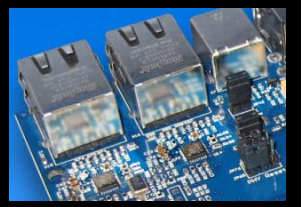
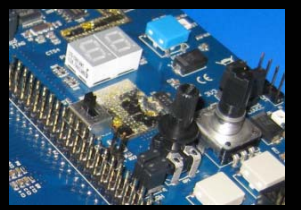
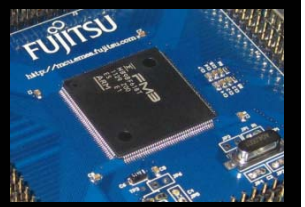
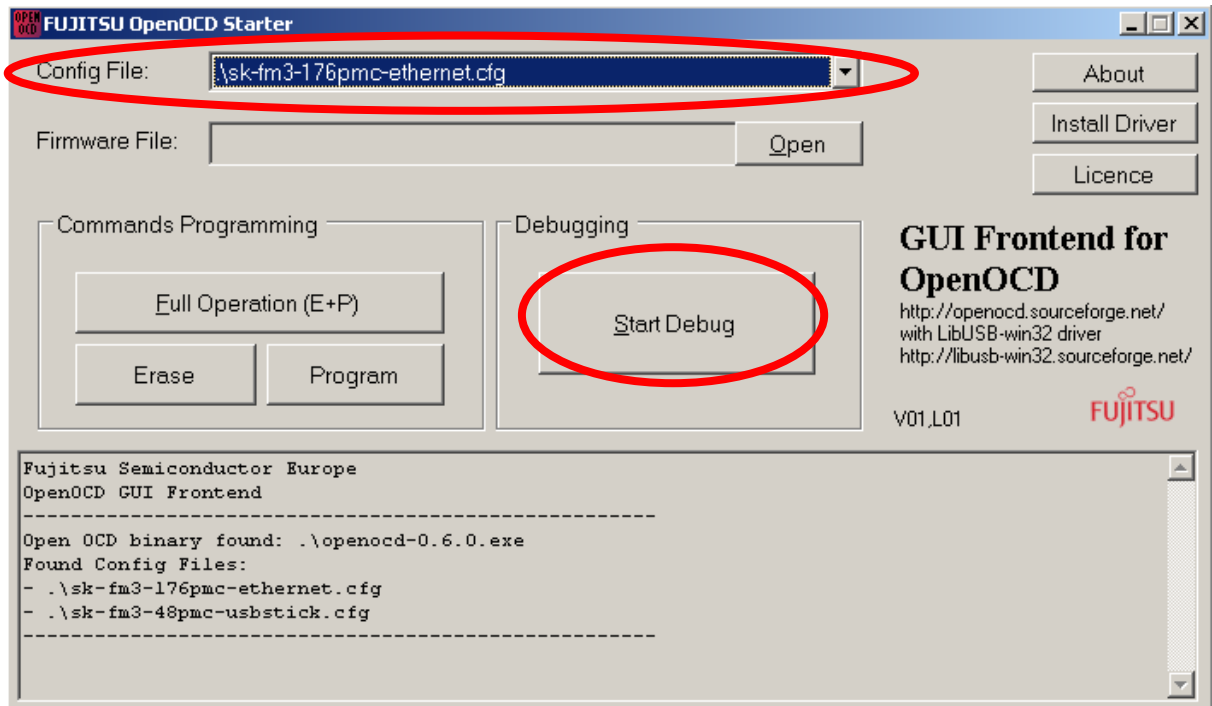
Debugging with OpenOCD

- **SK-FM3-176PMC-ETHERNET offers an on-chip debugger via USB X11**
  1. Connect the board on X15 to the USB-Port of your PC
  2. Open OpenOCD
  3. Select the sk-fm3-176pmc-ethernet in config file
  4. Click on *Start Debug*



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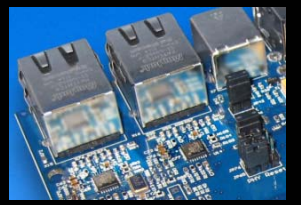
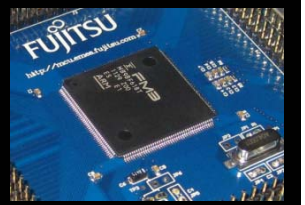
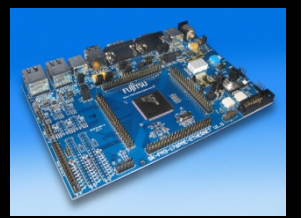
Debugging with OpenOCD

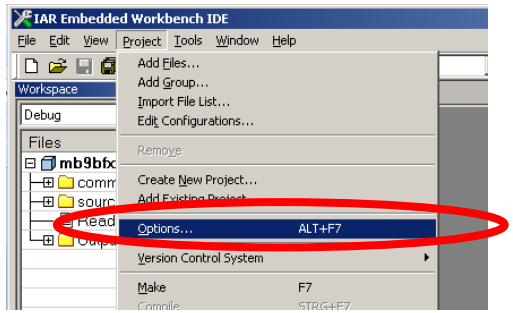




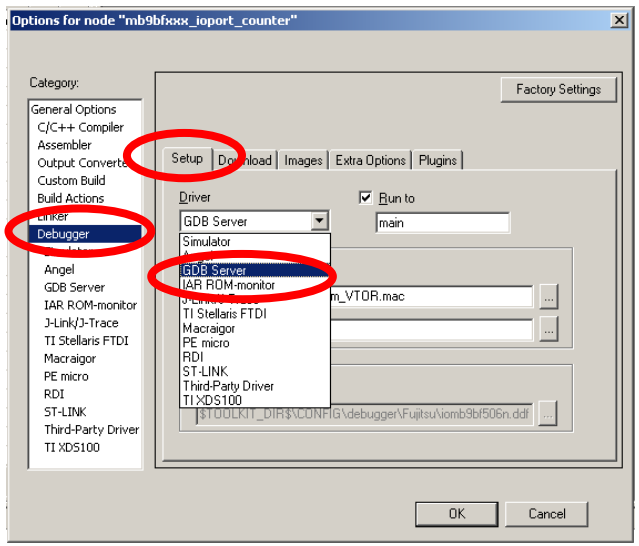


IAR Workbench configuration

1. Open the project you want to debug.
2. Go to Project->Options



3. Select Debugger
4. Select Setup
5. As driver select *GDB Server*



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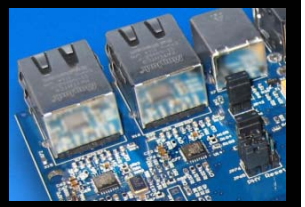
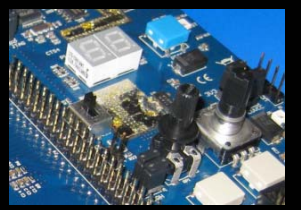
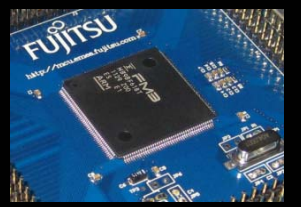
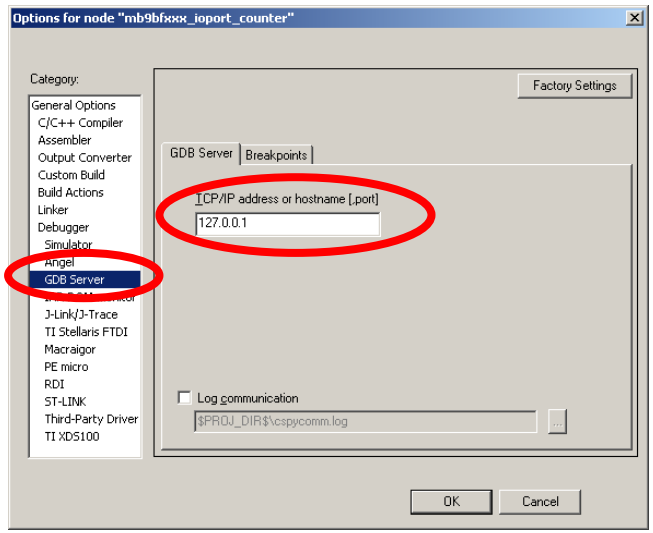
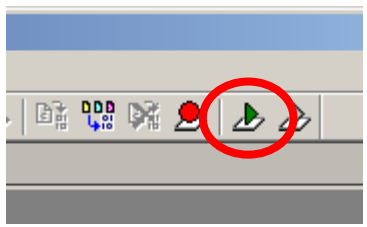
Debugging with OpenOCD

- **IAR Workbench configuration**
  6. Select GDB Server
  7. Type *127.0.0.1* on the field of TCP/IP adress



  8. Start debug in IAR Workbench



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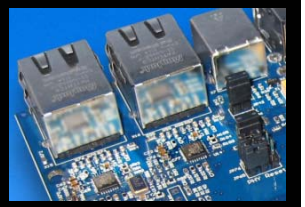
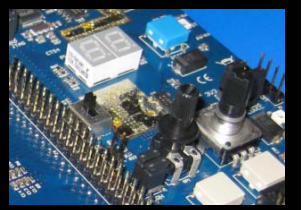
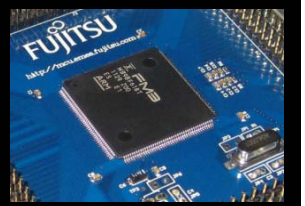
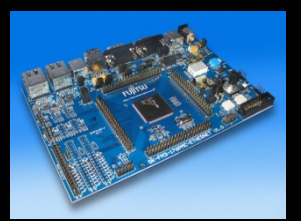
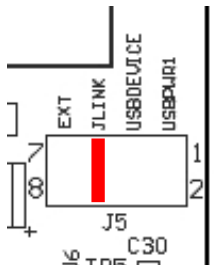
Debugging via JTAG



- **The MB9BFD18T microcontroller offers a JTAG-Interface, which is supported by SK-FM3-176PMC-ETHERNET.**
  - 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 X14 and to the USB-Port of your PC
  - Use IAR-Embedded Workbench to debug your program
  - If the JTAG-Adaper allows powering the target, then jumper J5 can be set as follows:



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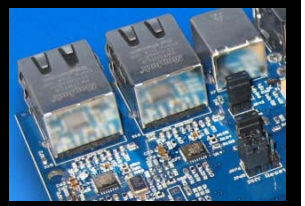
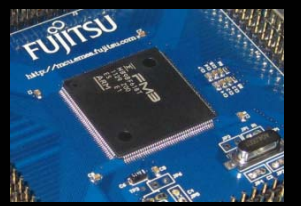
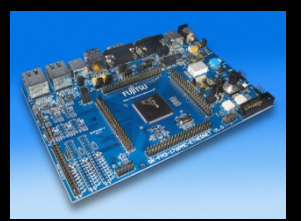
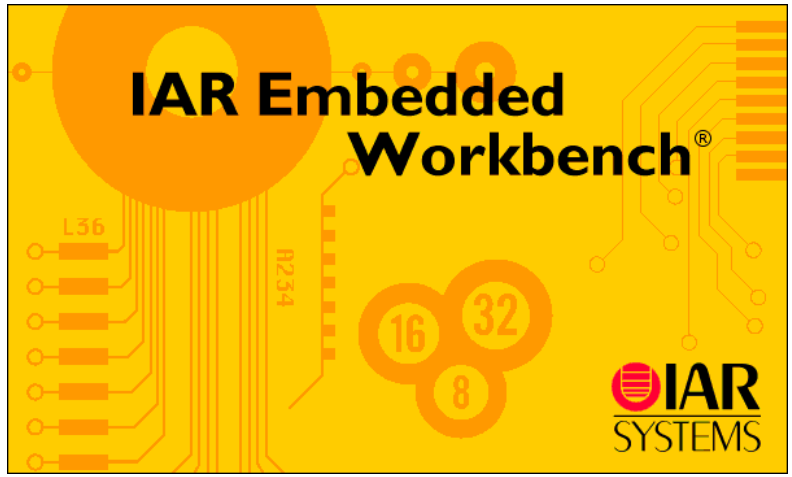
IAR-Embedded Workbench / KEIL µVision IDE and Debugger

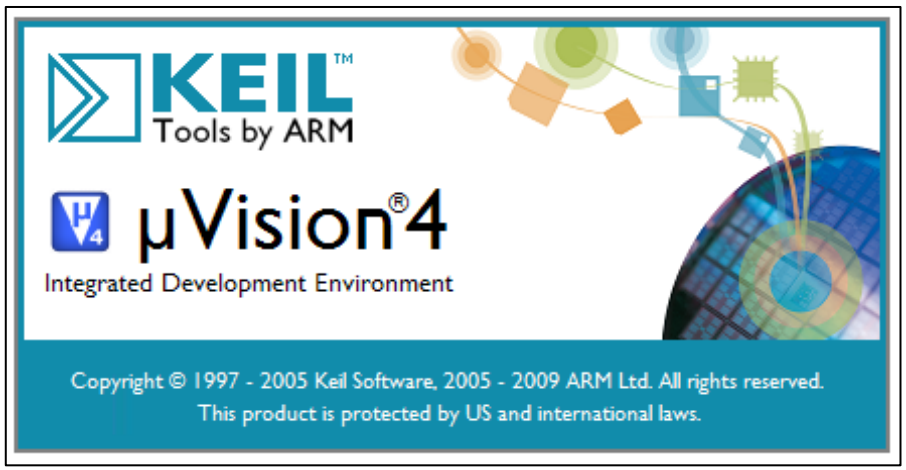




- Installation
- Getting Started
- Open Project
- Build Project
- Debug Project





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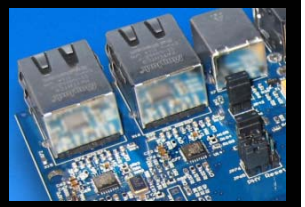
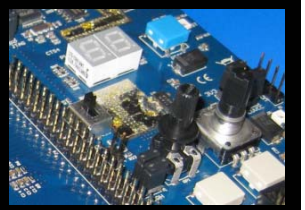
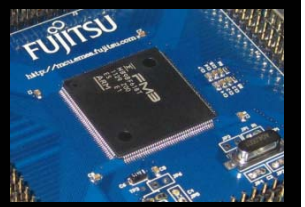
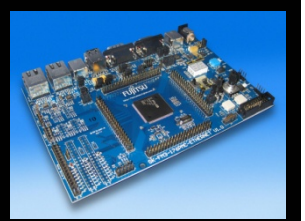
IAR Workbench Getting Started



- **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
- **Install J-Link Debugger (SK-FM3-176PMC-ETHERNET-JLINK)**
  - Connect J-Link to USB Port and follow installation instructions
    - Drivers:
      <Installation_Path>\IAR Systems\Embedded Workbench x.y\arm\drivers\Jlink\ x64 or *x86*
- **Start EWARM Workbench**

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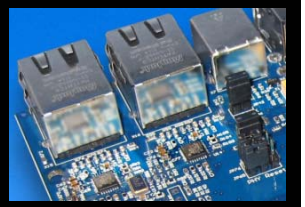
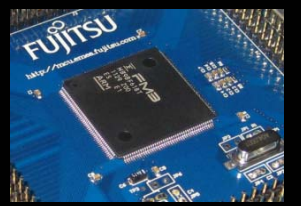
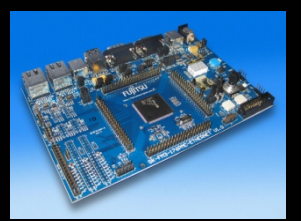
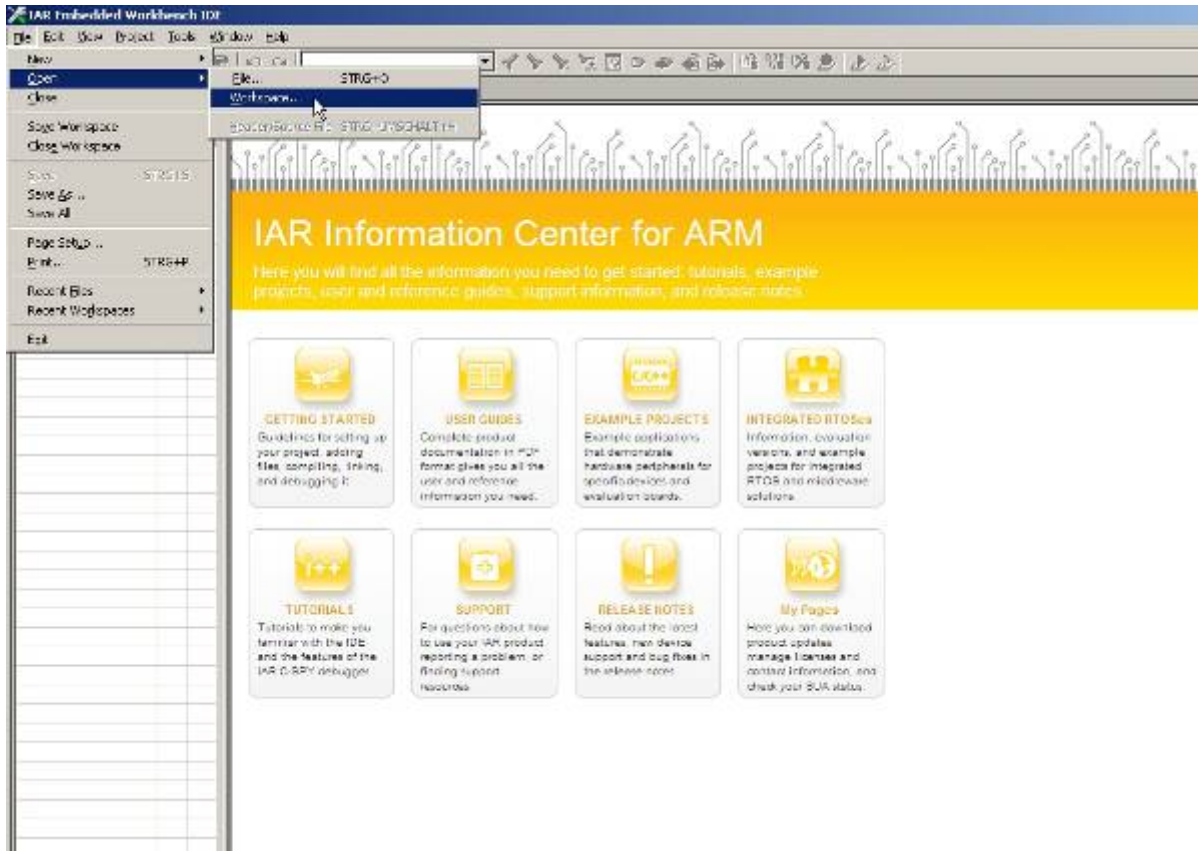
IAR Workbench Getting Started







- **Choose *File → Open → Workspace***
- **Select e.g. *\Examples\examples\mb9bfd18t_ioport_counter-v10\example\IAR\mb9bfd18t_ioport_counter.eww***



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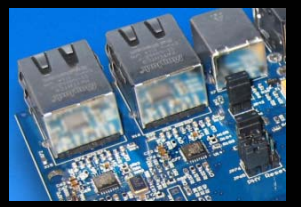
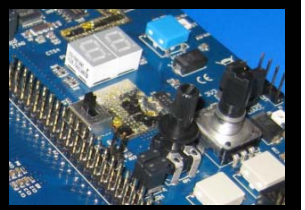
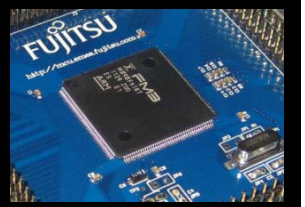
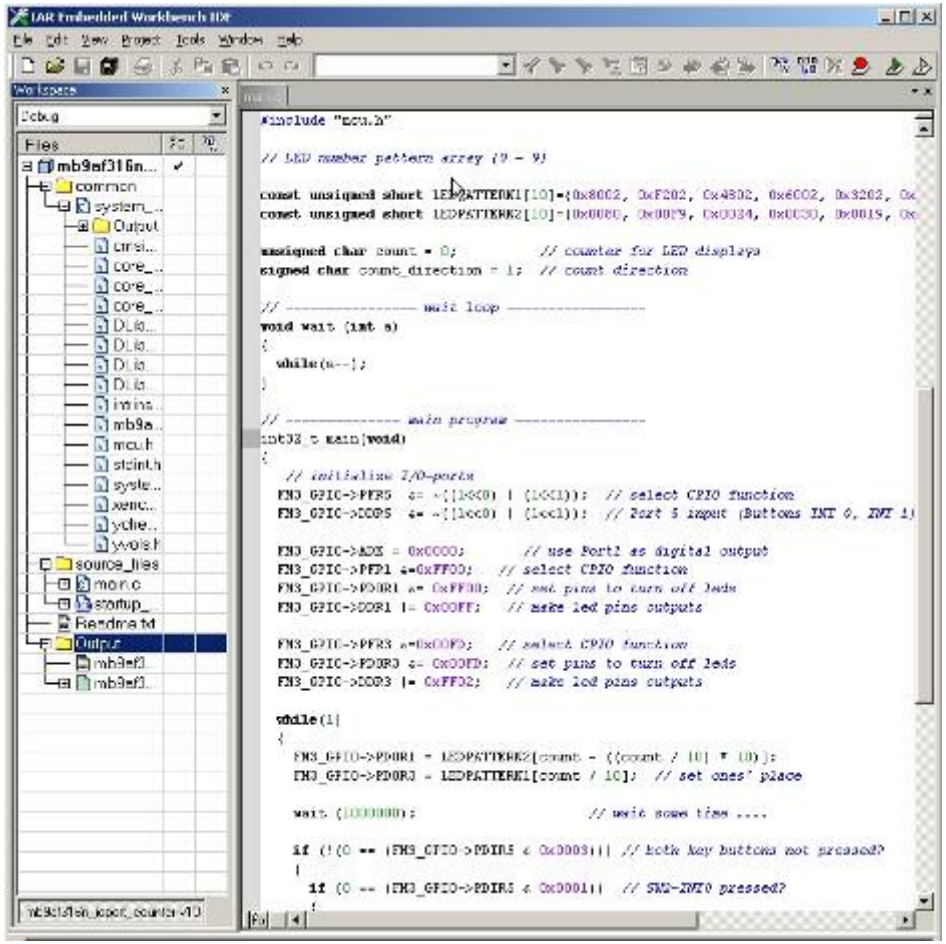
IAR Workbench – Main Window

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



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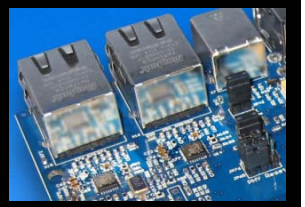
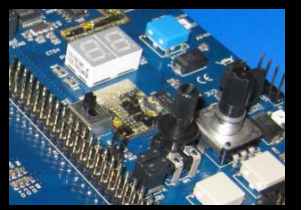
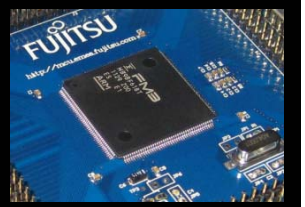
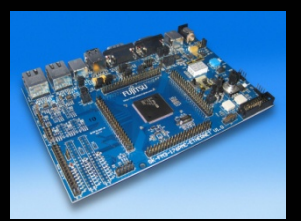
IAR Workbench – Menu Bar



- **Menu Bar**

File Control (new, open, save, etc.)

Configuration Control (e.g. RAM or ROM debugging)

Build Control (compile, make, stop build)

Edit Control (cut, copy, paste, undo, redo)

Navigation Control (Find, Bookmarks, File Navigation, etc.)

Debug Control (Breakpoint, start Debug w/ and w/o download)

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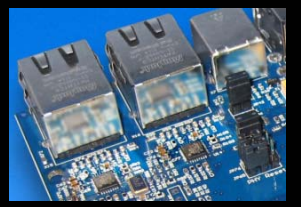
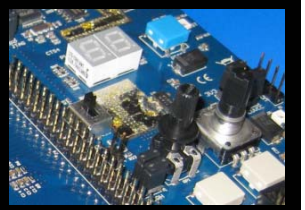
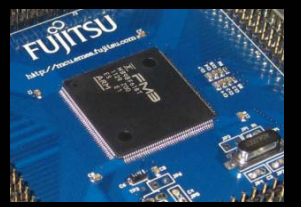
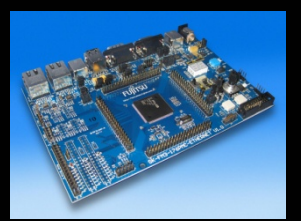
IAR Workbench – Workspace



Project Name

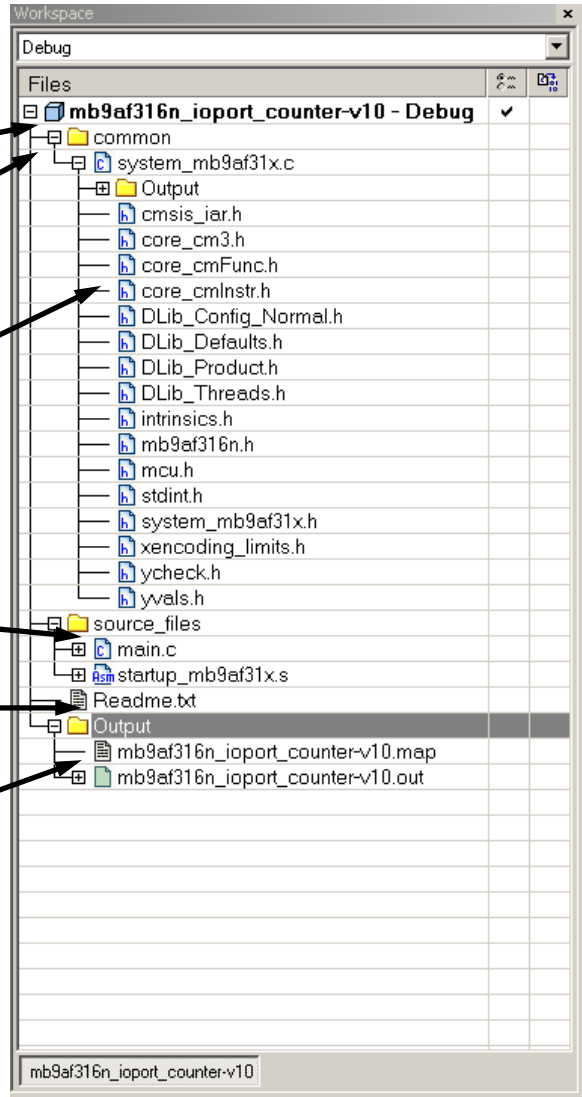
Sub Folder common

Includes

Main

Project Description

Project Built Output



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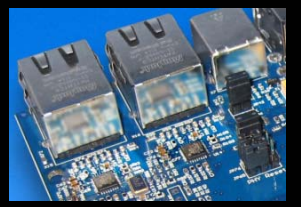
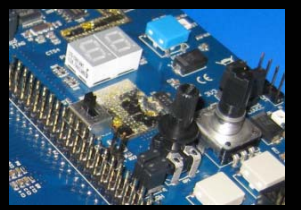
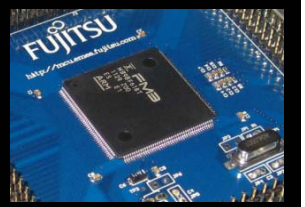
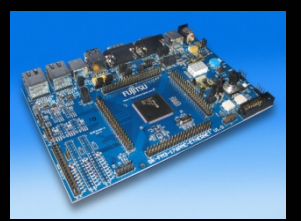
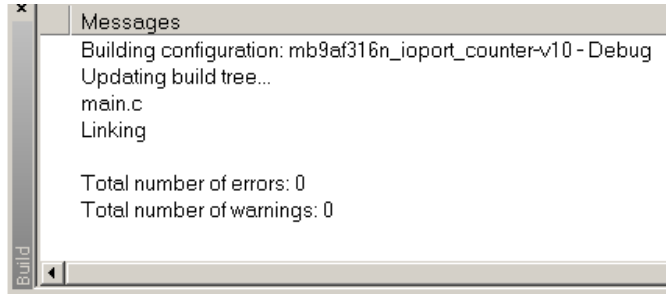
IAR Workbench – Making Project

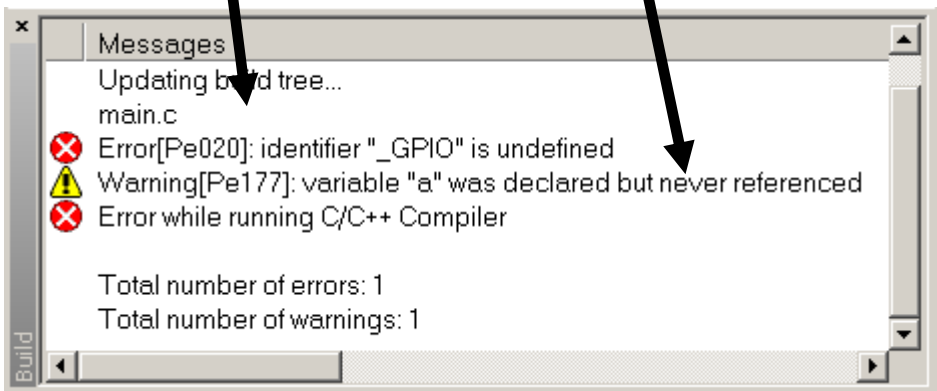






- **Making the Project**
  - Use Make-Icon (), <F7> or Menu: *Project→Make*
  - Check for no errors in Output window below



  - Build errors are indicated by  or  In Output window and Source view



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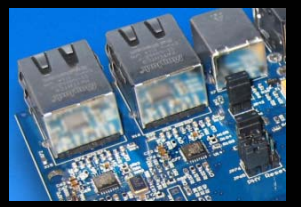
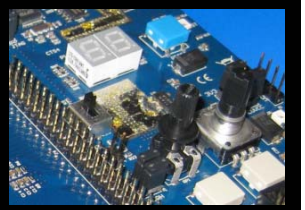
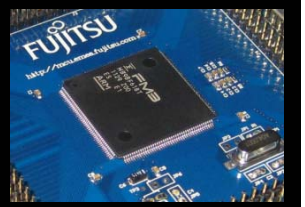
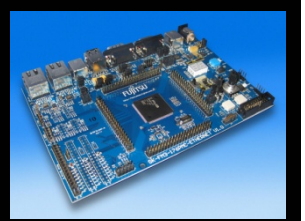
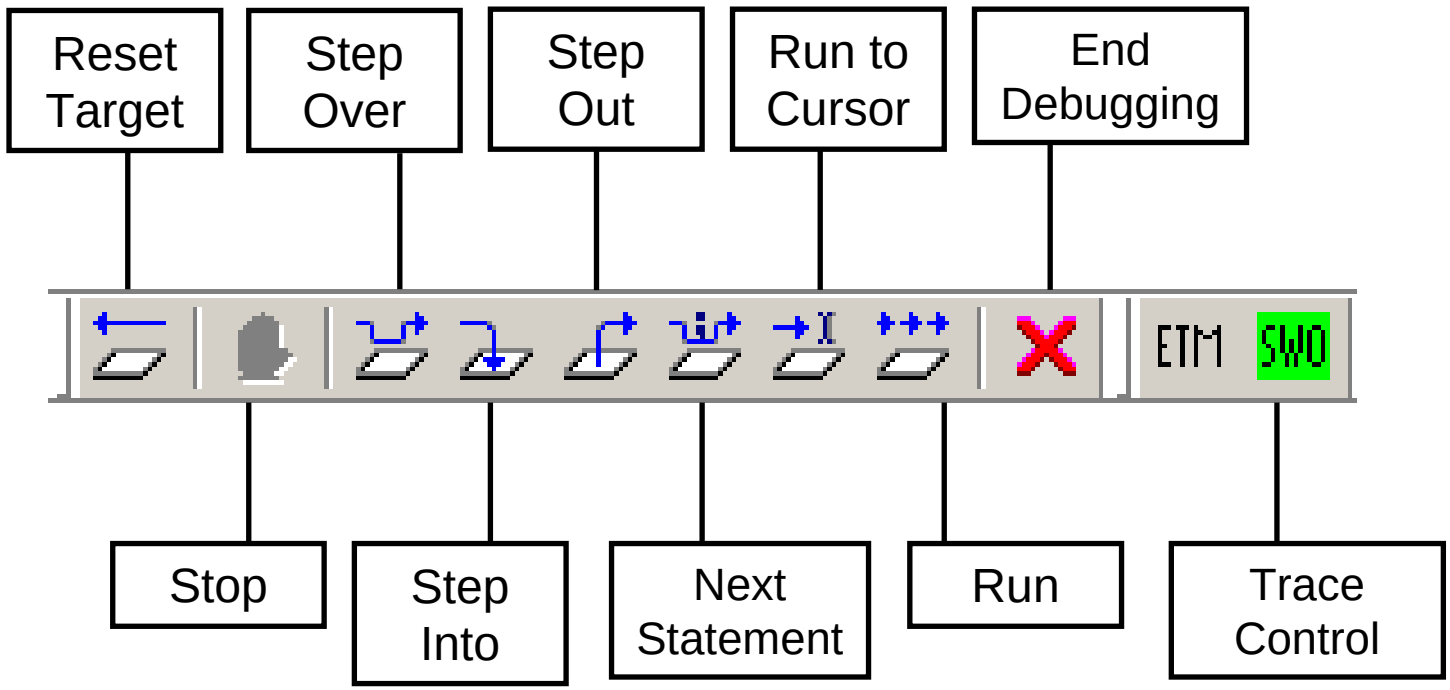
IAR Workbench – Download to Target



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



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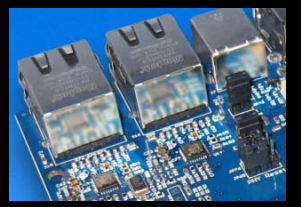
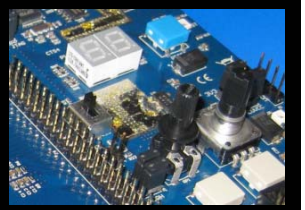
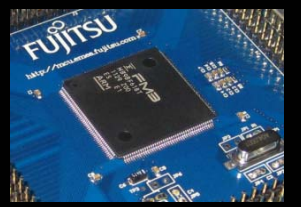
IAR Workbench – Debug (1)

- **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‘ disassebly view
  - Shows mixed mode view

Disassembly

Go to | 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   ORRS.W    r0, r0, #128            ; 0x80
```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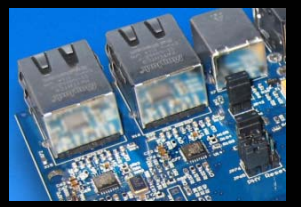
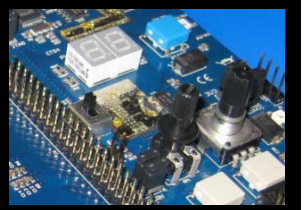
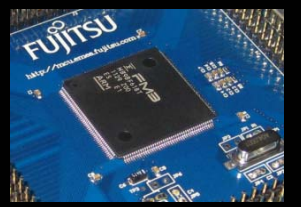

IAR Workbench – Debug (2)

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

Watch 1

Expression	Value	Location	Type
count	'.' (0x00)	0x20000004	unsigned char
<click to ...			

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

Quick Watch

count+55/ 0xbc

Expression	Value	Location	Type
count+55...	99		int

Watch 1 | Quick Watch

    - The drop down menu memorizes the last typed contents

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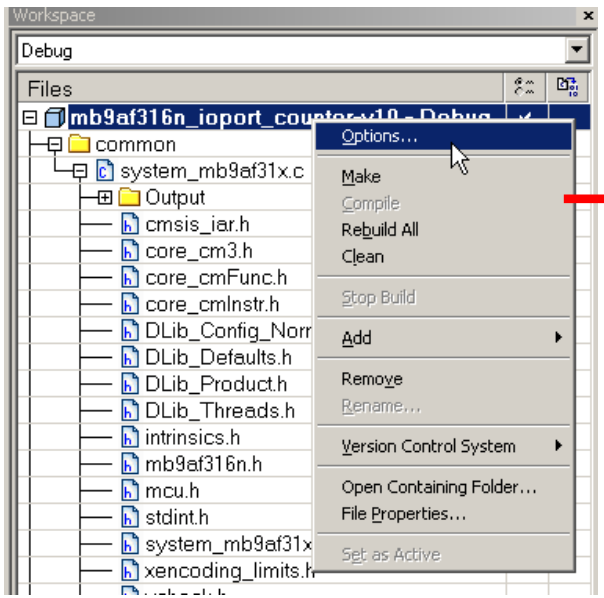
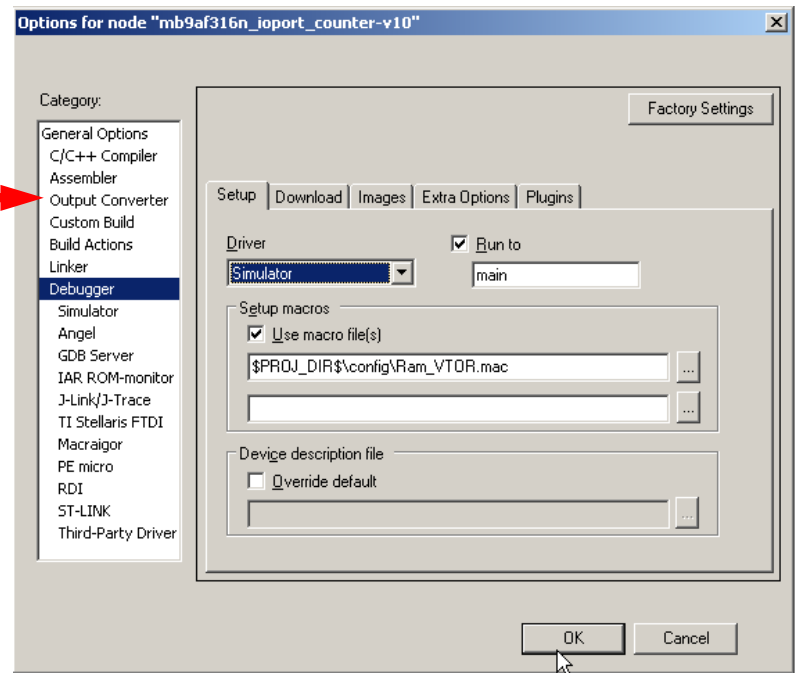
IAR Workbench – Simulator

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





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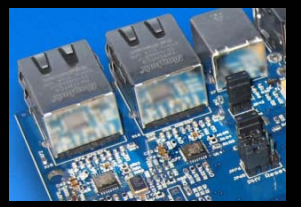
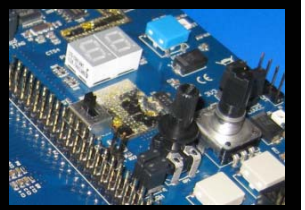
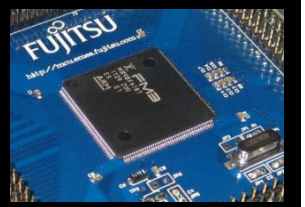
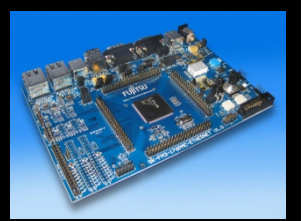
KEIL µVision IDE and Debugger Getting Started



- **Install µVision from KEIL-CD or download latest version from KEIL Website**
  - Evalualtion Version
    - https://www.keil.com/demo/eval/arm.htm
    - Registration required
- **Install ULINK-ME**
  - Specical installation is not needed, because ULINK-ME acts as a USB Human Interface Device (HID) and thus needs no extra USB driver
- **Install ULINK Pro (optional)**
  - ULINK Pro needs an own dedicated USB driver located in: *<Installation Path>\KEIL\ARM\ULINK*
- **Start µVision**

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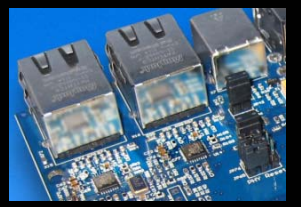
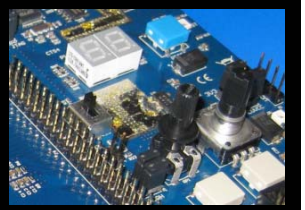
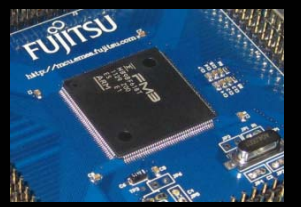
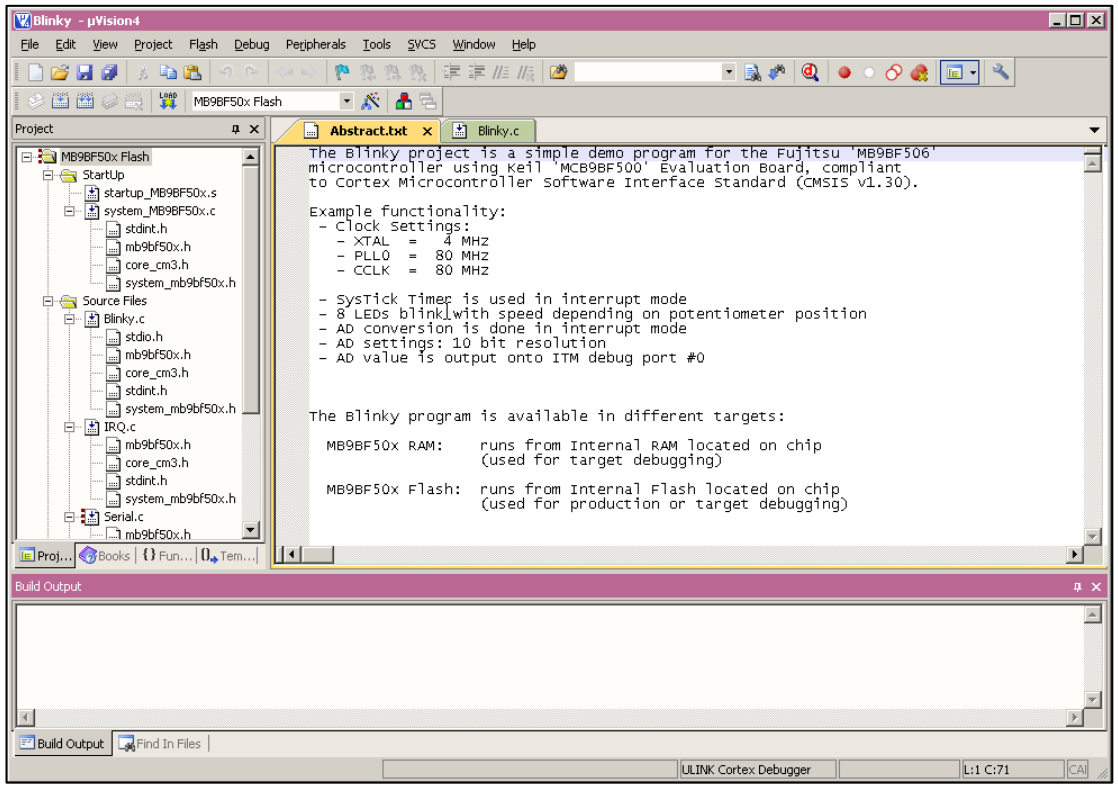
KEIL µVision – Getting Started

- **Choose Menu: *Project→Open Project...***
  - Browse to: \Examples\examples\mb9bfd18t_ioport_counter-v10\example\ARM\
  - Choose mb9bfd18t_ioport_counter.uvproj



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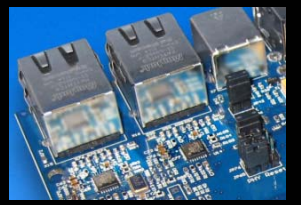
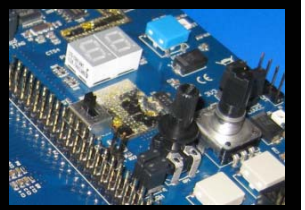
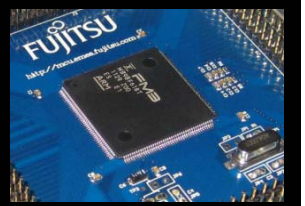
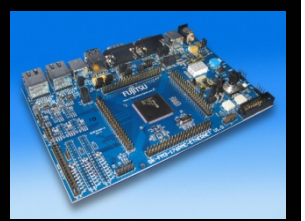
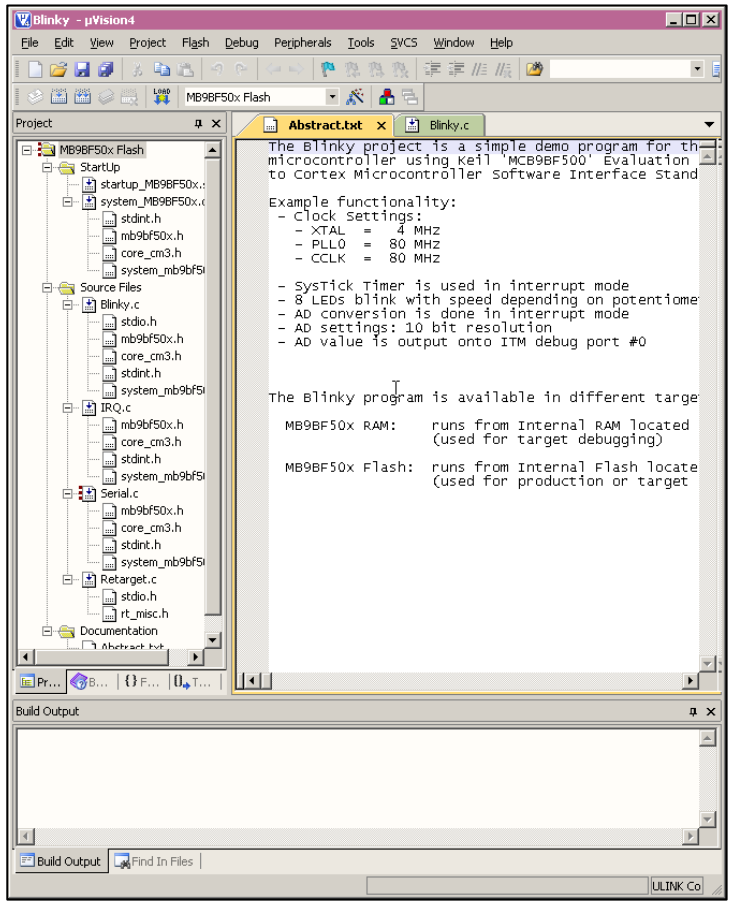
KEIL µVision – Main Window



- **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



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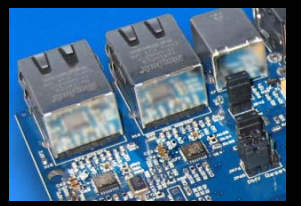
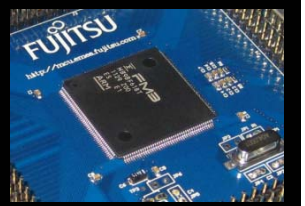
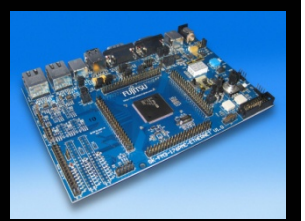
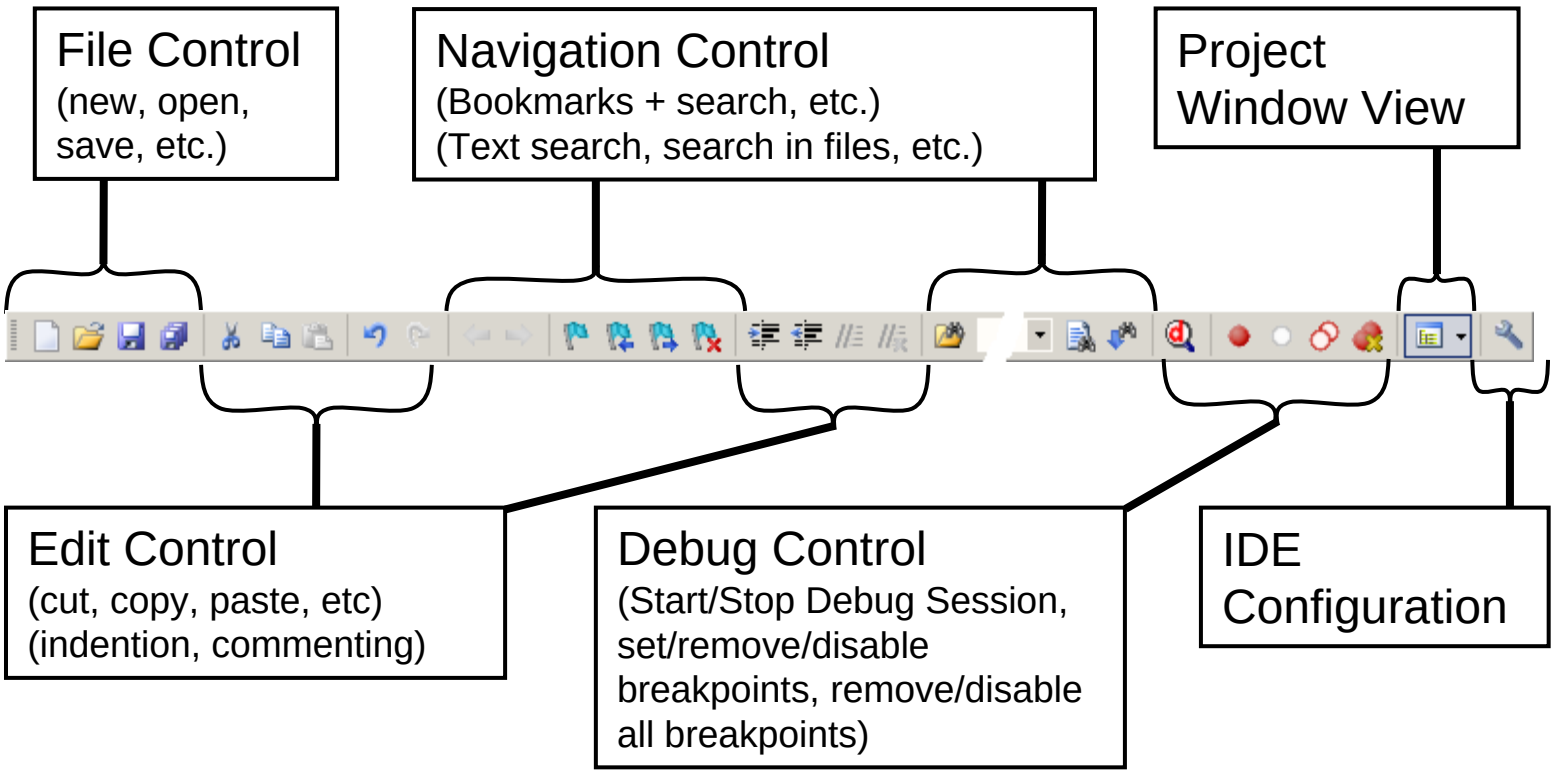
KEIL µVision – Menu Bars (1)







- **Menu Bar 1**
  - Can be moved in bar window area or set floating



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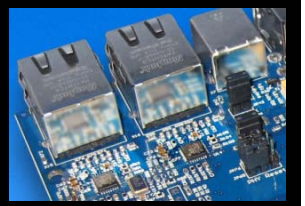
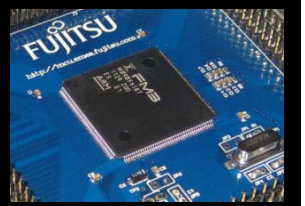
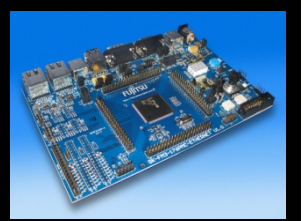
KEIL µVision – Menu Bars (2)







- **Menu Bar 2**
  - Can be moved in bar window area or set floating

Build Control
(Compile [Translate], Build, Rebuild, etc.)

Configuration Control
(e.g. RAM or ROM debugging)

Manage Books, File Extensions, Environment

Download to Target

Target Options

Manage Multi-Project Workspace

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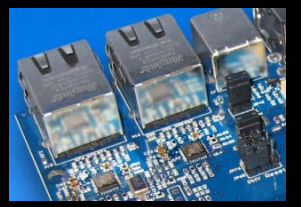
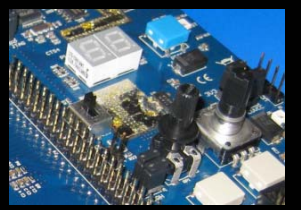
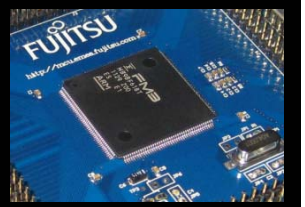
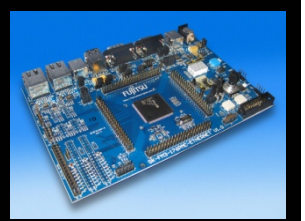
KEIL µVision – Project Window



- **µVision Project Window**

Project Name

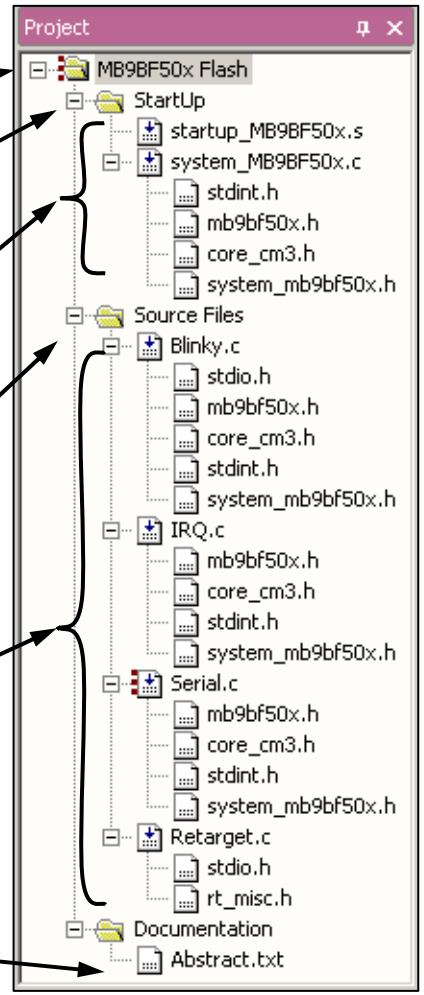
Startup Code Subfolder

Startup Code Source and HeaderFiles

Main Project Code Subfolder

Main Project Code Source and Header Files

Project Description Subfolder and Abstract File



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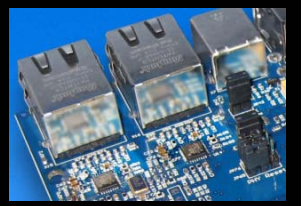
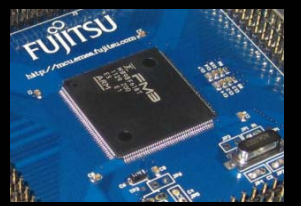
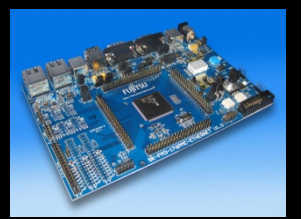
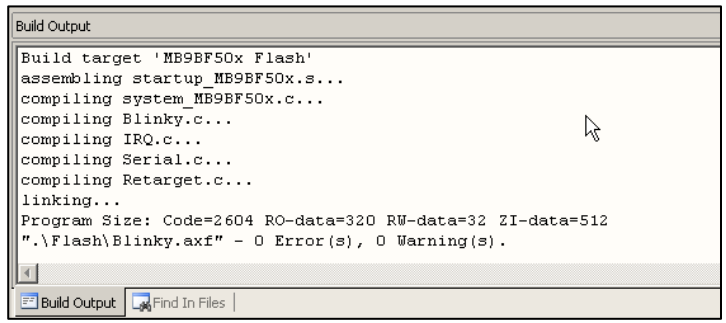
KEIL µVision – Making Project



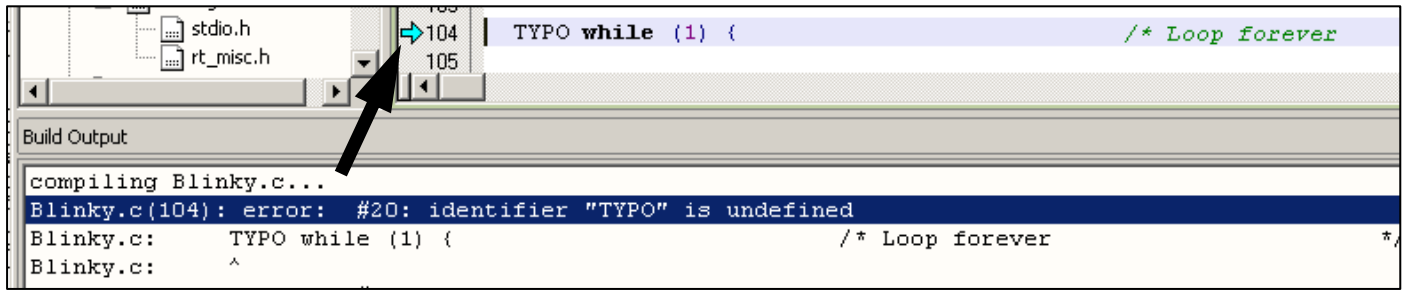


- **Making the Project**
  - Use Rebuild Icon ( ) or *Project→Rebuild all target files*
  - Check for no errors in Output window below



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



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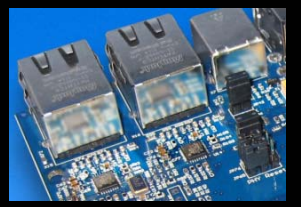
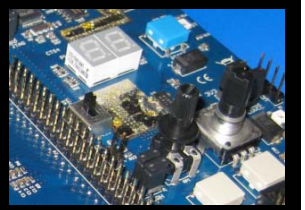
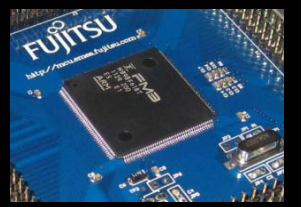
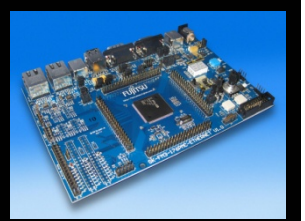
KEIL µVision – Debug (1)



- **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 () or Menu: *Debug→Start/Stop Debug Session*
  - Ending Debug Session
    - Use same way as for starting debug session

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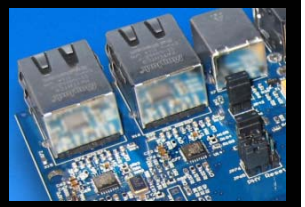
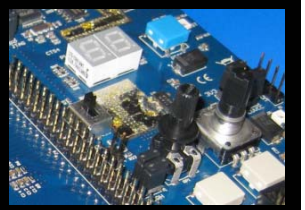
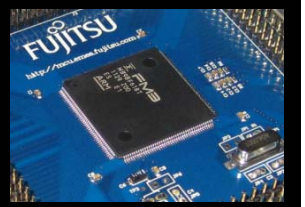
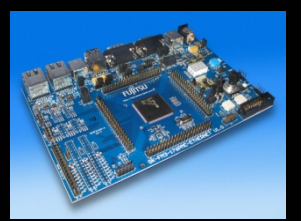
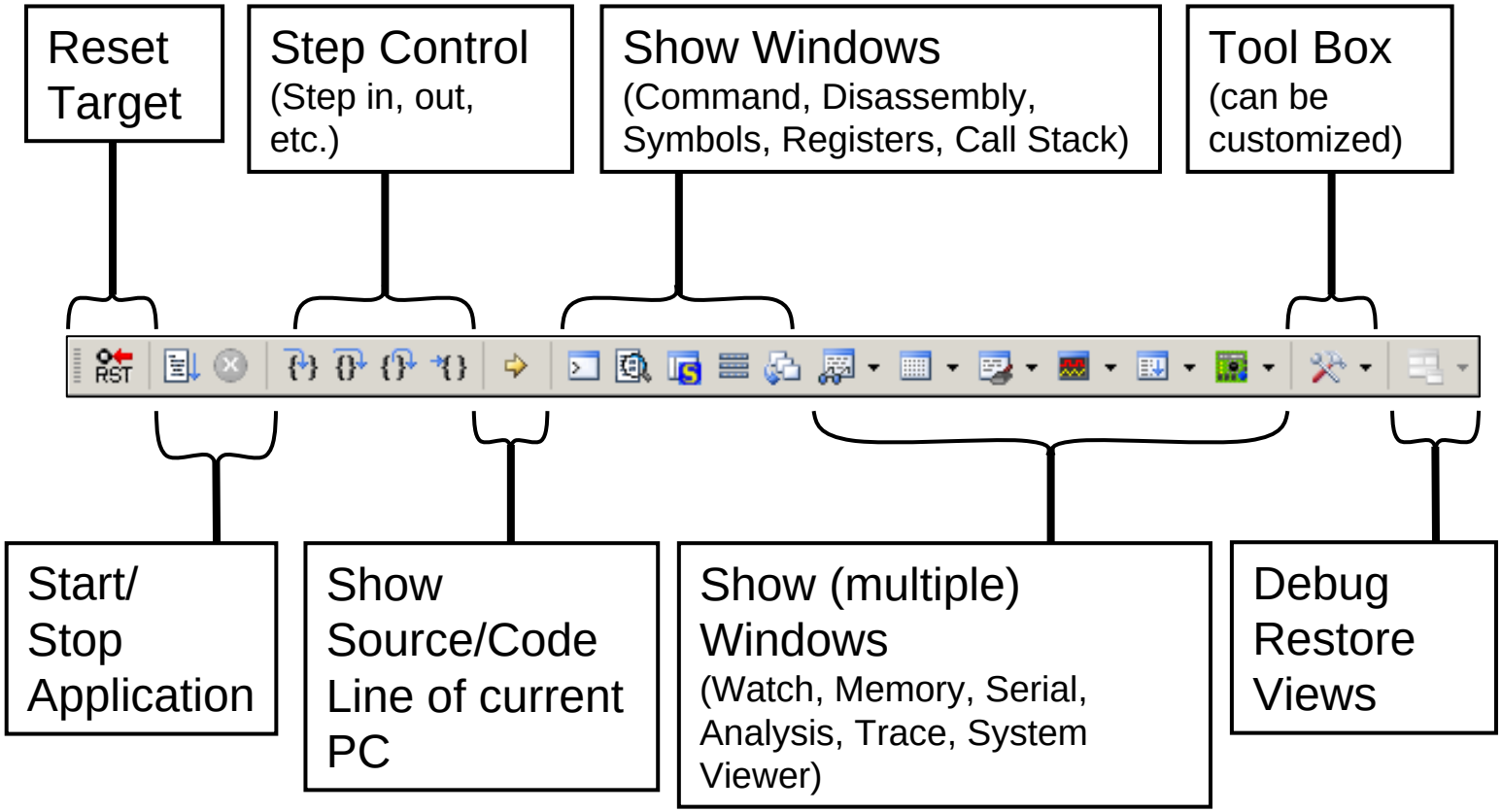
KEIL µVision – Debug (2)



- **Debugging Icon Bar**
  - During a Debug Session there will be visible a new icon bar



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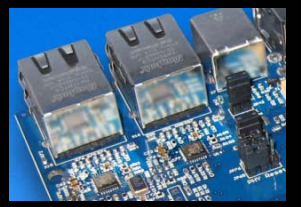
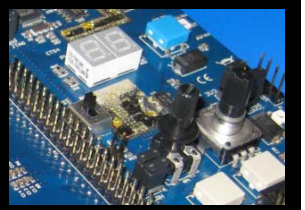
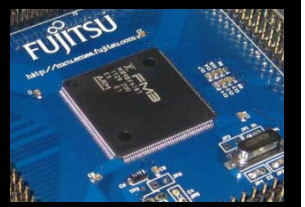
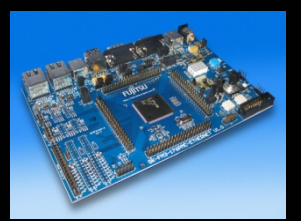
KEIL µVision – Debug (3)



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

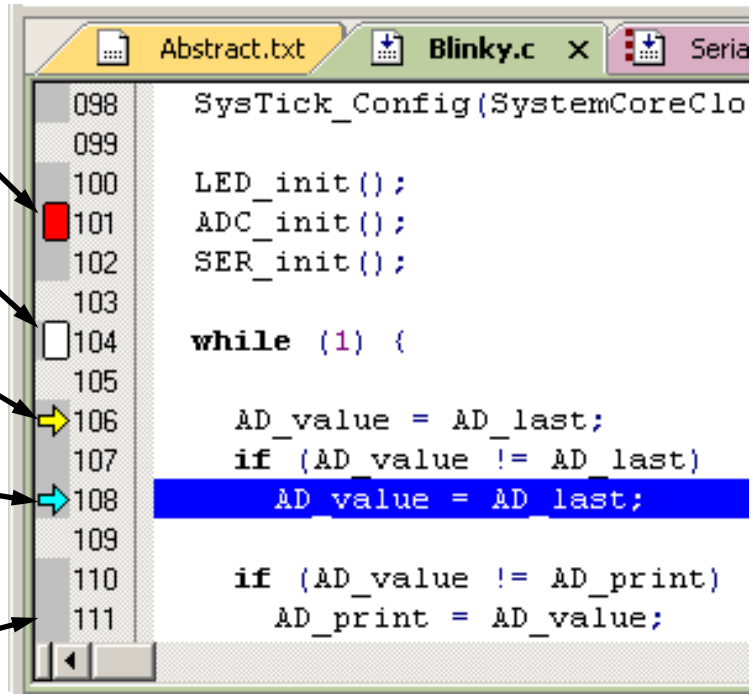
Active Breakpoint

Disabled Breakpoint

Current Program Counter

Current Cursor Line of Source Code

Code Lines with compiled Instructions (dark grey) ▯



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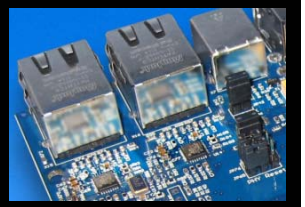
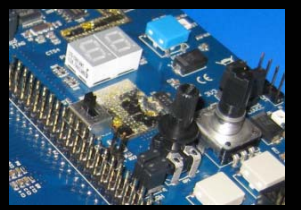
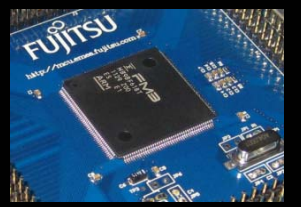
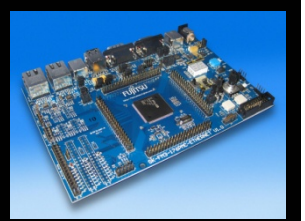
KEIL µVision – Debug (4)



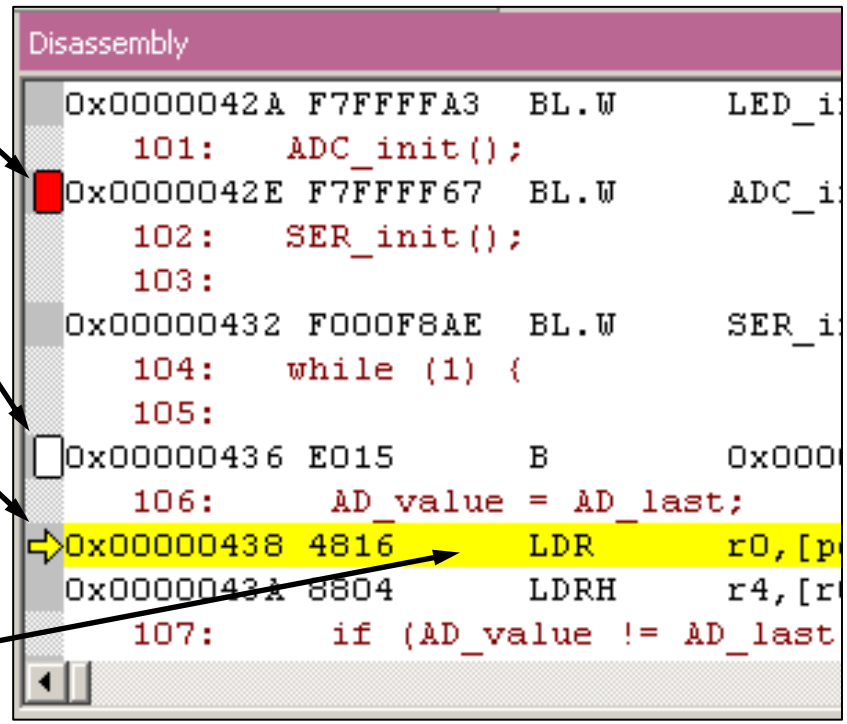
- **Disassembly View**
  - Mixed mode is selectable and deselectable

Active Breakpoint

Disabled Breakpoint

Current Program Counter

Current Cursor Line of Code highlighted in yellow background ( )



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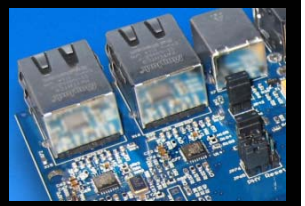
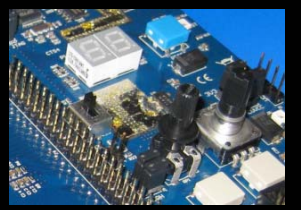
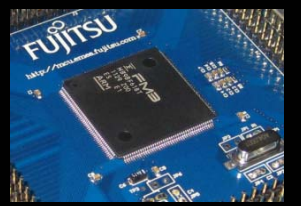
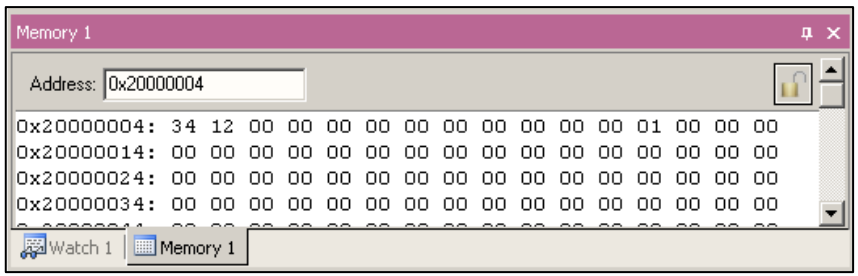
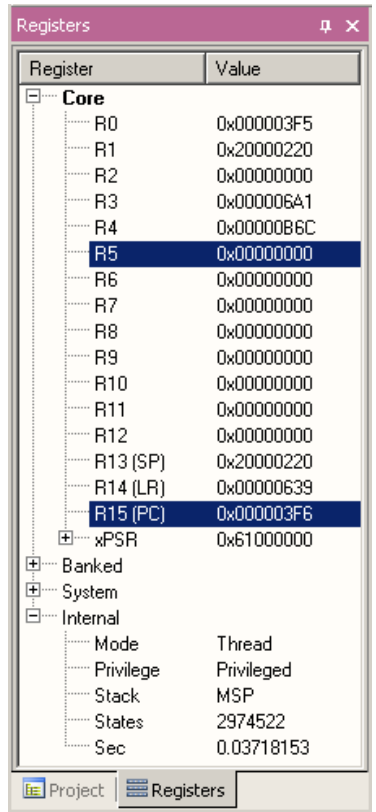
KEIL µVision – Debug (5)

- **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



- **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



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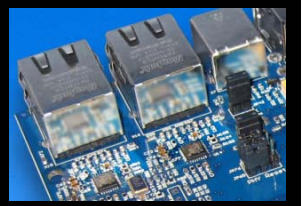
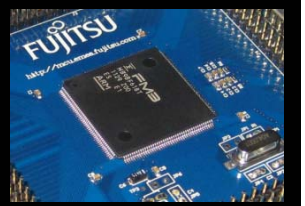
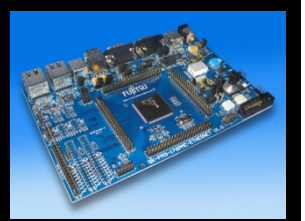
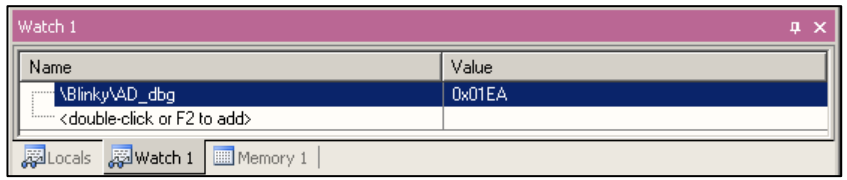
KEIL µVision – Debug (6)



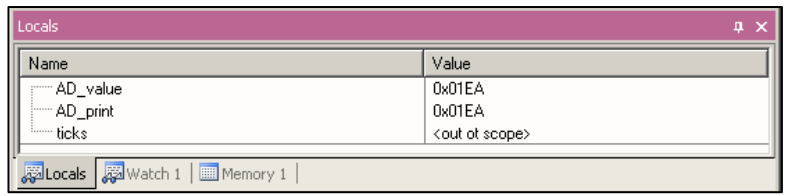




- **Variable Windows**
  - Watch Windows
    - Up to 2 Watch windows are sharing their tabs with e.g. Memory and Local views
    - Updated during runtime
    - Any changes are highlighted in dark blue text backround color
    - Displayed values can be changed by user during break



  - 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



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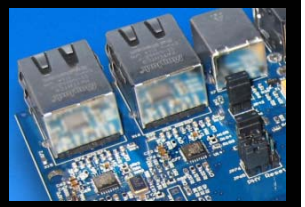
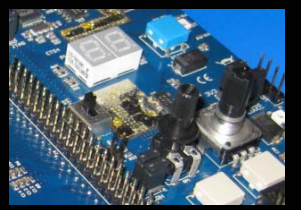
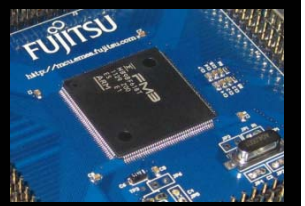
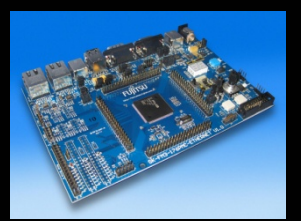
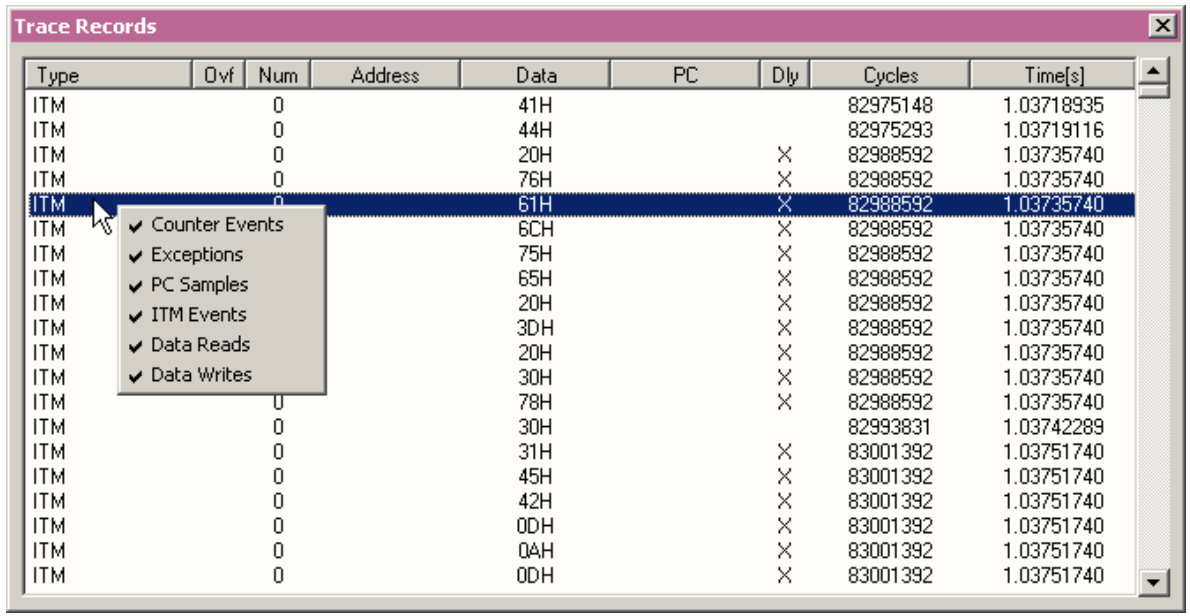
KEIL µVision – Trace (ULINK ME)



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



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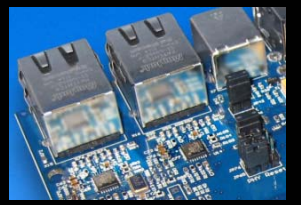
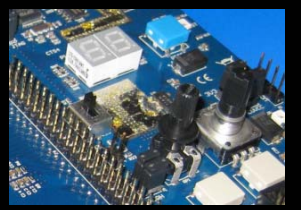
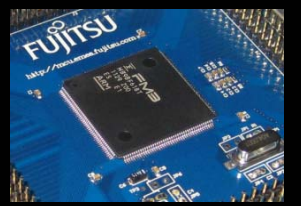
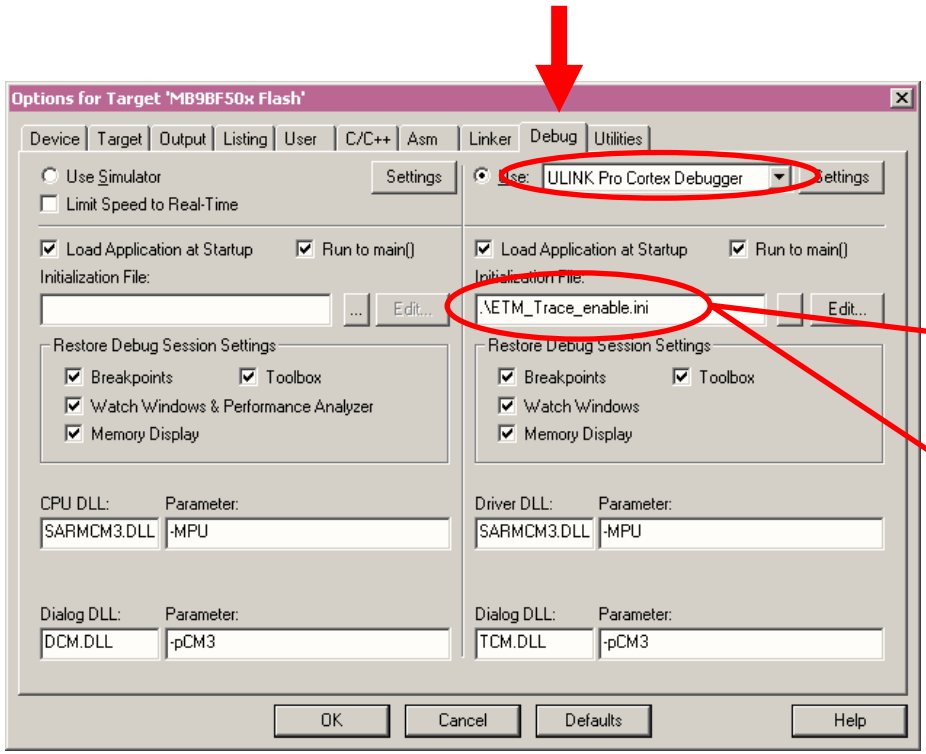
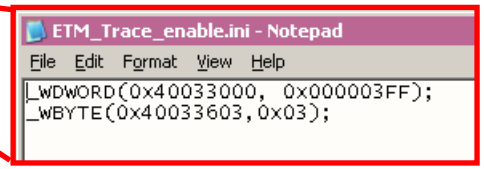
KEIL µVision – Trace (ULINK Pro) (1)

- **Trace via ETM**
  - Check settings in menu:
    Flash→Configure Flash Tools... Tab:*Debug*





enables ETM pins

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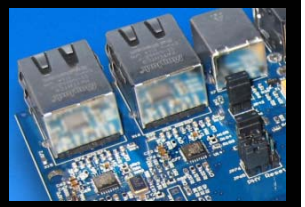
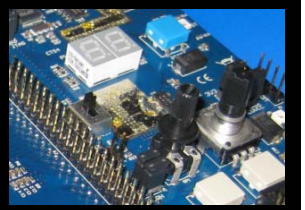
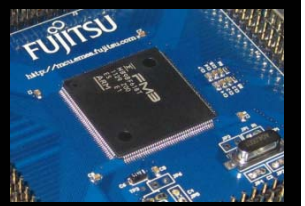
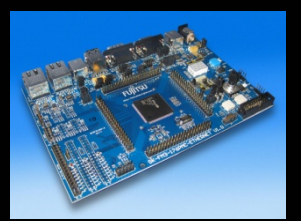
KEIL µVision – Trace (ULINK Pro) (2)



- **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 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 | 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;
```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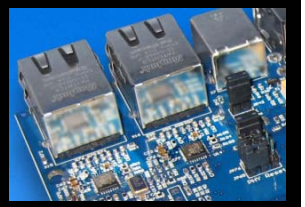
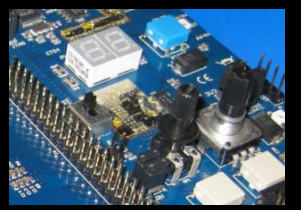
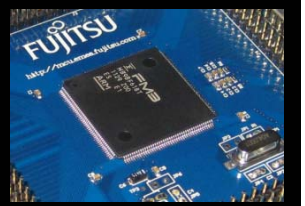
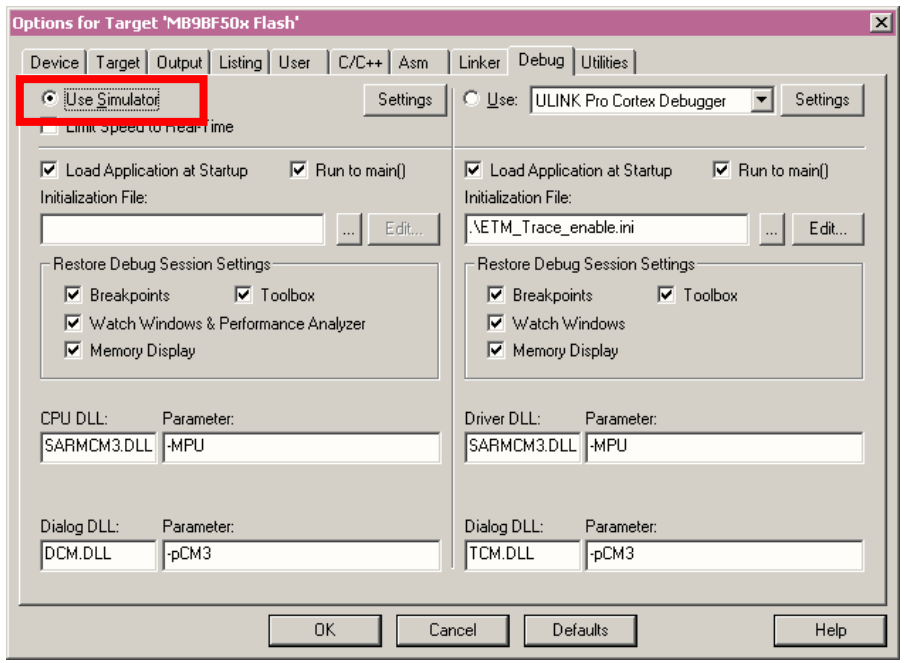
KEIL µVision – Simulator

- **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 by**.ini* files



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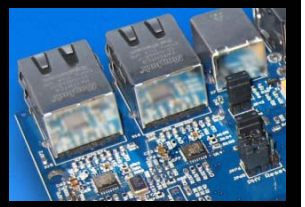
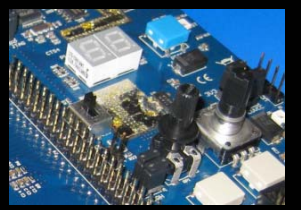
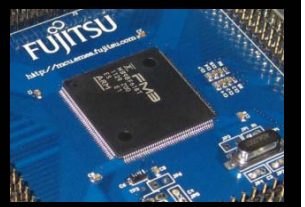

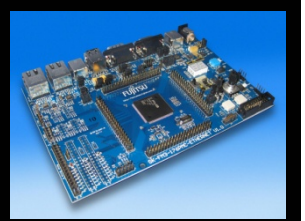

Free open-source toolchain

- **To setup and use a development toolchain based on free licensed open-source tools, please see our application note 300403: GNU Tool Chain for FUJITSU Cortex-M3 MCUs**
  - For new versions of this document, please check our website and search for *300403* or *GNU*
- **For further support, please consult directly the respective developers and official project websites:**
  - Eclipse IDE
  - YAGARTO – Yet another GNU ARM toolchain
  - OpenOCD – Open On-Chip Debugger
    please notice our OpenOCD Starter GUI that eases driver handling

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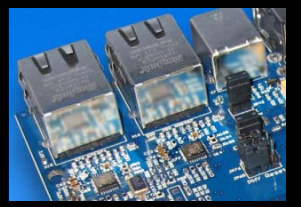
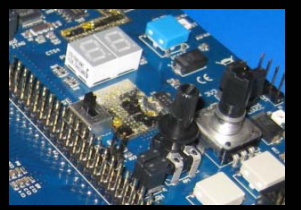
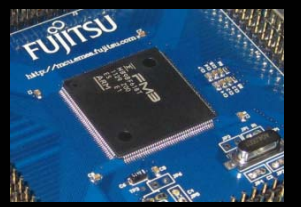


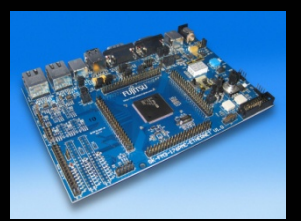

Further Steps

- **In order to learn more about Fujitsu's microcontrollers**
  - Visit our microcontroller website
    - http://mcu.emea.fujitsu.com
    - http://mcu.emea.fujitsu.com/mcu_product/detail/MB9BFD18TPMC.htm
  - See our application notes
    - http://mcu.emea.fujitsu.com/mcu_product/mcu_all_appnotes.htm
  - See our software examples
    - 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 get the latest *Fujitsu Micros DVD* containing all information regarding Fujitsu's 8-bit, 16-bit, and 32-bit microcontrollers

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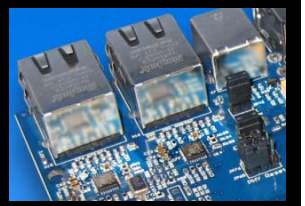
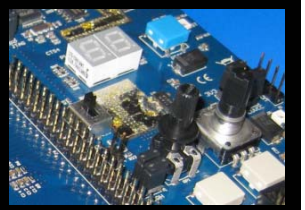
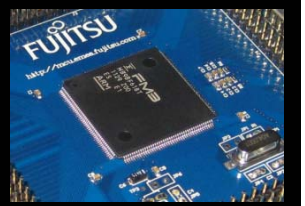
Seminars

For current information, please refer to http://www.fujitsu.com/emea/services/microelectronics/trainings/index.html







FM3 Seminar	Motion Control Workshop	USB Workshop
free of charge		
1 day – once per month	1 day **Inverter Control**	2 days
• Overview FM3 processor family o Memory o Peripheral resources o Packages • Processor architecture o Bus structure o Flash memory o Flash programming methods • Peripheral resources o Clock distribution o Timer o Interfaces o FM3 features • Development tool chains o IAR workbench, J-Link adapters o KEIL uVision, uLink adapters o Starter Kits • Practical exercises o Flash programming o Project setup and modification o Debugging o External interrupts	1. Introduction of Fujitsu MCU a. Line-Up of microcontrollers with motion control features b. Performance 2. Introduction of motors types a. ACIM b. BLDC c. PMSM 3. Introduction of common control types a. Sinusoidal commutation b. Field Orientated Control c. Space Vector Modulation 4. Peripherals for motion control based on FM3 devices a. Base Timer b. Multifunction Timer c. 12-bit A/D Converter d. Quad Position & Revolution Counter e. Interrupt Controller 5. Hands-on exercise a. Software example for a BLDC motor with hall effect sensor b. Software example for a field orientated control of a PMSM motor	Introduction USB vs. RS232 Historical Background Electrical Layer USB Protocol Enumeration Process (Descriptors & USB Settings) Transfer Types & Data Transfers USB Class Concept Software Driver Concepts USB Host in Embedded Systems USB Examples: Start with Virtual COM Port Using Fujitsu USB Descriptor Manager to create Template Classes & Descriptors PC Software programming using LibUSB with Windows Special Use Cases (e.g. boot loader)

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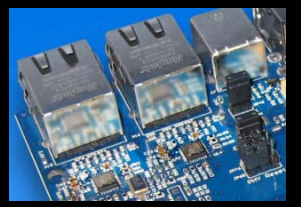
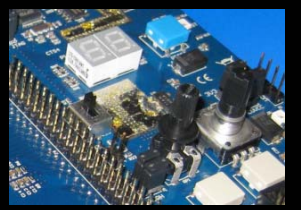
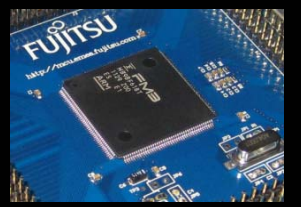
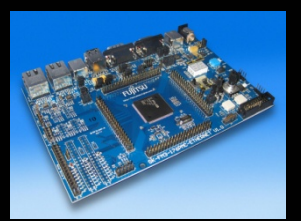
Trainings

MICRO CONSULT

- **Microconsult**
  - http://www.microconsult.com/english/training/description/e-CORTEX.shtml
  - **Cortex™-M3 (ARM): Architecture and Embedded Programming**
    - Cortex™-M Processor Architecture
    - Register organization, Special Purpose Register, Operation Modes, Stacks, Pipeline concept, Bit Banding
    - ARM Processor Cores - Overview (Cortex M0, M1, M3, M4, R4, A8, A9)
    - Cortex™-M Instruction Set
    - Exception and Interrupt Handling
    - Reset Modes, Clock Generation, Power Management, Memory Interface
    - Embedded Core Debugging
    - Efficient C Programming for Cortex Architectures / Hardware-near C
      - Interface C - Assembler
    - Practical Exercises with Keil µVision and ARM RealView Tools
- **Please contact Fujitsu to get 15% Discount**

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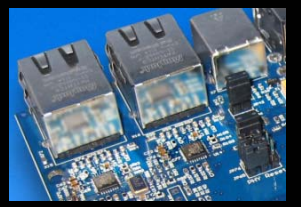
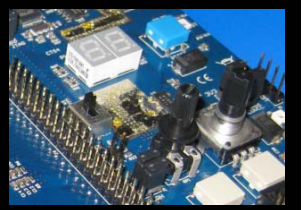
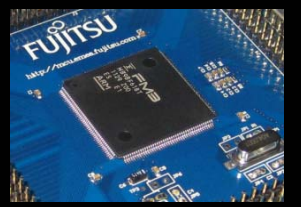

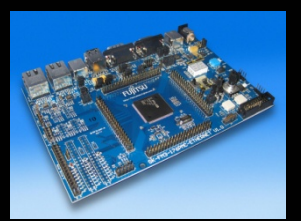

Contacts - Distribution

- **European distributors**

Anatec	**www.anatec.ch**
EBV Elektronik	**www.ebv.com**
Farnell	**www.farnell.com**
Glyn	**www.glyn.de , www.glyn.ch**
Ineltek	**www.ineltek.com**
Melchioni Electronica	**www.melchioni.it**
PN Electronics	**www.pne.fr**
Rutronik Elektronische Bauelemente	**www.rutronik.com**

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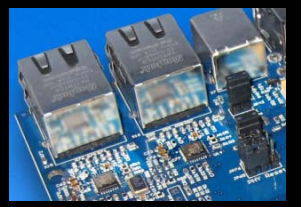
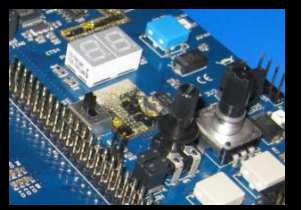
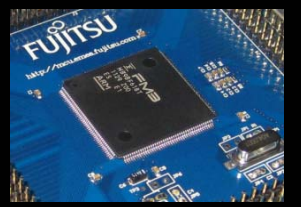

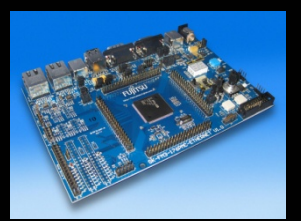

Fujitsu Semiconductor Europe

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

- **Germany (Headquarters)**
  63225 Langen — Tel: +49 (0) 61 03 69 00
- **France**
  91300 Massy — Tel: +33 (0) 1 64 47 97 00
- **Italy**
  20080 Milano — 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

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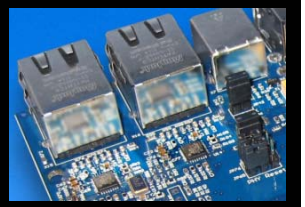
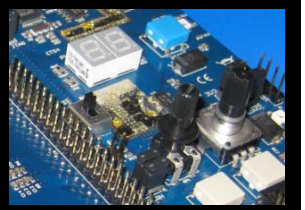
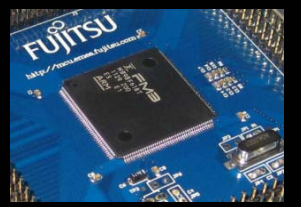
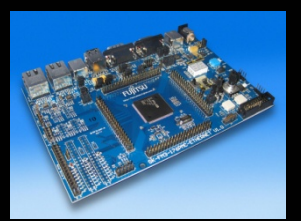
EU-Konformitätserklärung / EU declaration of conformity









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:

This evaluation board is a Class A product according to EN61326-1.
It is intended to be used only in a laboratory environment and might cause radio interference when used in residential areas. In this case, the user must take appropriate measures to control and limit electromagnetic interference.

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.

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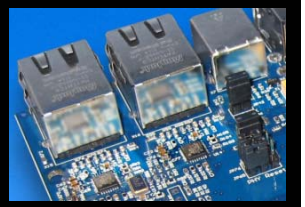
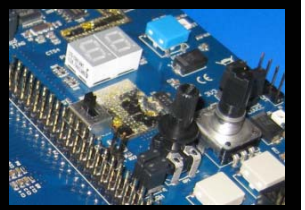
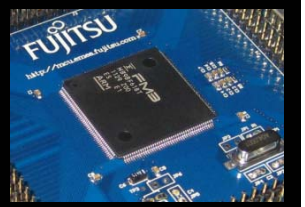
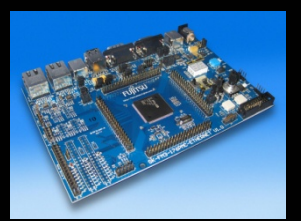
Recycling



- **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**

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